User's/Programmer's Reference

Agilent Technologies ESA Series Spectrum Analyzers

This reference documents firmware revision A.09.xx or greater.

This manual provides documentation for the following instruments:

Agilent Technologies ESA-E Series

E4401B (9 kHz- 1.5 GHz)
E4402B (9 kHz - 3.0 GHz)
E4404B (9 kHz - 6.7 GHz)
E4405B (9 kHz - 13.2 GHz)
E4407B (9 kHz - 26.5 GHz)

and

Agilent Technologies ESA-L Series

E4411B (9 kHz- 1.5 GHz)
E4403B (9 kHz - 3.0 GHz)
E4408B (9 kHz - 26.5 GHz)

Agilent Technologies

Notice

The information contained in this document is subject to change without notice.

Agilent Technologies makes no warranty of any kind with regard to this material, including but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Agilent Technologies shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

Safety Information

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

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

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

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

The instruction documentation symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the documentation.

This symbol is used to mark the on position of the power line switch.

This symbol is used to mark the standby position of the power line switch.

This symbol indicates that the input power required is AC.

WARNING	**This is a Safety Class 1 Product (provided with a protective earth ground incorporated in the power cord). The mains plug shall be inserted only in a socket outlet provided with a protected earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.**
WARNING	**No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock do not remove covers.**
WARNING	**If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.**
CAUTION	Always use the three-prong AC power cord supplied with this product. Failure to ensure adequate grounding may cause product damage.

Warranty

This Agilent Technologies instrument product is warranted against defects in material and workmanship for a period of three years from date of shipment. During the warranty period, Agilent Technologies will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by Agilent Technologies. Buyer shall prepay shipping charges to Agilent Technologies and Agilent Technologies shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to Agilent Technologies from another country.

Agilent Technologies warrants that its software and firmware designated by Agilent Technologies for use with an instrument will execute its programming instructions when properly installed on that instrument. Agilent Technologies does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error-free.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. AGILENT TECHNOLOGIES SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Should Agilent have a negotiated contract with the User and should any of the contract terms conflict with these terms, the contract terms shall control.

EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. AGILENT TECHNOLOGIES SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

Where to Find the Latest Information

Documentation is updated periodically. For the latest information about Agilent Technologies **ESA** Spectrum Analyzers, including firmware upgrades and application information, please visit the following Internet URL:

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

Microsoft® is a U.S. registered trademark of Microsoft Corp.

Bluetooth™ is a trademark owned by its proprietor and used under license.

Contents

Contents

Contents

Contents

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

List of Commands

1 Using This Document

This book provides you with descriptions and programming information for your analyzer.

Book Organization

There are many terms used throughout this book, for example "active function block," that are explained in detail in the Getting Started guide. It is recommended that you read the Getting Started guide first.

NOTE   The numeric keypad and alpha-numeric softkey fundamentals are described in the Getting Started guide.

What is in This Book

Book Organization - describes the organization of this book.

"Front-Panel Key Reference" - provides information about the front-panel and lower-level key functions of your analyzer. This information is organized alphabetically by the front-panel key name. For all functions associated with the measurements available when you press the front-panel **MEASURE** key, refer to Chapter 7, "One-Button Measurement Functions," on page 399.

"Programming Fundamentals" - provides information on SCPI, C programming language basics, and on using GPIB and RS-232.

"Status Registers" - contains a comprehensive description of status registers explaining what status registers are and how to use them. Information pertaining to all bits of the registers in Agilent ESA analyzers is also provided.

"Remote Command Reference" - contains SCPI (Standard Commands for Programmable Instruments) programming commands for the Agilent ESA spectrum analyzers. For all commands associated with the measurements available when you press the front-panel **MEASURE** key, refer to Chapter 7, "One-Button Measurement Functions," on page 399.

"Menu Maps" - illustrates the menu structure of the front-panel and lower-level keys. Refer to this chapter to identify the lower-level softkeys associated with the front-panel keys. For all menus associated with the measurements available when you press the front-panel **MEASURE** key, refer to Chapter 7, "One-Button Measurement Functions," on page 399.

"One-Button Measurement Functions"- provides menu maps and information about the front-panel and lower-level key functions of your analyzer and their associated programming commands for all measurements available when you press the front-panel **MEASURE** key. For all other analyzer functions refer to Chapter 6 , "Menu Maps," on page 373 and Chapter 2 , "Front-Panel Key Reference," on page 35.

Terms Used in This Book

The following terms are used to describe each key. Note that a key description may not use all the terms.

State Saved:. Indicates what happens to a particular function when the instrument state is saved (either to floppy disk or the internal c:\ drive). It also indicates whether the current settings of the function are maintained if the instrument is powered on or preset using **Power On Last State** or **User Preset**.

**Dependencies/
Couplings:.** Describes dependencies or interactions to other functions or settings in the analyzer.

Factory Preset:. Describes the function settings after a **Factory Preset**.

Range:. Describes the range of the smallest to largest values to which the function can be set. If you try to set a value below the minimum value, the analyzer defaults to the minimum value. If you try to set a value above the maximum value, the analyzer defaults to the maximum value.

History:. Describes the firmware revision history. *Only applies after first firmware release.*

**Remote
Command:.** Shows the syntax requirements for each SCPI command.

Example:. Provides command examples using the indicated remote command syntax.

2 Front-Panel Key Reference

The front-panel keys in this chapter are listed alphabetically and are described with their associated menu keys. The menu keys are arranged as they appear in your analyzer menus. All front-panel key information associated with the measurements available when you press the front-panel **MEASURE** key are located in Chapter 7.

AMPLITUDE Y Scale

Activates the reference level function and accesses the amplitude menu keys. Amplitude menu keys allow you to set functions that affect the way data on the vertical axis is displayed or corrected.

Ref Level

Allows the reference level to be changed. This function is activated when **AMPLITUDE Y Scale** is pressed. The reference level is the amplitude power or voltage represented by the top graticule on the display. Changing the value of the reference level changes the absolute amplitude level (in the selected amplitude units) of the top graticule line. The reference level can be changed using the step keys, the knob, or the numeric keypad. Pressing any digit (0 through 9) on the numeric keypad brings up the terminator menu.

Key Access: **AMPLITUDE / Y Scale**

Attenuation Auto Man

Sets the input attenuation to manual or automatic and allows you to set the attenuation level in 5 dB increments when **Attenuation (Man)** is selected. The analyzer input attenuator, which is normally coupled to the reference level control, reduces the power level of the analyzer input signal at the input mixer. The attenuator is recoupled when **Attenuation (Auto)** is selected. Attenuation can be changed using the step keys, the knob, or the numeric keypad. To select 0 dB, the numeric keypad must be used (except for E4401B or E4411B.)

Key Access: **AMPLITUDE / Y Scale**

CAUTION

To prevent damage to the input mixer, do not exceed a power level of +30 dBm at the input. To prevent signal compression, keep the power at the input mixer below 0 dBm. With the attenuator set to Auto, a signal at or below the reference level will result in a mixer level at or below the **Max Mixer Lvl**.

Scale/Div

Sets the logarithmic units per vertical graticule division on the display. The **Scale/Div** function is only available when the **Scale Type** key is set to **Log**. Scale/Div values may range from 0.1 to 20 dB per division With FM Demod (Option BAA) installed and **Demod View (On)** selected, the range is 1 kHz to 240 kHz/div. With Bluetooth™ FM Demodulation (Option 106) installed and **Demod View (On)** selected, the scale/division is fixed at approximately 40 kHz/division.

Key Access: **AMPLITUDE / Y Scale**

Scale Type
Log Lin

Scales the vertical graticule divisions in logarithmic units when **Log** is underlined. Logarithmic units may range from 0.1 to 20 dB per division. When **Lin** is underlined, the vertical divisions are linearly scaled and the default amplitude units are volts. The top of the display is set to the reference-level value and the bottom graticule becomes zero volts. (Each division of the graticule is one-tenth of the reference level in volts.) Pressing **Scale Type** always sets the units specified for the current amplitude scale. When **Power On** is set to **Preset** and **Preset Type** is set to **Factory**, pressing **Preset** or powering on the analyzer sets the default units. The fastest sweep time available when **Lin** is selected and the detector is set to average (**Det/Demod**, **Detector**, **Average**) is 8 milliseconds.

Key Access: **AMPLITUDE / Y Scale**

Presel Center

Agilent E4404B, E4405B, E4407B and E4408B only. Adjusts the frequency of the preselector filter (above 2.85 GHz) to optimize the amplitude accuracy at the active marker frequency. With **Input Mixer (Ext)** selected and the Mixer Type set to Presel (preselected), **Presel Center** adjusts the frequency of the external preselector filter to maximize the amplitude at the active marker frequency. If activated in a non-preselected band, **Presel Center** does nothing.

Preselector center should be used to improve amplitude accuracy for signals which fall into any one of the harmonic mixing bands. The harmonic mixing bands Frequency Ranges are:

Band	Frequency Range
1	2.85 - 6.7 GHz
2	6.2 - 13.2 GHz
3	12.8 - 19.2 GHz
4	18.7 - 26.5 GHz

Key Access: **AMPLITUDE / Y Scale**

Presel Adjust

Agilent E4404B, E4405B, E4407B and E4408B only. Allows manual adjustment of the preselector frequency to optimize its response on the signal of interest.

By changing the **Presel Adjust**, the center of the preselector filter can be moved in frequency. The signal of interest will appear to change in amplitude with the frequency response of the preselector filter.

Key Access: **AMPLITUDE / Y Scale**

Y Axis Units

Accesses the menu keys that change the amplitude units. Amplitude units are maintained for both logarithmic and linear modes. The amplitude units can be changed by pressing **dBm**, **dBmV**, **dBμV**, **dBμA**, **Watts**, **Volts**, and **Amps**. This key is unavailable when **FM Demod** and **Demod View** are on.

Key Access: **AMPLITUDE Y Scale**, **More**

Ref Lvl Offst   Adds an offset value to the displayed reference level. Reference-level offsets are only entered by using the numeric keypad. Entering an offset does not affect the trace or the attenuation value. Reference-level offsets are used when gain or loss occurs between a device under test and the analyzer input. Thus, the signal level measured by the analyzer may be referred to as the level at the input of an external amplitude-conversion device. When an amplitude offset is entered, its value appears on the left side of the display under `Offst` (as opposed to frequency offsets which appear at the bottom of the display). To eliminate an offset, press **Ref Lvl Offst**, **0**, **dB**. When **Preset Type** is set to **Factory**, pressing **Preset** also sets the offset to zero. See also the **Ext Amp Gain** key description.

Key Access: **AMPLITUDE Y Scale**, **More**

Int Preamp   *Agilent ESA-E Series only (E4401B, E4402B, E4404B, E4405B and*
On Off   *E4407B) with Option 1DS.* Turns the internal preamp on and off. Pressing **Int Preamp (On)** results in a correction being applied to compensate for the gain of the preamp so that amplitude readings show the value at the input connector. When the preamp is on, a `PA` indication appears on the left side of the display. The preamp is switched off in frequency bands above 3 GHz and the correction is not applied. In this case, the `PA` indication will still appear even though the preamp is not activated.

The preamp is specified to operate over a 1 MHz to 3 GHz range for the E4402B, E4404B, E4405B and E4407B. The preamp range for the E4401B is 100 kHz to 1.5 GHz, except for Option 1DP, which is 1 MHz to 1.5 GHz.

Key Access: **AMPLITUDE Y Scale**, **More**

Corrections   Accesses the **Corrections** menu keys which allow you to enable the corrections function and to select which set of correction factors you wish to modify.

Key Access: **AMPLITUDE Y Scale**, **More**

Apply Corrections
Yes No   Pressing **Apply Corrections (Yes)** turns on the amplitude-correction factors. Corrections will only be applied to the sets of correction factors whose correction state is set to On. To turn a set of correction factors on, use the **Correction On Off** key in the Antenna, Cable, Other, or User menus. When **Apply Corrections (Yes)** is selected, an `A` will appear on the screen annotation whether or not a correction set has been turned on using the **Correction (On)** key in the Antenna, Cable, Other, or User menus.

Key Access: **AMPLITUDE / Y Scale**, **More**, **Corrections**

Antenna   Accesses the Antenna menu of keys which allow you to correct for antenna loss, but may be used for any kind of correction.

Key Access: **AMPLITUDE / Y Scale**, **More**, **Corrections**

Correction On Off   Turns the amplitude correction function on or off for the selected set. The corrections state must be set to On for the correction to be applied.

Key Access: **AMPLITUDE / Y Scale**, **More**, **Corrections**, **Antenna**

NOTE   Antenna, Cable, and Other correction factors are generally entered as positive values. This indicates a loss in the external device. User correction factors are typically entered as negative values which indicate a gain in the external device.

Edit   Accesses menu keys that allow you to create and edit an amplitude-correction factor set. It puts the analyzer into a split-screen mode where the correction data is displayed in a table under the trace data. Pressing **ESC** while in this menu will exit the menu and remove the table from the screen. New points will be applied only after the editor is closed. The Tab keys are very useful for navigation between rows in the corrections table.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **Antenna**

Point

Allows you to create or edit an amplitude-correction factor data point. Up to 200 points may be defined for each set. Enter the point number to be created or edited by using the numeric keypad, then press **Enter**, or use the knob, tab, or step keys to move to an existing point. Press **Bk Sp** to correct errors. After selecting a point, **Frequency** becomes active.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **Antenna**, **Edit**

Frequency

Allows you to enter the frequency value for an amplitude-correction point. Enter the frequency value by using the numeric keypad. Change the frequency value by using the step keys or the knob. Press **Bk Sp** to correct errors. After selecting a point, **Amplitude** becomes active.

A frequency coordinate must always be specified for amplitude-correction factors.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **Antenna**, **Edit**

NOTE   The amplitude correction entered for the lowest frequency will be applied to all frequencies less than the lowest frequency entered. Similarly, the amplitude correction for the highest frequency entered will be applied to all frequencies greater than the highest frequency entered.

NOTE   For amplitude-correction factors, a maximum of two entries with the same frequency are valid. Only the first and last points of a series with the same frequency values are used; any middle points are ignored.

NOTE   Amplitude-correction data is sorted in the table by frequency. The sorting occurs immediately after you have entered the frequency value via the front-panel.

Amplitude

Allows you to enter the amplitude value for the current amplitude-correction point. After selecting a point, the point number automatically increments and **Frequency** becomes active to allow entry of the frequency of the next point. Press **Bk Sp** to correct errors.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **Antenna**, **Edit**

Delete Point

Allows you to delete the amplitude-correction data for the currently selected point. The prompt **I**f

you are sure, press key again to delete will appear on the display. Pressing **Delete Point** again will delete the point and adjust all of the point numbers as appropriate.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **Antenna**, **Edit**

Delete Correction Allows you to clear all data from the selected amplitude-correction set. The prompt If you are sure, press key again to delete will appear on the display. Pressing **Delete** again will delete the correction set.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **Antenna**

Cable   Allows you to correct for cable loss, but may be used for any kind of correction.

Key Access: **AMPLITUDE / Y Scale**, **More**, **Corrections**

Correction On Off Turns the amplitude correction function on or off for the selected set. The corrections state must be set to On for the correction to be applied.

Key Access: **AMPLITUDE / Y Scale**, **More**, **Corrections**, **Cable**

NOTE   Antenna, Cable, and Other correction factors are generally entered as positive values. This indicates a loss in the external device. User correction factors are typically entered as negative values which indicate a gain in the external device.

Edit   Accesses menu keys that allow you to create and edit an amplitude-correction factor set. It puts the analyzer into a split-screen mode where the correction data is displayed in a table under the trace data. Pressing **ESC** while in this menu will exit the menu and remove the table from the screen. New points will be applied only after the editor is closed. The Tab keys are very useful for navigation between rows in the corrections table.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **Cable**

Point

Allows you to create or edit an amplitude-correction factor data point. Up to 200 points may be defined for each set. Enter the point number to be created or edited by using the numeric keypad, then press **Enter**, or use the knob, tab, or step keys to move to an existing point. Press **Bk Sp** to correct errors. After selecting a point, **Frequency** becomes active.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **Cable**, **Edit**

Frequency

Allows you to enter the frequency value for an amplitude-correction point. Enter the frequency value by using the numeric keypad. Change the frequency value by using the step keys or the knob. Press **Bk Sp** to correct errors. After selecting a point, **Amplitude** becomes active.

A frequency coordinate must always be specified for amplitude-correction factors.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **Cable**, **Edit**

NOTE   The amplitude correction entered for the lowest frequency will be applied to all frequencies less than the lowest frequency entered. Similarly, the amplitude correction for the highest frequency entered will be applied to all frequencies greater than the highest frequency entered.

NOTE   For amplitude-correction factors, a maximum of two entries with the same frequency are valid. Only the first and last points of a series with the same frequency values are used; any middle points are ignored.

NOTE   Amplitude-correction data is sorted in the table by frequency. The sorting occurs immediately after you have entered the frequency value via the front-panel.

Amplitude

Allows you to enter the amplitude value for the current amplitude-correction point. After selecting a point, the point number automatically increments and **Frequency** becomes active to allow entry of the frequency of the next point. Press **Bk Sp** to correct errors.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **Cable**, **Edit**

Delete Point

Allows you to delete the amplitude-correction data for the currently selected point. The prompt `If you are sure, press key again to delete` will appear on the display. Pressing **Delete Point** again will delete the point and adjust all of the point numbers as appropriate.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **Cable**, **Edit**

Delete Correction Allows you to clear all data from the selected amplitude-correction set. The prompt `If you are sure, press key again to delete` will appear on the display. Pressing **Delete** again will delete the correction set.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **Cable**

Other Allows you to correct for gain or loss other than for antenna, cable, or user.

Key Access: **AMPLITUDE / Y Scale**, **More**, **Corrections**

Correction On Off Turns the amplitude correction function on or off for the selected set. The corrections state must be set to On for the correction to be applied.

Key Access: Amplitude Y Scale, More, Corrections, Other

NOTE   Antenna, Cable, and Other correction factors are generally entered as positive values. This indicates a loss in the external device. User correction factors are typically entered as negative values which indicate a gain in the external device.

Edit   Accesses menu keys that allow you to create and edit an amplitude-correction factor set. It puts the analyzer into a split-screen mode where the correction data is displayed in a table under the trace data. Pressing **ESC** while in this menu will exit the menu and remove the table from the screen. New points will be applied only after the editor is closed. The Tab keys are very useful for navigation between rows in the corrections table.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **Other**

Point

Allows you to create or edit an amplitude-correction factor data point. Up to 200 points may be defined for each set. Enter the point number to be created or edited by using the numeric keypad, then press **Enter**, or use the knob, tab, or step keys to move to an existing point. Press **Bk Sp** to correct errors. After selecting a point, **Frequency** becomes active.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **Other**, **Edit**

Frequency

Allows you to enter the frequency value for an amplitude-correction point. Enter the frequency value by using the numeric keypad. Change the frequency value by using the step keys or the knob. Press **Bk Sp** to correct errors. After selecting a point, **Amplitude** becomes active.

A frequency coordinate must always be specified for amplitude-correction factors.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **Other**, **Edit**

NOTE   The amplitude correction entered for the lowest frequency will be applied to all frequencies less than the lowest frequency entered. Similarly, the amplitude correction for the highest frequency entered will be applied to all frequencies greater than the highest frequency entered.

NOTE   For amplitude-correction factors, a maximum of two entries with the same frequency are valid. Only the first and last points of a series with the same frequency values are used; any middle points are ignored.

NOTE   Amplitude-correction data is sorted in the table by frequency. The sorting occurs immediately after you have entered the frequency value via the front-panel.

Amplitude

Allows you to enter the amplitude value for the current amplitude-correction point. After selecting a point, the point number automatically increments and **Frequency** becomes active to allow entry of the frequency of the next point. Press **Bk Sp** to correct errors.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **Other**, **Edit**

Delete Point

Allows you to delete the amplitude-correction data for the currently selected point. The prompt `If you are sure, press key again to delete` will appear on the display. Pressing **Delete Point** again will delete the point and adjust all of the point numbers as appropriate.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **Other**, **Edit**

Delete Correction Allows you to clear all data from the selected amplitude-correction set. The prompt `If you are sure, press key again to delete` will appear on the display. Pressing **Delete** again will delete the correction set.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **Other**

User   Allows you to correct for gain or loss and may be used for any type of correction.

Key Access: **AMPLITUDE / Y Scale**, **More**, **Corrections**

Correction On Off   Turns the amplitude correction function on or off for the selected set. The corrections state must be set to On for the correction to be applied.

Key Access: **AMPLITUDE / Y Scale**, **More**, **Corrections**, **User**

NOTE	Antenna, Cable, and Other correction factors are generally entered as positive values. This indicates a loss in the external device. User correction factors are typically entered as negative values which indicate a gain in the external device.

Edit   Accesses menu keys that allow you to create and edit an amplitude-correction factor set. It puts the analyzer into a split-screen mode where the correction data is displayed in a table under the trace data. Pressing **ESC** while in this menu will exit the menu and remove the table from the screen. New points will be applied only after the editor is closed. The Tab keys are very useful for navigation between rows in the corrections table.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **User**

Point

Allows you to create or edit an amplitude-correction factor data point. Up to 200 points may be defined for each set. Enter the point number to be created or edited by using the numeric keypad, then press **Enter**, or use the knob, tab, or step keys to move to an existing point. Press **Bk Sp** to correct errors. After selecting a point, **Frequency** becomes active.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **User**, **Edit**

Frequency

Allows you to enter the frequency value for an amplitude-correction point. Enter the frequency value by using the numeric keypad. Change the frequency value by using the step keys or the knob. Press **Bk Sp** to correct errors. After selecting a point, **Amplitude** becomes active.

A frequency coordinate must always be specified for amplitude-correction factors.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **User**, **Edit**

NOTE   The amplitude correction entered for the lowest frequency will be applied to all frequencies less than the lowest frequency entered. Similarly, the amplitude correction for the highest frequency entered will be applied to all frequencies greater than the highest frequency entered.

NOTE   For amplitude-correction factors, a maximum of two entries with the same frequency are valid. Only the first and last points of a series with the same frequency values are used; any middle points are ignored.

NOTE   Amplitude-correction data is sorted in the table by frequency. The sorting occurs immediately after you have entered the frequency value via the front-panel.

Amplitude

Allows you to enter the amplitude value for the current amplitude-correction point. After selecting a point, the point number automatically increments and **Frequency** becomes active to allow entry of the frequency of the next point. Press **Bk Sp** to correct errors.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **User**, **Edit**

Delete Point

Allows you to delete the amplitude-correction data for the currently selected point. The prompt `If you are sure, press key again to delete` will appear on the display. Pressing **Delete Point** again will delete the point and adjust all of the point numbers as appropriate.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **User**, **Edit**

Delete Correction Allows you to clear all data from the selected amplitude-correction set. The prompt `If you are sure, press key again to delete` will appear on the display. Pressing **Delete** again will delete the correction set.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **User**

Freq Interp
Log Lin Allows you to determine how trace values are computed between points in a correction table. If the linear mode is selected, a straight line is used between points in a correction table. If the logarithmic mode is selected, frequency values between points are computed by first taking the logarithm of both table values and the intermediate value.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **More**

Delete all Corrections Allows you to delete all amplitude-correction sets.

Key Access: **AMPLITUDE Y Scale**, **More**, **Corrections**, **More**

Ext Amp Gain Adds a positive or negative preamplifier gain value, which is subtracted from the displayed signal. (Use negative values for gain and positive values for loss.) The function is similar to the **Ref Lvl Offset** function, however with the **Ext Amp Gain** function, the attenuation may be changed depending on the preamplifier gain entered. A preamplifier gain offset is used for measurements that require an external preamplifier or long cables. The offset is subtracted from the amplitude readout so that the displayed signal level represents the signal level at the input of the preamplifier. The preamplifier gain offset is displayed at the top of the screen and is removed by entering zero. The preamplifier gain offset can only be entered using the numeric keypad. The preamplifier gain value is not affected by an instrument preset or a power cycle.

Key Access: **AMPLITUDE Y Scale**, **More**

Max Mixer Lvl   Allows you to change the maximum input mixer level from 10 dBm to –100 dBm in 10 dB steps using the step keys, and 1 dB steps using the knob. In addition, you may use the keypad to specify a value. The mixer level is equal to the reference level minus the attenuator setting. As the reference level changes, the input attenuator setting is changed to keep the power levels of on-screen signals less than the selected level at the input mixer. When **Preset Type** is set to **Factory**, pressing **Preset** resets the maximum input mixer level to –10 dBm.

Key Access: **AMPLITUDE Y Scale**, **More**

IF Gain
Auto Fixed   When using digital resolution bandwidths (RBW < 1 kHz), the analyzer uses IF Gain autoranging to set the optimum signal gain for digital processing. This technique produces the maximum measurement range without overloading the digital system. To increase measurement speed, select **IF Gain (Fixed)**. This setting decreases the display range to 70 dB, so you may have to adjust the reference level to ensure complete view of the signal.

Key Access: **Amplitude**, **More**, **More**

Auto Couple

Accesses the menus to couple functions in your analyzer. Coupled functions are functions that are linked.

Auto All
Auto-couples all coupled functions. If **Auto All** is pressed all coupled functions are set to **Auto**.

NOTE
This function is not available when the segmented sweep function is set to On, **(Segmented (On))**.

Coupled functions are functions that are linked. If one function is changed, the coupled function is changed. During normal operation, the sweep time, resolution bandwidth, video bandwidth, and center frequency step are coupled to span; the input attenuation is coupled to the reference level.

If any of these functions become uncoupled (is set to manual), a # sign appears next to the screen annotation representing the function on the screen. If one or more functions are manually set so that the amplitude or frequency becomes uncalibrated "Meas Uncal" appears on the top right side of the graticule.

To recouple the analyzer functions, the uncoupled function(s) must be individually set back to Auto. Or, you can press **Auto All** to return all of the functions to their default auto state. Pressing **Auto All** will couple the following functions:

- Sweep time will couple to the span, detector mode, resolution bandwidth, and video bandwidth.

- **Detector (Auto)** is set.

- **Avg Type (Auto)** is set.

- **PHNoise Opt (Auto)** is set.

- RF attenuation couples to reference level.

- Center frequency step size will couple to 10% of span.

- Sweep coupling (SR/SA) will couple back to SA mode.

- Source attenuation couples to source amplitude.

- Source power step couples to one vertical scale division.

Key Access: **Auto Couple**

NOTE
Although **Marker Count**, **Gate Time**, and **Marker Trace** have **Auto** settings, they are not affected by **Auto All**.

PhNoise Opt Auto Man	Chooses the LO (local oscillator) phase noise behavior that is optimum for measurement accuracy.

Key Access: Auto Couple

Auto   Allows the analyzer to automatically select an LO phase noise behavior that is optimum for the selected span and RBW. The **Auto** rules choose **Fast Tuning** whenever the span is >10 MHz otherwise the **Auto** rules choose **Optimize £(f)**.

Key Access: **Auto Couple, PhNoise Opt Auto Man**

Optimize £(f)   Optimizes for LO phase noise.

Key Access: **Auto Couple, PhNoise Opt Auto Man**

Optimize LO for Fast Tuning The LO behavior compromises phase noise within approximately 10 MHz of the carrier. This allows rapid measurement throughput when changing the center frequency or span.

Key Access: **Auto Couple, PhNoise Opt Auto Man**

Detector Auto Man Selects a specific detector, or in **Auto**, picks the appropriate detector for a particular measurement.

When discussing detectors, it is important to understand the concept of a trace "bucket." For every trace point displayed, there is a finite time during which the data for that point is collected. The analyzer has the ability to look at all of the data collected during that time and present a single point of trace data based on the detector mode. We call the interval during which the data for that trace point is being collected, the "bucket." Thus a trace is more than a series of single points. It is actually a series of trace "buckets." The data may be sampled many times within each bucket.

Selecting **Detector (Auto)** and **BW/Avg, Average (On)** changes the detector. The **Auto** choice depends on marker functions, trace functions, and the trace averaging function. If a marker function or measurement is running, the **Auto** choice of detector is either **Average** or **Sample**. When one of the detectors (such as **Average**) is manually selected instead of **Auto**, that detector is used regardless of other analyzer settings.

The **Average** detector displays the average of the signal within the bucket. The averaging method depends upon **Avg Type** selection (Video or RMS). When the **Average** detector is selected and the amplitude scale is linear, the fastest sweet time is 8 milliseconds.

The **Peak** detector displays the maximum of the signal within the bucket.

The **Sample** detector displays the instantaneous level of the signal at the time of the sampling.

The **Negative Peak** detector displays the minimum of the signal within the bucket.

Neither average nor sample detectors measure amplitudes of CW signals as accurately as peak, because they may not find a spectral component's true peak, but they do measure noise without the biases of peak detection.

The detector in use is indicated on the left side of the display. A # will appear next to it if the detector has been manually selected.

Key Access: **Auto Couple**

Auto   The system selects peak detection as the default, but if a condition arises where a different type of detection scheme provides greater accuracy, the system will use the alternate scheme. For example, when using the Marker Noise function, Auto mode selects Average detection for Res BWs > 300 Hz and Sample for Res BWs ≤ 300 Hz as shown in Figure 2-1.

Key Access: **Auto Couple, Detector Auto Man**

Figure 2-1 Detector (Auto) Selection Flowchart
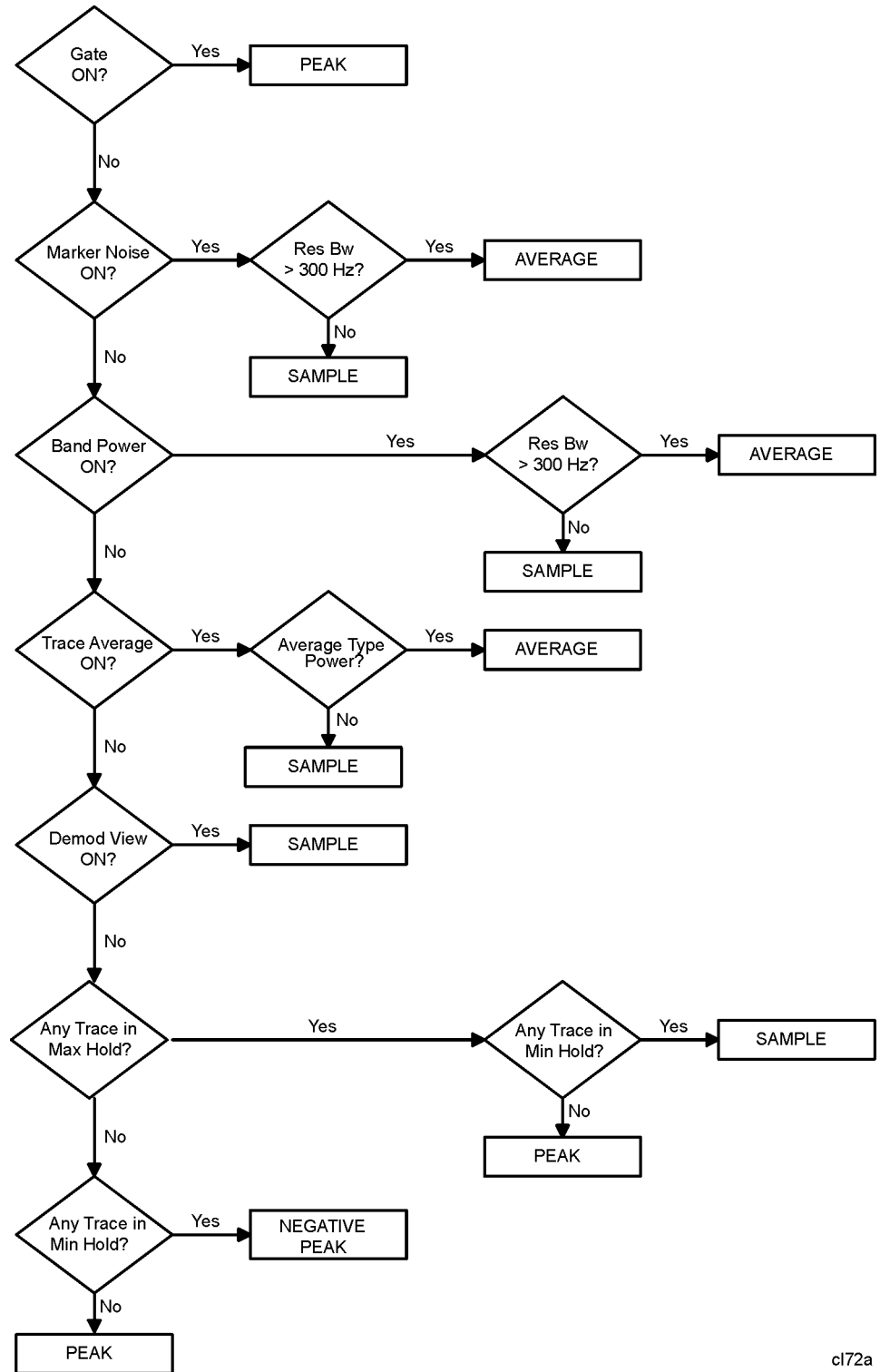
cl72a

Average   Allows you to select between video and power (RMS) averaging, via the **Average Type** key.

Average detection is used when measuring the average value of the amplitude across each trace interval (bucket). The averaging method used by the Average detector will be set to either Video or Power as appropriate when the Average Type is Auto coupled or may be set explicitly through the **BW/Avg**, **Avg Type Auto Man** key.

Video Average detection computes the averaged trace interval as appropriate to the Y-axis scale:

- Log-power average when in log scale.
- Voltage average when in linear scale.
- Frequency deviation when Demod View is enabled for FM Demod.

Power Average ("root mean square" or RMS) detection computes the RMS of the samples collected across the trace interval. The number of samples included in the RMS average for each trace interval depends on the sweep time, the resolution bandwidth, and whether or not option B7D is installed. With option B7D installed, more samples are available as appropriate for wider resolution bandwidths and faster sweep times. Slower sweep times also increase the number of samples averaged for each trace interval.

When **Average** is selected, Avg appears on the left side of the display.

NOTE   When the **Average** detector is selected in linear amplitude scale mode, the fastest sweet time is 8 milliseconds.

Key Access: **Auto Couple, Detector Auto Man**

Peak   Peak detection is used primarily when measuring sinusoidal (spectral) components. Peak detection obtains the maximum video signal value between the last display point and the present display point and stores this value in memory. When **Preset Type** is set to **Factory**, peak detection is selected at power on and by pressing **Preset**. When **Peak** detection is selected, Peak appears in the upper-left corner of the display.

Key Access: **Auto Couple, Detector Auto Man**

Sample   Sample detection is used primarily to display noise or noise-like signals. This detection should not be used to make the most accurate amplitude measurement of non noise-like signals. In sample mode, the instantaneous signal value at the present display point is placed in memory. When **Sample** detection is selected, Samp

appears in the upper-left corner of the display.

Key Access: **Auto Couple, Detector Auto Man**

Negative Peak   Negative peak detection functions the same as peak
detection, but selects the minimum video signal value.
This detection should not be used to make the most
accurate amplitude measurements of signals. When
Negative Peak is selected, NPeak appears in the
upper-left corner of the screen.

Key Access: **Auto Couple, Detector Auto Man**

Avg Type   Accesses the functions to automatically or manually choose from one of
Auto Man   the following averaging scales: Video or Power (RMS).

NOTE   If video averaging is selected, the measurement results are the average
of the signal level in the y-axis scale. If the power average (RMS) is
selected, all measured results are converted into power units before
averaging and filtering operations, and converted back to decibels for
displaying. The main point to remember is that there can be significant
differences between the average of the log of power and the log of the
average power.

There are actually four types of averaging processes within a spectrum
analyzer. All, except VBW filtering, are affected by this setting. They
are:

- Trace averaging (see **BW/Avg**, **Average (On)**).

  Averages signal amplitudes on a trace-to-trace basis. (The type of
  averaging (Video or Power (RMS)) is selected by pressing **BW/Avg**,
  Avg Type.)

- Average detector (see **Det/Demod**, **Detector**, **Average (Video/RMS)**).

  Averages signal amplitudes during the time or frequency interval
  represented by a particular measurement point. The method is
  determined by selection of either Video or RMS.

- Noise Marker (see **Marker**, **Noise**)

  Averages signal amplitudes across measurement points to reduce
  variations for noisy signals.

- VBW filtering.

  Filtering the video is a form of averaging the video signal.

When trace average is on (**BW/Avg**, **Average (On)**, the Average Type is
shown on the left side of the display. When **Avg Type (Auto)** is selected,
the analyzer chooses the type of averaging to be used as shown in
Figure 2-2. When one of the average types is selected manually, the

analyzer uses that type without regard to the other analyzer settings and sets **Avg Type** to **Man**.

Figure 2-2   **Auto Rules for Average Type**
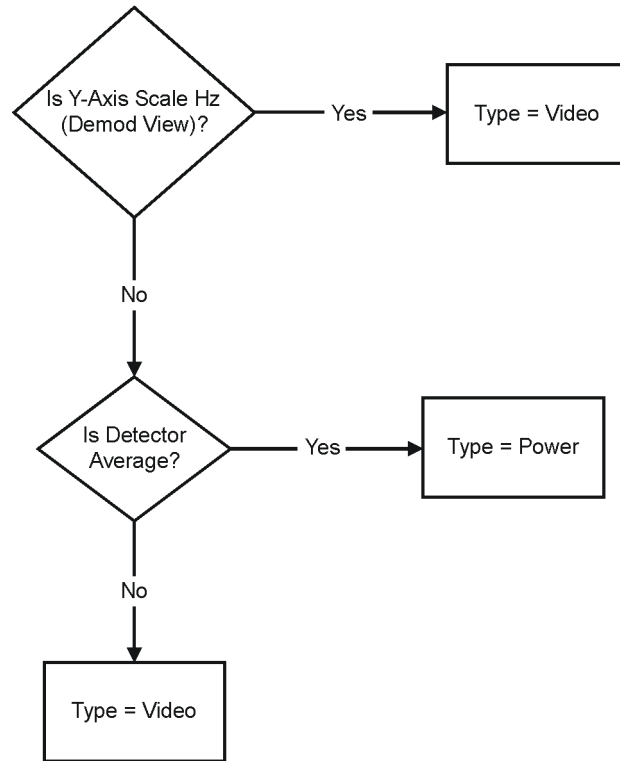
cl79a

Key Access: **Auto Couple**

Video Avg   Video averaging averages the data as appropriate for the y-axis scale. When **Avg Type**, **Video Avg** is selected, `VAvg` appears on the left side of the analyzer display if **Average** is On.

Key Access: **Auto Couple**, **Avg Type**

Pwr Avg   Power averaging is performed by converting the trace data from logarithmic to linear power units, and then averaging the power trace data. When **Avg Type**, **Pwr Avg** is selected, `PAvg` appears on the left side of the analyzer display if **Average** is On.

Key Access: **Auto Couple**, **Avg Type**

Bk Sp (Backspace)

The backspace key is located on the front panel and is used to change or correct an active function entry or a text entry before you save to a file.

BW/Avg

Activates the resolution bandwidth function and accesses the menu keys that control the bandwidth functions and averaging.

**Res BW
Auto Man**

Changes the 3 dB resolution bandwidth on the analyzer from 1 kHz to 5 MHz in a 1, 3, 10 sequence using the knob or step keys. If an unavailable bandwidth is entered using the numeric keypad, the closest available bandwidth in the 1, 3, 10 sequence is used. (Option 1DR provides additional 300 Hz, 200 Hz, 100 Hz, 30 Hz and 10 Hz bandwidths. For firmware revision A.08.00 and later, the bandwidth range is from 1 Hz to 5 MHz if you have both Options 1D5 and 1DR.) As the resolution bandwidth is decreased, the sweep time is modified to maintain amplitude calibration. Resolution bandwidth is also related to span. As span is decreased, the resolution bandwidth is decreased. As the resolution bandwidth changes, the video bandwidth, if in auto couple mode, changes to maintain the VBW/RBW ratio.

NOTE

With firmware A.08.00 and greater, in zero span, the auto/manual function of this key is not applicable. When **Res BW (Auto)** is selected in non-zero span, any changes to Res BW while in zero span will revert to the Auto value when you return to non-zero span. When **Res BW (Man)** is selected in non-zero span, any changes to Res BW while in zero span will be maintained when you return to non-zero span.

A "#" mark appears next to Res BW on the display when it is not coupled. To recouple the resolution bandwidth, press **Res BW (Auto)** (or press **Auto Couple, Auto All**). The resolution bandwidth can be changed using the step keys, the knob, or the numeric keypad.

Key Access: **BW/Avg**

**Video BW
Auto Man**

Changes the analyzer post-detection filter from 30 Hz to 3 MHz in a 1, 3, 10 sequence using the knob, step keys, or the numeric keypad. If an unavailable bandwidth is entered using the numeric keypad, the closest available bandwidth in the 1, 3, 10 sequence is used. (Option 1DR provides additional 1 Hz, 3 Hz and 10 Hz video bandwidths when the resolution bandwidth is ≤ 300 Hz.)

As the video bandwidth is decreased, the sweep time is increased to maintain amplitude calibration. A "#" mark appears next to VBW on the bottom of the analyzer display when it is not coupled. To couple the video bandwidth, press **Video BW (Auto)** (or press **Auto All**).

Key Access: **BW/Avg**

**VBW/RBW
Auto Man**
Selects the ratio between the video and resolution bandwidths. If signal responses near the noise level are visually masked by the noise, the ratio can be set to less than 1 to lower the noise. The knob and step keys change the ratio in a 1, 3, 10 sequence. When **Preset Type** is set to **Factory** and **Preset** is pressed or **Auto Couple**, **Auto All** have been selected, the ratio is set to 1.000 X. The ratio can be changed using the step keys, knob, or numeric keypad. When **VBW/RBW (Auto)** is selected, the ratio is determined by the rules in Figure 2-3.

Figure 2-3   VBW/RBW Ratio Auto Rules
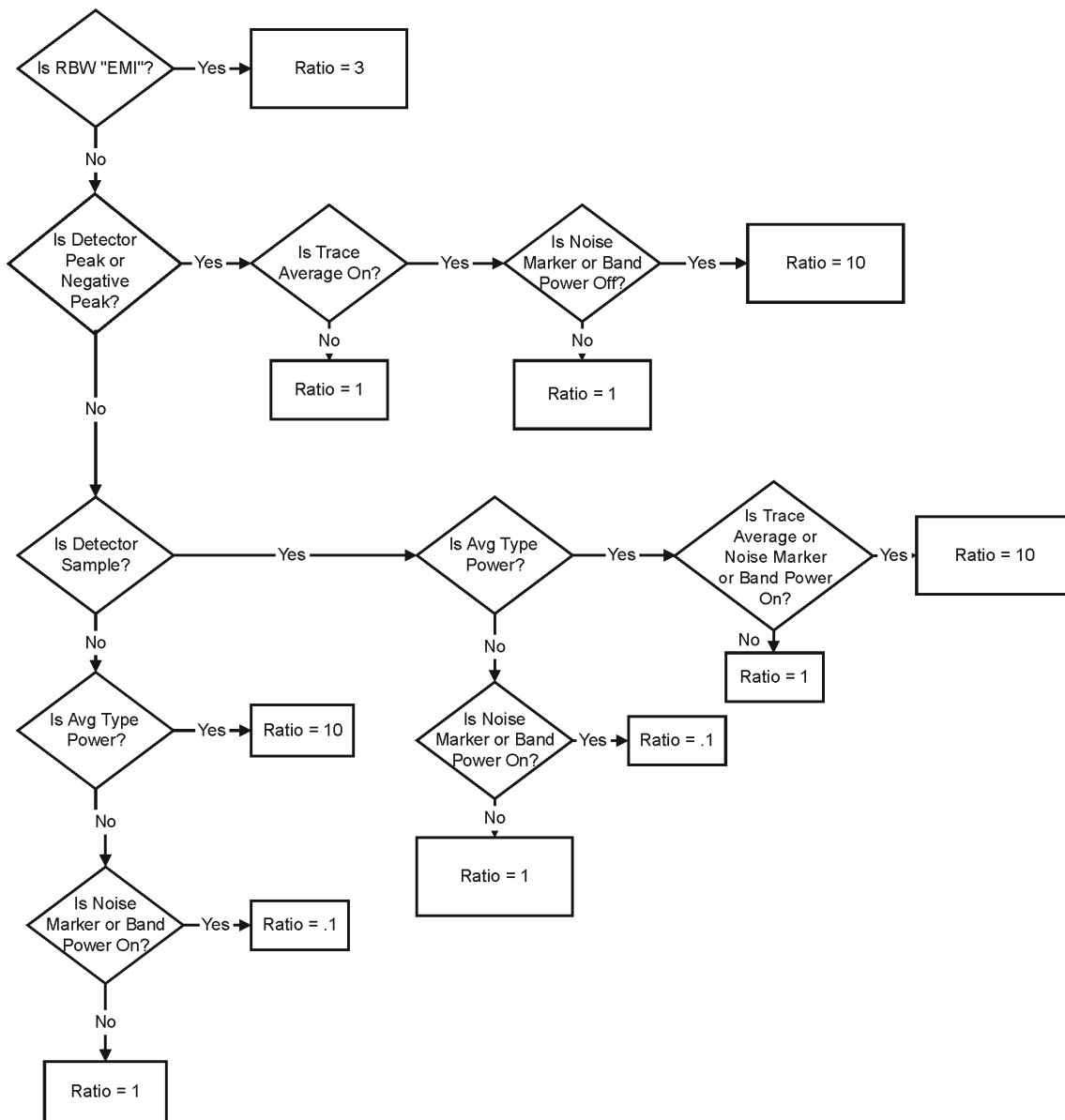
cl710a

Key Access: **BW/Avg**

**Average
On Off**

Initiates a digital averaging routine that averages the trace points in a number of successive sweeps resulting in trace "smoothing". The number of sweeps (average number) can be selected. Increasing the average number will further smooth the trace. The type of averaging used is selected by pressing **BW/Avg, Avg Type**.

The average is restarted when any of the following occurs:

- a new average number is entered.
- any measurement related parameter (e.g., Center Frequency) is changed.
- **Restart** is pressed.
- **Single Sweep** is pressed.

When in Single Sweep, the specified number of averages is taken, then the sweep stops. When in continuous sweep, the specified number of averages is taken, then the averaging continues with each new sweep averaged in with a weight of $\dfrac{1}{\text{Average Number}}$ and the old average reduced

by multiplying it by $\left(\text{Average Number} - \dfrac{1}{\text{Average Number}} \right)$.

To turn off averaging, press **Average (Off)**. The number of sweeps can only be entered using the numeric keypad, not the knob or step keys.

Key Access: **BW/Avg**

**Avg Type
Auto Man**

Accesses the functions to automatically or manually choose from one of the following averaging scales: Video or Power (RMS).

NOTE

If video averaging is selected, the measurement results are the average of the signal level in the y-axis scale. If the power average (RMS) is selected, all measured results are converted into power units before averaging and filtering operations, and converted back to decibels for displaying. The main point to remember is that there can be significant differences between the average of the log of power and the log of the average power.

There are actually four types of averaging processes within a spectrum analyzer. All, except VBW filtering, are affected by this setting. They are:

- Trace averaging (see **BW/Avg**).

  Averages signal amplitudes on a trace-to-trace basis. (Press Video or Power (RMS) when **Avg Type (Man)** is selected.)

- Average detector (see **Detector**, **Average**).

  Averages signal amplitudes during the time or frequency interval represented by a particular measurement point.

- Noise Marker (see **Marker**, **Noise**)

Averages signal amplitudes across measurement points to reduce variations for noisy signals.

- VBW filtering.

  Filtering the video is a form of averaging the video signal.

When trace average is on (**BW/Avg**, **Average (On)**, the Average Type is shown on the left side of the display. When **Avg Type (Auto)** is selected, the analyzer chooses the type of averaging to be used as shown in Figure 2-2 on page 56. When one of the average types is selected manually, the analyzer uses that type without regard to the other analyzer settings and sets **Avg Type** to **Man**.

Key Access: **BW/Avg**

Video Avg   Video averaging averages the data as appropriate for the y-axis scale. When **Avg Type**, **Video Avg** is selected, `VAvg` appears on the left side of the analyzer display if **Average** is On.

Key Access: **BW/Avg**, **Avg Type**

Pwr Avg   Power averaging is performed by converting the trace data from logarithmic to linear power units, and then averaging the power trace data. When **Avg Type**, **Pwr Avg** is selected, `PAvg` appears on the left side of the analyzer display if **Average** is On.

Key Access: **BW/Avg**, **Avg Type**

EMI Res BW   Accesses the **EMI Res BW** menu keys and allows you to choose between 6 dB bandwidths of **120 kHz**, **9 kHz** and **200 Hz**. The 200 Hz bandwidth is only available if Option 1DR (narrow resolution bandwidth) is installed and the span is less than 5 MHz. (*Option 1DR is available with Agilent ESA-E Series only (E4401B, E4402B, E4404B, E4405B and E4407B.)*)

This function is set to **None** when the resolution bandwidth is set to any other value using the **Resolution BW** key.

Key Access: **BW/Avg**

Det/Demod

Accesses the menu keys controlling detector functions, demodulation functions, if an FM Demod Option is installed (Option BAA or Option 106), and the speaker.

NOTE   The FM Demod internal circuitry must be aligned before use. Press **System**, **Alignments**, **Align Now**, **FM Demod**.

Detector Auto Man   Selects a specific detector, or uses the system to pick the appropriate detector (through **Auto**) for a particular measurement.

When discussing detectors, it is important to understand the concept of a trace "bucket." For every trace point displayed, there is a finite time during which the data for that point is collected. The analyzer has the ability to look at all of the data collected during that time and present a single point of trace data based on the detector mode. We call the interval during which the data for that trace point is being collected, the "bucket." Thus a trace is more than a series of single points. It is actually a series of trace "buckets." The data may be sampled many times within each bucket.

When the detector choice is **Auto**, selecting trace averaging (**BW/Avg**, **Average (On)**) changes the detector. The **Auto** choice depends on marker functions, trace functions, and the trace averaging function. If a marker function or measurement is running, the **Auto** choice of detector is either **Average** or **Sample**. When one of the detectors (such as **Average**) is manually selected instead of **Auto**, that detector is used without regard to other analyzer settings.

The **Average** detector displays the average of the signal within the bucket. The averaging method depends upon **Avg Type** selection (Video or RMS).

The **Sample** detector displays the instantaneous level of the signal at the center of the bucket represented by each display point.

The **Peak** detector displays the maximum of the signal within the bucket.

The **Negative Peak** detector displays the minimum of the signal within the bucket.

Neither average nor sample detectors measure amplitudes of CW signals as accurately as peak, because they may not find a spectral component's true peak, but they do measure noise without the biases of peak detection.

The detector in use is indicated on the left side of the display. A # will appear next to it if the detector has been manually selected.

Key Access: **Det/Demod**

Auto　　　　　The system selects peak detection as the default, but if a condition arises where a different type of detection scheme should be better utilized, the system will use the alternate scheme. For example, the Marker Noise function uses Average detection when in Auto mode because the system determines that the data will be more accurate for noise-type signals. Refer to Figure 2-1 on page 53 for more information.

Key Access: **Det/Demod, Detector Auto Man**

Average　　　　Average detection is used when measuring the average value of the amplitude across each trace interval (bucket). The averaging method used by the Average detector will be set to either Video or Power as appropriate when the Average Type is Auto coupled or may be set explicitly through the **BW/Avg**, **Avg Type Auto Man** key.

Video Average detection computes the averaged trace interval as appropriate to the Y-axis scale:

- Log-power average when in log scale.
- Voltage average when in linear scale.
- Frequency deviation when Demod View is enabled for FM Demod.

Power Average ("root mean square" or RMS) detection computes the RMS of the samples collected across the trace interval. The number of samples included in the RMS average for each trace interval depends on the sweep time, the resolution bandwidth, and whether or not option B7D is installed. With option B7D installed, more samples are available as appropriate for wider resolution bandwidths and faster sweep times. Slower sweep times also increase the number of samples averaged for each trace interval.

When **Average** is selected, Avg appears on the left side of the display.

NOTE　　　　When the **Average** detector is selected and the amplitude scale is linear, the fastest sweet time is 8 milliseconds.

Key Access: **Det/Demod, Detector Auto Man**

Peak　　　　　Peak detection is used primarily when measuring

sinusoidal (spectral) components. Peak detection obtains the maximum video signal value between the last display point and the present display point and stores this value in memory. Peak detection is selected at power on and by pressing **Preset** when **Preset Type** is set to **Factory** and **Power On** is set to **Preset**. When **Peak** detection is selected, `Peak` appears in the upper-left corner of the display.

Key Access: **Det/Demod, Detector Auto Man**

Sample   Sample detection is used primarily to display noise or noise-like signals. This detection should not be used to make the most accurate amplitude measurement of non noise-like signals. In sample mode, the instantaneous signal value at the present display point is placed in memory. When **Sample** detection is selected, `Samp` appears in the upper-left corner of the display.

Key Access: **Det/Demod, Detector Auto Man**

Negative Peak   Negative peak detection functions the same as peak detection, but selects the minimum video signal value. This detection should not be used to make the most accurate amplitude measurements of signals. When **Negative Peak** is selected, `NPk` appears in the upper-left corner of the screen.

Key Access: **Det/Demod, Detector Auto Man**

Demod   Accesses the menu keys to select **AM** demodulation, **FM** demodulation or demodulation **Off**. It also accesses the **Demod View On Off**, **Speaker On Off,** and **Demod Time** menu keys described below.

Key Access: **Det/Demod**

NOTE   The **FM** menu key only appears when the FM demod option (Option BAA) or Bluetooth™ FM Demodulation (Option 106) is installed. The two options are available on *Agilent ESA-E Series spectrum analyzers only (E4401B, E4402B, E4404B, E4405B and E4407B).*

NOTE   Segmented sweep is not available with the demodulation functions in this section.

Off   Turns demodulation off.

Key Access: **Det/Demod**, **Demod**

AM   Activating AM demodulation turns off FM demodulation (if it is on). For non-zero spans, a 10 kHz resolution bandwidth is used during demodulation, regardless of the screen annotation.

Key Access: **Det/Demod**, **Demod**

FM Turning FM demodulation on turns off AM demodulation (if it is on). For non-zero spans, a 100 kHz resolution bandwidth is used during the demodulation, regardless of the screen annotation. When the span is set to zero span, the displayed bandwidth is used. For best results, move the signal to be demodulated to within 3 graticules of the top of the display.

Key Access: **Det/Demod**, **Demod**

**Demod View
On Off** When **Demod View (On)** is pressed, the vertical scaling of the display is in frequency, and marker will read out the FM deviation in kHz. When Demod View is On, the following functions are not available: Log/Lin (the display is always linear and calibrated in Hz), Y Axis Units, Normalize, Display Line, Peak Excursion, and Peak Threshold. In AM Demod, pressing **Demod View (On)** has no effect. The Bluetooth™ FM Demod (Option 106) has a fixed vertical scale of approximately 40 kHz/Div.

Key Access: **Det/Demod**, **Demod**

**Speaker
On Off** Turns the internal speaker on and off. The volume from the speaker is controlled by the front-panel volume control knob. Selecting AM or FM turns the speaker on. Turning AM or FM off, pressing **Preset** when **Preset Type** is set to **Factory**, or cycling the power sets the speaker function to off.

Key Access: **Det/Demod**, **Demod**

Demod Time Allows you to set the time, in non-zero spans, to pause and demodulate the signal after each sweep. The demodulated signal can be heard during demodulation when in **Speaker (On)** mode. (In zero span, demodulation is performed (and can be heard) throughout the sweep.) In AM, the Video BW is set to 3 kHz and the Resolution BW is set to 10 kHz. In FM, the Video BW is set to 30 kHz and the Resolution BW is set to 100 kHz.

When AM or FM Demod is enabled, the instrument will tune to the marker frequency and wait for the Demod to take place. For long Demod times, pressing **Preset** when **Preset Type** is set to **Factory** will abort the Demod function. The default value is 500 ms.

Key Access: **Det/Demod**, **Demod**

NOTE

It is normal to hear clicking sounds when the Auto Alignment function is On. During retrace, a small portion of the analyzer circuitry is realigned. Some of the switching of the analyzer circuitry is done using relays. It is the rapid switching of these relays during retrace that causes the clicking sounds. To eliminate the clicking sounds, turn the auto alignment off by pressing **System**, **Alignments**, **Auto Align**, **Off**. When this is done, the **Align Now**, **All** function should be performed periodically. Refer to the Specifications Guide for your instrument to learn more information on how often to perform **Align Now**, **All** when the auto alignment is off.

Display

Accesses menu keys that allow you to control what is displayed on the analyzer, including titles, the display line, graticule and annotation, as well as the testing of trace data against user entered limits.

Full Screen   Allows the measurement window to expand horizontally over the entire instrument display. Pressing a key that brings up a new menu will cancel the full screen function.

Key Access: **Display**

**Display Line
On Off**   Activates an adjustable horizontal line that is used as a visual reference line. The line, which can be used for trace arithmetic, has amplitude values that correspond to its vertical position when compared to the reference level. The value of the display line appears in the active function block and on the left side of the display. The display line can be adjusted using the step keys, knob, or numeric keypad. Pressing any digit, 0 through 9, on the numeric keypad brings up the selected terminator menu. To deactivate the display line, press **Display Line (Off)**.

Key Access: **Display**

Limits   Accesses menu keys that allow you to create and define the parameters of limit lines.

Key Access: **Display**

**Limit 1
Limit 2**   Allows you to select either of the two available limits. The **Limit 1** and **Limit 2** keys access menu keys that allow you to set parameters for the selected limit.

Key Access: **Display**, **Limits**

**Type
Upper Lower**   Allows you to define the limit you are editing as either an upper or lower limit. An upper limit fails if the trace exceeds the limit. A lower limit fails if the trace falls below the limit.

Key Access: **Display**, **Limits**, **Limit 1** or **Limit 2**

Limit On Off   Turns the limit line display on and off. Either **Limit** or **Margin**, as well as **Test**, must be turned on for a limit test to work.

Key Access: **Display**, **Limits**, **Limit 1** or **Limit 2**

**Test
On Off**

Turns the testing of the limit lines on and off. If the trace is at or within the bounds of the set limit or margin, PASS LIMIT # or PASS MARGIN # is displayed in green in the upper left corner of the measurement area where # is the number of the selected limit line. (Colored annotation appears only with a color display.) Only positive margins are allowed for lower limits and only negative margins are allowed for upper limits. If the trace is out of the limit or margin boundaries, FAIL LIMIT # or FAIL MARGIN # is displayed in red. The results for Limit 2 are displayed below those for Limit 1. Either **Limit** or **Margin** must be turned on for **Test** to work.

Key Access: **Display**, **Limits**, **Limit 1** or **Limit 2**

**Margin
On Off**

Margin (Off) turns the margin off. **Margin (On)** allows you to set a limit line offset for the selected limit line. Either **Limit** or **Margin** as well as **Test**, must be turned on for a limit test to work.

Key Access: **Display**, **Limits**, **Limit 1** or **Limit 2**

Edit

Accesses the **Edit** menu keys which include **Point**, **Frequency** (or **Time** if **Display, Limits, X Axis Units (Time)** has been selected), **Amplitude**, **Connected to Previous Pt**, and **Delete Point**. **Edit** also accesses the limits table. The Tab keys allow you to move between the rows in the limits table. New limit segments will only be applied after the editor is closed. Pressing **Return**, or any key not associated with the editor, will close the editor.

Key Access: **Display**, **Limits**, **Limit 1** or **Limit 2**

Point

Allows you to create or edit a limit point. Up to 200 points may be defined for each limit line. Enter the point number to be created or edited using the numeric keypad, then Press **Enter**, or use the knob, Tab or step keys to move to an existing point. After selecting a point, **Frequency** (or **Time**) becomes active.

Key Access: **Display**, **Limits**, **Limit 1** or **Limit 2**, **Edit**

Frequency (The key label is **Time** if **X Axis Units (Time)** has been selected.)

Allows you to enter the frequency value for a limit point. After entering a value, the limit table is sorted to place the frequency or time in the correct order. For a new point, **Amplitude** defaults to 0 dBm and **Connected to Previous Pt** defaults to **Yes**. **Amplitude** then becomes active.

Key Access: **Display**, **Limits**, **Limit 1** or **Limit 2**, **Edit**

Amplitude

Allows you to enter the amplitude value for the current limit point. After entering a value, **Connected to Previous Pt** becomes active. If a Tab key is pressed without entering a value, the current **Amplitude** and **Connected to Previous Pt** values of the point are selected. If Tab ⇑ is pressed, the point number automatically increments to allow entry of the amplitude of the next point, or if a new point, to allow **Frequency** to be entered for the new point.

Key Access: **Display**, **Limits**, **Limit 1** or **Limit 2**, **Edit**

**Connected to Previous Pt
Yes No**

Allows you to determine whether the current point will be connected to the previous point. No limit testing is performed between disconnected points. Pressing this key when the Connected field is selected toggles the Connected value of the current point and increments the Point number to allow entry or editing of the Frequency of the next point. If a Tab key is pressed without entering a value, the current Connected value of the point is selected. If Tab ⇑ is pressed, the Point number automatically increments to allow entry of the Connected value of the next point, or if a new point, to allow **Frequency** to be entered for the new point.

Key Access: **Display**, **Limits**, **Limit 1** or **Limit 2**, **Edit**

Delete Point

Allows you to delete the current point in the limit line. You will be prompted with the message `If you are sure, press key again to delete.` Pressing **Delete Point** again will delete the point.

Key Access: **Display**, **Limits**, **Limit 1** or **Limit 2**, **Edit**

Delete Limit   Allows you to delete the current limit set. You will be prompted with the message `If you are sure, press key again to delete.` Pressing **Delete** again will delete the limit set.

Key Access: **Display**, **Limits**, **Limit 1** or **Limit 2**

**Freq Interp
Log Lin**   Allows you to determine how limit trace values are computed between points in a limit table. The available interpolation modes are linear and logarithmic. If the linear mode is used for both frequency and amplitude, a

straight line is used when interpolating between points in a limit table. If frequency interpolation is logarithmic, frequency values between limit points are computed by first taking the logarithm of both the table values and the intermediate value. A linear interpolation is then performed in this logarithmic frequency space. An exactly analogous manipulation is done for logarithmic amplitude interpolation.

Key Access: **Display**, **Limits**, **Limit 1** or **Limit 2**, **More**

Amptd Interp Log Lin
Allows you to determine how limit trace values are computed between points in a limit table. The available interpolation modes are linear and logarithmic. If the linear mode is used for both frequency and amplitude, a straight line is used when interpolating between points in a limit table.

Key Access: **Display**, **Limits**, **Limit 1** or **Limit 2**, **More**

NOTE
Interpolation modes determine how limit values are computed between points in the limit table. The appearance of a limit trace is also affected by the amplitude scale, which may be linear or logarithmic.

X Axis Units Freq Time
Selects whether limit lines will be entered using frequency or sweep time to define the segments. They can be specified as a table of limit line segments of amplitude versus frequency, or of amplitude versus time. Time values are evaluated with respect to the analyzer sweep time. A time value of zero corresponds to the start of the sweep, which is at the left edge of the graticule.

Switching the limit line definition between frequency and time will erase both of the current limit lines. The message `Changing X axis units will delete all limits. If you are sure, press key again to change units` will appear. Press **X Axis Units Freq Time** again to purge both limit lines and switch between frequency and time.

Key Access: **Display**, **Limits**

Limits Fixed Rel Allows you to choose fixed or relative limit lines. The fixed (**Fixed**) type uses the current limit line as a reference with fixed frequency and amplitude values. The relative (**Rel**) setting causes the current limit line value to be relative to the displayed center frequency and reference level amplitude values. When limit lines are specified with time, rather than frequency, the **Rel** setting only affects the amplitude values. The current amplitude values will be relative to the displayed reference level amplitude, but the time values will always start at the left edge of the graticule.

As an example, assume you have a frequency limit line. If the limit line is specified as fixed, entering a limit line segment with a frequency coordinate of 300 MHz displays the limit line segment at 300 MHz. If the same limit line table is specified as relative, it is displayed relative to the analyzer center frequency and reference level. If the center frequency is at 1.0 GHz, a relative limit line segment with a frequency coordinate of 300 MHz will display the limit line segment at 1.3 GHz. If the amplitude component of the relative limit line segment is –10 dB, then –10 dB is added to the reference level value to obtain the amplitude of the given segment (reference level offset included).

A limit line entered as fixed may be changed to relative, and one entered as relative may be changed to fixed. When changing between fixed and relative limit lines, the frequency and amplitude values in the limit line table change so that the limit line remains in the same position for the current frequency and amplitude settings of the analyzer. If a time and amplitude limit line is used, the amplitude values change but the time values remain the same.

Key Access: **Display**, **Limits**

Delete All Limits Allows you to purge data from the limit-line tables. Pressing **Delete Limits** after the prompt, `If you are sure, press key again to delete`, will delete the limits.

Key Access: **Display**, **Limits**

Title Accesses the following **Title** menu keys which allows you to change or clear a title on your display.

Key Access: **Display**

Change Title Allows you to write a title across the top of the display. The marker readout may interfere with the last characters. The markers can be turned off by pressing **Marker**, **More**, **Marker All Off**. Pressing **Change Title** accesses the Alpha Editor Menus that contain available characters and symbols.

NOTE Pressing **ESC** before exiting the Alpha Editor menus will retain the previous title.

The display title will remain until either **Change Title** is pressed again, or a trace is recalled that was previously saved with a title. A display title can also be cleared by using the clear function. Press **Display**, **Title**, **Clear Title**.

Key Access: **Display**, **Title**

Clear Title   Allows you to clear a title from the front-panel display. Once cleared, the title cannot be retrieved.

Key Access: **Display**, **Title**

Preferences   Accesses a menu of the following display functions which allow you to turn the graticule and annotation on or off.

Key Access: **Display**

**Graticule
On Off**   Turns the display graticule on and off.

Key Access: **Display**, **Preferences**

**Annotation
On Off**   Turns the screen annotation on or off, however, menu key annotation will remain on the screen. The screen annotation may not be required for prints or during remote operation.

Key Access: **Display**, **Preferences**

Enter

Terminates and enters into the analyzer a numerical value that has been entered from the front panel using the numeric keypad. (For most applications, it is better to use the units menu keys.)

When using the **File** key menus, the **Enter** key is used to terminate filename entries. When entering titles (**Display**, **Title**, **Change Title**), the **Enter** key is used to terminate title entries.

ESC

Use the escape key to exit any function without modifying current parameters. Pressing the **ESC** key will:

• Clear any numeric entry that you have begun to enter and cancels the active function (see the section on display annotation, active function area, and other display features in the Getting Started Guide for your instrument).

• Clear any title entry that you have begun to enter and cause the title to revert to the previous name.

• Clear input or output overloads.

• Clear error messages from the status line along the bottom of the display.

• Clear peak threshold from the display (turn it off) if the peak threshold line is on.

• Cancels a print, if one is in progress.

File

Accesses the menu keys used to view, save, load, and manage data on a floppy disk or the internal analyzer drive. Refer to the Getting Started Guide for your instrument for more information on file menu functions.

Catalog   Displays all directories and files located on the selected drive, depending upon the preferences set under the **Type** and **Sort** keys defined below.

Key Access: **File**

> **Type**   Allows you to select all types or one type of file(s) for viewing.
>
> Key Access: **File, Catalog**
>
> > **All**   Displays all files located on the selected drive.
> >
> > Key Access: **File, Catalog, Type**
> >
> > **Setup**   Displays all setup files (.SET) in the selected directory. Setups are a complete set of instrument parameters including traces, states, limits, and corrections.
> >
> > Key Access: **File, Catalog, Type**
> >
> > **State**   Displays all state files (.STA) in the selected directory. State files contain most instrument settings.
> >
> > Key Access: **File, Catalog, Type**
> >
> > **Trace**   Displays all trace files (.TRC and .CSV) in the selected directory.
> >
> > Key Access: **File, Catalog, Type**
> >
> > **Limits**   Displays all limits files (.LIM) in the selected directory.
> >
> > Key Access: **File, Catalog, Type**
> >
> > **Screen**   Displays all screen (.GIF and .WMF) files in the selected directory.
> >
> > Key Access: **File, Catalog, Type**
> >
> > **Corrections**   Displays all correction files (.ANT, .CBL, .OTH, .AMP) in the selected directory.
> >
> > Key Access: **File, Catalog, Type, More**

Measurement Results Displays all measurement results files in the selected directory. Measurement results files are saved in .CSV format (for importing into spreadsheets).

Key Access: **File**, **Catalog**, **Type**, **More**

Sort   Accesses the **Sort** menu keys that allow you to sort your files according to a selected file attribute.The selections include, **By Date**, **By Name**, **By Extension**, **By Size**, and **Order Up Down**. **Order (Up)** allows you to sort files in ascending order (for instance, A,B,C). **Order (Down)** allows you to sort files in descending order (for instance, C,B,A).

Key Access: **File, Catalog**

Dir Up   Allows you to move up one directory level. If at the top level, **Dir Up** moves to the drive level, displaying the available disk drives.

Key Access: **File, Catalog**

Dir Select   Accesses the highlighted directory on your display.

Key Access: **File, Catalog**

Save   Accesses menu keys that allow you to save analyzer setups, states, traces, limits, corrections and screen data to a floppy (A:) drive or internal flash (C:) drive.

NOTE   If you intend to save trace files for use with a personal computer, save them as .CSV (comma separated values). However, files fomatted in this way cannot be loaded back into the analyzer.

NOTE   Never remove the floppy disk during a save operation. To do so could corrupt *all* data on the floppy disk.

Key Access: **File**

Save Now   Executes the save function. When the save is complete, the message XXXXXX file saved (where **XXXXXX** is the filename) will appear in the status line on your display.

Note that once you have used the **File**, **Save**, **Save Now** keys to setup and save a file, the **Save** hardkey will perform an immediate **Save Now** of your file in the same format and to the same location.

Key Access: **File, Save**

NOTE	If the `Path:` field above the directory box is empty when pressing **Save Now**, the status line will display the error message: `Unable to save file, invalid path`. In this case, please select a drive.

Type   Allows you to select the type of data you want to save.

              Setup   Displays all previously saved setup files and detects the current setup parameters in preparation to save them in a file for retrieval at a future date. Setup files include all instrument settings including traces, states, limits, and corrections.

NOTE	When viewing a floppy disc with saved Setup files (filename.set) on a personal computer, notice there are also many similarly named files with extensions like .s01, .s02, etc. Do not delete these files as they are necessary to allow complete restoration of originally saved Setup.

Key Access: **File, Save, Type**

              State   Displays all previously saved state files and detects the current state parameters in preparation to save them in a file for retrieval at a future date. State files include all instrument settings but not traces, limits, and corrections. (This is the default setting when power is applied to the analyzer.)

Key Access: **File, Save, Type**

              Trace   Displays all previously saved trace files (.TRC) and detects the current trace in preparation to save it in a file for retrieval at a future date. A trace can be saved individually or as a group of traces. It can also be saved in .CSV (comma separated values) format (for importing into spreadsheets) or in .TRC format, accompanied by the analyzer state (for later recalling into the analyzer). (Note that CSV formatted data cannot be reloaded into the analyzer and TRC formatted data cannot be loaded into most personal computer programs.) Refer to the **Format** key description.

Key Access: **File, Save, Type**

Limits   Displays all previously saved limits files and detects the current limits in preparation to save them in a file for retrieval at a future date. Limits provide data sets to determine whether a trace has exceeded preset specifications. Limit sets can hold up to 200 points and can only be saved individually. Refer to the **File, Source** key description.

Key Access: **File, Save, Type**

Screen   Displays all previously saved screen files and captures the current screen displayed in preparation to save it in a file for retrieval at a future date. Screen files can be saved in any of the following formats: Bitmap, Metafile, Reverse Bitmap, and Reverse Metafile. Refer to the **Format** key description.

Key Access: **File, Save, Type**

NOTE   Screen files saved in WMF format can *only* be loaded into Microsoft®[1] applications such as Microsoft Word.

NOTE   The screen saved is that which was displayed before pressing **File**. For this reason, the screens seen while in the file menus cannot be saved.

Corrections   Displays all previously saved correction files and detects the current corrections in preparation to save them in a file for retrieval at a future date. Corrections provide a way to adjust the trace display for preset gain factors (such as for cable loss). A correction set may hold up to 200 points. Pressing **Corrections** activates the **Source** key. Refer to the **Source** key description.

Key Access: **File, Save, Type, More**

Measurement Results Displays all previously saved measurement results files and detects the current measurement results in preparation to save them in a file for retrieval at a future date.

---

1. Microsoft® is a U.S. registered trademark of Microsoft Corporation.

Measurement results files are saved in .CSV format (for importing into spreadsheets).

Key Access: **File, Save, Type, More**

Format *When **Type** is set to **Trace***, **Format** allows you to save a trace accompanied by the analyzer state. The **CSV** format is readable by a spreadsheet on your PC, but cannot be loaded back into the analyzer. The TRC format cannot be loaded into a PC, but can be loaded back into the analyzer. TRC files include the state of the analyzer and restore all settings when loaded.

*When **Type** is set to **Screen***, **Format** allows you to choose between bitmap and metafile formats. **Bitmap** saves the screen image in Graphics Interchange Format (GIF) and **Metafile** saves the screen image in Windows Metafile Format (WMF). **Reverse Bitmap** and **Reverse Metafile** turn black backgrounds to white and yellow traces to green so they can be printed visibly and with less use of black ink. Screen images cannot be loaded back into the analyzer.

Key Access: **File, Save**

Source *When **Type** is set to **Trace***, **Source** allows you to save trace **1**, **2**, or **3** along with state. Saving trace **All** saves all traces in a single .trc file, along with the state.

*When **Type** is set to **Corrections***, **Source** accesses the **Antenna**, **Cable**, **Other** and **User** menu keys, which allow you to select the type of correction to be saved.

*When **Type** is set to **Limits***, **Source** accesses the **Limit 1** and **Limit 2** menu keys. **Limit 1** and **Limit 2** provide data sets to determine whether a trace has exceeded preset specifications. Limit sets can hold up to 200 points and can only be saved individually.

Key Access: **File, Save**

Name Accesses the Alpha Editor and allows you to enter a filename. The external keyboard can also be used to enter a filename while the alpha editor is accessed.

Key Access: **File, Save**

NOTE Only capital letters (A-Z) and digits (0-9) may appear in file names (**8** characters, maximum). Additionally, file names include a 3 character extension which is automatically set by the instrument.

Dir Up   Allows you to move up one directory level. If at the top level, **Dir Up** moves to the drive level, displaying the available disk drives.

Key Access: **File, Save**

Dir Select   Accesses the highlighted directory on your display.

Key Access: **File, Save**

Load   Accesses menu keys that allow you to load analyzer setups, states, traces, limits and corrections into the analyzer from a floppy (A:) drive or internal flash (C:) drive.

Key Access: **File**

Load Now   Executes the load function. When the load is complete, the message XXXXXX file loaded (where XXXXXX is the filename) will appear in the status line on your display.

Key Access: **File, Load**

Type   Allows you to select the type of file you want to load.

Setup   Displays all setup files you may wish to load (.SET). Setup files include a complete set of instrument parameters including traces, states, limits, and corrections. Loading a setup restores the analyzer (as closely as possible) to all previous instrument settings at the time of the save.

Key Access: **File, Load, Type**

State   Displays all state files you may wish to load (.STA). Loading a state restores most settings to the previously saved values.

Key Access: **File, Load, Type**

Trace   Displays all trace files (.TRC) you may wish to load. Traces can be loaded individually or as a group. When a trace is loaded, the state that existed when that trace was saved is loaded along with the trace. Also, the loaded trace is placed in view mode.

Key Access: **File, Load, Type**

NOTE   If you wish to compare two saved traces, place traces in view mode before saving them. This prevents the trace from being rewritten based on a state change from subsequent loads.

Limits   Displays all limits files you may wish to load to determine whether a trace has exceeded preset specifications (.LIM). Limit sets can hold up to 200 points. Limits can only be loaded individually.

Key Access: **File, Load, Type**

NOTE   When loading Limits files, be sure you have selected the appropriate X Axis Units: frequency or time (**Display**, **Limits**, **X Axis Units**). If you are in time X-Axis Units, and you load frequency limits, all current limit line data will be erased and the analyzer will switch to frequency units. The reverse of the this situation also holds true.

Corrections   Displays all corrections files you may wish to load (.CBL, .ANT, .OTH, .AMP). Corrections provide a way to adjust the trace display for preset gain factors (such as for cable loss). A correction set may hold up to 200 points.

Key Access: **File, Load, Type, More**

Measurement Results   Displays all previously saved measurement results files you may wish to load. Measurement results files are saved in .CSV format (for importing into spreadsheets).

Key Access: **File, Load, Type, More**

Sort   Accesses the **Sort** menu key.

Sort accesses a menu of keys that allow you to view your saved files according to a selected file attribute. The selections include, **By Date**, **By Name**, **By Extension**, **By Size**, and **Order Up Down**. **Order** (Up) allows you to view files in ascending order (for instance, A,B,C). **Order** (Down) allows you to view files in descending order (for instance, C,B,A).

Key Access: **File, Load**

Destination   *When* **Type** *is set to* **Trace**, **Destination** allows you to direct your data to **Trace 1**, **Trace 2**, or **Trace 3**. If the data is for all three traces (for instance, **Source** was **All** when they were saved), the data will be returned to the original trace registers.

*When **Type** is set to **Limits**, **Destination** allows you to direct your data to **Limit 1** or **Limit 2**.*

Key Access: **File, Load**

Dir Up   Allows you to move up one directory level. If at the top level, **Dir Up** moves to the drive level, displaying the available disk drives.

Key Access: **File, Load**

Dir Select   Accesses the highlighted directory on your display. If [. .] is highlighted, this key acts in the same manner as **Dir Up**.

Key Access: **File, Load**

Delete   Allows you to delete files and directories.

Key Access: **File**

Delete Now   Executes the delete function. If a directory is selected to be deleted, the message `WARNING: You are about to delete the contents of directory XXXXXX` (where **XXXXXX** is the full path and directory name) will appear on your display. After a successful delete, the message `XXXXXX file deleted` (where **XXXXXX** is the filename) will appear in the status line on your display.

Key Access: **File, Delete**

Type   Allows you to select the type of file you want to delete.

Key Access: **File, Delete**

All   Displays all files you may wish to delete.

Key Access: **File, Delete, Type**

Setup   Displays all setup files you may wish to delete (.SET). A Setup file is a complete state of instrument parameters including traces, states, limits and corrections.

Key Access: **File, Delete, Type**

State   Displays all state files you may wish to delete (.STA).

Key Access: **File, Delete, Type**

Trace   Displays all trace files you may wish to delete (.TRC and .CSV).

Key Access: **File, Delete, Type**

	Limits	Displays all limits files you may wish to delete (.LIM).
		Key Access: **File, Delete, Type**
	Screen	Displays all screen files you may wish to delete (.GIF and .WMF).
		Key Access: **File, Delete, Type**
	Corrections	Displays all corrections files you may wish to delete (.CBL, .ANT, .OTH, .AMP).
		Key Access: **File, Delete, Type, More**

Measurement Results Displays all previously saved measurement results files you may wish to delete. Measurement results files are saved in (.CSV) format (for importing into spreadsheets).

Key Access: **File, Delete, Type, More**

Sort   **Sort** accesses a menu of keys that allow you view the files you wish to delete, according to a selected file attribute. The selections include, **By Date**, **By Name**, **By Extension**, **By Size**, and **Order Up Down**. **Order (Up)** allows you to view files you may wish to delete in ascending order (for instance, A,B,C). **Order (Down)** allows you to view files you may wish to delete in descending order (for instance, C,B,A).

Key Access: **File, Delete**

Dir Up   Allows you to move up one directory level. If at the top level, **Dir Up** moves to the drive level, displaying the available disk drives.

Key Access: **File, Delete**

Dir Select   Accesses the highlighted directory on your display. If [. .] is highlighted, this key acts in the same manner as **Dir Up**.

Key Access: **File, Delete**

Copy   Allows you to copy files from one directory to another or to one or more mass storage devices.

Key Access: **File**

Copy Now.   Executes the copy function. If the copy is successful, the message xxxxx file copied (where **xxxxx** is the filename) will appear on the display.

Key Access: **File**, **Copy**

Type. Allows you to select the type of file you want to copy.

Key Access: **File**, **Copy**

All. Displays all files you may wish to copy.

Key Access: **File**, **Copy**, **Type**

Setup. Displays all setup (.SET) files you may wish to copy. A Setup file is a complete state of instrument parameters including traces, states, limits and corrections.

NOTE When using a personal computer to copy Setup files, ensure the similarly named files with extensions like .s01, .so2, etc. are also copied. These files are necessary to allow complete restoration of originally saved Setup.

Key Access: **File**, **Copy**, **Type**

State. Displays all state (.STA) files you may wish to copy.

Key Access: **File**, **Copy**, **Type**

Trace. Displays all trace (.TRC and .CSV) files you may wish to copy.

Key Access: **File**, **Copy**, **Type**

Limits. Displays all limit (.LIM) files you may wish to rename.

Key Access: **File**, **Copy**, **Type**

Screen. Displays all screen (.GIF and .WMF) files you may wish to rename.

Key Access: **File**, **Copy**, **Type**

Corrections. Displays all corrections (.CBL, .ANT, .OTH, .AMP) files you may wish to rename.

Key Access: **File**, **Copy**, **Type**, **More**

Measurement Results. Displays all previously saved measurement results files you may wish to delete. Measurement results files are saved in (.CSV) format (for importing into spreadsheets).

Key Access: **File, Copy, Type, More**

Sort. **Sort** accesses a menu of keys that allow you to view the files you wish to copy according to a selected file

attribute. The selection includes, **By Date**, **By Name**, **By Extension**, **By Size**, and **Order Up Down**. **Order (Up)** allows you to view files you may wish to copy in ascending order (for instance, A,B,C). **Order (Down)** allows you to view files you may wish to copy in descending order (for instance, C,B,A).

Key Access: **File, Copy**

**Dir
From To**. Allows you to select the source and destination directories for your copy on one or more drives.

Key Access: **File, Copy**

Dir Up. Allows you to move up one directory level. If at the top level, **Dir Up** moves to the drive level, displaying the available disk drives.

Key Access: **File, Copy**

Dir Select. Accesses the highlighted directory on your display.

Key Access: **File, Copy**

Rename   Allows you to rename a file.

Key Access: **File**

Rename Now   Executes the rename function. When the rename is complete, the message XXXXXX file renamed to YYYYYY (where **XXXXXX** and **YYYYYY** are the filenames) will appear in the status line on your display.

Key Access: **File, Rename**

Type   Allows you to select the type of file you want to rename.

Key Access: **File, Rename**

All   Displays all files you may wish to rename.

Key Access: **File, Rename**, **Type**

Setup   Displays all setup (.SET) files you may wish to rename. A Setup file is a complete state of instrument parameters including traces, states, limits and corrections.

Key Access: **File, Rename**, **Type**

State   Displays all state (.STA) files you may wish to rename.

Key Access: **File, Rename**, **Type**

Trace		Displays all trace (.TRC and .CSV) files you may wish to rename.
		Key Access: **File, Rename, Type**
Limits		Displays all limit (.LIM) files you may wish to rename.
		Key Access: **File, Rename, Type**
Screen		Displays all screen (.GIF and .WMF) files you may wish to rename.
		Key Access: **File, Rename, Type**
Corrections		Displays all corrections (.CBL, .ANT, .OTH, .AMP) files you may wish to rename.
		Key Access: **File, Rename, Type, More**

Measurement Results Displays all previously saved measurement results files you may wish to rename. Measurement results files are saved in (.CSV) format (for importing into spreadsheets).

Key Access: **File, Rename, Type, More**

Sort   **Sort** accesses a menu of keys that allow you to view the files you wish to rename according to a selected file attribute. The selections include, **By Date**, **By Name**, **By Extension**, **By Size**, and **Order Up Down**. **Order (UP)** allows you to view files you may wish to rename in ascending order (for instance, A,B,C). **Order (Down)** allows you to view files you may wish to rename in descending order (for instance, C,B,A).

Key Access: **File, Rename**

Name   Accesses the Alpha Editor and allows you to enter a filename. The external keyboard can also be used to enter a filename while the alpha editor is accessed. Complete your entry by pressing **Return** or **Enter**.

NOTE   Only capital letters (A-Z) and digits (0-9) may appear in file names (8 characters, maximum). Additionally, file names include a 3 character extension which is automatically set by the instrument.

Key Access: **File, Rename**

Dir Up   Allows you to move up one directory level. If at the top level, **Dir Up** moves to the drive level, displaying the available disk drives.

Key Access: **File, Rename**

Dir Select	Accesses the highlighted directory on your display.
	Key Access: **File, Rename**

Create Dir Allows you to create subdirectories.

Key Access: **File, More**

Create Dir Now	Executes the create directory function. When the directory has been created, the message `Directory XXXXXX created` (where **XXXXXX** is the directory name) will appear in the status line on your display.
	Key Access: **File, More, Create Dir**
Name	Accesses the Alpha Editor and allows you to enter a filename. The external keyboard can also be used to enter a filename while the alpha editor is accessed. Complete your entry by pressing **Return** or **Enter**.
	Key Access: **File, More, Create Dir**

NOTE Only capital letters (A-Z) and digits (0-9) may appear in file names (8 characters, maximum). Additionally, file names include a 3 digit extension which is automatically set by the instrument.

Dir Up	Allows you to move up one directory level. If at the top level, **Dir Up** moves to the drive level, displaying the available disk drives.
	Key Access: **File, More, Create Dir**
Dir Select	Accesses the highlighted directory on your display.
	Key Access: **File, More, Create Dir**

Format Formats a double-density floppy disk to 1.44 MB format. 720 kB disks are not supported.

Key Access: **File**, **More**

Format Now	Executes the format function. After pressing **Format Now**, the following message will appear on the display: `WARNING: You are about to destroy ALL data on volume A: Press Format Now again to proceed or any other key to abort.` During the formatting, Formatting Disk will appear on the display. Once formatted, Volume A: formatted will appear in the status line on the display.

NOTE

When using a personal computer to manipulate Setup files (filename.set) saved to a floppy, ensure the similarly named files with extensions like .s01, .s02, etc. are handled in a like manner. For example, if you rename of the .set file, you must rename all the .s0x files, as well. These files are necessary to allow complete restoration of the originally saved Setup.

Key Access: **File, More, Format**

Freq Count

Activates the **Marker Normal** function if there are no markers, and then turns the marker count function on.

Marker Count On Off

Marker Count (On) turns on the marker counter. If no marker is active before **Marker Count (On)** is pressed, a marker is activated at the center of the display. Press **Marker Count (Off)** to turn the marker counter off. Press **Resolution (Man)** to change the marker counter resolution to an uncoupled value.

NOTE

Marker Count frequency readings are not affected by the frequency offset function.

An asterisk (*) may appear in the upper-right area of the display along with the message `Cntr 1` (the number in the message depends on the active marker). The ratio of the resolution bandwidth to span must be greater than 0.002 for the marker count function to work properly. `Marker Count: Widen Res BW` appears on the display if the bandwidth to span ratio is less than 0.002. `Widen RES BW` indicates that the resolution bandwidth must be increased or the span decreased.

Key Access: **Freq Count**

Resolution Auto Man

Allows the resolution of the marker counter to be selected manually or auto-coupled. The marker counter has a resolution range of 1 Hz to 100 kHz. The available resolution values are 1 Hz, 10 Hz, 100 Hz, 1 kHz, 10 kHz, and 100 kHz. The resolution can be changed by using the step keys or by entering the resolution using the numeric keypad or knob. The marker counter resolution can be auto coupled to the span by pressing **Resolution (Auto)**.

Key Access: **Freq Count**

FREQUENCY Channel

Activates the center frequency function, and accesses the menu of frequency functions. The center frequency, or start and stop frequency values appear below the graticule on the display.

Although the analyzer allows entry of frequencies greater than the specified frequency range, using frequencies greater than the frequency range of the analyzer is not recommended

NOTE   When changing both the center frequency and the span, change the frequency first since the span can be limited by the frequency value.

CAUTION   When operating in dc coupled mode, take care to protect the input mixer by limiting the input level to 0 Vdc and +30 dBm.

Center Freq   Activates the center frequency function (when **Scale Type** is set to **Lin**) which allows you to set the horizontal center of the display to a specific frequency. When **Scale Type** is set to **Log**, **Center Freq** activates the center frequency function which allows you to move the average of the start and stop frequencies. In this scale type the center frequency value will not necessarily represent the horizontal center of the display.

Key Access: **FREQUENCY Channel**

Start Freq   Sets the frequency at the left side of the graticule. The left and right sides of the graticule correspond to the start and stop frequencies. When these frequencies are activated, their values are displayed below the graticule in place of center frequency and span.

Key Access: **FREQUENCY Channel**

Stop Freq   Sets the frequency at the right side of the graticule. The left and right sides of the graticule correspond to the start and stop frequencies. When these frequencies are activated, their values are displayed below the graticule in place of center frequency and span.

Key Access: **FREQUENCY Channel**

**CF Step
Auto Man**   Changes the step size for the center frequency function. Once a step size has been selected and the center frequency function is activated, the step keys change center frequency by the step-size value. The step size function is useful for finding harmonics and sidebands beyond the current frequency span of the analyzer. When auto-coupled, the center frequency step size is set to one division (10 percent of the span).

Key Access: **FREQUENCY Channel**

Freq Offset   Allows you to input a frequency offset value that is added to the frequency readout of the marker, to account for frequency conversions external to the analyzer. Offset entries are added to all frequency readouts including marker, start frequency, and stop frequency. Offsets may only be entered using the numeric keypad. Offsets are not added to the span or frequency count readouts. Entering an offset does not affect the trace display. When a frequency offset is entered, its value appears on the bottom of the display. To eliminate an offset, perform a **Factory Preset**, or press **Freq Offset**, **0**, **Hz**.

When a frequency offset is entered, its value appears on the bottom of the display (as opposed to reference level offsets, which appear on the left side of the display). To eliminate an offset, press **Freq Offset**, **0**, and **Enter**. Pressing **Preset** also sets the offset to zero.

NOTE   This function is not available when **FREQUENCY, Scale Type (Log)** is selected.

NOTE   **Frequency, Scale Type (Log)** is not available when utilizing the frequency offset function.

Key Access: **FREQUENCY Channel**

**Signal Track   Moves the signal that is nearest to the active marker to the center of
On Off**   the display and keeps the signal there. ST appears in the lower-left corner of the display. An (*) may appear in the upper-right corner of the display while the analyzer is verifying that it has the correct signal.

Pressing **Signal Track (Off)**; **Preset** (with **Preset Type** set to **Factory**); or **Marker**, **More**, **Marker All Off** turns off the signal track function.

When signal track is on and the span is reduced, an automatic zoom is performed and the span is reduced in steps so that the signal remains at the center of the display. If the span is zero, signal track cannot be activated.

Key Access: **FREQUENCY Channel**

NOTE   If no marker is active, pressing **Signal Track (On)** will activate a marker, perform a peak search, and center the marker on the display.

NOTE   Switching to zero span sets **Signal Track (Off)**.

NOTE   **FREQUENCY, Scale Type (Log)** and **Segmented (On)** are not available when **Signal Track (On)** is selected.

**Scale Type
Log Lin**
Agilent ESA-E Series only (E4401B, E4402B, E4404B, E4405B and E4407B). Scales the horizontal (x-axis or frequency) graticule divisions logarithmically when **Scale Type (Log)** is selected. When **Scale Type (Lin)** is selected, the horizontal divisions are linearly scaled.

In **Scale Type (Log)**, the number of sweep points is limited to a multiple of the number of sweep segments. For example, if you select 308 points when 3 segments are required to create a logarithmic display, the points will be set at 306 points. The span determines the minimum number of sweep points. Pressing **Preset** (when **Preset Type** is set to **Factory**) sets **Scale Type to Lin**.

NOTE   Sweep time is auto-coupled when **Scale Type (Log)** is selected.

NOTE   **Marker Span Pair, Frequency Offset, Input Mixer (Ext), Segmented (On),
Signal Track (On)**, and **Demod View (On)**, are not available when **Scale
Type (Log)** is selected.

NOTE   **FREQUENCY, Scale Type (Log)** is not available when **Frequency Offset**,
Segmented (On), **Input Mixer (Ext)**, **Zero Span, Signal Track (On)** is selected.

Key Access: **FREQUENCY Channel**

Help

Accesses a short description of any front panel or menu key. After pressing **Help**, an explanation of the next key pressed will appear on the display. After the information is displayed, press any key to remove the help window. Pressing **ESC** allows you to remove the help window without changing functions.

Input/Output

Input Z Corr
50Ω 75Ω

Sets the input impedance for voltage-to-power conversions. The impedance you select is for computational purposes only, since the actual impedance is set by internal hardware to 50 Ω (except for Option 1DP). The default is 50 Ω (75 Ω with Option 1DP). Setting the computational input impedance to 75 Ω is useful when using a 75 Ω to 50 Ω adapter to measure a 75 Ω device on an analyzer having a 50 Ω input impedance.

Key Access: **Input/Output**

Coupling
AC DC

Only available in Agilent models E4402B or E4407B with Option UKB, and E4404B or E4405B. Specifies alternating current (ac) or direct current (dc) coupling at the analyzer input. Selecting ac coupling blocks any dc voltage at the analyzer input, but also decreases the frequency range of the analyzer. Input coupling is set to ac by an instrument preset (With **Preset Type** set to **Factory**). Some amplitude specifications apply only when coupling is set to dc. Refer to the appropriate amplitude specifications and characteristics for your analyzer.

Table 2-1   **Selecting Input Coupling**

ESA Model #	AC Frequency Range	DC Frequency Range
E4402B with Option UKB	100 kHz to 3 GHz	100 Hz to 3 GHz
E4404B	100 kHz to 6.7 GHz	9 kHz to 6.7 GHz
E4404B with Option UKB	100 kHz to 6.7 GHz	100 Hz to 6.7 GHz
E4405B	100 kHz to 13.2 GHz	9 kHz to 13.2 GHz
E4405B with Option UKB	100 kHz to 13.2 GHz	100 Hz to 13.2 GHz
E4407B with Option UKB	10 MHz to 26.5 GHz	100 Hz to 26.5 GHz

CAUTION

When operating in dc coupled mode, ensure protection of the input mixer by limiting the input level to 0 Vdc, +30 dBm.

Key Access: **Input/Output**

Amptd Ref (f=50 MHz) On Off	*Agilent E4401B and E4411B only*. Turns the internal amplitude reference signal on or off. When the internal amplitude reference signal is on, the RF input is disabled. Key Access: **Input/Output**
Amptd Ref Out (f=50 MHz) On Off	*Agilent E4402B, E4403B, E4404B, E4405B, E4407B and E4408B only*. Turns the external amplitude reference signal on or off. Key Access: **Input/Output**
Input Mixer	*Agilent E4407B with Option AYZ only*. Accesses the following Input Mixer menu keys: Key Access: **Input/Output**

	Input Mixer **Int Ext**	Allows you to select either the internal or an externally connected mixer as the input device. Selecting **Input Mixer (Ext)** activates all other keys in the Input Mixer menu and changes the attenuator annotation to `Ext Mix`. When **Input Mixer (Ext)** is selected, the attenuator function in the **AMPLITUDE** key menu is unavailable. Key Access: **Input/Output**, **Input Mixer**

NOTE	When **Input Mixer (Ext)** is selected, **FREQUENCY, Scale Type (Log)** is not available.
NOTE	**Input Mixer (Ext)** is not available when **FREQUENCY, Scale Type (Log)** is selected.

	Ext Mix Band	Accesses the Ext Mix Band key menus and allows you to select one of the pre-defined bands corresponding to the external mixer being used. The start and stop frequencies and a letter corresponding to the waveguide band in use, appears on each menu key. If **Mixer Type (Presel)** is selected, selecting **(K)**, **(E)**, **(W)**, **(F)**, **(D)**, **(G)**, **(Y)**, or **(J)** is not allowed. If **Harmonic (Man)** is selected, the word **User** will appear on the **Ext Mix Band** key. Key Access: **Input/Output**, **Input Mixer**

NOTE	Segmented sweep is only operable for this function when center frequency and span are set within the frequency band of the mixer. If the mixer range is changed, segmented sweep is turned off.

**Signal Ident
On Off**   Activates a signal identification algorithm when
                    Signal Ident (On) is selected, that either removes or aids
                    with the identification of multiple and image responses
                    of true input signals. Multiple and image responses
                    maybe generated when using unpreselected external
                    mixers.

                    Key Access: **Input/Output**, **Input Mixer**

NOTE   Segmented sweep is not available when **Signal Ident (On)** is selected.

NOTE   If the input signal is too broad band or unstable for the identification
                    process to properly identify it, turn off the signal identification and look
                    for two similar responses separated by approximately 642.8 MHz (twice
                    the 321.4 MHz first IF). If a "–" mixer mode (for example: 8–) is active,
                    the right member of the response pair is the correct response; if a "+"
                    mixer mode is active, the left member of the response pair is the correct
                    response.

                    The amplitude accuracy of the analyzer is degraded
                    when signal identification is active, and the message
                    `Signal Ident On, Amptd Uncal` will appear on the
                    display.

Signal ID
Mode   Allows you to select either of the following types of
                  signal identification methods:

                  Key Access: **Input/Output**, **Input Mixer**

        Image Suppress Selects a signal identification mode
                            that attempts to suppress all but valid
                            responses by mathematically removing
                            all image and multiple responses of
                            signals present at the mixer input. The
                            analyzer internally acquires the data in
                            a two sweep sequence, operates on the
                            acquired data, and displays the result
                            in Trace 1. Since two measurements
                            are taken for each display cycle, the
                            display update rate is reduced.

                            Key Access: **Input/Output**, **Input Mixer**,
                            Signal ID Mode

        Image Shift   Allows the analyzer, in a two sweep
                            sequence, to place data from the first
                            sweep in Trace 1, and data from the
                            second (frequency shifted) sweep in
                            Trace 2. Signal responses of Trace 1
                            and Trace 2 having the same horizontal
                            position are considered to be in the
                            current band and therefore can be
                            analyzed with the amplitude and
                            frequency measurement systems of the
                            analyzer. All other responses are
                            invalid and should be ignored.

                            Key Access: **Input/Output**, **Input Mixer**,
                            Signal ID Mode

Mixer Config Accesses the Mixer Config menu keys allowing you to
                  manually set the harmonic, control the preselected
                  mixers, and adjust the internal bias source for use with
                  mixers requiring bias.

                  Key Access: **Input/Output**, **Input Mixer**

        Harmonic
        Auto Man   The harmonic value with its associated
                            sign is automatically determined from
                            the Ext Mix Band selected when in
                            Harmonic (Auto) mode. **Harmonic (Man)**
                            allows you to enter a harmonic value
                            when required. If the harmonic mode
                            for the external mixer is listed as "8 –",
                            for example, enter the harmonic

number as "– 8". The minus sign indicates that the tuned frequency is below the desired LO harmonic by the IF of 321.4 MHz. Similarly, if the harmonic mode of the external mixer is listed as "8 +", enter the harmonic number as "8".

Key Access: **Input/Output**, **Input Mixer**, **Mixer Config**

Mixer Type
Presel Unpre   Allows you to select which type of mixer is in use. **Mixer Type (Presel)** activates a tuning signal that is routed to the **PRESEL TUNE OUTPUT** connector on the rear panel of the analyzer. This signal has a sensitivity of 1.5V/GHz of the LO frequency and drives the tune input of the HP/Agilent 11974 series of preselected mixers. The sweep rate in **Presel** mode is limited to 40 MHz/msec.

Key Access: **Input/Output**, **Input Mixer**, **Mixer Config**

Mixer Bias
On Off   **Mixer Bias (On)** activates and allows adjustment of an internal bias source for use with external mixers. The bias signal is present on the center conductor of the IF INPUT connector on the front panel. The mixer bias will be **Off** if **Harmonic (Auto)** and **Mixer Type (Presel)** is selected.

Key Access: **Input/Output**, **Input Mixer**, **Mixer Config**

Marker

Accesses the marker control keys which select the type and number of markers and turns them on and off. Markers are diamond-shaped characters that identify points of traces. Up to four pairs of markers may appear on the display simultaneously; only one pair can be controlled at a time. The marker that is controlled is called the "active" marker. Pressing **Marker** activates the **Normal** menu key.

Select Marker 1 2 3 4

Selects one of the four possible markers. A marker that has already been turned on will become active when it is selected. If a marker has been turned on and assigned to a specific trace, it will become active on that trace if that marker is selected.

Key Access: **Marker**

Normal

Activates a single frequency marker at the center position of the active trace if a marker is not already displayed. If a marker is displayed before the **Normal** function is enabled, the marker is enabled at the position of the selected marker. The marker number is indicated above the marker. Use the data controls to position the marker. The knob and/or Up/Down keys move the marker left or right. If a value is entered from the numeric keypad, the marker is moved to the trace point nearest to that value. Annotation in the active function block and in the upper-right corner of the display indicates the frequency and amplitude of the marker (time and amplitude, if in zero span.) The marker stays on the trace at the horizontal screen position where it was placed unless **Signal Track**, or a "marker to" key function (such as **Mkr → CF**, **Mkr → RL**, **Mkr → CF STEP**, **Mkr Δ Span**, or **Min Search**) is selected.Pressing **Normal** turns off the **Delta** function and moves the active marker to the delta marker position.

Key Access: **Marker**

Delta

Activates a second marker at the position of the first marker. (If no marker is present, two markers appear at the center of the display.) The amplitude and frequency (or time) of the first marker is fixed. The marker number is indicated above the delta marker, and the same number is indicated with an R (for example, 1R) above the reference marker. Use the data controls to position the delta marker. Annotation in the active function block and in the upper-right corner of the display indicates the frequency (or time) and amplitude differences between the two markers. The markers will be turned off if the scale type is changed between log and linear. (For information on using this function while in segmented sweep, refer to "Interaction with Other Analyzer Functions" in the segmented sweep section of this chapter which begins on "Segmented" on page 143.)

Key Access: **Marker**

NOTE	Pressing **Delta** again moves the reference marker to the active marker position, so you can make delta measurements from differing reference points without having to turn off the markers and begin again.

NOTE	The delta marker function permits signal-to-noise measurements provided the signal is a single spectral component (sinusoid). Place a normal marker on the signal, press **Delta**, place the delta marker in the noise, and activate **Marker Noise** (see below). The indicated amplitude difference is signal-to-noise/Hz.

Delta Pair **Ref Delta**	Enters a mode that allows adjustment of both the **Ref** (start) and **Delta** (stop) markers independently. Pressing **Delta Pair**, toggles between the reference and delta markers. The start marker number is indicated with a number and an `R` above the marker (for example, `1R`) and the delta marker is indicated with a marker number. This mode is useful in functions such as **Band Power**. (For information on using this function while in segmented sweep, refer to "Interaction with Other Analyzer Functions" in the segmented sweep section of this chapter which begins on "Segmented" on page 143.)

Key Access: **Marker**

NOTE	Ref and Delta markers maintain their displayed x-axis location, but not their frequency values when you change a parameter that redefines the x-axis scale. Reset these markers when parameters such as Span or Center Freq are changed.

Span Pair **Span Center**	Enters a mode that allows adjustment of both the ref and delta markers. Pressing **Span Pair**, toggles between the span and center markers. The start marker number is indicated with a number and an `R` above the marker (for example, `1R`) and the stop marker is indicated with a marker number. Adjusting the span changes the frequency difference between the two markers while maintaining the midpoint between the two markers at a fixed frequency. Changing the center changes the center point between the two markers while maintaining the frequency difference. This mode is useful in functions such as **Band Power**. (For information on using this function while in segmented sweep, refer to "Interaction with Other Analyzer Functions" in the segmented sweep section of this chapter which begins on "Segmented" on page 143.)

NOTE	Span Pair is not available when **FREQUENCY**, **Scale Type (Log)** is selected.

Key Access: **Marker**

Off   Turns off the marker that has been selected by the **Select Marker 1 2 3 4** key. **Off** also turns off functions related to the selected marker such as signal track and demodulation. It also removes marker annotation from the display.

Key Access: **Marker**

Select Marker 1 2 3 4   Selects one of the four possible markers. A marker that has already been turned on will become active when it is selected. If a marker has already been turned on and assigned to a specific trace, it will become active on that trace if that marker is selected.

Key Access: **Marker**, **More**

Marker Trace Auto 1 2 3   Assigns a marker to a trace. Pressing **Marker Trace Auto 1 2 3** will activate a marker on trace 1 if there are no markers turned on. If a marker is currently active, press **Marker Trace Auto 1 2 3** until **1**, **2**, or **3** is underlined. The active marker will be moved to the selected trace.

Selecting the **Auto** mode will move the marker to the trace that is automatically selected. The selection order is to look for the lowest numbered trace in the following order of trace modes: clear-write, max- hold, min-hold, view-mode. If there are no traces in any of these modes, it selects trace 1.

Key Access: **Marker**, **More**

Readout   Accesses the following menu keys that allow you to change the active marker readout.

Key Access: **Marker**, **More**

> **Frequency**   Sets the marker to **Frequency**. The default selection in non-zero spans, displays the absolute frequency of a normal marker or the frequency of the delta marker relative to the reference marker.
>
> Key Access: **Marker**, **More**, **Readout**
>
> **Period**   Sets the marker readout to **Period**. Displays the reciprocal of the above frequency.
>
> Key Access: **Marker**, **More**, **Readout**
>
> **Time**   Sets the marker readout to **Time**. The default selection in zero span, displays the time interval between a normal marker and the start of the sweep or the time of the delta marker relative to the reference marker.
>
> Key Access: **Marker, More, Readout**
>
> **Inverse Time**   Sets the marker readout to **Inverse Time**. Displays the reciprocal of the above time interval.
>
> Key Access: **Marker**, **More**, **Readout**

Function   Accesses the following marker function menu keys listed below.

Key Access: **Marker**, **More**

Band Power Indicates the power over that part of the trace between the reference and active markers. If only one marker is present when you press **Band Power**, a second marker is placed at the same location as the first marker. To reposition the markers, press **Marker** to access **Delta Pair** and **Span Pair** keys. If **Detector (Auto)** is selected, average detection is used for RBW ≥ 1 kHz, and Sample detection is used for RBW < 1 KHz.

Key Access: **Marker**, **More**, **Function**

NOTE   For best accuracy, set the video bandwidth to at least ten times the resolution bandwidth to minimize its averaging effect.

NOTE   **Band Power** has no meaning in zero span, and the indicated value is independent of signal level and marker placement.

Marker Noise Reads out the average noise level, referenced to a 1 Hz noise power bandwidth. If no marker is present, a marker appears at the center of the display. When Marker Noise is enabled in resolution bandwidths of 1 kHz and above, the auto coupled detector selection is set to Average and the Avg Type is set to Power because the trade-off between sweep time and variance of the result is best with power Average detection. (When the **Average** detector is selected and the amplitude scale is linear, the fastest sweet time is 8 milliseconds.) In resolution bandwidths < 1 kHz, the auto coupled detector selection is Sample. However, the Marker Noise function generates appropriately corrected values for all supported detector modes. If the marker delta function is on and the noise marker is activated and moved to measure the noise floor, the marker readout will display the signal-to-noise ratio.

NOTE   You can use **Delta** and **Marker Noise** to indicate noise level relative to sinusoidal signal (signal to noise). However, be sure to activate the delta marker before pressing **Marker Noise** or the reference marker units may be incorrect.

The noise marker averages 5% of the trace data values (one-half a horizontal division), centered on the location of the marker on the frequency or time scale. Marker noise indicates noise power density per Hertz or noise voltage per root Hertz depending upon the amplitude units selected. The number of sweep points is noted in

parenthesis to the right of the sweep time in the lower right corner of the graticule.

Note that the data values averaged will not always be symmetrical with respect to the marker position. If the marker is positioned within 2.5% of the beginning of the trace (one-quarter division), the trace data values in the first half-division will be averaged. Similarly, if the marker is positioned within 2.5% of the end of the trace, the trace data values in the last half-division will be averaged.

NOTE   Do not use Marker Noise to evaluate the displayed average noise level of the analyzer relative to the specification. Read the displayed average noise level directly from the display or use the normal marker. Refer to Application Note 150 for a discussion of how noise is displayed on a spectrum analyzer.

To guarantee accurate data for noise-like signals, a correction for equivalent noise bandwidth for each resolution bandwidth is measured and included in the measurement. The Marker Noise function accuracy is optimal when the detector is set either to Average or to Sample because neither of these detectors peak-biases the noise.

Key Access: **Marker**, **More**, **Function**

Off

Turns off the active function markers.

Key Access: **Marker**, **More**, **Function**

**Marker Table
On Off**

Compresses the graticule and displays marker information in a table. The information includes the marker number, trace number, marker type, X axis value, and the amplitude.

Key Access: **Marker**, **More**

Marker All Off

Turns off all of the markers, including markers used for signal track and demodulation. Marker annotation is also removed.

Key Access: **Marker**, **More**

Marker →

Accesses the following marker function menu keys:

Mkr → CF   Sets the center frequency of the analyzer to the marker frequency. In Delta mode, **Mkr → CF** sets the center frequency to the marker delta value. **Mkr → CF** is not available in zero span.

NOTE   When the frequency scale is in log mode, the center frequency is not at the center of the display.

Key Access: **Marker →**

Mkr → CF Step   Changes the center-frequency step size to match the value of the active marker. Press **Frequency** then **CF Step Auto Man** to view the step size. If marker delta is active, the step size will be set to the frequency difference between the markers. This function can be used to step from one signal harmonic to another. **Mkr → CF Step** is not available in zero span.

Key Access: **Marker →**

Mkr → Start   Changes the start frequency so that it is equal to the frequency of the active marker. In Delta mode, **Mkr → Start** sets the start frequency to the marker delta value. **Mkr→ Start** is not available in zero span.

Key Access: **Marker →**

Mkr→ Stop   Changes the stop frequency so that it is equal to the frequency of the active marker. In Delta mode, **Mkr → Stop** sets the stop frequency to the marker delta value. **Mkr → Stop** is not available in zero span.

Key Access: **Marker →**

Mkr Δ → Span   Sets the start and stop frequencies to the values of the delta markers. The marker is then set to normal at the center frequency. **Mkr Δ → Span** is not available if the marker is off, or in zero span.

Key Access: **Marker →**

NOTE   The above menu keys are not available when **Segmented (On)** is selected.

Mkr → Ref Lvl   Changes the reference level to the active marker value, moving the marked point to the reference level (top line of the graticule). In Delta mode, **Mkr → Ref Lvl** sets the reference level to the amplitude difference between the markers. (For example, if the difference is –15 dB, the reference level will be set to –15 dBm.)

Key Access: **Marker →**

Meas Control

(See "Meas Control" on page 459.)

Meas Setup

MEASURE

(See "MEASURE (Spectrum Analysis Mode)" on page 429.)

MODE

Selects the measurement mode of your analyzer. Spectrum analyzer mode (**Spectrum Analysis**) is the default mode. Other modes include GSM (requires Option BAH) and cdmaOne (requires Option BAC).

Mode Setup

(See "Mode Setup (Spectrum Analysis Mode)" on page 463.)

Next Window

Allows you to select the active window in functions which support split-screen display modes, such as zone span. In split-screen display modes, pressing **Zoom** allows you to switch between split-screen and full-sized displays of the active window. See also "Zoom".

NOTE   The active window is indicated by a solid green box around the window.

Peak Search

Places a marker on the highest peak based on the settings of the **Search Criteria** on page 114. Refer to **Peak Search Type** on page 115, for more information on the effect of setting **Peak Search Type** to **Max Value** or **Excursion & Threshold**. When you preset the analyzer, the **Peak Search Type** is set to **Max Value** unless you save **Peak Search Type** (Excursion & Threshold) as part of the user preset conditions and set **Preset** to **User**. Refer to **Preset** on page 117, for more information on presetting the analyzer.

NOTE   All peak search functions ignore the LO feedthrough. The process for determining if the Peak is the LO feedthrough takes into account Start Frequency, Span, Resolution Bandwidth, Resolution Bandwidth shape factor, and Frequency Accuracy. If there is no point of inflection within the LO feedthrough range, the point on the trace with maximum amplitude, that is higher in frequency than the LO feedthrough range, will be selected. Peak Search may locate the LO feedthrough when **FREQUENCY**, **Scale Type** (Log) is selected.

Meas Tools   Accesses the following frequently used menu keys which are replicated here for your convenience.

Peak Search   Performs peak search as described above.

   Key access: **Peak Search**, **Meas Tools**

Next Pk Right   Refer to "Next Pk Right" on page 113.

   Key access: **Peak Search**, **Meas Tools**

Next Pk Left   Refer to "Next Pk Left" on page 113 of this chapter.

   Key access: **Peak Search**, **Meas Tools**

Delta   Refer to "Delta" on page 100.

   Key access: **Peak Search**, **Meas Tools**

Mkr → CF   Refer to Mkr → CF on page 120.

   Key access: **Peak Search**, **Meas Tools**

Mkr → Ref Lvl   Refer to Mkr → Ref on page 121.

   Key access: **Peak Search**, **Meas Tools**

Function   Refer to "Function" on page 103.

   Key Access: **Peak Search**, **Meas Tools**

   Band Power   Refer to "Band Power" on page 103.

      Key Access: **Peak Search**, **Meas Tools**,

	Function	
Marker Noise	Refer to "Marker Noise" on page 103.	
	Key Access: **Peak Search**, **Meas Tools**, **Function**	
Off	Refer to "Off" on page 102.	
	Key Access: **Peak Search**, **Meas Tools**, **Function**	

Next Peak   Places the marker on the next highest peak. The signal peak must exceed the peak threshold value by the peak excursion value. If there is no peak, the marker will not move. (Also see the **Peak Excursion** and **Peak Threshold** key descriptions.)

Key Access: **Search**

Next Pk Right   Moves the marker to the next peak to the right of the current marker. The signal peak must exceed the peak threshold value by the peak excursion value. If there is no peak to the right, the marker will not move and the `No Peak Found` error message will appear on the display. (Also see the **Peak Excursion** and **Peak Threshold** key descriptions.)

Key Access: **Search**

Next Pk Left   Moves the marker to the next peak to the left of the current marker. The signal peak must exceed the peak threshold value by the peak excursion value. If there is no peak to the left, the marker will not move and the `No Peak Found` error message will appear on the display. (Also see the **Peak Excursion** and **Peak Threshold** key descriptions.)

Key Access: **Search**

Min Search   Moves the active marker to the minimum detected amplitude value.

Key Access: **Search**

Pk-Pk Search   Finds and displays the frequency (or time, if in zero span) and amplitude differences between the highest and lowest trace points.

Key Access: **Search**

Continuous Pk On Off   When a marker is placed on a signal and **Continuous Pk (On)** is pressed, the marker will remain on the signal even if the signal changes in frequency and amplitude.

Key Access: **Search**, **More**

N dB Points On Off   Activates the N dB function. Pressing **N dB Points (On)** turns on the N dB feature and activates two arrows that are N dB down from the marker. The frequency difference between the two arrows will be

displayed in the upper right-hand corner of the display. If the feature is unable to find data N dB below the marker, the value of –100 Hz will be displayed in the upper right-hand corner of the display.

For example, N dB Points can be used to measure the 3 dB bandwidth of a filter in a transmission test with the tracking generator. The default value is –3 dB. Possible values range from –1.00 dB to –80.00 dB. You can enter values to a resolution of 0.01 dB using the numeric key pad, 0.1 dB using the knob, or 10 dB using the step keys.

The measured signal cannot have more than one peak that is greater than or equal to N dB. A signal must be greater than the peak excursion above the peak threshold to be identified. The setting for peak excursion may be increased from the –6 dB default value so that noise will not be identified as signals. Increasing the value too much may cause a smaller signal to be missed or misinterpreted as part of a larger signal. The amplitude scale may be either linear or logarithmic.

The N dB function follows the active marker. If you turn on a marker after N dB Points has been activated, the arrows will follow that marker. If the marker associated with N dB Points moves, the arrows will move with the marker unless there is no data N dB below the marker.

Key Access: **Search**, **More**

Search Criteria Accesses the following menu keys:

Key access: **Search**, **More**

Peak Excursion Sets the minimum amplitude variation of signals that the marker can identify as a peak. If a value of 10 dB is selected, the marker moves only to peaks that rise and fall more than 10 dB above the peak threshold value. Pressing **Preset** (when **Preset Type** is set to **Factory**) or turning on power resets the excursion to 6 dB and the threshold to 90 dB below the reference level.

NOTE Two signal peaks, which are so close together that the amplitude drop between them is less than the peak-excursion value, are not recognized as two peaks. A signal peak is recognized only if it has a peak excursion drop above the noise floor, on both sides of the signal.

When the peak excursion value is 6 dB or higher, the marker-peaking functions do not recognize signals less than the peak excursion value above the noise floor. To correct this, when measuring signals near the noise floor, the excursion value can be reduced even further. To prevent the marker from identifying noise as signals, reduce the noise floor variance to a value less than the peak-excursion value by reducing the video bandwidth or by using video averaging.

Key access: **Peak Search**, **More**, **Search Criteria**

Peak Threshold Sets the minimum amplitude of signals that the marker can identify as a peak. For example, if a value of –90 dBm is selected, the marker moves only to peaks that rise and fall more than the peak excursion value above –90 dBm. Pressing **Preset** or turning the Power on resets the excursion to 6 dB and the threshold to –90 dBm.

The value of the threshold appears in the active-function block and on the lower-left side of the display. The threshold level does not influence the trace memory or marker position. The value of the peak threshold level can be changed using the step keys, the knob, or the numeric keypad. Pressing any digit, 0 through 9, on the numeric keypad brings up the selected terminator menu.

Key access: **Peak Search**, **More**, **Search Criteria**

Peak Search Type Allows you to select the peak search mode.

Key access: **Peak Search**, **More**, **Search Criteria**

Max Value When **Peak Search Type** is set to **Max Value**, a peak search places a marker on the highest peak, excluding the LO feedthrough peak.

Key Access: **Peak Search**, **More**, **Search Criteria**, **Peak Search Type**

Excursion & Threshold When **Peak Search** is set to **Excursion & Threshold**, a peak search places a marker on a peak that meets the **Peak Excursion** and **Peak Threshold** parameters. If **Peak Search Type** is set to **Excursion &Threshold** and no peak satisfies the selected parameters, a marker is placed at the center of the trace, and the error message, `No Peak Found` will appear. Refer to Show Errors on page 149, to remove the error message.

Key Access: **Peak Search**, **More**, **Search Criteria**, **Peak Search Type**

Peak Table Accesses the following **Peak Table** menu keys:

Key Access: **Peak Search**, **More 1 of 2**

**Peak Table
On Off**   Displays a list of up to ten signal peaks that is updated at the end of each sweep. The peaks can be sorted in order by descending amplitude or by ascending frequency. Peaks above or below the display line can be excluded from the table. The peak table function works with trace 1 only.

Key Access: **Search**, **More**, **Peak Table**

**Peak Sort
Freq Amptd**   Switches the peak table sorting routine between listing the peaks in order by descending amplitude or by ascending frequency.

Key Access: **Search**, **More**, **Peak Table**

Peak Readout   Accesses the following **Peak Readout** menu keys:

Key Access: **Search**, **More**, **Peak Table**

Normal

Shows up to ten signal peaks.

Key Access: **Search**, **More**, **Peak Table**, **Peak Readout**

> Display Line

Shows only peaks above the display line.

Key Access: **Search**, **More**, **Peak Table**, **Peak Readout**

< Display Line

Shows only peaks below the display line.

Key Access: **Search**, **More**, **Peak Table**, **Peak Readout**

Preset

Provides a known convenient starting point of the instrument state for making measurements. You can select whether a user preset, mode preset, or factory preset is performed. When you press **Preset**, the default is **Mode** preset, which will set the analyzer to the default state for the current mode. The user preset is user-defined using the **Save User Preset** function in the **System** menu (Press **System**, **Power On/Preset**, **Save User Preset**.) The **Preset Type** selection (**User**, **Mode** or **Factory**) can be set by pressing **System**, **Power On/Preset**, **Preset Type.**

NOTE The **Preset** menu keys are only available when the **Preset Type** key in the **System** menu is set to **User**. Press **System**, **Power On/Preset**, **Preset Type**, **User**.

If **Preset Type** is set to **Factory** in the **System** menu:

Pressing the **Preset** front-panel key performs a factory preset, which performs the following:

- Resets the analyzer to Spectrum Analyzer (SA) mode.
- Brings up the **Freq/Channel** menu.
- Sets certain conditions to their default values.
- Performs a processor test, but does not affect alignment data.
- Clears both the input and output buffers and clears all trace data.
- Sets the amplitude values of trace 2 and 3 to the bottom of the screen.
- Amplitude-correction factors are turned off, but remain in analyzer memory.
- Limit line testing is turned off, but the limit line tables remain in analyzer memory.
- Segmented sweep is turned off, but the segmented sweep tables remain in analyzer memory.
- The status byte is set to 0.

See Table 2-2 on page 118 for the conditions established by performing a factory preset.

NOTE For *Agilent E4402B or E4407Bwith Option UKB, E4404B, and E4405B* only, you can specify alternating current (ac) or direct current (dc) coupling at the analyzer input. Selecting ac coupling blocks any dc voltage at the analyzer input, but also decreases the frequency range of the analyzer. Make sure the analyzer is dc coupled when measuring below 100 kHz for ***Agilent E4402B, E4404B, and E4405B*** and below 10 MHz for *Agilent E4407B*. (See "Input/Output" in this chapter for more information on this setting.)

If **Preset Type** is set to **User** in the **System** menu:

Pressing the **Preset** front-panel key brings up the **User Preset**, **Mode Preset**, and **Factory Preset** menu keys.

- If **User Preset** is pressed, the user preset state is recalled. To set the user preset state, change the analyzer settings as desired, then press **System**, **Power On/Preset**, **Save User Preset**.

- If **Mode Preset** is pressed, the current mode settings are reset to the factory defaults. Pressing **Mode Preset** does not change the mode.

- If **Factory Preset** is pressed, a factory preset will be performed as described above.

NOTE   Recalling any state, including the user preset state, will affect the conditions of more parameters than are affected by a factory preset. For example, external preamp gain and input impedance correction are not affected by a factory preset but may be affected by a user preset.

NOTE   In the **System** menu, if **Power On** is set to **Preset**, and **Preset Type** is set to **Factory**, turning on the analyzer performs a factory preset. The last state of the analyzer (before it was turned off) is recalled if **Power On** is set to **Last**. The user preset state is recalled if **Power On** is set to **Preset** and **Preset Type** is set to **User**.

Table 2-2   **Factory Preset Conditions**

Amplitude correction factors	off
Amplitude Ref (Signal)	off
Amplitude units	50 Ω input – dBm log 75 Ω input – dBmV log
Annotation and graticule display	on
Attenuation	10 dB (auto-coupled)
Center frequency: E4401B and E4411B E4402B and E4403B E4404B E4405B E4407B and E4408B	 750 MHz 1.5 GHz 3.35 GHz 6.6 GHz 13.25 GHz
CF step size	10% of span
Coupled functions	all set to AUTO
Detector	Peak (auto-coupled)
Display line level	–25 dBm, display off

Table 2-2　　　**Factory Preset Conditions (Continued)**

Frequency (scale type)	Linear
Frequency offset	0 Hz
IF Gain	Auto
Input Coupling[1] E4402B & E4407B with Option UKB, E4404B, and E4405B	AC
Int Preamp	off
Limit line testing	off
Log scale (Amplitude)	10 dB/division
Marker count	off
Marker counter resolution	auto-coupled
Markers	off
Max Mixer level	−10 dBm
Measure	Meas Off
Radio Std	None
Reference level	0 dBm in power-on units
Reference level offset	0 dB
Reference level position	top (10th) graticule
Resolution bandwidth	3 MHz (auto-coupled)
Span E4401B and E4411B E4402B and E4403B E4404B E4405B E4407B and E4408B	 1.5 GHz 3.0 GHz 6.7 GHz 13.2 GHz 26.5 GHz
Speaker	Off
SRQ mask	40
Start Frequency	0 Hz

Table 2-2   **Factory Preset Conditions (Continued)**

Stop Frequency	
E4401B and E4411B	1.5 GHz
E4402B and E4403B	3.0 GHz
E4404B	6.7 GHz
E4405B	13.2 GHz
E4407B and E4408B	26.5 GHz
State Registers	unaffected
Segmented Sweep	off
Sweep Points	continuous
Sweep Time	
E4401B and E4411B	4 ms (auto coupled)
E4402B and E4403B	5 ms (auto coupled)
E4404B	16.75 ms (auto coupled)
E4405B	33 ms (auto coupled)
E4407B and E4408B	265 ms (auto coupled)
Sweep	401
Threshold level	−90 dBm, display off
Title	cleared
Trace 1	clear-write
Trace 2	blank, at bottom of display
Trace 3	blank, at bottom of display
Trigger	free run
Trig Delay Off	1 μsec
Trig Offset Off	0 sec
VBW/RBW ratio	1.000 X (auto-coupled)
Video averaging	off
Video bandwidth	3 MHz (auto-coupled)

1. E4401B, E4402B without Option UKB, E4403B, and E4411B have fixed AC
   coupling. E4407B without Option UKB and E4408B have fixed DC coupling.

User Preset　This key is only available when the **Preset Type** key is set to **User**. Press **System**, **Power On/Preset**, **Preset Type**, **User**.

User Preset loads the analyzer configuration that existed when **Save User Preset** was pressed. If **Save User Preset** has never been pressed, the factory preset state is loaded. If the user preset state has been saved but the load fails for any reason, the error message: Unable to load user state is displayed in the status line and the state is reset to whatever it was before the **Preset** key was pressed. This can sometimes happen if firmware has been upgraded or applications have been (un)installed after the user preset state was saved. **Save User Preset** can be accessed by pressing **System**, **Power On/Preset**.

Key Access: **Preset**

Mode Preset　This key is only available when the **Preset Type** key is set to **User**. Press **System**, **Power On/Preset**, **Preset Type**, **User**.

Mode Preset does not change the mode. It only resets the current mode settings to the factory defaults and to continuous sweeps/measurements.

Key Access: **Preset**

Factory Preset　This key is only available when the **Preset Type** key is set to **User**. Press **System**, **Power On/Preset**, **Preset Type**, **User**.

A factory preset is executed so all of the instrument modes are returned to the factory default state (i.e. Spectrum Analysis Mode and continuous sweep.) If you are not already in the spectrum analysis mode, it switches to that mode. A factory preset will not reset "persistent" functions such as GPIB address, time/date display style, or auto alignment state to the factory defaults.

Key Access: **Preset**

Save User Preset　This key is only available when the **Preset Type** key is set to **User**. Press **System**, **Power On/Preset**, **Preset Type**, **User**.

This key saves the current state of the analyzer into the **User Preset** state for recalling when the instrument is user preset. After you save a state here, you must go to the **Preset Type** key and select **User** in order to have this state used as the preset state.

Key Access: **Preset**

Print

Option A4H (GPIB and Parallel) or Option 1AX (RS-232 and Parallel) only. **Print** initiates an output of the display data, without an external controller, to a previously specified graphics printer. Refer to "Printer Setup and Operation" in your Getting Started or **Programmer's Guide** for detailed information about printing.

Press the **Print** key to immediately print the screen to the currently-defined printer. The screen remains frozen (no further sweeps are taken) until the data transfer to the printer is complete. Refer to the **Print Setup** key description in this chapter for more information about the structure and definitions of the printer keys.

If you need to abort a print in progress, use the **ESC** (escape) key.

NOTE   Printing requires an I/O interface. The *Agilent ESA Spectrum Analyzers Programmer's Guide*, included with the optional interfaces, provides interface details. Refer to "Printer Setup and Operation" in the *Agilent ESA Spectrum Analyzers Getting Started Guide* for more information about printing.

Print Setup

Option A4H (GPIB and Parallel) or 1AX (RS-232 and Parallel) only.
Accesses the menu keys which allow you to define a printer and select
printer options.

Printer Type   Accesses the Printer Type menu keys. When you connect your printer
and press the **Print** key, the analyzer will attempt to identify your
printer. If identification is unsuccessful, **None** or **Custom** will
automatically be set in the Printer Type menu.

Key Access: **Print Setup**

None   The Printer Type will automatically be set to **None**
                  when you press the **Print** key with an unsupported
                  printer connected to your analyzer.

                  Key Access: **Print Setup**, **Printer Type**

Custom   When you press the **Print** key and the analyzer cannot
                  identify your printer, **Custom** will automatically be set
                  in the Printer Type menu. Setting the Printer Type
                  menu key to **Custom** allows you to define your printer
                  using the **Define Custom** menu keys.

                  Key Access: **Print Setup**, **Printer Type**

Auto   When **Auto** is selected, and the **Print** key is pressed, the
                  analyzer will attempt to communicate with the printer
                  and obtain its identification. If the printer is identified,
                  the print will be successful and no message will appear
                  on the display. If the analyzer is not able to identify the
                  printer, the Printer Type will automatically be set to
                  Custom and an error message asking you to press
                  Define Custom to set up your printer will be displayed. If
                  the printer is not supported, the Printer Type will
                  automatically be set to **None** and an error message will
                  inform you that your printer is unsupported.

                  Key Access: **Print Setup**, **Printer Type**

Define Custom   Allows you to define your printer.

Key Access: **Print Setup**, **Printer Type**

**Language
PCL3 PCL5**   Allows you to define your printer as a Hewlett-Packard
                  PCL3. (Most DeskJets) or Hewlett-Packard PCL5
                  (LaserJets and DeskJets: 1100,1200,1600,2000 series)
                  printer.

                  Key Access: **Print Setup**, **Define Custom**

Color Capable

Yes No   Allows you to define the color capability of your printer.

Key Access: **Print Setup**, **Define Custom**

Orientation   Allows you to select either **Portrait** or **Landscape** printing. The **Orientation** key will not function with a PCL3 (HP DeskJet) printer.

Key Access: **Print Setup**

Prints/Page   Selects the number of prints per page when orientation is set to **Portrait**.
1 2   In **Landscape** printing, **Prints/Page** is always set to 1.

Key Access: **Print Setup**

Eject Page   Ejects your printed page.

Key Access: **Print Setup**

Page Size   Allows you to select from the following page sizes: **Executive**, **Letter**, **Legal**, **Ledger**, **A4**, and **A3**.

Key Access: **Print Setup, More**

Color   Allows you to select between color or black and white printing. This key
On Off   will not function when pressed unless the connected printer supports color.

Key Access: **Print Setup**, **More**

Restart

If no measurement is active and **Sweep (Single)** is selected, a new sweep is initiated.

(See "Restart" on page 471.)

Return

Returns you to the previous menu. Repeated presses of this key move back through previously selected menus (including previous pages selected by the **MORE** key.

NOTE   When a menu requiring a yes or no key press has been accessed, the **Return** key will not respond.

NOTE   When entering an alphanumeric value (a screen title or filename), pressing **Return** terminates the entry.

Save

Executes a save operation as though you were in the **File**, **Save** menu and had pressed **Save Now**. If you have previously used the **File**, **Save**, **Save Now** keys to setup and save a file, the **Save** hardkey will save your file in the same format and to the same location using a new automatically generated filename. If you have not saved a file since power on, a state file (.STA format) will be saved to the C: drive.

For example, if you use the **File**, **Save** menu to configure the analyzer to save Trace 1 in .CSV format on the C: drive, using the automatically generated file name (TRACE001.CSV), then every time the front panel **Save** key is pressed, Trace 1 will be saved in .CSV format and the filename will be incremented (TRACE002.CSV, TRACE003.CSV). This provides a convenient format for saving several files with the same format quickly.

NOTE   In the event that a valid save cannot be performed because a drive has not been selected, the **Save** key will report the error `No drive selected`. In this case, press **File**, **Save** and select a drive.

Single

When analyzer is in continuous sweep mode and not in a measurement
(**Measure**, **Meas Off**), this key changes the sweep control to single sweep
and executes a sweep after the trigger condition is met. If the analyzer
is already in single sweep, pressing **Single** executes a new sweep after
the trigger condition is met.

If Average is on (**BW/Avg**, **Average (On)**), pressing **Single** resets the
average trace and starts the average again from a count of zero. Sweeps
are averaged until N sweeps are then taken (where N is the average
number), and then the sweep is halted.

(See also "Single" on page 473.)

Source

Accesses the tracking generator key functions (Options 1DN or 1DQ only). Without Option 1DN or 1DQ, pressing **Source** will cause the error message `Option not installed` to appear on the analyzer display.

CAUTION	If **Auto Align** is on, the 3 GHz tracking generator will be momentarily retuned to approximately 1.557 GHz between most sweeps. Some devices under test (for example, amplifiers with AGC) may be susceptible to damage due to this momentary retuning. To avoid this momentary retuning, turn the auto align off by pressing **System**, **Alignments**, **Auto Align**, **Off**. Refer to the Specifications Guide for your instrument to learn more information about using the analyzer with Auto Align set to off.
Amplitude On Off	Activates (**On**) or deactivates (**Off**) the output power of the tracking generator. The power level can then be adjusted using the numeric keypad, step keys, or knob. Pressing any digit, 0 through 9, on the numeric keypad brings up the selected terminator menu. See the specifications chapter in the calibration guide for the available output power for your tracking generator.

Key Access: **Source** |
| CAUTION | Power-level sensitive devices connected to the tracking generator output may be accidentally damaged. This is because the actual source amplitude will be greater than the amplitude indicated on the analyzer, when the power sweep function is being used.

The source amplitude value is used as the starting amplitude for a power sweep. The ending amplitude for a power sweep is higher then the source amplitude value and it may actually be set to values beyond specified output levels. Therefore, exercise caution when connecting a power-level sensitive device to the tracking generator output. |
NOTE	For spectrum analyzers with Option 1DN or Option 1DQ, the tracking generator must be turned on (**Source**, **Amplitude (On)**) before you set up the segmented sweep table.
NOTE	When **Amplitude (Off)** is selected, the output attenuation on the Agilent E4402B, E4403B, E4404B, E4405B, E4407B, and E4408B is set to the maximum attenuation.
Power Sweep On Off	Sets the power-sweep function to **On** or **Off**. The value of the power-sweep range is displayed in the active-function block when you press **Power Sweep (On)**. The analyzer continues to sweep the specified

frequency range when power sweep is on. (To do a power sweep at a fixed frequency, set the analyzer to zero span at the desired frequency.) The available power-sweep range is a function of the source attenuator setting. For your instrument's available power sweep range refer to the appropriate *Specifications Guide for your analyzer.*

The output power of the tracking generator is swept according to the sweep rate of the analyzer. The output power is always swept from the source power setting to a higher power setting (negative source power sweep values are not allowed).

Power-sweep measurements are particularly useful in making gain compression measurements or output power versus frequency measurements.

CAUTION

When using the power sweep functionality, the actual source amplitude will be greater than the source amplitude indicated. The source amplitude value is the starting amplitude for a power sweep, so the ending amplitude for a power sweep will be higher then the displayed value. As a result, exercise caution when connecting a power-level sensitive device to the tracking generator output.

Key Access: **Source**

**Attenuation
Auto Man**

Allows you to select between automatic and manual adjustment of the tracking generator's output attenuator. The Agilent E4401B and E4411B can be manually adjusted from 0 to 60 dB in 10 dB steps. All other Agilent ESA analyzers can be manually adjusted from 0 to 56 dB in 8 dB steps. When auto-coupled, the attenuation function automatically adjusts the attenuator to yield the source amplitude level specified by the **Amplitude On Off** softkey function. For the Agilent E4401B and E4411B, press **Attenuation (Man)** for power sweeps greater than 10 dB.

Key Access: **Source**

**Amptd Step
Auto Man**

Allows you to set the step size of the power level range of the tracking generator. The default setting is one vertical scale division when in a logarithmic amplitude scale.

Key Access: **Source**

Amptd Offset

Offsets the displayed power of the tracking generator. Using the amplitude offset capability of the tracking generator allows you to take system losses or gains into account, thereby displaying the actual power delivered to the device under test.

Key Access: **Source**

Normalize   Key Access: **Source**

**Store Ref
(1→ 3)**   Copies trace 1 into trace 3. **Store Ref (1→ 3)** must be pressed before pressing **Normalize (On)**. If **Normalize (On)** is pressed before **Store Ref (1→ 3)**, the error message: `Store reference trace before turning on Normalize` is displayed in the status line, however Normalize has been activated.

Key Access: **Source**, **More**, **Normalize**

**Normalize
On Off**   **Normalize (On)** Activates the normalize function. On each sweep, the normalized trace (Trace 3) is subtracted from Trace 1 and the result is added to the normalized reference level. The display shows the result of the following calculation:

Trace 1 – Normalized Trace + Normalized Reference Level

The trace data is normalized with respect to the normalized reference level, even if the value of the normalized reference level is changed. This function remains in effect on all subsequent sweeps until it is turned off.

NOTE   Segmented sweep is not available when **Normalize (On)** is selected.

CAUTION   Trace 1 should be in clear write mode prior to setting normalize to on.

The normalize function is most useful for applying correction data to a trace while making a stimulus response measurement with a tracking generator. For example, connect the cables and a thru line, in place of the device to be measured, between the tracking generator and the analyzer input. Notice that the frequency response is not perfectly flat, showing the response of the cables, as well as the flatness of both the tracking generator and the analyzer.

Now press **Store Ref (1→ 3)**, **Normalize On**. Notice that the displayed trace is now flat, or normalized. The position of the normalized trace can now be moved to a different position on the display by changing the normalized reference position. This may be useful if the device to be tested has positive gain, such as an amplifier. Now replace the thru line with the device under test, and an accurate measurement of the gain or loss can be made.

Key Access: **Source**, **More**, **Normalize**

Norm Ref Lvl   Sets the level (in dB) of the normalized reference.

Key Access: **Source**, **More**, **Normalize**

Norm Ref Posn Offsets the displayed trace without affecting the instrument gain or attenuation settings. This allows the displayed trace to be moved without decreasing measurement accuracy. The normalized reference position is indicated with a (>) character on the left side of the display and a (<) character on the right side of the display.

Key Access: **Source**, **More**, **Normalize**

**Ref Trace
View BLank**   Allows you to view or blank the reference trace on the display.

Key Access: **Source**, **More**, **Normalize**

Tracking Peak   *Agilent E4402B, E4403B, E4404B, E4405B, E4407B, and E4408B only.* Activates a routine that automatically adjusts fine tracking adjustments to obtain the peak response of the tracking generator on the spectrum analyzer display. Tracking Peak is performed in the active resolution bandwidth.

Key Access: **Source**, **More**

Man Track Adj   *Agilent E4402B, E4403B, E4404B, E4405B, E4407B, and E4408B only.* Allows you to adjust the frequency of the tracking generator oscillator manually using the step keys, knob, or numeric keypad. The tracking adjust is tuned to maximize the amplitude of the trace.

Key Access: **Source**, **More**

NOTE   When **Source** is On, resolution bandwidths less than 1 kHz are not available.

NOTE   When the resolution bandwidth is less than 1 kHz, **Source** may not be turned on.

SPAN X Scale

NOTE

If **Power Stat CCDF** is selected in the **MEASURE** menu, see "SPAN X Scale (Complimentary Cumulative Distribution Function—CCDF)" on page 511 for **Span X Scale** key descriptions.

If **Spectrum Emission Mask** is selected in the **MEASURE** menu, see "SPAN X Scale (Spectrum Emissions Mask—SEM)" on page 595 for **Span X Scale** key descriptions.

Activates the **Span** function and accesses the menu of span functions. Pressing **SPAN X Scale** allows you to change the frequency range symmetrically about the center frequency. The frequency-span readout describes the total displayed frequency range. To determine frequency span per horizontal graticule division (when the frequency scale type is set to linear), divide the frequency span by 10.

Span

Allows you to enter a span frequency range value.

Key Access: **SPAN X Scale**

Span Zoom

Performs an automatic zoom so that the signal at the marker remains at the center of the display. If a marker is already on, the zoom begins at the frequency of the marker. If a marker is not already on, a marker is placed on the highest on-screen signal (ignoring the LO feedthrough). Signal-track is turned on, and the span function is activated. Entering a new span value causes the analyzer to change the span in steps, keeping the signal centered on the screen until the desired span is reached. The analyzer is left in Signal Track mode. Pressing **Span Zoom** performs the routine similar to pressing the following keys: **Search**, **Frequency**, **Signal Track (On)**, and **Span**.

NOTE

Span Zoom is not available when the **Frequency**, **Scale Type (Log)** is selected.

NOTE

Span Zoom leaves the analyzer in Signal Track mode.

NOTE

Span Zoom is not available when **Segmented (On)** is selected.

Key Access: **SPAN X Scale**

Full Span

Changes the analyzer span to full span showing the full frequency range of the analyzer. In external mixing mode, pressing **Full Span** changes the analyzer span to the specified range for the selected external mixing band. Full span sets **Signal Track (Off)** and **Segmented (Off)**.

Key Access: **SPAN X Scale**

Zero Span

Changes the frequency span to zero. In this mode, the current center frequency is displayed in the time domain (the x-axis is displayed in units of time), like a conventional oscilloscope.

Sweep times faster than those in the frequency domain display mode are available if Option AYX or B7D are installed.

Resolution Bandwidths less than 1 kHz are unavailable when in zero span if the sweep time is being achieved by utilizing the Option AYX or B7D.

Key Access: **SPAN X Scale**

NOTE

Sweep times that would require Option AYX or Option B7D are not available in zero span if the Resolution Bandwidth is less than 1 kHz.

NOTE

Zero Span is not available when **Segmented (On)** is selected. Segments in the segmented sweep function can be set to zero span by setting the span parameter in the segmented sweep editor to 0 Hz. (**Sweep, Segmented, Modify, Edit, Span**)

NOTE

The minimum number of sweep points in zero span varies with firmware revision:

Firmware Revision	Minimum # of Sweep Points in Zero Span
≤ A.03.03	401 (fixed)
A.04.xx	101
≥ A.05.00	2

NOTE

Zero Span sets **Signal Track (Off)** and **FREQUENCY, Scale Type** to linear mode.

Last Span

Changes the analyzer frequency span to the previous span setting. If pressed after **Signal Track** is turned off, the span setting returns to the span that was in effect before **Signal Track** was turned on. This is true, even if **Signal Track** was turned on as part of **Span Zoom**. Last span sets **Segmented (Off)**. The state of **Frequency, Scale Type Log Lin** is included in the recalled information.

Key Access: **SPAN X Scale**

Zone   Accesses menu keys that allow you to control the two-window zone function. This function allows you to have an upper window with a broad display of frequency and two zone markers (vertical bars) that define the span for the lower window. This function is only available on ESA-E Series Analyzers (E4401B, E4402B, E4404B, E4405B, and E4407B).

Key Access: **SPAN X Scale**

Zone
On Off   **Zone (On)** allows you to change from a one-window to a two-window display. The top window will display the trace with two vertical lines (Zone Markers) displayed at center frequency plus and minus 5% of the current span. (You can change the default zone frequency and zone span values using the **Zone Center** and **Zone Span** keys.) The top window will be inactive.

The bottom window will display the section of the trace in the top window that is between the Zone Markers. The span of the bottom window is 10% of the span of the top window. (You can change the default zone frequency and zone span values using the **Zone Center** and **Zone Span** keys.) When first activated, both windows have the same center frequency. The bottom window is active and the sweep time, resolution bandwidth, and video bandwidth have been coupled to the bottom window span.

There are separate annotations for frequency, bandwidth, sweep time, reference level, amplitude scale and scale/div for each window. The values for these parameters can be changed for each window independently.

To activate the top window, press the **Next Window** key located below the display. The active window is distinguished by a green border. Only the active window will have a sweep taken and updated to the display. When the active window is toggled, the state for the active window is saved, and the last state of the inactive window is recalled. When the window becomes inactive, its data invalid indicator will appear on the display. The data invalid indicator will remain until the window becomes the active window and a complete sweep has been executed. Pressing **Zoom** will change to a one-window display showing only the active window. Pressing **Zoom** again will return you to the two-window display. Pressing **Zone (Off)** will return you to a one-window display of the active window.

Key Access: **SPAN X Scale**, **Zone**

NOTE   Pressing **Zoom** will set **Zone (On)**, if it is off.

Zone Center   Allows you to change the frequency of the zone markers without changing the zone span. The zone markers are vertical lines marking the zone in the upper window. They determine the frequency range displayed in the lower window. As the zone markers in the upper window are moved, the center frequency of the lower window is changed but the lower window will not be updated to reflect the change unless it is selected as the active window. (See **Zone On Off**.)

The center frequency for the lower window is not limited by the selected start and stop frequencies in the upper window. However, if the frequency span of the lower window is outside of the span for the upper window, the vertical span markers will be displayed at the edge of the graticule. When the lower window is active, the **FREQUENCY Channel** key will allow you to change **Zone Center**. Any change to the lower window while it is active will change the center frequency.

Key Access: **SPAN X Scale**, **Zone**

Zone Span   Allows the span of the zone markers to be changed without changing the center frequency. The zone markers are vertical lines marking the zone in the upper window. They determine the frequency range displayed in the lower window. As the zone markers are moved, the span of the lower window is changed but the lower window will not be updated to reflect the change unless it is selected as the active window. (See **Zone On Off**.)

The span limit of the lower window is the same as the span limit of the analyzer. The span for the lower window is not limited to the selected span of the upper window. However, if the frequency span of the lower window is outside of the span of the upper window, the vertical span markers will not be displayed. When the lower window is active, the **SPAN X Scale** key will change **Zone Span**, and any change to **Zone Span** while the lower window is active, will change the span.

Key Access: **SPAN X Scale**, **Zone**

NOTE   Zone Span is not available when **Segmented (On)** is selected.

Zone Pk Right   Finds the next peak to the right of the zone center
frequency on the upper window trace and then moves
the zone so that it is centered around the new peak. The
zone span is not changed. The center frequency of the
lower window changes to reflect the new zone center
frequency. The lower window will not be updated until
it is made active. If no peak is found, the zone will not
be moved. A signal must obey the parameters defined
in **Search**, **Search Param** to be identified as a peak
signal. Pressing **Zone Pk Right** will have no effect if the
upper window is not the active window or if it is in zero
span.

Key Access: **SPAN X Scale**, **Zone**

Zone Pk Left   Finds the next peak to the left of the zone center
frequency on the upper window trace and then moves
the zone so that it is centered around the new peak. The
zone span is not changed. The center frequency of the
lower window changes to reflect the new zone center
frequency. The lower window will not be updated until
it is made active. If no peak is found, the zone will not
be moved. A signal must obey the parameters defined
in **Search**, **Search Param** to be identified as a peak
signal. Pressing **Zone Pk Left** will have no effect if the
upper window is not the active window or if it is in zero
span.

Key Access: **SPAN X Scale**, **Zone**

Standby

Removes power from the analyzer, except for a small portion of circuitry inside the switching power supply. No internal time base circuitry, or any other function outside of the power supply is powered when the analyzer is in "standby."

Sweep

Activates the sweep time function and accesses the following menu keys:

Sweep Time Auto Man
Selects the length of time the analyzer takes to tune across the displayed frequency span (or, in zero span, the time the analyzer takes to sweep the full screen). Reducing the sweep time increases the sweep rate. The sweep time can be changed using the step keys, the knob, or the numeric keypad.

In non-zero spans:

When the sweep time is auto-coupled, the analyzer selects the optimum (shortest) sweep time for the current settings. This selection process is influenced by several factors:

- The maximum tuning rate of the spectrum analyzer
- The selected Resolution Bandwidth and Video Bandwidth filters
- The maximum sample rate of the Analog-to-Digital converter (ADC) (Trace data are digitized and stored in memory)
- The number of trace points (**Sweep**, **Points**)
- The Amplitude Scale (logarithmic or linear)
- The Detector mode

You may select a sweep time less than the auto-coupled value; however this may generate measurement errors. If this happens, the error message: `Meas Uncal` will appear in the upper right corner of the display. When the **Average** detector is selected and the amplitude scale is linear, the fastest sweet time is 8 milliseconds.

In zero span:

The minimum sweep time is determined by the maximum sample rate of the ADC and the number of sweep points. With Option B7D, the fastest sweep time is 2.5 microseconds (with 101 sweep points). As the number of points increases, the sweep time increases. With Option AYX, the fastest sweep time is 5 microseconds (with 101 sweep points). With neither option installed, the fastest sweep time is 1 millisecond (with 101 sweep points) and 4 milliseconds (with 401 sweep points). When the **Average** detector is selected and the amplitude scale is linear, the fastest sweet time is 8 milliseconds.

NOTE   With firmware A.08.00 and greater, in zero span, the auto/manual function of this key is not applicable. When **Sweep Time (Auto)** is selected in non-zero span, any changes to Sweep Time while in zero span will revert to the Auto value when you return to non-zero span. When **Sweep Time (Man)** is selected in non-zero span, any changes to Sweep Time while in zero span will be maintained when you return to non-zero span.

The maximum sweep time is 4000 seconds for any set of conditions. Refer to your instrument's appropriate Specifications Guide for more information about Sweep Time and its relation to other instrument settings.

Key Access: **Sweep**

Sweep Single Cont

Switches the analyzer between the continuous-sweep mode and the single-sweep mode. Pressing **Sweep (Single)** puts the analyzer in single-sweep mode. Press **Single** on the front panel, to enable a sweep when in single-sweep mode. When **Sweep (Cont)** is selected, one sweep follows another as soon as it is triggered. Pressing **Preset** (When **Preset Type** is set to **Factory**) or turning the power on, sets the sweep mode to continuous sweep.

Key Access: **Sweep**

Auto Swp Coupling SR SA

Selects stimulus-response (SR) or spectrum-analyzer (SA) (default) auto-coupled sweep times. In stimulus-response mode, auto-coupled sweep times are usually much faster for swept-response measurements. Stimulus-response auto-coupled sweep times are typically valid in stimulus-response measurements when the system's frequency span is less than 20 times the bandwidth of the device under test.

Key Access: **Sweep**

Gate

Requires Option 1D6 (Time Gate). Accesses the following menu keys that allow you to setup various gate parameters:

Key Access: **Sweep**

Gate On Off

Requires Option 1D6 (Time Gate). Turns the gate function on and off. When set to **Gate (On)**, the video signal that is digitized is controlled by the gate circuitry. The gate circuitry switches between two states. When the gate is "open", the normal video signal of the analyzer is passed through the video filters to the peak detectors and digitizer of the analyzer. When the gate is "closed", the video filters, peak detectors, and digitizer are given a signal at the bottom of the display.

The gate function requires that a gate trigger signal be connected to the **GATE TRIG/EXT TRIG IN (TTL)** input on the rear panel. When the gate function is on, the state of the gate appears at the **GATE/HI SWP OUT (TTL)** rear panel connector. A TTL high output indicates that the gate is open. The gate out signal is only valid while the analyzer is sweeping. Between sweeps, the gate out signal is invalid. You can adjust the gate delay and gate length using an oscilloscope to view the gate out signal. The analyzer sweep time should be set to a large value (50 sec) during the adjustment so that the gate signal is

valid most of the time. When the adjustment is done you can set the analyzer back to the desired sweep time, or set it back to **Auto Couple**.

Key Access: **Sweep**, **Gate**

| NOTE | **Trig Delay (On)** and **Gate (On)** cannot be active at the same time. If **Trig Delay (On)** has been previously selected, it will be reset to **Trig Delay (Off)** when **Gate (On)** is selected. Conversely, if **Gate (On)** has been previously selected, it will be reset to **Gate (Off)** when **Trig Delay (On)** is selected. |

| NOTE | If **Gate (On)** is selected without an external trigger signal present, operating other functions, such as: tracking, frequency count, or preselector centering, may cause the analyzer to stop functioning until it is powered on again. |

Gate Control

Edge Level   Allows you to select between **Edge** and **Level** triggering of the gate. **Gate Control (Edge)** opens the gate in response to an edge trigger on the trigger input after a delay set in **Gate Delay**. The gate stays open for the selected **Gate Length**. When **Gate Control (Level)** is selected, the gate is open as long as the trigger input is true, as defined under the **Level Gate** key.

Key Access: **Sweep**, **Gate**

Edge Gate   Accesses menu keys that allow you to set up edge triggering.

Key Access: **Sweep**, **Gate**

Slope Pos Neg   Sets the polarity for edge triggering of the gate. When **Slope (Pos)** is pressed, a positive-going edge will trigger the opening of the gate, after the delay set with the **Gate Delay** key. When **Slope (Neg)** is pressed, a negative-going edge will trigger the opening of the gate after the set delay.

Key Access: **Sweep**, **Gate**, **Edge Gate**

Gate Delay   Controls the length of time from the trigger until the gate is turned on.

Key Access: **Sweep**, **Gate**, **Edge Gate**

Gate Length   Controls the length of time that the gate is on when using edge triggering to control the gate.

Key Access: **Sweep**, **Gate**, **Edge Gate**

Level Gate
High Low   Sets up level polarity that will open the gate. Requires
Option 1D6.

Level Gate (High) Selects a high TTL level to open the
gate. **Level Gate (Low)** selects a low TTL level to open the
gate.

Key Access: **Sweep**, **Gate**

Points   Allows you to set the number of points per sweep, from 101 to 8192 in
non-zero span and 2 to 8192 in zero span (firmware revision A.05.00
and greater). Use the knob, step keys, or numeric keypad to set this
value. When the sweep time is limited by the Analog to Digital
Converter (ADC) sample rate, the sweep time changes with the number
of points selected. The greater the number of points, the longer the
sweep time becomes. If **Preset** is pressed (and **Preset Type** is set to
Factory), or the analyzer power is cycled, the number of points per
sweep will default to 401. The current value of points is displayed next
to the sweep time.

When **FREQUENCY**, **Scale Type (Log)** is selected, the desired number of
sweep points may not be possible. Refer to "Scale Type Log Lin" on
page 93 for more information.

Changing the number of points has several effects on the analyzer.
Since markers are read at the point location, the marker reading may
change. Press **Peak Search**, again for greater accuracy in the marker
reading. All trace data for the current window is cleared. If in
continuous sweep mode, (**Sweep**, **Sweep (Cont)**), a new sweep begins
immediately. If average is on (**BW/Avg**, **Average (On)**), the averaging
starts over with a count of 0. With firmware revisions prior to A.08.00,
if Limit Lines are on (**Display**, **Limits**, **Modify**, **Limit 1 or 2 (On)**), they are
turned off.

Key Access: **Sweep**

NOTE   By selecting a number of sweep points greater than 401, you are
optimizing frequency resolution and accuracy while accepting a reduced
measurement speed. In addition to sweep points, the span, resolution
bandwidth, video bandwidth, average detection and center frequency
will also affect measurement speed.

This function is not available when signal identification is on
(**Input/Output, Input Mixer, Signal Ident (On)**).

When zone span is on (**Span**, **Zone. Zone (On)**), each window has its own
value for points.

This feature is not available in the E4403B, E4408B, or E4411B (ESA-L Series). The number of points per sweep for these models is always set to 401.

Segmented   Accesses the segmented sweep function and its editor.

Segmented sweep is a method in which you can select multiple frequency bands (a maximum of 32), specify their parameters individually, and display them as a single trace. This function of the analyzer results in faster measurements and provides greater detail and resolution in particular bands of interest. To set the parameters of individual segments, go to the editor (**Sweep, Segmented, Modify, Edit**) and refer to the parameter key descriptions below. For measurement examples of the segmented sweep function, refer to the *Agilent ESA Spectrum Analyzers Measurement Guide*.

Key Access: **Sweep**

NOTE   This feature is only available on ESA-E series analyzers (E4401B, E4402B, E4404B, E4405B, E4407B) with firmware revision ≥ A.05.00.

Segmented On Off

Turning segmented sweep on (**Sweep**, **Segmented**, **Segmented (On)**) displays each sweep segment from left to right in order of increasing start frequency. When segments have the same start frequency, the segments are displayed in order of increasing stop frequency. Overlapping segments are acceptable. (Note however; the reference marker for a marker delta will be displayed in the first segment).

Segments are demarcated by vertical lines. The width of a given segment is determined by the ratio of the number of sweep in the segment to the number of sweep in the total trace. For example, if there are five segments with 101 sweep each (505 total), each segment occupies 20% of trace. If you increase the number of in one of the segments to 404 (808 total), that segment will occupy half of the trace; the other four segments, 12.5% each. You can define up to 32 segments with a total maximum number of sweep equal to 8192.

NOTE   **Frequency**, **Scale Type (Log)** is not available when **Segmented (On)** is selected.

Key Access: **Sweep**, **Segmented**

Modify

Accesses the segmented sweep editor described below.

Key Access: **Sweep**, **Segmented**

Segmented Sweep Editor

When the editor is entered (**Sweep, Segmented, Modify, Edit**), the segmented sweep mode is turned on, and a dual-display appears. The upper window shows the trace, displayed as described above. The lower window shows the editor data in tabular form: one segment per row with segment number and parameter values occupying the seven columns. The paramenters that can be set are:

- Center Freq
- Span
- Resolution BW
- Video BW
- Sweep Time (Zero Span only)

The trace is updated after each segment has a complete row of data entered. Although thirty-two segments are possible, only 8 rows of data are shown in the table at a time.

Use the tab keys or softkey menu to navigate the editor. When defining a new segment, you may use the numeric keypad to set values. Pressing **Enter** places the value in the table and highlights the next parameter available for modification.

NOTE   The order of the segments may change when you enter center frequency or span because the sequence is based upon increasing start frequency.

Various parameters are coupled to ensure accurate measurements. You will not be able to enter a value that would result in a measurement that is uncalibrated.

Amplitude parameters are common to all segments and are defined via the amplitude softkey menu. Refer to "AMPLITUDE Y Scale" on page 36 for more information.

The data in the segmented sweep table is retained through a power cycle. Table values can only be deleted by the **Delete** keys described below.

To exit the editor press any key except **Print**, **Help,** and the viewing angle adjustments.

NOTE   Exiting the editor does not turn off segmented sweep. **Segmented (Off)** must be selected.

Interaction with Other Analyzer Functions

Certain conditions prevent segmented sweep from being activated, while others cause this mode to be turned off. For analyzers with Option AYZ, the mixer frequency range (**Input**, **Input Mixer (Ext)**, **Ext Mix Band**) must be set to include the frequencies of interest in the segmented sweep table. If the mixer range is not the same, segmented sweep will not turn on. If the mixer range is changed, segmented sweep will be turned off.

Segmented sweep is not available when the following analyzer functions are turned on: Demod, Signal ID, and Signal Track. In addition, keys which access these functions are grayed out if segmented sweep is on. This is also true for the following functions: Mkr→CF, Mkr→CF Step, Mkr→CF Start, Mkr→CF Stop, MkrΔ→Span, Span Zoom, Zone Span, and Zero Span.

Confining marker pairs (marker delta, delta pair, and span pair) to one segment facilitates interpretation of marker readings. However, marker pairs can provide useful information across segments. Amplitude readings are straightforward because the y-axis is consistent over all segments. Frequency or time readings require consideration of differences in sweep time, number of, and span when interpreting measurements across segments.

Marker delta functions differently depending upon the type of segment in which it is activated. If you turn on marker delta in a segment set to 0 Hz span, it remains in that segment and provides amplitude and time difference measurements. If you initiate a marker delta in a non-zero span segment, it will function across segments and continue to display frequency and amplitude information.

Delta pair and span pair function similarly to marker delta in segmented sweep with some characteristics which need to be noted. When a delta or span pair is initiated in segmented sweep, the analyzer defaults to the frequency domain. If you wish to make time measurements in a zero-span segment, the domain must be set to time (**Marker**, **More**, **Readout**, **Time**). The delta or span pair can traverse all segments without regard to the type of segment in which they were initiated.

NOTE   Turn markers off (**Marker**, **Off**) when entering or exiting segmented sweep (**Segmented**, **Segmented (Off)**).

Performing a factory preset will turn segmented sweep off. This is also true if you select full span or last span.

Functions which are parameters of segmented sweep are not available when accessed by pressing the following front-panel keys: **Auto Couple**, **BW/Avg** (**Resolution BW** and **Video BW**), **Frequency** (the entire softkey menu), **Span** (see above), and **Sweep** (**Sweep Time** and **Points**).

When the sweep trigger is set to any of the trigger selections other than free run, no sweep occurs until the trigger condition is met. Once the trigger occurs, all segments are swept, completing the entire trace.

NOTE   For spectrum analyzers with Option 1DN or Option 1DQ, the tracking generator must be turned on (**Source**, **Amplitude (On)**) before you set up the segmented sweep table.

The on/off state of the segmented sweep mode and the segmented sweep table can be saved as a "state" type file (see "Save" on page 127) or as part of the power on/preset function (see "Power On/Preset" on page 150).

NOTE   When loading a "state" type file, segmented sweep will not turn on if any of the parameters in the file contain optional instrument settings not currently loaded on the analyzer or frequency settings outside the current range of the analyzer.

Edit   Accesses the segmented sweep editor, where a maximum of thirty-two segments can be defined by the segment number and the six parameters described below. Use the data control keys described in the *Agilent ESA Spectrum Analyzer Getting Started Guide* to enter the setting as each parameter is highlighted. Refer to the "Editor" section above for more information.

Key Access: **Sweep**, **Segmented**, **Modify**

Segment   Allows you to select a previously defined segment or the next segment for modification. Use the numeric keypad to select a specific segment or press the **Tab** keys to access adjacent segments.

Key Access: **Sweep, Segmented, Modify, Edit**

Center Freq   Allows you to specify the center frequency for a particular segment using the data control keys. For more information on this function, refer to "Center Freq" on page 91.

Key Access: **Sweep, Segmented, Modify, Edit**

Span   Allows you to select a frequency range symmetrically about the center frequency for the current segment using the data control keys.

NOTE	The order of the segments may change when you enter center frequency or span because the sequence is based upon increasing start frequency. Refer to the "Displaying the Trace" section above, for clarification.

Zero span is available for any or all segments. It must be set by pressing **Span**, **0**, **Hz**. For more information on this function, refer to "Zero Span" on page 134.

Key Access: **Sweep, Segmented, Modify, Edit**

Res BW   Allows you to select the resolution bandwidth to a value between 1 kHz and 5 MHz for the current segment using the data control keys. For more information on this function, refer to "BW/Avg" on page 58.

Key Access: **Sweep, Segmented, Modify, Edit**

Video BW   Allows you to set the video bandwidth for the current segment to a value between 30 Hz and 3 MHz. For more information, refer to "Video BW Auto Man" on page 58.

Key Access: **Sweep, Segmented, Modify, Edit**

Points   Allows you to set the number of for the current segment. The minimum number of points in a zero span segment is 2; in a non-zero-span segment, 101. The maximum number of points in the total sweep is 8192. If you exceed the number of points available in one segment, the message: `Too much data; total sweep points limited` will be displayed in the status line (yellow on color displays).

Key Access: **Sweep, Segmented, Modify, Edit**

Sweep Time   Allows you to set the sweep time for the current zero span segment. For a non-zero span segment, the sweep time is auto-coupled to Span, Resolution Bandwidth, and Video Bandwidth and cannot be manually defined. The

minimum sweep time is displayed. Refer to "Sweep Time Auto Man" on page 139 for more information.

Key Access: **Sweep, Segmented, Modify, Edit, More**

NOTE   The parameters for each segment are limited to ensure the occurrence of only calibrated measurements.

Delete Segment   Deletes the highlighted segment.

Key Access: **Sweep, Segmented, Modify, Edit, More**

**Delete
Segment**   Initiates the deletion of all segments. After pressing this key once, the message: `If you are sure, press key again to delete` will be displayed. Pressing **Delete** again will complete the process.

Key Access: **Sweep, Segmented, Modify**

System (Local)

Accesses the System menu keys. Pressing **System (Local)** after the analyzer has been placed in the remote mode, places the analyzer in the local mode and enables front-panel control. During remote operation, `R` appears in the upper-right corner of the screen. `R`, `T`, `L`, or `S` may appear during remote operation, indicating talk, listen, or service request. Pressing the **System (Local)** key removes the `R` symbol in the upper-right corner.

Show Errors　Accesses a display of the last 30 errors reported. The most recent error will appear at the top of the list. The first error listed will be the first error removed if the error list is longer than 30 entries. If the same error message occurs several times the error message will be incremented rather than added to the list as a new error message.

The date and time identify the first time and the last time (if there is more than one of the same type of error) an error occurred. The number of identical errors is shown, and the error number is also shown with firmware revision A.08.00 and later.

Key Access: **System**

Prev Page　Allows you to access the previous page of error messages. It is grayed out if you are on the first page or only one page exists.

Key Access: **System**, **Show Errors**

Next Page　Allows you to access the next page of error messages. It is grayed out if you are on the last page or only one page exists.

Key Access: **System**, **Show Errors**

**Verbose SCPI
On Off**　The information in the Error History Screen is formatted to fit the screen size. Additional information is available via the `SYSTem:ERRor?` command. It indicates which SCPI command was executing when the error occurred and what about that command was unacceptable.

Example: First set `SYST:ERR:VERBOSE ON`

If the command `SENSe:FREQuently:CENTer 942.6MHz` is sent, then sending `SYST:ERR?` returns:

`–113, "Undefined
header;SENSe:FREQuently:<Err>CENTer 942.6MHz
$<NL>"`

Key Access: **System**, **Show Errors**

**Clear Error
Queue**   Clears the error queue in the **Show Errors** display.

Key Access: **System**, **Show Errors**

Power On/Preset   Accesses the following menu keys.

Key Access: **System**

**Power On
Last Preset**   Determines the state of the analyzer when the analyzer
is powered on. If the Power On function is set to **Preset**,
the state of the analyzer is the same as it is after **Preset**
is pressed, when the analyzer is powered on. If the
Power On function is set to **Last**, then the state that the
analyzer was in when it was powered off is recalled.

The setting (Last or Preset) of the Power On function is
not changed by pressing **Preset**. Use the **Power On/Preset**
menu key function to change the setting of the analyzer
state that is recalled at power on. Limit lines are not
recalled when the analyzer is powered on. Refer to
"Preset" in this chapter for more information.

Key Access: **System**, **Power On/Preset**

Preset Type   Allows you to select User, Mode, or Factory preset.

Key Access: **System**, **Power On/Preset**

User   Pressing **Preset (User)** sets the analyzer
to the settings defined by the **Save User
Preset** key. Refer to "Preset" in this
chapter for more information.

Key Access: **System**, **Power On/Preset**,
Preset Type

Mode   Selects the mode preset type to be the
instrument state that will be restored
when you do a preset. A mode preset
does not change the mode and it only
resets the settings of the current mode
to their factory defaults.

Key Access: **System**, **Power On/Preset,
Preset Type**

Factory   Pressing **Factory** presets the analyzer to
the configuration originally set at the
factory. Refer to the "Preset" key
description for the default factory-
configuration settings.

Key Access: **System**, **Power On/Preset,
Preset Type**

Key Access: **System**, **Power On/Preset**, **Preset Type**

**Save User
Preset**   Saves the active state of the analyzer into the User
                Preset register for recall on **Preset** if **Preset (User)** is
                selected. Refer to "Preset" in this chapter for more
                information.

                Key Access: **System**, **Power On/Preset**

Time/Date   Accesses the following **Time/Date** menu keys used to set and display the
                real-time clock:

                Key Access: **System**

**Time/Date
On Off**   Turns the display of the real-time clock on or off.

                Key Access: **System**, **Time/Date**

**Date Format
MDY DMY**   Changes the display of the date from a month-day-year
                format to a day-month-year format.

                Key Access: **System**, **Time/Date**

Set Time   Allows you to set the time of the real-time clock. Enter
                the time in 24 hour HHMMSS format, using the
                numeric keypad and pressing **Enter**. Valid hour (HH)
                values are from 00 to 23. Valid minute (MM) and second
                (SS) values are from 00 to 59.

                Key Access: **System**, **Time/Date**

Set Date   Allows you to set the date of the real-time clock. Enter
                the date in the YYYYMMDD format using the numeric
                keypad and press **Enter**. Valid year (YYYY) values are
                0000 through 9999. Valid month (MM) values are from
                01 to 12, and valid day values are from 01 to 31.

                Key Access: **System**, **Time/Date**

Alignments Accesses the following **Alignments** menu keys which align the internal
                circuitry of the analyzer, load default values for the alignment system,
                and adjust the 10 MHz reference.

                Key Access: **System**

Auto Align Accesses the **Auto Align** menu keys.

                             All   Turns on the automatic alignment of
                                             all measurement systems. When **Auto
                                             Align**, **All** is selected, "**AA**" appears along
                                             the left edge of the display.

                                             Key Access: **System**, **Alignments**

All but RF   Turns on the automatic alignment of all measurement systems except the RF section. (Eliminating automatic alignment of the RF prevents changes in the input impedance between sweeps, which could cause input device instability.) When **Auto Align**, **All but RF** is selected, "**AB**" appears along the left edge of the display.

Key Access: **System**, **Alignments**

Off   Turns off automatic alignment.

Key Access: **System**, **Alignments**

NOTE   It is normal to hear clicking sounds when the Auto Alignment function is On. During retrace, a small portion of the analyzer circuitry is realigned. Some of the switching of the analyzer circuitry is done using relays. It is the rapid switching of these relays during retrace that causes the clicking sounds. To eliminate the clicking sounds, turn the auto alignment off by pressing **System**, **Alignments**, **Auto Align**, **Off**. When this is done, the **Align Now**, **All** function should be performed periodically. Refer to the appropriate "Specifications and Characteristics" chapter of your Specifications Guide for more information on how often to perform **Align Now**, **All** when the auto alignment is off

Align Now   Accesses the **Align Now** menu keys and immediately executes an alignment cycle of the selected system(s). Menu key selections include:

Key Access: **System**, **Alignments**

All   Initiates the alignment of all systems. Except the Option 1DN Tracking Generator for models E4402B, E4403B, E4404B, E4405B, E4407B, and E4408B.

Key Access: **System**, **Alignments**, **Align Now**

RF
(Ext Cable)   Initiates the alignment of the RF system with a cable connected from AMPTD REF OUT to INPUT 50 Ω. *Models E4402B, E4403B, E4404B, E4405B, E4407B, and E4408B.*

Key Access: **System**, **Alignments**, **Align Now**

RF
Initiates the alignment of the RF system. *Models E4401B and E4411B only.* This Alignment uses an Internal Signal Source.

Key Access: **System**, **Alignments, Align Now**

**TG
(Ext Cable)**
Initiates the alignment of the tracking generator only when the Option 1DN is installed in Agilent E4402B, E4403B, E4404B, E4405B, E4407B, and E4408B. You must connect a cable from RF OUT 50 Ω to INPUT 50 Ω

Key Access: **System**, **Alignments, Align Now**

FM Demod
Initiates an alignment of the FM demodulation system only when Option BAA or Option 106 is installed.

Key Access: **System**, **Alignments, Align Now**

After a five minute warm-up, **Align Now**, **All** (with a cable connected from AMPTD REF OUT to INPUT 50 Ω) should be performed on Agilent E4402B, E4403B, E4404B, E4405B, E4407B, and E4408B. Refer to your analyzer's appropriate Specifications Guide for details on using **Align Now** when **Auto Align** is **Off**.

**Freq Correct
On Off**
Controls use of some of the correction factors. When On is underlined, frequency correction factors are used. When Off is underlined, frequency correction factors are not used, and `Freq Corr Off` appears on the display. Turning the correction factors off degrades frequency accuracy.

Key Access: **System**, **Alignments**

NOTE   Frequency correction factors must be on for the analyzer to meet its specified performance.

Timebase
Accesses the **Fine** and **Coarse** Timebase menu keys, which allow control of the 10 MHz time base frequency. This function is used to verify the settability of the 10 MHz reference and to adjust for changed operating conditions, such as temperature. Pressing **Load Defaults** or cycling power, resets the time base to its original value.

Key Access: **System**, **Alignments**

Load Defaults   Loads the default values for the alignment system, turns on the frequency corrections, and resets the time base to the factory values. **Align Now, All**, will automatically execute three times after pressing **Load Defaults**.

Key Access: **System**, **Alignments**

Remote Port   *With Option A4H (GPIB and Parallel) only*. Allows the GPIB address to be entered. The default address is 18.

With Option 1AX (RS-232 and Parallel) only. Allows the baud rate to be set. The available baud rate values are as follows: 110, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200. The default baud rate is 9600.

Key Access: **System**

Show System   Displays the number and description of the options installed in your analyzer. It also displays the instrument model number, product number, serial number, firmware revision number, Host ID (for licensing), bootrom revision, and amount of RAM and ROM.

Key Access: **System**, **More**

Prev Page   Allows you to access the previous page of show system. It is grayed out if you are on the first page or only one page exists.

Key Access: **System**, **More**, **Show System**

Next Page   Allows you to access the next page of show system. It is grayed out if you are on the last page or only one page exists.

Key Access: **System**, **More**, **Show System**

Show Hdwr   Gives detailed information about the hardware installed on your analyzer.

Key Access: **System**, **More**

Prev Page   Allows you to access the previous page of show hardware. It is grayed out if you are on the first page or only one page exists.

Key Access: **System**, **More**, **Show Hdwr**

Next Page   Allows you to access the next page of show hardware. It is grayed out if you are on the last page or only one page exists.

Key Access: **System**, **More**, **Show Hdwr**

Color Palette   Agilent ESA-E Series only (E4401B, E4402B, E4404B, E4405B and E4407B). Accesses the **Color Palette** menu keys. These keys are only available with analyzers having a color display.

Key Access: **System**, **More**

> **Default**   Sets all the display screen attributes to the factory defined colors.
>
> Key Access: **System**, **More**, **Color Palette**

> **Vision Impair 1**
> and
> **Vision Impair 2**   The special colors built into the **Vision Impair 1** and **Vision Impair 2** keys accommodate most color-deficient vision problems.
>
> Key Access: **System**, **More**, **Color Palette**

> **Optical Filter**   Accommodates the use of protective goggles while viewing lasers.
>
> Key Access: **System**, **More**, **Color Palette**

> **Monochrome**   Sets the display screen to green monochrome. The monochrome display uses different shades of green for each green value. This is especially useful for driving external monochrome monitors.
>
> Key Access: **System**, **More**, **Color Palette**

Diagnostics   Accesses the **Front Panel Test** menu key.

Key Access: **System**, **More**

> **Front Panel**
> **Test**   Allows you to verify the functionality of each front-panel key (except **Preset**). The number next to each key name increments once each time the key is pressed. Rotating the knobs causes the number of pulses to be counted. Press **ESC** to exit.
>
> Key Access: **System**, **More**, **Diagnostics**

Restore Sys Defaults   Resets the "persistent" state variables to their defaults. These are values, such as the GPIB address, that are unaffected by a power cycle or a preset (when **Preset Type** is set to **Factory**.)

Key Access: **System**, **More**

Table 2-3   **System Default Settings**

Feature	Default Setting
Color Printing	On
Custom Printer, Color Capability	No
Custom Printer, Language	PCL3
Date Format	MDY
Display Viewing Angle	4
External Amplifier Gain	0 dBm
GPIB Address	18
Input Impedance	50 (Ohm)[1]
Instrument Color Palette	Default palette
Manual Tracking Adjustment	2048
Page Size	Letter
Power On Last/Preset	Preset
Preset Factory/User	Mode
Print Format	Print screen mode
Print Orientation	Portrait
Printer Selection	Auto
Prints/ Page	1
RS-232 Baud Rate	9600
RS-232 DTR Control	On (hardware pacing)
RS-232 Receive Pacing	None (data pacing)
RS-232 RTS Control	IBFULL (hardware pacing)
RS-232 Transmit Pacing	None (data pacing)
Speaker Volume	0
Time Date Display	On
Verbose SCPI	Off

1. This value may be 75 ohms, depending upon the analyzer hardware config-
   uration.

Licensing   Accesses the security system to enable licensing for individual options.
For information on how to use this system, see the installation
information for individual options in the measurement personalities'
user's guides.

NOTE   Not all options can be enabled using this system and there is no way to turn *off* an option through this system. Once an option has been licensed for a given analyzer, it cannot be transferred to a different analyzer.

Key Access: **System**, **More**, **More**

Option   Accesses the Alpha Editor allowing you to enter a three character option number. To terminate the entry, press **Enter** or **Return**. An external keyboard may also be used for this entry. The option number will appear on the second line of the **Option** key. Key

Access: **System**, **More**, **Licensing**

License Key   Accesses the Alpha Editor allowing you to enter the license key number. To terminate the entry, press **Enter** or **Return**. An external keyboard may also be used for this entry. The license key number will appear on the second line of the **License Key** menu key.

Key Access: **System**, **More**, **Licensing**

Activate   Allows you to activate the option. When a valid option key number and license key number have been entered, press **Activate**. If your entry was correct, the option will be enabled and the message: `Option activated` will appear in the status line of your display. The option number and license key number will also be cleared from the **License Key** and **Option** key.

If your entry was incorrect, the error message: `License key invalid` will appear in the status line of your display. The option number and license key number can be edited until they are correct.

Key Access: **System**, **More**, **Licensing**

NOTE   It is possible to enable an option for which the analyzer is not yet configured. Therefore, the message `Option activated` does not mean that the option will immediately function. For a display of options that are enabled and for which the analyzer is properly configured, press **System**, **More**, **Show System**.

Personalities   Accesses a display listing the personalities that are currently installed in the analyzer. Information about the personalities are under the column headings **Opt** (option number), **Name** (option name), **Version** (personality version), **Licensed** (whether or not the personality is licensed), and **Size** (personality memory). At the bottom of the display is a line showing the available memory for installing personalities.

Key Access: **System**, **More**, **More**

NOTE Some files are shared between personalities. If shared files are installed, a personality may require less room than is indicated on the display. The **Uninstall** key will not delete any shared file unless the personality being deleted is the last personality to use the shared file.

Prev Page Allows you to view a previous page of installed personalities. It is grayed out if you are on the first page or only one page exists.

Key Access: **System**, **More**, **More**, **Personalities**

Next Page Allows you to view the next page of installed personalities. It is grayed out if you are on the last page or only one page exists.

Key Access: **System**, **More**, **More**, **Personalities**

Install Allows you to install personalities in the analyzer. For more information on this key, see the documentation that accompanies the personalities software.

Key Access: **System**, **More**, **More**, **Personalities**

Uninstall Allows you to uninstall a personality. Highlight the appropriate personality and press **Uninstall**, **Uninstall Now**. You will be prompted with the displayed message `If you are sure you want to uninstall, press Uninstall Now again`.

Some personalities may not be deleted. If the attempt is made to do so, the message `Can't uninstall this program` will appear on the display.

Key Access: **System**, **More**, **More**, **Personalities**

Service Accesses the **Service** menu keys. You must have a password to access this menu. For information, refer to the troubleshooting chapter in the your Service Guide.

Key Access: **System**, **More**, **More**

Tab Keys

The Tab keys are located below the display and are used to move between fields in the tables and forms.

Trace/View

Accesses the trace keys that allow you to store and manipulate trace information. Each trace is comprised of a series of data points in which amplitude information is stored. The analyzer updates the information for any active trace with each sweep.

NOTE   If you have selected **Channel Power**, **ACP**, **Harmonic Distortion**, **Burst Power**, **Power Stat CCDF**, or **Spectrum Emission Mask** in the **MEASURE** menu, refer to "One - Button Measurement Functions" on page 427.

Trace 1 2 3   Selects the menu keys used for trace 1, trace 2, or trace 3 functions. Press **Trace 1 2 3** until the number of the desired trace is underlined.

Key Access: **Trace/View**

CAUTION   When using normalization, the mode of traces 2 and 3 should not be changed.

Clear Write   Erases any data previously stored in the selected trace and continuously displays any signals during the sweep of the analyzer. This function is activated for trace 1 at power-on and by pressing **Preset**.

Key Access: **Trace/View**

Max Hold   Maintains the maximum level for each trace point of the selected trace (1, 2 or 3), and updates each trace point if a new maximum level is detected in successive sweeps.

NOTE   If the **Det/Demod**, **Detector** (Auto) is selected, the detection type may change with trace mode. See Figure 2-1 on page 53 for more detailed information.

Key Access: **Trace/View**

NOTE   Changing the vertical scale (**Amplitude**, **Scale Type**, Log or Lin), pressing **Restart**, turning averaging on (**BW/Avg**, **Average (On)**), or switching window in Zone Span (**Span**, **Zone**) restarts the held trace.

Min Hold   Maintains the minimum level for each trace point of the selected trace (1, 2 or 3), and updates each trace point if a new minimum level is detected in successive sweeps.

Key Access: **Trace/View**

NOTE   Changing the vertical scale (**Amplitude**, **Scale Type**, Log or Lin), pressing **Restart**, turning averaging on (**BW/Avg**, **Average (On)**), or switching

window in Zone Span (**Span**, **Zone**) restarts the held trace.

View   Holds and displays the amplitude data of the selected trace. The trace register is not updated as the analyzer sweeps. If a trace is deactivated by pressing **Blank**, the stored trace data can be retrieved by pressing **View**.

Key Access: **Trace/View**

Blank   Stores the amplitude data for the selected trace, and removes it from the display. The selected trace register will not be updated as the analyzer sweeps. This function is activated for traces 2 and 3 at power-on and by pressing **Preset** (when **Preset Type** is set to **Factory**.)

Key Access: **Trace/View**

Operations   Accesses the following **Operations** menu keys:

Key Access: **Trace/View**, **More**

1↔2   Exchanges the contents of the trace 1 register with the trace 2 register and puts trace 1 and 2 in view mode.

Key Access: **Trace/View**, **More**, **Operations**

2 – DL → 2   Subtracts the display line from trace 2 and places the result in trace 2 and puts trace 2 in view mode. The **2 – DL → 2** function is a math operation.

Key Access: **Trace/View**, **More**, **Operations**

2 ↔ 3   Exchanges the contents of trace 2 with trace 3 and puts trace 2 and 3 in view mode.

Key Access: **Trace/View**, **More**, **Operations**

1 → 3   Copies trace 1 into trace 3 and puts trace 3 in view mode.

Key Access: **Trace/View**, **More**, **Operations**

2 → 3   Copies trace 2 into trace 3 and puts trace 3 in view mode.

Key Access: **Trace/View**, **More**, **Operations**

Normalize   Accesses the following **Normalize** menu keys:

Key Access: **Trace/View**, **More**

Store Ref (1→ 3)   Copies trace 1 into trace 3. **Store Ref (1→ 3)** must be pressed before pressing **Normalize (On)**. If **Normalize (On)** is pressed before **Store Ref (1→ 3)**, the error message: `Store reference trace before turning on Normalize` is displayed in the status line, however

Normalize has been activated.

Key Access: **View/Trac**, **More**, **Normalize**

**Normalize
On Off**   **Normalize (On)** Activates the normalize function. On each sweep, the normalized trace (Trace 3) is subtracted from Trace 1 and the result is added to the normalized reference level. The display shows the result of the following calculation:

Trace 1 – Normalized Trace + Normalized Reference Level

The trace data is normalized with respect to the normalized reference level, even if the value of the normalized reference level is changed. This function remains in effect on all subsequent sweeps until it is turned off.

NOTE   Segmented sweep is not available when **Normalize (On)** is selected.

CAUTION   Trace 1 should be in clear write mode prior to setting normalize to on.

The normalize function is most useful for applying correction data to a trace while making a stimulus response measurement with a tracking generator. For example, connect the cables and a thru line, in place of the device to be measured, between the tracking generator and the analyzer input. Notice that the frequency response is not perfectly flat, showing the response of the cables, as well as the flatness of both the tracking generator and the analyzer.

Now press **Store Ref (1→ 3)**, **Normalize On**. Notice that the displayed trace is now flat, or normalized. The position of the normalized trace can now be moved to a different position on the display by changing the normalized reference position. This may be useful if the device to be tested has positive gain, such as an amplifier. Now replace the thru line with the device under test, and an accurate measurement of the gain or loss can be made.

Key Access: **Trace/View**, **More**, **Normalize**

Norm Ref Lvl   Sets the level (in dB) of the normalized reference.

Key Access: **Trace/View**, **More**, **Normalize**

Norm Ref Posn Offsets the displayed trace without affecting the instrument gain or attenuation settings. This allows the displayed trace to be moved without decreasing measurement accuracy. The normalized reference position is indicated with a (>) character on the left side of the display and a (<) character on the right side of the display.

Key Access: **Trace/View**, **More**, **Normalize**

**Ref Trace
View Blank** Allows you to view or blank the reference trace on the display.

Key Access: **Trace/View**, **More**, **Normalize**

Trig

Accesses the menu of keys that allow you to select the sweep mode and trigger mode of the analyzer.

Free Run   New sweep starts as soon as possible after the current sweep ends.

Key Access: **Trig**

Video   Activates the trigger condition that allows the next sweep to start if the detected RF envelope voltage rises to a level set by the video trigger level. When **Video** is pressed, a line appears on the display. The analyzer triggers when the input signal exceeds the trigger level at the left edge of the display. You can change the trigger level using the step keys, the knob, or the numeric keypad

Key Access: **Trig**

NOTE   This function is not available when the Resolution Bandwidth is less than 1 kHz. If a Resolution Bandwidth less than 1 kHz is selected while in Video Trigger mode, the Trigger mode changes to Free Run.

Line   Activates the trigger condition that allows the next sweep to be synchronized with the next cycle of the line voltage.

Key Access: **Trig**

NOTE   Line trigger is not available when operating from a dc power source.

External Pos Neg   Activates the trigger condition that allows the next sweep to start when the external voltage (connected to **GATE TRIG/EXT TRIG IN** on the rear panel) passes through approximately 1.5 volts. The external trigger signal must be a 0 V to +5 V TTL signal. This function also controls the trigger polarity (for positive or negative-going signals).

Key Access: **Trig**

TV   *Option B7B (TV Trigger and Picture on Screen) only*. Activates the trigger condition that allows the next sweep to be synchronized with the next occurrence of the synchronizing pulse of a selected TV line.

Line number range is dependent on the settings of the **Standard** and **Field** menus within the **TV Trig Setup** menu. When the line number is incremented beyond the upper limit, the value will change to the lower limit and continue incrementing from there. When the line number is decremented below the lower limit, the value will change to the upper limit and continue decrementing from there.

Key Access: **Trig**

RF Burst   *Option B7E (RF Communications Hardware) only.* Allows the analyzer to be triggered by an RF burst envelope signal. The trigger level can be set to either a level relative to the peak of the burst or to an absolute value.

Key Access: **Trig**

**Trig Delay
On Off**   Allows you to set and turn on or off a delay, during which the analyzer will wait to begin a sweep after receiving an external trigger signal. This function is not available when **Gate** is on. **Trig Delay** is active when **External** is selected.

Key Access: **Trig**, **More**

NOTE   This function is not available in Free Run or Video Trigger modes.

**Trig Offset
On Off**   Allows you to set and turn on or off an offset value from the trigger point of the sweep at which to begin storing data in the trace of the analyzer. The offset is specified as a function of time, and permits positive (pre trigger) and negative (post trigger) values to be specified.

Key Access: **Trig**, **More**

NOTE   This function is only available when in Zero Span. (It is grayed out when in swept span.) If this key is pressed in swept spans, the error message: `Trigger Offset unavailable in swept spans` is displayed in the status line. The value and state of Trigger Offset is remembered if Zero Span is exited and restored when Zero Span is reselected.

NOTE   This function is only available with Resolution Bandwidths of 1 kHz or greater. If this key is pressed when the Resolution Bandwidths is less than 1 kHz, the error message: `Trigger Offset unavailable in bandwidths < 1 kHz` is displayed in the status line. While Trigger Offset is on, it is not possible for the instrument to be set to a Resolution Bandwidth less than 1 kHz. Any attempt to do so will cause the error message: `Bandwidths <1 kHz unavailable with Trigger Offset on` to be displayed in the status line.

TV Trig Setup   *Option B7B (TV Trigger and Picture on Screen) only.* Accesses the setup functions for TV Trigger.

Key Access: **Trig**

Field   Allows you to determine how the fields of the TV picture signal will be affected by the trigger system. One complete TV image consists of one frame of 525 or 625 horizontal lines depending on the TV standard being used. Each frame is composed of two fields of interlacing lines, each consisting of 262 1/2 lines (or 312 1/2 lines). The fields are called Field One and Field

Two. Field One is viewed as having 263 lines (or 313 lines) and Field Two is viewed as having 262 lines (or 312 lines).

For the 525 line NTSC video standard, we refer to TV lines as follows (these are the Field Modes):

Entire Frame, lines 1 to 525
Field One, lines 1 to 263
Field Two, lines 1 to 262 (note that this really refers to "actual" lines 264 to 525)

For the 625 line PAL and SECAM video standards, we refer to TV lines as follows:

Entire Frame, lines 1 to 625
Field One, lines 1 to 313
Field Two, lines 314 to 625

As the Field is changed, the appropriate value for Line is chosen to keep triggering on the same line as before, or if this is not possible, the corresponding line in the new Field. For example, suppose line 264 is selected while in the NTSC-M standard and the Entire Frame mode. This is the first line in Field Two. If Field Two is then selected, the Line number changes to Line 1, the same actual line in the TV signal. If Field One is then selected, the line number stays at 1, but now we are triggering in the first line in Field One. The only exception to this is if we are on the last line of Field One and change to Field Two. In this case, we go to the last line in Field Two.

Key Access: **Trig**, **More, TV Trig Setup**

Entire Frame	Causes the selected line number to be viewed as an offset into the entire frame starting with line 1, the first line in Field One.
	Key Access: **Trig**, **More**, **TV Trig Setup**, **Field**
Field One	Causes the selected line number to be viewed as an offset into the first field starting with Line 1, the first line in Field One.
	Key Access: **Trig**, **More, TV Trig Setup**, **Field**

Field Two   Causes the selected line number to be viewed as an offset into the second field. If Line 1 is selected, it is the 264th line of the frame (NTSC-M, NTSC-Japan, PAL-M) or the 314th line of the frame (PAL-B,D,G,H,I, PAL-N-Combin, SECAM-L).

Key Access: **Trig**, **More**, **TV Trig Setup**, **Field**

Sync Pos Neg   Refers to the nature of the video waveform. Normal baseband video has a TV line sync pulse on the bottom of the waveform (more negative voltage). This is referred to as "negative" (**Sync Neg**). When the analyzer is used as a TV receiver to produce baseband video, the detected video is "upside down" with the sync pulse on the top of the waveform (this is true only for NTSC and PAL transmission standards, not for SECAM). This orientation is referred to as "positive" (**Sync Pos**).

Key Access: **Trig**, **More**, **TV Trig Setup**

Standard   Accesses the Standard menu keys which allow you to select from the following TV standards: **NTSC-M**, **NTSC-Japan**, **PAL-M**, **PAL-B,D,G,H,I**, **PAL-N**, **PAL-N-Combin**, **SECAM-L**.

Key Access: **Trig**, **More**, **TV Trig Setup**

TV Source   Allows you to select between the internal analyzer path (**SA**) or the EXT VIDEO IN connector on the rear panel (**Ext Video In**) as the source for the TV Trigger and TV Monitor functions. Note that this does not affect the signal viewed on the analyzer.

Key Access: **Trig**, **More**, **TV Trig Setup**

TV Monitor   When **TV Monitor** is pressed, the selected Standard is used to determine the proper setup of the analyzer hardware for presentation of the TV picture. When the TV picture is active and on the display, pressing a key that normally accesses a menu, instead restores the original ESA graphical display with the selected menu enabled. The active function remains active and can be adjusted while the picture is displayed.

Key Access: **Trig**, **More**, **TV Trig Setup**

NOTE   The color decoding circuitry is always enabled, even for weak and monochrome signals.

RF Burst Setup

Option B7E (RF Communications Hardware) only. Accesses the setup functions for RF burst trigger.

Key Access: **Trig**, **More**

Trigger Level Abs Rel

Allows you to set the trigger level to a level relative to the peak of the burst or to an absolute value.

Key Access: **Trig**, **More**, **RF Burst**

Frequency Selectivity On Off

Allows you to turn frequency selectivity on or off. With **Frequency Selectivity (Off)** selected, the trigger occurs on the signal prior to the resolution bandwidth filter. When **Frequency Selectivity (On)** is selected, the trigger occurs on the signal after the resolution bandwidth filter.

Key Access: **Trig**, **More**, **RF Burst**

Narrow Pulse Discriminator On Off

Turns the narrow pulse discriminator on or off. For modulation formats that have undesirable envelope ripple, **Narrow Pulse Discriminator (On)** allows you to prevent re-triggering on the ripple.

Key Access: **Trig**, **More**, **RF Burst**

⇑ (UP) and ⇓ (DOWN) Arrow Keys

The ⇑ (UP) and ⇓ (DOWN) arrow keys can be used to adjust the analyzer parameters incrementally. The arrow keys are also used to select between files or points on a list. These keys are also called step keys.

Viewing Angle

Controls the optimum viewing angle of the display. The viewing angle keys are located next to each other at the upper left-hand corner of the analyzer, bordering the display. These two keys allow you to adjust the intensity of the objects on the display so that it can be optimally viewed from different angles.

The **Viewing Angle** keys automatically repeat when they are held down.

Zoom

Allows you to switch between the split-screen and full-sized display of the active window in zone span and other functions which support split-screen display modes. The active window is indicated by a solid green line surrounding the window.

If **Zoom** is pressed while in a non-split-screen display mode, it will activate the zone span mode. (See **Span**, **Zone**, and also **Next Window**.) If **Zoom** is pressed when zone markers are off, it will turn on zone markers and put the display in split-screen mode. (See **Span**, **Zone.**)

3　　　**Programming Fundamentals**

The purpose of this chapter is to serve as a reminder of SCPI (Standard Commands for Programmable Instruments) fundamentals to those who have previous experience in programming SCPI. This chapter is not intended to teach you everything about the SCPI programming language. Refer to the "Agilent 8590 Series Programming Compatibility Guide" for analyzers with Option 290 (8590 Series Programming Code Compatibility).

The SCPI Consortium or IEEE can provide detailed information on the subject of SCPI programming. Refer to IEEE Standard 488.1-1987, *IEEE Standard Digital Interface for Programmable Instrumentation.* New York, NY, 1987, or to 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.

Valid ESA Spectrum Analyzer SCPI commands are used for examples in this chapter. Topics included in this chapter are:

- "Creating Valid Commands"
- "Command Notation Syntax"
- "Special Characters in Commands"
- "Parameters in Commands"
- "Improving Measurement Speed"
- "Putting Multiple Commands on the Same Line"
- "Overview of GPIB (Option A4H)"
- "Overview of RS-232 (Option 1AX)"

Creating Valid Commands

Commands are not case sensitive and there are often many different ways of writing a particular command. These are examples of valid commands for a given command syntax:

Command Syntax	Sample Valid Commands
`[:SENSe]:BANDwidth[:RESolution]` `<freq>`	The following sample commands are all identical. They will all cause the same result. • `:Sense:Band:Res 1700` • `:BANDWIDTH:RESOLUTION 1.7e3` • `:sens:band 1.7KHZ` • `:SENS:band 1.7E3Hz` • `:band 1.7kHz` • `:bandwidth:RES 1.7e3Hz`
`:CALCulate:MARKer[1]|2|3|4:Y?`	The last command below returns different results than the commands above it. The number 3 in the command causes this. See the command description for more information. • `:CALC:MARK:Y?` • `:calc:mark:y?` • `:CALC:MARK2:Y?`
`[:SENSe]:DETector[:FUNCtion]` `NEGative|POSitive|SAMPle`	• `DET:FUNC NEG` • `:Sense:Detector:Function Sample`
`:INITiate:CONTinuous OFF|ON|0|1`	The sample commands below are identical. • `:INIT:CONT ON` • `:init:continuous 1`

Command Notation Syntax

A typical command is made up of key words set off by colons. The key words are followed by parameters that can be followed by optional units.

Example: `:TRIGger:SEQuence:VIDeo:LEVel 2.5V`

The instrument does not distinguish between upper and lower case letters. In the documentation, upper case letters indicate the short form of the key word. The upper and lower case letters, together, indicate the long form of the key word. Either form may be used in the command.

Example: `:Trig:Seq:Vid:Lev 2.5V` is the same as `trigger:sequence:video:level 2.5V`.

NOTE
The command `:TRIGG:Sequence:Video:Level 2.5V` is not valid because `:TRIGG` is neither the long, nor the short form of the command.

Special Characters in Commands

Special Character	Meaning	Example
|	A vertical stroke between **parameters** indicates alternative choices. The effect of the command is different depending on which parameter is selected. A vertical stroke between **key words** indicates identical effects exist for several key words. Only one of these key words is used at a time. The command functions the same for either key word.	Command: **[:SENSe]:DETector[:FUNCtion] NEGative|POSitive|SAMPle** The choices are neg, pos, and samp. **:SENSe:DETector:FUNCtion SAMPle** is one possible command choice. Command: **[:SENSe]:CHPower:BANDwidth|BWIDth:INTegration** Two identical commands are: **:SENSe:CHPower:BANDwidth:INTegration** **:SENSe:CHPower:BWIDth:INTegration**
[ ]	Key words in square brackets are optional when composing the command. These implied key words will be executed even if they are omitted.	Command: **[SENSe:]BANDwidth[:RESolution]:AUTO** The following commands are all valid and have identical effects: **:bandwidth:auto** **:bandwidth:resolution:auto** **:sense:bandwidth:auto**
< >	Angle brackets around a word, or words, indicates they are not to be used literally in the command. They represent the needed item.	Command: **:SENSe:FREQ <freq>** In this command example the word <freq> should be replaced by an actual frequency: **:SENSe:FREQ 9.7 MHz**
{ }	Parameters in braces can optionally be used in the command either not at all, once, or several times.	Command: **[SENSe:]CORRection:CSET[1]|2|3|4:DATA:MERGe <freq>,<rel_ampl>{,<freq>,<rel_ampl>}** A valid form of this command is: **[SENSe:]CORRection:CSET1:DATA:MERGe 740000,.94 1250000,.31 3320000,1.7**

Parameters in Commands

There are four basic types of parameters: boolean, key words, variables and arbitrary block program data.

Boolean

The expression OFF|ON|0|1 is a two state boolean-type parameter. The numeric value 0 is equivalent to OFF. Any numeric value other than 0 is equivalent to ON. The numeric values of 0 or 1 are commonly used in the command instead of OFF or ON, and queries of the parameter always return a numeric value of 0 or 1.

Key Word

The parameter key words that are allowed for a particular command are defined in the command description and are separated with a vertical slash.

Units

Numerical variables may include units. The valid units for a command depends on the variable type being used. See the following variable descriptions. If no units are sent, the indicated default units will be used. Units can follow the numerical value with, or without, a space.

Variable

A variable can be entered in exponential format as well as standard numeric format. The appropriate variable range and its optional units are defined in the command description.

In addition to these values, the following key words may also be used in commands where they are applicable.

> MINimum - sets the parameter to the smallest possible value.

> MAXimum - sets the parameter to the largest possible value.

> UP - increments the parameter.

> DOWN- decrements the parameter.

Include the key word MINimum or MAXimum after the question mark in a query in order to return the numeric value of the key word.

Example query: `[:SENSE]:FREQuency:CENTer? MAXimum`

Variable Parameters

<ampl>,
<rel_ampl>   The <ampl> (amplitude) parameter and the <rel_ampl> (relative amplitude) parameter consist of a rational number followed by optional units. Acceptable units for <ampl> include: V, mV, μV, dBm, dBmV, dBμV, Watts, W. <rel_ampl> units are given in dB.

<angle>   An angle parameter is a rational number followed by optional
                 units. The default units are degrees. Acceptable units include:
                 DEG, RAD.

<file_name>   A file name parameter is the name of your file including the full
                 path. The back slash that follows the drive colon (C:\), usually
                 used in computer paths, is not used in the SCPI command string.

<freq>   A frequency parameter is a positive rational number followed by
                 optional units. The default unit is Hz. Acceptable units include:
                 Hz, kHz, MHz, GHz.

<integer>   There are no units associated with an integer parameter.

<number>   A number parameter is a member of the set of positive or
                 negative intrigers and including zero. Fractional numbers are
                 included in the number parameter. There are no units associated
                 with a number parameter.

<percent>   A percent parameter is a rational number between 0 and 100,
                 with no units.

<rel_power>   A relative power parameter is a positive rational number
                 followed by optional units. The default units are dB. Acceptable
                 units are dB only.

<string>   A string parameter includes a series of alpha numeric characters.

<time>   A time parameter is a rational number followed by optional
                 units. The default units are seconds. Acceptable units include: S,
                 MS, US.

Block Program Data

Definite length arbitrary block response data is defined in section 8.7.9.2 of 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.

<definite_length_block>   Allows data to be transmitted over the system
                                      interface as a series of 8 bit data bytes. This
                                      element is particularly useful for sending
                                      large quantities of data, 8 bit extended ASCII
                                      codes, or other data that are not able to be
                                      directly displayed.

                                      A definite length block of data starts with an
                                      ASCII header that begins with # and indicates
                                      how many additional data points are
                                      following in the block. For example, if the
                                      header is #512320, then interpret the header
                                      as follows:

- The first digit in the header (5) represents how many additional digits/bytes there are in the header.

- The numbers 12320 indicates 12 thousand, 3 hundred, 20 data bytes follow the header.

- To determine how may points in the block, divide 12320 by your selected data format bytes/point. Divide by 8 for real 64, or 4 for real 32. In this example there are 1540 points in the block if your selected data format is real 64.

Improving Measurement Speed

There are a number of things you can do in your programs to make them run faster:

There are additional things you can do to run faster if you are using a measurement personality option (i.e. instrument Modes other than the standard Spectrum Analysis Mode). The following applies only to a specific option mode:

Turn off the display updates

`:DISPlay:ENABle OFF` turns off the display. Updating the display slows down the measurement. For remote testing, since the computer is processing the data rather than a person, there is no need to display the data on the analyzer screen.

Disable auto alignment

`:CALibration:AUTO OFF` disables the automatic alignment process of the instrument. Automatic alignment processing occurs at the end of each sweep. In a stable operating environment, automatic alignment consumes very little instrument resources. However, in a high throughput application, any demand upon instrument resources affects measurement update rate.

NOTE   When auto alignment is off, the **Align Now**, **All** function should be performed periodically. Refer to the appropriate "Specifications and Characteristics" chapter in the *Agilent Technologies ESA Spectrum Analyzers Specifications Guide - E Series* or *Agilent Technologies ESA Spectrum Analyzers Specifications Guide - L Series* for more information on how often to perform **Align Now**, **All** when the auto alignment is off.

Use a fixed IF Gain range

In applications where narrow resolution bandwidths (< 1 kHz) are required and a high dynamic range is not required,
`:DISPlay:WINDow:TRACe:Y[SCALe]:LOG:RANGe:AUTO OFF` disables auto ranging and results in increased measurement update rate.

Disable the IF/Video/Sweep output ports

If the analyzer has Options A4J (IF, Video and Sweep Ports) or AYX (Fast Time Domain Sweeps), various output signals with rear-panel ports are controlled by instrument processing. If these ports are not used in a particular application, `:SYSTem:PORTs:IFVSweep:ENABle OFF` can be used to disable the ports and conserve instrument resources.

Select phase noise performance

`[:SENSe]:FREQuency:SYNThesis` can be used to optimize either phase noise performance or tuning speed. In some settings optimizing for tuning speed reduces sweep time and the "re-tune" time between sweeps. In other settings only the re-tune time is improved.

Use binary data format instead of ASCII

The ASCII data format is the instrument default since it is easier for people to understand and is required by SCPI for *RST. However, data input/output is faster using the binary formats.

`:FORMat:DATA REAL,64` selects the 64-bit binary data format for all your numerical data queries. You may need to swap the byte order if you are using a PC rather than UNIX. `NORMal` is the default byte order. Use `:FORMat:BORDer SWAP` to change the byte order so that the least significant byte is sent first.

When using the binary format, data is sent in a block of bytes with an ASCII header. A data query would return the block of data in the following format: `#DNNN<nnn binary data bytes>`

To parse the data:

- Read two characters (#D), where D tells you how many N characters follow the D character.
- Read D characters, the resulting integer specifies the number of data bytes sent.
- Read the bytes into a real array.

For example, suppose the header is #512320.

- The first character/digit in the header (5) tells you how many additional digits there are in the header.
- The 12320 means 12 thousand, 3 hundred, 20 data bytes follow the header.
- Divide this number of bytes by your current data format (bytes/data point), 8 for real,64. For this example, there are 1540 data points in the block of data.

Minimize the number of GPIB transactions.

When you are using the GPIB for control of your instrument, each transaction requires driver overhead and bus handshaking, so minimizing these transactions reduces the time used.

You can reduce bus transactions by sending multiple commands per transaction.

See the information on "Putting Multiple Commands on the Same Line" in the SCPI Language Basics section.

If you are using the pre-configured **MEASURE** key measurements and are making the same measurement multiple times with small changes in the measurement setup, use the single READ command. It is faster then using INITiate and FETCh.

Avoid unnecessary use of *RST.

Remember that *RST presets all the measurements and settings to their factory defaults and my also change the mode. This forces you to reset the measurement settings of the analyzer even if they use similar mode setup or measurement settings. See Minimize DUT/instrument setup changes. below.

Minimize DUT/instrument setup changes.

*   Some instrument setup parameters are common to multiple measurements. You should look at your measurement process with a focus on minimizing setup changes. If your test process involves nested loops, make sure that the inner-most loop is the fastest. Also, check if the loops could be nested in a different order to reduce the number of parameter changes as you step through the test.

*   Are you are using the pre-configured Measurements (**MEASURE** key)? Remember that if you have already set your Meas Setup parameters for a measurement, and you want to make another one of these measurements later, use READ:<meas>?. The MEASure:<meas>?. command resets all the settings to the defaults, while READ changes back to that measurement without changing the setup parameters from the previous use.

*   Are you are using the pre-configured Measurements (**MEASURE** key)? Also remember that Mode Setup parameters remain constant across all the measurements (such as: center/channel frequency, amplitude, radio standard, input selection, trigger setup). You don't have to re-initialize them each time you change to a different measurement.

Using an Option Mode: Minimize the number of GPIB transactions.

When you are using the GPIB for control of your instrument, each transaction requires driver overhead and bus handshaking, so minimizing these transactions reduces the time used.

*   If you are making the same measurement multiple times with small changes in the measurement setup, use the single READ command. It is faster than using INITiate and FETCh.

Putting Multiple Commands on the Same Line

Multiple commands can be written on the same line, reducing your code space requirement. To do this:

- Commands must be separated with a semicolon (;).

- If the commands are in different subsystems, the key word for the new subsystem must be preceded by a colon (:).

- If the commands are in the same subsystem, the full hierarchy of the command key words need not be included. The second command can start at the same key word level as the command that was just executed.

SCPI Termination and Separator Syntax

A terminator must be provided when an instrument is controlled using RS-232 (Option 1AX). There are several issues to be understood about choosing the proper SCPI terminator and separator when this is the case. There is no current SCPI standard for RS-232. Although one intent of SCPI is to be interface independent, <END> is only defined for IEEE 488 operation. At the time of this writing, the RS-232 terminator issue was in the process of being addressed in IEEE standard 1174.

A semicolon (;) is not a SCPI terminator, it is a separator. The purpose of the separator is to queue multiple commands or queries in order to obtain multiple actions and/or responses. Make sure that you do not attempt to use the semicolon as a terminator when using RS-232 control.

Basically all binary trace and response data is terminated with <NL><END>, as defined in Section 8.5 of 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.

The following are some examples of good and bad commands. The examples are created from an ESA spectrum analyzer with the simple set of commands indicated below:

```
[:SENSe]
     :POWer
          [:RF]
          :ATTenuation 40dB

[:SENSe]
     :FREQuency
          :STARt
     :POWer
     [:RF]
          :MIXer
               :RANGe
               [:UPPer]
```

```
:TRIGger
    [:SEQuence]
    :EXTernal [1]
          :SLOPe
              POSitive
```

Bad Command	Good Command
`PWR:ATT 40dB`	`POW:ATT 40dB`
The short form of **POWER** is **POW**, not **PWR**.	
`FREQ:STAR 30MHz;MIX:RANG −20dBm`	`FREQ:STAR 30MHz;POW:MIX:RANG −20dBm`
The **:MIX:RANG** command is in the same **:SENSE** subsystem as **:FREQ**, but executing the **:FREQ** command puts you back at the **:SENSE** level. You must specify **:POW** to get to the **:MIX:RANG** command.	
`FREQ:STAR 30MHz;POW:MIX RANG −20dBm`	`FREQ:STAR 30MHz;POW:MIX:RANG −20dBm`
:MIX and **:RANG** require a colon to separate them.	
`:POW:ATT 40dB;TRIG:FREQ:STAR 2.3GHz`	`:POW:ATT 40dB;:FREQ:STAR 2.3GHz`
:FREQ:STAR is in the **:SENSE** subsystem, not the **:TRIGGER** subsystem.	
`:POW:ATT?:FREQ:STAR?`	`:POW:ATT?;:FREQ:STAR?`
:POW and **:FREQ** are within the same **:SENSE** subsystem, but they are two separate commands, so they should be separated with a semicolon, not a colon.	
`:POW:ATT −5dB;:FREQ:STAR 10MHz`	`:POW:ATT 5dB;:FREQ:STAR 10MHz`
Attenuation cannot be a negative value.	

Overview of GPIB (Option A4H)

GPIB Instrument Nomenclature

An instrument that is part of a GPIB network is categorized as a listener, talker, or controller, depending on its current function in the network.

Listener   A listener is a device capable of receiving data or commands from other instruments. Any number of instruments in the GPIB network can be listeners simultaneously.

Talker   A talker is a device capable of transmitting data or commands to other instruments. To avoid confusion, an GPIB system allows only one device at a time to be an active talker.

Controller   A controller is an instrument, typically a computer, capable of managing the various GPIB activities. Only one device at a time can be an active controller.

GPIB Command Statements

Command statements form the nucleus of GPIB programming. They are understood by all instruments in the network. When combined with the programming language codes, they provide all management and data communication instructions for the system. Refer to the programming language manual and your computers I/O programming manual for more information.

The seven fundamental command functions are as follows:

- An abort function that stops all listener/talker activity on the interface bus, and prepares all instruments to receive a new command from the controller. Typically, this is an initialization command used to place the bus in a known starting condition (sometimes called: abort, abortio, reset, halt).

- A remote function that causes an instrument to change from local control to remote control. In remote control, the front panel keys are disabled except for the Local key and the line power switch (sometimes called: remote, resume).

- A local lockout function, that can be used with the remote function, to disable the front panel Local key. With the Local key disabled, only the controller (or a hard reset by the line power switch) can restore local control (sometimes called: local).

- A local function that is the complement to the remote command, causing an instrument to return to local control with a fully enabled front panel (sometimes called: local, resume).

- A clear function that causes all GPIB instruments, or addressed instruments, to assume a cleared condition. The definition of clear is unique for each instrument (sometimes called: clear, reset, control, send).

  In the Agilent ESA Spectrum Analyzer, clear does the following:

  1. Clears the Input Buffer and the Output Queue.

  2. Resets the parser.

  3. Clears any current operations, such as *OPC, i.e., returns the device to Operation Complete Query Idle State and Operation Complete Command Idle State.

  4. Aborts /resumes the current sweep.

- An output function that is used to send function commands and data commands from the controller to the addressed instrument (sometimes called: output, control, convert, image, iobuffer, transfer).

- An enter function that is the complement of the output function and is used to transfer data from the addressed instrument to the controller (sometimes called: enter, convert, image, iobuffer, on timeout, set timeout, transfer).

Overview of RS-232 (Option 1AX)

Serial interface programming techniques are similar to most general I/O applications. Due to the asynchronous nature of serial I/O operations, special care must be exercised to ensure that data is not lost by sending to another device before the device is ready to receive. Modem line handshaking can he used to help solve this problem. These and other topics are discussed in greater detail in your programming language documentation.

Settings for the Serial Interface

Please refer to the documentation on your computer and I/O to configure the serial interface. Some common serial interface configuration settings are:

Baud Rate to	9600
Bits per character to	8
Parity to	Odd or disabled
Stop bits to	1

Handshake and Baud Rate

To determine hardware operating parameters, you need to know the answer for each of the following questions about the peripheral device:

- Which of the following signal and control lines are actively used during communication with the peripheral?

  — Data Set Ready (DSR)

  — Clear to Send (CTS)

- What baud rate is expected by the peripheral?

Character Format Parameters

To define the character format, you must know the requirements of the peripheral device for the following parameters:

- Character Length: Eight data bits are used for each character, excluding start, stop, and parity bits.

- Parity Enable: Parity is disabled (absent) for each character.

- Stop Bits: One stop bit is included with each character.

Modem Line Handshaking

To use modem line handshaking for data transfer you would consider the following tasks:

1. Set Data Terminal Ready and Request-to-Send modem lines to active state.

2. Check Data Set Ready and Clear-to-Send modem lines to be sure they are active.

3. Send information to the interface and thence to the peripheral.

4. After data transfer is complete, clear Data Terminal Ready and Request-to-Send signals.

For ENTER operations:

1. Set Data Terminal Ready line to active state. Leave Request-to-Send inactive.

2. Check Data Set Ready and Data Carrier Detect modem lines to be sure they are active.

3. Input information from the interface as it is received from the peripheral.

4. After the input operation is complete, clear the Data Terminal Ready signal.

Data Transfer Errors

The serial interface can generate several types of errors when certain conditions are encountered while receiving data from the peripheral device. Errors can be generated by any of the following conditions:

- Parity error. The parity bit on an incoming character does not match the parity expected by the receiver. This condition is most commonly caused by line noise.

- Framing error. Start and stop bits do not match the timing expectations of the receiver. This can occur when line noise causes the receiver to miss the start bit or obscures the stop bits.

- Overrun error. Incoming data buffer overrun caused a loss of one or more data characters. This is usually caused when data is received by the interface, but no ENTER statement has been activated to input the information.

- Break received. A BREAK was sent to the interface by the peripheral device. The desktop computer program must be able to properly interpret the meaning of a break and take appropriate action.

4 Status Registers

This chapter contains a comprehensive description of status registers explaining what status registers are and how to use them. Information pertaining to all bits of the registers in Agilent ESA analyzers is also provided.

Use Status Registers to Determine the State of Analyzer Events and Conditions

Programs often need to detect and manage error conditions or changes in analyzer status. Agilent ESA products allow this function to be performed using status registers. You can determine the state of certain analyzer hardware and firmware events and conditions by programming the status register system.

Refer to Figure 4-1. The status system is comprised of multiple registers arranged in a hierarchical order. The service request enable register is at the top of the hierarchy and contains the general status information for the analyzer events and conditions. The lower-priority status registers propagate their data to the higher-priority registers in the data structures by means of summary bits. These registers are used to determine the states of specific events or conditions.

Figure 4-1   **Status Register System Simplified Block Diagram**
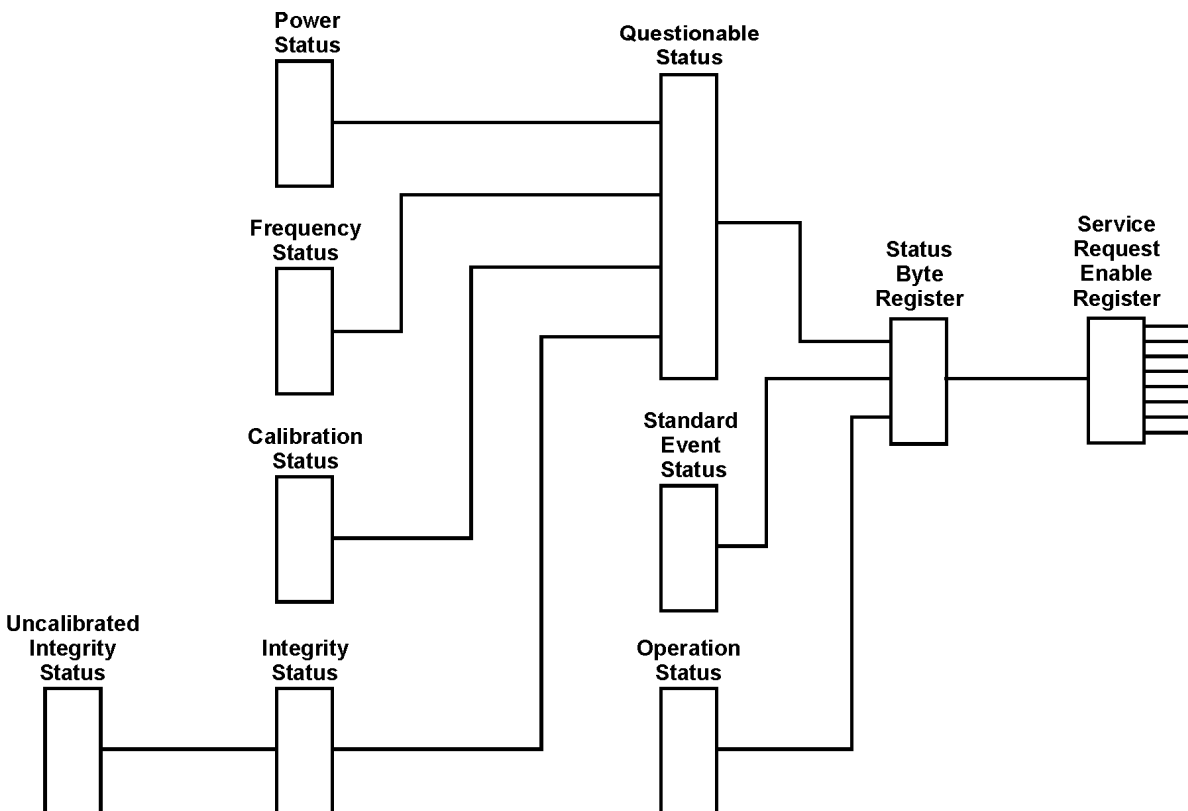
cl76c

The two methods used to programmatically access the information in status registers are the polling method and the service request method. An explanation of these methods is given in the next section "What are the Status Registers?"

What are the Status Registers?

Refer to Figure 4-2, which shows the overall status register system in detail. Most status registers are

composed of the five individual registers described below. One such status register in the figure is entitled "STATus: QUEStionable," which is both the name of the register, and the SCPI command form used to access the register. From now on, the SCPI command form will be used when referring to the various registers. There are IEEE common SCPI commands noted under some register names in parenthesis. These commands are associated with those registers, and their effects are described under "How Do You Access the Status Registers?" in this chapter, and in the beginning of Chapter 5, "Remote Command Reference." in this guide.

Refer to the right-hand part of the STATus: QUEStionable register while reading the following register descriptions.

Condition
Register   A condition register continuously monitors the hardware and firmware status of the analyzer. There is no latching or buffering for a condition register.

Negative
Transition
Filter   A negative transition filter specifies the bits in the condition register that will set corresponding bits in the event register when the condition bit changes from 1 to 0.

Positive
Transition
Filter   A positive transition filter specifies the bits in the condition register that will set corresponding bits in the event register when the condition bit changes from 0 to 1.

Event
Register   An event register latches transition events from the condition register as specified by the positive and negative transition filters. Bits in the event register are latched, and once set, they remain set until cleared by either querying the register contents or sending the ***CLS** command.

Event
Enable
Register   An event enable register specifies the bits in the event register that can generate a summary bit. Summary bits are, in turn, used by the status byte register.

Figure 4-2   **Overall Status Register System Diagram**

Status Byte Register (*STB?)

Unused	0
Unused	1
Error/Event Queue Summary	2
Questionable Status Summary	3
Message Available (MAV)	4
Std. Event Status Sum	5
Req. Serv. Sum (RQS)	6
Operation Status Sum	7

STATus: QUEStionable:POWer

R.P.P. Tripped	0
Source Unleveled	1
Source LO Unleveled	2
LO Unleveled	3
50 MHz Osc Unleveled	4
Reserved	5
Input Overload Tripped	6
Unused	7
LO Out Unleveled	8
Unused	9
Unused	10
Unused	11
Unused	12
Unused	13
Unused	14
Always Zero (0)	15

Condition Register / (-)Trans Filter / (+)Trans Filter / Event Register / Event Enable Reg.

STATus: QUEStionable

Reserved	0
Reserved	1
Reserved	2
POWer Summary	3
Reserved	4
FREQuency Summary	5
Reserved	6
Reserved	7
CALibration Summary	8
INTegrity Sum	9
Reserved	10
Reserved	11
Reserved	12
Reserved	13
Reserved	14
Always Zero (0)	15

Condition Register / (-)Trans Filter / (+)Trans Filter / Event Register / Event Enable Reg.

STATus:QUEStionable:FREQuency

Source Synth Unlocked	0
Freq Ref Unlocked	1
Reserved	2
Reserved	3
Synth Unlocked	4
Invalid Span or BW	5
Reserved	6
Reserved	7
Reserved	8
Demodulation	9
Unused	10
Unused	11
Unused	12
Unused	13
Unused	14
Always Zero (0)	15

Condition Register / (-)Trans Filter / (+)Trans Filter / Event Register / Event Enable Reg.

Standard Event Status Register (*ESE, *ESE?, *ESR?, *OPC)

Oper. Complete	0
Req. Bus Control	1
Query Error	2
Dev. Dep. Error	3
Execution Error	4
Command Error	5
User Request	6
Power On	7

Event Enable Reg.

STATus:OPERation

CALibrating	0
Reserved	1
Reserved	2
SWEeping	3
MEASuring	4
Waiting for TRIGger	5
Reserved	6
Reserved	7
Paused	8
Reserved	9
Reserved	10
Reserved	11
Reserved	12
Reserved	13
Reserved	14
Always Zero (0)	15

Condition Register / (-)Trans Filter / (+)Trans Filter / Event Register / Event Enable Reg.

STATus:QUEStionable:CALibration

Reserved	0
Reserved	1
TG Align Failure	2
RF Align Failure	3
IF Align Failure	4
LO Align Failure	5
ADC Align Failure	6
FM Demod Align Failure	7
Misc/Sys Align Failure	8
Unused	9
Tracking Peak Needed	10
Align RF Skipped	11
Align RF Now Needed	12
Reserved	13
Align Needed	14
Always Zero (0)	15

Condition Register / (-)Trans Filter / (+)Trans Filter / Event Register / Event Enable Reg.

Service Request Enable Register (*SRE, *SRE?)

7	6	5	4	3	2	1	0

STATus:QUEStionable:INTegrity:UNCalibrated

Oversweep (Meas Uncal)	0
Signal Ident On	1
Reserved	2
Unused	3
Unused	4
Unused	5
Unused	6
Unused	7
Unused	8
Unused	9
Unused	10
Unused	11
Unused	12
Unused	13
Unused	14
Always Zero (0)	15

Condition Register / (-)Trans Filter / (+)Trans Filter / Event Register / Event Enable Reg.

STATus:QUEStionable:INTegrity

Reserved	0
No Result Available	1
Measurement Timeout	2
Data Uncalibrated Summary	3
IF/ADC Over Range	4
Over Range	5
Under Range	6
Insufficient Data	7
Acquisition Failure	8
Memory Problem	9
Auto Trigger Timeout	10
Trigger Problem	11
Invalid Data	12
Unidentified Error	13
Setting Limited/Readjusted	14
Always Zero (0)	15

Condition Register / (-)Trans Filter / (+)Trans Filter / Event Register / Event Enable Reg.

cl73a

Status registers (except for the status byte register and the standard event status register) consist of the registers whose contents can be used to produce status summary bits.

These summary bits are then manipulated as follows: The condition register passes summary bits to the negative and positive transition filters, after which they are stored in the event register. The contents of the event register are logically ANDed with the contents of the event enable register and the result is logically ORed to produce a status summary bit. The status summary bit is then passed to the status byte register either directly, or through the STATus: QUEStionable register. Next, the summary bits are logically ANDed with the contents of the service request enable register and the result is logically ORed to produce the request service (***RQS**) bit in the status byte register.

How Do You Access the Status Registers?

There are two different methods to access the status registers:

- Common Commands Accesses and Controls
- Status Subsystem Commands

Common Command Access and Control

Most monitoring of the analyzer conditions is done at the highest level using the following IEEE common commands:

*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 standard event status register.

*OPC (operation complete) sets bit 0 in the standard event status register when all operations are complete.

*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.

Complete command descriptions are given in Chapter 5, "Remote Command Reference." under the subsection entitled "IEEE Common Commands" on page 229.

NOTE   If you are using the status bits and the analyzer mode is changed, the status bits should be read, and any error conditions resolved, prior to switching modes. Error conditions that exist prior to switching modes cannot be detected using the condition registers after the mode change. This is true unless they recur after the mode change, although transitions of these conditions can be detected using the event registers.

Changing modes resets all SCPI status registers and mask registers to their power-on defaults. Hence any event or condition register masks must be re-established after a mode change. Also note that the power up status bit is set by any mode change, since that is the default state after power up.

Status Subsystem Commands

Individual status registers can be set and queried using the commands in the STATus subsystem in Chapter 5, "Remote Command Reference." in this guide. There are two methods used to programmatically detect and manage error conditions or changes in analyzer status. Either method allows you to monitor one or more conditions. The two methods are:

• The Polling Method
• The Service Request (SRQ) Method

The Polling Method

In the polling method, the analyzer has a passive role. It only tells the controller that conditions have changed when the controller asks the right question. The polling method works well if you do not need to know about changes the moment they occur. This method is very efficient.

Use the polling method when either:

— 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

The Service Request (SRQ) Method

The SRQ method allows timely communication of information without requiring continuous controller involvement. Using this method, the analyzer takes a more active role. It tells the controller when there has been a condition change without the controller asking. The SRQ method should be used if you must know immediately when a condition changes. This is in contrast to the polling method, which requires the program to repeatedly read the registers to detect a change.

Use the SRQ method when either:

— 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 the analyzer is making a measurement
— you can't afford the performance penalty inherent to polling

Using the Service Request (SRQ) Method

Your language, bus, and programming environment must be able to support SRQ interrupts (for example, using C and C++ with the GPIB). When you monitor a condition with the SRQ method, you must establish the following parameters:

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 GPIB commands to enable the bits that monitor 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 analyzer sets the RQS bit and the GPIB SRQ line. The controller is informed of the change as soon as it occurs. The time the controller would otherwise have used to monitor the condition can now be used to perform other tasks. Your program also determines how the controller responds to the SRQ.

Generating a Service Request

Before using the SRQ method of generating a service request, first become familiar with how service requests are generated. Bit 6 of the status byte register is the request service summary (RQS) bit. The RQS bit is set whenever there is a change in the register bit that it has been configured to monitor. The RQS bit will remain set until the condition that caused it is cleared. It can be queried without erasing the contents using the **`*STB?`** command. Configure the RQS function using the **`*SRE`** command.

When a register set causes a summary bit in the status byte to change from 0 to 1, the analyzer 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 analyzer does not have a service request pending. (A service request is considered to be pending between the time the analyzer SRQ process is initiated, and the time the controller reads the status byte register.)

The SRQ process sets the GPIB SRQ line true. It also sets the status byte request service (RQS) bit to 1. Both actions are necessary to inform the controller that the analyzer 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 device 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 GPIB SRQ line 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 analyzer status byte register with a serial poll, the RQS bit is reset to 0. Other bits in the register are not affected.

Restarting a measurement with the `:INITiate` command can cause the measuring bit to pulse low. A low pulse causes an SRQ if the status register is configured to SRQ upon end-of-measurement. To avoid this, perform the following steps:

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

Example of Monitoring Conditions Using the :STATus Command

Use the following steps to monitor a *specific* 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.
4. Act upon the cause of the condition and the SRQ to re-enable the method.

The examples below show how to use the `:STATus` command to perform the following tasks:

- Check the analyzer hardware and firmware status.
  Do this by querying the condition registers which continuously monitor status. These registers represent the current state of the analyzer. 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 bit (condition), or bits.
  Once you have enabled a bit using the event enable register, the analyzer will monitor that particular bit. If the bit becomes true 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, which clears all event registers.
- Monitor a change in the condition of a particular bit, or bits.
  Once you have enabled a bit, the analyzer will monitor it for a change in its condition. The transition registers are preset to respond to the condition of going from 0 to 1 (positive transitions). This can be changed so that the selected bit is detected if it goes from 1 to 0 (negative transition), or if either transition occurs. Query the event register to determine whether or not a change has been made to how the transition registers respond. The event register can only be cleared by querying it or sending the `*CLS` command, which clears all event registers.

Setting and Querying the Status Register

See Figure 4-3. Each bit in a register is represented by a numerical value based on its location. This number is sent with the command to enable a particular bit. To enable more than one bit, send the sum of all of the bits involved.

For example, to enable bit 0 and bit 6 of the standard event status register, you would send the command `*ESE 65` (1 + 64).

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.

Figure 4-3   **Status Register Bit Values**
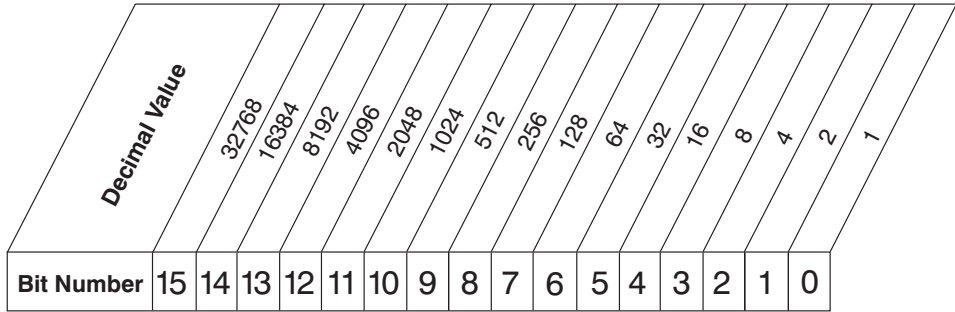
ck730a

Details of Bits in All Registers

Refer to Figure 4-2. The rest of this chapter lists the bits in each register shown in the figure, along with descriptions of their purpose.

Status Byte Register

Figure 4-4   **Status Byte Register Diagram**
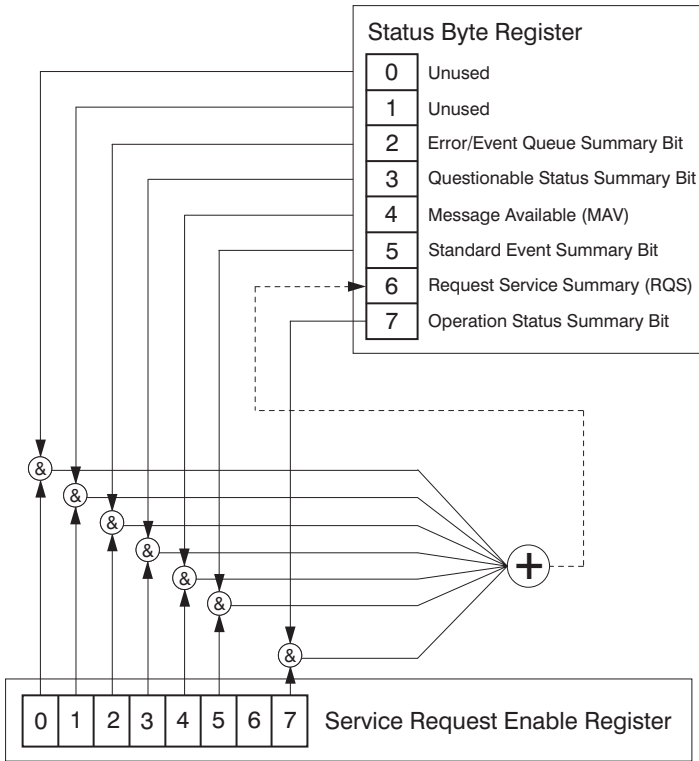
ck763a

The status byte register contains the following bits:

Bit	Decimal Value	Description
0	1	**Unused**: This bit is always set to 0.
1	2	**Unused**: This bit is always set to 0.
2	4	**Error/Event Queue Summery Bit**: A 1 in this bit position indicates that the SCPI error queue is not empty. The SCPI error queue contains at least one error message.
3	8	**Questionable Status Summary Bit**: A 1 in this bit position indicates that the questionable status summary bit has been set. The questionable status event register can then be read to determine the specific condition that caused this bit to be set.
4	16	**Message Available (MAV)**: A 1 in this bit position indicates that the analyzer has data ready in the output queue. There are no lower status groups that provide input to this bit.
5	32	**Standard Event Status Summary Bit**: A 1 in this bit position indicates that the standard event status 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	64	**Request Service (RQS) Summery Bit**: A 1 in this bit position indicates that the analyzer has at least one reason to report a status change. This bit is also called the master summary status bit (MSS).
7	128	**Operation Status Summary Bit**: A 1 in this bit position indicates that the operation status summary bit has been set. The operation status event register can then be read to determine the specific event that caused this bit to be set.

To query the status byte register, send the ***STB** command. The response will be the *decimal* sum of the bits that 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.

Service Request Enable Register

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

Send the ***SRE <number>** command (where **<number>** 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 operation status summary bit is set to 1, it will trigger a service request. Send the ***SRE 192** (128 + 64) command. The ***SRE?** command returns the decimal value of the sum of the bits enabled previously with the ***SRE <number>** command.

NOTE   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 service request enable register contains the following bits:

Figure 4-5   **Service Request Enable Register**
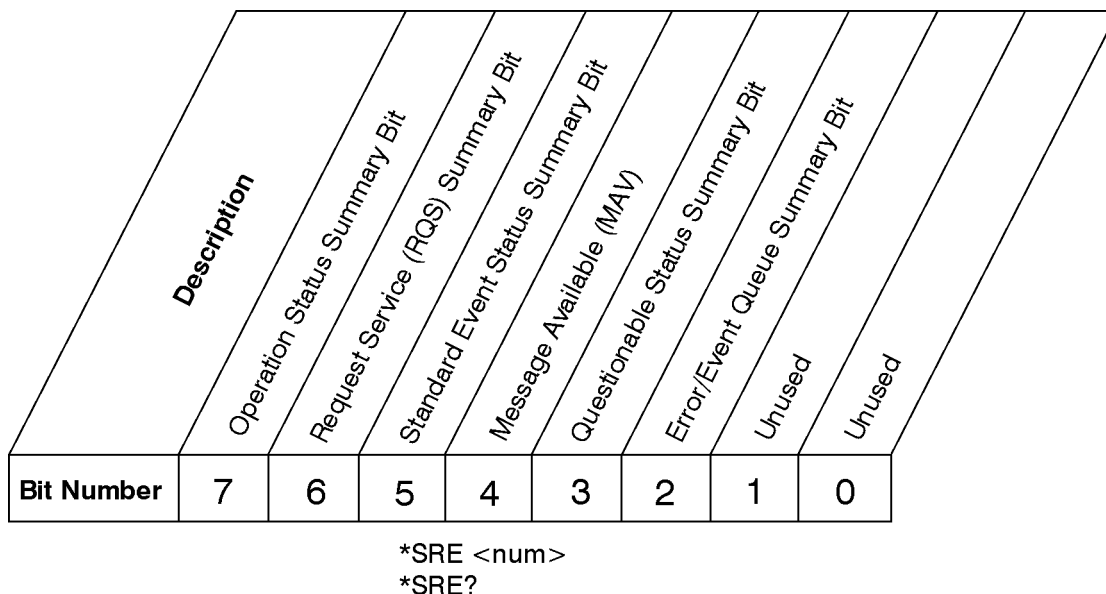
cb912a

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

Standard Event Status Register

The standard event status register is used to determine the specific event that sets bit 5 in the status byte register. The standard event status register does *not* have negative and positive transition registers, nor a condition register. Use the IEEE common commands at the beginning of Chapter 5, "Remote Command Reference." in this guide to access the register.

To query the standard event status register, send the ***ESR** command. 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.

See "Setting and Querying the Status Register" on page 198 in this chapter for more information.

Figure 4-6   **Standard Event Status Register Diagram**
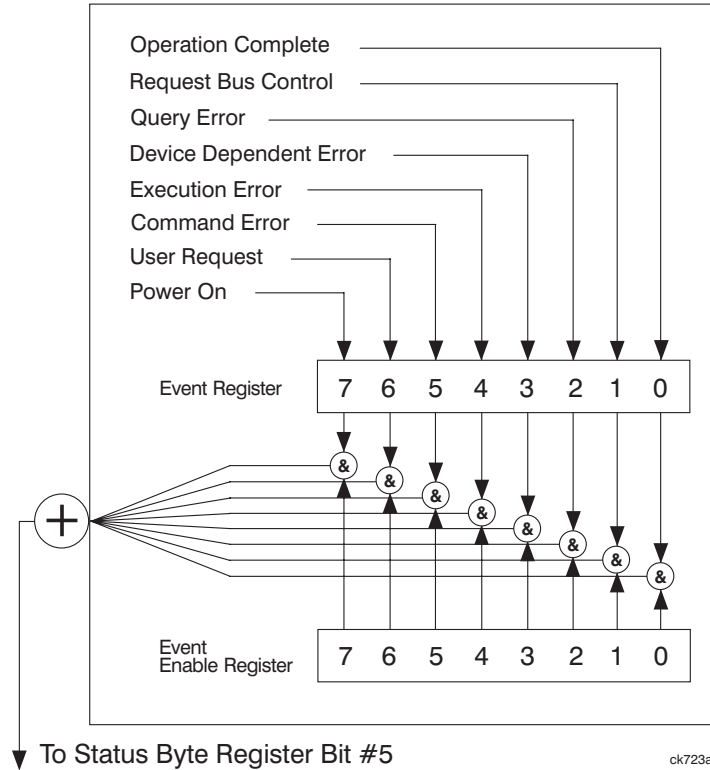
The standard event status register contains the following bits:

Bit	Decimal Value	Description
0	1	**Operation Complete**: A 1 in this bit position indicates that all operations were completed following execution of the ***OPC** command.
1	2	**Request Bus Control**: This bit is always set to 0. (The analyzer does not request control.)
2	4	**Query Error**: A 1 in this bit position indicates that a query error has occurred. Query errors have SCPI error numbers from −499 to −400.
3	8	**Device Dependent Error**: 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	16	**Execution Error**: A 1 in this bit position indicates that an execution error has occurred. Execution errors have SCPI error numbers from −299 to −200.

Bit	Decimal Value	Description
5	32	**Command Error**: A 1 in this bit position indicates that a command error has occurred. Command errors have SCPI error numbers from –199 to –100.
6	64	**User Request Key (Local**: A 1 in this bit position indicates that the **LOCAL** key has been pressed. This is true even if the analyzer is in local lockout mode.
7	128	**Power On**: A 1 in this bit position indicates that the analyzer has been turned off and then on.

Standard Event Status Event Enable Register

The event enable register (contained in the standard event status register) lets you choose which bits will set the summary bit (bit 5 of the status byte register) to 1. Send the ***ESE <number>** command (where **<number>** 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 also be set to 1, send the ***ESE 192** (128 + 64) command. The ***ESE?** command returns the decimal value of the sum of the bits previously enabled with the ***ESE <number>** command.

Figure 4-7   **Standard Event Status Event Enable Register**
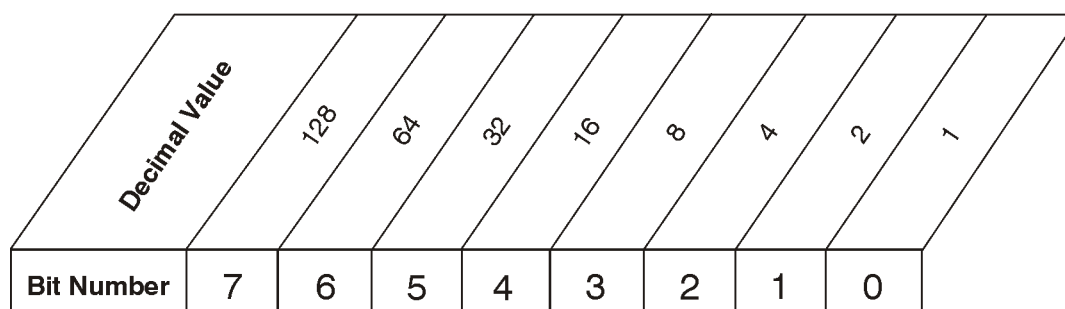
cb94a

STATus:OPERation Register

The STATus:OPERation register is used to determine the specific event that sets bit 7 in the status byte register. This register also monitors the current measurement state and checks to see if the analyzer is performing any of these functions:

- measuring
- calibrating
- sweeping
- waiting for a trigger

Figure 4-8 **Status Operation Register Diagram**
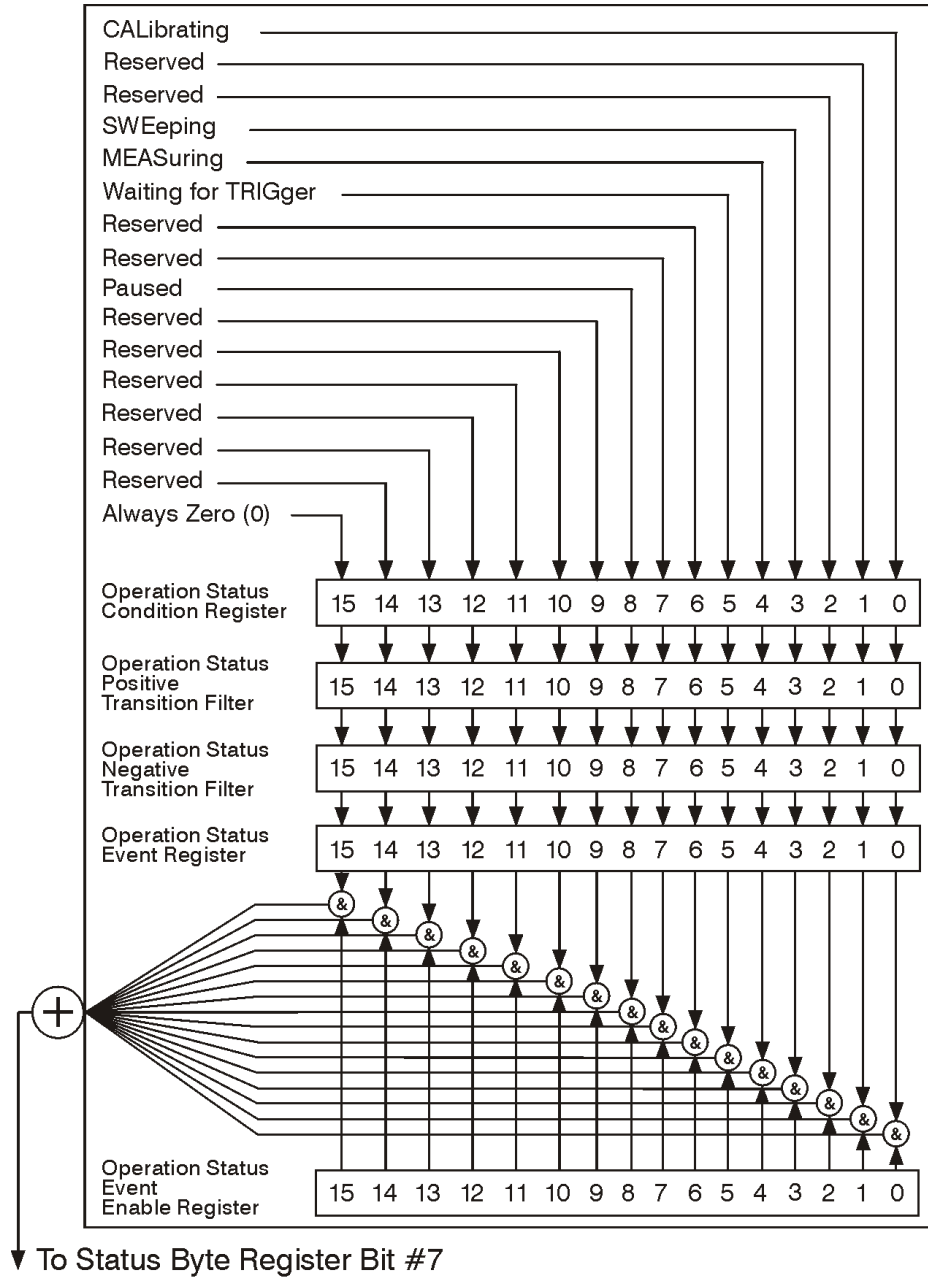
cl76a

The STATus:OPERation condition register contains the following bits:

Bit	Decimal Value	Description
0	0	**Calibrating**: A 1 in this bit position indicates that the analyzer is performing a self-calibration.

Bit	Decimal Value	Description
1	2	**Reserved**: This bit is not used by the analyzer, but is for future use with other Agilent products.
2	4	**Reserved**: This bit is not used by the analyzer, but is for future use with other Agilent products.
3	8	**Sweeping**: A 1 in this bit position indicates that a sweep is in progress.
4[a]	16	**Measuring**: A 1 in this bit position indicates that a measurement is in progress.
5[a]	32	**Waiting for Trigger**: A 1 in this bit position indicates that a measurement is in a "wait for trigger" state.
6	64	**Reserved**: This bit is not used by the analyzer, but is for future use with other Agilent products.
7	128	**Reserved**: This bit is not used by the analyzer, but is for future use with other Agilent products.
8[b]	256	**Paused**: A 1 in this bit position indicates that the instrument is in the paused state of the measurement.
9	512	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
10	1024	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
11	2048	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
12	4096	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
13	8192	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
14	16384	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
15	32768	**Always Zero (0)**

a. The description of this bit refers to any measurement under the **MEASURE** key.
b. This bit applies to ESA optional measurement personalities only, and may or may not be implemented in all such personalities.

STATus:OPERation Condition and Event Enable Registers

The STATus:OPERation condition register continuously monitors the hardware and firmware status of the analyzer, and is read-only. To query the register, send the :STATus:OPERation:CONDition? command. The response will be the *decimal* sum of the bits that are set to 1. For example, if bit number 9 and bit number 3 are set to 1, the decimal sum of the 2 bits is 512 plus 8. So the decimal value 520 is

returned.

The transition filter specifies which types of bit state changes in the condition register will set corresponding bits in the event register. The changes may be positive (from 0 to 1) or negative (from 1 to 0). Send the **`:STATus:OPERation:NTRansition <num>`** (negative transition) command or the **`:STATus:OPERation:PTRansition <num>`** (positive transition) command (where **`<num>`** is the sum of the decimal values of the bits you want to enable).

The STATus:OPERation event register latches transition events from the condition register as specified by the transition filters. Event registers are destructive read-only data. Reading data from an event register will clear the content of that register. To query the event register, send the **`:STATus:OPERation:[:EVENt]?`** command.

The STATus:OPERation event enable register lets you choose the bits that will set the operation status summary bit (bit 7) of the status byte register to 1. Send the **`:STATus:OPERation:ENABle <num>`** command where **`<num>`** is the sum of the decimal values of the bits you want to enable.

For example, to enable bit 9 and bit 3 (so that whenever either bit 9 or 3 is set to 1, the operation status summary bit of the status byte register will be set to 1), send the `:STATus:OPERation:ENABle 520` (512 + 8) command. The `:STATus:OPERation:ENABle?` command returns the decimal value of the sum of the bits previously enabled with the `:STATus:OPERation:ENABle <num>` command.

STATus:QUEStionable Registers

STATus:QUEStionable registers monitor the overall analyzer condition. They are accessed with the **`:STATus:OPERation`** and **`:STATus:QUEStionable`** commands in the **`:STATus`** command subsystem.

The STATus:QUEStionable registers also monitor the analyzer to see if there are any questionable events that occurred. These registers look for anything that may cause an error or that may induce a faulty measurement. Signs of a faulty measurement include the following:

- hardware problems
- out of calibration situations
- unusual signals

NOTE	All bits are summary bits from lower-level event registers. (For a general diagram of the STATus:QUEStionable register, see Figure 4-9.)

A Questionable Status condition register query response will be the decimal sum of the bits which are set to 1. For example, if bit number 9 and bit number 3 are set to 1, the decimal sum of the 2 bits is 512 plus 8. So the decimal value 520 is returned.

The transition filter specifies which types of bit state changes in the condition register will set corresponding bits in the event register. The changes may be positive (from 0 to 1) or negative (from 1 to 0). Send the command `:STATus:QUEStionable:NTRansition <num>` (negative transition) or `:STATus:QUEStionable:PTRansition <num>` (positive transition) where `<num>` is the sum of the decimal values of the bits you want to enable.

The Questionable Status event register latches transition events from the condition register as specified by the transition filters. Event registers are destructive read-only. Reading data from an event register will clear the content of that register. To query the event register, send the command `:STATus:QUEStionable[:EVENt]?`

Figure 4-9   **Status Questionable Register Diagram**

To Status Byte Register Bit #3

ck759a
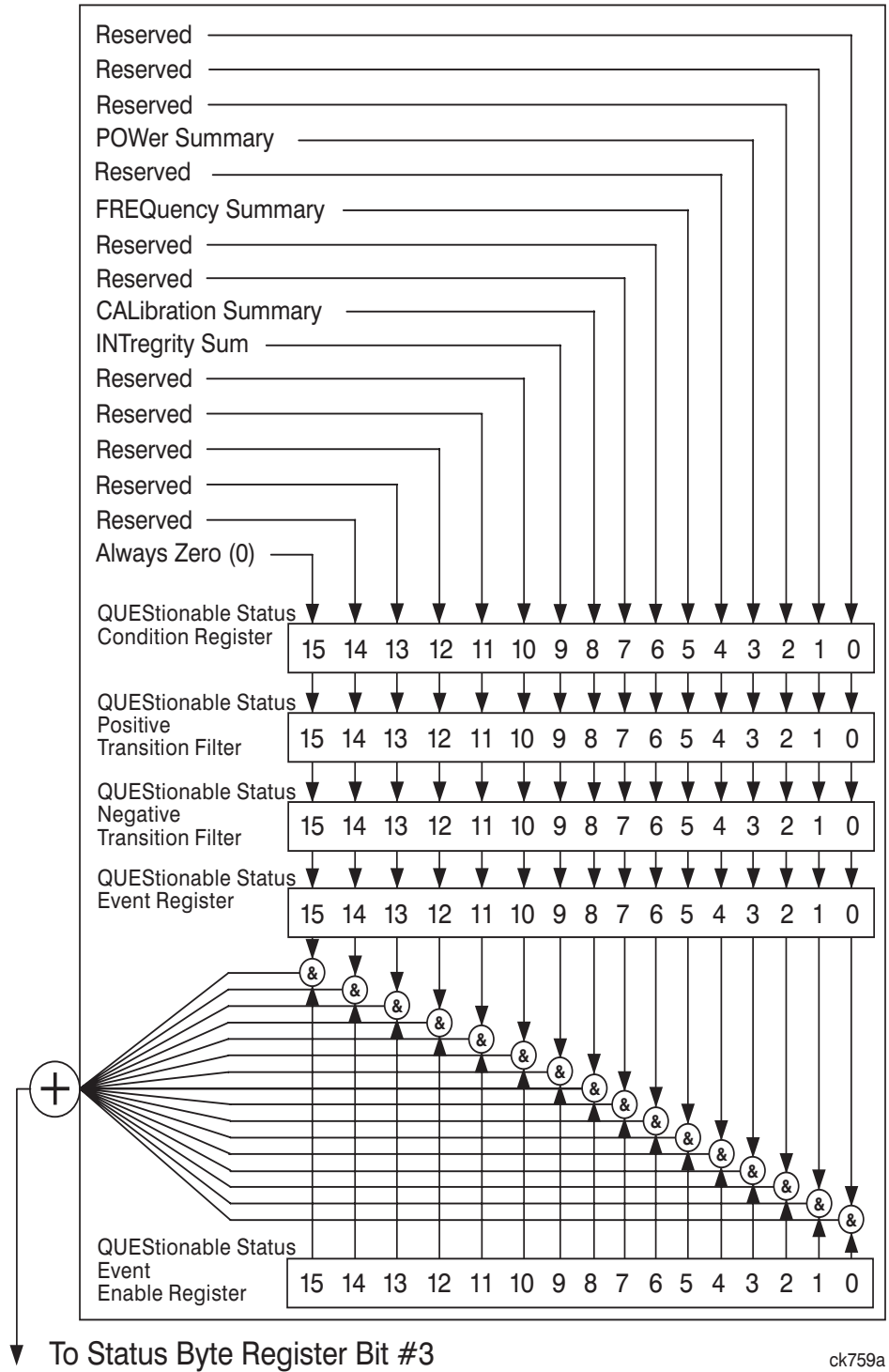
STATus:QUEStionable:POWer Register

Figure 4-10   **Questionable Status Power Register Diagram**
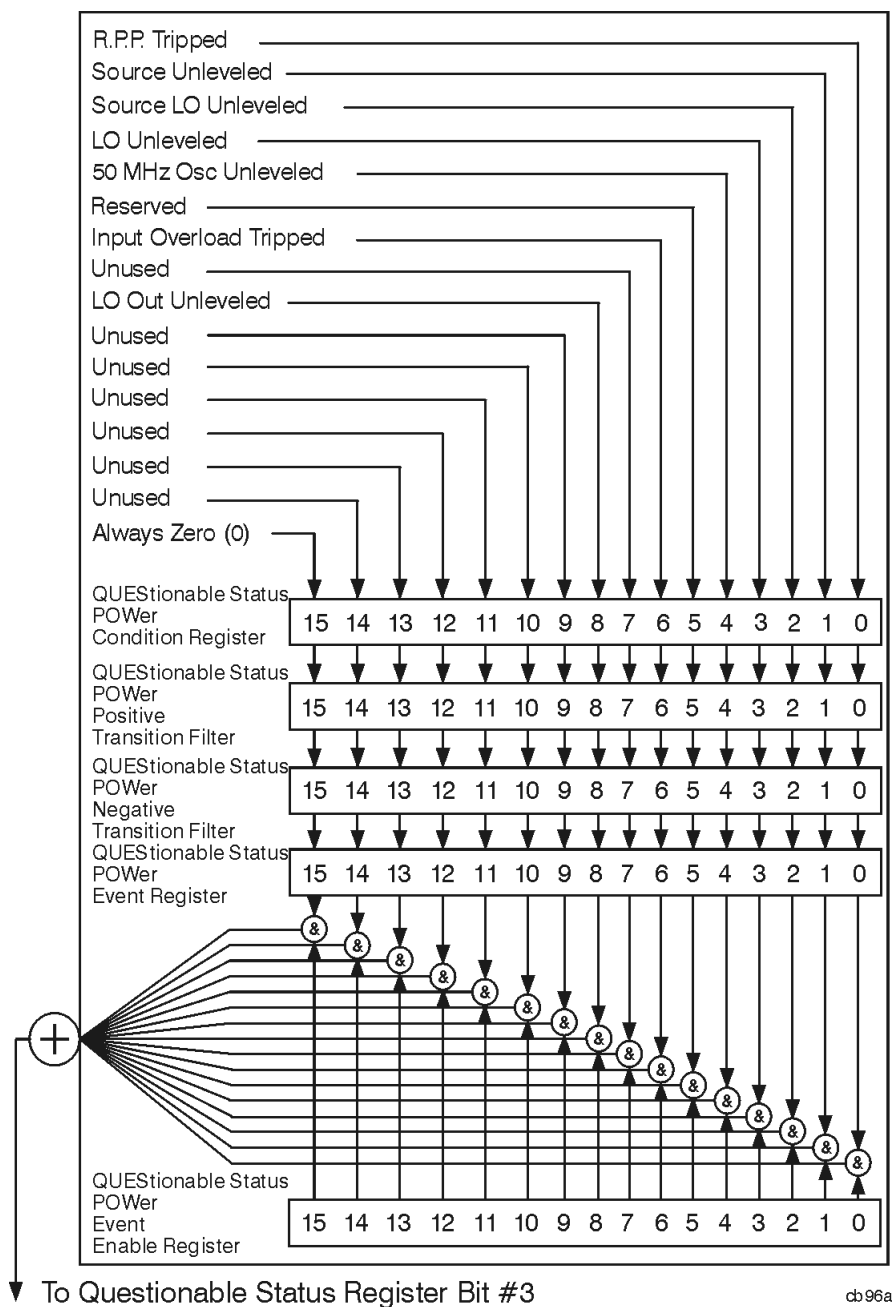
Bit descriptions in the Questionable Status Power Condition Register are given in the following table.

Bit	Decimal Value	Description
0	0	**R.P.P Tripped**: A 1 in this bit position indicates that the reverse power protection is tripped (Agilent ESA models E4401B and E4411B only). Reverse power protection is "overload" protection for the tracking generator.
1	2	**Source Unleveled**: A 1 in this bit position indicates that the source (tracking generator) output is unleveled.
2	4	**Source LO Unleveled**: A 1 in this bit position indicates that the local oscillator (LO) in the source (tracking generator) is unleveled.
3	8	**LO Unleveled**: A 1 in this bit position indicates that the analyzer local oscillator (LO) is unleveled.
4	16	**50 MHz Osc Unleveled**: A 1 in this bit position indicates that the 50 MHz amplitude reference signal is unleveled.
5	32	**Reserved**: This bit is not used by the analyzer, but is for future use with other Agilent products.
6	64	**Input Overload Tripped**: A 1 in this bit position indicates that the input overload protection is tripped (Agilent ESA models E4401B and E4411B only).
7	128	**Unused**: This bit is always set to 0.
8	256	**LO Out Unleveled**: A 1 in this bit position indicates that the first local oscillator (LO) output is unleveled. (Agilent ESA model E4407B option AYZ, External Mixing, only).
9	512	**Unused**: This bit is always set to 0.
10	1024	**Unused**: This bit is always set to 0.
11	2048	**Unused**: This bit is always set to 0.
12	4096	**Unused**: This bit is always set to 0.
13	8192	**Unused**: This bit is always set to 0.
14	16384	**Unused**: This bit is always set to 0.
15	32768	**Always Zero (0)**: This bit is always set to 0.

Questionable Status Event Enable Register

The Questionable Status Event Enable Register lets you choose which bits in the Questionable Status Event Register will set the summary bit (bit 3 of the Status Byte Register) to 1. Send the command `:STATus:QUEStionable:ENABle <num>` where <num> is the sum of the decimal values of the bits you want to enable.

For example, to enable bit 9 and bit 3 so that whenever either of those bits is set to 1, the Questionable Status Summary bit of the Status Byte Register will be set to 1, send the command **:STAT:QUES:ENAB 520** (512 + 8). The command **:STATus:QUEStionable:ENABle?** returns the decimal value of the sum of the bits previously enabled with the **:STATus:QUEStionable:ENABle <num>** command.

Figure 4-11   **Questionable Status Event Enable Register**

STATus:QUEStionable:ENABle <num>
STATus:QUEStionable:ENABle?
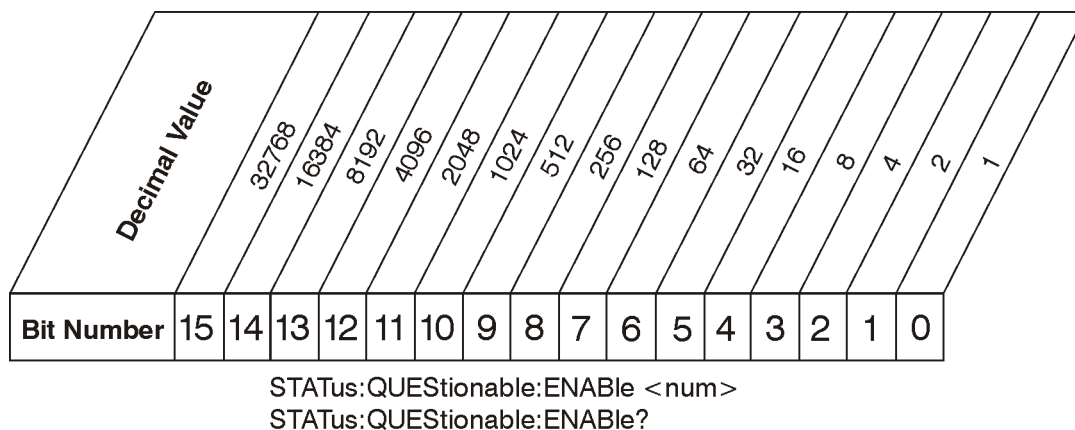
cb95a

Bit descriptions in the Status Questionable Condition Register are given in the following table.

Bit	Decimal Value	Description
0	1	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
1	2	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
2	4	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
3	8	**POWer Summary**: This is the summary bit for the Questionable Power Status Register.
4	16	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
5	32	**FREQuency Summary**: This is the summary bit for the Questionable Frequency Status Register.
6	64	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
7	128	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.

Bit	Decimal Value	Description
8	256	**CALibration Summary**: This is the summary bit for the Questionable Calibration Status Register.
9	512	**INTegrity Sum**: This is the summary bit for the Questionable Integrity Status Register.
10	1024	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
11	2048	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
12	4096	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
13	8192	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
14	16384	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
15	32768	**Always Zero (0)**

Questionable Status Power Condition and Event Registers

The Questionable Status Power Condition Register continuously monitors output power status of the analyzer. Condition registers are read-only. To query the condition register, send the command **:STATus:QUEStionable:POWer:CONDition?** The response will be the decimal sum of the bits which are set to 1.

The transition filter specifies which types of bit state changes in the condition register will set corresponding bits in the event register. The changes may be positive (from 0 to 1) or negative (from 1 to 0). Send the command **:STATus:QUEStionable:POWer:NTRansition <num>** (negative transition) or **:STATus:QUEStionable:POWer:PTRansition <num>** (positive transition) where **<num>** is the sum of the decimal values of the bits you want to enable.

The Questionable Status Power Event Register latches transition events from the condition register as specified by the transition filters. Event registers are destructive read-only. Reading data from an event register will clear the content of that register. To query the event register, send the command **:STATus:QUEStionable:POWer[:EVENt]?**

See "Questionable Status Event Enable Register" on page 210 for an explanation of how to set the summary bit using the event enable register. In this case, use the command **:STATus:QUEStionable:POWer:ENABle <num>**.

STATus:QUEStionable:FREQuency Register

Figure 4-12 **Questionable Status Frequency Register Diagram**
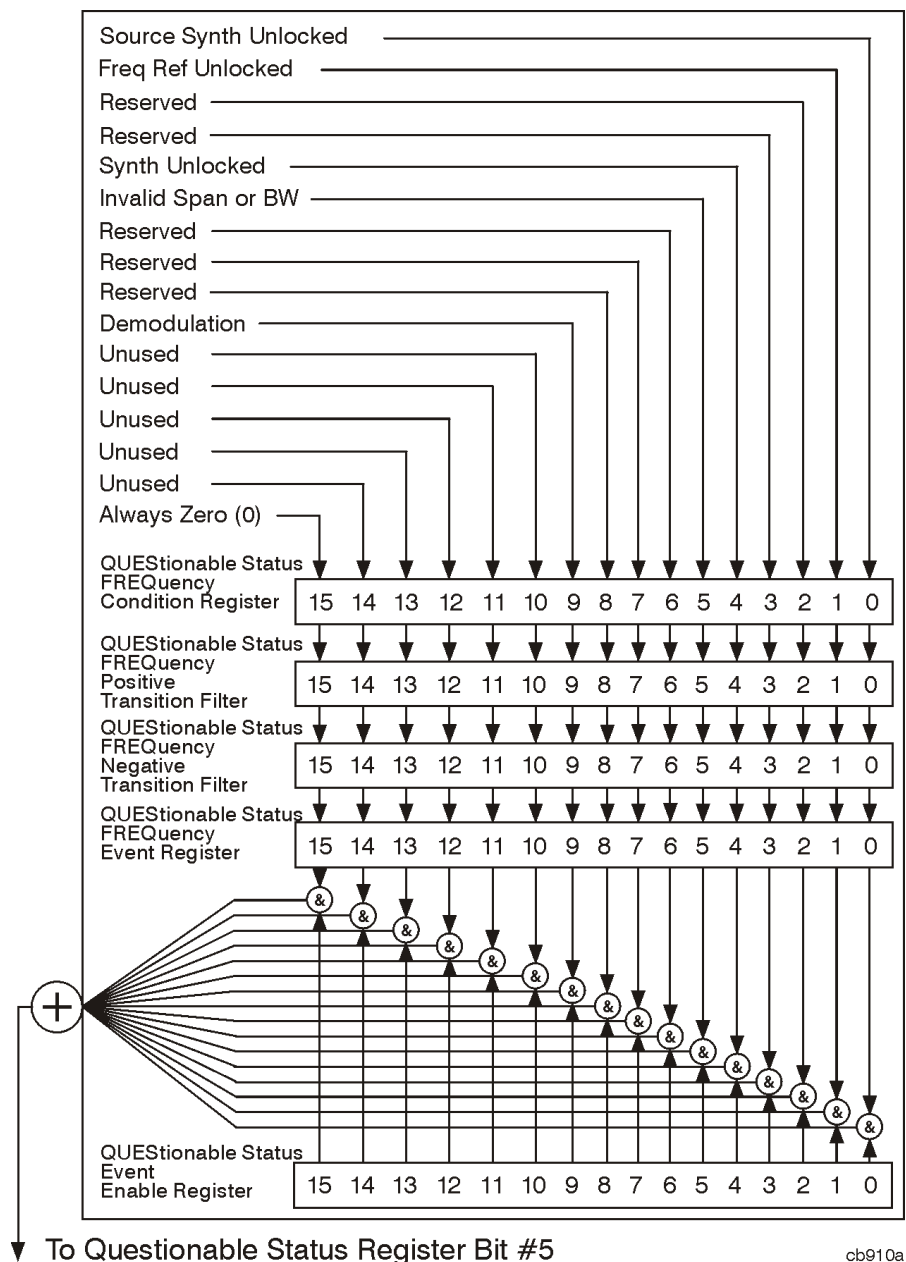
cb910a

Bit descriptions in the Questionable Status Frequency Condition Register are given in the following table.

Bit	Decimal Value	Description
0	0	**Source Synth Unlocked**: A 1 in this bit position indicates that the synthesizer in the source (tracking generator) is unlocked.
1	2	**Freq Ref Unlocked**: A 1 in this bit position indicates that the analyzer frequency reference is unlocked.
2	4	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
3	8	**Reserved**: This bit is not used by the analyzer, but is for future use with other Agilent products.
4	16	**Synth Unlocked**: A 1 in this bit position indicates that the analyzer synthesizer is unlocked.
5	32	**Invalid Span or BW**: A 1 in this bit position indicates an invalid span or bandwidth during frequency count.
6	64	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
7	128	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
8	256	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
9	512	**Demodulation**: A 1 in this bit position indicates an invalid span during FM Demodulation and Listen measurements.
10	1024	**Unused**: This bit is always set to 0.
11	2048	**Unused**: This bit is always set to 0.
12	4096	**Unused**: This bit is always set to 0.
13	8192	**Unused**: This bit is always set to 0.
14	16384	**Unused**: This bit is always set to 0.
15	32768	**Always Zero (0)**: This bit is always set to 0.

Questionable Status Frequency Condition and Event Enable Registers

The Questionable Status Frequency condition register continuously monitors output frequency status of the analyzer. Condition registers are read-only. To query the condition register, send the command `:STATus:QUEStionable:FREQuency:CONDition?` The response will be the *decimal* sum of the bits which are set to 1.

The negative and positive transition filters specify which types of bit state changes in the condition register will set corresponding bits in the event register. The changes may be positive (from 0 to 1) or negative (from 1 to 0). Send the command **:STATus:QUEStionable:FREQuency :NTRansition <num>** (negative transition) or **:STATus:QUEStionable :FREQuency:PTRansition <num>** (positive transition) where **<num>** is the sum of the decimal values of the bits you want to enable.

The Questionable Status Frequency Event register latches transition events from the condition register as specified by the transition filters. Event registers are destructive read-only. Reading data from an event register will clear the content of that register. To query the event register, send the command **:STATus:QUEStionable:FREQuency [:EVENt]?**

See "Questionable Status Event Enable Register" on page 210 for an explanation of how to set the summary bit using the event enable register. In this case, use the command **:STATus:QUEStionable:FREQ:ENABle <num>**.

STATus:QUEStionable:CALibration Register

Figure 4-13   Questionable Status Calibration Register Diagram

To Questionable Status Register Bit #8   cl78a

Bit descriptions in the Questionable Status Calibration Condition Register are given in the following table.

Bit	Decimal Value	Description
0	0	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
1	2	**Reserved**: This bit is not used by the analyzer, but are for future use with other Agilent products.
2	4	**TG Align Failure**: A 1 in this bit position indicates that a failure has occurred while trying to align the tracking generator (TG).
3	8	**RF Align Failure**: A 1 in this bit position indicates that a failure has occurred while trying to align the RF section.
4	16	**IF Align Failure**: A 1 in this bit position indicates that a failure has occurred while trying to align the IF section.
5	32	**LO Align Failure**: A 1 in this bit position indicates that a failure has occurred while trying to align the local oscillator (LO).
6	64	**ADC Align Failure**: A 1 in this bit position indicates that a failure has occurred while trying to align the analog-to-digital converter (ADC).
7	128	**FM Demod Align Failure**: A 1 in this bit position indicates that a failure has occurred while trying to align the FM demodulation circuitry. (Agilent ESA models E4401B, E4402B, E4404B, E4405B, and E4407B Option BAA, FM Demodulation, only).
8	256	**Misc/Sys Align Failure**: A 1 in this bit position indicates that a digital demodulation RF alignment failure has occurred.
9	512	**Unused**: This bit is always set to 0.
10	1024	**Tracking Peak Needed**: A 1 in this bit position indicates that a tracking peak needs to be performed (the tracking generator is in operation). (Agilent ESA models E4402B, E4403B, E4405B, E4407B, and E4408B, with Option 1DN, Tracking Generator, only).
11	2048	**Align RF Skipped**: A 1 in this bit position indicates that the alignment of the RF section was skipped, perhaps due to an external 50 MHz signal having been detected.
12	4096	**Align RF Now Needed**: A 1 in this bit position indicates that the RF section needs to be aligned.

Bit	Decimal Value	Description
13	8192	**Reserved**: This bit is not used by the analyzer, but is for future use with other Agilent products.
14	16384	**Align Needed**: A 1 in this bit position indicates that a full alignment is needed, perhaps due to a large temperature change having been detected with auto align off, or due to default data being used.
15	32768	**Always Zero (0)**: This bit is always set to 0.

STATus:QUEStionable:INTegrity:UNCalibrated Register

Figure 4-14   Questionable Status Integrity Uncalibrated Register Diagram

Bit descriptions in the Questionable Status Integrity Uncalibrated Condition Register are given in the following table.

Bit	Decimal Value	Description
0	0	**Oversweep (Meas Uncal)**: A 1 in this position indicates that the analyzer is in a state that could lead to uncalibrated measurements. This is typically caused by sweeping too fast for the current combination of span, resolution bandwidth, and video bandwidth. Auto coupling may resolve this problem.
1	2	**Signal Ident ON**: A 1 in this bit position indicates that amplitude measurements may be in error due to signal identification routines being active. Amplitude accuracy is degraded when signal identification is active. (Agilent ESA model E4407B Option AYZ, External Mixing, only.)
2	4	**Reserved**: This bit is not used by the analyzer, but is for future use with other Agilent products.
3	8	**Unused**: This bit is always set to 0.
4	16	**Unused**: This bit is always set to 0.
5	32	**Unused**: This bit is always set to 0.
6	64	**Unused**: This bit is always set to 0.
7	128	**Unused**: This bit is always set to 0.
8	256	**Unused**: This bit is always set to 0.
9	512	**Unused**: This bit is always set to 0.
10	1024	**Unused**: This bit is always set to 0.
11	2048	**Unused**: This bit is always set to 0.
12	4096	**Unused**: This bit is always set to 0.
13	8192	**Unused**: This bit is always set to 0.
14	16384	**Unused**: This bit is always set to 0.
15	32768	**Always Zero (0)**: This bit is always set to 0.

Questionable Status Calibration Condition and Event Enable Registers

The Questionable Status Calibration condition register continuously monitors the calibration status of the analyzer. Condition registers are read-only. To query the condition register, send the command `:STATus:QUEStionable:CALibration:CONDition?` The response will be the decimal sum of the bits which are set to 1.

The transition filter specifies which types of bit state changes in the condition register will set corresponding bits in the event register. The changes may be positive (from 0 to 1) or negative (from 1 to 0). Send the command `:STATus:QUEStionable:CALibration:NTRansition <num>` (negative transition) or `:STATus:QUEStionable:CALibration:PTRansition <num>` (positive transition) where `<num>` is the sum of the decimal values of the bits you want to enable.

The Questionable Status Calibration Event register latches transition events from the condition register as specified by the transition filters. Event registers are destructive read-only. Reading data from an event register will clear the content of that register. To query the event register, send the command `:STATus:QUEStionable:CALibration [:EVENt]?`

See for an explanation of how to set the summary bit using the event enable register. In this case, use the command `:STATus:QUEStionable:CALibration:ENABle <num>`.

Questionable Status Integrity Uncalibrated Condition and Event Enable Registers

The Questionable Status Integrity Uncalibrated Condition Register continuously monitors the calibration status of the analyzer. Condition registers are read-only. To query the condition register, send the command `:STATus:QUEStionable:INTegrity:UNCalibrated:CONDition?` The response will be the decimal sum of the bits which are set to 1.

The transition filter specifies which types of bit state changes in the condition register will set corresponding bits in the event register. The changes may be positive (from 0 to 1) or negative (from 1 to 0). Send the command `:STATus:QUEStionable:INTegrity:UNCalibrated:NTRansition <num>` (negative transition) or `:STATus:QUEStionable:INTegrity:UNCalibrated:PTRansition <num>` (positive transition) where `<num>` is the sum of the decimal values of the bits you want to enable.

The Questionable Status Integrity Uncalibrated Event Register latches transition events from the condition register as specified by the transition filters. Event registers are destructive read-only. Reading data from an event register will clear the content of that register. To query the event register, send the command `:STATus:QUEStionable:INTegrity:UNCalibrated[:EVENt]?`

See for an explanation of how to set the summary bit using the event enable register. In this case, use the command `:STATus:QUEStionable:INTegrity:UNCalibrated:ENABle <num>`.

STATus:QUEStionable:INTegrity Register

Figure 4-15   **Questionable Status Integrity Register Diagram**

Bit descriptions in the Questionable Status Integrity Condition Register are given in the following table.

Bit	Decimal Value	Description
0	1	**Reserved**: This bit is not used by the analyzer, but is for future use with other Agilent products.
1[a]	2	**No Result Available**: A 1 in this bit position indicates that a measurement terminated with no measurement results.
2[a]	4	**Measurement Timeout**: A 1 in this bit position indicates that a measurement terminated due to a timeout.
3	8	**Data Uncalibrated Summary**: This is the summary bit for the Questionable Status Integrity Uncalibrated Register.
4	16	**IF/ADC Over Range**: The signal input level is too high, causing the analyzer analog-to-digital converter (ADC) range to be exceeded. This may occur with resolution bandwidths less than or equal to 300 Hz in zero span. (Agilent ESA models E4401B, E4402B, E4404B, E4405B, and E4407B only.)
5[a]	32	**Over Range**: A 1 in this bit position indicates that the signal is too large at the analog-to-digital converter (ADC).
6[a]	64	**Under Range**: A 1 in this bit position indicates that the signal is too small at the analog-to-digital converter (ADC).
7[a]	128	**Insufficient Data**: A 1 in this bit position indicates that there is not enough information to perform the measurement or function.
8[a]	256	**Acquisition Failure**: A 1 in this bit position indicates that the demod algorithm cannot correlate to the signal.
9[a]	512	**Memory Problem**: A 1 in this bit position indicates a failure of the file system memory or digital signal processor (DSP) memory.
10[a]	1024	**Auto-Trigger Timeout**: A 1 in this bit position indicates that the measurement timed out due to no trigger.
11[a]	2048	**Trigger Problem**: A 1 in this bit position indicates that the measurement timed out due to no trigger.
12	4096	**Invalid Data**: A 1 in this bit position indicates that the present trace data does not reflect the existing analyzer state. Trigger a new sweep and/or measurement.
13[a]	8192	**Unidentified Error**: A 1 in this bit position indicates that a measurement has terminated for a reason other than that given in any of the other bits.

Bit	Decimal Value	Description
14[a]	16384	**Setting Limited/Readjusted**: A 1 in this bit position indicates that the user settings could not be achieved with the existing hardware; values were set to limits.
15	32768	**Always Zero (0)**: This bit is always set to 0.

a. This bit applies to ESA optional measurement personalities only, and may or may not be implemented in all such personalities.

Questionable Status Integrity Event Condition and Enable Registers

The Questionable Status Integrity Condition Register continuously monitors the calibration status of the analyzer. Condition registers are read-only. To query the condition register, send the command `:STATus:QUEStionable:INTegrity:CONDition?` The response will be the decimal sum of the bits which are set to 1.

The transition filter specifies which types of bit state changes in the condition register will set corresponding bits in the event register. The changes may be positive (from 0 to 1) or negative (from 1 to 0). Send the command `:STATus:QUEStionable:INTegrity:NTRansition <num>` (negative transition) or `:STATus:QUEStionable:INTegrity:PTRansition <num>` (positive transition) where `<num>` is the sum of the decimal values of the bits you want to enable.

The Questionable Status Integrity Event Register latches transition events from the condition register as specified by the transition filters. Event registers are destructive read-only. Reading data from an event register will clear the content of that register. To query the event register, send the command `:STATus:QUEStionable:INTegrity[:EVENt]?`

See "Questionable Status Event Enable Register" on page 210 for an explanation of how to set the summary bit using the event enable register. In this case, use the command `:STATus:QUEStionable:INTegrity:ENABle <num>`.

5   Remote Command Reference

This chapter contains SCPI (Standard Commands for Programmable Instruments) programming commands for the Agilent ESA spectrum analyzers. For all commands associated with the measurements available when you press the front-panel MEASURE key, refer to Chapter 7, "One-Button Measurement Functions," on page 399.

The first few pages of this chapter contain common commands specified 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. Following these commands, the Agilent ESA spectrum analyzers SCPI commands are listed.

NOTE Refer to Chapter 4 , "Status Registers," on page 191 which supplements the information presented in this chapter. Refer to Chapter 2 , "Front-Panel Key Reference," on page 35 in this guide for additional information about the operation of each analyzer function. Refer to Chapter 7, "One-Button Measurement Functions," on page 399 in this guide for all programming commands associated with the measurements available when you press the front-panel **MEASURE** key. Use the analyzer **HELP** key to obtain similar information about analyzer key functions.

Refer to the "Agilent 8590/ESA Spectrum Analyzers Programming Conversion Guide" for specific backwards compatibility information between commands for HP/Agilent 8590-Series spectrum analyzers and Agilent ESA spectrum analyzers.

Refer to the "Agilent 8590 Series Programming Compatibility Guide" for analyzers with Option 290 (8590 Series Programming Code Compatibility). When Option 290 is installed, all SCPI commands are disabled and the remote language becomes a subset of the remote commands used in Agilent 8590 Series analyzers.

SCPI Sections and Subsections

SCPI commands related to major functional areas (such as calculate or) are grouped into blocks, or subsystems. Some of these subsystems are further divided into subsections (such as calculate/marker, or sense/harmonics). An instrument model is then created to represent the way in which instrument functionality is viewed and categorized by SCPI. Refer to *IEEE SCPI-1997 Volume 2: Command Reference, Standard Commands for Programmable Instruments,* Version 1997.0, May, 1997 for a more complete description of the SCPI instrument model.

The SCPI subsystems in this chapter are listed in alphabetical order. Likewise, the SCPI commands are in alphabetical order within the subsystem in which they belong. Refer to the following table to locate SCPI command subsystems and subsections by page number.

SCPI Subsystem/Subsection	Page
IEEE Common Commands	page 229
:ABORt	page 234
:CALCulate	page 235
:CALCulate:LLINe	page 238
:CALCulate:MARKer	page 245
:CALCulate:NTData	page 257
:CALibration	page 258
:CONFigure	page 263
:COUPle	page 264
:DISPlay	page 266
:FORMat	page 274
:HCOPy	page 276
:INITiate	page 279
:INPut	page 282
:INSTrument	page 285
:MMEMory	page 286
:OUTPut	page 291
[:SENSe]:	page 292
[:SENSe]:AVERage	page 293

SCPI Subsystem/Subsection	Page
[:SENSe]:BANDwidth	page 297
[:SENSe]:CORRection	page 299
[:SENSe]:DEMod	page 303
[:SENSe]:DETector	page 305
[:SENSe]:FREQuency	page 307
[:SENSe]:MIXer	page 312
[:SENSe]:POWer	page 315
[:SENSe]:SIDentify	page 318
[:SENSe]:SWEep	page 320
:SOURce	page 329
:STATus	page 335
:STATus:QUEStionable	page 337
:SYSTem	page 346
:TRACe	page 355
:TRIGger	page 361
:UNIT	page 371

IEEE Common Commands

These commands are specified 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.

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. The SCPI equivalent for this command is the same as `:CALibrate[:ALL]?`

NOTE	Before executing this command, connect a cable between front panel connector AMPTD REF OUT and the INPUT connector for all Agilent ESA spectrum analyzers except Agilent models E4401B and E4411B.
	If the cable is not connected, **`CAL:ALL`** will perform a subset of the RF alignment and a subsequent **`CAL:RF`** will be required for the analyzer to meet its specified performance.
	The query performs a full alignment and returns a number indicating the success of the alignment. A zero is returned if the alignment is successful, even if only a subset of the RF alignment is performed.

Front Panel
Access: **System**, **Alignments**, **Align All Now**

Clear Status

`*CLS`

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

Remarks:.   See **`*STB?`**

Standard Event Status Enable

`*ESE <number>`

`*ESE?`

Sets the bits in 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, execution error, command error and power on. A summary bit is generated on execution of the command.

Query returns the state of the standard event status enable register.

Range:.   Integer, 0 to 255

Standard Event Status Register Query

*ESR?

Queries and clears the standard event status event register. (This is a destructive read.)

Range: Integer, 0 to 255

Identification Query

*IDN?

Returns an instrument identification information string. 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

Example: `Hewlett-Packard, E4401B, US39120213, A.06.00`

NOTE   As shown in the example, the analyzer returns "Hewlett-Packard" as the manufacturer even though it is now manufactured by Agilent Technologies. This is intentional. Agilent Technologies was created out of the Hewlett-Packard company, and the Hewlett-Packard name is retained to support those customers who have purchased ESA analyzers in the past.

Front Panel
Access: **System, Show System**

Instrument State Query

*LRN?

Returns current instrument state data in a block of defined length. The information is in a machine readable format only. Sending the query returns the following format:

#PQQQSYST:SET #NMMM<state_data>

The following example is a response to ***LRN?** The actual sizes will vary depending on the instrument state data size.

Example: #42031SYST:SET #42016<state data>

The number 4 (P in the preceding query response format) means there are 4 numbers that make up the size of the data that follows. In this example, 2031 bytes will follow the number 4 (42031).

2031 and 2016 (QQQ and MMM in the preceding query response format) represent data size in bytes.

The state can be changed by sending this block of data to the instrument after removing the size information:

Example: **SYST:SET #NMMM<state_data>**

Operation Complete

*OPC

*OPC?

Sets bit 0 in the standard event status register to "1" when all pending operations have finished.

The query stops any new commands from being processed until the current processing is complete. Then it returns a "1", and the program continues. This query can be used to synchronize events of other instruments on the external bus.

*OPC and ***OPC?** are currently effective only when immediately preceded by either the :**INITiate:IMMediate** or a :**CALibration** command.

Query Instrument Options

This function is provided in the analyzer SCPI language reference in the SYSTem subsystem under :**SYSTem:OPTions?**.

Recall

*RCL <register>

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

Range: Registers are an integer, 0 to 127

Remarks: See also commands :**MMEMory:LOAD:STATe** and
                :**MMEMory:STORe:STATe**

                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.

Front Panel
Access: **File, Recall State**

Reset

*RST

This command presets the instrument to a factory defined condition that is
appropriate for remote programming operation. ***RST** is equivalent to performing
the two commands :**SYSTem:PRESet** and ***CLS**. This command always
performs a factory preset.

NOTE   The preset performed by ***RST** is always a factory preset. That is, the same preset
performed by :**SYSTem:PRESet** when :**SYSTem:PRESet:TYPE** is set to
FACTory.

Front Panel
Access: **Preset**

Save

*SAV <register>

This command saves the instrument state to the specified instrument memory
register.

Range: Registers are an integer, 0 to 127

Remarks: See also commands :**MMEMory:LOAD:STATe** and
                 :**MMEMory:STORe:STATe**

Front Panel
Access: **File, Save State**

Service Request Enable

*SRE <integer>

*SRE?

This command sets the value of the service request enable register.

The query returns the value of the register.

Range: Integer, 0 to 255

Read Status Byte Query

*STB?

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

Remarks: See ***CLS**

Trigger

*TRG

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

Remarks: See also the :**INITiate:IMMediate** command

Self Test Query

*TST?

This query is used by some instruments for a self test.

For Agilent ESA analyzers, ***TST?** always returns 0; no tests are performed.

Front Panel
Access: **System, Alignments, Align All Now**

Wait-to-Continue

*WAI

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

ABORt Subsystem

Abort

:ABORt

Restarts any sweep or measurement in progress and resets the sweep or trigger system. A measurement refers to any of the measurements found in the **MEASURE** menu. SCPI commands associated with these measurements are located in Chapter 7, "One-Button Measurement Functions," on page 399.

  If :**INITiate:CONTinuous** is off (single measure), then :**INITiate:IMMediate** will start a new single measurement.

  If :**INITiate:CONTinuous** is on (continuous measure), a new continuous measurement begins immediately.

The INITiate and TRIGger subsystems contain additional related commands.

Front Panel
Access: **Restart** for continuous measurement mode

CALCulate Subsystem

This subsystem is used to perform post-acquisition data processing. In effect, the collection of new data triggers the CALCulate subsystem. In this instrument, the primary functions in this subsystem are markers and limits. CALCulate subsystem commands used for measurements in the **MEASURE** and **Meas Setup** menus are located in Chapter 7, "One-Button Measurement Functions," on page 399.

NdBpoints

:CALCulate:BWIDth|BANDwidth:NDB <rel_ampl>

:CALCulate:BWIDth|BANDwidth:NDB?

Selects the power level, below the peak of the signal, at which the signal bandwidth will be measured by the markers.
:CALCulate:BWIDth|BANDwidth[:STATe] must be ON.

NOTE	To query the result of NdBpoints, use the command **:CALCulate:BWIDth|BANDwidth:RESult?**

Factory Preset
and *RST: –3 dB

Range: –80 dB to –1 dB

Default Unit: dB

Remarks: Refer to **:CALCulate:BWIDth|BANDwidth[:STATe]** for an explanation of this marker function.

Front Panel
Access: **Peak Search (or Search), N dB Points**

NdBresults

:CALCulate:BWIDth|BANDwidth:RESult?

Returns the measured bandwidth at the power level defined by
:CALCulate:BWIDth:NDB. –100 is returned if
:CALCulate:BWIDth|BANDwidth[:STATe] is off, or when a result is not available. Refer to **CALCulate:BWIDth|BANDwidth[:STATe]** for an explanation of this marker function.

Range: Real value less than the current frequency span

Default Unit: Hz

Remarks: When segmented sweep is on, a result will not be available when the NDB marker crosses a segment boundary.

Front Panel
Access: **Peak Search (or Search), N dB Points**

NdBstate

:CALCulate:BWIDth|BANDwidth[:STATe] OFF|ON|0|1

:CALCulate:BWIDth|BANDwidth[:STATe]?

Controls the bandwidth measurement function. The function measures the bandwidth, at the number of dB down specified in **:CALCulate:BWIDth:NDB**, of the maximum signal on the display.

Factory Preset
and *RST: Off

Remarks: When this command is turned on, the bandwidth measurement
                    function (N dB Points) is associated with the active marker. If
                    no marker is active at the time this command is turned on,
                    marker 1 becomes the active marker, and a peak search is
                    performed. No restrictions exist for moving the bandwidth
                    measurement function markers to any other signal on the
                    display. However, when this function is turned on, all other
                    concurrent marker functions are suspended.

Front Panel
Access: **Peak Search (or Search), N dB Points On Off**

Calculate Correction at Frequency

`:CALCulate:CORRection:ATFREquency? <freq>`

Calculates the total correction factor for a specified frequency point.

Example: `:CALC:CORR:ATFRE? 1.5E8`

Remarks: Refer to `[:SENSe]:CORRection:CSET[1]|2|3|4:DATA`
                    `<freq>, <rel_ampl> {,<freq>, <rel_ampl}` for an
                    explanation of correction factors.

Test Current Trace Data Against all Limit Lines

`:CALCulate:CLIMits:FAIL?`

Queries the status of the limit line testing. Returns a 0 if the trace data passes when
compared with all the current limit lines. Returns a 1 if the trace data fails any limit
line test.

CALCulate:LLINe Subsection

Limit lines can be defined for your measurement. You can then have the instrument compare the data to your defined limits and indicate a pass/fail condition.

NOTE Refer also to **:MMEMory** and **:TRACe** subsystems for more trace and limit line commands.

Delete All Correction Sets in Memory

:CALCulate:LLINe:ALL:DELete

Deletes all correction sets in volatile memory.

History: Added with firmware revision A.08.00.

Front Panel
Access: **Display, Limits, Delete All Limits**

Control Limit Line Amplitude Interpolation

**:CALCulate:LLINe[1]|2:AMPLitude:INTerpolate:TYPE
LOGarithmic|LINear**

:CALCulate:LLINe[1]|2:AMPLitude:INTerpolate:TYPE?

Selects the type of interpolation done for the amplitude values of the designated limit line when comparing to measured data.

Factory Preset
and *RST: Not affected by preset

Remarks: Once this function is defined, the selected type is persistent. Persistent means that it retains the setting previously selected, even through a power cycle.

Front Panel
Access: **Display, Limits, Limit 1|2, Amptd Interp Log Lin**

Set Fixed or Relative Limit Lines

:CALCulate:LLINe:CMODe FIXed|RELative

:CALCulate:LLINe:CMODe?

Specifies whether the current limit lines are fixed or relative.

NOTE If you need to change the domain with
 :**CALCulate:LLINe:CONTrol:DOMain**, do it before this command.
Changing the domain deletes all the existing limit line values.

Factory Preset
and *RST: Not affected by preset

Remarks: For Amplitude Parameters:

Regardless of whether the limit line is based on frequency or
sweep time, amplitude parameters in a limit line table represent
absolute values or relative values. In fixed, the limit line
amplitude values are specified in absolute amplitude and do not
depend on the reference level. In relative, the limit line
amplitude values are relative to the current reference level.

For Fixed Frequency Parameters:

The frequency values in a limit line table are fixed values, and
the limit line is positioned accordingly. Fixed limit lines are
specified in absolute frequency and do not depend upon the
center frequency values.

For Relative Frequency Parameters:

The frequency values in a limit line table are relative values and
positions the limit line relative to the center frequency settings.
Relative limit lines are specified in relative frequency and are
positioned with respect to the current center frequency. When
the current center frequency value is changed, the segment
frequencies are converted according to the current center
frequency value.

For Time Parameters:

Limit lines that are based on sweep time are always relative to
the start time. The horizontal position of the limit line is not
affected by this command.

Front Panel
Access: **Display, Limits, Limits Fixed Rel**

Set Limit Line X-axis Units

:CALCulate:LLINe:CONTrol:DOMain FREQuency|TIME

:CALCulate:LLINe:CONTrol:DOMain?

Selects how the limit line segments are defined: according to frequency, or
according to the sweep time setting of the spectrum analyzer.

NOTE   Changing this setting deletes *all* existing limit data from the analyzer. In other
words, if a limit line has already been defined, changing the type clears the existing
limit line.

Factory Preset
and *RST: Not affected by Preset

Remarks: For TIME, the limit line segments are placed on the spectrum
                analyzer display with respect to the sweep time setting of the
                analyzer, with 0 at the left edge of the display.

                For FREQuency, segments are placed according to the
                frequency that is specified for each segment.

Front Panel
Access: **Display, Limits, X Axis Units Freq Time**

Control Limit Line Frequency Interpolation

**:CALCulate:LLINe[1]|2:CONTrol:INTerpolate:TYPE
LOGarithmic|LINear**

:CALCulate:LLINe[1]|2:CONTrol:INTerpolate:TYPE?

Selects the type of interpolation done for the frequency values of the designated
limit line when comparing to measured data. This only applies in the frequency
domain. This function does not work in zero span (when the analyzer is in the time
domain).

Remarks: Once this function is defined, the selected type is persistent.
                Persistent means that it retains the setting previously selected,
                even through a power cycle.

Front Panel
Access: **Display, Limits, Limit 1|2, Freq Interp Log Lin**

Define Limit Line Values

**:CALCulate:LLINe[1]|2:DATA
<x-axis>,<ampl>,<connected>{,<x-axis>,<ampl>,<connected>}**

:CALCulate:LLINe[1]|2:DATA?

Defines limit line values, and destroys all existing data. Up to 200 points may be
defined for each limit. No units are allowed.

- <x-axis> – can be frequency or time values as specified by
  :CALCulate:LLINe:CONTrol:DOMain. Frequencies are always in Hz.
  Time is always in seconds. No unit is allowed in this parameter.
- <ampl> – amplitude values are in the current Y-axis units. Up to two amplitude
  values can be provided for each x-axis value, by repeating <x-axis> in the data
  list. No unit is allowed in this parameter.
- <connected> – connected values are either 0 or 1. A 1 means this point should
  be connected to the previously defined point to define the limit line. A 0 means
  that it is a point of discontinuity and is not connected to the preceding point.
  The "connected" value is ignored for the first point.

Example: **CALC:LLIN1:DATA
                1000000000,–20,0,200000000,–30,1**

Range: **<x-axis>** –30 Gs to +30 Gs for time limits

<x-axis> –30 GHz to +350 GHz for frequency limits

<ampl> –120 dBm to +100 dBm

<connected> 0 or 1

Remarks: If two amplitude values are entered for the same frequency, a single vertical line is the result. In this case, if an upper line is chosen, the amplitude of lesser frequency (amplitude 1) is tested. If a lower line is chosen, the amplitude of greater frequency (amplitude 2) is tested.

For linear amplitude interpolation and linear frequency interpolation, the interpolation is computed as:

$$y \ = \ \frac{y_{i+1} - y_i}{f_{i+1} - f_i}(f - f_i) + y_i$$

For linear amplitude interpolation and log frequency interpolation, the interpolation is computed as:

$$y \ = \ \frac{y_{i+1} - y_i}{\log f_{i+1} - \log f_i}(\log f - \log f_i) + y_i$$

For log amplitude interpolation and linear frequency interpolation, the interpolation is computed as:

$$\log y \ = \ \frac{\log y_{i+1} - \log y_i}{f_{i+1} - f_i}(f - f_i) + \log y_i$$

For log amplitude interpolation and log frequency interpolation, the interpolation is computed as:

$$\log y \ = \ \frac{\log y_{i+1} - \log y_i}{\log f_{i+1} - \log f_i}(\log f - \log f_i) + \log y_i$$

Front Panel
Access: **Display, Limits, X Axis Units Freq Time**

Display, Limits, Limit 1|2, Edit

Display, Limits, Limit 1|2, Edit, Point

Display, Limits, Limit 1|2, Edit, Frequency

Display, Limits, Limit 1|2, Edit, Amplitude

Display, Limits, Limit 1|2, Edit, Connected

Display, Limits, Limit 1|2, Edit, Delete Point

Merge Additional Values into the Existing Limit Line

**:CALCulate:LLINe[1]|2:DATA:MERGe
<x-axis>,<ampl>,<connected>{,<x-axis>,<ampl>,<connected>}**

Adds the points with the specified values to the current limit line, allowing you to merge limit line data. Up to two amplitude values are allowed for each x value. If too much data is merged, as many points as possible are merged into the existing limit and then an error is reported. Up to 200 points total may be defined for each limit.

- <x-axis> can be frequency or time values as specified by **:CALCulate:LLINe:CONTrol:DOMain**. Frequencies are always in Hz. Time is always in seconds. No unit is allowed in this parameter.
- <ampl> – amplitude values are in the current Y-axis units. No unit is allowed in this parameter.
- <connected> connected values are either 0 or 1. A 1 means this point should be connected to the previously defined point to define the limit line. A 0 means that it is a point of discontinuity and is not connected to the preceding point. The "connected" value is ignored for the first point.

Range: <x-axis> –30 Gs to +30 Gs for time limits

                   <x-axis> –30 GHz to +350 GHz for frequency limits

                   <ampl> –120 dBm to +100 dBm

                   <connected> 0 or 1

Front Panel
Access: **Display, Limits, X Axis Units Freq Time**

Delete Limit Line

:CALCulate:LLINe[1]|2:DELete

Deletes the selected limit line.

Display the Limit Line

:CALCulate:LLINe[1]|2:DISPlay OFF|ON|0|1

:CALCulate:LLINe[1]|2:DISPlay?

Controls the display of the current limit line.

Factory Preset
and *RST: Off

Front Panel
Access: **Display, Limits, Limit 1|2, Limit On Off**

Test the Data Against the Limit Line

:CALCulate:LLINe[1]|2:FAIL?

Queries the status of the limit line testing. Returns a 0 if the data passes, and returns a 1 if there is a failure. This query value is valid only if margin or limit test is On. Use the command **:CALCulate:LLINe[1]|2:STATe OFF|ON|0|1** to activate limit line testing.

Set the Margin Size

:CALCulate:LLINe[1]|2:MARGin <rel_ampl>

:CALCulate:LLINe[1]|2:MARGin?

Allows you to define the amount of measurement margin that is added to the designated limit line.

Factory Preset
and *RST: not affected

Default Units: dB

Remarks: The margin must be negative for upper limit lines, and positive for lower limits.

Front Panel
Access: **Display, Limits, Limit 1|2, Margin On Off**

Display the Limit Margin

:CALCulate:LLINe[1]|2:MARGin:STATe OFF|ON|0|1

:CALCulate:LLINe[1]|2:MARGin:STATe?

Allows you to display a measurement margin that is added to the designated limit line to do secondary testing of the data.

Factory Preset
and *RST: Off

Front Panel
Access: **Display, Limits, Limit 1|2, Margin On Off**

Control Limit Line Testing

`:CALCulate:LLINe[1]|2:STATe OFF|ON|0|1`

`:CALCulate:LLINe[1]|2:STATe?`

Turns limit line testing on/off. The limit and margin will only be tested if they are displayed. Use `:CALCulate:LLINe[1]|2:DISPlay` to turn on the display of limit lines, and `:CALCulate:LLINe[1]|2:MARGin:STATe` to turn on the display of margins. If margin and limit display are both turned off, limit test is automatically turned off. Use `:CALCulate:LLINe[1]|2:FAIL?` to return the state of pass or fail after limit line state has been turned on.

Factory Preset
and *RST: Off

Front Panel
Access: **Display, Limits, Limit 1|2, Limit On Off**

Select the Type of Limit Line

`:CALCulate:LLINe[1]|2:TYPE UPPer|LOWer`

`:CALCulate:LLINe[1]|2:TYPE?`

Sets a limit line to be either an upper or lower type limit line. An upper line will be used as the maximum allowable value when comparing with the data. A lower limit line defines the minimum value.

Factory Preset
and *RST: Upper; not affected by preset

Remarks: If a margin has already been set for this limit line, and this command is used to change the limit type, then the margin value is reset to 0 dB.

Front Panel
Access: **Display, Limits, Limit 1|2, Type Upper Lower**

CALCulate:MARKer Subsection

Markers All Off on All Traces

`:CALCulate:MARKer:AOFF`

Turns off all markers on all the traces.

Front Panel
Access: **Marker, Marker All Off**

Continuous Peaking Marker Function

`:CALCulate:MARKer[1]|2|3|4:CPEak[:STATe] OFF|ON|0|1`

`:CALCulate:MARKer[1]|2|3|4:CPEak[:STATe]?`

Turns on or off continuous peaking. It continuously puts the selected marker on the highest displayed signal peak.

Factory Preset
and *RST: Off

Remarks: This command may not be used to activate a given marker.

Front Panel
Access: **Peak Search (or Search), Continuous Pk On Off**

Frequency Counter Marker Resolution

`:CALCulate:MARKer:FCOunt:RESolution <real>`

`:CALCulate:MARKer:FCOunt:RESolution?`

Sets the resolution of the marker frequency counter. Setting the resolution to AUTO will couple the marker counter resolution to the frequency span.

Factory Preset
and *RST: 1 kHz

Range: 1 Hz to 100 kHz

Default Unit: Hz

Front Panel
Access: **Freq Count, Resolution Auto Man**

Frequency Counter Marker Automatic Resolution

:CALCulate:MARKer:FCOunt:RESolution:AUTO OFF|ON|0|1

:CALCulate:MARKer:FCOunt:RESolution:AUTO?

Sets the resolution of the marker frequency counter so it is automatically coupled to the frequency span, generating the fastest accurate count.

Factory Preset
and *RST: On

Front Panel
Access: **Freq Count, Resolution Auto Man**

Frequency Counter Marker

:CALCulate:MARKer[1]|2|3|4:FCOunt[:STATe] OFF|ON|0|1

:CALCulate:MARKer[1]|2|3|4:FCOunt[:STATe]?

Turns on or off the marker frequency counter. To query the frequency counter, use **:CALCulate:MARKer[1]:FCOunt:X?** If the specified marker number is not the active marker, it becomes the active marker. If the specified marker number is not on, it is turned on and becomes the active marker. Once the marker count is on, it is on for any active marker, not just for the one used in the command. A 1 is returned only if marker count is on and the selected number is the active marker.

Factory Preset
and *RST: Off

Remarks: If a frequency count x value is generated when the frequency count state is off, then 9e15 is returned.

Front Panel
Access: **Freq Count, Marker Count On Off**

Frequency Counter Marker Query

:CALCulate:MARKer[1]|2|3|4:FCOunt:X?

Queries the marker frequency counter.

Remarks: If a frequency count x value is generated when the frequency count state is off, then 9e15 is returned.

Marker Function

:CALCulate:MARKer[1]|2|3|4:FUNCtion BPOWer|NOISe|OFF

:CALCulate:MARKer[1]|2|3|4:FUNCtion?

Selects the marker function for the specified marker. To query the value returned by the function, use **:CALCulate:MARKer[1]|2|3|4:Y?**

   BPOWer is the power integrated within the bandwidth

NOISe is a noise measurement

OFF turns off all functions

Remarks: When a measurement under the front panel **MEASURE** key is started, this command is turned off. If this command is turned on when any of the **MEASURE** key measurements are in progress, that measurement will be stopped.

Front Panel
Access: **Marker, Function**

Marker Peak (Maximum) Search

`:CALCulate:MARKer[1]|2|3|4:MAXimum`

Performs a peak search based on the search mode settings of `:CALCulate:MARKer:PEAK:SEARch:MODE`.

NOTE See command `:CALCulate:MARKer:PEAK:SEARch:MODE`

Front Panel
Access: **Peak Search (or Search), Meas Tools**, **Peak Search**

Marker Peak (Maximum) Left Search

`:CALCulate:MARKer[1]|2|3|4:MAXimum:LEFT`

Places the selected marker on the next highest signal peak to the left of the current marked peak.

Remarks: The marker will be placed at the next highest peak that rises and falls by at least the peak excursion above the peak threshold. If no peak meets the excursion and threshold criteria, a No Peak Found error (202) is given.

Front Panel
Access: **Peak Search (or Search), Next Pk Left**

Marker Next Peak (Maximum) Search

`:CALCulate:MARKer[1]|2|3|4:MAXimum:NEXT`

Places the selected marker on the next highest signal peak from the current marked peak.

Remarks: The marker will be placed at the highest peak that rises and falls by at least the peak excursion above the peak threshold. If no peak meets the excursion and threshold criteria, a No Peak Found error (202) is given.

Front Panel
Access: **Peak Search (or Search), Next Peak**

Marker Peak (Maximum) Right Search

`:CALCulate:MARKer[1]|2|3|4:MAXimum:RIGHt`

Places the selected marker on the next highest signal peak to the right of the current marked peak.

Remarks: The marker will be placed at the highest peak that rises and falls by at least the peak excursion above the peak threshold. If no peak meets the excursion and threshold criteria, a No Peak Found error (202) is given.

Front Panel
Access: **Peak Search (or Search), Next Pk Right**

Marker Peak (Minimum) Search

`:CALCulate:MARKer[1]|2|3|4:MINimum`

Places the selected marker on the lowest point on the trace that is assigned to that particular marker number.

Front Panel
Access: **Peak Search (or Search), Min Search**

Marker Mode

`:CALCulate:MARKer[1]|2|3|4:MODE POSition|DELTa|BAND|SPAN`

`:CALCulate:MARKer[1]|2|3|4:MODE?`

Selects the type of markers that you want to activate. Refer to the "*Agilent ESA Spectrum Analyzers User's Guide*" for a more complete explanation of this function.

Position selects a normal marker that can be positioned on a trace and from which trace information will be generated.

Delta activates a pair of markers, one of which is fixed at the current marker location. The other marker can then be moved around on the trace. The marker readout shows the difference between the two markers.

Band activates a pair of band markers, where each marker can be independently positioned on the trace. The marker readout shows the difference between the two markers.

Span activates a pair of span markers, where the marker positioning is controlled by changing the span and/or center frequency between the two markers. The marker readout shows the difference between the two markers.

Remarks: If a marker is not active when the mode is queried, "Off" will be returned.

Front Panel
Access: **Marker, Normal**

Marker, Delta

Marker, Delta Pair Ref Delta

Marker, Span Pair Span Center

Define Peak Excursion

`:CALCulate:MARKer:PEAK:EXCursion <rel_ampl>`

`:CALCulate:MARKer:PEAK:EXCursion?`

Specifies the minimum signal excursion above the threshold for the internal peak identification routine to recognize a signal as a peak. This applies to all traces and all windows. (The excursion is the delta power from the noise level to the signal peak.)

NOTE   See command `:CALCulate:MARKer:PEAK:SEARch:MODE`

Factory Preset
and *RST: 6 dB

Range: 0 to 100 dB

Default Unit: dB

Front Panel
Access: **Peak Search (or Search), Search Criteria, Peak Excursion**

Define Peak Search

`:CALCulate:MARKer:PEAK:SEARch:MODE PARameter|MAXimum`

`:CALCulate:MARKer:PEAK:SEARch:MODE?`

Sets the peak search mode.

Factory Preset
and *RST: MAXimum

Remarks: If mode is set to MAXimum, peak search will place the marker at the maximum amplitude in the trace. If mode is set to PARameter, peak search will place the marker at the highest peak that rises and falls by at least the peak excursion above the peak threshold. If no peak meets the excursion and threshold criteria, a No Peak Found error (error 202) is issued.

Next peak, next peak right, next peak left, and peak table are not affected by this command. They will always use peak excursion and peak threshold for search criteria.

Front Panel
Access: **Peak Search (or Search), Search Criteria, Peak Search Type, Max Value|Excursion & Threshold**

Define Peak Threshold

`:CALCulate:MARKer:PEAK:THReshold <ampl>`

`:CALCulate:MARKer:PEAK:THReshold?`

Specifies the minimum signal level for the analyzers internal peak identification routine to recognize a signal as a peak. This applies to all traces and all windows.

NOTE   See command **`:CALCulate:MARKer:PEAK:SEARch:MODE`**

Range: Reference level to the bottom of the display

Default Unit: Amplitude units

Front Panel
Access: **Peak Search (or Search), Search Criteria, Peak Threshold**

Peak to Peak Delta Markers

`:CALCulate:MARKer[1]|2|3|4:PTPeak`

Positions delta markers on the highest and lowest points on the trace.

Factory Preset
and *RST: Off

Front Panel
Access: **Peak Search (or Search), Pk-Pk Search**

Set Center Frequency to the Marker Value

`:CALCulate:MARKer[1]|2|3|4[:SET]:CENTer`

Sets the center frequency equal to the specified marker frequency, which moves the marker to the center of the screen. In delta marker mode, the center frequency is set to the marker delta value. This command is not available in zero span.

Front Panel
Access: **Marker –>, Mkr –> CF**

Set Reference Level to the Marker Value

`:CALCulate:MARKer[1]|2|3|4[:SET]:RLEVel`

Sets the reference level to the specified marker amplitude. In delta marker mode, the reference level is set to the amplitude difference between the markers.

Front Panel
Access: **Marker –>, Mkr –> Ref Lvl**

                 Peak Search (or Search), Meas Tools, Mkr –> Ref Lvl

Set Span to the Marker Value

`:CALCulate:MARKer[1]|2|3|4[:SET]:SPAN`

Sets the span to the value of the specified marker frequency. The specified marker must be in delta mode. Select the delta marker mode with `CALCulate:MARKer[1]|2|3|4:MODE DELTa`. This command is not available in zero span.

Front Panel
Access: **Marker, Delta, Marker –>, Mkr Δ –> Span**

Set Start Frequency to the Marker Value

`:CALCulate:MARKer[1]|2|3|4[:SET]:STARt`

Sets the start frequency to the value of the specified marker frequency. In delta marker mode, the start frequency is set to the marker delta value. This command is not available in zero span.

Front Panel
Access: **Marker –>, Mkr –> Start**

Set Center Frequency Step Size to the Marker Value

`:CALCulate:MARKer[1]|2|3|4[:SET]:STEP`

Sets the center frequency step size to match the marker frequency. In delta marker mode, the center frequency step size will be set to the frequency difference between the markers. Select the delta marker mode with `:CALCulate:MARKer[1]|2|3|4:MODE DELTa`. This command is not available if the delta marker is off, or in zero span.

Front Panel
Access: **Marker –>, Mkr –> CF Step**

Peak Search (or Search), Meas Tools, Mkr –> CF

Set Stop Frequency to the Marker Value

`:CALCulate:MARKer[1]|2|3|4[:SET]:STOP`

Sets the stop frequency to the value of the active marker frequency. In delta marker mode, the stop frequency is set to the marker delta value. This command is not available in zero span.

Front Panel
Access: **Marker –>, Mkr –> Stop**

Marker On/Off

`:CALCulate:MARKer[1]|2|3|4:STATe OFF|ON|0|1`

`:CALCulate:MARKer[1]|2|3|4:STATe?`

Turns the selected marker on or off.

Front Panel
Access: **Marker, Off**

Marker Table On/Off

:CALCulate:MARKer:TABLe:STATe OFF|ON|0|1

:CALCulate:MARKer:TABLe:STATe?

Turns the marker table on or off

Front Panel
Access: **Marker, Marker Table On Off**

Marker to Trace

:CALCulate:MARKer[1]|2|3|4:TRACe <integer>

:CALCulate:MARKer[1]|2|3|4:TRACe?

Assigns the specified marker to the designated trace 1, 2, or 3.

Factory Preset
and *RST: 1

Range: 1 to 3

Front Panel
Access: **Marker, Marker Trace Auto 1 2 3**

Marker to Trace Auto

:CALCulate:MARKer[1]|2|3|4:TRACe:AUTO OFF|ON|0|1

:CALCulate:MARKer[1]|2|3|4:TRACe:AUTO?

Turns on or off the automatic marker to trace function.

Factory Preset
and *RST: **AUTO ON**

Front Panel
Access: **Marker, Marker Trace Auto 1 2 3**

Continuous Signal Tracking Function

:CALCulate:MARKer[1]|2|3|4:TRCKing[:STATe] OFF|ON|0|1

:CALCulate:MARKer[1]|2|3|4:TRCKing[:STATe]?

Turns on or off marker signal tracking. It continuously puts the selected marker on the highest displayed signal peak and moves it to the center frequency. This allows you to keep a signal that is drifting in frequency, on the display.

Factory Preset
and *RST: Off

Remarks: When a measurement under the front panel **MEASURE** key is
                   started, this command is turned off. If this command is turned
                   on when any of the **MEASURE** key measurements are in
                   progress, that measurement will be stopped.

Front Panel
Access: **FREQUENCY/Channel, Signal Track On Off**

Marker X Value

`:CALCulate:MARKer[1]|2|3|4:X <param>`

`:CALCulate:MARKer[1]|2|3|4:X?`

Position the designated marker on its assigned trace at the specified trace X value.
The value is in the X-axis units (which is often frequency or time).

The query returns the current X value of the designated marker.

Default Unit: Matches the units of the trace on which the marker is positioned

Front Panel
Access: **Marker**

Span Markers Center Frequency X Value

`:CALCulate:MARKer[1]|2|3|4:X:CENTer <param>`

`:CALCulate:MARKer[1]|2|3|4:X:CENTer?`

Position the center frequency, of the designated span-type marker pair, at the
specified trace X value. The value is in the X-axis units (which is often frequency
or time) Use `:CALCulate:MARKer:MODE SPAN` to select span markers.

The query returns the current X value center frequency of the designated markers.

Range: Matches the units of the trace on which the markers are
                   positioned

Front Panel
Access: **Marker, <active marker>, Span Pair**

Marker X Position

`:CALCulate:MARKer[1]|2|3|4:X:POSition <integer>`

`:CALCulate:MARKer[1]|2|3|4:X:POSition?`

Position the designated marker on its assigned trace at the specified X position.

The query returns the current X position for the designated marker.

Range: Refer to the `[:SENSe]:SWEep:POINts` command.

Front Panel
Access: **Marker**

Span Markers Center Frequency X Position

`:CALCulate:MARKer[1]|2|3|4:X:POSition:CENTer <param>`

`:CALCulate:MARKer[1]|2|3|4:X:POSition:CENTer?`

Position the center frequency, of the designated span-type marker pair, at the specified trace X position. Use `:CALCulate:MARKer:MODE SPAN` to select span markers.

The query returns the current X position center frequency of the designated markers.

Range: Refer to the `[:SENSe]:SWEep:POINts` command.

Front Panel
Access: **Marker, <active marker>, Span Pair**

Span Markers Span X Position

`:CALCulate:MARKer[1]|2|3|4:X:POSition:SPAN <param>`

`:CALCulate:MARKer[1]|2|3|4:X:POSition:SPAN?`

Change the frequency span, of the designated span-type marker pair, to position the markers at the desired trace X positions. Use `:CALCulate:MARKer:MODE SPAN` to select span markers.

The query returns the current X position frequency span of the designated markers.

Range: Refer to the `[:SENSe]:SWEep:POINts` command.

Front Panel
Access: **Marker, <active marker>, Span Pair**

Delta Pair Markers Start Frequency X Position

`:CALCulate:MARKer[1]|2|3|4:X:POSition:STARt <param>`

`:CALCulate:MARKer[1]|2|3|4:X:POSition:STARt?`

Position the left-most marker, the start (reference) frequency of the designated band-type marker pair, at the specified trace X position. Use `:CALCulate:MARKer:MODE BAND` to select band markers.

The query returns the current X position start/reference frequency of the designated marker.

Range: Refer to the `[:SENSe]:SWEep:POINts` command.

Front Panel
Access: **Marker, <active marker>, Delta Pair**

Delta Pair Markers Stop Frequency X Position

`:CALCulate:MARKer[1]|2|3|4:X:POSition:STOP <param>`

`:CALCulate:MARKer[1]|2|3|4:X:POSition:STOP?`

Position the right-most marker, the stop frequency of the designated band-type marker pair, at the specified trace X position. Use `:CALCulate:MARKer:MODE BAND` to select band markers.

The query returns the current X position stop frequency of the designated marker.

Range: Refer to the `[:SENSe]:SWEep:POINts` command.

Front Panel
Access: **Marker, <active marker>, Delta**

Marker X-Axis Readout

`:CALCulate:MARKer[1]|2|3|4:X:READout`
`FREQuency|TIME|ITIMe|PERiod`

`:CALCulate:MARKer[1]|2|3|4:X:READout?`

Selects the units for the x-axis readout of the marker. Available units are:

Frequency
Time
Inverse of time
Period

Factory Preset
and *RST: Frequency

Front Panel
Access: **Marker, Readout, Frequency**

Marker, Readout, Time

Marker, Readout, Inverse Time

Marker, Readout, Period

Span Markers Span X Value

`:CALCulate:MARKer[1]|2|3|4:X:SPAN <param>`

`:CALCulate:MARKer[1]|2|3|4:X:SPAN?`

Change the frequency span of the designated span-type marker pair to position the markers at the desired trace X values. The value is in the X-axis units (which is usually frequency or time). Use `:CALCulate:MARKer:MODE SPAN` to select span markers.

The query returns the current X value frequency span of the designated markers. If span markers are not selected, the query returns the latest marker reading as a span (always positive).

Default Unit: Matches the units of the trace on which the markers are
                       positioned.

Front Panel
Access: **Marker, <active marker>, Span Pair**

Delta Pair Markers Start Frequency X Value

:CALCulate:MARKer[1]|2|3|4:X:STARt <param>

:CALCulate:MARKer[1]|2|3|4:X:STARt?

Position the start (reference) frequency of the designated band-type marker pair, at
the specified trace X value. The value is in the X-axis units (which is often
frequency or time). Use **:CALCulate:MARKer:MODE BAND** to select band
markers.

The query returns the current X value start/reference frequency of the designated
marker.

Default Unit: Matches the units of the trace on which the markers are
                       positioned

Front Panel
Access: **Marker, <active marker>, Delta Pair**

Delta Pair Markers Stop Frequency X Value

:**CALCulate:MARKer[1]|2|3|4:X:STOP <param>**

:CALCulate:MARKer[1]|2|3|4:X:STOP?

Position the stop frequency of the designated band-type marker pair, at the
specified trace X value. The value is in the X-axis units (which is often frequency
or time). Use :**CALCulate:MARKer:MODE BAND** to select band markers.

The query returns the current X value stop frequency of the designated marker.

Default Unit: Matches the units of the trace on which the markers are
                       positioned

Front Panel
Access: **Marker, <active marker>, Delta Pair**

Marker Read Y Value

:CALCulate:MARKer[1]|2|3|4:Y?

Read the current Y value for the designated marker or delta on its assigned trace.
The value is in the Y-axis units for the current trace (which is often dBm).

Default Unit:.   Matches the units of the trace on which the marker is positioned

Remarks:.   This command can be used to read the results of marker
                       functions such as band power and noise that are displayed in the
                       marker value field on the analyzer.

CALCulate:NTData Subsection

Normalize the Trace Data

:CALCulate:NTData[:STATe] OFF|ON|0|1

:CALCulate:NTData[:STATe]?

One sweep of trace data is copied to trace 3 (firmware version greater then A.03.03, **NRML** in firmware version less than or equal to A.03.03), which is used as the reference trace. Then for all subsequent trace sweeps, display trace 1 = data collected into trace 1 – data in trace 3 (firmware version greater than A.03.03, NRML in firmware version less than or equal to A.03.03).

Front Panel
Access: **View/Trace, Normalize, Normalize On Off**

CALibration Subsystem

These commands control the self-alignment and self-diagnostic processes.

Align All Instrument Assemblies

`:CALibration[:ALL]`

`:CALibration[:ALL]?`

Performs an alignment of all the assemblies within the instrument, except for the tracking generator (Option 1DN or 1DQ), if installed (except Agilent model E4401B or E4411B.

Before executing this command, connect a cable between front panel connector **AMPTD REF OUT** and the **INPUT** connector for all Agilent ESA spectrum analyzers except Agilent models E4401B and E4411B.

If the cable is not connected, **CAL:ALL** will perform a subset of the RF alignment and a subsequent **CAL:RF** will be required for the analyzer to meet its specified performance.

The query performs a full alignment and returns a number indicating the success of the alignment. A zero is returned if the alignment is successful, even if only a subset of the RF alignment is performed.

Front Panel
Access: **System, Alignments, Align Now, All**

Set Auto Align Mode All or Not RF

`:CALibration:AUTO:MODE ALL|NRF`

`:CALibration:AUTO:MODE?`

This command determines whether or not to include RF alignment as part of the automatic alignment routines. Eliminating automatic alignment of the RF prevents changes in the input impedance between sweeps, which could cause input device instability.

Factory Preset
and *RST: All at power-up

Front Panel
Access: **System, Alignments, Auto Align, All**

                   System, Alignments, Auto Align, All but RF

Automatic Alignment

`:CALibration:AUTO OFF|ON|0|1`

`:CALibration:AUTO?`

Turns the automatic alignment on and off. This is run continuously, at the completion of each sweep.

Factory Preset
and *RST: On at power-up

Front Panel
Access: **System, Alignments, Auto Align, All**

System, Alignments, Auto Align, All but RF

System, Alignments, Auto Align, Off

Return to the Default Alignment Data

`:CALibration:DATA:DEFault`

Initializes the alignment data to the factory defaults.

Front Panel
Access: **System, Alignments, Load Defaults**

Align FM Demodulation

`:CALibration:FMDemod`

`:CALibration:FMDemod?`

Performs an alignment of the FM Demodulation board if Option BAA (FM Demodulation) or Option 106 (Bluetooth™)[1] is installed. The query form of this command performs the alignment and returns zero if the alignment is successful.

NOTE   Both this command and front panel access are available only when Option BAA (FM Demodulation) or Option 106 (Bluetooth™) is installed.

Front Panel
Access: **System, Alignments, Align Now, FM Demod**

---

1. Bluetooth is a trademark owned by its proprietor and used by Agilent Technologies under license.

Query the Internal or External Frequency Reference

`:CALibration:FREQuency:REFerence?`

This is a query only. It reports the location of where the instrument frequency reference is generated.

Range: INT or EXT

Coarse Adjust the Frequency Reference

`:CALibration:FREQuency:REFerence:COARse <setting>`

`:CALibration:FREQuency:REFerence:COARse?`

Allows coarse adjustment of the internal 10 MHz reference oscillator timebase of the analyzer.

NOTE **`:CALibration:ALL`** is required after **`COARse`** is set.

Range: Integer, 0 to 255

Front Panel
Access: **System, Alignments, Time Base, Coarse**

Fine Adjust the Frequency Reference

`:CALibration:FREQuency:REFerence:FINE <setting>`

`:CALibration:FREQuency:REFerence:FINE?`

Allows fine adjustment of the analyzer internal 10 MHz reference oscillator timebase.

NOTE **`:CALibration:ALL`** is required after **`FINE`** is set.

Range: Integer, 0 to 255

Front Panel
Access: **System, Alignments, Time Base, Fine**

Select the Frequency Corrections

`:CALibration:FREQuency[:STATe] OFF|ON|0|1`

`:CALibration:FREQuency[:STATe]?`

Turns on or off the frequency corrections.

Factory Preset
and *RST: On

Front Panel
Access: **System, Alignments, Freq Correct On Off**

Align the RF Circuitry

:CALibration:RF

:CALibration:RF?

Performs an alignment of the RF assembly.

The query performs the alignment and returns a zero if the alignment is successful.

Before executing this command, connect a cable between front panel connector **AMPTD REF OUT** and the **INPUT** connector for all Agilent ESA spectrum analyzers except Agilent models E4401B and E4411B. If the cable is not connected, the alignment will fail.

Front Panel
Access: **System, Alignments, Align Now, RF**

Select the Source State for Calibration

:CALibration:SOURce:STATe OFF|ON|0|1

:CALibration:SOURce:STATe?

Controls the state of the 50 MHz alignment signal.

NOTE	The alignment signal is internally switched to the **INPUT** for Agilent models E4401B and E4411B. For all other models, connect a cable between front panel connector **AMPTD REF OUT** and the **INPUT** connector before performing a calibration.

Factory Preset
and *RST: Off

Front Panel
Access: For Agilent ESA models E4401B and E4411B:

                  Input/Output (or Input), Amptd Ref (f=50 MHz) On Off

                  For all other Agilent ESA models:

                  Input/Output (or Input), Amptd Ref Out (f=50 MHz) On Off

Calibrate the Tracking Generator

:CALibration:TG

:CALibration:TG?

Performs an alignment of the tracking generator assembly.

The query performs the alignment and returns a zero if the alignment is successful.

NOTE   This command is only applicable on Agilent ESA models E4402B, E4403B, E4404B, E4405B, E4407B, and E4408B. Before executing this command, connect a cable between front panel connector **RF OUT** and the **INPUT** connector. The alignment will fail using command **CAL:TG** if the cable is not connected.

Front Panel
Access: **System, Alignments, Align Now, TG**

CONFigure Subsystem

Configure the Basic Spectrum Analyzer State

:CONFigure:SANalyzer

This command causes the present measurement to exit (the same functionally as pressing **MEASURE, Meas Off**), and places the analyzer in base instrument spectrum analyzer state. CONFigure subsystem commands used for measurements in the **MEASURE** and **Meas Setup** menus are located in Chapter 7, "One-Button Measurement Functions," on page 399.

COUPle Subsystem

Some measurement settings are automatically coupled together to optimize speed and accuracy. These commands control that coupling.

COUPle the Function to Other Settings

`:COUPle ALL|NONE`

`:COUPle?`

The instrument can automatically couple instrument settings together for accurate measurements and optimum dynamic range. This command is used to override the coupling for special measurement needs.

`COUPle NONE` puts these functions into the manually set (not coupled) mode. `COUPle ALL` puts the functions into the auto coupled mode, and also puts the sweep coupling mode into SA (couple all).

The following list of analyzer functions can be automatically coupled:

    Resolution bandwidth
    Span

    Average type   (Firmware revision A.08.00 or greater)
                    Marker functions

    Detector   (Firmware revision A.08.00 or greater)
    Marker functions
                    Average On Off
                    Average type

    Attenuation
                    Reference level
                    External amplifier gain
                    Preamp

    Center frequency step
                    Span (in swept spans)
                    Resolution bandwidth (in zero spans)

    Video bandwidth
                    Resolution bandwidth

    Tracking Generator
                    Sweep coupling mode (SR/SA)

    VBW/RBW ratio (Firmware revision A.08.00 or greater)

    Sweep time
                    Span
                    Video bandwidth
                    Resolution bandwidth

Sweep points
Phase noise optimization

Phase Noise Optimization   (Firmware revision A.08.00 or greater)
Span

NOTE   Although marker count, gate time, and marker trace have auto settings, they are not
affected by Couple.

Factory Preset
and *RST: All

Front Panel
Access: **Auto Couple, Auto All**

DISPlay Subsystem

The DISPlay subsystem controls the selection and presentation of textual, graphical, and trace information. Within a display, information may be separated into individual windows.

Display Viewing Angle

`:DISPlay:ANGLe <integer>`

`:DISPlay:ANGLe?`

Changes the viewing angle for better viewing in different environments.

Factory Preset
and *RST: The factory default is 4. This parameter is persistent, which means that it retains the setting previously selected, even through a power cycle.

Range: Integer, 1 to 7

Front Panel
Access: **Viewing angle keys**

Date and Time Display Format

`:DISPlay:ANNotation:CLOCk:DATE:FORMat MDY|DMY`

`:DISPlay:ANNotation:CLOCk:DATE:FORMat?`

Allows you to set the format for displaying the real-time clock. To set the date time use: SYSTem:DATE <year>, <month>, <day>.

Factory Preset
and *RST: The factory default is MDY. This parameter is persistent, which means that it retains the setting previously selected, even through a power cycle.

Front Panel
Access: **System, Time/Date, Date Format MDY DMY**

Date and Time Display

`:DISPlay:ANNotation:CLOCk[:STATe] OFF|ON|0|1`

`:DISPlay:ANNotation:CLOCk[:STATe]?`

Turns on and off the display of the date and time on the spectrum analyzer screen.

Factory Preset
and *RST: The factory default is On. This parameter is persistent, which
                    means that it retains the setting previously selected, even
                    through a power cycle.

Front Panel
Access: **System, Time/Date, Time/Date On Off**

Display Annotation Title Data

:DISPlay:ANNotation:TITLe:DATA <string>

:DISPlay:ANNotation:TITLe:DATA?

Enters the text that will be displayed in the user title area of the display.

Front Panel
Access: **Display, Title**

                    Display, Title, Change Title

                    Display, Title, Clear Title

Turn the Entire Display On/Off

:DISPlay:ENABle OFF|ON|0|1

Turns the display on or off. Having the display turned off may increase repetitive
measurement rate.

The following key presses will turn display enable back on:

1. If in local, press any key

2. If in remote, press the local (system) key

3. If in local lockout, no key (the computer must either cancel local lockout, or
re-enable the display)

Factory Preset
and *RST: On

Turn the Full Screen Display On/Off

:DISPlay:MENU:STATe OFF|ON|0|1

:DISPlay:MENU:STATe?

Turns the full screen display mode on or off. Press **System, System** to turn off full
screen mode.

History: Added with firmware revision A.08.00.

Window Annotation

`:DISPlay:WINDow:ANNotation[:ALL] OFF|ON|0|1`

`:DISPlay:WINDow:ANNotation[:ALL]?`

Turns the screen annotation on or off for all windows.

Factory Preset
and *RST: On

Front Panel
Access: **Display, Preferences, Annotation On Off**

Trace Graticule Display

`:DISPlay:WINDow:TRACe:GRATicule:GRID[:STATe] OFF|ON|0|1`

`:DISPlay:WINDow:TRACe:GRATicule:GRID[:STATe]?`

Turns the graticule on or off.

Factory Preset
and *RST: On

Front Panel
Access: **Display, Preferences, Graticule On Off**

Trace X-Axis Scale Offset

`:DISPlay:WINDow:TRACe:X[:SCALe]:OFFSet <freq>`

`:DISPlay:WINDow:TRACe:X[:SCALe]:OFFSet?`

Specifies the frequency offset for all frequency readouts such as center frequency, except that it does not affect marker count.

Factory Preset
and *RST: 0 Hz

Range: –500 THz to 500 THz

Default Unit: Hz

History: Prior to firmware revision A.06.00, the lower range is –3 GHz.

Remarks: Frequency offset is not available when frequency scale type is
                Log (`[:SENSe]:SWEep:SPACing LINear|LOGarithmic`).

Front Panel
Access: **FREQUENCY/Channel, Freq Offset**

Display Line Amplitude

`:DISPlay:WINDow:TRACe:Y:DLINe <ampl>`

`:DISPlay:WINDow:TRACe:Y:DLINe?`

Defines the level of the display line, in the active amplitude units if no units are specified.

Factory Preset
and *RST: 2.5 divisions below the reference level

Range: 10 display divisions below the reference level to the reference level

Default Unit: Current active units

Front Panel
Access: **Display, Display Line On Off**

Display Line On/Off

`:DISPlay:WINDow:TRACe:Y:DLINe:STATe OFF|ON|0|1`

`:DISPlay:WINDow:TRACe:Y:DLINe:STATe?`

Turns the display line on or off.

Factory Preset
and *RST: Off

Front Panel
Access: **Display, Display Line On Off**

IF Gain Auto/Reference Level Auto Ranging

`:DISPlay:WINDow:TRACe:Y[:SCALe]:LOG:RANGe:AUTO OFF|ON|0|1`

`:DISPlay:WINDow:TRACe:Y[:SCALe]:LOG:RANGe:AUTO?`

This command enables and disables auto ranging. The speed benefits gained with this command are realized only when in narrow resolution (digital) bandwidths. The setting of auto range has no effect when in analog resolution bandwidths.

Factory Preset
and *RST: On

History: This command is available with firmware revision A.04.00 and later.

Remarks: When using digital resolution bandwidths (RBW < 1 kHz) the analyzer uses IF Gain auto ranging to set the optimum signal gain for digital processing. This technique produces the greatest measurement range without overloading the digital system. To increase the measurement speed this IF Gain auto ranging may be set to fixed mode. When in fixed mode, make sure the signal is not set above the reference level and the reference is set so that the signal is within the display range. When in fixed mode the measurement has approximately 70 dB of display range.

Front Panel
Access: **AMPLITUDE/Y Scale, IF Gain Auto Fixed** (front panel access is available with firmware revision A.06.00 and later).

Normalized Reference Level

:DISPlay:WINDow:TRACe:Y[:SCALe]:NRLevel <rel_ampl>

:DISPlay:WINDow:TRACe:Y[:SCALe]:NRLevel?

Sets the normalized reference level.

NOTE	See command **:CALCulate:NTData[STATe] OFF|ON|0|1**

Factory Preset
and *RST: 0 dB

Range: –327.6 to 327.6 dB

Default Unit: Current active units

Front Panel
Access: **View/Trace, Normalize, Norm Ref Lvl**

Normalized Reference Level Position

:DISPlay:WINDow:TRACe:Y[:SCALe]:NRPosition <integer>

:DISPlay:WINDow:TRACe:Y[:SCALe]:NRPosition?

Selects the position of the normalized reference level. The top and bottom graticule lines correspond to 10 and 0, respectively.

NOTE	See command **:CALCulate:NTData[STATe] OFF|ON|0|1**

Factory Preset
and *RST: 10

Range: integer

Front Panel
Access: **View/Trace, Normalize, Norm Ref Posn**

Trace Y-Axis Amplitude Scaling

:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision <rel_ampl>

:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision?

Sets the per-division display scaling for the y-axis when y-axis units are set to amplitude units.

Factory Preset
and *RST: 10 dB

Range: 0.1 to 20.0 dB

Default Unit: dB

Front Panel
Access: **AMPLITUDE/Y Scale, Scale/Div**

Trace Y-Axis Frequency Scaling

:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision:FREQuency <freq>

:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision:FREQuency?

This command sets the per-division display scaling for the y-axis, when the y-axis units are set to frequency units, such as when looking at FM deviation with the command **[:SENSe]:DEMod:VIEW[:STATe] OFF|ON|0|1**.

NOTE   For Option 106 (Bluetooth FM Demodulation) only the query form of this command is available; the value is determined during alignment.

Factory Preset
and *RST: 20 kHz (with Option BAA, FM Demodulation)

                   Approximately 40 kHz (with Option 106, Bluetooth FM Demodulation)

Range: 1 kHz to 240 kHz (with Option BAA, FM Demodulation)

                   Fixed (with Option 106, Bluetooth FM Demodulation)

Default Unit: Hz

Front Panel
Access: **AMPLITUDE/Y Scale, Scale/Div**

Trace Y-Axis Reference Level

:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel <ampl>

:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel?

Sets the amplitude value of the reference level for the y-axis.

Factory Preset
and *RST:.   0 dBm

Range:.　　　　With zero reference level offset:

> ESA E4401B, E4411B: –149.9 to 50 dBm
> ESA E4402B, E4403B: —149.9 to 55 dBm
>
> ESA E4404B: —149.9 to 55 dBm
> ESA E4405B: —149.9 to 55 dBm
> ESA E4407B, E4408B: –149.9 to 55 dBm

> –149.9 to 55 dBm with zero reference level offset and max
> mixer level = –10 dBm. In external mixing, the range is –327.5
> to –10 dBm with max mixer level
> = –10 dBm.

Default Unit:.　　Current active units

Remarks:.　　　The input attenuator setting may be affected. The minimum
displayed value of reference level is –327.6 dBm, and the
maximum displayed value is 327.6 dBm. See the remarks given
for the command
`:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel:OFFSet`
`<rel_ampl>`

Front Panel
Access:.　　　**Amplitude Y Scale**, **Ref Level**

Trace Y-Axis Reference Level Offset

`:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel:OFFSet <rel_ampl>`

`:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel:OFFSet?`

Sets the amplitude level offset for the y-axis.

Factory Preset
and *RST:　　　0 dB

Range:　　　　–327.6 to 327.6 dB

Default Unit:　　dB

Remarks:　　　The sum of (reference level offset + reference level) is clipped to
the range –327.6 to 327.6 dB. The maximum limits are
determined by the setting of the first of these two parameters,
within the boundaries of their individual limits when initially
set.

For example, if the reference level is (first) set to –20 dBm, then
the reference level offset can be set to values of –307.6 dB to
327.6 dB. In the case of a 327.6 dB reference level offset, the
resultant reference level value changes to 307.6 dBm. The
reference level value range can be initially set to values from
–149.9 to 55 dBm.

Setting the reference level offset value first yields the following: If the reference level offset is (first) set to –30 dB, then the reference level can be set to values of –327.6 to 25 dBm. The reference level is "clamped" at 25 dBm because its positive value of 55 dBm is reached at 25 dBm with an offset of –30 dB. Its own positive amplitude limit applies.

If the reference level offset is (first) set to 30 dB, then the reference level can be set to values of –327.6 to 85 dBm. Again, the positive amplitude limit of reference level (alone) is factored in to the resultant combined limit.

Front Panel
Access: **Amplitude Y Scale, Ref Level Offst**

Vertical Axis Scaling

`:DISPlay:WINDow:TRACe:Y[:SCALe]:SPACing LINear|LOGarithmic`

`:DISPlay:WINDow:TRACe:Y[:SCALe]:SPACing?`

Specifies the vertical graticule divisions as log or linear units.

Factory Preset
and *RST: Logarithmic

Front Panel
Access: **AMPLITUDE/Y Scale, Scale Type Log Lin**

FORMat Subsystem

The FORMat subsystem sets a data format for transferring numeric and array information. **TRACe[:DATA]** and **TRACe[:DATA]?** are affected by FORMat subsystem commands.

Byte Order

:FORMat:BORDer NORMal|SWAPped

:FORMat:BORDer?

This command selects the binary data byte order for data transfer. 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]** and query **:TRACe[:DATA]?** commands.

NOTE	Normal mode is when the byte sequence 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 mode is when the byte sequence begins with the LSB first, and ends with the MSB last in the sequence: 4|3|2|1.

Factory Preset
and *RST: Normal

Numeric Data format

**:FORMat[:TRACe][:DATA]ASCii|INTeger,32|REAL,32|
REAL,64|UINTeger,16**

:FORMat[:TRACe][:DATA]?

This command changes the format of the trace data input and output. It affects only the data format for setting and querying trace data for the **:TRACe[:DATA]** and query **:TRACe[:DATA]?** commands.

NOTE   This command specifies the formats used for trace data during data transfer across any remote port.

For corrected trace data (**:TRACe[:DATA]** with parameter **<trace_name>**), **REAL**, and **ASCii** formats will provide trace data in the current amplitude units. **INTeger** format will provide trace data in mdBm. The fastest mode is **INTeger,32**.

For uncorrected trace data (**:TRACe[:DATA]** with parameter **RAWTRACE**), **UINTeger**, and **INTeger** formats apply to **RAWTRACE** queries, and return uncorrected ADC values. The fastest mode is **UINTeger,16**.

For state data, the format cannot be changed. It is always in a machine readable format only (machine units).

Table 5-1

Corrected Trace Data Types :TRACe:DATA? <trace_name>	
Data Type	**Result**
ASCII	Amplitude Units
INT,32 (fastest)	Internal Units
REAL,32	Amplitude Units
REAL,64	Amplitude Units

Table 5-2

Uncorrected Trace Data Types :TRACe:DATA? RAWTRACE	
Data Type	**Result**
INT,32	Uncorrected ADC Values
UINT,16 (fastest)	Uncorrected ADC Values

ASCii - Amplitude values are in ASCII, in amplitude units, separated by commas.

INTeger, 32 - Binary 32-bit integer values in internal units (mdBm), in a definite length block.

REAL, 32 (or 64) - Binary 32-bit, or 64-bit, real values in amplitude units), in a definite length block.

UINTeger, 16 - Binary 16-bit unsigned integer uncorrected ADC values, in a definite length block.

Factory Preset
and *RST:.   ASCII

HCOPy Subsystem

The HCOPy subsystem controls the setup of plotting and printing to an external device.

Abort the Print

`:HCOPy:ABORt`

Aborts hard copy printout of results.

Front Panel
Access: **ESC** (with print in progress)

Printer Type

`:HCOPy:DEVice:TYPE AUTO|CUSTom|NONE`

`:HCOPy:DEVice:TYPE?`

Sets up the printer by selecting printer type.

AUTO - the instrument queries the printer to determine the printer type and automatically sets itself for that printer

CUSTom - allows you to select a custom printer if your printer cannot be auto-configured

NONE - tells the instrument that the hard copy output device is not a printer

Factory Preset
and *RST: The factory default is AUTO. This parameter is persistent, which means that it retains the setting previously selected, even through a power cycle.

Front Panel
Access: **Print Setup, Printer Type**

Color Hard Copy

`:HCOPy:IMAGe:COLor[:STATe] OFF|ON|0|1`

`:HCOPy:IMAGe:COLor[:STATe]?`

Selects between color and monochrome mode for hard copy output.

Factory Preset
and *RST: The factory default is On. This parameter is persistent, which means that it retains the setting previously selected, even through a power cycle.

Front Panel
Access: **Print Setup, Color On Off**

Print a Hard Copy

:HCOPy[:IMMediate]

The entire screen is output to the parallel port.

Front Panel
Access: **Print**

Form Feed the Print Item

:HCOPy:ITEM:FFEed[:IMMediate]

Sends the printer a command to form feed.

Front Panel
Access: **Print Setup, Eject Page**

Page Orientation

:HCOPy:PAGE:ORIentation LANDscape|PORTrait

:HCOPy:PAGE:ORIentation?

Specifies the orientation of the print.

NOTE   Landscape mode is not presently supported for PCL-3 printers.

Factory Preset
and *RST: The factory default is Landscape. This parameter is persistent,
                   which means that it retains the setting previously selected, even
                   through a power cycle.

Front Panel
Access: **Print Setup, Orientation, Landscape**

                           Print Setup, Orientation, Portrait

Number of Items Printed on a Page

:HCOPy:PAGE:PRINts <integer>

:HCOPy:PAGE:PRINts?

Sets the number of display print outputs sent to print on one piece of paper, before
a form feed is sent.

Factory Preset
and *RST: The factory default is 1. This parameter is persistent, which means that it retains the setting previously selected, even through a power cycle.

Range: Integer, 1 or 2

Front Panel
Access: **Print Setup, Prints/Page 1 2**

Printed Page Size

:HCOPy:PAGE:SIZE A|B|A3|A4|LETTer|LEGal|EXECutive|LEDGer

:HCOPy:PAGE:SIZE?

Formats the print image for the selected page size. Page size "A" is letter, and page size "B" is ledger. There is no size standardization for "legal" or "executive."

Factory Preset
and *RST: The factory default is letter. This parameter is persistent, which means that it retains the setting previously selected, even through a power cycle.

Front Panel
Access: **Print Setup, /Page Size**

INITiate Subsystem

The INITiate subsystem is used to control the initiation of the trigger. Refer to the TRIGger and ABORt subsystems for related commands.

Continuous or Single Measurements

`:INITiate:CONTinuous OFF|ON|0|1`

`:INITiate:CONTinuous?`

Selects whether the trigger system is continuously initiated or not.

This command affects sweep if not in a measurement, and affects trigger when in a measurement. A "measurement" refers to any of the functions under the **MEASURE** key. This corresponds to continuous sweep or single sweep operation when not in a measurement, and continuous measurement or single measurement operation when in a measurement. Commands used for measurements in the **MEASURE** and **Meas Setup** menus are located in Chapter 7, "One-Button Measurement Functions," on page 399.

When not in a measurement, this command does the following:

- When ON at the completion of each sweep cycle, the sweep system immediately initiates another sweep cycle.

- When OFF, the sweep system remains in an "idle" state until CONTinuous is set to ON or an `:INITiate[:IMMediate]` command is received. On receiving the `:INITiate[:IMMediate]` command, it will go through a single sweep cycle, and then return to the "idle" state.

- The query returns 1 or 0 into the output buffer. 1 is returned when there is continuous sweeping. 0 is returned when there is only a single sweep.

When in a measurement, this command does the following:

- When ON at the completion of each trigger cycle, the trigger system immediately initiates another trigger cycle.

- When OFF, the trigger system remains in an "idle" state until CONTinuous is set to ON or an `:INITiate[:IMMediate]` command is received. On receiving the `:INITiate[:IMMediate]` command, it will go through a single trigger cycle, and then return to the "idle" state.

- The query returns 1 or 0 into the output buffer. 1 is returned when in a continuous measurement state. 0 is returned when there is only a single measurement.

Factory Preset: Continuous

*RST: Continuous, or On

Front Panel
Access: **Sweep**, **Sweep Cont Single**

                   Single

                   Meas Control, **Measure Cont Single**

Take New Data Acquisitions

:INITiate[:IMMediate]

This command initiates a sweep if not in a measurement. If in a measurement, it triggers the measurement. A "measurement" refers to any function under the **MEASURE** key.

Remarks: See also the ***TRG** command

                  Use the **:TRIGer[:SEQuence]:SOURce EXTernal** command to select the external trigger.

                  The instrument must be in the single measurement mode. If :INITiate:CONTinuous is ON then the command is ignored.

                  Use **:FETCh?** to transfer a measurement result from memory to the output buffer. Refer to individual commands in the MEASure subsystem for more information.

                  If the analyzer is in signal identification mode, two sweeps are required, as this mode relies on the acquisition of data from two successive sweeps. Therefore, if the analyzer is in single sweep mode, two sweep triggers are needed to generate the sweep pair. In image suppress mode, synchronization is ensured by first turning off signal identification, initiating a single sweep, then turning on signal identification followed by two single sweeps. See **[:SENSe]:SIDentify** for more information about signal identification state.

Front Panel
Access: **Sweep, Sweep Cont Single**

                   Single

                   Meas Control, Measure Cont Single

Pause the Measurement

:INITiate:PAUSe

This command applies to measurements found in the **MEASURE** menu. Use this command to pause the current measurement by changing the current measurement state from the "wait for trigger" state to the "paused" state. If the measurement is not in the "wait for trigger" state when the command is issued, the transition will be made the next time that state is entered as part of the trigger cycle. When in the pause state, the analyzer auto-align process stops. If the analyzer is paused for a long period of time, measurement accuracy may degrade.

Front Panel
Access: **Meas Control, Pause**

Restart the Measurement

:INITiate:RESTart

This command applies to measurements found in the **MEASURE** menu. Use this command to restart the present measurement from the "idle" state, regardless of its operating state. It is equivalent to **:INITiate[:IMMediate]** for single measurement mode, or **:ABORt** for continuous measurement mode.

Front Panel
Access: **Restart**

                     Meas Control, Restart

Resume the Measurement

:INITiate:RESume

This command applies to measurements found in the **MEASURE** menu. Use this command to resume the current measurement by changing the current measurement state from the "paused" state back to the "wait for trigger" state.

Front Panel
Access: **Meas Control, Resume**

INPut Subsystem

The INPut subsystem controls the characteristics of analyzer input ports.

Input Port Coupling

`:INPut:COUPling AC|DC`

`:INPut:COUPling?`

Selects ac or dc coupling for the front panel INPUT port. A blocking capacitor is switched in for the ac mode.

CAUTION   Instrument damage can occur if there is a dc voltage present at the INPUT and dc coupling is selected.

Factory Preset
and *RST: ac

Remarks: This command is available only on Agilent ESA spectrum
                   analyzer models E4402B Option UKB, E4407B Option UKB,
                   E4404B, or E4405B. See Table 5-3 for frequency range limits
                   for your ESA model and option.

Table 5-3   **Selecting Input Coupling**

Model Number	AC Frequency Range	DC Frequency Range
E4402B with *Option UKB*	100 kHz to 3 GHz	100 Hz to 3 GHz
E4404B	100 kHz to 6.7 GHz	9 kHz to 6.7 GHz
E4404B with *Option UKB*	100 kHz to 6.7 GHz	100 Hz to 6.7 GHz
E4405B	100 kHz to 13.2 GHz	9 kHz to 13.2 GHz
E4405B with *Option UKB*	100 kHz to 13.2 GHz	100 Hz to 13.2 GHz
E4407B with *Option UKB*	10 MHz to 26.5 GHz	100 Hz to 26.5 GHz

Front Panel
Access: **Input/Output (or Input), Coupling AC DC**

Select Internal or External Mixer

:INPut:MIXer INTernal|EXTernal

:INPut:MIXer?

This command selects either the internal or external input mixer and is available only with Option AYZ (External Mixing).

Refer also to commands in the **[:SENSe]:MIXer** subsection.

Factory Preset
and *RST: INTernal

History: This command is available with firmware revision A.03.00 and later.

Remarks: External mixing is not available when frequency scale type is Log (**[:SENSe]:SWEep:SPACing LINear|LOGarithmic**).

Selecting the external input mixer activates all the keys in the Input Mixer menu and changes the RF attenuation annotation readout on the display to "Ext Mix."

Front Panel
Access: **Input/Output (or Input), Input Mixer Int Ext**

Select Mixer Type

:INPut:MIXer:TYPE PRESelected|UNPReselect

:INPut:MIXer:TYPE?

This command selects the type of mixer being used and is available only with Option AYZ (External Mixing).

Refer also to commands in the **[:SENSe]:MIXer** subsection.

Factory Preset
and *RST: UNPReselect

History: This command is available with firmware revision A.03.00 and later.

Remarks: Setting mixer type to Presel activates a tuning signal that is routed to the PRESEL TUNE OUTPUT connector on the analyzer rear panel. This signal drives the tune input of the HP/Agilent 11974-Series Preselected Mixers at 1.5V/GHz. The sweep rate in this mode is limited to 40 MHz/msec.

NOTE	Preselected Mixer Type is not allowed when AUTO harmonic and Ext Mix Band K, E, W, F, D, G, Y, or J is selected.

Front Panel
Access: **Input/Output (or Input), Input Mixer, Mixer Config, Mixer Type Presel Unpre**

Clear the Input Overload

`:INPut:PROTection:CLEar`

Resets the overload protection circuitry for the input connector. There is no query form of this command.

NOTE

This command is valid only for Agilent ESA models E4401B or E4411B.

The excessive input signal may have caused 15 dB of attenuation to be switched in, or it may have completely switched the input connector out so that it is connected to the internal reference signal.

INSTrument Subsystem

This subsystem includes commands for querying and selecting instrument measurement (personality option) modes.

Select Application

:INSTrument[:SELect] "SA"|(application specific mode)

:INSTrument[:SELect]?

Select the measurement application (mode) by enumerated choice. The actual available choices depend upon which applications (modes) are installed in the instrument. See the manual that was part of the installed option for the mode designator (if any) of that option.

Once the instrument mode is selected, only the commands that are valid for that mode can be executed.

NOTE   If you are using the SCPI status registers and the analyzer mode is changed, the status bits should be read, and any error conditions resolved, prior to switching modes. Error conditions that exist prior to switching modes cannot be detected using the condition registers after the mode change. This is true unless they recur after the mode change, although transitions of these conditions can be detected using the event registers.

Changing modes resets all SCPI status registers and mask registers to their power-on defaults. Therefore, any event or condition register masks must be re-established after a mode change. Also note that the power up status bit is set by any mode change, since that is the default state after power up.

Factory Preset
and *RST: Persistent state with factory default of Spectrum Analyzer

Front Panel
Access: **Mode**

MMEMory Subsystem

The purpose of the MMEMory subsystem is to provide access to mass storage devices such as internal or external disk drives.

NOTE   Refer also to **:CALCulate** and **:TRACe** subsystems for more trace and limit line commands.

Agilent ESA analyzers use two types of mass storage devices:

- 3.5 inch disk drive (high density, 1.44 MBytes formatted) designated "A:"

- Part of flash memory and treated as a device designated "C:"

The MMEMory command syntax term **<file_name>** is a specifier having the form: drive:\directory\name.ext, where the following rules apply:

- "drive" is "A:" or "C:"

- "\directory\" is the path name

- "name" is a DOS file name of up to eight characters, letters (A-Z, a-z) and numbers (0-9) only (lower case letters are read as uppercase)

- "ext" is an optional file extension using the same rules as "name," but consists of up to three characters total

Catalog the Selected Memory Location

:MMEMory:CATalog? <drive>

where "drive" is "A:" or "C:"

Lists all files in the specified drive. The return data will be of the format:
<mem_used>,<mem_free>,<file_listing>

Each **<file listing>** indicates the name, and size of one file in the directory list: **<file_name>,<file_size>**

Example: Catalog drive C:, which is in instrument memory:
                   :MMEMory:CATalog? "C:"

Front Panel
Access: **File**

Copy a File

:MMEMory:COPY <file_name1>,<file_name2>

To copy a file, the source file name is <file_name1> and the destination file name is <file_name2>.

Example: **:MMEM:COPY "C:oldname.sta","A:\newname.sta"**

Front Panel
Access: **File, Copy**

Move Data to File

:MMEMory:DATA <file_name>,<definite_length_block>

:MMEMory:DATA? <file_name>

Loads **<definite_length_block>** into the memory location **<file_name>**.

The query returns the contents of the <file_name> in the format of a definite length block. This command can be used for copying files out of the analyzer over the remote bus. Refer to chapter 3, Programming Examples, for more information.

Example: Load "abcd" into C:source.txt:
:MMEM:DATA "C:source.txt","#14abcd"

Delete a File

:MMEMory:DELete <file_name>

Delete a file.

Example: **:MMEM:DEL "C:source.txt"**

Remarks: If <file_name> does not exist, a "File Name Error" will occur.

Front Panel
Access: **File, Delete**

Load a Corrections Table from a File

**:MMEMory:LOAD:CORRection
ANTenna|CABLe|OTHer|USER,<file_name>**

Loads the data in the file <file_name> to the specified correction set.

Example: **:MMEM:LOAD:CORR ANT, "A:TEST5.CBL"**

Front Panel
Access: **File, Load, Type, Corrections**

Load a Limit Line from Memory to the Instrument

:MMEMory:LOAD:LIMit LLINE1|LLINE2,<file_name>

Loads a limit line, from the specified file in mass storage to the instrument. Loading a time limit line deletes any frequency limit lines. Similarly, loading a frequency limit line deletes any time limit lines.

Example: **:MMEM:LOAD:LIM LLINE2,"C:mylimit.lim"**

Remarks: There is no SCPI short form for parameters **LLINE1|LLINE2**.

Front Panel

Access: **File, Load, Type, Limits**

Load an Instrument State from a File

:MMEMory:LOAD:STATe 1,<file_name>

The contents of the state file are loaded into the current instrument state.

Example: **:MMEM:LOAD:STAT 1,"C:mystate.sta"**

Remarks: See also commands **:MMEMory:LOAD:STATe** and
                 :MMEMory:STORe:STATe

                 If the revision of the state being loaded is newer than the
                 revision of the instrument, no state is recalled and an error is
                 reported.

                 If the revision of the state being loaded is equal to the revision of
                 the instrument, all regions of the state will be loaded.

                 If the revision of the state being loaded is older than the revision
                 of the instrument, the instrument will only load the older regions
                 of the state.

Front Panel
Access: **File, Load, Type, State**

Load a Trace From a File to the Instrument

:MMEMory:LOAD:TRACe <file_name>

The contents of the file are loaded into TRACE1. The file name must have a file
extension of :trc or :csv. The file extension determines whether a trace is loaded,
or a trace with its state, are loaded. The :csv extension is for trace files using the
CSV (comma-separated values) format. The :trc extension is for files that include
both trace and state data.

Example: **:MMEM:LOAD:TRAC "C:mytrace.trc"**

Remarks: See also commands **:MMEMory:LOAD:STATe** and
                 :MMEMory:STORe:STATe

                 If the revision of the state being loaded is newer than the
                 revision of the instrument, no state is recalled and an error is
                 reported.

                 If the revision of the state being loaded is equal to the revision of
                 the instrument, all regions of the state will be loaded.

                 If the revision of the state being loaded is older than the revision
                 of the instrument, the instrument will only load the older regions
                 of the state.

Make a Directory

`:MMEMory:MDIRectory <dir_path>`

where "path" is "A:\" or "C:\"

Makes a directory or subdirectory in the specified path.

Example: Make a directory in C:\, which is in instrument memory:
`:MMEMory:MDIRectory "C:\"`

Front Panel
Access: **File, Create Dir**

Delete a Directory

`:MMEMory:RDIRectory <dir_name>`

Deletes the specified directory and all files and subdirectories within that directory.

Front Panel
Access: **File, Delete**

Store a Corrections Table to a File

`:MMEMory:STORe:CORRection`
`ANTenna|CABLe|OTHer|USER,<file_name>`

Stores the specified correction set to the file named <file_name>.

Example: `:MMEM:STOR:CORR ANT, "A:TEST1.ANT"`

Remarks: This command will fail if the `<file_name>` already exists.

Front Panel
Access: **File, Save, Type, Corrections**

Store a Limit Line in a File

`:MMEMory:STORe:LIMit LLINE1|LLINE2,<file_name>`

Stores the specified limit line to the specified file in memory.

Example: `:MMEM:STOR:LIM LLINE2,"C:mylimit.lim"`

Remarks: This command will fail if the `<file_name>` already exists.
There is no SCPI short form for parameters `LLINE1|LLINE2`.

Front Panel
Access: **File, Save, Type, Limits**

Store Measurement Results in a File

:MMEMory:STORe:RESults <file_name>

Saves the results of the current measurement into a comma-separated file. Only works when a measurement has been chosen from the **MEASURE** menu. SCPI commands associated with these measurements are located in Chapter 7, "One-Button Measurement Functions," on page 399. The filename extension is .CSV. This command will fail if the file **<file_name>** already exists.

Example: **:MMEM:STOR:RES "A:ACP.CSV"**

Front Panel
Access: **File, Save, Type, Measurement Results**

Store a Screen Image in a Graphic File

:MMEMory:STORe:SCReen <file_name>

Saves the current instrument screen image, as a graphic file, to the specified file in memory. The file must have a :gif or :wmf file extension. The specified file extension determines which file format the instrument will use to save the image.

Example: **:MMEM:STOR:SCR "C:myscreen.gif"**

Remarks: This command will fail if the **<file_name>** already exists.

Front Panel
Access: **File, Save, Type, Screen**

Store an Instrument State in a File

:MMEMory:STORe:STATe 1,<file_name>

Saves the instrument state to the file in memory.

Example: **:MMEM:STOR:STAT 1,"C:mystate.sta"**

Remarks: This command will fail if the **<file_name>** already exists.

Store a Trace in a File

:MMEMory:STORe:TRACe <label>,<file_name>

Saves the specified trace to a file in memory. The file name must have a file extension of :trc or :csv. The file extension determines whether a trace is stored, or a trace with its state, are stored. The :csv extension is for trace files using the CSV (comma-separated values) format. The :trc extension is for files that include both trace and state data.

Example: **:MMEM:STOR:TRAC TRACE3,"C:mytrace.trc"**

Range: Trace labels are: TRACE1|TRACE2|TRACE3|ALL

Remarks: This command will fail if the **<file_name>** already exists.

Front Panel Access: **File, Save, Type, Trace**

OUTPut Subsystem

The OUTPut subsystem controls the characteristics of the tracking generator output port. Refer to the "SOURce Subsystem" on page 329, which also contains commands that control the characteristics of the tracking generator.

Turn Output On/Off

`:OUTPut[:STATe] OFF|ON|0|1`

`:OUTPut[:STATe]?`

Controls the tracking generator output.

Factory Preset
and *RST: Off

Front Panel
Access: **Source, Amplitude On Off**

SENSe Subsystem

Sets the instrument state parameters so that you can measure the input signal.

SENSe subsystem commands used for measurements in the **MEASURE** and **Meas Setup** menus are located in Chapter 7, "One-Button Measurement Functions," on page 399. These commands may be used only to set parameters of a specific measurement when the measurement is active.

[:SENSe]:AVERage Subsection

Clear the Current Average

[:SENSe]:AVERage:CLEar

Re-start the trace averaging function.

NOTE   Re-start the trace at the beginning of a sweep to obtain valid average data. To do this, remotely abort the sweep and initiate a single sweep.

Set the Average Count

[:SENSe]:AVERage:COUNt <integer>

[:SENSe]:AVERage:COUNt?

Specifies the number of measurements that are combined.

Factory Preset
and *RST: 100

Range: 1 to 8192

Front Panel
Access: **BW/Avg, Average On Off**

Turn Averaging On/Off

[:SENSe]:AVERage[:STATe] OFF|ON|0|1

[:SENSe]:AVERage[:STATe]?

This command toggles averaging off and on. Averaging combines the value of successive measurements to average out measurement variations.

Factory Preset
and *RST: Off

Remarks: When a measurement under the front panel **MEASURE** key is started, this command is turned off for video averaging (**[:SENSe]:AVERage:TYPE VIDeo**). If this command is turned on for video averaging when any of the **MEASURE** key measurements are in progress, that measurement will be stopped.

Front Panel
Access: **BW/Avg, Average On Off**

Turn Automatic Averaging On/Off

`[:SENSe]:AVERage:TYPE:AUTO OFF|ON|0|1`

`[:SENSe]:AVERage:TYPE:AUTO?`

Sets the averaging to be automatically set to the appropriate type for the current measurement setup. Or allows you to manually choose the type of averaging with `[:SENSe]:AVERage:TYPE`.

When AUTO is On:

If the Y Axis Scale is not Linear or Log, then average type is Video (Y Axis Scale) Averaging.

If the Y Axis Scale is Linear or Log, then average type is Power Averaging.

If the Detector is Peak, Sample, or Negative Peak (not Average), then average type is Video Average.

See Figure 5-1, which shows these auto rules for average type in flowchart format.

Figure 5-1   **Auto Rules for Average Type**

Auto Rules for Average Type
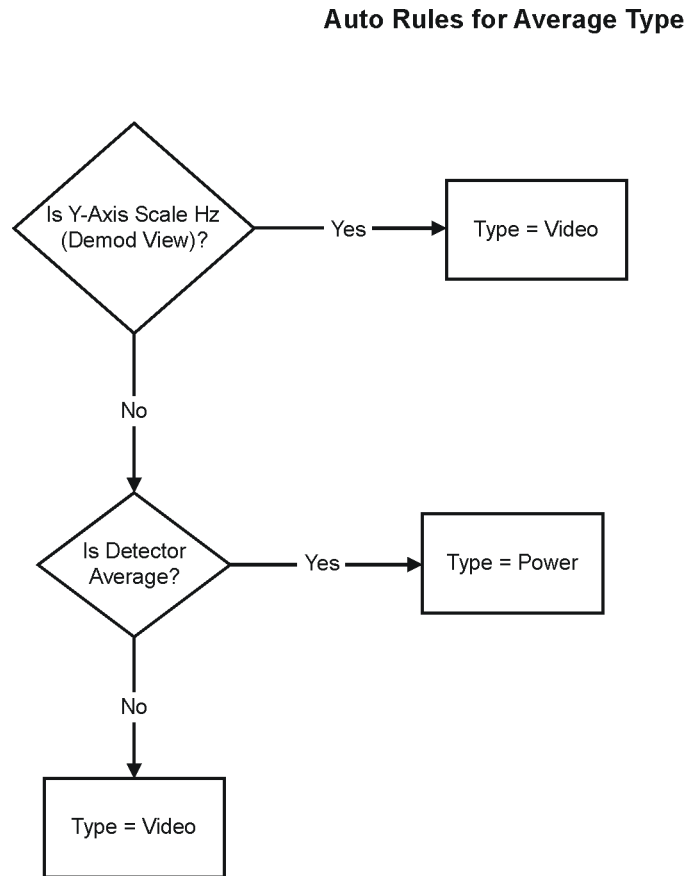
cl79a

Factory Preset
and *RST: On

History: Added with firmware revision A.08.00.

Front Panel
Access: **BW/Avg, Avg Type, Auto Man**

Type of Averaging for Measurements

[:SENSe]:AVERage:TYPE VIDeo|RMS

[:SENSe]:AVERage:TYPE?

Successive measurements of data can be combined to average out measurement variations. Detector is set to average and Avg type is set to power (RMS) to measure RMS voltage (avg power).

NOTE   As a best practice, set amplitude scale (**:DISP:WIND:TRAC:Y:SPAC**) prior to average type.

VIDeo logarithmically averages the power of the video data (typical units are dBm). This command is equivalent to pressing front panel keys **BW/Avg, Avg Type, Video.**

RMS averages the linear power of successive measurements (typical units are watts).

The following parameters of this command are supported, but not recommended for new designs. They are provided for limited compatibility to other spectrum analyzers. When used, the parameters are converted as follows:

TYPE LINear maps to RMS.

TYPE LPOWer maps to VIDeo.

TYPE POWer maps to RMS.

TYPE SCALar and VOLTage will map to VIDeo in linear amplitude scale. If the amplitude scale is LOG, an error is generated.

TYPE LOG maps to VIDeo. If the amplitude scale is not LOG (linear or Y Axis Units = Hz), an error is generated.

For compatibility with firmware revisions prior to A.08.00, query **[:SENSe]:AVERage:TYPE?** will return LPOW or POW if LPOW or POW is used during the setting and no further changes have occurred to set the average type (such as from the front panel).

Factory Preset
and *RST: VID

History: Changed with firmware revision A.08.00.

Front Panel
Access: **BW/Avg, Avg Type**

[:SENSe]:BANDwidth Subsection

Resolution Bandwidth

`[:SENSe]:BANDwidth|BWIDth[:RESolution] <freq>`

`[:SENSe]:BANDwidth|BWIDth[:RESolution]?`

Specifies the resolution bandwidth.

Example:	BAND 1 kHz
Range:	1 kHz to 5 MHz (standard instrument)
	10 Hz to 5 MHz (E4401B, E4402B, E4405B, E4407B with Option 1DR)
	1 Hz to 5 MHz (E4401B, E4402B, E4405B, E4407B with Options 1DR and 1D5)
Default Unit:	Hz
Front Panel Access:	**BW/Avg, Resolution BW Auto Man**

Resolution Bandwidth Automatic

`[:SENSe]:BANDwidth|BWIDth[:RESolution]:AUTO OFF|ON|0|1`

`[:SENSe]:BANDwidth|BWIDth[:RESolution]:AUTO?`

Couples the resolution bandwidth to the frequency span.

Factory Preset and *RST:	On
Example:	BWID:AUTO On
History:	This command function changed with firmware revision A.08.00. With :**AUTO ON** in zero span, an error will be generated.
Remarks:	Auto-couple resolution bandwidth is not available in zero span.

Video Bandwidth

`[:SENSe]:BANDwidth|BWIDth:VIDeo <freq>`

`[:SENSe]:BANDwidth|BWIDth:VIDeo?`

Specifies the video bandwidth.

Factory Preset and *RST:	3 MHz

Range: 1 Hz to 3 MHz. This range is dependent upon the setting of
                 [:SENSe]:BANDwidth|BWIDth[:RESolution] and
                 installed options.

Default Unit: Hz

Front Panel
Access: **BW/Avg, Video BW Auto Man**

Video Bandwidth Automatic

[:SENSe]:BANDwidth|BWIDth:VIDeo:AUTO OFF|ON|0|1

[:SENSe]:BANDwidth|BWIDth:VIDeo:AUTO?

Couples the video bandwidth to the resolution bandwidth.

Factory Preset
and *RST: On

Front Panel
Access: **BW/Avg, Video BW Auto Man**

Video to Resolution Bandwidth Ratio

[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio <number>

[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio?

Specifies the ratio of the video bandwidth to the resolution bandwidth.

Factory Preset
and *RST: 1.0

Range: 0.00001 to 3.0e6

Front Panel
Access: **BW/Avg, VBW/RBW Ratio**

Video to Resolution Bandwidth Ratio Mode Select

[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio:AUTO OFF|ON|0|1

[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio:AUTO?

Selects auto or manual mode for video bandwidth to resolution bandwidth ratio.
Refer to Figure 2-3 on page 59, which is a flowchart that illustrates VBW and
RBW Ratio auto rules.

Factory Preset
and *RST: On

History: Added with firmware revision A.08.00.

Front Panel
Access: **BW/Avg, VBW/RBW, Auto Man**

[:SENSe]:CORRection Subsection

Delete All Corrections

[:SENSe]:CORRection:CSET:ALL:DELete

This command deletes all existing corrections.

History: Added with firmware revision A.08.00.

Front Panel
Access: **Amplitude/Y Scale, Corrections, Delete All Corrections**

Perform Amplitude Correction

[:SENSe]:CORRection:CSET:ALL[:STATe] OFF|ON|0|1

[:SENSe]:CORRection:CSET:ALL[:STATe]?

Turns On or Off the amplitude corrections. When turned On, only the correction sets that were turned on are enabled. When turned Off, all of the correction sets are disabled.

Factory Preset
and *RST: Off

Remarks: To turn On or Off an individual correction set, use:
                    [:SENSe]:CORRection:CSET[1]|2|3|4[:STATe].

Front Panel
Access: **Amplitude/Y Scale, Corrections, Antenna, Correction On
                    Off**

                    Amplitude/Y Scale, Corrections, Cable, Correction On Off

                    Amplitude/Y Scale, Corrections, Other, Correction On Off

                    Amplitude/Y Scale, Corrections, User, Correction On Off

Set Amplitude Correction Data

**[:SENSe]:CORRection:CSET[1]|2|3|4:DATA
<freq>,<rel_ampl>{,<freq>,<rel_ampl>}**

[:SENSe]:CORRection:CSET[1]|2|3|4:DATA?

Sets the amplitude correction data. These frequency/amplitude corrections will be applied to the displayed data to correct for system losses/gains outside the analyzer. Four different sets of correction data can be stored.

Example: **:CORR:CSET1:DATA
                    900E6,0.3,1.0E9,0.35,1.3E9,0.2**

Range: 200 points per set

Default Unit: There are no units on the frequency and amplitude pairs. They must be entered in hertz (Hz) and decibels (dB).

Remarks: CSET number equivalents to front panel access definitions are as follows:

> CSET or CSET1 is Antenna
> CSET2 is Cable
> CSET3 is Other
> CSET4 is User

Front Panel

Access: **Amplitude/Y Scale, Corrections, Antenna, Edit Point|Frequency|Amplitude|Delete Point**

Amplitude/Y Scale, Corrections, Cable, Edit Point|Frequency|Amplitude|Delete Point

Amplitude/Y Scale, Corrections, Other, Edit Point|Frequency|Amplitude|Delete Point

Amplitude/Y Scale, Corrections, User, Edit Point|Frequency|Amplitude|Delete Point

Merge Additional Values into the Existing Amplitude Correction Data

[:SENSe]:CORRection:CSET[1]|2|3|4:DATA:MERGe
<freq>,<rel_ampl>{,<freq>,<rel_ampl>}

Adds the points with the specified values to the current amplitude correction data, allowing you to merge correction data. If too much data is merged, as many points as possible are merged into the existing data and then an error is reported.

- **<freq>** is the frequency (in Hz) where the correction should be applied; no unit is allowed in this parameter
- **<rel_ampl>** is the amount of relative amplitude correction (in dB) needed; no unit is allowed in this parameter

Remarks: CSET number equivalents to front panel access definitions are as follows:

> CSET or CSET1 is Antenna
> CSET2 is Cable
> CSET3 is Other
> CSET4 is User

Delete Amplitude Correction

`[:SENSe]:CORRection:CSET[1]|2|3|4:DELete`

Deletes the specified correction set. If the set was On, it is turned Off.

Front Panel
Access: **AMPLITUDE/Y Scale, Corrections,
                 Antenna|Cable|Other|User, Delete Correction**

Set Amplitude Correction Frequency Interpolation

`[:SENSe]:CORRection:CSET[1]|2|3|4:X:SPACing`
`LINear|LOGarithmic`

Sets the frequency interpolation to linear or logarithmic for the specified correction
set.

Remarks: Logarithmic frequency scale corrections are linearly
                 interpolated between correction points with respect to the
                 logarithm of the frequency. Linear frequency scale corrections
                 are interpolated along straight lines, connecting adjacent points
                 on a linear scale.

Front Panel
Access: **AMPLITUDE/Y Scale, Corrections, Freq Interp Log Lin**

Perform Amplitude Correction

`[:SENSe]:CORRection:CSET[1]|2|3|4[:STATe] OFF|ON|0|1`

`[:SENSe]:CORRection:CSET[1]|2|3|4[:STATe]?`

Turns the amplitude correction function on or off for the given set.

NOTE   `[:SENSe]:CORRection:CSET:ALL[:STATe]` must be on for this command to
                 function.

Factory Preset
and *RST: Off

Remarks: CSET number equivalents to front panel access definitions are
                  as follows:

                        CSET or CSET1 is Antenna
                        CSET2 is Cable
                        CSET3 is Other
                        CSET4 is User

Front Panel
Access: **AMPLITUDE/Y Scale, Corrections,
                  Antenna|Cable|Other|User, Correction On Off**

Input Impedance Correction

`[:SENSe]:CORRection:IMPedance[:INPut][:MAGNitude] <number>`

`[:SENSe]:CORRection:IMPedance[:INPut][:MAGNitude]?`

Amplitude correction is applied to the display data to adjust for measurement situations where the unit under test has a different impedance than the 50 Ω input impedance of the analyzer. Some Agilent ESA analyzers have Option 1DP, 75 Ω input. In this case, you may want to convert the data to make measurements in a 50 Ω system.

Factory Preset
and *RST: The factory default is the input impedance of the analyzer.

Range: 50 or 75 ohms

Default Unit: ohms

Front Panel
Access: **Input, Input Z Corr 50 Ω 75 Ω**

External Amplifier Correction

`[:SENSe]:CORRection:OFFSet[:MAGNitude] <rel_ampl>`

`[:SENSe]:CORRection:OFFSet[:MAGNitude]?`

A single value of amplitude correction can be applied to the displayed trace data to compensate for signal losses or gains that are due to other devices in the measurement setup, rather than the unit under test.

Factory Preset
and *RST: 0 dB

Range: –81.9 to 81.9

Default Unit: dB

Front Panel
Access: **AMPLITUDE/Y Scale, Ext Amp Gain**

[:SENSe]:DEMod Subsection

Type of Demodulation

[:SENSe]:DEMod AM|FM

[:SENSe]:DEMod?

Sets the type of demodulation. FM is available only with Option BAA (FM Demodulation) or Option 106 (Bluetooth™[1]).

Factory Preset
and *RST: AM

Front Panel
Access: **Det/Demod, Demod, AM**

                 Det/Demod, Demod, FM

FM Deviation

[:SENSe]:DEMod:FMDeviation <freq>

[:SENSe]:DEMod:FMDeviation?

Sets the total FM frequency deviation for full screen demodulation. This command is available only with Option BAA (FM Demodulation) or Option 106 (Bluetooth). The query form of this command only is applicable with Option 106.

Factory Preset
and *RST:.   100 kHz for Option BAA; approximately 40 kHz for Option 106
                 (determined during FM demodulation alignment)

Range:.   5 kHz to 1.2 MHz

Default Unit:.   Hz

Front Panel
Access:.   **AMPLITUDE, Scale/Div**

Demodulation Control

[:SENSe]:DEMod:STATe OFF|ON|0|1

[:SENSe]:DEMod:STATe?

Turns demodulation on or off.

Factory Preset
and *RST:.   Off

Front Panel
Access:.   **Det/Demod, Demod, Off**

---

1. Bluetooth is a registered trademark owned by its proprietor and used under license.

Demod Time

`[:SENSe]:DEMod:TIME <time>`

`[:SENSe]:DEMod:TIME?`

Sets the time used for frequency domain demodulation.

Factory Preset
and *RST: 500 ms

Range: 2 ms to 100 s

Default Unit: seconds

Front Panel
Access: **Det/Demod, Demod, Demod Time**

Demod View

`[:SENSe]:DEMod:VIEW[:STATe] OFF|ON|0|1`

`[:SENSe]:DEMod:VIEW[:STATe]?`

This command causes the demodulated signal to be displayed. If FM Demod is on, then the display scales the y-axis in units of kHz. The scale/div is set with the command `:DISPlay:WINDow:TRACe:Y [:SCALe]:PDIVision:FREQuency <freq>` if FM Demod is on. If FM Demod is on, then several functions are not available; these include: Log/Lin (display is always in linear), Y-Axis Units, Marker Search functions, Normalize, Display Line, Peak Excursion, and Peak Threshold. There is no effect when AM demodulation is used (only applicable for FM demodulation).

Factory Preset
and *RST: Off

Remarks: This command is not available when Demod is set to Off.

Front Panel
Access: **Det/Demod, Demod, FM, Demod View**

[:SENSe]:DETector Subsection

Automatic Detection Type Selected

[:SENSe]:DETector:AUTO OFF|ON|0|1

[:SENSe]:DETector:AUTO?

Switches automatically to the optimum detection type for typical measurements using the current instrument settings.

The detector type is average if any of these are on:

Noise marker
Band power markers
Trace averaging when the Average Type is Power (RMS).

The detector type is sample if any of the following conditions are true:

Trace averaging is on with average type of video
Both max and min hold trace modes are on
Resolution bandwidth is less than 1 kHz, and noise marker, band power markers, or trace averaging is on

The detector type is negative peak if any trace is in min hold and no traces are in max hold.

The detector type is peak if the above conditions are off.

Manually changing the detector function turns Auto off.

Refer to Figure 2-1 on page 53, which shows a decision tree of how detection type is determined.

Factory Preset
and *RST: On

History: Added with firmware revision A.08.00.

Front Panel
Access: **Det/Demod**, **Detector**

Type of Detection

[:SENSe]:DETector[:FUNCtion]
NEGative|POSitive|SAMPle|AVERage|RMS

[:SENSe]:DETector[:FUNCtion]?

Specifies the detection mode.

For each trace interval (bucket), average detection displays the average of all the samples within the interval. The averaging can be done using two methods:

the power method (RMS)

the video method (Y Axis Units)

The method is controlled by the BW/Avg, Avg Type key.

NOTE	The combination of the average detector and the power average type is equivalent to what is sometimes referred to as "RMS detection."

Negative peak detection displays the lowest sample taken during the interval being displayed.

Positive peak detection displays the highest sample taken during the interval being displayed.

Sample detection displays the sample taken during the interval being displayed, and is used primarily to display noise or noise-like signals. In sample mode, the instantaneous signal value at the present display point is placed into memory. This detection should not be used to make the most accurate amplitude measurement of non noise-like signals.

Average detection is used when measuring the average value of the amplitude across each trace interval (bucket). The averaging method used by the average detector is set to either video or power as appropriate when the average type is auto coupled.

Factory Preset
and *RST:.   Positive

History:.   Added Average and RMS elements to the command with
                 firmware revision A.08.00.

Front Panel
Access:.   **Det/Demod**, **Detector**
                     Det/Demod, **Detector**, **Peak**
                     Det/Demod, **Detector**, **Sample**
                     Det/Demod, **Detector**, **Negative Peak**
                     Det/Demod, **Detector**, **Average**

[:SENSe]:FREQuency Subsection

Center Frequency

`[:SENSe]:FREQuency:CENTer <freq>`

`[:SENSe]:FREQuency:CENTer UP|DOWN`

`[:SENSe]:FREQuency:CENTer?`

Set the center frequency.

NOTE   In log sweep mode, the minimum start frequency is 10 Hz.

Factory Preset
and *RST: ESA E4401B, E4411B: 750 MHz

                ESA E4402B, E4403B: 1.5 GHz

                ESA E4404B: 3.35 GHz

                ESA E4405B: 6.6 GHz

                ESA E4407B, E4408B: 13.25 GHz

Range: ESA E4401B, E4411B: –80 MHz[1] to 1.58 GHz

                ESA E4402B, E4403B: –80 MHz[1] to 3.10 GHz

                ESA E4404B: –80 MHz[1] to 6.78 GHz

                ESA E4405B: –80 MHz[1] to 13.3 GHz

                ESA E4407B, E4408B: –80 MHz[1] to 27.0 GHz

Default Unit: Hz

Front Panel
Access: **FREQUENCY/Channel, Center Freq**

Center Frequency Step Size Automatic

`[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1`

`[:SENSe]:FREQuency:CENTer:STEP:AUTO?`

Specifies whether the step size is set automatically based on the span.

Factory Preset
and *RST: On

Front Panel
Access: **FREQUENCY/Channel, CF Step Auto Man**

    1. 10 Hz minimum in log sweep mode.

Center Frequency Step Size

[:SENSe]:FREQuency:CENTer:STEP[:INCRement] <freq>

[:SENSe]:FREQuency:CENTer:STEP[:INCRement]?

Specifies the center frequency step size.

Factory Preset
and *RST: Span/10

Range: Maximum negative frequency to the maximum positive
               frequency listed below:

               ESA E4401B, E4411B: –1.58 to 1.58 GHz

               ESA E4402B, E4403B: –3.10 to 3.10 GHz

               ESA E4404B: –6.78 to 6.78 GHz

               ESA E4405B: –13.3 to 13.3 GHz

               ESA E4407B, E4408B: –27.0 to 27.0 GHz

Default Unit: Hz

Front Panel
Access: **FREQUENCY/Channel, CF Step Man**

Frequency Span

[:SENSe]:FREQuency:SPAN <freq>

[:SENSe]:FREQuency:SPAN?

Set the frequency span. Setting the span to 0 Hz puts the analyzer into zero span.

Factory Preset
and *RST: ESA E4401B, E4411B: 1.5 GHz

               ESA E4402B, E4403B: 3.0 GHz

               ESA E4404B: 6.7 GHz

               ESA E4405B: 13.2 GHz

               ESA E4407B, E4408B: 26.5 GHz

Range: ESA E4401B, E4411B: 0 Hz, 100 Hz to 1.58 GHz

               ESA E4402B, E4403B: 0 Hz, 100 Hz to 3.10 GHz

               ESA E4404B: 0 Hz, 100 Hz to 6.78 GHz

               ESA E4405B: 0 Hz, 100 Hz to 13.3 GHz

               ESA E4407B, E4408B: 0 Hz, 100 Hz to 27.0 GHz

Default Unit: Hz

Front Panel
Access: **SPAN/X Scale, Span**

                 SPAN/X Scale, Zero Span

Full Frequency Span

`[:SENSe]:FREQuency:SPAN:FULL`

Set the frequency span to full scale.

Factory Preset
and *RST: ESA E4401B, E4411B: 1.5 GHz

                 ESA E4402B, E4403B: 3.0 GHz

                 ESA E4404B: 6.7 GHz

                 ESA E4405B: 13.2 GHz

                 ESA E4407B, E4408B: 26.5 GHz

Front Panel
Access: **SPAN/X Scale, Full Span**

Last Frequency Span

`[:SENSe]:FREQuency:SPAN:PREVious`

Set the frequency span to the previous span setting.

Front Panel
Access: **SPAN/X Scale, Last Span**

Start Frequency

`[:SENSe]:FREQuency:STARt <freq>`

`[:SENSe]:FREQuency:STARt?`

Set the start frequency.

NOTE   In log sweep mode, the minimum start frequency is 10 Hz.

Factory Preset
and *RST: 0 Hz

Range: ESA E4401B, E4411B: –80 MHz[1] to 1.58 GHz

                 ESA E4402B, E4403B: –80 MHz[1] to 3.10 GHz

                 ESA E4404B: –80 MHz[1] to 6.78 GHz

---

1. 10 Hz minimum in log sweep mode.

ESA E4405B: –80 MHz[1] to 13.3 GHz

ESA E4407B, E4408B: –80 MHz[1] to 27.0 GHz

Default Unit: Hz

Front Panel
Access: **FREQUENCY/Channel, Start Freq**

Stop Frequency

[:SENSe]:FREQuency:STOP <freq>

[:SENSe]:FREQuency:STOP?

Set the stop frequency.

Factory Preset
and *RST: ESA E4401B, E4411B: 1.5 GHz

ESA E4402B, E4403B: 3.0 GHz

ESA E4404B: 6.7 GHz

ESA E4405B: 13.2 GHz

ESA E4407B, E4408B: 26.5 GHz

Range: ESA E4401B, E4411B: –80 MHz[1] to 1.58 GHz

ESA E4402B, E4403B: –80 MHz[1] to 3.10 GHz

ESA E4404B: –80 MHz[1] to 6.78 GHz

ESA E4405B: –80 MHz[1] to 13.3 GHz

ESA E4407B, E4408B: –80 MHz[1] to 27.0 GHz

Default Unit: Hz

Front Panel
Access: **FREQUENCY/Channel, Stop Freq**

Frequency Synthesis Mode

[:SENSe]:FREQuency:SYNThesis 1|2|3

[:SENSe]:FREQuency:SYNThesis?

This command switches between two phase noise optimization modes. Mode 2 optimizes the analyzer for close-in phase noise. Mode 3 optimizes the analyzer for tuning speed. Mode 1 is not recommended for new designs.

This command is available for the following models only:

---

1. 10 Hz minimum in log sweep mode.

E4402B, E4403B, E4404B, E4405B, E4407B, E4408B

Factory Preset
and *RST: 3

History: Added with firmware revision A.08.00.

Front Panel
Access: **AUTO COUPLE, PhNoise Opt**

Frequency Synthesis State

[:SENSe]:FREQuency:SYNThesis:AUTO OFF|ON|0|1

[:SENSe]:FREQuency:SYNThesis:AUTO?

This command switches between auto and manual phase noise selection.

When in auto mode, the phase noise optimization is set as follows:

- For spans ≤ 10 MHz, the analyzer is optimized for phase noise.
- For spans > 10 MHz, the analyzer is optimized for fast tuning.

This command is available for the following models only:

E4402B, E4403B, E4404B, E4405B, E4407B, E4408B

Factory Preset
and *RST: On

History: Added with firmware revision A.08.00.

Front Panel
Access: **AUTO COUPLE, PhNoise Opt**

[SENSe]:MIXer Subsection

Select External Mixer Band

`[:SENSe]:MIXer:BAND K|A|Q|U|V|E|W|F|D|G|Y|J|USER`

`[:SENSe]:MIXer:BAND?`

This command allows the selection of one of the pre-defined bands corresponding to the external mixer currently in use. This command is available only with Option AYZ (External Mixing).

Factory Preset
and *RST: Band A (26.5-40 Ghz)

Remarks: If the mixer harmonic configuration
(`[:SENSe]:MIXer:HARMonic:AUTO OFF|ON|0|1` is
set to Off (manual), then a query will return "`USER`".

NOTE   Bands K, E, W, F, D, G, Y, and J are not available if Mixer Type is set to Presel.

Front Panel
Access: **Input/Output (or Input), Input Mixer, Ext Mix Band**

External Mixer Bias Adjust

`[:SENSe]:MIXer:BIAS <numeric>`

`[:SENSe]:MIXer:BIAS?`

This command allows the adjustment of an internal bias source for use with external mixers. This command is available only with Option AYZ (External Mixing).

Factory Preset
and *RST: 0

Range: –10 mA to 10 mA

Default Unit: mA

Remarks: The bias signal is present on the center conductor of the IF
INPUT connector on the front panel. See related command
`[:SENSe]:MIXer:BIAS[:STATe] OFF|ON|0|1`.

NOTE   Mixer Bias will be set to Off when transitioning from manual harmonic mode to auto harmonic mode.

Front Panel
Access: **Input/Output (or Input), Input Mixer, Mixer Config, Mixer
Bias On Off**

Set External Mixer Bias On/Off

[:SENSe]:MIXer:BIAS:STATe OFF|ON|0|1

[:SENSe]:MIXer:BIAS:STATe?

This command activates an internal bias source for use with external mixers. This command is available only with Option AYZ (External Mixing).

Factory Preset
and *RST: Off

Remarks: The bias signal is present on the center conductor of the IF Input connector on the front panel. See related command **[:SENSe]:MIXer:BIAS <numeric>**.

NOTE	Mixer Bias will be set to Off when transitioning from manual harmonic mode to auto harmonic mode.

Front Panel
Access: **Input/Output (or Input), Input Mixer, Mixer Config, Mixer Bias On Off**

Set External Mixer LO Harmonic Value

[:SENSe]:MIXer:HARMonic <integer>

[:SENSe]:MIXer:HARMonic?

This command allows you to set the LO harmonic value for mixers other than the HP/Agilent 11970-Series or 11974-Series Mixers. This is done after the mixer harmonic configuration (**[:SENSe]:MIXer:HARMonic:AUTO OFF|ON|0|1**) is set to Off (manual). This command is available only with Option AYZ (External Mixing).

Factory Preset
and *RST: –8 (Band A, 26.5-40 GHz)

Range: Any non-zero integer from –50 to 50, inclusive

Remarks: The harmonic value with its associated sign is automatically determined from the external mixer band selected. This is the AUTO mode. For mixers other than the HP/Agilent 11970-Series or 11974-Series, an LO harmonic other than that determined in the AUTO mode may be required. This is achieved using this command and related command **[:SENSe]:MIXer:HARMonic:AUTO OFF|ON|0|1**.

Set External Mixer LO Harmonic Mode

`[:SENSe]:MIXer:HARMonic:AUTO OFF|ON|0|1`

`[:SENSe]:MIXer:HARMonic:AUTO?`

This command allows you to set the external mixer LO harmonic mode to either automatic or manual. The manual mode is used with mixers other than the HP/Agilent 11970-Series or 11974-Series Mixers to manually choose the required LO harmonic. This command is available only with Option AYZ (External Mixing).

Refer also to commands `:INPut:MIXer INTernal|EXTernal` and `:INPut:MIXer:TYPE PRESelected|UNPReselect`.

Factory Preset
and *RST: AUTO

Remarks: The harmonic value with its associated sign is automatically determined from the external mixer band selected. This is the AUTO mode. For mixers other than the HP/Agilent 11970-Series or 11974-Series, an LO harmonic other than that determined in the AUTO mode may be required. This is achieved using this command and related command `[:SENSe]:MIXer:HARMonic <value>`.

NOTE   Manually selecting a harmonic will remove any restrictions on Mixer Bias and Mixer Type, and External Mixer Band will become USER. Returning the Harmonic to AUTO will reset the band to A, set Mixer Type to UNPReselect, and turn Mixer Bias Off.

Front Panel
Access: **Input/Output (or Input), Input Mixer, Mixer Config, Harmonic Auto Man**

[:SENSe]:POWer Subsection

Input Attenuation

`[:SENSe]:POWer[:RF]:ATTenuation <rel_ampl>`

`[:SENSe]:POWer[:RF]:ATTenuation?`

Set the input attenuator. This value is set at its auto value if input attenuation is set to auto.

Factory Preset
and *RST: 10 dB

Range: ESA E4401B, E4411B: 0 to 60 dB

                    ESA E4402B, E4403B, E4404B, E4405B: 0 to 75 dB

                    ESA E4407B, E4408B: 0 to 65 dB

Default Unit: dB

Front Panel
Access: **AMPLITUDE/Y Scale, Attenuation Auto Man**

Input Port Attenuator Auto

`[:SENSe]:POWer[:RF]:ATTenuation:AUTO OFF|ON|0|1`

`[:SENSe]:POWer[:RF]:ATTenuation:AUTO?`

Select the input port attenuator range to be set either automatically or manually.

   On – Input attenuation is automatically set as determined by the Reference Level Setting.

   Off – Input attenuation is manually set

Factory Preset
and *RST: On

Front Panel
Access: **AMPLITUDE Y Scale, Attenuation**

Input Port Power Gain

`[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1`

`[:SENSe]:POWer[:RF]:GAIN[:STATe]?`

Turns the internal preamp on or off.

Factory Preset
and *RST: Off

Remarks: This command is available only with Option 1DS installed.

Front Panel
Access: AMPLITUDE/Y Scale, Int Preamp On Off

Input Port Maximum Mixer Power

[:SENSe]:POWer[:RF]:MIXer:RANGe[:UPPer] <ampl>

[:SENSe]:POWer[:RF]:MIXer:RANGe[:UPPer]?

Specifies the maximum power at the input mixer.

Factory Preset
and *RST: −10 dBm

Range: −100 dBm to 10 dBm

Default Unit: dBm

Front Panel
Access: **AMPLITUDE/Y Scale, Max Mixer Lvl**

Optimize Preselector Frequency

[:SENSe]:POWer[:RF]:PADJust <freq>

[:SENSe]:POWer[:RF]:PADJust?

This command allows user-defined adjustment of the preselector frequency to optimize its response on the signal of interest.

Factory Preset
and *RST: 0 Hz

Range: −250 MHz to 250 MHz

Default Unit: None. Use the MHz terminator in order for this command to work.

Remarks: This command is available only on Agilent ESA models E4404B, E4405B, E4407B, and E4408B. Use this command for signals close to the noise level, multiple signals close together, or for other conditions when the preselector is not tuned to the frequency of interest.

Front Panel
Access: **AMPLITUDE/Y Scale, Presel Adjust**

Preselector Center

`[:SENSe]:POWer[:RF]:PCENter`

In internal mixing, this command centers the preselector filter at the signal of interest. In external mixing, the external preselector filter is adjusted to the peak of the filter response to maximize the amplitude at the active marker frequency. This command has no effect if it is activated in non-preselected bands. This command is usable from 3 GHz to the maximum frequency of the analyzer.

NOTE   This command is available only on Agilent ESA models E4404B, E4405B, E4407B, and E4408B. This command has no effect with markers set to less than 3 GHz.

Remarks: A peak search will be done if no marker is on.

Front Panel
Access: **AMPLITUDE/Y Scale, Presel Center**

[:SENSe]:SIDentify Subsection

Set Mixer Signal Identification Mode

`[:SENSe]:SIDentify:MODE ISUPpress|ISHift`

`[:SENSe]:SIDentify:MODE?`

This command lets you choose one of two types of signal identification methods when viewing multiple responses from non-preselected external mixers. This command is available only with Option AYZ (External Mixing). Refer to `:INPut:MIXer:TYPE` to select the type of mixer being used.

Factory Preset
and *RST: ISUPpress

History: Added with firmware revision A.03.00.

Front Panel
Access: **Input/Output (or Input), Input Mixer, Signal ID Mode, Image Suppress**

                 Input/Output (or Input), Input Mixer, Signal ID Mode, Image Shift

Set Mixer Signal Identification State

`[:SENSe]:SIDentify[:STATe] OFF|ON|0|1`

`[:SENSe]:SIDentify[:STATe]?`

This command activates an algorithm which either removes or aids with the identification of multiple responses. These responses are generated from a single input signal using non-preselected external mixers.

Factory Preset
and *RST: Off

History: Added with firmware revision A.03.00.

Remarks: Signal identification relies on the acquisition of data from two successive sweeps. Therefore, if the analyzer is in single sweep mode, two sweep triggers are needed to generate the sweep pair. In image suppress mode, synchronization is ensured by first turning off signal identification, initiating a single sweep, then turning on signal identification followed by two single sweeps.

To synchronize in image shift mode, turn off signal identification, initiate a single sweep, and turn on signal identification. The results of the first sweep after signal identification is turned on must be ignored. The data from the second sweep is available in Trace 1 and the data from the third (shifted) sweep is available in Trace 2.

NOTE   Signal identification is not available with signal track, resolution bandwidths ≤300 Hz, demod, or averaging. Signal identification will be turned off when input mixer is set to internal.

Front Panel
Access: **Input/Output (or Input), Input Mixer, Signal Ident On Off**

[:SENSe]:SWEep Subsection

Sweep Points

[:SENSe]:SWEep:POINts <number of points>

[:SENSe]:SWEep:POINts?

This command sets the number of sweep points.

Factory Preset
and *RST: 401

Example: **:SWEep:POIN 401**

History: This command is available only on analyzers with firmware
                  revision A.04.00 and later. Analyzers with firmware revisions
                  prior to A.04.00 have the number of sweep points fixed at 401.

Range: 101 to 8192, (2 to 8192 in zero span for analyzers with firmware
                  revision A.05.00 and later)

Remarks: The number of sweep points can be set only with Agilent ESA
                  models E4401B, E4402B, E4404B, E4405B, and E4407B.
                  Sweep points for ESA models E4403B, E4408B, and E4411B
                  are fixed at 401 points. The number of sweep points may be
                  queried on all analyzers with firmware revision A.04.00 and
                  later.

                  For analyzers with firmware revisions prior to A.08.00, any
                  change to sweep points sets the following commands as shown:

                  :CALCulate:LLINe1:DISPlay to off, and
                  :CALCulate:LLINe2:DISPlay to off.

                  Whenever the number of sweep points change, the following
                  functions are affected:

                  •   All trace data is erased

                  •   Any traces in view mode will go to blank mode

                  •   Sweep time is re-calculated

                  •   Any limit lines that are on will be turned off (For analyzers
                      with firmware revisions prior to A.08.00)

Front Panel
Access: **Sweep, Points**

Query Number of Segments

[:SENSe]:SWEep:SEGMent:COUNt?

Returns the number of segments that have been defined in the segmented sweep data.

NOTE   This command applies to the following models having firmware revision A.05.00 or later: E4401B, E4402B, E4404B, E4405B, E4407B.

Factory Preset
and *RST: 0

Range: 0 to 32

Set All Segment Data

[:SENSe]:SWEep:SEGMent:DATA[:ALL] <SSTop|CSPan>,<string>

[:SENSe]:SWEep:SEGMent:DATA[:ALL]? <SSTop|CSPan>

Specify parameters for all segments of a segmented sweep. The data is entered as comma-separated ASCII values in sequential order of segments desired. Segments will be sorted in order of increasing start frequency. If multiple segments have the same start frequency, they will appear in order of increasing stop frequency. It is possible to define segments that overlap.

For SSTop, the data order used for each segment is: start frequency, stop frequency, resolution bandwidth, video bandwidth, number of points, and sweep time.

For CSPan, the data order used for each segment is: center frequency, span, resolution bandwidth, video bandwidth, number of points, and sweep time.

NOTE   This command applies to the following models having firmware revision A.05.00 or later: E4401B, E4402B, E4404B, E4405B, or E4407B.

NOTE   Command **[:SENSe]:SWEep:SEGMent:DATA[:ALL]** will delete any previous segment data.

Example: **:SENSe:SWEep:SEGMent:DATA:ALL CSPan,50e06,5e6,1e5,1e5,101,.0050,1e09,5e6 ,1e5,1e5,101,.05**

This example defines two segments. The first segment has a center frequency of 50 MHz and the second segment has a center frequency of 1 GHz.

Range: The range depends upon the model number, installed options, and firmware revision of your instrument; see the Specifications Guide for details. The ranges that apply to all instrument models that can be controlled with this command are resolution bandwidth, video bandwidth, and number of points.

Resolution Bandwidth: 1 kHz to 5 MHz

Video Bandwidth: 30 Hz to 3 MHz

Number of Points: 101 to 8192, 2 to 8192 in zero span. The total number of points for all segments is ≤ 8192 .

Default Unit: Fundamental units (without entering the actual units)

Front Panel
Access: **Sweep, Segmented, Modify, Edit, Center Freq**

Sweep, Segmented, Modify, Edit, Span

Sweep, Segmented, Modify, Edit, Resolution BW

Sweep, Segmented, Modify, Edit, Video BW

Sweep, Segmented, Modify, Edit, Points

Sweep, Segmented, Modify, Edit, Sweep Time

Merge Data With Segmented Sweep Data

[:SENSe]:SWEep:SEGMent:DATA:MERGe <SSTop|CSPan>,<string>

Merges the data to the segmented sweep data. Segments will be sorted in order of increasing start frequency. If multiple segments have the same start frequency, they will appear in order of increasing stop frequency. It is possible to define segments that overlap.

For SSTop, the data order used for each segment is: start frequency, stop frequency, resolution bandwidth, video bandwidth, number of points, and sweep time.

For CSPan, the data order used for each segment is: center frequency, span, resolution bandwidth, video bandwidth, number of points, and sweep time.

NOTE   This command applies to the following models having firmware revision A.05.00 or later: E4401B, E4402B, E4404B, E4405B, E4407B.

Example: **:SENSe:SWEep:SEGMent:DATA:MERGe
CSPan,150e06,5e6,1e5,1e5,101,.050,110e06,5
e6,1e5,1e5,100,.05**

This example merges two segments into the segmented sweep table. The first segment has a center frequency of 150 MHz and the second segment has a center frequency of 110 MHz.

Range: The range depends upon the model number, installed options, and firmware revision of your instrument; see the Specifications Guide for details. The ranges that apply to all instrument models that can be controlled with this command are resolution bandwidth, video bandwidth, and number of points.

Resolution Bandwidth: 1 kHz to 5 MHz

Video Bandwidth: 30 Hz to 3 MHz

Number of Points: 101 to 8192, 2 to 8192 in zero span. The total number of points for all segments is ≤ 8192 .

Default Unit: Fundamental units (without entering the actual units)

Delete All Segmented Sweep Data

[:SENSe]:SWEep:SEGMent:DELete

Deletes all segmented sweep data.

NOTE	This command applies to the following models having firmware revision A.05.00 or later: E4401B, E4402B, E4404B, E4405B, E4407B.

Front Panel
Access: **Sweep, Segmented, Modify, Delete**

Delete Some Segmented Sweep Data

[:SENSe]:SWEep:SEGMent:DELete:ROW <integer>

Deletes only the specified segmented sweep data (row).

NOTE	This command applies to the following models having firmware revision A.05.00 or later: E4401B, E4402B, E4404B, E4405B, E4407B.

Range: 1 to maximum number of segments

Front Panel
Access: **Sweep, Segmented, Modify, Edit, Delete Segment**

NOTE	The front panel keys shown for this command deletes the active segment only. The remote command deletes any specified segment.

Turn On/Off Segmented Sweep

[:SENSe]:SWEep:SEGMent[:STATe] OFF|ON|0|1

[:SENSe]:SWEep:SEGMent[:STATe]?

Turns on or off segmented sweep. Segmented sweep is a mode where only bands of interest are measured with the data presented in a single trace. This improves measurement speed and provides more detail and resolution in those bands of interest.

NOTE	When segmented sweep is turned on or off, all trace data (including stored trace data) is deleted.

NOTE	This command applies to the following models having firmware revision A.05.00 or later: E4401B, E4402B, E4404B, E4405B, E4407B.

Factory Preset
and *RST: Off

Remarks: Segmented sweep will be turned off if any of the following actions occur remotely or manually:

>Factory Preset

>Full Span is activated

>Last Span is activated

>On entering a measurement (**:MEASure** subsystem commands)

While segmented sweep is on, the following functions are unavailable:

>Auto couple

>BW/Avg: RBW, VBW

>Center/Start/Stop frequency, CF Step, and frequency Offset

>Span, sweep time, and points

Front Panel
Access: **Sweep, Segmented, ON/OFF**

Set Frequency Domain Scale Type

[:SENSe]:SWEep:SPACing LINear|LOGarithmic

[:SENSe]:SWEep:SPACing?

Selects either linear or logarithmic for the frequency domain (X-axis) scale. The trace query of comma-separated values maps frequency/amplitude pairs for the mathematical interpolation of the log frequency axis. The value of **[:SENSe]:SWEep:POINts** is adjusted to reflect the acquisition of data for the given sweep span when log sweep spacing is enabled.

Factory Preset
and *RST: Linear

Remarks: Refer to the User's Guide for detailed information on the interactions of this command with other functions.

History: Added with firmware revision A.08.00.

Front Panel
Access: **FREQUENCY, Scale Type**

Sweep Time

[:SENSe]:SWEep:TIME <time>

[:SENSe]:SWEep:TIME?

Specifies the time in which the instrument sweeps the display.

Factory Preset
and *RST: ESA E4401B, E4411B: 4 ms

                ESA E4402B, E4403B: 5 ms

                ESA E4404B: 16.75 ms

                ESA E4405B: 33 ms

                ESA E4407B, E4408B: 265 ms

Range: The range depends upon the installed options, number of sweep
                points, and firmware revision of your instrument. See "Sweep
                Time Range" in the Specifications Guide for details.

Default Unit: seconds

Remarks: A span value of 0 Hz causes the analyzer to enter zero span
                mode. In zero span the X-axis represents time rather than
                frequency. In this mode, the sweep time may be set to faster
                values when Options AYX or B7D are installed.

Front Panel
Access: **Sweep, Sweep Time Auto Man**

Automatic Sweep Time

[:SENSe]:SWEep:TIME:AUTO OFF|ON|0|1

[:SENSe]:SWEep:TIME:AUTO?

Automatically selects the fastest sweep time for the current settings.

Factory Preset
and *RST: On

History: This command function changed with firmware revision
                A.08.00. With :**AUTO ON** in zero span, an error will be
                generated.

Front Panel
Access: **Sweep, Sweep Time Auto Man**

Sweep Time Mode

`[:SENSe]:SWEep:TIME:AUTO:MODE SRESponse|SANalyzer`

`[:SENSe]:SWEep:TIME:AUTO:MODE?`

Specifies the type of automatic coupling for the fastest sweep time at the current settings.

Stimulus response

Spectrum analyzer

Factory Preset
and *RST: SANalyzer

Front Panel
Access: **Sweep, Sweep Coupling SR SA**

Time Gating Delay (Option 1D6 Only)

`[:SENSe]:SWEep:TIME:GATE:DELay <time>`

`[:SENSe]:SWEep:TIME:GATE:DELay?`

Sets the delay time from when the gate trigger occurs to when the gate opens. This is for **EDGE** triggering only.

Factory Preset
and *RST: 1 μs

Range: 0.3 μs to 429 seconds

Default Unit: seconds

Front Panel
Access: **Sweep, Gate Setup, Edge Setup, Gate Delay**

Time Gate Length (Option 1D6 Only)

`[:SENSe]:SWEep:TIME:GATE:LENGth <time>`

`[:SENSe]:SWEep:TIME:GATE:LENGth?`

Specifies the gate time length in seconds; for **EDGE** triggering only.

Factory Preset
and *RST: 1 μs

Range: 0.3 μs to 429 seconds

Default Unit: seconds

Front Panel
Access: **Sweep, Gate Setup, Edge Setup, Gate Length**

Time Gate Level (Option 1D6 Only)

`[:SENSe]:SWEep:TIME:GATE:LEVel HIGH|LOW`

`[:SENSe]:SWEep:TIME:GATE:LEVel?`

Selects the level of the gate signal; this command is for LEVel triggering only.

Factory Preset
and *RST: High

Front Panel
Access: **Sweep, Gate Setup, Level Setup**

Time Gate Polarity (Option 1D6 Only)

`[:SENSe]:SWEep:TIME:GATE:POLarity NEGative|POSitive`

`[:SENSe]:SWEep:TIME:GATE:POLarity?`

Selects the polarity of the gate signal; this command is for EDGE triggering only.

Factory Preset
and *RST: Positive

Front Panel
Access: **Sweep, Gate, Edge Gate, Slope Pos Neg**

Preset Time Gate (Option 1D6 Only)

`[:SENSe]:SWEep:TIME:GATE:PRESet`

Presets the time-gated spectrum analysis capability.

Remarks: This command resets gate parameters to default values, as
                  follows:

                  Gate trigger type = edge

                  Gate polarity = positive

                  Gate delay = 1 µs

                  Gate length = 1 µs

                  Gate level = high

Control Time Gate (Option 1D6 Only)

`[:SENSe]:SWEep:TIME:GATE[:STATe] OFF|ON|0|1`

`[:SENSe]:SWEep:TIME:GATE[:STATe]?`

Turns time gating on or off.

NOTE   Time gate cannot be turned on if external trigger delay is on.

Factory Preset
and *RST: Off

Front Panel
Access: **Sweep, Gate, Gate On Off**

Time Gate Trigger Type (Option 1D6 Only)

[:SENSe]:SWEep:TIME:GATE:TYPE LEVel|EDGE

[:SENSe]:SWEep:TIME:GATE:TYPE?

Selects between edge and level mode for time-gated spectrum analysis.

Level triggers the gate when the signal surpasses a specific level, set to either low or high.

Edge triggers the gate when the edge of a signal is encountered, set to either a negative-going edge or a positive-going edge.

Factory Preset
and *RST: Edge

Front Panel
Access: **Sweep, Gate, Gate Control Edge Level**

SOURce Subsystem

The SOURce subsystem controls the signal characteristics of the tracking generator. Refer also to the "OUTPut Subsystem" on page 291 which contains a command that controls the tracking generator output.

Sets the Output Power Offset Correction

:SOURce:CORRection:OFFSet <rel_ampl>

:SOURce:CORRection:OFFSet?

Specifies an offset for the displayed output power level. An offset power level can be added to the displayed level to compensate for system losses (for example, cable loss) or gains (for example, preamplifier gain.) This offset does not change the power out of the source, it only changes the display so that it reads out the actual power delivered to the device under test.

Factory Preset
and *RST: 0 dB

Range: –327.6 dB to 327.6 dB

Default Unit: Currently selected source power units

Front Panel
Access: **Source, Amptd Offset**

Source Attenuation

:SOURce:POWer:ATTenuation <ampl>

:SOURce:POWer:ATTenuation?

Attenuates the source output level. Specifically setting
  :SOURce:POWer:ATTenuation <ampl> sets the mode to manual
(**:SOURce:POWer:ATTenuation:AUTO OFF**).

Factory Preset
and *RST: ESA E4401B, E4411B: 0 dB

                  ESA E4402B, E4403B: 8 dB

                  ESA E4404B: 8 dB

                  ESA E4405B: 8 dB

                  ESA E4407B, E4408B: 8 dB

Range: ESA E4401B, E4411B: 0 dB to 60 dB in 10 dB steps

                  ESA E4402B, E4403B: 0 dB to 56 dB in 8 dB steps

                  ESA E4404B: 0 dB to 56 dB in 8 dB steps

ESA E4405B: 0 dB to 56 dB in 8 dB steps

ESA E4407B, E4408B: 0 dB to 56 dB in 8 dB steps

Default Unit: dB

Front Panel
Access: **Source, Attenuation Auto Man**

Automatic Source Attenuation

`:SOURce:POWer:ATTenuation:AUTO OFF|ON|0|1`

`:SOURce:POWer:ATTenuation:AUTO?`

Selects if the source output level attenuator will be set automatically, or manually.

Factory Preset
and *RST: On

Front Panel
Access: **Source, Attenuation Auto Man**

Sets the Output Power

`:SOURce:POWer[:LEVel][:IMMediate][:AMPLitude] <ampl>`

`:SOURce:POWer[:LEVel][:IMMediate][:AMPLitude] UP|DOWN`

`:SOURce:POWer[:LEVel][:IMMediate][:AMPLitude]?`

Specifies the source output power level. Use :SOURce:POWer:SWEep to set the change in power level across the sweep. Also see :SOURce:POWer:STARt and OUTPut[:STATe].

CAUTION   Power-level sensitive devices connected to the tracking generator output may be accidentally damaged. This is because the actual source amplitude will be greater than the amplitude indicated on the analyzer, when the power sweep function is being used.

The source amplitude value is used as the starting amplitude for a power sweep. The ending amplitude for a power sweep is higher then the source amplitude value and it may actually be set to values beyond specified output levels. Therefore, exercise caution when connecting a power-level sensitive device to the tracking generator output.

Factory Preset
and *RST: −10 dBm

Range: ESA E4401B, E4411B with option 1DN (50 Ohm Tracking
                   Generator): −70 dBm to 3 dBm

                   ESA E4401B, E4411B with Option 1DQ (75 Ohm Tracking
                   Generator): −27.25 dBmV to 45.75 dBmV

                   ESA E4402B, E4403B: −66 dBm to 3 dBm

                   ESA E4404B: −66 dBm to 3 dBm

                   ESA E4405B: −66 dBm to 3 dBm

                   ESA E4407B, E4408B: −66 dBm to 3 dBm

Default Unit: dBm

Front Panel
Access: **Source, Amplitude On Off**

Sets the Source Output Power Mode

:SOURce:POWer:MODE FIXed|SWEep

:SOURce:POWer:MODE?

Sets the source output to be at a single amplitude (fixed) or to sweep through a
range of power levels.

Factory Preset
and *RST: Fixed

Front Panel
Access: **Source, Power Sweep On Off**

Set the Source Sweep Power Range

`:SOURce:POWer:SPAN <rel_ampl>`

`:SOURce:POWer:SPAN?`

Specifies the range of power levels through which the source output will sweep. Use `:SOURce:POWer:STARt` to set the power level at the start of the power sweep. This command is equivalent to `:SOURce:POWer:SWEep.`

Factory Preset
and *RST: 0 dB

Range: 0 dB to 20 dB

Default Unit: dB

Set the Output Power at the Start of the Sweep

`:SOURce:POWer:STARt <ampl>`

`:SOURce:POWer:STARt?`

Specifies the source output power level at the start of the power sweep. Use `:SOURce:POWer:SPAN` to set the change in power level across the sweep. This command is equivalent to
`:SOURce:POWer[:LEVel][:IMMediate][:AMPLitude]`.

CAUTION   Power-level sensitive devices connected to the tracking generator output may be accidentally damaged. This is because the actual source amplitude will be greater than the amplitude indicated on the analyzer, when the power sweep function is being used.

The source amplitude value is used as the starting amplitude for a power sweep. The ending amplitude for a power sweep is higher then the source amplitude value and it may actually be set to values beyond specified output levels. Therefore, exercise caution when connecting a power-level sensitive device to the tracking generator output.

Set the Output Power to Step Automatically

`:SOURce:POWer:STEP:AUTO OFF|ON|0|1`

`:SOURce:POWer:STEP:AUTO?`

Specifies the source power step size to be one vertical scale division when in logarithmic scale, or 10 dB when in linear scale.

Factory Preset
and *RST: On

Front Panel
Access: **Source, Amptd Step Auto Man**

Set the Output Power Step Size

:SOURce:POWer:STEP[:INCRement] <ampl>

:SOURce:POWer:STEP[:INCRement]?

Specifies the source power step size.

Default Unit: dB

Front Panel
Access: **Source, Amptd Step Auto Man**

Set the Source Sweep Power Range

:SOURce:POWer:SWEep <rel_ampl>

:SOURce:POWer:SWEep?

Specifies the range of power levels through which the source output will sweep. Use **:SOURce:POWer:STARt** to set the power level at the start of the power sweep. See also **:SOURce:POWer:SPAN**.

Factory Preset
and *RST: 0 dB

Range: 0 dB to 20 dB

Default Unit: dB

Front Panel
Access: **Source, Power Sweep On Off**

Output Power Tracking

:SOURce:POWer:TRCKing <integer>

:SOURce:POWer:TRCKing?

Adjusts the tracking of the source output with the spectrum analyzer sweep in the present resolution bandwidth.

Factory Preset
and *RST: This command is persistent. The term persistent means that the command retains the setting previously selected, even through a power cycle.

Range: Integer, 0 to 4095

Remarks: This command is not needed with the 1.5 GHz tracking generator.

Front Panel
Access: **Source, Man Track Adj**

Output Power Tracking Peak

`:SOURce:POWer:TRCKing:PEAK`

Automatically adjusts the tracking of the source output with the spectrum analyzer sweep so that the power is maximized for the present resolution bandwidth.

Remarks: This command is not applicable for the 1.5 GHz tracking generator.

Front Panel
Access: **Source, Tracking Peak**

STATus Subsystem

The STATus subsystem controls the SCPI-defined status-reporting structures.

Operation Condition Query

:STATus:OPERation:CONDition?

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

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

Operation Enable

:STATus:OPERation:ENABle<integer>

:STATus:OPERation:ENABle?

This command determines which bits in the Operation Condition Register will set bits in the Operation Event register, which also sets 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 Preset sets all bits in this enable register to 0. To have any Operation Events reported to the Status Byte Register, 1 or more bits must be set to 1.

Factory Preset
and *RST: 0

Range: Integer, 0 to 32767

Operation Event Query

:STATus:OPERation[:EVENt]?

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

NOTE The register requires that the equivalent 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 data is cleared.

Operation Negative Transition

:STATus:OPERation:NTRansition <integer>

:STATus:OPERation:NTRansition?

This command determines which bits in the Operation Condition register will set the corresponding bit in the Operation Event register when that 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.

Factory Preset
and *RST: 0

Range: Integer, 0 to 32767

Operation Positive Transition

:STATus:OPERation:PTRansition <integer>

:STATus:OPERation:PTRansition?

This command determines which bits in the Operation Condition register will set the corresponding bit in the Operation Event register when that 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.

Factory Preset
and *RST: 32767 (all 1's)

Range: Integer, 0 to 32767

Preset the Status Byte

:STATus:PRESet

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 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.

STATus:QUEStionable Subsection

This subsection controls the SCPI-defined status-reporting structures.

Questionable Calibration Condition

:STATus:QUEStionable:CALibration:CONDition?

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

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

Questionable Calibration Enable

:STATus:QUEStionable:CALibration:ENABle <integer>

:STATus: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.

Factory Preset
and *RST: 32767 (all 1's)

Range: Integer, 0 to 32767

Questionable Calibration Event Query

:STATus:QUEStionable:CALibration[:EVENt]?

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

NOTE   The register requires that the equivalent 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 data is cleared.

Questionable Calibration Negative Transition

`:STATus:QUEStionable:CALibration:NTRansition <integer>`

`:STATus:QUEStionable:CALibration:NTRansition?`

This command determines which bits in the Questionable Calibration Condition
register will set the corresponding bit in the Questionable Calibration Event
register when that 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.

Factory Preset
and *RST: 0

Range: Integer, 0 to 32767

Questionable Calibration Positive Transition

`:STATus:QUEStionable:CALibration:PTRansition <integer>`

`:STATus:QUEStionable:CALibration:PTRansition?`

This command determines which bits in the Questionable Calibration Condition
register will set the corresponding bit in the Questionable Calibration Event
register when that 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.

Factory Preset
and *RST: 32767 (all 1's)

Range: Integer, 0 to 32767

Questionable Condition

`:STATus:QUEStionable:CONDition?`

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

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

Questionable Enable

`:STATus:QUEStionable:ENABle <integer>`

`:STATus:QUEStionable:ENABle?`

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

NOTE   The preset condition is to have all bits in this enable register set to 0. To have any Questionable Events reported to the Status Byte Register, 1 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 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.

Factory Preset
and *RST: 0

Range: Integer, 0 to 32767

Questionable Event Query

`:STATus:QUEStionable[:EVENt]?`

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

NOTE   The register requires that the equivalent 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 data is cleared.

Questionable Frequency Condition

`:STATus: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.

Questionable Frequency Enable

:STATus:QUEStionable:FREQuency:ENABle <integer>

:STATus: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.

Factory Preset
and *RST: 32767 (all 1's)

Range: Integer, 0 to 32767

Questionable Frequency Event Query

:STATus:QUEStionable:FREQuency[:EVENt]?

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

NOTE   The register requires that the equivalent 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 data is cleared.

Questionable Frequency Negative Transition

:STATus:QUEStionable:FREQuency:NTRansition <integer>

:STATus:QUEStionable:FREQuency:NTRansition?

This command determines which bits in the Questionable Frequency Condition register will set the corresponding bit in the Questionable Frequency Event register when that 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.

Factory Preset
and *RST: 0

Range: Integer, 0 to 32767

Questionable Frequency Positive Transition

:STATus:QUEStionable:FREQuency:PTRansition <integer>

:STATus:QUEStionable:FREQuency:PTRansition?

This command determines which bits in the Questionable Frequency Condition register will set the corresponding bit in the Questionable Frequency Event register when that 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.

Factory Preset
and *RST: 32767 (all 1's)

Range: Integer, 0 to 32767

Questionable Integrity Condition

:STATus: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.

Questionable Integrity Enable

:STATus:QUEStionable:INTegrity:ENABle <integer>

:STATus: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.

Factory Preset
and *RST: 32767 (all 1's)

Range: Integer, 0 to 32767

Questionable Integrity Event Query

:STATus:QUEStionable:INTegrity[:EVENt]?

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

NOTE   The register requires that the equivalent 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 data is cleared.

Questionable Integrity Negative Transition

:STATus:QUEStionable:INTegrity:NTRansition <integer>

:STATus:QUEStionable:INTegrity:NTRansition?

This command determines which bits in the Questionable Integrity Condition register will set the corresponding bit in the Questionable Integrity Event register when that 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.

Factory Preset
and *RST: 0

Range: Integer, 0 to 32767

Questionable Integrity Positive Transition

:STATus:QUEStionable:INTegrity:PTRansition <integer>

:STATus:QUEStionable:INTegrity:PTRansition?

This command determines which bits in the Questionable Integrity Condition register will set the corresponding bit in the Questionable Integrity Event register when that 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.

Factory Preset
and *RST: 32767 (all 1's)

Range: Integer, 0 to 32767

Questionable Integrity Uncalibrated Enable

**:STATus:QUEStionable:INTegrity:UNCalibrated:ENABle
<integer>**

:STATus: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.

Factory Preset
and *RST: 32767 (all 1's)

Range: Integer, 0 to 32767

Questionable Integrity Uncalibrated Event Query

:STATus:QUEStionable:INTegrity:UNCalibrated[:EVENt]?

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

The register requires that the equivalent 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 data is cleared.

Questionable Integrity Uncalibrated Negative Transition

**:STATus:QUEStionable:INTegrity:UNCalibrated:NTRansition
<integer>**

:STATus:QUEStionable:INTegrity:UNCalibrated:NTRansition?

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 that 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.

Factory Preset
and *RST: 0

Range: integer, 0 to 32767

Questionable Integrity Uncalibrated Positive Transition

**:STATus:QUEStionable:INTegrity:UNCalibrated:PTRansition
<integer>**

:STATus:QUEStionable:INTegrity:UNCalibrated:PTRansition?

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 that 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.

Factory Preset
and *RST: 32767 (all 1's)

Range: integer, 0 to 32767

Questionable Negative Transition

:STATus:QUEStionable:NTRansition <integer>

:STATus:QUEStionable:NTRansition?

This command determines which bits in the Questionable Condition register will set the corresponding bit in the Questionable Event register when that 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.

Factory Preset
and *RST: 0

Range: integer, 0 to 32767

Questionable Power Condition

:STATus: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.

Questionable Power Enable

:STATus:QUEStionable:POWer:ENABle <integer>

:STATus: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.

Factory Preset
and *RST: 32767 (all 1's)

Range: integer, 0 to 32767

Questionable Power Event Query

:STATus:QUEStionable:POWer[:EVENt]?

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

NOTE   The register requires that the equivalent 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 data is cleared.

Questionable Power Negative Transition

`:STATus:QUEStionable:POWer:NTRansition <integer>`

`:STATus:QUEStionable:POWer:NTRansition?`

This command determines which bits in the Questionable Power Condition register will set the corresponding bit in the Questionable Power Event register when that 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.

Factory Preset
and *RST: 0

Range: integer, 0 to 32767

Questionable Power Positive Transition

`:STATus:QUEStionable:POWer:PTRansition <integer>`

`:STATus:QUEStionable:POWer:PTRansition?`

This command determines which bits in the Questionable Power Condition register will set the corresponding bit in the Questionable Power Event register when that 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.

Factory Preset
and *RST: 32767 (all 1's)

Range: integer, 0 to 32767

Questionable Positive Transition

`:STATus:QUEStionable:PTRansition <integer>`

`:STATus:QUEStionable:PTRansition?`

This command determines which bits in the Questionable Condition register will set the corresponding bit in the Questionable Event register when that 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.

Factory Preset
and *RST: 32767 (all 1's)

Range: integer, 0 to 32767

SYSTem Subsystem

This subsystem is used to set the controls and parameters associated with the overall system communication. These functions are not related to instrument performance.

GPIB Address

:SYSTem:COMMunicate:GPIB[1][:SELF]:ADDRess <integer>

:SYSTem:COMMunicate:GPIB[1][:SELF]:ADDRess?

Sets and queries the GPIB address.

NOTE   This command applies only to analyzers having Option A4H. Only one Option A4H can be installed in an instrument.

Factory Preset
and *RST: It is set to 18 by **:SYSTem:PRESet:PERSistent**, which sets the persistent state values to their factory defaults.

This command is persistent. The term persistent means that the command retains the setting previously selected, even through a power cycle.

Range: Integer, 0 to 30

Front Panel
Access: **System, Remote Port**

Serial Port DTR Setup

:SYSTem:COMMunicate:SERial[1]:CONTrol:DTR OFF|ON|IBFull

:SYSTem:COMMunicate:SERial[1]:CONTrol:DTR?

Sets the hardware pacing scheme. Only one Option 1AX can be installed in an instrument.

Off - holds the DTR line in the unasserted (off) condition

On - holds the DTR line in the asserted (on) condition

IBFull - selects the input buffer full mode for the DTR line. The IBFull parameter sets the DTR line to indicate when the device is ready to receive. When the number of received bytes in the input buffer of the device reaches the stop threshold, the device will unassert the DTR line. When the number of bytes has been reduced to the start threshold, the device will assert DTR indicating that it can receive input again. The device will also monitor the state of CTS and will stop transmission if the line becomes unasserted.

Factory Preset
(no *RST):   The factory default is On. This parameter is persistent, which
                 means that it retains the setting previously selected, even
                 through a power cycle.

Serial Port RTS Setup

:SYSTem:COMMunicate:SERial[1]:CONTrol:RTS OFF|ON|IBFull

:SYSTem:COMMunicate:SERial[1]:CONTrol:RTS?

Sets the hardware pacing (hand-shaking) scheme. Many high speed asynchronous
modems use this line (paired with CTS) as receive/transmit pacing. Only one
Option 1AX can be installed in an instrument.

Off - indicates that the RTS line should always be asserted

On - indicates that the RTS line should always be unasserted

IBFull - selects the input buffer full mode for the RTS line. IBFull sets the RTS
line to indicate when the device is ready to receive. When the number of
received bytes in the input buffer of the device reaches the stop threshold, the
device will unassert the RTS line. When the number of bytes has been reduced
to the start threshold, the device will assert RTS indicating that it can receive
input again. RTS is sometimes called RFR (ready for receiving). The device
will also monitor the state of CTS and will stop transmission if that line
becomes unasserted.

Factory Preset
(no *RST):   The factory default is IBFull. This parameter is persistent, which
                 means that it retains the setting previously selected, even
                 through a power cycle.

Serial Port Baud Rate Setup

:SYSTem:COMMunicate:SERial[1][:RECeive]:BAUD <baud_rate>

:SYSTem:COMMunicate:SERial[1][:RECeive]:BAUD?

Only one Option 1AX can be installed in an instrument.

Factory Preset
(no *RST):   The factory default is 9600. This parameter is persistent, which
                 means that it retains the setting previously selected, even
                 through a power cycle.

Range: Supported baud rates are
                 110|300|600|1200|2400|4800|9600|19200|38400|
                 57600|115200

Front Panel
Access: **System, Remote Port**

Serial Port Receive Pace Setup

`:SYSTem:COMMunicate:SERial[1][:RECeive]:PACE XON|NONE`

`:SYSTem:COMMunicate:SERial[1][:RECeive]:PACE?`

Set the receive pace to on or none for an instrument, with the RS-232 interface installed. Only one Option 1AX can be installed in an instrument. If no optional serial port number is specified, port 1 is assumed.

Factory Preset
(no *RST):   The factory default is none. This parameter is persistent, which means that it retains the setting previously selected, even through a power cycle.

Serial Port Transmit Pace Setup

`:SYSTem:COMMunicate:SERial[1]:TRANsmit:PACE XON|NONE`

`:SYSTem:COMMunicate:SERial[1]:TRANsmit:PACE?`

Set the transmit pace to on or none for an instrument, with the RS-232 interface installed. Only one Option 1AX can be installed in an instrument. If no optional serial port number is specified, port 1 is assumed.

Factory Preset
(no *RST):   The factory default is none. This parameter is persistent, which means that it retains the setting previously selected, even through a power cycle.

Hardware Configuration Query

`:SYSTem:CONFigure:HARDware?`

Returns string of information about the current hardware in the instrument.

Front Panel
Access: **System, Show Hardware**

Display the Hardware Configuration

`:SYSTem:CONFigure:HARDware:STATe OFF|ON|0|1`

`:SYSTem:CONFigure:HARDware:STATe?`

Shows the current hardware configuration of the instrument on the display.

Factory Preset
and *RST: Off

Front Panel
Access: **System, Show Hdwr**

System Configuration Query

:SYSTem:CONFigure[:SYSTem]?

Returns string of information about the configurations of the instrument.

Front Panel
Access: **System, Show System**

Display System Configuration

:SYSTem:CONFigure[:SYSTem]:STATe OFF|ON|0|1

:SYSTem:CONFigure[:SYSTem]:STATe?

Shows the current system configuration of the instrument on the display.

Factory Preset
and *RST: Off

Front Panel
Access: **System, Show System**

Set Date

:SYSTem:DATE <year>,<month>,<day>

:SYSTem:DATE?

Sets the date of the real-time clock of the instrument.

Year is a 4-digit integer

Month is an integer 1 to 12

Day is an integer 1 to 31 (depending on the month)

Front Panel
Access: **System, Time/Date, Set Date**

Error Information Query

:SYSTem:ERRor[:NEXT]?

This command queries the earliest entry to the error queue and then deletes that entry. *CLS clears the entire error queue.

Front Panel
Access: **System, Show Errors**

Locate SCPI Command Errors

:SYSTem:ERRor:VERBose OFF|ON|0|1

:SYSTem:ERRor:VERBose?

Adds additional information to the error messages returned by the
:SYSTem:ERRor? command. It indicates which SCPI command was executing when the error occurred and what about that command was unacceptable.

<error number>,"<error message>;<annotated SCPI command>"

The maximum length of the <annotated SCPI command> is 80 characters. If the error occurs in a SCPI command longer than 80 characters, the <Err> sentinel is placed at the end of the <annotated SCPI command>.

Example:	First set **SYST:ERR:VERBose ON**
	If the command **SENSe:FREQuently:CENTer 942.6MHz** is sent, then sending **SYST:ERR?** returns:

—113,"Undefined header;SENSe:FREQuently:<Err>CENTer 942.6MHz $<NL>"

> The <Err> shown after FREQuently shows you the spelling error. (The $<NL> is the typical representation for the command terminator.
>
> If the command **SENSe:FREQ:CENTer 942.6Sec** is sent, then sending **SYST:ERR?** returns:

—131,"Invalid suffix;SENSe:FREQuency:CENTer 942.6Sec<Err> $<NL>"

> The <Err> shown after Sec shows you the invalid suffix.

Factory Preset and *RST:	Not affected by *RST
Remarks:	The verbose SCPI error debugging state is global to all the SCPI interfaces.
History:	Added with firmware revision A.08.00.
Front Panel Access:	System, Show Errors, Verbose SCPI ON OFF

Host Identification Query

:SYSTem:HID?

This command returns a string that contains the host identification. This ID is required in order to obtain the license key that enables a new application or option.

Front Panel Access:	**System, Show System**

License Key – Install Application/Option

`:SYSTem:LKEY <"option">, <"license key">`

`:SYSTem:LKEY? <"option">`

This command enters the license key required for installing the specified new application or option. The query returns a string that contains the license key for a specified application or option that is already installed in the instrument. The license key will also be returned if the application is not currently in memory, but had been installed at some previous time.

Example: **`:SYST:LKEY "BAC", "123A456B789C"`**

An option is a three character string that specifies the option or application that is to be installed, as found in the Ordering Guide (for example, BAH for GSM Measurement Personality). The option name must be enclosed in quotes.

A license key is a 12-character hexadecimal string given with the option. The license key is unique to a specific option installed in the instrument with a specific host ID, as returned by **`:SYST:HID?`**. The license key must be enclosed in quotes.

Front Panel
Access: **System, Licensing**

Delete a License Key

`:SYSTem:LKEY:DELete <"option">`

This command allows you to delete the license key from instrument memory for the selected option.

NOTE   In general, deleting the license key number is not recommended. If the license key is deleted, you will be unable to reload or update the application in instrument memory without re-entering the license key. The license key works with one particular instrument host ID only.

Query Instrument Options

`:SYSTem:OPTions?`

Returns a list of the options that are installed.

It is a comma separated list such as: "1DS,1D6,A4H,A4J,1DN"

Front Panel
Access: **System, Show System**

Power On Elapsed Time

`:SYSTem:PON:ETIMe?`

Returns the number of seconds that have elapsed since the analyzer was turned on for the very first time.

Front Panel
Access: **System, Show System**

Power On Time

`:SYSTem:PON:TIME?`

Returns the number of milliseconds that have elapsed since the analyzer was last turned on.

Power On Type

`:SYSTem:PON:TYPE PRESet|LAST`

`:SYSTem:PON:TYPE?`

Sets the defined instrument conditions after a power-on or **Preset**.

PRESet - The instrument settings at power-on will be either the factory preset or user preset, as set by **`:SYSTem:PRESet:TYPE FACTory|USER.`**

LAST - The instrument settings at power-on will be the settings at the time of power down.

Factory Preset
and *RST: The factory default is Preset. This parameter is persistent, which means that it retains the setting previously selected, even through a power cycle.

Front Panel
Access: **System, Power On/Preset, Power On Last Preset**

Enable IF/Video/Sweep Output Ports

`:SYSTem:PORTs:IFVSweep:ENABle OFF|ON|0|1`

`:SYSTem:PORTs:IFVSweep:ENABle?`

This command enables or disables the IF, video, and sweep output ports for analyzers having options A4J (IF, Sweep, and Video Ports) and AYX (Fast Time Domain Sweeps).

Factory Preset
and *RST: On

Example: **`:SYST:PORT:IFVS:ENAB ON`**

Range: On/Off

History: Added with firmware revision A.04.00.

Remarks: Disable the output ports for faster measurement times.

Preset

:SYSTem:PRESet

Returns the instrument to a set of defined conditions. The particular set is selected by **:SYSTem:PRESet:TYPE**. This command does not change any persistent parameters. The term persistent means that the command retains the setting previously selected, even through a power cycle.

Front Panel
Access: **Preset**

Persistent State Reset

:SYSTem:PRESet:PERSistent

Sets the persistent state values to their factory defaults. The term persistent means that the command retains the setting previously selected, even through a power cycle. Examples of persistent functions are: GPIB address, power-on type, and preset type.

Front Panel
Access: **System, Restore Sys Defaults**

Preset Type

:SYSTem:PRESet:TYPE FACTory|USER|MODE

Selects the preset state to be either factory-defined or user-defined preset conditions.

Factory Preset
and *RST: The factory default is **MODE**. This parameter is persistent, which means that it retains the setting previously selected, even through a power cycle.

History: Changed with firmware revision A.08.00. Previous firmware revisions had default type **FACTory**.

Remarks: **:SYSTem:PRESet:USER:SAVE** defines the *user preset*.

Front Panel
Access: **System, Power On/Preset, Preset Type**

Save User Preset

`:SYSTem:PRESet[:USER]:SAVE`

Saves the current instrument conditions as the *user preset* condition.

Front Panel
Access: **System, Power On/Preset, Save Type Preset**

Speaker Control

`:SYSTem:SPEaker[:STATe] OFF|ON|0|1`

`:SYSTem:SPEaker[:STATe]?`

Turns the internal speaker on or off.

Factory Preset
and *RST: Off

Front Panel
Access: **Det/Demod, Demod, Speaker On Off**

Set Time

`:SYSTem:TIME <hour>,<minute>,<second>`

`:SYSTem:TIME?`

Sets the time of the real-time clock of the instrument.

Hour must be an integer 0 to 23.

Minute must be an integer 0 to 59.

Second must be an integer 0 to 59.

Front Panel
Access: **System, Time/Date, Set Time**

SCPI Version Query

`:SYSTem:VERSion?`

Returns the SCPI version number with which the instrument complies.

TRACe Subsystem

The TRACe subsystem controls access to the internal trace memory of the analyzer.

NOTE   Refer also to :**CALCulate** and :**MMEMory** subsystems for more trace and limit line commands.

Copy Trace

:TRACe:COPY <source_trace>,<dest_trace>

Transfers the source trace to the destination trace and leaves the destination trace in VIEW mode.

Source traces are: TRACE1|2|3

Destination traces are: TRACE1|2|3

Example: **:TRAC:COPY TRACE2,TRACE1**

Front Panel
Access: **View/Trace, Operations, 1 –> 3**

                  View/Trace, Operations, 2 –> 3

Transfer Trace Data

:TRACe[:DATA] <trace_name>|RAWTRACE,<definite_length_ block>|<comma_separated_ASCII_data>

:TRACe[:DATA]? <trace_name> |RAWTRACE|LLINE1|LLINE2

This command transfers trace data from the controller to the instrument. The data format is set by the command :**FORMat [:TRACe][:DATA]**. The data is comma-separated ASCII values in ASCII formatting, and a definite length block in REAL, INTeger, and UINTeger formatting.

The query returns the current values of the designated trace. The data is terminated with <NL><END> (for GPIB that is newline, or linefeed, followed by EOI set true; for RS-232 this is newline only.)

LLINE1 and **LLINE2** can only be queried; they cannot be set.

<trace_name> is **TRACE1|2|3**

NOTE   This command does not allow setting all trace points to the same amplitude value
by sending just a single value. If you need to set all trace points to the same value,
you must send the same value to each trace point.

Rawtrace data is available with **UINT,16** or **INT,32** formatting. It is unitless,
returns uncorrected ADC values, and is the fastest method of obtaining
measurement data.

Example: **:TRAC:DATA TRACE1,#41604<binary trace
                   data><LF-EOI>**

Remarks: Commands **:MMEM:STOR:TRAC** and **:MMEM:LOAD:TRAC** are
                   used to transfer trace data to, or from, the internal hard drive or
                   floppy drive of the instrument.

                   The number of points in a trace is specified by
                   [:SENSe]:SWEep:POINts. The trace data format is
                   determined by **:FORMat[:TRACe][:DATA]**, and the binary
                   data byte order is determined by **:FORMat:BORDer**.

                   If the parameter to the query is **LLINE1** or **LLINE2**, a very large
                   positive or negative value is returned at any point outside the
                   range of limit values. A large positive number is returned for an
                   upper limit, and a large negative value for lower limits. There is
                   no SCPI short form for parameters **LLINE1|LLINE2.**

Exchange Traces

:TRACe:EXCHange <trace_1>,<trace_2>

Exchanges 2 traces, point by point and leaves both in VIEW mode.

   Trace_1 choices are: TRACE1|2|3

   Trace_2 choices are: TRACE1|2|3

Example: **:TRAC:EXCH TRACE3,TRACE2**

Front Panel
Access: **View/Trace, Operations, 1 <–> 3**

                   View/Trace, Operations, 2 <–> 3

Trace Math Add

**:TRACe:MATH:ADD
<destination_trace>,<source_trace1>,<source_trace2>**

Adds the magnitudes of the two source traces and places the result in the destination trace.

Destination traces are: TRACE1|2|3

Source traces are: TRACE1|2|3

Example: **:TRAC:MATH:ADD TRACE2,TRACE1,TRACE3** is equivalent to : (trace 2 = trace 1 + trace 3)

Mean Trace Data

:TRACe:MATH:MEAN? <trace>

Returns the mean of the amplitudes of the trace amplitude elements in measurement units.

Traces are: TRACE1|2|3

Query the Signal Peaks

:TRACe:MATH:PEAK[:DATA]?

Outputs the signal peaks by frequency or by amplitude. This command uses only trace1 data.

The sort mode is determined by the command :TRACe:MATH:PEAK:SORT. The commands :CALCulate:MARKer:PEAK:EXCursion and :CALCulate:MARKer:PEAK:THReshold are used to determine what is a signal peak. To get the number of signals found meeting the specified limits, use the query :TRACe:MATH:PEAK:POINts?

Query Number of Peaks Found

:TRACe:MATH:PEAK:POINts?

Outputs the number of signal peaks identified. The amplitude of the peaks can then be queried with **:TRACe:MATH:PEAK:DATA?** This command uses only trace1 data.

Peak Sorting

:TRACe:MATH:PEAK:SORT AMPLitude|FREQuency

:TRACe:MATH:PEAK:SORT?

Determines if the signals in the **:TRACe:MATH:PEAK:DATA?** query are sorted by frequency or amplitude.

Amplitude sorts the identified peaks by descending amplitude.

Frequency sorts the identified peaks by increasing frequency.

Smooth Trace Data

`:TRACe:MATH:SMOoth <trace>`

Smooths the trace according to the number of points specified in
`:TRACe:MATH:SMOoth:POINts`. There is no equivalent front panel function.

Traces are: TRACE1|2|3, and RAWTRACE commands.

The purpose of this function is to perform a spatial video averaging as compared to
the temporal version supplied by the video-average command
`[:SENSe]:AVERage:TYPE VIDeo`. The functions of `:TRACe:MATH:SMOoth`
`<trace>` and `[:SENSe]:AVERage:TYPE VIDeo|POWer` are not
interchangeable.

Each point value is replaced with the average of the values of the selected number
of points, with half of those points located on each side of any particular point
(when possible). Refer to Figure 5-2. This figure illustrates a 401 point trace with a
smoothing number of 31. Think of the trace points as "buckets" of data. To smooth
(arbitrary) point 273, the analyzer averages buckets 258 through 287 and applies
that value to point 273.

Figure 5-2   **Smoothing With 401 Trace Points and 31 Smoothing Points**
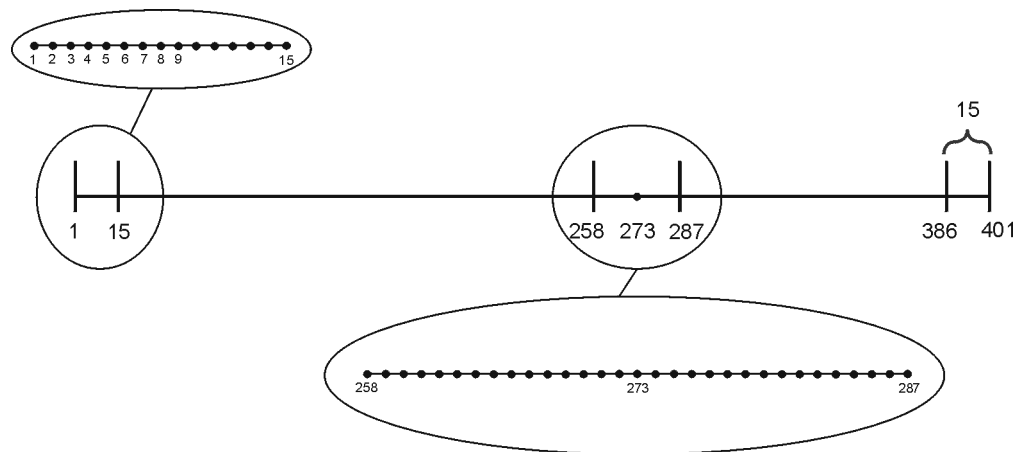
cl71a

Increasing the number of points increases smoothing at the cost
of decreasing resolution.

The amount of smoothing decreases at the end points. Because
`:TRACe:MATH:SMOoth <trace>` averages values that occur
before and after the data point in time, display irregularities can
be caused at the start and stop frequencies. To avoid possible
irregularities (signal distortion) at the ends of the trace, use
small values for the smooth parameter.

Refer to Figure 5-2 for a discussion of this end-point smoothing phenomena. With 31 smoothing points and a 401 point trace, point 16 will be the first point to have full 31-bucket smoothing. Likewise, point 385 will be the last point with full 31-bucket smoothing. Under the conditions stated, points 2 through 15 will be smoothed as follows: Point 2 is derived from averaging buckets 1 through 3. Point 3 is derived from averaging buckets 1 through 5, Point 4 is derived from averaging buckets 1 through 7, and so forth until point 16 is reached. The quantity of buckets used for the smoothing running average increases at the rate of 2 buckets per point, from point 1 to point ([smoothing number/2] + 1), at which time the full number of smoothing points is utilized. The same characteristic occurs at the completion of the trace, beginning at point 386, when the number of averaging buckets begins to decrease until point 401 is reached.

By replacing the value of each point in a trace with the average of the values of a number of points centered about that point, any rapid variations in noise or signals are smoothed into more gradual variations. It thereby performs a function similar to reducing the video bandwidth without the corresponding changes in sweep time; as such, frequency resolution is decreased. Also, signal peaks are reduced with large smoothing values; and this can cause the amplitude to appear to be less than its actual value.

Number of Points for Smoothing

`:TRACe:MATH:SMOoth:POINts <integer>`

`:TRACe:MATH:SMOoth:POINts?`

Specifies the number of points that will be smoothed in `:TRACe:MATH:SMOoth`. See that command for an explanation of how smoothing is performed.

Increasing the number of points increases smoothing at the cost of decreasing resolution. If the number of points is an even number, then the number of points is increased by one. If the number of points is larger than the number of sweep points, then the number of sweep points is used, unless the number of sweep points is even, in which case the number of points will be the sweep points minus one. The number of points smoothed is always an odd number.

Range: Integer, 3 to current number of sweep points

Trace Math Subtract

`:TRACe:MATH:SUBTract`
`<destination_trace>,<source_trace1>,<source_trace2>`

Subtracts the magnitude of the two source traces (trace 1 − trace 2) and places the result in the destination trace.

Destination traces are: TRACE1|2|3

Source traces are: TRACE1|2|3

Example: **:TRAC:MATH:SUBT TRACE3,TRACE3,TRACE2** is equivalent
to: (trace 3 = trace 3 − trace 2)

Trace Math Subtract From Display Line

:TRACe:MATH:SUBTract:DLINe <trace>

Subtracts the magnitude of the display line from the selected trace and places the
result back in the selected trace.

Trace is: TRACE1|2|3

Example: **:TRAC:MATH:SUBT:DLIN TRACE1**

is equivalent to: (trace1 = trace 1 − display line)

Front Panel
Access: **View/Trace, Operations, 2 − DL –> 2**

Select Trace Display Mode

:TRACe1|2|3:MODE WRITe|MAXHold|MINHold|VIEW|BLANk

:TRACe1|2|3:MODE?

Selects the display mode for the selected trace.

Write puts the trace in the normal mode, updating the data.

Maximum hold displays the highest measured trace value for all the data that
has been measured since the function was turned on.

Minimum hold displays the lowest measured trace value for all the data that has
been measured since the function was turned on.

View turns on the trace data so that it can be viewed on the display.

Blank turns off the trace data so that it is not viewed on the display.

Remarks:. Whenever the number of sweep points change, the following
functions are affected:

• All trace data is erased

• Any traces in view mode will go to blank mode

Front Panel
Access:. **View/Trace, Clear Write**

View/Trace, Max Hold

View/Trace, Min Hold

View/Trace, View

View/Trace, Blank

View/Trace, Normalize, Ref Trace View Blank

TRIGger Subsystem

The TRIGger subsystem is used to set the controls and parameters associated with triggering the data acquisitions. Other trigger-related commands are found in the INITiate and ABORt subsystems.

External Trigger, Line, and TV Trigger Delay Value

`:TRIGger[:SEQuence]:DELay <delay>`

`:TRIGger[:SEQuence]:DELay?`

This command sets the amount of trigger delay when using the rear panel external trigger input, the front panel input with TV trigger, or the line trigger.

Factory Preset
and *RST: 1 µs

Range: 0.3 µs to 429 seconds

Default Unit: seconds

External Trigger, Line, and TV Trigger Delay Enable

`:TRIGger[:SEQuence]:DELay:STATe OFF|ON|0|1`

`:TRIGger[:SEQuence]:DELay:STATe?`

This command allows you to turn on or off a delay, during which the analyzer will wait to begin a sweep after receiving an external trigger signal, a front panel TV trigger, or a line trigger.

Factory Preset
and *RST: Off

Default Unit: seconds

Remarks: Free-run activates the trigger condition that allows the next
                    sweep to start as soon as possible after the last sweep. This
                    function is not available when **Gate** is on.

Front Panel
Access: **Trig, Trig Delay On Off**

External Trigger Slope

:TRIGger[:SEQuence]:EXTernal[1]:SLOPe POSitive|NEGative

:TRIGger[:SEQuence]:EXTernal[1]:SLOPe?

This command activates the trigger condition that allows the next sweep to start when the external voltage (connected to **GATE TRIG/EXT TRIG IN** on the rear panel) passes through approximately 1.5 volts. The external trigger signal must be a 0 V to +5 V TTL signal. This function only controls the trigger polarity (for positive or negative-going signals).

Factory Preset
and *RST: Positive

Front Panel
Access: **Trig, External Pos Neg**

Trigger Offset

:TRIGger[:SEQuence]:OFFSet <64 bit floating point value>

:TRIGger[:SEQuence]:OFFSet?

This command sets the trigger offset.

Factory Preset
and *RST: 0 seconds

Example: **:TRIG:SEQ:OFFS 1.0s**

Range: Hardware specific; dependent upon the ADC being used, current state, and the number of sweep points.

Default Unit: seconds

Remarks: Trigger offset refers to the specified time interval before or after the trigger event from which data is to be written to the trace, and then displayed. Ordinarily, the trigger offset value is zero, and trace data is displayed beginning at the trigger event. A negative trigger offset value results in the display of trace data prior to the trigger event. A positive trigger offset value results in an effective delay in the display of trace data after the trigger event.

The trigger offset value used when the feature is enable will depend on the following parameters:

- Normal trigger offset value originally entered

- Specific instrument hardware in use

- Sweep time

- Number of sweep points

The effective trigger offset value will be re-calculated whenever any of these parameters change.

Front Panel
Access: **Trig, Trig Offset**

RF Burst Frequency Selectivity

:TRIGger[:SEQuence]:RFBurst:FSELectivity[:STATe] OFF|ON|0|1

:TRIGger[:SEQuence]:RFBurst:FSELectivity?

The RF burst circuit can sample the 21.4 MHz IF either before or after RBW filtering. When frequency selectivity is On, the RBW-filtered IF signal is used, increasing the frequency selectivity.

This command is available only when Option B7E (RF Communications Hardware) is installed.

Factory Preset
and *RST: Off

History: Added with firmware revision A.08.00.

Front Panel
Access: **Trig, More 1 of 2, RF Burst Setup, Frequency Selectivity**

RF Burst Absolute Mode Setting

:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute <ampl>

:TRIGger[:SEQuence]:RFBurst:LEVel?

Select the trigger level of the RF burst envelope signal. The value can be set to an absolute level, with the units displayed in the current y-axis units.

This command is available only when Option B7E (RF Communications Hardware) is installed.

Factory Preset
and *RST: 0 dBm

Range: −100 dBm to 100 dBm

Default Unit: dBm

History: Added with firmware revision A.08.00.

Front Panel
Access: **Trig, More 1 of 2, RF Burst Setup**

RF Burst Relative Mode Setting

:TRIGger[:SEQuence]:RFBurst:LEVel:RELative <rel_ampl>

:TRIGger[:SEQuence]:RFBurst:LEVel?

Set the trigger level when using the RF burst (wideband) trigger. The value is relative to the peak of the burst. RF burst is also known as RF envelope.

This command is available only when Option B7E (RF Communications Hardware) is installed.

Factory Preset
and *RST: −6 dB

Range: −45 dB to 0 dB

Default Unit: dB

History: Added with firmware revision A.08.00.

Front Panel
Access: **Trig, More 1 of 2, RF Burst Setup**

RF Burst Mode Setting

:TRIGger[:SEQuence]:RFBurst:LEVel:TYPE ABSolute|RELative

:TRIGger[:SEQuence]:RFBurst:LEVel:TYPE?

Select the trigger level of the RF burst envelope signal. The level can be set to either a level relative to the peak of the burst (RELative mode) or to an absolute level (ABSolute mode).

This command is available only when Option B7E (RF Communications Hardware) is installed.

Factory Preset
and *RST: Relative

History: Added with firmware revision A.08.00.

Front Panel
Access: **Trig, More 1 of 2, RF Burst Setup**

RF Burst Narrow Pulse Discriminator

:TRIGger[:SEQuence]:RFBurst:NPDiscrim[:STATe] OFF|ON|0|1

:TRIGger[:SEQuence]:RFBurst:NPDiscrim?

The narrow pulse discriminator prevents undesirable re-triggering on multiple peaks when the RF envelope has significant ripple.

Factory Preset
and *RST: Off

History: Added with firmware revision A.08.00.

Front Panel
Access: **Trig, More 1 of 2, RF Burst Setup, Narrow Pulse
                    Discriminator**

Trigger Source

```
:TRIGger[:SEQuence]:SOURce
IMMediate|VIDeo|LINE|EXTernal|RFBurst|TV
```

```
:TRIGger[:SEQuence]:SOURce?
```

Specifies the source (or type) of triggering used to start a measurement.

Immediate is free-run triggering

Video triggers on the video signal level

Line triggers on the power line signal

External allows you to connect an external trigger source

RF Burst triggers on the bursted frame

TV triggers on the selected line of a TV frame

Factory Preset
and *RST: Immediate (free-run triggering)

Remarks: Free-run activates the trigger condition that allows the next
                    sweep to start as soon as possible after the last sweep.

History: Added TV trigger mode with firmware revision A.03.00.

                    Added RF Burst mode for analyzers having Option B7E (RF
                    Communications Hardware), with firmware revision A.08.00.

Front Panel
Access: **Trig, Free Run**

                    Trig, Video

                    Trig, Line

                    Trig, External Pos Neg

                    Trig, TV

                    Trig, RF Burst

NOTE   Trigger Delay is not available in Free Run, so turning Free Run on turns off Trigger
                    Delay, but preserves the value of Trigger Delay.

Set TV Field Mode

:TRIGger[:SEQuence]:TV:FMODe ENTire|ODD|EVEN

:TRIGger[:SEQuence]:TV:FMODe?

This command allows the user to determine how the fields of the TV picture signal will be treated by the trigger system. Requires Option BAA and B7B.

Factory Preset
and *RST: ENTire (entire frame)

Range: **ENTire (entire frame)**

For formats NTSC-M, NTSC-Japan, and PAL-M, the minimum line is 1, and the maximum line is 525.

For formats PAL-B, D, G, H, I, PAL-N, PAL-N Combin, and SECAM-L, the minimum line is 1, and the maximum line is 625.

ODD (Field 1)

For formats NTSC-M, NTSC-Japan, and PAL-M, the minimum line is 1, and the maximum line is 263.

For formats PAL-B, D, G, H, I, PAL-N, PAL-N Combin, and SECAM-L, the minimum line is 1, and the maximum line is 313.

EVEN (Field 2)

For formats NTSC-M, NTSC-Japan, and PAL-M, the minimum line is 1, and the maximum line is 262.

For formats PAL-B, D, G, H, I, PAL-N, PAL-N Combin, and SECAM-L, the minimum line is 1, and the maximum line is 312.

NOTE   Refer to chapter 6, Front-Panel Key Reference, in the *Agilent ESA Spectrum Analyzers User's Guide* for a more detailed explanation of TV fields and command dependencies.

History: Added TV trigger mode with firmware revision A.03.00.

Front Panel
Access: **Trig, TV Trig Setup, Field, Entire Frame**

Trig, TV Trig Setup, Field, Field One

Trig, TV Trig Setup, Field, Field Two

Set TV Line Number for Synchronization

:TRIGger[:SEQuence]:TV:LINE <line>

:TRIGger[:SEQuence]:TV:LINE?

This command allows you to set the TV line number to which the analyzer will synchronize its sweep. Requires Option BAA and B7B.

Factory Preset and *RST:	17
Range:	The range is dependent upon the Field Mode, as described in the command **:TRIGger[:SEQuence]:TV:FMODe ENTire|ODD|EVEN** : The minimum value is the minimum line, and rolls over to the maximum value. The maximum value is the maximum line, and rolls over to the minimum value.
History:	Added TV trigger mode with firmware revision A.03.00.
Remarks:	Refer to the command :TRIGger[:SEQuence]:SOURce:TV, which is used to activate TV triggering.

Set Analyzer for TV Picture Monitoring

:TRIGger[:SEQuence]:TV:MONitor OFF\|ON\|0\|1

:TRIGger[:SEQuence]:TV:MONitor?

The currently-selected standard is used to determine the proper setup of the hardware state of the video digitization circuitry for presentation of the TV picture. Requires Option BAA and B7B.

Factory Preset and *RST:	Off
History:	Added TV trigger mode with firmware revision A.03.00.
Front Panel Access:	**Trig, TV Trig Setup, TV Monitor**

Set the Video Waveform Sync. Pulse Direction

:TRIGger[:SEQuence]:TV:SLOPe POSitive\|NEGative

:TRIGger[:SEQuence]:TV:SLOPe?

This command defines the direction of the sync pulse on the TV video waveform.

Normal baseband video has sync pulses on the bottom of the waveform (use the **NEG** parameter for more negative voltage). However, when the analyzer is used to demodulate an NTSC or PAL TV RF carrier, the detected video waveform is "upside down" with sync pulses on the top of the waveform (use the **POS** parameter for more positive voltage). When the analyzer is used to demodulate a SECAM TV RF carrier, the detected video waveform has normal polarity (use the **NEG** parameter).

Factory Preset
and *RST: POSitive

History: Added TV trigger mode with firmware revision A.03.00.

Front Panel
Access: **Trig, TV Trig Setup, Sync Pos Neg**

Select TV Signal Path

:TRIGger[:SEQuence]:TV:SOURce SANalyzer|EXTernal

:TRIGger[:SEQuence]:TV:SOURce?

This command is used to select between the internal spectrum analyzer signal path (the detected video is fed to the TV trigger), or the **EXT VIDEO IN** connector on the analyzer rear panel. Requires Option BAA and B7B.

Factory Preset
and *RST: SANalyzer

History: Added TV trigger mode with firmware revision A.03.00.

Front Panel
Access: **Trig, TV Trig Setup, TV Source, SA**

                   Trig, TV Trig Setup, TV Source, EXT Video In

Select TV Standard

:TRIGger[:SEQuence]:TV:STANdard
MNTSc|JNTSc|MPAL|BPAL|NPAL|CPAL|LSEC

:TRIGger[:SEQuence]:TV:STANdard?

This command allows you to choose one of the various TV standards. Requires Option BAA and B7B.

As the TV standard is changed, the current line value is clipped as necessary to keep it valid for the chosen standard and field mode.   For example, line 600 is selected in Entire Frame mode in PAL-N; if NTSC-M is selected, the line number is clipped to 525. Or, if line 313 is selected in Field 1 mode in PAL-N and NTSC-M is selected, the line number is clipped to 263. Changing back to the PAL-N standard will leave the line number at 263.

Factory Preset
and *RST: NTSC-M

Example: **:TRIG:SEQ:TV:STAN MNTS**

History: Added TV trigger mode with firmware revision A.03.00.

Remarks: Once this function is defined, the selected type is persistent.
                   Persistent means that it retains the setting previously selected,
                   even through a power cycle. The setting will change with "Load
                   State."

Front Panel
Access: Trig, TV Trig Setup, Standard, NTSC-M

Trig, TV Trig Setup, Standard, NTSC-Japan

Trig, TV Trig Setup, Standard, PAL-M

Trig, TV Trig Setup, Standard, PAL-B,D,G,H,I

Trig, TV Trig Setup, Standard, PAL-N

Trig, TV Trig Setup, Standard, PAL-N Combin

Trig, TV Trig Setup, Standard, SECAM-L

Video Trigger Level Amplitude

`:TRIGger[:SEQuence]:VIDeo:LEVel <ampl>`

`:TRIGger[:SEQuence]:VIDeo:LEVel?`

Specifies the level at which a video trigger will occur.

Factory Preset
and *RST: 2.5 divisions below reference level

Range: 10 display divisions below reference level to reference level

Default Unit: current amplitude units

Remarks: Video is adjusted using this command, but must also be selected
                       using the command **`:TRIGger[:SEQuence]:SOURce
                       VIDeo`**. When in FM Demod and Demod View is on, the Video
                       Trigger level is adjusted/queried using the command
                        **`:TRIGger[:SEQuence]:VIDeo:LEVel:FREQuency
                       <freq>`**.

NOTE   Trigger Delay is not available in Video trigger mode, so turning Video on turns off
                  Trigger Delay, but preserves the value of Trigger Delay.

Front Panel
Access: **Trig, Video**

Video Trigger Level Frequency

`:TRIGger[:SEQuence]:VIDeo:LEVel:FREQuency <freq>`

`:TRIGger[:SEQuence]:VIDeo:LEVel:FREQuency?`

This command is used to adjust the Video Trigger level when in FM Demod, and
Demod View is on.

Default Unit: Hz

Remote Command Reference
TRIGger Subsystem

Remarks: Video is adjusted using this command, but must also be selected using the command **:TRIGger[:SEQuence]:SOURce VIDeo**. When not in FM Demod, the Video Trigger level is adjusted/queried using the command **:TRIGger[:SEQuence]:VIDeo:LEVel <ampl>**.

NOTE   Trigger Delay is not available in Video trigger mode, so turning Video on turns off Trigger Delay, but preserves the value of Trigger Delay.

---

370   **Chapter 5**

UNIT Subsystem

Select Power Units of Measure

`:UNIT:POWer DBM|DBMV|DBUV|DBUA|V|W|A`

`:UNIT:POWer?`

Specifies amplitude units for the input, output and display.

Factory Preset
and *RST: dBm in log amplitude scale

         volts in linear amplitude scale

History: Ampere and decibel microampere units are available only with instruments having firmware revision A.06.00 and later.

Front Panel
Access: **AMPLITUDE/Y Scale, Amptd Units**

         AMPLITUDE/Y Scale, Amptd Units, dBm

         AMPLITUDE/Y Scale, Amptd Units, dBmV

         AMPLITUDE/Y Scale, Amptd Units, dBμV

         AMPLITUDE/Y Scale, Amptd Units, Volts

         AMPLITUDE/Y Scale, Amptd Units, Watts

         AMPLITUDE/Y Scale, Amptd Units, Amps

         AMPLITUDE/Y Scale, Amptd Units, dBμA

6 Menu Maps

This chapter provides a visual representation of the front panel keys and their associated menu keys (Spectrum Analysis mode is selected). Refer to Chapter 2 , "Front-Panel Key Reference," on page 35 for key function descriptions.

What You Will Find in This Chapter

This chapter provides menu maps for all front-panel keys except those associated with the measurements available when you press the front-panel **MEASURE** key (refer to Chapter 7, "One-Button Measurement Functions," on page 399 for these menus). The Alpha Editor Menu is shown separately, though it is accessed when entering data for many keys. The front-panel key menus appear in alphabetical order as follows:

Alpha Editor Menu

Alpha Editor Menus

Alpha Editor 1 a

Alpha Editor 2 b

Alpha Editor

A B C D E F G
H I J K L M N
O P Q R S T U
V W X Y Z

Alpha Editor

A B C D E F G
H I J K L M N
O P Q R S T U
V W X Y Z
More 1 of 2

Alpha Editor

a b c d e f g
h i j k l m n
o p q r s t u
v w x y z
More 2 of 2

Alpha Editor 3 c

Alpha Editor

A B C D E F G
H I J K L M N
O P Q R S T U
V W X Y Z
$\beta \Delta \Sigma \Omega$
Space
More 1 of 3

Alpha Editor

a b c d e f g
h i j k l m n
o p q r s t u
v w x y z
$\pi \rho \tau \mu$
Space
More 2 of 3

Alpha Editor

( ) : ; , ' "
_ ! ? ~
+ - * / < > =
| / \ { } [ ]
@ # $ % ^ &
Space
More 3 of 3

a. The Alpha Editor 1 menu is used to configure system options and licensing.
b. The Alpha Editor 2 menu is used to name files.
c. The Alpha Editor 3 menu is used to change titles on the display.

AMPLITUDE Y Scale Menu
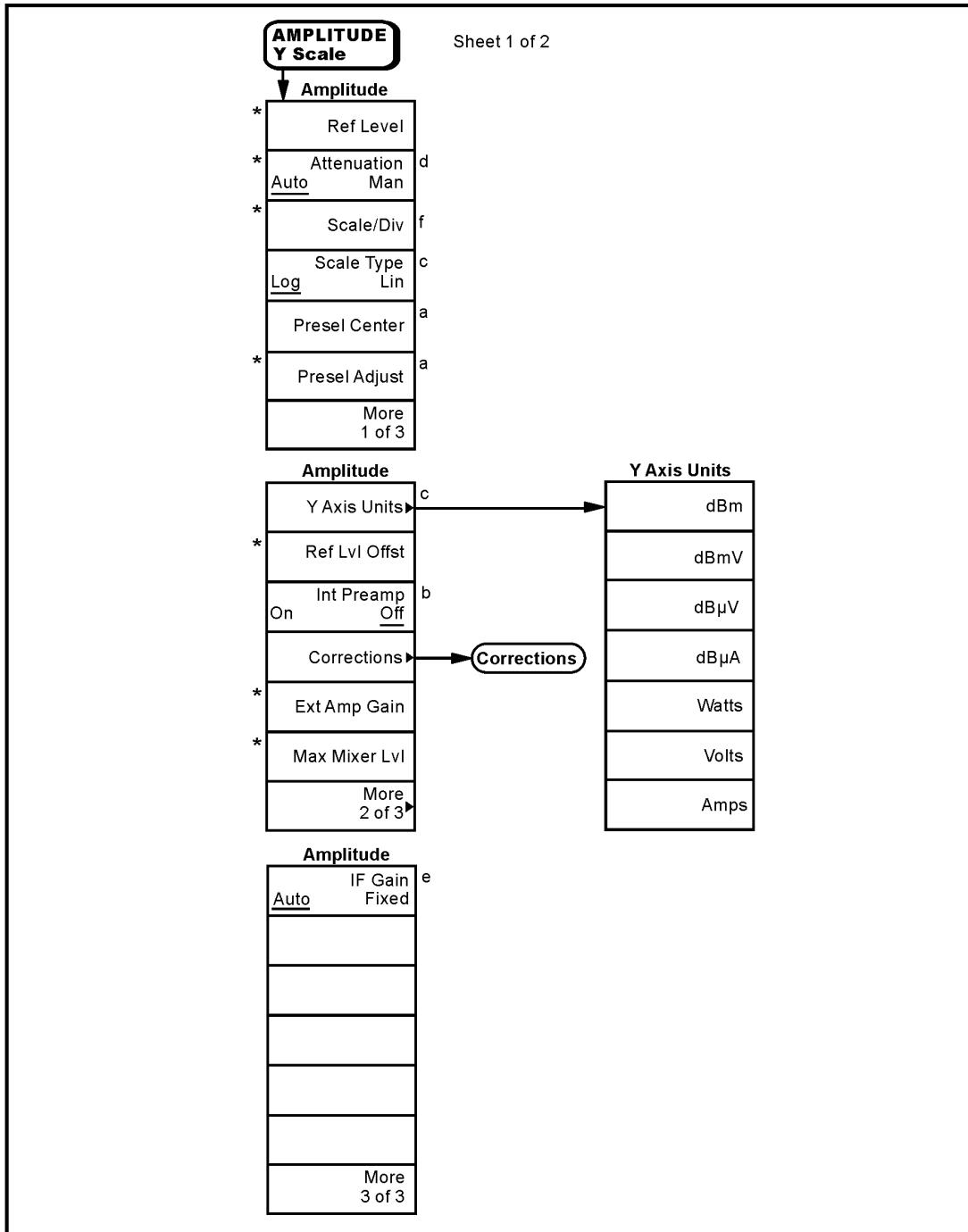
a. Agilent E4404B, E4405B, E4407B and E4408B only
b. ESA-E Series only (E4401B, E4402B, E4404B, E4405B and E4407B)
c. Grayed out in FM Demod. **Demod View (On)**
d. Not available in External Mixing Mode (Option AYZ)
e. Available only with Option 1DR (Narrow Resolution Bandwidth) and firmware revision $\geq$ A.06.00
f. Grayed out when Demod View is accessed through Option 106 (Bluetooth FM Demodulation)
* An active function which allows data entry

pl749b

Amplitude Y Scale: Corrections Menu

(Corrections)   Sheet 2 of 2

Corrections
Apply
Corrections
Yes   No
Antenna
[Off]
Cable
[Off]
Other
[Off]
User
[Off]

More
1 of 2

Antenna
Correction
On   Off

Edit ▶

Delete
Correction

Cable
Correction
On   Off

Edit ▶

Delete
Correction

Other
Correction
On   Off

Edit ▶

Delete
Correction

User
Correction
On   Off

Edit ▶

Delete
Correction

Corrections
Freq Interp
Log   Lin

Delete All
Corrections
More
2 of 2

Edit
* Point
1
* Frequency
300 MHz
* Amplitude
2 dB

Delete Point

Edit
* Point
1
* Frequency
300 MHz
* Amplitude
2 dB

Delete Point

Edit
* Point
1
* Frequency
300 MHz
* Amplitude
2 dB

Delete Point

Edit
* Point
1
* Frequency
300 MHz
* Amplitude
2 dB

Delete Point

* An active function which allows data entry

pl750b

Auto Couple Menu

PhNoise Opt

Auto
Optimize £(f)
Optimize LO for Fast Tuning

Auto Couple

Auto Couple

Auto All
PhNoise Opt [a] Auto   Man
Detector Auto   Man
Avg Type Auto   Man

Average Type

Auto
Video Avg
Pwr Avg

Detector

Auto
Average
Peak
Sample
Negative Peak
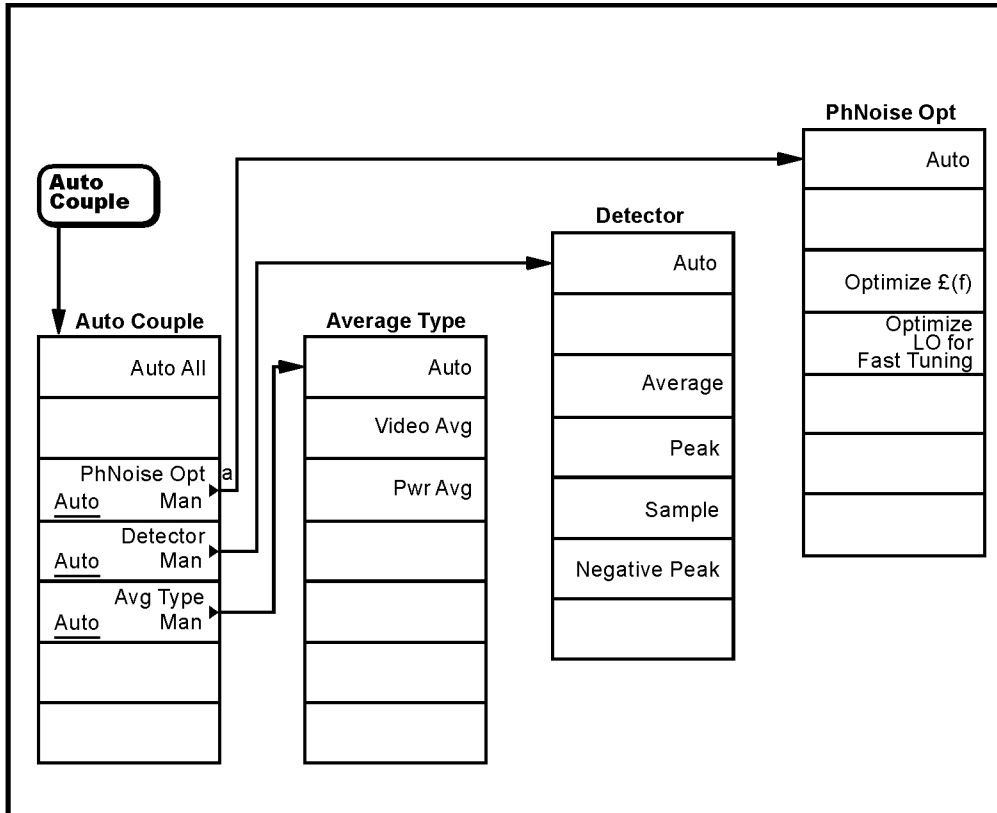
a. Not available on models E4401B and E4411B.

pl753b

BW/Avg Menu
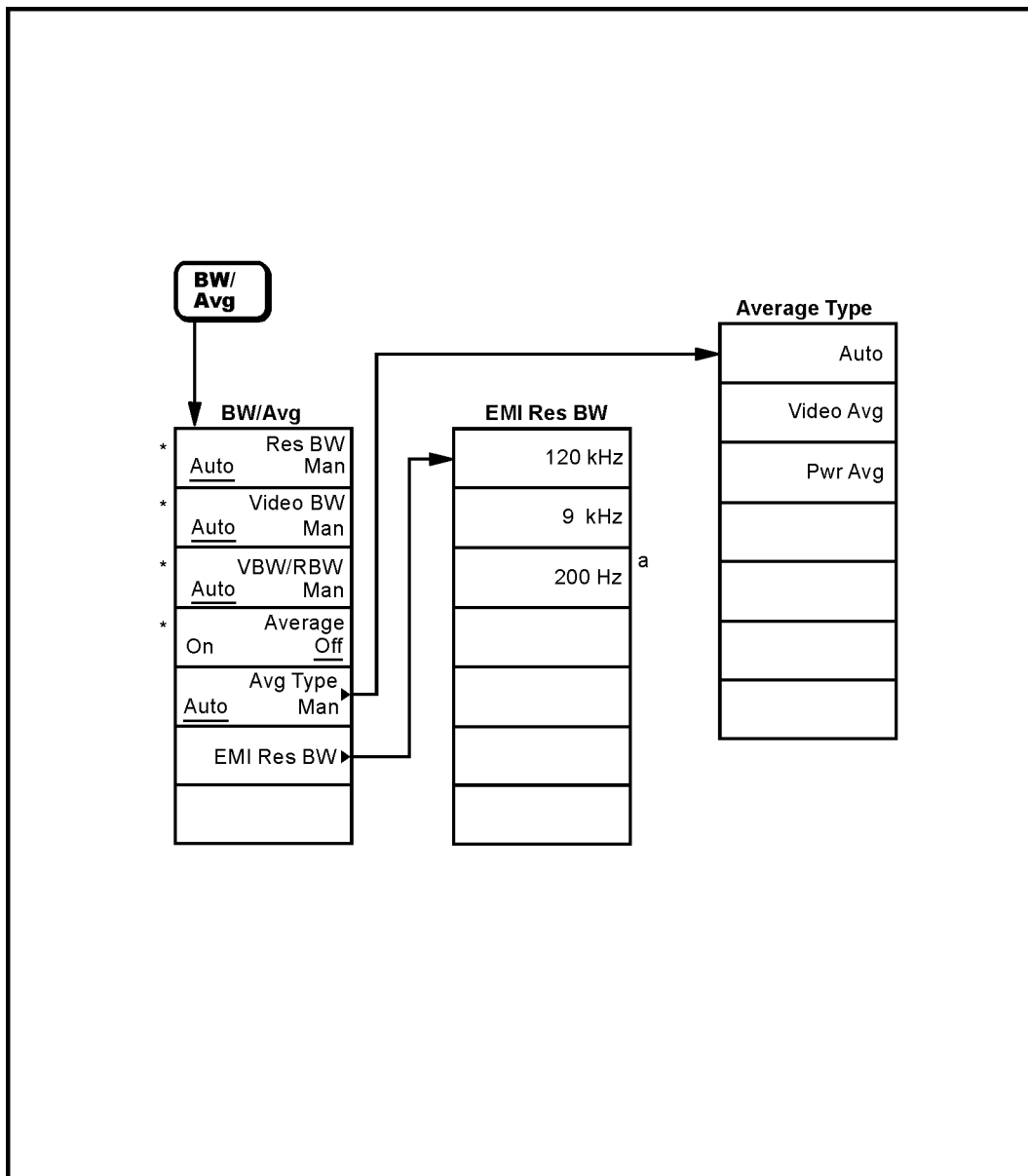
a. Available only with Option 1DR (narrow resolution bandwidth) and spans < 5MHz
* An active function which allows data entry

pl754b

Det/Demod Menu
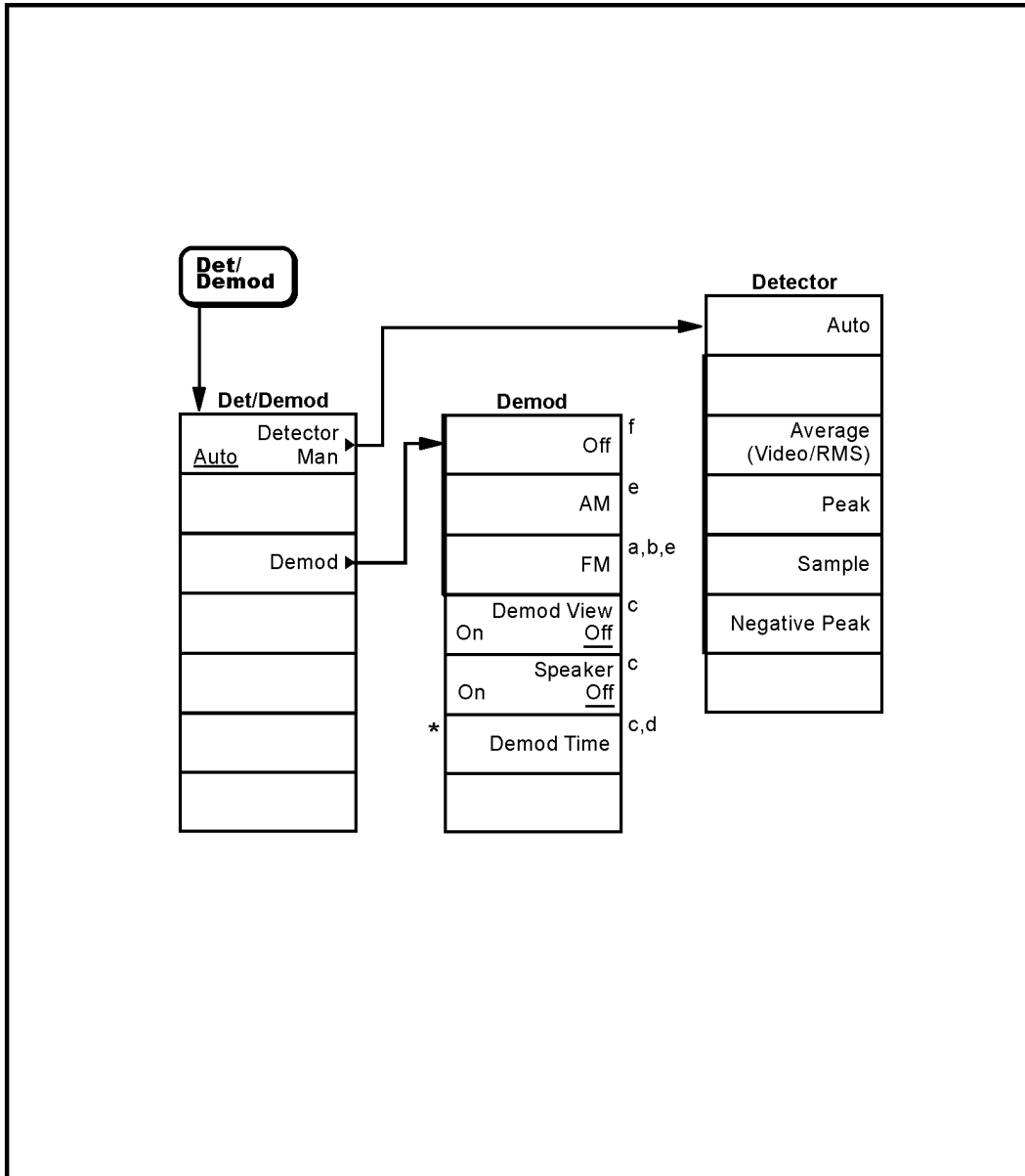
a. Agilent ESA-E Series only (E4401B, E4402B, E4404B, E4405B and E4407B)
b. Available only with Option BAA (FM Demod) or Option 106 (Bluetooth FM Demodulation)
c. Grayed out unless **AM** or **FM Demod** is on
d. Grayed out when span = 0 Hz
e. Turns the speaker on
 f. Turns the speaker off
* An active function which allows data entry

pl756b

Display Menu
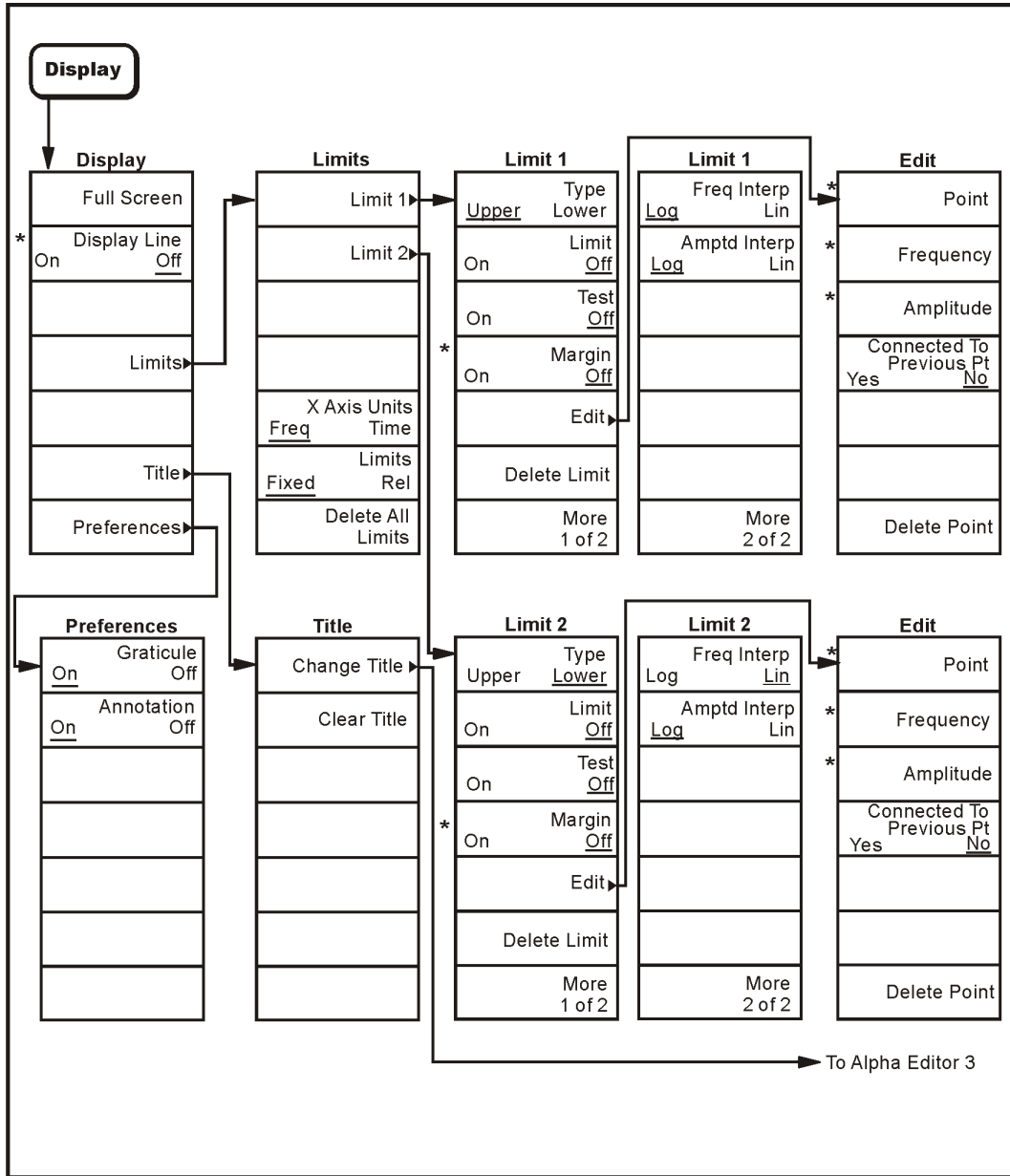
* An active function which allows data entry

pl758b

File Menus (1 of 3)

File   Sheet 1 of 3

File

Catalog▶
Save▶
Load▶ ᵇ
Delete▶ ᵇ
Copy▶ ᶜ
Rename▶ ᶜ
More 1 of 2

Catalog

Type▶
Sort▶
Dir Up
Dir Select

Sort

By Date
By Name
By Extension
By Size
Order Up / Down

Type

All
Setup
State
Trace
Limits
Screen
More 1 of 2

Type

Corrections
Measurement Results
More 2 of 2

File

Create Dir▶ ᶜ
Format▶ ᶜ
More 2 of 2

To Alpha Editor 2 ◀

Save

Save Now
Type▶
Format▶ ᵈ
Source▶ ᵉ
Name▶
Dir Up
Dir Select

Type

Setup
State
Trace
Limits
Screen
More 1 of 2

Type

Corrections
Measurement Results
More 2 of 2

(When Type = Trace)
Source

Trace 1
Trace 2
Trace 3
All Traces

(When Type = Corrections)
Source

Antenna
Cable
Other
User

(When Type = Limits)
Source

Limit 1
Limit 2

(When Type = Trace)
Format

Trace + State
CSV

(When Type = Screen)
Format

Bitmap
Metafile
Reverse Bitmap
Reverse Metafile

a. Grayed out if no directory selected.
b. Continued on sheet 1 of 3.
c. Continued on sheet 3 of 3.
d. Available only when **Type** is set to **Trace** or **Screen**.
e. Available only when **Type** is set to **Trace**, **Limits**, or **Corrections**.

pl761b

File Menus (2 of 3)

File   Sheet 2 of 3

File
- Catalog ▶ b
- Save ▶ b
- Load ▶
- Delete ▶
- Copy ▶ c
- Rename ▶ c
- More 1 of 2

Load
- Load Now
- Type ▶
- Sort ▶
- Destination ▶ d
- Dir Up
- Dir Select

Sort
- By Date
- By Name
- By Extension
- By Size
- Order Up/Down a

Type
- Setup
- State
- Trace
- Limits
- More 1 of 2

Type
- Corrections
- Measurement Results
- More 2 of 2

File
- Create Dir ▶ c
- Format ▶ c
- More 2 of 2

Delete
- Delete Now
- Type ▶
- Sort ▶
- Dir Up
- Dir Select

Type
- All
- Setup
- State
- Trace
- Limits
- Screen
- More 1 of 2 a

(When Type = Trace) Destination
- Trace 1
- Trace 2
- Trace 3

(When Type = Limits) Destination
- Limit 1
- Limit 2

Sort
- By Date
- By Name
- By Extension
- By Size
- Order Up/Down

Type
- Corrections
- Measurement Results
- More 2 of 2

a. Grayed out if no directory selected.
b. Continued on sheet 1 of 3.
c. Continued on sheet 3 of 3.
d. Only available when **Type** is set to **Trace** or **Limits**.

pl73d

File Menus (3 of 3)

```
┌──────┐
│ File │   Sheet 3 of 3
└──────┘
   │
   ▼
```

File
- Catalog ▸ b
- Save ▸ b
- Load ▸ c
- Delete ▸ c
- Copy ▸
- Rename ▸
- More 1 of 2

Copy
- Copy Now
- Type ▸
- Sort ▸
- From / Dir To
- Dir Up
- Dir Select

Sort
- By Date
- By Name
- By Extension
- By Size
- Up / Order Down

Type
- All
- Setup
- State
- Trace
- Limits
- Screen
- More 1 of 2

Type
- Corrections
- Measurement Results
- More 2 of 2

File
- Create Dir ▸
- Format ▸
- More 2 of 2

Rename
- Rename Now
- Type ▸
- Sort ▸
- Name ▸
- Dir Up
- Dir Select

Sort
- By Date
- By Name
- By Extension
- By Size
- Up / Order Down

Type
- All
- Setup
- State
- Trace
- Limits
- Screen
- More 1 of 2

Type
- Corrections
- Measurement Results
- More 2 of 2

Format
- Format Now

Create Dir
- Create Dir Now
- Name ▸
- Dir Up
- Dir Select

To Alpha Editor 2

a. Grayed out if no directory selected.
b. See sheet 1 of 3.
c. Continued on sheet 2 of 3.

pl760b

Freq Count (Marker) Menu

```
           ┌─────────┐
           │ Freq    │ a
           │ Count   │
           └─────────┘
                │
                ▼
           Freq Count
        ┌──────────────┐
        │ Marker Count │
        │ On      Off  │
      * ├──────────────┤
        │  Resolution  │
        │ Auto     Man │
        ├──────────────┤
        │              │
        ├──────────────┤
        │              │
        ├──────────────┤
        │              │
        ├──────────────┤
        │              │
        ├──────────────┤
        │              │
        └──────────────┘
```
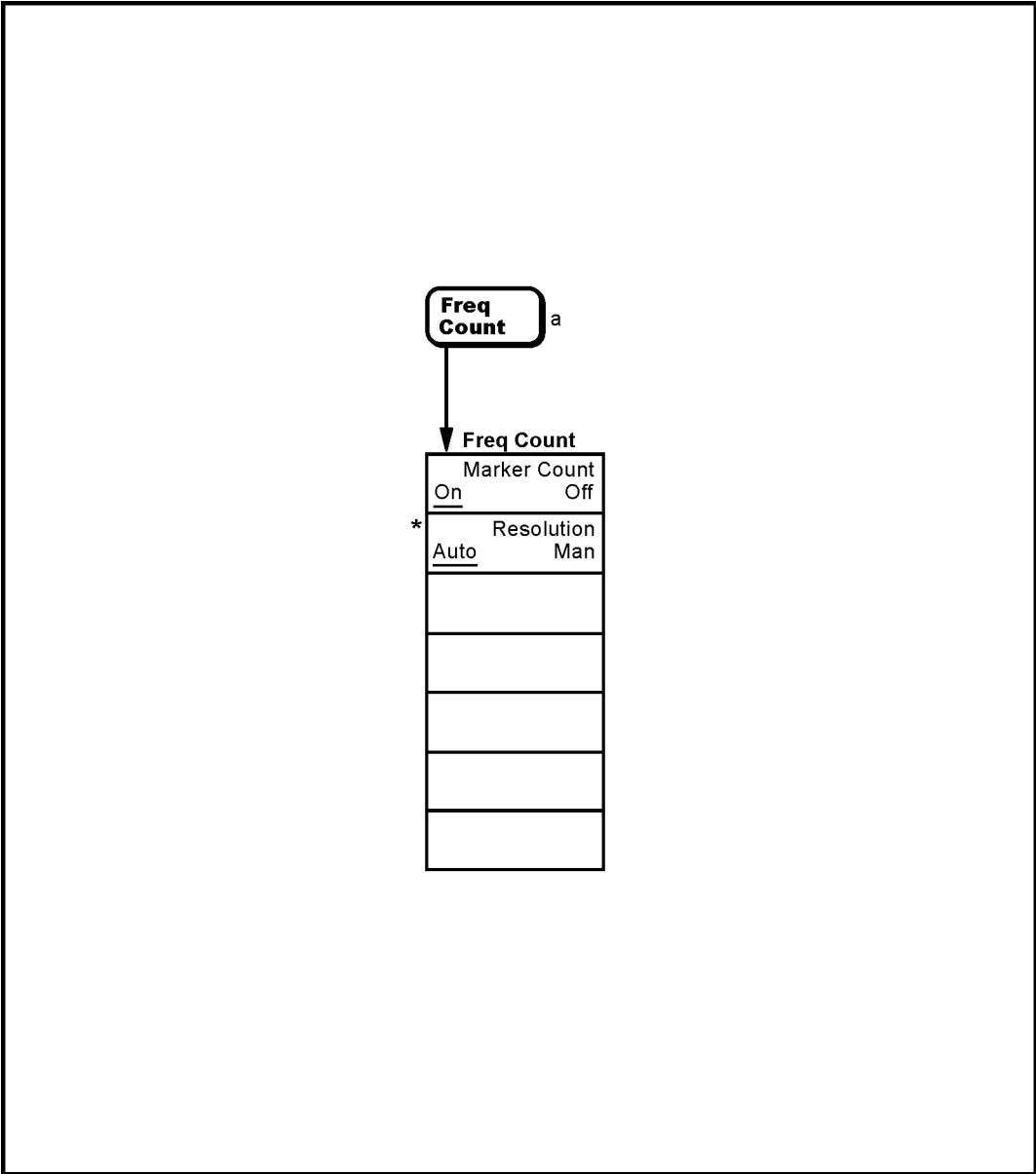
* An active function which allows data entry

a. Not available when **Frequency, Scale Type (Log)** is selected.

pl76

FREQUENCY Channel Menu

```
┌─────────────┐
│ FREQUENCY   │
│ Channel     │
└─────────────┘
        │
        ▼
    Freq/Channel
  ┌──────────────────┐
* │   Center Freq    │
  ├──────────────────┤
* │   Start Freq     │
  ├──────────────────┤
* │   Stop Freq      │
  ├──────────────────┤
* │   CF Step        │
  │ Auto        Man  │
  ├──────────────────┤
* │   Freq Offset    │ a
  ├──────────────────┤
  │   Signal Track   │
  │ On          Off  │
  ├──────────────────┤
  │   Scale Type     │ b
  │ Log         Lin  │
  └──────────────────┘
```
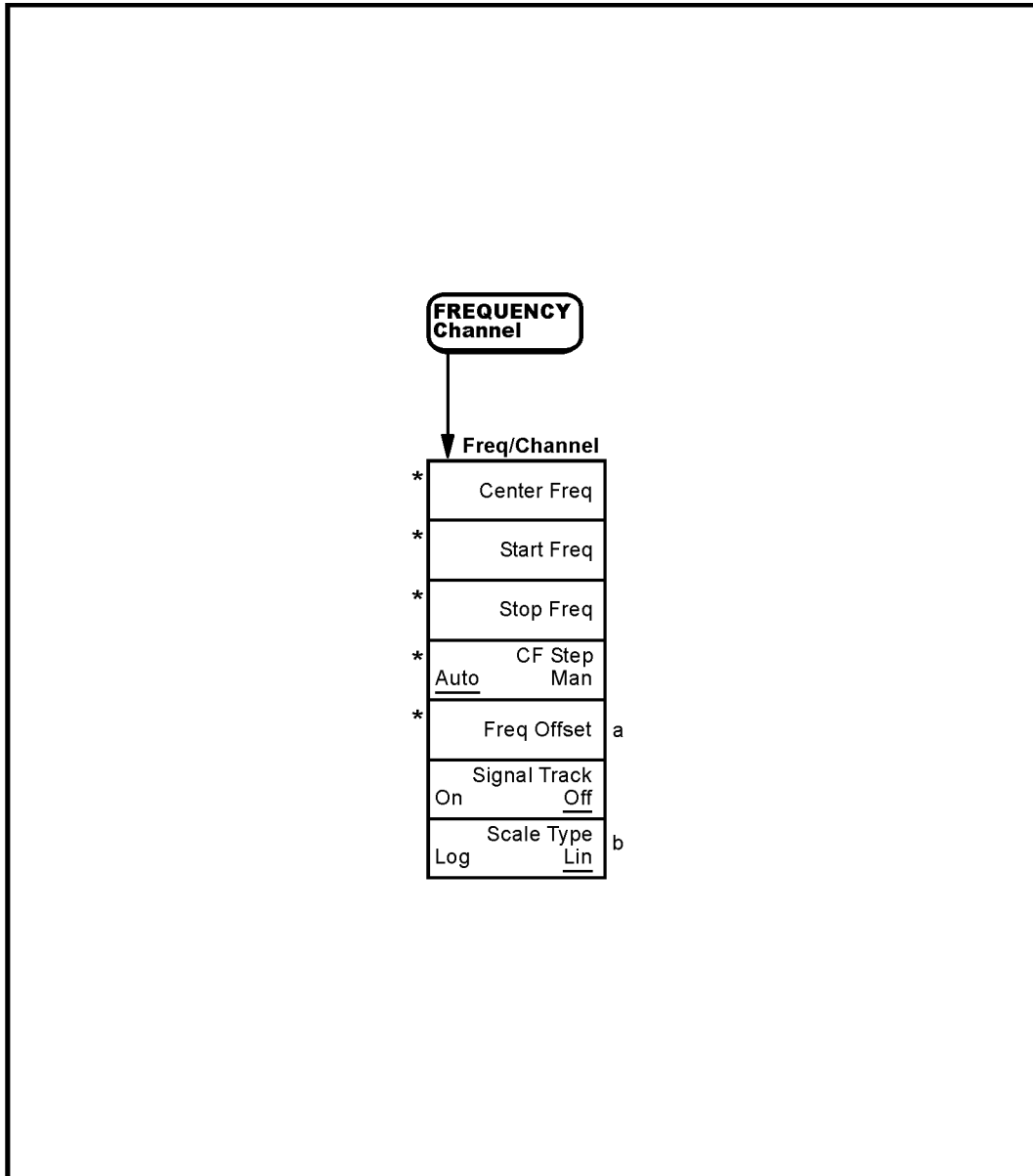
a. Not available when **FREQUENCY, Scale Type (Log)** is selected.
b. Agilent ESA-E Series only (E4401B, E4402B, E4405B and E4407B)
* An active function which allows data entry

pl763b

Input/Output Menu


```
Input/
Output
```

Input/Output
- Input Z Corr 50 Ω 75 Ω
- Coupling AC DC — a
- Amptd Ref Out (f = 50 MHz) On Off — b
- Input Mixer ▶ — d,f

Input Mixer
- Input Mixer Int Ext — g
- Ext Mix Band ▶ — e
- Signal Ident On Off — e
- Signal ID Mode ▶ — e
- Mixer Config ▶ — e

Ext Mix Band
- 18-26.5 GHz (K) — c
- 26.5-40 GHz (A)
- 33-50 GHz (Q)
- 40-60 GHz (U)
- 50-75 GHz (V)
- 60-90 GHz (E) — c
- More 1 of 3

Ext Mix Band
- 75-110 GHz (W) — c
- 90-140 GHz (F) — c
- 110-170 GHz (D) — c
- 140-220 GHz (G) — c
- 170-260 GHz (Y) — c
- 220-325 GHz (J) — c
- More 2 of 3

Mixer Config
- * Harmonic Auto Man
- Mixer Type Presel Unpre
- * Mixer Bias On Off — c

Signal ID Mode
- Image Supress
- Image Shift

Ext Mix Band
- User
- More 3 of 3

a. Agilent E4402B or E4407B with Option UKB, E4404B, and E4405B only
b. Key label is **Amptd Ref** for E4401B and E4411B
c. Grayed out if **Mixer Type** is **Presel**
d. E4407B Option AYZ (External Mixing) only
e. Grayed out if **Input Mixer** is **Int**
f. Grayed out if the Tracking Generator is on
   (**Source, Amplitude (On)**) or **Internal Preamp (On)**
   is selected.
g. Not available when **Frequency, Scale Type (Log)** is selected.
* An active function which allows data entry

pl729b

Marker Menu

Marker

Marker

Select Marker
1   2   3   4

*   Normal

*   Delta

*   Delta Pair
Ref   Delta

*   Span Pair
Span   Center

Off

More
1 of 2

Marker

Select Marker
1   2   3   4

Marker Trace
Auto   1   2   3

Readout▶

Function▶

Marker Table
On   Off

Marker All Off

More
2 of 2

Readout

Frequency

Period

Time

Inverse Time   a

Function

Band Power

Marker Noise

Off
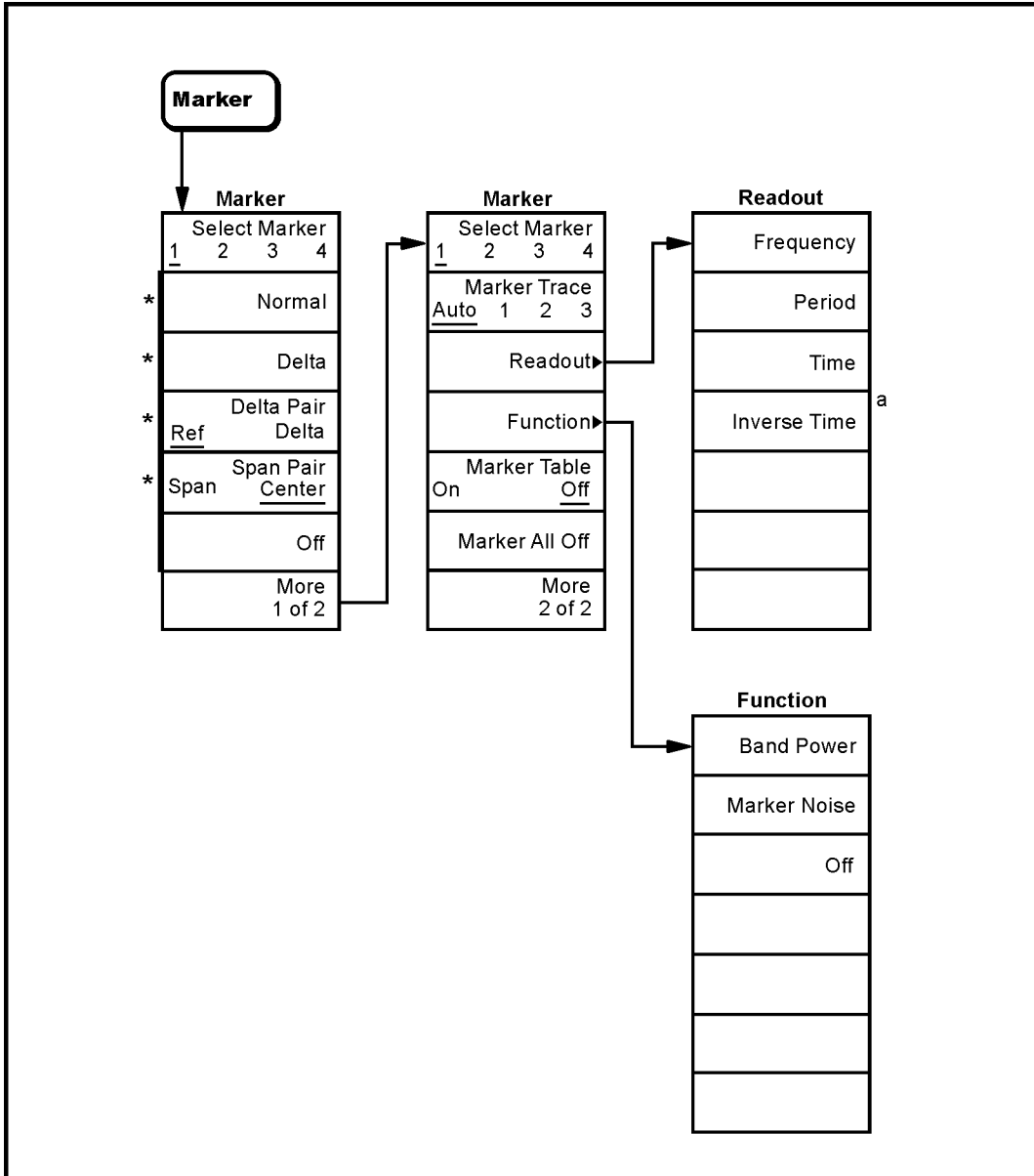
a. Available in zero span with **Marker Delta** active.

* An active function which allows data entry

pl764b

Marker → Menu
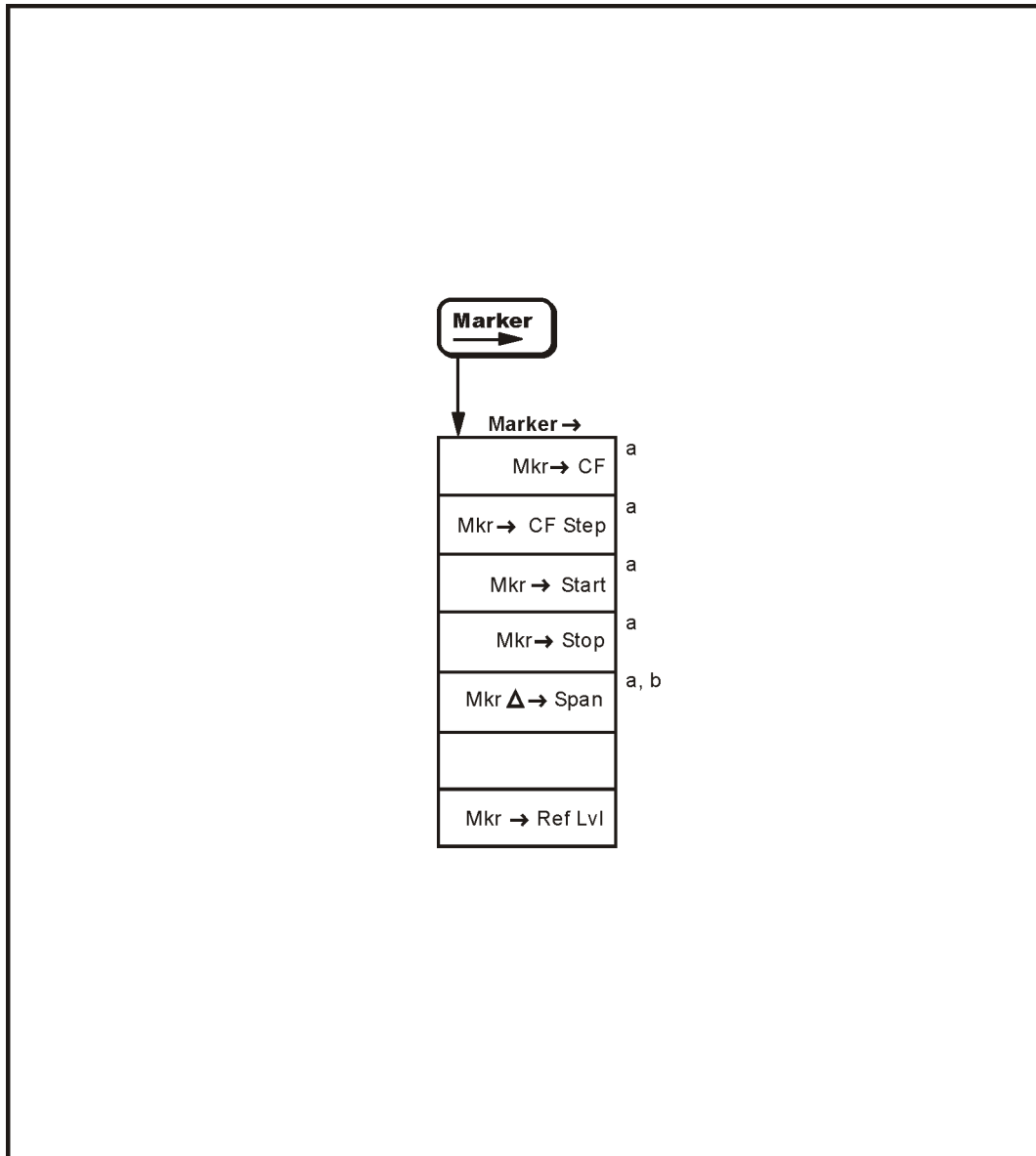
a. Not active when **span** is set to zero (Zero Span)
b. Active only when **Marker**, **Delta** is selected.

pb910a

Peak Search Menu

Peak
Search

Peak Search

Meas Tools▶
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk - Pk Search
More 1 of 2

Peak Search

*	Continuous Pk On Off
*	N dB Points On Off
	Search Criteria▶
	Peak Table▶
	More 2 of 2

Search Param

*	Peak Excursion
*	Peak Threshold
	Peak Search Type▶

Pk Srch Type

Max Value
Excursion & Threshold

Meas Tools

	Peak Search
	Next Pk Right
	Next Pk Left
*	Delta
	Mkr ➜ CF a
	Mkr ➜ Ref Lvl
	Function▶

Peak Table

Peak Table On   Off
Peak Sort Freq   Amptd
Peak Readout▶

Peak Readout

Normal
> Display Line
< Display Line

Function

Band Power
Marker Noise
Off

* An active function which allows data entry
a. Unavailable in zero span

pl777b

Preset Menu

Preset ^a

Preset

| User Preset |
| Mode Preset |
| Factory Preset |
| |
| Save User Preset |
| |
| |
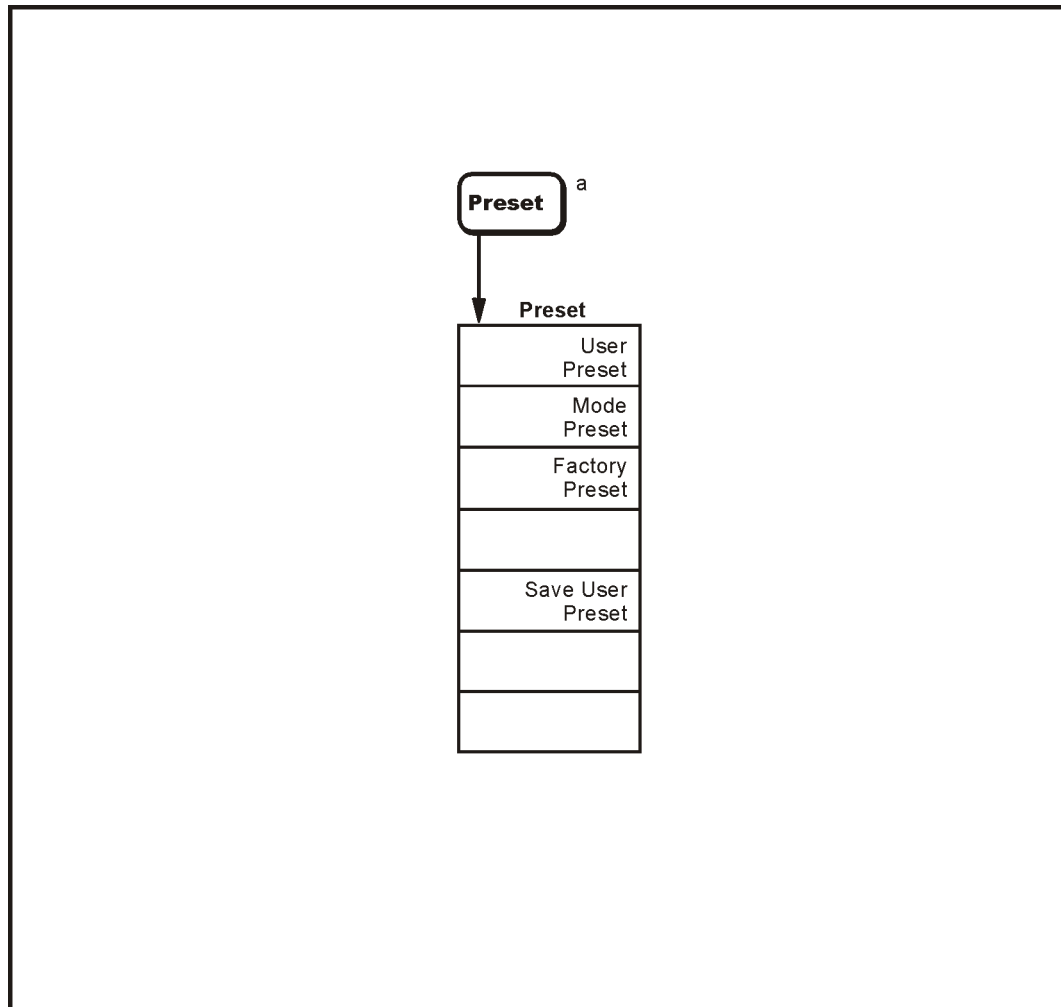
a. Appears only when Preset is set to User in the **System, Power On/Preset, Preset Type** menu. Otherwise **Preset** performs a **Factory Preset**.

pl768b

Print Setup Menu

Print
Setup

Print Setup

Printer Type
Auto

Define Custom b

Orientation
Portrait a

Prints/Page
1   2

Eject Page

More
1 of 2

Print Setup

Page Size
Letter

Color
On   Off c

More
2 of 2

Print Setup

Executive

Letter

Legal

Ledger

A4

A3

Orientation

Portrait

Landscape

Define Custom

Language
PCL3   PCL5

Color Capable
Yes   No

Printer Type

None

Custom

Auto
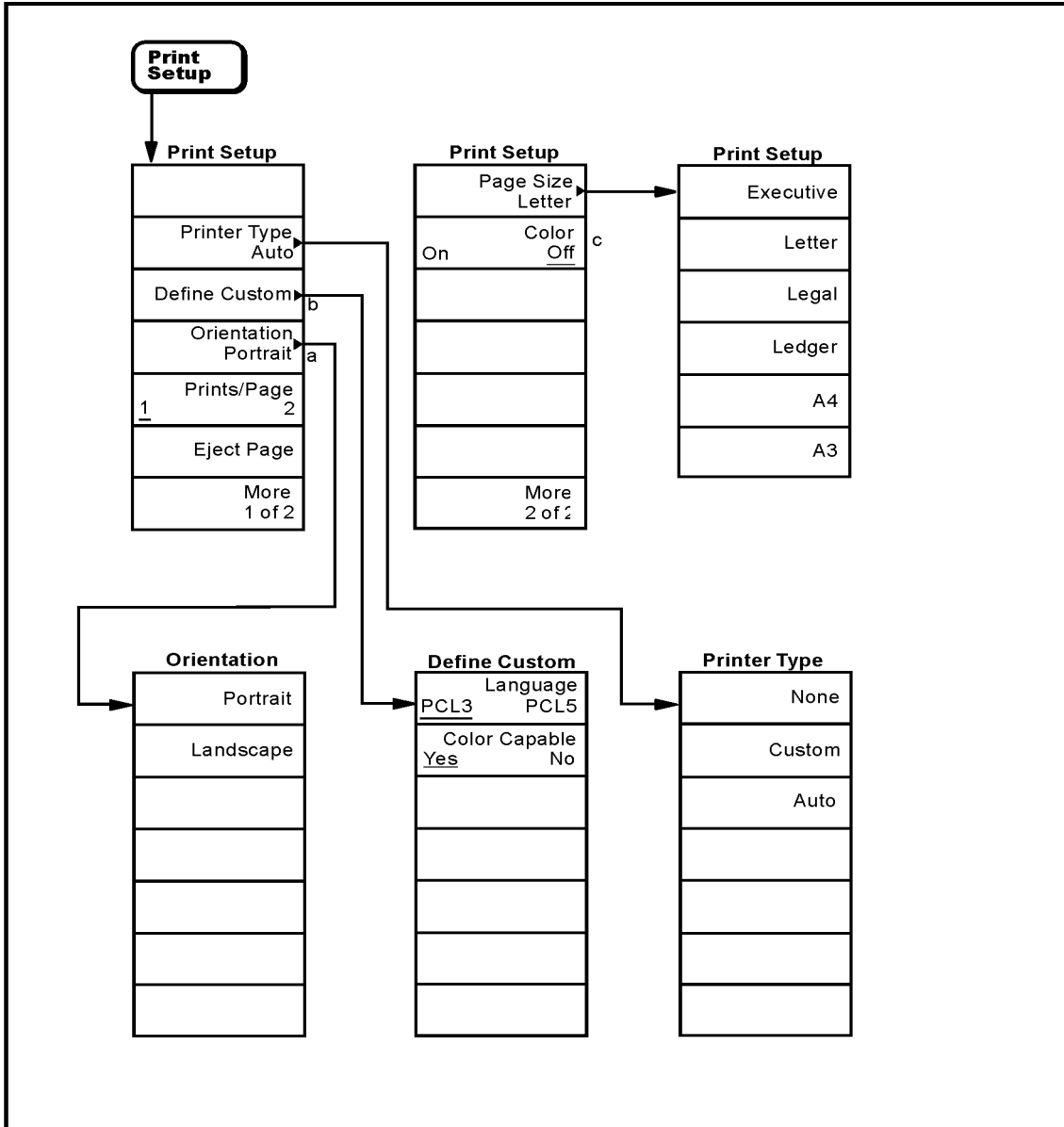
a. Available only with PCL5 printers.
b. Grayed out unless **Custom** is selected in the **Printer Type** menu.
c. Available only with color printers.

pl792a

Source Menu
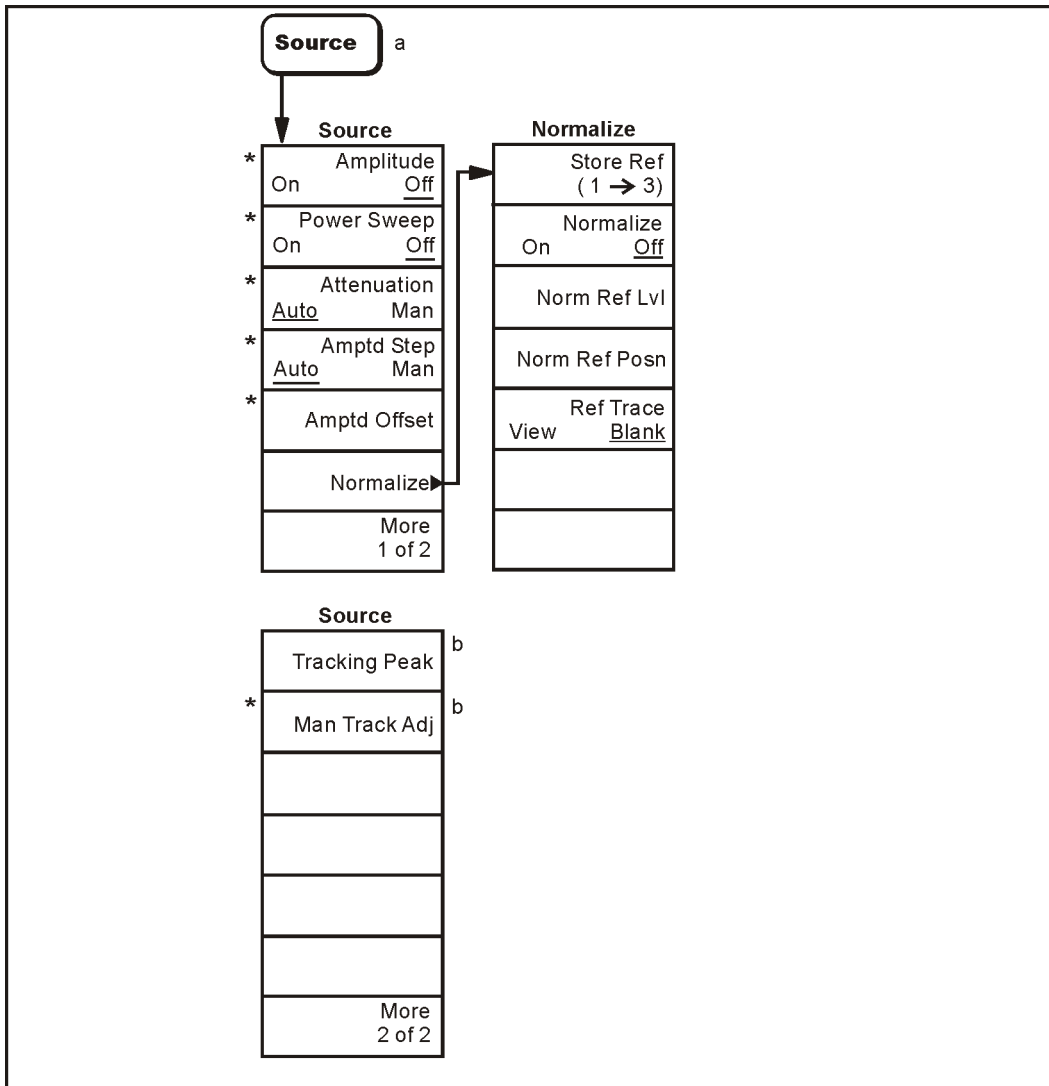
a. Source menu available only with Option 1DN or Option 1DQ installed

b. Agilent E4402B, E4403B, E4404B, E4405B, E4407B and E4408B only

* An active function which allows data entry

pl779b

SPAN (X Scale) Menu
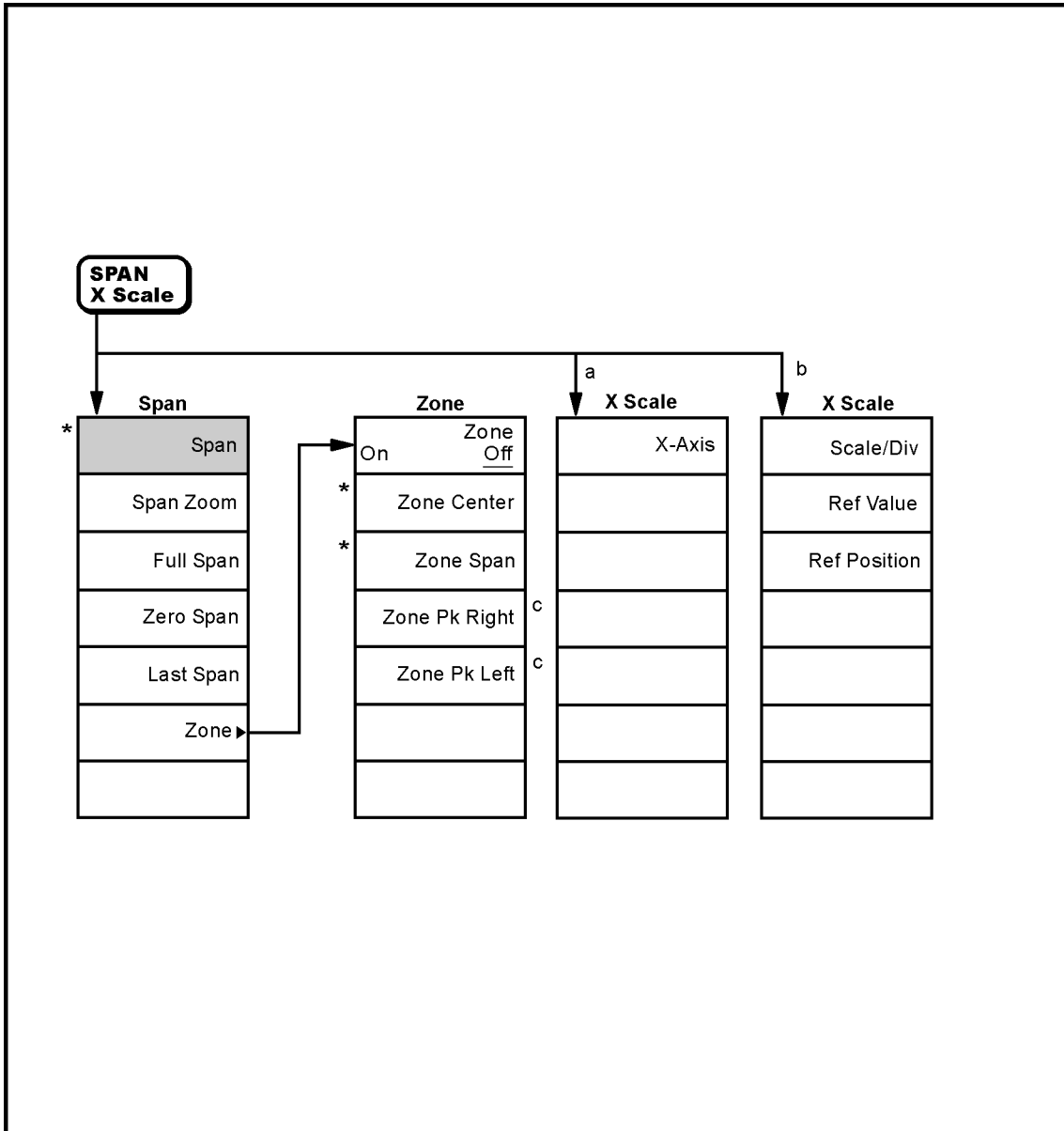
a. Appears only when **Power Stat CCDF** is selected in the **MEASURE** menu.
b. Appears only when **Spectrum Emission Mask** is selected in the **MEASURE** menu.
c. Available only when the upper window is active.
∗ An active function which allows data entry.

pl714a

Sweep Menu
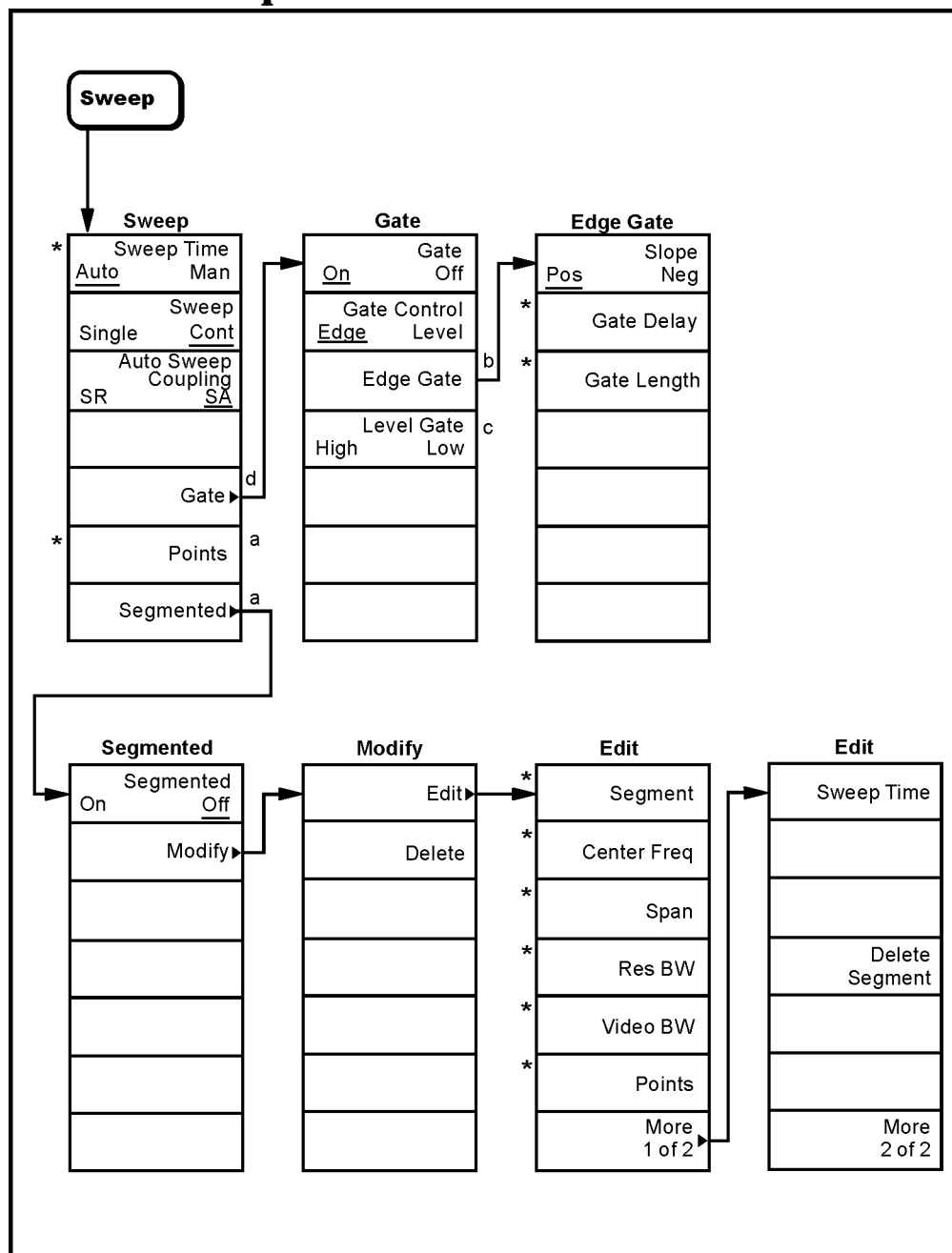
a. Agilent ESA-E Series only (E4401B, E4402B, E4404B, E4405B and E4407B)
b. Grayed out unless **Edge** is selected as **Gate Control**
c. Grayed out unless **Level** is selected as **Gate Control**
d. Agilent ESA - E Series only with Option 1D6 (Time Gated Spectrum Analysis) (E4401B
   E4402B, E4404B, E4405B and E4407B)
* An active function which allows data entry

pl769b

System Menu
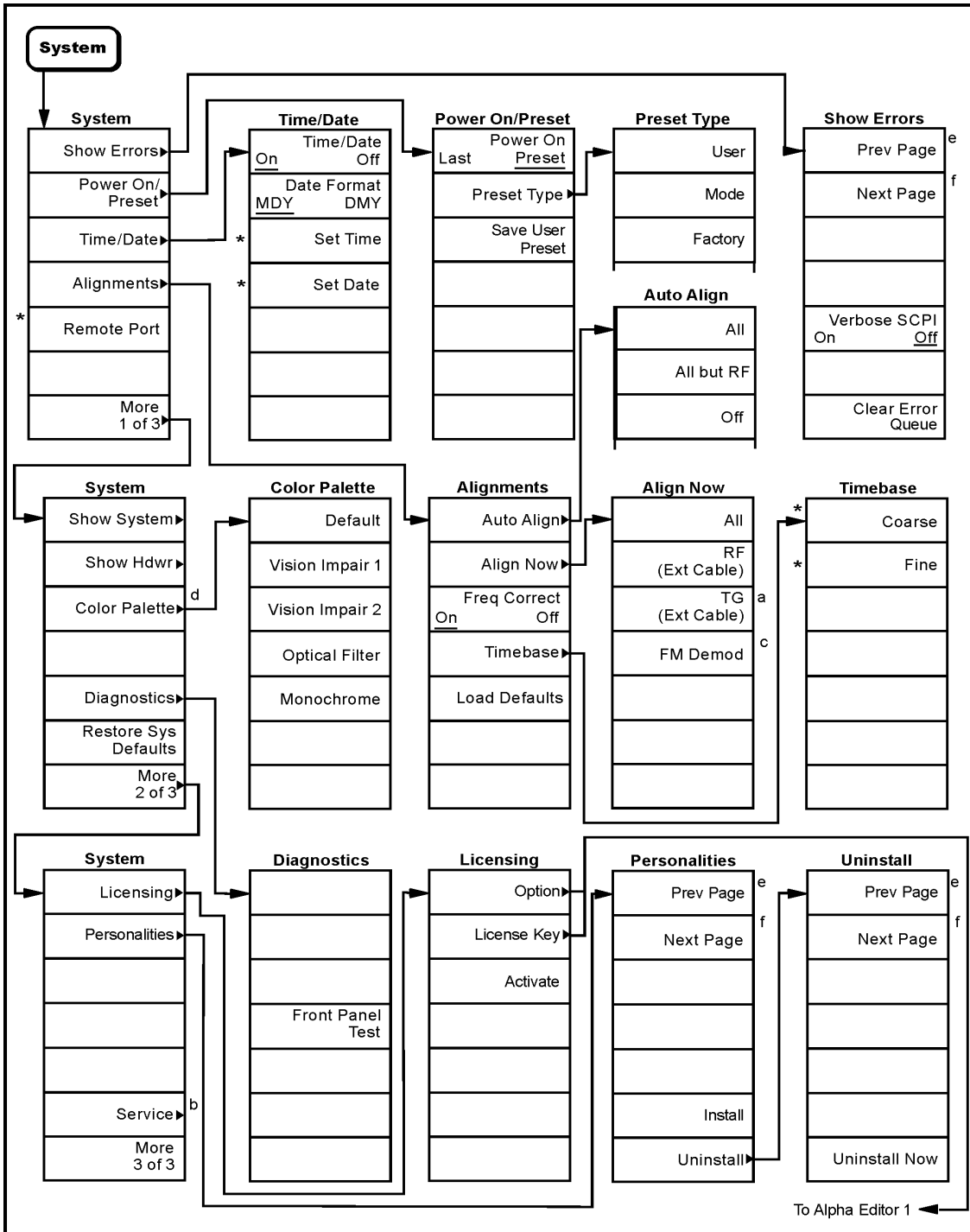
a. Agilent E4402B, E4403B, E4404B, E4405B, E4407B and E4408B with Option 1DN only
b. For Service menus, refer to the ESA Spectrum Analyzers Service Guide
c. Available only with Option BAA (FM Demodulation)
d. Agilent ESA-E series only (E4401B, E4402B, E4404B, E4405B, and E4407B)
e. Grayed out when on the last page or if there is only one page
f. Grayed out when on the first page or if there is only one page
∗ An active function which allows data entry

pl774b

Trace/View Menu

Trace/View   Sheet 1 of 7

Trace

Trace
1   2   3
Clear Write
Max Hold
Min Hold
View
Blank
More 1 of 2

Trace

Operations ▶
Normalize ▶
More 2 of 2

Normalize

Store Ref (1 ➜ 3)
Normalize On   Off
* Norm Ref Lvl
* Norm Ref Posn
Ref Trace View   Blank

Operations

1 <-> 2
2 - DL ➜ 2
2 <-> 3
1 ➜ 3
2 ➜ 3
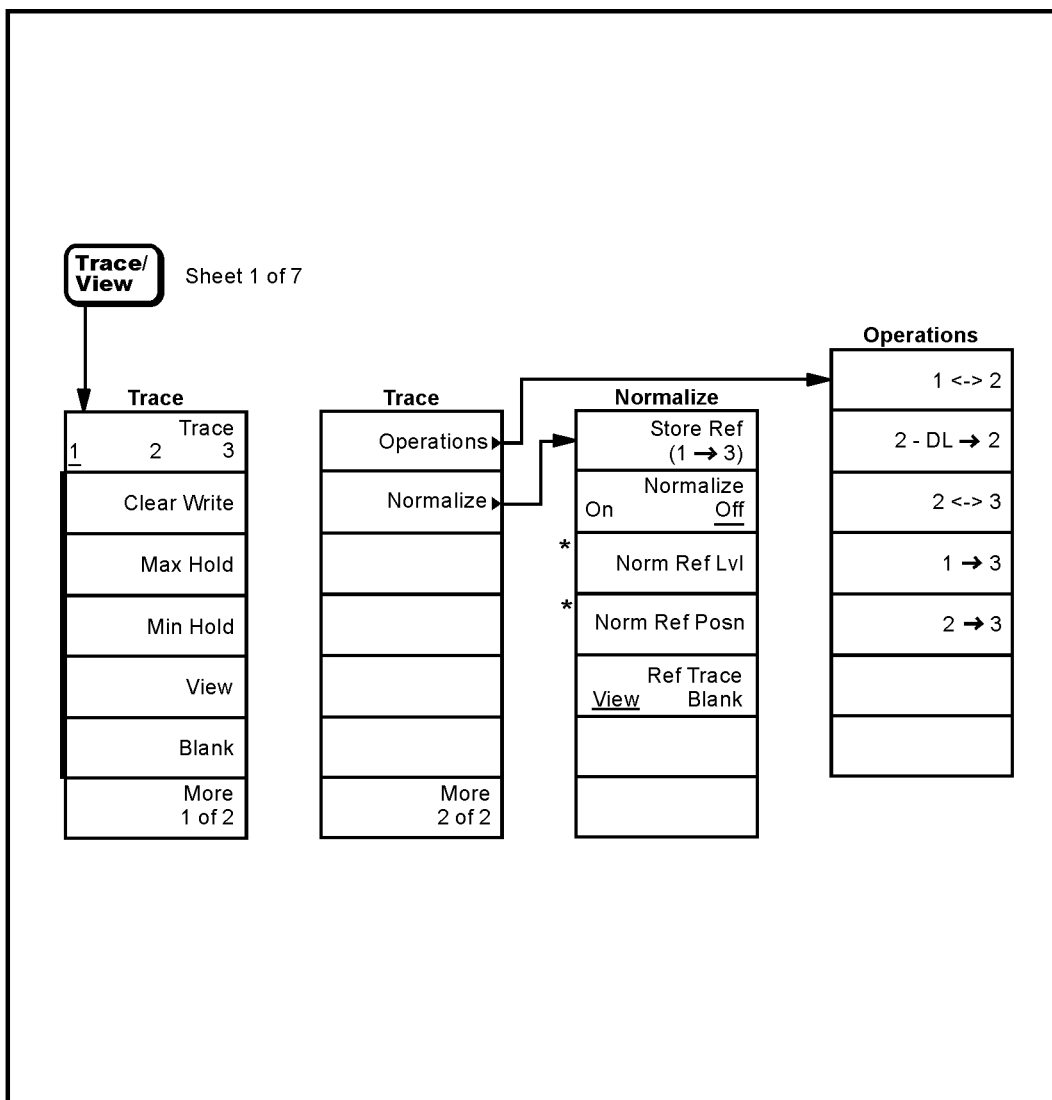
* An active function which allows data entry

pl778b

Trig Menu
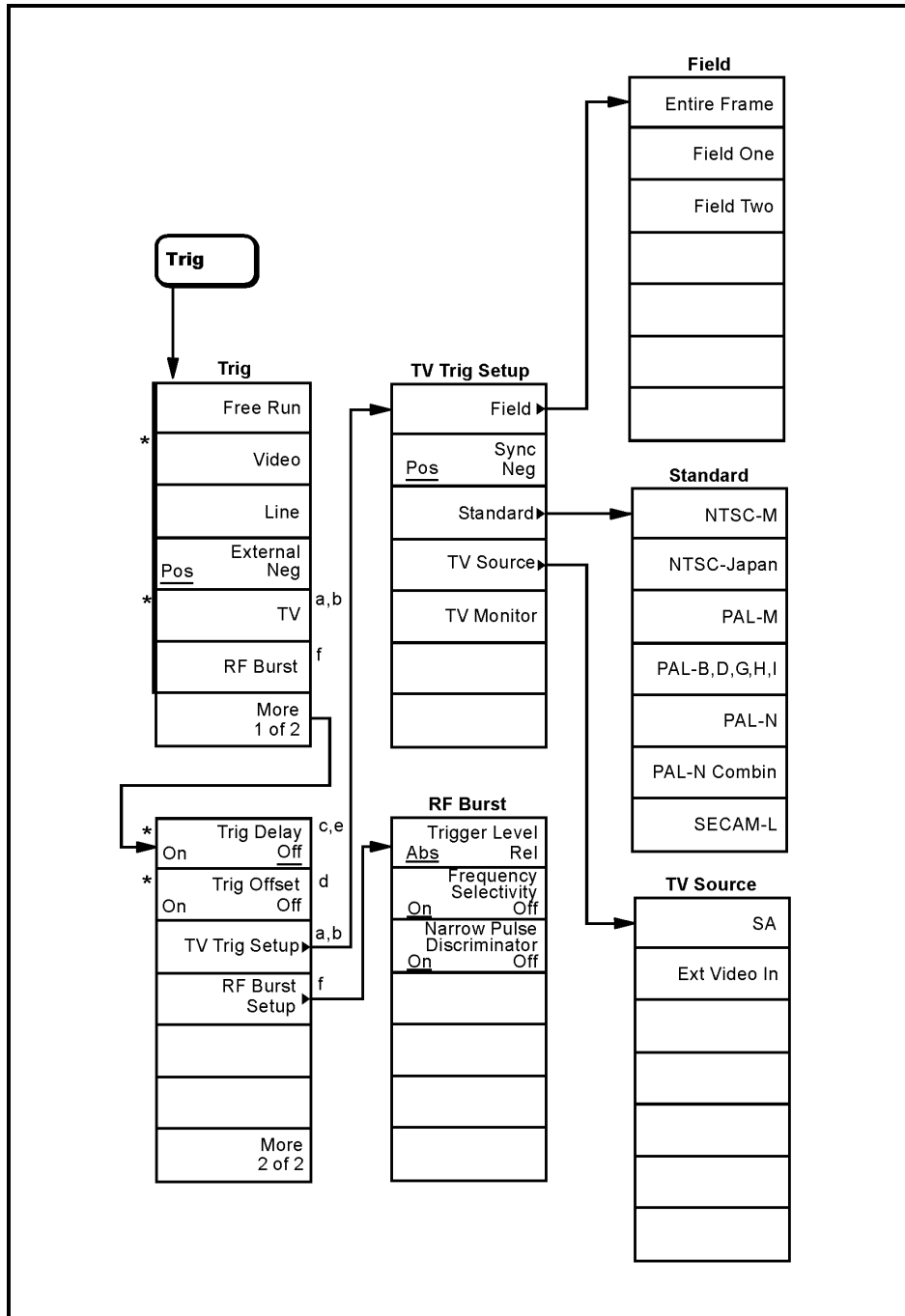
Field

Entire Frame
Field One
Field Two

Trig

Free Run
Video
Line
External Pos Neg
TV
RF Burst
More 1 of 2

TV Trig Setup

Field ▶
Sync Pos Neg
Standard ▶
TV Source ▶
TV Monitor

Standard

NTSC-M
NTSC-Japan
PAL-M
PAL-B,D,G,H,I
PAL-N
PAL-N Combin
SECAM-L

RF Burst

Trigger Level Abs Rel
Frequency Selectivity On Off
Narrow Pulse Discriminator On Off

TV Source

SA
Ext Video In

Trig Delay On Off
Trig Offset On Off
TV Trig Setup ▶
RF Burst Setup ▶
More 2 of 2

a. Agilent ESA-E Series only (E4401B, E4402B, E4404B, E4405B, and E4407B)
b. Available only with Option B7B (TV Trigger and Picture on Screen)
c. Trig Delay cannot be turned on if Gate is turned on
d. Available only in zero span and in resolution bandwidths ≥ 1 kHz
e. Available only in **Line** and **External** trigger modes
f. Available only with Option B7E (RF Communications Hardware)
✱ An active function which allows data entry

pl772b

7 One-Button Measurement Functions

This chapter provides you with menu maps, functional descriptions, and remote programming commands for all measurements available to you when you press the front-panel **Measure** key (Spectrum Analysis mode is selected). Use the following table to locate the menus you wish to view and Table 7-1 on page 427 to locate the key descriptions and programming commands for these measurements.

7.1 One-Button Measurement Menu Maps

This section provides a visual representation of all front-panel key menus associated with the measurements available when you press the front-panel **Measure** key. The key menus common to all measurements (**Measure**, **Meas Control**, and **Mode Setup**) are presented first. Then, the key menus unique to each measurement are displayed. Use the table below to locate the menus of interest.

Menu Map	Location	Menu Map	Location
Measure	Page 401	**Mult-Carrier Power Menus**	
Meas Control	Page 402	**Meas Setup**	Page 418
Mode Setup	Page 403	**Trace/View**	Page 419
ACP Menus		**Occupied BW Menus**	
Meas Setup	Page 404	**Meas Setup**	Page 420
Trace/View	Page 405	**Spectrum Emission Mask Menus**	
Burst Power Menus		**Display**	Page 423
Meas Setup	Page 406	**Marker**	Page 425
Trace/View	Page 407	**Meas Setup**	Page 421
CCDF Menus (Power Stat)		**Span X Scale**	Page 424
Display	Page 410	**Trace/View**	Page 422
Marker	Page 412	**Spurious Emissions Menus**	
Meas Setup	Page 408	**Meas Setup**	Page 426
Span X Scale	Page 411		
Trace/View	Page 409		
Channel Power Menus			
Meas Setup	Page 413		
Trace/View	Page 414		
Harmonic Distortion Menus			
Meas Setup	Page 415		
Trace/View	Page 416		
Intermod (TOI) Menus			
Meas Setup	Page 417		

7.1.1   MEASURE Key
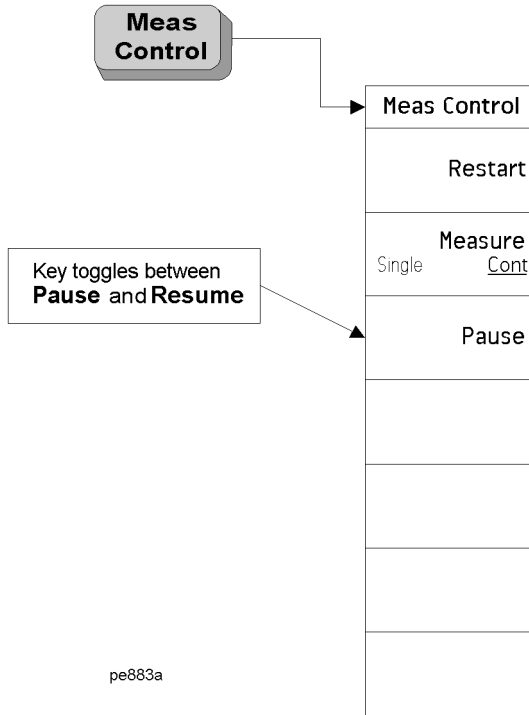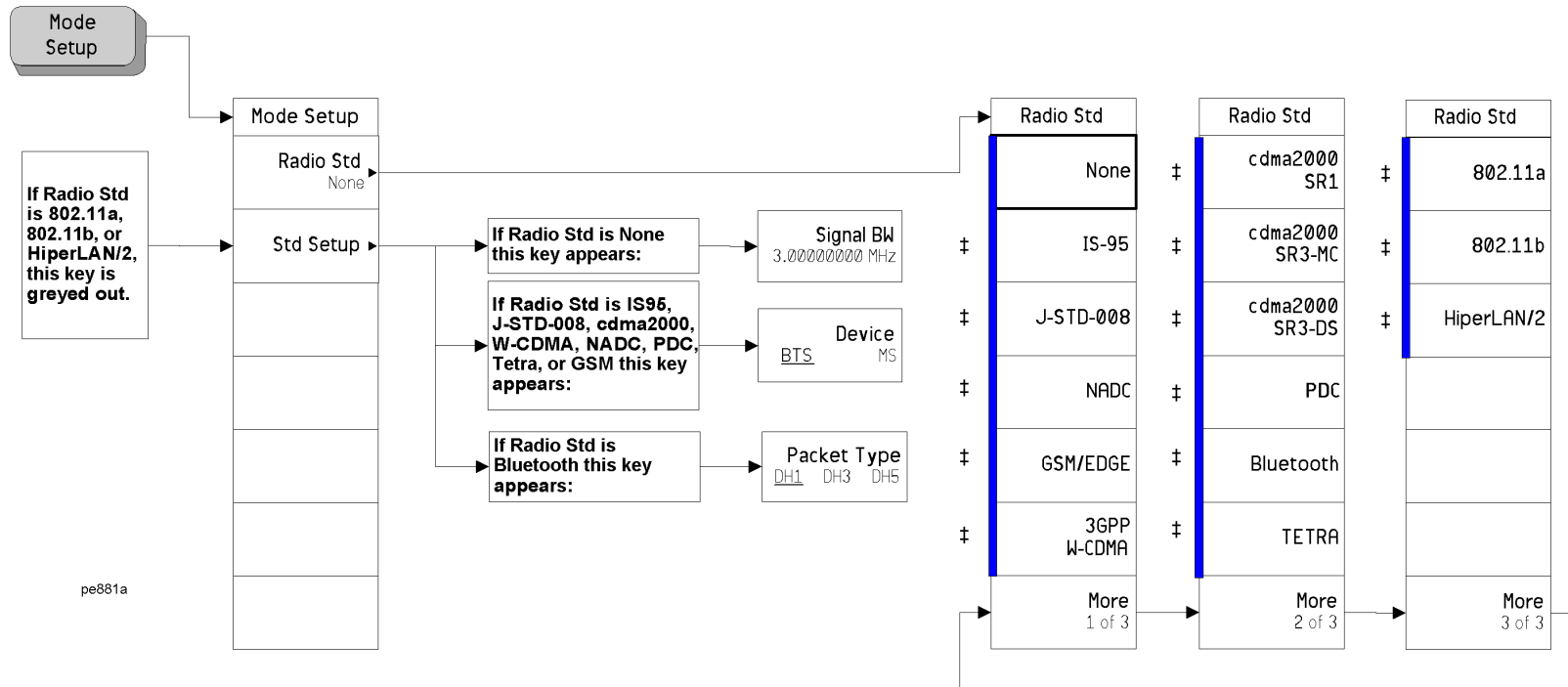
MEASURE

Measure		Measure
Meas Off		Harmonic Distortion
Channel Power		Burst Power
Occupied BW		Intermod (TOI)
ACP		Spurious Emissions
Multi-Carrier Power		Spectrum Emission Mask
Power Stat CCDF		
More 1 of 2		More 2 of 2

pe882a

7.1.2   Meas Control Key

pe883a

7.1.3   Mode Setup Key

pe881a

A bar on the left of two or more softkeys indicates that the keys are a set of mutually exclusive choices.

‡   A double-dagger to the left of the softkey indicates a function that is not always available. It is dependent on other instrument settings.

7.1.4 ACP Measurement: Meas Setup Key

Meas Setup

If measurement chosen is: ACP

Note: The menus under Meas Setup are measurement dependent and vary with each measurement

pe887a

Meas Setup

Avg Number
10
On   Off

Avg Mode
Exp   Repeat

Chan Integ BW
1.2300 MHz

Offset/Limits ▶

Meas Type
Total Pwr Ref ▶

Optimize
Ref Level

More
1 of 2

Meas Setup

Method
IBW   RBW

Total Pwr Ref
-6.78 dBm
Auto   Man

Limit Test
On   Off

RRC Filter
On   Off

Filter Alpha
0.22

Noise
Correction
On   Off

More
2 of 2

Meas Type

Total Pwr Ref

PSD Ref

Offset/Limits

Offset
A B C D E F

Offset Freq
3.00000000 kHz
On   Off

Ref BW
2.00000000 MHz

Pos Offset
Limit
0.00 dB

Neg Offset
Limit
0.00 dB

A bar on the left of two or more softkeys indicates that the keys are a set of mutually exclusive choices.

† A dagger to the left of the softkey indicates that when the key is pressed this is an active function.

7.1.5 ACP Measurement: Trace/View Key
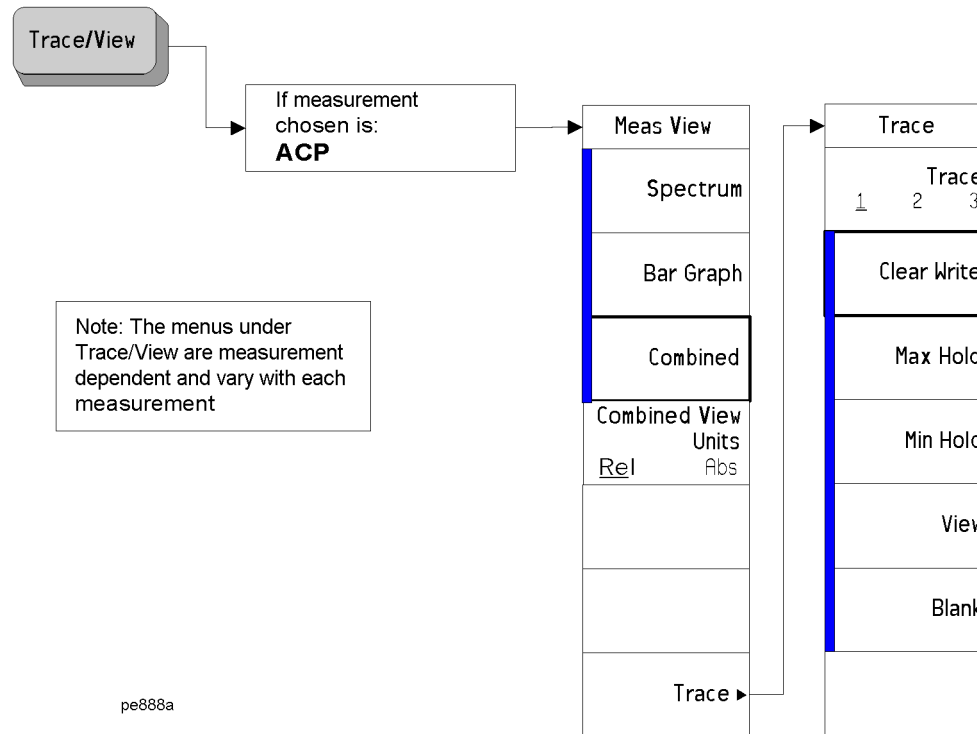
Trace/View

If measurement
chosen is:
ACP

Meas View

Spectrum

Bar Graph

Combined

Combined View
Units
Rel   Abs

Trace ▶

Trace

Trace
1   2   3

Clear Write

Max Hold

Min Hold

View

Blank

Note: The menus under
Trace/View are measurement
dependent and vary with each
measurement

pe888a

A bar on the left of two or more softkeys indicates that the keys are a set of mutually exclusive choices.

7.1.6 Burst Power Measurement: Meas Setup Key
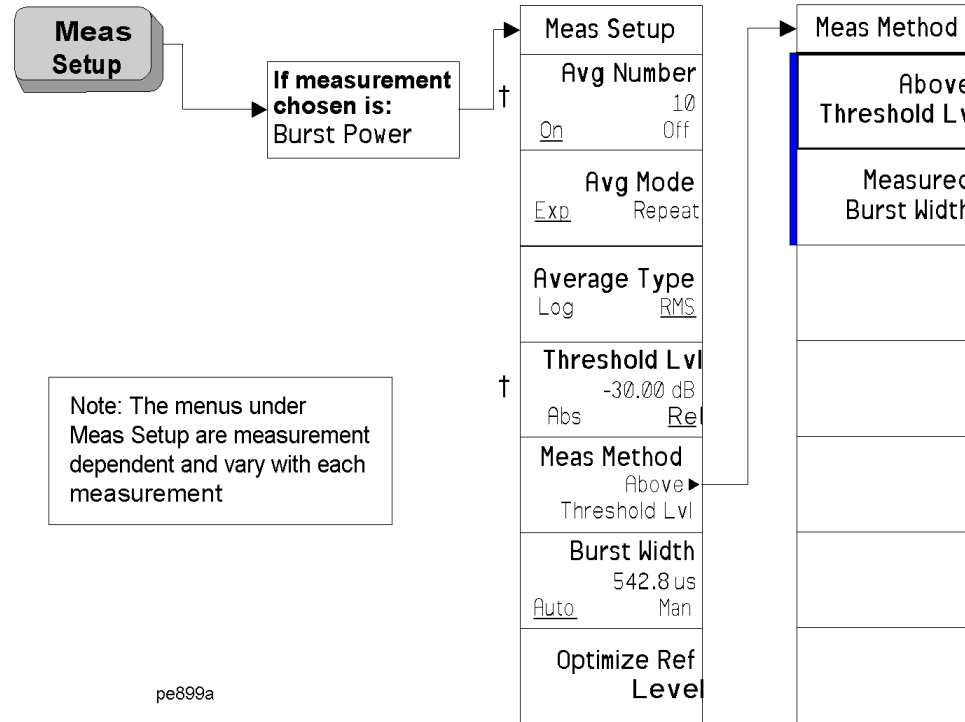
Meas
Setup

If measurement
chosen is:
Burst Power

†

Meas Setup

Avg Number
10
On   Off

Avg Mode
Exp   Repeat

Average Type
Log   RMS

Threshold Lvl
-30.00 dB
Abs   Rel

Meas Method
Above ▶
Threshold Lvl

Burst Width
542.8 us
Auto   Man

Optimize Ref
Level

†

Meas Method

Above
Threshold Lvl

Measured
Burst Width

Note: The menus under
Meas Setup are measurement
dependent and vary with each
measurement

pe899a

† A dagger to the left of the softkey indicates that when the key is pressed this is an active function.

7.1.7   Burst Power Measurement: Trace/View Key
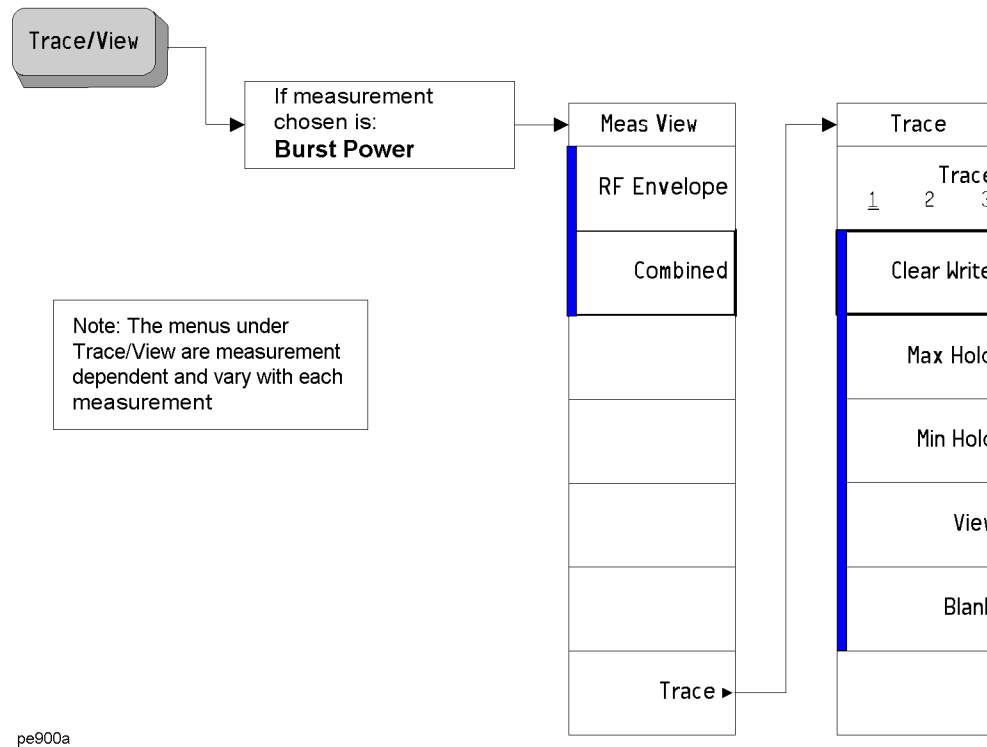
Trace/View

If measurement
chosen is:
Burst Power

Meas View

RF Envelope

Combined

Note: The menus under
Trace/View are measurement
dependent and vary with each
measurement

Trace ▶

Trace

Trace
1   2   3

Clear Write

Max Hold

Min Hold

View

Blank

pe900a

A bar on the left of two or more softkeys indicates that the keys are a set of mutually exclusive choices.

7.1.8 CCDF (Power Stat) Measurement: Meas Setup Key
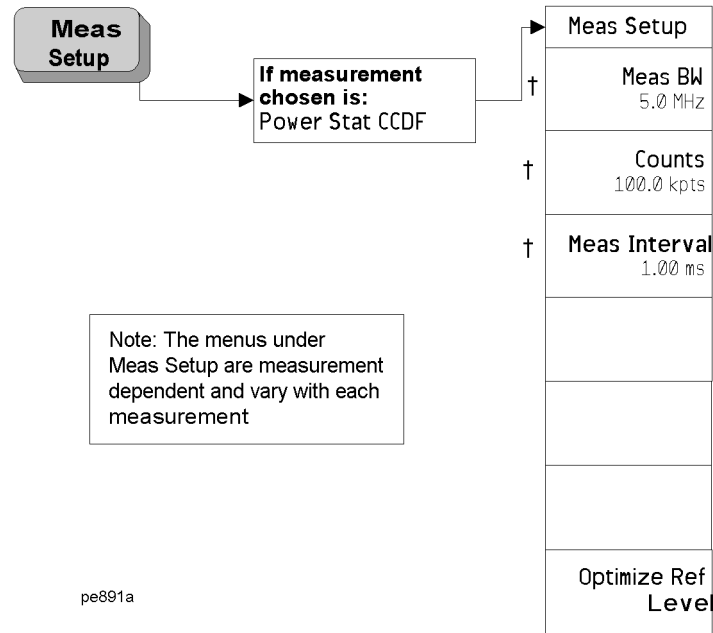
Meas Setup

If measurement chosen is: Power Stat CCDF

† Meas Setup

† Meas BW
5.0 MHz

† Counts
100.0 kpts

† Meas Interval
1.00 ms

Optimize Ref Level

Note: The menus under Meas Setup are measurement dependent and vary with each measurement

pe891a

†   A dagger to the left of the softkey indicates that when the key is pressed this is an active function.

7.1.9 CCDF (Power Stat) Measurement: Trace/View Key
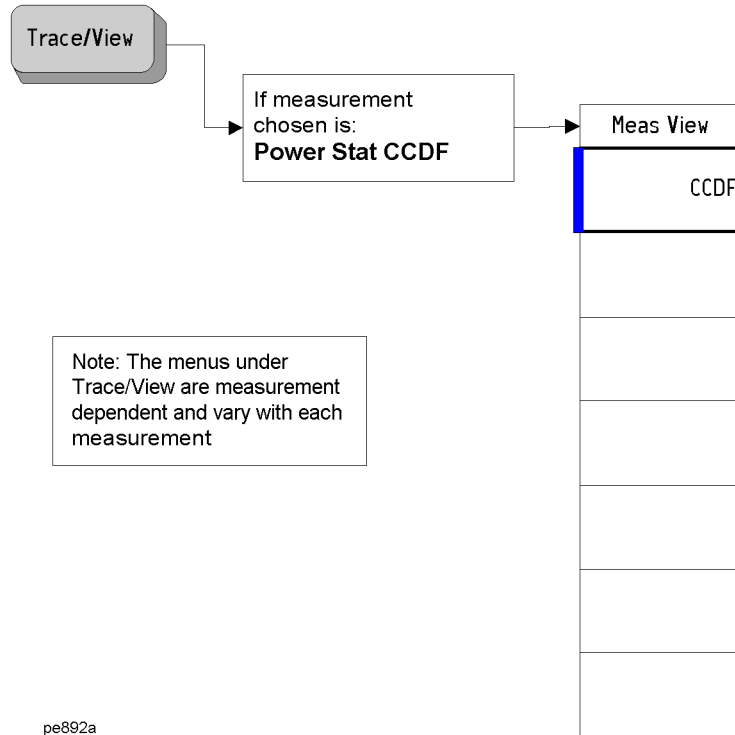
Trace/View

If measurement
chosen is:
Power Stat CCDF

Meas View

CCDF

Note: The menus under
Trace/View are measurement
dependent and vary with each
measurement

pe892a

A bar on the left of two or more softkeys indicates that the keys are a set of mutually exclusive choices.

7.1.10 CCDF (Power Stat) Measurement: Display Key

Display

If measurement
chosen is:
Power Stat CCDF

Note: The menus under
Display are measurement
dependent and vary with each
measurement

pe893a

Display

Full Screen

Store Ref
Trace

Ref Trace
On   Off

Gaussian
Trace
On   Off

Preferences ▶

Preferences

Graticule
On   Off
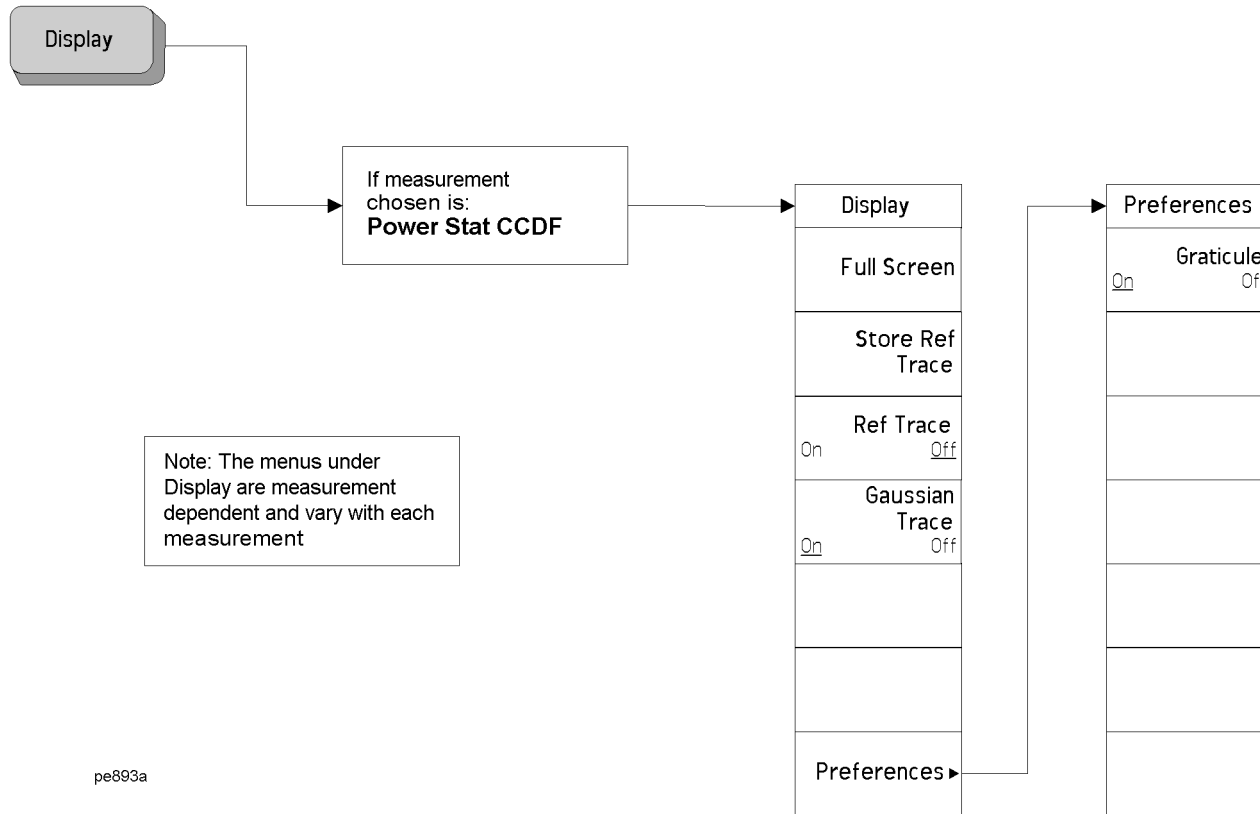
7.1.11   CCDF (Power Stat) Measurement: Span X Scale Key
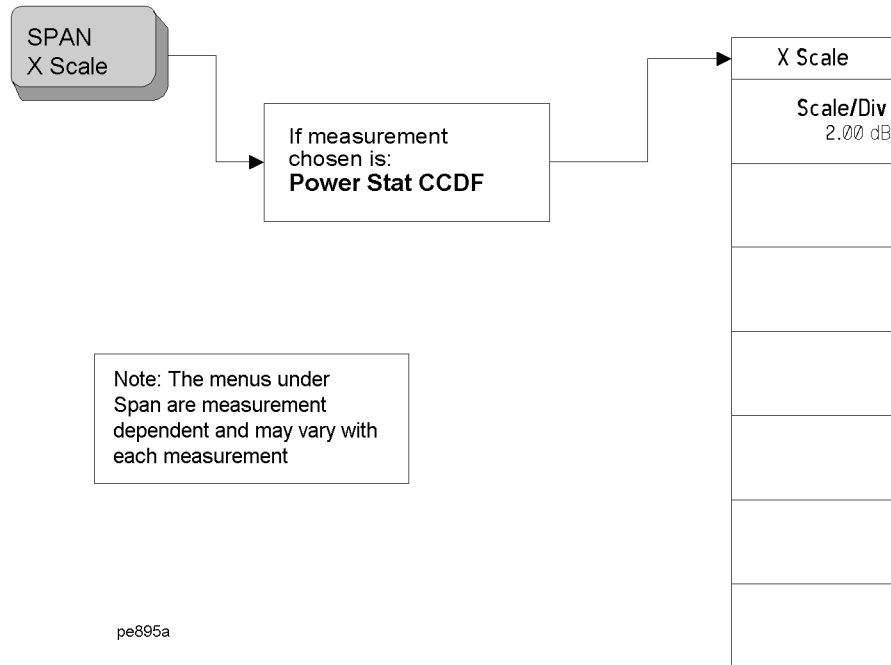
SPAN
X Scale

If measurement
chosen is:
Power Stat CCDF

Note: The menus under
Span are measurement
dependent and may vary with
each measurement

pe895a

X Scale

Scale/Div
2.00 dB

7.1.12   CCDF (Power Stat) Measurement: Marker Key
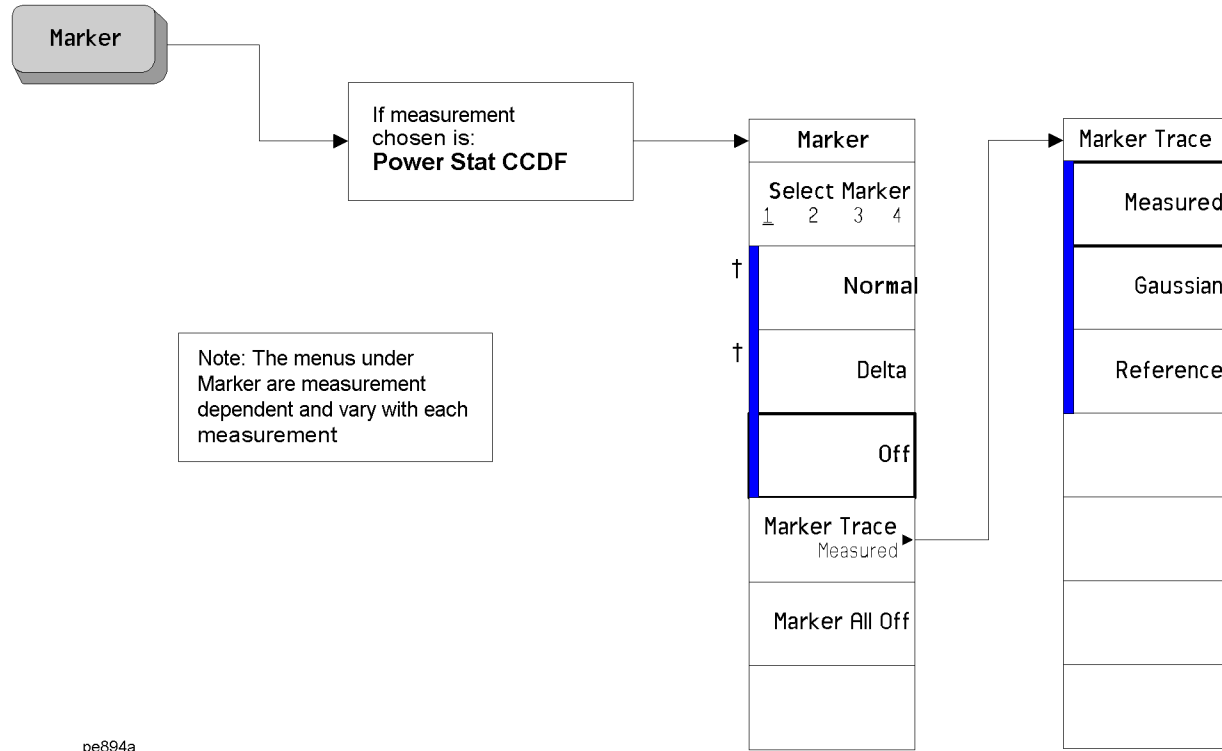
Marker

If measurement
chosen is:
Power Stat CCDF

Note: The menus under
Marker are measurement
dependent and vary with each
measurement

Marker

Select Marker
1   2   3   4

† Normal

† Delta

Off

Marker Trace
   Measured

Marker All Off

Marker Trace

Measured

Gaussian

Reference

pe894a

A bar on the left of two or more softkeys indicates that the keys are a set of mutually exclusive choices.

†   A dagger to the left of the softkey indicates that when the key is pressed this is an active function.

7.1.13 Channel Power Measurement: Meas Setup Key
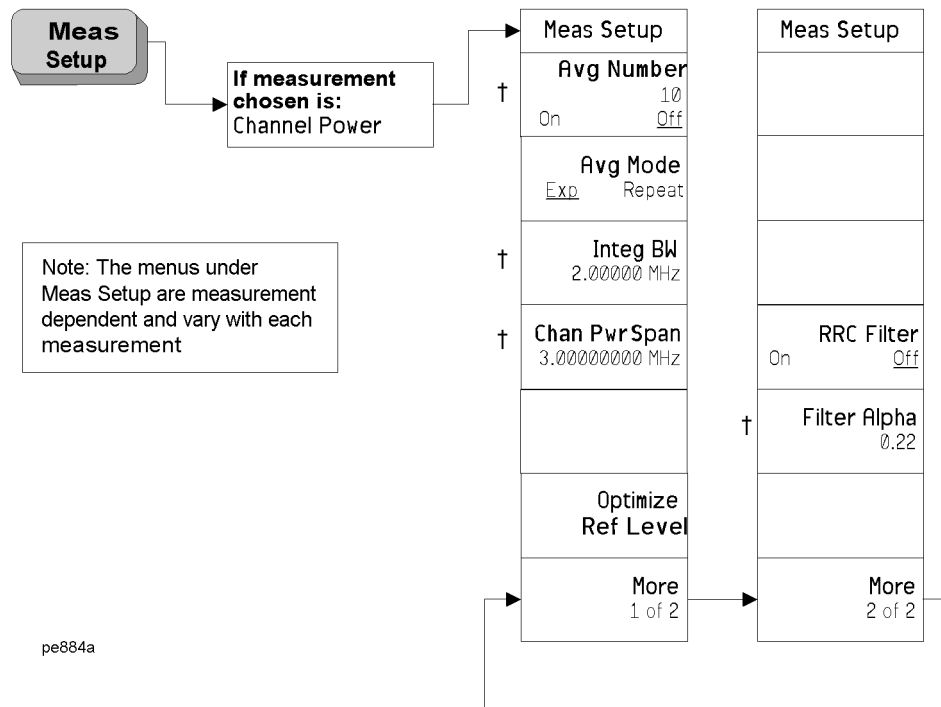
Meas Setup

If measurement chosen is:
Channel Power

Note: The menus under Meas Setup are measurement dependent and vary with each measurement

Meas Setup

† Avg Number
10
On   Off

Avg Mode
Exp   Repeat

† Integ BW
2.00000 MHz

† Chan Pwr Span
3.00000000 MHz

Optimize
Ref Level

More
1 of 2

Meas Setup

RRC Filter
On   Off

† Filter Alpha
0.22

More
2 of 2

pe884a

† A dagger to the left of the softkey indicates that when the key is pressed this is an active function.

7.1.14   Channel Power Measurement: Trace/View Key
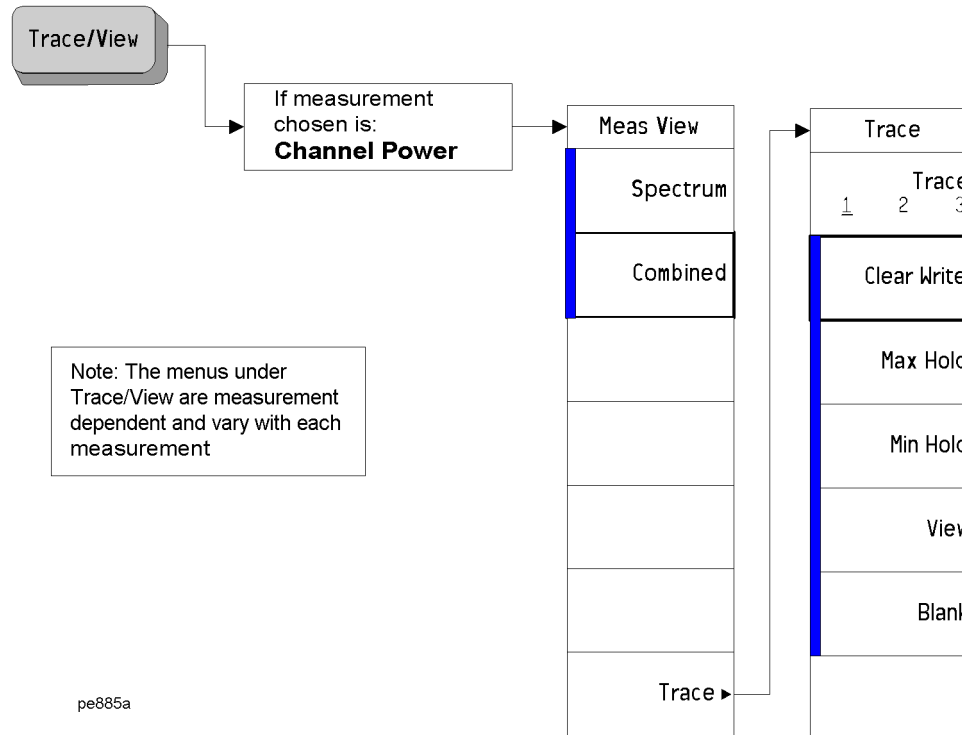
pe885a

A bar on the left of two or more softkeys indicates that the keys are a set of mutually exclusive choices.

7.1.15 Harmonic Distortion Measurement: Meas Setup Key
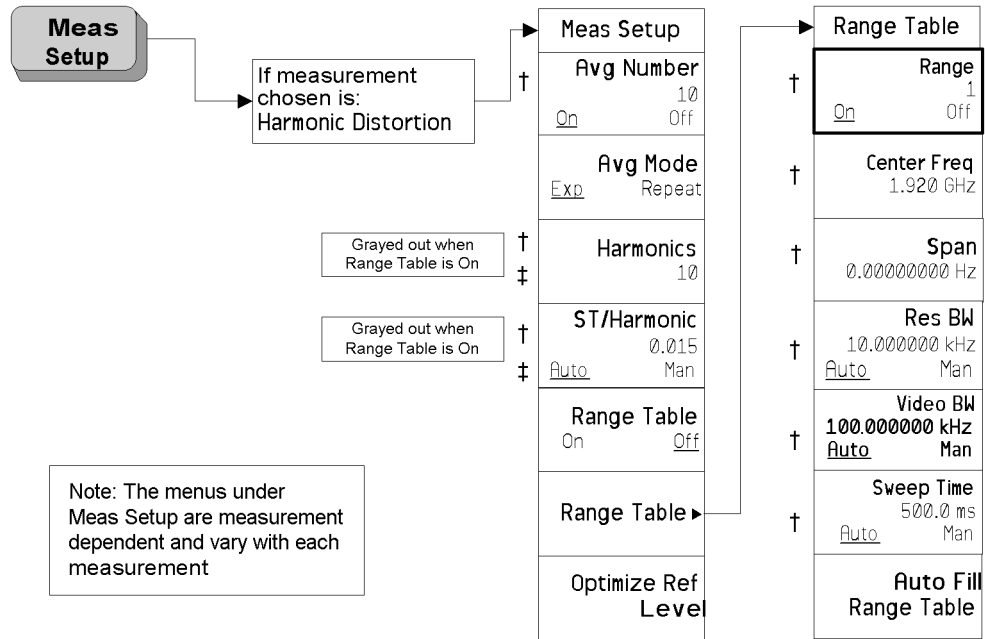
pe897a

† A dagger to the left of the softkey indicates that when the key is pressed this is an active function.

‡ A double-dagger to the left of the softkey indicates a function that is not always available. It is dependent on other instrument settings.

7.1.16 Harmonic Distortion Measurement: Trace/View Key
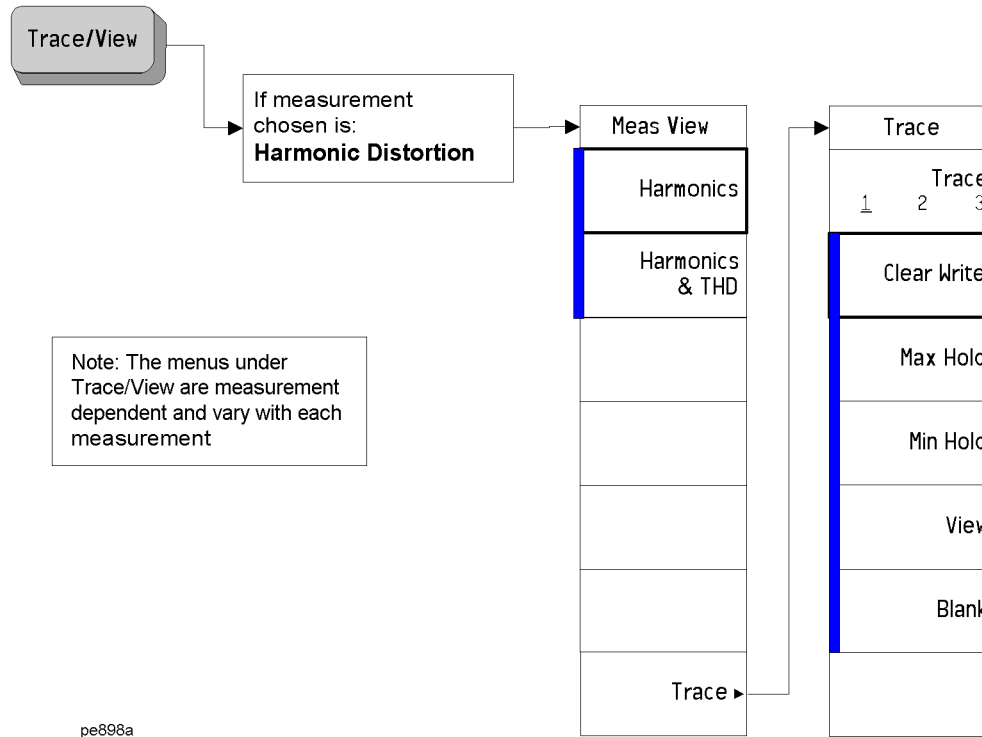
Trace/View

If measurement
chosen is:
Harmonic Distortion

Note: The menus under
Trace/View are measurement
dependent and vary with each
measurement

Meas View

Harmonics

Harmonics
& THD

Trace ▶

Trace

Trace
1   2   3

Clear Write

Max Hold

Min Hold

View

Blank

pe898a

A bar on the left of two or more softkeys indicates that the keys are a set of mutually exclusive choices.

7.1.17   Third Order Intercept Measurement: Meas Setup Key
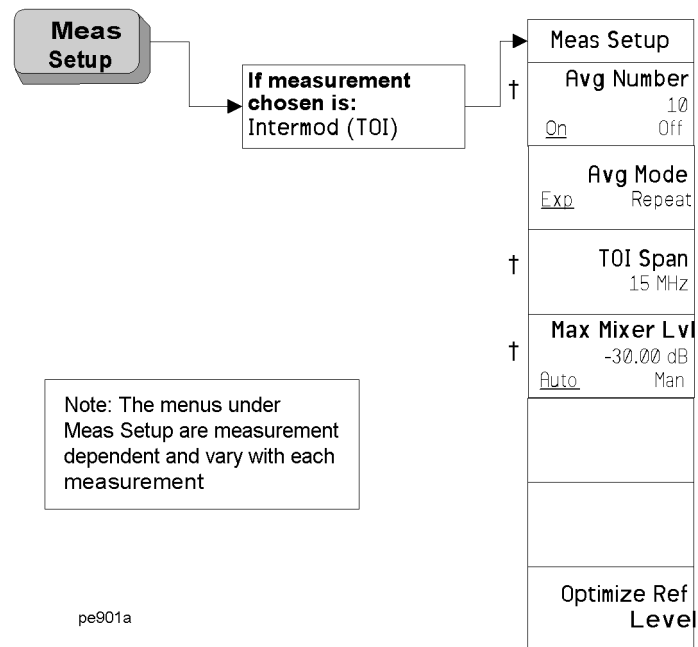
pe901a

Note: The menus under Meas Setup are measurement dependent and vary with each measurement

†   A dagger to the left of the softkey indicates that when the key is pressed this is an active function.

7.1.18 Multi-Carrier Power Measurement: Meas Setup Key

Meas Setup

If measurement chosen is:
Multi Carrier Power

†

Note: The menus under Meas Setup are measurement dependent and vary with each measurement

Meas Setup

Avg Number
10
On   Off

Avg Mode
Exp   Repeat

Carrier Setup ▶

Offset/Limits ▶

Carrier Result
1

Optimize
Ref Level

More
1 of 2

†
‡

Meas Setup

Method
IBW   RBW

Power Ref
-6.78 dBm
Auto   Man

Limit Test
On   Off

RRC Filter
On   Off

Filter Alpha
0.22

Noise
Correction
On   Off

More
2 of 2

Offset/Limits

Offset
A   B   C

Offset Freq
5.00000000 MHz

Offset
Integ BW
3.84000000 MHz

Upper Offset
Limit
0.00 dB

Lower Offset
Limit
0.00 dB

Carrier Setup

Carriers
4

Ref Carrier
2
Auto   Man

Ref Car Freq
6.59750 GHz
Auto   Man

Configure
Carriers ▶

Config Carriers

Carrier
1

Carrier Pwr
Present
Yes   No

Carrier Width
5.00000000 MHz

Carrier
Integ BW
3.84000000 MHz

pe889a

† A dagger to the left of the softkey indicates that when the key is pressed this is an active function.

‡ A double-dagger to the left of the softkey indicates a function that is not always available. It is dependent on other instrument settings.

7.1.19 Multi-Carrier Power Measurement: Trace/View Key
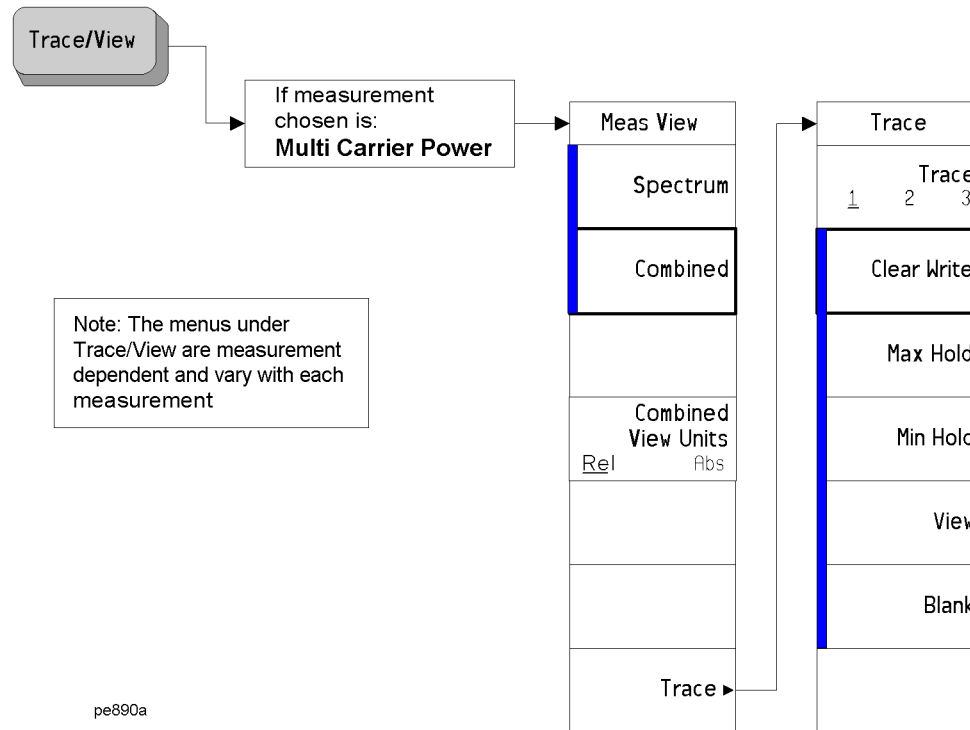
pe890a

A bar on the left of two or more softkeys indicates that the keys are a set of mutually exclusive choices.

7.1.20 Occupied Bandwidth Measurement: Meas Setup Key
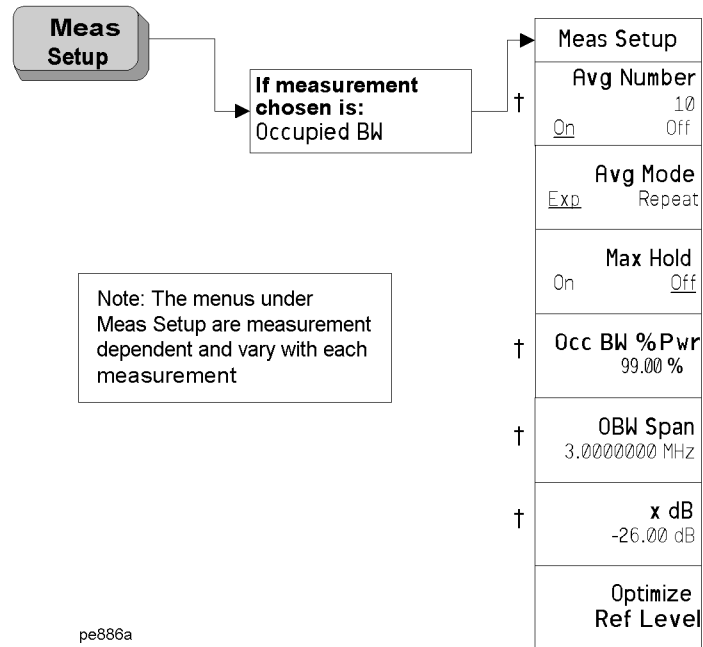
Meas Setup

If measurement chosen is: Occupied BW

†

Note: The menus under Meas Setup are measurement dependent and vary with each measurement

pe886a

Meas Setup

Avg Number
10
On   Off

Avg Mode
Exp   Repeat

Max Hold
On   Off

† Occ BW %Pwr
99.00 %

† OBW Span
3.0000000 MHz

† x dB
-26.00 dB

Optimize
Ref Level

† A dagger to the left of the softkey indicates that when the key is pressed this is an active function.

7.1.21 Spectrum Emission Mask Measurement: Meas Setup Key

Meas Setup

If measurement chosen is:
Spectrum Emission Mask

Meas Setup

† Avg Number
10
On   Off

Meas Type ▶
Total Pwr Ref

Note: The menus under Meas Setup are measurement dependent and vary with each measurement

Ref Channel ▶

Offset/Limits ▶

Optimize
Ref Level

More
1 of 2

Meas Setup

RRC Filter
On   Off

† Filter Alpha
0.22

More
2 of 2

Offset/Limits

Offset
A B C D E

† Start Freq
2.51500 MHz
On   Off

† Stop Freq
2.71500 MHz

† Sweep Time
1.000 ms
Auto   Man

† Res BW
30.00 kHz
Auto   Man

† Meas BW
(Integ BW)
1 x Res BW

More
1 of 2

Offset/Limits

Offset
A B C D E

† Abs Start
-14.00 dBm

† Abs Stop
-14.00 dBm
Couple   Man

† Rel Start
-30.00 dBc

† Rel Stop
-30.00 dBc
Couple   Man

Fail Mask ▶
Absolute

More
2 of 2

Fail Mask

Absolute

Relative

Abs AND Rel

Abs OR Rel

Ref Channel

† Chan Integ BW
3.8400 MHz

† Chan Span
5.00000 MHz

Sweep Time
3.400 ms
Auto   Man

Res BW
75.0000 kHz
Auto   Man

† Total Pwr Ref
-74.30 dBm
Auto   Man

Meas Type

Total Pwr Ref

PSD Ref

Meas Type: This key will be greyed out and set to PSD Ref when Radio Std = 802.11a, 802.11b, or HiperLAN/2

Total Pwr Ref key: title will be **Total Pwr Ref** or **PSD Ref** depending on currently selected Meas Type

pe903a

A bar on the left of two or more softkeys indicates that the keys are a set of mutually exclusive choices.

† A dagger to the left of the softkey indicates that when the key is pressed this is an active function.

7.1.22 Spectrum Emission Mask Measurement: Trace/View Key
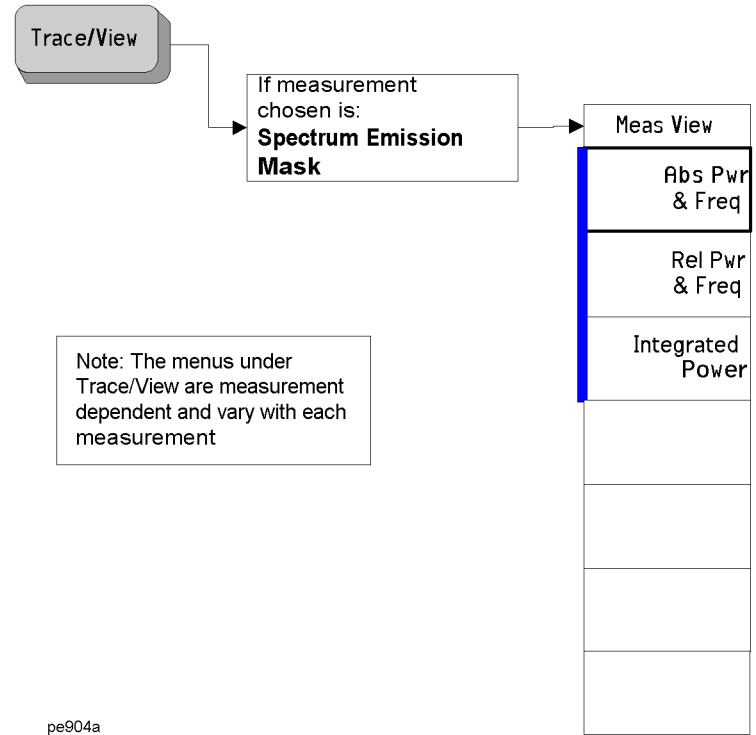
Trace/View

If measurement
chosen is:
**Spectrum Emission
Mask**

Note: The menus under
Trace/View are measurement
dependent and vary with each
measurement

Meas View

Abs Pwr
& Freq

Rel Pwr
& Freq

Integrated
Power

pe904a

A bar on the left of two or more softkeys indicates that the keys are a set of mutually exclusive choices.

7.1.23   Spectrum Emission Mask Measurement: Display Key
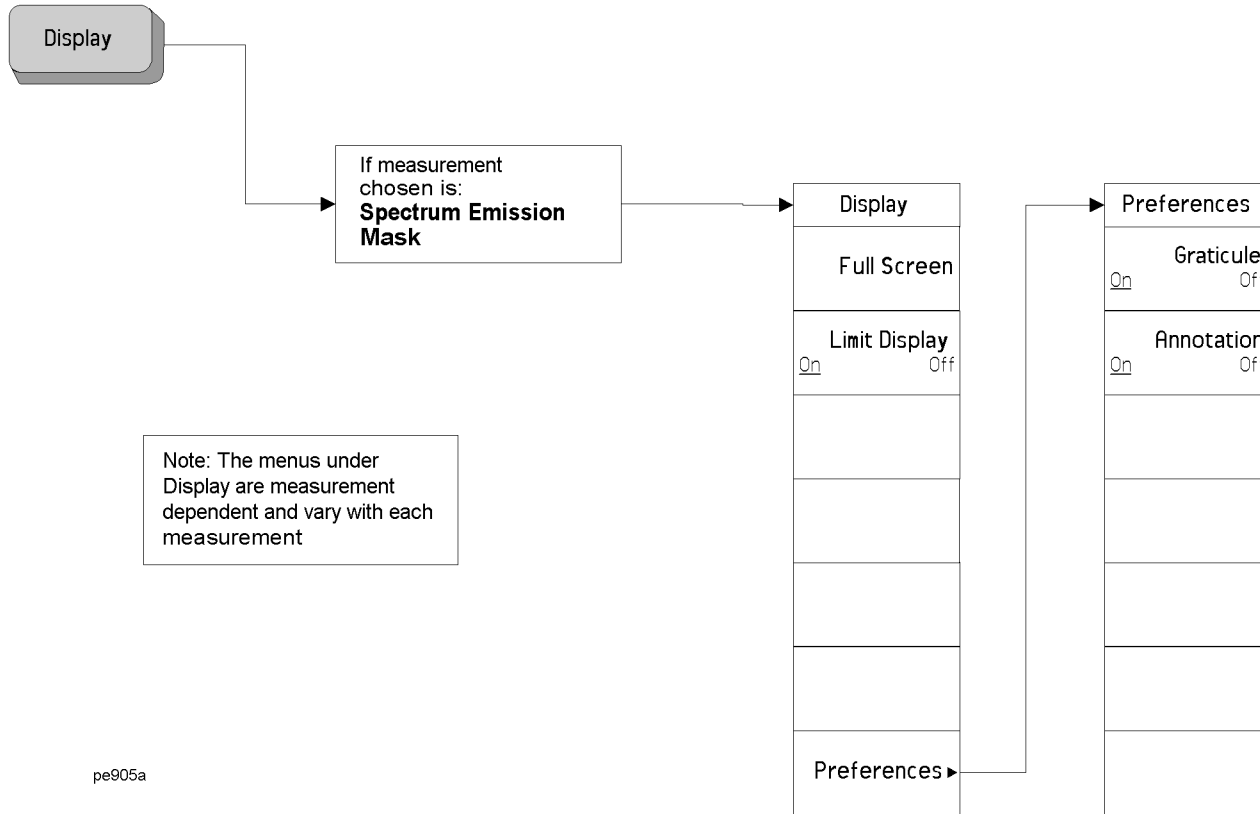
Display

If measurement
chosen is:
**Spectrum Emission
Mask**

Note: The menus under
Display are measurement
dependent and vary with each
measurement

Display

Full Screen

Limit Display
On   Off

Preferences ▶

Preferences

Graticule
On   Off

Annotation
On   Off

pe905a

SPAN
X Scale

If measurement
chosen is:
Spectrum Emissions Mask

X Scale

Scale/Div
2.00 dB

Ref Value
1.50000000
GHz

Ref Position
Left   Ctr   Right

Note: The menus under
Span are measurement
dependent and may vary with
each measurement

pe895_1a
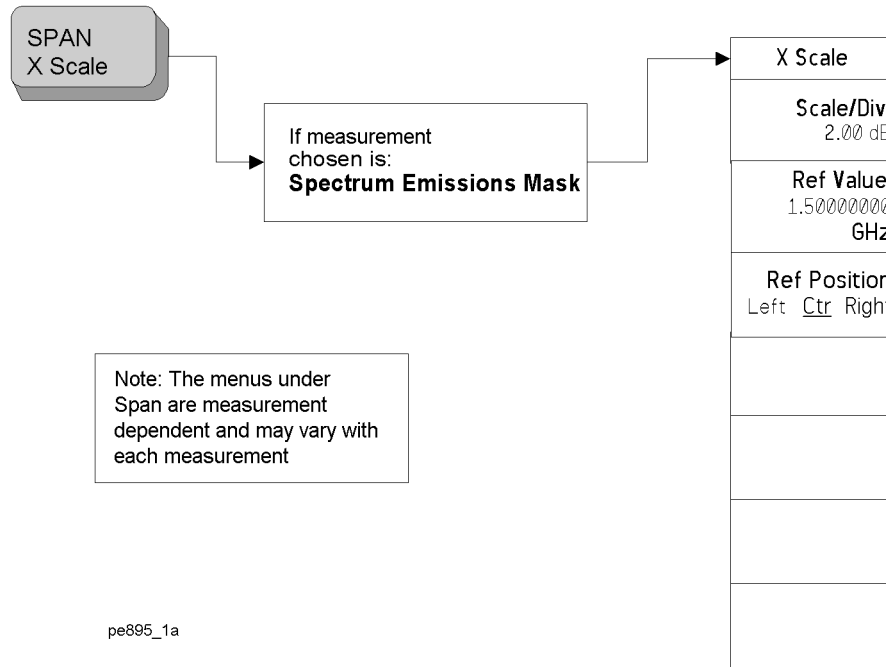
7.1.25   Spectrum Emission Mask Measurement: Marker Key

Marker

If measurement
chosen is:
**Spectrum Emission
Mask**

Marker ->

Select Marker
1   2   3   4

† Normal

Off

Note: The menus under
Marker are measurement
dependent and vary with each
measurement

Peak
Search

Freq
Count

Marker
Fctn

Marker
->

These hardkeys are
disabled within the SEM
measurement, as the
features in the menus are
unavailable
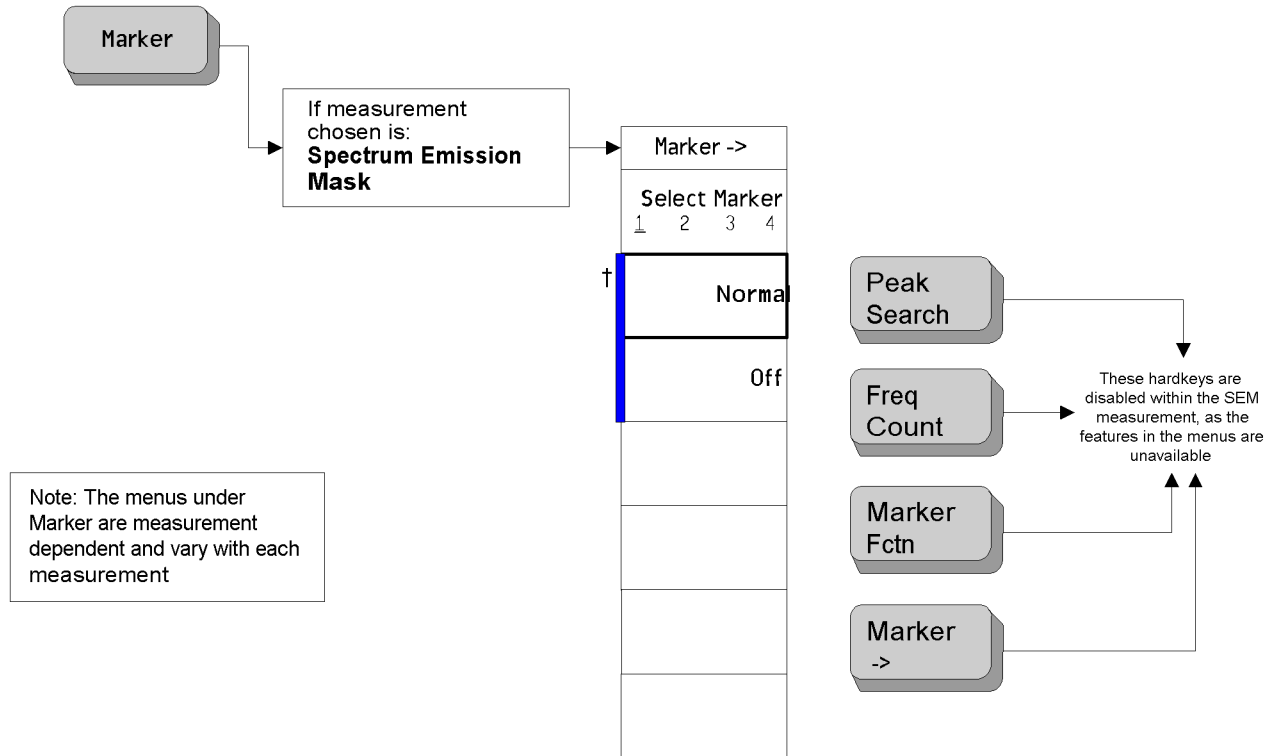
pe906a

A bar on the left of two or more softkeys indicates that the keys are a set of mutually exclusive choices.

7.1.26   Spurious Emissions Measurement: Meas Setup Key

Meas Setup

If measurement chosen is:
Spurious Emissions

Note: The menus under
Meas Setup are measurement
dependent and vary with each
measurement

pe902a

Meas Setup

Avg Number
10
On   Off †

Avg Mode
Exp   Repeat †

Range Table ▶ †

Meas Type
Examine   Full †

Spur
0
†

Ref Level
0.00 dBm
On   Off †

Fast
Spurious Meas
On   Off

Range Table

Range
1
On   Off †

Start Freq
1.92000000 GHz †

Stop Freq
1.98000000 GHz †

Res BW
1.20000000 MHz †

Video BW
1.20000000 MHz †

Sweep Time
1.000 ms
Auto   Man †

More
1 of 2

Range Table

Range
1
On   Off †

Abs Start Limit
-50.00 dBm †

Abs Stop Limit
-50.00 dBm
Auto   Man †

Peak Excursn
6.00 dB †

Pk Threshold
-90.00 dB †

More
2 of 2

†   A dagger to the left of the softkey indicates that when the key is pressed this is an active function.

7.2 One - Button Measurement Functions

This section provides key descriptions and programming information for each key associated with the measurements available when you press the front-panel **Measure** key. Note that the information for keys common to all measurements (**Measure**, **Meas Control**, **Mode Setup**, **Restart**, and **Single**) is presented first and the information unique to each measurement is grouped by measurement type. Use the table below to locate the key descriptions and remote commands for the measurement of interest.

Table 7-1

Key Function	Page Location
Measure	429
Meas Control	459
Mode Setup	463
Restart	471
Single	473
ACP Measurement	
Meas Setup	475
Trace/View	487
Burst Power Measurement	
Meas Setup	493
Trace/View	499
CCDF Measurement (Power Stat)	
Meas Setup	503
Display	507
Span X Scale	511
Marker	513
Channel Power Measurement	
Meas Setup	519
Trace/View	525
Harmonic Distortion Measurement	
Meas Setup	529
Trace/View	539

Table 7-1

Key Function	Page Location
Intermod (TOI) Measurement	
Meas Setup	541
Mult-Carrier Power Measurement	
Meas Setup	545
Trace/View	561
Occupied BW Measurement	
Meas Setup	567
Spectrum Emission Mask Measurement	
Meas Setup	573
Trace/View	591
Display	593
Span X Scale	595
Marker	597
Spurious Emissions Measurement	
Meas Setup	599

ccc

7.3 MEASURE (Spectrum Analysis Mode)

In the Spectrum Analysis mode (see the **Mode** key), this key displays a menu that lets you to make transmitter power measurements such as adjacent channel power, occupied bandwidth, and harmonic distortion measurements. If other modes are available and have been selected, the measurements for that particular mode will be displayed. Some common settings can be made for these measurements using the function under the **Mode Setup** key. For example, you may select one of several radio standards available by pressing **Mode Setup**, **Radio Std**.

NOTE   The measurements described in the "One-Button Measurement Functions" chapter are available in SA mode (see **Mode** key). Other measurements are available in other modes if an optional personality is installed.

Dependencies/
Couplings: When a measurement is activated, Signal Track, Video Averaging, Segmented Sweep, Band Power and Marker Noise will be turned off.

When Signal Track, Video Averaging, Band Power, Marker Noise or Span Zoom are activated, a running measurement will be turned off.

Remote Command Info:

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

Figure 1   Measurement Group of Commands
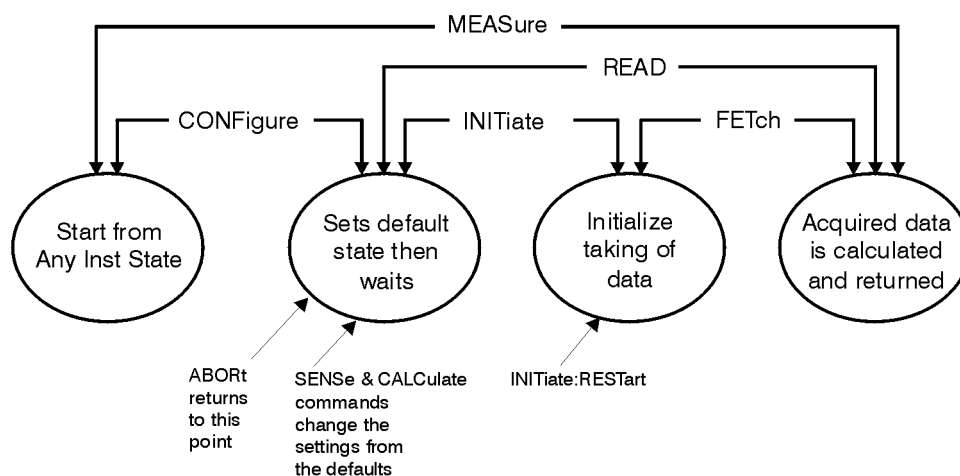
Measure Commands:

```
: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. 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. See Figure 1.

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 sets the instrument to single measurement mode but should not initiate the taking of measurement data unless INIT:CONTinuous is ON. After you change any measurement settings, the READ command can be used to initiate a measurement without changing the settings back to their defaults. The CONFigure command also turns the averaging function on and sets the number of averages to 10 for all measurements.

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, e.g. 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.

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)

7.3.2 Meas Off

Turns the measurement function off, so no measurement is currently active. When **Meas Off** is selected there are no functions under the **Meas Setup** key.

Key Path: **MEASURE**

Remote Command:

:CONFigure:SANalyzer

Remote Command Notes: :CONFigure:SANalyzer causes the present measurement to exit and places the analyzer in spectrum analysis mode.

Example: CONF:SAN

7.3.3   Channel Power

Channel Power measures the power and power spectral density in the channel bandwidth that you specify. One marker pair on the display indicates the edges of the channel bandwidth. The center frequency, reference level, and channel bandwidth must be set by the user. For more information see "Meas Setup (Channel Power—CHP)" on page 519.

You can configure measurement settings by pressing **Meas Setup** after selecting **Channel Power**. You can make a measurement in single or continuous sweep mode. Pressing **Meas Control** enables you to pause or restart a measurement, or toggle between continuous and single measurement. To set **Ref Level** automatically, use **Optimize Ref Level**.

The power calculation method used to determine the channel power is a traditional method known as the integration bandwidth (IBW) method. A swept spectrum is used as the basis for this calculation. Therefore, it is important to set the resolution bandwidth correctly before making this measurement using the following formula:

$$RBW = k(span)/n$$

Where k is a value between 1.2 and 4.0 and n is the number of trace points.

NOTE   Because of the noise-like nature of the signals being measured, the video bandwidth should be ≥ 10 times the resolution bandwidth.

Figure 7-1   **Channel Power Measurement Results**
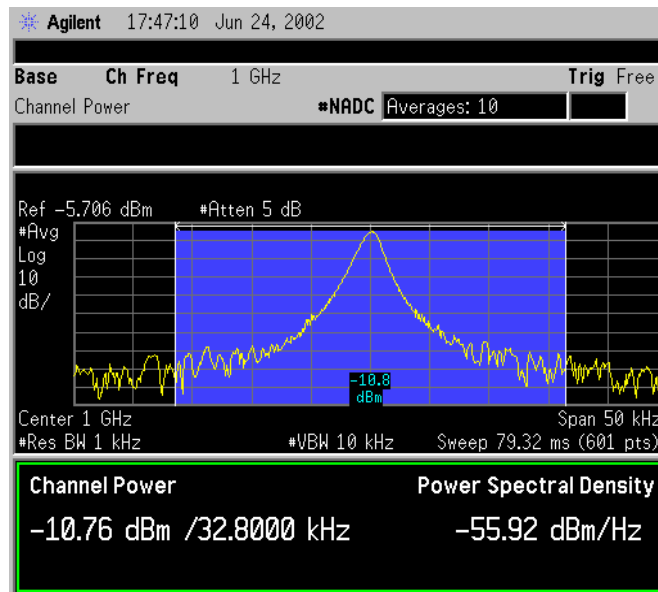
NOTE   The displayed trace is the current trace, not the averaged trace.

Pressing **Meas Setup** after **Channel Power** has been selected will access the channel power

measurement setup menu. Pressing **Radio Standard** after **Mode Setup** has been selected will access all the Radio Standards available for which this measurement can be applied. Pressing **Meas Control** after **Channel Power** has been selected will access the channel power measurement control menu which allows you to pause or restart your measurement, or toggle between continuous and single measurement.

Key Path: **MEASURE**

Remote Command:

Measurement Results Available	
Command	**Results Returned**
:CONFigure:CHPower :INITiate:CHPower	Not Applicable
:FETCh:CHPower? :MEASure:CHPower? :READ:CHPower?	Returns two values that correspond to the Channel Power and Power Spectral Density.
:FETCh:CHPower:CHPower? :MEASure:CHPower:CHPower? :READ:CHPower:CHPower?	Returns a single value that corresponds to the Channel Power.
:FETCh:CHPower:DENSity? :MEASure:CHPower:DENSity? :READ:CHPower:DENSity?	Returns a single value that corresponds to the Power Spectral Density.

Remote Command Notes: The main channel power is returned in the current amplitude units, and the density value is returned in current amplitude units/Hz

Example: FETC:CHP? or MEAS:CHP? or READ:CHP? command returns scalar results of main channel power and power density.

FETC:CHP:CHP? or MEAS:CHP:DENS? or READ:CHP:DENS? commands will return the single scalar result specified.

7.3.4 Occupied BW

Occupied Bandwidth integrates the power of the displayed spectrum and puts markers at the frequencies between which a selected percentage of the power is contained. The measurement defaults to 99% of the occupied bandwidth power. The power-bandwidth routine first computes the combined power of all signal responses contained in the trace. For 99% occupied power bandwidth, markers are placed at the frequencies on either side of 99% of the power. 1% of the power is evenly distributed outside the markers. The difference between the marker frequencies is the 99% power bandwidth and is the value displayed. For more information see "Meas Setup (Occupied Bandwidth—OBW)" on page 567.

The occupied bandwidth function also indicates the difference between the analyzer center frequency and the center frequency of the channel, referred to as "Transmit Freq Error". The measurement can be made in single or continuous sweep mode. The center frequency, reference level, and channel spacing must be set by the user.

To configure measurement settings, press **Meas Setup** after selecting **Occupied BW**. Pressing **Radio Standard** after **Mode Setup** has been selected will access all the Radio Standards available for which this measurement can be applied. Pressing **Meas Control** enables you to pause or restart a measurement, or toggle between continuous and single measurement.

Key Path: **MEASURE**

Remote Command:

Measurement Results Available	
Command	**Results Returned**
:CONFigure:OBW :INITiate:OBW	Not Applicable
:FETCh:OBW? :MEASure:OBW? :READ:OBW?	Returns two values that correspond to the Occupied BW and Transmit Frequency Error in Hertz.
:FETCh:OBW:OBWidth? :MEASure:OBW:OBWidth? :READ:OBW:OBWidth?	Returns a single value that corresponds to the Occupied BW in Hertz.
:FETCh:OBW:FERRor?:MEASure:OBW:FERRor? :READ:OBW:FERRor?	Returns a single value that corresponds to the Transmit Frequency Error in Hertz.
:FETCh:OBW:XDB? :MEASure:OBW:XDB? :READ:OBW:XDB?	Returns a single value that corresponds to the x dB BW in Hertz.

Remote Command Notes: The results for both values are returned in Hz.

Example: FETC:OBW? or MEAS:OBW? or READ:OBW? command returns scalar results of occupied bandwidth and transmit frequency error.

FETC:OBW:OBW? or MEAS:OBW:FERR? or READ:OBW:FERR? commands

will return the single scalar result specified.

7.3.5 Adjacent Channel Power—ACP

Adjacent Channel Power (ACP) is a measure of the power that leaks into adjacent transmit channels. Depending on the radio standard selected from the Mode Setup menu, this measurement can run in several different modes in order to measure different types of signals. For more information see "Meas Setup (Adjacent Channel Power—ACP)" on page 475.

ACP measures the power present in adjacent transmit channels. The span is set according to the six available offsets and their associated integration bandwidths defined by you or the selected radio standard (**Mode Setup**, **Radio Std**). The root-raised cosine filter also affects the span and is only available for NADC and 3GPP W-CDMA radio standards.

When **Method** is set to **IBW**, one sweep of the trace will be taken, and the band power for each offset will be computed. Results will be displayed relative to the total power or the power spectral density, depending on your selection after pressing **Meas Setup**, **Meas Type.** You may view the results as the current trace, bar graph, or a combination. When **Method** is set to **RBW**, the main channel and offsets will be measured in zero span and the combined results reported according to the **Meas Type** selection.

The measurement settings may be configured by pressing **Meas Setup** after **ACP** has been selected. Pressing **Radio Standard** after **Mode Setup** has been selected will access all the Radio Standards available for which this measurement can be applied. Pressing **Meas Control** allows you to pause or restart your measurement, or toggle between continuous and single measurement mode.

Key Path: **MEASURE**

Remote Command:

Measurement Results Available		
Condition	**Command**	**Results Returned**
	:CONFigure:ACPower :INITiate:ACPower	Not Applicable
Radio Std = None and only offset A is on	:FETCh:ACPower[n]? :MEASure:ACPower[n]? :READ:ACPower[n]?	Returns 3 comma-separated values that correspond to: main channel power, lower-adjacent channel power (dBc), and upper-adjacent channel power (dBc).

Radio Std ≠ None
or
Radio Std = None and more than one offset is   on
 	
Meas Type = Total Pwr Ref
		Returns 28 comma-separated values that correspond in the following order:
		
		1. Main Channel- relative power (dB)
		2. Main Channel- absolute power (dBm)
		3. Main Channel- relative power (dB)
		4. Main Channel- absolute power (dBm)
		5. Negative Offset Frequency (1)
		    - relative power (dB)
		6. Negative Offset Frequency (1)
		    - absolute power (dBm)
		7. Positive Offset Frequency (1)
		    - relative power (dB)
		8. Positive Offset Frequency (1)
		    - absolute power (dBm)
		
		...
		
		25. Negative Offset Frequency (6)
		    - relative power (dB)
		26. Negative Offset Frequency (6)
		    - absolute power (dBm)
		27. Positive Offset Frequency (6)
		    - relative power (dB)
		28. Positive Offset Frequency (6)
		    - absolute power (dBm)
		
		Center frequency relative power is relative to the center frequency absolute power and therefore is always equal to 0.00 dB.

Measurement Results Available (Continued)		
Condition	**Command**	**Results Returned**

Radio Std ≠ None
or
Radio Std = None and more than one offset is   on
 	
Power spectral density reference
	not specified or n=1	Returns 28 comma-separated scalar results, in the following order:
		
		1. Main Channel - relative power (dB)
		2. Main Channel - absolute power (dBm/Hz)
		3. Main Channel - relative power (dB)
		4. Main Channel - absolute power (dBm/Hz)
		5. Negative offset frequency (1)
		    - relative power (dB)
		6. Negative offset frequency (1)
		    - absolute power (dBm/Hz)
		7. Positive offset frequency (1)
		    - relative power (dB)
		8. Positive offset frequency (1)
		    - absolute power (dBm/Hz)
		
		...
		
		25. Negative Offset Frequency (6)
		    - relative power (dB)
		26. Negative Offset Frequency (6)
		    - absolute power (dBm)
		27. Positive Offset Frequency (6)
		    - relative power (dB)
		28. Positive Offset Frequency (6)
		    - absolute power (dBm)
		
		Main channel relative power is relative to the center frequency absolute power and therefore, is always equal to 0.00 dB.

Remote Command Notes: The main channel power is returned in the current amplitude units, and the lower and upper channel results are always returned in dB.

Example: FETC:ACP? or MEAS:ACP? or READ:ACP? commands return the scalar results of main channel power, lower channel power (relative), and upper channel power (relative) if only one offset is set to on. Otherwise, 28 values are returned. These are the main channel power in dBm and dBc from the carrier (0 dBc) each repeated, followed by the absolute and relative power levels for each lower and upper offset if Meas Type is Total Power Ref. Otherwise they are the main channel power spectral density and relative power spectral density
(0 dB) each repeated, followed by the absolute and relative spectral density values for each upper and lower offset.

7.3.6 Multi-Carrier Power

Multi-Carrier Power is the measure of the power that leaks into adjacent transmit channels when two or more carriers are present. The results reported are identical to the adjacent power measurement, but the setup is different to allow for two or more carriers. For more information see "Meas Setup (Multi-Carrier Power—MCP)" on page 545.

The measurement settings may be configured by pressing **Meas Setup** after **Multi-Carrier Power** has been selected. Pressing **Meas Control** allows you to pause or restart your measurement, or toggle between continuous and single measurement mode.

Key Path: **MEASURE**

Remote Command:

Measurement Results Available		
Command	**n**	**Results Returned**
:CONFigure:MCPower	N/A	Not Applicable
:FETCh:MCP[n]? :MEASure:MCP[n]? :READ:MCP[n]?	n=1 (or not specified)	Returns 20 comma-separated scalar results, in the following order. 1. First Carrier - relative power (dBc) 2. First Carrier - absolute power (dBm) 3. Second carrier frequency - relative power (dBc) 4. Second carrier frequency - absolute power (dBm) 5. lower -5 MHz offset - relative power (dBc) 6. lower-5 MHz offset - absolute power (dBm) 7. upper -5 MHz offset - relative power (dBc) 8. upper-5 MHz offset - absolute power (dBm) 9. lower 5 MHz offset - relative power (dBc) 10. lower 5 MHz offset - absolute power (dBm) 11. upper 5 MHz offset - relative power (dBc) 12. upper 5 MHz offset - absolute power (dBm) 13. lower 10 MHz offset - relative power (dBc) 14. lower 10 MHz offset - absolute power (dBm) 15. upper 10 MHz offset - relative power (dBc) 16. upper 10 MHz offset - absolute power (dBm) 17. lower 15 MHz offset - relative power (dBc) 18. lower 15 MHz offset - absolute power (dBm) 19. upper 15 MHz offset - relative power (dBc) 20. upper 15 MHz offset -- absolute power (dBm) If the results are not available, −999.0 is returned.
:FETCh:MCPower? :MEASure:MCPower? :READ:MCPower?	n=2...12	Returns absolute and relative values for carrier n. If results are not available −999.0 is returned

Measurement Results Available (Continued)		
Command	**n**	**Results Returned**
:FETCh:MCPower? :MEASure:MCPower? :READ:MCPower?	n=13	Returns 36 comma-separated scalar results, in the following order. 1 to 24. All carriers absolute and relative values 25. lower 5 MHz offset - relative power (dBc) 26. lower 5 MHz offset - absolute power (dBm) 27. upper 5 MHz offset - relative power (dBc) 28. upper 5 MHz offset - absolute power (dBm) 29. lower 10 MHz offset - relative power (dBc) 30. lower 10 MHz offset - absolute power (dBm) 31. upper 10 MHz offset - relative power (dBc) 32. upper 10 MHz offset - absolute power (dBm) 33. lower 15 MHz offset - relative power (dBc) 34. lower 15 MHz offset - absolute power (dBm) 35. upper 15 MHz offset - relative power (dBc) 36. upper 15 MHz offset - absolute power (dBm) If the results are not available, −999.0 is returned.

Example: FETC:MCP? or MEA:MCP? or READ:MCP?

7.3.7 Power Stat CCDF

The CCDF measurement is a statistical measurement of a high-level signal or peak power. It shows in both graphical and tabular form for what percentage of the time a signal exceeds its average power, and by how much this average is exceeded. For more information see "Meas Setup Power Stat CCDF (Complimentary Cumulative Distribution Function)" on page 503.

NOTE CCDF measurement requires the installation of Option AYX or Option B7D.

For each single sweep of this measurement, the average power is defined by:

$$Pavg = \left(\sum_{1}^{n} (V^2/Z_0) \right) / n$$

where V is the envelope voltage, Z_0 is the characteristic impedance, and n is the number of samples (32k maximum).

Pavg is used as a guideline to define the probability of the samples, which is xdB above the average power. The number of samples collected per sweep depends upon the sampling rate and the setting of the measurement interval. Multiple sweeps may be required if the sample number exceeds the number of samples collected per sweep. The results and the CCDF curve are updated after each sweep.

Results from a 2.17 GHz 3GPP W-CDMA input signal are shown below in Figure 7-2.

NOTE It is important to set the correct center frequency before initiating this measurement.

Figure 7-2 **Power Stat CCDF Measurement Results**
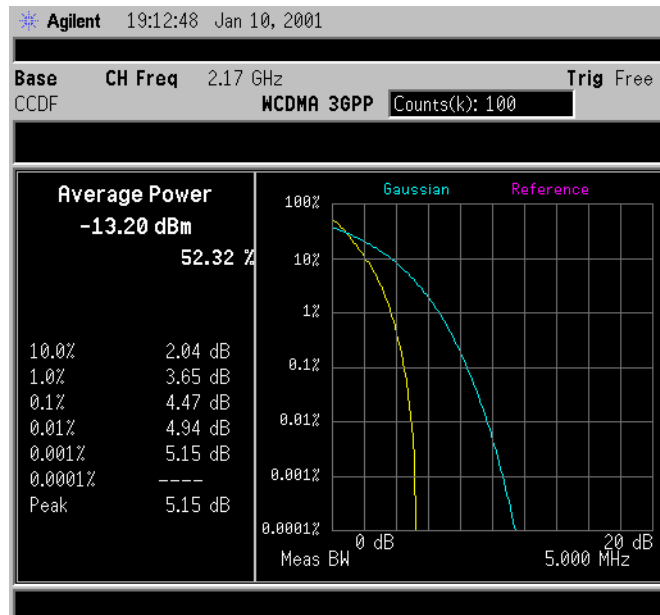
Pressing **Meas Setup** after **Power Stat CCDF** has been selected will access the Power Stat CCDF measurement setup menu. The factory defaults provide a good starting point for this measurement. The settings are adjustable, however, to meet specific requirements. Pressing **Radio Standard** after **Mode Setup** has been selected will access all the Radio Standards available for which this measurement can be applied. Pressing **Meas Control** after **Power Stat CCDF** has been selected will access the Power Stat CCDF measurement control menu which allows you to pause or restart your measurement, or toggle between continuous and single measurement.

Key Path: **MEASURE**

Remote Command:

Measurement Results Available		
Command	**n**	**Results Returned**
:CONFigure:PSTatistic :INITiate:PSTatistic	N/A	Not Applicable
:FETCh:PSTatistic[n]? :MEASure:PSTatistic[n]? :READ:PSTatistic[n]?	n=1 (or not specified)	Returns 10 scalar results, in the following order. 1. Average input power (in dBm) 2. Probability at the average input power (in%) 3. Power level that has 10% of the power 4. Power level that has 1% of the power 5. Power level that has 0.1% of the power 6. Power level that has 0.01% of the power 7. Power level that has 0.001% of the power 8. Power level that has 0.0001% of the power 9. Peak power (in dB) 10. Count
	n=2	Returns a series of 501 floating point numbers (in percent) that represent the current measured power statistics trace. This is the probability at specific power levels (average power), in the following order: 1. Probability at 0 dB power 2. Probability at 0.1 dB power 3. Probability at 0.2 dB power … 501. Probability at 50.0 dB power
	n=3	Returns a series of 501 floating point numbers (in percent) that represent the Gaussian trace. This is the probability at specific power levels (average power), in the following order: 1. Probability at 0 dB power 2. Probability at 0.1 dB power 3. Probability at 0.2 dB power … 501.Probability at 50.0 dB power

Measurement Results Available (Continued)		
Command	**n**	**Results Returned**
	n=4	Returns a series of 501 floating point numbers (in percent) that represent the user-definable reference trace. This is the probability that at specific power levels (average power) will occur, as follows: 1. Probability at 0 dB power 2. Probability at 0.1 dB power 3. Probability at 0.2 dB power … 501. Probability at 50.0 dB power

Example: FETC:PST? or MEAS:PST? or READ:PST?

FETC:PST2? or MEAS:PST2? or READ:PST2?

FETC:PST3? or MEAS:PST3? or READ:PST3?

7.3.8   Harmonic Distortion

Turns on the harmonic distortion measurement that measures any number of harmonics from 2 - 10. This measurement displays harmonics of a single carrier signal or complex digitally modulated carriers and computes the total harmonic distortion. You can specify how the analyzer determines the harmonics to be measured in a range table (see Table 7-2 on page 532). If the range table is turned off, the analyzer implements the measurement on the carrier with the largest amplitude peak (having a frequency > 0 Hz, a peak excursion > 6 dB on both sides, and an amplitude ≥ –50 dBm) at the time the measurement is started. The total harmonic distortion is then calculated from the measured harmonics. For more information see "Meas Setup (Harmonic Distortion)" on page 529.

When measuring the Nth harmonic, the analyzer will choose the narrowest resolution bandwidth that is ≤ N times the resolution bandwidth used to measure the fundamental. Widening the resolution bandwidth allows the measurement to capture all modulation on the harmonics. An asterisk (*) will appear next to the amplitude of measured harmonics for which the desired resolution bandwidth could not be set. The measurement will still be accurate as long as the signal has little or no modulation. The measurement precision is two decimal places for the amplitude results and four significant digits for the frequency results.

To configure the measurement settings, press **Meas Setup** after selecting **Harmonic Distortion**. Pressing **Meas Control** enables you to pause or restart a measurement, or toggle between continuous and single measurement. To display the total harmonic distortion (THD), press **Trace/View**, **Harmonics & THD**.

The total harmonic distortion (THD) is then calculated from the measured harmonics and

displayed as a percentage according to the following equation:

$$\%THD = 100 \times \frac{\left(\sqrt{\sum_{h=2}^{H_{max}} E_h^2}\right)}{E_f}$$

Where:

%THD = Total Harmonic Distortion as a percentage
h = harmonic number
H_{max} = Maximum Harmonic Value listed
E_h = voltage of harmonic h
E_f = voltage of fundamental signal

Refer to the *Agilent Technologies ESA Spectrum Analyzers Measurement Guide* for examples of this measurement and the calculation of Total Harmonic Distortion.

Key Path: **MEASURE**

Remote Command:

Measurement Results Available		
Command	**n**	**Results Returned**
:CONFigure:HARMonics :INITiate:HARMonics	N/A	Not Applicable
:FETCh:HARMonics:AMPLitude:ALL? :MEASure:HARMonics:AMPLitude:ALL? :READ:HARMonics:AMPLitude:ALL?	N/A	Returns the amplitude values of the first ten harmonics. The first value (for the fundamental) is measured in dBm. The remaining harmonics are measured in dBc from the fundamental. If fewer than ten harmonics are measured, zero is returned for any harmonic not measured.
:FETCh:HARMonics:AMPLitude[n]? :MEASure:HARMonics:AMPLitude[n]? :READ:HARMonics:AMPLitude[n]?	n=1 to 10 (n=1 for n not specified)	Returns the amplitude of the specified harmonic number n, where n=1 returns the amplitude of the fundamental in units of dBm. For example, n = 9 returns the amplitude of the ninth harmonic measured in dBc from the fundamental.
:FETCh:HARMonics[:DISTortion]? :MEASure:HARMonics[:DISTortion]? :READ:HARMonics[:DISTortion]?	N/A	Returns the computed total harmonic distortion as a percentage.

Measurement Results Available

Command	n	Results Returned
:FETCh:HARMonics:FREQuency:ALL ? :MEASure:HARMonics:FREQuency:ALL? :READ:HARMonics:FREQuency:ALL?	N/A	Returns the frequency values of the first ten harmonics, in Hz. The first harmonic is the fundamental. If fewer than ten harmonics are measured, zero is returned for any harmonic not measured.
:FETCh:HARMonics:FREQuency[n]? :MEASure:HARMonics:FREQuency[n]? :READ:HARMonics:FREQuency[n]?	n=2 to 10 (n=1 for n not specified)	Returns the frequency of the specified harmonic number N (in Hz).
:FETCh:HARMonics:FUNDamental? :MEASure:HARMonics:FUNDamental? :READ:HARMonics:FUNDamental?	N/A	Returns the frequency of the fundamental, measured in Hz.
:FETCh:HARMonics[n]? :MEASure:HARMonics[n]? :READ:HARMonics[n]?	n=1 to 2 (n=1 for n not specified)	These commands return the power of the spurious emissions at the selected harmonic frequencies of the current channel frequency using the selected resolution bandwidth filter. You can set the number of harmonics to be measured. For each harmonic, the reference level is set 40 dB above the largest amplitude limit with input attenuation held constant. The attenuation is set to limit the carrier (fundamental) power at the spectrum analyzer input mixer to the value determined by **Max Mixer Lvl**. not specified or n=1 Returns one value that corresponds to the total harmonic distortion (RMS voltage %). n=2 Returns one value that corresponds to the total harmonic distortion (dB).

Example: FETC:HARM:AMPL:ALL?

MEAS:HARM:AMPL2 returns the amplitude of the second harmonic measured in dBc from the fundamental.

READ:HARM:FREQ10 returns the frequency of the tenth harmonic in Hz.

7.3.9 Burst Power

Measures the average power in zero-span mode for the captured burst. This measurement is primarily for use with time domain modulated signals (Bluetooth™, GSM /Edge, and NADC). The burst width, if not user defined, is determined by finding the peak in the captured data, then searching for the first place that the trace is higher than the threshold level. This is considered to be the start of the burst. The stop of the burst is the first position in the trace that falls below the threshold level. The mean carrier power is calculated based on the burst width and the threshold level. Refer to the following figure for clarification of these parameters.
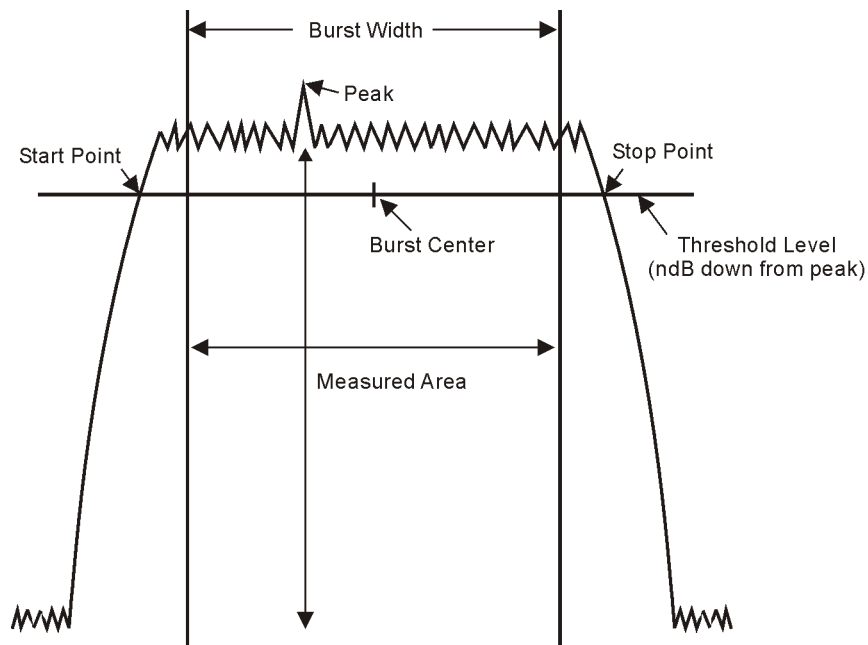
pl746b

The burst power measurement acquires data from the "Measured Area" above when a radio standard is chosen and when **Meas Setup**, **Meas Method**, **Measured Burst Width** is selected. When **Meas Setup**, **Meas Method**, **Above Threshold Lvl** is selected, the "Measured Area" extends the burst width delimiter lines to the start and stop points.

The mean carrier power is calculated by:

1. converting each trace point amplitude from dBm into linear power

2. Adding the above amplitudes together and dividing by the number of points included in the average.

3. This value is then displayed in logarithmic form (dBm).

$$(Pavg) \;=\; 10\log 10\left\{\frac{\left[\left(\displaystyle\sum_{n}^{m}\left(10^{\frac{p}{10}}\right)\right)\right]}{m-n}\right\}$$

where Pavg = average power, n is the start trace point, m= the stop trace point, and p= the trace point amplitude power in dBm.

Figure 7-3 shows an example of the results obtained when measuring a Bluetooth™ signal and with a user-defined burst width.

Figure 7-3   Burst Power Measurement Results
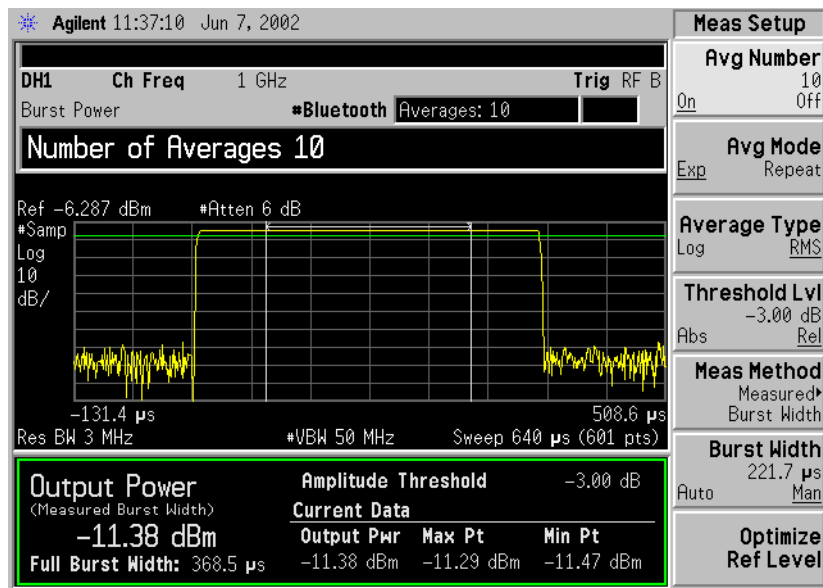
NOTE   The analyzer defaults to zero-span mode and the sweep time is set to capture at least one burst. The sweep time can be changed by pressing **Sweep**, **Sweep Time**.

Pressing **Meas Setup** after **Burst Power** has been selected displays the burst power measurement setup menu. Pressing **Meas Control** after **Burst Power** has been selected displays the burst power control menu, where you can pause or restart a measurement, or toggle between continuous and single measurement.

Key Access: **MEASURE**

NOTE	The measurements described above are those available in SA mode (see **Mode** key). Other measurements are available in other modes if an optional personality is installed.

Key Path: **MEASURE**

Remote Command:

Measurement Results Available		
Command	**n**	**Results Returned**
:CONFigure:BPOWer :INITiate:BPOWer	N/A	Not Applicable
:FETCh:BPOWer[n]? :MEASure:BPOWer[n]? :READ:BPOWer[n]?	n=1 (or not specified)	Returns 10 scalar results, in the following order. 1. Sample time 2. Power (RMS of carrier power) 3. Power averaged 4. Number of samples, 5. Amplitude threshold (relative) 6. Maximum trace point on the measured part of the burst. 7. Minimum trace point on the measured part of the burst. 8. Burst width (actual measured width, using the threshold level) 9. Measured time 10. Measured points
	n=2	Returns the displayed RF envelope trace data separated by commas. The number of data values is determined by the setting of the trace points parameter.

Example: FETC:BPOW? or MEAS:BPOW? or READ:BPOW?

7.3.10   Intermod (TOI)

The third order intermodulation (TOI) measurement computes and displays the output intercept point (IP3), and places markers upon the trace to indicate the measured signals and third-order products. For more information see "Meas Setup (Third Order Intercept—TOI)" on page 541.

Key Path: **MEASURE**

Remote Command:

Measurement Results Available	
Command	**Results Returned**
:CONFigure:TOI :INITiate:TOI	Not Applicable
:FETCh:TOI? :MEASure:TOI? :READ:TOI?	Returns 6 scalar results, in the following order. 1. The worst case Output Intercept Power value in dBm. 2. The worst case Output Intermod Point in Hz 3. The lower Output Intercept Power value in dBm 4. The lower Output Intermod Point in Hz 5. The upper Output Intercept Power value in dBm 6. The upper Output Intermod Point in Hz
:FETCh:TOI:IP3? :MEASure:TOI:IP3? :READ:TOI:IP3?	Returns the worst case Output Intercept Power value in dBm.

Example: FETC:TOI? or MEAS:TOI? or READ:TOI?

FETC:TOI:IP3? or MEAS:TOI:IP3? or READ:TOI:IP3?

7.3.11   Spurious Emissions

The spurious emissions measurement identifies and determines the power level of spurious emissions in certain frequency bands. For more information see "Meas Setup (Spurious Emissions)" on page 599.

Key Path: **MEASURE**

History: Added with firmware revision A.08.00

Remote Command:

:CONFigure:SPURious

:INITiate:SPURious

:FETCh:SPURious[n]?

:MEASure:SPURious[n]?

:READ:SPURious[n]?

n	Results Returned
n=1 (or not specified)	Returns a variable-length list of values containing detailed spur information. The total number of data values returned is (1 + 6x spurs), where x is the number of spurs identified. You can have up to 121 data entries if you have the maximum 20 spurs identified. The values returned are in the following order: 1. Number of spurs in items 2 through 6 in this list [Repeat the following for each spur] 2. Spur number 3. Range number in which spur was located (integer) 4. Frequency of spur (Hz) 5. Amplitude of spur (dBm) 6. Absolute limit (dBm) 7. Pass or Fail (1 | 0)
n=2 through 21	Returns trace data values for the selected frequency range (where range number = n − 1). If the selected range is not active, then 9.91E37 is returned for each non-active trace data element.
n=22	Returns the number of spurs found.

Example: MEAS:SPUR?

7.3.12   Spectrum Emission Mask

Spectrum Emission Mask measurement includes the in-band and out-of-band spurious emissions. As it applies to W-CDMA (3GPP), this is the power contained in a specified frequency bandwidth at certain offsets relative to the total carrier power. It may also be expressed as a ratio of power spectral densities between the carrier and the specified offset frequency band. For more information see "Meas Setup (Spectrum Emissions Mask—SEM)" on page 573.

Key Path: **MEASURE**

History: Firmware revision A.08.00

Remote Command:

Measurement Results Available		
Command / Condition	**n**	**Results Returned**
:CONFigure:SEMask :INITiate:SEMask	N/A	Not Applicable
:FETCh:SEMask[n]? :MEASure:SEMask[n]? :READ:SEMask[n]? Using Total Power Reference	n=1 (or not specified)	Returns 60 scalar results, in the following order: 1. Reserved for the future use, returns –999.0 2. Absolute power at the center frequency (reference) area (dBm) 3. Reserved for the future use, returns –999.0 4. Reserved for the future use, returns –999.0 5. Peak frequency in the center frequency (reference) area (Hz) 6. Reserved for the future use, returns –999.0 7. Reserved for the future use, returns –999.0 8. Reserved for the future use, returns –999.0 9. Reserved for the future use, returns –999.0 10.Reserved for the future use, returns -999.0. 11.Relative power on the negative offset A (dBc) 12.Absolute power on the negative offset A (dBm) 13.Relative peak power on the negative offset A (dBc) 14.Absolute peak power on the negative offset A (dBm) 15.Peak frequency in the negative offset A (Hz) 16.Relative power on the positive offset A (dBc) 17.Absolute power on the positive offset A (dBm) 18.Relative peak power on the positive offset A (dBc) 19.Absolute peak power on the positive offset A (dBm) 20.Peak frequency in the positive offset A (Hz) 21.Relative power on the negative offset B (dBc) … 59.Absolute peak power on the positive offset E (dBm) 60.Peak frequency in the positive offset E (Hz)

Measurement Results Available (Continued)		
Command / Condition	**n**	**Results Returned**
Using Power Spectral Density Reference	(Continued) n=1 (or not specified)	Returns 60 scalar results, in the following order: 1. Reserved for the future use, returns –999.0 2. Absolute power at the center frequency (reference) area (dBm) 3. Reserved for the future use, returns –999.0 4. Reserved for the future use, returns –999.0 5. Peak frequency in the center frequency (reference) area (Hz) 6. Reserved for the future use, returns –999.0 7. Reserved for the future use, returns –999.0 8. Reserved for the future use, returns –999.0 9. Reserved for the future use, returns –999.0 10.Reserved for the future use, returns -999.0. 11.Relative power on the negative offset A (dB) 12.Absolute power on the negative offset A (dBm/Hz) 13.Relative peak power on the negative offset A (dB) 14.Absolute peak power on the negative offset A (dBm/Hz) 15.Peak frequency in the negative offset A (Hz) 16.Relative power on the positive offset A (dB) 17.Absolute power on the positive offset A (dBm/Hz) 18.Relative peak power on the positive offset A (dB) 19.Absolute peak power on the positive offset A (dBm/Hz) 20.Peak frequency in the positive offset A (Hz) 21.Relative power on the negative offset B (dB) … 59.Absolute peak power on the positive offset E (dBm/Hz) 60.Peak frequency in the positive offset E (Hz)
	n=2	Returns the displayed frequency domain spectrum trace data separated by comma. The number of data points is determined by the setting of the trace points parameter.
	n=3	Returns the displayed frequency domain absolute limit trace data separated by comma. The number of data points is determined by the setting of the trace points parameter.
	n=4	Returns the displayed frequency domain relative limit trace data separated by comma. The number of data points is determined by the setting of the trace points parameter.

Measurement Results Available (Continued)		
Command / Condition	**n**	**Results Returned**
Using Total Power Reference	n=5	**Total Power Reference** Returns 12 scalar values (in dBm) of the absolute power of the segment frequencies: 1. Total power reference (dBm) 2. Reserved for the future use, returns –999.0 3. Negative offset frequency (A) 4. Positive offset frequency (A) … 11.Negative offset frequency (E) 12.Positive offset frequency (E).
Using Power Spectral Density Reference	n=5	**Power Spectral Density Reference** Returns 12 scalar values (in dBm/Hz) of the absolute power of the segment frequencies: 1. Total power reference (dBm/Hz) 2. Reserved for the future use, returns –999.0 3. Negative offset frequency (A) 4. Positive offset frequency (A) … 11.Negative offset frequency (E) 12.Positive offset frequency (E).
Using Total Power Reference	n=6	**Total Power Reference** Returns 12 scalar values (in dBc) of the power relative to the carrier at the segment frequencies: 1. Reserved for the future use, returns –999.0 2. Reserved for the future use, returns –999.0 3. Negative offset frequency (A) 4. Positive offset frequency (A) … 11.Negative offset frequency (E) 12.Positive offset frequency (E).
Using Power Spectral Density Reference	n=6	**Power Spectral Density Reference** Returns 12 scalar values (in dBc/Hz) of the power relative to the carrier at the segment frequencies: 1. Reserved for the future use, returns –999.0 2. Reserved for the future use, returns –999.0 3. Negative offset frequency (A) 4. Positive offset frequency (A) … 11.Negative offset frequency (E) 12.Positive offset frequency (E).

Measurement Results Available (Continued)		
Command / Condition	**n**	**Results Returned**
	n=7	Returns 12 pass/fail test results (0 = passed, or 1 = failed) determined by testing the absolute power in each offset against the specified offset's absolute power limits: 1. Reserved for the future use, returns −999.0 2. Reserved for the future use, returns −999.0 3. Negative offset frequency (A) 4. Positive offset frequency (A) … 11.Negative offset frequency (E) 12.Positive offset frequency (E).
	n=8	Returns 12 scalar values of the pass/fail (0 = passed, or 1 = failed) results determined by testing the relative power in each offset against the specified offset's relative power limits: 1. Reserved for the future use, returns −999.0 2. Reserved for the future use, returns −999.0 3. Negative offset frequency (A) 4. Positive offset frequency (A) … 11.Negative offset frequency (E) 12.Positive offset frequency (E).
	n=9	Returns 12 scalar values of frequency (in Hz) that have peak power in each offset: 1. Reserved for the future use, returns −999.0 2. Reserved for the future use, returns −999.0 3. Negative offset frequency (A) 4. Positive offset frequency (A) … 11.Negative offset frequency (E) 12.Positive offset frequency (E).
	n=10	Returns 12 scalar values (in dBm) of the absolute peak power of the segment frequencies: 1. Reserved for the future use, returns −999.0 2. Reserved for the future use, returns −999.0 3. Negative offset frequency (A) 4. Positive offset frequency (A) … 11.Negative offset frequency (E) 12.Positive offset frequency (E).

Measurement Results Available (Continued)		
Command / Condition	**n**	**Results Returned**
	n=11	Returns 12 scalar values (in dBc) of the peak power relative to the carrier at the segment frequencies: 1. Reserved for the future use, returns −999.0 2. Reserved for the future use, returns −999.0 3. Negative offset frequency (A) 4. Positive offset frequency (A) … 11.Negative offset frequency (E) 12.Positive offset frequency (E).

Example: FETC:SEM? or MEA:SEM? or READ:SEM?

7.3.13 Current Measurement Query (Remote Command Only)

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

Remote Command:

:CONFigure?

Example: CONF?

7.4 Meas Control

These functions allow you to pause and resume the currently selected measurement and to select between continuous or single measurements.

NOTE   If no measurement has been selected from the **MEASURE** menu, these functions are not available.

Key Path: Front-panel key

7.4.1 Restart

This function restarts a previously paused measurement at the beginning. If the current measurement is still in process, it will stop it as soon as possible and restart it from the beginning.

Key Path: Front-panel key. It can also be found under **Meas Control**.

Remote Command:

`:INITiate:RESTart`

Remote Command Notes: This command is equivalent to sending an `:ABORt` command followed by an `:INITiate[:IMMediate]` command. See "Abort the Sweep or Measurement (Remote Command Only)" on page 461. for more information.

Example: `INIT:REST`

7.4.2 Measure

Switches the analyzer between triggering the current measurement/sweep continuously or triggering a single measurement. The front panel **Single** key also puts the analyzer in single-measurement mode.

Key Path: **Meas Control**

State Saved: Save

Factory Preset: Continuous

Remote Command:

Use `:INITiate:CONTinuous OFF|ON`

Remote Command Notes: This command affects sweeping when in the SA mode. It affects measurements when a measurement has been selected from the MEASure command subsystem.

- When ON, at the completion of each trigger cycle, the trigger system immediately initiates another trigger cycle.

- When OFF, the trigger system remains in an "idle" state until CONTinuous is set to ON or an :INITiate[:IMMediate] command is received. On receiving the :INITiate[:IMMediate] command, it will go through a single trigger cycle, and then return to the "idle" state.

- The query `INIT:CONT?` returns 1 or 0. 1 is returned when the instrument is continuous triggering. 0 is returned when it is single triggering.

Example: `INIT:CONT OFF`

7.4.3   Pause or Resume

This function pauses the currently running measurement. Pressing **Pause** will toggle between pausing and resuming your measurement. The key label will toggle between **Pause** and **Resume**. If an averaged measurement was in progress, the average counter is frozen when the measurement is halted

Key Path: **Meas Control**

Remote Command:

`:INITiate:PAUSe` to pause the measurement

`:INITiate:RESume` to resume the measurement.

Example: `INIT:PAUS`

Remote Command Notes: See "Abort the Sweep or Measurement (Remote Command Only)" on page 461. for more information.

7.4.4   Trigger a Sweep or Measurement (Remote Command Only)

This command initiates a sweep if in SA mode with no measurement currently selected.

The command is ignored if the instrument is in a measurement (selected under the MEASURE key), but the measurement is currently running, (`INITiate:CONTinuous ON`).

If a measurement is selected but it is in the idle state (i.e. it's not running, `INITiate:CONT OFF`), this command triggers the instrument, when trigger conditions are met. The trigger system is initiated, it completes one full trigger cycle and returns to the "waiting" state. Depending on the measurement selected and the number of averages, there may be multiple data acquisitions, with multiple trigger events, for one full trigger cycle.

Remote Command:

`:INITiate[:IMMediate]`

Remote Command Notes: See also the `*TRG` command and the TRIGger subsystem.

Use the `[:SENSe]:<meas>:TRIGger:SOURce` command to select the desired trigger. The instrument must be in the single measurement mode. If `:INITiate:CONTinuous` is ON then the command is ignored.

Use `:FETCh?` to transfer a measurement result from memory to the output buffer. Refer to individual commands in the MEASure subsystem for more information.

For SA mode:

If the analyzer is in signal identification mode, two sweeps are required, as this mode relies on the acquisition of data from two successive sweeps. Therefore, if the analyzer is in single sweep mode, two sweep triggers are needed to generate the sweep pair. In image suppress mode, synchronization is ensured by first turning off signal identification, initiating a single sweep, then turning on signal identification followed by two single sweeps. See `[:SENSe]:SIDentify` for more information about signal identification state.

Example: `INIT:IMM`

7.4.5   Abort the Sweep or Measurement (Remote Command Only)

Stops any sweep or measurement in progress and resets the sweep or trigger system. A measurement refers to any of the measurements found in the **MEASURE** menu. If the trigger conditions are met, another sweep is initiated immediately.

If `:INITiate:CONTinuous` is off (single measure), then `:INITiate:IMMediate` will start a new single measurement.

If `:INITiate:CONTinuous` is on (continuous measure), a new continuous measurement begins immediately.

The INITiate and/or TRIGger subsystems contain additional related commands.

Remote Command:

`:ABORt`

Remote Command Notes: In the continuous measurement mode, the **Restart** key is equivalent to `ABORt`.

Example: `ABOR`

7.5 Mode Setup (Spectrum Analysis Mode)

Enables you to change measurement settings common to *all* measurements in the **MEASURE** menu. In Spectrum Analysis mode, there are several built-in power measurements (ACP, Power Stat CCDF, harmonic distortion). Parameters that you set in the Mode Setup menu affect all of these measurements.

Key Path: Front-panel key

7.5.1 Radio Std

Accesses the radio standards key menu to enable you to select a radio standard. Selecting a radio standard modifies spectrum analyzer settings for the measurement activated under the **MEASURE** menu.

Key Path: **Mode Setup**

Factory Preset: None

History: Added with ESA firmware revision A.08.00

Remote Command:

```
[:SENSe]:RADio:STANdard[:SELect]
NONE|IS95|JSTD|C2000SR1|C2000DS|C2000MC|W3GPP|BLUEtooth|NADC|PDC|GSM|Tetra
|WL802DOT11A|WL802DOT11B|HIPERLAN2
```

```
[:SENSe]:RADio:STANdard[:SELect]?
```

7.5.1.1 None

Selects no radio standard. If **Radio Std, None** is selected when a measurement is running, all measurement parameters are returned to their default values. Analyzer parameters outside the **MEASURE** or **Meas Setup** key menus are not affected.

Key Type: 1 of N menu

Key Path: **Mode Setup, Radio Std**

History: Added with ESA firmware revision A.07.00

Remote Command:

Use `[:SENSe]:RADio:STANdard[:SELect]` See "Radio Std" on page 463.

Example: RAD:STAN NONE

7.5.1.2 IS-95

Sets the specific parameters for the selected measurement (located under the "MEASURE (Spectrum Analysis Mode)" key description) appropriate for industry standard IS-95. The Spectrum Emissions Mask, Harmonic Distortion, and Spurious Emissions measurements are not available when this radio standard is selected.

Key Type: 1 of N menu

Key Path: **Mode Setup, Radio Std**

History: Added with ESA firmware revision A.07.00

Remote Command:

Use[:SENSe]:RADio:STANdard[:SELect] See "Radio Std" on page 463.

Example: RAD:STAN IS95

7.5.1.3 J-STD-008

Sets the specific parameters for the selected measurement (located under the "MEASURE (Spectrum Analysis Mode)" key description) appropriate for industry standard J-STD-008. The Spectrum Emissions Mask, Harmonic Distortion, and Spurious Emissions measurements are not available when this radio standard is selected.

Key Type: 1 of N menu

Key Path: **Mode Setup, Radio Std**

History: Added with ESA firmware revision A.07.00

Remote Command:

Use[:SENSe]:RADio:STANdard[:SELect] See "Radio Std" on page 463.

Example: RAD:STAN JSTD

7.5.1.4 NADC

Sets the specific parameters for the selected measurement (located under the "MEASURE (Spectrum Analysis Mode)" key description) appropriate for industry standard NADC. Channel Power and Intermod TOI measurements are not available when **Device (MS)** is selected. All other measurements are available when this radio standard is selected except: Spectrum Emissions Mask, Harmonic Distortion, Spurious Emissions, and Multi-Carrier Power.

Key Type: 1 of N menu

Key Path: **Mode Setup, Radio Std**

History: Added with ESA firmware revision A.07.00

Remote Command:

Use[:SENSe]:RADio:STANdard[:SELect] See "Radio Std" on page 463.

Example: RAD:STAN NADC

7.5.1.5   GSM/EDGE

Sets the specific parameters for the selected measurement (located under the "MEASURE (Spectrum Analysis Mode)" key description) appropriate for industry standard GSM/EDGE. Power Stat CCDF and Burst Power are the only measurements available for this standard.

Key Type: 1 of N menu

Key Path: **Mode Setup, Radio Std**

History: Added with ESA firmware revision A.07.00

Remote Command:

Use[:SENSe]:RADio:STANdard[:SELect] See "Radio Std" on page 463.

Example: RAD:STAN GSM

7.5.1.6   3GPP W-CDMA

Sets the specific parameters for the selected measurement (located under the "MEASURE (Spectrum Analysis Mode)" key description) appropriate for industry standard W-CDMA. All measurements except Harmonic Distortion and Spurious Emissions are available for this standard.

Key Type: 1 of N menu

Key Path: **Mode Setup, Radio Std**

History: Added with ESA firmware revision A.07.00

Remote Command:

Use[:SENSe]:RADio:STANdard[:SELect] See "Radio Std" on page 463.

Example: RAD:STAN W3GPP

7.5.1.7   cdma2000 SR1

Sets the specific parameters for the selected measurement (located under the "MEASURE (Spectrum Analysis Mode)" key description) appropriate for industry standard cdma2000-SR1. All measurements except Harmonic Distortion, Spurious Emissions, and Spectrum Emission Mask are available for this standard.

Key Type: 1 of N menu

Key Path: **Mode Setup, Radio Std**

History: Added with ESA firmware revision A.07.00

Remote Command:

Use[:SENSe]:RADio:STANdard[:SELect] See "Radio Std" on page 463.

Example: RAD:STAN C2000SR1

7.5.1.8   cdma2000 SR3-MC

Sets the specific parameters for the selected measurement (located under the "MEASURE (Spectrum Analysis Mode)" key description) appropriate for industry standard cdma2000:SR3-MC. All measurements except Multi-Carrier Power, Harmonic Distortion, Spurious Emissions and Spectrum Emission Mask are available for this standard.

Key Type: 1 of N menu

Key Path: **Mode Setup, Radio Std**

History: Added with ESA firmware revision A.07.00

Remote Command:

Use[:SENSe]:RADio:STANdard[:SELect] See "Radio Std" on page 463.

Example: RAD:STAN C2000MC

7.5.1.9   cdma2000 SR3-DS

Sets the specific parameters for the selected measurement (located under the "MEASURE (Spectrum Analysis Mode)" key description) appropriate for industry standard cdma2000:SR3-DS. All measurements except Multi-Carrier Power, Harmonic Distortion, Spurious Emissions and Spectrum Emission Mask are available for this standard.

Key Type: 1 of N menu

Key Path: **Mode Setup, Radio Std**

History: Added with ESA firmware revision A.07.00

Remote Command:

Use[:SENSe]:RADio:STANdard[:SELect] See "Radio Std" on page 463.

Example: RAD:STAN C2000DS

7.5.1.10   PDC

Sets the specific parameters for the selected measurement (located under the "MEASURE (Spectrum Analysis Mode)" key description) appropriate for industry standard PDC. The

Burst Power measurement is not available when **Device (BTS)** is selected. The Channel Power and Intermod TOI measurements are not available when **Device (MS)** is selected. All other measurements except Multi-Carrier Power, Harmonic Distortion, Spurious Emissions and Spectrum Emission Mask measurements are available for this standard.

Key Type: 1 of N menu

Key Path: **Mode Setup, Radio Std**

History: Added with ESA firmware revision A.07.00

Remote Command:

Use`[:SENSe]:RADio:STANdard[:SELect]`

Example: `RAD:STAN PDC`

7.5.1.11   Bluetooth™

Sets the specific parameters for the selected measurement (located under the "MEASURE (Spectrum Analysis Mode)" key description) appropriate for industry standard Bluetooth™. Power Stat CCDF and Burst Power are the only measurements available for this standard.

Key Type: 1 of N menu

Key Path: **Mode Setup, Radio Std**

History: Added with ESA firmware revision A.07.00

Remote Command:

Use`[:SENSe]:RADio:STANdard[:SELect]`

Example: `RAD:STAN BLUE`

7.5.1.12   TETRA

Sets the specific parameters for the selected measurement (located under the "MEASURE (Spectrum Analysis Mode)" key description) appropriate for industry standard TETRA. This standard is only available for the Channel Power and ACP measurements.

Key Type: 1 of N menu

Key Path: **Mode Setup, Radio Std**

History: Added with ESA firmware revision A.09.00

Remote Command:

Use`[:SENSe]:RADio:STANdard[:SELect]`

Example: `RAD:STAN TETR`

7.5.1.13   802.11a

Sets the specific parameters for the selected measurement (located under the "MEASURE (Spectrum Analysis Mode)" key description) appropriate for industry standard 802.11a. This standard is only available for the Spectrum Emission Mask (SEM) measurement.

Key Type: 1 of N menu

Key Path: **Mode Setup, Radio Std**

History: Added with ESA firmware revision A.09.00

Remote Command:

Use[:SENSe]:RADio:STANdard[:SELect] See "Radio Std" on page 463.

Example: RAD:STAN WL802DOT11A

7.5.1.14   802.11b

Sets the specific parameters for the selected measurement (located under the "MEASURE (Spectrum Analysis Mode)" key description) appropriate for industry standard 802.11b. This standard is only available for the Spectrum Emission Mask (SEM) measurement.

Key Type: 1 of N menu

Key Path: **Mode Setup, Radio Std**

History: Added with ESA firmware revision A.09.00

Remote Command:

Use[:SENSe]:RADio:STANdard[:SELect] See "Radio Std" on page 463.

Example: RAD:STAN WL802DOT11B

7.5.1.15   Hiper LAN/2

Sets the specific parameters for the selected measurement (located under the "MEASURE (Spectrum Analysis Mode)" key description) appropriate for industry standard Hiper LAN2. This standard is only available for the Spectrum Emission Mask (SEM) measurement.

Key Type: 1 of N menu

Key Path: **Mode Setup, Radio Std**

History: Added with ESA firmware revision A.09.00

Remote Command:

Use[:SENSe]:RADio:STANdard[:SELect] See "Radio Std" on page 463.

Example: RAD:STAN HIPERLAN2

7.5.2   Std Setup

Accesses the key menu for selecting the device, packet type, or signal bandwidth to be measured.

Key Path: **Mode Setup**

History: Added with ESA firmware revision A.07.00

Remote Command:

There is no equivalent remote command.

7.5.2.1   Signal BW

Allows you to set the measurement bandwidth when **Radio Std (None)** is selected. This function is available only when you select None as the standard.

Key Path: **Mode Setup**, **Std Setup**

Factory Preset: 3.0 MHz

Default Terminator: Hz

Range: The non-zero span range of the analyzer

History: Added with ESA firmware revision A.07.00

Remote Command:

[:SENSe]:RADio:STANdard:SBWidth <freq>

[:SENSe]:RADio:STANdard:SBWidth?

Example: RAD:STAN:SBW 2MHZ

7.5.2.2   Device BTS/MS

This function is only available when you have selected the standard: IS-95, J-STD-008, cdma2000, W-CDMA, NADC, PDC, Tetra, or GSM. It enables you to select either the base transmitter station (BTS) setup defaults or the mobile station (MS) defaults for the standard that you have selected. This key is unavailable when you select Bluetooth™.

Key Path: **Mode Setup, Std Setup**

Factory Preset: BTS

History: Added with ESA firmware revision A.07.00

Remote Command:

[:SENSe]:RADio:STANdard:DEVice BTS|MS

[:SENSe]:RADio:STANdard:DEVice?

Example: RAD:STAN:DEV MS

7.5.2.3 Packet Type

This function is only available when the standard you have selected is Bluetooth™. It enables you to set the instrument settings for testing DH1, DH3, or DH5 packet type.

Key Path: **Mode Setup, Std Setup**

Factory Preset: DH1

History: Added with ESA firmware revision A.07.00

Remote Command:

[:SENSe]:RADio:STANdard:PACKet DH1|DH3|DH5

[:SENSe]:RADio:STANdard:PACKet?

Example: RAD:STAN:PACK DH1

7.5.3 Autorange of Power Setting (Remote command only)

This command is the remote version of the **Optimize Ref Level** key. If this function is applicable to the currently selected measurement, this command sets the reference level and attenuator to optimum values based on the signal present at the input.

NOTE	There is always a minimum of 5 dB of attenuation set to protect the analyzer input.

History: Added with ESA firmware revision A.07.00

Remote Command:

[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE

Example: POW:RANG:AUTO ONCE

7.6   Restart

This function restarts a previously paused measurement at the beginning. If the measurement is active, it will stop it as soon as possible and restart it from the beginning. If no measurement is active and **Sweep (Single)** is selected, a new sweep is initiated.

When in **Average (On)** mode, (**BW/Avg**, **Average**) the averaging function is restarted (the trace is reset and the average number is reset to zero).

Key Path: Front-panel key. It can also be found under **Meas Control**.

Remote Command:

`:INITiate:RESTart`

Remote Command Notes: This command is equivalent to sending an `:ABORt` command followed by an `:INITiate[:IMMediate]` command. See "Abort the Sweep or Measurement (Remote Command Only)" on page 461. for more information.

Example: `INIT:REST`

7.7 Single

If the analyzer is in continuous sweep mode and not in a measurement (**Measure**, **Meas Off**), pressing **Single** changes the sweep control to single sweep, and executes a sweep after the trigger condition is met. If the analyzer is already in single sweep, pressing **Single** executes a new sweep after the trigger condition is met.

Some instrument settings require more than one sweep to complete the measurement (see **BW/Avg**, **Average**), or if you have selected a measurement from the functions under the **MEASURE** key, this function sets the trigger system to be initiated only once. In this case the trigger condition can be met only once and then all the necessary sweeps will be executed to make the measurement or complete the averaging function.

With Average on (**BW/Avg**, **Average** (On)), pressing **Single** resets the average trace and starts the average again from a count of zero. Sweeps are averaged until N sweeps are then taken (where N is the average number), and then the sweep is halted.

State Saved: Single sweep setting is saved in instrument state

Factory Preset: Continuous

Remote Command:

`:INITiate[:IMMediate]`

`*TRG`

Remote Command Notes: Use the `:TRIGger[:SEQuence]:SOURce` command to select the trigger source.

See also the "*TRG" command on Page 233.

Example: `*TRG`

`TRIG:IMM`

7.8   Meas Setup (Adjacent Channel Power—ACP)

If the adjacent channel power (ACP) measurement has been selected in the **Measure** menu of the spectrum analysis mode, this key displays the ACP measurement setup menu.

The adjacent channel power measurement measures the power that leaks into adjacent transmit channels. Depending on the radio standard chosen from the Mode Setup menu, this measurement can run in several different modes in order to measure different types of signals.

Key Path: Front-panel key

Remote Command:

There is no equivalent remote command.

7.8.1   Avg Number

Pressing **Avg Number** to **On** enables you to specify the number of measurements that will be averaged when calculating the measurement result. The average will be displayed at the end of each sweep.Setting **Avg Number** to **Off** disables the measurement averaging.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: 10 / Off

Range: 1 to 1000

Remote Command:

[:SENSe]:ACPower:AVERage:COUNt <integer>

[:SENSe]:ACPower:AVERage:COUNt?

[:SENSe]:ACPower:AVERage[:STATe] OFF|ON|0|1 turns the averaging on or off.

[:SENSe]:ACPower:AVERage[:STATe]?

Example: ACP:AVER:COUN 10

                ACP:AVER:COUN?

                ACP:AVER OFF

                ACP:AVER?

7.8.2   Avg Mode

Press **Avg Mode** to select the type of termination control used for the averaging function as either **Exp** or **Repeat**. This determines the averaging action after the specified number of measurements (average count) is reached.

- **EXP** (Exponential Averaging mode)—When you set **Avg Mode** to **Exp**, each successive data acquisition after the average count is reached is exponentially weighted and combined with the existing average. Exponential averaging weights new data more than old data, which facilitates tracking of slow-changing signals. The average will be displayed at the end of each sweep.

- **Repeat**—When you set **Avg Mode** to **Repeat**, after reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: EXPonential

Remote Command:

[:SENSe]:ACPower:AVERage:TCONrol EXPonential|REPeat

[:SENSe]:ACPower:AVERage:TCONrol?

Example: ACP:AVG:TCON EXP

                          ACP:AVG:TCON?

7.8.3   Chan Integ BW

Press **Chan Integ BW** to specify the range of integration used in calculating the power in the main channel.

Key Path: **Meas Setup**

Key Notes: If "RRC Filter" is on, the actual integration bandwidth used is the displayed integration bandwidth multiplied by (1 + "Filter Alpha").

State Saved: Saved in instrument state.

Factory Preset: 2.0 MHz or as defined by the selected radio standard.

Default Terminator: Hz

Knob Increment: Span/50 if non-zero span.

                          RBW/100 if zero span.

Step Key
Increment: RBW if **CF Step** is set to **Auto** with zero span.

                          Span/10 if **CF Step** is set to **Auto** with non-zero span.

CF Step if **CF Step** is set to **Manual**.

Range: Depends on the adjacent-channel settings and the minimum and maximum analyzer span.

Remote Command:

[:SENSe]:ACPower:BANDwidth|BWIDth:INTegration <freq>

[:SENSe]:ACPower:BANDwidth|BWIDth:INTegration?

Example: ACP:BWID:INT 5E6

ACP:BWID:INT?

7.8.4 Offset/Limits

Accesses menu keys that allow you to configure the offsets for the ACP measurement.

Key Path: **Meas Setup**

7.8.4.1 Offset

Selects the offset the menu keys will affect. Press **Offset** until the letter of the desired offset is underlined.

Key Path: **Meas Setup**, **Offset Setup**

State Saved: Saved in instrument state.

Factory Preset: A

Remote Command:

There is no remote command for this function.

7.8.4.2 Offset Freq

Enables you to set the frequency difference from the center of the main channel to the center of the offset for a maximum of 6 offsets (labeled A-F). It also allows you to turn on/off the offsets that you want to measure.

Key Path: **Meas Setup**, **Offset Setup**

State Saved: Saved in instrument state.

Factory Preset: 3 MHz, if no radio standard (**None**) is selected.

If a radio standard is selected, the default value is defined by the selected standard. This command, along with commands [:SENSe]:ACPower:OFFSet:LIST:BANDwidth|BWIDth[:INTegration] and [:SENSe]:ACPower:OFFSet:LIST:STATe, are used to set an entire

array of values. The following table shows the default array if no radio standard (**None**) is selected.

Offset	State	Frequency	Integ. BW
A	ON	3 MHz	2 MHz
B	OFF	0	2 MHz
C	OFF	0	2 MHz
D	OFF	0	2 MHz
E	OFF	0	2 MHz
F	OFF	0	2 MHz

Default Terminator: Hz

Knob Increment: Span/50 if non-zero span.

RBW/100 if zero span.

Step Key
Increment: RBW if **CF Step** is set to **Auto** with zero span.

Span/10 if **CF Step** is set to **Auto** with non-zero span.

CF Step if **CF Step** is set to **Manual**.

Range: 0 Hz to 45 MHz

History: Added with firmware revision A.07.00.

Remote Command:

[:SENSe]:ACPower:OFFSet:LIST[:FREQuency]
<f_offset>,<f_offset>,<f_offset>,<f_offset>,<f_offset>,<f_offset>

[:SENSe]:ACPower:OFFSet:LIST[:FREQuency]?

[:SENSe]:ACPower:OFFSet:LIST:STATE
OFF|ON|0|1, OFF|ON|0|1, OFF|ON|0|1, OFF|ON|0|1, OFF|ON|0|1, OFF|ON|0|1

[:SENSe]:ACPower:OFFSet:LIST:STATE?

Remote Command Notes: This command, along with commands [:SENSe]:ACPower:OFFSet:LIST:BANDwidth|BWIDth[:INTegration] and [:SENSe]:ACPower:OFFSet:LIST:STATe, are used to set the parameters for all of the offsets, up to six. The following table shows the values of these parameters if no radio standard (**None**) is selected.

Offset	State	Frequency	Integ. BW
A	ON	3 MHz	2 MHz
B	OFF	0	2 MHz

Offset	State	Frequency	Integ. BW
C	OFF	0	2 MHz
D	OFF	0	2 MHz
E	OFF	0	2 MHz
F	OFF	0	2 MHz

Example: Sending fewer than six parameters to one of these commands will leave the values of the unspecified offsets unchanged. If you don't send settings for all 6 offsets, it will set all the offsets that you specified, then it will set any remaining offsets to the same setting as the last offset that you sent.

`ACP:OFFS:LIST 50 Hz,75 Hz,100 Hz,125 Hz,150 Hz,175 Hz`

`ACP:OFFS:LIST:STAT ON,ON,ON,OFF,OFF,OFF`

For example, after the above command is sent, sending the command with only four parameters (`ACP:OFFS:LIST:STAT ON,ON,ON,OFF`) will result in the fifth and sixth offset remaining the same as the previous setting (OFF).

7.8.4.3   Ref BW

Sets the reference bandwidth (integration bandwidth) for each offset.

Key Path: **Meas Setup, Offset Setup**

State Saved: Saved in instrument state.

Factory Preset: 2 MHz, if no radio standard (**None**) is selected.

If a radio standard is selected, the default value is defined by the selected standard. This command, along with commands [:SENSe]:ACPower:OFFSet:LIST[:FREQuency] and [:SENSe]:ACPower:OFFSet:LIST:STATe are used to set an entire array of values. The following table shows the default array if no radio standard (**None**) is selected.

Offset	State	Frequency	Integ. BW
A	ON	3 MHz	2 MHz
B	OFF	0 Hz	2 MHz
C	OFF	0 Hz	2 MHz
D	OFF	0 Hz	2 MHz
E	OFF	0 Hz	2 MHz

Offset	State	Frequency	Integ. BW
F	OFF	0 Hz	2 MHz

Default Terminator: Hz

Range: 300 Hz to 20 MHz

History: Added with firmware revision A.07.00.

Remote Command:

```
[:SENSe]:ACPower:OFFSet:LIST:BANDwidth|BWIDth[:INTegration]
<bw>,<bw>,<bw>,<bw>,<bw>,<bw>
```

```
[:SENSe]:ACPower:OFFSet:LIST:BANDwidth|BWIDth[:INTegration]?
```

Remote Command Notes: If a radio standard is selected, the default value is defined by the selected standard. This command, along with commands [:SENSe]:ACPower:OFFSet:LIST[:FREQuency] and [:SENSe]:ACPower:OFFSet:LIST:STATe are used to set an entire array of values. The following table shows the default array if no radio standard (**None**) is selected.

Offset	State	Frequency	Integ. BW
A	ON	3 MHz	2 MHz
B	OFF	0 Hz	2 MHz
C	OFF	0 Hz	2 MHz
D	OFF	0 Hz	2 MHz
E	OFF	0 Hz	2 MHz
F	OFF	0 Hz	2 MHz

Example: `ACP:OFFS:LIST:BAND 50,50,50,50,50,50`

               `ACP:OFFS:LIST:BAND?`

7.8.4.4   Pos Offset Limit

Enables you to set the upper limit for the upper segment of the specified offset pair.

Key Path: **Meas Setup**, **Offset Setup**

State Saved: Saved in instrument state.

Factory Preset: 0.00 dB

Default Terminator: dB

Range: −200 dB to 200 dB

History: Added with firmware revision A.08.00.

Remote Command:

```
:CALCulate:ACPower:OFFSet:LIST:LIMit:POSitive[:UPPer]:DATA
<rel_power>,<rel_power>,<rel_power>,<rel_power>,<rel_power>,<rel_power>
```

```
:CALCulate:ACPower:OFFSet:LIST:LIMit:POSitive[:UPPer]:DATA?
```

Example: `CALC:ACP:OFFS:LIST:LIM:POS:DATA 10,10,10,10,10,10`

                 `CALC:ACP:OFFS:LIST:LIM:POS:DATA?`

7.8.4.5   Neg Offset Limit

Enables you to set the upper limit for the lower segment of the specified offset pair.

Key Path: **Meas Setup**, **Offset Setup**

State Saved: Saved in instrument state.

Factory Preset: 0.00 dB

Default Terminator: dB

Range: −200 dB to 200 dB

History: Added with firmware revision A.08.00.

Remote Command:

```
:CALCulate:ACPower:OFFSet:LIST:LIMit:NEGative[:UPPer]:DATA
<rel_power>,<rel_power>,<rel_power>,<rel_power>,<rel_power>,<rel_power>
```

```
:CALCulate:ACPower:OFFSet:LIST:LIMit:NEGative[:UPPer]:DATA?
```

Example: `CALC:ACP:OFFS:LIST:LIM:NEG:DATA −50,−50,−50,−50,−50,−50`

                 `CALC:ACP:OFFS:LIST:LIM:NEG:DATA?`

7.8.5   Meas Type

Press **Meas Type** to specify the reference for the measurement, either **Total Pwr Ref** or **PSD Ref**. Relative values can be displayed referenced to either the total power (**Total Pwr Ref**) or the power spectral density (**PSD Ref**) measured in the main channel.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: Total Pwr Ref

History: Added with firmware revision A.07.00.

Remote Command:

[:SENSe]:ACPower:TYPE PSDRef|TPRef

[:SENSe]:ACPower:TYPE?

Example: ACP:TYPE PSDR

                ACP:TYPE?

7.8.6   Optimize Ref Level

Sets the input attenuator and reference level to optimize the robustness of the measurement, in which it is free from errors due to input compression and log amp range limitations. The input attenuator setting will not necessarily give the optimum dynamic range, nor the optimum accuracy. No single setting can optimize both, and the optimum setting often depends on the signal characteristics.

NOTE	There will always be a minimum of 5 dB of attenuation set to protect the analyzer input.

Key Path: **Meas Setup**

State Saved: Not saved.

Remote Command:

[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE

Example: POW:RANG:AUTO ONCE

7.8.7   Method

Enables you to set the measurement method to either the integration bandwidth method (IBW) or the resolution bandwidth method (RBW). The resolution bandwidth method is most useful for measuring cdmaOne and cdma2000 signals.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: IBW

History: Added with firmware revision A.08.00.

Remote Command:

[:SENSe]:ACPower:METHod IBW|RBW

[:SENSe]:ACPower:METHod?

Example: ACP:METH RBW

               ACP:METH?

7.8.8 Total Pwr Ref

Enables you to set the adjacent channel power reference to automatic or manual. When set to automatic, the carrier power result reflects the measured power value in the carrier. When set to manual, the last measured value is captured and held, or may be entered by the user. Relative values are displayed, referenced to the total power measured in the main channel.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: Auto, Measured carrier power value

Terminators: dBm

Default Terminator: dBm

Range: –200 dBm to 200 dBm

History: Added with firmware revision A.07.00.

Remote Command:

[:SENSe]:ACPower:CARRier[:POWer]

[:SENSe]:ACPower:CARRier:AUTO[:STATe] OFF|ON|0|1

[:SENSe]:ACPower:CARRier:AUTO[:STATe]?

[:SENSe]:ACPower:CARRier[:POWer] <ampl>

[:SENSe]:ACPower:CARRier[:POWer]?

Example: ACP:CARR:AUTO 0

               ACP:CARR:AUTO?

               ACP:CARR -100

               ACP:CARR?

7.8.9 PSD Ref

Enables you to set the power spectral density in the carrier (main channel) that will be used to compute the relative power spectral density values for the offsets. When the PSD Ref state is set to Auto, this will be set to the measured carrier power spectral density.

Factory Preset: 0 dBm

Terminators: dBm

Default Terminator: dBm

Step Key
Increment: `1, 1.5, 2...`

Range: –999 dBm to +999 dBm

History: Added with firmware revision A.07.01.

Remote Command:

`[:SENSe]:ACPower:CARRier:CPSD <dBm>`

`[:SENSe]:ACPower:CARRier:CPSD?`

Remote Command Notes: This function is only available when measurement type is set to PSD Ref, use the command `[:SENSe]:ACPower:TYPE PSDRef` to select the measurement type.

Example: `ACP:CARR:CPSD 5`

7.8.10   Limit Test

Pressing **Limit Test** turns the testing of the limit line on or off. Any offsets that are in the off state are not measured and their results will not be displayed on screen.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: Off

History: Updated with firmware revision A.07.01.

Remote Command:

`[:SENSe]:ACPower:LIMit[:STATe] OFF|ON|0|1`

`[:SENSe]:ACPower:LIMit[:STATe]?`

Example: `ACP:LIM 1`

                     `ACP:LIM?`

7.8.11   RRC Filter

Pressing **Filter** turns the Root Raised Cosine filter on or off. This filter is the type specified in the NADC and 3GPP W-CDMA standards and is only available when **3GPP W-CDMA** or **NADC** is selected as the **Radio Std** from the **Mode Setup** menu. If **3GPP W-CDMA** is selected, the rolloff value (alpha) for the filter will be initially set to 0.22 and T will be 260 ns. If **NADC** is selected, the rolloff will be initially set to 0.35 and T will be 42 μs. The rolloff value can be changed using.

The filter is unavailable when the measurement method is set to **RBW**.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: Off

History: Added with firmware revision A.08.00.

Remote Command:

[:SENSe]:ACPower:FILTer[:RRC][:STATe] OFF|ON|0|1

[:SENSe]:ACPower:FILTer[:RRC][:STATe]?

Example: ACP:FILT 1

              ACP:FILT?

7.8.12   Filter Alpha

Press **Filter** to input the alpha value for the RRC Filter. This parameter is available when **3GPP W-CDMA**, **NADC**, or **Tetra** has been selected as the Radio Std. from the Mode Setup menu.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: 0.22 when W-CDMA is selected, 0.35 when NADC or Tetra is selected, otherwise Off.

Knob Increment: 0.01

Step Key
Increment: 0.1

Range: 0.01 to 1.0

History: Added with firmware revision A.09.00.

Remote Command:

[:SENSe]:ACPower:FILTer[:RRC]:ALPHA <number>

[:SENSe]:ACPower:FILTer[:RRC]:ALPHA?

Example: ACP:FILT:ALPH 0.22

              ACP:FILT:ALPH?

7.8.13   Noise Correction

Pressing **Noise Correction** turns noise correction **on** or **off**. When you set **Noise Corr** to **On**, a calibration of the noise floor is performed and used to correct for analyzer noise floor contribution to measurement levels, increasing dynamic range.

Noise Correction is unavailable when the radio standard is set to NADC or PDC when the measurement method is set to RBW.

Key Path: Meas Setup,

State Saved: Saved in instrument state.

Factory Preset: Off

History: Added with firmware revision A.07.01.

Remote Command:

[:SENSe]:ACPower:CORRection:NOISe[:AUTO] OFF|ON|0|1

[:SENSe]:ACPower:CORRection:NOISe[:AUTO]?

Remote Command Notes: The noise correction feature is not available when the radio standard is set to NADC or PDC

Example: ACP:CORR:NOIS 1

                 ACP:CORR:NOIS?

7.9 Trace/View (ACP Measurement)

If **ACP** has been selected in the **Measure** menu of the Spectrum Analysis mode, this key displays the appropriate **Trace/View** menu for the adjacent channel power (ACP) measurement.

Displays menu keys that enable you to set how trace information is stored and displayed.

Key Path:　　　Front-panel key

Factory Preset: Spectrum

Remote Command:

There is no equivalent remote command for this function.

7.9.1 Spectrum

Pressing **Spectrum** selects the spectral display of the measurement.

Key Path:　　　　**Trace/View**

Factory Preset: Spectrum

History:　　　　Added with firmware revision A.07.00

Remote Command:

There is no remote command for this function.

7.9.2 Bar Graph

Pressing **Bars** turns the graphic bar display on or off.

Key Path:　　　　**Trace/View**

Factory Preset: Spectrum

History:　　　　Added with firmware revision A.07.00

Remote Command:

There is no remote command for this function.

7.9.3 Combined

Pressing **Combined** selects the measurement to be displayed as a bar graph and spectrum as

shown below.
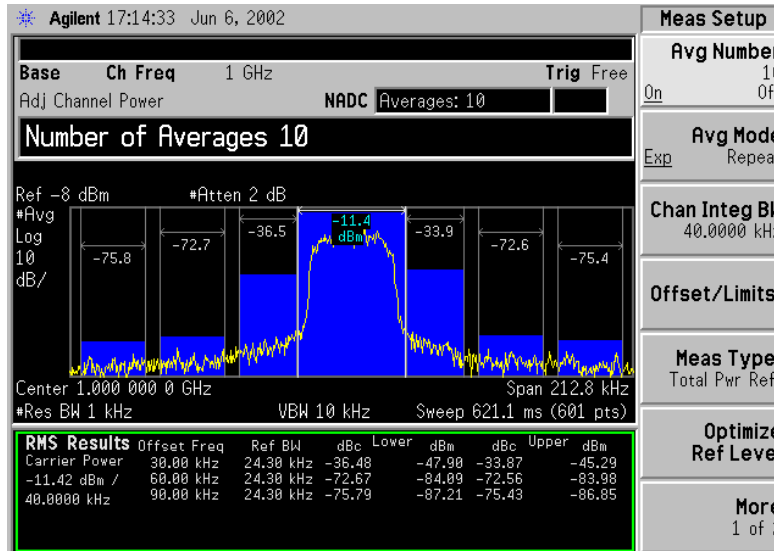
Key Path: **Trace/View**

Factory Preset: Spectrum

History: Added with firmware revision A.07.00

Remote Command:

There is no remote command for this function.

7.9.4   Combined View Units

Pressing **Combined View Units** selects the units (**dBc** or **dBm**) for the floating numeric displays when **Combined** is selected.

Key Path: **Trace/View**

Factory Preset: dBc

History: Added with firmware revision A.08.00

Remote Command:

There is no remote command for this function.

7.9.5   Trace

Displays menu keys that enable you to set how the trace information is stored and displayed.

Key Path: **Trace/View**

State Saved: Saved in Instrument State for all traces

Remote Command:

There is no remote command for this function.

7.9.5.1 Trace (1 2 3)

Determines which trace the menu keys will affect. Press **Trace 1 2 3** until the number of the desired trace is underlined.

Key Path: **Trace/View**, **Trace**

State Saved: Saved in Instrument State for all traces

Remote Command:

:TRACe[1]|2|3:MODE WRITe|MAXHold|MINHold|VIEW|BLANk

    WRITe = **Clear Write**

    MAXHold = **Max Hold**

    MINHold = **Min Hold**

    VIEW = **View**

    BLANk = **Blank**

:TRACe[1]|2|3:MODE?

Remote Command Notes: Whenever the number of sweep points change, the following functions are affected:

- All trace data is erased
- Any traces in view mode will go to blank mode

Example: TRAC:MODE WRIT

                TRAC:MODE MAXH

                TRAC:MODE MINH

                TRAC:MODE VIEW

                TRAC:MODE BLANk

                TRAC:MODE?

7.9.5.2 Clear Write

Erases any data previously stored in the selected trace and continuously displays signals during the sweep of the analyzer.

Key Path: **Trace/View**, **Trace**

Remote Command:

See "Trace/View (ACP Measurement)" on page 487.

Example: TRAC:MODE WRIT

7.9.5.3   Max Hold

Maintains the maximum level for each trace point of the selected trace (1, 2 or 3), and updates each trace point if a new maximum level is detected in successive sweeps.

Key Path: **Trace/View, Trace**

Remote Command:

See "Trace/View (ACP Measurement)" on page 487.

Example: TRAC:MODE MAXH

7.9.5.4   Min Hold

Maintains the minimum level for each trace point of the selected trace (1, 2 or 3), and updates each trace point if a new minimum level is detected in successive sweeps.

Key Path: **Trace/View, Trace**

Remote Command:

See "Trace/View (ACP Measurement)" on page 487.

Example: TRAC:MODE MINH

7.9.5.5   View

Holds and displays the amplitude data of the selected trace. The trace is not updated as the analyzer sweeps.

Key Path: **Trace/View, Trace**

Remote Command:

:TRACe[1]|2|3:MODE WRITe|MAXHold|MINHold|VIEW|BLANk

Example: TRAC:MODE VIEW

7.9.5.6   Blank

Stores the amplitude data for the selected trace and removes it from the display. The selected trace register will not be updated as the analyzer sweeps.

Key Path: **Trace/View, Trace**

Remote Command:

`:TRACe[1]|2|3:MODE WRITe|MAXHold|MINHold|VIEW|BLANk`

Example: TRAC:MODE BLAN

7.10   Meas Setup (Burst Power)

When **Burst Power** has been selected in the **Measure** menu of the Spectrum Analysis Mode, this key displays the appropriate measurement setup menu.

The burst power measurement is an accurate method of determining the average power for the specified burst.

Key Path: Front-panel key

History: Added with firmware revision A.07.00

Remote Command:

There is no equivalent remote command.

7.10.1   Avg Number

Press **Avg Number (On)** to specify the number of measurement averages used when calculating the measurement result. The average is displayed at the end of each sweep.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: 10 averages / Off

Range: 1 to 1000

History: Added with firmware revision A.07.00

Remote Command:

[:SENSe]:BPOWer:AVERage:COUNt <integer>

[:SENSe]:BPOWer:AVERage:COUNt?

[:SENSe]:BPOWer:AVERage[:STATe] OFF|ON|0|1

[:SENSe]:BPOWer:AVERage[:STATe]?

Example: BPOW:AVER:COUN 100

                BPOW:AVER ON

7.10.2   Avg Mode

Press **Avg Mode** to select the type of termination control used for the averaging function to either **Exp** or **Repeat**. This determines the averaging action after the specified number of

measurements (average count) is reached.

- **EXP** (Exponential Averaging mode)—When you set **Avg Mode** to **Exp**, each successive data acquisition after the average count is reached is exponentially weighted and combined with the existing average. Exponential averaging weights new data more than old data, which facilitates tracking of slow-changing signals. The average will be displayed at the end of each sweep.

- **Repeat**—When you set **Avg Mode** to **Repeat**, after reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: EXPonential

Range: EXPonential|REPeat

History: Added with firmware revision A.07.00

Remote Command:

`[:SENSe]:BPOWer:AVERage:TCONrol EXPonential|REPeat`

`[:SENSe]:BPOWer:AVERage:TCONrol?`

Example: `BPOW:AVG:TCON EXP`
                `BPOW:AVG:TCON?`

7.10.3   Average Type

Allows you to specify the type of result averaging to be performed.

- **Log** — Selects averaging that sums the trace data and divides by the number of data points.

- **RMS** — Selects averaging that converts trace data from dB to power units, then averages the power trace data. This selection requires more time to perform.

Key Path: **Meas Setup**

Factory Preset: RMS

Range: RMS or Log

History: Added with firmware revision A.07.00

Remote Command:

`[:SENSe]:BPOWer:AVERage:TYPe LPOWer|POWer`

`[:SENSe]:BPOWer:AVERage:TYPe?`

Example: `BPOW:AVG:TYP LPOW`er to select Log type.
                `BPOW:AVG:TYP?`

7.10.4 Threshold Lvl

Enables you to set the level above which the mean carrier power calculation is based. The threshold level can be described in dB (**Rel**) or dBm (**Abs**).

Key Path: **Meas Setup**

Factory Preset: −30 dB

Terminators: dB or dBm

Default Terminator dB

Knob Increment: 0.1 dB/dBm

Step Key
Increment: 6 dB/dBm

Range: −60 dBm to 60 dBm (in absolute mode)

               −60 dB to 0 dB (in relative mode)

History: Added with firmware revision A.07.00

Remote Command:

[:SENSe]:BPOWer:THReshold <number>

[:SENSe]:BPOWer:THReshold?

[:SENSe]:BPOWer:THReshold:TYPE ABSolute|RELative

[:SENSe]:BPOWer:THReshold:TYPE?

Example: SENS:BPOW:THR:TYPE ABS

7.10.5 Meas Method

Allows you to select the measurement method.

- **Above Threshold Lvl** — Selects the user defined threshold level or default level (-3.00 dB) as the criteria in making the measurement.

- **Measured Burst Width** — This measurement method is not available for the following radio standards: IS-95, J-STD-008, cdma2000-SR1, cdma2000-SR3, W-DCMA 3GPP.

NOTE   The measurements described above are those available in SA mode (see **Mode** key). Other measurements are available in other modes if an optional personality is installed.

Key Path: **Meas Setup**

Factory Preset: Above Threshold Lvl (THReshold)

Range: Measured Burst Width (BWIDth) to Above Threshold Lvl (THReshold)

History: Added with firmware revision A.07.00

Remote Command:

[:SENSe]:BPOWer:METHod THReshold|BWIDth

[:SENSe]:BPOWer:METHod?

Example: BPOW:METH BWID to select burst width as the measurement method.

7.10.6 Burst Width

Sets the burst width parameter to automatic mode (**Auto**) or manual mode (**Man**).

- **Auto** — The burst width is automatically calculated based on the threshold level. For example, if the threshold level is set to 3 dB, the burst width will be the time between the two 3 dB points. This will update after each sweep, but before any results are calculated. Since the measurement only measures over the burst width, this will force a measurement between the 3 dB points.

- **Man** — To specify the burst width to measure a portion of the burst. You can enter a fixed-time value in seconds, or specify the burst width as a percentage of the last measured burst width. If you specify the burst width as a percentage, the fixed-value time is instantaneously calculated and displayed on the softkey.

NOTE   This key will be greyed out if **Meas Method** is set to **Above Threshold Lvl**.

Key Path: **Meas Setup**

Factory Preset: 542.77 µs

Terminators: %, s, ms, µs, ns (% from front panel only)

Default Terminator: seconds (s)

Knob Increment: 0.1 µs

Step Key
Increment: 10 µs

Range: 0.1 µs to 2 ks

History: Added with firmware revision A.07.00

Remote Command:

[:SENSe]:BPOWer:BURSt:WIDTh <time>

[:SENSe]:BPOWer:BURSt:WIDTh?

[:SENSe]:BPOWer:BURSt:AUTO OFF|ON|0|1

[:SENSe]:BPOWer:BURSt:AUTO?

Remote Command Notes: Burst width cannot be set remotely as a percent of the current burst width. That functionality is available from the front panel, but the command must be sent with a time value.

Example: SENS:BPOW:BURST:AUTO ON

7.10.7   Optimize Ref Level

Sets the input attenuator and reference level to optimize the robustness of the measurement, which is its freedom from errors due to input compression and log amp range limitations.

NOTE	There will always be a minimum of 5 dB of attenuation set to protect the analyzer input.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: n/a

History: Added with firmware revision A.07.00

Remote Command:

[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE

Example: POW:RANG:AUTO ONCE

7.11   Trace/View (Burst Power)

If **Burst Power** has been selected in the **Measure** menu of the Spectrum Analysis mode, this key displays the appropriate **Trace/View** menu for the burst power measurement.

Displays menu keys that enable you to set how trace information is stored and displayed.

Key Path: Front-panel key

History: Added with firmware revision A.08.00

Remote Command:

There is no remote command for this key.

7.11.1   RF Envelope

Press **RF Envelope** to view the measurement results as shown in the following figure. The results are updated after each sweep.
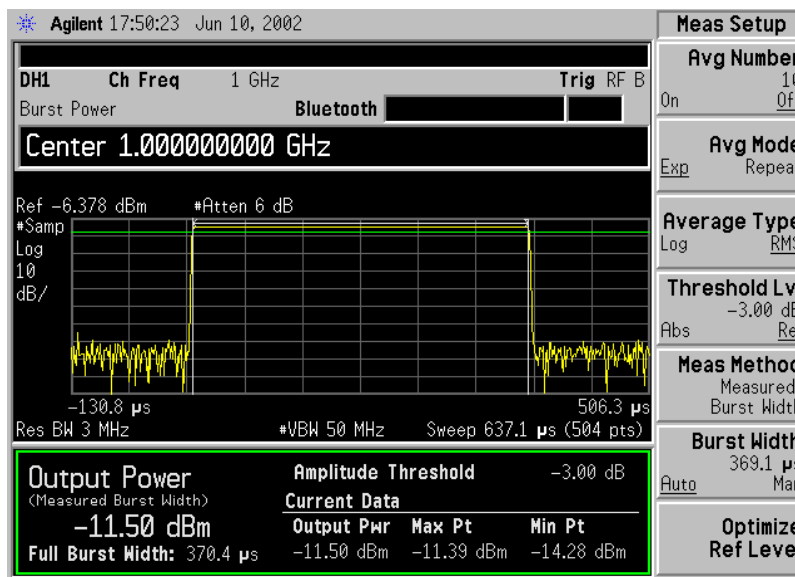
Key Path: **Trace/View**

History: Added with firmware revision A.08.00

7.11.2   Combined

Pressing **Combined** displays measurement results the same as RF Envelope, but has a blue bar between the markers to indicate the measured output power level. The actual measure

output power is displayed at the bottom of the bar. Refer to the following figure.
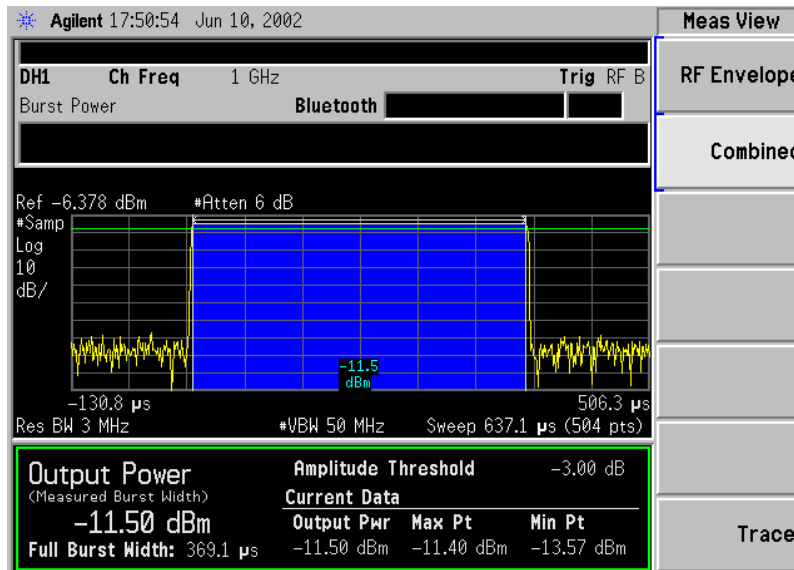
Key Path: **Trace/View**

History: Added with firmware revision A.08.00

7.11.3   Trace

Displays menu keys that enable you to set how the trace information is stored and displayed.

Key Path: **Trace/View**

State Saved: Saved in Instrument State for all traces

History: Added with firmware revision A.08.00

Remote Command:

There is no remote command for this function.

7.11.3.1   Trace (1 2 3)

Determines which trace the menu keys will affect. Press **Trace 1 2 3** until the number of the desired trace is underlined.

Key Path: **Trace/View, Trace**

State Saved: Saved in Instrument State for all traces

History: Added with firmware revision A.08.00

Remote Command:

There is no remote command for this function.

7.11.3.2   Clear Write

Erases any data previously stored in the selected trace and continuously displays signals during the sweep of the analyzer.

Key Path: **Trace/View, Trace**

Remote Command:

`:TRACe[1]|2|3:MODE WRITe|MAXHold|MINHold|VIEW|BLANk`

Example: TRAC:MODE WRIT

7.11.3.3   Max Hold

Maintains the maximum level for each trace point of the selected trace (1, 2 or 3), and updates each trace point if a new maximum level is detected in successive sweeps.

Key Path: **Trace/View, Trace**

Remote Command:

`:TRACe[1]|2|3:MODE WRITe|MAXHold|MINHold|VIEW|BLANk`

Example: TRAC:MODE MAXH

7.11.3.4   Min Hold

Maintains the minimum level for each trace point of the selected trace (1, 2 or 3), and updates each trace point if a new minimum level is detected in successive sweeps.

Key Path: **Trace/View, Trace**

Remote Command:

`:TRACe[1]|2|3:MODE WRITe|MAXHold|MINHold|VIEW|BLANk`

Example: TRAC:MODE MINH

7.11.3.5   View

Holds and displays the amplitude data of the selected trace. The trace is not updated as the analyzer sweeps.

Key Path: **Trace/View, Trace**

Remote Command:

`:TRACe[1]|2|3:MODE WRITe|MAXHold|MINHold|VIEW|BLANk`

Example: TRAC:MODE VIEW

7.11.3.6 Blank

Stores the amplitude data for the selected trace and removes it from the display. The selected trace register will not be updated as the analyzer sweeps.

Key Path: **Trace/View, Trace**

Remote Command:

`:TRACe[1]|2|3:MODE WRITe|MAXHold|MINHold|VIEW|BLANk`

Example: TRAC:MODE BLAN

7.12 Meas Setup Power Stat CCDF (Complimentary Cumulative Distribution Function)

When **Power Stat CCDF** has been selected in the **Measure** menu of the Spectrum Analysis mode, this key displays the appropriate measurement setup menu for the complimentary cumulative distribution function (CCDF).

Power Complimentary cumulative distribution function (CCDF) curves characterize the higher-level power of the signal. It provides the distribution of peak-to-average power ratios versus probability. A CCDF curve is defined by how much time the waveform spends at or above the specified power level. The percent of time the signal spends at or above this level defines the probability for that particular power level.

Key Path: Front-panel key

History: Added with firmware revision A.07.00.

Remote Command:

There is no equivalent remote command.

7.12.1 Meas BW

Press **Meas BW** to set the measurement 3 dB resolution bandwidth according to the channel bandwidth. The range is 1.0 kHz to 5.0000 MHz with 0.1 kHz resolution.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: Defined by the radio standard selected.

Terminators: Hz, kHz, MHz, GHz

Knob Increment: Steps through available Res BW filters.

Step Key
Increment: Steps through available Res BW filters.

Range: Lowest non-zero Span supported by Analyzer to the maximum Span of the ESA

History: Added with firmware revision A.07.00.

Remote Command:

[:SENSe]:PSTatistic:BANDwidth|BWIDth <freq>

[:SENSe]:PSTatistic:BANDwidth|BWIDth?

Remote Command Notes: You may enter only valid Res BW filter frequencies.

This command is coupled with the analyzer resolution bandwidth

Example: PST:BAND 10 or PST:BWID 10

                PST:BAND? or PST:BWID?

7.12.2 Counts

Press **Counts** to set the accumulated number of sampling points for data acquisition. The range is 1 kpoints (kilo point–1x10e3 point) to 2.000000 Gpoints (Giga point–1x10e9 point) with 1 kpoint resolution. While this key is activated, enter a value from the numeric keypad by terminating with one of the unit keys shown.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: 1.00e5

Range: 1e3 to 1e9

History: Added with firmware revision A.07.00.

Remote Command:

[:SENSe]:PSTatistic:COUNts <integer>

[:SENSe]:PSTatistic:COUNts?

Example: PST:COUN 1.0e6

                PST:COUNt?

7.12.3 Meas Interval

Press **Meas Interval** to specify the time interval over which the measurement is made. The range is 1.0 μs to 3.195 ms and dependent on the measurement bandwidth setting with 1 μs resolution

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: 1.0e–3s

Default Terminator: s

Range: 1 μs minimum. Maximum value depends upon the measurement bandwidth. BW factor = 5 x meas BW or 10,000,000; whichever is less.

History: Added with firmware revision A.07.00.

Remote Command:

[:SENSe]:PSTatistic:SWEep:TIME <time>

```
[:SENSe]:PSTatistic:SWEep:TIME?
```

Example: PST:SWE:TIME 1.0e–3

                PST:SWE:TIME?

7.12.4   Optimize Ref Level

Sets the input attenuator and reference level to optimize the robustness of the measurement, which is its freedom from errors due to input compression and log amp range limitations.

NOTE	There will always be a minimum of 6 dB of attenuation set to protect the analyzer input.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: n/a

Range: n/a

History: Added with firmware revision A.07.00.

Remote Command:

```
[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE
```

Example: POW:RANG:AUTO ONCE

7.13   Display (Complimentary Cumulative Distribution Function—CCDF)

Press **Display** to access menu keys that allow you to configure parameters for the CCDF measurement.

NOTE   The keys described below are measurement dependent. To access the display menus, for the CCDF measurement press **Measure**, **Power Stat CCDF**, then **Display**.

7.13.1   Full Screen

Expands the measurement window horizontally over the entire instrument display. Pressing any other key that results in a new menu cancels the full screen function.

Any error occurring turns full screen mode off.

Key Path: **Display**

Key Path: **Display**

State Saved: Not saved in state.

Factory Preset: Off

Factory
Default: Off

7.13.2   Store Ref Trace

Press **Store Ref Trace** to copy the currently measured curve as the user-definable reference trace. The captured data will remain until the other mode is chosen. Pressing this key refreshes the reference trace.

Key Path: **Display**

Factory Preset: n/a

Remote Command:

`:CALCulate:PSTatistic:STORe:REFerence`

Example: `CALC:PST:STOR:REF`

7.13.3   Ref Trace

Press **Ref Trace** to toggle the reference trace display function between **On** and **Off**.

Key Path: **Display**

State Saved: Saved in instrument state.

Factory Preset: Off

Remote Command:

`:DISPlay:PSTatistic:REFerence[:STATe] OFF|ON|0|1`

`:DISPlay:PSTatistic:REFerence[:STATe]?`

Example: `PST:REF 1`

                `PST:REF?`

7.13.4 Gaussian Trace

Press **Gaussian Line** to toggle the Gaussian line display function between **On** and **Off**.

Key Path: **Display**

State Saved: Saved in instrument state.

Factory Preset: Off

Remote Command:

`:DISPlay:PSTatistic:GAUSsian[:STATe] OFF|ON|0|1`

`:DISPlay:PSTatistic:GAUSsian[:STATe]?`

Example: `PST:GAUS 1`

                `PST:GAUS?`

7.13.5 Preferences

Displays menu keys that enable you to turn the graticule and annotation on or off.

Key Path: **Display**

State Saved: Saved in instrument state.

Factory Preset: No title

Fundamental
Units: N/A

7.13.5.1 Graticule (On Off)

Pressing Graticule turns the display graticules **On** or **Off**.

Key Path: **Display, Preferences**

Factory Preset: On

Factory
Default: On

Terminators: Enter

7.14   SPAN X Scale (Complimentary Cumulative Distribution Function—CCDF)

Activates the Span function for the CCDF measurement and displays the menu of span functions.

Key Path: Front-panel key

State Saved: Saved in Instrument State

Remote Command:

See the Scale/Div command below.

7.14.1   Scale/Div

Allows you to enter a numeric value to change the horizontal display sensitivity by setting the decibel units per horizontal graticule division.

Key Path: **MEASURE**, **Power Stat CCDF**, **SPAN X Scale**

State Saved: Saved in instrument state.

Factory Preset: 2.0 dB

Default Terminator: dB

Range: 0.1 to 20.00 dB with 0.01 dB resolution

Remote Command:

:DISPlay:PSTatistic:XSCale <rel_ampl>

:DISPlay:PSTatistic:XSCale?

Example   DISP:PST:XSC 10 dB

                DISP:PST:XSC?

7.15   Marker
(Complimentary Cumulative Distribution Function—CCDF)

Displays the Marker control menu for the CCDF measurement. All markers are off until either **Normal** or **Delta** is pressed. There are three control modes for the markers:

- **Normal (POSition)** - A single marker placed at the 0 dB point of the selected value of **Marker Trace** that can be moved to any point on the trace.

- **Delta (DELTa)** - Places the selected marker and the next marker at the position of the previous marker on the specified trace (selected by pressing **Marker Trace**). The next marker is the reference marker (set to normal) and the selected marker is a moveable marker (delta) that you can place at any point on the trace. The difference between the selected marker and the reference marker is displayed.

- **Off (Off)** - Turns off the active marker.

Key Path: Front-panel key

State Saved: The control mode for each marker, as well as the position of each marker, is saved in instrument state.

Factory Preset: All Off.

History: Added with firmware revision A.07.00

Remote Command:

There is no equivalent remote command. These commands control the three marker modes. Refer to the Normal, Delta, and Off key descriptions for additional information.

`:CALCulate:PSTatistic:MARKer[1]|2|3|4:MODE NORMal|DELTa|OFF`

`:CALCulate:PSTatistic:MARKer[1]|2|3|4:MODE?`

Remote Command Notes: See also the marker positioning commands:

Example: `CALC:PST:MARK:MODE DELT` activates a delta marker (marker 1) at the 0 dB point of your measurement (yellow line).

7.15.1   Select Marker

Selects one of the four possible markers. Once a marker is selected, it can be set to any of the control modes **Normal**, **Delta**, or **Off**.

Key Path: **Marker** (after **MEASURE**, **Power Stat CCDF** is selected.)

State Saved: The number of the selected marker is saved in instrument state.

Factory Preset: Marker 1

History: Added with firmware revision A.07.00

Remote Command:

`:CALCulate:PSTatistic:MARKer[1]|2|3|4[:STATe] OFF|ON|0|1`

`:CALCulate:PSTatistic:MARKer[1]|2|3|4[:STATe]?`

Sets or queries the state of a marker. Setting a marker to state ON or 1 selects that 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 display. Setting a marker to state OFF or 0 selects that marker and turns it off. The response to the query will be 0 if OFF, 1 if ON.

Example: `CALC:PST:MARK2 ON` selects marker 2.

                `CALC:PST:MARK:STAT ON` will not modify a marker that is already on.

7.15.2   Normal

Sets the control mode for the selected marker to **Normal**. If the marker is off, a single marker is activated at the 0 dB point of the selected trace (see "Marker Trace" on page 515). You can then adjust the selected marker using the numeric keypad, knob, or ⇑ ⇓ keys.

Key Path: **Marker** (after **MEASURE**, **Power Stat CCDF** is selected.)

Factory Preset: Off

History: Added with firmware revision A.07.00

Remote Command:

`:CALCulate:MARKer[1]|2|3|4:MODE POSition|NORMal`

`:CALCulate:MARKer[1]|2|3|4:MODE?`

Example: `CALC:PST:MARK:MODE NORM` selects marker 1 and sets it to **Normal**.

7.15.3   Delta

Sets the control mode for the selected marker to **Delta**. In **Delta** mode the display shows the difference between the active (**Delta**) marker and a reference marker. When **Delta** mode is selected the reference marker is placed at the current marker position, unless the marker was **OFF**, in which case both the active marker and the reference marker are placed at 0 dB point of the selected trace (see "Marker Trace" on page 515). You can adjust the trace point of the active delta marker. Annotation in the active function block and in the upper-right corner of the display indicates the power ratio (dB) difference and probability (percentage) difference of the two markers.

Key Path: **Marker** (after **MEASURE**, **Power Stat CCDF** is selected.)

History: Added with firmware revision A.07.00

Remote Command:

`:CALCulate:MARKer[1]|2|3|4:MODE POSition|DELTa`

`:CALCulate:MARKer[1]|2|3|4:MODE?`

Example: `CALC:PST:MARK3:MODE DELT` selects marker 3 as a delta marker and places a reference marker at the 0 dB point on the specified trace (see "Marker Trace" on page 515). If marker 3 is OFF it places both the active and the reference markers at the 0 dB point of the specified trace.

7.15.4   Off

Turns off the selected marker. In addition, **Off** also turns off functions related to the selected marker.

Key Path: **Marker** (after **MEASURE**, **Power Stat CCDF** is selected.)

History: Added with firmware revision A.07.00

Remote Command:

`:CALCulate:MARKer[1]|2|3|4:STATe OFF|ON|0|1`

`:CALCulate:MARKer[1]|2|3|4:STATe?`

Example:

`CALC:PST:MARK3:STAT OFF` selects marker 3 and sets it to **Off**.

7.15.5   Marker Trace

Chooses which trace the selected marker will be placed on. You can pick **Measured**, **Gaussian**, or **Reference**.

Key Path: **Marker** (after **MEASURE**, **Power Stat CCDF** is selected.)

State Saved: The **Marker Trace** for each marker is saved in instrument state.

Factory Preset: Measured

History: Added with firmware revision A.07.00

Remote Command:

`:CALCulate:PSTatistic:MARKer[1]|2|3|4:TRACe MEASured|GAUSsian|REFerence`

Puts the marker on the specified trace.

`:CALCulate:PSTatistic:MARKer[1]|2|3|4:TRACe?`

The query returns the type of the trace on which the marker currently resides.

Example: `CALC:PST:MARK1:TRAC GAUSsian` places marker 1 on the Gaussian trace.

7.15.6 Marker All Off

Turns off all markers.

NOTE	Selecting any measurement (including **Meas Off**) under **Measure**, turns off the marker table.

Key Path: **Marker** (after **MEASURE**, **Power Stat CCDF** is selected.)

History: Added with firmware revision A.07.00

Remote Command:

`:CALCulate:PSTatistic:MARKer[1]|2|3|4:AOFF`

Example: `CALC:PST:MARK:AOFF` turns off all markers.

7.15.7 Marker X Position

Sets the marker X position (horizontal) to a specified point on the X axis in the current X-axis units (dB). If the value chosen would place the marker off screen, the marker will be placed at the left or right side of the display, on the specified trace (see "Marker Trace" on page 515). If the marker is off, this command has no effect.

Key Path: **Marker**

Key Notes: When a marker is active, you may use the knob, numeric keypad, or ⇑ ⇓ keys to specify the horizontal location of the marker.

Terminators: dB

Step Key
Increment: 1 dB

Range: 0 to 50 dB

History: Added with firmware revision A.07.00

Remote Command:

`:CALCulate:PSTatistic:MARKer[1]|2|3|4:X <dB>`

Sets the marker X position in the current X-axis units (dB).

`:CALCulate:PSTatistic:MARKer[1]|2|3|4:X?`

Queries the marker X position in the current x-axis units. For the response to be valid, the marker must be on.

`:CALCulate:PSTatistic:MARKer[1]|2|3|4:X:POSition <dB>`

`:CALCulate:PSTatistic:MARKer[1]|2|3|4:X:POSition?`

This defines marker X position in display points from 0 to 50 dB.

Example: `CALC:PST:MARK:X 30 dB` activates a normal marker (marker 1) at the 30 dB location on the specified trace (see "Marker Trace" on page 515).

`CALC:PST:MARK2:X:POS 10` selects marker 2 and moves it to 1 dB location on the specified trace.

7.15.8   Marker Y Position

Displays the marker Y position (vertical) of the specified trace (see "Marker Trace" on page 515) in the current Y-axis units (percent).

History: Added with firmware revision A.07.00

Remote Command:

`:CALCulate:PSTatistic:MARKer[1]|2|3|4:Y?`

Queries the marker Y value or delta in the current y axis units. The marker must be **ON** for the response to be valid.

Example: `CALC:PST:MARK1:Y?`

7.15.9   Marker Maximum and Minimum (Remote Command Only)

Moves the marker to the maximum or minimum detected amplitude value on the display. If the marker is off, this command has no effect.

History: Added with firmware revision A.07.00

Remote Command:

`:CALCulate:PSTatistic:MARKer[1]|2|3|4:MAXimum`

`:CALCulate:PSTatistic:MARKer[1]|2|3|4:MINimum`

Example: `CALC:PST:MARK:MAX`

`CALC:PST:MARK3:MIN`

7.16   Meas Setup (Channel Power—CHP)

When the channel power measurement has been selected in the **Measure** key menu of the Spectrum Analysis Mode, this key displays the appropriate measurement setup menu.

The Channel Power measurement measures the power and power spectral density in the channel bandwidth that you specify. One marker pair on the display indicates the edges of the channel bandwidth. The center frequency, reference level, and channel bandwidth must be set by the user.

Key Path: Front-panel key

Dependencies/
Couplings: Menu changes depending on the Mode and Measurement selected.

State Saved: No save

Remote Command:

There is no equivalent remote command.

7.16.1   Avg Number

To specify the number of measurement averages used when calculating the measurement result set **Avg Number** to **On**. The average will be displayed at the end of each sweep. Setting **Avg Number** to **Off** disables measurement averaging.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: 10 averages/ Off

Knob Increment: 1

Step Key
Increment: 1

Range: 1 to 1000

Remote Command:

[:SENSe]:CHPower:AVERage:COUNt <integer>

[:SENSe]:CHPower:AVERage:COUNt?

[:SENSe]:CHPower:AVERage[:STATe] OFF|ON|0|1

[:SENSe]:CHPower:AVERage[:STATe]?

Example: CHP:AVER:COUN 10

                  CHP:AVER:COUN?

                  CHP:AVER OFF

                  CHP:AVER?

7.16.2   Avg Mode

Press **Avg Mode** to select the type of termination control used for the averaging function to either **Exp** or **Repeat**. This determines the averaging action after the specified number of measurements (average count) is reached.

- **EXP** (Exponential Averaging mode)—When you set **Avg Mode** to **Exp**, each successive data acquisition after the average count is reached is exponentially weighted and combined with the existing average. Exponential averaging weights new data more than old data, which facilitates tracking of slow-changing signals. The average will be displayed at the end of each sweep.

- **Repeat**—When you set **Avg Mode** to **Repeat**, after reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: EXPonential

Remote Command:

[:SENSe]:CHPower:AVERage:TCONrol EXPonential|REPeat

[:SENSe]:CHPower:AVERage:TCONrol?

Example: CHP:AVG:TCON EXP

                  CHP:AVG:TCON?

7.16.3   Integ BW

Press **Integ BW** to specify the range of integration used in calculating the power in the channel, for example. set the main (center) channel bandwidth. Note that the integration bandwidth is displayed on the trace as two markers connected by an arrow. Be sure the **Span** of the instrument is set between 1 and 10 times the integration bandwidth.

Key Path: **Meas Setup**

Key Notes: If "RRC Filter" is on, the actual integration bandwidth used is the displayed integration bandwidth multiplied by (1 + "Filter Alpha").

State Saved: Saved in instrument state.

Factory Preset: 2 MHz, or as defined by the selected radio standard.

Terminators: GHz, MHz, kHz, Hz

Default Terminator: Hz

Knob Increment: `1, 1.5, 2, 3, 5, 7.5, 10...`

Step Key
Increment: 1%

Range: Lowest non-zero Span to maximum span supported by your analyzer.

Remote Command:

`[:SENSe]:CHPower:BANDwidth|BWIDth:INTegration <freq>`

`[:SENSe]:CHPower:BANDwidth|BWIDth:INTegration?`

Example: `CHP:BAND:INT 1 MHz`

                     `CHP:BAND:INT?`

7.16.4   Chan Pwr Span

Press **Chan Pwr Span** to set the analyzer span for the channel power measurement. When the **RRC Filter** is set to **On**, the lower limit for the span is $(1 + \text{alpha}) \times \text{Integration BW}$.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: 3 MHz, or as defined by the selected radio standard.

Default Terminator: Hz

Knob Increment: `1, 1.5, 2, 3, 5, 7.5, 10...`

Step Key
Increment: 1%

Range: Current integration bandwidth to 10 times the integration bandwidth or span of your analyzer.

Remote Command:

`[:SENSe]:CHPower:FREQuency:SPAN <freq>`

`[:SENSe]:CHPower:FREQuency:SPAN?`

Example: `CHP:FREQ:SPAN 2 MHz`

                     `CHP:FREQ:SPAN?`

7.16.5   Optimize Ref Level

Sets the input attenuator and reference level to optimize the robustness of the measurement, which is its freedom from errors due to input compression and log amp range limitations.

NOTE	There will always be a minimum of 5 dB of attenuation set to protect the analyzer input.

Key Path: **Meas Setup**

State Saved: Not saved.

Remote Command:

[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE

Example: POW:RANG:AUTO ONCE

7.16.6   RRC Filter

Pressing **RRC Filter** turns the Root Raised Cosine filter on or off. This filter is the type specified in the Tetra and 3GPP W-CDMA standards. This parameter is only available when either **3GPP W-CDMA** or **TETRA** has been selected as the **Radio Std** from the **Mode Setup** menu. If **3GPP W-CDMA** is selected, the rolloff value (alpha) for the filter will be initially set to 0.22 and T will be 260 ns. If **TETRA** is selected, the rolloff will be initially set to 0.35 and T will be 55.56 μs. The rolloff value can be changed using **Filter Alpha.**

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: Off

History: Added with firmware revision A.09.00.

Remote Command:

[:SENSe]:CHPower:FILTer[:RRC][:STATe] OFF|ON|0|1

[:SENSe]:CHPower:FILTer[:RRC][:STATe]?

Example: CHP:FILT 1

CHP:FILT?

7.16.7   Filter Alpha

Press **RRC Filter** to input the alpha value for the RRC Filter. This parameter is only available when either **3GPP W-CDMA** or **Tetra** has been selected as the Radio Std. from the Mode Setup menu.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: 0.22 when W-CDMA is selected, 0.35 for TETRA, otherwise Off.

Knob Increment: 0.01

Step Key
Increment: 0.1

Range: 0.01 to 1.0

History: Added with firmware revision A.09.00.

Remote Command:

[:SENSe]:CHPower:FILTer[:RRC]:ALPHA <number>

[:SENSe]:CHPower:FILTer[:RRC]:ALPHA?

Example: CHP:FILT:ALPH 0.22

                 CHP:FILT:ALPH?

7.17   Trace/View (Channel Power Measurement)

If **Channel Power** has been selected in the **Measure** menu of the Spectrum Analysis mode, this key displays the appropriate **Trace/View** menu for the channel power measurement.

Displays menu keys that enable you to set how trace information is stored and displayed.

Key Path: Front-panel key

Factory Preset: Spectrum

Remote Command:

There is no equivalent remote command for this function.

7.17.1   Spectrum

Pressing **Spectrum** selects the spectral display of the measurement.

Key Path: **Trace/View**

Factory Preset: Spectrum

Remote Command:

There is no remote command for this function.

7.17.2   Combined

Pressing **Combined** selects the measurement to be displayed as a bar graph and spectrum.

Key Path: **Trace/View**

Factory Preset: Spectrum

Remote Command:

There is no remote command for this function.

7.17.3   Trace

Displays menu keys that enable you to set how the trace information is stored and displayed. Refer to "Trace/View" on page 160 for more information on these functions.

Key Path: **Trace/View**

State Saved: Saved in Instrument State for all traces

History: Added with firmware revision A.08.00

Remote Command:

There is no remote command for this function.

7.17.3.1   Trace (1 2 3)

Determines which trace the menu keys will affect. Press **Trace 1 2 3** until the number of the desired trace is underlined.

Key Path: **Trace/View, Trace**

State Saved: Saved in Instrument State for all traces

Remote Command:

There is no remote command for this function.

7.17.3.2   Clear Write

Erases any data previously stored in the selected trace and continuously displays signals during the sweep of the analyzer.

Key Path: **Trace/View, Trace**

Remote Command:

:TRACe[1]|2|3:MODE WRITe

Example: TRAC:MODE WRIT

7.17.3.3   Max Hold

Maintains the maximum level for each trace point of the selected trace (1, 2 or 3), and updates each trace point if a new maximum level is detected in successive sweeps.

Key Path: **Trace/View, Trace**

Remote Command:

:TRACe[1]|2|3:MODE MAXHold

Example: TRAC:MODE MAXH

7.17.3.4   Min Hold

Maintains the minimum level for each trace point of the selected trace (1, 2 or 3), and updates each trace point if a new minimum level is detected in successive sweeps.

Key Path: **Trace/View, Trace**

Remote Command:

`:TRACe[1]|2|3:MODE MINHold`

Example: TRAC:MODE MINH

7.17.3.5   View

Holds and displays the amplitude data of the selected trace. The trace is not updated as the analyzer sweeps.

Key Path: **Trace/View, Trace**

Remote Command:

`:TRACe[1]|2|3:MODE WRITe|VIEW`

Example: TRAC:MODE VIEW

7.17.3.6   Blank

Stores the amplitude data for the selected trace and removes it from the display. The selected trace register will not be updated as the analyzer sweeps.

Key Path: **Trace/View, Trace**

Remote Command:

`:TRACe[1]|2|3:MODE WRITe|BLANk`

Example: TRAC:MODE BLAN

7.18   Meas Setup (Harmonic Distortion)

When the harmonic distortion measurement has been selected in the Measure key menu of the Spectrum Analysis Mode, this key displays the appropriate measurement setup menu.

Key Path: Front-Panel key

Saved State: Not saved.

7.18.1   Avg Number

Press **Avg Number (On)** to specify the number of measurement averages used when calculating the measurement result. The average will be displayed at the end of each sweep.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: 10 averages / Off

Range: 1 to 1000

Remote Command:

[:SENSe]:HARMonics:AVERage:COUNt <integer>

[:SENSe]:HARMonics:AVERage:COUNt?

[:SENSe]:HARMonics:AVERage[:STATe] OFF|ON|0|1

[:SENSe]:HARMonics:AVERage[:STATe]?

Example: HARM:AVER:COUN 100

              HARM:AVER ON

7.18.2   Avg Mode

Press **Avg Mode** to select the type of termination control used for the averaging function to either **Exp** or **Repeat**. This determines the averaging action after the specified number of measurements (average count) is reached.

* **EXP** (Exponential Averaging mode)—When you set **Avg Mode** to **Exp**, each successive data acquisition after the average count is reached is exponentially weighted and combined with the existing average. Exponential averaging weights new data more than old data, which facilitates tracking of slow-changing signals. The average will be displayed at the end of each sweep.

- **Repeat**—When you set **Avg Mode** to **Repeat**, after reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: EXPonential

Range: EXPonential | REPeat

Remote Command:

[:SENSe]:HARMonics:AVERage:TCONrol EXPonential|REPeat

[:SENSe]:HARMonics:AVERage:TCONrol?

Example: HARM:AVG:TCON EXP

                        HARM:AVG:TCON?

7.18.3   Harmonics

Harmonics indicates the number of harmonics to measure before computing the total harmonic distortion. The minimum number is 2 (only the fundamental and second harmonic will be measured). The maximum number is 10.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: 10

Range: 2 to 10

Remote Command:

[:SENSe]:HARMonics:NUMBer <integer>

[:SENSe]:HARMonics:NUMBer?

Example: HARM:NUMB 5

7.18.4   ST/Harmonic

Sets the sweep time used to measure each harmonic. The value is set to 200 divided by the resolution bandwidth, or 10 ms, whichever is greater when the measurement is started. This sweep time is used only for measuring harmonics. The analyzer sweep time before the measurement was started is used for finding the fundamental.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: 10 ms / Auto

Default Terminator: seconds

Range: 10 ms to maximum sweep time of the analyzer

Remote Command:

[:SENSe]:HARMonics:SWEeptime:STATe OFF|ON|0|1

[:SENSe]:HARMonics:SWEeptime:STATe?

[:SENSe]:HARMonics:SWEeptime <time>

[:SENSe]:HARMonics:SWEeptime?

Remote Command Notes: ON is equal to automatic (Auto). OFF is equal to manual
                        (Man).

Example: HARM:SWE:STAT OFF

                HARM:SWE 100 ms

7.18.5 Range Table

Press Range Table to specify whether the range table is to be used or not. When **Range Table**
is set to **Off** the harmonics are measured. When **Range Table** is set to On the first active
range is considered to be the fundamental and the subsequent active ranges are used as
the harmonics. At least two ranges must be active if **Range Table** is set to **On**.

Key Path: **Meas Setup**

Factory Preset: See .

Range: Off|On

History: Added with firmware revision A.09.00

Remote Command:

[:SENSe]:HARMonics:RTABle:STATe OFF|ON|0|1

[:SENSe]:HARMonics:RTABle:STATe?

Example: HARM:RTAB:STAT OFF

7.18.6 Edit Range Table

Enables you to enter the settings for up to 10 ranges, either using the instrument front
panel keys or remotely. Upon entering the range table, the measurement stops, then the
analyzer is set to a constantly sweeping idle state. The analyzer is then set to the current
values for range 1 (whether range 1 is on or off). If a range is currently off, the values in the

range table for that range are replaced with `---` (see Range 5 in the illustration) to indicate this range is currently inactive.
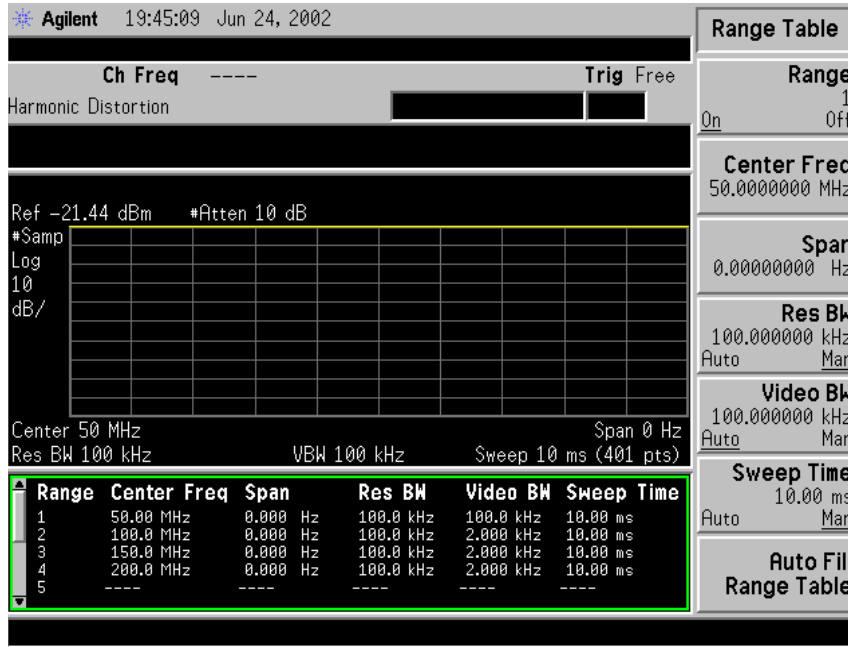
NOTE   You can edit the range table at anytime by pressing any front-panel key except the following: **Esc**, **System**, **File**, **Save**, **Print Setup**, **Print**, **Marker**, **Peak Search**, **Freq Count**, **Next Marker**, **Next Window**, or **Zoom**.

Key Path: **Meas Setup**

Saved State: All values for all ranges are saved in instrument state.

Factory Preset: For each range, the following settings are selected: **Range State**(On), **Zero Span**, **Res BW Mode**(Man), **Video BW**(Man) is set to 2 kHz, and **Sweep Time Mode**(Auto) is set to 10 mseconds. The table below defines the other default parameter settings for the measurement.

Table 7-2   **Range Table Default Settings**

Range	Center Freq (GHz)	Res BW (kHz)
1	1.000	100.0
2	2.000	200.0
3	3.000	300.0
4	4.000	430.0
5	5.000	510.0

Table 7-2   Range Table Default Settings

Range	Center Freq (GHz)	Res BW (kHz)
6	6.000	620.0
7	7.000	750.0
8	8.000	820.0
9	9.000	910.0
10	10.00	1000.0

History: Added with firmware revision A.09.00

Remote Command:

There is no equivalent remote command.

7.18.6.1 Range

Selects a range and updates the values on the other **Range Table** keys so that they reflect the settings for the selected range. If **Range** is set to **On** it is used as part of the measurement; when set to **Off** it is excluded. A range is made up of the next parameters.

Key Path: **Meas Setup**, **Range Table**

Factory Preset: See Table 7-2 on page 532.

Range: Off|On

Remote Command:

This parameter can send up to 10 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted. For example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values remain as they were.

```
[:SENSe]:HARMonics:RANGe[:LIST]:STATe OFF|ON|0|1
```

The query for this parameter will always return 20 values.

```
[:SENSe]:HARMonics:RANGe[:LIST]:STATe?
```

Example: HARM:RANG:LIST:STAT ON,OFF,ON,ON

7.18.6.2 Center Freq

Used to set the center frequency of the analyzer.

Key Path: **Meas Setup**, **Range Table**

Factory Preset: See Table 7-2 on page 532.

Knob Increment: 1%

Step Key
Increment: `1, 1.5, 2, 3, 5, 7.5, 10,...`

Range: Frequency range of your analyzer.

History: Added with firmware revision A.09.00

Remote Command:

This parameter can send up to 10 values. The location in the list sent corresponds to the range the value is associated. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

`[:SENSe]:HARMonics:RANGe[:LIST]:FREQuency <integer>`

The query for this parameter will always return 10 values.

`[:SENSe]:HARMonics:RANGe[:LIST]:FREQuency?`

Example: `HARM:RANG:LIST FREQ 300`

7.18.6.3   Span

Span is used to set the span of the analyzer.

Key Path: **Meas Setup**, **Range Table**

Factory Preset: See Table 7-2 on page 532.

Knob Increment: Steps through the available spans.

Step Key
Increment: Steps through the available spans.

Range: Span of your analyzer.

History: Added with firmware revision A.09.00

Remote Command:

This parameter can send up to 10 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

`[:SENSe]:HARMonics:RANGe[:LIST]:SPAN`

`[:SENSe]:HARMonics:RANGe[:LIST]:SPAN?`

7.18.6.4   Res BW

Res BW is used to set the resolution bandwidth of the analyzer. When **Auto** is selected the

analyzer determines the optimum setting, while **Man** enables you to determine the setting.

Key Path: **Meas Setup, Range Table**

Factory Preset: See Table 7-2 on page 532.

Knob Increment: Steps through the available resolution bandwidth filters.

Step Key
Increment: Steps through the available resolution bandwidth filters.

Range: Resolution bandwidth range of your analyzer.

History: Added with firmware revision A.09.00

Remote Command:

This parameter can send up to 10 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

```
[:SENSe]:HARMonics:RANGe[:LIST]:BWIDth|BANDwidth[:RESolution]:AUTO
OFF|ON|0|1
```
selects the mode.

```
[:SENSe]:HARMonics:RANGe[:LIST]:BWIDth|BANDwidth[:RESolution]<integer>
```

The query for this parameter always returns 10 values.

```
[:SENSe]:HARMonics:RANGe[:LIST]:BWIDth|BANDwidth[:RESolution]:AUTO?
```

```
[:SENSe]:HARMonics:RANGe[:LIST]:BWIDth|BANDwidth[:RESolution]?
```

7.18.6.5   Video BW

Video BW is used to set the video bandwidth of the analyzer. When **Auto** is selected the analyzer determines the optimum setting, while **Man** enables you to determine the setting.

Key Path: **Meas Setup, Range Table**

Factory Preset: See Table 7-2 on page 532.

Knob Increment: Steps through the available video bandwidth filters.

Step Key
Increment: Steps through the available video bandwidth filters.

Range: Video bandwidth range of your analyzer.

History: Added with firmware revision A.09.00

Remote Command:

This parameter can send up to 10 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will

remain as they were.

`[:SENSe]:HARMonics:RANGe[:LIST]:BWIDth|BANDwidth:VIDeo:AUTO OFF|ON|0|1`
selects the mode.

`[:SENSe]:HARMonics:RANGe[:LIST]:BWIDth|BANDwidth:VIDeo` **<integer>**

The query for this parameter will always return 10 values.

`[:SENSe]:HARMonics:RANGe[:LIST]:BWIDth|BANDwidth:VIDeo:AUTO?`

`[:SENSe]:HARMonics:RANGe[:LIST]:BWIDth|BANDwidth:VIDeo?`

7.18.6.6 Sweep Time

Sweep Time is used to set the sweep time of the analyzer. When **Auto** is selected the analyzer determines the optimum setting, while **Man** enables you to determine the setting.

Key Path: **Meas Setup, Range Table**

Factory Preset: See Table 7-2 on page 532.

Knob Increment: 1%

Step Key
Increment: `1, 1.5, 2, 3, 5, 7.5, 10,...`

Range: Sweep time range of your analyzer.

History: Added with firmware revision A.09.00

Remote Command:

This parameter can send up to 10 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

`[:SENSe]:HARMonics:RANGe[:LIST]:SWEep:TIME:AUTO OFF|ON|0|1` selects the mode.

`[:SENSe]:HARMonics:RANGe[:LIST]:SWEep:TIME:` **<integer>**

The query for this parameter will always return 10 values.

`[:SENSe]:HARMonics:RANGe[:LIST]:SWEep:TIME:AUTO?`

`[:SENSe]:HARMonics:RANGe[:LIST]:SWEep:TIME?`

7.18.6.7 Auto Fill Range Table

Auto Fill Range Table is used to automatically setup the range table based on the current center frequency. When selected, the current center frequency is taken as the fundamental and the frequency in range one is set to this value. Each of the subsequent ranges center frequency parameters are set to the appropriate integer multiple of the fundamental frequency. **Res BW**, **Video BW** and **Sweep Time** are all set to **Auto**.

Key Path: **Meas Setup, Range Table**

Factory Preset: See .

Knob Increment: 1%

Step Key
Increment: `1, 1.5, 2, 3, 5, 7.5, 10,...`

Range: Sweep time range of your analyzer.

History: Added with firmware revision A.09.00

Remote Command:

`[:SENSe]:HARMonics:RTABle:FILL <no query>`

Example: `HARM:RTAB:FILL`

7.18.7 Optimize Ref Level

Sets the input attenuator and reference level to optimize the robustness of the measurement, which is its freedom from errors due to input compression and log amp range limitations.

NOTE	There will always be a minimum of 5 dB of attenuation set to protect the analyzer input.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Remote Command:

`[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE`

Example: `POW:RANG:AUTO ONCE`

7.19 Trace/View (Harmonics)

If **Harmonic Distortion** has been selected in the **Measure** menu of the Spectrum Analysis mode, this key displays the appropriate **Trace/View** menu to view the harmonic measurement results.

Displays menu keys to view the harmonic measurement results in two views, **Harmonic** and **Harmonic & THD**.

Key Path: Front-panel key

History: Added with firmware revision A.08.00

7.19.1 Harmonics

Press **Harmonics** to view the measurement results in numeric form.

Key Path: **Trace/View**

7.19.2 Harmonics & THD

Press **Harmonics & THD** to view the measurement results in numeric form, as well as the total harmonic distortion (THD) displayed as a percentage and as a dB value.

Key Path: **Trace/View**
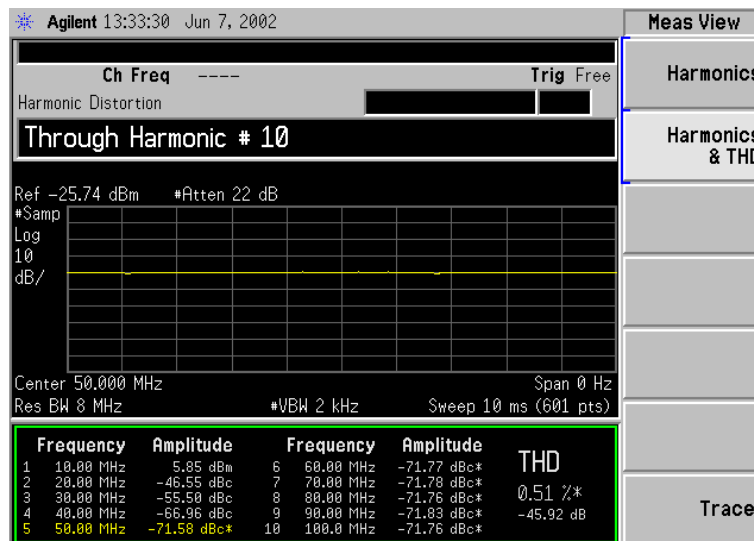
7.20   Meas Setup (Third Order Intercept—TOI)

When **Intermod (TOI)** measurement has been selected in the **Measure** menu of the Spectrum Analysis Mode, this key displays the appropriate measurement setup menu for third order intercept (TOI) .

The TOI measurement computes and displays the output intercept point (IP3), and places markers upon the trace to indicate the measured signals and third-order products.

Key Path: Front-panel key

Dependencies/
Couplings: Menu changes depending on the Mode and Measurement selected.

History: Added with ESA firmware revision A.08.00

Remote Command:

There is no equivalent remote command.

7.20.1   Avg Number

Set **Avg Number** to On to specify the number of measurement averages used when calculating the measurement result. The average will be displayed at the end of each sweep. Setting **Avg Number** to Off disables measurement averaging.

Key Path: **Meas setup**

State Saved: Saved in instrument state.

Factory Preset: 10 averages / Off

Range: 1 through 1000

History: Added with ESA firmware revision A.08.00

Remote Command:

[:SENSe]:TOI:AVERage:COUNt <integer>

[:SENSe]:TOI:AVERage:COUNt?

[:SENSe]:TOI:AVERage[:STATe] OFF|ON|0|1

[:SENSe]:TOI:AVERage[:STATe]?

Example: TOI:AVER ON

               TOI:AVER?

7.20.2 Avg Mode

Press **Avg Mode** to select the type of termination control used for the averaging function to either **Exp** or **Repeat**. This determines the averaging action after the specified number of measurements (average count) is reached.

- **EXP** (Exponential Averaging mode)—When you set **Avg Mode** to **Exp**, each successive data acquisition after the average count is reached is exponentially weighted and combined with the existing average. Exponential averaging weights new data more than old data, which facilitates tracking of slow-changing signals. The average will be displayed at the end of each sweep.

- **Repeat**—When you set **Avg Mode** to **Repeat**, after reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: EXPonential

History: Added with ESA firmware revision A.08.00

Remote Command:

[:SENSe]:TOI:AVERage:TCONrol EXPonential|REPeat

[:SENSe]:TOI:AVERage:TCONrol?

Example: TOI:AVG:TCON EXP

                        TOI:AVG:TCON?

7.20.3 TOI Span

Press **Span** to specify the frequency span in which intermodulation products are measured.

Key Path: **Meas Setup**

Key Note: If you modify the value of Span in the base instrument Span menu, the value in the Meas Setup menu will be updated to reflect the new value and the measurement will restart if it is running.

Factory Preset: 15 MHz, or as defined by the radio standard selected.

Range: Non-Zero Span of Analyzer

History: Added with ESA firmware revision A.08.00

Remote Command:

`[:SENSe]:TOI:FREQuency:SPAN <number>`

`[:SENSe]:TOI:FREQuency:SPAN?`

Example: `TOI:FREQ:SPAN 20 MHz`

                `TOI:FREQ:SPAN?`

7.20.4   Max Mixer Lvl

Press **Max Mixer Lev** to change the maximum input mixer level from 10 dBm to –100 dBm in 5 dB steps using the step keys, and 1 dB steps using the knob. In addition, you may use the keypad to specify a value. The mixer level is equal to the reference level minus the attenuator setting. As the reference level changes, the input attenuator setting is changed to keep the power levels of on-screen signals less than the selected level at the input mixer. Pressing **Preset** resets the maximum input mixer level to –10, but activating the TOI measurement sets this value to –30 dBm.

Key Path: **Meas Setup**

Factory Preset: –30.00 dBm/Auto

Range: 0 VDC, +30 dBm

History: Added with ESA firmware revision A.08.00

Remote Command:

`[:SENSe]:TOI:FREQuency:MIXer:RANGe[:UPPer] <number>`

`[:SENSe]:TOI:FREQuency:MIXer:RANGe[:UPPer]?`

`[:SENSe]:TOI:FREQuency:MIXer:RANGe:AUTO OFF|ON|0|1`

`[:SENSe]:TOI:FREQuency:MIXer:RANGe:AUTO?`

Example: `TOI:FREQ:MIX:RANG –10 dBm`

                `TOI:FREQ:MIX:RANG?`

                `TOI:FREQ:MIX:RANG:AUTO 1`

                `TOI:FREQ:MIX:RANG:AUTO?`

7.20.5   Optimize Ref Level

Sets the input attenuator such that the mixer level is near -30 dBm for each tone. The user may want to trade off analyzer noise and analyzer-induced distortion by manually changing the attenuator setting from this starting point. This function also sets the reference level to place the tones near the top of the screen, optimizing the log amplifier measurement range.

NOTE	There is always a minimum of 5 dB of attenuation set to protect the analyzer input.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

History: Added with ESA firmware revision A.08.00

Remote Command:

`[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE`

Example: `TOI:RANG:AUTO ONCE`

                                    `TOI:RANG:AUTO?`

7.21 Meas Setup (Multi-Carrier Power—MCP)

If the MCP measurement has been selected in the **Measure** menu of the Spectrum Analysis mode, this key displays the MCP measurement setup menu.

The Multi-Carrier Power measurement is a measure of the power in two or more transmit channels and of the power that leaks into their adjacent transmit channels. The results reported are similar to the adjacent channel power measurement, but the setup is different to allow for two or more carriers present.

Key Path: Front-panel key

Dependencies/
Couplings: • Parameter defaults change depending on the Radio Standard selected.

                 • Video BW ≥ 10 times RBW (if possible)

                 • Sweep time is coupled to span, RBW, and VBW if the measurement method is set to IBW.

History: Added with firmware revision A.08.00

Remote Command:

There is no equivalent remote command.

7.21.1 Avg Number

Pressing **Avg Number** to **On** enables you to specify the number of measurements that will be averaged when calculating the measurement result. The average will be displayed at the end of each sweep. Setting **Avg Number** to **Off** disables the measurement averaging.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: 10 / Off

Range: 1 through 1000

History: Added with firmware revision A.08.00

Remote Commands:

[:SENSe]:MCPower:AVERage:COUNt <integer>

[:SENSe]:MCPower:AVERage:COUNt?

[:SENSe]:MCPower:AVERage[:STATe] OFF|ON|0|1

[:SENSe]:MCPower:AVERage[:STATe]?

Example: MCP:AVER:COUN 10

```
MCP:AVER:COUN?

MCP:AVER OFF

MCP:AVER?
```

7.21.2   Avg Mode

Press **Avg Mode** to select the type of termination control used for the averaging function as either **Exp** or **Repeat**. This determines the averaging action after the specified number of measurements (average count) is reached.

- **EXP** (Exponential Averaging mode)—When you set **Avg Mode** to **Exp**, each successive data acquisition after the average count is reached is exponentially weighted and combined with the existing average. Exponential averaging weights new data more than old data, which facilitates tracking of slow-changing signals. The average will be displayed at the end of each sweep.

- **Repeat**—When you set **Avg Mode** to **Repeat**, after reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: Exponential

History: Added with firmware revision A.08.00

Remote Command:

[:SENSe]:MCPower:AVERage:TCONrol EXPonential|REPeat

[:SENSe]:MCPower:AVERage:TCONrol?

Example: MCP:AVG:TCON EXP

                MCP:AVG:TCON?

7.21.3   Carrier Setup

Accesses the Carrier Setup and Configure Carriers menus that allow you to define the various parameters for each carrier.

Key Path: **Meas Setup**

History: Added with firmware revision A.09.00.

Remote Command:

There is no equivalent remote command.

7.21.3.1   Carriers

Press **Carriers** to specify the number of carriers to be measured.

Key Path: **Meas Setup, Carrier Setup**

Factory Preset: 4

Step Key
Increment: 1

Range: 2 to 12

History: Added with firmware revision A.09.00.

Remote Command:

`[:SENSe]:MCPower:CARRier:COUNt<integer>`

`[:SENSe]:MCPower:CARRier:COUNt?`

Example: `MCP:CARR:COUN 10`

                  `MCP:CARR:COUN?`

7.21.3.2   Ref Carrier

Press **Ref Carrier** (Man) to specify the carrier (identified by a numeric position) from which all relative power measurements will be made. When **Ref Carrier** is set to **Auto**, the analyzer selects the carrier with the highest power as the reference.

Key Path: **Meas Setup, Carrier Setup**

Key Notes: The carrier must have power present in order to be assigned as a reference carrier frequency. If you change the reference carrier's power present value from "YES" to "NO", the next carrier to the left (or to the right, if there are none to the left) will be assigned as the reference carrier. If it currently has power present set to No, this will change to Yes. This is also true when there are only two carriers with a "YES" value. Refer to the "Carrier Pwr Present" key description for more information on setting the carrier power present value.

                    If you specify a reference carrier position when **Ref Carrier** (Auto) is selected, the state will switch to manual. If the carrier you select is currently configured as having no power present, it will be changed to having power present.

Factory Preset: Auto

Range: Auto/Man
                  1 to 12

History: Added with firmware revision A.09.00.

Remote Command:

[:SENSe]:MCPower:RCARrier:AUTO OFF|ON|0|1

[:SENSe]:MCPower:RCARrier:AUTO?

[:SENSe]:MCPower:RCARrier<integer>

[:SENSe]:MCPower:RCARrier?

Remote Command Notes: Refer to "Key Notes:" above.

Example: MCP:RCAR:AUTO ON

                 MCP:RCAR 3

                 MCP:RCAR?

7.21.3.3   Ref Carrier Freq

Press **Ref Carrier Freq** (Man) to select the reference carrier frequency for this measurement. The center frequency is then calculated using the algorithm below:

1. Cntr Freq 1 = Ref Freq – [0.5 (Carrier Width of Ref Carrier)]

2. Cntr Freq 2 = Cntr Freq 1– (Total of all Carrier Widths excluding the Ref Carrier Width)

3. Cntr Freq = Cntr Freq 2 + [(Total of all Carrier Widths)/2]

Pressing **Ref Carrier Freq** (Auto) distributes the carriers evenly around the current center frequency. The reference carrier frequency is then calculated using the algorithm below:

1. Ref Freq 1 = Cntr Freq – [(Total of all Carrier Widths)/2]

2. Ref Freq 2 = Ref Freq 1+ (Total of all Carrier Widths excluding the Ref Carrier Width)

3. Ref Freq = Ref Freq 2 + [0.5 (Carrier Width of Ref Carrier)]

The above procedure ensures carrier visibility on the analyzer display.

Key Path: **Meas Setup, Carrier Setup**

Dependencies/
Couplings: The reference carrier can be re-assigned by implementing changes to carrier power present values. Refer to "Key Notes:" above for details.

State Saved: Saved in instrument state.

Factory Preset: Auto/Calculated based on current center frequency. Refer to the "algorithm" above when defining the **Ref Carrier Freq**(Auto) key.

Terminators: Hz, kHz, MHz, GHz

Default Terminator GHz

Resolution: 1 Hz

Knob Increment: Span ÷ 50

Step Key
Increment: If **CF Step**(Auto) is selected: span/10.
             If **CF Step**(Man) is selected: CF Step

Range: Analyzer minimum to analyzer maximum

History   Added with firmware revision A.09.00.

Remote Command:

```
[:SENSe]:MCPower:RCFRequency<Freq>
```

```
[:SENSe]:MCPower:RCFRequency?
```

```
[:SENSe]:MCPower:RCFRequency:AUTO OFF|ON|0|1
```

```
[:SENSe]:MCPower:RCFRequency:AUTO?
```

Example: MCP:RCFR 2 GHz

              MCP:RCFR?

7.21.3.4   Configure Carriers

Accesses the Config Carriers menu that allows further definition of each carrier.

Key Path: **Meas Setup, Carrier Setup**

History: Added with firmware revision A.09.00.

Remote Command:

There is no equivalent remote command.

7.21.3.4.1   Carrier

Selects the carrier number you wish to configure.

Key Path: **Meas Setup, Carrier Setup, Configure Carriers**

Dependencies/
Couplings: All keys available on the Configure Carrier key menu are coupled to this
              key.

State Saved: Saved in instrument state.

Factory Preset: 1

Knob Increment: 1

Step Key
Increment: 1

Range: 2 to 12

History: Added with firmware revision A.09.00.

Remote Command:

There is no equivalent remote command.

7.21.3.4.2   Carrier Pwr Present

Press **Carrier Pwr Present** (Yes) to specify carriers which have power present. First, press the **Carrier** key and select the carrier number you wish to define, using the Step Keys (⇓ ⇑), the knob, or the numeric keypad. (The carrier number selected is shown on the **Carrier** key.) Then toggle the **Carrier Pwr Present** key to indicate either yes or no.

If a carrier is defined as having no power present, the power displayed will be relative to the reference carrier. If a carrier is defined as having power present, the absolute power will be displayed.

Carriers with power present are included in the total carrier power result.

Key Path: **Meas Setup**, **Carrier Setup**, **Configure Carriers**

Dependencies/
Couplings: This key assigns a value (YES or NO) to the carrier number displayed on the **Carrier** key.

State Saved: Saved in instrument state.

Factory Preset: YES, YES, YES, YES

Range: Yes or No

History: Added with firmware revision A.09.00.

Remote Command:

[:SENSe]:MCPower:CARRier:LIST:PPResent YES|NO

[:SENSe]:MCPower:CARRier:LIST:PPResent?

Remote Command Notes:
 • The position number in the list sent corresponds to the carrier number you are designating. For example: "YES, YES, NO, YES, YES, NO" defines six carriers. Carriers 1, 2, 4, and 5 are defined as having power present whereas carriers 3 and 6 do not have power present. If you need to change carrier 5, you must send all carriers up to 5. Carrier 6 will remain unchanged. If you send more values than the number of carriers specified using the **Carriers** key, (in this example, there are six carriers) they will be ignored.

 • The query for this parameter returns the current value for all carriers (with and without power present).

Example: MCP:CARR:PPR YES,NO,YES,NO,YES

                   MCP:CARR:PPR?

7.21.3.4.3   Carrier Width

Press **Carrier Width** to specify the width of each carrier including carriers with no power present. There is a corresponding one-to-one relationship between each carrier width value and the specified number of carriers. First, press the **Carrier** key and select the carrier number you wish to define, using the Step Keys (⇓ ⇑), the knob, or the numeric keypad. (The carrier number selected is shown on the **Carrier** key.) Then press the **Carrier Width** key and enter the width using the numeric keypad.

Key Path: **Meas Setup**, **Carrier Setup**, **Configure Carriers**

Key Notes: The **Carrier** key determines which carrier width you are defining.

State Saved: Saved in instrument state.

Factory Preset: 5 MHz, 5 MHz, 5 MHz, 5 MHz

Terminators: Hz, kHz, MHz, GHz

Default Terminator: Hz

Resolution: 1 Hz

Step Key
Increment: If **CF Step**(Auto) is selected: span/10.
                If **CF Step**(Man) is selected: CF Step

Range: 0 Hz to 45 MHz

History: Added with firmware revision A.09.00.

Remote Command:

[:SENSe]:MCPower:CARRier:LIST:WIDTh <Hz>

[:SENSe]:MCPower:CARRier:LIST:WIDTh?

Remote Command Notes:
- The position number of the each carrier width in the list sent corresponds to the carrier number you are defining. For example: "5 MHz, 10 MHz, 5 MHz" defines six carriers. Carriers 1, 2, 4, and 5 are defined as having power present whereas carriers 3 and 6 do not have power present. If you need to change carrier 5, you must send all carriers up to 5. Carrier 6 will remain unchanged. If you send more values than the number of carriers specified using the **Carriers** key, (in this example, there are six carriers) they will be ignored.

- The query for this parameter returns the current value for all carriers (with and without power present).

Example: MCP:CARR:LIST:WIDT 5 MHz,10 MHz,4 MHz,15 MHz,5 MHz,10 MHz

                MCP:CARR:LIST:WIDT?

7.21.3.4.4 Carrier IntegBW

Press **Carrier IntegBW** to define the integration bandwidth used to calculate the power in the carriers.

Key Path: **Meas Setup**, **Carrier Setup**, **Configure Carriers**

State Saved: Saved in instrument state.

SCPI Status Bits/
OPC Dependencies: The integration bandwidth is specified differently depending on the radio standard selected. If **Mode Setup**, **Radio Std**, **3GPP W-CDMA** is selected and the RRC filter is on, the actual integration bandwidth used will be the displayed integration bandwidth multiplied by (1 + filter alpha).

Factory Preset: 3.84 MHz, 3.84 MHz, 3.84 MHz, 3.84 MHz

Terminators: Hz, kHz, MHz, GHz

Default Terminator Hz

Resolution:

Knob Increment: Span ÷ 50

Step Key
Increment: If **CF Step**(Auto) is selected: span/10.
                      If **CF Step**(Man) is selected: CF Step

Range: 100 Hz to 20 MHz

History: Added with firmware revision A.09.00.

Remote Command:

`[:SENSe]:MCPower:CARRier:LIST:BANDwidth|BWIDth:[INTegration]<Hz>`

`[:SENSe]:MCPower:CARRier:LIST:BANDwidth|BWIDth:[INTegration]?`

Example: `MCP:CARR:BAND 3.5MHz,2.85MHz,3.84MHz`

7.21.4 Offsets/Limits

Displays menu keys that enable you to configure the offsets and limits for the MCP measurement.

Key Path: **Meas Setup**

History: Added with firmware revision A.08.00

Remote Command:

There is no equivalent remote command.

7.21.4.1 Offset

Enables you to select the offset the menu keys will affect. Press **Offset** until the letter of the desired offset (A, B, or C) is underlined.

Key Path: **Meas Setup**, **Offset/Limits**

Factory Preset: A

History: Added with firmware revision A.08.00

Remote Command:

There is no equivalent remote command.

7.21.4.2 Offset Freq

Sets the frequency difference between the upper and lower carrier frequencies. If you set the frequency of any offset to 0 Hz, the offset is turned off and not included in the displayed results.

Key Path: **Meas Setup**, **Offset/Limits**

State Saved: Saved in instrument state.

Factory Preset: 5 MHz, 10 MHz, 15 MHz

Terminators: Hz, kHz, MHz, GHz

Default Terminator: Hz

Range: 0 MHz to 45 MHz

History: Added with firmware revision A.09.00

Remote Command:

[:SENSe]:MCPower:OFFSet:LIST:[FREQuency]<Hz>,<Hz>,<Hz>

[:SENSe]:MCPower:OFFSet:LIST:[FREQuency]?

Example: MCP:OFFS:LIST:5MHz,7.5MHz,15MHz

MCP:OFFS:LIST:?

7.21.4.3 Offset Integ BW

Sets the bandwidth for the selected offset (refer to "Offset" above).

Key Path: **Meas Setup**, **Offset/Limits**

Key Notes: If "RRC Filter" is on, the actual integration bandwidth used is the displayed integration bandwidth multiplied by (1 + "Filter Alpha").

State Saved: Saved in instrument state.

Factory Preset: 3.84 MHz, 3.84 MHz, 3.84 MHz

Terminators: Hz, kHz, MHz, GHz

Default Terminator: Hz

Knob Increment: Span ÷ 50

Step Key
Increment: If **CF Step**(Auto) is selected: span/10
If **CF Step**(Man) is selected: CF Step

Range: 100 Hz to 20 MHz

History: Added with firmware revision A.09.00

Remote Command:

`[:SENSe]:MCPower:OFFSet:LIST:BANDwidth|BWIDth:[INTegration]<Hz>,<Hz>,<Hz>`

`[:SENSe]:MCPower:OFFSet:LIST:BANDwidth|BWIDth:[INTegration]<Hz>,<Hz>,<Hz>`

Example: `MCP:OFFS:LIST:BWIDth 5MHz,3MHz,5MHz`

`MCP:OFFS:LIST:BWID?`

7.21.4.4 Upper Offset Limit

Sets the selected offset limit (refer to "Offset" above) for the offset to the right of the carriers.

Key Path: **Meas Setup**, **Offset/Limits**

State Saved: Saved in instrument state.

Factory Preset: 0 dB, 0 dB, 0 dB

Default Terminator: dB

Knob Increment: 1

Step Key
Increment: 5

Range: −200 dB to 200 dB

History: Added with firmware revision A.08.00

Remote Command:

`:CALCulate:MCPower:OFFSet:LIST:LIMit:POSitive[:UPPer]:DATA <dB>,<dB>,<dB>`

`:CALCulate:MCPower:OFFSet:LIST:LIMit:POSitive[:UPPer]:DATA?`

Example: `CALC:MCP:OFFS:LIST:LIM:POS:DATA −50dB,−55dB,−60dB`

`:CALC:MCP:OFFS:LIST:LIM:POS:DATA?`

7.21.4.5 Lower Offset Limit

Sets the selected offset limit (refer to "Offset" above) for the offset to the left of the carriers.

Key Path: **Meas Setup, Offset/Limits**

State Saved: Saved in instrument state.

Factory Preset: 0 dB, 0 dB, 0 dB

Default Terminator: dB

Knob Increment: 1

Step Key
Increment: 5

Range: −200 dB through 200 dB

History: Added with firmware revision A.08.00

Remote Command:

`:CALCulate:MCPower:OFFSet:LIST:LIMit:NEGative[:UPPer]:DATA <dB>,<dB>,<dB>`

`:CALCulate:MCPower:OFFSet:LIST:LIMit:NEGative[:UPPer]:DATA?`

Example: `CALC:MCP:OFFS:LIST:LIM:NEG:DATA −50dB,−55dB,−60dB`

                `CALC:MCP:OFFS:LIST:LIM:NEG:DATA?`

7.21.5 Carrier Result

Press **Carrier Result** to select the result you wish to display on the last line of the carrier power results list except when:

- the carrier result number ≤ 4 (the first 4 carrier power results are displayed)

- the carrier result number ≥ 9 (the last 4 carrier power results are displayed)

Key Path: **Meas Setup**

Key Notes: This key is only available when **Meas Control**, **Measure** (Single) is selected.

State Saved: Not saved.

Factory Preset: 1

Step Key
Increment: 1

Range: 1 to number of carriers.

History   Added with firmware revision A.0900

Remote Command:

There is no equivalent remote command.

7.21.6 Optimize Ref Level

Sets the input attenuator and reference level to optimize the robustness of the measurement, which is its freedom from errors due to input compression and log amp range limitations..

NOTE	There will always be a minimum of 5 dB of attenuation set to protect the analyzer input.

Key Path: **Meas Setup**

State Saved: Not saved.

History: Added with firmware revision A.08.00

Remote Command:

[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE

Example: POW:RANG:AUTO ONCE

7.21.7 Method

Enables you to set the measurement method to either the integration bandwidth method (IBW) or the resolution bandwidth method (RBW). The resolution bandwidth method is most useful for measuring cdmaOne and cdma2000 signals.

Key Path: **Meas Setup**

Key Notes: When Method is set to RBW, neither Noise Correction nor RRC Filter are available.

State Saved: Saved in instrument state.

Factory Preset: IBW

Range: IBW | RBW

History: Added with firmware revision A.09.00.

Remote Command:

[:SENSe]:MCPower:METHod IBW|RBW

[:SENSe]:MCPower:METHod?

Example: MCP:METH RBW

```
MCP:METH?
```

7.21.8 Pwr Ref

Enables you to set the multi-carrier power reference to automatic or manual. When set to automatic, the carrier power result reflects the measured power value in the selected reference carrier (**Meas Setup**, **Carrier Setup**, **Ref Carrier**). When set to manual, the result is referenced to the last measured value, or you may specify the reference for the multi-carrier power measurement. Relative values are displayed, referenced to the "Pwr Reference" value.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: Off/Measured power in the reference carrier.

Terminators: dBm

Default Terminator: dBm

Range: −200 dBm to 200 dBm

History: Added with firmware revision A.09.00.

Remote Command:

```
[:SENSe]:MCPower:CARRier:AUTO[:STATe] OFF|ON|0|1
```

```
[:SENSe]:MCPower:CARRier:AUTO[:STATe]?
```

```
[:SENSe]:MCPower:CARRier[:POWer]<dBm>
```

```
[:SENSe]:MCPower:CARRier[:POWer]?
```

Example: `MCP:CARR:AUTO 0`

               `MCP:CARR:AUTO?`

               `MCP:CARR -100`

               `MCP:CARR?`

7.21.9 Limit Test

Pressing **Limit Test** turns limit testing on or off. Any offsets that are in the off state are not measured and their results will not be displayed on screen.

Key Path: **Meas Setup**, **More**

State Saved: Saved in instrument state.

Factory Preset: Off

History: Added with firmware revision A.08.00

Remote Command:

[:SENSe]:MCPower:LIMit[:STATe] OFF|ON|0|1

[:SENSe]:MCPower:LIMit[:STATe]?

Example: MCP:LIM ON

           MCP:LIM?

7.21.10 RRC Filter

Pressing **RRC Filter** turns the Root Raised Cosine filter for the carriers and all adjacent channels on or off. The RRC filter is the type specified in the 3GPP W-CDMA standards, with rolloff (α) = Filter Alpha parameter (defined below).

Key Path: **Meas Setup**, **More**

Key Notes: This key is not available when **Meas Setup**, **Method** (RBW) is selected.

State Saved: Saved in instrument state.

Factory Preset: Off

History: Added with firmware revision A.09.00

Remote Command:

[:SENSe]:MCPower:FILTer[:RRC][:STATe] OFF|ON|0|1

[:SENSe]:MCPower:FILTer[:RRC][:STATe]?

Example: MCP:FILT 1

           MCP:FILT?

7.21.11 Filter Alpha

Press **Filter** to input the alpha value for the RRC Filter. This parameter is only available when **3GPP W-CDMA** or **None** has been selected as the radio standard from the Mode Setup menu.

Key Path: **Meas Setup, More**

State Saved: Saved in instrument state.

Factory Preset: 0.22 when W-CDMA is selected, otherwise Off.

Range: Off/On

History: Added with firmware revision A.09.00.

Remote Command:

[:SENSe]:MCPower:FILTer[:RRC]:ALPHA <number>

```
[:SENSe]:MCPower:FILTer[:RRC]:ALPHA?
```

Example: `MCP:FILT:ALPHA .33`

                `MCP:FILT:ALPHA?`

7.21.12 Noise Correction

Pressing **Noise Correction** turns noise correction **on** or **off**. When you set **Noise Correction** to **On**, a calibration of the noise floor is performed and used to correct for analyzer noise floor contribution to measurement levels, increasing dynamic range.

Key Path: **Meas Setup, More**

Key Notes: This key is not available when **Meas Setup**, **Method** (RBW) is selected or when signal tracking is on.

State Saved: Saved in instrument state.

Factory Preset: Off

History: Added with firmware revision A.09.00.

Remote Command:

```
[:SENSe]:MCPower:CORRection:NOISe[:AUTO] OFF|ON|0|1
```

```
[:SENSe]:MCPower:CORRection:NOISe[:AUTO]?
```

Remote Command Notes: The noise correction feature is not available when the measurement method is RBW (**Meas Setup**, **Method** (RBW) or when signal tracking is on.

Example: `MCP:CORR:NOIS 1`

                `MCP:CORR:NOIS?`

7.22 Trace/View (Multi-Carrier Power Measurement)

If **Multi-Carrier Power** has been selected in the **Measure** menu of the Spectrum Analysis mode, this key displays the appropriate **Trace/View** menu for the multi-carrier power measurement.

Displays menu keys that enable you to set how trace information is stored and displayed.

Key Path: Front-panel key

History: Added with firmware revision A.08.00

Remote Command:

There is no equivalent remote command for this function.

7.22.1 Spectrum

Pressing **Spectrum** selects the spectral display of the measurement.

Key Path: **Trace/View**

Factory Preset: Spectrum

History: Added with firmware revision A.08.00

Remote Command:

There is no remote command for this function.

7.22.2 Combined

Pressing **Combined** selects the measurement to be displayed as a bar graph and spectrum.

Key Path: **Trace/View**

Factory Preset: Spectrum

History: Added with firmware revision A.08.00

Remote Command:

There is no remote command for this function.

7.22.3 Combined View Units

Pressing **Combined View Units** selects the units (**dBc** or **dBm**) for the floating numeric displays when **Combined** is selected.

Key Path: **Trace/View**

Factory Preset: dBc

History: Added with firmware revision A.08.00

Remote Command:

There is no remote command for this function.

7.22.4 Trace

Displays menu keys that enable you to set how the trace information is stored and displayed.

Key Path: **Trace/View**

State Saved: Saved in Instrument State for all traces

History: Added with firmware revision A.08.00

Remote Command:

There is no remote command for this function.

7.22.4.1 Trace (1 2 3)

Determines which trace the menu keys will affect. Press **Trace 1 2 3** until the number of the desired trace is underlined.

Key Path: **Trace/View, Trace**

State Saved: Saved in Instrument State for all traces

History: Added with firmware revision A.08.00

Remote Command:

There is no remote command for this function.

7.22.4.2 Clear Write

Erases any data previously stored in the selected trace and continuously displays signals during the sweep of the analyzer.

Key Path: **Trace/View, Trace**

History: Added with firmware revision A.08.00

Remote Command:

:TRACe[1]|2|3:MODE WRITe

Example: TRAC:MODE WRIT

7.22.4.3   Max Hold

Maintains the maximum level for each trace point of the selected trace (1, 2 or 3), and updates each trace point if a new maximum level is detected in successive sweeps.

Key Path: **Trace/View, Trace**

History: Added with firmware revision A.08.00

Remote Command:

`:TRACe[1]|2|3:MODE MAXHold`

Example: TRAC:MODE MAXH

7.22.4.4   Min Hold

Maintains the minimum level for each trace point of the selected trace (1, 2 or 3), and updates each trace point if a new minimum level is detected in successive sweeps.

Key Path: **Trace/View, Trace**

History: Added with firmware revision A.08.00

Remote Command:

`:TRACe[1]|2|3:MODE MINHold`

Example: TRAC:MODE MINH

7.22.4.5   View

Holds and displays the amplitude data of the selected trace. The trace is not updated as the analyzer sweeps.

Key Path: **Trace/View, Trace**

History: Added with firmware revision A.08.00

Remote Command:

`:TRACe[1]|2|3:MODE WRITe|VIEW`

Example: TRAC:MODE VIEW

7.22.4.6   Blank

Stores the amplitude data for the selected trace and removes it from the display. The selected trace register will not be updated as the analyzer sweeps.

Key Path: **Trace/View, Trace**

History: Added with firmware revision A.08.00

Remote Command:

`:TRACe[1]|2|3:MODE WRITe|BLANk`

Example: TRAC:MODE BLAN

7.23   Meas Setup (Occupied Bandwidth—OBW)

When **Occupied BW** has been selected in the **Measure** menu of the Spectrum Analysis Mode, this key displays the appropriate measurement setup menu.

The Occupied Bandwidth measurement integrates the power of the displayed spectrum and puts markers at the frequencies between which a selected percentage of the power is contained. The measurement defaults to 99% of the occupied bandwidth power. The power-bandwidth routine first computes the combined power of all signal responses contained in the trace. For 99% occupied power bandwidth, markers are placed at the frequencies on either side of 99% of the power. 1% of the power is evenly distributed outside the markers. The difference between the marker frequencies is the 99% power bandwidth and is the value displayed.

The occupied bandwidth function also indicates the difference between the analyzer center frequency and the center frequency of the channel, referred to as "Transmit Freq Error". The measurement can be made in single or continuous sweep mode. The center frequency, reference level, and channel spacing must be set by the user.

Key Path: Front-panel key

7.23.1   Avg Number

Press **Avg Number** (On) to specify the number of measurement averages used when calculating the measurement result. The average is displayed at the end of each sweep. Press **Avg Number** (Off) to disable measurement averaging.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: 10 averages / Off

Range: 1 through 1000

Remote Command:

[:SENSe]:OBWidth:AVERage:COUNt <integer>

[:SENSe]:OBWidth:AVERage:COUNt?

[:SENSe]:OBWidth:AVERage[:STATe] OFF|ON|0|1

[:SENSe]:OBWidth:AVERage[:STATe]?

Example: OBW:AVER:COUN 20

                        OBW:AVER:COUN?

```
OBW:AVER ON

OBW:AVER?
```

7.23.2   Avg Mode

Enables you to select the type of termination control used for the averaging function (**Exp** or **Repeat**). This determines the averaging action after the specified number of measurements (average count) is reached. **Avg Mode** has no effect on measurements that are not averaged.

- **EXP** (Exponential Averaging mode)—Each successive data acquisition after the average count is reached is exponentially weighted and combined with the existing average. Exponential averaging weights new data more than old data, which facilitates tracking of slow-changing signals. The average is displayed at the end of each sweep.

- **Repeat**—After reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: EXPonential

Remote Command:

```
[:SENSe]:OBWidth:AVERage:TCONtrol EXPonential|REPeat

[:SENSe]:OBWidth:AVERage:TCONtrol?
```

Example: OBW:AVG:TCON EXP

                OBW:AVG:TCON?

7.23.3   Max Hold

Enables you to turn maximum hold trace feature **On** or **Off** for the measurement. Maximum hold displays and holds the maximum responses of a signal.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: Off

Remote Command:

```
[:SENSe]:OBWidth:MAXHold OFF|ON|0|1

[:SENSe]:OBWidth:MAXHold?
```

Example: OBW:MAXH ON

                OBW:MAXH?

7.23.4   Occ BW % Pwr

Enables you to change the percentage of signal power used when determining the occupied bandwidth.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: 99.0%

Range: 10.0% through 99.99%

Remote Command:

[:SENSe]:OBWidth:PERCent <percent>

[:SENSe]:OBWidth:PERCent?

Example: OBW:PERC 98

                         OBW:PERC?

7.23.5   OBW Span

Enables you to specify the range of integration used in calculating the total power from which the percent occupied bandwidth is then calculated. The analyzer span will be set to the same value as the OBW Span for the measurement. OBW Span should be set to approximately 2 times the expected occupied bandwidth result.

Key Path: **Meas Setup**

Factory Preset: 3 MHz, or as defined by the radio standard selected.

Default Terminator: Hz

Range:

Remote Command:

[:SENSe]:OBWidth:FREQuency:SPAN <freq>

[:SENSe]:OBWidth:FREQuency:SPAN?

Example: OBW:FREQ:SPAN 10 MHz

                         OBW:FREQ:SPAN?

7.23.6   x dB

Enables you to specify the range of integration used in calculating the total power from

which the percent occupied bandwidth is then calculated. The analyzer span is set to the same value as the OBW Span for the measurement. Set OBW Span to approximately 2 times the expected occupied bandwidth result.

Enables you to specify the power level used to determine the emission bandwidth as the number of dB down from the highest signal point (P_1), within the occupied bandwidth span. Frequencies f_1 and f_2 are determined as the furthest frequencies xdB below and above P_1, respectively. The emission bandwidth is then calculated as $f_2 - f_1$ as shown in Figure 7-4.

NOTE   The asterisk next to the x dB bandwidth value in Figure 7-4 indicates the results may not have been determined with optimal analyzer settings. If emission bandwidth is your primary interest, select **Meas Setup, Max Hold.** Then change detector mode to peak by pressing **Det/Demod, Detector, Peak.** Acquiring peak data ensures accuracy of this measurement.

Figure 7-4   **Occupied Bandwidth Measurement Results**
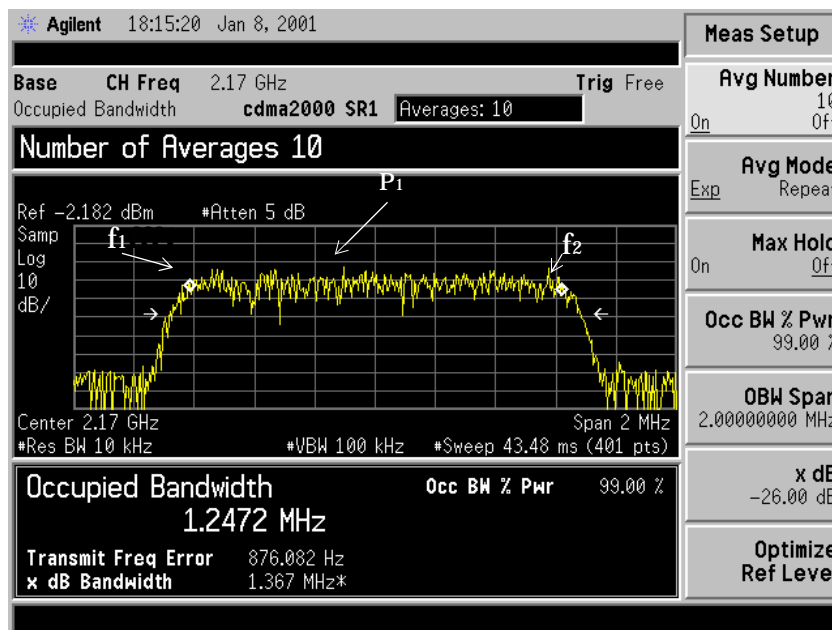
NOTE   The "Transmit Freq Error" displayed above is defined as the difference between the $(f_{2 + f1})/2$ and the tuned center frequency of the signal.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: −26 dB

Default Terminator: dB

Range: −100.0 dB through −0.1 dB

Remote Command:

`[:SENSe]:OBWidth:XDB <dB value>`

`[:SENSe]:OBWidth:XDB?`

Example: `OBW:XDB −50 dB`

`OBW:XDB?`

7.23.7 Optimize Ref Level

Sets the input attenuator and reference level to optimize the robustness of the measurement, which is its freedom from errors due to input compression and log amp range limitations..

NOTE   There will always be a minimum of 5 dB of attenuation set to protect the analyzer input.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: n/a

Remote Command:

`[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE`

Example: `POW:RANG:AUTO ONCE`

7.24   Meas Setup (Spectrum Emissions Mask—SEM)

When the spectrum emissions mask measurement has been selected in the **Measure** menu of the Spectrum Analysis Mode, this key displays the appropriate measurement setup menu.

Spectrum Emissions Mask (SEM) measurement includes the in-band and out-of-band spurious emissions. As it applies to W-CDMA (3GPP), this is the power contained in a specified frequency bandwidth at certain offsets relative to the total carrier power. It may also be expressed as a ratio of power spectral densities between the carrier and the specified offset frequency band.

Key Path: Front-panel key

History: Updated with firmware revision A.09.00

                 Added with firmware revision A.08.00

7.24.1   Avg Number

Press **Avg Number (On)** to specify the number of measurement averages used when calculating the measurement result. The average will be displayed at the end of each sweep.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: 10 averages / Off

Range: 1 through 1000

Remote Command:

[:SENSe]:SEMask:AVERage:COUNt <integer>

[:SENSe]:SEMask:AVERage:COUNt?

[:SENSe]:SEMask:AVERage[:STATe] OFF|ON|0|1

[:SENSe]:SEMask:AVERage[:STATe]?

Example: SEM:AVER:COUN 15

                SEM:AVER 1

7.24.2   Meas Type

Displays a menu where you can select a measurement reference type, **Total Pwr Ref** or **PSD Ref.**

Key Path: **Meas Setup**

Factory Preset: Total Pwr Ref

Remote Command:

[:SENSE]:SEMask:TYPE TPRef | PSDRef

[:SENSE]:SEMask:TYPE?

Example: SEM:TYPE TPRef or SEM:TYPE PSDRef

              SEM:TYPE?

7.24.2.1   Total Pwr Ref

When **Total Pwr Ref** is selected, the power in the carrier is used as the reference in computing the relative power values for the offsets.

Key Path: **Meas Setup**, **Meas Type**

Readback: Reads back "Total Pwr Ref" to the Meas Type key.

History: Updated with firmware revision A.09.00

7.24.2.2   PSD Ref

When **PSD Ref** is selected, the mean power spectral density of the carrier is used in computing the relative power spectral density values for the offsets.

Key Path: **Meas Setup**, **Meas Type**

Readback: Reads back "PSD Ref" to the **Meas Type** key.

Factory Preset: On (Auto)

History: Updated with firmware revision A.09.00

7.24.3   Ref Channel

Accesses the menu of keys that enable you to change the reference channel settings.

Key Path: **Meas Setup**

7.24.3.1   Chan Integ BW

Specifies the integration bandwidth used in calculating the power in the main channel.

Key Path: **Meas Setup, Ref Channel**

Factory Preset: 3.84 MHz

Range: 10% to 100% of the setting of Chan Span

Remote Command:

`[:SENSe]:SEMask:BANDwidth[n]|BWIDth[n]:INTegration <number>`

`[:SENSe]:SEMask:BANDwidth[n]|BWIDth[n]:INTegration?`

Example: `SEM:BAND[n]:INT 4 MHz`

`SEM:BWID[n]:INT 4 MHz`

`SEM:BAND[n]:INT?`

`SEM:BWID[n]:INT?`

7.24.3.2   Chan Span

Specifies the span used in measuring the power in the main channel.

Key Path: **Meas Setup, Ref Channel**

Factory Preset: 5 MHz

Knob Increment: 1% of the set span.

Range: 1 kHz to 10 MHz

Remote Command:

`[:SENSe]:SEMask:FREQuency:SPAN <number>`

`[:SENSe]:SEMask:FREQuency:SPAN?`

Example: `SEM:FREQ:SPAN 4 MHz`

`SEM:FREQ:SPAN?`

7.24.3.3   Sweep Time

Specifies the sweep time used in measuring the power in the main channel.

Key Path: **Meas Setup, Ref Channel**

Factory Preset: Auto/On

Range: 1 ms through 4 ks

Remote Command:

```
[:SENSe]:SEMask:SWEeptime <number>

[:SENSe]:SEMask:SWEeptime?

[:SENSe]:SEMask:SWEeptime:AUTO OFF|ON|0|1

[:SENSe]:SEMask:SWEeptime:AUTO?
```

Example: SEM:SWE 4 s
             SEM:SWE?
             SEM:SWE:AUTO 1
             SEM:SWE:AUTO?

7.24.3.4   Res BW

Specifies the resolution bandwidth used in measuring and the power in the main channel.

Key Path: **Meas Setup**, **Ref Channel**

Factory Preset: 100 kHz/On

Range: Full Range provided by Base Instrument Hardware.

History: Remote command updated with firmware revision A.09.00

Remote Command:

```
[:SENSe]:SEMask:BANDwidth|BWIDth[:RESolution] <freq>

[:SENSe]:SEMask:BANDwidth|BWIDth[:RESolution]?


[:SENSe]:SEMask:BANDwidth|BWIDth[:RESolution]:AUTO OFF|ON|0|1

[:SENSe]:SEMask:BANDwidth|BWIDth[:RESolution]:AUTO?
```

Remote Command Notes: If an unavailable bandwidth is entered, the closest available bandwidth in the 1, 3, 10 sequence is used. Refer to "Res BW Auto Man" on page 58.

Example: SEM:BAND 4 MHz
             SEM:BWID 4 MHz
             SEM:BAND?
             SEM:BWID?

             SEM:BAND:AUTO 1
             SEM:BWID:AUTO 1
             SEM:BAND:AUTO?
             SEM:BWID:AUTO?

7.24.3.5   Total Pwr Ref *or* PSD Ref

Displays the type of power measurement reference selected using the **Meas Type** key (see "Meas Type" on page 574).

Total Pwr Ref is the power in the carrier that is used as the reference in computing the relative power values for the offsets. When **Man** is selected, this can be set by the user. When **Auto** is selected, this is the measured power in the reference carrier.

PSD Ref is the mean power spectral density in the carrier that is used as the reference in computing the relative power spectral density values for the offsets. When **Man** is selected, this can be set by the user, when **Auto** is selected, this is the measured mean power spectral density in the reference carrier.

Key Path: **Meas Setup**, **Ref Channel**

Factory Preset: 0.00 dBm/Off

Range: −200.0 dBm to 200.0 dBm.

Remote Command:

`[:SENSe]:SEMask:CARRier[:POWer] <ampl>`

`[:SENSe]:SEMask:CARRier[:POWer]?`

`[:SENSe]:SEMask:CARRier:AUTO[:STATe] OFF|ON|0|1`

`[:SENSe]:SEMask:CARRier:AUTO[:STATe]?`

Example: `SEM:CARR 0 dBm`

`SEM:CARR?`

`SEM:CARR:AUTO 1`

`SEM:CARR:AUTO?`

7.24.4   Offset/Limits

Displays the menus where you can change the following parameters for offset frequency settings and pass/fail tests: **Offset**, **Start Freq**, **Stop Freq**, **Sweep Time**, **Res BW**, and **Limits**. If **Spectrum Segment** is set to **Offset**. Refer to the tables below for default settings of particular radio standards of interest.

Table 7-3   **Offsets & Limits Defaulted for W-CDMA (3GPP) Base Station Measurements[a]**

Offset	Start Freq (MHz)	Stop Freq (MHz)	Res BW (kHz)	Abs Start (dBm)	Abs Stop (dBm)	Abs Couple	Rel Start (dBc)	Rel Stop (dBc)	Meas BW
A, On	2.515	2.715	30.00	−14.00	−14.00	Couple	−30.00	−30.00	1

Table 7-3 **Offsets & Limits Defaulted for W-CDMA (3GPP) Base Station Measurements[a]**

Offset	Start Freq (MHz)	Stop Freq (MHz)	Res BW (kHz)	Abs Start (dBm)	Abs Stop (dBm)	Abs Couple	Rel Start (dBc)	Rel Stop (dBc)	Meas BW
B, On	2.715	3.515	30.00	−14.00	−26.00	Man	−30.00	−30.00	1
C, On	3.515	4.000	30.00	−26.00	−26.00	Couple	−30.00	−30.00	1
D, On	4.000	8.000	30.0	−13.00	−13.00	Couple	−30.00	−30.00	33
E, On	8.000	12.500	1000.0	−13.00	−13.00	Couple	−30.00	−30.00	1

a. **Fail Mask** is set to Absolute and **Rel Stop** is set to Couple.

Table 7-4 **Offsets & Limits Defaulted for W-CDMA (3GPP) Mobile Station Measurements[a]**

Offset	Start Freq (MHz)	Stop Freq (MHz)	Res BW (kHz)	Abs Start (dBm)	Abs Stop (dBm)	Rel Start (dBc)	Rel Stop (dBc)	Rel Couple	Meas BW
A, On	2.515	3.485	30.00	−71.07	−71.07	−35.23	−49.78	Man	1
B, On	4.000	7.500	1000.0	−55.84	−55.84	−35.50	−39.00	Man	1
C, On	7.500	8.500	1000.0	−55.84	−55.84	−39.00	−49.00	Man	1
D, On	8.500	12.000	1000.0	−55.84	−55.84	−49.00	−49.00	Couple	1
E, Off	12.500	15.000	1000.0	−55.84	−55.84	−49.00	−49.00	Couple	1

a. **Abs Stop** is set to Couple and **Fail Mask** is set to Abs AND Rel.

Table 7-5 **Offsets & Limits Defaulted for 802.11a and HiperLAN/2 Radio Standards [a]**

Offset	Start Freq (MHz)	Stop Freq (MHz)	Abs Start (dBm)	Abs Stop (dBm)	Abs Couple	Rel Start (dBc)	Rel Stop (dBc)	Rel Couple	Meas BW
A, On	9.00	11.00	16.00	−4.00	Man	0.00	−20.00	Man	1
B, On	11.00	20.00	−4.00	−12.00	Man	−20.00	−28.00	Man	1
C, On	20.00	30.00	−12.00	−24.00	Man	−28.00	−40.00	Man	1
D, On	30.00	50.00	−24.00	−24.00	Couple	−40.00	−40.00	Couple	1
E, Off	50.00	100.00	−24.00	−24.00	Couple	−40.00	−40.00	Couple	1

a. **Sweep Time** is set to 100 mseconds, **Res BW** is set to 100 kHz, and **Fail Mask** is set to Rel.

Table 7-6   Offsets & Limits Defaulted for 802.11b Radio Standard[a]

Offset	Start Freq (MHz)	Stop Freq (MHz)	Abs Start (dBm)	Abs Stop (dBm)	Rel Start (dBc)	Rel Stop (dBc)	Meas BW
A, On	11.00	22.00	–10.00	–10.00	–30.00	–30.00	1
B, On	22.00	50.00	–30.00	–30.00	–50.00	–50.00	1
C, Off	50.00	70.00	–30.00	–30.00	–50.00	–50.00	1
D, Off	70.00	90.00	–30.00	–30.00	–50.00	–50.00	1
E, Off	90.00	100.00	–30.00	–30.00	–50.00	–50.00	1

a. **Sweep Time** is set to 100 mseconds, **Res BW** is set to 100 kHz, **Fail Mask** is set to Rel, and **Abs Stop** and **Rel Stop** are both set to Couple

7.24.4.1 Offset

Selects the offset pairs (upper and lower) that the menu keys affect, and displays the memory selection menu from **A** to **E** (where you can store up to 5 sets of values for **Start Freq, Stop Freq, Sweep Time, Res BW, Meas BW, Abs Start, Abs Stop**, and so forth). Press **Offset** until the letter of the desired offset (A, B, C, D, or E) is underlined. Only one selection at a time is shown on this key label.

Key Path: **Meas Setup, Offset/Limits**

State Saved: Saved in instrument state.

Factory Preset: A

Remote Command:

There is no remote command for this function.

7.24.4.2 Start Freq

Specifies the inner limit (frequency closest to the carrier) for both segments of the specified offset pair. When **Start Freq** (Off) is selected, the offset pair is not measured.

Key Path: **Meas Setup, Offset/Limits**

State Saved: Saved in instrument state.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 577 for this value.

Default Terminator: Hz

Range: 0 Hz to the Stop Freq (for that offset) minus 10 Hz

Remote Command:

[:SENSe]:SEMask:OFFSet[n]:LIST:FREQuency:STARt <freq>, ... [<freq>] (up to five values)

[:SENSe]:SEMask:OFFSet[n]:LIST:FREQuency:STARt?

[:SENSe]:SEMask:OFFSet[n]:LIST:STATe OFF|ON|0|

[:SENSe]:SEMask:OFFSet[n]:LIST:STATe?

Remote Command Notes: Comma separated list of up to 5 values. n = 1 for BTS and n = 2 for MS. Default is BTS.

Offsets that are turned off, for the currently selected offset will return a -999.0 when queried.

Example: SEM:OFFS:LIST:FREQ:STAR 2 MHz

SEM:OFFS:LIST:FREQ:STAR?

SEM:OFFS:LIST:STAT 1

SEM:OFFS:LIST:STAT?

7.24.4.3   Stop Freq

Specifies the outer limit (frequency furthest from the carrier) for both segments of the specified offset pair. The lower range is limited to the setting of **Start Freq**.

Key Path: **Meas Setup**, **Offset/Limits**

State Saved: Saved in instrument state.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 577 for this value.

Default Terminator: Hz

Range: The Start Freq (for that offset) plus 10 Hz to 100 MHz

Remote Command:

[:SENSe]:SEMask:OFFSet[n]:LIST:FREQuency:STOP <freq> ... [<freq>] (up to five values)

[:SENSe]:SEMask:OFFSet[n]:LIST:FREQuency:STOP?

Remote Command Notes: Comma separated list of up to 5 values. n = 1 for BTS and n = 2 for MS. Default is BTS.

Example: SEM:OFFS:LIST:FREQ:STOP 4 MHz

SEM:OFFS:LIST:FREQ:STOP?

7.24.4.4   Sweep Time

Specifies the sweep time for the currently selected offset, and toggles this function between **Auto** and **Manual** for each offset.

Key Path: **Meas Setup, Offset/Limits**

State Saved: Saved in instrument state.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default
                 tables for "Offset/Limits" on page 577 for this value.

Default Terminator: s (seconds)

Range: 1 ms to 4 ks

Remote Command:

`[:SENSe]:SEMask:OFFSet[n]:LIST:SWEeptime <time> ... [<time>]` (up to five
values)

`[:SENSe]:SEMask:OFFSet[n]:LIST:SWEeptime?`

`[:SENSe]:SEMask:OFFSet[n]:LIST:SWEeptime:AUTO OFF|ON|0|1`

`[:SENSe]:SEMask:OFFSet[n]:LIST:SWEeptime:AUTO?`

Remote Command Notes: Comma separated list of up to 5 values. n = 1 for BTS and n = 2
                        for MS. Default is BTS.

Example: `SEM:OFFS:LIST:SWE:AUTO 4 ms`

                `SEM:OFFS:LIST:SWE:AUTO?`

                `SEM:OFFS:LIST:SWE 4 ms`

                `SEM:OFFS:LIST:SWE?`

7.24.4.5   Res BW

Specifies the resolution bandwidth used in measuring the offset pair. When set to Auto, the Res BW from the default tables for "Offset/Limits" on page 577 are used. When set to Man, the range of settings is the range of available Res BWs of the analyzer, except the maximum is further limited to not exceed (Stop Freq - Start Freq).

Key Path: **Meas Setup, Offset/Limits**

State Saved: Saved in instrument state.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default
                 tables for "Offset/Limits" on page 577 for this value.

Default Terminator: Hz

Remote Command:

`[:SENSe]:SEMask:OFFSet[n]:LIST:BANDwidth|BWIDth[:RESolution]` `<freq>...[<freq>]` (up to five values)

`[:SENSe]:SEMask:OFFSet[n]:LIST:BANDwidth|BWIDth[:RESolution]?`

`[:SENSe]:SEMask:OFFSet[n]:LIST:BANDwidth|BWIDth[:RESolution]:AUTO` `OFF|ON|0|1`

`[:SENSe]:SEMask:OFFSet[n]:LIST:BANDwidth|BWIDth[:RESolution]:AUTO?`

Remote Command Notes: Comma separated list of up to5 values. n = 1 for BTS and n = 2 for MS. Default is BTS (1).

You may only enter valid Res BW filter frequencies. Refer to "Res BW Auto Man" on page 58.

Example: `SEM:OFFS:LIST:BAND 40 kHz` or `SEM:OFFS:LIST:BWID 40 kHz`

`SEM:OFFS:LIST:BAND?` or `SEM:OFFS:LIST:BWID?`

`SEM:OFFS:LIST:BAND:AUTO 0` or `SEM:OFFS:LIST:BWID:AUTO 0`

`SEM:OFFS:LIST:BAND:AUTO?` or `SEM:OFFS:LIST:BWID:AUTO?`

7.24.4.6   Meas BW

Enables you to specify the bandwidth to use when measuring the offset. When using the front panel, only the currently selected offset is affected. All the offsets are affected when using the remote command. This is the multiplier applied to the resolution bandwidth to determine the bandwidth to integrate when calculating the power.

Key Path: **Meas Setup**, **Offset/Limits**

Key Notes: The 3GPP standard allows for the construction of an effective measurement bandwidth out of a group of narrower resolution bandwidths. This allowance is a remedy for the potential loss in dynamic range which can occur when carrier energy leaks into the offset due to the RBW filter's shape factor (nominally 12:1). When the offset's ratio of start frequency to the Meas BW is small (approximately 4:1), it is recommended that you select a small Res BW value (30 kHz) and a large multiplier (Meas BW=33) in order to increase the dynamic range of the measurement. Refer to offset D in Table 7-3, "Offsets & Limits Defaulted for W-CDMA (3GPP) Base Station Measurements," on page 577.

When setting Meas BW > 1, dynamic range is increased, however measurement time is also increased since an increased number of sweep points are required to make the measurement. For Meas BW > 1, consider this equation for trace points:

Trace points = (Offset Stop Freq - Offset Start Freq)/ (Meas BW/100)

When Meas BW = 1, the number of trace points are set at the value specified upon entering the measurement.

Dependencies/
Couplings: This parameter must adhere to the rule: (N x Res BW) ≤ (Stop Freq of the offset - Start freq of the offset), where N is Meas BW value. If the Res BW is changed, Meas BW will change to ensure this rule.

n/a

State Saved: Saved in instrument state.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 577 for this value.

Default Terminator: x Res BW

Knob Increment: 1

Step Key
Increment: 1

Range: 1 to 1000

History: Added with firmware revision A.09.00

Remote Command:

`[:SENSe]:SEMask:OFFSet[n]:LIST:BANDwidth|BWIDth:IMULti <integer>`

`[:SENSe]:SEMask:OFFSet[n]:LIST:BANDwidth|BWIDth:IMULti?`

`[:SENSe]:SEMask:OFFSet[n]:LIST:BANDwidth|BWIDth[:RESolution]:AUTO OFF|ON|0|1`

`[:SENSe]:SEMask:OFFSet[n]:LIST:BANDwidth|BWIDth[:RESolution]:AUTO?`

Remote Command Notes: Comma separated list of up to 5 values. n = 1 for BTS and n = 2 for MS. Default is BTS (1).

Example: `SEM:OFFS:LIST:BAND:IMUL 40` or `SEM:OFFS:LIST:BWID:IMUL 40`

`SEM:OFFS:LIST:BAND:IMUL?` or `SEM:OFFS:LIST:BWID:IMUL?`

`SEM:OFFS:LIST:BAND:AUTO 0` or `SEM:OFFS:LIST:BWID:AUTO 0`

`SEM:OFFS:LIST:BAND:AUTO?` or `SEM:OFFS:LIST:BWID:AUTO?`

7.24.4.7 Abs Start

Enables you to enter an absolute level limit at **Start Freq** for the currently selected offset ranging from −200.00 to +50.00 dBm with 0.01 dB resolution.

Key Path: **Meas Setup**, **Offset/Limits**

State Saved: Saved in instrument state.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 577 for this value.

Default Terminator: dBm

Range: −200 dBm to 50 dBm

Remote Command:

[:SENSe]:SEMask:OFFSet[n]:LIST:STARt:ABSolute <ampl>,...[<ampl>] (up to five values)

[:SENSe]:SEMask:OFFSet[n]:LIST:STARt:ABSolute?

Remote Command Notes: Comma separated list of up to 5 values. n = 1 for BTS and n = 2 for MS. Default is BTS (1).

Example: SEM:OFFS:LIST:STAR:ABS −20 dBm

                SEM:OFFS:LIST:STAR:ABS

7.24.4.8   Abs Stop

Enables you to enter an absolute level limit at **Stop Freq** for the currently selected offset ranging from −200.00 to +50.00 dBm with 0.01 dB resolution, and to toggle this function between **Couple** and **Man**. If set to **Couple**, this is coupled to **Abs Start** to make a flat limit line. If set to **Man**, **Abs Start** and **Abs Stop** you can enter different values to make a sloped limit line.

Key Path: **Meas Setup**, **Offset/Limits**

State Saved: Saved in instrument state.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 577 for this value.

Default Terminator: dBm

Range: −200 dBm to 50 dBm

Remote Command:

[:SENSe]:SEMask:OFFSet[n]:LIST:STOP:ABSolute <ampl>,...[<ampl>] (up to five values)

[:SENSe]:SEMask:OFFSet[n]:LIST:STOP:ABSolute?

[:SENSe]:SEMask:OFFSet[n]:LIST:STOP:ABSolute:COUPle OFF|ON|0|1

[:SENSe]:SEMask:OFFSet[n]:LIST:STOP:ABSolute:COUPle?

Remote Command Notes: Comma separated list of up to 5 values. n = 1 for BTS and n = 2 for MS. Default is BTS (1).

Example: `SEM:OFFS:LIST:STOP:ABS –20 dBm`

                `SEM:OFFS:LIST:STOP:ABS`

`SEM:OFFS:LIST:STOP:ABS:COUP 0`

`SEM:OFFS:LIST:STOP:ABS:COUP?`

7.24.4.9   Rel Start

Enables you to enter a relative level limit at **Start Freq** ranging from –150.00 to +50.00 dBc with 0.01 dB resolution.

Key Path: **Meas Setup, Offset/Limits, More**

State Saved: Saved in instrument state.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 577 for this value.

Default Terminator: dBc

Range: –200 dBc to 50 dBc

Remote Command:

`[:SENSe]:SEMask:OFFSet[n]:LIST:STARt:RCARrier <rel_ampl>,... [<rel_ampl>]`
`(up to five values)`

`[:SENSe]:SEMask:OFFSet[n]:LIST:STARt:RCARrier?`

Remote Command Notes: Comma separated list of 5 values. n = 1 for BTS and n = 2 for MS. Default is BTS (1).

Example: `SEM:OFFS:LIST:STAR:RCAR –20 dBc`

                `SEM:OFFS:LIST:STAR:RCAR`

7.24.4.10   Rel Stop

Enables you to enter a relative level limit at **Stop Freq** ranging from –150.00 to +50.00 dBc with 0.01 dB resolution, and to toggle this function between **Couple** and **Man**. If set to **Couple**, this is coupled to **Rel Start** to make a flat limit line. If set to **Man**, **Rel Start** and **Rel Stop** you can enter different values to make a sloped limit line.

Key Path: **Meas Setup, Offset/Limits, More**

State Saved: Saved in instrument state.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 577 for this value.

Default Terminator: dBc

Range: −200 dBc to 50 dBc

Remote Command:

[:SENSe]:SEMask:OFFSet[n]:LIST:STOP:RCARrier <real number>,[<real number>]...

[:SENSe]:SEMask:OFFSet[n]:LIST:STOP:RCARrier?

[:SENSe]:SEMask:OFFSet[n]:LIST:STOP:RCARrier:COUPle OFF|ON|0|1

[:SENSe]:SEMask:OFFSet[n]:LIST:STOP:RCARrier:COUPle?

Remote Command Notes: Comma separated list of 5 values. n = 1 for BTS and n = 2 for MS. Default is BTS (1).

Example: SEM:OFFS:LIST:STOP:RCAR −20 dBm

                  SEM:OFFS:LIST:STOP:RCAR

                  SEM:OFFS:LIST:STOP:RCAR:COUP 0

                  SEM:OFFS:LIST:STOP:RCAR:COUP?

7.24.4.11 Fail Mask

Displays the menu to select one of the following logic keys for fail conditions between the measurement results and the test limits: **Absolute**, **Relative**, **Abs AND Rel**, and **Abs OR Rel.**

    Absolute - Fail is shown if one of the absolute spectrum emission mask measurement results is larger than the limit between **Abs Start** and **Abs Stop**, inclusive. This is the default selection for each offset for BTS measurements.

    Relative - Fail is shown if one of the relative spectrum emission mask measurement results is larger than the limit between **Rel Start** and **Rel Stop**, inclusive.

    Abs AND Rel - Fail is shown if one of the absolute spectrum emission mask measurement results is larger than the limit between **Abs Start** and **Abs Stop**, inclusive AND one of the relative spectrum emission mask measurement results is larger than the limit for **Rel Start** and **Rel Stop**. This is the default for MS measurements.

    Abs OR Rel - Fail is shown if one of the absolute spectrum emission mask measurement results is larger than the limit between **Abs Start** and **Abs Stop**, inclusive OR one of the relative spectrum emission mask measurement results is larger than the limit for **Rel Start** and **Rel Stop**.

Key Path: **Meas Setup, Offset/Limits, More**

State Saved: Saved in instrument state.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default

tables for "Offset/Limits" on page 577 for this value.

Remote Command:

```
[:SENSe]:SEMask:OFFSet[n]:LIST:TEST
ABSolute|AND|OR|RELative,ABSolute|AND|OR|RELative,ABSolute|AND|OR|RELative
,ABSolute|AND|OR|RELative
```

```
[:SENSe]:SEMask:OFFSet[n]:LIST:TEST?
```

Remote Command Notes: Comma separated list of 5 values. n = 1 for BTS and n = 2 for MS. Default is BTS (1).

Example: `SEM:OFFS:LIST:TEST ABS,REL,ABS AND REL,ABS OR REL`
             `SEM:OFFS:LIST:TEST?`

7.24.4.11.1   Absolute

Set the limit test to show Fail if one of the absolute spectrum emission mask measurement results is larger than the limit for **Abs Start** and/or **Abs Stop**. This is the default selection for each offset

Key Path: **Meas Setup**, **Offset/Limits**, **More**, **Fail Mask**

State Saved: Saved in instrument state.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 577 for this value.

Remote Command:

Refer to "Fail Mask" on page 586.

7.24.4.11.2   Relative

Sets the limit test to show Fail if one of the relative spectrum emission mask measurement results is larger than the limit for **Rel Start** and/or **Rel Stop**.

Key Path: **Meas Setup**, **Offset/Limits**, **More**, **Fail Mask**

State Saved: Saved in instrument state.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 577 for this value.

Remote Command:

Refer to "Fail Mask" on page 586.

7.24.4.11.3   Abs AND Rel

Set the limit test to show Fail if one of the absolute spectrum emission mask measurement

results is larger than the limit for **Abs Start** and **Abs Stop** AND one of the relative spectrum emission mask measurement results is larger than the limit for **Rel Start** and **Rel Stop**.

Key Path: **Meas Setup**, **Offset/Limits**, **More**, **Fail Mask**

State Saved: Saved in instrument state.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 577 for this value.

Remote Command:

Refer to "Fail Mask" on page 586.

7.24.4.11.4   Abs OR Rel

Set the limit test to show Fail if one of the absolute spectrum emission mask measurement results is larger than the limit for **Abs Start** and **Abs Stop** OR one of the relative spectrum emission mask measurement results is larger than the limit for **Rel Start** and **Rel Stop**.

Key Path: **Meas Setup**, **Offset/Limits**, **More**, **Fail Mask**

State Saved: Saved in instrument state.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 577 for this value.

Remote Command:

Refer to "Fail Mask" on page 586.

7.24.5   Optimize Ref Level

Sets the input attenuator and reference level to optimize the robustness of the measurement, which is its freedom from errors due to input compression and log amp range limitations..

NOTE	There is always a minimum of 5 dB of attenuation set to protect the analyzer input.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Remote Command:

[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE

Example: POW:RANG:AUTO ONCE

7.24.6 RRC Filter

Pressing **RRC Filter** turns the Root Raised Cosine filter on or off. This filter is the type specified in the 3GPP W-CDMA standards. This parameter is only available when **3GPP W-CDMA** is selected as the **Radio Std** from the **Mode Setup** menu. If **3GPP W-CDMA** is selected, the rolloff value (alpha) for the filter will be initially set to 0.22 and T will be 260 ns. The rolloff value can be changed using **Filter Alpha**.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: Off

History: Added with firmware revision A.09.00.

Remote Command:

```
[:SENSe]:SEMask:FILTer[:RRC][:STATe] OFF|ON|0|1
```

```
[:SENSe]:SEMask:FILTer[:RRC][:STATe]?
```

Example: SEM:FILT 1

              SEM:FILT?

7.24.7 Filter Alpha

Press **RRC Filter** to input the alpha value for the RRC Filter. This parameter is only available when **3GPP W-CDMA** is selected as the Radio Std. from the Mode Setup menu.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: 0.22 when W-CDMA is selected, otherwise Off.

Knob Increment: 0.01

Step Key
Increment: 0.1

Range: 0.01 to 1.0

History: Added with firmware revision A.09.00.

Remote Command:

```
[:SENSe]:SEMask:FILTer[:RRC]:ALPHA <number>
```

```
[:SENSe]:SEMask:FILTer[:RRC]:ALPHA?
```

7.25 Trace/View (Spectrum Emissions Mask)

If **Spectrum Emission Mask** has been selected in the **Measure** menu of the Spectrum Analysis mode, this key displays the appropriate **Trace/View** menu for the spectrum emission mask (SEM).

Displays menu keys that enable you to set how trace information is stored and displayed.

Key Path: Front-panel key

History: Added with firmware revision A.08.00

Remote Command:

There is no remote command for this function.

7.25.1 Abs Pwr & Freq

Press **Abs Pwr & Freq** to view the measurement results of Spectrum (Ref: Total Pwr, Seg: Offset) measurements in the graph window as absolute peak power and frequency. The absolute peak power levels, in dBm and those corresponding offset frequency ranges on both sides of the reference channel are displayed in the text window.

Key Path: **Trace/View**

Saved State: Saved in instrument state.

Factory Preset: On

History: Added with firmware revision A.07.00

Remote Command:

There is no remote command for this function.

7.25.2 Rel Pwr & Freq

Press **Rel Pwr & Freq** to view the measurement results of Spectrum (Ref: Total Pwr, Seg: Offset) measurements in the graph window as power relative to the carrier power and frequency. The relative power levels in dBc and those corresponding offset frequency ranges on both sides of the reference channel are displayed in the text window.

Key Path: **Trace/View**

Saved State: Saved in instrument state.

History: Added with firmware revision A.07.00

Remote Command:

There is no remote command for this function.

7.25.3   Integrated Power

Press **Integrated Power** to view the measurement results of Spectrum (Ref: Total Pwr, Seg: Offset) measurements in the graph window as integrated absolute and relative peak power and frequency. The absolute and relative peak power levels integrated throughout the bandwidths between the start and stop frequencies and those corresponding offset frequency ranges on both sides of the reference channel are displayed in the text window.

Key Path: **Trace/View**

Saved State: Saved in instrument state.

History: Added with firmware revision A.07.00

Remote Command:

There is no remote command for this function.

7.26 Display (Spectrum Emissions Mask—SEM)

Displays menu keys that enable you to configure parameters for the CCDF measurement.

NOTE The keys described below are measurement dependent. To access the display menus, for the SEM measurement press **Measure**, **Spectrum Emission Mask**, then **Display**.

7.26.1 Full Screen

Expands the measurement window horizontally over the entire instrument display. Pressing any other key that results in a new menu cancels the full screen function.

Key Path: **Display**

Key Path: **Display**

State Saved: Not saved in state.

Factory Preset: Off

Factory
Default: Off

History: Added with firmware revision A.08.00

7.26.2 Limit Display

Allows you to toggle the limit lines display function for spectrum emission mask measurements between **On** and **Off**. If set to **On**, the absolute limit lines and the relative limit lines are shown on the spectrum emission mask measurement display.

Key Path: **Display**, **Limit Display**

State Saved: Saved in instrument state.

Factory Preset: On

History: Added with firmware revision A.08.00

7.26.3 Preferences

Displays menu keys that enable you to turn the graticule and annotation on or off.

Key Path: **Display**

State Saved: Saved in instrument state.

History: Added with firmware revision A.08.00

7.26.3.1   Graticule (On Off)

Pressing Graticule turns the display graticules **On** or **Off**.

Key Path: **Display**, **Preferences**

Factory Preset: On

Factory
Default: On

Terminators: **Enter**

History: Added with firmware revision A.08.00

7.26.3.2   Annotation (On Off)

Turns the screen annotation on or off, however, menu key annotation will remain on the display. The screen annotation may not be required for prints or during remote operation.

Key Path: **Display**

Factory Preset
and *RST: On

Factory
Default: On

Terminators: Enter

History: Added with firmware revision A.08.00

7.27 SPAN X Scale (Spectrum Emissions Mask—SEM)

Activates the Span function for the SEM measurement and displays the menu of span functions.

Key Path: Front-panel key

State Saved: Saved in Instrument State

Remote Command:

See the Scale/Div, Ref Value, and Ref Position commands below.

7.27.1 Scale/Div

Allows you to enter a numeric value to change the horizontal display sensitivity by setting the frequency units per horizontal graticule division. To determine full display frequency span, multiply the frequency span per horizontal graticule division by 10. This function is only available when you select **Spectrum Emissions Mask** from the Measurement menu.

Key Path: **MEASURE, Spectrum Emission Mask, SPAN X Scale**

State Saved: Saved in Instrument State

Factory Preset: 2.50000000 MHz

7.27.2 Ref Value

Press **Ref Value** to set the frequency represented by the selected horizontal graticule line on the display (the reference). The current value is indicated by `Ref Value` in the upper left corner of the display. You can change the reference value using the step keys, the knob, or the numeric keypad. You can set the reference line location using the **Ref Position** setting. This function is only available when you select **Spectrum Emissions Mask** from the Measurement menu.

Key Path: **MEASURE, Spectrum Emission Mask, SPAN X Scale**

State Saved: Saved in Instrument State

Factory Preset: Center frequency value in Factory Preset state.

7.27.3 Ref Position

Press Ref Position to position the X-Scale reference to the extreme left line, center line, or extreme right line of the display graticule.

Key Path: **MEASURE, Spectrum Emission Mask, SPAN X Scale**

Factory Preset: Center

7.28 Marker (Spectrum Emissions Mask—SEM)

Displays the Marker control menu for the SEM measurement. If no markers are active, **Marker** selects marker 1, sets it to **Normal** and places it to the right of the display. There are two control modes for the markers:

- **Normal (POSition)** - A single marker that can be moved to any point on the trace.

- **Off (Off)** - Turns off the active marker or marker pair.

Key Path: Front-panel key

State Saved: The control mode for each marker, as well as the position of each marker, is saved in instrument state.

Factory Preset: All Off.

Remote Command:

There is no equivalent remote command.

7.28.1 Select Marker

Selects one of the four possible markers. Once a marker is selected, it can be set to any of the control modes **Normal** or **Off**.

Key Path: **Marker**

State Saved: The number of the selected marker is saved in instrument state.

Factory Preset: Marker 1

History: Remote command updated with firmware revision A.09.00

Remote Command:

`:CALCulate:SEMask:MARKer[1]|2|3|4:STATe OFF|ON|0|1`

`:CALCulate:SEMask:MARKer[1]|2|3|4:STATe?`

Remote Command Notes: Sets or queries the state of a marker. Setting a marker to state ON or 1 selects that marker. Setting a marker which is OFF to state ON or 1 puts it in **Normal** mode and places it on the screen to the right of the displayed measurement graph. Setting a marker to state OFF or 0 selects that marker and turns it off. The response to the query will be 0 if OFF, 1 if ON.

Example: `CALC:SEM:MARK2:STAT ON` selects marker 2.

`CALC:SEM:MARK:STAT ON` will not modify a marker that is already on.

7.28.2   Normal

Sets the control mode for the selected marker to **Normal** (see "Select Marker" on page 597). If the marker is off, a single marker is activated and placed on the screen to the right of the measurment graph. You can then adjust the trace point of the marker using the knob, numeric keypad, or ⇑ ⇓ keys.

Key Path: **Marker**

Factory Preset: Off

History: Remote command updated with firmware revision A.09.00

Remote Command:

See "Marker (Spectrum Emissions Mask—SEM)" on page 597 for the mode command.

Example: `CALC:SEM:MARK:STAT ON` selects marker 1 and sets it to **Normal**.

7.28.3   Off

Turns off the selected marker. In addition, **Off** also turns off functions related to the selected marker.

Key Path: **Marker**

Factory Preset: Off

History: Remote command updated with firmware revision A.09.00

Remote Command:

See "Select Marker" on page 597 for the command to select the control mode.

Example: `CALC:SEM:MARK3:STAT OFF` selects marker 3 and sets it to **Off**.

7.29 Meas Setup (Spurious Emissions)

When the spurious emissions measurement has been selected in the **Measure** menu of the Spectrum Analysis mode, this key displays the appropriate measurement setup menu.

The spurious emissions measurement identifies and determines the power level of spurious emissions in certain frequency bands.

Key Path: Front-panel key

History: Added with firmware revision A.08.00

Remote Command:

There is no equivalent remote command.

7.29.1 Avg Number

Press **Avg Number** to **On** to specify the number of measurements that will be averaged when calculating the measurement result. The average will be displayed at the end of each sweep. **Off** disables the measurement averaging.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: 10 averages / Off

Range: 1 to 1000

Remote Command:

[:SENSe]:SPURious:AVERage:COUNt <integer>

[:SENSe]:SPURious:AVERage:COUNt?

[:SENSe]:SPURious:AVERage[:STATe] OFF|ON|0|1 turns the averaging on or off.

[:SENSe]:SPURious:AVERage[:STATe]?

Example: SPUR:AVER:COUN 10

                SPUR:AVER OFF

7.29.2 Avg Mode

Selects the type of termination control used for the averaging function (Exp or Repeat). This determines the averaging action after the specified number of measurements (average count) is reached.

- **EXP** (Exponential Averaging mode)—When you set **Avg Mode** to **Exp**, each successive data acquisition after the average count is reached is exponentially weighted and combined with the existing average. Exponential averaging weights new data more than old data, which facilitates tracking of slow-changing signals. The average will be displayed at the end of each sweep.

- **Repeat**—When you set **Avg Mode** to **Repeat**, after reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: EXPonential

Range: EXPonential|REPeat

Remote Command:

[:SENSe]:SPURious:AVERage:TCONrol EXPonential|REPeat

[:SENSe]:SPURious:AVERage:TCONrol?

Example: SPUR:AVG:TCON EXP

                       SPUR:AVG:TCON?

7.29.3 Range Table

Enables you to enter the settings for up to 20 ranges, either using the instrument front panel keys or remotely. Upon entering the range table, the measurement stops, then the analyzer is set to a constantly sweeping idle state. The analyzer is then set to the current values for range 1 (whether range 1 is on or off). If a range is currently off, the values in the range table for that range are replaced with --- (see Range 5 in the illustration) to

indicate this range is currently inactive.

Key Path: **Meas Setup**

Saved State: All values for all ranges are saved in instrument state.

Factory Preset: For each range, the following settings are selected: **Video BW** (Auto), **Sweep Time** (Auto), **Absolute Limit** = −50 dBm, **Peak Threshold** = −90 dBm, **Peak Excursion** = 6 dB, and **Abs Stop Limit Mode** (Auto) is set to −50 dBm. The table below defines the other parameter's settings for the measurement. The values for ranges 1 through 5 are based on the W-CDMA (3GPP) BTS Spurious Emission measurement.

Table 7-7   **Range Table Default Settings**

Range	Start Freq (GHz)	Stop Freq (GHz)	Res BW (kHz)
1	1.920	1.980	1000
2	1.894	1.920	300
3	2.100	2.102	100
4	2.175	2.180	100
5	0.800	1.000	5000
6-20	1.5	2.5	Auto

Remote Command:

There is no equivalent remote command.

7.29.3.1 Range

Selects a range and updates the values on the other **Range Table** keys so that they reflect the settings for the selected range. If **Range** is set to **On** it is used as part of the measurement; when set to **Off** it is excluded.

Key Path: **Meas Setup**, **Range Table**

Factory Preset: See "Range Table" on page 600.

Range: Off | On

Remote Command:

This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted. For example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values remain as they were.

`[:SENSe]:SPURious[:RANGe][:LIST]:STATe OFF|ON|0|1`

The query for this parameter will always return 20 values.

`[:SENSe]:SPURious[:RANGe][:LIST]:STATe?`

Example: `SPUR:STAT OFF,ON,ON,OFF,ON,ON`
                 lists values 1 through 6

7.29.3.2 Start Freq

Used to set the start frequency of the analyzer.

Key Path: **Meas Setup**, **Range Table**

Factory Preset: See "Range Table" on page 600.

Knob Increment: 1%

Step Key
Increment: `1, 1.5, 2, 3, 5, 7.5, 10,...`

Range: Frequency range of your analyzer.

Remote Command:

This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

`[:SENSe]:SPURious[:RANGe][:LIST]:FREQuency:STARt <integer>`

The query for this parameter will always return 20 values.

```
[:SENSe]:SPURious[:RANGe][:LIST]:FREQuency:STARt?
```

7.29.3.3 Stop Freq

Stop Freq is used to set the stop frequency of the analyzer.

Key Path: **Meas Setup**, **Range Table**

Factory Preset: See "Range Table" on page 600.

Knob Increment: 1%

Step Key
Increment: `1, 1.5, 2, 3, 5, 7.5, 10,...`

Range: Frequency range of your analyzer.

Remote Command:

This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

```
[:SENSe]:SPURious[:RANGe][:LIST]:FREQuency:STOP <integer>
```

The query for this parameter will always return 20 values.

```
[:SENSe]:SPURious[:RANGe][:LIST]:FREQuency:STOP?
```

7.29.3.4 Res BW

Res BW is used to set the resolution bandwidth of the analyzer. When **Auto** is selected the analyzer determines the optimum setting, while **Man** enables you to determine the setting.

Key Path: **Meas Setup**, **Range Table**

Factory Preset: See "Range Table" on page 600.

Knob Increment: Steps through the available resolution bandwidth filters.

Step Key
Increment: Steps through the available resolution bandwidth filters.

Range: Resolution bandwidth range of your analyzer.

Remote Command:

This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

```
[:SENSe]:SPURious[:RANGe][:LIST]:BANDwidth[:RESolution]:AUTO OFF|ON|0|1
```

selects the mode.

`[:SENSe]:SPURious[:RANGe][:LIST]:BANDwidth[:RESolution]<integer>`

The query for this parameter always returns 20 values.

`[:SENSe]:SPURious[:RANGe][:LIST]:BANDwidth[:RESolution]:AUTO?`

`[:SENSe]:SPURious[:RANGe][:LIST]:BANDwidth[:RESolution]?`

7.29.3.5   Video BW

Video BW is used to set the video bandwidth of the analyzer. When **Auto** is selected the analyzer determines the optimum setting, while **Man** enables you to determine the setting.

Key Path: **Meas Setup**, **Range Table**

Factory Preset: See "Range Table" on page 600.

Knob Increment: Steps through the available video bandwidth filters.

Step Key
Increment: Steps through the available video bandwidth filters.

Range: Video bandwidth range of your analyzer.

Remote Command:

This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

`[:SENSe]:SPURious[:RANGe][:LIST]:BWIDth|BANDwidth:VIDeo:AUTO OFF|ON|0|1`
selects the mode.

`[:SENSe]:SPURious[:RANGe][:LIST]:BWIDth|BANDwidth:VIDeo <integer>`

The query for this parameter will always return 20 values.

`[:SENSe]:SPURious[:RANGe][:LIST]:BWIDth|BANDwidth:VIDeo:AUTO?`

`[:SENSe]:SPURious[:RANGe][:LIST]:BWIDth|BANDwidth:VIDeo?`

7.29.3.6   Sweep Time

Sweep Time is used to set the sweep time of the analyzer. When **Auto** is selected the analyzer determines the optimum setting, while **Man** enables you to determine the setting.

Key Path: **Meas Setup**, **Range Table**

Factory Preset: See "Range Table" on page 600.

Knob Increment: 1%

Step Key
Increment: `1, 1.5, 2, 3, 5, 7.5, 10,...`

Range: Sweep time range of your analyzer.

Remote Command:

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:TIME:AUTO OFF|ON|0|1, OFF|ON|0|1

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:TIME:AUTO?

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:TIME: <time>, <time>,... (up to 20 sweeptimes)

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:TIME?

Remote Command Notes: This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

The query for this parameter will always return 20 values.

Example: [:SENSe]:SPURious[:RANGe][:LIST]:SWEep:TIME:AUTO ON,OFF,ON

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:TIME: 4ms,10ms

7.29.3.7 Abs Start Limit

Abs Start Limit is used to set the absolute start limit to the set value, then sets the absolute stop limit to the same value as the start limit. If any spurs are located above the current setting of **Peak Excursn** will be added to the results table. A red F will be appended to the amplitude value of the spur if the measured amplitude of the spur is above the limit set with **Abs Start Limit**.

Key Path: **Meas Setup, Range Table**

Dependencies/
Couplings: If the limit is set to **Auto**, **Abs Start Limit** and **Abs Stop Limit** are coupled to make a flat limit line. If set to **Man**, the absolute start and stop limits can take different values to make a sloped limit line.

Factory Preset: See "Range Table" on page 600.

Knob Increment: 0.1 dB

Step Key
Increment: 1 dB

Range: −150 dBm to 50 dBm

History: Added with firmware revision A.09.00

Remote Command:

:CALCulate:SPURious[:RANGe][:LIST]:LIMit:ABSolute[:UPPER]:DATA:STARt <integer>

:CALCulate:SPURious[:RANGe][:LIST]:LIMit:ABSolute[:UPPER]:DATA:STARt?

Remote Command Notes: This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

The query for this parameter will always return 20 values.

Related commands are
[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:TIME:AUTO?

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:TIME?

7.29.3.8 Abs Stop Limit

Abs Stop Limit is used to determine the limit above which spurs will report a failure. If any spurs are located above the current setting of **Peak Excursn** will be added to the results table. A red F will be appended to the amplitude value of the spur if the measured amplitude of the spur is above the limit set with **Abs Stop Limit**.

Key Path: **Meas Setup**, **Range Table**

Dependencies/
Couplings: If the limit is set to **Auto**, **Abs Start Limit** and **Abs Stop Limit** are coupled to make a flat limit line. If set to **Man**, the absolute start and stop limits can take different values to make a sloped limit line.

Factory Preset: See "Range Table" on page 600.

Knob Increment: 0.1 dB

Step Key
Increment: 1 dB

Range: −150 dBm to 50 dBm

History: Added with firmware revision A.09.00

Remote Command:

:CALCulate:SPURious[:RANGe][:LIST]:LIMit:ABSolute[:UPPER]:DATA:STOP <integer>,<integer>

:CALCulate:SPURious[:RANGe][:LIST]:LIMit:ABSolute[:UPPER]:DATA:STOP?

:CALCulate:SPURious[:RANGe][:LIST]:LIMit:ABSolute[:UPPER]:DATA:STOP:AUTO OFF|ON|0|1, OFF|ON|0|1

:CALCulate:SPURious[:RANGe][:LIST]:LIMit:ABSolute[:UPPER]:DATA:STOP:AUTO?

Remote Command Notes: This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

The query for this command will always return 20 values.

Example: `:CALC:SPUR:LIM:ABS:DATA -23,-27`

`:CALC:SPUR:LIM:ABS:DATA:AUTO ON, ON, ON, ON`

7.29.3.9   Peak Excursn

Peak Excursn sets the minimum amplitude variation of signals that can be identified as peaks. For example, if a value of 6 dB is selected, peaks that rise and fall more than the 6 dB above the peak threshold value are identified.

Key Path: **Meas Setup, Range Table**

Factory Preset: See "Range Table" on page 600.

Knob Increment: 1 dB

Step Key
Increment: 1 dB

Range: 0.0 dB to 100.0 dB

Remote Command:

This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

`[:SENSe]:SPURious[:RANGe][:LIST]:PEAK:EXCursion <integer>`

The query for this parameter will always return 20 values.

`[:SENSe]:SPURious[:RANGe][:LIST]:PEAK:EXCursion?`

7.29.3.10   Pk Threshold

Pk Threshold sets the minimum amplitude of signals that can be identified as peaks. For example, if a value of -90 dBm is selected, only peaks that rise and fall more than the peak excursion value which is above -90 dBm are identified.

Key Path: **Meas Setup, Range Table**

Factory Preset: See "Range Table" on page 600.

Knob Increment: 1 dB

Step Key
Increment: 1 dB

Range: −100 dB to 0.0 dB

Remote Command:

This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

`[:SENSe]:SPURious[:RANGe][:LIST]:PEAK:THReshold <integer>`

The query for this parameter will always return 20 values.

`[:SENSe]:SPURious[:RANGe][:LIST]:PEAK:THReshold?`

7.29.4   Meas Type

Specifies the measurement type (Examine or Full). This parameter is coupled to the average mode. If you select Examine, the measurement sets **Avg Mode** to **Exp**. If you select Full, the measurement sets **Avg Mode** to **Rep**. The behavior of each measurement type is described below.

	Single		Continuous	
	No Spurs	**Spurs**	**No Spurs**	**Spurs**
Examine	All active ranges are measured. Upon completion, the measurement is set to the idle state. The message No Spurs is displayed.	All active ranges are measured and the found spurs are reported. Upon completion, the measurement is set to the idle state. The trace containing the worst spur is restored. **Spur** is enabled (no longer greyed out). A marker is added, set to the frequency of the worst spur.	All active ranges are measured. Upon completion, the analyzer remains set to the last range checked with an active trace. The message No Spurs is displayed.	All active ranges are measured and the found spurs are reported. Upon completion the analyzer is set to the range containing the worst spur found and continually sweeps this range. **Spur** is enabled (no longer greyed out). A marker added, set to the frequency of the worst spur.
Full	All active ranges are measured. Upon completion, the measurement is set to the idle state. The message No Spurs is displayed.	All active ranges are measured and the found spurs are reported. Upon completion, the measurement is set to the idle state. The trace of the last active range is displayed.	Measurement continually cycles through all active ranges.	All active ranges are measured and the found spurs are reported. On each cycle of the active ranges, the report on spurs found is reset. This ensures that remote queries retrieve the trace data that matches the currently displayed results.

Key Path: **Meas Setup**

State Saved: Saved in instrument state.

Factory Preset: Examine

Range: Examine | Full

Remote Command:

[:SENSe]:SPURious:TYPE EXAMine|FULL

[:SENSe]:SPURious:TYPE?

Remote Command Notes n/a

Example: SPUR:TYPE FULL

7.29.5   Spur

Enables you to view any spurs that have been found. The measurement sets the analyzer to the range in which the currently selected spur was found. The range settings changes only if the selected spur is in the range that is different from the current range settings. A marker identifies the currently selected spur on the trace.

NOTE   This key is enabled only when **Meas Type** is set to **Examine**, and only upon completion of a measurement.

Key Path: **Meas Setup**

Saved State: No values are saved to state.

Factory Preset: 1

Knob Increment: 1

Step Key
Increment: 1

Range: 1 to 100

Remote Command:

[:SENSe]:SPURious:SPUR <**integer**>

[:SENSe]:SPURious:SPUR?

7.29.6   Ref Level

Pressing **Ref Level** sets the reference level of the analyzer.

Key Path: **Meas Setup**

Saved State: Ref Level state is saved to instrument state. Ref Level value is
                 recalculated for each active range the value is not stored in instrument
                 state.

Factory Preset: 0.00 dBm

Knob Increment: 1

Step Key
Increment: 10

Range: –180 dBm to 20 dBm

Remote Command:

[:SENSe]:SPURious:POWer[:RF]:LEVel <integer>

[:SENSe]:SPURious:POWer[:RF]:LEVel?

[:SENSe]:SPURious:POWer[:RF]:RANGe:AUTO OFF|ON|0|1

[:SENSe]:SPURious:POWer[:RF]:RANGe:AUTO?

Example: SPUR:POW:RF:LEV 10

                SPUR:POW:RF:RANG:AUTO ON

7.29.7   Fast Spurious Meas

Pressing **Fast Spurious Meas** turns the fast spurious measurement test on or off. Pressing **Fast Spurious Meas** to **On** provides a faster method of execution as with fast spurious testing spurs above the limit line are reported. Any spurs reported outside the limit will cause the measurement to fail. See "Abs Start Limit" on page 605 for more information.

Key Path: **Meas Setup**

Saved State: Ref Level state is saved to instrument state. Ref Level value is
                 recalculated for each active range the value is not stored in instrument
                 state.

Factory Preset: Off

Range: Off|On

Remote Command:

[:SENSe]:SPURious:FSMeas OFF|ON|0|1

[:SENSe]:SPURious:FSMeas?

Example: SPUR:FSM ON

Index

Index

Index

Index

Index

Index

Index

Index

Index

Index

Index