User's Guide

Agilent Technologies ESA Series Spectrum Analyzers

This guide documents firmware revision A.08.xx

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

Manufacturing Part Number: E4401-90402
Supersedes: E4401-90236
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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.

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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

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1 Menu Maps

This chapter provides a visual representation of the front panel keys and their associated menu keys when the analyzer is in spectrum analyzer (SA) mode. Refer to Chapter 2 , "Front-Panel Key Reference," on page 47 for key function descriptions.

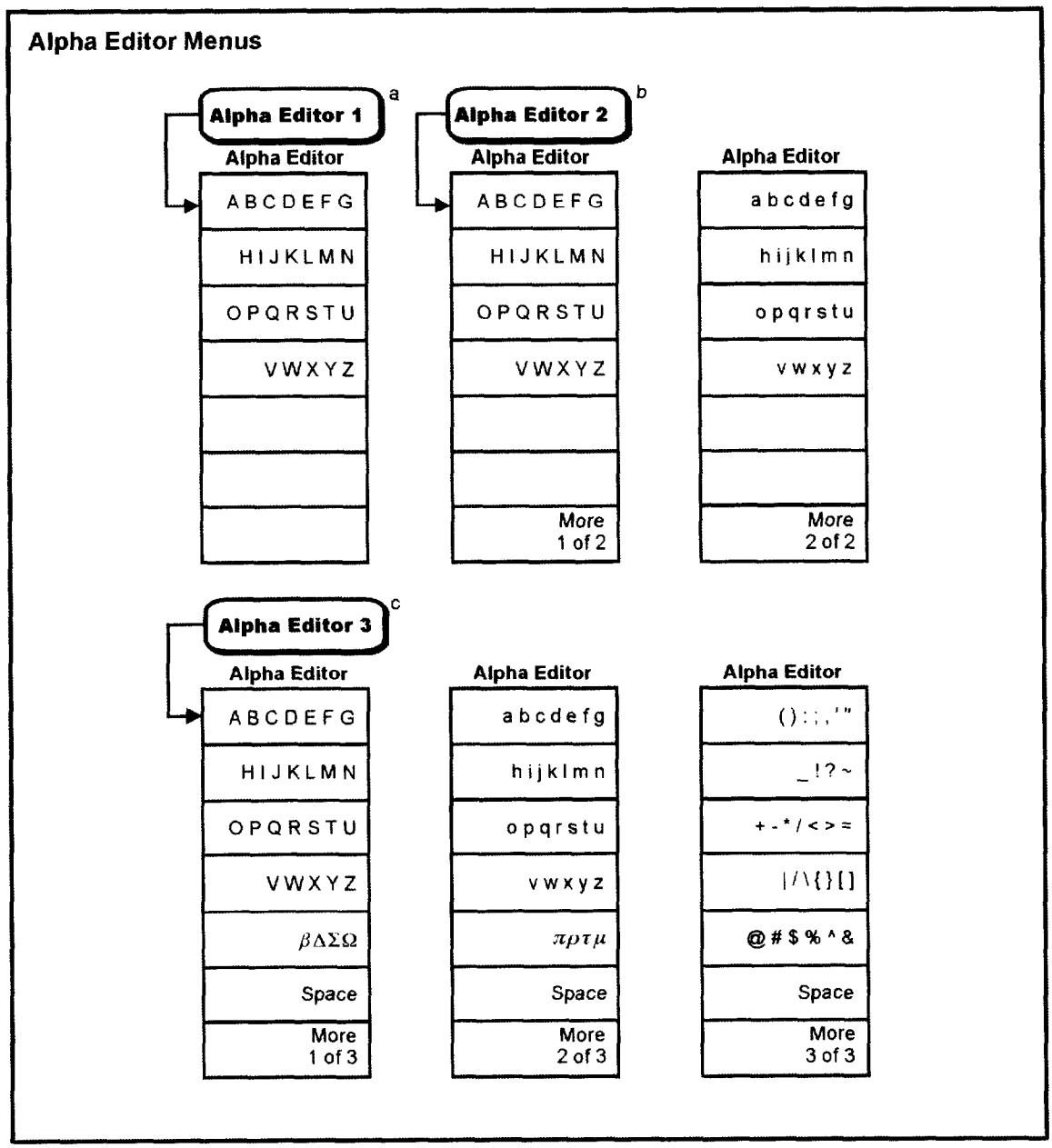
What You Will Find in This Chapter

This chapter provides menu maps for the front-panel keys having associated menus. The Alpha Editor Menu is associated with many keys, but is shown separately. The front-panel key menus appear in alphabetical order as follows:

Table 1-1

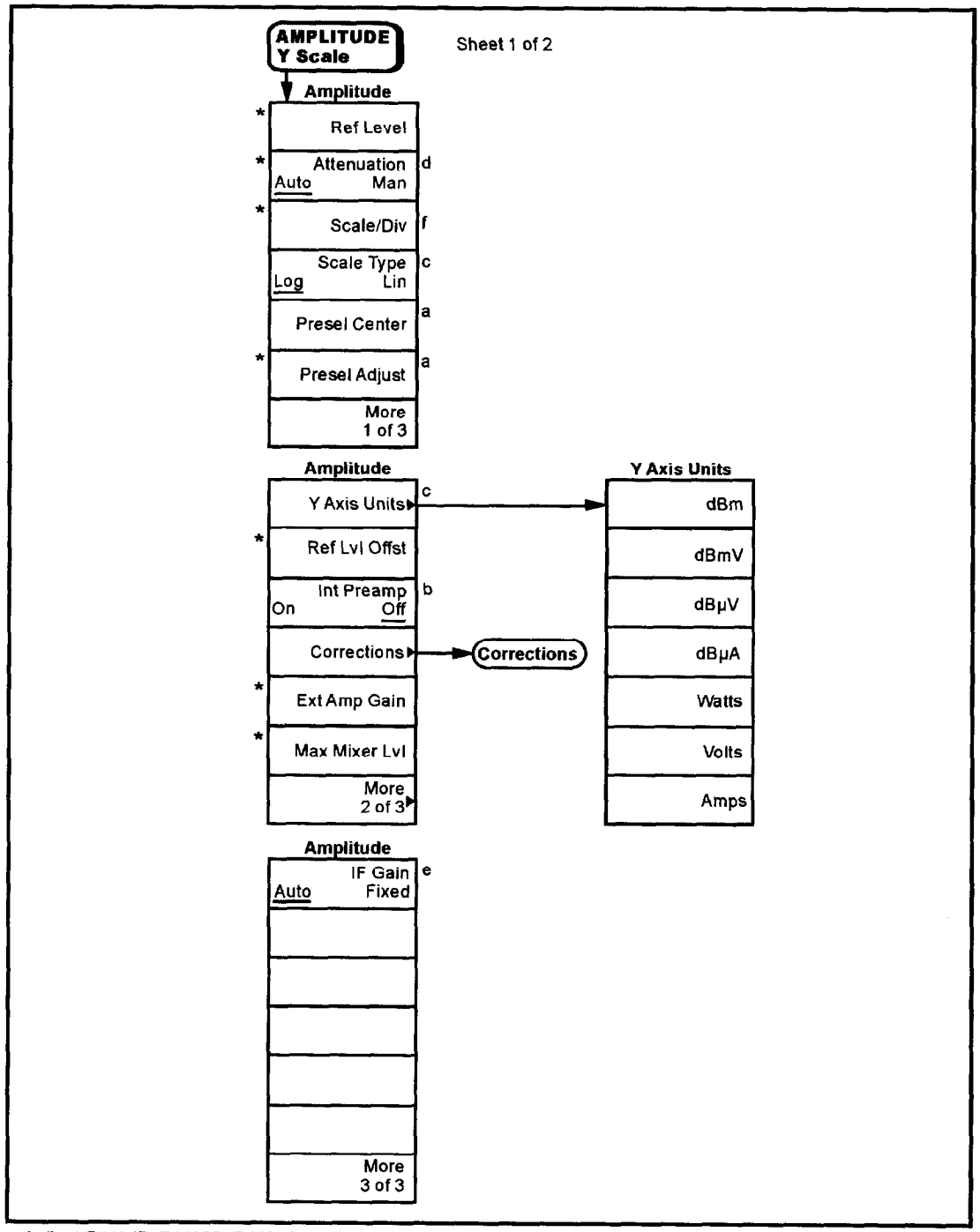
Menus

Alpha Editor Menu



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.

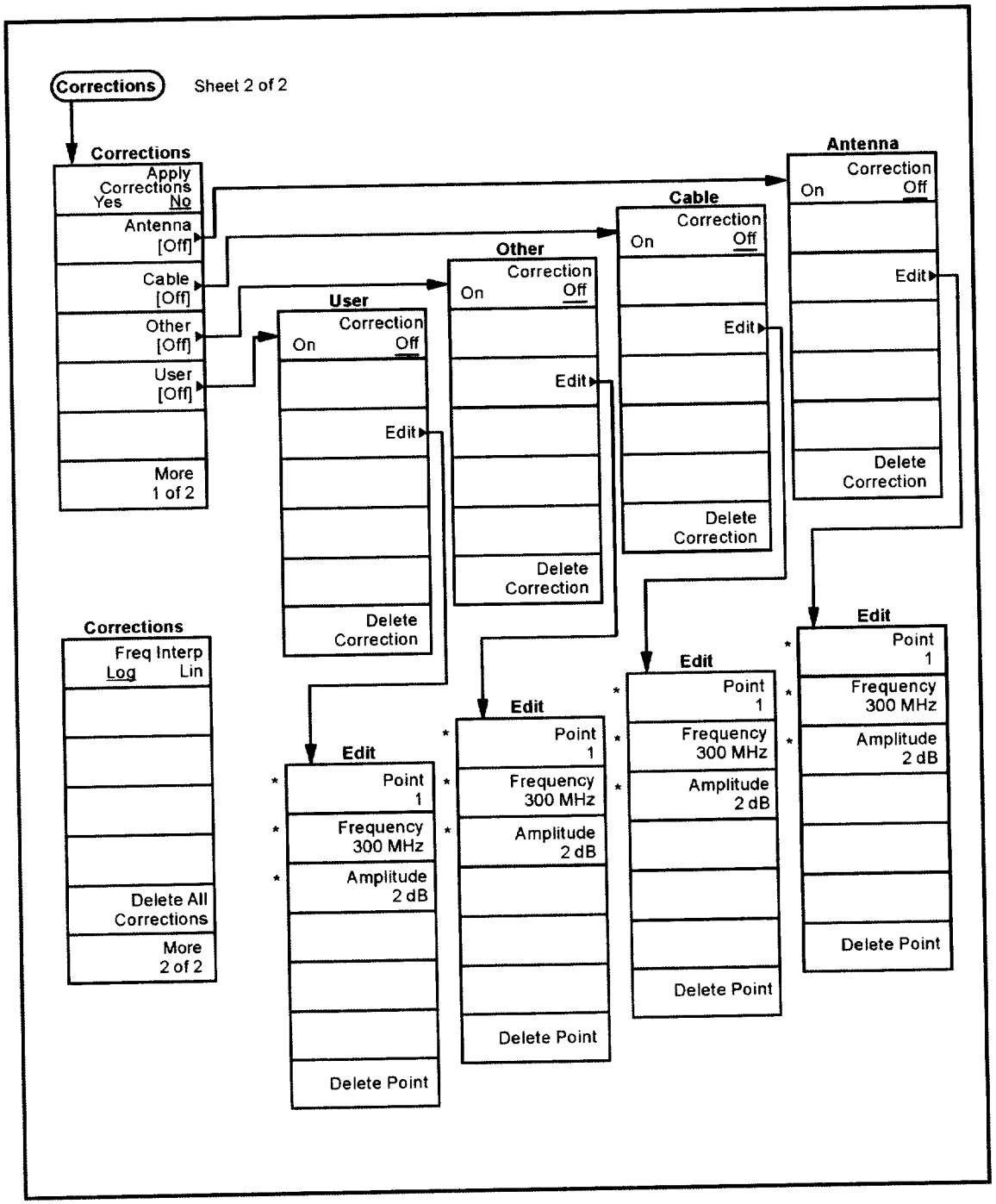
AMPLITUDE Y Scale Menu



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 ≥ 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

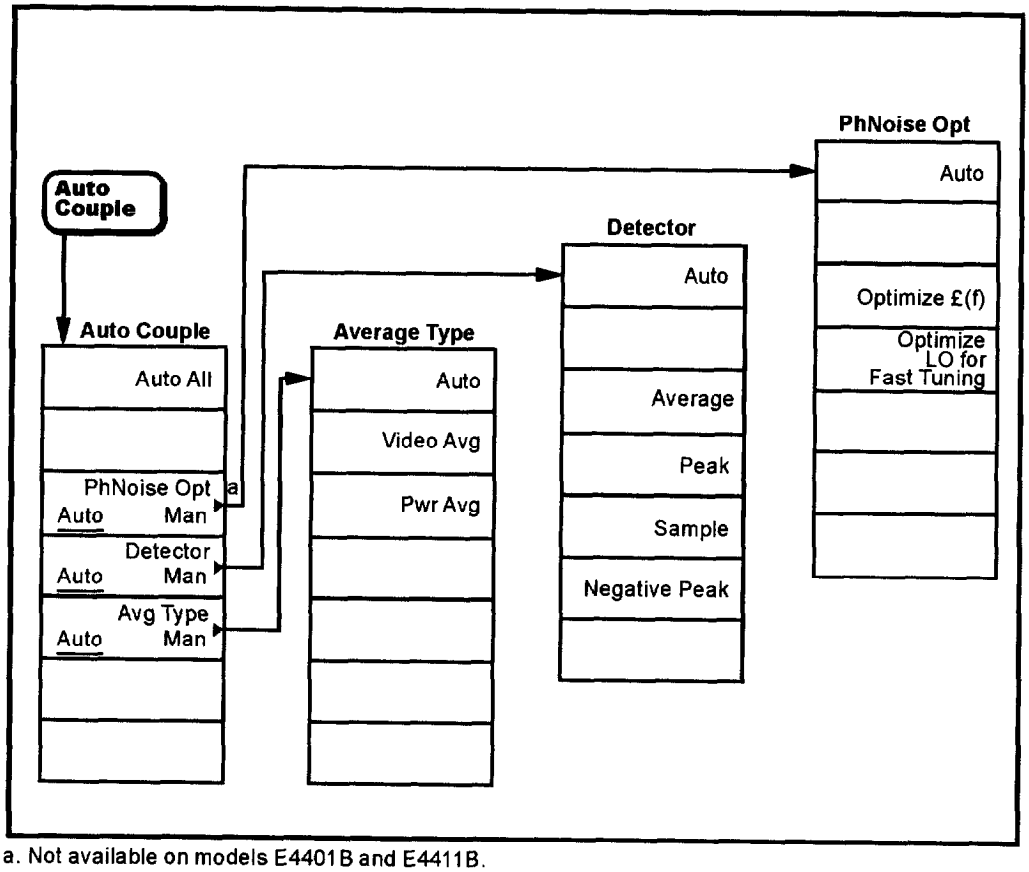
Amplitude Y Scale: Corrections Menu



* An active function which allows data entry

pl750b

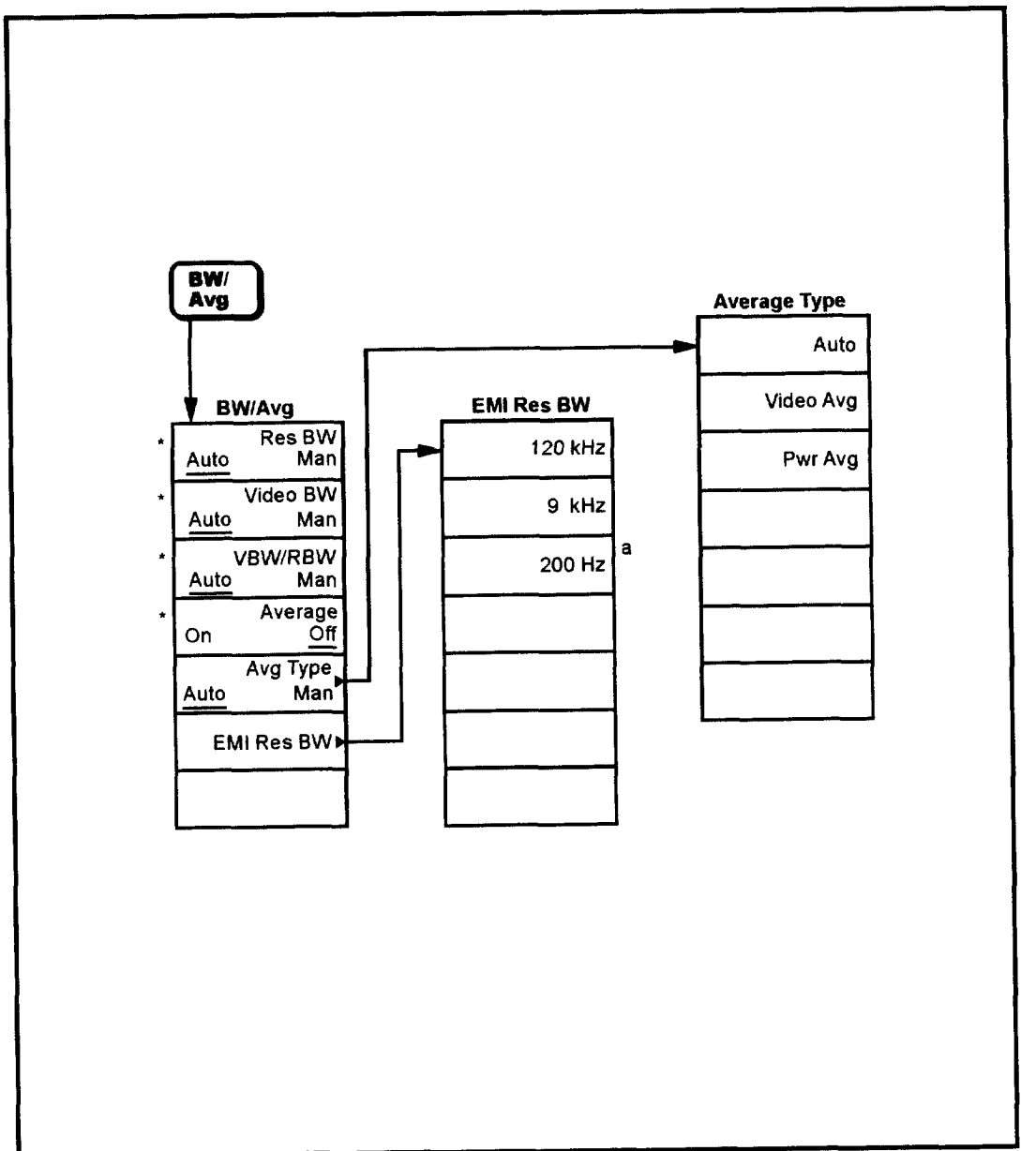
Auto Couple Menu



a. Not available on models E4401B and E4411B.

pl753b

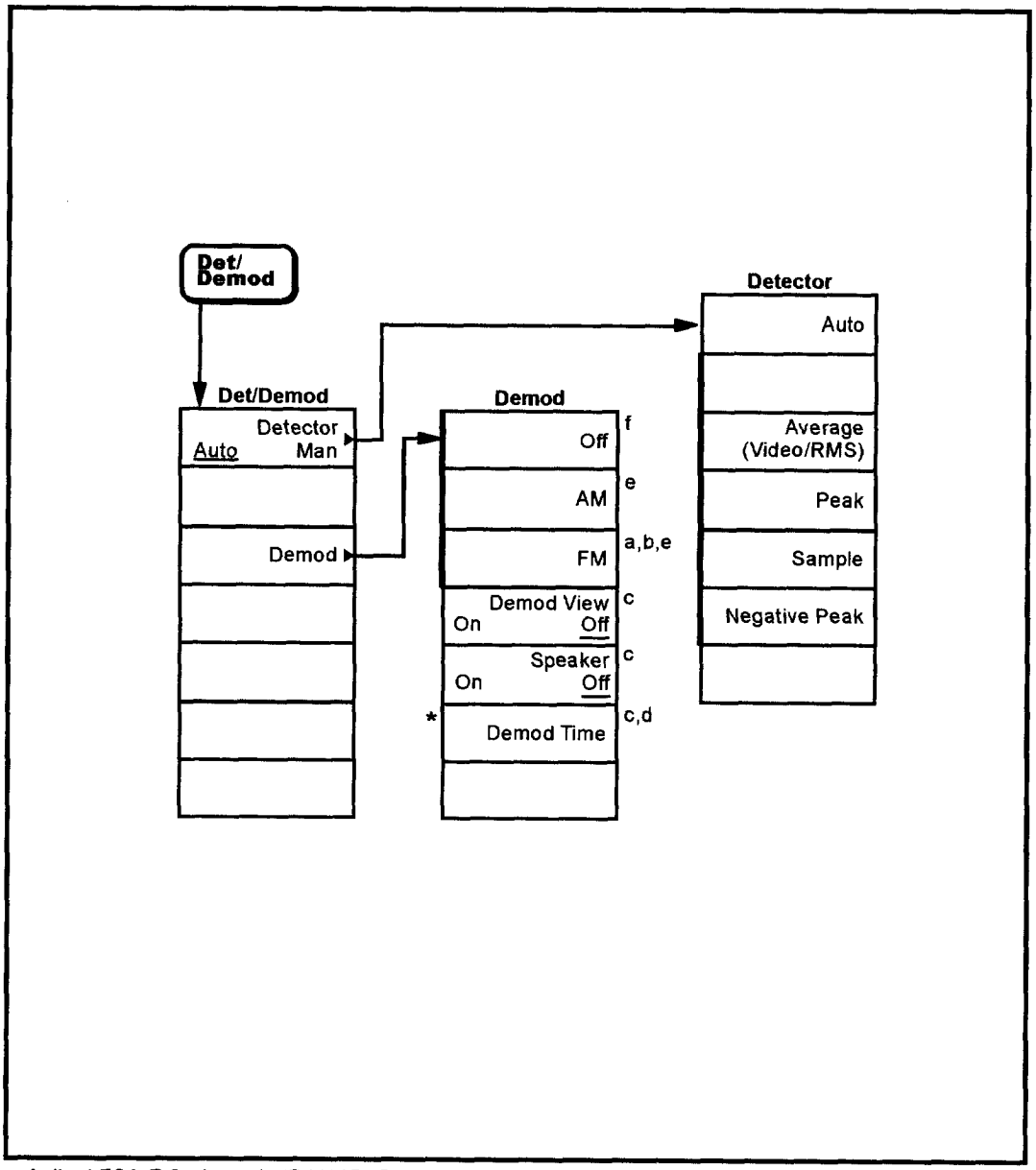
BW/Avg Menu



a. Available only with Option 1DR (narrow resolution bandwidth) and spans < 5MHz
* An active function which allows data entry

pl754b

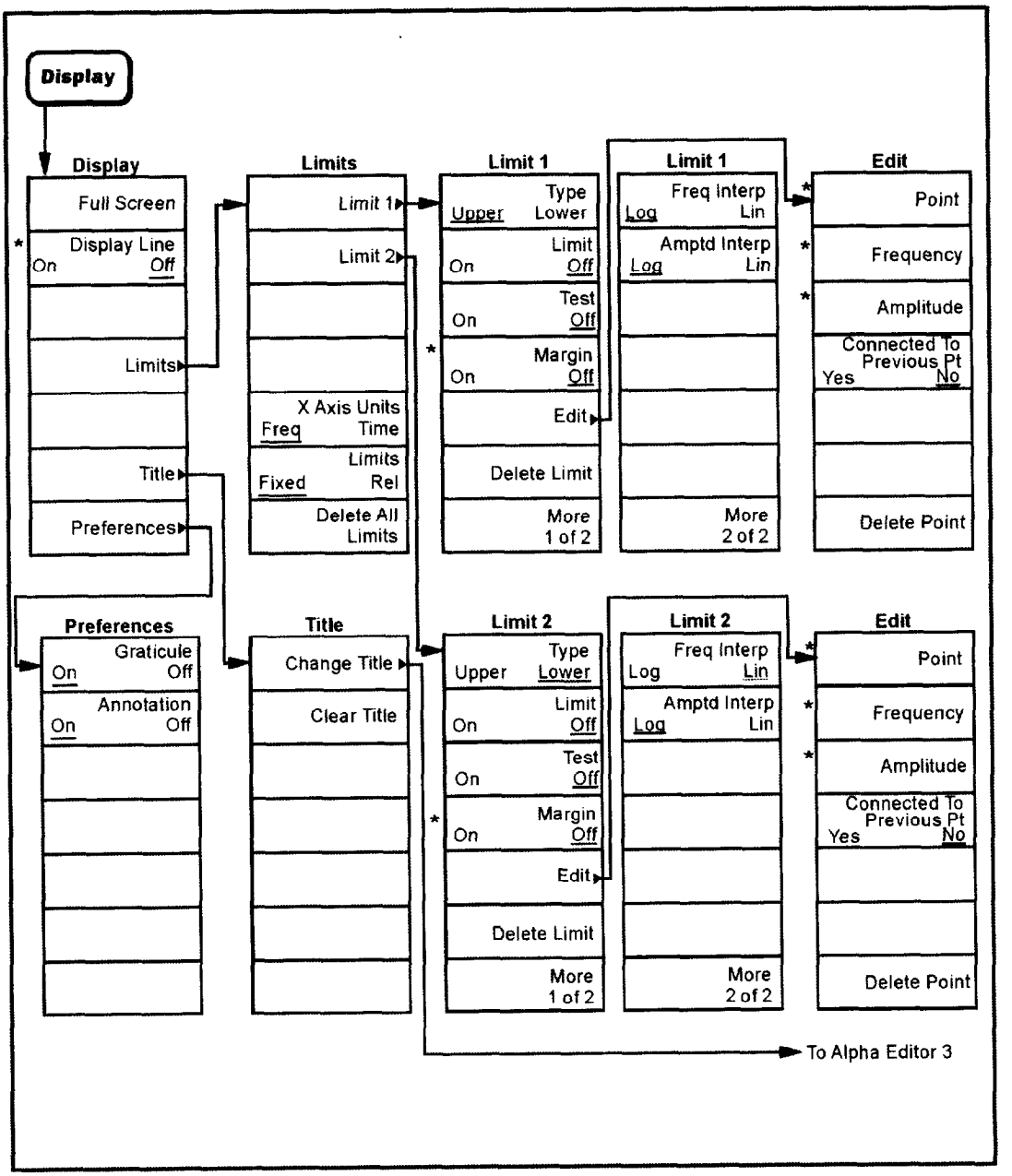
Det/Demod Menu



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

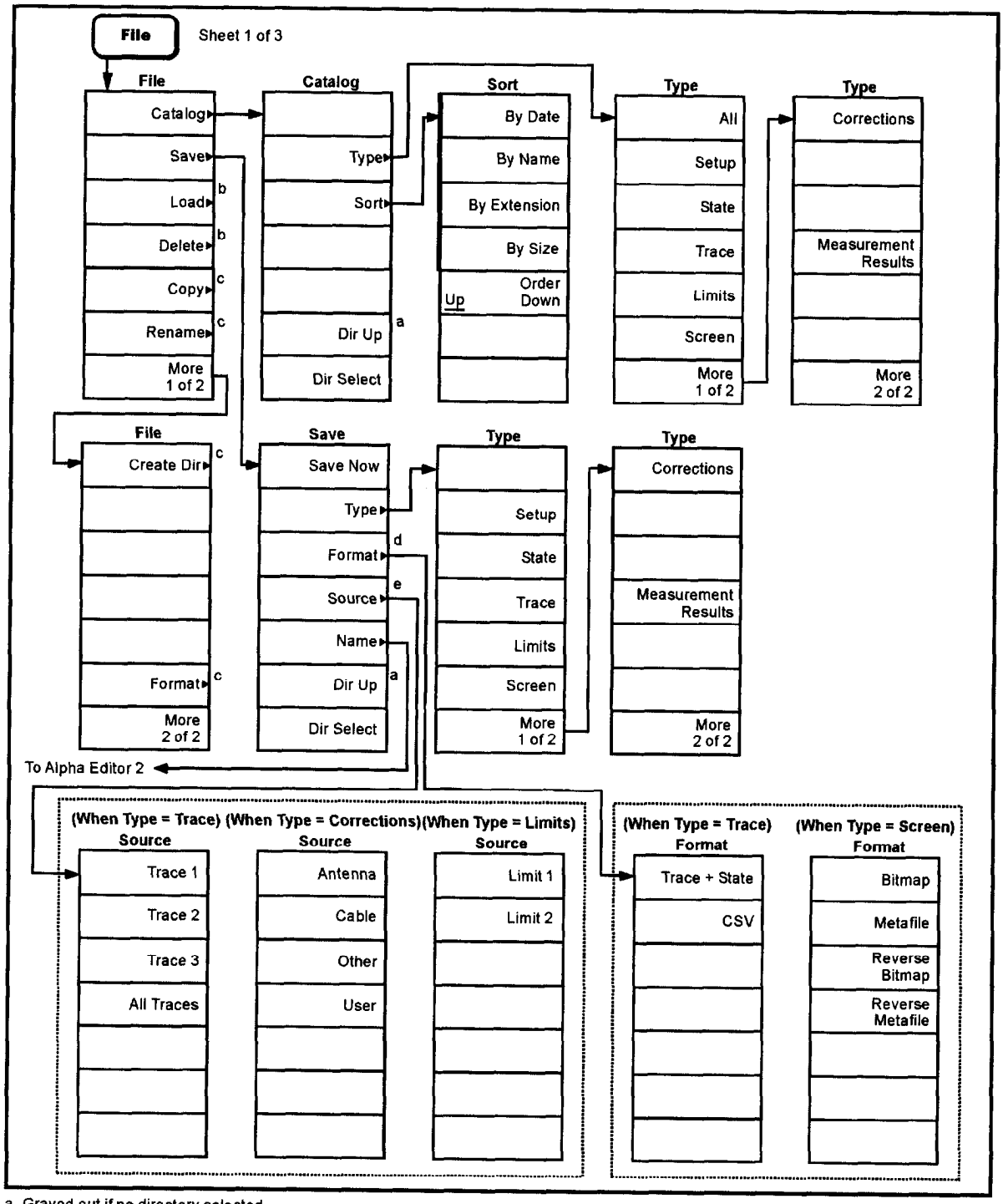
Display Menu



* An active function which allows data entry

pl758b

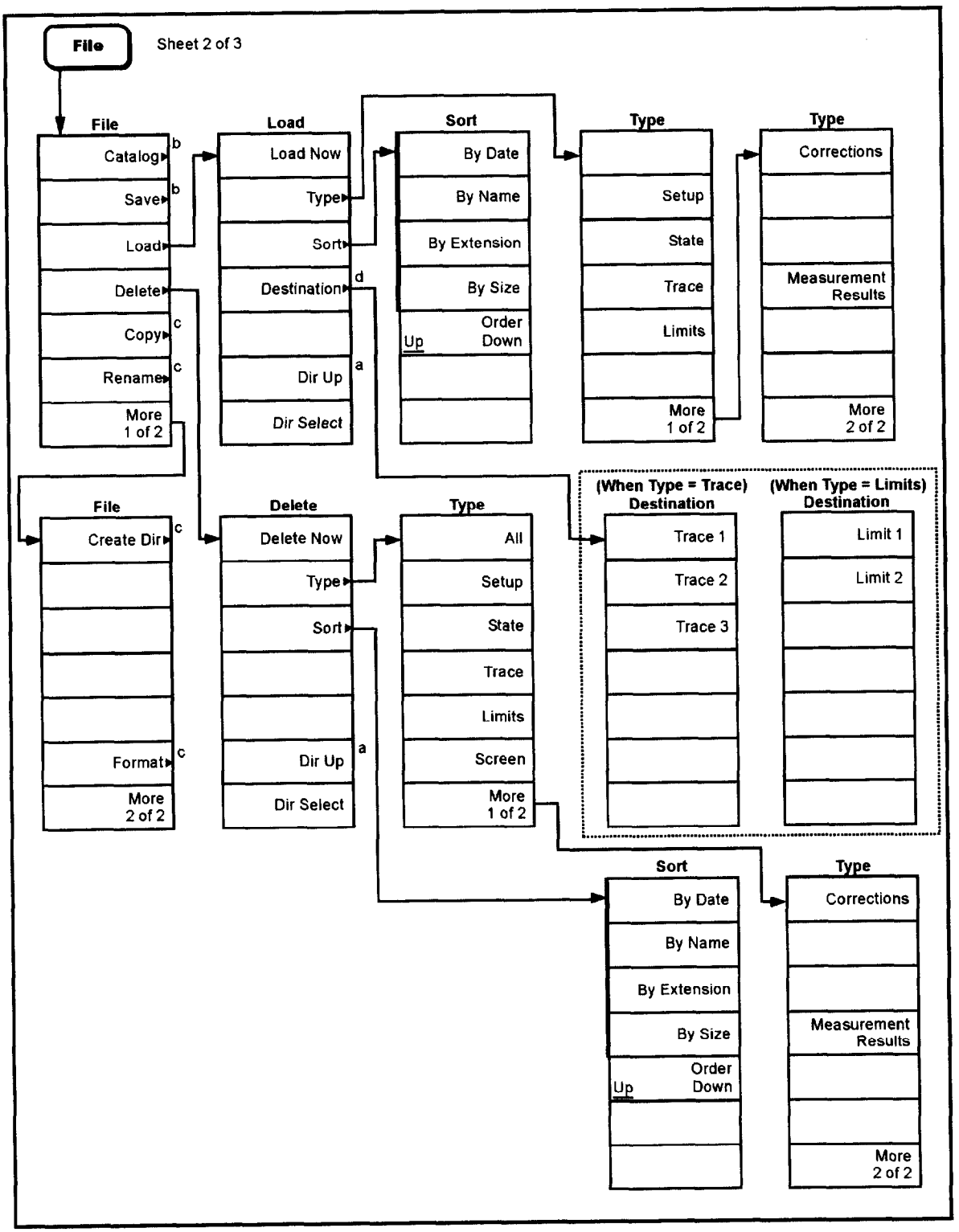
File Menus (1 of 3)



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

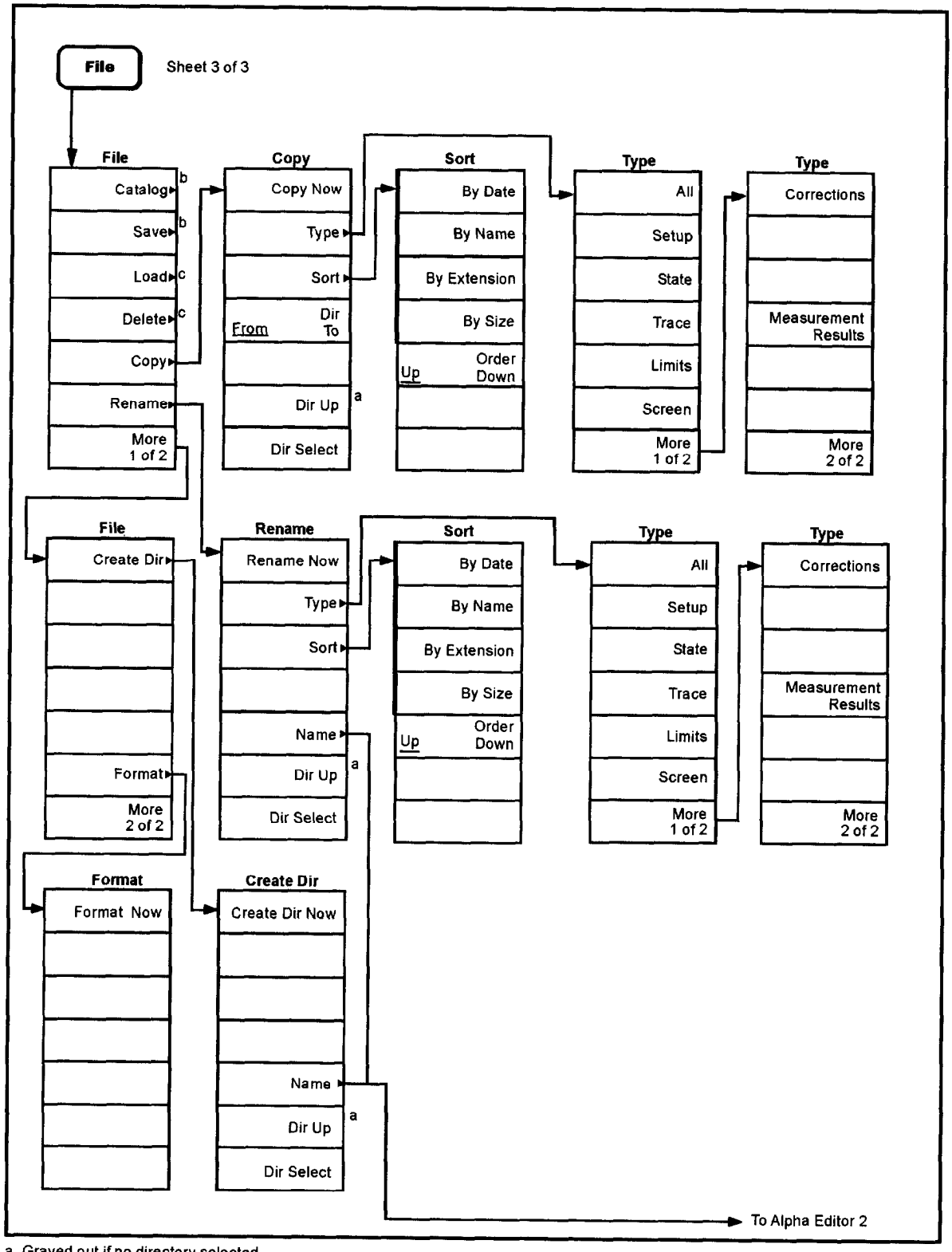
File Menus (2 of 3)



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

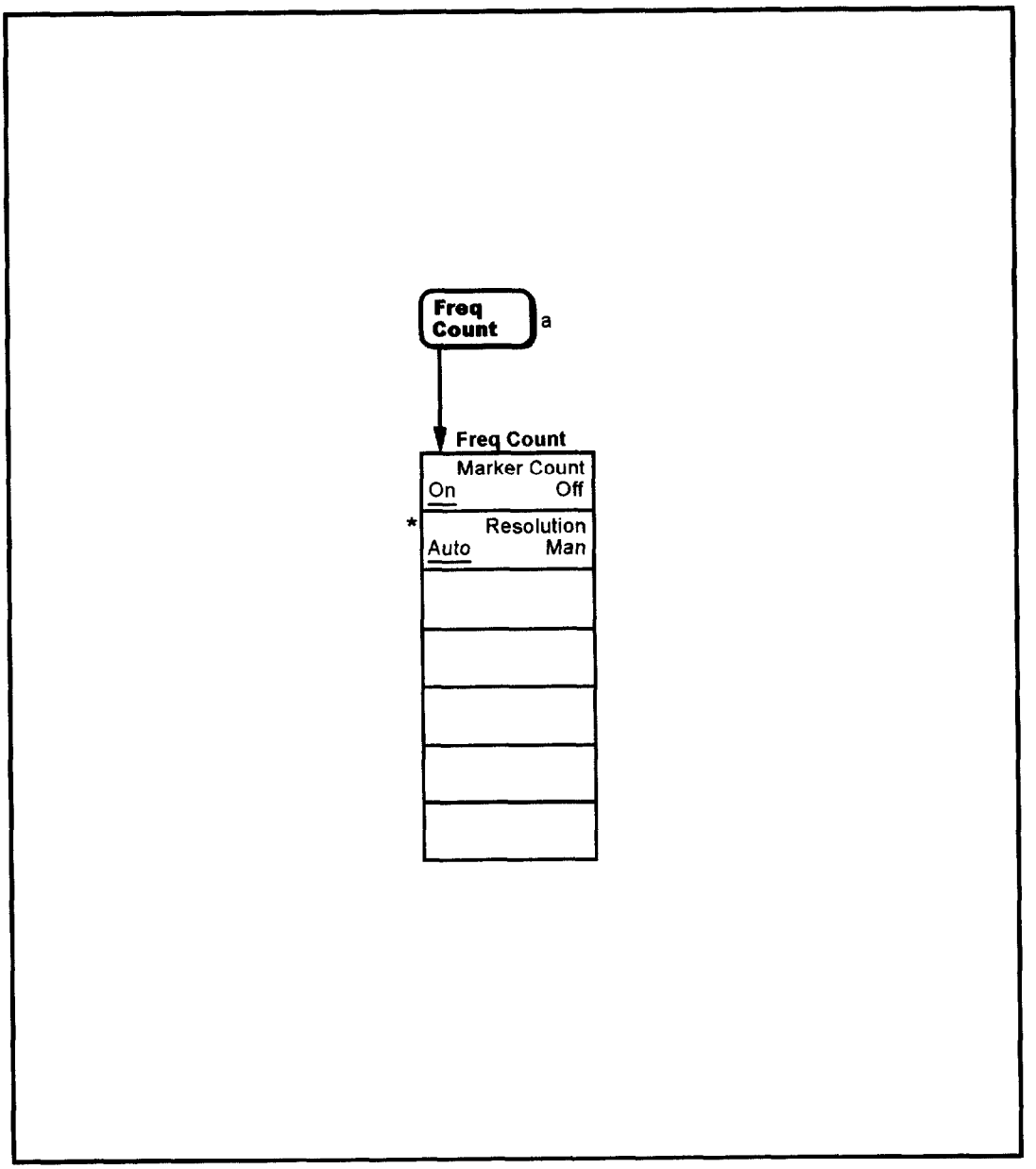
File Menus (3 of 3)



a. Grayed out if no directory selected.
b. See sheet 1 of 3.
c. Continued on sheet 2 of 3.

pl760b

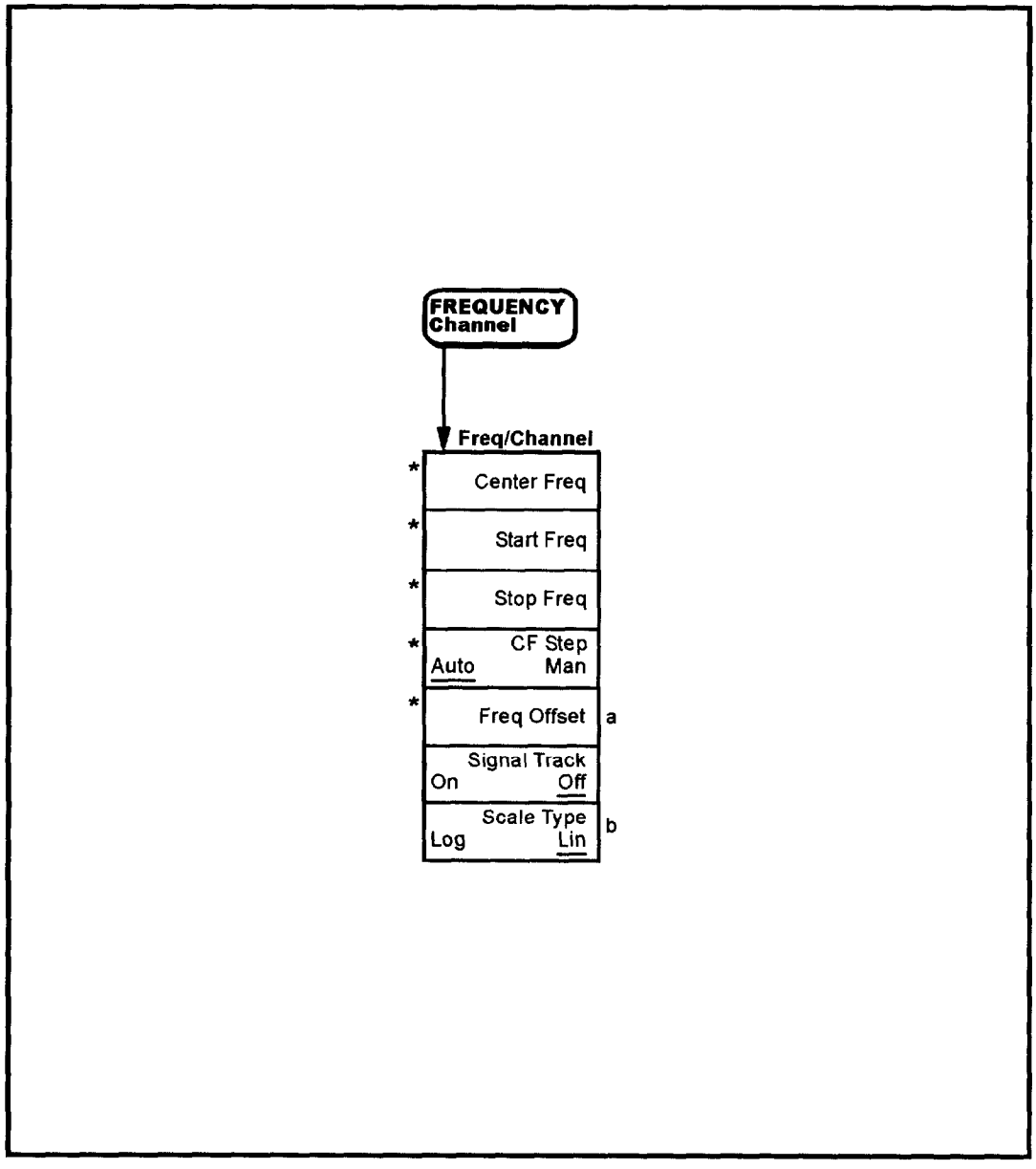
Freq Count (Marker) Menu



* An *active function* which allows data entry
a. Not available when **Frequency, Scale Type (Log)** is selected.

pl76

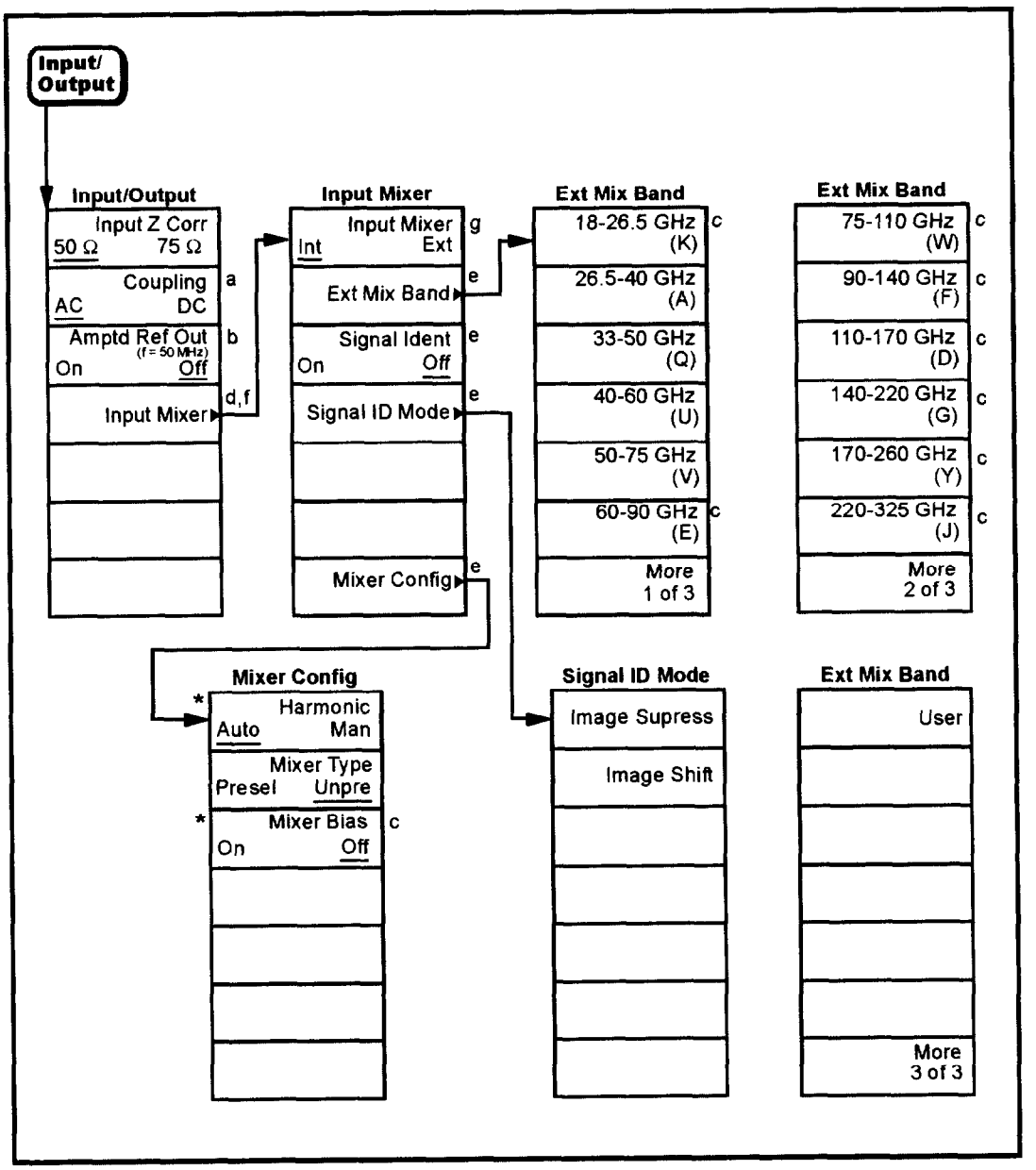
FREQUENCY Channel Menu



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

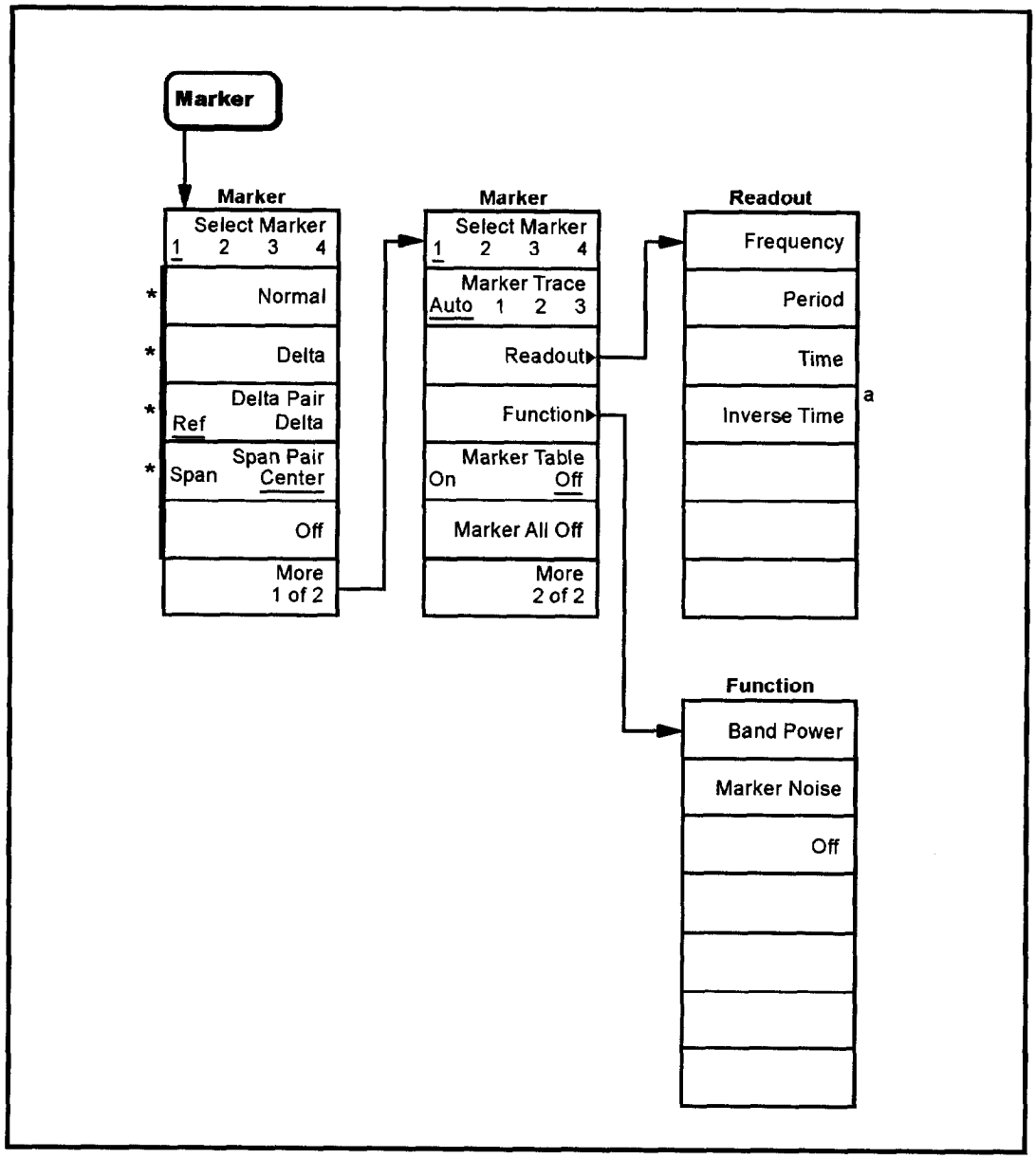


a. Agilent E4402B or E4407B with Option UKB, E4404B, and E4405B only
b. Key label is **Amptd Ref** for E4401B and E4411B
c. Grayed out if **Mixer Type** is **Presel**
d. E4407B Option AYZ (External Mixing) only
e. Grayed out if **Input Mixer** is **Int**
f. Grayed out if the Tracking Generator is on (**Source, Amplitude (On)**) or **Internal Preamp (On)** is selected.
g. Not available when **Frequency, Scale Type (Log)** is selected.

pl729b

* *An active function which allows data entry*

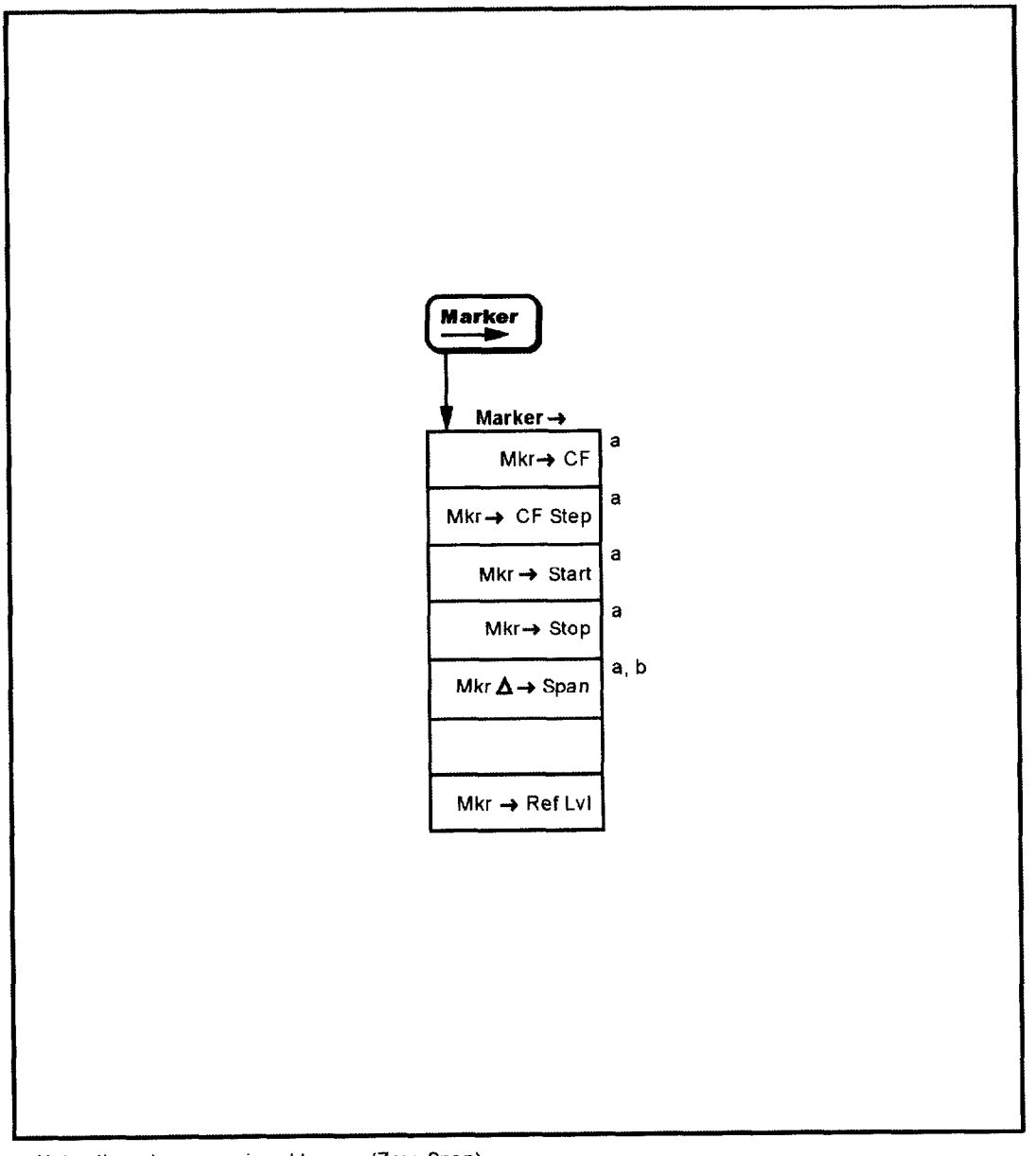
Marker Menu



a. Available in zero span with **Marker Delta** active.
* An active function which allows data entry

pl764b

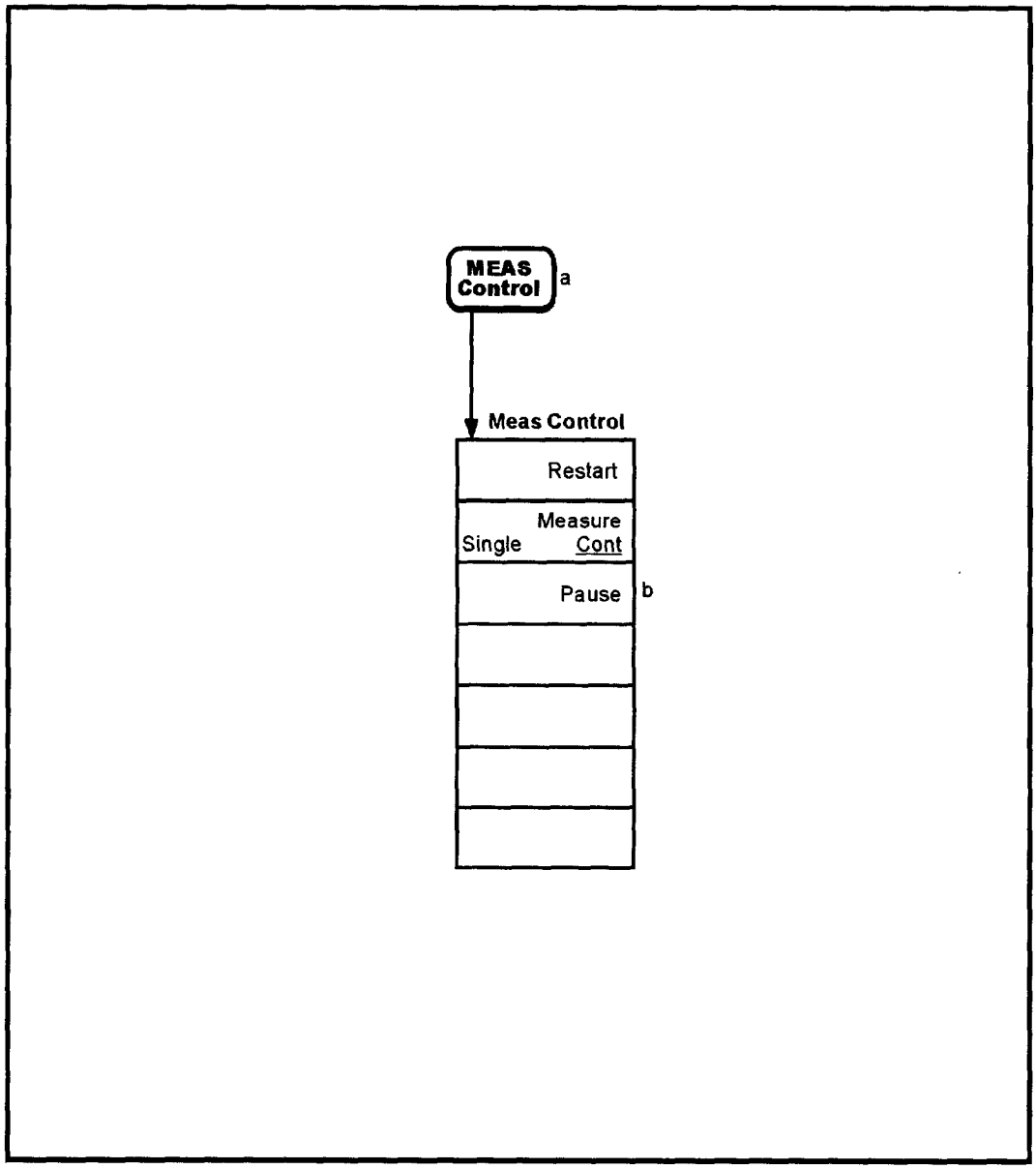
Marker → Menu



a. Not active when **span** is set to zero (Zero Span)
b. Active only when **Marker**, **Delta** is selected.

pb910a

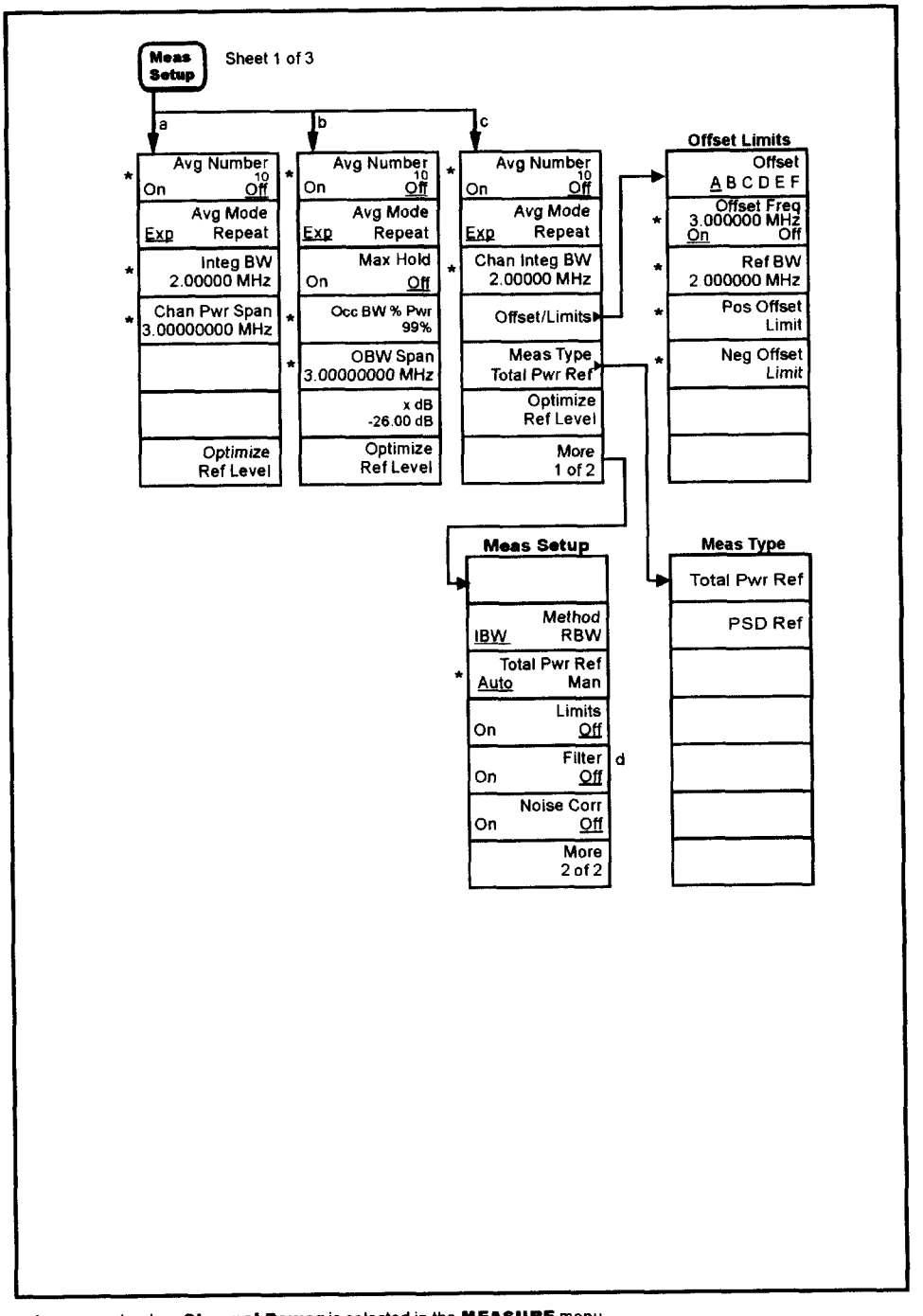
Meas Control Menu



a. Appears only when **Channel Power, Occupied BW, ACP, Multi-Carrier Power, Power Stat CCDF, Harmonic Distortion, Burst Power, Intermod (TOI), Spurious Emissions,** or **Spectrum Emissions Mask** is selected in the **Measure** menu.
b. Displays "Resume" if the measurement is paused.

pn82a

Meas Setup Menu for Channel Power, Occupied BW, and ACP

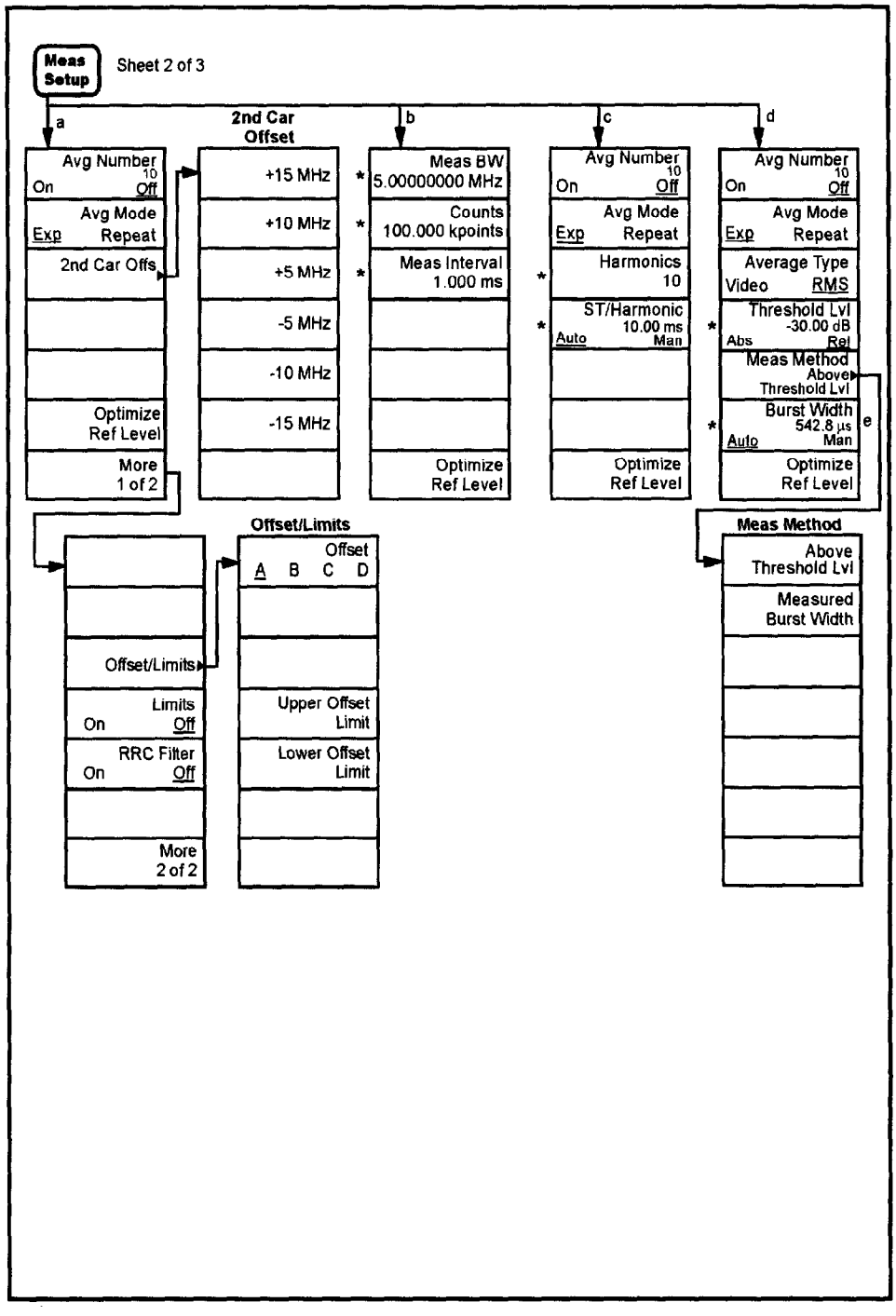


a. Appears only when **Channel Power** is selected in the **MEASURE** menu.
b. Appears only when **Occupied BW** is selected in the **MEASURE** menu.
c. Appears only when **ACP** is selected in the **MEASURE** menu.
d. Always grayed out except when **Radio Std, NADC** or **Radio Std, W-CDMA 3GPP** is selected.

* An active function which allows data entry.

pl773b

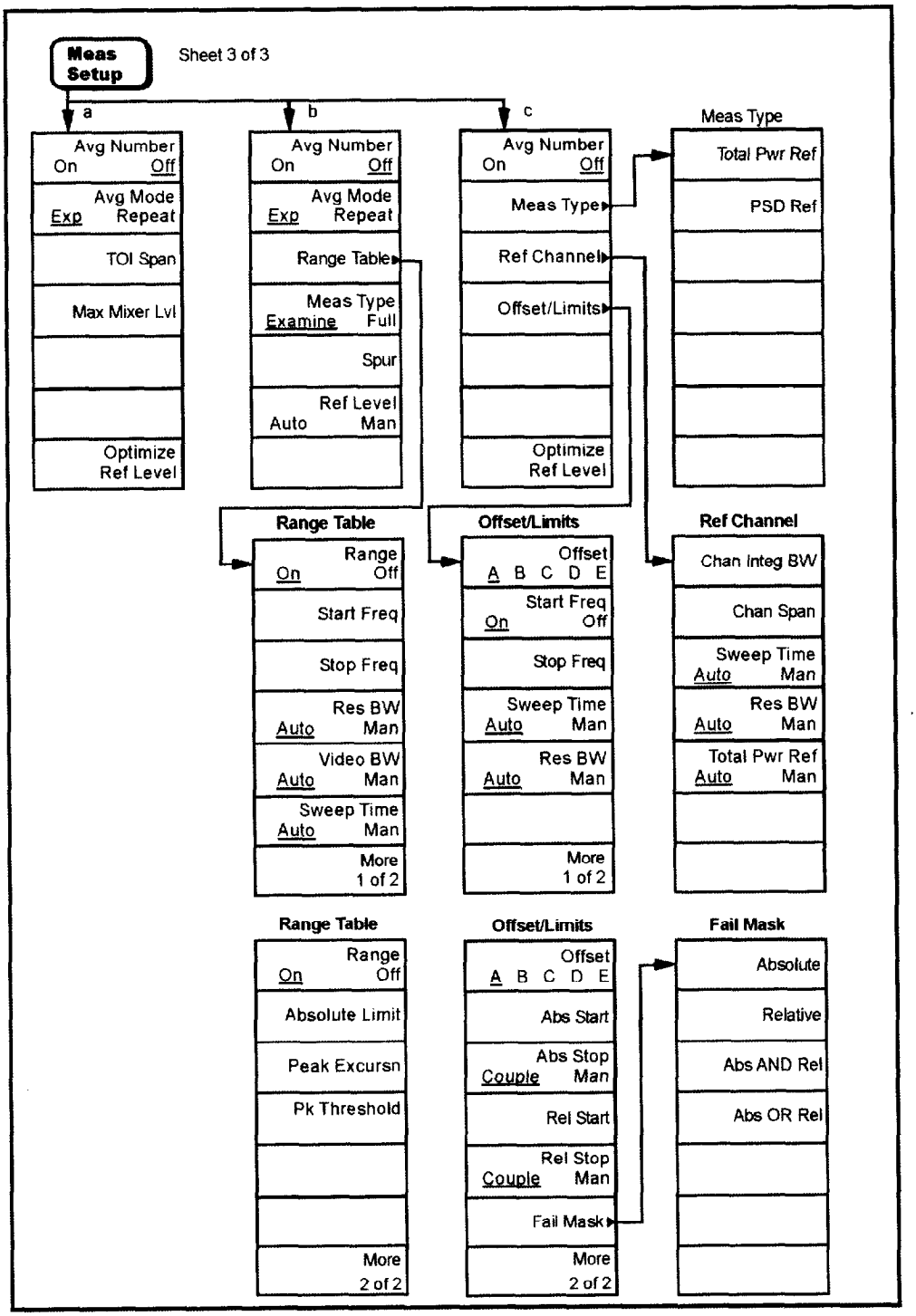
Meas Setup Menu for Multi-Carrier Power, Power Stat CCDF, Harmonic Distortion, and Burst Power



a. Appears only when **Multi Carrier Power** is selected in the **MEASURE** menu.
b. Appears only when **Power Stat CCDF** is selected in the **MEASURE** menu.
c. Appears only when **Harmonic Dist** is selected in the **MEASURE** menu.
d. Appears only when **Burst Power** is selected in the **MEASURE** menu.
e. Greyed out when **Meas Method**, **Above Threshhold Lvl** is selected.
* An active function which allows data entry.

pl765b

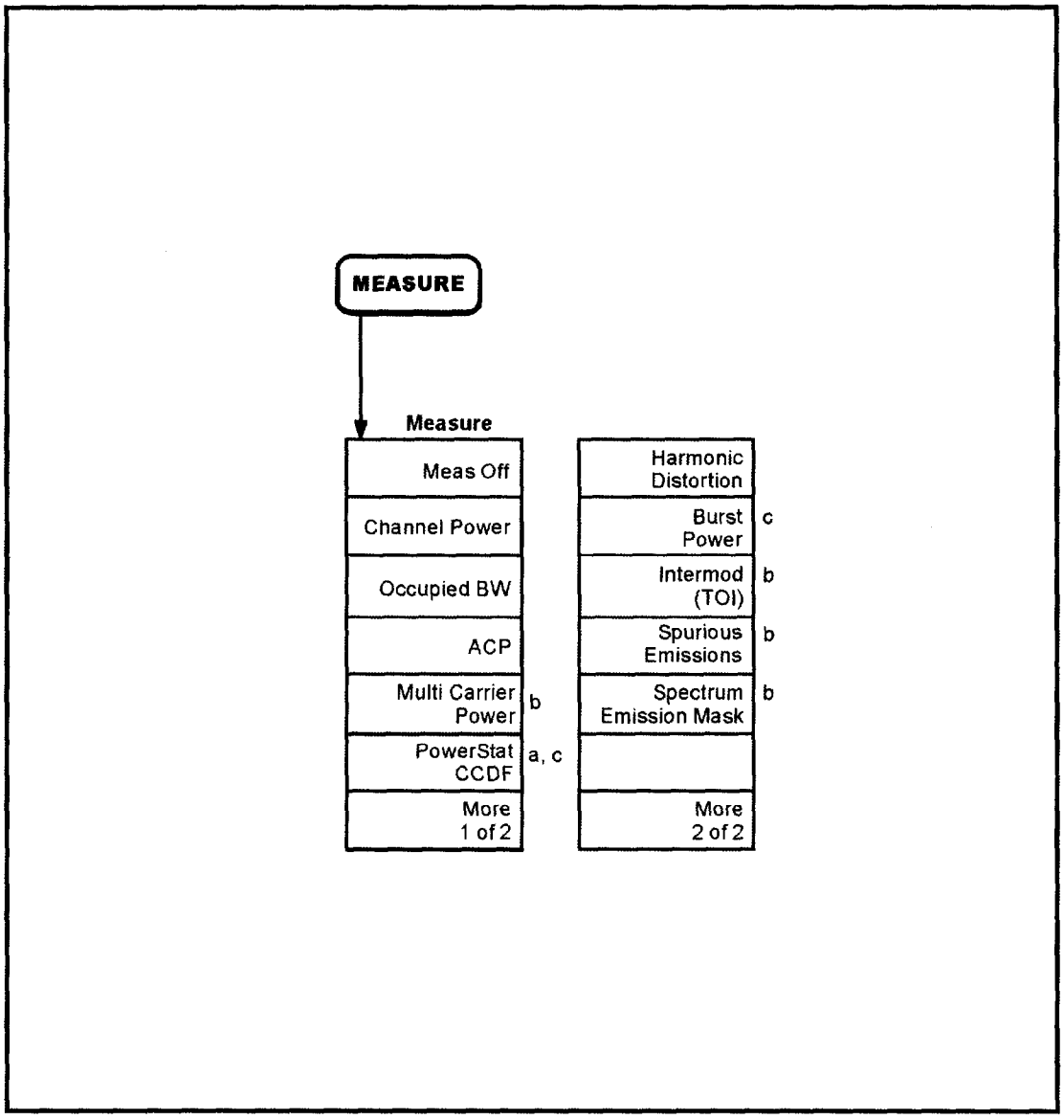
Meas Setup Menu for Intermod (TOI), Spurious Emissions and Spectrum Emission Mask



a. Appears only when **Intermod (TOI)** is selected in the **MEASURE** menu
b. Appears only when **Spurious Emissions** is selected in the **MEASURE** menu
c. Appears only when **Spectrum Emission Mask** is selected in the **MEASURE** menu

pl783b

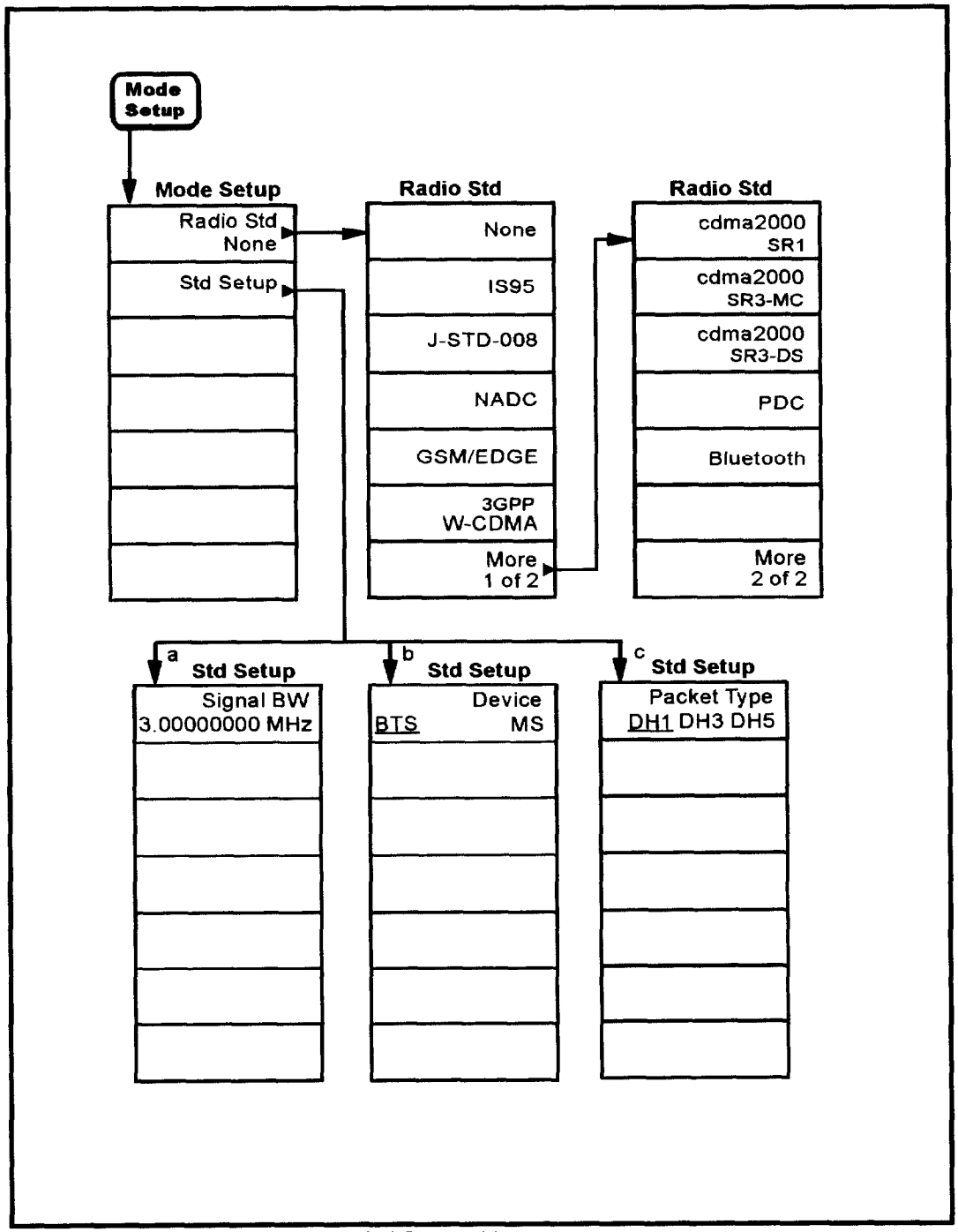
MEASURE Menu



a. Option AYX (Fast Digitized Time Sweeps) or Option B7D (Digital Signal Processing and Fast ADC) is required to ensure measurement accuracy.
b. Only available in firmware revision A.08.00 and later.
c. Only available in firmware revision A.07.00 and later.

pl766b

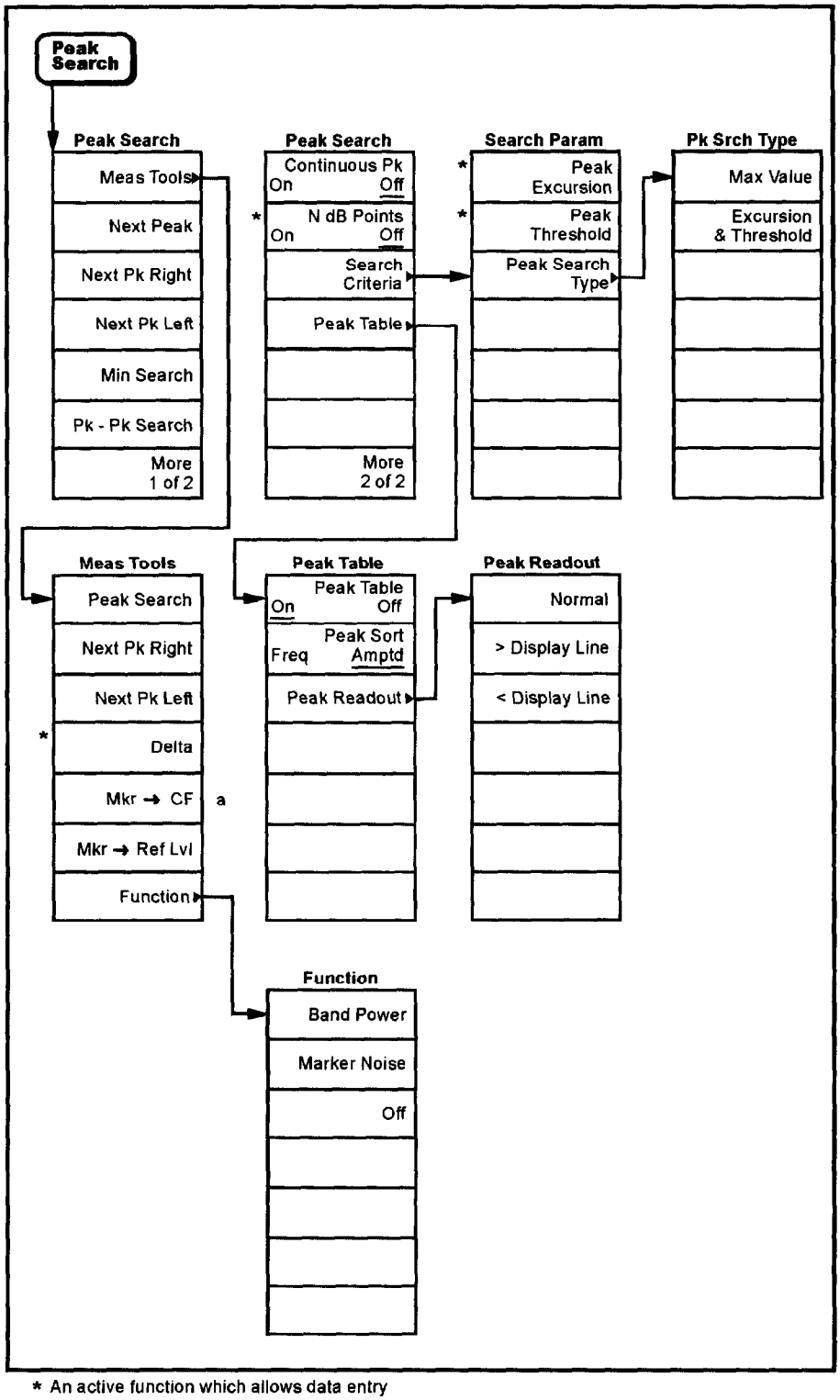
Mode Setup Menu



a. After selecting **Radio Std**, **None**, **Std Setup**, this menu appears.
b. After selecting **Std Setup**, this menu appears for the following radio standards: IS95, J-STD-008, cdma2000, W-CDMA, NADC, PDC, or GSM.
c. After selecting **Std Setup** this menu appears for the Bluetooth radio standard.

pn84a

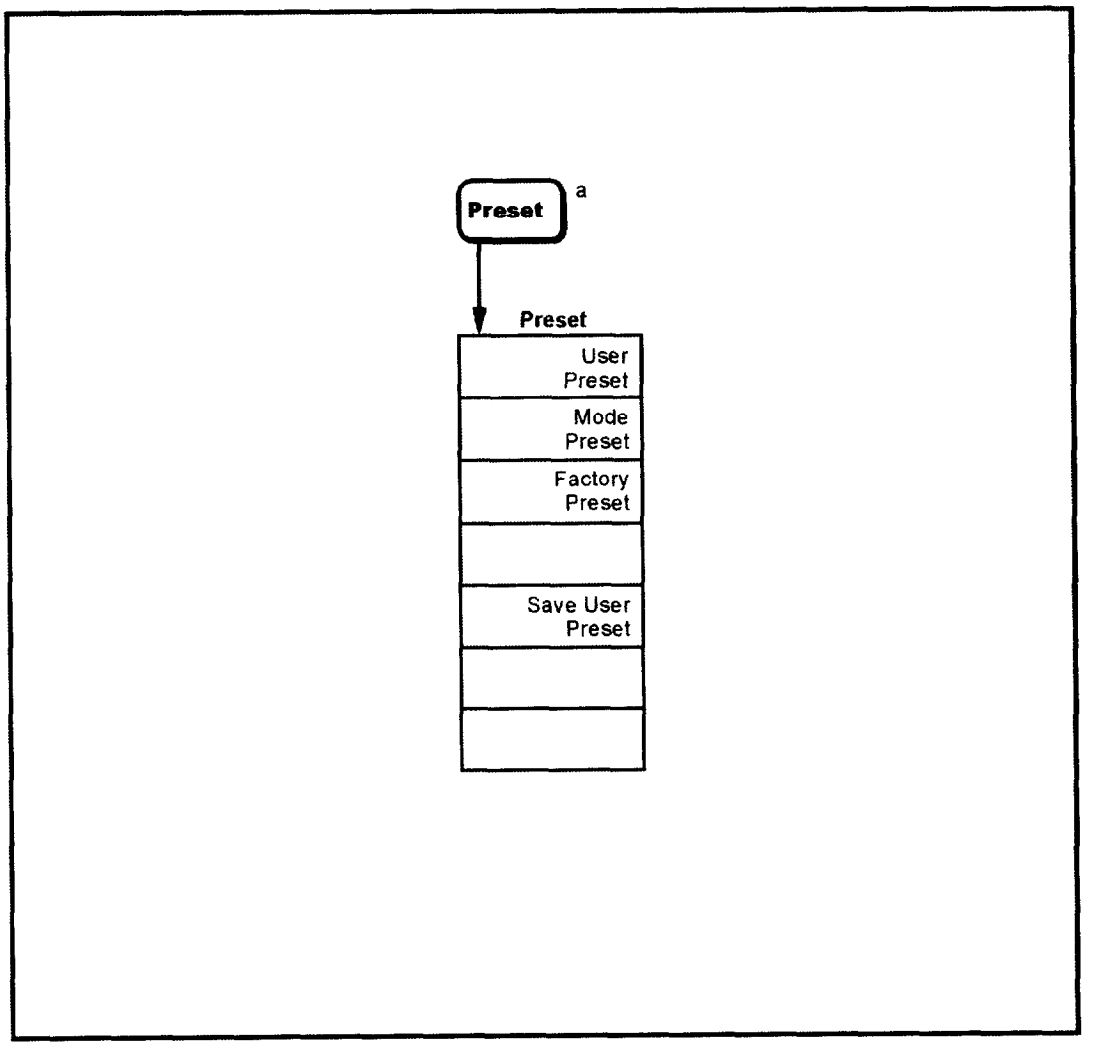
Peak Search Menu



* An active function which allows data entry
a. Unavailable in zero span

pl777b

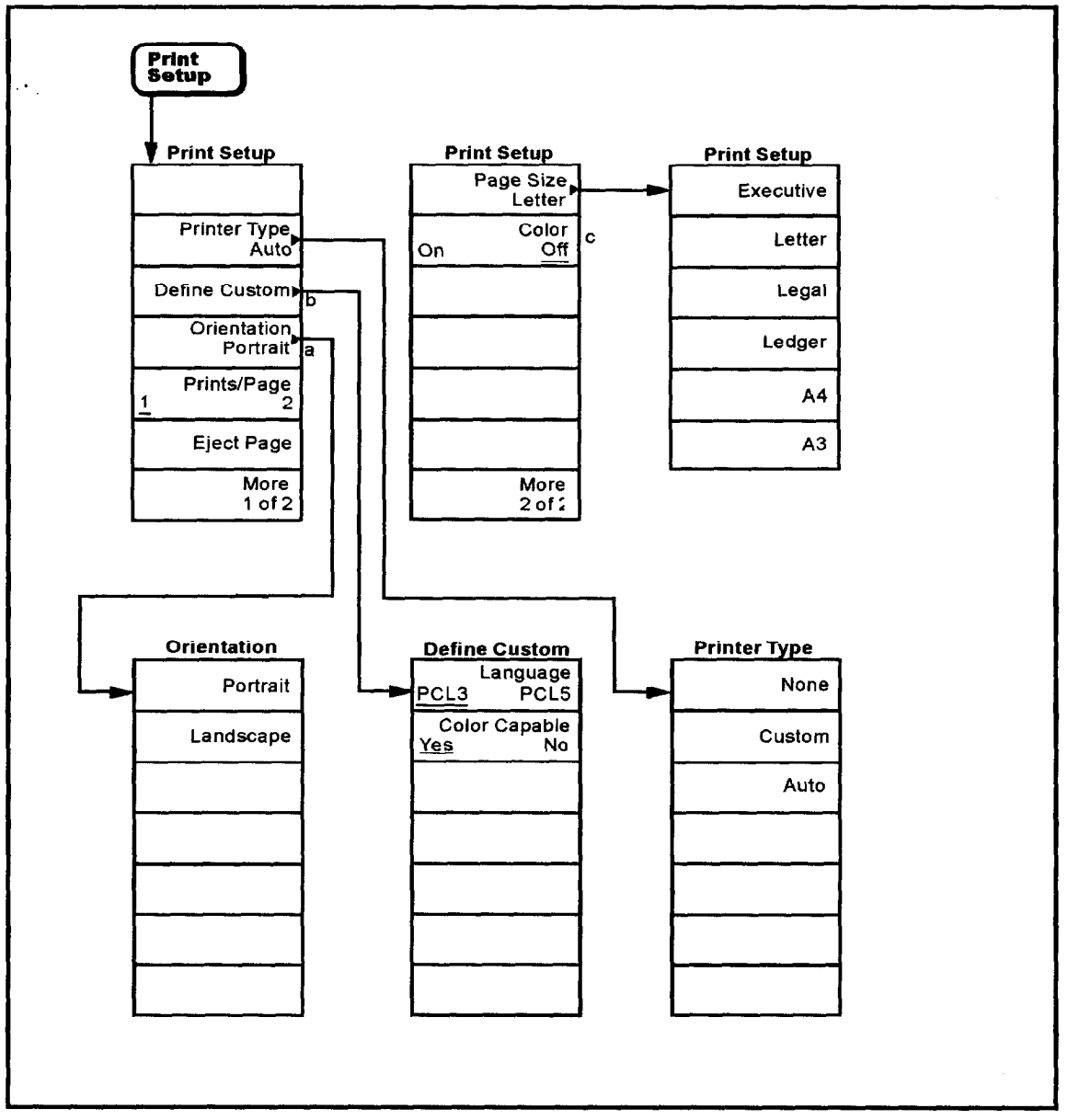
Preset Menu



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

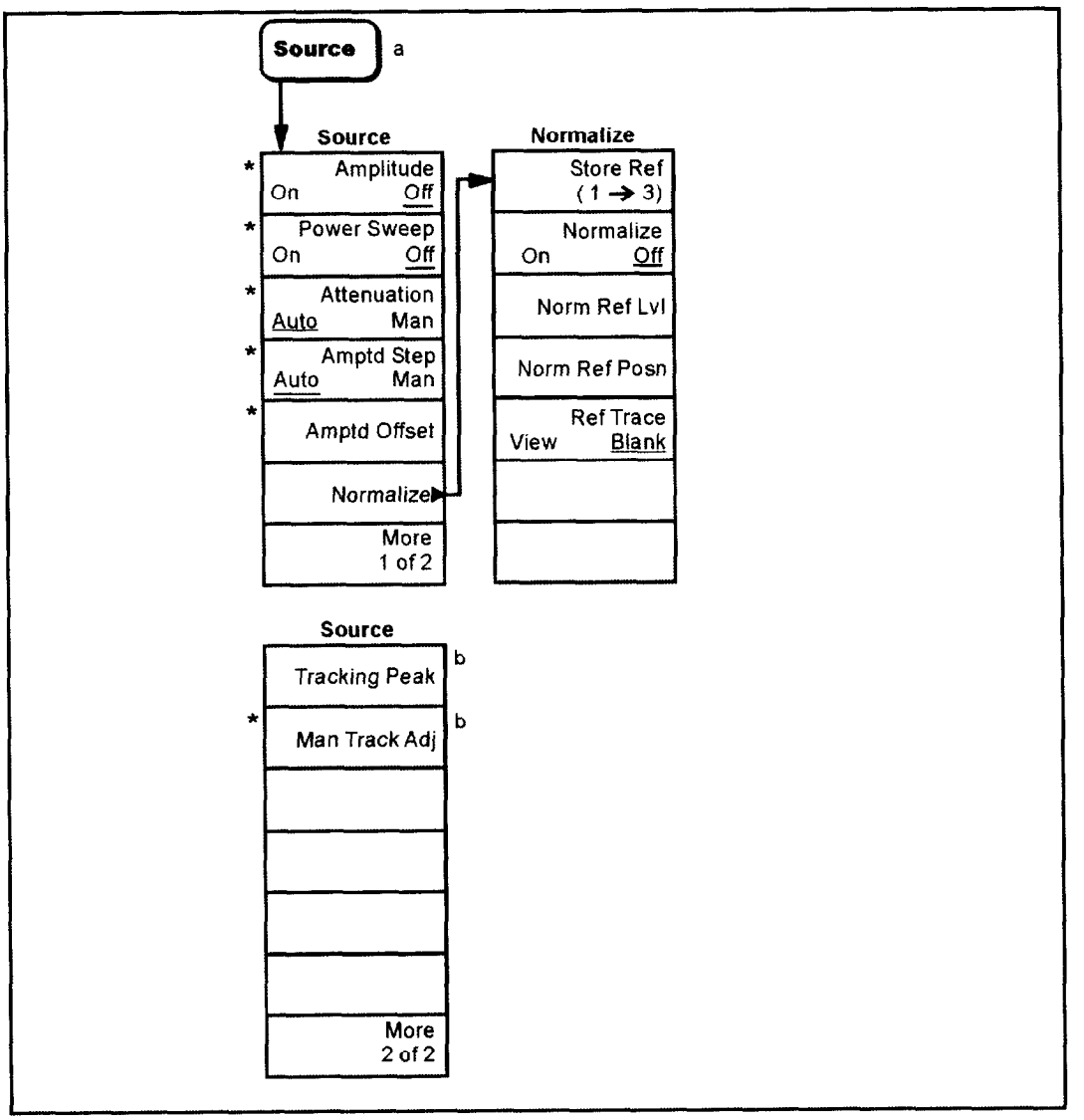
Print Setup Menu



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



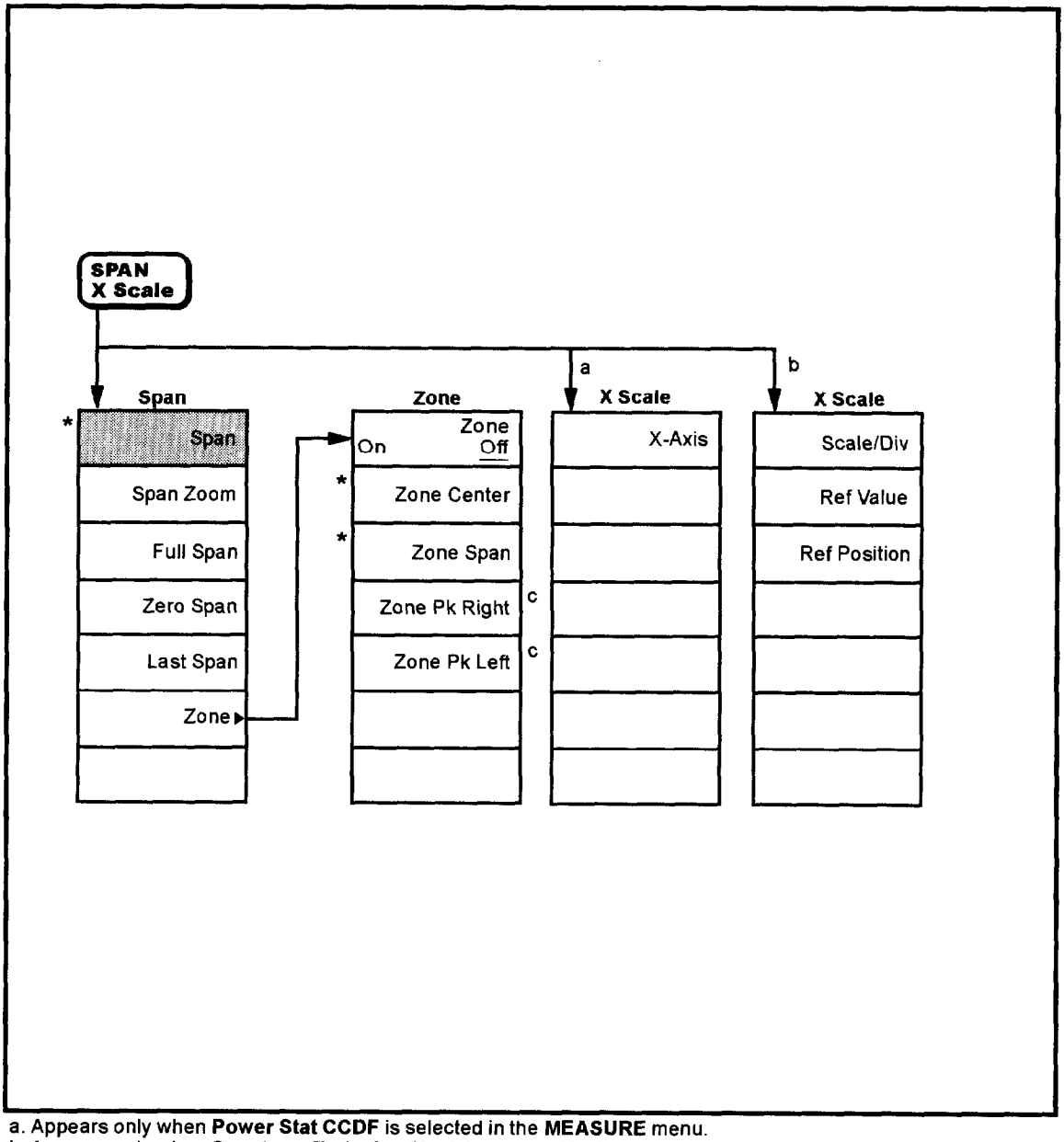
a. Source menu available only with Option 1DN or Option 1DQ installed

b. Agilent E4402B, E4403B, E4404B, E4405B, E4407B and E4408B only

* An active function which allows data entry

pl779b

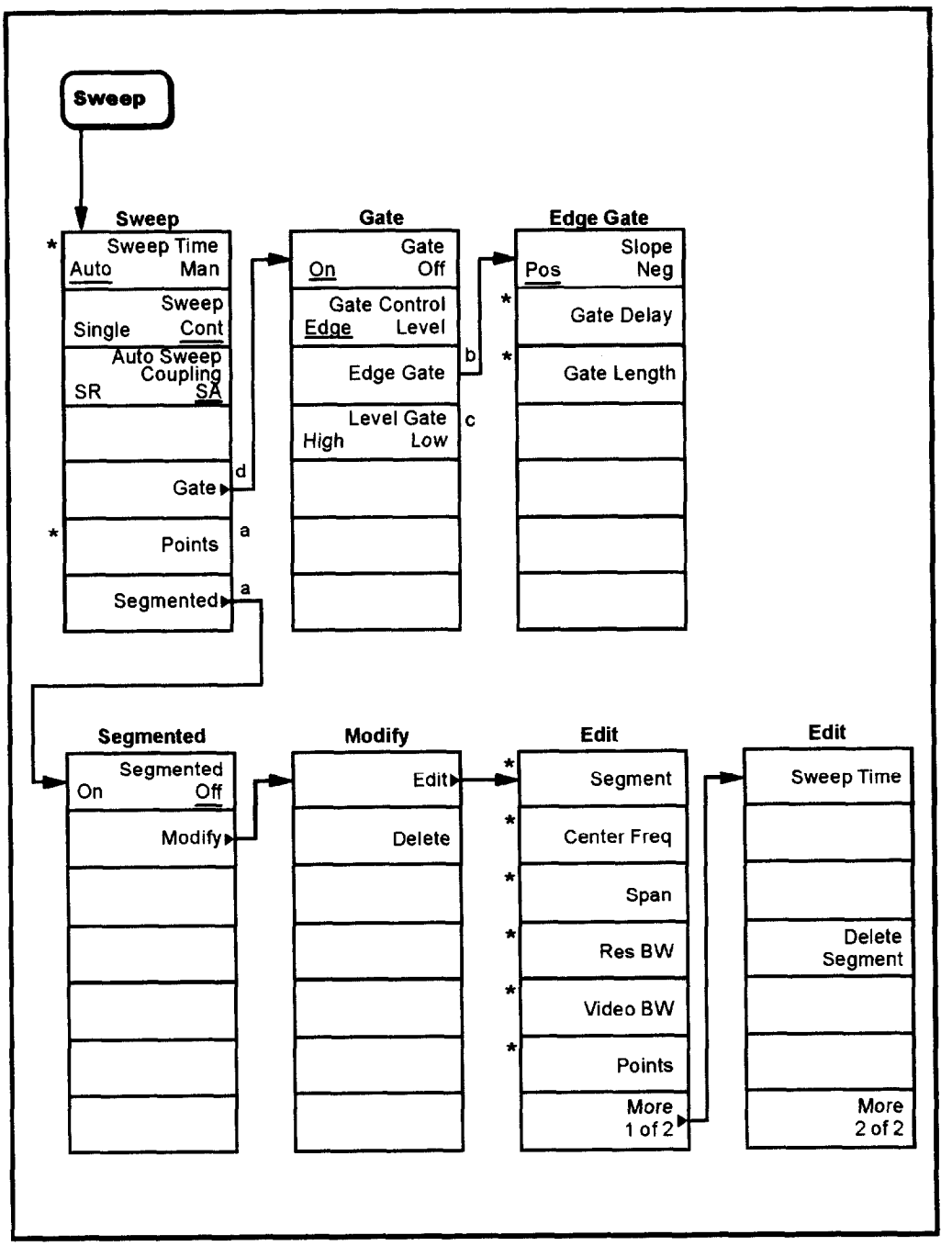
SPAN (X Scale) Menu



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

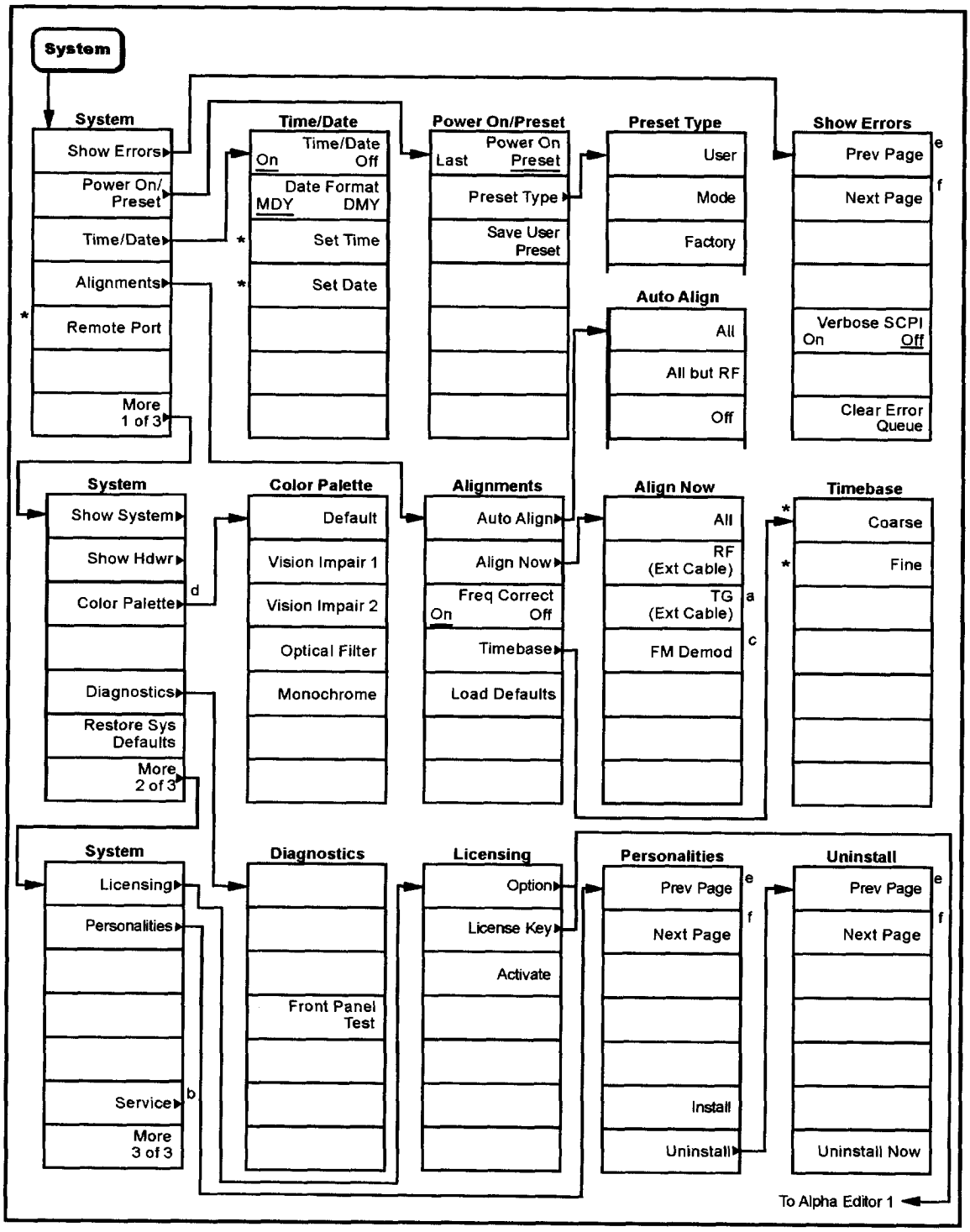
Sweep Menu



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

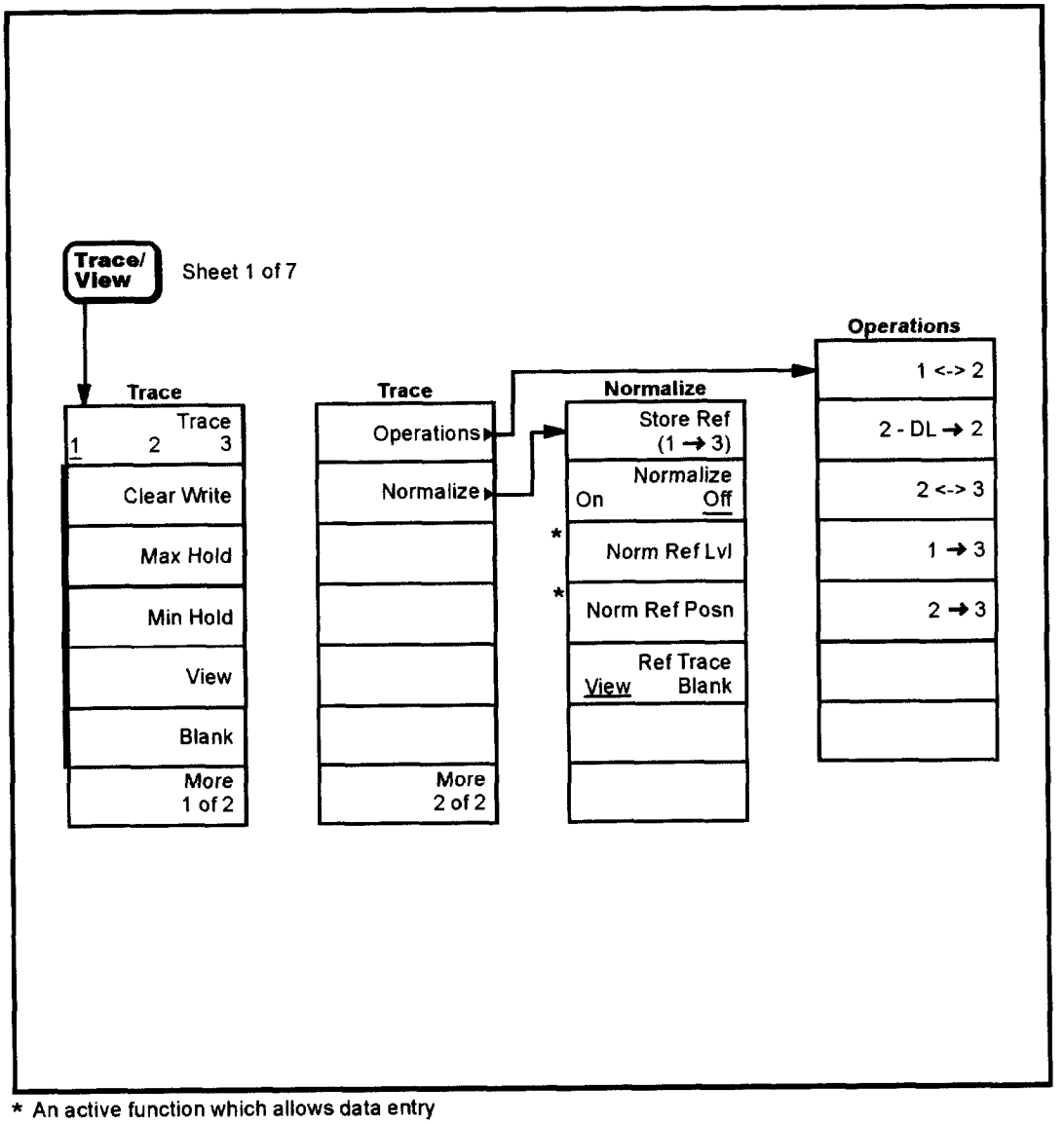
System Menu



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

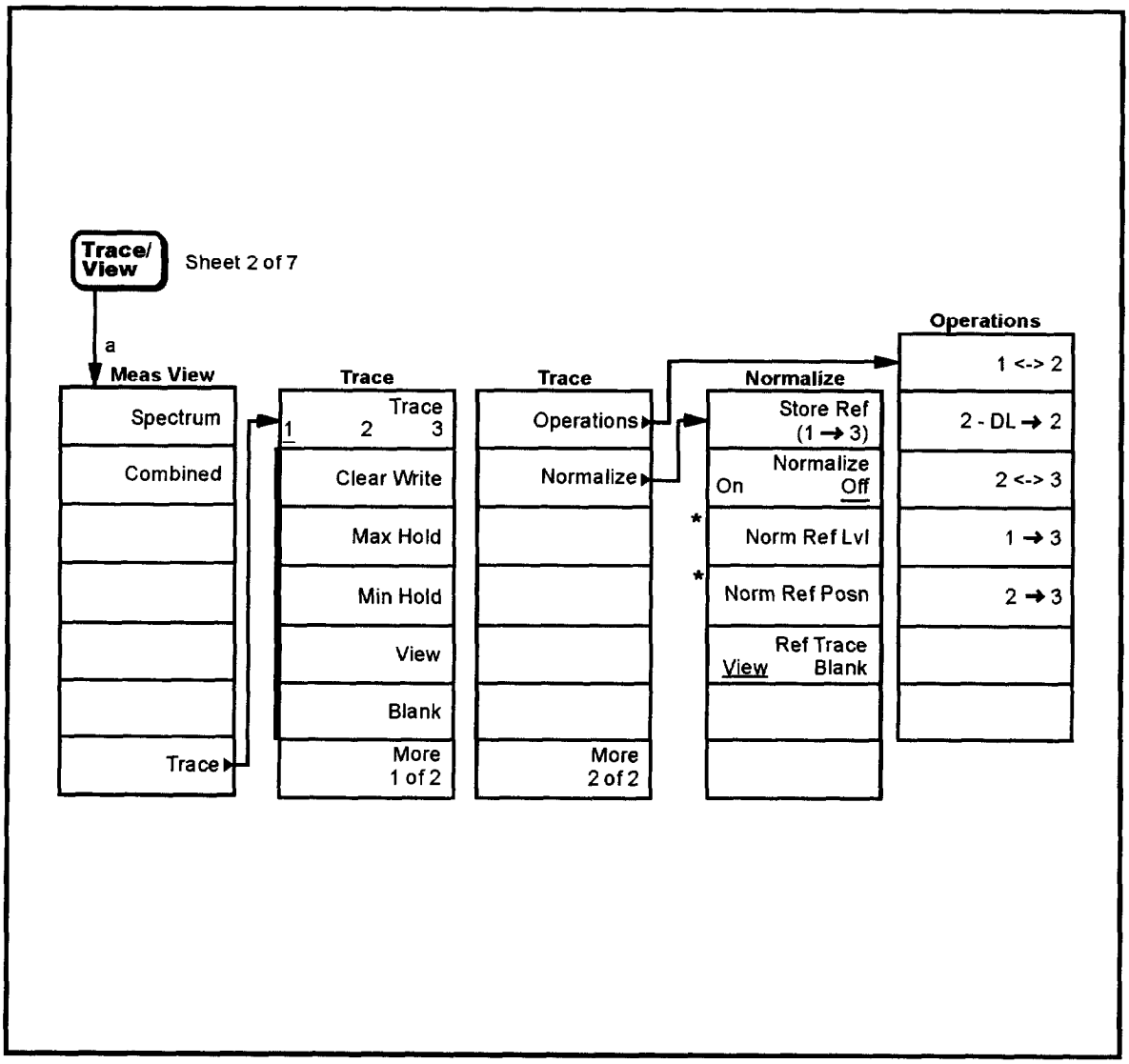
Trace/View Menu



* An active function which allows data entry

pl778b

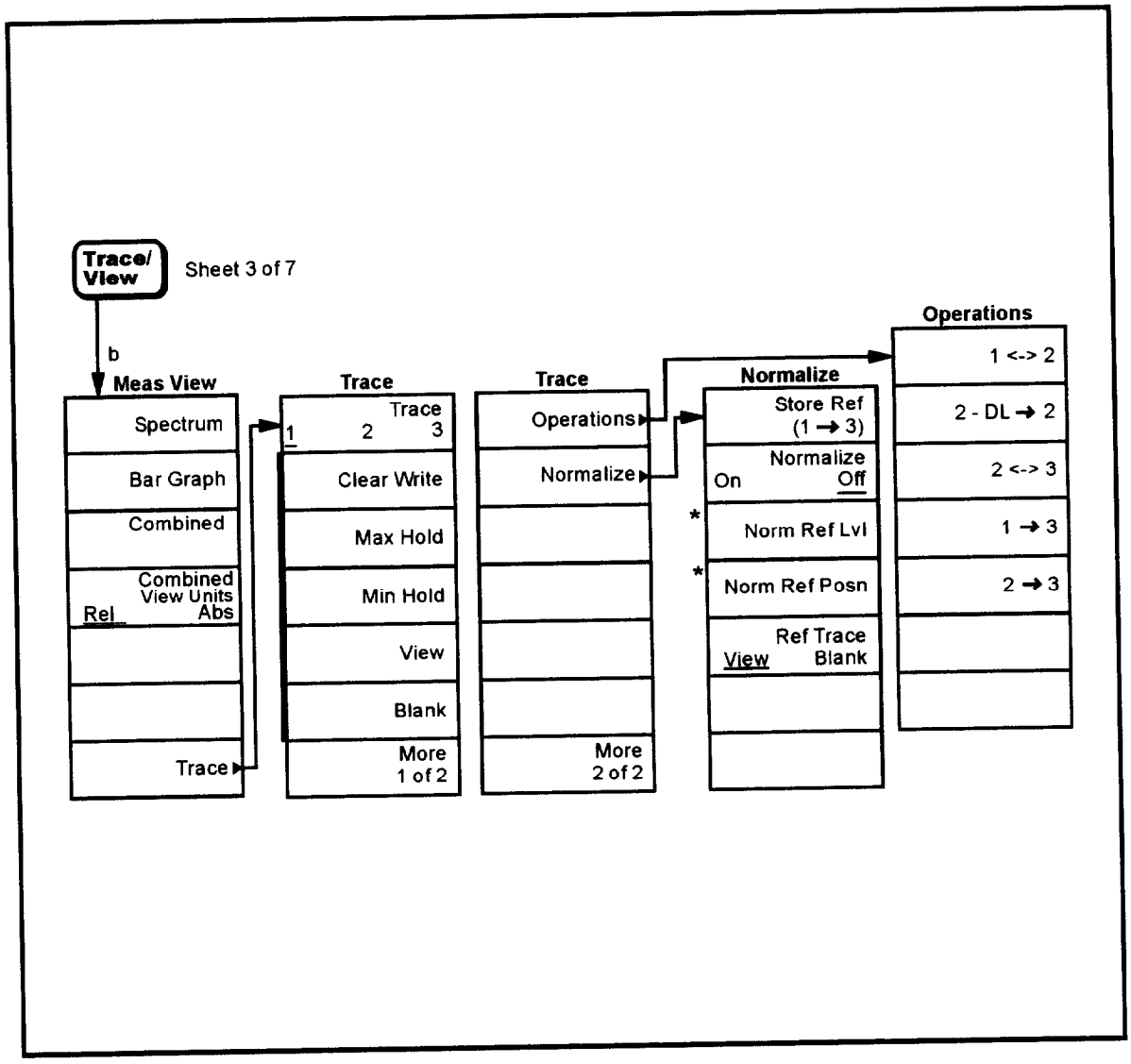
Trace/View Menu (Channel Power)



a. Appears only when **Channel Power** is selected in the **MEASURE** menu.

pl786b

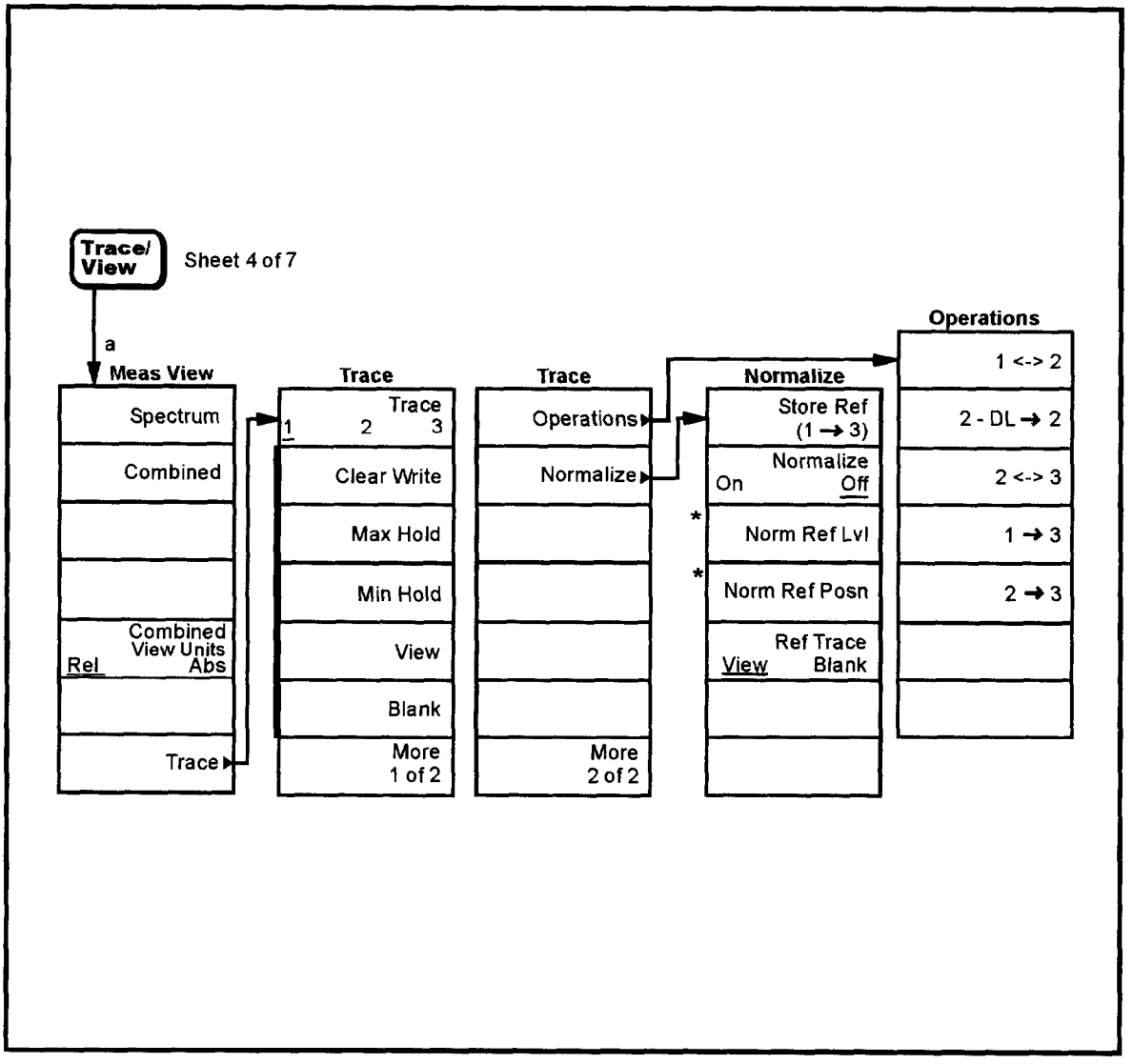
Trace/View Menu (ACP)



b. Appears only when **ACP** is selected in the **MEASURE** menu.

pl787b

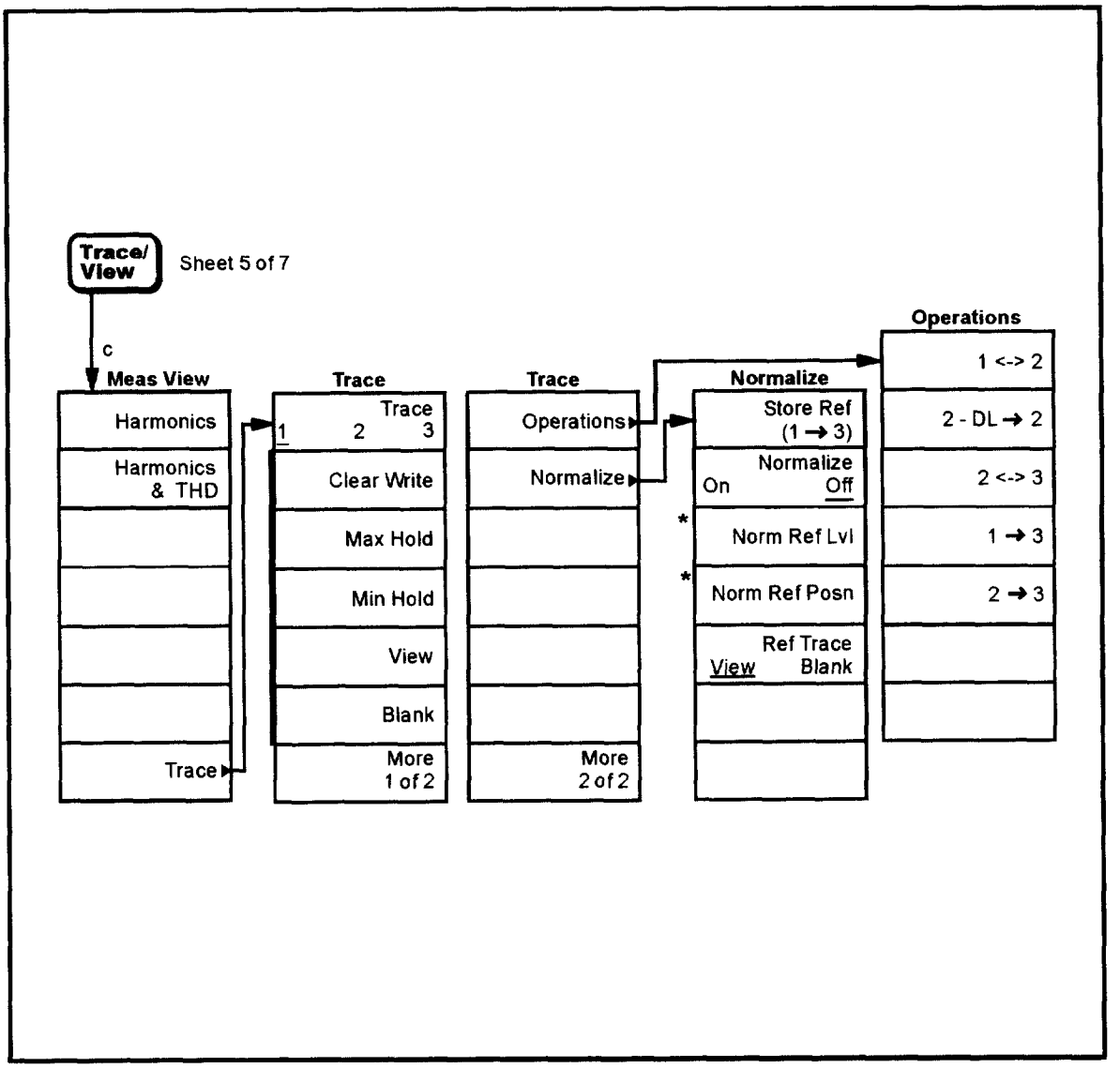
Trace/View Menu (Multi-Carrier Power)



a. Appears only when **Multi Carrier Power** is selected in the **MEASURE** menu.

pl793b

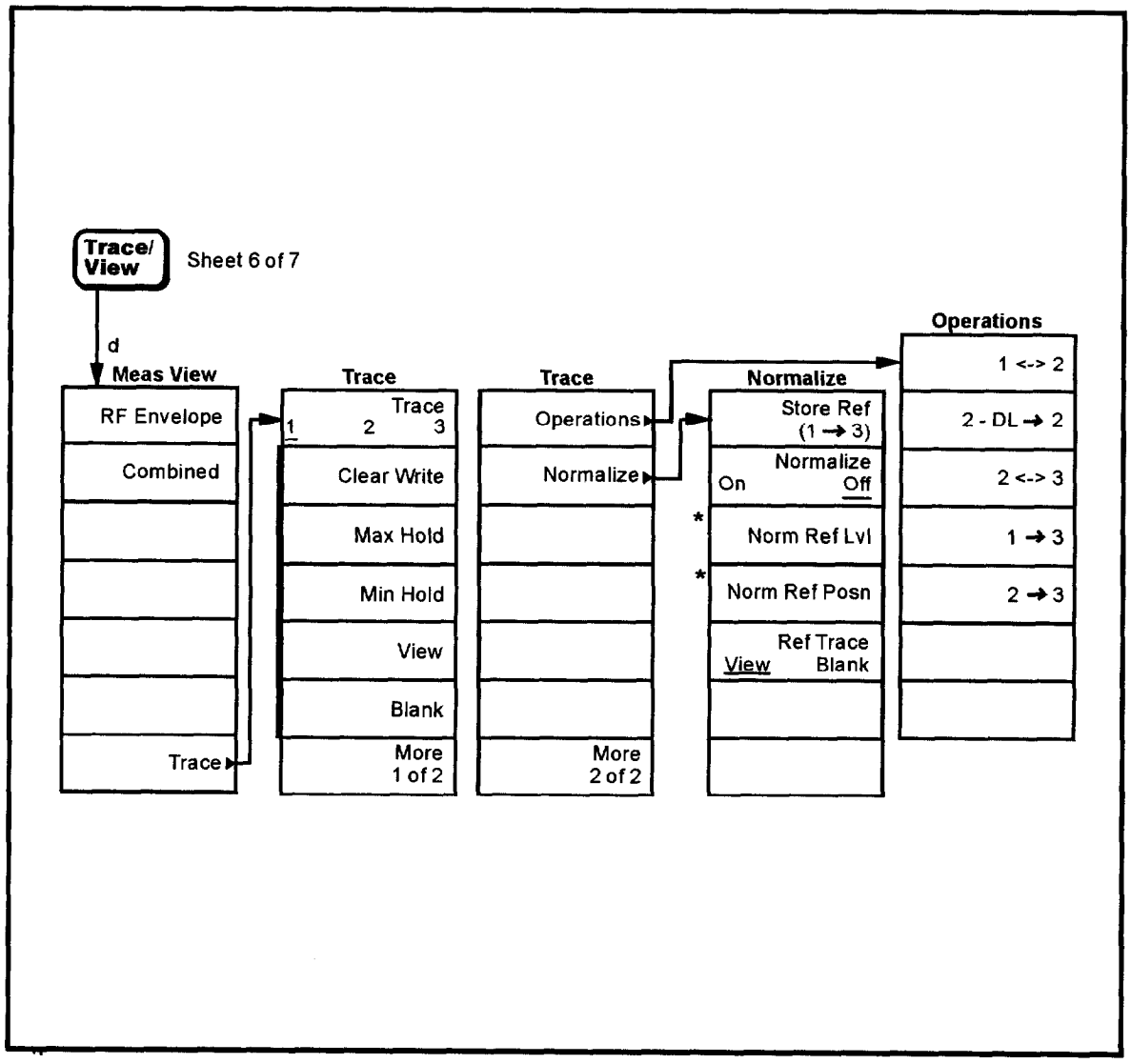
Trace/View Menu (Harmonic Distortion)



c. Appears only when **Harmonic Distortion** is selected in the **MEASURE** menu.

pl788b

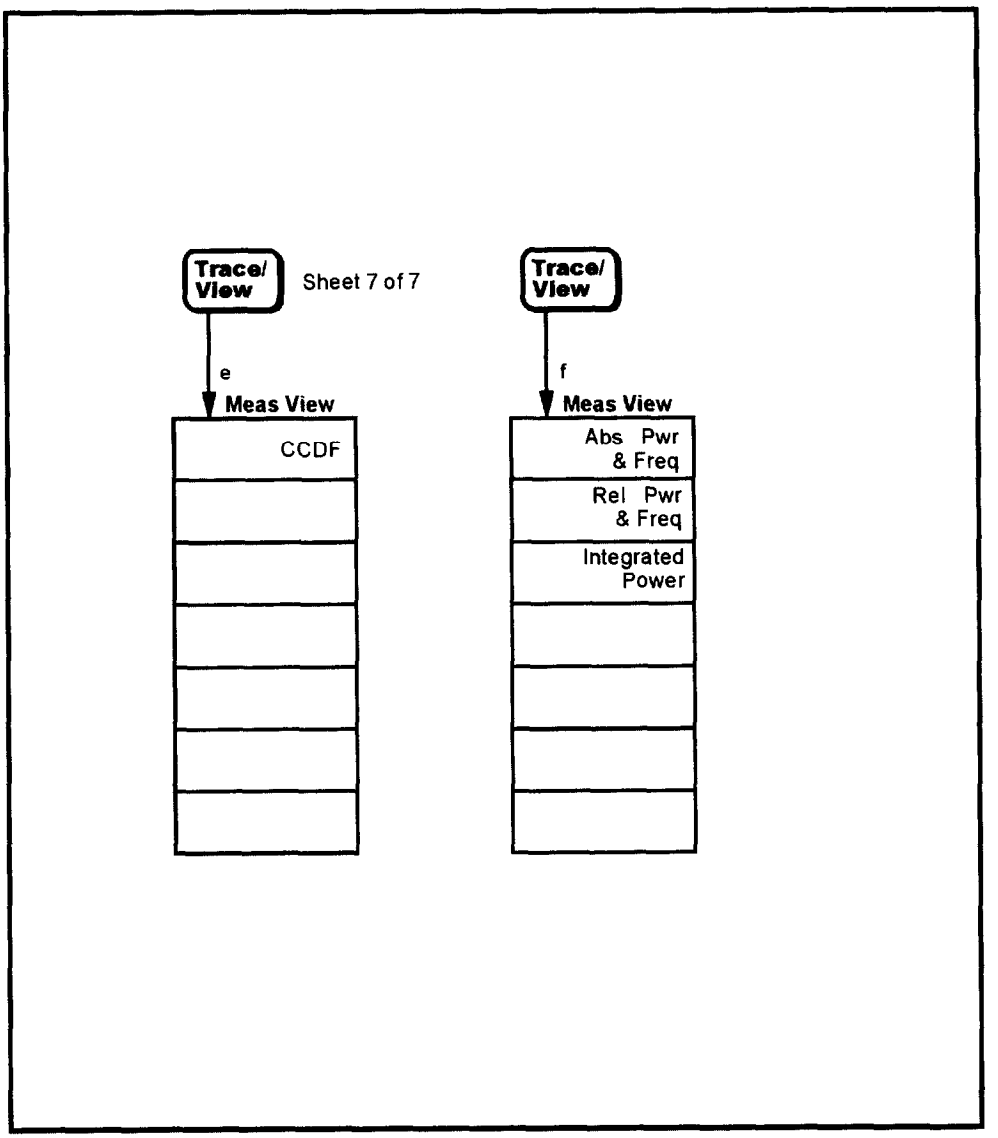
Trace/View Menu (Burst Power)



d. Appears only when **Burst Power** is selected in the **MEASURE** menu.

pl789b

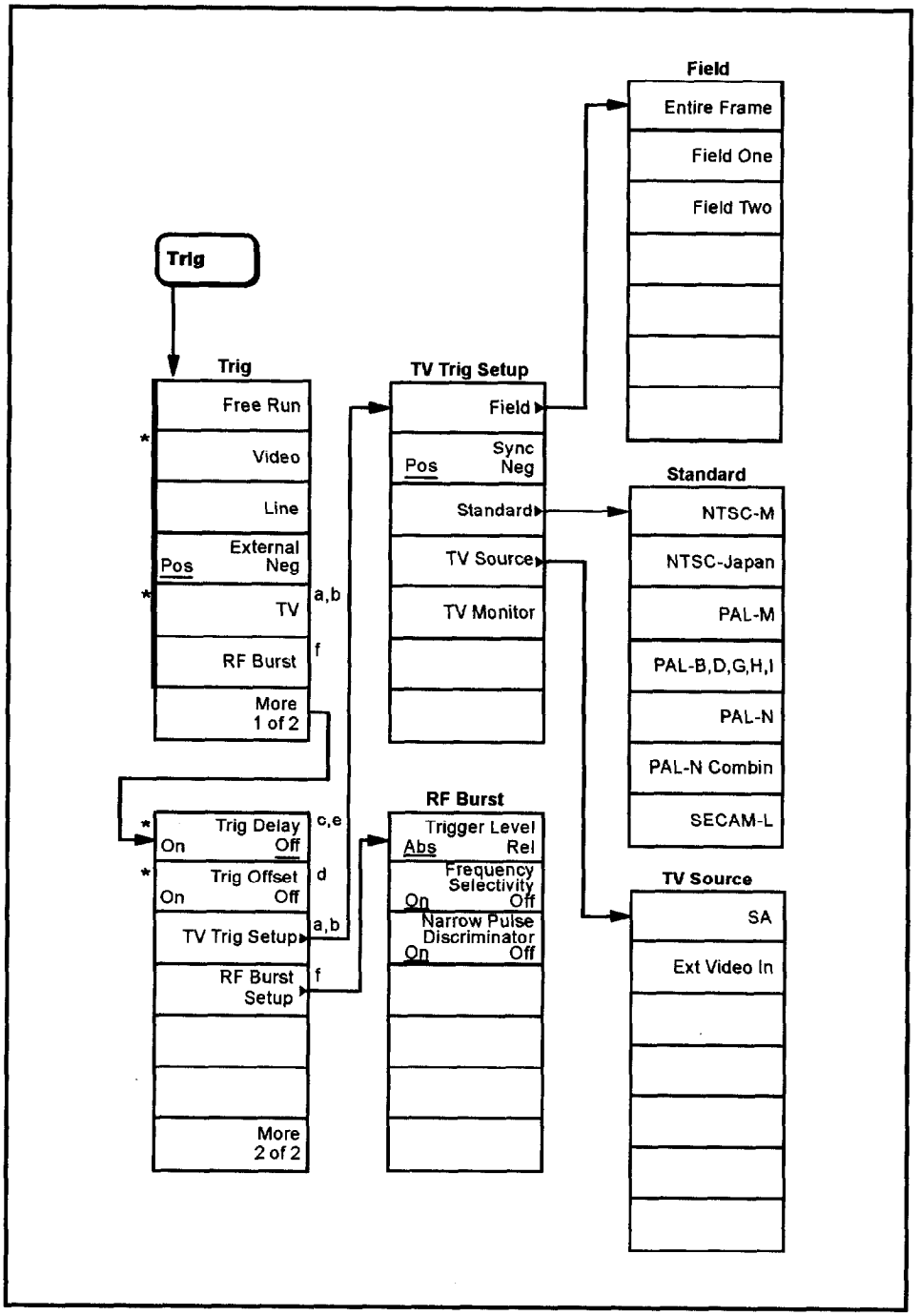
Trace/View Menu (Power Stat CCDF and Spectrum Emission Mask)



e. Appears only when **Power Stat CCDF** is selected in the **MEASURE** menu.
f. Appears only when **Spectrum Emission Mask** is selected in the **MEASURE** menu.

pl790b

Trig Menu



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

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. Use the following table to locate a specific key.

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> Display Line	page 168
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1 → 3	page 215
2 → 3	page 215
2 ↔ 3	page 215
2 – DL → 2	page 215
2nd Car Offs	page 135
120 kHz	page 81
200 Hz	page 81
9 kHz	page 81
Above Threshold Level	page 140
Abs AND Rel	page 150
Abs OR Rel	page 150
Abs Start	page 149
Abs Stop Couple Man	page 149
Absolute	page 150
Absolute Limit	page 145
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Alignments	page 205
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AMPLITUDE Y Scale	page 56
Amplitude On Off	page 181
Amptd Interp Log Lin	page 91
Amptd Offset	page 182

Key Label	Page Location
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Amptd Ref Out (f=50 MHz) On Off	page 116
Amptd Step Auto Man	page 182
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Apply Corrections Yes No	page 58
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Average On Off	page 80
Average Mode Exp Repeat	page 127, page 129, page 131, page 138, page 139, page 141, page 143
Avg Number On Off	page 127, page 128, page 131, page 134, page 139 page 141, page 143, page 147
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Man Track Adj	page 184
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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.

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 On Off

Agilent ESA-E Series only (E4401B, E4402B, E4404B, E4405B and 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 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, 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, 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).

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.

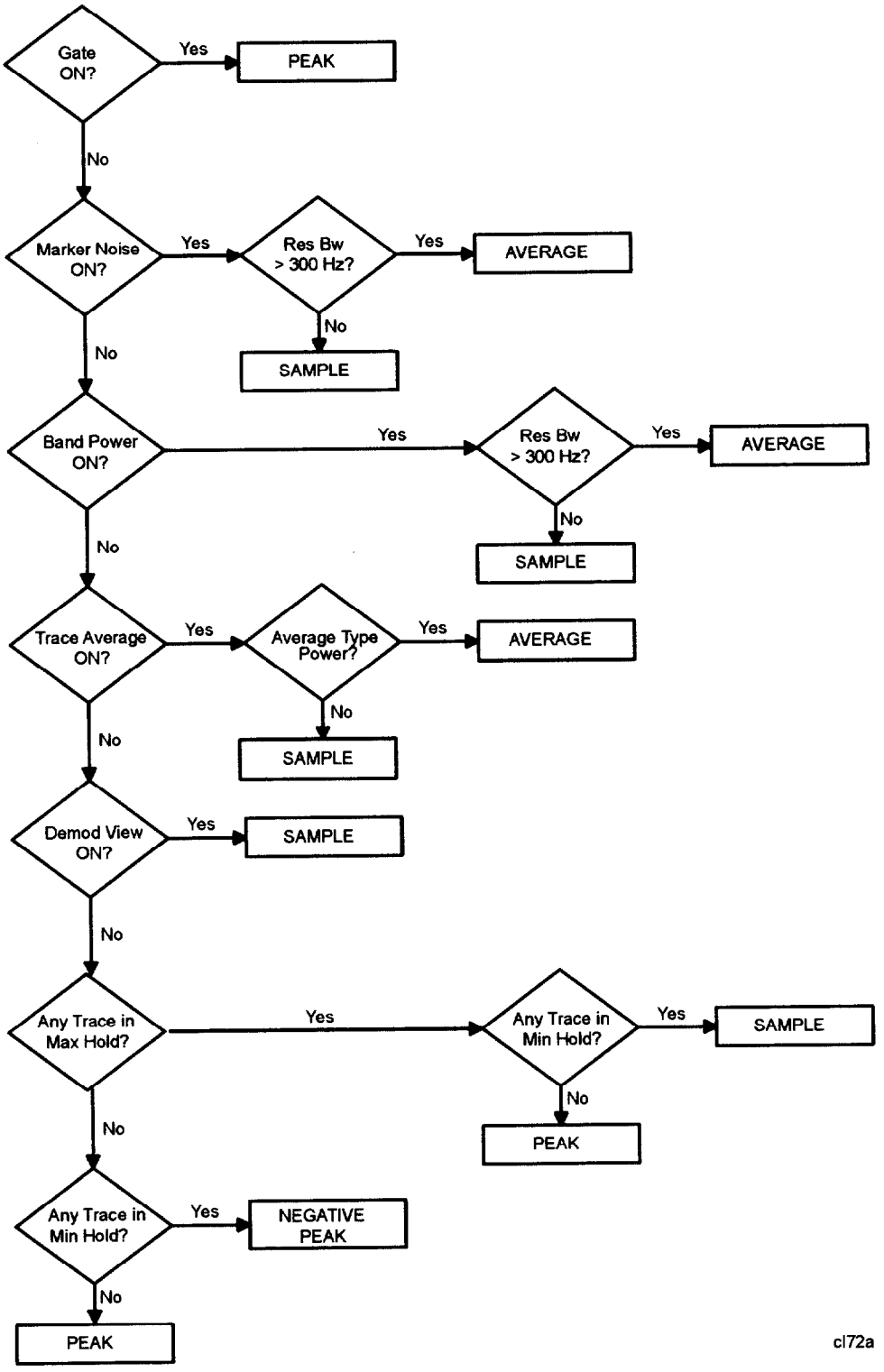
The detector in use is indicated on the left side of the display. A # will appear next to it if the detector has been manually selected.

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



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.

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 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, 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**)

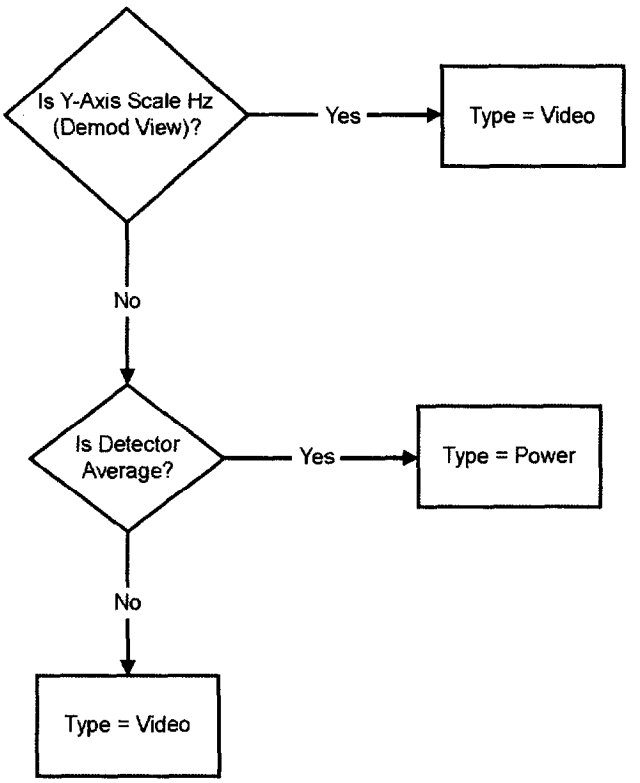
  Averages signal amplitudes across measurement points to reduce variations for noisy signals.

- 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



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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.)

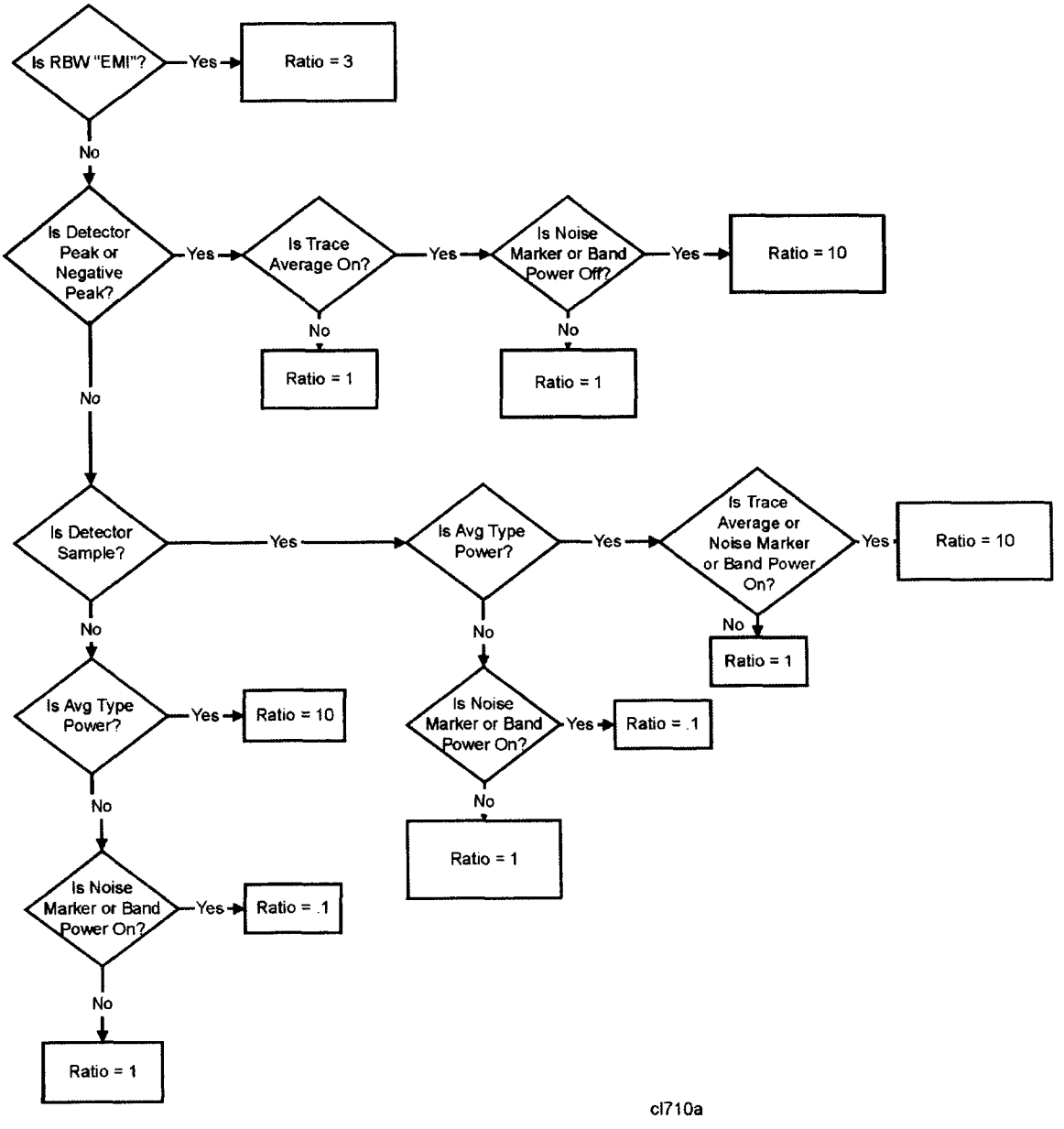
As the video bandwidth is decreased, the sweep time is increased to maintain amplitude calibration. A "#" mark appears next to VBW on the bottom of the analyzer display when it is not coupled. To couple the video bandwidth, press **Video BW (Auto)** (or press **Auto All**).

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



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 $\frac{1}{\text{Average Number}}$ and the old average reduced by multiplying it by $\left(\text{Average Number} - \frac{1}{\text{Average Number}}\right)$.

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 76. 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.

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.

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 On Off

Moves the signal that is nearest to the active marker to the center of 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 197.)

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 197.)

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 197.)

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 sweeptime and variance of the result is best with power Average detection. 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

If in a measurement, accesses a menu of keys that allow you to pause, resume, or restart one of the measurements available in the **MEASURE** key menu. **Meas Control** also allows you to select between continuous and single sweeps or measurements.

Press **MEASURE** and then select one of the available measurements (**Channel Power, Occupied BW, ACP, Multi-Carrier Power, Power Stat CCDF, Harmonic Distortion, Burst Power, Intermod (TOI), Spurious Emissions**, or **Spectrum Emission Mask**). Once the desired measurement is selected, press **Meas Control**. **Meas Control** accesses the following keys:

Restart

Performs the same functions as the "Restart" front-panel key. Repeats your measurement from the beginning. Pressing **Restart** while a measurement is being made will halt the current measurement routine at the first possible stopping point and repeat the measurement.

Key Access: **Meas Control**

Measure Single Cont

Measure (Single) allows you to take one measurement sweep and display the measurement results. **Measure (Cont)** allows you to continuously run a measurement, displaying the results after each measurement sweep.

Key Access: **Meas Control**

Pause

Allows you to pause a 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 and the measurement sweeping is halted.

Key Access: **Meas Control**

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.

Meas Setup

If in a measurement, **Meas Setup** displays one of six measurement setup menus. The setup menu displayed depends on which measurement **(Channel Power, Occupied BW, ACP, Multi-Carrier Power, Power Stat CCDF, Harmonic Distortion, Burst Power, Intermod (TOI), Spurious Emissions,** or **Spectrum Emission Mask)** has been selected in the **MEASURE** menu.

NOTE The measurements described below are those available in SA mode (see **Mode** key). Other measurements are available in other modes if an optional personality is installed.

Channel Power Meas Setup Menu Keys

To access the following keys for setting up a channel power measurement, press **MEASURE, Channel Power** and then the front-panel **Meas Setup** key.

Avg Number On Off

Press **Avg Number (On)** to specify the number of averages used when calculating the measurement result. The average will be displayed at the end of each sweep. **Avg Number (Off)** disables measurement averaging.

Key Access: **Meas Setup**

Avg Mode Exp Repeat

Allows you to select the type of termination control used for the averaging function. 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 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.

Repeat After reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Access: **Meas Setup**

Integ BW

Allows you to specify the range of integration used in calculating the power in the channel, defaults to 2.0 MHz, or is defined by the radio standard selected. See Table 2-2. The range for this parameter is the available non-zero span range of the analyzer.

Key Access: **Meas Setup**

Table 2-2 Channel Power Default Settings for Radio Standards

Standard	Format	Device	Integration BW	Chan Pwr Span	VBW/RBW
None	N/A	N/A	2 MHz	3 MHz	10/1
IS95	N/A	BTS/MS	1.23 MHz	1.845 MHz	100 kHz/ 10 kHz
NADC	N/A	BTS/MS	32.8 kHz	49.2 kHz	10 kHz/ 1 kHz
W-CDMA	3GPP	BTS/MS	5.0 MHz	7.5 MHz	100 kHz/ 10 kHz
cdma2000	SR1	BTS/MS	1.23 MHz	1.845 MHz	100 kHz/ 10 kHz
cdma2000	SR3	BTS/MS	3.69 MHz	5.535 MHz	300 kHz/ 30 kHz
PDC	N/A	BTS/MS	21 kHz	31.5 kHz	100 kHz/ 10 kHz

Chan Pwr Span

Allows you to specify the frequency span for the channel power measurement, defaults to 3.0 MHz, or is defined by the radio standard selected. (See Table 2-2 for other radio standard defaults.) Although channel power span is coupled to the integration bandwidth (IBW) at approximately 1.6 times the IBW, this parameter can be set manually: minimum = IBW, maximum = 10 times the IBW or the span of the analyzer.

Key Access: **Meas Setup**

Optimize Ref Level

Sets the reference level and attenuator to optimum values based on the signal present at the input.

Key Access: **Meas Setup**

Occupied BW Meas Setup Menu Keys

To access the following keys for setting up an occupied bandwidth measurement, press **MEASURE**, **Occupied BW** and then the front-panel **Meas Setup** key.

Avg Number On Off

Press **Avg Number (On)** to specify the number of averages used when calculating the measurement result. The average will be displayed at the end of each sweep. **Avg Number (Off)** disables measurement averaging.

Key Access: **Meas Setup**

Avg Mode
Exp Repeat

Allows you to select the type of termination control used for the averaging function. 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 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.

Repeat After reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Access: **Meas Setup**

Max Hold
On Off

Allows 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 Access: **Meas Setup**

Occ BW % Pwr

Allows you to change the percentage of the total input signal power used when determining the occupied bandwidth. The acceptable range for this parameter is from 10% to 99.99%.

Key Access: **Meas Setup**

OBW Span

Allows 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. Refer to Table 2-3.

Key Access: **Meas Setup**

Table 2-3 Occupied Bandwidth Default Settings for Radio Standards

Standard	Format	Device	OBW Span	VBW/RBW
None	N/A	N/A	3 MHz	10/1[1]
IS95	N/A	BTS/MS	2.0 MHz	100 kHz/ 10 kHz
NADC	N/A	BTS/MS	80 kHz	10 kHz/ 1 kHz
W-CDMA	3GPP	BTS/MS	6.0 MHz	1 MHz/ 100 kHz
cdma2000	SR1	BTS/MS	2.0 MHz	100 kHz/ 10 kHz

Table 2-3 **Occupied Bandwidth Default Settings for Radio Standards**

Standard	Format	Device	OBW Span	VBW/RBW
cdma2000	SR3	BTS/MS	6.0 MHz	1 MHz/ 100 kHz
PDC	N/A	BTS/MS	31.5 kHz	3 kHz/ 300 Hz

1. Maximum RBW available and < 1% of the OBW span.

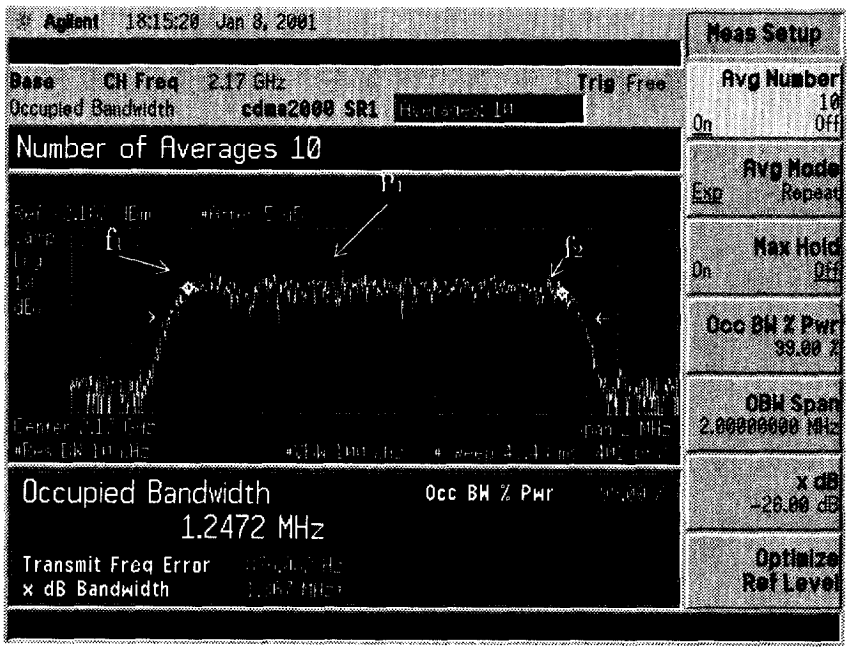
x dB

Allows 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 x dB below and above P_1, respectively. The emission bandwidth is then calculated as $f_2 - f_1$ as shown in Figure 6-1.

NOTE

The asterisk next to the x dB value in Figure 2-4 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 2-4 **Occupied Bandwidth Measurement Results**



NOTE The "Transmit Freq Error" displayed above is defined as the difference between the $(f_2 + f_1)/2$ and the tuned center frequency of the signal.

Optimize Ref Level Sets the reference level and attenuator to optimum values based on the signal present at the input.

Key Access: **Meas Setup**

ACP Meas Setup Menu Keys

To access the following keys for setting up an adjacent channel power measurement, press **MEASURE**, **ACP** and then the front-panel **Meas Setup** key.

Avg Number On Off Press **Avg Number (On)** to specify the number of averages used when calculating the measurement result. The average will be displayed at the end of each measurement. **Avg Number (Off)** disables measurement averaging.

Key Access: **Meas Setup**

Avg Mode Exp Repeat Allows you to select the type of termination control used for the averaging function. 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 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.

Repeat After reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Access: **Meas Setup**

Chan Integ BW Allows you to specify the range of integration used in calculating the power in the main channel. The default value is 2.0000 MHz. The range for this parameter is 300 Hz to 20 MHz. When selecting a radio standard by pressing **Mode Setup**, **Radio Std**, this parameter is defined by Table 2-4.

Table 2-4 Adjacent Channel Power Default Settings for Radio Standards

Parameter	None	IS-95	J-STD-008	NADC	3GPP W-CDMA	cd,a2000 SR1	cdma2000 SR3-MC	cdma2000 SR3-DS	PDC
Detector	Avg	Avg	Avg	Avg (BTS) Peak (MS)	Avg	Avg	Avg	Avg	Peak
Sweep Time	5.12 ms	59.4 ms	59.4 ms	337.6 ms (BTS) 8.02 s (MS)	43.6 ms	59.4 ms	59.4 ms	59.4 ms	8.02 s
Span	8 MHz	0 Hz	0 Hz	212.8 kHz	24.68 MHz	0 Hz	0 Hz	0 Hz	221 kHz
RBW	100 kHz	3.0 MHz	3.0 MHz	1 kHz	30 kHz	3.0 MHz	5.0 MHz	5.0 MHz	1 kHz
VBW	1 MHz	3.0 MHz	3.0 MHz	10 kHz	300 kHz	3.0 MHz	3.0 MHz	3.0 MHz	10 kHz
Main Channel IBW	2.00 MHz	1.23 MHz	1.23 MHz	40 kHz (not filtered	3.84 MHz (displayed) 4.68 MHz (actual, RRC filtered)	1.23 MHz	3.96 MHz	3.96 MHz	21 kHz
Offset A Freq	3.00 MHz	750 kHz (BTS)	885 kHz (BTS)	30 kHz	5 MHz	750 kHz (BTS)	2.13 MHz (BTS)	2.65 MHz	50 kHz
Offset A Freq	N/A	885 kHz (MS)	1.265 MHz (MS)	N/A	N/A	885 kHz (MS)	2.65 MHz (MS)	N/A	N/A
Offset A BW	2.00 MHz	30 kHz	30 kHz (BTS & MS)	24.3 kHz (displayed) 32.8 kHz (actual, RRC Filtered)	3.84 MHz (displayed) 4.68 MHz (actual, RRC filtered)	30 kHz	30 kHz (BTS & MS)	30 kHz	21 kHz
Offset A RBW	N/A	30 kHz	30 kHz	N/A	N/A	30 kHz	30 kHz	30 kHz	N/A
Offset A VBW	N/A	300 kHz	300 kHz	N/A	N/A	300 kHz	300 kHz	300 kHz	N/A
Offset B Freq	N/A	1.98 MHz	1.256 MHz	60 kHz	10 MHz	1.98 MHz	2.5 MHz (BTS) 3.75 (MS)	3.75 MHz	100 kHz
Offset B BW	N/A	30 kHz	12.5 kHz (BTS)	24.3 kHz (displayed) 32.8 kHz (actual, RRC Filtered)	3.84 MHz (displayed) 4.68 MHz (actual, RRC filtered)	30 kHz	30 kHz (BTS & MS)	30 kHz	21 kHz
Offset B RBW	N/A	30 kHz	10 kHz (BTS)	N/A	N/A	30 kHz	30 kHz	30 kHz	N/A
Offset B VBW	N/A	300 kHz	100 kHz (BTS)	N/A	N/A	300 kHz	300 kHz	300 kHz	N/A
Offset C Freq	N/A	N/A	N/A	90 kHz	N/A	N/A	N/A	N/A	N/A

Table 2-4 Adjacent Channel Power Default Settings for Radio Standards

Parameter	None	IS-95	J-STD-008	NADC	3GPP W-CDMA	cd,a2000 SR1	cdma2000 SR3-MC	cdma2000 SR3-DS	PDC
Offset C IBW	N/A	N/A	N/A	24.3 kHz (displayed) /32.8 kHz (actual, RRC Filtered)	N/A	N/A	N/A	N/A	N/A
RRC Filter State	N/A	N/A	N/A	N/A	On	N/A	N/A	N/A	N/A
RRC Filter α	N/A	N/A	N/A	.35	.22	N/A	N/A	N/A	N/A

Key Access: **Meas Setup**

Offset/Limits Allows you to edit frequencies and reference bandwidths for a maximum of 6 offsets (labeled A-F).

Key Access: **Meas Setup**

Offset Allows you to select which offset (A-F) you wish to define.

Offset Freq Sets the frequency difference from the center of the main channel to the center of the offset. When **Radio Std, None** is selected, the default is 3.0 MHz.

Ref BW Sets the reference bandwidth (integration bandwidth) for each offset. When **Radio Std, None** is selected, the default is 2.0 MHz.

Pos Offset Limit Sets the limit for the upper segment of the specified offset pair.

Neg Offset Limit Sets the limit for the lower segment of the specified offset pair.

Key Access: **Meas Setup, Offset/Limits**

Meas Type Allows you to specify the reference for the ACP measurement. Relative values can be displayed referenced to either the total power or the power spectral density measured in the main channel.

Total Pwr Ref Press **Total Pwr Ref** to specify the reference for the measurement to the total power.

PSD Ref Press **PSD Ref** to specify the reference for the measurement to power spectral density.

Key Access: **Meas Setup, Meas Type**

Optimize Ref Level

Sets the reference level and attenuator to optimum values based on the signal present at the input.

Key Access: **Meas Setup**

Method IBW RBW

Allows you to select between the integration bandwidth measurement method (IBW), or the resolution bandwidth measurement method (RBW). The resolution bandwidth method is most useful for measuring cdmaOne and cdma2000 SRI signals.

Key Access: **Meas Setup, More**

Total Pwr Ref Auto Man

Allows you to specify the reference for the adjacent channel power measurement when set to **Auto**. Relative values are displayed, referenced to the total power measured in the main channel.

Key Access: **Meas Setup, More**

Limits On Off

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 appear on the display.

Key Access: **Meas Setup, More**

Filter On Off

Adds root raised cosine filtering required by the standards when **Radio Std, NADC** or **Radio Std, W-CDMA 3GPP** are selected. The filter rolloff (α) is 0.22 for W-CDMA 3GPP and 0.35 for NADC.

Key Access: **Meas Setup, More**

Noise Corr On Off

When **Noise Corr (On)** is selected, a calibration of the noise floor is performed and used to correct for analyzer noise floor contribution to measurement levels.

Key Access: **Meas Setup, More**

Multi-Carrier Power Meas Setup Menu Keys

To access the following keys for setting up a multi-carrier power measurement, press **MEASURE, Multi-Carrier Power** and then the front-panel **Meas Setup** key.

The multi-carrier power measurement is a measure of the power that leaks into adjacent transmit channels. The results reported are identical to the adjacent channel power measurement, but the setup is different to allow for two or more carriers present.

Avg Number On Off

Press **Avg Number (On)** to specify the number of averages used when calculating the measurement result. The average will be displayed at the end of each sweep. **Avg Number (Off)** disables measurement averaging.

Key Access: **Meas Setup**

Avg Mode
Exp Repeat

Allows you to select the type of termination control used for the averaging function. 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 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.

Repeat After reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Access: **Meas Setup**

2nd Car Offs

Allows you to change the frequency difference from the main carrier to the second carrier, measured in MHz. The center frequency of the main carrier is the analyzer center frequency less half of the second carrier offset in MHz. The second carrier center frequency is the main carrier center frequency plus the second carrier offset value in MHz. The available offset values are –15, –10, –5, 5, 10, and 15 MHz. The negative values set the offset below the main carrier frequency, and the positive values set the offset above the main carrier frequency.

Key Access: **Meas Setup**

Optimize Ref Level

Sets the reference level and attenuator to optimum values based on the signal present at the input.

Key Access: **Meas Setup**

Offset/Limits

Displays menu keys that allow you to configure the offsets for the multi-carrier power measurement.

Key Access: **Meas Setup**, **More**

Offset
A B C D Selects the offset the menu keys will affect. Press **Offset** until the letter of the desired offset (A, B, C, or D) is underlined.

Upper Offset Limit Sets the limit for the upper segment of the specified offset pair.

Lower Offset Limit Sets the limit for the lower segment of the specified offset pair.

Key Access: **Meas Setup**, **More**, **Ofs & Limits**

Limits On Off

Turns the limits on or off.

Key Access: **Meas Setup, More**

RRC Filter On Off

Turns the Root Raised Cosine filter on or off. The RRC filter is the type specified in the W-CDMA 3GPP standards, with rolloff (α)=0.2.

Key Access: **Meas Setup, More**

Table 2-5 Multi-Carrier Power Default Settings for 3GPP W-CDMA

Parameter	None	3GPP W-CDMA
Detector	Avg	Avg
Sweep Time	86.4 ms	87.6 ms
Span	48.84 MHz	49.68 MHz
RBW	30 kHz	30 kHz
VBW	300 kHz	300 kHz
RRC Filter a	N/A	.22

Power Stat CCDF Meas Setup Menu Keys

To access the following keys for setting up a power statistics or complementary cumulative distribution function (CCDF) measurement, press **MEASURE, Power Stat CCDF** and then the front-panel **Meas Setup** key.

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 given power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

Meas BW 5.0 MHz

Allows you to set the measurement bandwidth according to the channel bandwidth. The range is 1.00 kHz to 5.00 MHz.

Key Access: **Meas Setup**

Counts 100.000 k

Allows you to set the accumulated number of sampling for data acquisition. The range is 1.00 k (1×10^3) to 1.00 G (1×10^9).

Key Access: **Meas Setup**

Meas Interval 1.00 ms

Allows you to specify the time interval over which the measurement is made. The range is dependent upon the measurement bandwidth.

Key Access: **Meas Setup**

Optimize Ref Level

Sets the reference level and attenuator to optimum values based on the signal present at the input.

Key Access: **Meas Setup**

Table 2-6 CCDF Default Settings for Radio Standards

Standard	Format	Device	Meas Interval	VBW/RBW
None	N/A	N/A	1.0 ms	Wide open/ 5 MHz
IS95	N/A	BTS/MS	1.0 ms	Wide open/ 3 MHz
GSM/EDGE	N/A	BTS/MS	1.0 ms	Wide open/ 1 MHz
W-CDMA	3GPP	BTS/MS	1.0 ms	Wide open/ 5 MHz
cdma2000	SR1	BTS/MS	1.0 ms	Wide open/ 5 MHz
cdma2000	SR3	BTS/MS	1.0 ms	Wide open/ 5 MHz
NADC	N/A	BTS/MS	1.0 ms	Wide open/ 100 kHz
PDC	N/A	BTS/MS	1.0 ms	Wide open/ 100 kHz

Harmonic Distortion Meas Setup Menu Keys

To access the following keys for setting up a harmonic distortion measurement, press **MEASURE**, **Harmonic Distortion** and then the front-panel **Meas Setup** key.

Avg Number
On Off

Press **Avg Number** (On) to specify the number of averages used when calculating the measurement result. The average will be displayed at the end of each sweep. (Off) disables measurement averaging.

Key Access: **Meas Setup**

Avg Mode
Exp Repeat

Allows you to select the type of termination control used for the averaging function. 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 — 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.

Repeat — After reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Access: **Meas Setup**

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 Access: **Meas Setup**

ST/Harmonic
Auto Man

ST/Harmonic (Auto) sets the sweeptime to 200 divided by the resolution bandwidth or 10 ms, whichever is greater. **ST/Harmonic** (Man) allows you to specify any sweeptime from 10 ms to the analyzer maximum. This sweeptime is used only for measuring harmonics. The sweeptime set before the measurement began is used for finding the fundamental.

Key Access: **Meas Setup**

Optimize
Ref Level

Sets the reference level and attenuator to optimum values based on the signal present at the input.

Key Access: **Meas Setup**

Burst Power Meas Setup Menu Keys

To access the following keys for setting up a burst power measurement, press **MEASURE**, **Burst Power** and then the front-panel **Meas Setup** key.

Key Access: **Meas Setup**

Avg Number
On Off

Press **Avg Number** (On) to specify the number of averages used when calculating the measurement result. The average will be displayed at the end of each sweep. **Avg Number** (Off) disables measurement averaging.

Key Access: **Meas Setup**

Avg Mode
Exp Repeat

Allows you to select the type of termination control used for the averaging function. 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 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.

Repeat After reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Access: **Meas Setup**

Avg Type
Video Power

Allows you to specify the type of result averaging to be performed.

Video Selects averaging that sums the trace data and divides by the number of data .

Power Selects averaging that converts trace data from dBm to power units, then averages the power trace data. This selection requires more time to perform.

Key Access: **Meas Setup**

Threshold Lvl
Abs Rel

Allows you to set the level above which the mean carrier power calculation is based upon. The threshold level may be described in dB (relative to the carrier) or dBm (absolute).

Key Access: **Meas Setup**

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: IS95, J-STD-008, cdma2000-SR1, cdma2000-SR3, W-DCMA 3GPP.

Key Access: **Meas Setup**

Table 2-7 Burst Power Default Settings for Radio Standards

Standard	Format	Device	Method	Sweep Time	Burst Width	Threshold Level	Resolution BW	Video BW
None	N/A	N/A	ATL[1]	640 µs	N/A	–30 dB	3 MHz	Wide Open
IS95		BTS/ MS	ATL[2]	2 ms	N/A	–30 dB	3 MHz	Wide Open
GSM/ EDGE	N/A	BTS/ MS	MBW[3]	2 ms	N/A	-20 dB	300 kHz	300 kHz
W-CDMA	3GPP	BTS/ MS	ATL[2]	2 ms	N/A	–30 dB	5 MHz	Wide Open
cdma2000	SR1	BTS/ MS	ATL[2]	2 ms	N/A	–30 dB	3 MHz	Wide Open
cdma2000	SR3	BTS/ MS	ATL[2]	2 ms	N/A	–30 dB	5 MHz	Wide Open
NADC	N/A	BTS	MBW[3]	10 ms	Auto	-30 dB	100 kHz	Wide Open
NADC	N/A	MS	ATL[2]	6 ms	N/A	-30 dB	100 kHz	Wide Open
PDC	N/A	BTS	MBW[3]	10 ms	Auto	-30 dB	100 kHz	Wide Open
PDC	N/A	MS	MBW[3]	6 ms	N/A	-30 dB	100 kHz	Wide Open
Bluetooth™	DH1,DH3, DH5	N/A	N/A	N/A	N/A	N/A	3 MHz	Wide Open

1. Above threshold level
2. Above threshold level
3. Measured Burst Width

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.

Burst Width
Auto Man

Sets the burst width parameter to automatic mode **(Auto)** or manual mode **(Man)**.

In **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 . 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 .

In **Man** you can 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 menu key.

Key Access: **Meas Setup**

Optimize
Ref Level

Sets the reference level and attenuator to optimum values based on the signal present at the input.

Key Access: **Meas Setup, More**

Intermod (TOI) Meas Setup Menu Keys

To access the following keys for setting up a third order intercept (TOI) measurement, press **MEASURE**, **Intermod (TOI)**, and then the front-panel **Meas Setup** key.

Key Access: **Meas Setup**

Avg Number
On Off

Press **Avg Number (On)** to specify the number of averages used when calculating the measurement result. The average will be displayed at the end of each sweep. **Avg Number (Off)** disables measurement averaging.

Key Access: **Meas Setup**

Avg Mode
Exp Repeat

Allows you to select the type of termination control used for the averaging function. 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 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.

Repeat After reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Access: **Meas Setup**

TOI Span

Press **TOI Span** to specify the frequency span in which intermodulation products are measured. The preset value (when **Preset Type** is set to **Factory**) is 15 MHz, or as defined in the following table by the radio standard selected.

Radio Standard	Device	Span	VBW	RBW
None	N/A	15 MHz	100 kHz	100 kHz
IS95	BTS/MS	10 MHz	100 kHz	100 kHz
cdma2000 SR1	BTS/MS	10 MHz	100 kHz	100 kHz
cdma2000 SR3	BTS/MS	30 MHz	300 kHz	300 kHz
W-CDMA 3GPP	BTS/MS	30 MHz	300 kHz	300 kHz
NADC	BTS/MS	400 kHz	3 kHz	3 kHz
PDC	BTS/MS	250 kHz	3 kHz	3 kHz

Key Access: **Meas Setup**

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 in 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. Performing a **Factory Preset** resets the maximum input mixer level to –10 dBm.

Key Access: **Meas Setup**

Optimize Ref Level

Sets the reference level and attenuator to optimum values based on the signal present at the input.

Key Access: **Meas Setup**

Spurious Emissions Meas Setup Menu Keys

To access the following keys for setting up a spurious emissions measurement, press **MEASURE**, **Spurious Emissions** and then the front-panel **Meas Setup** key. The spurious emissions measurement identifies and determines the power level of spurious emissions in certain frequency bands.

Key Access: **Meas Setup**

Avg Number On Off

Press **Avg Number (On)** to specify the number of averages used when calculating the measurement result. The average will be displayed at the end of each sweep. **Avg Number (Off)** disables measurement averaging.

Key Access: **Meas Setup**

Avg Mode Exp Repeat

Allows you to select the type of termination control used for the averaging function. 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 — 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.

Repeat — After reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Access: **Meas Setup**

Range Table

Allows you to enter the settings for up to twenty ranges using the instrument front panel keys or remotely. Upon entering the range table the measurement is stopped, then the analyzer is set to a constantly sweeping idle state. The analyzer will then be 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 will be replaced with (---) to indicate that the range us currently inactive.

Key Access: **Meas Setup**

NOTE

The range table can be exited at anytime by pressing any front-panel key with the exception of the following: **ESC**, **System**, **File**, **Save**, **Print Setup**, **Print**, **Marker**, **Peak Search**, **Freq Count**, **Next Marker**, **Next Window**, and **Zoom**.

The following table defines the default settings for the range table. The values for ranges 1 through 5 are based on the W-CDMA (3GPP) BTS Spurious Emission measurement.

Range	Start Freq (GHz)	Stop Freq (GHz)	Res BW (kHz)	Video BW	Sweep Time	Absolute Limit	Peak Threshold	Peak Excursion
1	1.920	1.980	1200	Auto	Auto	-50 dBm	-90 dBm	6 dB
2	1.894	1.920	510	Auto	Auto	-50 dBm	-90 dBm	6 dB
3	2.100	2.102	100	Auto	Auto	-50 dBm	-90 dBm	6 dB
4	2.175	2.180	100	Auto	Auto	-50 dBm	-90 dBm	6 dB
5	0.800	1.000	4000	Auto	Auto	-50 dBm	-90 dBm	6 dB
6-20	1.5	2.5	Auto	Auto	Auto	-50 dBm	-90 dBm	6 dB

Range
On Off

Allows you to select from the 20 ranges in the range table. When a range has been selected, the values of the range table parameters will appear on the **Range Table** menu keys. If **Range** is set to **On**, the selected range values will be used in your measurement. If **Range** is set to **Off**, the selected range values will not be used. The range parameters are listed in the table above.

Key Access: **Meas Setup, Range Table**

Start Freq

Allows you to set the start frequency for the selected range.

Key Access: **Meas Setup, Range Table**

Stop Freq

Allows you to set the stop frequency for the selected range.

Key Access: **Meas Setup, Range Table**

Res BW
Auto Man

Allows you to set the resolution bandwidth for the selected range. When **Auto** is selected, the analyzer determines the optimum setting, while **Man** allows you to enter the setting.

Key Access: **Meas Setup, Range Table**

Video BW
Auto Man

Allows you to set the video bandwidth for the selected range. When **Auto** is selected, the analyzer determines the optimum setting, while **Man** allows you to enter the setting.

Key Access: **Meas Setup, Range Table**

Sweep Time
Auto Man

Allows you to set the sweep time for the selected range. When **Auto** is selected, the analyzer determines the optimum setting, while **Man** allows you to enter the setting.

Key Access: **Meas Setup, Range Table**

Range
On Off

Allows you to select from the 20 ranges in the range table. When a range has been selected, the values of the range table parameters will appear on the **Range Table** menu keys. If **Range** is set to **On**, the selected range values will be used in your measurement. If **Range** is set to **Off**, the selected range values will not be used. The range parameters are listed in the table above.

Key Access: **Meas Setup, Range Table, More**

Absolute Limit

Allows you to determine the limit above which spurs will report a failure. Any spur located above the current setting of **Peak Excursn** will be added to the results table. An **F** (in red on analyzers with a color display) will be appended to the amplitude value of the spur if the measured amplitude of the spur is above the limit set with **Absolute Limit**.

Key Access: **Meas Setup, Range Table, More**

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 6 dB above the peak threshold value are identified.

Key Access: **Meas Setup, Range Table, More**

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 excursn value, which is above –90 dBm, are identified.

Key Access: **Meas Setup, Range Table, More**

Meas Type
Examine Full

Allows you to specify the measurement type, either **Examine** or **Full**. This parameter is coupled to the average mode. If the measurement type selected is **Examine**, the measurement sets **Avg Mode** to **Exp**. When **Full** is selected as the measurement type, 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 and `No Spurs` is then displayed.	All active ranges are measured and the found spurs are reported. Upon completion the measurement is set to the idle state and the trace containing the worst spur is restored. **Spur** is then enabled (no longer greyed out). A marker is also added which is 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 and `No Spurs` is then 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 then enabled (no longer greyed out). A marker is also added which is set to the frequency of the worst spur.
Full	All active ranges are measured. Upon completion the measurement is set to the idle state and `No Spurs` is then displayed.	All active ranges are measured and the found spurs are reported. Upon completion the measurement is set to the idle state, displaying the trace of the last active range.	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 spurs found is reset. This ensures any remote queries retrieve the trace data that matches the currently displayed results.

Key Access: **Meas Setup**

Spur

Press **Spur** to view any spurs which have been found. The measurement will set the analyzer to the range in which the currently selected spur was found. The range settings will only change if the selected spur is in a range which is different from the current range settings.

Key Access: **Meas Setup**

Ref Level
Auto Man

Sets the reference level of the analyzer.

Key Access: **Meas Setup**

Spectrum Emission Mask Meas Setup Menu Keys

To access the following keys for setting up a spectrum emission mask measurement, press **MEASURE**, **Spectrum Emission Mask**, and then the front-panel **Meas Setup** key.

Avg Number On Off

Press **Avg Number** (On) to specify the number of averages used when calculating the measurement result. The average will be displayed at the end of each sweep. **Avg Number** (Off) disables measurement averaging.

Key Access: **Meas Setup**

Meas Type

Allows you to specify the reference for the spectrum emission mask measurement.

Total Pwr Ref Press **Total Pwr Ref** to specify the reference for the measurement to the total power.

PSD Ref Press **PSD Ref** to specify the reference for the measurement to power spectral density.

Key Access: **Meas Setup, Meas Type**

Ref Channel

Chan Integ BW Allows you to specify the channel integration bandwidth used in calculating the power in the main channel.

Chan Span Allows you to specify the channel span used in calculating the power in the main channel.

Sweep Time Auto Man Allows you to specify the sweep time used in calculating the power in the main channel.

Res BW Auto Man Allows you to specify the resolution bandwidth used in calculating the power in the main channel.

Total Pwr Ref Auto Man This parameter allows you to select whether to calculate the carrier power based on the signal at the analyzer input, or use a fixed value as reference. Enables the use of the Agilent Dynamic Range Extender. The Agilent Dynamic Range Extender will effectively "remove" the carrier from the signal coming into the analyzer. The fixed value can be entered manually.

Key Access: **Meas Setup, Ref Channel**

Offset/Limits

Accesses the following parameters for offset frequency settings and pass/fail tests: **Offset**, **Start Freq**, **Stop Freq**, **Sweep Time**, **Res BW**, and **Limits**. The following Tables show the default settings for BTS and MS measurements.

Key Access: **Meas Setup**

Table 2-1 Offsets & Limits Defaulted for BTS Measurements

Offset	Start Freq (MHz)	Stop Freq (MHz)	Sweep Time (us)	Res BW (kHz)	Abs Start (dBm)	Abs Stop (dBm)	Rel Start (dBc)	Rel Stop (dBc)	Fail Mask	Meas BW (MHz)
A, On	2.515	2.715	Auto	30.00	–14.00	–14.00	–30.00	–30.00	Abs	1
B, On	2.715	3.515	Auto	30.00	–14.00	–26.00	–30.00	–30.00	Abs	1
C, On	3.515	4.000	Auto	30.00	–26.00	–26.00	–30.00	–30.00	Abs	1
D, Off	4.000	7.500	Auto	1000.0	–13.00	–13.00	–30.00	–30.00	Abs	20
E, Off	7.500	12.500	Auto	1000.0	–13.00	–13.00	–30.00	–30.00	Abs	1

Table 2-2 Offsets & Limits Defaulted for MS Measurements

Offset	Start Freq (MHz)	Stop Freq (MHz)	Sweep Time (us)	Res BW (kHz)	Abs Start (dBm)	Abs Stop (dBm)	Rel Start (dBc)	Rel Stop (dBc)	Fail Mask	Meas BW (MHz)
A, On	2.515	3.485	Auto	30.00	–71.07	–71.07	–35.23	–49.78	AND	1
B, On	4.000	7.500	Auto	1000.0	–55.84	–55.84	–35.50	–39.00	AND	1
C, On	7.500	8.500	Auto	1000.0	–55.84	–55.84	–39.00	–49.00	AND	1
D, Off	8.500	12.500	Auto	1000.0	–55.84	–55.84	–49.00	–49.00	AND	1
E, Off	12.500	15.000	Auto	1000.0	–55.84	–55.84	–49.00	–49.00	AND	1

Offset
A B C D E

Allows you to select an offset that will determine the settings of the parameters in the Offset/Limits key menus. The default settings for 5 sets of offsets (A through E) for both MS and BTS measurements are shown in Table 2-1, and Table 2-2. Press Offset until the letter of the desired offset (A, B, C, D or E) is underlined.

Start Freq
On Off

Allows you to specify the limit (start frequency) for the upper segment of the specified offset pair, and to toggle this function between **On** and **Off** for each offset.

Stop Freq

Allows you to specify the limit (stop frequency) for the upper segment of the specified offset pair.

Sweep Time
Auto Man

Allows you to specify the sweep time for the currently selected offset, and to toggle this function between **Auto** and **Man** for each offset.

Res BW
Auto Man

Sets the limit for the upper segment of the specified offset pair, and allows you to toggle this function between **Auto** and **Man**.

Key Access: **Meas Setup**, **Offset/Limits**

Offset
A B C D E

Allows you to select an offset that will determine the settings of the parameters in the Offset/Limits key menus. The default settings for 5 sets of offsets (A through E) for both MS and BTS measurements are shown in Table 2-1, and Table 2-2. Press Offset until the letter of the desired offset (A, B, C, D or E) is underlined.

Abs Start

Allows you to enter an absolute level limit at **Start Freq** ranging from –200.00 to +50.00 dBm with 0.01 dB resolution.

Key Access: **Meas Setup**, **Offset/Limits**, **More**

Abs Stop
Couple Man

Sets the limit for the upper segment of the specified offset pair, and allows you to enter an absolute level limit at **Stop Freq** ranging from –200.00 to +50.00 dBm with 0.01 dB resolution. When set to **Couple**, **Abs Stop** is coupled to **Abs Start** to make a flat limit line. When **Abs Start** has been pressed, and **Abs Stop** is set to **Man**, you can enter different values to make a sloped limit line.

Key Access: **Meas Setup**, **Offset/Limits**, **More**

Rel Start

Sets the limit for the upper segment of the specified offset pair. **Rel Start** allows you to enter a relative level limit at **Start Freq** ranging from –150.00 to +50.00 dBc with 0.01 dB resolution.

Key Access: **Meas Setup**, **Offset/Limits**, **More**

Rel Stop
Couple Man

Sets the limit for the upper segment of the specified offset pair. **Rel Stop** allows you to enter a relative level limit at **Stop Freq** ranging from –150.00 to +50.00 dBc with 0.01 dB resolution. When set to **Couple**, **Rel Stop** is coupled to **Rel Start** to make a flat limit line. When **Rel Start** has been pressed, and **Rel Stop** is set to **Man**, you can enter different values to make a sloped limit line.

Key Access: **Meas Setup**, **Offset/Limits**, **More**

Fail Mask

Allows you to select from a menu of logic keys for fail conditions between the measurement results and the test limits.

Key Access: **Meas Setup**, **Offset/Limits**, **More**

Absolute

Sets 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**

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**.

Abs AND Rel

Sets 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**.

Abs OR Rel

Sets 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 Access: **Meas Setup**, **Offset/Limits**, **More**, **Fail Mask**

Optimize Ref Level

Sets the reference level and attenuator to optimum values based on the signal present at the input.

Key Access: **Meas Setup**

MEASURE

In the Spectrum Analysis mode, **MEASURE** accesses a menu of keys that allow you to make channel power, occupied bandwidth, adjacent channel power, multi-carrier power, complementary cumulative distribution function (CCDF), harmonic distortion, burst power, intermodulation (TOI), spurious emissions, and spectrum emission mask measurements. These measurements can be setup by you or you may select one of several radio standards available by pressing **Mode Setup, Radio Standard**. The standards currently available are: IS95, J-STD-008, cdma2000 (SR1), W-CDMA (3GPP), cdma2000 (SR3-MC), cdma2000 (SR3-DS), NADC, PDC, GSM/EDGE, and Bluetooth™.

NOTE The measurements described below are those available in SA mode (see **Mode** key). Other measurements are available in other modes if an optional personality is installed.

NOTE When a measurement is activated, Signal Track, Video Averaging, Segmented Sweep, Band Power and Marker Noise will be turned off.

NOTE When Signal Track, Video Averaging, Band Power, Marker Noise or Span Zoom are activated, a running measurement will be turned off.

Meas Off Turns the active measurement function off.

Key Access: **MEASURE**

Channel Power Measures and reports the power in the channel (integration) bandwidth as well as the computed power spectral density as shown in Figure 2-5.

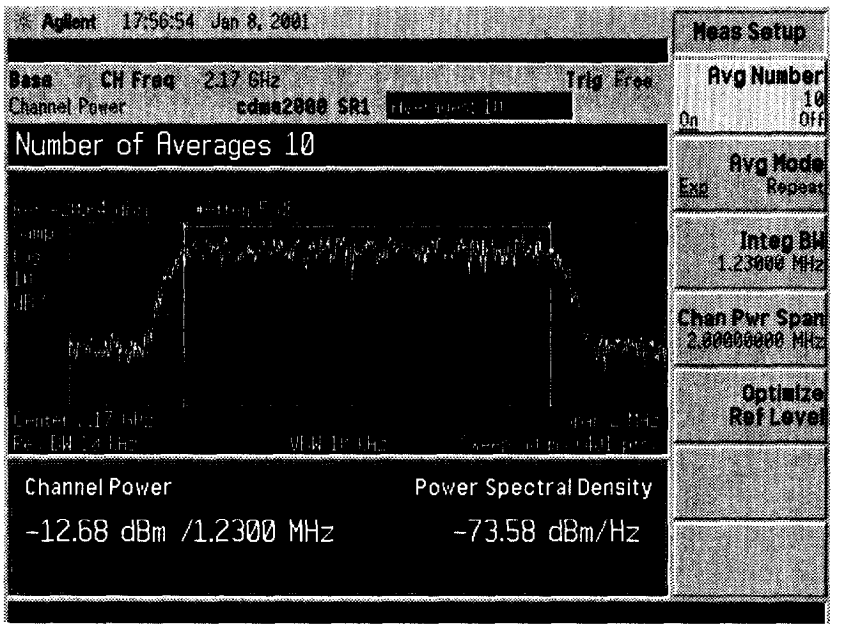
The power calculation method used to determine the channel power is a traditional method known as the integration bandwidth (IBW) method. A swept spectrum is used as the basis for this calculation. Therefore, it is important to set the resolution bandwidth correctly before making this measurement using 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 2-5 **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 (NADC MS, excluded). 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 Access: **MEASURE**

Occupied BW

Integrates the power of the displayed spectrum and puts markers at the frequencies between which the selected percentage of the power is contained. (Refer to Figure 2-4 on page 130.) 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. This difference is referred to as "Transmit Freq Error" in Figure 2-4 on page 130.

Pressing **Meas Setup** after **Occupied BW** has been selected will access the occupied bandwidth 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 (GSM/EDGE and Bluetooth™, excluded). Pressing **Meas Control** after **Occupied BW** has been selected will access the occupied bandwidth measurement control menu which allows you to pause or restart your measurement, or toggle between continuous and single measurement.

Key Access: **MEASURE**

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 W-CDMA 3GPP 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 offets will be measured in zero span and the combined results reported according to the **Meas Type** selection.

Pressing **Meas Setup** after **ACP** has been selected will access the adjacent 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 (GSM/EDGE and Bluetooth™, excluded). Pressing **Meas Control** after **ACP** has been selected will access the adjacent channel power measurement control menu which allows you to pause or restart your measurement, or toggle between continuous and single measurement.

Key Access: **MEASURE**

Multi-Carrier Power

Multi-Carrier Power is the measure of the power that leaks into adjacent transmit channels. The results reported are identical to the adjacent power measurement, but the setup is different to allow for two or more carriers present.

Key Access: **MEASURE**

Power Stat CCDF

Plots curves which characterize the signal's higher level power. 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 given power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

NOTE CCDF measurement requires the installation of Option AYX or Option B7D to ensure measurement accuracy.

For each single sweep of this measurement, the average power is defined by:

$$Pavg = \left(\sum_{1}^{n} (V^2/Z_0) \right) / n$$

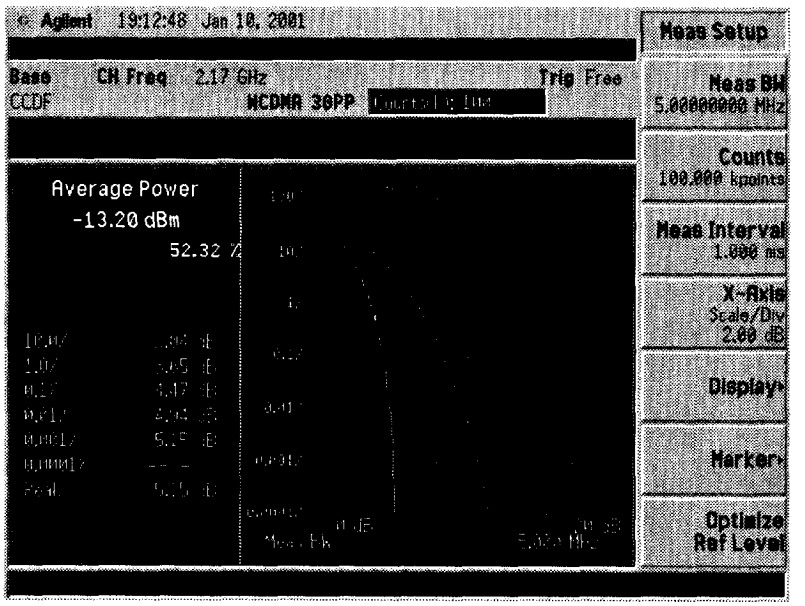
where V is the envelope voltage, Z_0 is the characteristic impedance, and n is the number of samples (32k maximum).

Pavg is used as a guideline to define the probability of the samples, which is x dB 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 every single sweep.

Results from a 2.17 GHz W-CDMA 3GPP input signal are shown below in Figure 2-6.

NOTE It is important to set the correct center frequency before initiating this measurement.

Figure 2-6 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 Access: **MEASURE**

Harmonic Distortion

Measures the harmonics of the strongest signal present in the span and computes the total harmonic distortion for the signal. The carrier must be the strongest peak (having a frequency > 0 Hz, a peak excursion > 6 dB on both sides, and an amplitude ≥–50 dBm) on the display at the time the measurement is started. The total harmonic distortion is then calculated from the measured harmonics and displayed as a percentage according to the following equation:

$$\%\text{THD} = 100 \times \frac{\left(\sqrt{\sum_{h=2}^{H_{max}} E_h^2}\right)}{E_f}$$

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.

NOTE

Limit the span to a bandwidth sufficient to view the modulated signal before initiating this measurement. Because resolution bandwidth is coupled to span, this provides the resolution bandwidth enough range to capture all the harmonics.

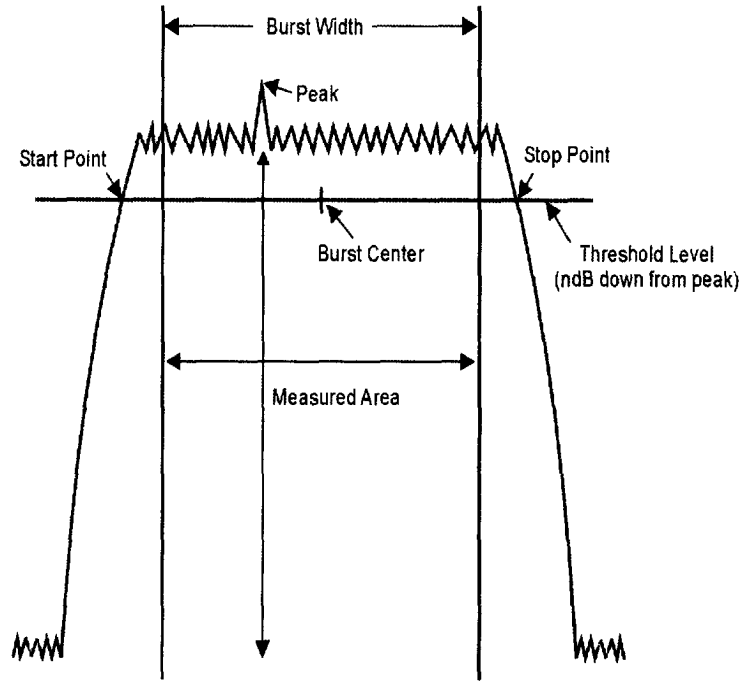
Pressing **Meas Setup** after **Harmonic Distortion** has been selected will access the harmonic distortion measurement setup menu. Pressing **Meas Control** after **Harmonic Distortion** has been selected will access the harmonic distortion control menu which allows you to pause or restart your measurement, or toggle between continuous and single measurement.

Key Access: **MEASURE, More**

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 Figure 2-7 for clarification of these parameters.

Figure 2-7 Burst Power Measurement



The burst power measurement acquired data from the "Measured Area" above when a radio standard is chosen or 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:

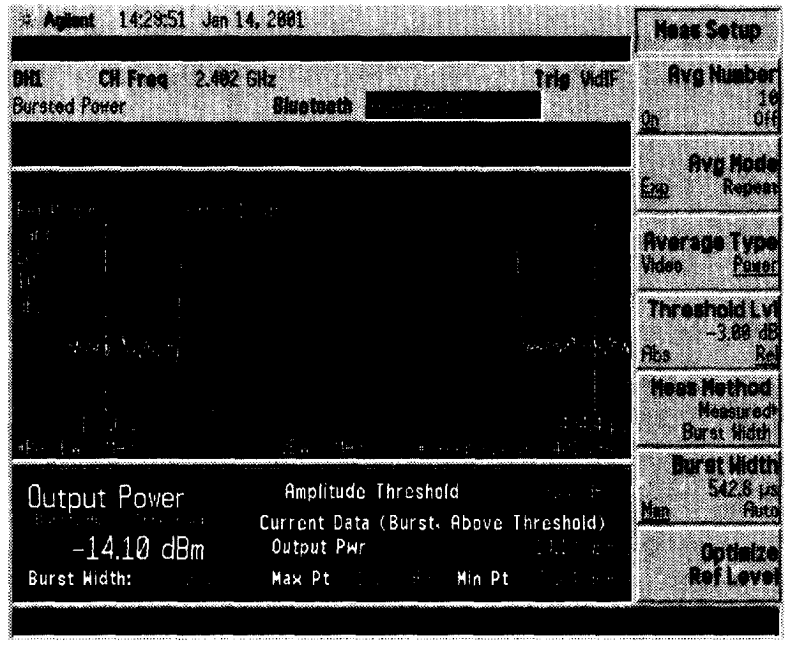
1. converting each trace point amplitude from dBm into linear power
2. Adding the above amplitudes together and dividing by the number of points included in the average.
3. This value is then displayed in logarithmic form (dBm).

$$(Pavg) = 10\log 10\left\{\frac{\left(\sum_{n}^{m}\left(10^{\frac{p}{10}}\right)\right)}{m-n}\right\}$$

where Pavg = average power, n is the start trace point, m= the stop trace point, and p= the trace point amplitude power in dBm.

The figure below shows an example of the results obtained when measuring a Bluetooth™ signal and with a user-defined burst width.

Figure 2-8 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 will access the burst power measurement setup menu. Pressing **Meas Control** after **Burst Power** has been selected will access the burst power control menu which allows you to pause or restart your measurement, or toggle between continuous and single measurement.

Key Access: **MEASURE, More**

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.

Intermod (TOI) Computes and displays the third order intercept (TOI) point and places markers on the trace to indicate the measured signals and third-order products.

Key Access: **MEASURE, More**

Spurious Emissions The spurious emissions measurement identifies and determines the power level of spurious emissions in certain frequency bands.

Key Access: **MEASURE, More**

Spectrum Emission Mask The spectrum emission mask measurement includes the in-band and out-of-band spurious emissions. It may also be expressed as a ratio of power spectral densities between the carrier and the specified offset frequency band.

Key Access: **MEASURE, More**

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

Brings up a menu for setting up the current mode. The **SA** mode has the following mode setup functions.

Radio Std

Accesses the radio standards key menu. Selecting a radio standard modifies spectrum analyzer settings only when one of the measurements (Channel Power, Occupied BW, ACP, Multi-Carrier Power, Power Stat CCDF, Harmonic Distortion, Burst Power, Intermod (TOI), Spurious Emissions, Spectrum Emission Mask) have been activated under the **MEASURE** menu.

Key Access: **Mode Setup**

None

Selects no radio standard. If **Radio Std, None** is selected when a measurement is running, essentially a "mini-preset" occurs. All instrument parameters set by the formerly active measurement (**Meas Setup** key menu) are restored to their factory default values. Analyzer parameters outside the **MEASURE** or **Meas Setup** key menus are not affected.

Key Access: **Mode Setup, Radio Std**

IS95

Sets the specific parameters for the selected measurement (located under the "MEASURE" key description) appropriate for industry standard IS95. All measurements are available for this standard.

Key Access: **Mode Setup, Radio Std**

J-STD-008

Sets the specific parameters for the selected measurement (located under the "MEASURE" key description) appropriate for industry standard J-STD-008. All measurements are available for this standard.

Key Access: **Mode Setup, Radio Std**

NADC

Sets the specific parameters for the selected measurement (located under the "MEASURE" key description) appropriate for industry standard NADC. The Burst Power measurement is not available when **Device (BTS)** is selected. The Channel Power measurement is not available when **Device (MS)** is selected. All other measurements are available for this standard.

Key Access: **Mode Setup, Radio Std**

GSM/EDGE

Sets the specific parameters for the selected measurement (located under the "MEASURE" key description) appropriate for industry standard GSM/EDGE. All measurements are available for this standard except Channel Power, ACP, and Occupied BW.

Key Access: **Mode Setup, Radio Std**

W-CDMA 3GPP

Sets the specific parameters for the selected measurement (located under the "MEASURE" key description) appropriate for industry standard W-CDMA. All measurements are available for this standard.

Key Access: **Mode Setup, Radio Std**

cdma2000 SR1

Sets the specific parameters for the selected measurement (located under the "MEASURE" key description) appropriate for industry standard cdma2000-SR1. All measurements are available for this standard.

Key Access: **Mode Setup, Radio Std, More**

cdma2000 SR3-MC

Sets the specific parameters for the selected measurement (located under the "MEASURE" key description) appropriate for industry standard cdma2000:SR3-MC. All measurements are available for this standard.

Key Access: **Mode Setup, Radio Std, More**

cdma2000 SR3-DS

Sets the specific parameters for the selected measurement (located under the "MEASURE" key description) appropriate for industry standard cdma2000:SR3-DS. All measurements are available for this standard.

Key Access: **Mode Setup, Radio Std, More**

PDC

Sets the specific parameters for the selected measurement (located under the "MEASURE" key description) appropriate for industry standard PDC. The Burst Power measurement is not available when **Device (BTS)** is selected. The Channel Power measurement is not available when **Device (MS)** is selected. All other measurements are available for this standard.

Key Access: **Mode Setup, Radio Std, More**

Bluetooth™ Sets the specific parameters for the selected measurement (located under the "MEASURE" key description) appropriate for industry standard Bluetooth™. All measurements are available for this standard except Channel Power, ACP, and Occupied BW.

Key Access: **Mode Setup, Radio Std, More**

Std Setup Accesses the key menu for selecting the device, packet type, or signal bandwidth to be measured.

Key Access: **Mode Setup**

Device

BTS MS Allows you to select either the base transmitter station (BTS) or the mobile station (MS) for all radio standards except Bluetooth™.

Key Access: **Mode Setup, Std Setup**

Packet Type

DH1 DH3 DH5 Allows you to select the packet type for Bluetooth™ measurement.

Key Access: **Mode Setup, Std Setup**

Signal BW

3.00000000 MHz Allows you to set the measurement bandwidth when **Radio Std (None)** is selected.

Key Access: **Mode Setup, Radio Std, None, Std Setup**

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 166. Refer to **Peak Search Type** on page 167, 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 169, for more information on presetting the analyzer.

NOTE All peak search functions ignore the LO feedthrough. 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 165.

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

Next Pk Left Refer to "Next Pk Left" on page 165 of this chapter.

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

Delta Refer to "Delta" on page 120.

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 123.

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

Band Power Refer to "Band Power" on page 123.

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

Marker Noise Refer to "Marker Noise" on page 123.

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

Off Refer to "Off" on page 122.

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 203, 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 2-8 on page 170 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 2-8 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 2-8 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 2-8 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
1 2 Selects the number of prints per page when orientation is set to **Portrait**. 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
On Off Allows you to select between color or black and white printing. This key will not function when pressed unless the connected printer supports color.

Key Access: **Print Setup, More**

Restart

Restarts the current measurement activated in the **Measure** key menu.

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).

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

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.

When analyzer is in continuous sweep mode and also in a measurement (selected under the **Measure** key), this key changes the measurement control to take a single measurement and executes a single measurement after the trigger condition is met. If the analyzer is already in single sweep, pressing **Single** executes a new measurement 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.

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

When the source attenuation is set manually, the actual source amplitude may be greater than the amplitude indicated by the source amplitude. With source attenuation set to manual, source amplitude is permitted to be set to values beyond output levels to accommodate the full range of the analyzer capabilities. As a result, 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.

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**

CAUTION

When the source attenuation is set manually, the actual source amplitude may be greater than the amplitude indicated by the source amplitude. With source attenuation set to manual, source amplitude is permitted to be set to values beyond output levels to accommodate the full range of the analyzer capabilities. As a result, exercise caution when connecting a power-level sensitive device to the tracking generator output

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 (CCDF)" on page 190 for **Span X Scale** key descriptions.

If **Spectrum Emission Mask** is selected in the **MEASURE** menu, see "SPAN X Scale (Spectrum Emission Mask)" on page 191 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**

SPAN X Scale (CCDF)

If **Power Stat CCDF** is selected in the **MEASURE** menu, **SPAN X Scale** accesses the following key.

X-Axis

Allows you to enter a numeric value to change the horizontal display sensitivity. The range is 0.1 to 20.00 dB with 0.01 dB resolution. The default setting is dependent upon the radio standard selected. Refer to "Mode Setup" on page 160 for a list of available standards.

Key Access: **MEASURE, Power Stat CCDF, SPAN X Scale**

SPAN X Scale (Spectrum Emission Mask)

If **Spectrum Emission Mask** is selected in the **MEASURE** menu, **SPAN X Scale** accesses the following keys.

Scale/Div

Sets the frequency units per horizontal graticule division on the display. To determine full display frequency span, multiply the frequency span per horizontal graticule division by 10.

Key Access: **MEASURE, Spectrum Emission Mask, SPAN X Scale**

Ref Value

Sets the frequency represented by the selected horizontal graticule line on the display (the reference). The current value is indicated by `Ref` 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.

Key Access: **MEASURE, Spectrum Emission Mask, SPAN X Scale**

Ref Position

Positions the X-Scale reference to the extreme left line, center line, or extreme right line of the display graticule.

Key Access: **MEASURE, Spectrum Emission Mask, SPAN X Scale**

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**)

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.

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).

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 113 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 56 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 179) or as part of the power on/preset function (see "Power On/Preset" on page 204).

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 111.

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 186.

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 78.

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 78.

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 193 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 2-9 **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 configuration.

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 the **Trace/View** sections specific to those measurements.

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.

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**

Trace/View (ACP)

If **ACP** is selected in the **MEASURE** menu, **Trace/View** displays the following menu for the adjacent channel power (ACP) measurement.

Spectrum

Selects the spectral display of the measurement.

Key Access: **Measure, ACP, Trace/View**

Bar Graph

Displays of bar graph of the measurement.

Key Access: **Measure, ACP, Trace/View**

Combined

Selects the measurement to be displayed as a bar graph and spectrum.

Key Access: **Measure, ACP, Trace/View**

Combined Rel Abs

Allows you to select relative (dB) or absolute (dBm) levels to be displayed in the graphic section of the display. Both bar graph and spectrum views are shown.

Key Access: **Measure, ACP, Trace/View**

Trace

Accesses menu keys that allow you to set how the trace information is stored and displayed. Refer to "Trace/View" on page 214 for **Trace** menu key information.

Key Access: **Measure, ACP, Trace/View**

Trace/View (Multi-Carrier Power)

If **Multi-Carrier Power** (MCP) is selected in the **MEASURE** menu, **Trace/View** displays the following menu for the (MCP) measurement.

Spectrum

Selects the spectral display of the measurement.

Key Access: **Measure, Multi-Carrier Power, Trace/View**

Combined

Selects the measurement to be displayed as a bar graph and spectrum.

Key Access: **Measure, Multi-Carrier Power, Trace/View**

Combined Rel Abs

Allows you to select relative (dB) or absolute (dBm) levels to be displayed in the graphic section of the display. Both bar graph and spectrum views are shown.

Key Access: **Measure, Multi-Carrier Power, Trace/View**

Trace

Accesses menu keys that allow you to set how the trace information is stored and displayed. Refer to "Trace/View" on page 214 for **Trace** menu key information.

Key Access: **Measure, Multi-Carrier Power, Trace/View**

Trace/View (Burst Power)

If **Burst Power** is selected in the **MEASURE** menu, **Trace/View** displays the following menu for the burst power measurement.

RF Envelope

Key Access: **Measure, Burst Power, Trace/View**

Combined

Displays the measurement results the same as RF Envelope, but has a blue bar between the markers to indicate the measured output power level. The actual measured output power is displayed at the bottom of the bar.

Key Access: **Measure, Burst Power, Trace/View**

Trace

Accesses menu keys that allow you to set how the trace information is stored and displayed. Refer to "Trace/View" on page 214 for **Trace** menu key information.

Key Access: **Measure, Burst Power, Trace/View**

Trace/View (Channel Power)

If **Channel Power** is selected in the **MEASURE** menu, **Trace/View** displays the following menu for the channel power measurement.

Spectrum

Selects the spectral display of the measurement.

Key Access: **Measure, Channel Power, Trace/View**

Combined

Selects the measurement to be displayed as a bar graph and spectrum.

Key Access: **Measure, Channel Power, Trace/View**

Trace

Accesses menu keys that allow you to set how the trace information is stored and displayed. Refer to "Trace/View" on page 214 for **Trace** menu key information.

Key Access: **Measure, Channel Power, Trace/View**

Trace/View (Harmonic Distortion)

If **Harmonic Distortion** is selected in the **MEASURE** menu, **Trace/View** displays the following menu for the harmonic distortion measurement.

Harmonics

Displays the harmonic number, frequency, and amplitude of the harmonic found in the lower window on the analyzer display.

Key Access: **Measure, Harmonic Distortion, Trace/View**

Harmonics & THD

Displays the harmonic number, frequency, and amplitude of the harmonic found in the lower window on the analyzer display, as well as the total harmonic distortion (THD), which is shown as a percentage and as a dB value.

Key Access: **Measure, Harmonic Distortion, Trace/View**

Trace

Accesses menu keys that allow you to set how the trace information is stored and displayed. Refer to "Trace/View" on page 214 for **Trace** menu key information.

Key Access: **Measure, Harmonic Distortion, Trace/View**

Trace/View (Power Stat CCDF)

If **Power Stat CCDF** is selected in the **MEASURE** menu, **Trace/View** displays the following menu for the complimentary cumulative distribution function (CCDF) measurement.

CCDF

Performs a CCDF measurement. The measurement bandwidth is set to 5 MHz, counts to 100 kpoints, measurement interval to 1.00 ms and the x-axis scale to 2.00 dB/div. The displayed traces are a Gaussian line and the current measured trace.

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 given power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

Key Access: **Measure, Power Stat CCDF, Trace/View**

Trace/View (Spectrum Emission Mask)

If **Spectrum Emission Mask** is selected in the **MEASURE** menu, **Trace/View** displays the following menu for the spectrum emission mask measurement.

Abs Pwr & Freq

Allows you to view the measurement results of spectrum measurements in the graph window as absolute peak power and frequency. The absolute peak power levels in dBm and corresponding offset frequency ranges on both sides of the reference channel are displayed in the text window.

Key Access: **Measure, Spectrum Emission Mask, Trace/View**

Rel Pwr & Freq

Allows you to view the measurement results of spectrum measurements in the graph window as power relative to the carrier power and frequency. The relative power levels in dBc and corresponding offset frequency ranges on both sides of the reference channel are displayed in the text window

Key Access: **Measure, Spectrum Emission Mask, Trace/View**

Integrated Power

Allows you to view the measurement results of spectrum 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 corresponding offset frequency ranges on both sides of the reference channel, are displayed in the text window

Key Access: **Measure, Spectrum Emission Mask, Trace/View**

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**.)

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