

# **Getting Started Guide**

## **Agilent Technologies ESA Series Spectrum Analyzers**

**This guide documents firmware revision A.09.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: E4401-90437  
Supercedes: E4401-90413**

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

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### 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.**

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### CAUTION

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

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### 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.

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## Additional Information

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

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

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# **1 Installation and Setup**

This chapter provides the following information that you may need when you first receive your spectrum analyzer:

- “Initial Inspection” on page 7.
- “Power Requirements” on page 9.
- “Turning on the Analyzer for the First Time” on page 14.
- “Printer Setup and Operation” on page 18.
- “Protecting Against Electrostatic Discharge” on page 21.
- “Running Internal Alignments” on page 17.
- “Legal Information” on page 22.

## Initial Inspection

Inspect the shipping container and the cushioning material for signs of stress. Retain the shipping materials for future use, as you may wish to ship the analyzer to another location or to Agilent Technologies for service. Verify that the contents of the shipping container are complete. The following table lists the items shipped with the analyzer.

Item	Description
<b>Accessories</b>	
Adapter, Type-N (m) to BNC (f)	Not shipped with Option 1DP. Two adapters are shipped with Option 1DN.
Adapter, BNC (m) to F (f), 75 $\Omega$	Shipped only with Option 1DP. Two adapters shipped with Option 1DQ.
Adapter, Type-N (m) to SMA (f)	Shipped only with Option 1DN for Agilent E4402B, E4403B, E4404B, E4405B, E4407B, and E4408B. Not shipped with Option BAB.
Adapter, APC 3.5 (f) to APC 3.5 (f)	Shipped only with Option BAB.
Adapter, BNC (f) to SMA (m)	Shipped only with Option BAB.
Cable, BNC (m) to BNC (m), 203 mm	Shipped only with Agilent E4402B, E4403B, E4404B, E4405B, E4407B, and E4408B.
Cable, SMA (m) to Type-N (m), 220 mm	Shipped only with Option 1DN for Agilent E4402B, E4403B, E4404B, E4405B, E4407B, and E4408B.
Power Cable (See <a href="#">Table 1-3. on page 12</a> )	Connection for power source.
<b>Standard Documentation Set</b>	
Getting Started Guide	Covers unpacking and setting up the analyzer, analyzer features, and how to make a basic measurement. Includes information on options and accessories, and what to do if you have a problem.
User's and Programmer's Reference	Describes analyzer features in detail, including front-panel key descriptions, basic spectrum analyzer programming information, and SCPI command descriptions.
Measurement Guide	Provides details on how to measure various signals, and how to use catalogs and files.
Specifications Guide	Documents specifications, safety, and regulatory information.
Instrument Messages and Functional Tests	Includes instrument messages (and suggestions for troubleshooting them), and manual functional tests.
Programming Conversion Guide	Describes SCPI programming command compatibility for 8590, ESA series analyzers.
Documentation CD-ROM	Includes the documents in the standard set (listed above). You can view and print the information as needed. See the CD-ROM jacket for installation information.

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**NOTE** If you purchased one or more optional measurement personalities, the related guides for the options you ordered are included.

Service documentation is *not* included in the standard documentation set. See “Options” on page 65 for information on ordering.

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### If There Is a Problem

If the shipping materials are damaged or the contents of the container are incomplete:

- Contact the nearest Agilent Technologies office to arrange for repair or replacement (Table 6-2. on page 85). You will not need to wait for a claim settlement.
- Keep the shipping materials for the carrier’s inspection.
- If you must return an analyzer to Agilent Technologies, use the original (or comparable) shipping materials (see “Returning an Analyzer for Service” on page 86).



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## Power Requirements

The only physical installation of your Agilent spectrum analyzer is a connection to a power source.

Line voltage does *not* need to be selected.

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**WARNING**     **Failure to ground the analyzer properly can result in personal injury. Before turning on the analyzer, you must connect its protective earth terminals to the protective conductor of the main power cable. Insert the main power cable plug into a socket outlet that has a protective earth contact *only*. DO NOT defeat the earth-grounding protection by using an extension cable, power cable, or autotransformer without a protective ground conductor.**

**If you are using an autotransformer, make sure its common terminal is connected to the protective earth contact of the power source outlet socket.**

**This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective 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.**

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**CAUTION**     **VENTILATION REQUIREMENTS:** When installing the product in a cabinet, the convection into and out of the product must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the product by 4°C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, then forced convection must be used.

This analyzer has autoranging line voltage input. Be sure the supply voltage is within the specified range.

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**NOTE**     For more information regarding analyzer specifications, see the Specifications guide.

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**Table 1-1. AC Power Requirements**

Description	Specifications
Voltage	90 to 132 Vrms (47 to 440 Hz)
Voltage	195 to 250 Vrms (47 to 66 Hz)
Power Consumption, On	< 300 W
Power Consumption, Standby	< 5 W

**Table 1-2. DC Power Requirements**

Description	Specifications
Voltage	12 to 20 Vdc
Power Consumption	< 200 W
Power Consumption, Standby	< 5 W

## Checking the Fuse

Where IEC regulations apply, use a 5 by 20 mm, rated F5A, 250 V IEC approved fuse. This fuse may be used with input line voltages of 115 V or 230 V. Its part number is 2110-0709.

Where UL/CSA regulations apply, use a 5 by 20 mm rated fast blow, 5 A, 125 V UL/CSA approved fuse (part number 2110-0756). ***This fuse may only be used with an input line voltage of 115 V.***

The line fuse is housed in a fuse holder in the upper left hand corner of the rear panel.

To remove the fuse, ***first disconnect the power cord from the analyzer.*** Then insert the tip of a screwdriver into the slot at the middle of the fuse holder, and turn counterclockwise to extend the fuse holder.

---

**WARNING**     **For continued protection against fire hazard, replace the line fuse only with the same type and rating. The use of other fuses or material is prohibited.**

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## AC Power Cord

The analyzer is equipped with a three-wire power cord, in accordance with international safety standards. This cable grounds the analyzer cabinet when connected to an appropriate power line outlet. The cable appropriate to the original shipping location is included with the analyzer.

Various AC power cables are available that are unique to specific geographic areas. You can order additional AC power cables for use in different areas. [AC Power Cords, on page 12](#) lists the available AC power cables, illustrates the plug configurations, and identifies the geographic area in which each cable is appropriate.

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**NOTE**      The front panel switch is a standby switch *only*; it is *not* a LINE switch (power disconnecting device).

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**WARNING**      **Install the product so that the detachable power cord is readily identifiable and easily reached by the operator. The detachable power cord is the product disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the product. The front panel switch is only a standby switch and is not a LINE switch. Alternatively, an externally installed switch or circuit breaker (which is readily identifiable and is easily reached by the operator) may be used as a disconnecting device.**

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**CAUTION**      Always use the three-prong AC power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord can cause product damage.

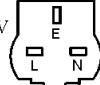



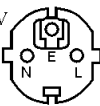
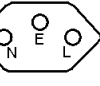

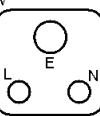

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**CAUTION**      This analyzer has autoranging line voltage input. Be sure the supply voltage is within the specified range. (Refer to the specifications guide for your analyzer.)

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**Table 1-3. AC Power Cords**

Plug Type <sup>a</sup>	Cable Part Number	Plug <sup>b</sup> Description	Length cm (in.)	Cable Color	For Use in Country
250V 	8120-1351	Straight BS 1363 A	229 (90)	Mint Gray	Option 900 United Kingdom, Hong Kong, Cyprus, Nigeria, Singapore, Zimbabwe
	8120-1703	90°	229 (90)	Mint Gray	
250V 	8120-1369	Straight AS 3112	210 (79)	Gray	Option 901 Argentina, Australia, New Zealand, Mainland China
	8120-0696	90°	200 (78)	Gray	
125V 	8120-1378	Straight NEMA 5-15P	203 (80)	Jade Gray	Option 903 United States, Canada, Brazil, Colombia, Mexico, Philippines, Saudi Arabia, Taiwan
	8120-1521	90°	203 (80)	Jade Gray	
125V 	8120-4753	Straight NEMA 5-15P	229 (90)	Gray	Option 918 Japan
	8120-4754	90°	229 (90)	Gray	
250V 	8120-1689	Straight CEE 7/VII	200 (78)	Mint Gray	Option 902 Continental Europe, Central African Republic, United Arab Republic
	8120-1692	90°	200 (78)	Mint Gray	
230V 	8120-2104	Straight SEV Type 12	200 (78)	Gray	Option 906 Switzerland
	8120-2296	90°	200 (78)	Gray	
220V 	8120-2956	Straight SR 107-2-D	200 (78)	Gray	Option 912 Denmark
	8120-2957	90°	200 (78)	Gray	
250V 	8120-4211	Straight IEC 83-B1	200 (78)	Mint Gray	Option 917 South Africa, India
	8120-4600	90°	200 (78)	Mint Gray	
250V 	8120-5182	Straight SI 32	200 (78)	Jade Gray	Option 919 Israel
	8120-5181	90°	200 (78)	Jade Gray	

a. E =earth ground, L = line, and N = neutral.

b. Plug identifier numbers describe the plug only. The part number is for the complete cable assembly.

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## Battery Information

The analyzer uses a lithium battery to enable the internal memory to retain data. The date when the battery was installed is on a label on the rear panel of the analyzer. See Figure 1-1.

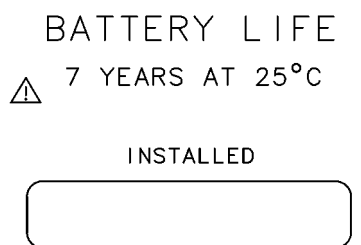
The minimum life expectancy of the battery is 7 years at 25 °C, or 1 year at 55 °C. If you experience problems with the battery or the recommended time period for battery replacement has elapsed, see [“Returning an Analyzer for Service” on page 86](#)

If you wish to replace the battery yourself, you can purchase the service documentation that provides all necessary test and maintenance information.

You can order the service documentation for an Agilent ESA spectrum analyzer through your Agilent Sales and Service office. The documentation is described under [“Options” on page 65](#).

After replacing the analyzer battery, write the date of battery replacement on the rear-panel label.

**Figure 1-1. Rear-Panel Battery Information Label**



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**NOTE** If the analyzer's clock does not work, the problem is the battery. See [“Returning an Analyzer for Service” on page 86](#).

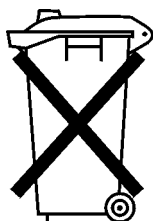
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**WARNING** **Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended. Discard used batteries according to the manufacturer's instructions.**

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DO NOT THROW BATTERIES AWAY BUT COLLECT AS SMALL CHEMICAL WASTE.

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## Turning on the Analyzer for the First Time

- Plug in the power cord.

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**WARNING**     **If this product is to be energized via an external auto transformer for voltage reduction, make sure that its common terminal is connected to a neutral (earthed pole) of the power supply.**

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**CAUTION**     The analyzer is shipped with a a transportation disk inserted in the disk drive to prevent damage to the disk drive during transportation. This transportation disk, or a blank floppy disk, should be inserted in the disk drive whenever transporting the analyzer.

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**NOTE**            Do not connect anything else to the analyzer yet.

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- Choose a power on preference using the switch on the rear panel (refer to [Rear-Panel Features, on page 32](#), item 14). The **PWR ALWAYS ON** setting turns the analyzer on whenever external power is applied. This mode is useful if an external power switch is used to control a rack of several instruments. Nevertheless, if you set the analyzer to standby using the front panel **Standby** key (see [Rear-Panel Features, on page 32](#), item 23) and the external power is removed and restored within 20 seconds, the analyzer will remain in standby.

The **PWR NORM** setting assigns analyzer on/off control to the front-panel **On** and **Standby** keys (see “[Front-Panel Connectors and Keys](#)” on page 24, item 23). If the analyzer is on and the external power is removed and restored within 20 seconds, the analyzer will turn on. On the other hand, if the external power is removed and restored after 20 seconds, the analyzer will remain in standby regardless of the front-panel switch settings.

- Press the | (On) key to turn the analyzer on.

## Information Screen

An information screen appears during the initialization process. The information screen contains the analyzer product number and a URL for accessing product support information on the World Wide Web. See [“Additional Information” on page 2](#).

---

**NOTE** The information screen displays for approximately 10 seconds before the initialization process is complete.

Record the firmware revision and serial number, and keep it for reference. If you should ever need to call Agilent Technologies for service or with any questions regarding your analyzer, it will be helpful to have this information readily available. You can also obtain the firmware revision and serial number by pressing **System, More, Show System**.

---

- Allow the analyzer to warm-up for 5 minutes before making a calibrated measurement. To meet its specifications, the analyzer must meet operating temperature conditions.
- If the analyzer is an Agilent Technologies E4402B, E4403B, E4404B, E4405B, E4407B, or E4408B, connect a BNC cable from the AMPTD REF OUT to INPUT 50  $\Omega$  using an adapter. After a 5 minute warm-up, press **System, Alignments, Align Now, All**.
- 

**CAUTION** When operating in dc coupled mode on analyzers with Option UKB ensure protection of the input mixer by limiting the input level to 0 Vdc, +30 dBm.

When operating in ac coupled mode, ensure protection of the input mixer by limiting the input level to 50 Vdc, +30 dBm.

---

**NOTE** It is normal to hear clicking when the Auto Alignment function is on. See [“Running Internal Alignments” on page 17](#) for more information.

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## Using an External Reference

If you wish to use an external 10 MHz source as the reference frequency, connect an external reference source to the **10 MHz REF IN** connector on the rear panel. The signal level should be greater than  $-15$  dBm.

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**NOTE** It is not necessary to connect the 10 MHz REF OUT to the 10 MHz REF IN on the rear of the analyzer. Doing so results in a “Frequency Reference Error” message.

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1. To use an external frequency reference, connect it to the **EXT REF IN** connector on the rear panel (see [“Rear-Panel Features” on page 32](#)).

## **Firmware Revision**

To view the firmware revision of your analyzer, press **System, More, Show System**. If you call Agilent Technologies regarding your analyzer, it is helpful to have this revision and the analyzer serial number available.



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## Running Internal Alignments

Each time the analyzer is powered on, the internal alignment routine runs automatically.

The analyzer was shipped from the factory with the Alignments mode set to **Auto, Align All**.

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**NOTE** When the Alignment routine runs, you will hear the attenuator settings changing, which generates noise. This is *not* an indication of trouble.

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### Manually Performing an Alignment

If the analyzer is an Agilent Technologies E4402B, E4403B, E4404B, E4405B, E4407B, or E4408B, connect a BNC cable from the AMPTD REF OUT to INPUT 50  $\Omega$  using an adapter. After a 5 minute warm-up, press **System, Alignments, Align Now, All**.

---

**NOTE** It is normal to hear clicking when the Auto Alignment function is on. During the interval between sweeps, portions of the analyzer's circuitry are realigned. Some of the circuitry is controlled by relays. It is the rapid switching of these relays between sweeps which causes the clicking sound. Under normal operation, these relays will last over 50 years.

To eliminate the clicking sound, turn off the automatic alignment. (See the Alignments key description in your User's guide.) With **Auto Align** turned off, however, the Align Now All function should be performed periodically. For more information on how often to perform Align Now All when the Auto Alignment function is off, refer to the appropriate "Specifications and Characteristics" chapter in your specifications guide.

---

If **Auto Align, Off** is selected, refer to the Specifications guide for the conditions required to maintain calibration.

---

## Printer Setup and Operation

A printer can be connected to your analyzer if it is equipped with an external I/O interface. Supported printers accept Hewlett-Packard Printer Control Language Level 3 (PCL3) or 5 (PCL5). Refer to the documentation or specifications supplied with your printer, or contact the manufacturer to identify your printer's language.

### Equipment

- IEEE 1284 compliant printer cable.
- Supported and tested printers are listed below. Note that there are many PCL3/5 printers that may work with your analyzer, however, they have not been tested.
  - PCL3 printers include most HP DeskJet printers.
  - PCL5 printers include most HP LaserJet printers.

---

**NOTE** The following printers are not compatible with your analyzer.

- HP Deskjet 720C, 722C, 820C and 1600C
  - Epson MX-80, FX-85, Stylus, and LQ-570
- 

Printer Models	Language Type	Color Capable
HP DeskJet 310, 320, 350C, 400L	PCL3	yes
HP DeskJet 500C, 550C, 600, 660C, 672C, 680C, 682C, 690C, 693C	PCL3	yes
HP DeskJet 840C, 850C, 870C, 890C, 895C	PCL3	yes
HP DeskJet 935C, 970C, 990C	PCL3	yes
HP DeskJet 1120C, 1150C	PCL3	yes
HP Inkjet 2000C	PCL 3	yes
HP LaserJet III	PCL3/5	no
HP LaserJet 4P	PCL3/5	no
HP LaserJet 5L, 5M, 5N, 5P, 5SI	PCL3/5	no
HP LaserJet 6L, 6MP	PCL5	no
HP LaserJet 2100 Series,	PCL3/5	no
HP LaserJet 4050N	PCL3/5	yes
HP LaserJet 5000GN	PCL3/5	yes
HP Professional Series 2500CM	PCL3	yes
HP Professional Series 2500CM	PCL3	yes

## Interconnection and Setup

1. Turn off the printer and the analyzer.
2. Connect the printer to the analyzer parallel I/O interface connector using an IEEE 1284 compliant parallel printer cable.
3. If appropriate, configure your printer using configuration menus or switches. Refer to your printer's documentation for more specific information on configuring your printer.
4. Turn on the analyzer and printer.
5. Press **Print Setup** on the front panel and then press the **Printer Type** menu key. **Printer Type** accesses the following keys:

<b>None</b>	<b>None</b> disables the analyzer from attempting to print to a printer. This is the appropriate setting if no printer is connected to the analyzer.
<b>Custom</b>	<b>Custom</b> allows you to access the <b>Define Custom</b> menu keys. The <b>Define Custom</b> menu keys allow you to specify printer characteristics such as PCL Level and printer color capability.
<b>Auto</b>	<b>Auto</b> enables the analyzer to automatically attempt to identify the connected printer when the <b>Print</b> key is pressed or when <b>Printer Type</b> is set to <b>Auto</b> .

6. Press **Printer Type** to access the **Printer Type** menu keys. Press **Auto** to make the analyzer attempt to identify the connected printer. When you press **Auto**, the analyzer will respond in one of the three following ways:

- The **Print Setup** menu will be displayed with the **Auto** key selected and no new message will be displayed in the display status line. This indicates that the analyzer has successfully identified the connected printer and no further setup is required. As long as **Auto** remains selected in the **Printer Type** menu, the analyzer will attempt to identify the printer when the front panel **Print** key is pressed. The selected printer will be displayed by pressing **System, More 1 of 3, Show System**.
- The **Print Setup** menu will be displayed with the **Custom** key selected and one of the following diagnostic messages will be displayed in the display status line:

Unknown printer, Define Custom to set up printer

No printer response, Define Custom to set up printer

Invalid printer response, Define Custom to set up printer

This indicates that the analyzer was unable to automatically identify the connected printer, and **Custom** has been selected in the **Printer Type** menu. Press **Print Setup, Define Custom** to select specific printer characteristics such as the printer language (PCL3 or PCL5) and color printing capability. Once you have set these characteristics to match those of your connected printer, the printer setup process is complete. As long as **Custom** remains selected in the **Printer Type** menu, the analyzer will not attempt to automatically identify the connected printer when the front panel **Print** key is pressed.

- The **Print Setup** menu will be displayed with the **None** key selected and the following message will appear in the display status line:

Unsupported printer, Printer Type set to None

This indicates that the analyzer has successfully identified the connected printer, but the printer is not supported by the analyzer. As long as **None** is selected in the **Printer Type** menu, the analyzer will respond to any print command by displaying the message `Printer Type is None` in the display status line.

7. Select the desired paper size by pressing **Print Setup**, **More**, **Page Size**, then choose the appropriate page size for which your printer is configured. This setting will remain unchanged with **Preset** or **Power Cycle**.

The factory default page size is **Letter**. The page size will be reset to **Letter** if **System**, **More**, **Restore Sys Defaults** is executed.

### Testing Printer Operation

When you have completed the analyzer's printer setup, press **Print Setup**, then press **Print** on the front panel. If the printer is ready and the printer setup was successful, a printout of the analyzer display will be printed. If the printer is not ready, the message `Printer Timeout` will appear on the analyzer display. `Printer Timeout` will remain on the display until the printer is ready or until you press **ESC** to cancel the printout request.

---

**NOTE** There may be some small discrepancies in the color mapping of the analyzer display to your color printer. Due to differences in display and printer technologies, the default display colors do not map exactly to the printer colors. For example trace 1 is yellow on your analyzer display while it maps to green on your printer.

---

## Protecting Against Electrostatic Discharge

Electrostatic discharge (ESD) can damage or destroy electronic components (the possibility of unseen damage caused by ESD is present whenever components are transported, stored, or used).

### Test Equipment and ESD

To help reduce ESD damage that can occur while using test equipment:

- Before connecting any coaxial cable to an analyzer connector for the first time each day, momentarily short the center and outer conductors of the cable together.
- Personnel should be grounded with a 1 M  $\Omega$  resistor-isolated wrist-strap before touching the center pin of any connector and before removing any assembly from the analyzer.
- Be sure that all instruments are properly earth-grounded to prevent build-up of static charge.

---

**WARNING**     **Do not use these first three techniques when working on circuitry with a voltage potential greater than 500 volts.**

---

- Perform work on all components or assemblies at a static-safe workstation.
- Keep static-generating materials at least one meter away from all components.
- Store or transport components in static-shielding containers.
- Always handle printed circuit board assemblies by the edges. This reduces the possibility of ESD damage to components and prevent contamination of exposed plating.

For information on ordering static-safe accessories, see “Accessories” on page 77.

### Additional Information about ESD

For more information about ESD and how to prevent ESD damage, contact the Electrostatic Discharge Association (<http://www.esda.org>). The ESD standards developed by this agency are sanctioned by the American National Standards Institute (ANSI).

## Legal Information

---

**WARNING**     **This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall be inserted only in a socket outlet provided with a protective 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.**

**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.**

---

### Warranty

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

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

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

### LIMITATION OF WARRANTY

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

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

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

### EXCLUSIVE REMEDIES

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

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## **2 Front and Rear Panel Features**

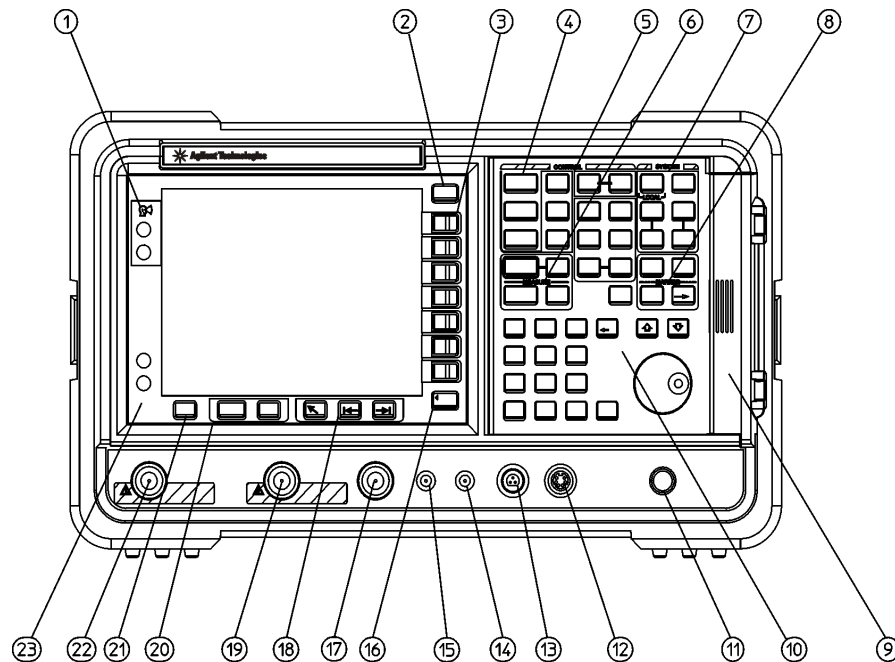
This chapter gives you an overview of the front and rear panels of your analyzer. For details on analyzer keys and remote programming, refer to the User's and Programmer's guides. For connector specifications (including input/output levels), see the Specifications guide.

## Front-Panel Overview

This section provides information on the analyzer's front panel, including:

- Front Panel Connectors and Keys, and
- “Display Annotation” on page 28

### Front-Panel Connectors and Keys



pb938a

- 1 Viewing Angle** keys allow you to adjust the display so that it can be optimally viewed from different angles.
- 2 Esc.** The **Esc** (escape) key cancels any entry in progress. **Esc** will abort a print (if one is in progress) and clear error messages from the status line at the bottom of the display. It also clears input and tracking generator overload conditions.
- 3 Menu keys** are the unlabeled keys next to the screen. The menu key labels are the annotation on the screen next to the unlabeled keys. Most of the labeled keys on the analyzer front panel (also called front-panel keys) access menus of keys having related functions.
- 4 FREQUENCY Channel, SPAN X Scale, and AMPLITUDE Y Scale** are the three large keys that activate the primary analyzer functions and access menus of related functions. The secondary labels on these keys (Channel, X Scale, and Y Scale) are used in some measurements.



- 5 **CONTROL** functions access menus that allow you to adjust the resolution bandwidth, adjust the sweep time, and control the analyzer display. They also set other analyzer parameters needed for making measurements.
- 6 **MEASURE** accesses a menu of keys that automate some common analyzer measurements. Once a measurement is running, **Meas Setup** accesses additional menu keys for defining your measurement. **Meas Control** and **Restart** access additional measurement control functions.
- 7 **SYSTEM** functions affect the state of the entire analyzer.
- Various setup and alignment routines are accessed with the **System** key.
- The green **Preset** key resets the analyzer to a known state.
- The **File** key menu allows you to save and load setups, traces, states, limit-line tables, screens, measurement results, and amplitude correction factors to or from analyzer memory or the floppy disk drive. The **Save** key immediately executes the **Save Now** function defined under **File** in your User's guide.
- The **Print Setup** menu keys allow you to configure hardcopy outputs. The **Print** key immediately sends hardcopy data to the printer. See your User's guide for more details.
- 8 **MARKER** functions control the markers, read out frequencies and amplitudes along the analyzer trace, automatically locate the signals of highest amplitude, and access functions like **Marker Noise** and **Band Power**.
- 9 The **Media Door** on the right side of the front panel accesses the 3.5 inch disk drive and the **Earphone** connector. The earphone connector provides a connection for an earphone jack which bypasses the internal speaker.
- 10 The **Data Control Keys**, which include the step keys, knob, and numeric keypad, allow you to change the numeric value of an active function such as center frequency, start frequency, resolution bandwidth, and marker position.
- The data controls will change the active function in a manner prescribed by that function. For example, you can change center frequency in fine steps with the knob, in discrete steps with the step keys, or to an exact (1 Hz resolution) value with the numeric keypad.
- The **Knob** provides fine incremental changes of functions such as center frequency, reference level, and marker position. Clockwise rotation of the knob increases values. The extent of alteration is determined by the size of the measurement range. The speed at which the knob is turned affects the rate at which the values are changed.

For slow sweeps, the analyzer uses a smooth panning feature which is designed to move the trace display to the latest function value as the knob is turned. When center, stop or, start frequency or reference level is adjusted, the signal will shift right or left or up or down with the rotation of the knob before a new sweep is actually taken. An asterisk is placed in the message block (the upper right-hand corner of the analyzer display) to indicate that the data on the screen does not reflect data at the current setting.

The **Numeric Keypad** allows entry of exact values for many of the analyzer functions. You may include a decimal point in the number portion. If not, the decimal point is placed at the end of the number.

Numeric entries must be terminated with a units key. When a numeric entry is begun, the menu keys show the units key labels. The units keys change depending on what the active function is. For example, the units keys for frequency span are **GHz**, **MHz**, **kHz**, and **Hz**, whereas the units for reference level are **+dBm**, **-dBm**, **mV**, **μV**, and **μA**.

---

**NOTE** If an entry from the numeric keypad does not coincide with an allowed function value (for example, that of a 12 MHz bandwidth), the analyzer defaults to the nearest allowable value.

---

The **Step Keys** (↓ ↑) increase or decrease the active function value. The step size depends upon the current analyzer measurement. Each press results in a single step change. For those parameters with fixed values (resolution bandwidth), the next value in a sequence is selected each time a step key is pressed. Step size is predictable (e.g., 10% of span for center frequency) and can be set for some functions (i.e., center frequency). Out-of-range values or out-of-sequence values will not occur using these keys.

**11** **VOLUME.** The **VOLUME** knob adjusts the volume of the internal speaker. The speaker is turned on and off with the **Speaker On Off** key in the **Det/Demod** menu.

**12** **EXT KEYBOARD.** The **EXT KEYBOARD** connector is a 6-pin mini-DIN connector. The keyboard can be used to enter screen titles and filenames.

---

**NOTE** To avoid damage to the analyzer, always turn off power before plugging a keyboard into the analyzer.

---

**13** **PROBE POWER** provides power for high-impedance ac probes or other accessories. (+15 V, -12.6 V, 150 mA maximum)

**14** **LO OUTPUT** provides the proper local oscillator signal for use with external mixers (Option AYZ).

**15** **IF INPUT** connects to the IF OUTPUT of the external mixer (Option AYZ).

- 16 **Return.** The **Return** key accesses the previously selected menu. Continuing to press **Return** accesses earlier menus. **Return** also terminates entry of alpha numeric functions (e.g., **Title**).
- 17 **AMPTD REF OUT** provides an amplitude reference signal of 50 MHz at  $-20$  dBm. *Agilent ESA models E4402B, E4403B, E4404B, E4405B, E4407B, and E4408B only.*
- 18 **Tab Keys** are used to move around in the **Limit** editor, the **Correction** editor and similar table-driven forms.
- 19 **INPUT 50 $\Omega$**  (**INPUT 75 $\Omega$**  for **Option 1DP**) is the signal input for the analyzer.

---

**CAUTION** When operating in dc coupled mode on analyzers with Option UKB, ensure protection of the input mixer by limiting the input level to 0 Vdc, +30 dBm.

When operating in ac coupled mode, ensure protection of the input mixer by limiting the input level to 50 Vdc, +30 dBm.

---

- 20 The **Next Window** key can be used to select the active window in functions which support split-screen display modes, such as **Zone** markers. (Refer to “**Zone**” in the User’s guide for more information.) In such modes, pressing **Zoom** allows you to switch between the split-screen and full-sized display of the active window.
- 21 **Help.** Press the **Help** key and then any front panel or menu key to get a short description of the key function and the associated SCPI command. The next key you press will remove the help window from the display.
- 22 **RF OUT 50 $\Omega$**  for Option 1DN or **RF OUT 75 $\Omega$**  (**for Option 1DQ**) is the source output for the built-in tracking generator. Option 1DN or 1DQ only.

---

**CAUTION** If the tracking generator output power is too high, it may damage the device under test. Do not exceed the maximum power that the device under test can tolerate.

---

- 23 The | (**On**) key turns the analyzer on, while the **Standby** key turns most of the analyzer off. An analyzer alignment is performed (if **Auto Align** is on) every time the analyzer is turned on. After turning on the analyzer, allow 5 minutes of warm-up time to ensure the analyzer will meet all specifications.

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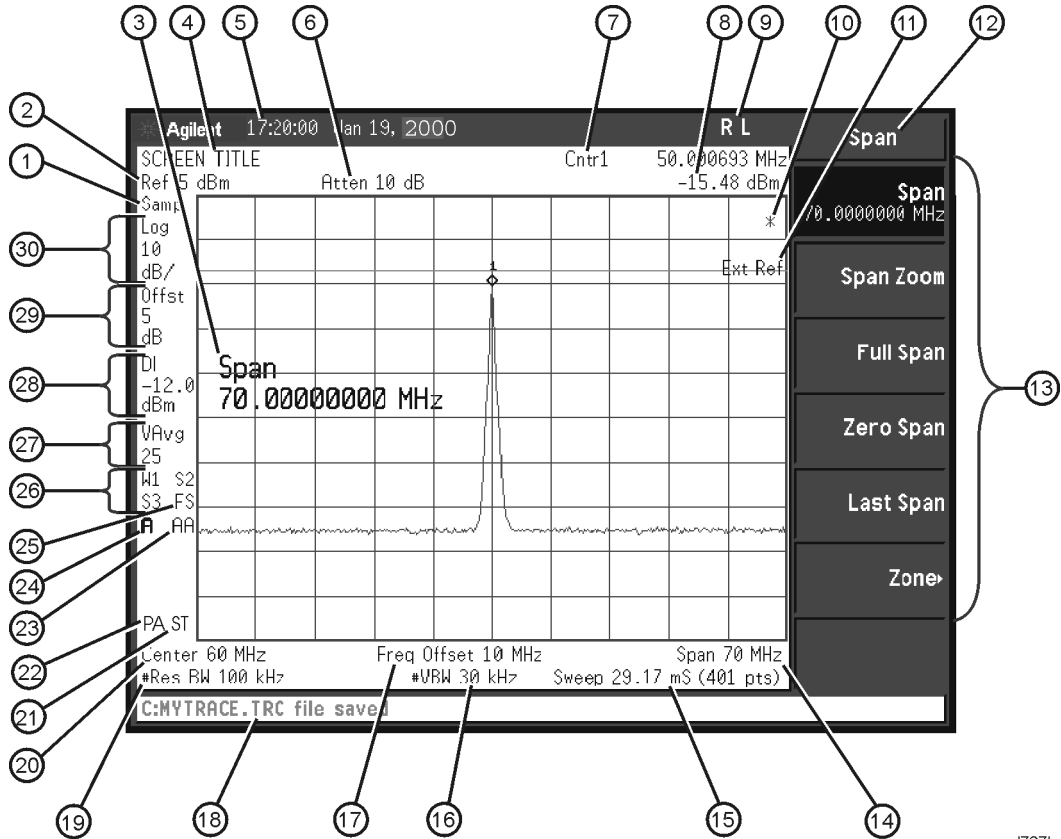
**NOTE** The analyzer continues to draw power even if the line power switch is in standby. The detachable power cord is the analyzer disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the analyzer. The front-panel switch is only a standby switch and is not a **LINE** switch (disconnecting device).

---

## Display Annotation

Here is an example of the annotation that may appear on an analyzer display. The display annotation is referenced by numbers which are listed in the following table. The Function Key column indicates which key activates the function related to the annotation. Refer to your User's guide for more information on a specific function key.

**Figure 2-1. Screen Annotation**



pl727b

**Table 2-1. Screen Annotation**

Item	Description	Function Key
1 <sup>a</sup>	Detector mode	Detector
2	Reference level	Ref Level
3	Active function block	Refer to the description of the activated function.
4	Screen title	Change Title
5	Time and date display	Time/Date On Off
6 <sup>a,b</sup>	RF attenuation	Attenuation Auto Man

**Table 2-1. Screen Annotation (Continued)**

Item	Description	Function Key
7	Marker frequency	<b>Marker</b> or <b>Marker Count On Off</b>
8	Marker amplitude	<b>Marker</b>
9	GPIB annunciators	See Table 2-2. on page 32 for more information.
10 <sup>c</sup>	Data invalid indicator	<b>Sweep (Single)</b> or <b>View/Trace</b>
11	Status Informational messages	See your Instrument Messages and Functional Tests manual for more information.
12	Key menu title	Dependent on key selection.
13	Key menu	See key label descriptions in the User's guide for more information.
14	Frequency span or stop frequency	<b>Span</b> or <b>Stop Freq</b>
15 <sup>a</sup>	Sweep time/Points	<b>Sweep Time Auto Man, Sweep Points</b>
16 <sup>a</sup>	Video bandwidth	<b>Video BW Auto Man</b>
17	Frequency offset	<b>Freq Offset</b>
18	Display status line	Displays analyzer status and error messages. Cleared by pressing <b>Esc</b> key. See your User's guide for more information.
19 <sup>a</sup>	Resolution bandwidth	<b>Resolution BW Auto Man</b>
20	Center frequency or start frequency	<b>Center Freq</b> or <b>Start Freq</b>
21	Signal track	<b>Frequency, Signal Track</b>
22	Internal preamp	<b>Amplitude, Int Preamp</b>
23 <sup>d</sup>	Auto alignment routine is on	<b>Auto Align</b>
24	Amplitude corrections are on (This indicates that the overall correction state is On. There may be any or none of the individual corrections On.)	<b>Correction On Off</b>
25	Trigger/Sweep	<b>Trig, Sweep</b> See tables below for more information.
26	Trace mode	<b>Trace</b> See tables below for more information.

**Table 2-1. Screen Annotation (Continued)**

Item	Description	Function Key
27	Average	<b>Average On Off</b> V <sub>Avg</sub> indicates video average on. P <sub>Avg</sub> indicates power average on.
28	Display line	<b>Display Line On Off</b>
29	Amplitude offset	<b>Ref Lvl Offst</b>
30	Amplitude scale	<b>Scale Type Log Lin</b>

- a. A # in front of any display annotation indicates that the function is uncoupled. (Refer to your User's guide)
- b. When the analyzer is set to the external mixer state (Option AYZ), item 6 changes to display Ext Mix in place of Atten XdB. In addition, if Mixer Bias is on, a +I or -I is appended to Ext Mix.
- c. When the (\*) is displayed, it means that some or all trace data may not match the annotation due to possible changes in analyzer settings.
- d. AA indicates that auto alignment of all analyzer parameters, except the tracking generator and FM demodulation options, will occur. AB indicates that auto alignment of all analyzer functions except the RF section (and tracking generator and FM demodulation options) will occur. No indicator will appear if auto alignment is off.

Refer to the following tables for the screen annotation codes for trace, trigger, and sweep modes.

**Table 2-2. Screen Annotation for GPIB Annunciators**

Screen Annotation	Description
R	Remote Operation
L	GPIB Listen
T	GPIB Talk
S	GPIB SRQ

**Table 2-3. Screen Annotation for Trigger Mode**

Screen Annotation	Description
F	Free Run
L	Line
V	Video
E	External
T <sup>a</sup>	TV
B <sup>b</sup>	RF Burst

- a. Option BAA and B7B only.
- b. Option B7E only.

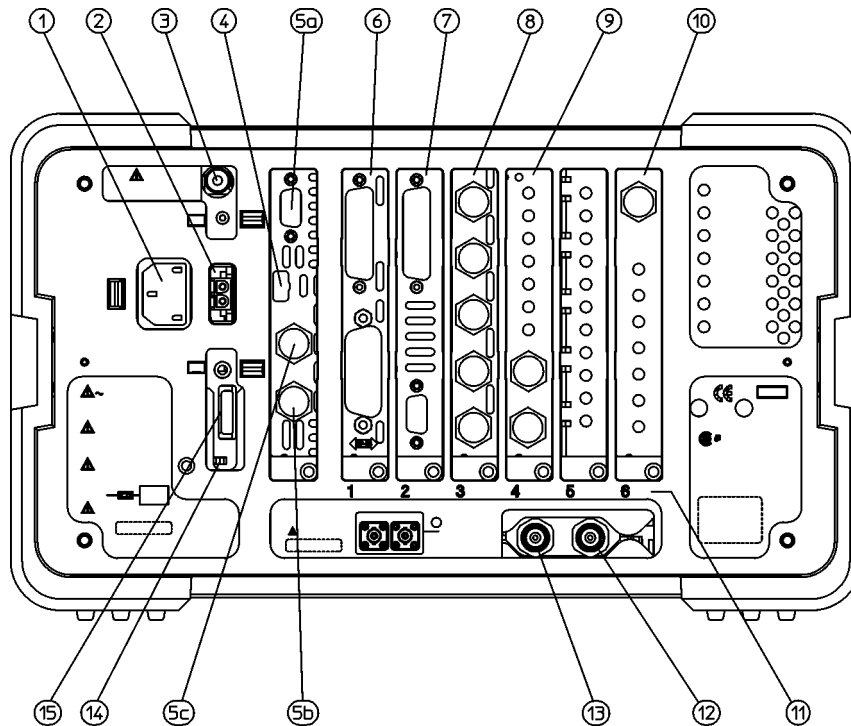
**Table 2-4. Screen Annotation for Sweep Mode**

Screen Annotation	Description
C	Continuous
S	Single Sweep

**Table 2-5. Screen Annotation for Trace Mode**

Screen Annotation	Description
W	Clear Write
M	Maximum Hold
V	View
S	Store Blank
m	Minimum Hold
1	Trace 1
2	Trace 2
3	Trace 3

## Rear-Panel Features



pl722

- 1 **Power input** is the input for the ac line power source. Make sure that the line-power source outlet has a protective ground contact.
- 2 **DC Power** is the input for the dc power source. Refer to the “Power Requirements” section in the specifications guide for your analyzer.

---

**CAUTION** AC line power and dc power should not be plugged in simultaneously.

---

- 3 **Line Fuse.** The fuse is removed by twisting counterclockwise 1/4 turn. Replace only with a fuse of the same rating. See the label on the rear panel.
- 4 **Service Connector.** The service connector is for service use only.



**5 Inputs/Outputs** (Refer to the specifications guide for more information.)

- 5a** **VGA OUTPUT** drives an external VGA compatible monitor with a signal that has 31.5 kHz horizontal, 60 Hz vertical synchronizing rate, non-interlaced.
- 5b** **GATE/HI SWP OUT (TTL)** is high when the analyzer is sweeping or when **Gate** (Option 1D6) is active.
- 5c** **GATE TRIG/EXT TRIG IN (TTL)** accepts the positive edge of an external voltage input that triggers the analyzer internal sweep source or the gate function (Time Gate, Option 1D6).

Table 2-6. and Table 2-7. show the appropriate rear panel slots to be used for the optional cards available with the Agilent ESA Spectrum Analyzers. Refer to Table 2-6. if you have an Agilent ESA-L Series Spectrum Analyzer. Refer to Table 2-7. if you have an Agilent ESA-E Series Spectrum Analyzer.

- (P) = Preferred Card Slot
- (A) = Acceptable Card Slot
- (-) = Unacceptable Card Slot

**Table 2-6. Agilent ESA-L Series (E4403B, E4408B, E4411B)**

Slot #	1	2	5	6
GPIB and Parallel (Option A4H)	P	A	-	-
Serial and Parallel Interface (Option 1AX)	P	A	-	-
IF, Video, and Sweep Ports (Option A4J)	-	-	P	-
Frequency Extension <sup>a</sup>		-	-	P

a. The Frequency Extension Assembly comes standard with the Agilent E4408B.

**Table 2-7. Agilent ESA-E Series (E4401B, E4402B, E4404B, E4405B, E4407B)**

Slot #	1 <sup>a</sup>	2	3	4	5	6
GPIB and Parallel Interface (Option A4H) <sup>b</sup>	P	A	A	A	–	–
RS-232 and Parallel Interface (Option 1AX) <sup>b</sup>	P	A	A	A	–	–
Fast Time Domain Sweeps (Option AXX) <sup>c</sup>	–	A	P	A	–	–
IF, Video, and Sweep Ports (Option A4J) <sup>c</sup>	A	A	A	A	P	A
FM Demodulation (Option BAA) <sup>d</sup>	–	A	P	A	A	A
Frequency Extension <sup>e</sup>	–	A	A	A	A	P
Digital Signal Processing and Fast ADC (Option B7D)	–	–	–	P	–	–
RF Communications Hardware (Option B7E)	–	–	–	–	P	–
ACPR Dynamic Range Extension (Option 120)	–	P	A	A	A	A
Bluetooth™ <sup>f</sup> FM Demodulation (Option 106) <sup>d,g</sup>	–	A	P	A	A	A

- a. Some cards may not be installed due to mechanical interference.  
b. Only one optional remote interface (Option A4H or Option 1AX) can be installed at a time.  
c. Only one IF and Sweep Port option (Option A4J or Option AXX) can be installed at a time.  
d. Only one demod option (Option BAA or Option 106) can be installed at a time.  
e. The Frequency Extension Assembly comes standard with the Agilent E4404B, E4405B and E4407B.  
f. Bluetooth™ is a trademark owned by its proprietor and used by Agilent Technologies under license.  
g. Option 106 is required to make measurements in Bluetooth™ Measurement Personality (Option 228)

- 6 GPIB and parallel interface (Option A4H) is an optional interface. GPIB supports remote analyzer operation. A parallel port is included for printing only.
- 7 RS-232 and parallel interface (Option 1AX) is an optional interface. RS-232 supports remote analyzer operation. A parallel port is included for printing only.

---

**NOTE** Printing is only supported from the parallel port.

---

**8 IF, Video, and Sweep Ports** (Option A4J or Option AYX): (Refer to the specifications guide for more information.)

---

**NOTE** Only one IF and Sweep Port option (Option A4J or Option AYX) can be installed at a time.

---

**SWP OUT** provides a voltage ramp corresponding to the sweep of the analyzer (0 V to 10 V).

**HI SWP IN (TTL)** can be grounded to stop and reset the sweep. Once the sweep has been stopped, removing the ground will trigger the start of a new sweep.

**HI SWP OUT (TTL)** is high when the analyzer is sweeping.

**AUX VIDEO OUT** provides detected video output (before the analog-to-digital conversion) proportional to vertical deflection of the trace. Output is from 0 V to 1 V. Amplitude-correction factors are not applied to this signal.

**AUX IF OUT** is a 50  $\Omega$ , 21.4 MHz IF output that is the down-converted signal of the RF input of the analyzer. Amplitude-correction factors are not applied to this signal. This output is taken after the resolution bandwidth filters and step gains and before the log amplifier.

**9 FM Demod** (Option BAA) allows you to demodulate, display, and measure deviation on FM signals. You can listen to audio signals on a built-in speaker or with an earphone. Refer to “[FM Demodulation \(Option BAA\)](#)” in the [Chapter 5 , “Options and Accessories,”](#) on page 55 for more information.

Bluetooth™ FM Demodulation (Option 106) allows you to demodulate, display and measure deviation on Bluetooth™ signals. Refer to “[Bluetooth™ FM Demodulation \(Option 106\)](#)” in the [Chapter 5 , “Options and Accessories,”](#) on page 55 for more information.

**10 Frequency Extension Assembly** controls the microwave front-end components in the Agilent E4404B, E4405B, E4407B, and E4408B.

**PRESEL TUNE OUTPUT** provides a signal to control external preselected mixers if [External Mixing \(Option AYZ\)](#) is installed.

**11 Card Slot Identification Numbers.** Refer to Table 2-6. and Table 2-7. for card slot versus option card compatibility information.

**12 10 MHz REF IN** accepts an external frequency source to provide the 10 MHz, -15 to +10 dBm as a timebase.

---

**NOTE** It is not necessary to connect the 10 MHz REF OUT to the 10 MHz REF IN on the rear panel of the analyzer. Doing so will result in a Frequency Reference Error message.

---

13 **10 MHz REF OUT** provides a 10 MHz, 0 dBm minimum, timebase reference signal.

14 **Power On Selection** selects an analyzer power preference.

The **PWR ALWAYS ON** setting turns the analyzer on whenever external power is applied. This mode is useful if an external power switch is used to control a rack of several instruments. Nevertheless, if you set the analyzer to standby using the front panel **Standby** key (see Figure 2-1. on page 22, item 23) and the external power is removed and restored within 20 seconds, the analyzer will remain in standby.

Power Always On		
Analyzer state before removing power	A lapse in power < 20 sec.	A lapse in power > 20 sec.
On	On	On
Standby	Standby	On

The **PWR NORM** setting assigns analyzer on/off control to the front-panel **On** and **Standby** keys (see Figure 2-1. on page 22, item 23). If the analyzer is on and the external power is removed and restored within 20 seconds, the analyzer will turn on. On the other hand, if the external power is removed and restored after 20 seconds, the analyzer will remain in standby regardless of the front panel switch settings.

Power Norm		
Analyzer state before removing power	A lapse in power < 20 sec.	A lapse in power > 20 sec.
On	On	Standby
Standby	Standby	Standby

15 **DC Fuse** protects the analyzer from drawing too much dc power. Replace only with a fuse of the same rating. See the label on the rear panel.

---

## Key Overview

The keys labeled **FREQUENCY Channel**, **System**, and **Marker** are all examples of front-panel keys. The front-panel keys are dark gray, light gray, green, or white in color. Front-panel keys that are white perform an immediate action rather than bringing up a menu. The only green key is the **Preset** key, which performs an analyzer reset (A summary of all front panel keys and their related menu keys can be found in user's guide for your analyzer). Pressing most of the dark or light gray front-panel keys accesses menus of functions that are displayed along the right side of the display. These are called menu keys.

Menu keys list functions other than those accessed directly by the front panel keys. To activate a menu key function, press the key immediately to the right of the annotation on the screen. The menu keys that are displayed depend on which front-panel key is pressed and which menu level is enabled.

If a menu key function's value can be changed, it is called an active function. The function label of the active function is highlighted after that key has been selected. For example, press **AMPLITUDE Y Scale**. This calls up the menu of related amplitude functions. Note the function labeled **Ref Level** (the default selected key in the Amplitude menu) is highlighted. **Ref Level** also appears in the active function block, indicating that it is the active amplitude function and can now be changed using any of the data entry controls.

A menu key with **On** and **Off** in its label can be used to turn the menu key's function on or off. To turn the function on, press the menu key so that **On** is underlined. To turn the function off, press the menu key so that **Off** is underlined. In the manual, when **On** should be underlined, it will be indicated as **Function (On)**.

A function with **Auto** and **Man** in the label can either be auto-coupled or have its value manually changed. The value of the function can be changed manually using the numeric keypad, knob, or step keys. To auto-couple a function, press the menu key so that **Auto** is underlined. In the manual, when **Auto** should be underlined, it will be indicated as **Function (Auto)**.

In some key menus, one key label will always be highlighted to show which key has been selected. For example, when you press **Marker**, you will access a menu of keys in which some of the keys are grouped together by a blue bar (on analyzers with a color display) on the left side of the menu. The **Normal** key, which is the **Marker** menu default key, will be highlighted. When you press another key within the blue bar region, such as **Delta**, the highlight will move to that key to show it has been selected.

In other key menus, one key label will always be highlighted to show which key has been selected but the menu is immediately exited when a selection is made. For example, when you press the **Orientation** key (on the **Print Setup** menu), it will bring up its own menu of keys. The **Portrait** key, which is the **Orientation** menu default key, will be highlighted. When you press the **Landscape** key, the highlight will move to that key to show it has been selected and the screen will return to the **Print Setup** menu.

## Front and Rear Panel Symbols



This symbol is used to indicate power ON.



This symbol is used to indicate power STANDBY mode.



This symbol indicates the input power required is AC.



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



The CE mark is a registered trademark of the European Community.



The C-Tick mark is a registered trademark of the Australian Spectrum Management Agency.



This is a symbol of an Industrial Scientific and Medical Group 1 Class A product.



The CSA mark is a registered trademark of the Canadian Standards Association.

---

## **3 Making a Basic Measurement**

This chapter provides information on basic analyzer operation. For more information on making measurements, see the measurement guide for your analyzer.

This chapter is divided into the following sections:

- [“Using the Front Panel”](#) on page 41.

- [“Presetting the Spectrum Analyzer”](#) on page 42.
- [“Viewing a Signal”](#) on page 43.

---

**CAUTION**

Ensure that the total power of all signals at the analyzer input does *not* exceed +30 dBm (1 watt).

---

**Basic Assumption**

The material in this chapter is presented with the assumption that you understand the analyzer’s front and rear panel layout, and display annotations. If you do not, refer to [“Front and Rear Panel Features”](#) on page 23.



## Using the Front Panel

### Entering Data


When setting measurement parameters, there are several ways to enter or modify the value of the *active* function:

- Knob** Increments or decrements the current value.
- Arrow Keys** Increments or decrements the current value.
- Numeric Keypad** Enters a specific value. Then press the desired terminator (either a unit softkey, or the **Enter** hardkey).
- Unit Softkeys** Terminate a value that requires a unit-of-measurement.
- Enter Key** Terminates an entry when either no unit of measure is needed, or you want to use the default unit.


### Using Menu Keys

Menu Keys (which appear along the right side of the display) provide access to many analyzer functions. Here are examples of menu key types:

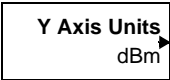
**Toggle** Allows you to activate/deactivate states.

*Example:*  Toggles the selection (underlined choice) each time you press the key.

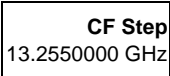
**Submenu** Displays a new menu of softkeys.

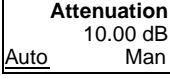
*Example:*  A submenu key allows you to view a new menu of softkeys related to the submenu key category.

**Choice** Allows you to make a selection from a list of values.

*Example:*  A choice key displays the currently selected submenu choice, in this example, dBm. When the choice is made, the submenu automatically returns.

**Adjust** Highlights the softkey and sets the active function.

*Examples:*  Press this type of key and enter a value.

 The default for softkeys with an automatic (**Auto**) or manual (**Man**) choice is automatic. *After* you enter a value, the selection changes to manual. You can also press the softkey twice to change to manual.

## Presetting the Spectrum Analyzer

Preset provides a known starting point for making measurements. The analyzer has three types of preset:

- Factory Preset** Restores the analyzer to its factory-defined state.
- User Preset** Restores the analyzer to a user-defined state.
- Mode Preset** This type of preset restores the currently selected mode to a known state.

For details, see the User's guide.

When **Preset Type** is set to **Factory**, pressing the green **Preset** key triggers a factory preset. When **Preset Type** is set to **User**, pressing **Preset** displays the softkeys **Factory Preset**, **User Preset**, and **Mode Preset** (if applicable); you then select the preset you want. If **Preset Type** is set to **Mode**, but a personality is not installed, pressing **Preset** triggers a factory preset.

### Creating a User Preset

If you constantly use settings which are not the factory defaults, use the following steps to create a user-defined preset:

1. Set analyzer parameters as desired.
2. Press **System, Power On/Preset, Save User Preset** to set the current parameters as the user preset state.
3. Press **Preset** to select **User** in the same softkey menu to enable user preset as an option.

### Disabling User Preset

Go to the **Power On/Preset** menu (press **System, Power On/Preset**) and select a **Preset Type** of **Factory** or **Mode**.

---

## Viewing a Signal

1. Press **Preset**. If the softkeys **Factory Preset** and **User Preset** appear, select **Factory Preset**.
2. Connect the analyzer's rear panel 10 MHz REF OUT to the front-panel input.

### Setting Reference Level and Center Frequency

---

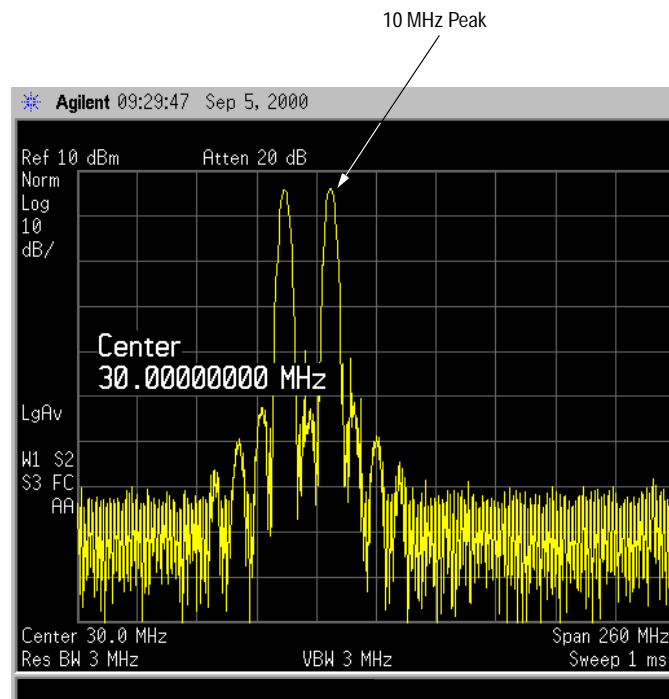
**NOTE** The display examples in this section are made using various analyzer models, you may see some variations depending upon your analyzer.

---

3. Set the reference level to 10 dBm: Press **AMPLITUDE**, **10, dBm**.
4. Set the center frequency to 30 MHz: Press **FREQUENCY**, **Center Freq, 30, MHz**.

The 10 MHz reference signal spectrum appears on the display, as shown in Figure 3-1.

**Figure 3-1** 10 MHz Internal Reference Signal and Associated Spectrum

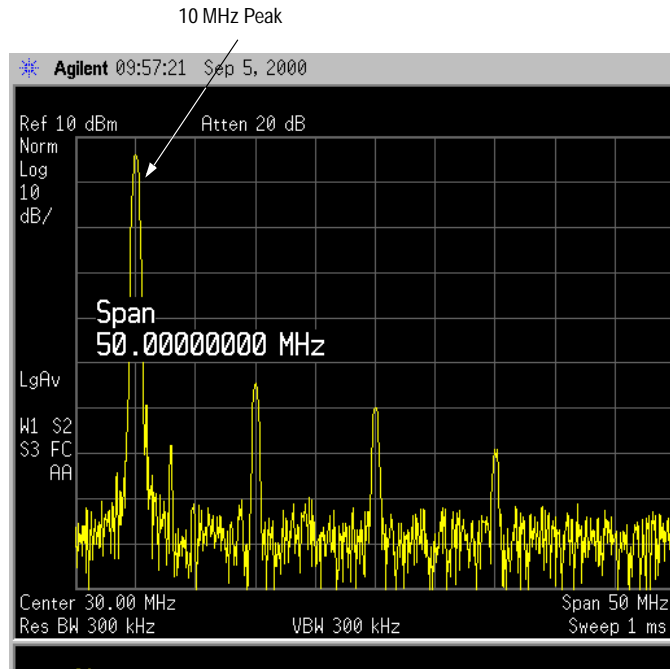


### Setting Frequency Span

5. Set the frequency span to 50 MHz: Press **SPAN, 5, 0, MHz**.

This displays the signal as shown in Figure 3-2.

**Figure 3-2 Span Changed to 50 MHz**



### Reading Frequency & Amplitude

6. Place a marker (labeled 1) on the 10 MHz peak, as shown in Figure 3-3.

Press **Peak Search**.

Note that the frequency and amplitude of the marker appear both in the active function block, and in the upper-right corner of the screen. You can use the knob, the arrow keys, or the softkeys in the Peak Search menu to move the marker. Pressing **Esc** removes the value from the display.

7. If you have moved the marker, return it to the peak of the 10 MHz signal.

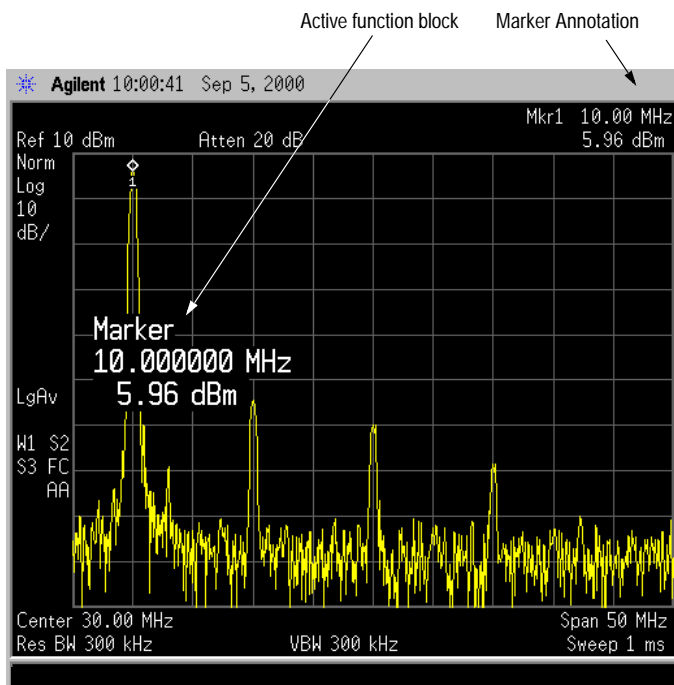
### Changing Reference Level

8. Press **AMPLITUDE**, and note that reference level (Ref Level) is now the active function. Press **Marker →, Mkr → Ref Lvl**.

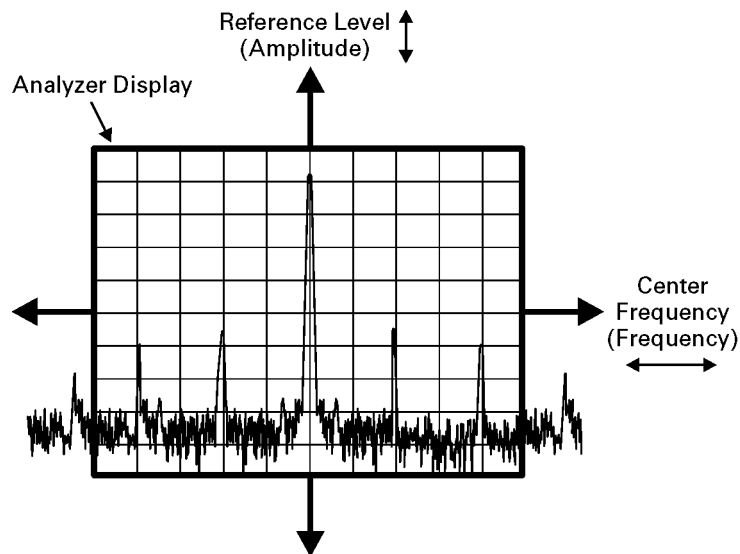
Note that changing the reference level changes the amplitude value of the top graticule line.

Figure 3-4 shows the relationship between center frequency and reference level. The box represents the analyzer display. Changing the center frequency changes the horizontal placement of the signal on the display. Changing the reference level changes the vertical placement of the signal on the display. Increasing the span increases the frequency range that appears horizontally across the display.

**Figure 3-3 A Marker on the 10 MHz Peak**



**Figure 3-4 Relationship Between Frequency and Amplitude**



bd21\_5l.cdr

## Improving Frequency Accuracy

9. While not all of the zeros following the decimal in the active function block are significant, the numbers after the decimal in the marker annotation (upper-right corner of screen) *are* significant. To improve the accuracy of the frequency reading in the marker annotation, turn on the frequency count function by pressing **Freq Count**.
10. Note softkey **Marker Count On Off**. If **Off** is underlined, press the softkey to toggle marker count on.

As shown in Figure 3-5:

- The marker annotation changes from **Mkr1** to **Cntrl**.
- The displayed resolution in the marker annotation improves.

---

**NOTE** When you use the frequency count function, if the ratio of the resolution bandwidth to the span is less than 0.002, the following message appears on the display: **Marker Count: Widen Res BW**

This indicates that the resolution bandwidth is too narrow.

---

11. Press **Marker** →, **Mkr** → **CF** to move the 10 MHz peak to the center of the display.

## Valid Marker Count Range

12. Move the marker down the skirt of the 10 MHz peak. Note that although the readout in the active function changes, as long as the marker is at least 26 dB above the noise, the counted value (upper-right corner of display) does not change (see Figure 3-6). For an accurate count, the marker does not have to be at the exact peak.

---

**NOTE** Marker count functions properly only on CW signals or discrete peaks. For a valid reading, the marker must be  $\geq 26$  dB above the noise.

---

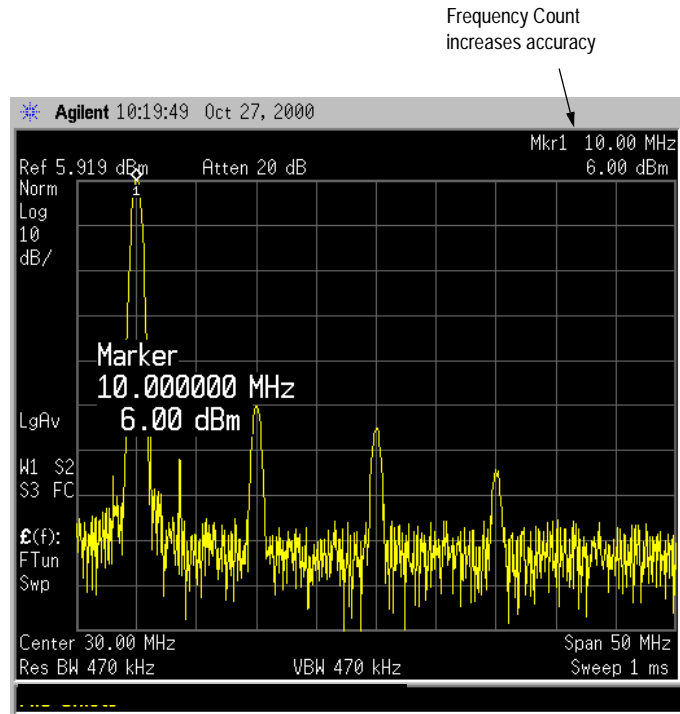
13. Press **BW/Avg**, **Res BW**, then enter a new value. This action makes the resolution bandwidth the active function and allows you to experiment with different resolution bandwidth (RBW) values.
14. Press **Marker**, **Off** to turn the marker off.

---

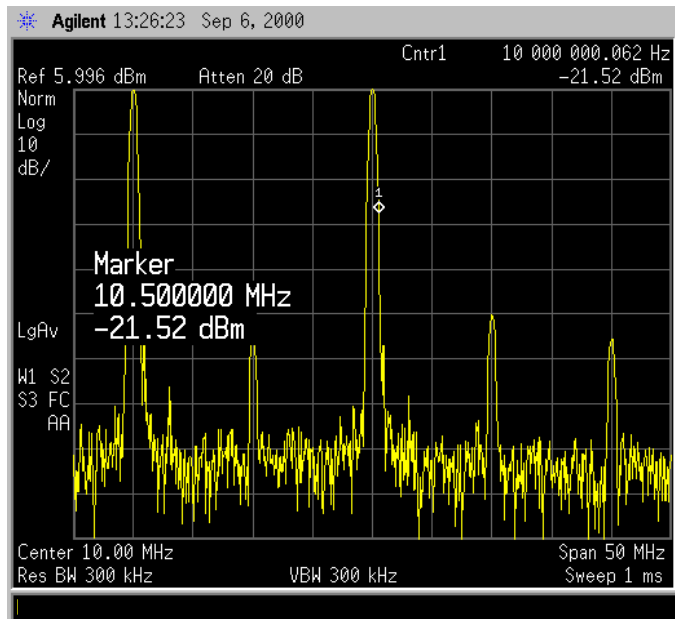
**NOTE** After properly setting the analyzer to display your signal, you can save the settings as either a user preset (press **System**, **Power On/Preset**, **Save User Preset**), or a file (see “[Saving a File](#)” on page 54).

---

**Figure 3-5** Increasing Marker Frequency Accuracy



**Figure 3-6** Using Marker Counter



Making a Basic Measurement  
Viewing a Signal



---

## **4 Viewing Catalogs and Saving Files**

## File Menu Functions

This chapter describes how to use the functions located under the front-panel **File** key. Data storage and retrieval are handled similarly to that of personal computers (PCs). Like PCs, these analyzers include an internal storage drive and a floppy disk drive, both of which have directory and sub-directory capability.

---

**NOTE** The descriptions in this section assume the analyzer has firmware revision A.04.00 or later. The file menu functions in earlier firmware are different. If you would like to upgrade your analyzer to the latest firmware revision, please visit the following web site:

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

---

You will learn how to do all of the following:

- locate and view files in the catalog
- create a directory
- format a floppy disk
- save a file
- load a file
- rename a file
- copy a file
- delete a file

---

**NOTE** The display examples in this section are made using various analyzer models, you may see some variations depending upon your analyzer.

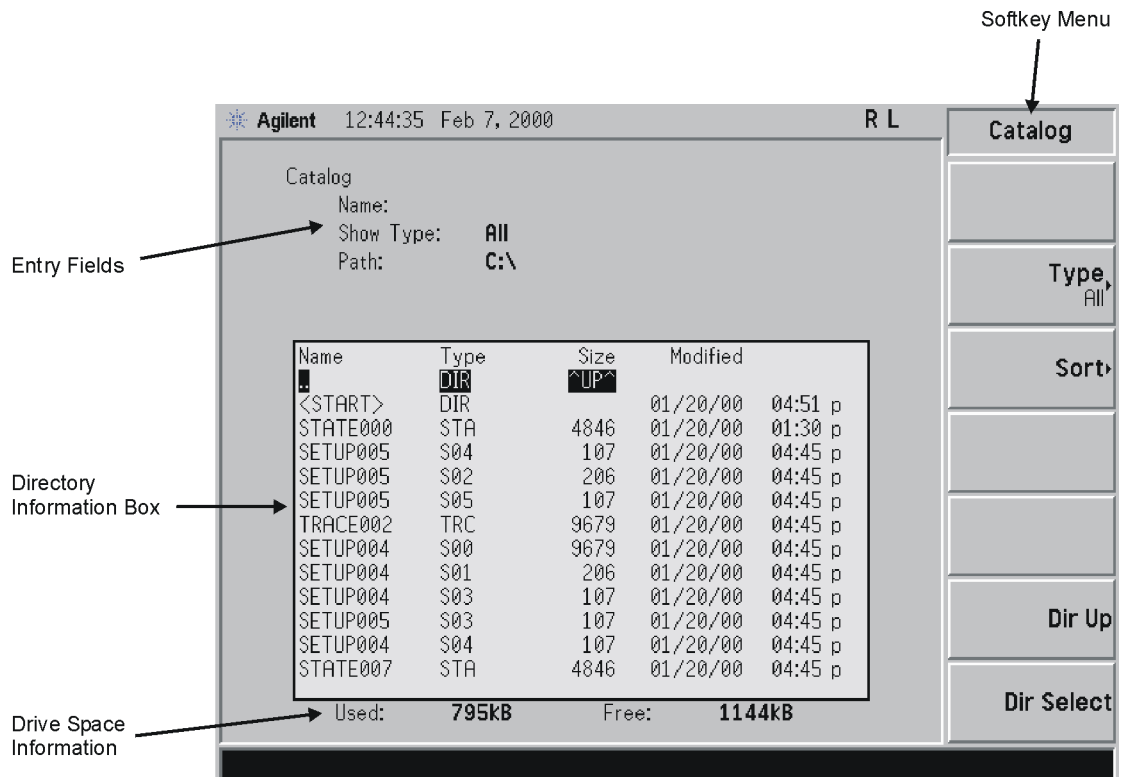
---

### Locating and viewing files in the catalog

Techniques for locating files and directories are consistent throughout the various file menu functions. Although this section provides specific information about navigation in the catalog, you may wish to refer back to this section when performing other operations of the file menu.

Press **File, Catalog** to bring up a screen display as shown in Figure 4-1.

**Figure 4-1. Catalog Menu**



pl72e

1. The entry fields show the parameters for the files viewed. Entry fields that are being modified or are modifiable are indicated by highlighting (inverse video). Each file menu function has its own unique set of entry fields pertaining to that function. Below are the fields listed under the catalog key:
  - a. Name: field states the filename.
  - b. Show Type: field displays the type of files viewed.
  - c. Path: field displays the drive and directory location of the files.
2. The directory information box displays the drives, directories, and/or files currently described in the entry fields. Highlighting a row of information selects that location and updates the entry fields. There are four column headings in this area of the display. They are described as follows:
  - a. Name: column states the drive ([ -A- ] or [ -C- ]) if at the top level on the drive, directory name, or filename.
  - b. Type: column displays the extension of the filename, for example, .SET, .STA, .TRC. Directories are displayed as DIR and drives have nothing listed under Type: . They are only designated by the Name: column ([ -A- ] or [ -C- ]).
  - c. Size: column displays the size of the file in bytes.
  - d. Modified: column displays the date and time the last change occurred.

3. The softkey menu has four options:
  - a. **Type:** allows you to choose the type of file you wish to view. (You may view all types by using the **All** key under **Type**.)
  - b. **Sort:** Under the **Sort** key, you can sort by any of the four columns and you can choose up (ascending) or down (descending).
  - c. **Dir Up:** moves you up one directory level. If you are already at the top level, this key moves you up to the drive level, displaying the available disk drives.
  - d. **Dir Select:** moves you down into the highlighted directory or up into the next level (directory or drive) if the “. . .” under the **Name:** column is highlighted.

---

**NOTE** Navigation keys: Use the front-panel **Step Keys** or **Knob** and the **Dir Up** or **Dir Select** keys to move around in the directory information box.

---

4. The drive space line shows the number of bytes used on the drive and the number of bytes still free on the drive.

## Creating a directory

Directories and sub-directories can be created on both the A: floppy disc and the internal C: drive. This allows maximum flexibility in organizing files. For this example, we will create a directory on the C: drive.

1. Press **File**, **More 1 of 2**, **Create Dir**. Your screen should look similar to Figure 4-1, except the entry fields will be **Dir Name:** and **Path:** and the **Heading** will read: **Directories**.
2. Navigate through the file system until the **Path:** field displays **C:\**. (Use the **Step Keys**, **Knob**, **Dir Up**, and/or **Dir Select** keys.)
3. Press **Name** and enter the name, “**START**” using the Alpha Editor. (The numeric keypad is also available for the filename.) Press **Enter** (hardkey) when the **Dir Name:** field contains this directory title. (Use the **Bk Sp** hardkey on the front panel to make corrections.)
4. Press **Create Dir Now** to execute the operation. The message: **Creating Directory** appears on the screen. Then the status bar displays: **Directory C:\START created**.
5. To make a sub-directory, scroll down to the **START** directory you just created and press **Dir Select**. The **Path:** field should now read: **C:\START\**. Repeat **Steps 3 and 4** above, using a *new name*. The status bar now should read: **Directory C:\START\new name created**.

## Formatting a Floppy Disk

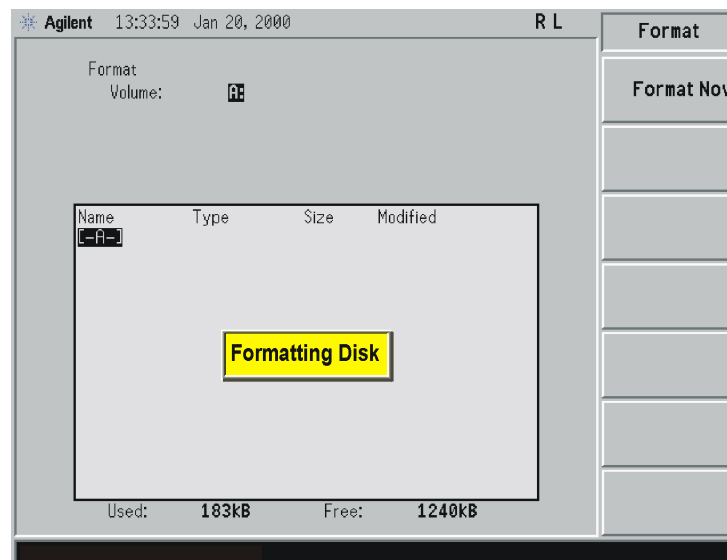
You can format a floppy disk in the analyzer. The format is MS-DOS®. Note that it is not necessary to format your floppy disk with the analyzer; preformatted disks can be used with the analyzer.

1. Place the 1.44-MB disk you wish to format into the floppy drive (A:\) of the analyzer. Only 1.44-MB floppy disks are supported by the analyzer. Therefore, 720-kB floppy disks will not work reliably.
2. Access the **Format** key by pressing **File, More**, and then **Format**. The directory information box is active (highlighted), however, only the floppy disk volume [ -A- ] is shown on the display.

The directory information box displays all files present on the floppy disk inserted in drive “A:”. If you have not inserted a disk into drive “A:”, or the disk you are attempting to format has no pre-existing formatting, the error message: bad, missing, or unformatted disk is displayed in the status line.

3. Press **Format Now**. The following message appears in the display window: **WARNING: You are about to destroy ALL data on Volume A:.** Press **Format Now** again to proceed or any other key to abort. **To abort disk format, press any key but Format Now. When a disk is formatted, all data on the disk is destroyed.**
4. Press **Format Now** a second time to format the disk. You will see the message: **Formatting Disk** in the display window. Pressing any other key after receiving the warning in step 3 on [page 53](#), will abort the formatting process. See Figure 4-2. The format process takes approximately three minutes.

**Figure 4-2. Format Menu**



5. When formatting is complete, a message, **Volume A: formatted** appears on the status line. The disk is now ready to save files.

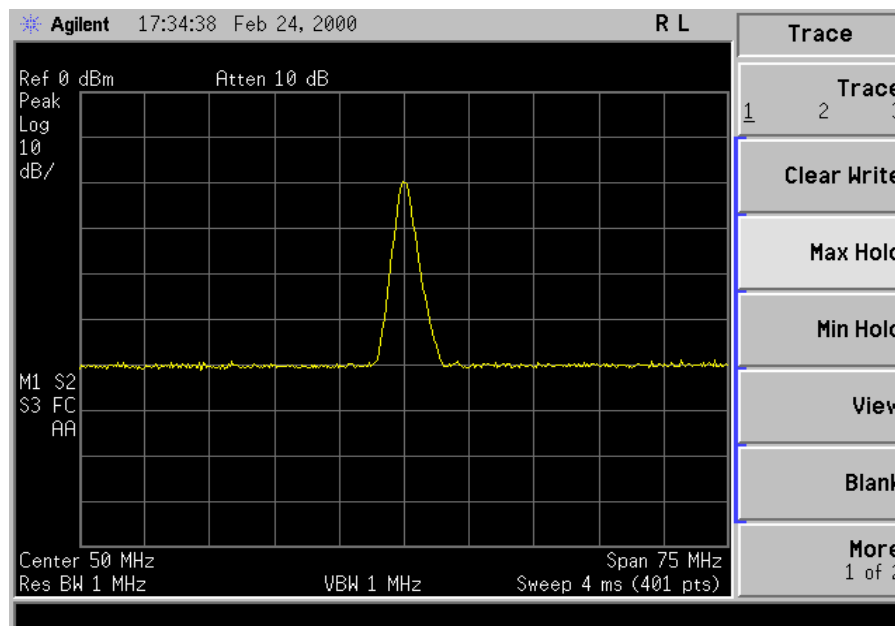
## Saving a File

You can save files (setups, states, traces, limits, corrections, measurement results, or screens) to a floppy disk (A:\), or the internal drive (C:\). In this example you will save a trace to the internal C: drive.

### Step 1. Set up the analyzer trace

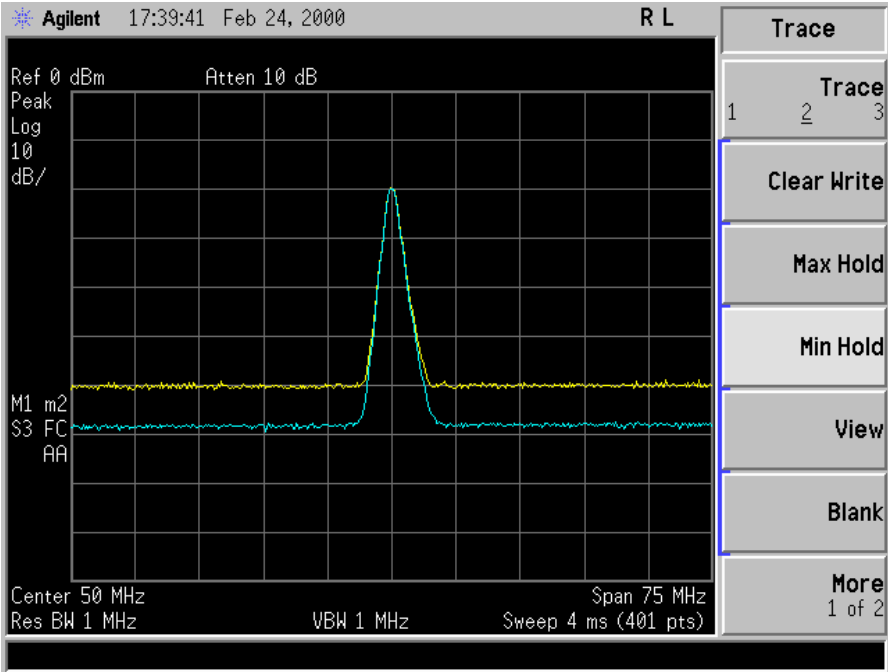
1. Perform a factory preset by pressing **Preset**, **Factory Preset** (if present).
2. Turn on the internal 50 MHz alignment signal of the analyzer as follows:
  - For the *Agilent E4401B and E4411B*, use the internal 50 MHz alignment signal of the analyzer as the signal being measured. Press **Input/Output**, **Amptd Ref (On)**.
  - For all other models connect a cable between the front-panel AMPTD REF OUT to the analyzer INPUT, then press **Input/Output**, **Amptd Ref Out (On)**.
3. Set the center frequency to 50 MHz by pressing **FREQUENCY**, **Center Freq**, **50**, **MHz**.
4. Set the span to 75 MHz by pressing **SPAN**, **Span**, **75**, **MHz**. The reference signal will appear on the display.
5. View trace 1 and put it into maximum hold by pressing **View/Trace**, **Max Hold**. (Trace 1 should already be underlined, but if not, press **Trace 1 2 3** until 1 is underlined and then press **Max Hold**.) Your analyzer display should look similar to Figure 4-3.

**Figure 4-3. Viewing Trace 1**



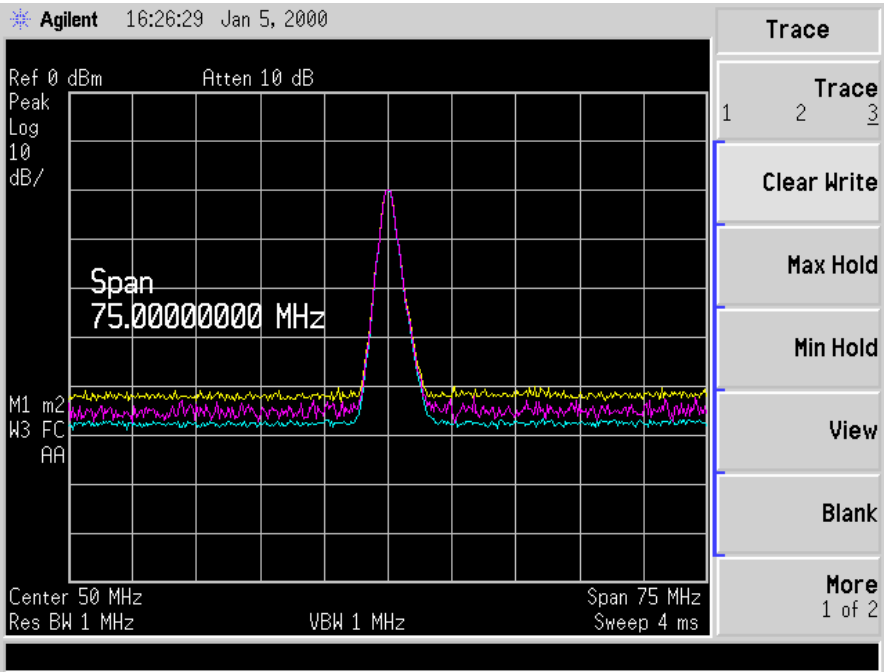
6. Activate trace 2 and put it into minimum hold by pressing **Trace (2)**, **Min Hold**. Your analyzer display should look similar to Figure 4-4.

**Figure 4-4. Viewing Traces 1 and 2**



7. Activate trace 3 by pressing Trace (3), Clear Write. Your analyzer display should look similar to Figure 4-5.

**Figure 4-5. Viewing Traces 1, 2, and 3**



## Step 2. Save the file

1. To access the **Save** menu, press, **File, Save**.
2. Select the type of file you want to save. In this example you are saving a trace; press **Type, Trace**.
3. Select the trace you wish to save (1, 2, 3, or all traces). In this example you will save trace 3; press **Source** (softkey), **Trace 3**.
4. Select the format you wish to use for saving the trace, either trace plus state (**Trace + State**) or comma separated value (**CSV**). In this example you will save as trace plus state; press **Format, Trace + State**.
5. Enter a filename by pressing **Name**. The Alpha Editor appears. For this example you will name the file, "TEST1". (The numeric keypad is also available for the filename.) Note that the file extension is always set by the system and for this file type the extension is `TRC`. You must now press the **Enter** (hardkey) to get back to the **Save** menu.

---

**NOTE** You need to use a filename that does not already exist in the current directory. The filename is limited to eight characters, alpha (A-Z) or numeric (0-9) in any combination. The analyzer will not allow you to overwrite an existing file. If you select a filename that already exists, the status bar will display the message: `File already exists`. If you do not choose a filename, the analyzer will automatically generate a name based on the type of file you are saving (**Setup: SETUP, State: STATE, Trace: TRACE, Limits: LIMIT, Corrections: COREC, Screen: SCREN**). It also generates a three digit integer (starting at 000 and extending through 999, remembering the previously saved value through a power cycle) which it adds to the name, for example: `TRACE056.TRC`. Also note that this three digit integer increments upon each attempted save until a unique filename is created, without regard to the success of the save.

---

6. The destination for the saved file is shown in the `Path:` field. In this example, you will select the path as `C:\START\`. If the correct location is not listed in the `Path:` field, change directories as follows:
  - a. Press **Dir Up** or **Dir Select** and use the step keys or knob, to highlight the desired destination directory.
  - b. Press **Dir Select** and confirm your choice displayed in the `Path:` field.
7. Press **Save Now** or **Save** (hardkey) to save the file to the `C:\Start\` location. The message **Saving Now** is displayed during this operation. For this example, the status line displays: `C:\START\TEST1.TRC file saved`.

---

**NOTE** When saving to drive (A:), never remove the floppy disk during the save operation. To do so could corrupt *all* data on the floppy disk.

---



## Loading a file

1. Reset the analyzer by pressing **Preset, Factory Preset** (if present).
2. To access the **Load** menu, press **File, Load**.
3. Select the type of file you want to load (setup, state, trace, limits, or corrections). In this example you are loading a trace file; press **Type, Trace**.

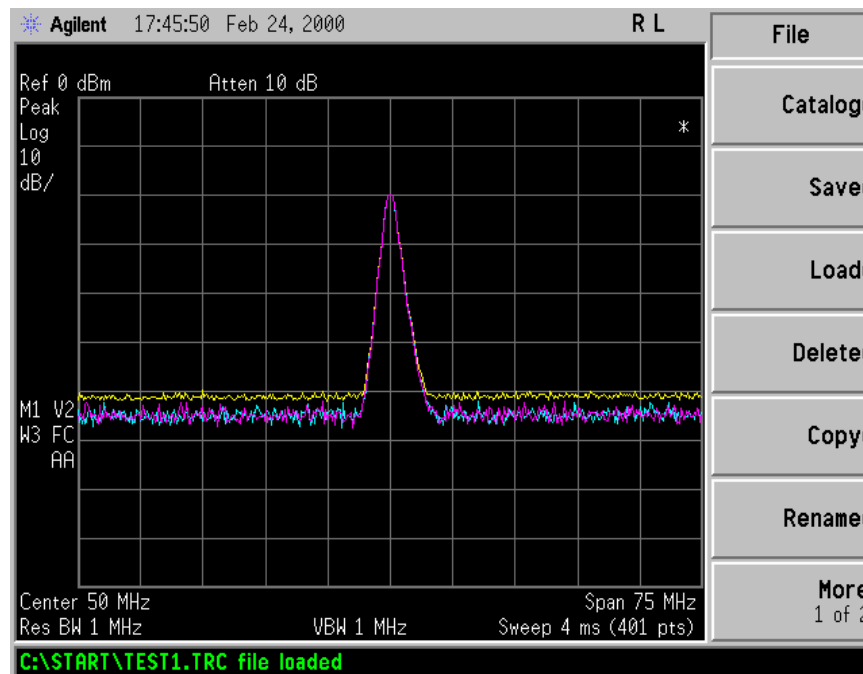
---

**NOTE** Not all file types can be loaded back into the analyzer. For example, Screen files and CSV (comma separated value) files cannot be loaded. CSV and Screen files are designed for use with a PC.

---

4. Select the directory where your file is located. In this example, select the **C:\START\** directory. (Use the front-panel step keys, knob, **Dir Up**, and/or **Dir Select** keys to locate the directory.)
5. Select the file you want to load into the analyzer by moving the cursor with the front-panel knob to highlight the file name. In this example the file is **TEST1.TRC**. Select the trace into which you wish to load the file. In this example, load it into Trace 2. (**Destination, Trace 2**).
6. Press **Load Now** to load the specified file. Your display should look similar to Figure 4-6. The status bar reads: **C:\START\TEST1.TRC file loaded**.

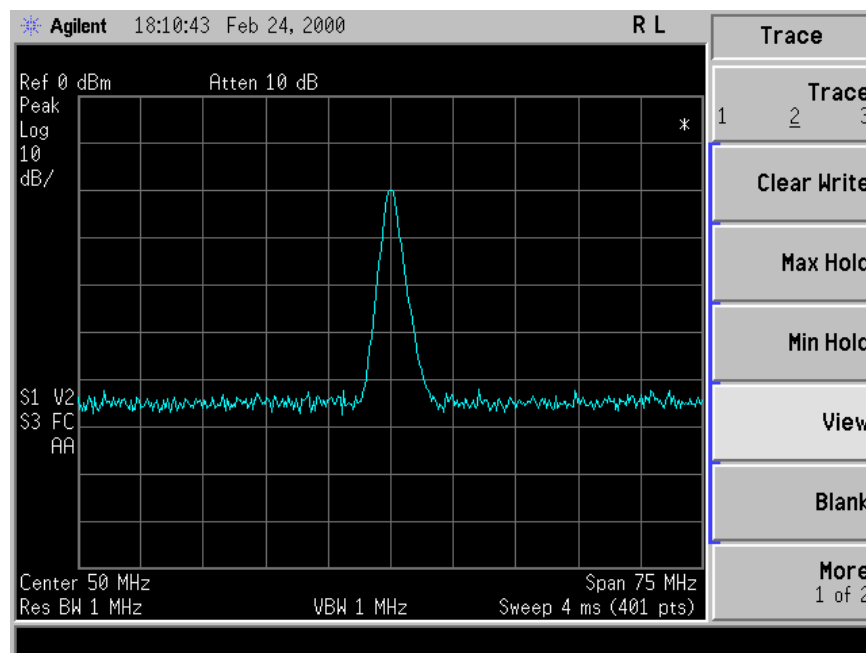
**Figure 4-6. File Loaded**



**NOTE** You should notice that the trace you saved, in this example trace 3, is loaded to trace 2. If you wish to verify this condition, remove the signal input. For Agilent E4401B and E4411B, press **Input/Output, Amptd Ref (Off)**, for all other models, press **Input/Output, Amptd Ref Out (Off)**.

Note that when a trace is loaded, it is placed in view mode. To see that trace 2 is in view mode, blank traces 1 and 3 by pressing **View/Trace, Trace 1, Blank, Trace 3, Blank**. Then press Trace 2. Notice that trace 2 is the only trace displayed in view mode (the view key is selected, and the trace is not sweeping). Your display should look similar to Figure 4-7.

**Figure 4-7. Verifying Trace 1**



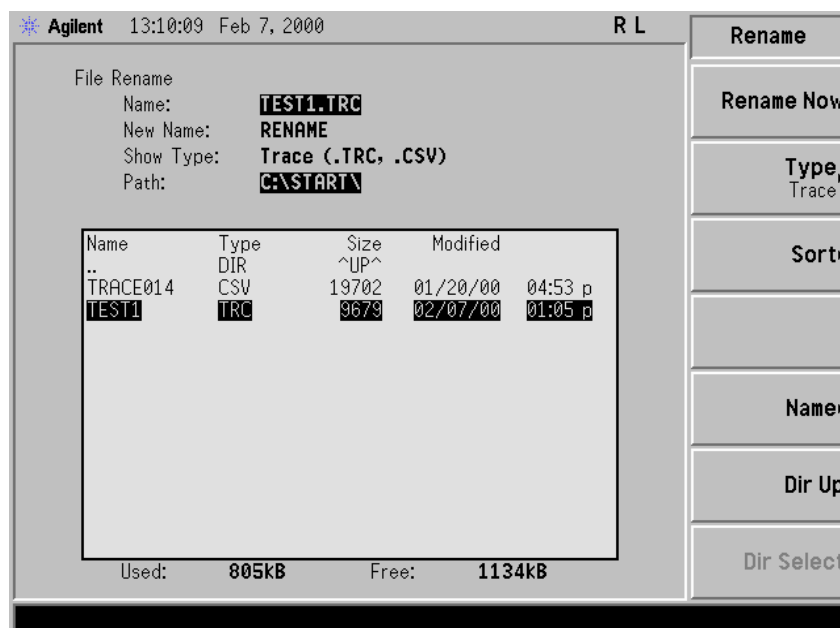
**CAUTION** When operating in dc coupled mode, ensure protection of the input mixer by limiting the input level to 0 Vdc and +30 dBm.

**NOTE** When loading Limits files, be sure you have selected the appropriate X Axis Units: frequency or time (Display, Limits, Properties, 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 the frequency domain. The reverse of this situation also holds true.

## Renaming a File

1. To access the **Rename** menu, press **File, Rename**.
2. Select the type of file you want to rename (setup, state, trace, limits, screens, or corrections). In this example you are renaming a trace file; press **Type, Trace**.
3. Select the drive and directory where your file is located. In this example, choose drive **C:\START**.
4. Select the file you want to rename. In this example, choose the file **TEST1.TRC**.
5. Press **Name** to open the Alpha Editor menu. For this example, rename the file to **RENAME** using the Alpha Editor softkeys. (The **Name:** field is limited to eight characters.) Your display should look similar to Figure 4-8.
6. Press **Enter, Rename Now:** your file is now renamed and visible within the directory displayed on your analyzer. The status line displays the message: **C:\START\TEST1.TRC file renamed to C:\START\RENAME.TRC.**

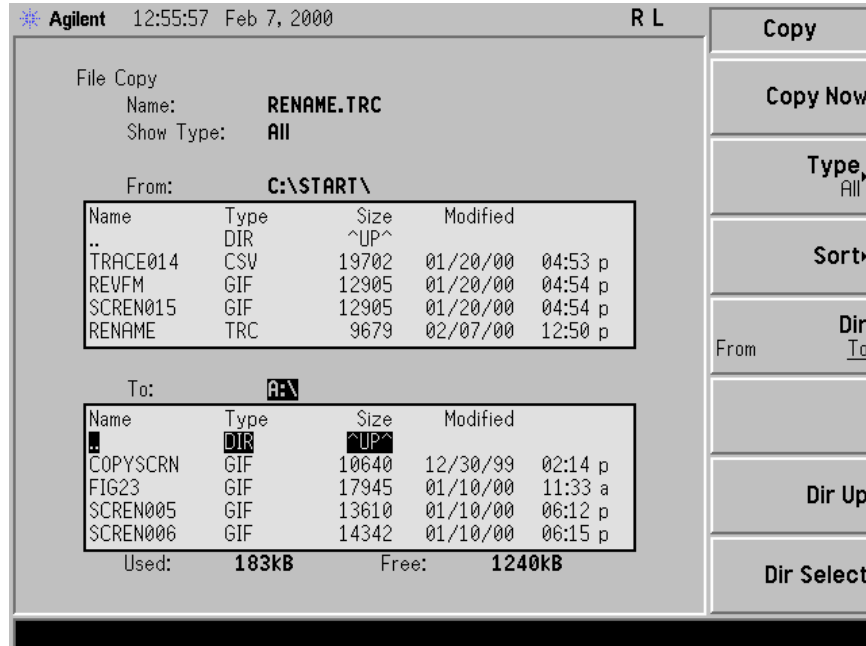
**Figure 4-8. Renaming a File**



## Copying a File

1. To access the Copy menu, press **File, Copy**. This menu function brings up 2 directory boxes as described by the **From:** and **To:** fields located directly above the boxes. Refer to Figure 4-9.

**Figure 4-9. Copy Menu**



2. Put a formatted floppy in the A: drive.
3. Select the type of file you want to copy (setup, state, trace, limits, screens, or corrections). In this example you are copying a trace file from the C: drive to the A: drive; press, **Type, Trace**.
4. Press **Dir** (in the key menu) to underline **From:**. Notice the **From:** field (just above the top directory box) highlights the location from which you will be copying. Using the navigation keys (**Dir Up**, **Direct select**, step keys, or front panel knob), locate the C: \START\ directory.
5. Scroll to highlight the file displayed in the directory box from which you wish to copy. In this example, you will need to highlight the file **RENAME**.
6. Press **Dir** (in the key menu) to underline **To:**. The **To:** field (just above the bottom directory box) is highlighting the location to which you will be copying. Using the navigation keys as described above, highlight the A: \ drive.

---

**NOTE** When pressing **Dir (To)**, the file chosen in the **From:** location is no longer highlighted, however the **Name:** field above the **From** directory box displays the chosen file; in this example: **RENAME.TRC**.

---

---

**NOTE** Highlighting a filename in the **To:** directory box has no significance. The file cannot be placed inside another file.

---

7. Press **Copy Now** to execute the operation. The message: "Copying file" is displayed during the copying process. Upon completion, the status bar reads: "C:\START\RENAME.TRC file copied". You have now copied the file **RENAME** from the C: drive to the A: drive.

## Deleting a File

1. To access the Delete menu, press **File, Delete**.
2. Select the type of file you want to delete (setup, state, trace, limits, screens, or corrections). In this example, you are deleting a trace file; press **Type, Trace**.
3. Select the drive and directory where the file you wish to delete is located. In this example, choose **C:\START\**. Use the navigation keys (**Dir Up, Dir Select**, step keys, front panel knob) to highlight this location in the **Path:** field. (Refer to "[Locating and viewing files in the catalog](#)" on page 50 for more instructions.)
4. Select the file you want to delete. In this example, choose the file **RENAME.TRC**. Move the cursor with the navigation keys to highlight the file name.
5. Press **Delete Now**. The message: **Deleting file pops up on the display during the operation**. Upon completion, the status bar reads: **C:\START\RENAME.TRC file deleted**. Your file is now deleted and is no longer visible in the directory displayed on your analyzer.

## Using the Alpha Editor

The Alpha Editor enables you to select letters to enter a name for a file or directory (**File**, **Rename**, for example).

1. Use the **More** keys to display the softkey that lists the character you want. Each softkey has several characters on it.
2. When you press a softkey, its characters are displayed on individual softkeys.
3. Select the one you want.

---

## **5 Options and Accessories**

This chapter lists options and accessories available for your analyzer.

## Ordering Options and Accessories

Options and accessories help you configure the analyzer for your specific applications, and enable you to use the analyzer.

### Options (see [page 65](#))

All options are available when you order a spectrum analyzer; some options are also available as kits that you can order and install after you receive the analyzer. Order kits through your local Agilent Sales and Service Office.

At the time of analyzer purchase, options can be ordered using your product number and the number of the option you are ordering. For example, if you are ordering Option 1D6 for an Agilent E4401B, you would order E4401B 1D6.

If you are ordering an option after the purchase of your analyzer, you will need to add a U (for upgrade) to the product number and then specify which option you are ordering.

If you know the option you wish to order, refer to Table on page 78 which is in ascending order by option number. The options are described below, they are listed in alphabetical order by name for your review, see “Option Descriptions” on page 67.

### Accessories (see [page 77](#))

Order accessories through your local Agilent Sales and Service Office.



## Options

Option	E4411B	E4401B	E4402B	E4403B	E4404B	E4405B	E4407B	E4408B
042	Gray Backpack carrying case	•	•	•	•	•	•	•
044	Yellow Backpack carrying case	•	•	•	•	•	•	•
060	Low Emission <sup>ab</sup>		•	•		•	•	
106	Bluetooth™ FM Demodulation <sup>c</sup>			•		•	•	
120	ACPR Dynamic Range Extension			•		•	•	
225	Distance to Fault Measurement Personality		•	•		•	•	
226	Phase Noise Measurement Personality		•	•		•	•	
227	Cable TV Measurement Personality		•	•		•	•	
228	Bluetooth™ Measurement Personality			•		•	•	
229	Modulation Analysis			•		•	•	
230	Benchlink Web Remote Control Software <sup>d</sup>		•	•		•	•	
231	ESA to 89600 Series Software Link Utility			•		•	•	
290	8590 Series Programming Code <sup>e</sup> Compatibility	•	•	•	•	•	•	•
304	Bluetooth™ Premium Bundle			•		•	•	
0B0	Delete Manual Set	•	•	•	•	•	•	•
0B1	Add Manual Set	•	•	•	•	•	•	•
0BV	Service Documentation, Component Level	•	•	•	•	•	•	•
0BW	Service Documentation, Assembly Level	•	•	•	•	•	•	•
1AX	RS-232 and Parallel Interface <sup>e</sup>	•	•	•	•	•	•	•
1CP	Rack Mount with Handles	•	•	•	•	•	•	•
1D5	High Stability Frequency Reference		•	•		•	•	
1D6	Time-Gated Spectrum Analysis		•	•		•	•	
1D7	50 to 75 Ohm Matching Pad	•	•	•	•	•	•	•
1DN	50 Ohm Tracking Generator	•	•	•	•	•	•	•
1DP	75 Ohm input <sup>f</sup>	•	•					
1DQ	75 Ohm Tracking Generator <sup>g</sup>	•	•					

Options and Accessories  
Options

Option		E4411B	E4401B	E4402B	E4403B	E4404B	E4405B	E4407B	E4408B
1DR	Narrow Resolution Bandwidths		•	•		•	•	•	
1DS	RF Preamplifier		•	•		•	•	•	
A4H	GPIB and Parallel Interface <sup>h</sup>	•	•	•	•	•	•	•	•
A4J	IF, Video and Sweep Ports <sup>i</sup>	•	•	•	•	•	•	•	•
A5D	DC Power Cable	•	•	•	•	•	•	•	•
AXT	Transit Case	•	•	•	•	•	•	•	•
AYT	Gray Soft Carrying/Operating Case	•	•	•	•	•	•	•	•
AYU	Yellow Carrying/Operating Case	•	•	•	•	•	•	•	•
AYX	Fast Time Domain Sweeps <sup>j</sup>		•	•		•	•	•	
AYZ	External Mixing							•	
B70	Benchlink Spectrum Analyzer	•	•	•	•	•	•	•	•
B72	Enhanced Memory <sup>k</sup>	•	•	•	•	•	•	•	•
B74	RF and Digital Communications Hardware			•		•	•	•	
B75	Performance Bundle <sup>f</sup>		•	•		•	•	•	
B7B	TV Trigger and Picture on Screen <sup>l</sup>		•	•		•	•	•	
B7D	Digital Signal Processing and Fast ADC <sup>m</sup>			•		•	•	•	
B7E	RF Communications Hardware			•		•	•	•	
B7K	Distance to Fault Accessory Kit		•	•		•	•	•	
BAA	FM Demodulation <sup>n</sup>		•	•		•	•	•	
BAB	APC 3.5 Input Connector							•	•
BAC	cdmaOne Measurement Personality			•		•	•	•	
BAH	GSM Measurement Personality			•		•	•	•	
UE2	Firmware Upgrade Kit	•	•	•	•	•	•	•	•
UKB	Low Frequency Extension <sup>o</sup>			•		•	•	•	
UK6	Commercial Calibration <sup>f</sup>	•	•	•	•	•	•	•	•
UK9	Front Panel Cover	•	•	•	•	•	•	•	•
W32	3 Year Calibration Contract	•	•	•	•	•	•	•	•

Option		E4411B	E4401B	E4402B	E4403B	E4404B	E4405B	E4407B	E4408B
W50	5 Year Service Support	•	•	•	•	•	•	•	•
W52	5 Year Calibration Contract	•	•	•	•	•	•	•	•

- a. This option is incompatible with Option B7B.
- b. This option operates only with ac input power. Battery or dc power will not enable this option on the analyzer.
- c. Option 106 is incompatible with Option BAA.
- d. This option requires Option A4H or 1AX.
- e. Option 1AX is incompatible with Option A4H
- f. This option is only available at time of purchase.
- g. This option has a 75 Ohm output impedance, and is only available with Option 1DP.
- h. Option A4H is incompatible with Option 1AX.
- i. Option A4J is incompatible with Option AXX.
- j. Option AXX contains functionality of Option A4J.
- k. Standard on analyzers with serial numbers greater than US41440000 or MY41440000
- l. Option B7B requires Option BAA.
- m. Option B7D contains Fast ADC compatibility of Option AXX, but does not contain functionality of Option A4J.
- n. Option BAA is incompatible with Option 106
- o. Option UKB requires Option 1DR.

## Option Descriptions

Each option is described below in alphabetical order.

### 12 Vdc Power Cable (Option A5D)

Option A5D provides a 12 Vdc power cable that allows your analyzer to be powered from 12 V automotive or truck batteries.

### 3 Year Calibration Contract (Option W32)

Option W32 provides your analyzer with a 3 year analyzer calibration contract.

### 5 Year Calibration Contract (Option W52)

Option W52 provides your analyzer with a 5 year analyzer calibration contract.

### 5 Year Service Support (Option W50)

Option W50 provides your analyzer with a total of 5 years of service support. This adds a 2 year service contract to the analyzer's base 3 year warranty.

### 50 $\Omega$ to 75 $\Omega$ Matching Pad (Option 1D7)

This option provides a 50  $\Omega$  to 75  $\Omega$  matching pad with dc block to be used on the analyzer input. The pad has a frequency range of  $\leq$  MHz to 2 GHz. It adapts your standard 50  $\Omega$  analyzer to be compatible with a 75  $\Omega$  system under test. Connector types are 50  $\Omega$  Type-N (m) to 75  $\Omega$  BNC (f).

### **50 Ohm Tracking Generator (Option 1DN)**

Option 1DN provides a 9 kHz to 1.5 GHz built-in tracking generator for the Agilent E4401B and the Agilent E4411B. Option 1DN provides a 9 kHz to 3 GHz built-in tracking generator for the Agilent E4402B, E4403B, E4404B, E4405B, E4407B and E4408B. This source creates a source-receiver combination that allows insertion-loss, frequency response, and return-loss measurements. The tracking generator has a wide distortion-free dynamic range, plus good sensitivity and selectivity.

### **75 Ohm Input Impedance (Option 1DP)**

This option provides a 75  $\Omega$  input impedance instead of the standard 50  $\Omega$  impedance. Analyzers with this option use cables, circuit boards, and front panels that are different from the standard units. Option 1DP is only available on the Agilent E4401B and E4411B.

Option 1DP is not available after the purchase of your analyzer.

### **75 Ohm Tracking Generator (Option 1DQ)**

Option 1DQ provides a 1 MHz to 1.5 GHz built-in tracking generator for the Agilent E4401B and the Agilent E4411B. This source creates a source-receiver combination that allows insertion-loss, frequency response, and return-loss measurements. The tracking generator has a wide distortion-free dynamic range, plus good sensitivity and selectivity.

Option 1DQ has a 75  $\Omega$  output impedance, and is only available with Option 1DP.

### **8590 Series Programming Code Compatibility (Option 290)**

Option 290 allows use of a limited set of 8590 Series programming commands to control the ESA Series analyzers. When this option is installed on an ESA analyzer, remote programming using SCPI commands is not possible. This option must be uninstalled to restore SCPI programming functionality.

### **ACPR Dynamic Range Extension (Option 120)**

Option 120 provides extended dynamic range for ACPR measurements by improving phase noise at offsets 800 kHz to 8 MHz.

### **Additional Manual Set (Option 0B1)**

Option 0B1 provides an additional copy of the User's, Calibration, Specifications, and Reference guides for your instrument.

### **APC 3.5 Input Connector (Option BAB)**

The type-N female connector is replaced with an APC 3.5 mm male connector. An APC 3.5 (f) to APC 3.5 (f), and BNC (f) to SMA (m) adapters are included for alignment purposes.

### **Backpack Operating and Carrying Cases (Option 042/044)**

Options 042 and 044 are protective soft operating and backpack carrying cases. Option 042 is made of gray rip-stop nylon and Option 044 is made of yellow rip-stop nylon. An outside pocket holds manuals or other accessories. Reinforced adjustable padded shoulder straps

provides ergonomic distribution between your shoulders. The front and rear panel soft covers adjust to be compatible with the front panel protective hard cover (Option UK9) and snap on battery pack (HP/Agilent E1779A). Side ventilation allows for operation without removal, but the maximum operating temperature is reduced to 45 °C.

### **Benchlink Spectrum Analyzer (Option B70)**

Option B70 provides the Benchlink Spectrum Analyzer software which can be used to capture screen images and trace data using a personal computer (PC). The captured information can then be used in other PC applications, including word processing and spread sheets.

### **Benchlink Web Remote Control Software (Option 230)**

Option 230 provides software which can be used to control the analyzer remotely over the web. When the analyzer is connected via GPIB to one personal computer (PC), access to the analyzer is available through any internet connection by specifying the IP address of the physically connected PC. The following analyzer functions are available through remote web access:

- front panel control
- capture screen images
- capture trace data
- remote programming commands (SCPI)

### **Bluetooth™ FM Demodulation (Option 106)**

Option 106 is required to perform FM demodulation on signals measured with the Bluetooth™ Measurement Personality (Option 228).

Option 106 allows you to demodulate, display and measure deviation of Bluetooth™ FM modulated signals. You can listen to audio signals on a built-in speaker or with an earphone.

Option 106 provides the following additional port:

EXT VIDEO OUT - provides a detected video output (before the analog-to-digital conversion) proportional to the vertical deflection of the trace (75 Ω).

### **Bluetooth™ Measurement Personality (Option 228)**

Option 228 provides transmitter and receiver measurements required to test Bluetooth™ devices. The set of Bluetooth™ measurements includes:

- Modulation Overview
- Output Power
- Carrier Frequency Drift
- Monitor Band/Channel
- Initial Carrier Frequency Tolerance
- Modulation Characteristics

Option 228 includes: Bluetooth™ user's guide, Bluetooth™ quick reference card, Bluetooth™ measurement guide, and Bluetooth™ programming commands manual.

Bluetooth™ FM Demodulation (Option 106) is required for full functionality of this personality.

### **Bluetooth™ Premium Bundle (Option 304)**

Option 304 provides the following:

- Bluetooth™ FM demodulator (Option 106)
- Bluetooth™ measurement personality (Option 228)
- high stability frequency reference (Option 1D5)
- digital signal processing and fast ADC (Option B7D)
- RF communications hardware (Option B7E)
- enhanced memory upgrade (Option B72)
- RF preamplifier (Option 1DS)

### **Cable TV Measurement Personality (Option 227)**

Option 227 provides measurement capabilities necessary for installation and service of cable TV systems.

### **cdmaOne Measurement Personality (Option BAC)**

Option BAC provides transmitter and receiver measurements that comply with various international digital communications standards, including TIA/EIA/IS-95-A, TIA/EIA-95-B, TIA/EIA/IS-97-A, TIA/EIA-97-B, TIA7/EIA/IS-98-A, TIA/EIA-98-B, J-STD-008, J-STD-018, J-STD-019, ARIB STD-T53, CKOR, and PKOR. The set of cdmaOne measurements includes:

- channel power
- receiver channel power
- modulation accuracy (RHO)
- code domain power
- receiver spurious
- out-of-band spurious
- harmonics
- occupied bandwidth
- monitor channel/band
- close-in spur

Option BAC includes a cdmaOne user's guide, cdmaOne quick reference card, cdmaOne measurement guide and cdmaOne programming commands manual.

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**NOTE** For optimum performance of this personality, installation of "RF and Digital Communications Hardware (Option B74)" is recommended.

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### **Commercial Calibration with Test Data (Option UK6)**

Option UK6 provides the factory calibration test data on a floppy disk and the standard commercial calibration certificate on the initial analyzer shipment.

Option UK6 is only available at time of purchase.

### **Component Level Service Documentation (Option 0BV)**

Option 0BV provides a copy of the *Agilent ESA/EMC Spectrum Analyzers Component-Level Information*. The component-level information includes parts lists, component-location diagrams, and schematic diagrams for selected assemblies.

### **Delete Manual Set (Option 0B0)**

Option 0B0 deletes copies of the User's, Calibration, Programmer's, Specifications, Measurement guides.

### **Digital Signal Processing and Fast ADC (Option B7D)**

Option B7D provides digital signal processing, fast ADC, and a faster RMS detector. This option is required for many of the mobile communication measurements in the GSM and cdmaOne measurement personalities. Option B7D must be ordered with Option B7E (RF communications hardware) and Option 1D5 (high stability frequency reference).

For A.07.00 firmware revisions and later, either this option or Option AXX (Fast Digitized Time Domain Sweeps) is required to perform the PowerStat Complementary Cumulative Distribution Function (PowerStat CCDF) for all radio standards.

### **Distance to Fault Accessory Kit (Option B7K)**

Option B7K includes the 86205A (RF bridge), 11636A (power divider), 909A (coax termination), 11512A (coax short), 8120-8687 (coax cable), in a padded case.

### **Distance to Fault Measurement Personality (Option 225)**

Option 225 performs a Fast Fourier Transform to calculate the distance to a cable fault. This option must be ordered with tracking generator (Option 1DN). This measurement includes on-screen instructional dialog to guide set up and calibration. Velocity factor and cable loss can be user-defined or selected from several different pre-defined cable types.

### **Enhanced Memory Upgrade (Option B72)**

Option B72 provides 2 SIMMS which increases the analyzer's RAM to 32 MBytes and its flash or data storage memory to 16 MBytes (10 MBytes of which are available to the user for data storage and measurement personalities). Note, this option is standard in analyzers with prefixes of US4144 and MY4144 and above.

### **ESA to 89600 Series Software Link Utility (Option 231)**

Option 231 adds connectivity of an ESA analyzer to a Windows NT 4.0 or Wind2000 based PC running Agilent 89600 VSA software. The Agilent 89600 VSA software is not included with this option, it is available separately.

### **External Mixing (Option AYZ)**

Option AYZ allows the use of HP/Agilent 11970 Series, and HP/Agilent 11974 external mixers with the Agilent E4407B analyzer to extend the frequency range to 110 GHz. Operation to 325 GHz is also possible with non-HP/Agilent mixers.

### **Fast Digitized Time Domain Sweeps (Option AYX)**

Option AYX allows fast digitized sweep times as fast as 20  $\mu$ sec in spans of 0 Hz. Refer to the **Sweep** key description in your User's guide for information about possible sweep times. It also provides the following additional inputs and outputs:

Option AYX - provides the analyzer with additional inputs and outputs. They are as follows: SWP OUT, HI SWP OUT (TTL), HI SWP IN (TTL), AUX VIDEO OUT, and AUX IF OUT.

SWP OUT - sweep ramp output, provides a voltage ramp proportional to the sweep of the analyzer (0 V to 10 V).

HI SWP OUT (TTL) - provides the HI SWP TTL signal as an output (TTL high during a sweep, TTL low during a retrace). It indicates when the analyzer is sweeping

HI SWP IN (TTL) - allows external sweep control. It can be grounded to stop and reset the sweep.

AUX VIDEO OUT - provides detected video output (before the analog-to-digital conversion) proportional to vertical deflection of the trace.

AUX IF OUT - provides a 50  $\Omega$ , 21.4 MHz IF output that is the down-converted signal of the RF input of the analyzer.

For A.07.00 firmware revisions and later, either this option or Option B7D (Digital Signal Processing and Fast ADC) is required to perform the PowerStat Complementary Cumulative Distribution Function (PowerStat CCDF) for all radio standards. It is also required to perform the ACP measurement when the NADC radio standard is selected.



### **Firmware Upgrade Kit (Option UE2)**

Option UE2 provides the most current ESA spectrum analyzer firmware on 3-1/2 inch floppy disks.

### **FM Demodulation (Option BAA)**

Option BAA allows you to demodulate, display and measure deviation of FM modulated signals. You can listen to audio signals on a built-in speaker or with an earphone.

Option BAA provides the following additional port:

EXT VIDEO OUT - provides a detected video output (before the analog-to-digital conversion) proportional to the vertical deflection of the trace (75  $\Omega$ ).

### **Front Panel Protective Cover (Option UK9)**

The cover assembly snaps onto the front of your analyzer to protect the front panel during travel and when the unit is not in use. The front panel protective cover includes a storage compartment to house small accessories or cables.

### **GPIB and Parallel Interface (Option A4H)**

Option A4H allows you to control your analyzer from a computer that uses a general purpose interface bus (GPIB). Option A4H includes a GPIB connector, a parallel interface connector for printers, a CD-ROM containing IntuiLink Toolbar software<sup>1</sup>, and the Programmer's guide for your analyzer.

Option A4H allows the analyzer to copy its display to a printer connected to the parallel interface connector.

### **GSM Measurement Personality (Option BAH)**

Option BAH provides transmitter and receiver measurements that comply with various international digital communications standards, including ETS 300 607-1, ETS 300 609-1, ETS 300 910, and J-STD-007. The set of GSM measurements includes, transmit power, power steps, power versus time, spurious emissions suite, intermodulation attenuation suite, phase and frequency error, cable fault location suite, slow frequency hopping cycle verification, monitor suite, and output RF spectrum suite. Option BAH includes a GSM user's guide, GSM quick reference card, GSM measurement guide, and programming commands manual.

### **Hard Transit Case (Option AXT)**

Option AXT provides a hard transit case. The hard transit case will survive commercial transportation. This rugged case has two wheels and an extendible handle for easy transport. The case can also accommodate two battery packs and ac adapters.

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1. This program allows you to download spectrum analyzer display or data files to a personal computer using Microsoft® Word or Microsoft® Excel. IntuiLink Toolbar installation instructions are included with the CD-ROM.

### **High Stability Frequency Reference (Option 1D5)**

Option 1D5 improves the frequency reference accuracy. The analyzer's synthesizer is phase locked to an oven controlled crystal oscillator (OCXO), instead of the standard VCXO. When present with narrow resolution bandwidth (Option 1DR) it provides 1 Hz and 10 Hz resolution bandwidths.

### **IF, Sweep and Video Ports (Option A4J)**

Option A4J provides the analyzer with additional inputs and outputs. They are as follows: SWP OUT, HI SWP OUT (TTL), HI SWP IN (TTL), AUX VIDEO OUT, and AUX IF OUT.

SWP OUT - sweep ramp output, provides a voltage ramp proportional to the sweep of the analyzer (0 V to 10 V).

HI SWP OUT (TTL) - provides the HI SWP TTL signal as an output (TTL high during a sweep, TTL low during a retrace). It indicates when the analyzer is sweeping.

HI SWP IN (TTL) - allows external sweep control. It can be grounded to stop sweeping.

AUX VIDEO OUT - provides detected video output (before the analog-to-digital conversion) proportional to vertical deflection of the trace.

AUX IF OUT - provides a 50  $\Omega$ , 21.4 MHz IF output that is the down-converted signal of the RF input of the analyzer.

### **Low Emission (Option 060)**

Option 060 provides reduced radiated and conducted emissions to comply with EN55011 Class B requirements. This option applies during ac operation only.

Option 060 is incompatible with TV Trigger (Option B7B).

### **Low Frequency Extension (Option UKB)**

Option UKB extends the frequency range of the analyzer on the low end to 100 Hz when DC coupling is selected. This option requires installation of "Narrow Resolution Bandwidth (Option 1DR)" and is only available on ESA models E4402B, E4404B, E4405B, and E4407B.

### **Modulation Analysis Personality (Option 229)**

Option 229 adds demodulation and analysis of the following base-band modulation formats.

- QPSK
- Offset QPSK
- $\pi/4$  dQPSK
- QAM 16, 32, 64, 128, and 256
- GMSK (GSM standard compliant only)
- 8 FSK (EDGE standard compliant only)

This option also includes the ability to connect the analyzer to a Windows NT 4.0® or Win2000® based PC running Agilent 89600 VSA software. The Agilent 89600 VSA software is not included with this option, it is available separately.

### **Narrow Resolution Bandwidth (Option 1DR)**

This option provides additional narrow resolution bandwidths of 10 Hz, 30 Hz, 100 Hz, and 300 Hz and 200 Hz EMI. These bandwidths improve the analyzer sensitivity and allow you to resolve closely spaced signals. If high stability frequency reference (Option 1D5) is also installed then 1 Hz and 3 Hz resolution bandwidth filters are available.

### **Operating and Carrying Cases (Option AYT/AYU)**

Options AYT and AYU are protective soft operating and carrying cases. Option AYT is made of gray rip-stop nylon and Option AYU is made of yellow rip-stop nylon. An outside pocket holds manuals or other accessories. A reinforced adjustable padded shoulder strap provides ergonomic distribution between your hand and shoulder. The front and rear panel soft covers adjust to be compatible with the front panel protective hard cover (Option UK9) and snap on battery pack (Agilent E1779A). Side ventilation allows for operation without removal, but the maximum operating temperature is reduced to 45 °C.

### **Performance Bundle (Option B75)**

Option B75 provides the pre-amplifier, narrow resolution bandwidths, and high stability frequency reference. Refer to Options 1DS, 1DR, and 1D5 for details.

This option is only available at time of purchase.

### **Phase Noise Measurement Personality (Option 226)**

Option 226 is an automated phase noise (dBc/Hz) measurement solution, providing the ability to measure SSB noise, RMS noise, DANL, as well as the real-time generation of a phase noise vs. log offset frequency, and phase noise vs. time. High Stability Frequency Reference (*Option 1D5*) is recommended. Narrow resolution bandwidth (Option 1DR) is highly recommended. Without Option 1DR, the minimum offset frequency will be 10 kHz.

### **Pre-amplifier (Option 1DS)**

The pre-amplifier improves the analyzer's sensitivity (lowers the noise floor) by approximately 16 dB.

### **Rack Mount Kit With Handles (Option 1CP)**

Option 1CP provides the parts necessary to mount the analyzer in a standard 19 inch (482.6 mm) equipment rack. It includes front handles and rack slides for added convenience. Rack mount height is 8.75 in (222.3 mm).

### **RF and Digital Communications Hardware (Option B74)**

Option B74 includes the RF Communications Hardware (*Option B7E*), Digital Signal Processing and Fast ADC (*Option B7D*), Time-Gated Spectrum Analysis (*Option 1D6*), Memory Extension (*Option B72*), High Stability Frequency Reference (*Option 1D5*), Preamplifier (*Option 1DS*), and Narrow Resolution Bandwidth (*Option 1DR*) assemblies. These options are required for optimum performance of the cdmaOne (*Option BAC*) or GSM measurement personality (*Option BAH*).

### **RF Communications Hardware (Option B7E)**

Option B7E provides the communications hardware required for many digital communication measurements. Option B7E must be ordered with Option B7D (digital signal processing and fast ADC) and Option 1D5 (high stability frequency reference). This provides burst carrier trigger capability.

### **RS-232 and Parallel Interface (Option 1AX)**

Option 1AX allows you to control your analyzer from a computer that uses an RS-232 interface. It includes a 2.5 meter 9-pin (f) to 9-pin (f) connector RS-232 cable (Agilent 5182-4794), a parallel interface connector for printers, a CD-ROM containing IntuiLink Toolbar software<sup>1</sup>, and the Programmer's guide for your analyzer.

Option 1AX allows the analyzer to copy its display to a printer.

### **Service Documentation and Performance Verification and Adjustment Software (Option 0BW)**

Option 0BW provides a copy of the *Agilent ESA Spectrum Analyzers Service Guide* and PC-based performance verification and adjustment software on CD-ROM. The service guide describes assembly level troubleshooting procedures, provides a parts list, and documents the adjustment procedures.

### **Time-Gated Spectrum Analysis (Option 1D6)**

Option 1D6 allows you to selectively measure the spectrum of signals that may overlap in the frequency domain, but are separated in the time domain. By adjusting a time gate based on a user-supplied trigger signal, you can significantly increase the diagnostic capability of your spectrum analyzer for time-interleaved signals.

### **TV Trigger and Picture on Screen (Option B7B)**

*Option B7B requires Option BAA.*

Option B7B allows you to trigger the analyzer sweep on a TV line of a demodulated TV waveform and view TV images in NTSC, PAL and SECAM standards on the analyzer display.

Option B7B provides the following additional ports:

EXT VIDEO IN/TV TRIG OUT - provides a shared baseband video input and a TTL output for the TV trigger (output through 75  $\Omega$  source impedance).

EXT VIDEO OUT - provides a detected video output (before the analog-to-digital conversion) proportional to the vertical deflection of the trace (similar to Option BAA alone), and provides pass through of the signal at EXT VIDEO IN/TV TRIG OUT, if selected (75  $\Omega$ ).

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1. This program allows you to download spectrum analyzer display or data files to a personal computer using Microsoft® Word or Microsoft® Excel. IntuiLink Toolbar installation instructions are included with the CD-ROM.

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## Accessories

A number of accessories are available from Agilent Technologies to help you configure your analyzer for your specific applications. They can be ordered through your local Agilent Sales and Service Office and are listed below.

### 50 $\Omega$ /75 $\Omega$ Minimum Loss Pad

The HP/Agilent 11852B is a low VSWR minimum loss pad that allows you to make measurements on 75  $\Omega$  devices using an analyzer with a 50  $\Omega$  input. It is effective over a frequency range of dc to 2 GHz.

### 75 $\Omega$ Matching Transformer

The HP/Agilent 11694A allows you to make measurements in 75  $\Omega$  systems using an analyzer with a 50  $\Omega$  input. It is effective over a frequency range of 3 to 500 MHz.

### AC Probe

The Agilent 85024A high frequency probe performs in-circuit measurements without adversely loading the circuit under test. The probe has an input capacitance of 0.7 pF shunted by 1 M  $\Omega$  of resistance and operates over a frequency range of 300 kHz to 3 GHz. High probe sensitivity and low distortion levels allow measurements to be made while taking advantage of the full dynamic range of the spectrum analyzer.

The Agilent 41800A low frequency probe has a low input capacitance and a frequency range of 5 Hz to 500 MHz.

### Broadband Preamplifiers and Power Amplifiers

Preamplifiers and power amplifiers can be used with your spectrum analyzer to enhance measurements of very low-level signals.

- The Agilent 8447D preamplifier provides a minimum of 25 dB gain from 100 kHz to 1.3 GHz.

The Agilent 87405A preamplifier provides a minimum of 22 dB gain from 10 MHz to 3 GHz. (Power is supplied by the probe power output of the analyzer.)

The Agilent 85905A CATV 75 ohm preamplifier provides a minimum of 18 dB gain from 45 MHz to 1 GHz. (Power is supplied by the probe power output of the analyzer.)

- The 11909A low noise preamplifier provides a minimum of 32 dB gain from 9 kHz to 1 GHz and a typical noise figure of 1.8 dB.

### Carrying Strap (Part Number E4401-60028)

This carrying strap comes with Options AYT and AYU. It can also be ordered separately and used with Agilent ESA analyzers.

## External Keyboard

You may use any IBM AT compatible keyboard with a mini DIN connector. Screen titles and filenames can be entered with the external keyboard.

## GPIB Cable

For use with Option A4H. The Agilent 10833 Series GPIB cables interconnect GPIB devices and are available in four different lengths. GPIB cables are used to connect controllers to a spectrum analyzer.

## HP/Agilent 11970 Series Harmonic Mixers

The 11970 Series harmonic mixers are available to extend the frequency range of analyzers with Option AYZ (external mixing) up to 110 GHz. The following six models are available:

**Table 5-1.**

HP/Agilent Model Number	Frequency Range
11970K	18.0 to 26.5 GHz
11970A	26.5 to 40.0 GHz
11970Q	33.0 to 50.0 GHz
11970U	40.0 to 60.0 GHz
11970V	50.0 to 75.0 GHz
11970W	75.0 to 110 GHz

## HP/Agilent 11974 Series Preselected Millimeter Mixers

11974 Series preselected millimeter mixers are available to extend the frequency range of analyzers with Option AYZ (external mixing) up to 75 GHz. Preselection reduces mixer overload from broadband signals, reduces radiation of local oscillator harmonics back to the device under test, and reduces the level of image and multiple responses displayed. The following four models are available:

**Table 5-2.**

HP/Agilent Model Number	Frequency Range
11974A	26.5 to 40.0 GHz
11974Q	33.0 to 50.0 GHz
11974U	40.0 to 60.0 GHz
11974V	50.0 to 75.0 GHz

## Agilent E1779A Battery Pack

The E1779A is a battery pack that will power an Agilent analyzer for 80 to 114 minutes, depending on the options installed in the analyzer. Refer to the *E1779A Battery Pack User's Guide* for more information.

## Parallel Interface Cable

For use with Option A4H and 1AX. A 36-pin to 25-pin male-to-male 2 meter cable can be used to connect supported printers to an analyzer. This cable must be IEEE-1284 compliant.

## Printer

**For use with Option A4H or 1AX.** The DeskJet personal printers provide black and white or color printing for another form of permanent records of your test results. The HP LaserJet series printers are also compatible. The printers connect to the parallel interface installed on the analyzer with either Option A4H (standard) or 1AX.

## RF and Transient Limiters

The Agilent 11867A and 11693A RF Limiters protect the analyzer input circuits from damage due to high power levels. The 11867A operates over a frequency range of dc to 1800 MHz and begins reflecting signal levels over 1 mW up to 10 W average power and 100 watts peak power. The 11693A microwave limiter (0.1 to 12.4 GHz, usable to 18 GHz) guards against input signals over 1 milliwatt up to 1 watt average power and 10 watts peak power.

The Agilent 11947A Transient Limiter protects the analyzer input circuits from damage due to signal transients. It specifically is needed for use with a line impedance stabilization network (LISN). It operates over a frequency range of 9 kHz to 200 MHz, with 10 dB of insertion loss.

## RF Bridges

The Agilent 86205A 50  $\Omega$  RF bridge and 86207A 75  $\Omega$  RF bridge can be used to make reflection measurements using an analyzer with tracking generator Option 1DN or 1DQ or with an external signal generator. These external directional bridges offer high directivity and excellent port match. The 86205A operates over a frequency range of 300 kHz to 6 GHz. The 86207A operates over a frequency range of 300 kHz to 3 GHz.

## **RS-232 Cable**

THE FOLLOWING NEEDS ATTENTION REGARDING THE AVAILABLE CABLES.  
PERHAPS FRANCIS CAN BE OF ASSISTANCE.

For use with Option 1AX. The 24542G is a 3 meter 9-pin (f) to 25-pin (m) RS-232 cable. The HP 24542U is a 3 meter 9-pin (f) to 9-pin (f) RS-232 cable for serial 9-pin PC connection to an analyzer. The modem cable required is HP 24542M 9-pin (f) to 25-pin (m), and the PC cable is HP 24542U. The Agilent 5182-4794 is a 2.5 meter 9-pin (f) to 9-pin (f) RS-232 cable for serial 9-pin PC connection to an analyzer (included with Option 1AX).



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## **6 In Case of Difficulty**

This chapter includes information on how to check for a problem with your Agilent Technologies spectrum analyzer, and how to return it for service.

If you experience a problem or would like additional information about your analyzer, Agilent Technologies' worldwide organization is ready to provide the support you need.

Before calling Agilent Technologies, however (or returning an analyzer for service), perform the quick checks listed in “[Check the Basics](#)” on page 84. This check may eliminate the problem.

If a problem persists, you may choose to:

- Repair the analyzer yourself. See “[Service Options](#)” on page 85.
- Return the analyzer to Agilent Technologies for repair. See “[Returning an Analyzer for Service](#)” on page 86, for more information.

---

**WARNING**     **No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock, do not remove covers.**

---

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**NOTE**         If the analyzer is still under warranty or is covered by a maintenance contract, it will be repaired under the terms of the warranty or plan (the warranty is located at the front of this manual).

                    If the analyzer is no longer under warranty or is not covered by an Agilent Technologies maintenance plan, Agilent Technologies will notify you of the cost of the repair after examining the analyzer.

---

## Types of Spectrum Analyzer Messages

The analyzer can generate various messages that appear on the display during operation.

For a complete list of spectrum analyzer messages, see the Instrument Messages and Functional Tests manual. The following table describes the four types of spectrum analyzer messages.

**Table 6-1**      **Types of Messages**

Type of Message	Location	Notes
<b>Informational</b> messages typically provide verification that an action has occurred. In general, no user intervention is required.	Bottom of the display in the status line (in green on analyzers with a color display).	Messages will remain until the message is cleared by pressing <b>Esc</b> or <b>Preset</b> , or is overwritten by another message.
<b>Pop-up</b> messages prompt you to verify that an action will be performed or tell you that an action is currently being performed.	Middle of the display in a framed box.	Message remains until you acknowledge the prompt, or the action is completed.
<b>Status</b> messages indicate a condition that may result in erroneous data being displayed. Multiple status messages may be displayed at the same time.	Right side of the display and/or in the SCPI Status Register system.	Most messages remain only until the erroneous condition is corrected.
<b>User Error</b> messages appear when an attempt has been made to set a parameter incorrectly or an operation has failed (such as saving a file).	Bottom of the display in the status line (in yellow on analyzers with a color display) and in the SCPI Error Queue.	Messages remain until you clear the error (press <b>System</b> , <b>Show Errors</b> , <b>Clear Error Queue</b> ), or another message is displayed in the status line.  Pressing the <b>Esc</b> or <b>Preset</b> keys will clear error messages from the display, but the messages will remain in the error queue.

## Before Calling Agilent Technologies

### Check the Basics

- Is there power at the receptacle?
- Is the analyzer turned on? Listen for internal fan noise to determine if the analyzer cooling fan is running. Feel the right side of the analyzer to feel for air flow.
- If other equipment, cables, and connectors are being used with your spectrum analyzer, make sure they are connected properly and operating correctly.
- Review the measurement procedures being performed when the problem first appeared. Are all of the settings correct?
- If the analyzer is not functioning as expected, return the analyzer to a known state by pressing **Preset**, and **Factory Preset** (if displayed).

---

**NOTE** Some analyzer settings are not affected by a Preset. If you wish to reset the analyzer configuration to the state it was in when it was originally sent from the factory, press **System, Power On/Preset, Preset Type, Factory**. Then press the green **Preset** hardkey on the front panel.

---

- Is the measurement being performed, and the results that are expected, within the specifications and capabilities of the analyzer? Refer to the Specifications guide for your analyzer.
- To meet specifications, the analyzer must be aligned. Either the Auto Align (On) feature must be selected (press **System, Alignments, Auto Align, On**), or the analyzer must be manually aligned at least once every hour (see your specifications guide for more information), or whenever the temperature changes more than 3°C. When **Auto Align, On** is selected, the AA screen annotation appears on the left edge of the display.
- Perform an Alignment. Press **System, Alignments, Align Now, All**.
- If the previously performed alignments did not resolve the problem, press **System, Alignments, Load Defaults**. Then press **System, Alignments, Align Now, All**.
- Is the analyzer displaying an error message? If so, refer to the Instrument Messages and Functional Tests manual.
- If the necessary equipment is available, perform the functional tests in the Instrument Messages and Functional Tests document for your analyzer.

## Read the Warranty

The warranty for your analyzer is on [page 22](#). Please read it and become familiar with its terms.

If your analyzer is covered by a separate maintenance agreement, please be familiar with its terms.

## Service Options

Agilent Technologies offers several optional maintenance plans to service your analyzer after the warranty has expired. Call your Agilent Technologies office for full details.

If you want to service the analyzer yourself after the warranty expires, you can purchase the service documentation that provides all necessary test and maintenance information.

You can order the service documentation, *Option 0BW* (assembly level troubleshooting and adjustment software) through your Agilent Technologies office.

## Calling Agilent Technologies

Agilent Technologies has offices around the world to provide you with complete support for your analyzer. To obtain servicing information or to order replacement parts, contact the nearest Agilent Technologies office listed in [Table 6-2](#), on page 85. In any correspondence or telephone conversations, refer to your analyzer by its product number, full serial number, and firmware revision.

Press **System, More (1 of 3), Show System**, and the product number, serial number, and firmware revision information will be displayed on your analyzer screen. A serial number label is also attached to the rear panel of the analyzer.

**Table 6-2. Contacting Agilent Technologies**

**Online assistance:** <http://www.agilent.com/find/assist>

**United States**  
(tel) 1 800 452 4844

**Latin America**  
(tel) (305) 269 7500  
(fax) (305) 269 7599

**New Zealand**  
(tel) 0 800 738 378  
(fax) 64 4 495 8950

**Canada**  
(tel) 1 877 894 4414  
(fax) (905) 282-6495

**Japan**  
(tel) (81) 426 56 7832  
(fax) (81) 426 56 7840

**Asia Pacific**  
(tel) (852) 3197 7777  
(fax) (852) 2506 9284

**Europe**  
(tel) (31 20) 547 2323  
(fax) (31 20) 547 2390

**Australia**  
(tel) 1 800 629 485  
(fax) (61 3) 9210 5947

## Returning an Analyzer for Service

### Service Tag

When you are returning an analyzer to Agilent Technologies for service, fill out and attach one of the blue service tags provided at the end of this chapter. Please be as specific as possible about the problem. If you have recorded any error messages that appeared on the display, have completed a functional test, or have any other specific data on the performance of your analyzer, please include a copy of this information.

### Original Packaging

Before shipping, pack the unit in the original factory packaging materials if they are available. If the original materials were not retained, see "[Other Packaging](#)" (below).

---

**NOTE** Install the transportation disk into the floppy drive to reduce the possibility of damage during transportation. If the original transportation disk is not available, a blank floppy may be substituted.

---

### Other Packaging

---

**CAUTION** Analyzer damage can result from using packaging materials other than those specified. Never use styrene pellets in any shape as packaging materials. They do not adequately cushion the equipment or prevent it from shifting in the carton. They cause equipment damage by generating static electricity and by lodging in the analyzer louvers, blocking airflow.

---

You can repackage the analyzer with commercially available materials, as follows:

1. Attach a completed service tag to the analyzer.
2. Install the transportation disk or a blank floppy disk into the disk drive.
3. Wrap the analyzer in antistatic plastic to reduce the possibility of damage caused by electrostatic discharge.
4. Use a strong shipping container. The carton must be both large enough and strong enough to accommodate the analyzer. A double-walled, corrugated cardboard carton with 159 kg (350 lb) bursting strength is adequate. Allow at least 3 to 4 inches on all sides of the analyzer for packing material.
5. Surround the equipment with three to four inches of packing material and prevent the equipment from moving in the carton. If packing foam is not available, the best alternative is S.D.-240 Air Cap™ from Sealed Air Corporation (Hayward, California, 94545). Air Cap™ looks like a plastic sheet filled with 1-1/4 inch air bubbles. Use the pink-colored Air Cap to reduce static electricity. Wrapping the equipment several times in this material should both protect the equipment and prevent it from moving in the carton.

6. Seal the shipping container securely with strong nylon adhesive tape.
7. Mark the shipping container “**FRAGILE, HANDLE WITH CARE**” to assure careful handling.
8. Retain copies of all shipping papers.

In Case of Difficulty  
Returning an Analyzer for Service



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