Getting Started Guide

ESA Series Spectrum Analyzers

This manual provides documentation for the following instruments:

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

Agilent Technologies

Notice

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

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

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

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

Additional Information

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

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

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
Accessories	
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 Ω	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.
IntuiLink Toolbar software, CD-ROM	Provides a set of connectivity tools that enable you to easily move data from your analyzer to your PC.
Power Cable (See Table 1-3 on page 12)	Connection for power source.
Standard Documentation Set	
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/Programmer's Guide	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.

Item	Description
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.

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 and Accessories" on page 65 for information on ordering.

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. 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 92).

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.

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 earth 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.**

CAUTION	The Mains wiring and connectors shall be compatible with the connector used in the premise electrical system. Failure, to ensure adequate earth grounding by not using the correct components may cause product damage, and serious injury.

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 instrument has auto-ranging line voltage input, be sure the supply voltage is within the specified range and voltage fluctuations do not to exceed 10 percent of the nominal supply voltage.

NOTE	This product is designed for indoor use only.

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

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 fuses, and or circuit breakers only with same type and ratings. The use of other fuses, circuit breakers or materials is prohibited.**

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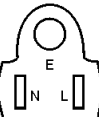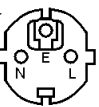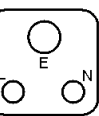
NOTE	The front panel switch is a standby switch *only*; it is *not* a LINE switch (power disconnecting device).

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 instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. 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.**

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.

CAUTION	This instrument has auto-ranging line voltage input, be sure the supply voltage is within the specified range and voltage fluctuations do not to exceed 10 percent of the nominal supply voltage.

Table 1-3   **AC Power Cords**

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

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 92.

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

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

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

You can order the service documentation for Agilent spectrum analyzers through your Agilent Sales and Service office. The documentation is described under "Options and Accessories" on page 65.

NOTE   If the analyzer's clock does not work, the problem is the battery. See "Returning an Analyzer for Service" on page 92.

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.**
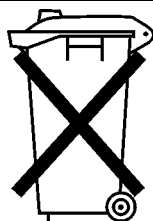
WARNING   **The Agilent Technologies E4402B, E4403B, E4404B, E4405B, E4407B, E4408B, E4411B, E7402A, E7405A may be used with an E1779B Rechargeable Battery Pack which contains a Ni-Cd battery. The battery must be recycled or disposed of properly.**

Turning on the Analyzer for the First Time

❏ Plug in the power cord.

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.**

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.

NOTE	Do not connect anything else to the analyzer yet.

❏ Choose a power on preference using the switch on the rear panel (refer to "Rear-Panel Features" on page 31, 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 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 Ω 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.

Why Aren't All the Personality Options Loaded in Memory?

Many measurement personality options are available for use with this instrument. If the option is loaded in the instrument, you must also have a license key entered, to use it.

Some versions of instrument hardware my not have enough memory to accommodate all the options that you have ordered. If this is the case you will need to swap the applications in/out of memory, as needed. It may also be possible to upgrade your hardware to have more memory. Contact your local sales/service office.

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.

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.

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 31).

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.

TIP	You can get automatic electronic notification of new firmware releases and other product updates/information by subscribing to the *Agilent Technologies Test & Measurement E-Mail Notification Service* for the PSA and ESA Series at http://www.agilent.com/find/notifyme

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**.

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

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 Ω 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:

   None   **None** disables the analyzer from attempting to print to a printer. This is the appropriate setting if no printer is connected to the analyzer.

   Custom   **Custom** allows you to access the **Define Custom** menu keys. The **Define Custom** menu keys allow you to specify printer characteristics such as PCL Level and printer color capability.

   Auto   **Auto** enables the analyzer to automatically attempt to identify the connected printer when the **Print** key is pressed or when **Printer Type** is set to **Auto**.

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 MΩ 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 83.

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).

Safety Information

| WARNING | This is a Safety Class 1 Product (provided with a protective earth 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.

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. |

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 Guide. 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, see below

- "Display Annotations" on page 28

Front-Panel Connectors and Keys

pb938a
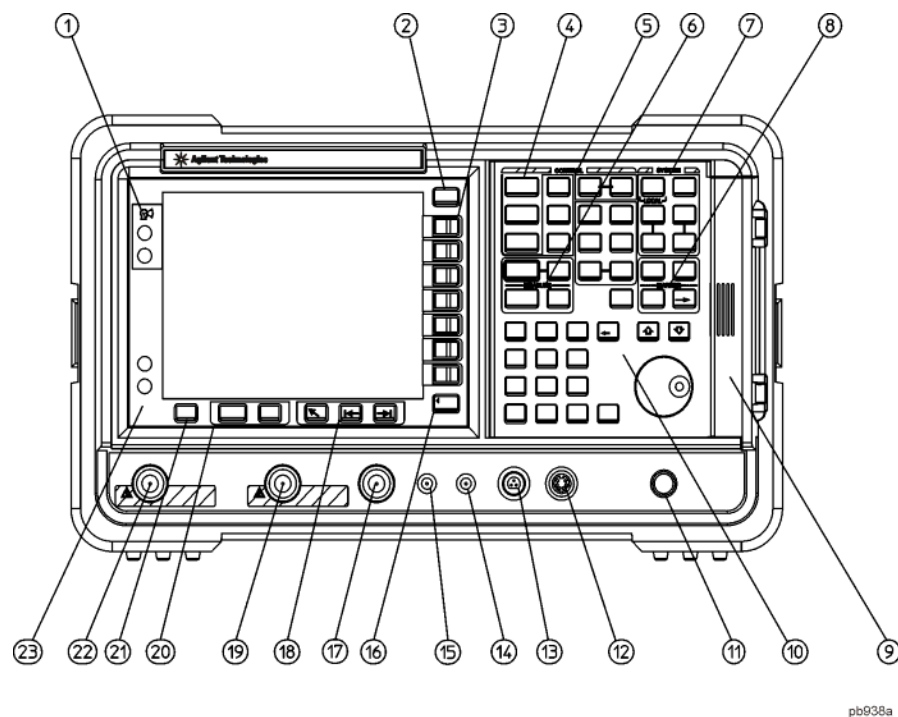
1	**Viewing Angle** keys adjust the display so that it can be optimally viewed from different angles.
2	**Esc**. The **Esc** (escape) key cancels any entry in progress. **Esc** will abort a print (if one is in progress) and clear error messages from the status line at the bottom of the display. It also 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 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 saves/loads 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 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, 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 50Ω (**INPUT 75Ω** 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** switches 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 50Ω** for Option 1DN or **RF OUT 75Ω** (**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.

NOTE	The analyzer continues to draw power even if the line power switch is in standby. The main power cord can be used as the system disconnecting device. It disconnects the mains circuits from the mains supply. The front-panel switch is only a standby switch and is not a LINE switch (disconnecting device).

Display Annotations
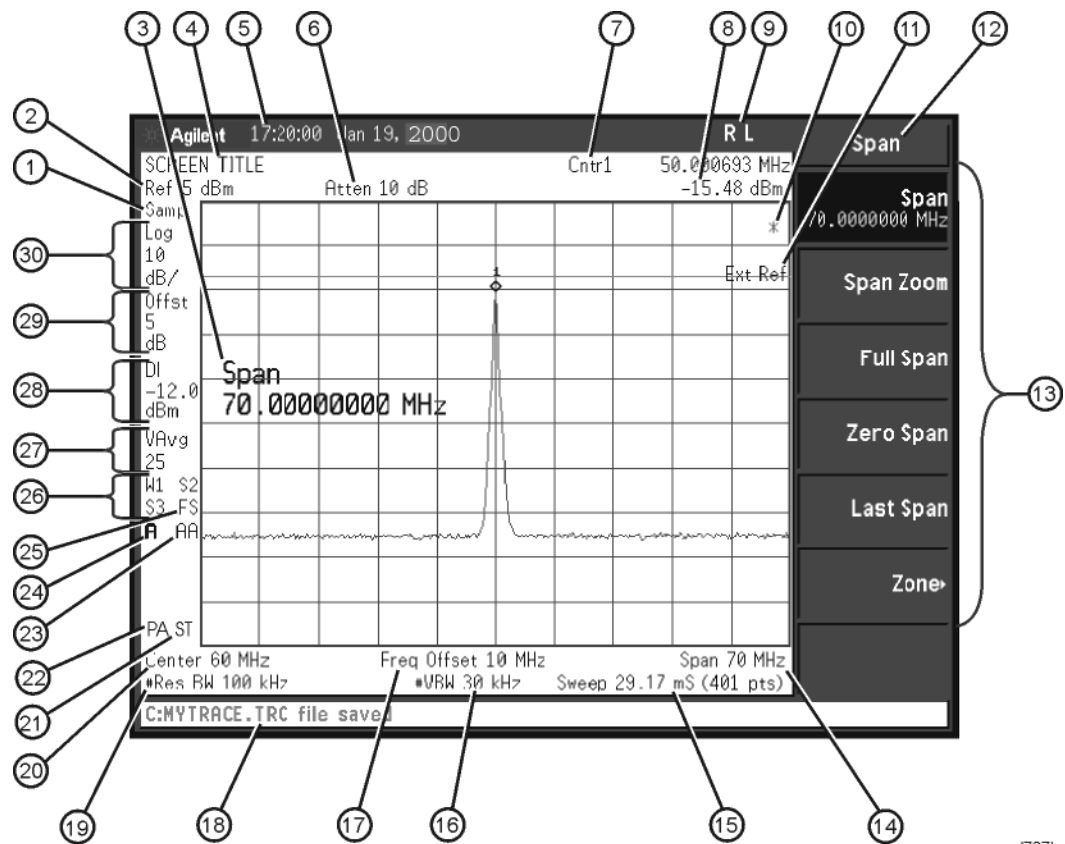
pl727b

Table 2-1   Screen Annotation

Item	Description	Associated Function Key
1[a]	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[a,b]	RF attenuation	**Attenuation Auto Man**
7	Marker frequency	**Marker** or **Marker Count On Off**
8	Marker amplitude	**Marker**

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

Item	Description	Associated Function Key
9	GPIB annunciators **R** - remote operation **L** - GPIB listen **T** - GPIB talk **S** - GPIB SRQ	See programming documentation.
10[c]	Data invalid indicator	**Sweep (Single)** or **View/Trace**
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	**Span** or **Stop Freq**
15a	Sweep time/Points	**Sweep Time Auto Man**, **Sweep Points**
16a	Video bandwidth	**Video BW Auto Man**
17	Frequency offset	**Freq Offset**
18	Display status line	Displays analyzer status and error messages. Cleared by pressing **Esc** key. See your User's guide for more information.
19a	Resolution bandwidth	**Resolution BW Auto Man**
20	Center frequency or start frequency	**Center Freq** or **Start Freq**
21	Signal track	**Frequency**, **Signal Track**
22	Internal preamp	**Amplitude**, **Int Preamp**
23[d]	Auto alignment routine is on	**Auto Align**
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.)	**Correction On Off**
25	Trigger/Sweep **F** - free-run trigger **L** - line trigger **V** - video trigger **E** - external (front) trigger **T** - TV trigger (Options BAA, B7B only) **B** - RF burst trigger (Opt B7E only) **C** - continuous sweep **S** - single sweep	**Trig**, **Sweep**

Table 2-1   Screen Annotation (Continued)

Item	Description	Associated Function Key
26	Trace mode **W** - clear write **M** - maximum hold **m** - minimum hold **V** - view **S** - store blank **1** - trace 1 **2** - trace 2 **3** - trace 3	**Trace**
27	Average	**Average On Off** `VAvg` indicates video average on. `PAvg` indicates power average on.
28	Display line	**Display Line On Off**
29	Amplitude offset	**Ref Lvl Offst**
30	Amplitude scale	**Scale Type Log Lin**

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.

Rear-Panel Features

pl722
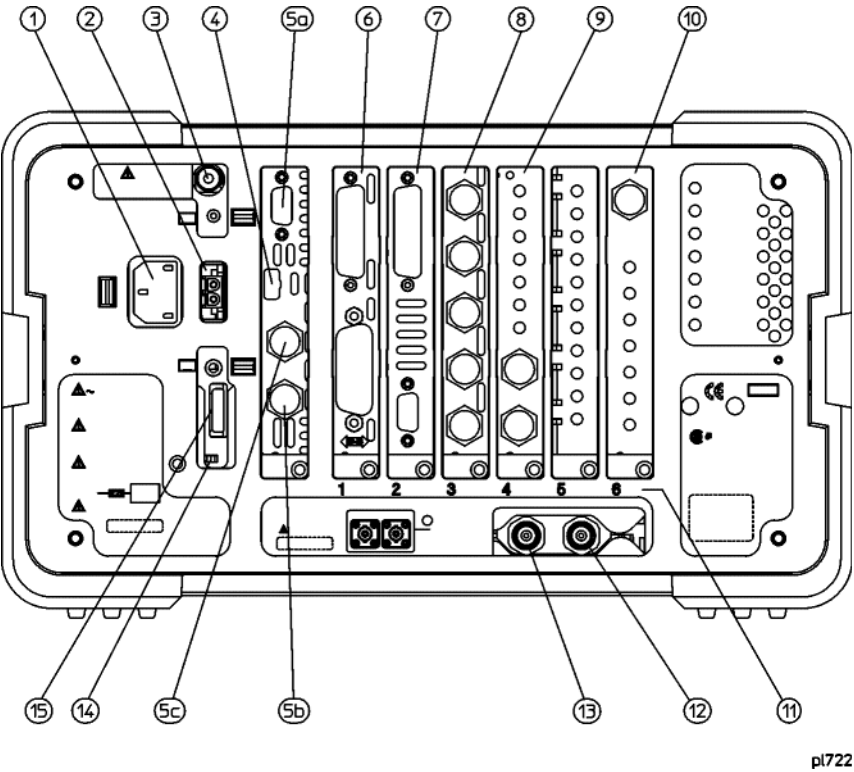
| 1 | **Power input** is the input for the ac line power source. Make sure that the line-power source outlet has a protective ground contact. |

| 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 2-2 and Table 2-3. show the appropriate rear panel slots to be used for the optional cards available with the Agilent ESA Spectrum Analyzers. Refer to Table 2-2. if you have an Agilent ESA-L Series Spectrum Analyzer. Refer to Table 2-3. if you have an Agilent ESA-E Series Spectrum Analyzer.

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

Table 2-2   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[a]		–	–	P

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

Table 2-3   Agilent ESA-E Series (E4401B, E4402B, E4404B, E4405B, E4407B)

Slot #	1[a]	2	3	4	5	6
GPIB and Parallel Interface (Option A4H)[b]	P	A	A	A	–	–
RS-232 and Parallel Interface (Option 1AX)b	P	A	A	A	–	–
Fast Time Domain Sweeps (Option AYX)[c]	–	A	P	A	–	–
IF, Video, and Sweep Ports (Option A4J)c	A	A	A	A	P	A
FM Demodulation (Option BAA)[d]	–	A	P	A	A	A
Noise Figure (Option 219)	A	A	P	A	–	–
Frequency Extension[e]	–	A	A	A	A	P
Digital Signal Procession and Fast ADC (Option B7D)	–	–	–	P	–	–
RF Communications Hardware (Option B7E)	–	–	–	–	P	–
ACPR Dynamic Range Extension (Option 120)	–	P	A	A	A	A
Bluetooth™ [f] FM Demodulation (Option 106)d,[g]	–	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 AYX) 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.)

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.

NOTE   The video output signal may be blanked during retrace when automatic alignment is on. This effect can be reduced with longer sweep times, or eliminated by turning Auto Align off. For more information, refer to the Alignments key description in the ESA User's and Programmers Reference, Volume 1.

AUX IF OUT is a 50 Ω, 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.

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

---

9   **FM Demod** (Option BAA) demodulates, displays, and measures deviation on FM signals. You can listen to audio signals on a built-in speaker or with an earphone. Refer to "Det/Demod" and "FM Demodulation (Option BAA)" in the Options chapter for more information.

Bluetooth™ FM Demodulation (Option 106) demodulates, displays and measures deviation on Bluetooth™ signals. Refer to "Det/Demod" and "Bluetooth™ FM

Demodulation (Option 106)" in the Options chapter 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 2-2 and Table 2-3 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.

The arrow keys located below the analyzer display (sometimes referred to as Tab keys) can be used to navigate within tables, for example the Limit-Line table. These keys are used to move between rows. The Left-arrow key moves up, while the right-arrow key moves down. While navigating through the table, the cursor (inverse video highlight) stays in the same column. Navigating left or right in the table is accomplished by choosing the desired field using the front-panel keys.

Front and Rear Panel Symbols

This symbol is used to indicate power ON (green LED).

This symbol is used to indicate power STANDBY mode (yellow LED).

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.
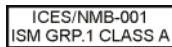
The C-Tick mark is a registered trademark of the Australian Spectrum Management Agency.
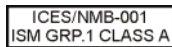
This ISM device complies with Canadian ICES-001.
Cet appareil ISM est conforme a la norme NMB du Canada.

This is also a symbol of an Industrial Scientific and Medical Group 1 Class A product (CISPR 11, Clause 4).

The CSA mark is a registered trademark of the CSA International.

This symbol indicates separate collection for electrical and electronic equipment mandated under EU law as of August 13, 2005. All electric and electronic equipment are required to be separated from normal waste for disposal (Reference WEEE Directive 2002/96/EC).

Indicates the time period during which no hazardous or toxic substance elements are expected to leak or deteriorate during normal use. Forty years is the expected useful life of the product.

This symbol on all primary and secondary packaging indicates compliance to China standard GB 18455-2001.

South Korean Class A EMC Declaration
A 급 기기 (업무용 방송통신기자재)
이 기기는 업무용 (A 급) 전자파적합기기로서 판 매자 또는 사용자는 이 점을 주 의하시기 바라 며 , 가정외의 지역에서 사용하는 것을 목적으 로 합니다 .

This equipment is Class A suitable for professional use and is for use in electromagnetic environments outside of the home.

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 front and rear panel layout, and display annotations of your analyzer. If you do not, refer to "Front and Rear Panel Features" on page 23.


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

Using the Front Panel
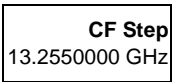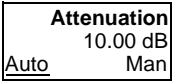
Entering Data

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** key).

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:

| **Signal Track** | |
| On | Off |

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

Submenu   Displays a new menu of softkeys.

Example:

Catalog▶

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:

Y Axis Units▶
dBm

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:

CF Step
13.2550000 GHz

Press this type of key and enter a value.

Attenuation	
10.00 dB	
Auto	Man

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/Programmer's manual.

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.

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

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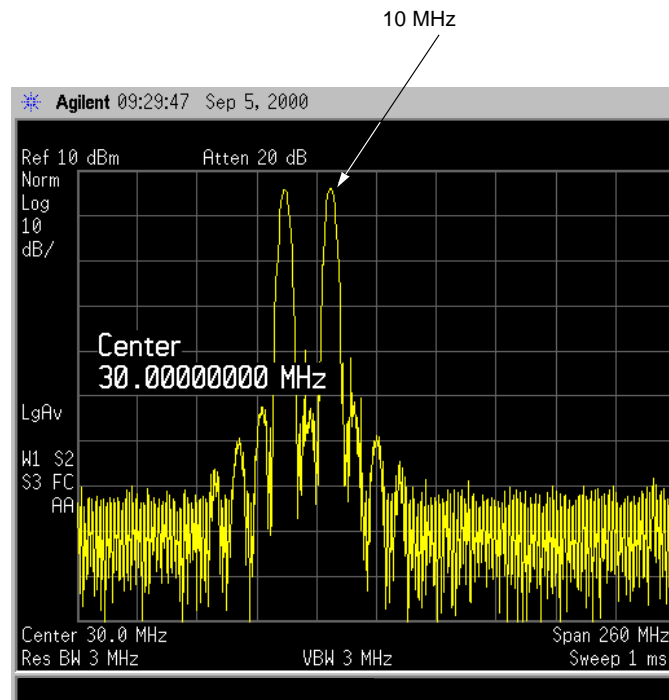
Setting Frequency Span

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
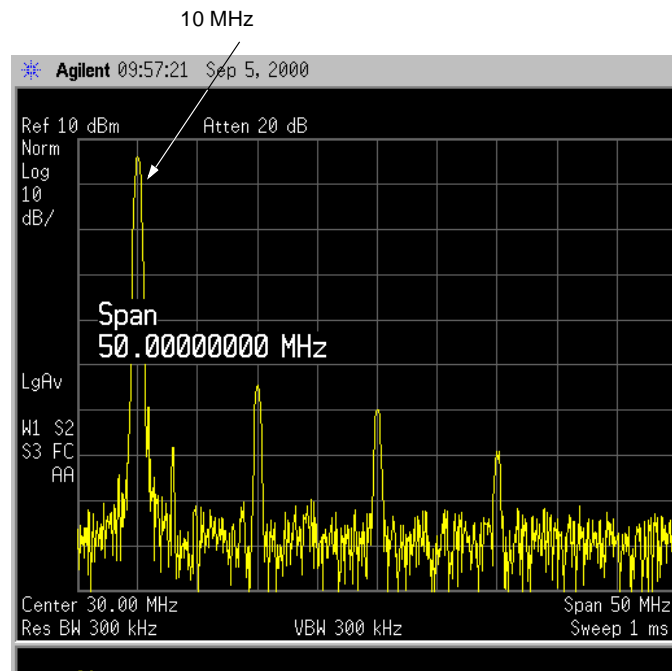
Reading Frequency & Amplitude

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

Active function   Marker
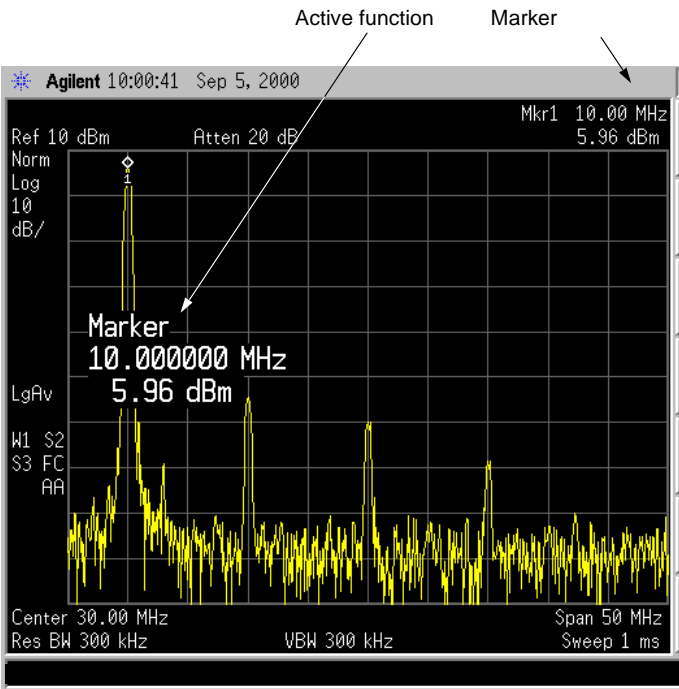
Figure 3-4   Relationship Between Frequency and Amplitude
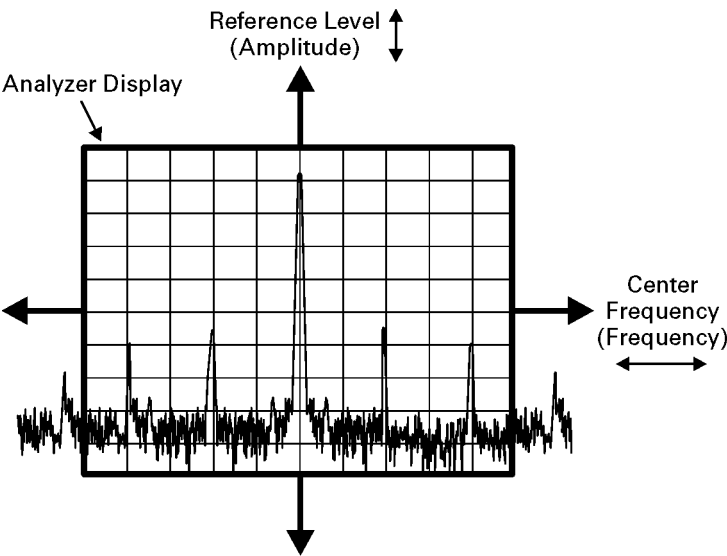
Improving Frequency Accuracy

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 Cntr1.
    •   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 ≥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 55).

Figure 3-5   Increasing Marker Frequency Accuracy
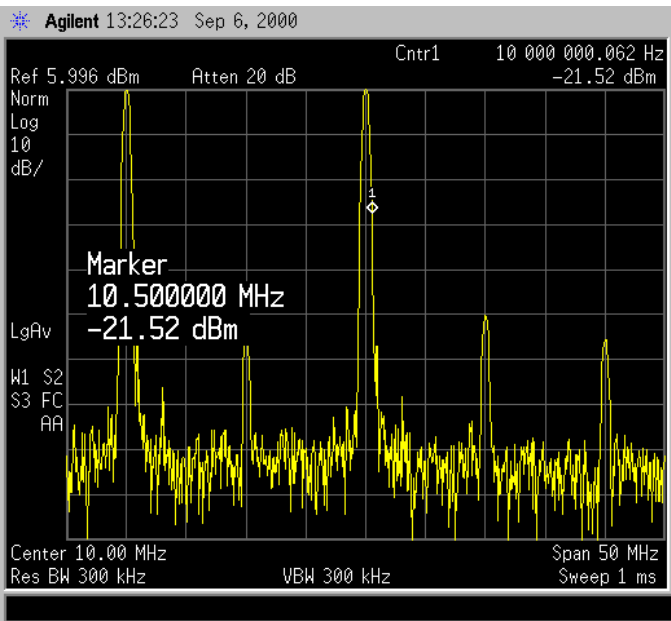
Frequency Count
increases accuracy
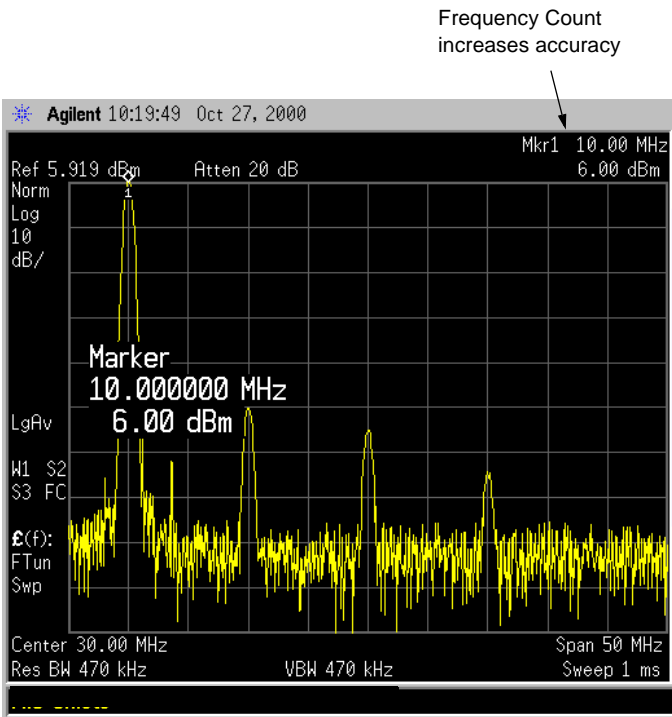
Figure 3-6   Using Marker Counter

4   Viewing Catalogs and Saving Files

The analyzer stores and retrieves data similarly to the way that a personal computer (PC) does: both have internal storage and a floppy disk drive. While a PC has an internal *drive*, the analyzer's internal storage is nonvolatile (flash) memory, which acts as an internal drive. As with a PC, both the internal storage and the floppy disk drive have directory and sub-directory capability; in the analyzer, directories and subdirectories are called catalogs.

This chapter tells you how to:

- locate catalogs and view files, on .

- save a file, on .

For more information on catalogs and files, see the Measurement guide.

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 book 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.

The analyzer has three default catalogs (directories):

- State, which stores analyzer settings.
- Trace, which stores trace information.
- Screen, which stores screen captures of the display in .gif or .wmf format.

NOTE	Trace files are not bitmap files. Files saved as **Trace** cannot be imported into other applications or converted. If you require the use of other applications, for example Microsoft□ Word or Microsoft□ Excel, be sure to save your files as .gif or .wmf formats using **Screen** for your file **Type**.

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

Figure 4-1.   Catalog Menu
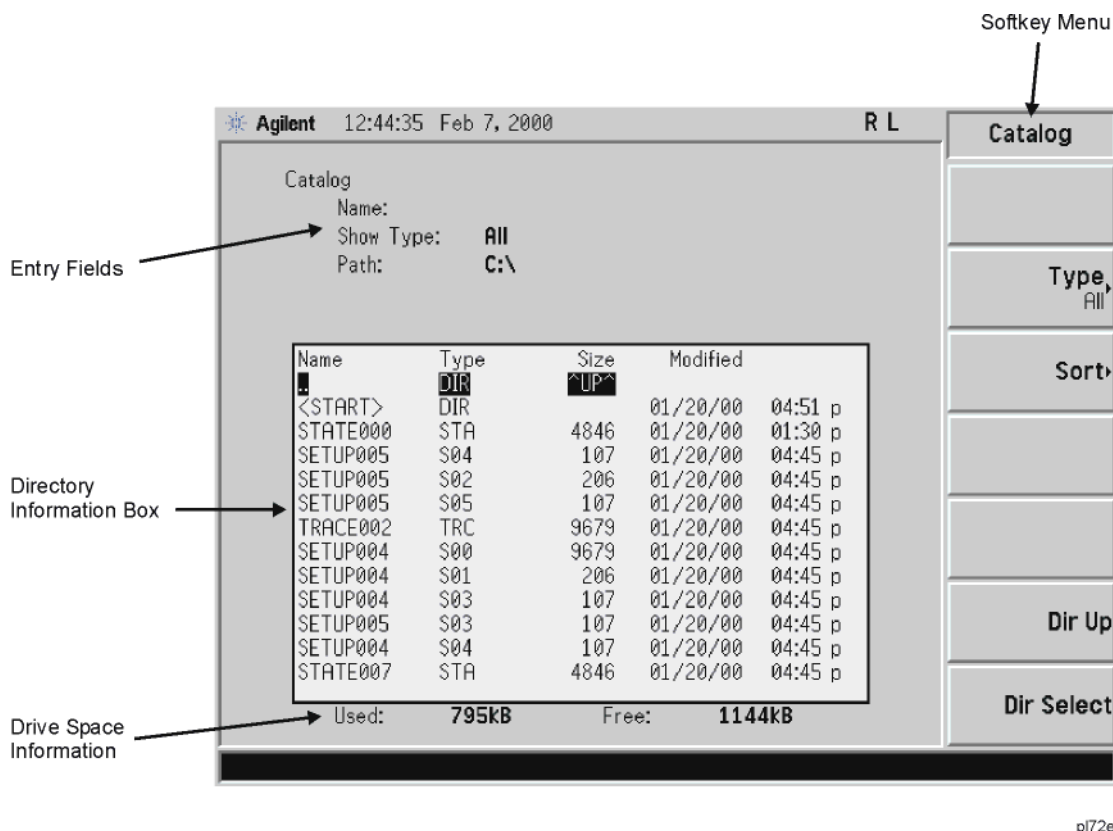
NOTE   Use the front-panel **Step Keys** or **Knob** and the **Dir Up** or **Dir Select** keys to move up
            and down within the directory information box.

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□[1]. 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 54, will abort the formatting process. See Figure 4-2. The format process takes approximately three minutes.

Figure 4-2. Format Menu
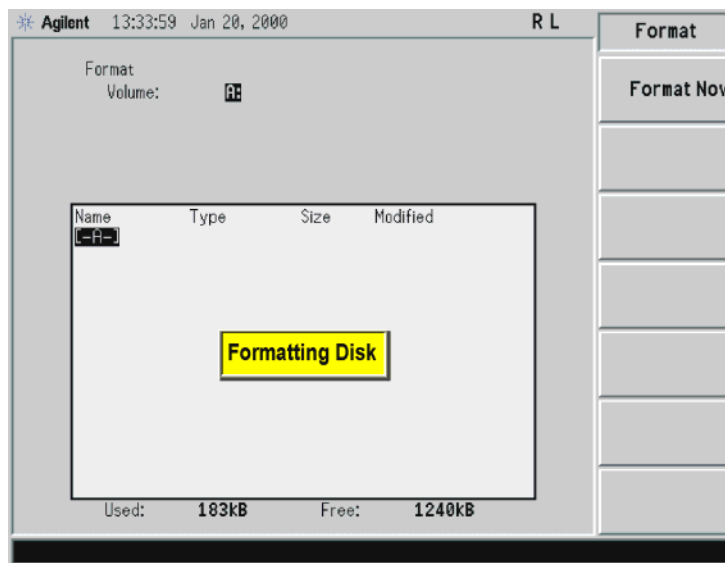
5. When formatting is complete, a message, Volume A: formatted appears on the status line. The disk is now ready to save files.

---

1. MS-DOS□ is a U.S. registered trademark of Microsoft Corporation.

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.

NOTE	Trace files are not bitmap files. Files saved as **Trace** cannot be imported into other applications or converted. If you require the use of other applications, for example Microsoft☐ Word or Microsoft☐ Excel, be sure to save your files as .gif or .wmf formats using **Screen** for your file **Type**.

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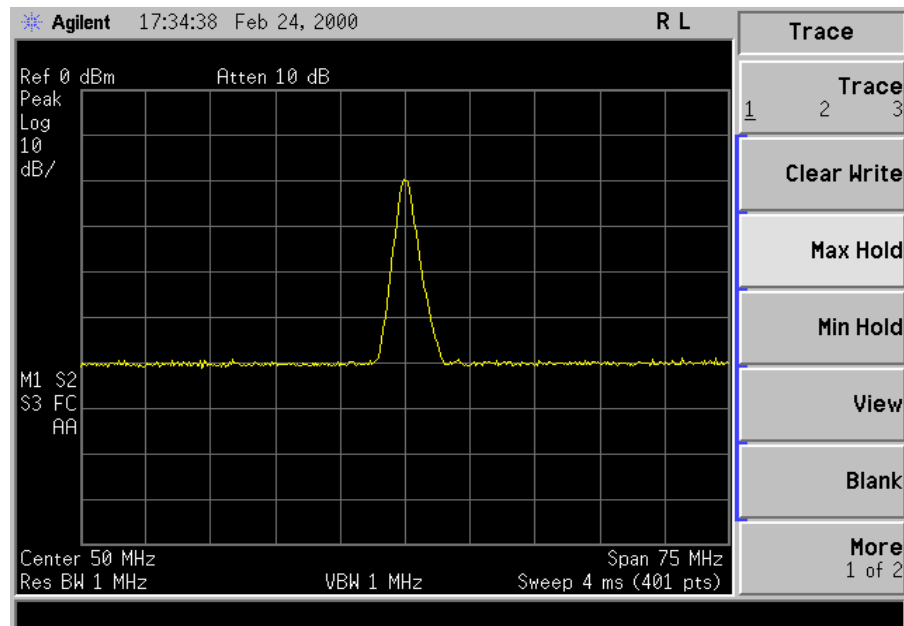
6. Activate trace 2 and put it into minimum hold by pressing **Trace (2)**, **Min Hold**. Your analyzer display should look similar to Figure 4-4.

Figure 4-4. Viewing Traces 1 and 2
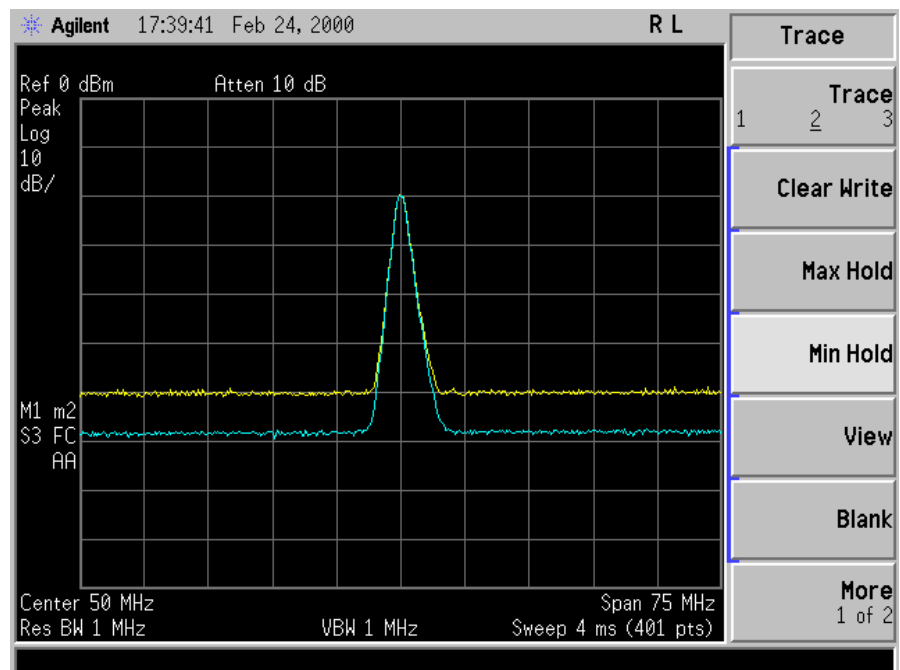
7. Activate trace 3 by pressing **Trace (3)**, **Clear Write**. Your analyzer display should look similar to Figure 4-5.

Figure 4-5. Viewing Traces 1, 2, and 3
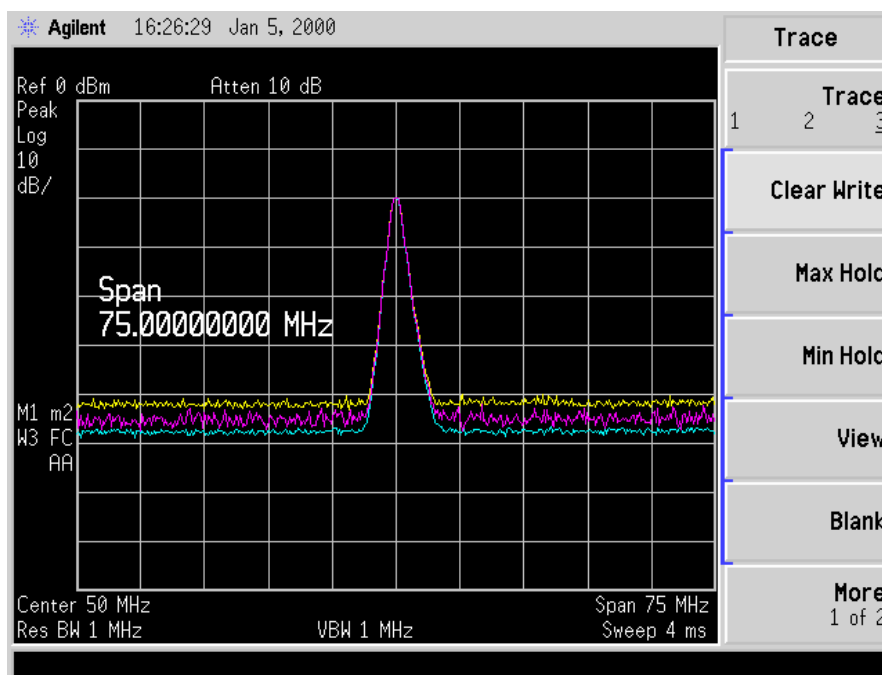
Step 2. Save the file

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**.

NOTE   Trace files are not bitmap files. Files saved as **Trace** cannot be imported into other applications or converted. If you require the use of other applications, for example Microsoft□ Word or Microsoft□ Excel, be sure to save your files as .gif or .wmf formats using **Screen** for your file **Type**.

---

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

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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
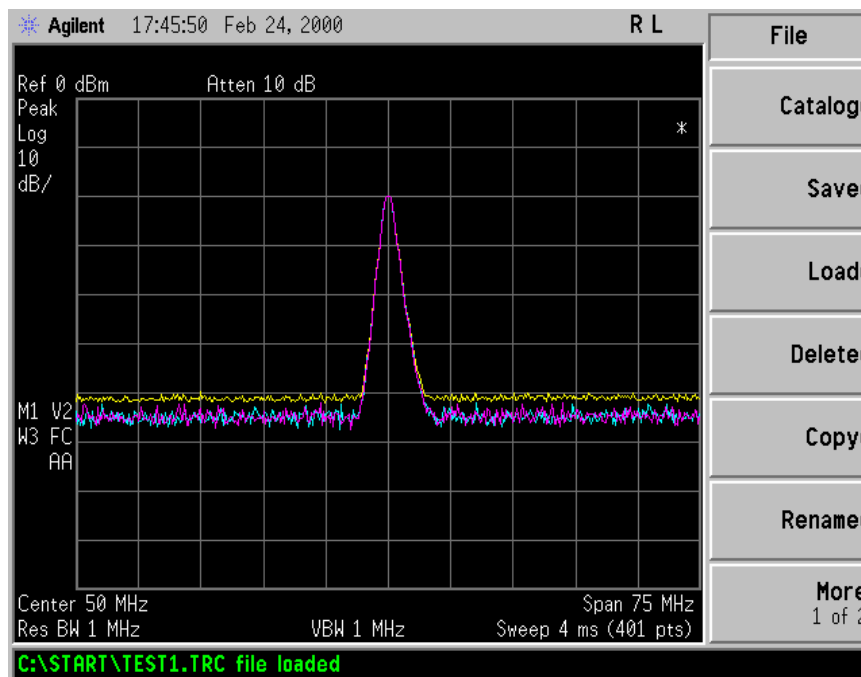
NOTE	You should notice that the trace you saved, in this example trace 3, is loaded to trace 2. If you wish to verify this condition, remove the signal input. For Agilent E4401B and E4411B, press **Input/Output**, **Amptd Ref (Off)**, for all other models, press **Input/Output**, **Amptd Ref Out (Off)**.
	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
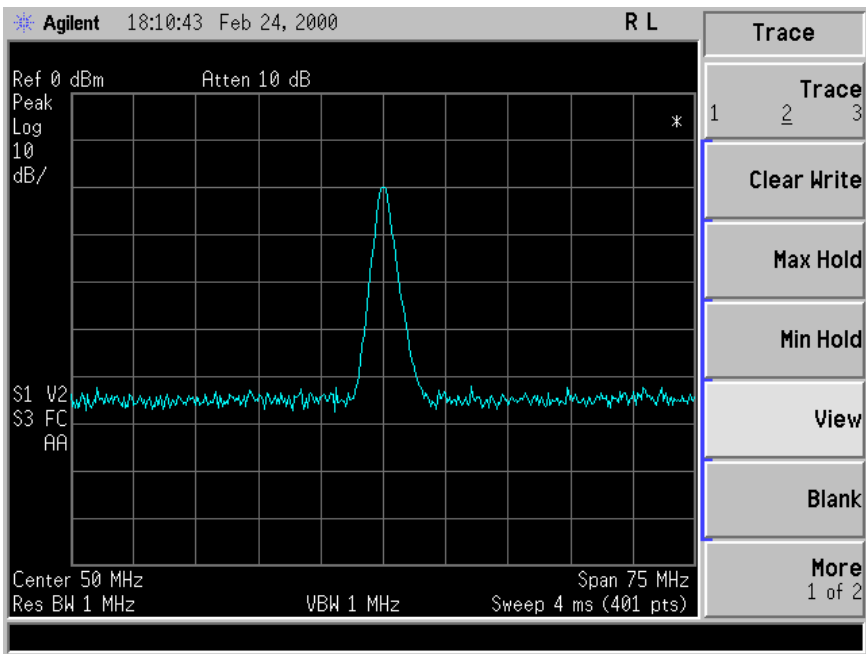
CAUTION	When operating in dc coupled mode, ensure protection of the input mixer by limiting the input level to 0 Vdc and +30 dBm.

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 the 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
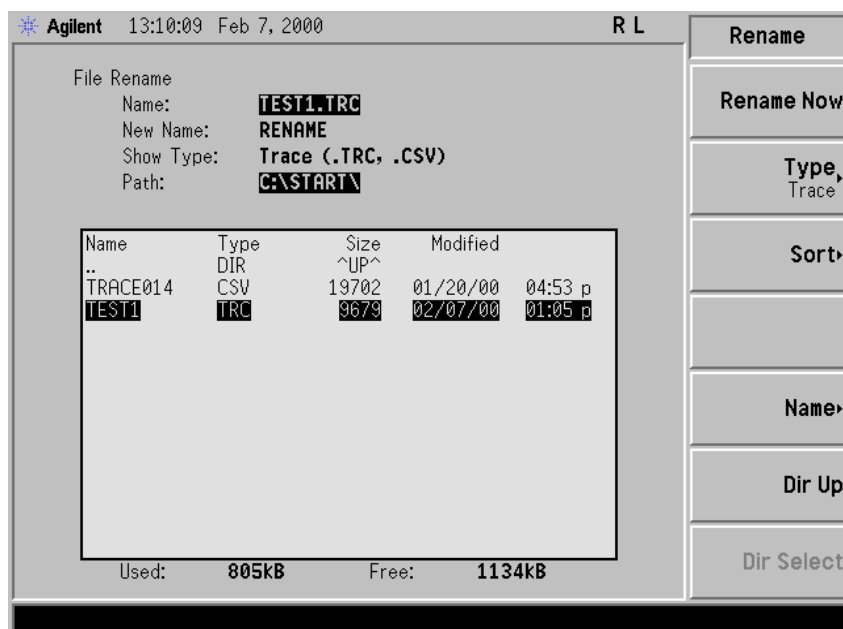
Copying a File

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
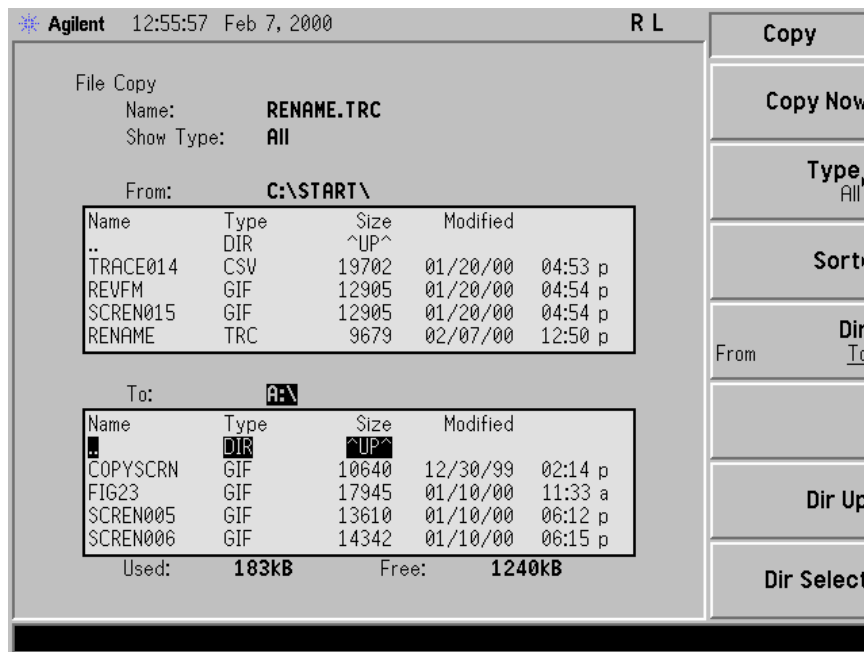
2. Put a formatted floppy in the A: drive.

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 51 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

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 67)

Unless specified otherwise, 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 E4402B, you would order E4402B-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 (for example, E4402BU-1D6.)

If you know the option you wish to order, refer to "Options" on page 67 which is in ascending order by option number and type. Complete option descriptions can be found in the following section, listed in alphabetical order by option name under "Option Descriptions" on page 70.

For the latest information on Agilent Spectrum Analyzer options and upgrade kits, visit the following Internet URL:

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

Accessories (see page 83)

Order accessories through your local Agilent Sales and Service Office.

Options

Option		ESA E-Series					ESA L-Series		
		E4401B	E4402B	E4404B	E4405B	E4407B	E4411B	E4403B	E4408B
042	Gray Backpack Carrying Case	●	●	●	●	●	●	●	●
044	Yellow Backpack Carrying Case	●	●	●	●	●	●	●	●
049	Color Display[a]						●	●	●
060	Low Emission[bc]	●	●	●	●	●			
106	Bluetooth™ FM Demodulation[d]		●	●	●	●			
120	ACPR Dynamic Range Extension		●	●	●	●			
219	Noise Figure Measurement Personality and Hardware	●	●	●	●	●			
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[e]	●	●	●	●	●			
231	ESA to 89600 Series Software Link Utility		●	●	●	●			
252	EDGE Upgrade GSM to Personality[f]		●	●	●	●			
266	8566 Series Programming Code Compatibility [e]	●		●	●	●		●	
290	8590 Series Programming Code Compatibility [g]	●	●	●	●	●	●	●	●
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[h]	●	●	●	●	●	●	●	●
1CP	Rack Mount with Handles	●	●	●	●	●	●	●	●

Option		ESA E-Series					ESA L-Series		
		E4401B	E4402B	E4404B	E4405B	E4407B	E4411B	E4403B	E4408B
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[i]	•					•		
1DQ	75 Ohm Tracking Generator[j]	•					•		
1DR	Narrow Resolution Bandwidths	•	•	•	•	•	•	•	•
1DS	RF Preamplifier	•	•	•	•	•			
8ZE	Refurbished Analyzer	•	•	•	•	•	•	•	•
A4H	GPIB and Parallel Interface[k]	•	•	•	•	•	•	•	•
A4J	IF, Video and Sweep Ports[l]	•	•	•	•	•	•	•	•
A5D	DC Power Cable	•	•	•	•	•	•	•	•
AXT	Hard Transit Case	•	•	•	•	•	•	•	•
AYQ	FM Demod / Quasi Peak Detector[m]		•	•	•	•			
AYT	Gray Soft Carrying/Operating Case	•	•	•	•	•	•	•	•
AYU	Yellow Carrying/Operating Case	•	•	•	•	•	•	•	•
AYX	Fast Time Domain Sweeps	•	•	•	•	•			
AYZ	External Mixing					•			
B70	Benchlink Spectrum Analyzer Connectivity Software	•	•	•	•	•	•	•	•
B72	Enhanced Memory[n]	•	•	•	•	•	•	•	•
B74	RF and Digital Communications Hardware[i]		•	•	•	•			
B75	Performance Bundle[h]	•	•	•	•	•			
B7B	TV Trigger and Picture on Screen[o]	•	•	•	•	•			
B7D	Digital Signal Processing and Fast ADC[p]		•	•	•	•			
B7E	RF Communications Hardware[q]		•	•	•	•			
B7K	Distance to Fault Accessory Kit	•	•	•	•	•			

Option		ESA E-Series					ESA L-Series		
		E4401B	E4402B	E4404B	E4405B	E4407B	E4411B	E4403B	E4408B
BAA	FM Demodulation[r]	•	•	•	•	•			
BAB	APC 3.5 Input Connector					•			•
BAC	cdmaOne Measurement Personality		•	•	•	•			
BAH	GSM Measurement Personality		•	•	•	•			
BAS	Express Option: Basic Analyzer[i]						•	•	•
BTG	Express Option: Basic Analyzer with Tracking Generator[i]						•	•	•
COM	Express Option: Communications Test Analyzer[i]		•	•	•	•			
HD4	Bundled Options (A4H, A4J and 1DP, and 227)						•		
HD5	CATV Service and Installation Analyzer enhanced bundle option						•		
H70	70 MHz IF Output		•	•	•	•			
STD	Express Option: Standard Analyzer[i]		•	•	•	•			
STG	Express Option: Standard Analyzer with Tracking Generator[i]		•	•	•	•			
UE2	Firmware Upgrade Kit	•	•	•	•	•	•	•	•
UKB	Low Frequency Extension[s]		•	•	•	•			
UK6	Commercial Calibration[h]	•	•	•	•	•	•	•	•
UK9	Front Panel Cover	•	•	•	•	•	•	•	•
R-50C-011-3: 3 Year Inclusive Calibration Contract		•	•	•	•	•	•	•	•
R-50C-011-5: 5 Year Inclusive Calibration Contract		•	•	•	•	•	•	•	•
R-51B-001-3C: 3 Year Service Support		•	•	•	•	•	•	•	•
R-51B-001-5C: 5 Year Service Support		•	•	•	•	•	•	•	•

a. Included with new analyzer purchase.
b. This option is incompatible with Option B7B and Option 1DP.
c. Option 060 performance is obtained only when using ac input power. Standard performance is obtained when using battery or dc power.
d. Option 106 is incompatible with Option BAA and AYQ.
e. This option requires Option A4H.
f. Option 252 requires Option BAH.
g. This option requires Option A4H or Option 1AX.

h. Option 1AX is incompatible with Option A4H
i. This option is only available at time of purchase.
j. This option has a 75 Ohm output impedance, and is only available with Option 1DP.
k. Option A4H is incompatible with Option 1AX.
l. Option A4J is incompatible with Option AYX (Option AYX contains functionality of Option A4J).
m. Option AYQ is incompatible with Option BAA and 106.
n.   Standard on analyzers with serial numbers greater than US41440000 or MY41440000
o. Option B7B requires Option BAA.
p. Option B7D requires Options B7E and 1D5, and contains Fast ADC compatibility of Option AYX, but does not contain functionality of Option A4J.
q. Option B7E requires Options B7D and 1D5.
r. Option BAA is incompatible with Option 106 and AYQ.
s. Option UKB requires Option 1DR.

Option Descriptions

Option Number	Name	Description
STD	Express Option: Standard Analyzer	Option STD simplifies ordering and speeds delivery of ESA-E Series analyzers with the following included options: • Fast Digitized Time Domain Sweeps with additional IF, Video, and Sweep Ports (Option AYX) • FM Demodulation (Option BAA)
STG	Express Option: Standard Analyzer with Tracking Generator	Option STG includes the 50 Ohm Tracking Generator (Option 1DN) with the same included options listed in the Option STD description.
BAS	Express Option: Basic Analyzer	Option BAS simplifies ordering and speeds delivery of ESA-L Series analyzers with the following option: • IF, Video, and Sweep Ports (Option A4J)
BTG	Express Option: Basic Analyzer with Tracking Generator	Option BTG includes the 50 Ohm Tracking Generator (Option 1DN) with the IF, Video, and Sweep Ports (Option A4J) listed in the Option BAS description.
COM	Express Option: Communications Test Analyzer	Option STD simplifies ordering and speeds delivery of ESA-E Series analyzers with the following included options: • Digital Signal Processing & Fast ADC (Option B7D) • FM Demodulation (Option BAA) • High Stability Frequency Reference (Option 1D5) • Narrow Resolution Bandwidth (Option 1DR) • RF Communications Hardware (Option B7E)

Option Number	Name	Description
HD4	Bundle Options	E4411B Option HD4 consists of the standard options A4H, A4J, 1DP, and 227. For information concerning the operation and connections, reference the standard user's and service guides for the E1799A under Option 227. You will need to refer to the E4411B User's and Service Guide under Options A4H, 1DP, and A4J. Option HD4 includes the following: • E4411B Opt A4H GPIB Parallel Interface • E4411B Opt 1DP (75Ω RF Input Impedance) • E4411B Opt A4J (IF and Sweep Ports) • E4411B Opt 227, Cable TV Measurement Personality User's Guide and Disk
HD5	Bundle Options	E4411B Option HD5 consists of the standard options A4H, A4J, 1DP, 227, along with special option HDS. For information concerning the operation and connections, reference the standard user's and service guides for the E1799A under Option 227. You will need to refer to the E4411B User's and Service Guide under Options A4H, 1DP, and A4J. Option HD5 includes the following: • E4411B Opt A4H (GPIB Parallel Interface) • E4411B Opt 1DP (75Ω RF Input Impedance) • E4411B Opt A4J (IF and Sweep Ports) • E4411B Opt 227, Cable TV Measurement Personality User's Guide and Disk • E4411B Opt HDS (Special Option Internal Preamplifier)

Option Number	Name	Description
H70	70 MHz IF Output Upgrade	E440xB Option H70 provides an analog 70 MHz IF Output to the rear panel of the ESA by down-converting the 321.4 MHz IF signal. The 70 MHz IF is always "ON" while the ESA is powered up. For all conversion loss parameters listed below, the attenuator setting is 0 dB. In highband, the preselector center routine must be performed to achieve the conversion loss listed below. If applicable, when Option 1DS (100 kHz to 3 GHz Preamp) is on, there will be a 28 dB to 30 dB of gain in the 70 MHz IF Output on the rear panel of the ESA. With the Preamp ON the conversion loss outlined below will be +22 dB. While performing the "Align All" routine on the ESA, the 70 MHz IF Output will be corrupted due to the systems variable gain circuit stepping through the alignment routine. There are no flatness corrections for the 70 MHz IF Out. **Nominal Characteristics for the 70 MHz IF** | Parameter	70 MHz IF
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Frequency	70 MHz
Conversion Loss < 3 GHz	−6 dB (± 2 dB)
Conversion Loss > 3 GHz	−8 dB (± 6 dB)
IF Bandwidth[a]:	
Lowband < 3 GHz	30 MHz
Highband ≥ 3 GHz	30 to 60 MHz	 a. Lowband has a fixed 30 MHz filter that determines the IF bandwidth. Highband IF bandwidth is dependent on the internal RF YIG filter. In all other respects this instrument is identical to the standard instrument specifications.
B72	Enhanced Memory Upgrade	Option B72 provides 2 SIMMS which increases the analyzer's RAM to 32 MBytes and its flash or data storage memory to 16 MBytes (8 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.
UE2	Firmware Upgrade Kit	Option UE2 provides the most current ESA spectrum analyzer firmware on 3-1/2 inch floppy disks.

Option Number	Name	Description
1D7	50 Ω to 75 Ω Matching Pad	This option provides a 50 Ω to 75 Ω matching pad with dc block to be used on the analyzer input. The pad has a frequency range of 9 ≤ MHz to 2 GHz. It adapts your standard 50 Ω analyzer to be compatible with a 75 Ω system under test. Connector types are 50 Ω Type-N (m) to 75 Ω BNC (f).
1DN	50 Ω Tracking Generator	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 source-receiver combination has a wide distortion-free dynamic range, plus good sensitivity and selectivity.
1DP	75 Ω Input Impedance	This option provides a 75 Ω input impedance instead of the standard 50 Ω 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.
1DQ	75 Ω Tracking Generator	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 source-receiver combination has a wide distortion-free dynamic range, plus good sensitivity and selectivity. Option 1DQ has a 75 Ω output impedance, and is only available with Option 1DP.
1D6	Time-Gated Spectrum Analysis	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.

Option Number	Name	Description
B7B	TV Trigger and Picture on Screen	*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 Ω 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 Ω).
120	ACPR Dynamic Range Extension	Option 120 provides extended dynamic range for ACPR measurements by improving phase noise at offsets 800 kHz to 8 MHz.
BAB	APC 3.5 Input Connector	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.
049	Color Display	Option 049 changes the monochrome display in the ESA L-Series to a color display. Included with new analyzer purchases.
B7D	Digital Signal Processing and Fast ADC	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 AYX (Fast Digitized Time Domain Sweeps) is required to perform the PowerStat Complementary Cumulative Distribution Function (PowerStat CCDF) for all radio standards.
AYZ	External Mixing	Option AYZ allows the use of Agilent 11970 Series, and 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-Agilent mixers.

Option Number	Name	Description
AYX	Fast Digitized Time Domain Sweeps	Option AYX allows fast digitized sweep times as fast as 20 μsec 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: 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 Ω, 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.
1D5	High Stability Frequency Reference	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.
A4J	IF, Sweep and Video Ports	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 Ω, 21.4 MHz IF output that is the down-converted signal of the RF input of the analyzer.

Option Number	Name	Description
060	Low Emission	Option 060 provides reduced radiated and conducted emissions to comply with EN55011 Class B requirements. The reduced emissions applies during ac operation only. Option 060 is incompatible with TV Trigger (Option B7B) and 75Ω input impedance (Option 1DP).
UKB	Low Frequency Extension	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 Option 1DR and is only available on ESA models E4402B, E4404B, E4405B, and E4407B.
1DR	Narrow Resolution Bandwidth	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.
1DS	Preamplifier	The preamplifier improves the analyzer's sensitivity (lowers the noise floor) by approximately 16 dB.
B74	RF and Digital Communications Hardware	Option B74 includes: • 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), • Narrow Resolution Bandwidth (Option 1DR). These options are required for optimum performance of the cdmaOne (Option BAC) or GSM measurement personality (Option BAH).
B75	Performance Bundle	Option B75 provides: • RF Preamplifier (Option 1DS) • Narrow Resolution Bandwidths (Option 1DR) • High Stability Frequency Reference (Option 1D5) Refer to Options 1DS, 1DR, and 1D5 for details. *This option is only available at time of purchase.*
B7E	RF Communications Hardware	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.

Option Number	Name	Description
BAA	FM Demodulation	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 Ω).
AYQ	FM Demodulation with Quasi-Peak Detector	Option AYQ 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 AYQ also provides your analyzer with squelch and quasi-peak detector capabilities.
A4H	GPIB and Parallel Interface	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, and the programmer's guide for you analyzer. The IntuiLink software 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. Option A4H allows the analyzer to copy its display to a printer connected to the parallel interface connector. Option A4H is included with, or can be replaced with Option 1AX with all new analyzer orders. This option was formerly available as a separate option with previous analyzers.
1AX	RS-232 and Parallel Interface	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, and the programmer's guide for your analyzer. IntuiLink Toolbar allows you to download spectrum analyzer display or data files to a personal computer using Microsoft□ Word or Microsoft□ Excel. Option 1AX allows the analyzer to copy its display to a printer connected to the parallel interface port. Option 1AX can replace Option A4H, which is included with all new analyzer orders. This option was formerly available as a separate option with previous analyzers.
B7K	Distance to Fault Accessory Kit	Option B7K includes the 86205A (RF bridge), 11636A (power divider), 909A (coax termination), 11512A (coax short), 8120-8687 (coax cable), in a padded case.

Option Number	Name	Description
225	Distance to Fault Measurement Personality	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.
106	Bluetooth™ FM Demodulation	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).
228	Bluetooth™ Measurement Personality	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.
304	Bluetooth™ Premium Bundle	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)
227	Cable TV Measurement Personality	Provides measurement capabilities necessary for installation and service of cable TV systems.

Option Number	Name	Description
BAC	cdmaOne Measurement Personality	Provides transmitter and receiver measurements that comply with various international digital communications standards. The measurements include: • 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 For optimum performance of this personality, Option COM with RF Preamplifier (Option 1DS) is recommended.
BAH	GSM Measurement Personality	Provides transmitter and receiver measurements that comply with various international digital communications standards. The measurements include: • 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 • Output RF spectrum suite For optimum performance of this personality, Option COM with Time-Gated Spectrum Analysis (Option 1D6) and RF Preamplifier (Option 1DS) are recommended.
252	EDGE Measurement Personality	This option works with the GSM personality, Option BAH. It provides additional transmitter and receiver measurements that comply with the digital communications standards. The measurements include: • EDGE power versus time • EDGE EVM (error vector magnitude) • EDGE output RF spectrum suite

Option Number	Name	Description
229	Modulation Analysis Personality	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.
219	Noise Figure Measurement Personality and Hardware	Provides noise figure measurements including: • Limit lines • Loss compensation • Extended frequency (measures up/down converters) To have specified performance below 3 GHz, you need the preamp Option 1DS.
226	Phase Noise Measurement Personality	Option 226 is an automated phase noise (dBc/Hz) measurement solution. It provides 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.
266	HP 8566B/8568B Programming Code Compatibility	Option 266 allows use of a limited set of 8566B/8568B programming commands to control the ESA Series analyzers. When this option is enabled, SCPI commands are disabled if the remote language selected is not SCPI.
290	8590 Series Programming Code Compatibility	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.
231	ESA to 89600 Series Software Link Utility	Option 231 adds connectivity of an ESA analyzer to a Windows NT 4.0 or Windows 2000 based PC running Agilent 89600 VSA software. The Agilent 89600 VSA software is not included with this option. It is available separately.

Option Number	Name	Description
B70	Benchlink Spectrum Analyzer	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 processors and spread sheets.
230	Web Remote Control Software	Option 230 provides software which can be used to control the analyzer remotely over the web. When the analyzer is connected via GP-IB 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)
A5D	12 Vdc Power Cable	Option A5D provides a 12 Vdc power cable that allows your analyzer to be powered from 12 V automotive or truck batteries.
UK9	Front Panel Protective Cover	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.
042 044	Backpack Operating and Carrying Cases	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 E1779B). Side ventilation allows for operation without removal, but the maximum operating temperature is reduced to 45 °C.
AYT AYU	Operating and Carrying Cases	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 E1779B). Side ventilation allows for operation without removal, but the maximum operating temperature is reduced to 45 °C.

Option Number	Name	Description
AXT	Hard Transit Case	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.
1CP	Rack Mount Kit with Handles	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).
0B1	Additional Manual Set	Option 0B1 provides an additional copy of the User/Programmer, Measurements and Specifications documentation for your instrument.
0B0	Delete Manual Set	Option 0B0 deletes copies of the User's/Programmer's, Specifications and Measurements guides.
0BW	Service Documentation and Performance Verification and Adjustment Software	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.
0BV	Component Level Service Documentation	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.
UK6	Commercial Calibration with Test Data	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.*
R-50C-011-3	3 Year Inclusive Calibration Contract	Provides your analyzer with a 3 year analyzer calibration contract.
R-51B-001-3C	3 Year Service Support	Provides your analyzer with a total of 3 years of service support. This adds a 2 year service contract to the analyzer's base 1 year warranty.
R-50C-011-5	5 Year Inclusive Calibration Contract	Provides your analyzer with a 5 year analyzer calibration contract.
R-51B-001-5C	5 Year Service Support	Provides your analyzer with a total of 5 years of service support. This adds a 4 year service contract to the analyzer's base 1 year warranty.
8ZE	Refurbished Analyzer	Refurbished ESA E-Series and L-Series Spectrum Analyzers with various hardware options can be ordered subject to availability. Measurement personalities may be included or upgraded with Option 8ZE orders.

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 Ohm/75 Ohm Minimum Loss Pad

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

75 Ohm Matching Transformer

The HP/Agilent 11694A allows you to make measurements in 75 Ohm systems using an analyzer with a 50 Ohm 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 MOhm 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.

AC Probe (Low Frequency)

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 83006A preamplifier provides a minimum of 26 dB gain from 10 MHz to 26.5 GHz.

- 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 (0.5 to 4 meters). GPIB cables are used to connect controllers to a spectrum analyzer.

USB/GPIB Cable

For use with Option A4H. The Agilent 82357A USB/GPIB interface provides a direct connection from the USB port on your laptop or desktop PC to GPIB instruments. It comes with the SICL and VISA software for Windows® 98 (SE)/Me/2000/XP. Using VISA software, your existing GPIB programs work immediately, without modification. The 82357A is a standard Plug and Play device and you can interface with up to 14 GPIB instruments.

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 E1779B Battery Pack

The E1779B 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 *E1779B Battery Pack User's Guide* for more information.

NOTE Agilent recommends a two person lift when using this instrument with the model 1779B battery pack attached.

Parallel Interface Cable

For use with Option 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 HP 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 Ω RF bridge and 86207A 75 Ω 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

For use with Option 1AX. The 24542GC is a 3 meter 9-pin (f) to 25-pin (m) RS-232 cable. The Agilent 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 Agilent 24542M 9-pin (f) to 25-pin (m), and the PC cable is Agilent 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).

Static Safe Accessories

9300-0797	3M static control mat 0.6 m × 1.2 m (2 ft. × 4 ft.) with a 4.6 cm (15 ft.) ground wire. Does *not* include wrist strap or cord
9300-1367	Wrist-strap, color black, stainless steel. Four adjustable links and a 7 mm post-type connection.
9300-0980	Wrist-strap cord 1.5 m (5 ft.)
9300-1308	ESD heel-strap (reusable 6 to 12 months)

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, or returning an analyzer for service, perform the quick checks listed in "Check the Basics" on page 90. This check may eliminate the problem.

If a problem persists, you may choose to:

• Repair the analyzer yourself. See "Service Options" on page 91.

• Return the analyzer to Agilent Technologies for repair. See "Returning an Analyzer for Service" on page 92, for more information.

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

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
Informational 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 **Esc** or **Preset**, or is overwritten by another message.
Pop-up 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.
Status 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.
User Error 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 **System, Show Errors, Clear Error Queue**), or another message is displayed in the status line. Pressing the **Esc** or **Preset** 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** key 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.

TIP   You can get automatic electronic notification of new firmware releases and other product updates/information by subscribing to the *Agilent Technologies Test & Measurement E-Mail Notification Service* for the PSA or ESA Series at http://wwwdb.tm.agilent.com/cgi-bin/notification/user.pl

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Read the Warranty

The warranty for your analyzer is documented in the front of your specs guide. 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.

Connector Care

Cleaning connectors with alcohol shall only be done with the instruments power cord removed, and in a well-ventilated area. Allow all residual alcohol moisture to evaporate, and the fumes to dissipate prior to energizing the instrument.

WARNING   **If flammable cleaning materials are used, the material shall not be stored, or left open in the area of the equipment. Adequate ventilation shall be assured to prevent the combustion of fumes, or vapors.**

For information on proper connector care and cleaning, go to the following URL:

http://cp.literature.agilent.com/litweb/pdf/08510-90360.pdf

Contacting Agilent Technologies

For assistance, contact your nearest Agilent Technologies Sales and Service Office. To find your local Agilent office access the following URL, or if in the United States, call the following telephone number:

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

1-800-829-4444 (8 am - 8 pm ET, Monday - Friday)

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.

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.

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