

Getting Started Guide

Agilent Technologies PSA Spectrum Analyzers

This manual provides documentation for the following instrument:

Agilent Technologies PSA Series

E4440A (3 Hz - 26.5 GHz)



Agilent Technologies

Manufacturing Part Number: E4440-90009

Printed in USA

January 2001

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

WARNING

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

CAUTION

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

NOTE

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



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



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



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



This symbol is used to mark the ON position of the power button.



This symbol is used to mark the OFF position of the power button.



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 the instructions in the documentation.



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



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



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



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

WARNING

This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall be inserted only in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.

WARNING

If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.

Warranty

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

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

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1 **Preparing for Use**

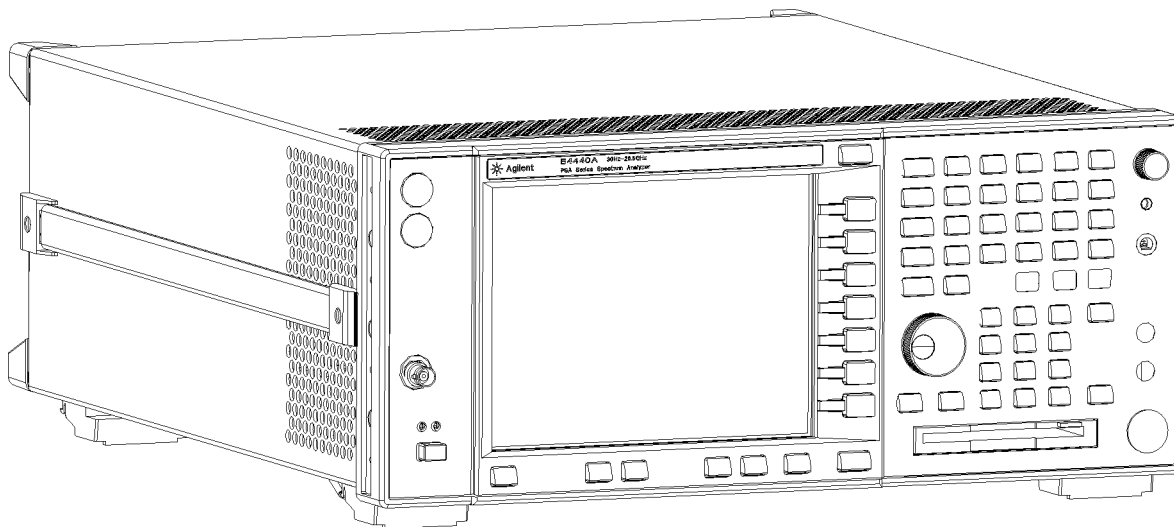
This chapter provides information on how to inspect your Agilent Technologies PSA Spectrum Analyzer (when it arrives) and what to expect when it is first powered on. This chapter also includes the analyzer's power requirements.

Introducing the Agilent E4440A Performance Spectrum Analyzer

The Agilent E4440A performance spectrum analyzer (PSA) measures and monitors complex RF and microwave signals. The analyzer integrates traditional spectrum measurements with advanced vector signal analysis, optimizing speed, accuracy, and dynamic range.

The Agilent PSA spectrum analyzer is readily adaptable to meet changing measurement needs. Optional features enable the analyzer to be configured as a comprehensive analytical tool for communications systems and components. See [Chapter 5, “Options and Accessories,”](#) for more information.

Figure 1-1 Agilent Technologies E4440A Performance Spectrum Analyzer



WARNING

To prevent electrical shock, disconnect the Agilent Technologies E4440A from mains before cleaning. Use a dry cloth or one that is slightly dampened with water to clean the external case parts. Do not attempt to clean internally.

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. [Table 1-1](#) lists the items shipped with your analyzer.

Table 1-1 Items Shipped with Your Analyzer

Part Number	Description
Accessories	
(See Table 1-2)	Power Cable
Standard Documentation Set	
E4440-90009	Getting Started Guide
E4440-90010	Reference Guide
E4440-90012	Measurement Guide
E4440-90011	Specifications Guide
E4440-90030	Instrument Messages and Functional Tests
E4440-90029	Programming Conversion Guide
E4440-90008	Documentation CD

NOTE

Items included with the shipment of your analyzer may change corresponding to the option ordered. See [“How to Order Options,”](#) on [page 62](#) for more information. See also, [“Documentation,”](#) on [page 68](#) for more information regarding the Standard Documentation Set.

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. See [Table 4-2, “Agilent Technologies Sales and Service Offices,”](#) in [Chapter 4](#) for contact information. You will not need to wait for a claim settlement.
- Keep the shipping materials for the carrier’s inspection.
- Use the original (or comparable) shipping materials to return the instrument to Agilent Technologies, if necessary. See [“How to Return Your Analyzer for Service,”](#) in [Chapter 4](#) for detailed shipping procedures.

Power Requirements

The Agilent PSA spectrum analyzer's only physical installation 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.

WARNING

This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.

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.

NOTE

For more information regarding instrument specifications, see the *Agilent Technologies PSA Spectrum Analyzers Specifications Guide*.

CAUTION

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

Table 1-2 Power Requirements

Description	Specifications
Voltage	100 to 132 Vrms
Frequency	47 to 66 Hz/360 to 440 Hz
Power Consumption, On	Base Fully Loaded < 260 W < 450 W
Power Consumption, Standby	< 20 W

NOTE This instrument does NOT contain customer serviceable fuses.

AC Power Cord

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



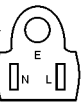
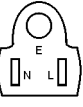



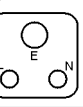

NOTE The front panel switch is a standby switch *only* and is not a LINE switch (power disconnecting device).

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

Various AC power cables are available. They are unique to specific geographic areas. The cable appropriate to the original shipping location is included with the instrument. You can order additional AC power cables for use in different areas. The following table (next page) lists the available AC power cables, illustrates the plug configurations, and identifies the geographic area in which each cable is appropriate.

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

Preparing for Use
Power Requirements

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

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

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

plugs

Battery Information

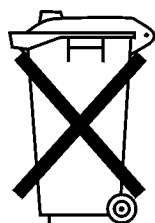
The analyzer uses a Lithium Polycarbon Monofluoride battery to power the instrument clock. The battery is located on the CPU board.

NOTE

If the clock does not work, the problem is the battery. See [“How to Return Your Analyzer for Service,”](#) in Chapter 4.

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.



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

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Turning on the Analyzer for the First Time

Plug in the power cord. Then press power switch (located in the lower left-hand corner of the analyzer's front panel) to turn the analyzer on. See [“Front-Panel Features,” on page 22.](#)

Information Screen

An information screen will be displayed during the initialization process. The information screen will contain your analyzer product number and a URL for accessing product support information on the World Wide Web. See [“Additional Information” on page 69.](#)

NOTE

The information screen may be displayed for as long as 1 minute before the initialization process is complete.

Firmware Revision Number

The firmware revision number is available by pressing **System, More(1 of 3), Show System**. If you need to call Agilent Technologies regarding your analyzer, it will be helpful to have this number readily available.

Connect an External Reference

If you wish to use an external frequency reference, connect an external reference source to the **EXT REF IN** connector on the rear panel (see [“Rear-Panel Features,” on page 26.](#)) The input amplitude range is -5 dBm to 10 dBm. The input frequency range is 1 MHz to 30 MHz.

The frequency of the external reference must be entered into the analyzer. Press **Input/Output, Freq Ref** and select the **Ext** function. Next, enter the frequency of the external frequency reference using the keypad.

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.

Warm-Up Time

Allow the spectrum analyzer to warm-up for 30 minutes before attempting to make a calibrated measurement. The instrument must meet operating temperature conditions to ensure that it meets its specifications.

Printer Setup and Operation

Equipment

- IEEE 1284 compliant printer cable.
- Supported printer equipped with a parallel interface. (A supported printer is one that accepts Hewlett-Packard Printer Control Language Level 3 or 5). Your printer's language can be found in its documentation or in the specifications found on the manufacturers web page.
 - PCL3 printers include most HP DeskJet printers.
 - PCL5 printers include most HP LaserJet printers.

Printer Models	Language Type	Color Capable
HP DeskJet 340	PCL3	yes
HP DeskJet 400	PCL3	yes
HP DeskJet 540	PCL3	no
HP DeskJet 540C	PCL3	yes
HP DeskJet 600	PCL3	no
HP DeskJet 670C, 672C, 680C, 682C	PCL3	yes
HP DeskJet 720C, 722C, 820C	Windows only (not compatible)	no
HP DeskJet 600C, 660C, 670C, 680C, 690C	PCL3	yes
HP DeskJet 840C, 850C, 870C, 890C, 895C	PCL3	yes
HP DeskJet 970C	PCL3	yes
HP DeskJet 1120C	PCL3	yes
HP DeskJet 1200C/PS	PCL5	yes
HP DeskJet 1600C	PCL5	yes
HP InkJet 2000C Series	PCL3	yes
HP InkJet 2200/2250 Series	PCL5	yes
HP LaserJet 4L, 4P	PCL5	no
HP LaserJet 5, 5L, 5M, 5P, 5MP	PCL5	no

Printer Models	Language Type	Color Capable
HP LaserJet 6, 6L, 6M, 6P, 6MP	PCL5	no
HP LaserJet 2100 Series	PCL5	no
HP LaserJet 5000 Series	PCL5	no
HP DesignJet 755CM (C3198B)	PCL5	yes

Interconnection and Setup

1. Turn off the printer and the analyzer.
2. Connect the printer to the analyzer parallel I/O interface connector on the rear panel using an IEEE 1284 compliant parallel printer cable. See [“Rear-Panel Features,”](#) on page 26.
3. Turn on the analyzer and printer.
4. Press **Print Setup** on the front panel and then press the **Printer Setup** menu key.
5. Select the printer language and color capability appropriate for your printer. See the table above this section for a list of some compatible printers.

Testing Printer Operation

When you have completed the printer setup for the analyzer, 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 not responding** will appear at the bottom of the screen.

Protect Against Electrostatic Discharge

Electrostatic discharge (ESD) can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe work station. There are two combinations of accessories available that provide ESD protection.

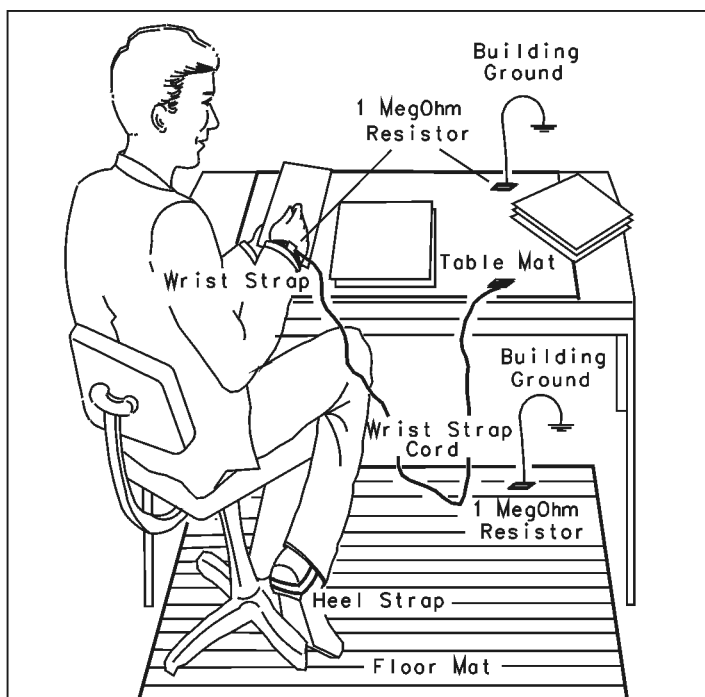
- conductive table-mat and wrist strap combination
- conductive floor-mat and heel strap combination

A significant level of ESD protection is provided by using both combinations of accessories at the same time. Only the table-mat and wrist-strap combination provides adequate ESD protection when used alone. The static-safe accessories must provide at least 1 M Ω of isolation from ground to ensure user safety.

NOTE

Static-safe accessories can be ordered through your local Agilent Technologies Sales and Service office. See [Table 4-2, on page 58](#). See [Table 1-3, on page 18](#) for static safe accessory part numbers and descriptions.

Figure 1-2 Example of a Static-Safe Work Station



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Table 1-3 Static Safe Accessories

Agilent Part Number	Description
9300-0797	Set includes: 3M static control mat 0.6 m × 1.2 m (2 ft. × 4 ft.) and 4.6 cm (15 ft.) ground wire. (The wrist-strap and wrist-strap cord are not included. They must be ordered separately.)
9300-0980	Wrist-strap cord 1.5 m (5 ft.)
9300-1383	Wrist-strap, color black, stainless steel, without cord, has four adjustable links and a 7 mm post-type connection.
9300-1169	ESD heel-strap (reusable 6 to 12 months)

Handling Electronic Components and ESD

The possibility of unseen damage caused by ESD is present whenever components are transported, stored, or used. The risk of ESD damage can be greatly reduced by close attention to how all components are handled. Refer to the following guidelines when handling components:

- Perform work on all components 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.

CAUTION

Always handle printed circuit board assemblies by the edges. This will reduce the possibility of ESD damage to components and prevent contamination of exposed plating.

Test Equipment Usage and ESD

- Before connecting any coaxial cable to an instrument 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 instrument.
- Be sure that all instruments are properly earth-grounded to prevent build-up of static charge.

Reducing Damage Caused by ESD

The following suggestions may help reduce ESD damage that occurs during testing and servicing operations:

- Momentarily ground the center and outer conductors of any coaxial cable before connecting it to the instrument.
- Make sure that personnel are grounded with a resistor-isolated wrist strap before touching the pin of any connector or removing any assembly from the unit.
- Prevent a buildup of static charge by ensuring that all instruments are properly earth-grounded.

WARNING

These techniques for a static-safe work station should not be used when working on circuitry with a voltage potential greater than 500 volts.

Additional Information about ESD

For more information about preventing ESD damage, contact the Electrical Over Stress/Electrostatic Discharge (EOS/ESD) Association, Inc. The ESD standards developed by this agency are sanctioned by the American National Standards Institute (ANSI).

Internal Alignment

The instrument's internal alignment routine is performed automatically each time the instrument is powered on. It is required to run every 24 hours or, if the internal instrument temperature changes $\pm 3^{\circ}$ C.

The instrument was shipped from the factory with the "Alignments" mode set to Auto. The Auto setting allows the alignment routine to run automatically every 24 hours or, if the temperature changes $\pm 3^{\circ}$ C.

NOTE When the Alignment routine runs, you will hear the attenuator settings changing. This generates a certain amount of audible noise and is not an indication of trouble.

NOTE For more detailed information regarding the alignment routine (including how to run of the alignments or, how the instrument can alert you when alignment is required) refer to the *Agilent Technologies PSA Spectrum Analyzers Reference Guide*.

Manually Performing an Alignment

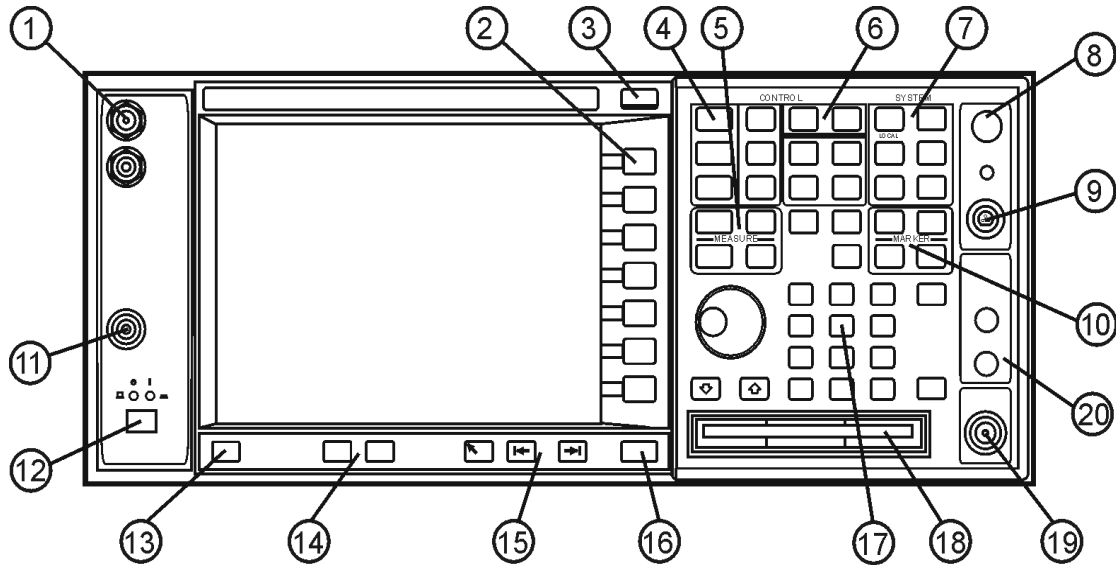
Press **System, Alignments, Align All Now**, after the 30 minute warm-up period has completed to align the instrument. If **Auto Align, Off** is selected, refer to the analyzer specifications for the conditions required to maintain calibration.

2 System Features

This chapter provides information about front panel and rear panel functions and features. Display annotation characteristics, functions, and features are also defined.

Front-Panel Features

Figure 2-1 Front-Panel Feature Overview



ge81a

- 1 **Inputs** The **I INPUT** and the **Q INPUT** ports allow connection of an analog I/Q demodulator.

— **This feature not currently implemented.**
- 2 **Softkeys** There are seven unlabeled keys on the front panel of the spectrum analyzer. These keys are called “softkeys.” Menu labels, identifying the current function of each softkey, are displayed directly to the left of each key on the analyzer screen. Softkey menus are dependent on the menu level activated by the user.

The currently active softkey is highlighted by having a lighter gray background. Softkeys which are not available for use are grayed-out (text appears in gray). Softkeys which form a set of mutually exclusive menu choices are grouped together by a blue bar on the left of the key labels. See [“Using Softkeys” on page 45](#) for additional information regarding front panel softkeys.

- 3 ESC Key** The **ESC** key exits any function without modifying current parameters.
- Clear an active function.
 - Cancel a print job, returning front panel control to the user.
 - Clear error messages displayed in the status bar.
 - Exit a service diagnostic test.
 - Stop an alignment in progress.
 - Cancel a numeric entry in progress by leaving the original value unchanged and returning to the previous menu.
- 4 Control Keys** Control keys set parameters that are used for making measurements in the current measurement mode.
- Control the center frequency or channel number.
 - Set the horizontal and vertical scales.
 - Initiate an average or a trigger.
 - Control the sweep.
 - Adjust the way results are viewed
 - Control signal input and output.
- 5 Measure Keys** Measure keys select and set up specific measurements within the current application.
- Select and initiate measurements.
 - Set measurement parameters.
 - Restart a measurement.
- 6 Mode Keys** Mode Keys select measurement mode and mode parameters.
- Auto couple functions.
 - Select optimal sweep type, time, bandwidth, and detection mode.
- 7 System Keys** System Keys access features that are used with all instrument modes and affect the state of the entire spectrum analyzer.
- Display error messages.
 - Restore system defaults.
 - Identify and change the current GPIB, IP, and Ethernet addresses.
 - Print or save what is on the screen.
 - Install, uninstall, or display instrument options.
 - Display, format, or set the date and time.
 - Display the instrument firmware revision, options installed, and instrument serial number.

8	Vol. Control/ Earphones	The volume knob adjusts the volume of the internal speaker or earphone. The earphone connector provides a connection for an earphone jack which bypasses the internal speaker.
9	PROBE PWR	The PROBE PWR output supplies power for external high frequency probes and accessories.
10	Marker Keys	Marker keys obtain specific information about the displayed measurement. They may be used to perform the following functions: <ul style="list-style-type: none">• Assign a marker to a trace.• Search for signal peaks.• Move the active marker.• Select or activate a marker.
11	EXT TRIGGER INPUT	The EXT TRIGGER INPUT allows external triggering of measurements. The external trigger accepts an external trigger signal between -5 V and $+5\text{ V}$, and has a nominal impedance of $>10\text{ k}\Omega$.
12	POWER ON/OFF	The Power On/Off switch turns the instrument on. An LED light is located above the Power On/Off switch. A green light indicates that the instrument is powered on. A yellow light indicates that the instrument is in standby mode.

NOTE The instrument continues to draw power even if the line power switch is in standby. The detachable power cord is the instrument disconnecting device (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 (disconnecting device).

13	Help Key	— This feature not currently implemented. This feature will be implemented with a future firmware upgrade.
14	Window Keys	— This feature not currently implemented. This feature will be implemented with a future firmware upgrade.
15	Navigation Keys	— This feature not currently implemented. This feature will be implemented with a future firmware upgrade.
16	Return Key	The Return key exits the current menu and returns to the previous menu.

- 17 Data Controls** Data controls are used to change the numeric value of an active function. Entries made using data controls will be visible in the active function area of the display.
- The knob allows continuous changes of the active function value. It also allows changes of many function values which are incrementally adjustable.
 - Step keys allow discrete increases and/or decreases of the active function value. The step size depends upon the spectrum analyzer measurement range or on a preset amount. Out-of-range values or out-of-sequence values will not occur using these keys.
 - The numeric keypad allows entry of exact values for many of the spectrum analyzer functions.

Numeric entries must be terminated with an appropriate units of measurement key. The units softkey menu will automatically appear when you enter a digit. The **Enter** key may be used to terminate numeric data with the default unit or measurement or when no unit of measurement is being entered.

NOTE If an entry from the numeric keypad does not coincide with an allowed function value, the spectrum analyzer defaults to the nearest allowable value, or displays an error.

- 18 Floppy Disk Drive** Accepts 3.5 inch 1.44 MB floppy disks.

NOTE Only 1.44 MB floppy disks are supported by the analyzer. 720 KB floppy disks will NOT work reliably in the analyzer. See [“Prepare a Floppy Disk” on page 35](#).

- 19 RF Input** The 50 Ω RF input allows for input of an external RF signal. The connector is a type N female or APC 3.5 male (option BAB).

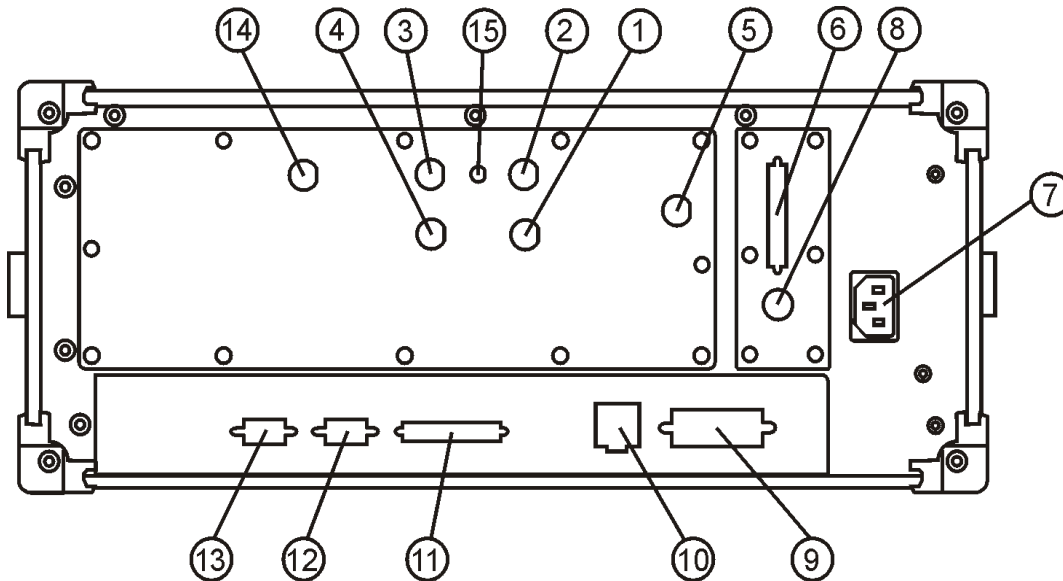
CAUTION Ensure that the total power of all signals at the analyzer input does *not* exceed +30 dBm (1 watt).

When AC coupled (**Input/Output, RF Coupling AC**), the maximum DC voltage to the RF input is ± 100 V. When DC coupled, the maximum DC voltage is $< \pm 0.2$ Vdc.

- 20 EXTERNAL MIXING IN/OUT** Allows connections for external mixing (input and output).
— **This feature not currently implemented.**

Rear-Panel Features

Figure 2-2 Rear-Panel Feature Overview



ge82a

- | | | |
|---|------------------------------|--|
| 1 | TRIGGER 2 OUT | TRIGGER 2 OUT provides a transmitter tester trigger output. This is used to synchronize other test equipment with the spectrum analyzer. |
| 2 | TRIGGER 1 OUT | TRIGGER 1 OUT provides a transmitter tester trigger output. This is used to synchronize other test equipment with the spectrum analyzer. |
| 3 | EXT REF IN | EXT REF IN allows the input of a 1 to 30 MHz external frequency reference signal. The external reference frequency must be entered by the user. |
| 4 | 10 MHz OUT (SWITCHED) | 10 MHz OUT (SWITCHED) provides an output of the transmitter tester's internal 10 MHz frequency reference signal. This is used to lock the frequency reference of other test equipment to the spectrum analyzer. This is a switched output. |
| 5 | TRIGGER IN | TRIGGER IN allows external triggering of measurements. The external trigger signal level is 5V TTL, and has a nominal impedance of 10 kΩ. |
| 6 | SCSI | — This feature is for factory use ONLY. |
| 7 | Line power input | The Line power input is the AC power connection. The line voltage operates at nominally 115 V (47 to 440 Hz) or at nominally 230 V (47 H to 66 Hz). The input power ranges for the power supply are 100 to 132 V or 195 to 250 Vrms. The power supply automatically senses the input power and switches between these two ranges. There is no customer replaceable power fuse. Make sure that the line-power source outlet has a protective ground contact. |

- 8 **KYBD** The **KYBD** port enables connection of an external PS-2 keyboard using a 6-pin mini-DIN connector
- **This feature not *fully* implemented. Currently, this function can only be used for firmware upgrades.**

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

- 9 **GPIB** The **GPIB** port allows the connection of a General Purpose Interface Bus (GPIB) (IEEE 488.1) cable, which enables remote instrument operation.

- 10 **LAN** The **LAN** connection is a TCP/IP Interface which can be used:
- as a SICL server emulating IEEE 488.2 protocol over LAN.
 - for a telnet programming port that can be sent SCPI commands.
 - for a TCP/IP socket programming port that can be sent SCPI commands.
 - for FTP operations (to retrieve a screen, trace, or state file from the rubicon/userdir directory).

NOTE For more information on remote programming with your spectrum analyzer, refer to the *Agilent Technologies PSA Spectrum Analyzers Reference Guide*.

- 11 **PARALLEL** The **PARALLEL** connection supports remote printing.

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

- 12 **MONITOR** The **MONITOR** port allows connection of an external VGA monitor, using a 15-pin mini D-SUB connector.

- 13 **RS-232** The **RS-232** serial port allows connection of a PC, printer, or modem, using a 9-pin RS-232 cable.

— **This feature not currently implemented. This feature will be implemented in a future release.**

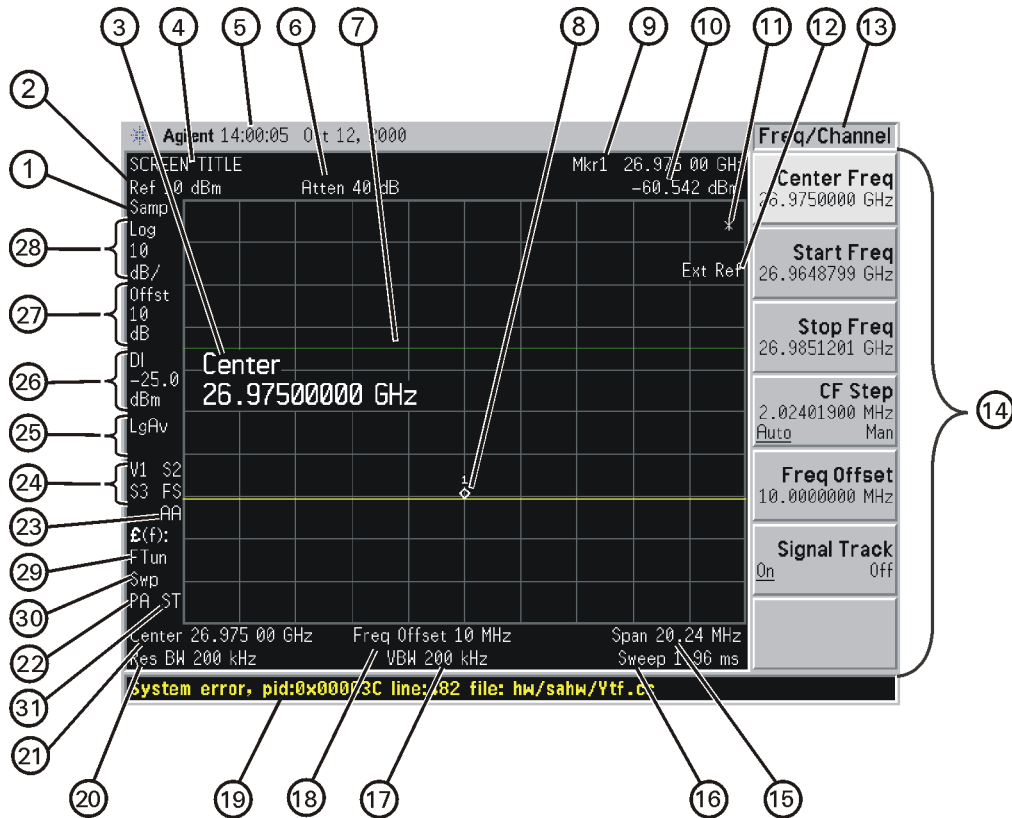
- 14 **Pre-Sel
Tune Out** **Pre-Sel Tune Out** allows tuning voltage for Preselected mixer.

- 15 **321.4 MHz
IF Out** 321.4 MHz IF Out provides 321.4 MHz output.

Display Annotation

Here is an example of the annotation that may appear on an analyzer display. The screen annotation below is referenced by numbers 1–31, which are also listed and described in [Table 2-1](#) immediately following this section. The Function Key column indicates which key combination activates the function related to the annotation. Refer to [“Front-Panel Features”](#) on page 22 for more information on a specific function key.

Figure 2-3 Screen Annotation



ge85a

Table 2-1 Display Annotation

Item	Description	Function Keys
1	Detector type ^a	Det/Demod, Detector
2	Reference level	Amplitude, Ref Level
3	Active function block	Refer to the description of the activated function.
4	Screen title	Display, Title
5	Time and date display	System, Time/Date
6	RF attenuation ^a	Amplitude, Attenuation
7	Display line	Display, Display Line
8	Marker	Marker
9	Active marker	Marker
10	Active marker frequency and amplitude	Marker
11	Data invalid indicator	See information below this table.
12	Status message area	Displays status messages. See Table 4-1 on page 55 .
13	Key menu title	Dependent on menu selection.
14	Softkey menu	See key label descriptions in “Front-Panel Features” on page 22 .
15	Frequency span or stop frequency	Span or Frequency, Stop Freq
16	Sweep time ^a	Sweep, Sweep Time
17	Video bandwidth ^a	BW/Avg, Video BW
18	Frequency offset	Frequency, Freq Offset
19	Display status line	Displays informational and error messages. See Table 4-1 on page 55 .
20	Resolution bandwidth ^a	BW/Avg, Res BW
21	Center frequency or start frequency	Frequency, Center Freq or Start Freq
22	Internal preamp	Amplitude, Int Preamp
23	Auto alignment routine status	System, Alignments, Auto align See information following this table.

Table 2-1 Display Annotation

Item	Description	Function Keys
24	Trigger or Trace	Trig or Trace/View See information following this table.
25	Average ^a	BW/Avg, Average (The number shown indicates current average number) vAvg indicates voltage average on. LgAv indicates log power average on. PAvg indicates power average on.
26	Display line annotation	Display, Display Line
27	Amplitude offset	Amplitude, Ref Lvl Offst
28	Amplitude scale	Amplitude, Scale Type or Amplitude, Scale/Div
29	Phase noise optimization ^a	Mode Setup, PhNoise Opt See information below this table.
30	Sweep type ^a	Sweep, Sweep Type
31	Signal track	Frequency, Signal Track

a. Signifies a function that can be auto-coupled. A (#) symbol in front of this display annotation indicates that the function is uncoupled.

Item 11 refers to the data invalid indicator. When the (*) is displayed, it means that some or all trace data may not match the annotation due to possible changes in instrument settings.

Item 23 refers to the auto alignment mode. **AA** indicates that auto alignment of all analyzer parameters will occur. **AL** indicates that the instrument will alert you with an on-screen message when alignment is needed. No indicator will appear if auto alignment is off.

Item 24 refers to the trigger and sweep modes of the analyzer. The first letter **F** indicates the spectrum analyzer is in free-run trigger mode. The second letter **C** indicates the spectrum analyzer is in continuous-sweep mode. Refer to [Table 2-2](#) for other valid annunciators for the first letter and for the second letter.

Item 24 also refers to the trace modes of the analyzer. The first letter **w** indicates that the analyzer is in clear-write mode. The second letter is **1**, representing trace 1. The trace 2 trace mode is **s2**, indicating trace 2 (2) is in the store-blank mode (s). The trace mode annotation for trace 3 is displayed under the trace mode annotation of trace 1. The trace 3 trace mode is **s3**, indicating trace 3 (3) is in the store blank mode (s). Refer to [Table 2-2](#) for other valid trace mode annunciators.

Item 29 indicates that Phase Noise can be optimized for the following:

f<50k = frequencies less than 50 kHz from carrier.

f>50k = frequencies greater than 50 kHz from carrier.

FTun = optimization of LO for fast tuning.

NOTE Refer to the following table for screen annotation codes for trace, trigger, and sweep modes. GPIB annunciators are also referenced.

Table 2-2 **Screen Annotation Codes**

Trace Mode		GPIB Annunciators		Sweep Mode		Trigger Mode	
m	Minimum Hold	L	GPIB Listen	C	Continuous	X	External (front)
M	Maximum Hold	R	Remote Operation	S	Single Sweep	R	External (rear)
S	Blank (store)	S	GPIB SRQ			F	Free Run
V	View	T	GPIB Talk			L	Line
W	Clear Write					V	Video

File Menu Functions

This section 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 internal (C:) drive is actually nonvolatile (flash) memory, but functions similarly to a PC hard drive.

Read this section to learn how to do all of the following:

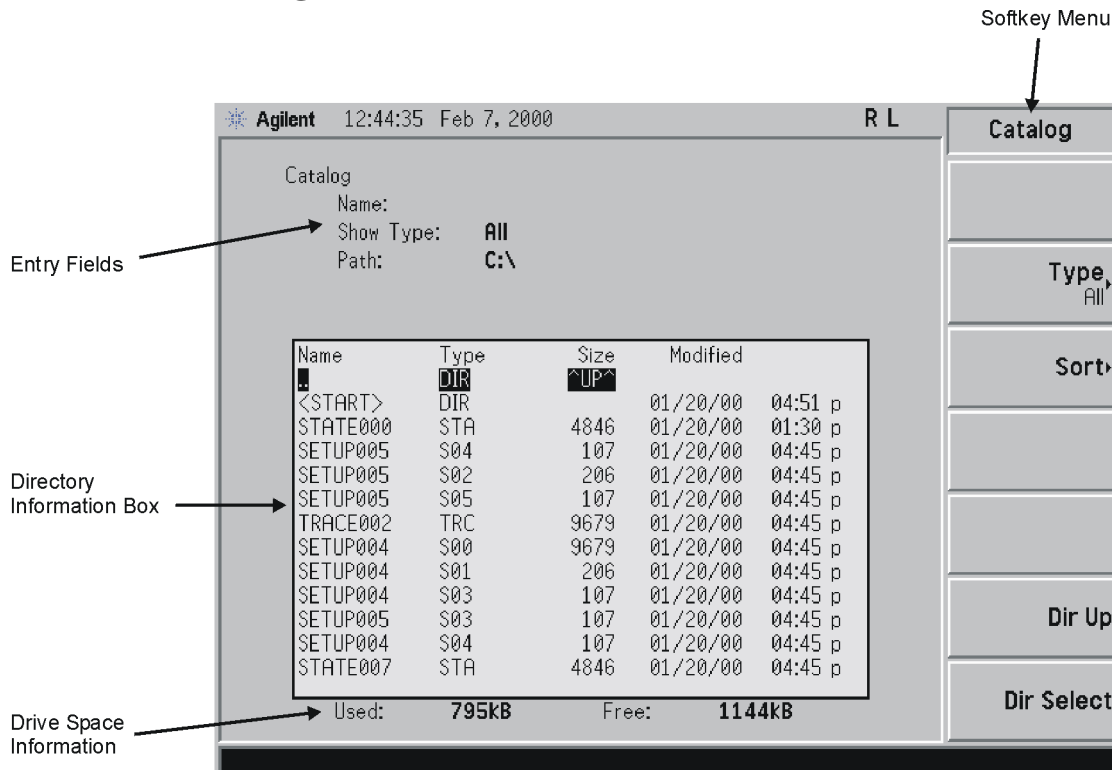
- locate and view files in the catalog
- create a directory
- prepare a floppy disk
- save a file
- load a file
- rename a file
- copy a file
- delete a file

Locate and View 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.

NOTE Press **File, Catalog** to bring up a screen display as shown in [Figure 2-4](#).

Figure 2-4 Catalog Menu



- 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:
 - Name: field states the filename.
 - Show Type: field displays the type of files viewed.
 - Path: field displays the drive and directory location of the files.
- 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:
 - Name: column shows the names of files and directories within the current directory. The drive ([-A-] or [-C-]), if at the top level, will be shown.
 - Type: column displays the extension of the filename, for example, .SET, .STA, .TRC. Directories are displayed as DIR. Drives have nothing listed under Type: . They are only designated by the Name: column ([-A-] or [-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:** allows you to 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 up and down within the directory information box.

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

Creating a Directory

Directories and sub-directories can be created on both the A: floppy disk 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 2-4](#), 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:**, as follows:
 - a. Press **Dir Up** until you reach the drive level (**[-A-]** and **[-C-]** displayed).
 - b. Turn the knob or press the step keys until **[-C-]** is highlighted.
 - c. Press **Dir Select**.
3. Press **Name** and enter the name “**START**” using the Alpha Editor. 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. Once your directory is created, the status bar displays: **Directory C:\START created**.

5. To make a sub-directory, scroll down (use knob or step keys) 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.`

Prepare a Floppy Disk

You can prepare a floppy disk for use in the analyzer by deleting all files and directories on the disk. The floppy disk must be formatted in 1.44 MB format prior to successful use in the analyzer. You may use pre-formatted disks or format disks with the use of a PC (the format is MS DOS®¹). Use the following instructions to prepare your floppy disk:

NOTE If no data is stored on the floppy you wish to use, you may skip this procedure. This procedure provides simple instruction outlining how to delete all previously stored data on your pre-formatted floppy disk.

1. Place the disk you wish to prepare into the floppy drive (A:\) of the analyzer.

NOTE Only 1.44 MB floppy disks are supported by the analyzer. 720 KB floppy disks will NOT work reliably in the analyzer.

2. Press **File, More(1 of 2)**. The directory information box is active (highlighted), however, only the floppy disk volume [-A-] is shown on the display.

NOTE If the disk you are attempting to prepare has no pre-existing formatting, or is not inserted in the drive (A:\), the error message: `Bad, missing, or unformatted disk` is displayed in the status line.

3. Press **Delete All**. The following message appears in the display window: `WARNING: You are about to destroy ALL data on Volume A: . Press Delete all again to proceed or any other key to abort.`

CAUTION To abort deletion of all data, press any key other than **Delete All**.

4. Press **Delete All** a second time to delete all files and directories.
 - a. You will see the message: `Delete All` in the display window. Pressing any other key after receiving the warning (step 3), will abort the formatting process.
5. When formatting is complete, the following message appears in the status line: `Volume A: delete complete.`

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

Save a File

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

Step 1. Set up the analyzer trace

1. Press **Preset** on the analyzer.
2. Press **Input/Output, Input Port, Amptd Ref** to turn on the 50 MHz signal.
3. Press **Frequency, 50, MHz** to place the signal in the center of the screen.

Step 2. Save the file

1. To access the **Save** menu, press **File, Save**.
2. Select the type of file you want to save. In this example you are saving a trace; press **Type, Trace**.
3. Select the trace you wish to save (1, 2, 3, or all traces). In this example you will save trace 1; press **Source** (softkey), **Trace 1**.
4. Select the format for which you wish to save the trace: 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 complete the name entry.
6. The destination for the saved file is shown in the **Path:** field. In this example, you will select the path as C:\START\.

NOTE If the correct location is not listed in the **Path:** field, change directories by pressing **Dir Up** (softkey) or using the step keys or knob, highlight the directory you wish. Pressing **Dir Select** then confirms your choice which is 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. When the saving of the file is complete, 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.

NOTE

You need to use a filename that does not already exist in the current directory. The filename is limited to eight characters, alpha (A–Z) or numeric (0–9) in any combination. The analyzer will not allow you to overwrite an existing file. If you select a filename that already exists, the status bar will display the message: `File already exists`. If you do not choose a filename, the analyzer will automatically generate a name based on the type of file you are saving (Setup: `SETUP`, State: `STATE`, Trace: `TRACE`, Limits: `LIMIT`, Corrections: `COREC`, Screen: `SCREEN`). 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.

Load 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) 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. You should see the 50 MHz signal at the center of the screen (frozen in View mode). The status bar reads: `C:\START\TEST1.TRC file loaded`.
7. Some key points about loading traces:
 - a. The state of the analyzer is saved along with the trace. Therefore, when the trace is loaded, all of the settings and annotations are restored to the values displayed previously (when the trace was originally stored).
 - b. The trace is loaded in View mode so that it does not update and the data remains onscreen for printing, analysis, etc.

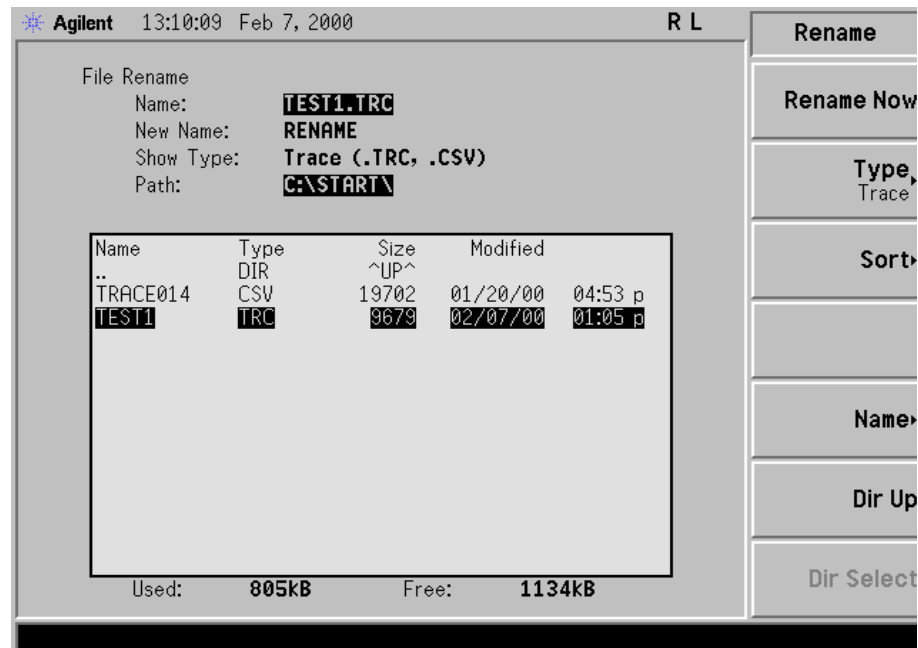
NOTE

You should notice that the trace you saved (in this example trace 1) is loaded to trace 2. And, trace 2 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).

Rename 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 2-5](#).
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.**

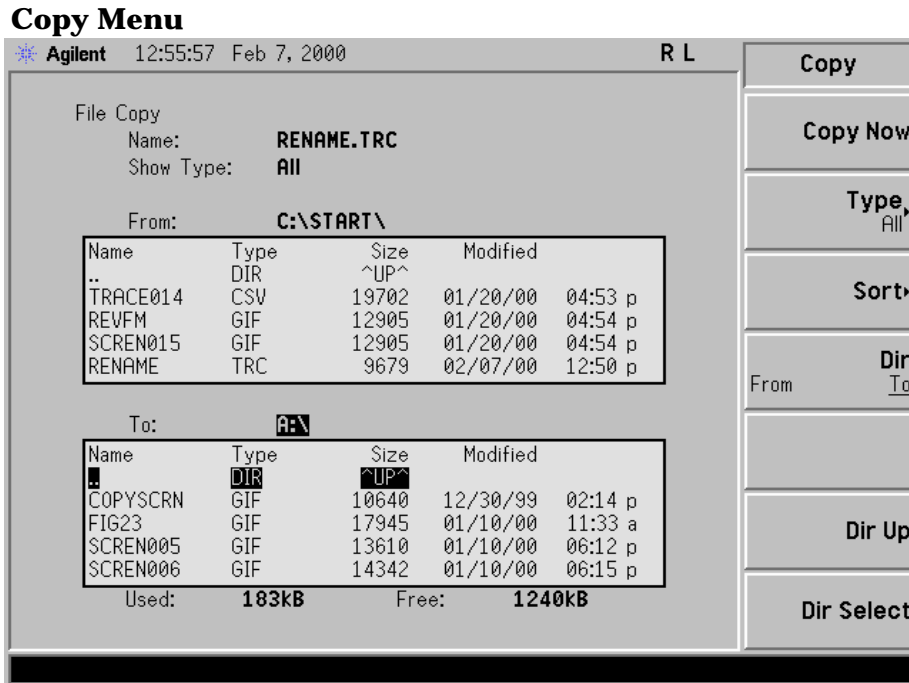
Figure 2-5 Renaming a File



Copy a File

1. To access the Copy menu, press **File, Copy**. This menu function brings up two directory boxes as described by the **From:** and **To:** fields located directly above the boxes. Refer to [Figure 2-6](#).

Figure 2-6



2. Place a formatted 1.44 MB floppy disk into 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.

Delete 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 [“Locate and View Files in the Catalog” on page 32](#) 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.

3 Making a Basic Measurement

This chapter provides information regarding basic analyzer operation, including instructions on how to preset the instrument and view a basic signal.

Basic Assumption

The material in this chapter is presented with the assumption that you understand the analyzer's display annotations, front panel, and rear panel layout. If you do not understand the features and/or characteristics associated with the analyzer's display annotations and front and rear panel, refer to [Chapter 2, "System Features,"](#) on page 21.

This chapter is divided into the following sections:

- ["Using the Front Panel"](#) on page 45
- ["Presetting the Spectrum Analyzer"](#) on page 46
- ["Viewing a Signal"](#) on page 47

CAUTION

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

Using the Front Panel

Entering Data


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

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

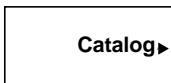
Using Softkeys

Softkeys (which appear along the right side of the display) provide access to many analyzer functions. Here are examples of softkey types:


Toggle Allows you to activate/deactivate states.

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

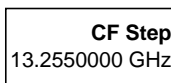
Submenu Displays a new menu of softkeys.

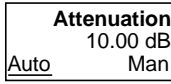
Example:  A submenu key allows you to view a new menu of softkeys related to the submenu key category.

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

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

Adjust Highlights the softkey and sets the active function.

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

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

Presetting the Spectrum Analyzer

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

Factory Preset Restores the analyzer to its factory-defined state. For details, see the *Agilent Technologies PSA Spectrum Analyzers Reference Guide*.

User Preset Restores the analyzer to a user-defined state.

With a user preset enabled, pressing the green **Preset** key displays the softkeys **Factory Preset** and **User Preset**; you then select the preset you want. If a user preset has *not* been enabled, 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 instrument 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 underline (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 toggle **Preset** to underline **Factory**.

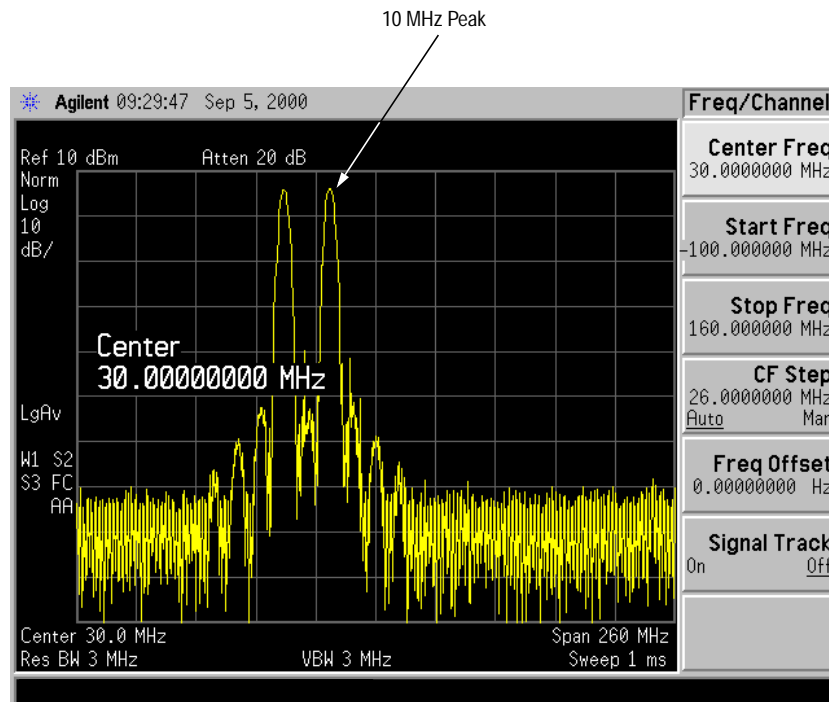
Viewing a Signal

1. Press **Preset**. If the softkeys **Factory Preset** and **User Preset** appear, select **Factory Preset**.
2. Press **Input/Output**, and note the **10MHz Out** setting. If **Off** is active (underlined), press the softkey to toggle the reference on.
3. Connect the analyzer's rear panel 10 MHz OUT (SWITCHED) to the front-panel input.
4. Set the reference level to 10 dBm: Press **Amplitude**, **1**, **0**, **dBm**.
5. Set the center frequency to 30 MHz: Press **FREQUENCY**, **3**, **0**, **MHz**.

Setting Reference Level and Center Frequency

The 10 MHz reference signal spectrum appears on the display, as shown in [Figure 3-1](#).

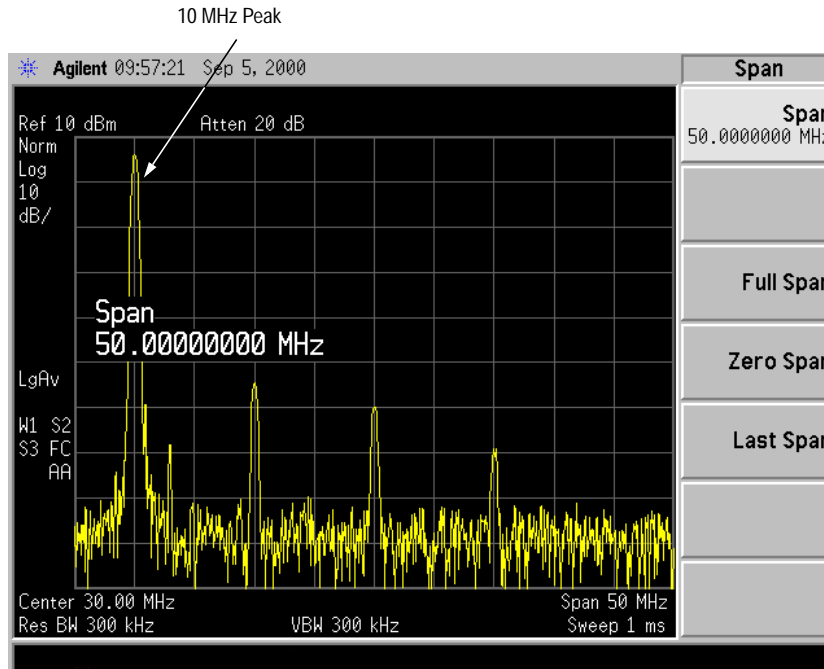
Figure 3-1 10 MHz External Reference Signal and Associated Spectrum



Setting Frequency Span

6. 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

7. 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.

8. If you have moved the marker, return it to the peak of the 10 MHz signal. Then set the *peak* of the signal to the reference level (the top graticule line on the display).

Changing Reference Level

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

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

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

Figure 3-3 A Marker on the 10 MHz Peak

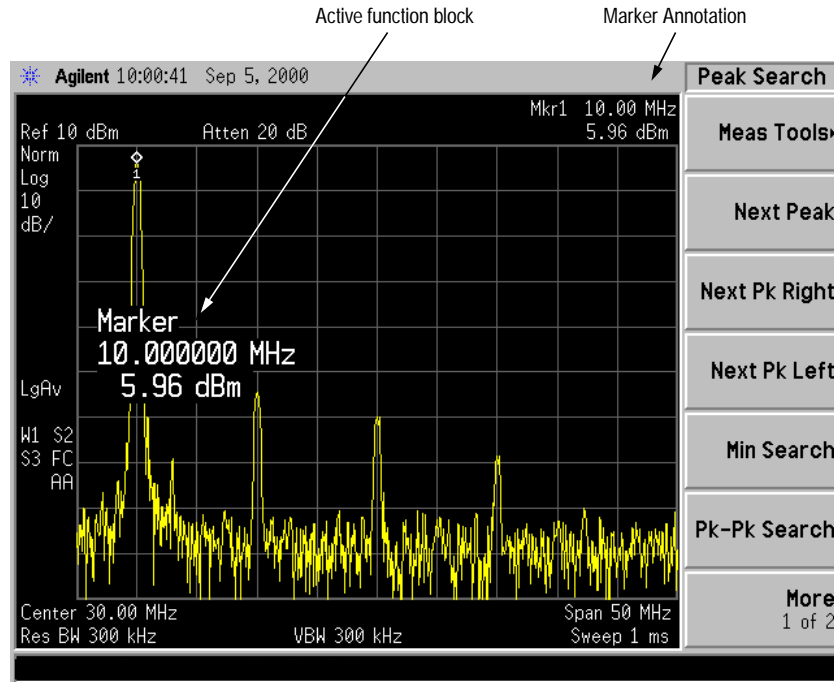
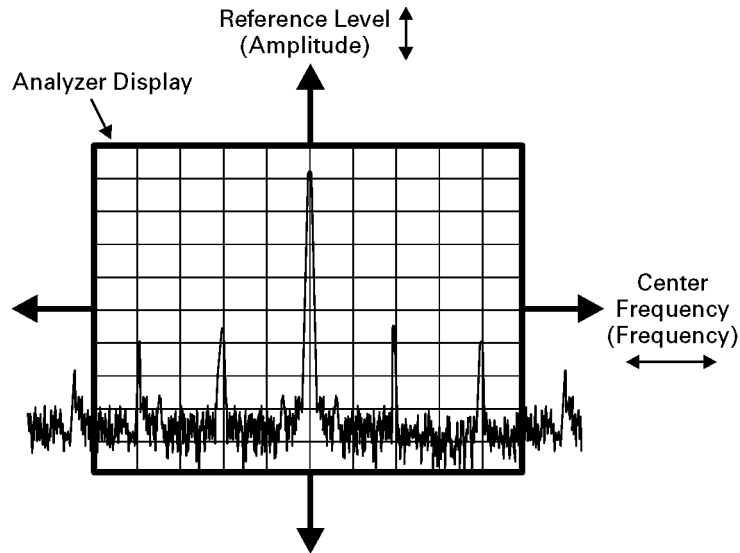


Figure 3-4 Relationship Between Frequency and Amplitude



bd21_5l.cdr

**Increasing
Frequency
Accuracy**

10. 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 increase the accuracy of the frequency reading in the marker annotation, turn on the frequency count function.

- a. Press **Mkr Fctn**.
 - The **Marker Fctn** softkeys appear.
- b. Press **Marker Count**.
 - The **Marker Count** softkeys appear.

11. Note softkey **Marker Count On Off**. If **Off** is underlined, press the softkey to toggle marker count on.

As shown in [Figure 3-5](#):

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

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:

Freq Count: Reduce Span/RBW ratio

This indicates that the resolution bandwidth is too narrow.

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

**Valid Marker
Count Range**

13. 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.

14. 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.

15. Press **Marker**, **Off** to turn the marker off.

NOTE

Upon creation of your signal, you may save your settings as a user preset (press **System**, **Power On/Preset**, **Save User Preset**) or you may save your settings as a file (see [“Save a File” on page 36](#)).

Figure 3-5 Increasing Marker Frequency Accuracy

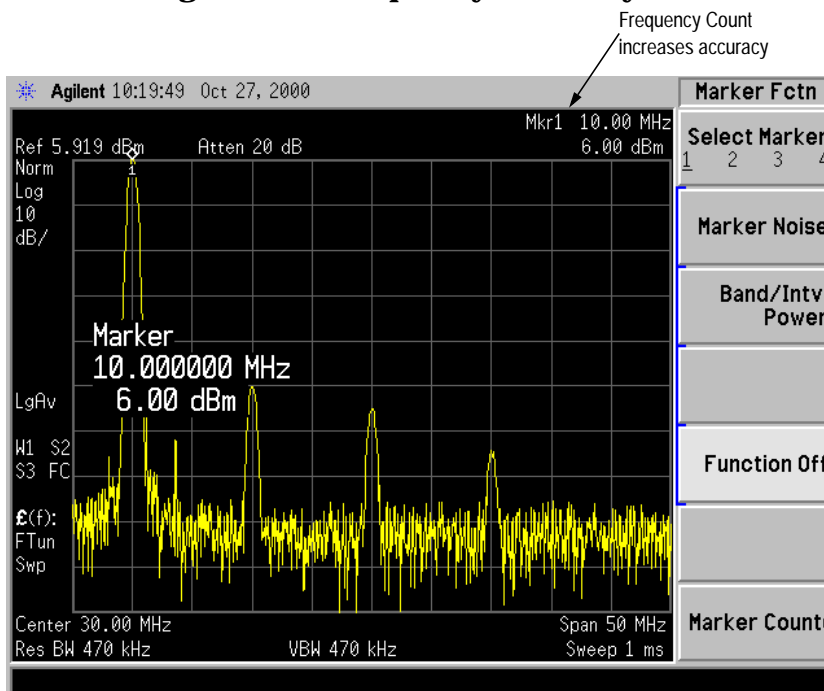
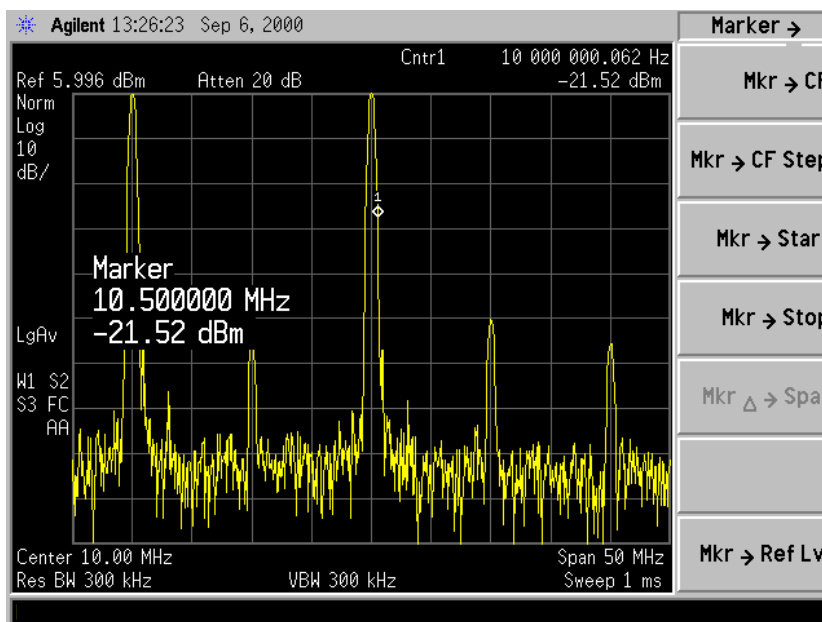


Figure 3-6 Using Marker Counter



4 Troubleshooting

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

If You Have a Problem

If you experience a problem or would like additional information about your instrument, Agilent Technologies' worldwide sales and service organization is ready to provide the support you need. See [“How to Call Agilent Technologies” on page 57](#).

Before calling Agilent Technologies or returning your analyzer for service, perform the quick checks listed in [“Check the Basics” on page 56](#). It is possible that a quick check may eliminate your problem altogether.

If the problem persists, you may choose to:

- Repair the instrument yourself. See [“Service Options” on page 57](#).
- Return the instrument to Agilent Technologies for repair. See [“How to Return Your Analyzer for Service” on page 59](#), 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 instrument.

Types of Spectrum Analyzer Messages

The analyzer can generate various messages that appear on the display during operation. A complete list of spectrum analyzer messages can be found in the *Agilent Technologies PSA Spectrum Analyzers Instrument Messages and Functional Tests* document. The four types of spectrum analyzer messages are listed in the table below.

Table 4-1 **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).	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 also clear error messages.
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) and in the SCPI Error Queue.	Messages remain until you preset the analyzer, press ESC , or another message is displayed in the status line.

Before You Call Agilent Technologies

Check the Basics

- ❑ Is there power at the receptacle?
- ❑ Is the analyzer turned on? Check to see if the green LED above the power switch is on. Also, listen for internal fan noise to determine if the instrument cooling fans are running.
- ❑ If other equipment, cables, and connectors are being used with your Agilent Technologies PSA 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 the **Preset** key.

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 (Factory)**. Then press the green **Preset** hardkey (on the front panel).

- ❑ Is the measurement being performed, and the results that are expected, within the specifications and capabilities of the analyzer? Refer to the “Specifications and Characteristics” chapters in the *Agilent Technologies PSA Spectrum Analyzers Specifications Guide* for analyzer specifications.
- ❑ If the instrument is not communicating via the LAN connection, check for the presence of blinking yellow LEDs on the rear panel LAN connector. If the Rx (receive) LED is not blinking, check the LAN cable and LAN integrity.
- ❑ In order 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 24 hours, 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 All Now**.
- ❑ If the previously performed alignments did not resolve the problem, press **System, Alignments, Restore Align Defaults**. Then press **System, Alignments, Align All Now**.

- ❑ Is the analyzer displaying an error message? If so, refer to the *Agilent Technologies PSA Spectrum Analyzers Instrument Messages and Functional Tests* document.
- ❑ If the necessary equipment is available, perform the functional tests in the *Agilent Technologies PSA Spectrum Analyzers Instrument Messages and Functional Tests* document.

Read the Warranty

The warranty for your analyzer is at the front of this manual. 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 sales and service 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.

How to Call Agilent Technologies

Agilent Technologies has sales and service offices around the world to provide you with complete support for your analyzer. To obtain servicing information or to order replacement parts, contact the nearest Agilent Technologies sales and service office listed in [Table 4-2](#). In any correspondence or telephone conversations, refer to your analyzer by its product number, full serial number, and firmware revision.

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

Table 4-2 Agilent Technologies Sales and Service Offices

UNITED STATES		
Instrument Support Center Agilent Technologies (800) 403-0801		
EUROPEAN FIELD OPERATIONS		
Headquarters Agilent Technologies S.A. 150, Route du Nant-d'Avril 1217 Meyrin 2/ Geneva Switzerland (41 22) 780.8111	France Agilent Technologies France 1 Avenue Du Canada Zone D'Activite De Courtaboeuf F-91947 Les Ulis Cedex France (33 1) 69 82 60 60	Germany Agilent Technologies GmbH Agilent Technologies Strasse 61352 Bad Homburg v.d.H Germany (49 6172) 16-0
Great Britain Agilent Technologies Ltd. Eskdale Road, Winnersh Triangle Wokingham, Berkshire RG41 5DZ England (44 118) 9696622		
INTERCON FIELD OPERATIONS		
Headquarters Agilent Technologies 3495 Deer Creek Rd. Palo Alto, CA 94304-1316 USA (415) 857-5027	Australia Agilent Technologies Australia Ltd. 31-41 Joseph Street Blackburn, Victoria 3130 (61 3) 895-2895	Canada Agilent Technologies (Canada) Ltd. 17500 South Service Road Trans-Canada Highway Kirkland, Quebec H9J 2X8 Canada (514) 697-4232
Japan Agilent Technologies Japan, Ltd. Measurement Assistance Center 9-1, Takakura-Cho, Hachioji-Shi Tokyo 192-8510, Japan TEL (81)- 426-56- 7832 FAX (81)- 426-56- 7840	Singapore Agilent Technologies Singapore (Pte.) Ltd. 150 Beach Road #29-00 Gateway West Singapore 0718 (65) 291-9088	Taiwan Agilent Technologies Taiwan 8th Floor, H-P Building 337 Fu Hsing North Road Taipei, Taiwan (886 2) 712-0404
China China Agilent Technologies 38 Bei San Huan X1 Road Shuang Yu Shu Hai Dian District Beijing, China (86 1) 256-6888		

How to Return Your Analyzer for Service

Service Tag

If you are returning your analyzer to Agilent Technologies for servicing, fill in and attach a blue service tag. Several service tags are supplied at the rear of this chapter. Please be as specific as possible about the nature of the problem. If you have recorded any error messages that appeared on the display, or have completed a functional test, or have any other specific data on the performance of your analyzer, please send a copy of this information with your analyzer.

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 shipping. 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 instrument with commercially available materials, as follows:

1. Attach a completed service tag to the instrument.
2. Install the transportation disk or a blank floppy disk into the disk drive.
3. Wrap the instrument 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.

5 Options and Accessories

This chapter lists the options and accessories that can be ordered along with your Agilent Technologies PSA spectrum analyzer.

Options

How to Order Options

A number of options are available from Agilent Technologies to help you configure your analyzer for your specific applications. Options can be ordered when you order your analyzer. Some of the options are also available as kits that can be ordered and installed after you have received your spectrum analyzer. These options can be ordered through your local Agilent Sales and Service Office.

Options are ordered using the product number of your analyzer and the number of the option that you are ordering. When ordering an option after the purchase of your analyzer, you will need to add a U (for upgrade) to the product number. For example, if you are ordering Option 1DS for an Agilent E4440, you would order E4440A Option 1DS. If you are ordering Option 1DS for an Agilent E4440A after you have received your analyzer, you would order E4440AU Option 1DS.

Manual Set on CD-ROM Only (Option 0B0)

Option 0B0 provides the option to receive instrument documentation on CD-ROM *only*. The documentation CD-ROM contains the standard documentation set as well as Adobe Acrobat Reader with Search. See [“Documentation CD-ROM” on page 69](#).

Additional Manual Set (Option 0B1)

Option 0B1 provides an additional set of the standard documentation set shipped with your instrument. See [“Initial Inspection” on page 9](#) for information about standard documentation shipped with your instrument.

Rack Mount Kit (Option 1CM)

Rack mount kit. Includes rack mount flanges and hardware. Used to rack mount instruments without front handles (available as P/N 5063-9215).

Front Handle Kit (Option 1CN)

Handle kit (available as P/N 5063-9228).

Rack Mount Kit with Handles (Option 1CP)

Option 1CP provides the parts necessary to rack mount an instrument which has front handles attached (available as P/N 5063-9222).

Rack Slide Kit (Option 1CR)

Rack slide kit (available as P/N E4406-60115).

Preamplifier (Option 1DS)

Provides an internal preamplifier assembly with a frequency range of 500 kHz to 3 GHz.

APC 3.5 Input Connector (Option BAB)

The type-N female connector is replaced with an APC 3.5-mm male connector.

Commercial Calibration with Test Data (Option UK6)

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

NOTE

Option UK6 is only available at time of purchase.

5 Year Warranty Service Support (Option W50)

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

Accessories

How to Order 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 Offices.

RF and Transient Limiters

The Agilent 11867A and 11693A RF Limiters protect the spectrum analyzer input circuits from damage due to high power levels. The Agilent 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 Agilent 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 11947A Transient Limiter protects the spectrum analyzer input circuits from damage due to signal transients. It specifically is needed for use with a LISN (line impedance stabilization network). It operates over a frequency range of 9 kHz to 200 MHz, with 10 dB of insertion loss.

50 Ω /75 Ω Minimum Loss Pad

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

75 Ω Matching Transformer

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

AC Probe

The Agilent 85024A high frequency probe performs in-circuit measurements without adversely loading the circuit under test. The probe has an input capacitance of 0.7 pF shunted by 1 M Ω 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.

NOTE

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.

GPIB Cable

The Agilent 10833A/B/C/D GPIB cables interconnect GPIB devices and are available in four different lengths (from 0.5m to 4m). GPIB cables are used to connect printers and controllers to a spectrum analyzer.

Parallel Interface

The analyzer rear panel has a 25-pin female connector. Please use a compatible cable which corresponds to the printer you are using. See [“Printer Setup and Operation” on page 15](#).

6 **Where to Find More Information**

This chapter contains sections describing where to find additional information about your Agilent Technologies PSA spectrum analyzer.

Documentation

With the purchase of your instrument, you receive a standard documentation set. You also receive a documentation CD-ROM which includes the entire standard documentation set. See [“Documentation CD-ROM” on page 69](#).

NOTE Service documentation is not included in the standard documentation set. To order service documentation, see [“How to Order Options” on page 62](#).

Table 6-1 Standard Documentation Set

Getting Started Guide	Unpack and set up your analyzer. Learn about your instrument’s features and how to make a basic measurements. View information regarding available options and accessories. Learn about what actions to take, should you encounter a problem.
Reference Guide	Learn how to use your instrument’s features in detail. Find front-panel key descriptions. View basic spectrum analyzer programming information and SCPI command descriptions.
Specifications Guide	View instrument specifications, safety, and regulatory information.
Measurement Guide	Learn how to make detailed measurements of various types of signals. View examples of spectrum analyzer measurements and external source measurements. Learn how to troubleshoot measurement problems.
Instrument Messages and Functional Tests	Learn how to perform manual functional tests using “step by step” procedures. View information regarding status messages, informational messages, and error messages.
Programming Conversion Guide	Reference SCPI programming command compatibility for 8590, 8560, 8568, ESA/PSA series analyzers.
Documentation CD-Rom	Includes items listed above. Does not include <i>Agilent Technologies PSA Service Guide</i> . See “Documentation CD-ROM” on page 69 .

NOTE Items (such as the standard documentation set) included with shipment of your analyzer may change corresponding to the option ordered. See [“How to Order Options” on page 62](#) for more information.

Documentation CD-ROM

The documentation CD-ROM allows you to view and print data easily. Your documentation CD-ROM includes the standard documentation set (see “[Initial Inspection](#)” on page 9).

NOTE

The Documentation CD-ROM does not include the Service Guide. For information on ordering the Service Guide, see “[How to Order Options](#)” in [Chapter 5](#).

Installation

For information regarding CD-ROM installation, follow the instructions provided on the jacket of your CD-ROM.

Contact Agilent Technologies

Agilent Technologies has sales and service offices around the world to provide you with complete support for your analyzer. To obtain additional information or to order additional options or accessories, contact the nearest Agilent Technologies sales and service office listed in [Table 4-2 on page 58](#).

Additional Information

For the latest information about this instrument, including firmware upgrades, application information, and product information, please visit the following URL:

www.agilent.com/find/psa/