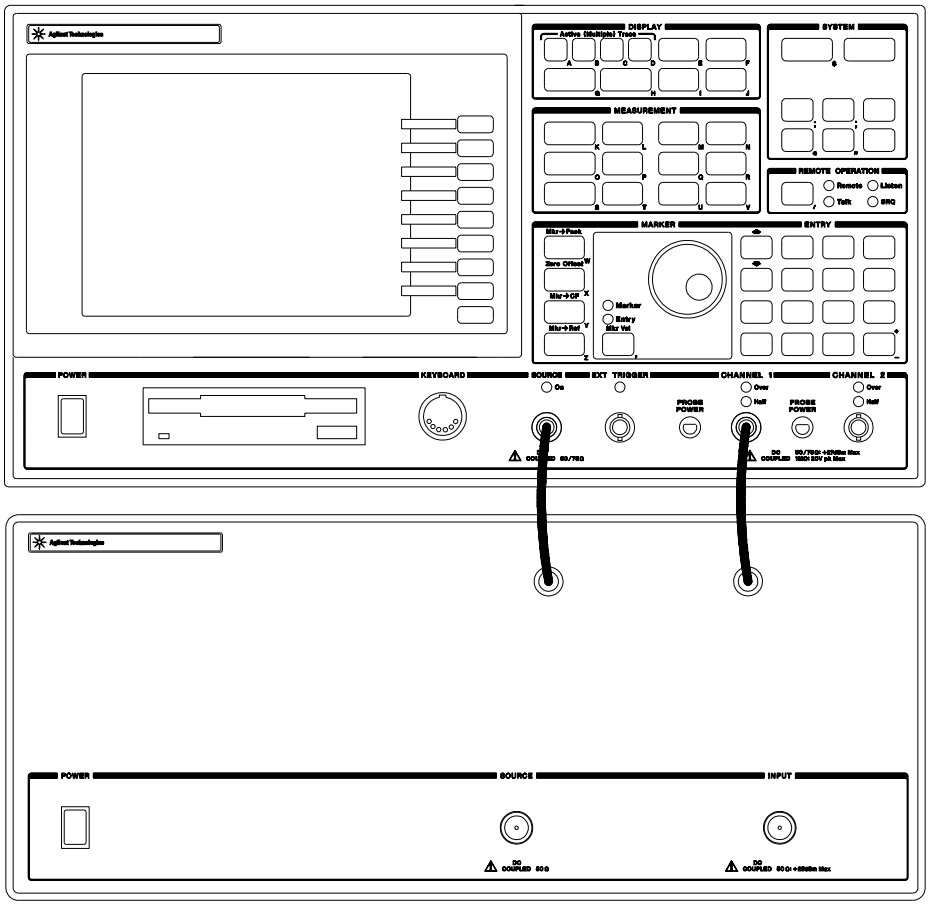
Agilent Technologies 89441A Getting Started Guide



Agilent Technologies

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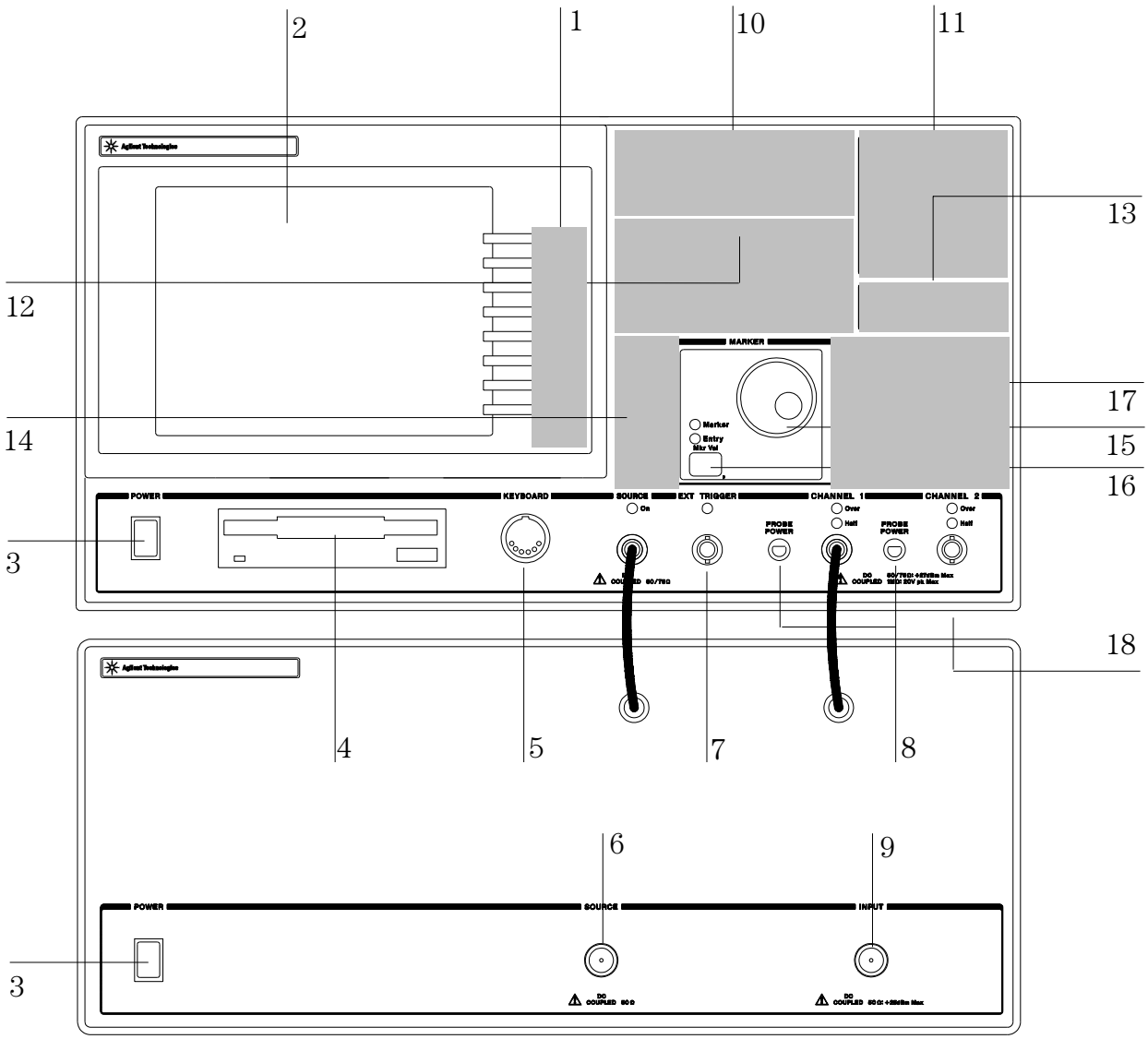
The Analyzer at a Glance



Front Panel

1-A softkey's function changes as different menus are displayed. Its current function is determined by the video label to its left, on the analyzer's screen.

2-The analyzer's screen is divided into two main areas. The menu area, a narrow column at the screen's right edge, displays softkey labels. The data area, the remaining portion of the screen, displays traces and other data.

3-The POWER switch turns the analyzer on and off.

4-Use a 3.5 inch flexible disk (DS,HD) in this disk drive to save your work.

5-The KEYBOARD connector allows you to attach an optional keyboard to the analyzer. The keyboard is most useful for writing and editing Agilent Instrument BASIC programs.

6- The SOURCE connector routes the analyzer's source output to your DUT. If option AY8 (internal RF source) is installed, the conector is a type-N. If option AY8 is not installed, the connector is a BNC. Output impedance is selectable: 50 ohms or 75 ohms with option 1D7 (minimum loss pads).

7-The EXT TRIGGER connector lets you provide an external trigger for the analyzer.

8-The PROBE POWER connectors provides power for various Agilent active probes.

9-The INPUT connector routes your test signal or DUT output to the analyzer's receiver. Input impedance is selectable: 50 ohms or 75 ohms with option 1D7 (minimum loss pads).

10-Use the DISPLAY hardkeys and their menus to select and manipulate trace data and to select display options for that data.

11-Use the SYSTEM hardkeys and their menus to control various system functions (online help, plotting, presetting, and so on).

12-Use the MEASUREMENT hardkeys and their menus to control the analyzer's receiver and source, and to specify other measurement parameters.

13-The REMOTE OPERATION hardkey and LED indicators allow you to set up and monitor the activity of remote devices.

14-Use the MARKER hardkeys and their menus to control marker positioning and marker functions.

15-The knob's primary purpose is to move a marker along the trace. But you can also use it to change values during numeric entry, move a cursor during text entry, or select a hypertext link in help topics

16-Use the Marker/Entry key to determine the knob's function. With the Marker indicator illuminated the knob moves a marker along the trace. With the Entry indicator illuminated the knob changes numeric entry values.

17-Use the ENTRY hardkeys to change the value of numeric parameters or to enter numeric characters in text strings.

18-The optional CHANNEL 2 input connector routes your test signal or DUT output to the analyzer's receiver. Input impedance is selectable: 50 ohms, 75 ohms, or 1 megohm. For ease of upgrading, the CHANNEL 2 BNC connector is installed even if option AY7 (second input channel) is not installed.

For more details on the front panel, display the online help topic "Front Panel". See the chapter "Using Online Help" if you are not familiar with using the online help index.

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Saftey Summary

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies, Inc. assumes no liability for the customer's failure to comply with these requirements.

GENERAL

This product is a Safety Class 1 instrument (provided with a protective earth terminal). The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

All Light Emitting Diodes (LEDs) used in this product are Class 1 LEDs as per IEC 60825-1.

ENVIRONMENTAL CONDITIONS

This instrument is intended for indoor use in an installation category II, pollution degree 2 environment. It is designed to operate at a maximum relative humidity of 95% and at altitudes of up to 2000 meters. Refer to the specifications tables for the ac mains voltage requirements and ambient operating temperature range.

BEFORE APPLYING POWER

Verify that the product is set to match the available line voltage, the correct fuse is installed, and all safety precautions are taken. Note the instrument's external markings described under Safety Symbols.

GROUND THE INSTRUMENT

To minimize shock hazard, the instrument chassis and cover must be connected to an electrical protective earth ground. The instrument must be connected to the ac power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

FUSES

Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuse holders. To do so could cause a shock or fire hazard.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes.

DO NOT REMOVE THE INSTRUMENT COVER

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified service personnel.

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

Caution

The CAUTION sign denotes a hazard. It calls attention to an operating procedure, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

Safety Symbols

 Warning, risk of electric shock

 Caution, refer to accompanying documents

 Alternating current

 Both direct and alternating current

 Earth (ground) terminal

 Protective earth (ground) terminal

 Frame or chassis terminal

 Terminal is at earth potential.

 Standby (supply). Units with this symbol are not completely disconnected from ac mains when this switch is off

Notation Conventions

Before you use this book, it is important to understand the types of keys on the front panel of the analyzer and how they are denoted in this book.

Hardkeys Hardkeys are front-panel buttons whose functions are always the same. Hardkeys have a label printed directly on the key. In this book, they are printed like this: [**Hardkey**].

Softkeys Softkeys are keys whose functions change with the analyzer's current menu selection. A softkey's function is indicated by a video label to the left of the key (at the edge of the analyzer's screen). In this book, softkeys are printed like this: [softkey].

Toggle Softkeys Some softkeys toggle through multiple settings for a parameter. Toggle softkeys have a word highlighted (of a different color) in their label. Repeated presses of a toggle softkey changes which word is highlighted with each press of the softkey. In this book, toggle softkey presses are shown with the requested toggle state in bold type as follows:
"Press [key name **on**]" means "press the softkey [key name] until the selection **on** is active."

Shift Functions In addition to their normal labels, keys with blue lettering also have a shift function. This is similar to shift keys on an pocket calculator or the shift function on a typewriter or computer keyboard. Using a shift function is a two-step process. First, press the blue [**Shift**] key (at this point, the message "shift" appears on the display). Then press the key with the shift function you want to enable.
Shift function are printed as two key presses, like this:
[**Shift**] [**Shift Function**]

Numeric Entries Numeric values may be entered by using the numeric keys in the lower right hand ENTRY area of the analyzer front panel. In this book values which are to be entered from these keys are indicted only as numerals in the text, like this:
Press 50, [enter]

Ghosted Softkeys A softkey label may be shown in the menu when it is inactive. This occurs when a softkey function is not appropriate for a particular measurement or not available with the current analyzer configuration. To show that a softkey function is not available, the analyzer "ghosts" the inactive softkey label. A ghosted softkey appears less bright than a normal softkey. Settings/values may be changed while they are inactive. If this occurs, the new settings are effective when the configuration changes such that the softkey function becomes active.

In This Book

This book, “Agilent Technologies 89441A Getting Started Guide”, is designed to help you become comfortable with the Agilent 89441A Vector Signal Analyzers. It provides step-by step examples of how to use this analyzer to perform tasks which you have probably performed with other analyzers. By performing these tasks you will become familiar with many of the basic features—and how those features fit together to perform actual measurements.

This book also contains a chapter to help you prepare the analyzer for use, including instructions for inspecting and installing the analyzer.

To Learn More About the Analyzer

You may need to use other books in the analyzer’s manual set. See the “Documentation Roadmap” at the end of this book to learn what each book contains.

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Table of Contents

1

Using Online Help

You can learn about your analyzer from online help which is built right into the instrument and is available to you any time you use the analyzer. This section shows you how to use online help to learn about specific keys or topics. You can use online help in conjunction with other documentation to learn about your analyzer in depth, or you can refresh your memory for keys you seldom use. You can use online help while working with your analyzer since online help does not alter the analyzer setup.

To learn about online help

1 Enter the online help system:
Press [**Help**].

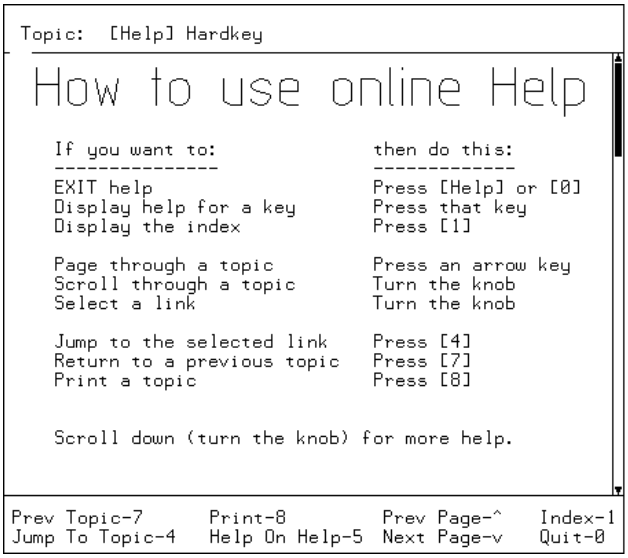
2 Display online help for the [**Help**] hardkey:
Press [**5**] on the numeric keypad.

3 Use the knob or the up-arrow or down-arrow keys to move through the pages.

4 Quit online help:
Press [**Help**].
or
Press [**0**] on the keypad.
Take a few moments to read the help overview. It's only five pages long, and it includes descriptions of advanced features like the index and cross-reference "links" that can help you locate the information you need more quickly.

When you enter the help system it displays help on the last key you pressed. If you have just turned on the analyzer online help for the [**Help**] key is displayed.

When you quit help, the analyzer restores the display and menu that was displayed before you enabled help. Using online help does not alter your measurement setup.



This legend shows which numeric keys access online help features

To display help for hardkeys and softkeys

This example displays topics related to triggering.

1 Enter the online help system:
Press [**Help**].

2 Display help for a hardkey:
Press [**Trigger**].

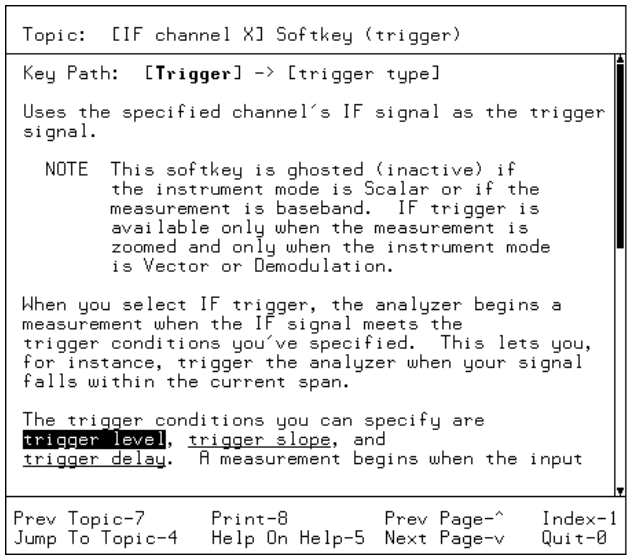
3 Use the knob or the up and down arrow keys to page through the topic.

4 Select a softkey topic:
Press [trigger type], [IF channel 1].

5 Quit online help:
Press [**Help**]
or
Press [**0**] on the keypad.

Pressing [**Preset**] always returns the analyzer to its preset state. If you press any other key when help is enabled, the analyzer displays a help topic describing the key's function. For help on the preset state, select "Preset hardkey" from the help index (you will learn how to do this later in this section) or press [**Preset**] then [**Help**].

These lines show the name of the selected softkey and the path to its hardkey



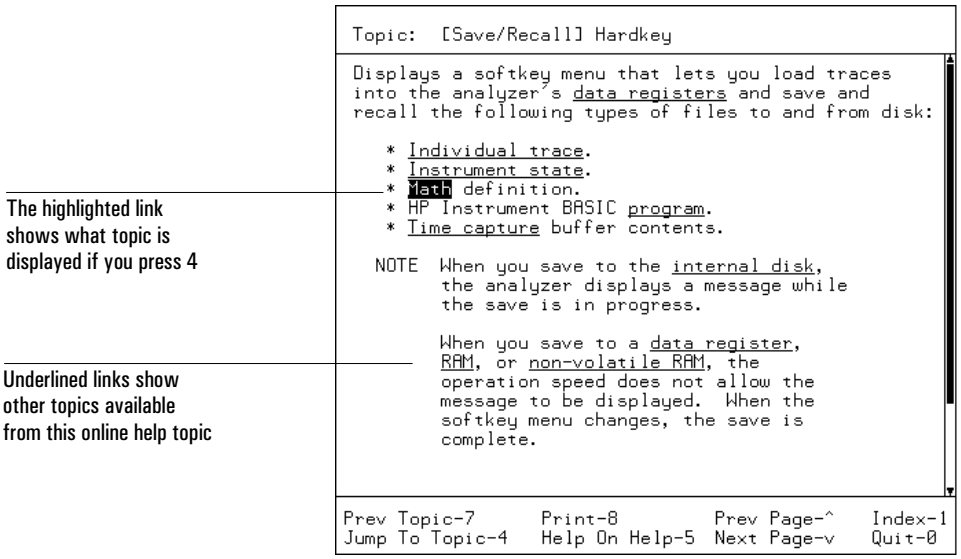
To display a related help topic

This example displays topics related to saving and recalling.

1. Enter the online help system:
   Press [**Help**].
2. Display help for a hardkey:
   Press [**Save/Recall**].
3. Scroll with the knob to highlight the Math topic.
4. Select that topic:
   Press [**4**].
5. Return to previous topics:
   Press [**7**].
6. Quit online help:
   Press [**Help**].

On a given screen full of online help text, there may be several special words (or phrases) that are linked to related topics. Most of these words are underlined to identify them as links, but one is highlighted to identify it as the currently-selected link. The knob allows you to select a different link by moving the highlighting from one link to the next. Once you've selected the link you want, press [**4**] on the keypad to display the related topic.

You can follow links through as many as 20 topics and still return to the original topic. Just press [**7**] one time for each link you followed, and you'll return to the original topic via all of the related topics you displayed.



To select a topic from the help index

1 Enter the online help system:
Press [**Help**].

2 Display the index:
Press [**1**].

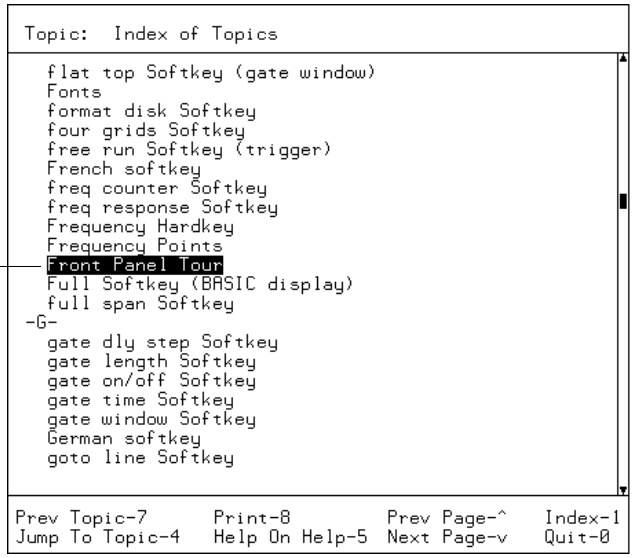
3 Turn the knob to select the topic you want help on
or
for faster paging press and hold the up-arrow or down-arrow keys then use the knob to select a topic.

4 Display the topic:
Press [**4**].

5 Quit online help:
Press [**Help**].
or
Press [**0**].

The help index contains an alphabetical listing of all help topics. Most topics listed in the index describe the hardkeys and softkeys, but some are of a more general nature. These more general topics are only available via the index or via "links" from related topics. An example appears below–the "Front Panel Tour" topic is only available through the index or the "links", not by pressing any hardkey or softkey.

You can select any topic in the index by scrolling to highlight it then pressing 4



2

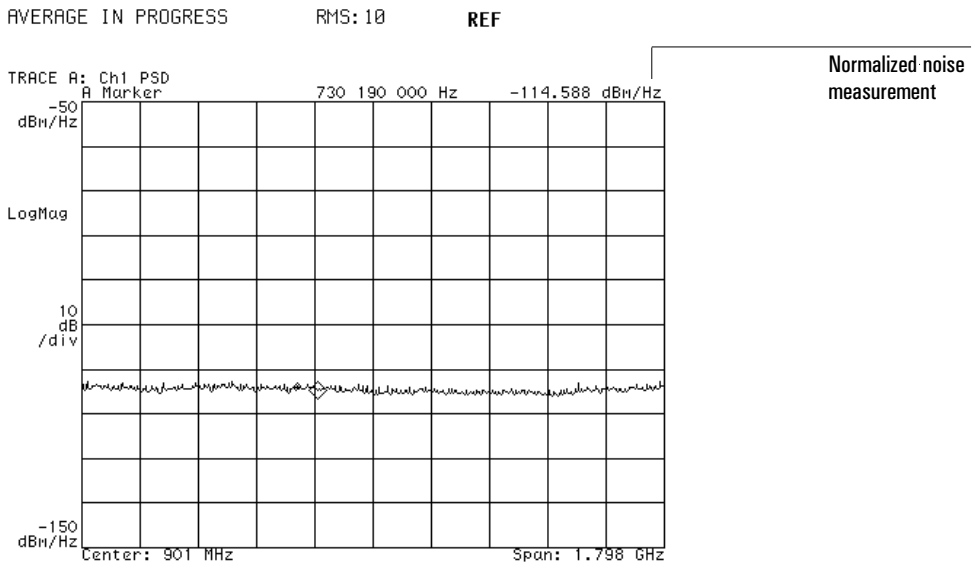
Making Simple Noise Measurements

This chapter shows you how to make typical noise measurements. In this example, we will be making random noise, band power noise, and signal to noise measurements.

To measure random noise

1. Initialize the analyzer:
   Press [**Preset**].
2. Select a power spectral density measurement:
   Press [**Measurement Data**], [PSD] (select **ch1** with a 2-channel analyzer).
3. Turn on averaging:
   Press [**Average**], [average **on**].
4. Start an averaged measurement:
   Press [**Meas Restart**].
5. Use the knob to move the marker along the trace.
   The display should be similar to the one shown below.

   To learn more about the choices you make in this measurement, display online help for the various keys used (see "Using Online Help" if you are not familiar with how to do this).



In this example you are measuring the noise-power of the analyzer's noise floor. The displayed marker value reflects noise-power normalized to a 1-Hz bandwidth.

To measure band power

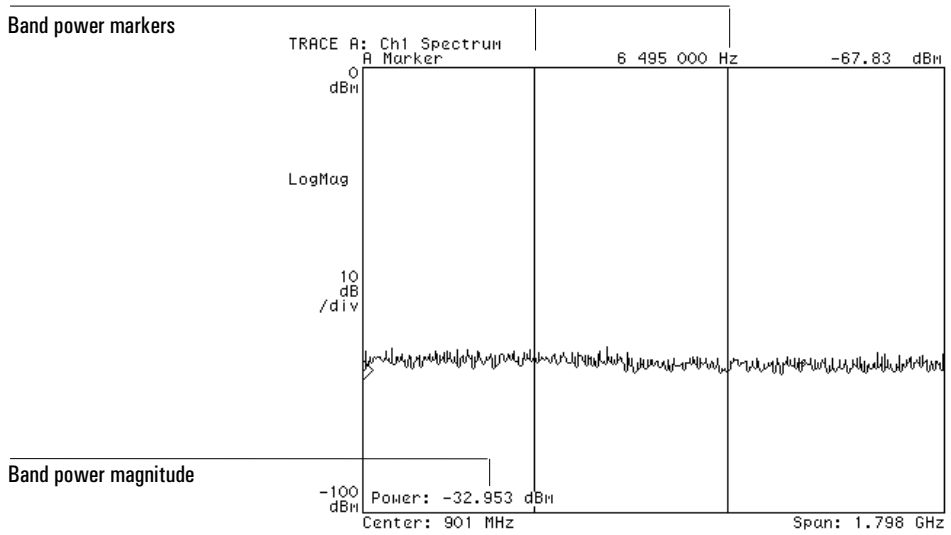
1 Initialize the analyzer:
Press [**Preset**].

2 Turn on averaging:
Press [**Average**], [average **on**].

3 Start an averaged measurement:
Press [**Meas Restart**].

4 Turn on the band power markers:
Press [**Marker Function**], [band power markers], [band pwr mkr **on**], [band power]
Press [**ResBW/Window**], [detector], [sample]
Press [**Marker Function**], [band power markers].

5 Change the width of the band:
Press [band right], [**Marker**|**Entry**],
then use the knob to move the marker to the desired location.
Press [band left],
then use the knob to move the marker to the desired location.
The display should similar to the one below. The grid lines have been turned off to highlight the band power markers.



In this example you are measuring the power of the analyzer's noise floor within a defined band. The value displayed in the lower left corner of the display reflects the total power within the frequency band encompassed by the markers. The grid lines have been turned off to highlight the band power markers.

To measure signal to noise ratios

1 Select the baseband receiver mode and initialize the analyzer:
Press [**Instrument Mode**] [receiver] [RF section (0-10 MHz)].
Press [**Preset**].

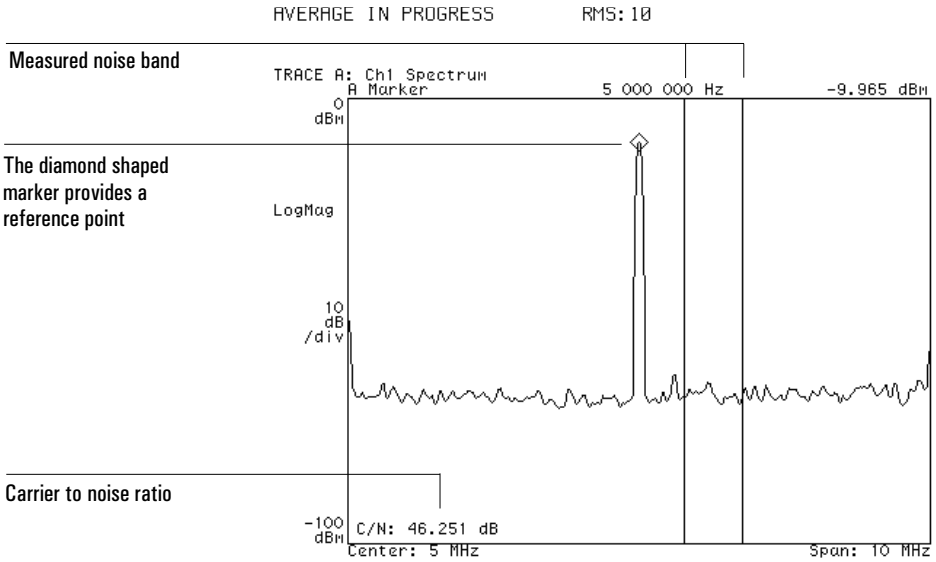
2 Supply a signal from the internal source:
Connect the SOURCE output to the INPUT with a BNC cable.
Press [**Source**], [source **on**], [sine freq], 5, [MHz]

3 Place the marker on the signal peak:
Press [**Marker**⇒], [marker to peak]
or
Press [**Shift**], [**Marker**]

4 Select video averaging:
Press [**Average**], [average **on**]

5 Turn on the carrier-to-noise marker:
Press [**Marker Function**], [band power markers], [band pwr mkr **on**], [power ratio **C/N**].

6 Press [**Marker**|**Entry**]
Rotate the knob to move the measurement band from the signal to a noise area.
The display should appear as below. The grid lines have been turned off to highlight the band power markers.

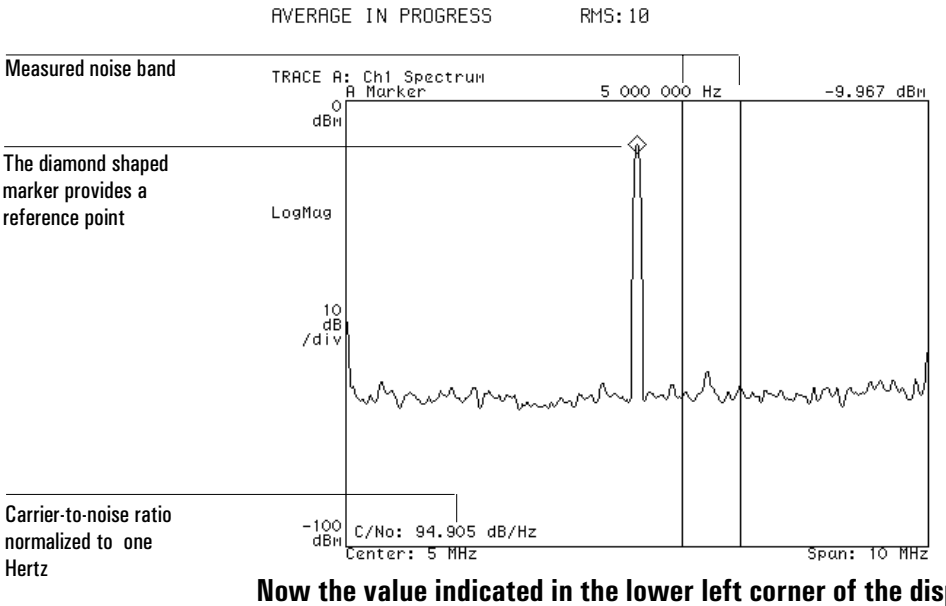


The value indicated in the lower left corner of the display reflects the difference between the marker level at the carrier peak and the total noise within the band markers.

7 Change to a normalized noise measurement:
Toggle to [power ratio **C/No**]
The display should appear as below. The grid lines have been turned off to highlight the band power markers.

The carrier-to-noise and carrier-to-normalized-noise marker measurements require that the standard (diamond shaped) marker be on the signal peak as a reference. If the marker is not on, the displayed value will only reflect the noise level.

Step 3 above illustrates that there are two ways to perform certain actions—by using the hardkey/softkey sequence or by using the short-cut shift/hardkey sequence.



Now the value indicated in the lower left corner of the display reflects the difference between the marker level at the carrier peak and the noise-power within the band markers normalized to one Hertz bandwidth.

You can perform band power measurements in either Vector or Scalar Mode. If you use Scalar mode and you have selected a combination of resolution bandwidth, window type, and number of frequency points such that the analyzer implements the detector, the analyzer will prompt you to select the sample detector in order to calculate the band power accurately.

3

Using Gating to Characterize a Burst Signal

This chapter uses the time gating feature to analyze a multi-burst signal which is provided on the Signals Disk which accompanies the analyzer's *Operator's Guide*. Time gating allows you to isolate a portion of a time record for further viewing and analysis. For more details on time gating concepts see "Gating Concepts" in the *Operator's Guide*.

To Use Time Gating

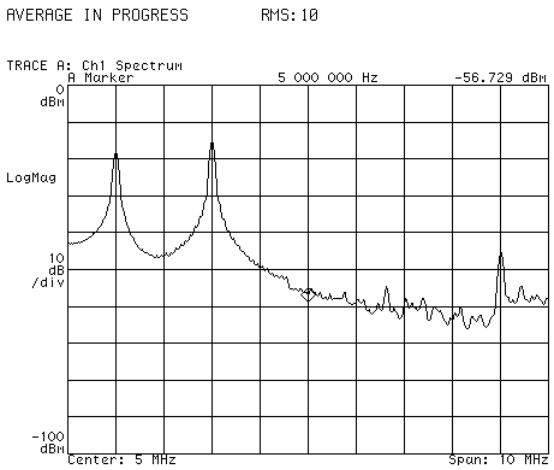
First we'll look at the spectrum of the signal and see that three components exist. Then we'll look at the time display of the burst signal and analyze each burst separately to determine which spectral components exist in each burst.

1 Select the baseband receiver mode and initialize the analyzer:
Press [**Instrument Mode**] [receiver] [RF section (0-10 MHz)].
Press [**Preset**].

2 Load the source signal file BURST.DAT into data register D3:
Insert the Signals Disk in the analyzer's disk drive.
Press [**Save/Recall**], [default disk], [internal disk] to select the internal disk drive.
Press [Return] (bottom softkey), [catalog **on**] to display the files on the disk.
Rotate the knob until the file BURST.DAT is highlighted.
Press [recall trace], [from file into D3], [enter].

3 Connect the SOURCE output to the INPUT with a BNC cable.

4 Turn on the source and select arbitrary signal D3:
Press [**Source**], [source **on**], [source type], [arb data reg], [D3], [Return], [arbitrary].
Press [**Average**], [average **on**].
The display should now appear as shown below.



The spectrum with averaging turned on. Note existence of three components.

5 Configure the display and the measurement:

Press [**Display**], [2 grids], [more display setup], [grids **off**].
Press [**B**], [**Measurement Data**], [main time] (toggle to **ch1** on a 2-channel analyzer).
Press [**Ref Lvl/Scale**], [Y per div], 50, [mV].
Press [**Trigger**], [trigger type], [internal source].
Press [**Time**], [main length], 32, [us].

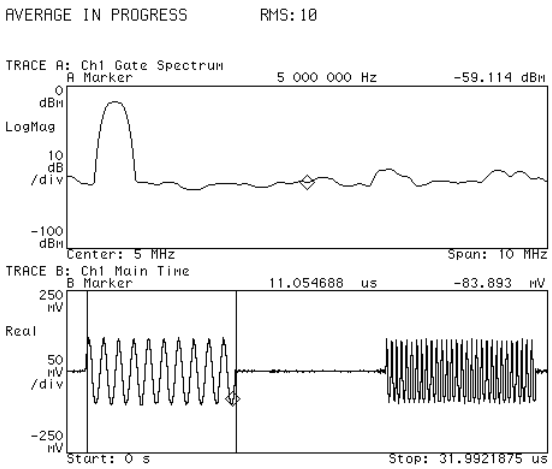
6 Set up the time gating and examine the first burst:

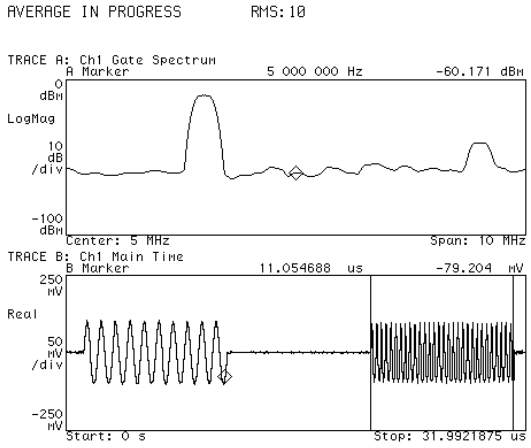
Press [**Time**], [gate **on**], [gate length], 10, [us].
Press [ch1 gate dly], [**Marker**|**Entry**]
Rotate the knob until the gate is at each end of the first burst signal.
The display should now appear as shown to the left below.

7 Examine the second burst:

Rotate the knob until the gate is at each end of the second burst signal.
The display should now appear as shown to the right below.

Note that the [**Time**] menu must be displayed, the [gate delay] softkey active, and the knob in the Entry mode to move the gate by turning the knob.





Spectrum (top trace) of the burst is derived by gating the time signal (bottom trace). The gate's delay and length are selected to encompass the burst signal (vertical markers show gate position). Note existence of the first spectral component in the left display and the existence of the other two components in the right display.

4

Measuring Relative Phase

This section shows you how to make typical relative phase measurements on modulated carrier signals. In this example, you measure the phase of sidebands on AM and PM signals relative to the carrier. The test signals are provided on the Signals Disk which accompanies the analyzer's *Operator's Guide*.

To measure the relative phase of an AM signal

1 Select the baseband receiver mode and initialize the analyzer:
Press [**Instrument Mode**] [receiver] [RF section (0-10 MHz)].
Press [**Preset**].

2 Load AM and PM signals from the Signals Disk into registers and play the AM signal through the source:
Insert the Signals Disk in the internal disk drive.
Use the BNC cable to connect the SOURCE output to the INPUT.
Press [**Save/Recall**], [default disk], [internal disk].
Press [Return], [catalog **on**].
Rotate the knob to highlight AMSIG.DAT
Press [recall trace], [from file into D1], [enter].
Rotate the knob to highlight PMSIG.DAT
Press [from file into D2] [enter].
Press [**Source**], [source **on**], [source type], [arbitrary].

3 Configure the measurement and display:
Press [**Frequency**], [span], 150, [kHz],
Press [**Trigger**], [trigger type], [internal source],
Press [**Sweep**], [single].

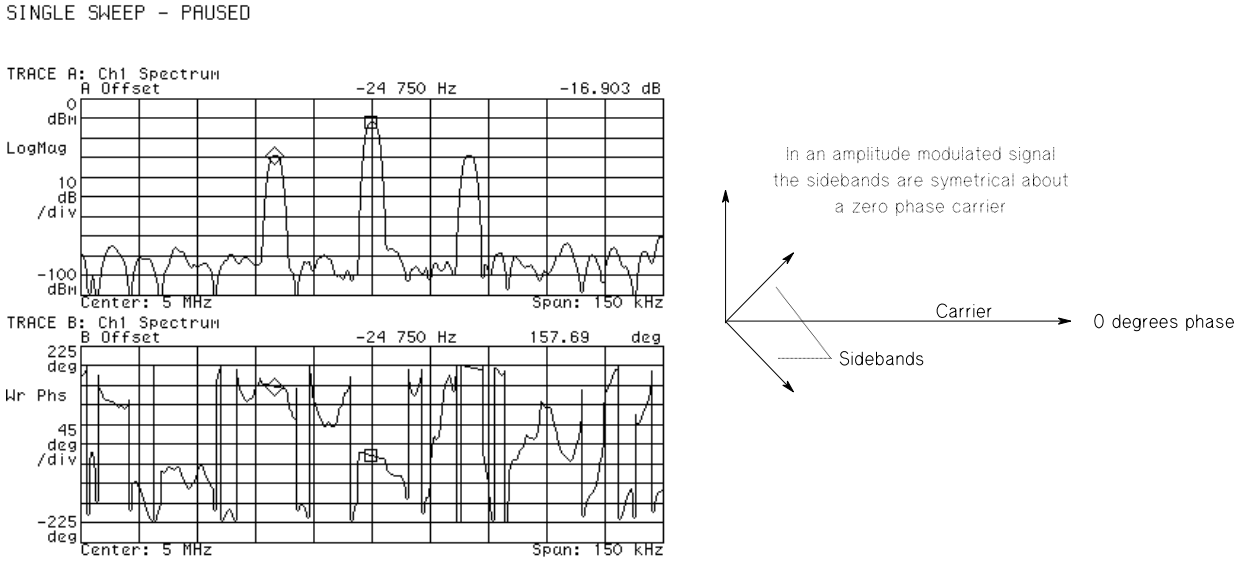
4 Activate a different trace as a phase display:
Press [**Display**], [2 grids],
Press [**B**], [**Measurement Data**], [spectrum] (select **ch1** with a 2-channel analyzer),
Press [**Data Format**], [phase **wrap**]

5 Start a single sweep:
Press [**Pause**|**Single**].

6 Activate two traces:
Press [**Shift**], [**A**] (two Active Trace LEDs are now turned on)

7 Turn on marker coupling and zero the offset marker on the carrier:
Press [**Marker**], [couple mkrs **on**],
Press [**Shift**], [**Marker**] to place the marker on the carrier peak,
Press [**Shift**], [**Marker⇒**] to zero the offset marker.

8 Use the search marker to measure the phase of the two largest sidebands relative to the carrier:
Press [**Marker Search**], [next peak], and note the phase displayed for the lower trace.
Press [next peak] again and note the phase.



The phase values vary with each sweep but for an AM signal the average phase of the sidebands is equal to the carrier phase.

To measure the relative phase of an PM signal

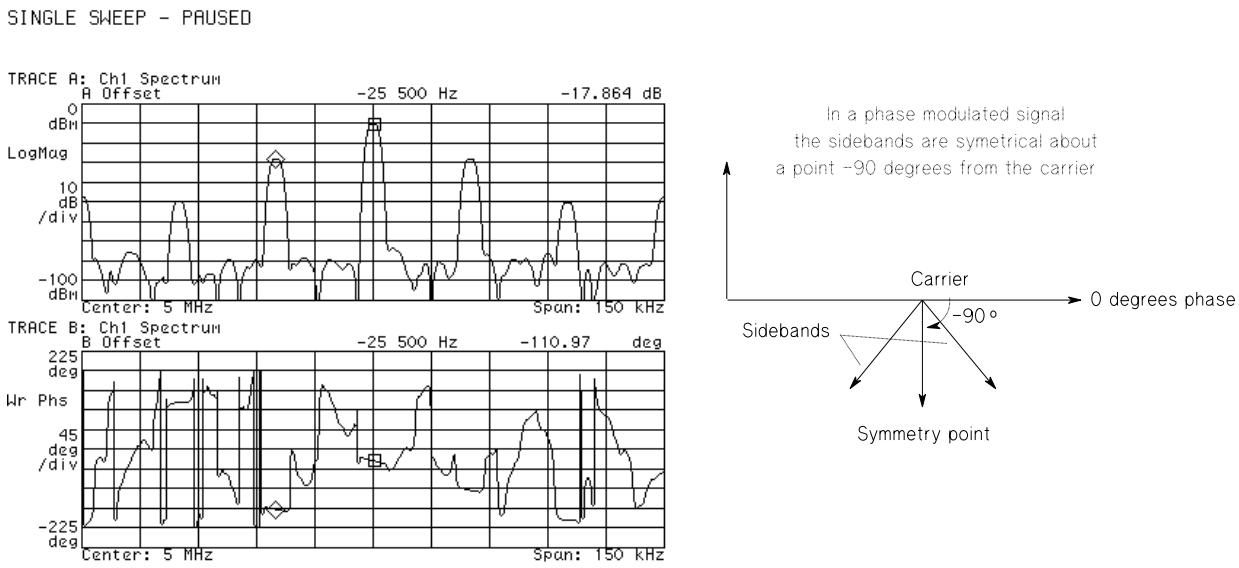
Continue from "To measure the relative phase of an AM signal."

1 Replace the arbitrary source AM signal with the PM signal in register D2:
Press [**Source**], [source type], [arb data reg], [D2].

2 Start a single sweep:
Press [**Pause**|**Single**].

3 Zero the offset marker on the carrier:
Press [**Shift**], [**Marker**],
Press [**Shift**], [**Marker⇒**]

4 Use the search marker to measure the phase of the two largest sidebands relative to the carrier:
Press [**Marker Search**], [next peak] and note the phase displayed for the lower trace.
Press [next peak] again and note the phase.



The phase values vary with each sweep but for a PM signal the average phase of the two sidebands is equal to –90 degrees from the carrier.

5

Characterizing a Filter

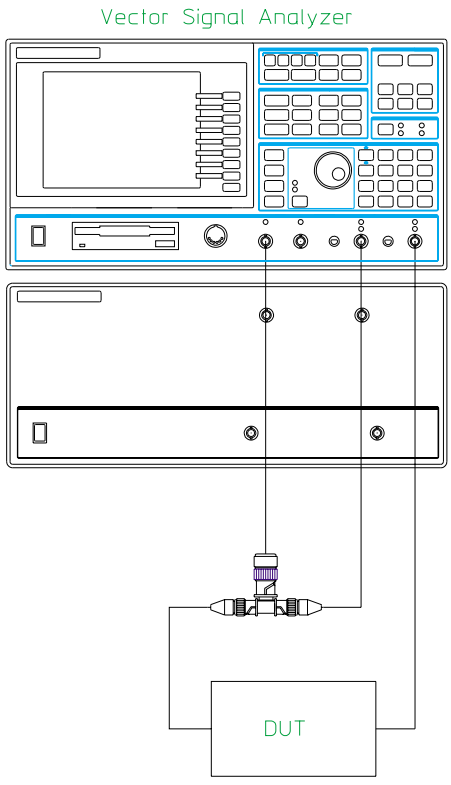
This section shows you how to make a typical network measurement. In this example, we will be characterizing a 4.5 MHz bandpass filter.

To set up a frequency response measurement

Note: This measurement can only be performed with a 2-channel analyzer—you must have option AY7.

You must use the source output and the channel 1 and channel 2 inputs on the IF section for network measurements.

1. Using a BNC "T" adapter or power splitter and BNC cables, connect the analyzer's SOURCE to the CHANNEL 1 input directly and to the CHANNEL 2 input through a filter as shown in the illustration below.
2. Select the IF baseband receiver mode and initialize the analyzer:
   Press [**Instrument Mode**] [receiver] [IF section (0-10 MHz)].
   Press [**Preset**].
3. Configure the analyzer to make two-channel frequency response measurements:
   Press [**Measurement Data**], [freq response].



4 Configure the source and measurement for a frequency response measurement:
Press [**Source**], [source **on**],
Press [source type], [periodic chirp],
Press [Return], (bottom softkey)
Press [level], .5, [Vrms].

Press [**Res Bw/Window**], [rbw mode **arb**],
Press [main window], [uniform].

Press [**Range**], [channel **both**], [ch* single range up-down].

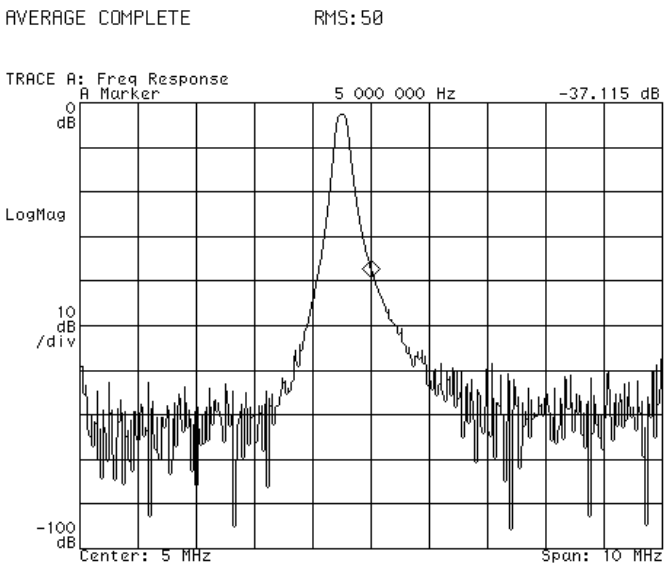
Press [**Average**], [average **on**]
Press [num averages], 50, [enter],
Press [average type], [rms (video)].

Press [**Auto Scale**].

5 Start an averaged measurement:
Press [**Meas Restart**].

The display should appear similar to that shown below. To learn more about the choices you make in this measurement, display online help for the various keys used (see "Using Online Help" if you are not familiar with how to do this).

Note the distinction between selecting the *range* (the sensitivity of the analyzer's input circuitry) and selecting the *scale* (the position of the data on the display).



Frequency response data displays the output of a device-under-test divided by the input

To use the absolute marker

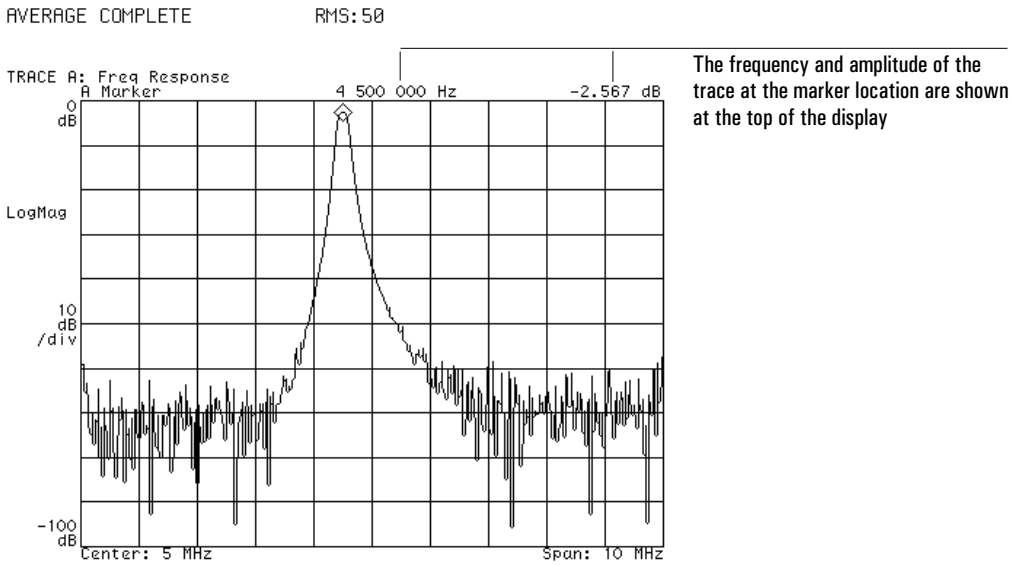
Continue from "To set up a frequency response measurement."

1 Move the marker to the largest part of the frequency response trace:

Press [**Marker⇒**], [marker to peak].
or
Press [**Shift**], [**Marker**]

2 Move the marker with the knob to view the absolute gain/loss of this particular filter network at different frequencies.

Note that there are two ways to perform some functions. In this example you may move the marker to the highest point on the trace by selecting the function in a softkey menu or by using a shift function.



The marker reflects the absolute amplitude and frequency

To use the relative marker

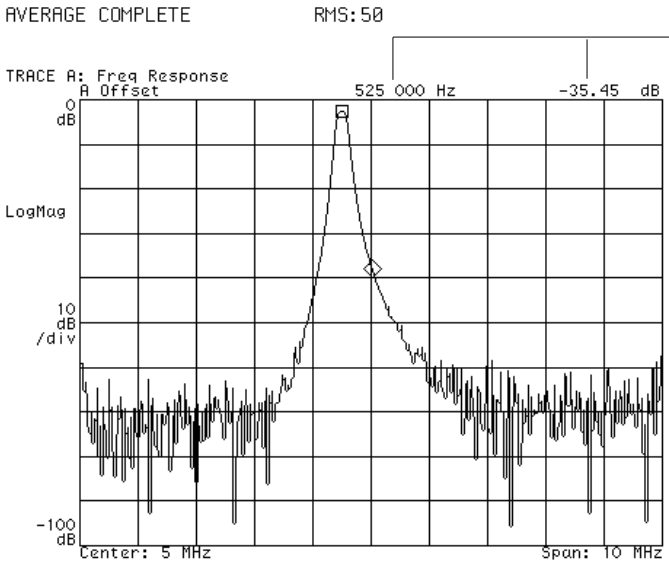
Continue from "To set up a frequency response measurement" or from "Using the absolute marker."

1 Move the marker to the largest part of the frequency response trace if it is not already there:
Press [**Shift**], [**Marker**].

2 Establish the reference point for the relative (offset) marker:
Press [**Marker**], [zero offset]
or
Press [**Shift**], [**Marker⇒**]

3 Move the marker with the knob to view the relative gain/loss of this particular filter at different frequencies.

The offset marker allows you to establish a reference point with the square-shaped marker. As you move diamond-shaped marker, the value displayed by the marker readout reflects the difference between the reference point and the marker.



The marker reflects the amplitude and frequency relative to the reference point

To use the search marker

Complete "To set up a frequency response measurement" or continue from one of the previous marker measurements.

1 Move the marker to the largest part of the frequency response trace if it is not already there:

Press [**Shift**], [**Marker**].

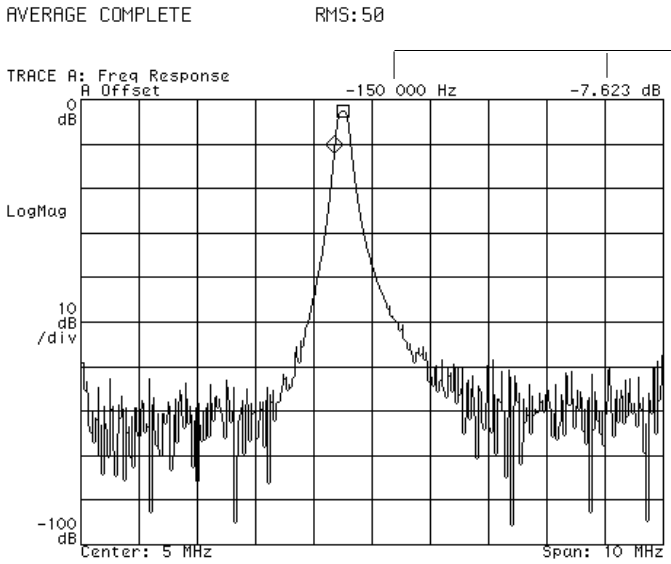
2 Activate and zero the offset marker if it is not already activated:

Press [**Shift**], [**Marker⇒**].

3 Define the search target level and perform a search:

Press [**Marker Search**], [search setup],
Press [search target], –6, [dB],
Press [search right], [search left].

The search marker allows you to quickly find a target value. When the offset marker is activated the target value is relative to the reference point.



The search marker finds a Y-axis value with reference to a target value

To display phase

Complete "To set up a frequency response measurement" or continue from one of the previous marker measurements.

1 Display a second trace:
Press [**Display**], [2 grids].

2 Activate the second trace and define it as a frequency response measurement:
Press [**B**], [**Measurement Data**], [frequency response].

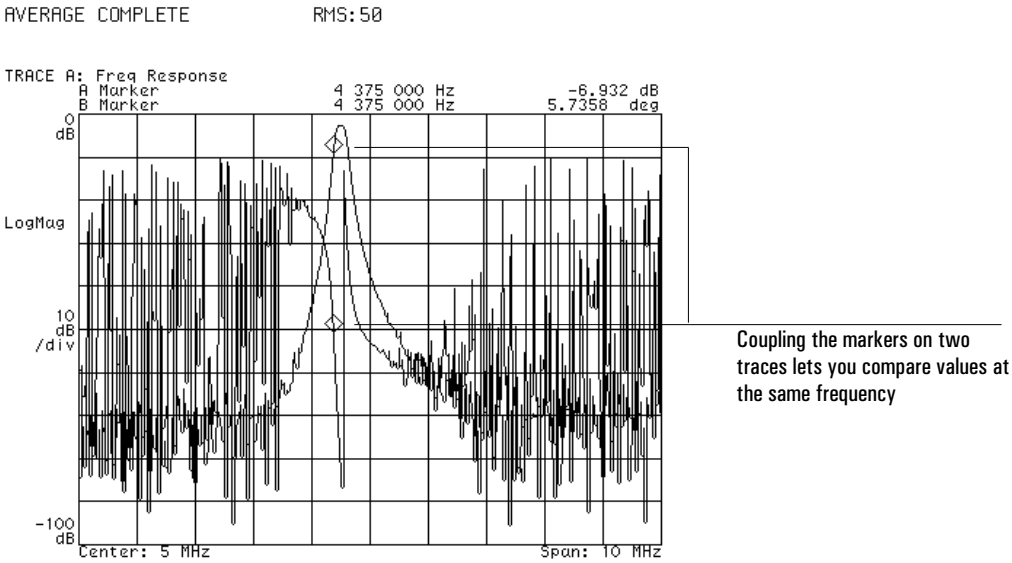
3 Specify phase data for the second trace:
Press [**Data Format**], [phase **wrap**].

4 Couple the markers on traces A and B:
Press [**Marker**], [couple mkrs **on**].

5 Move the markers with the knob to determine phase with respect to frequency response.

6 Overlap the two traces:
Press [**Shift**], [**A**].
Press [**Display**] [single grid].

In this example, note that a trace which is *displayed* is not necessarily *active* (capable of being configured). You must specifically activate a displayed trace in order to change its configuration. For example, if you have chosen the relative marker in one trace then couple the markers, the marker on the second trace will be absolute, rather than relative, unless you activate the second trace and select the relative marker.

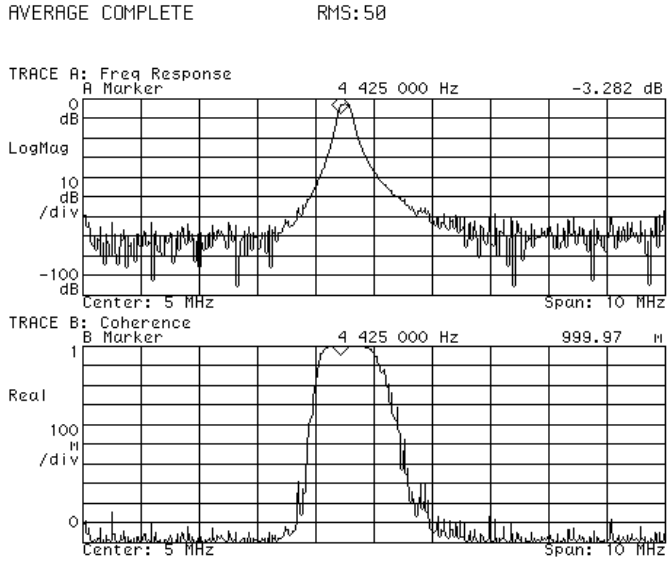


To display coherence

Complete “To set up a frequency response measurement” or continue from one of the previous measurements.

1 Display a second trace:
Press [**Display**], [2 grids].

2 Activate the second trace and select a coherence measurement:
Press [**B**], [**Data Format**], [magnitude **linear**], [**Measurement Data**], [more choices], [coherence].



Coherence indicates the statistical validity of a frequency response measurement

6

General Tasks

This chapter shows you how to perform various common tasks. These include setting up and using peripherals and defining and using math functions.

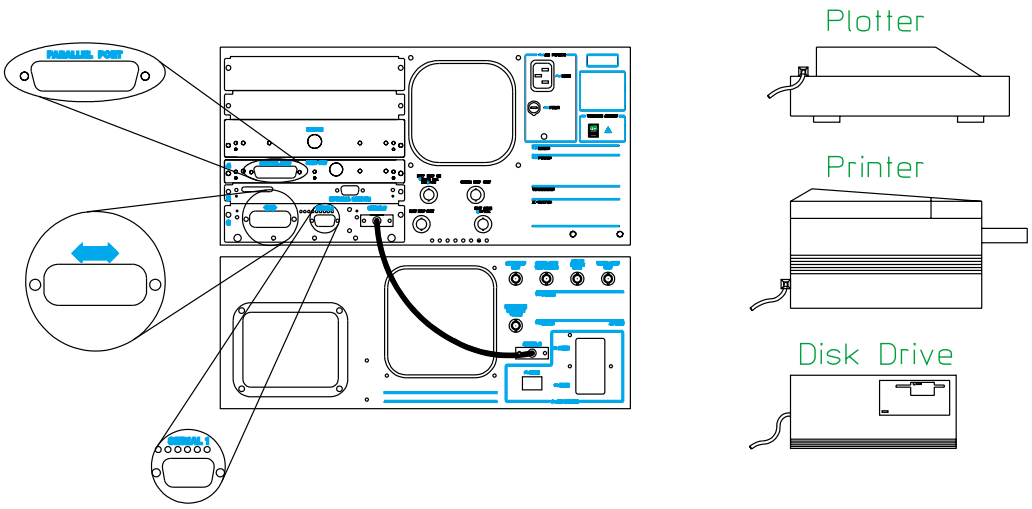
To set up peripherals.

You may connect peripherals to three ports—one GPIB port, one serial port, and one parallel port. GPIB peripherals may include printers, plotters, and external disk drives. Supported serial devices are plotters and printers. Certain printers are parallel devices.

1. **Connect the ports of your peripheral and analyzer with the correct cables. See "Preparing the Analyzer for Use" for information on physical connections.**
2. **Turn on the peripherals.**
3. **Set up GPIB peripherals:**
   Determine the address of the peripheral from your peripheral's documentation
   Use this as <num> below.
   On the analyzer, press [**Local/setup**], [peripheral addresses].
   Press the softkey corresponding to your device type.
   Press <num>, [enter].
   Repeat this step for each GPIB peripheral.
4. **Set up serial peripherals:**
   Refer to your serial device's documentation to select correct setup parameters.
   Press [Serial 1 setup] and enter the correct parameters.

Note that the parallel interface requires no special setup.

Display online help for more details on setup and parameter choices.

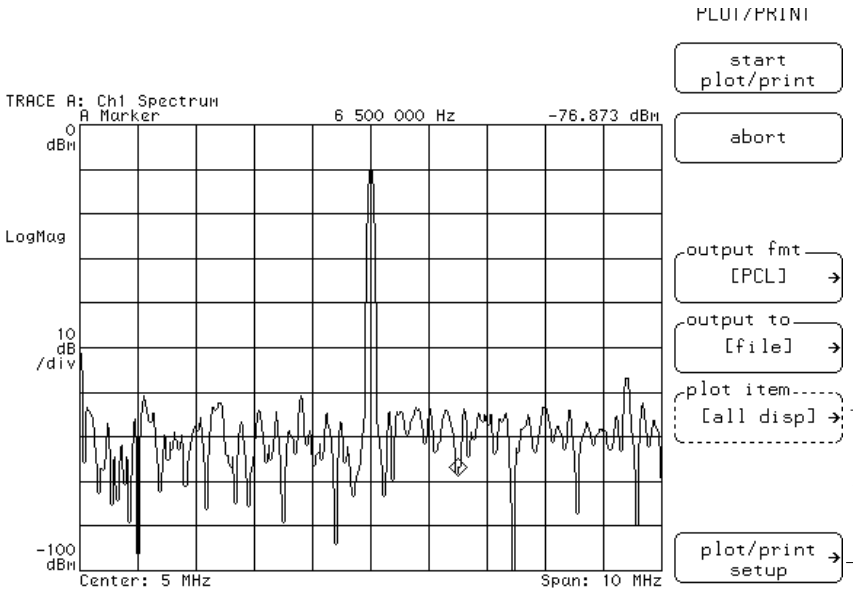


To print or plot screen contents

1. Set up your printer or plotter if you haven't already done so.
2. Select the output format and device type:
   Press [**Plot/Print**], [output fmt] and select the desired format.
   Press [device defaults] and select a device if you want other than the default.
3. Select the type of output port:
   Press [**Plot/Print**], [output to]
   and select the port to which your printer or plotter is attached.
4. Press [**Local/Setup**], [system controller].
5. Press [**Plot/Print**], [start plot/print]

The analyzer is only able to initiate printing or plotting if it is attached to a printer or plotter and is designated as the system controller. If you haven't already set up your printer or plotter, see "To set up peripherals." All of the screen's contents, except the softkey labels, are printed when you complete this task.

You may select various parameters under the [plot item] and [plot/print setup] softkeys depending on your particular peripheral. To learn more about these parameters, display online help for the relevant softkeys.



With a plotter, you can elect to plot portions of the display

You can control certain device options, depending on your output device

You must use the PLOT/PRINT menu to select the correct type of device and port before starting a plot or print of the screen contents.

To save data with an internal or RAM disk

You may save trace data, instrument states, trace math functions, instrument BASIC programs, and time-capture buffers.

1. Select the default disk:
   Press [**Save/Recall**], [default disk]
   Press [nonvolatile RAM disk], [volatile RAM disk] or [internal disk]
2. Press [Return].
3. Press the softkey that matches the type of data you want to save.
4. Enter the file name if you have chosen to save to a file:
   Use the hardkeys (which have now been remapped to represent the symbols etched to the lower right of them), softkeys, knob, and numeric keys to type in a file name.
5. Press [enter].

For more information on the softkeys and parameter choices, display online help.

If you are using the internal disk drive, you must insert a formatted 3.5-inch flexible disk into the analyzer's internal disk drive. If you want to save data but the disk has not been previously formatted see "To format a disk."

To recall data with an internal or RAM disk

You may recall trace data, instrument states, trace math functions, instrument BASIC programs, and time-capture buffers.

1. Select the default disk:
   Press [**Save/Recall**], [default disk]
   Press [nonvolatile RAM disk], [volatile RAM disk] or [internal disk]
2. Press [Return].
3. To easily recall a file you may press [catalog **on**] to display the names of files stored on the disk then use the knob to scroll to the desired file.
4. Press the softkey that matches the type of data you want to recall (then select a storage register if you are recalling a trace).
5. If you have not selected a file name from the catalog, enter the file name:
   Use the hardkeys (which have now been remapped to represent the symbols etched to the lower right of them), softkeys, knob, and numeric keys to type in a file name.
6. Press [enter].

For more information on the softkeys and parameter choices, display online help.

To format a disk

1. Select the disk drive you want to format:
   Press [**Disk Utility**], [default disk].
   Press the softkey corresponding to the disk drive you want to format.
2. Press [Return], [format disk].
   Select appropriate parameters for your disk drive (disk type, interleave etc.).
3. Press [perform format], [proceed].

You may format 3.5-inch disks in the internal disk drive. They must be double-sided, high-density flexible disks that are not write-protected.

The analyzer may take a few minutes to format a disk (depending on the type of disk) and is unavailable for other tasks during that time.

Caution You can damage both the disk and the drive if you attempt to eject a disk when the "Format disk in progress" message is displayed or when the disk's "busy" light is on.

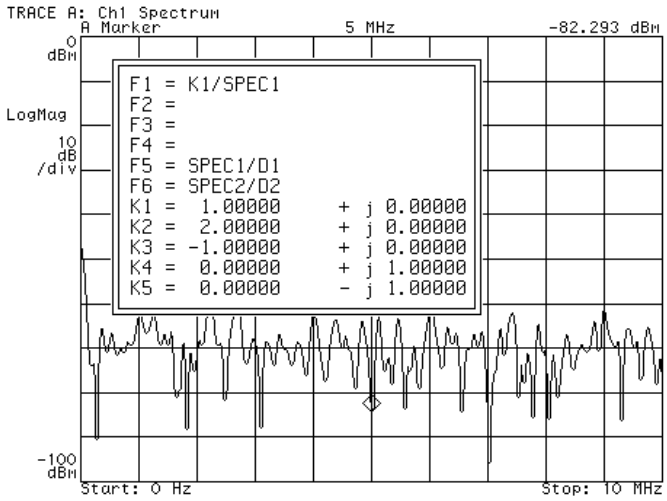
To create a math function

In this section you learn how to create a math function which inverts a signal.

1 Initialize the analyzer:
Press [**Preset**]

2 Define a constant:
Press [**Math**], [define constant], [define K1]
Press [real part], 1, [enter], [imag part], 0, [enter].

3 Define a math function:
Press [**Math**], [define F1]
Press [constant], [K1], [/], [meas data], [spectrum], [enter].
A math function remains in memory through a Preset but will be erased when you power down the analyzer. If you want to preserve the math function for future use, save it in the non-volatile RAM or on an internal disk.



You can create up to 6 functions and 5 constants

To use a math function

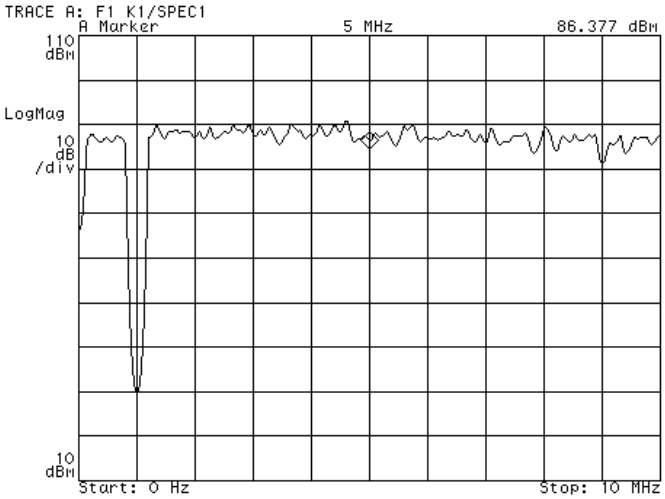
In this section you learn how to apply a a math function to a signal. This task assumes that you have completed "To create a math function."

1 Initialize the analyzer:
Press [**Preset**]

2 Provide an averaged signal from the internal source:
Press [**Source**], [source **on**], [**Average**], [average **on**].

3 Apply the inversion math function you created to this signal:
Press [**Measurement Data**], [math func], [F1].

4 Press [**Auto Scale**].



A user-created math function is applied to a signal

To display a summary of instrument parameters

1 Press [**View State**].

2 Press [measurement state] or [input/source state].

These summaries reflect the current states of important measurement, input, and source parameters. You may use these summaries to:

- quickly check the current setup
- document the setup (The list can be printed or plotted.)

You will note that the contents of the measurement state differ depending on the instrument mode. This reflects the fact that some parameters are not used for a particular instrument mode.

MEASUREMENT STATE

Inst Mode	Vector Meas from input		Channels	2
Freq	Start Stop	0 Hz 10 MHz	Center Span	5 MHz 10 MHz
Res Bw/ Window	Rbw Rbw mode Window	377.51 kHz arb flat top	Rbw coupling Time len Num freq pts	fixed 10.117 us 401
MainTime	Ch1 delay Ch2 delay	0 s 0 s	Width Gate	32.031 us on
GateTime	Ch1 delay Ch2 delay	21.25 us 0 s	Width	10.117 us
Average	Status Type Overlap	on rms expo 0 %	Num averages Repeat avg Fast avg	10 off off

Press [View State] > [off] to turn off this table

INPUT/SOURCE STATE

Range/ Input	-- Channel 1 -- Status Range Autorange Input Z 1M imped Coupling Alias LPF	on 0 dBm off 50 Ohm 50 Ohm AC in	-- Channel 2 -- Status Range Autorange Input Z 1M imped Coupling Alias LPF	off 0 dBm off 50 Ohm 50 Ohm AC in
Trigger	Type Slope Ch1 delay Ext arm Arm slope	int source + 0 s off above	Level Ch2 delay Arm level Arm delay	0 V 0 s 0 V 0 s
Source	Status Type Output Z	on arbitrary 50 Ohm	Level Sine freq DC offset	-20 dBVpk 1 MHz 0 V

Press [View State] > [off] to turn off this table

State summaries provide a quick view of the instrument setup parameters

7

Preparing the Analyzer for Use

Preparing the Analyzer for Use

This chapter contains instructions for inspecting and installing the analyzer. This chapter also includes instructions for cleaning the screen, transporting and storing the analyzer.

Power Requirements

The analyzer can operate from a single-phase ac power source supplying voltages as shown in the table. With all options installed, the total power consumption of both sections is less than 1025 VA.

AC Line Voltage

Range	Frequency
90-140 Vrms	47-63 Hz
198-264 Vrms	47-63 Hz

The line-voltage selector switches are set at the factory to match the most commonly used line voltage in the country of destination; the appropriate fuses are also installed. To check or change either the line-voltage selector switch or the fuse, see the appropriate sections later in this chapter.

Warning **Only a qualified service person, aware of the hazards involved, should measure the line voltage.**

Caution Before applying ac line power to the analyzer, ensure the line-voltage selector switches are set for the proper line voltage and the correct line fuses are installed in the fuse holders.

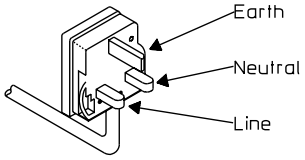
Power Cable and Grounding Requirements

On the GPIB connector, pin 12 and pins 18 through 24 are tied to chassis ground and the GPIB cable shield. The instrument frame, chassis, covers, and all exposed metal surfaces including the connectors' outer shell are connected to chassis ground. However, if channel 2 in the IF section is not installed, the channel 2 BNC connector's outer shell is not connected to chassis ground.

Warning **DO NOT interrupt the protective earth ground or "float" the analyzer. This action could expose the operator to potentially hazardous voltages.**

The analyzer is equipped with two three-conductor power cords which ground the analyzer when plugged into appropriate receptacles. The type of power cable plug shipped with each analyzer depends on the country of destination. The following figure shows available power cables and plug configurations.

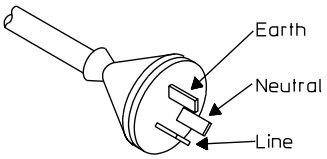
United Kingdom
Option 900



PLUG*: BS 1363A
CABLE*: P/N 8120-1351

220V-5A
OPERATION

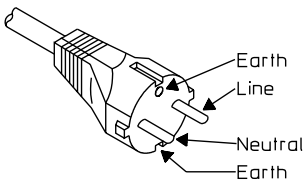
Australia/New Zealand
Option 901



PLUG*: NZSS 198/AS C112
CABLE*: P/N 8120-1369

220V-6A
OPERATION

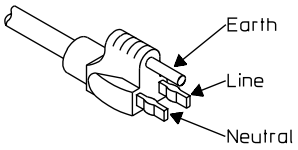
Continental Europe
Option 902



PLUG*: CEE7-V11
CABLE*: P/N 8120-1689

220V-6A
OPERATION

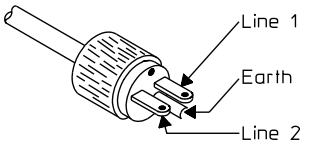
North America
Option 903



PLUG*: NEMA 5-15P
CABLE*: P/N 8120-1378

125V-10A**
OPERATION

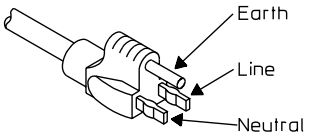
North America
Option 904



PLUG*: NEMA-6-15P
CABLE*: P/N 8120-0698

250V-6A**
OPERATION

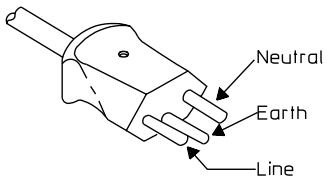
Japan
Option 918



PLUG*: MITI 41-9692
CABLE*: P/N 8120-4753

125V-12A
OPERATION

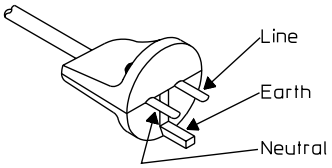
Switzerland
Option 906



PLUG*: SEV 1011.1959-24507
TYPE 12
CABLE*: P/N 8120-2104

220V-6A
OPERATION

Denmark
Option 912



PLUG*: DHCR 107
CABLE*: P/N 8120-2956

220V-6A
OPERATION

*The number shown for the plug is the industry identifier for the plug only, the number shown for the cable is an Agilent part number for a complete cable including the plug.

**UL listed for use in the United States of America.

Warning

The power cable plug must be inserted into an outlet provided with a protective earth terminal. Defeating the protection of the grounded analyzer cabinet can subject the operator to lethal voltages.

To do the incoming inspection

The analyzer was carefully inspected both mechanically and electrically before shipment. It should be free of marks or scratches, and it should meet its published specifications upon receipt.

1 Inspect the analyzer for physical damage incurred in transit. If the analyzer was damaged in transit, do the following:

- Save all packing materials.
- File a claim with the carrier.
- Call your Agilent Technologies sales and service office.

Warning **If the analyzer is mechanically damaged, the integrity of the protective earth ground may be interrupted. Do not connect the analyzer to power if it is damaged.**

2 Check that the line-voltage selector switches are set for the local line voltage.

The line-voltage selector switches are set at the factory to match the most commonly used line voltage in the country of destination. To check or change the line-voltage selector switches, see "To change the IF section's line-voltage switch" and "To change the RF section's line-voltage switch."

3 Check that the correct line fuses are installed in the fuse holders.

The fuses are installed at the factory for the most commonly used line voltage in the country of destination. There is one line fuse in the IF section and one line fuse in the RF section. To determine if the correct line fuses are installed, see "To change the IF section's fuse" and "To change the RF section's fuse."

4 Connect the IF section to the RF section.

For instructions on connecting the sections, see "To connect the sections."

5 Using the supplied power cords, plug the analyzer's IF section and RF section into appropriate receptacles.

The analyzer is shipped with two three-conductor power cords that ground the analyzer when plugged into appropriate receptacles. The type of power cable plug shipped with each analyzer depends on the country of destination.

6 Set the RF section's rear panel and front panel power switches to on.

Press the "|" symbol end of the rocker-switches located on the lower right of the rear panel and on the lower left of the front panel. The RF section provides standby power for the high precision frequency reference. The rear-panel line switch interrupts all power including standby power when you press the "**0**" symbol end of the switch. The front-panel power switch interrupts all power except standby power when you press the "**0**" symbol end of the switch.

7 Set the IF section's power switch to on.

Press the "|" symbol end of the rocker-switch located on the lower left of the front panel. The analyzer requires about 30 seconds to complete its power-on routine.

8 Test the electrical performance of the analyzer using the operation verification or the performance tests in chapter 2, "Verifying Specifications" in the *Installation and Verification Guide*.

The operation verification tests verify the basic operating integrity of the analyzer; these tests take about 2.5 hours to complete and are a subset of the performance tests. The performance tests verify that the analyzer meets all the performance specifications; these tests take about 5 hours to complete.

To connect the sections

Do NOT use the IF section's EXT REF OUT connector or optional OVEN REF OUT connector as an external reference output.

1 **Attach the IF section to the RF section.**

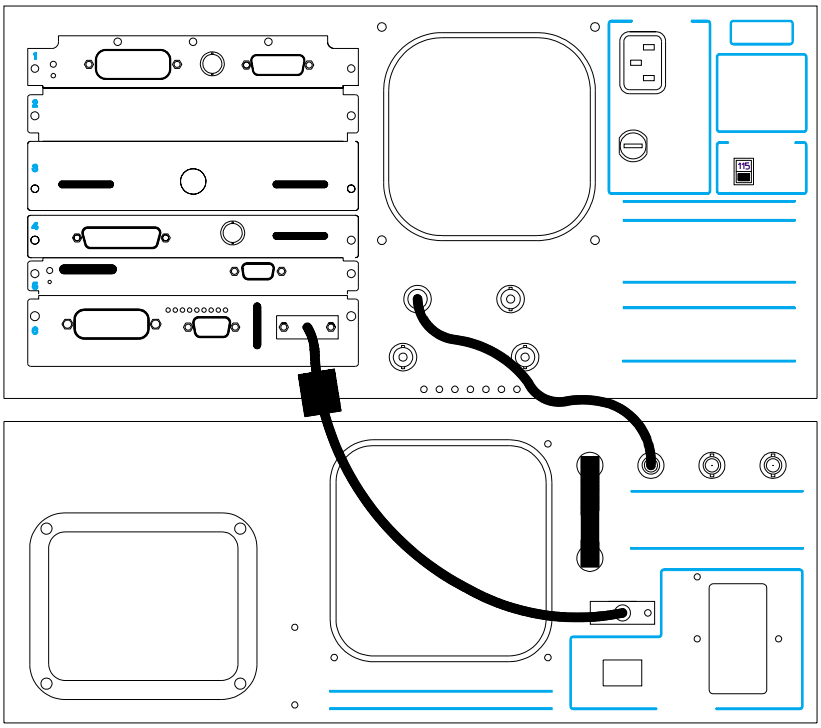
If the hardware is not installed, follow the instructions supplied with the Rear Panel Lock Foot Kit. If the hardware is already installed, slide the IF section on top of the RF section making sure the front lock-links engage the IF section's frame. Screw the rear lock feet together.

2 **Connect the RF section's SERIAL 2 port to the IF section's SERIAL 2 port using the supplied serial interface interconnect cable. Make sure the end of the cable with the EMI suppressor is conected to the IF section.**

3 **Connect the RF section's OVEN REF OUT connector to the EXT REF IN connector using the supplied coax BNC-to-coax BNC connector.**

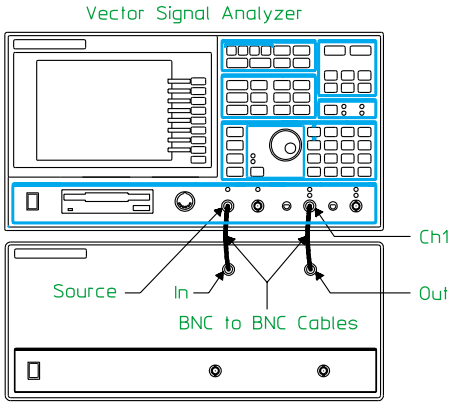
If the RF section does not have the OVEN REF OUT connector (option AY4, Delete High Precision Frequency Reference), connect a 1 MHz, 2 MHz, 5 MHz, or 10 MHz sine or square wave, with an amplitude greater than 0 dBm to the RF section's EXT REF IN connector. For best residual phase-noise, use 10 MHz with an amplitude greater than or equal to 5 dBm. See the *Technical Data* publication in the beginning of your *Installation and Verification Guide* for specifications that require the high precision frequency reference.

4 **Connect the RF section's 10 MHz REF TO IF SECTION connector to the IF section's EXT REF IN connector using the supplied 12-inch BNC-to-BNC cable.**



5 Connect the IF section's SOURCE connector to the RF section's IN connector using the supplied 8.5-inch BNC-to-BNC cable.

6 Connect the IF section's CHANNEL 1 connector to the RF section's OUT connector using the supplied 8.5-inch BNC-to-BNC cable.



To install the analyzer

The analyzer is shipped with plastic feet in place, ready for use as a portable bench analyzer. The plastic feet are shaped to make full-width modular instruments self-align when they are stacked.

- **Install the analyzer to allow free circulation of cooling air.**
  Cooling air enters the analyzer through the rear panel and exhausts through both sides.

Warning

To prevent potential fire or shock hazard, do not expose the analyzer to rain or other excessive moisture.

- **Protect the analyzer from moisture and temperatures or temperature changes that cause condensation within the analyzer.**
  The operating environment specifications for the analyzer are listed in the *Technical Data* publication in the beginning of your *Installation and Verification Guide*.

Caution

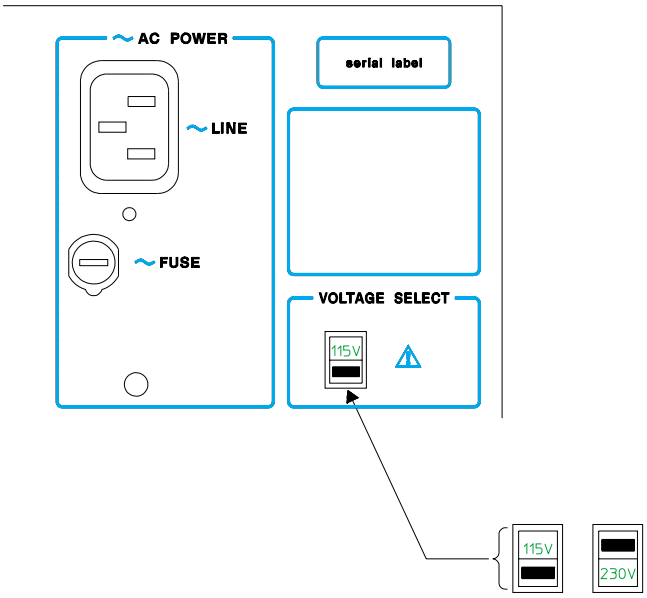
Use of the equipment in an environment containing dirt, dust, or corrosive substances will drastically reduce the life of the disk drive and the flexible disks. The flexible disks should be stored in a dry, static-free environment.

- **To install the analyzer in an equipment cabinet, follow the instructions shipped with the rack mount kits.**

To change the IF section's line-voltage switch

The line-voltage selector switch is set at the factory to match the most commonly used line voltage in the country of destination.

1. Unplug the power cord from the IF section (the section with "Agilent 89431A" silk screened on the lower right rear panel).
2. Slide the line voltage selector switch to the proper setting for the local line voltage.
3. Check to see that the proper fuse is installed. See "To change the IF section's fuse."



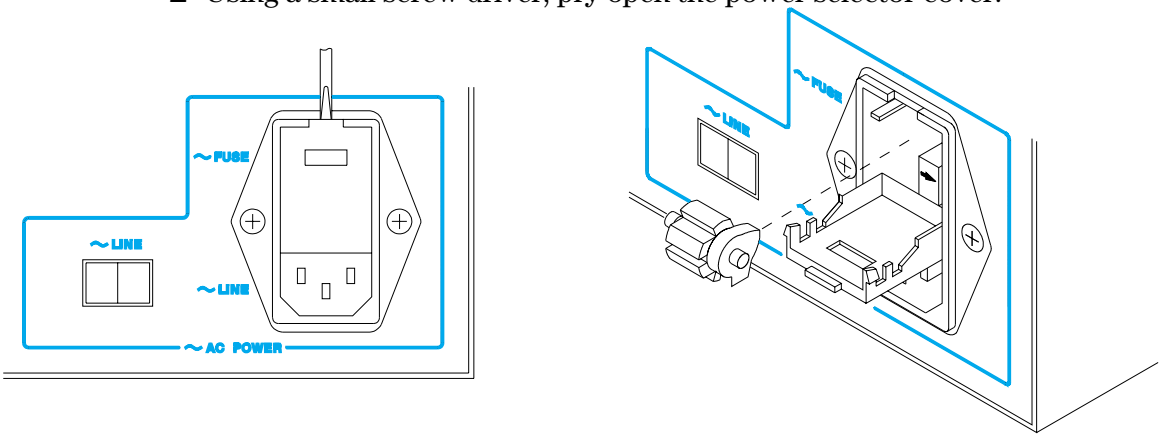
AC Line Voltage		Voltage Select Switch
Range	Frequency	
90-140 Vrms	47-440 Hz	115
198-264 Vrms	47-63 Hz	230

Warning **Only a qualified service person, aware of the hazards involved, should measure the line voltage.**

To change the RF section's line-voltage switch

The line-voltage selector switch is set at the factory to match the most commonly used line voltage in the country of destination.

1. Unplug the power cord from the RF section (the section with "Agilent 89431A" silk screened on its lower left rear panel).
2. Using a small screw driver, pry open the power selector cover.



3. Remove the cylindrical line voltage selector.
4. Position the cylindrical line voltage selector so the required voltage will be facing out of the power selector, then reinstall.

AC Line Voltage

Range	Frequency	Selector Switch
90-110 Vrms	47-63 Hz	100
103-140 Vrms	47-63 Hz	120
198-242 Vrms	47-63 Hz	220
216-264 Vrms	47-63 Hz	240

Warning

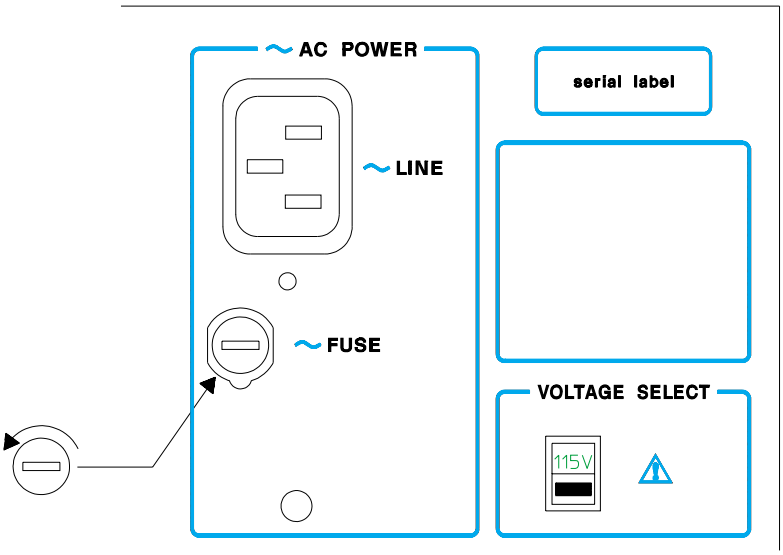
Only a qualified service person, aware of the hazards involved, should measure the line voltage.

5. Check to see that the proper fuse is installed. See "To change the RF section's fuse."
6. Close the power selector by pushing firmly on the power selector cover.
7. Check that the correct line voltage appears through the power selector cover.

To change the IF section's fuse

The fuse is installed at the factory to match the most commonly used line voltage in the country of destination.

1. Unplug the power cord from the IF section (the section with "Agilent 89410A" silk screened on its lower right rear panel).
2. Using a small screw driver, press in and turn the fuse holder cap counter-clockwise. Remove when the fuse cap is free from the housing.



3. Pull the fuse from the fuse holder cap.
4. To reinstall, select the proper fuse and place in the fuse holder cap.

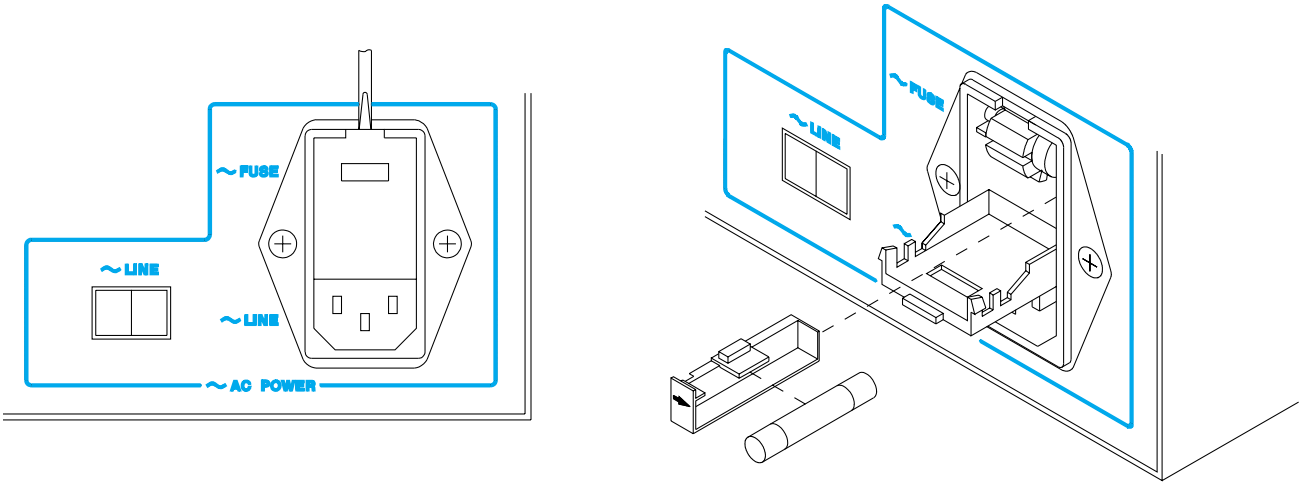
AC Line Voltage		Voltage Select Switch	Fuse	
Range	Frequency		Agilent Part Number	Type
90-140 Vrms	47-440 Hz	115	2110-0342	8 A 250 V Normal Blow
198-264 Vrms	47-63 Hz	230	2110-0055	4 A 250 V Normal Blow

5. Place the fuse holder cap in the housing and turn clockwise while pressing in.

To change the RF section's fuse

The fuse is installed at the factory to match the most commonly used line voltage in the country of destination.

1. Unplug the power cord from the RF section (the section with "Agilent 89431A" silk screened on its lower left rear panel).
2. Using a small screw driver, pry open the power selector cover.



3. Pull the white fuse holder out of the power selector and remove the fuse from the fuse holder.
4. Select the proper fuse and place in the fuse holder.

RF Section	AC Line Voltage		Selector Switch	Fuse	
	Range	Frequency		Agilent Part Number	Type
Agilent 89431A	90-110 Vrms	47-63 Hz	100	2110-0381	3 A 250 V Slow Blow
Agilent 89431A	103-140 Vrms	47-63 Hz	120	2110-0381	3 A 250 V Slow Blow
Agilent 89431A	198-242 Vrms	47-63 Hz	220	2110-0304	1.5 A 250 V Slow Blow
Agilent 89431A	216-264 Vrms	47-63 Hz	240	2110-0304	1.5 A 250 V Slow Blow

1. Align the white arrow on top of the fuse holder with the white arrow on the power selector cover. All three arrows should point in the same direction. Push the fuse holder into the top slot of the power selector.
2. Close the power selector by pushing firmly on the power selector cover.
3. Check that the correct line voltage appears through the power selector cover.

To connect the analyzer to a LAN

Analyzers with option UFG, 4 megabyte extended RAM and additional I/O, have a ThinLAN and AUI (attachment unit interface) port for connecting the analyzer to the LAN (local area network).

1. Set the power switch to off (**0**).
2. Connect the ThinLAN BNC cable to the ThinLAN port or the appropriate media access unit (MAU) to the AUI port.
3. Set the power switch to on (|).
4. Press the following keys:

   [**Local/Setup**]
   [LAN port setup]
   [port select ThinLAN (BNC)] or [port select AUI (MAU)]
   [IP address]
   internet protocol address
   [**Return**]
   [LAN power-on **active**]

See your LAN system administrator for the internet protocol address. Your LAN system administrator can also tell you if you need to set the gateway address or subnet mask.

To connect the analyzer to a serial device

The IF section's Serial 1 port is a 9-pin, EIA-574 port that can interface with a printer or plotter. The total allowable transmission path length is 15 meters.

- Connect the IF section's SERIAL 1 port to a printer or plotter using a 9-pin female to 25-pin RS-232-C cable.

Part Number	Cable Description
Agilent 24542G	9-pin female EIA-574 to 25-pin male RS-232
HP 24542H	9-pin female EIA-574 to 25-pin female RS-232

To connect the analyzer to a parallel device

The IF section's Parallel Port is a 25-pin, Centronics port. The Parallel Port can interface with PCL printers or HP-GL plotters.

- Connect the IF section's rear panel PARALLEL PORT connector to a plotter or printer using a Centronics interface cable.

To connect the analyzer to an GPIB device

The analyzer is compatible with the General Purpose Interface Bus (GPIB). Total allowable transmission path length is 2 meters times the number of devices or 20 meters, whichever is less. Operating distances can be extended using an GPIB Extender.

Analyzers with option UFG, 4 megabytes extended RAM and additional I/O, have an additional GPIB connector. The additional GPIB connector, SYSTEM INTERCONNECT, is only for connection to the spectrum analyzer used with the Agilent 89411A 21.4 MHz Down Converter.

- **Connect the analyzer's rear panel GPIB connector to an GPIB device using an GPIB interface cable.**

Caution

The analyzer contains metric threaded GPIB cable mounting studs as opposed to English threads. Use only metric threaded GPIB cable lockscrews to secure the cable to the analyzer. Metric threaded fasteners are black, while English threaded fasteners are silver.

For GPIB programming information, see the *Agilent 89400 Series GPIB Command Reference*.

To connect the analyzer to an external monitor

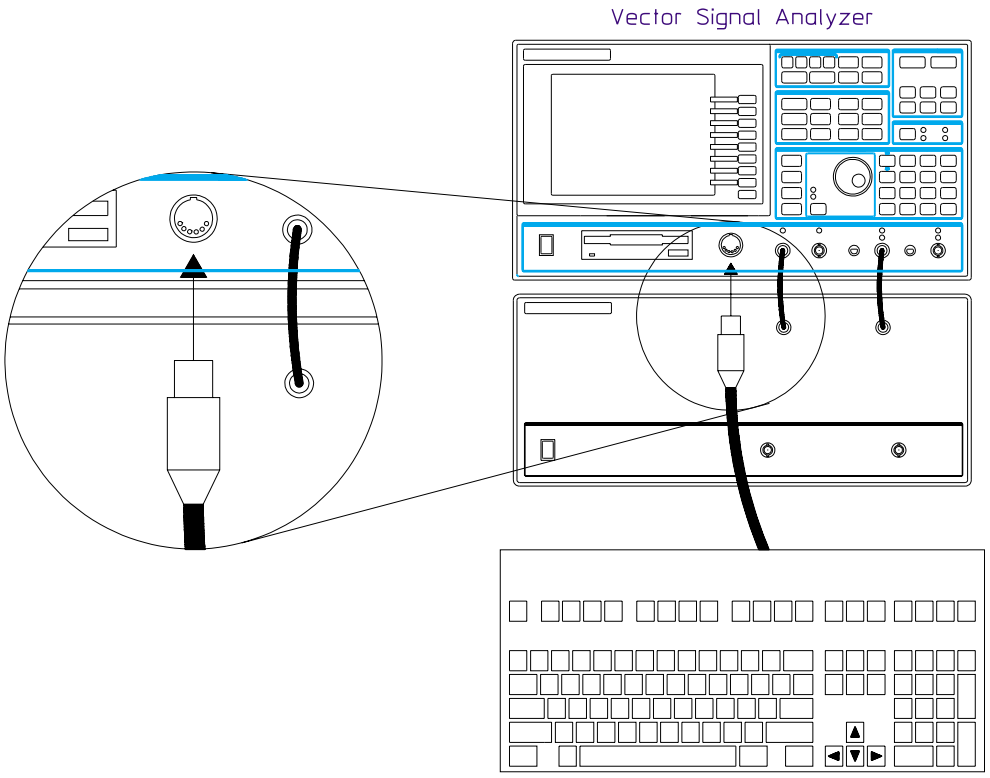
The External Monitor connector is a 15-pin connector with standard VGA pinout. The External Monitor connector can interface with an external, multi-scanning monitor. The monitor must have a 25.5 kHz horizontal scan rate, a 60 Hz vertical refresh rate, and must conform to EIA-343-A standards.

- **Connect the analyzer's rear panel EXTERNAL MONITOR connector to an external monitor using an appropriate cable.**
  For additional information, see "EXTERNAL MONITOR connector" in the analyzer's online help.

To connect the optional keyboard

The analyzer may be connected to an optional external keyboard. The keyboard remains active *even when the analyzer is not in alpha entry mode*. This means that you can operate the analyzer using the external keyboard rather than the front panel. Pressing the appropriate keyboard key does the same thing as pressing a hardkey or a softkey on the analyzer's front panel.

1. Set the IF section's power switch to on (|).
2. Connect the round plug on the keyboard cable to the KEYBOARD connector on the analyzer's front panel. Make sure to align the plug with the connector pins.



3. Connect the other end of the keyboard cable to the keyboard.

Caution

In addition to the U.S. English keyboard, the analyzer supports U.K. English, German, French, Italian, Spanish, and Swedish. Use only the Hewlett-Packard approved keyboard for this product. Hewlett-Packard does not warrant damage or performance loss caused by a non-approved keyboard. See the beginning of this guide for part numbers of approved Hewlett-Packard keyboards.

4 To configure your analyzer for a keyboard other than U.S. English, press [**System Utility**] [keyboard type]. Then press the appropriate softkey to select the language.

Configuring your analyzer to use a keyboard other than U.S. English only ensures that the analyzer recognizes the proper keys for that particular keyboard. Configuring your analyzer to use another keyboard *does not* localize the on-screen annotation or the analyzer's online HELP facility.

To connect the optional minimum loss pad

The minimum loss pad (option 1D7) provides a 50 ohm matched impedance to the analyzer and a 75 Ω matched impedance to the device under test.

1 Connect the minumum loss pad to the RF section's INPUT or SOURCE connector.

2 Connect a 75 Ω cable between the minimum loss pad and the device under test.

Use either a 75 Ω type-N cable or the supplied 75 Ω type-N(m)-to-BNC(f) adapter and a 75 Ω BNC cable.

Caution

Do NOT connect a 50 Ω cable or adapter to the 75 Ω minimum loss pad. The center pin is larger in a 50 Ω type-N connector than in a 75 Ω type-N connector. Connecting a 50 Ω type-N connector to the 75 Ω minimum loss pad will damage the 75 Ω minimum loss pad.

To clean the screen

The analyzer screen is covered with a plastic diffuser screen (this is not removable by the operator). Under normal operating conditions, the only cleaning required will be an occasional dusting. However, if a foreign material adheres itself to the screen, do the following:

1. Set the IF section's power switch to off (**O**).
2. Remove the power cord.
3. Dampen a soft, lint-free cloth with a mild detergent mixed in water.
4. Carefully wipe the screen.

Caution

Do not apply any water mixture directly to the screen or allow moisture to go behind the front panel. Moisture behind the front panel will severely damage the instrument.

To prevent damage to the screen, do not use cleaning solutions other than the above.

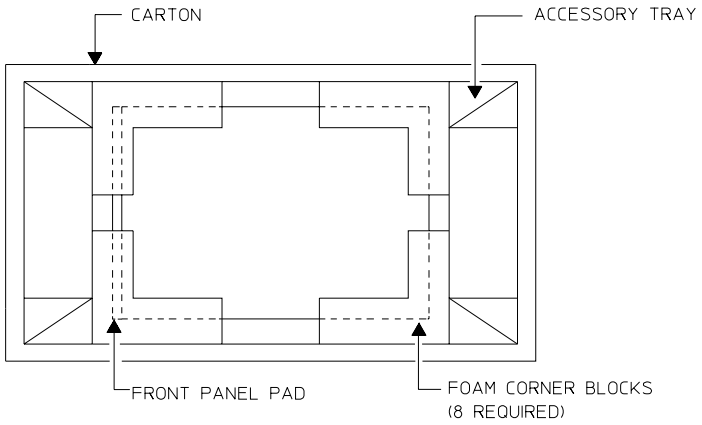
To store the analyzer

- Store the analyzer in a clean, dry, and static free environment.
  For other requirements, see environmental specifications in the *Technical Data* publication in the beginning of your *Installation and Verification Guide*.

To transport the analyzer

- **Disconnect the IF section from the RF section and package each section using the original factory packaging or packaging identical to the factory packaging.** Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices.
- **If returning the analyzer to Hewlett-Packard for service, attach a tag to each container describing the following:**
  - Type of service required
  - Return address
  - Model number
  - Full serial number

  In any correspondence, refer to the analyzer by model number and both serial numbers.
- **Mark the containers FRAGILE to ensure careful handling.**
- **If necessary to package the analyzer in containers other than original packaging, observe the following (use of other packaging is not recommended):**
  - Wrap each section in heavy paper or anti-static plastic.
  - Protect the front panels with cardboard.
  - Use double-wall cartons made of at least 350-pound test material.
  - Cushion each section to prevent damage.



Caution Do not use styrene pellets in any shape as packing material for the analyzer. The pellets do not adequately cushion the analyzer and do not prevent the analyzer from shifting in the carton. In addition, the pellets create static electricity which can damage electronic components.

If the IF section will not power up

- ❑ Check that the power cord is connected to the IF section and to a live power source.
- ❑ Check that the front-panel switch is on (**I**).
- ❑ Check that the voltage selector switch is set properly.
  See "To change the IF section's line-voltage switch" on page 7-10.
- ❑ Check that the fuse is good.
  See "To change the IF section's fuse" on page 7-12.
- ❑ Check that the IF section's air circulation is not blocked.
  Cooling air enters the IF section through the rear panel and exhausts through both sides. If the IF section's air circulation is blocked, the IF section powers down to prevent damage from excessive temperatures. The IF section remains off until it cools down and its power switch is set to off (**0**) then to on (**I**).
- ❑ Obtain service, if necessary. See "Need Assistance?" at the end of this guide.

If the RF section will not power up

- ❑ Check that the power cord is connected to the RF section and to a live power source.
- ❑ Check that the RF section's rear panel and front panel power switches are on (|).
- ❑ Check that the voltage selector switch is set properly.
  See "To change the RF section's line-voltage switch" on page 7-11.
- ❑ Check that the fuse is good.
  See "To change the RF section's fuse" on page 7-13.
- ❑ Check that the RF section's air circulation is not blocked.
  Cooling air enters the RF section through the rear panel and exhausts through both sides. If the RF section's air circulation is blocked, the RF section powers down to prevent damage from excessive temperatures. The RF section turns back on when it cools down.
- ❑ Obtain service, if necessary. See "Need Assistance?" at the end of this guide.

If the analyzer's stop frequency is 10 MHz

- ❑ Check that the RF section's fan is running.
  If the fan is not running, see "If the RF section will not power up."
- ❑ Check that the Serial 2 port on the IF section and on the RF section are connected together.
- ❑ Press [**Instrument Mode**] and check that the receiver softkey displays "RF section (2-2650 MHz)".
  If the receiver softkey does not display "RF section (2-2650 MHz)" press [receiver] [RF section (2-2650 MHz)].
- ❑ Leaving the RF section on, turn the IF section off (**0**) then on (**I**).
  The IF section will not detect the RF section if the RF section was not on before the IF section performs the power-on routine.
- ❑ Obtain service, if necessary. See "Need Assistance?" at the end of this guide.

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Agilent 89400-Series Documentation Roadmap

If you are thinking about...	And you want to...	Then read the analyzer's...
Unpacking and installing the analyzer	Install the analyzer, or do operation verification or performance verification tests	*Installation and Verification Guide*
Getting started	Make your first measurements with your new analyzer	*Getting Started Guide*
	Review measurement concepts	*Operator's Guide*
	Learn what each key does	Online Help (press the [Help] key)
Making measurements	Learn how to make typical measurements	*Getting Started Guide and Operator's Guide*
Creating automated measurements (To receive Agilent Instrument BASIC and Agilent Instrument BASIC manuals, order option 1C2)	Learn the Agilent Instrument BASIC interface	*Agilent 89400-Series Using Agilent Instrument BASIC*
	Program with Agilent Instrument BASIC	*Agilent Instrument BASIC User's Handbook*
Remote operation	Learn about the GPIB and SCPI	*GPIB Programmer's Guide*
	Find specific GPIB commands quickly	*Agilent 89400-Series GPIB Commands: Quick Reference*
	Find GPIB command details	*Agilent 89400-Series GPIB Command Reference*
Using analyzer data with a PC application	Transfer analyzer data to or from a PC (Personal Computer) application	*Standard Data Format Utilities: User's Guide*
	Display analyzer data on a PC, or display PC data on the analyzer	
Servicing the analyzer (To receive service information, order option OB3)	Adjust, troubleshoot, or repair the analyzer	*Service Guide*

89441-90012

Need Assistance?

If you need assistance, contact your nearest Agilent Technologies Sales and Service Office listed in the Agilent Catalog. You can also find a list of local service representatives on the Web at: ***http://www.agilent-tech.com/services/English/index.html*** or contact your nearest regional office listed below.

If you are contacting Agilent Technologies about a problem with your Agilent 89410A Vector Signal Analyzer, please provide the following information:

- ❑ Model number: Agilent 89410A
- ❑ Serial number:
- ❑ Options:
- ❑ Date the problem was first encountered:
- ❑ Circumstances in which the problem was encountered:
- ❑ Can you reproduce the problem?
- ❑ What effect does this problem have on you?

You may find the serial number and options from the front panel of your analyzer by executing the following:

Press [**System Utility**], [more], [serial number].

Press [**System Utility**], [options setup].

If you do not have access to the Internet, one of these centers can direct you to your nearest representative:

United States	Test and Measurement Call Center (800) 452-4844 (Toll free in US)
Canada	(905) 206-4725
Europe	(31 20) 547 9900
Japan	Measurement Assistance Center (81) 426 56 7832 (81) 426 56 7840 (FAX)
Latin America	(305) 267 4245 (305) 267 4288 (FAX)
Australia/New Zealand	1 800 629 485 (Australia) 0800 738 378 (New Zealand)
Asia-Pacific	(852) 2599 7777 (FAX) (852) 2506 9285