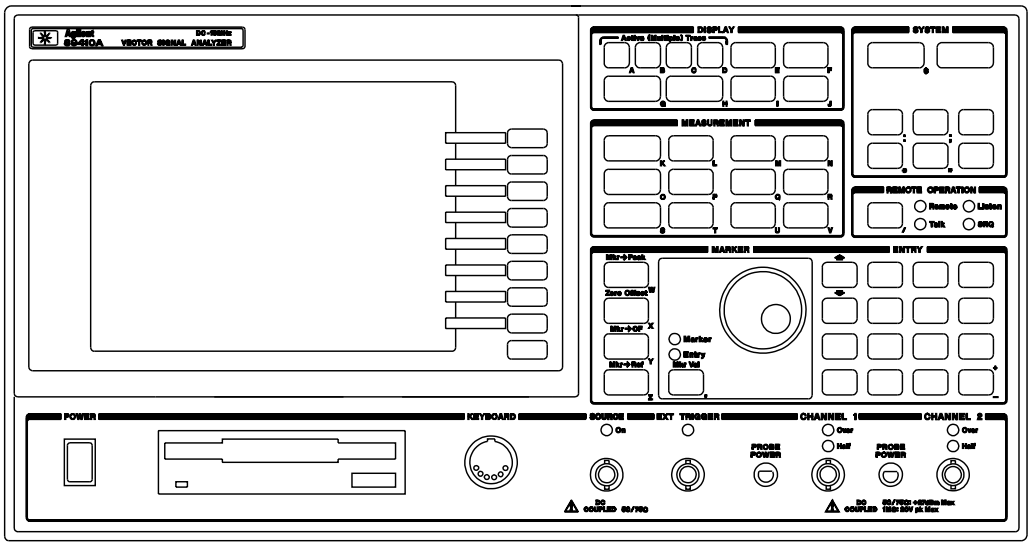
Agilent Technologies 89410A Getting Started Guide



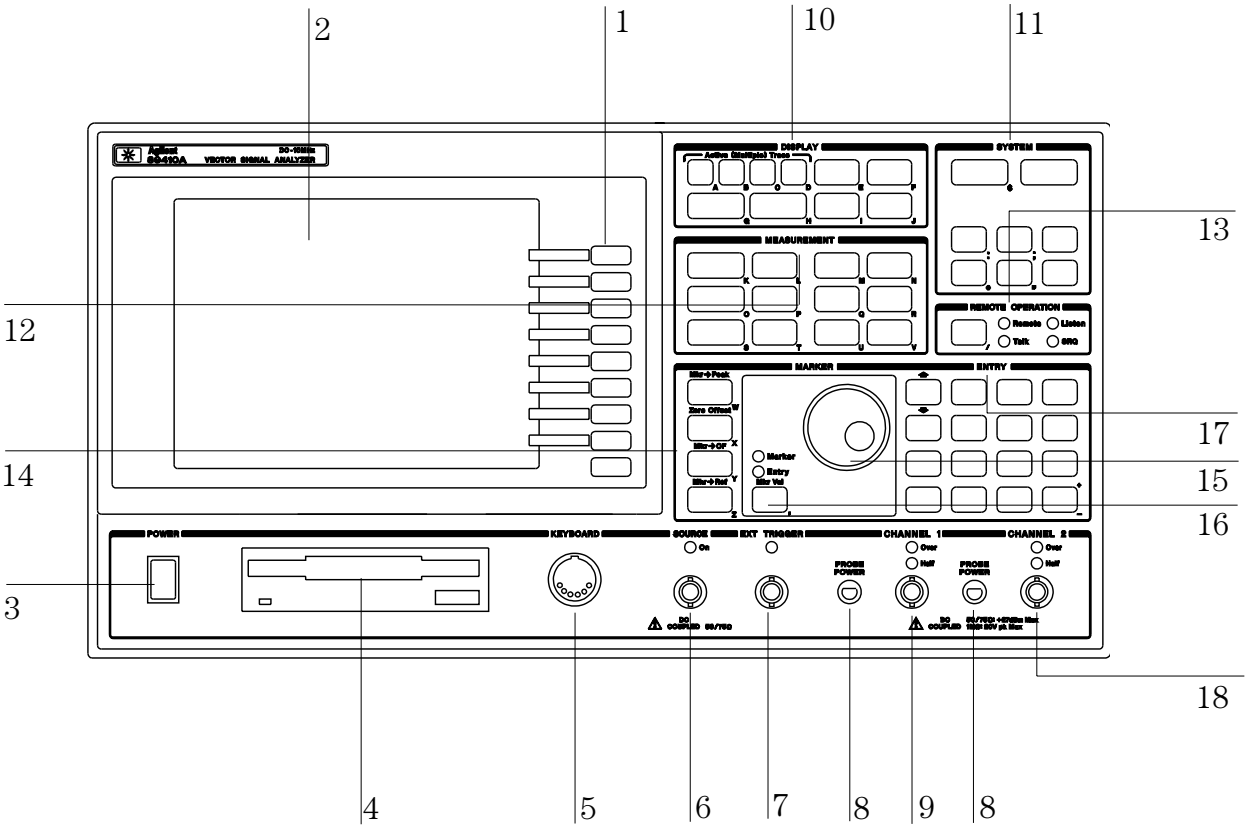
Agilent Technologies

Agilent Technologies Part Number 89410-90092
Printed in U.S.A.
For instruments with firmware version A.08.00

Print Date: May 2000
© Agilent Technologies 1994,1995, 2000. All rights reserved.
8600 Soper Hill Road Everett, Washington 98205-1209 U.S.A.

This software and documentation is based in part on the Fourth Berkeley Software Distribution under license from The Regents of the University of California. We acknowledge the following individuals and institutions for their role in the development: The Regents of the University of California.

The Agilent 89410A at a Glance



Agilent 89410A 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 HP Instrument BASIC programs.

6- The SOURCE connector routes the analyzer's source output to your DUT. Output impedance is selectable: 50 ohms or 75 ohms.

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

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

9-The CHANNEL 1 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.

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 HP 89410A 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.

This page left intentionally blank

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 89410A Getting Started Guide”, is designed to help you become comfortable with the Agilent 89410A DC-10MHz Vector Signal Analyzer. 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 Agilent 89410A.

To Learn More About the Agilent 89410A

You may need to use other books in the Agilent 89410A manual set. See the “Documentation Roadmap” at the end of this book to learn what each book contains.

This page left intentionally blank

Table of Contents

1 Using Online Help

To learn about online help 1-2

To display help for hardkeys and softkeys 1-3

To display a related help topic 1-4

To select a topic from the help index 1-5

2 Making Simple Noise Measurements

To measure random noise 2-2

To measure band power 2-3

To measure signal to noise ratios 2-4

To measure adjacent-channel power 2-6

3 Using Gating to Characterize a Burst Signal

To Use Time Gating 3-2

4 Measuring Relative Phase

To measure the relative phase of an AM signal 4-2

To measure the relative phase of an PM signal 4-4

5 Characterizing a Filter

To set up a frequency response measurement 5-2

To use the absolute marker 5-4

To use the relative marker 5-5

To use the search marker 5-6

To display phase 5-7

To display coherence 5-8

6 General Tasks

To set up peripherals. 6-2
To print or plot screen contents 6-3
To save data with an internal or RAM disk 6-4
To recall data with an internal or RAM disk 6-5
To format a disk 6-6
To create a math function 6-7
To use a math function 6-8
To display a summary of instrument parameters 6-9

Inspection and Installation

7 Preparing the Analyzer for Use

Preparing the Analyzer for Use 7-2
To do the incoming inspection 7-5
To install the analyzer 7-7
To change the line-voltage selector switch 7-8
To change the fuse 7-9
To connect the analyzer to a LAN 7-10
To connect the analyzer to a serial device 7-10
To connect the analyzer to a parallel device 7-11
To connect the analyzer to an HP-IB device 7-11
To connect the analyzer to an external monitor 7-12
To connect an external frequency reference 7-12
To connect the optional frequency reference 7-13
To connect the optional keyboard 7-14
To clean the screen 7-16
To store the analyzer 7-16
To transport the analyzer 7-17
If the analyzer will not power up 7-18

Index

Documentation Road Map

Need Assistance

1

Using Online Help

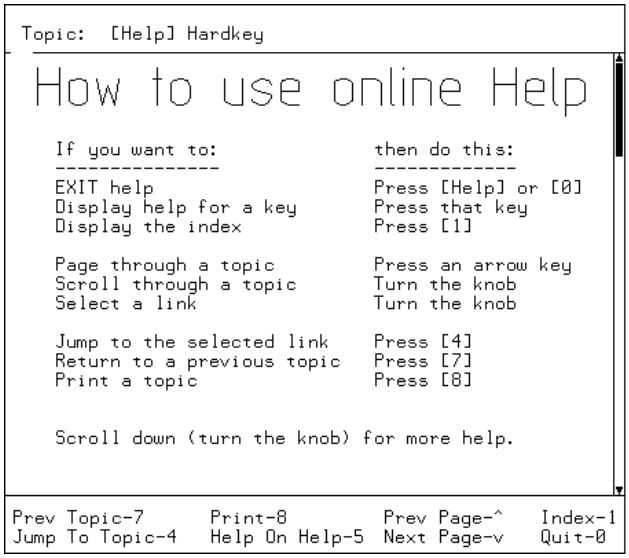
You can learn about your analyzer from online help which is built right into the instrument and is available to you any time you use the analyzer. This section shows you how to use online help to learn about specific keys or topics. You can use online help in conjunction with other documentation to learn 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.



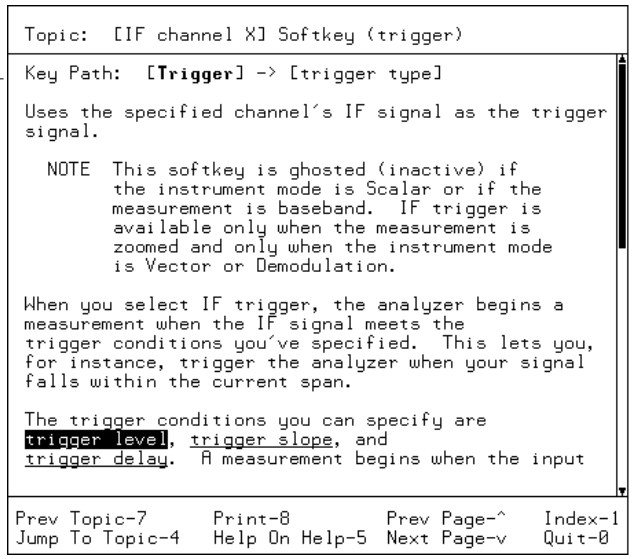
This legend shows which numeric keys access online help features

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

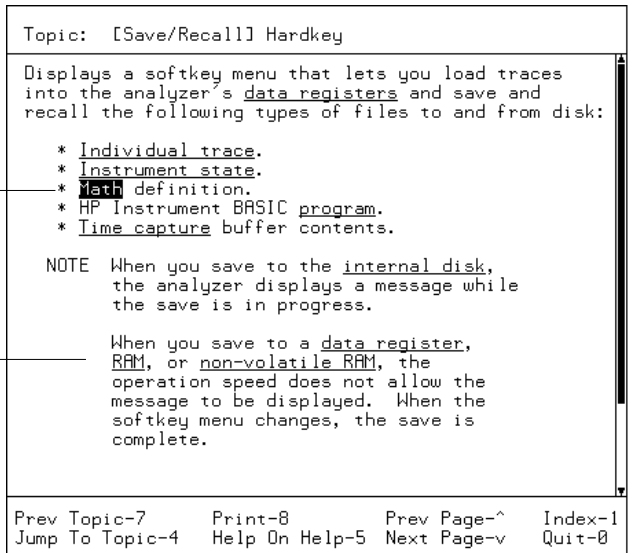
To display a related help topic

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.



The highlighted link shows what topic is displayed if you press 4

Underlined links show other topics available from this online help topic

To select a topic from the help index

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

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

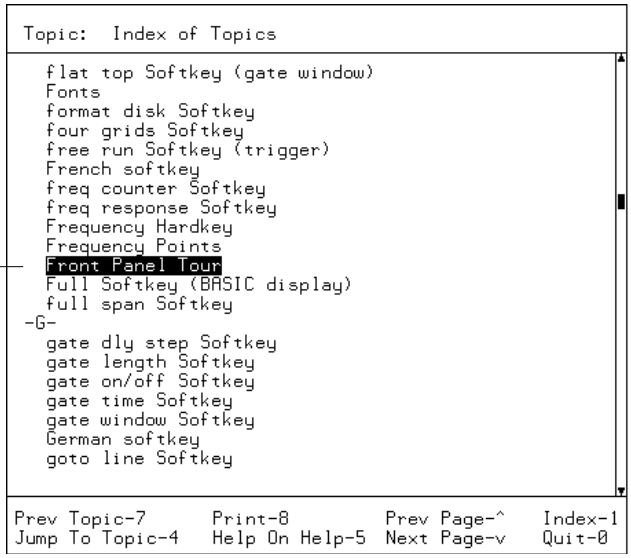
3 Turn the knob to select the topic you want help on
or
for faster paging press and hold the up-arrow or down-arrow keys then use the knob to select a topic.

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**].

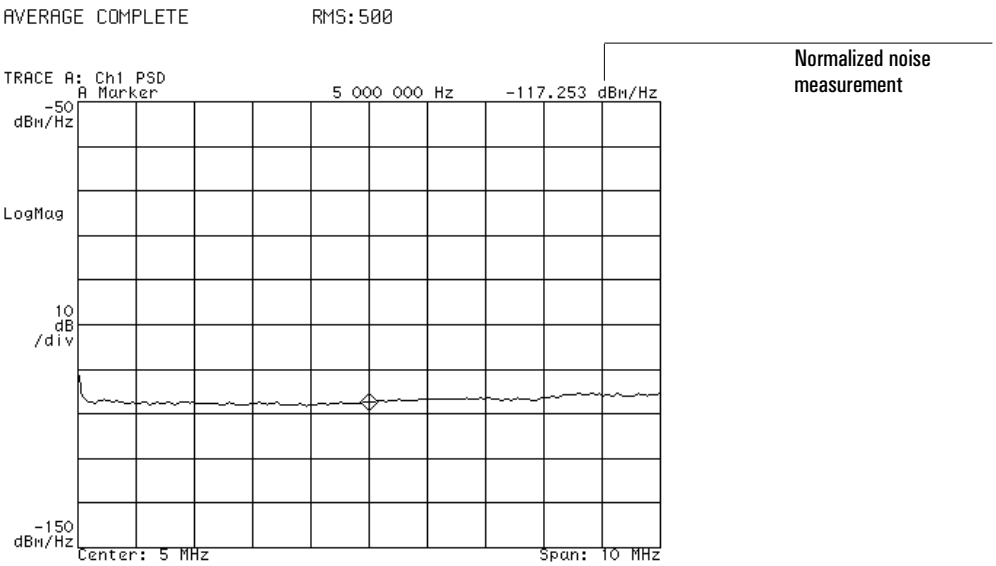
2 Select a power spectral density measurement:
Press [**Measurement Data**], [PSD] (select **ch1** with a 2-channel analyzer).

3 Configure the measurement and display:
Press [**Average**], [average **on**],
Press [num averages], 500, [enter],
Press [average type], [rms (video)],
Press [Return] (bottom softkey),
Press [fast avg **on**], [update rate], 100, [enter] to speed the measurement.

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

The display should appear as 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

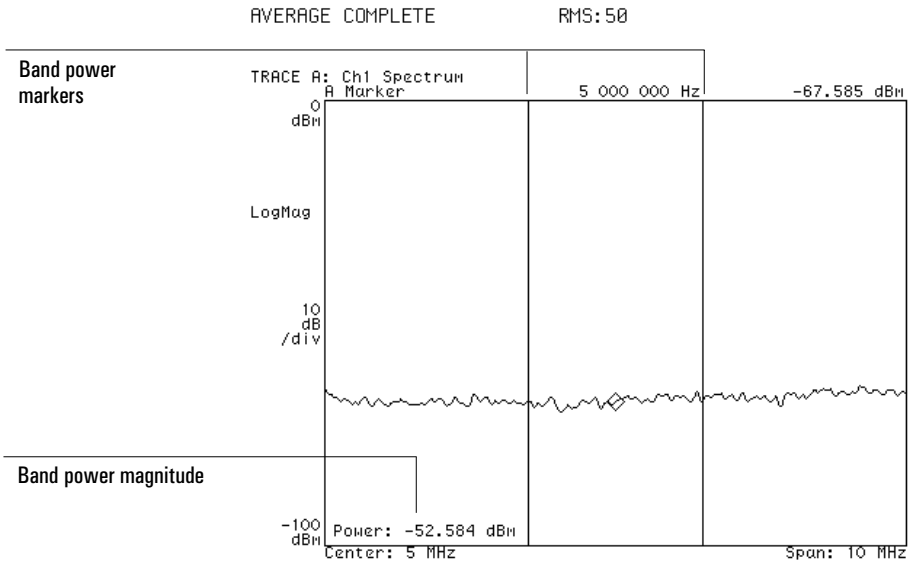
1 Initialize the analyzer:
Press [**Preset**].

2 Select video averaging:
Press [**Average**], [average **on**],
Press [num averages], 50, [enter],
Press [average type], [rms (video)]

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].

5 Change the width of the band:
Press [band width], [**Marker**|**Entry**],
then use the knob to change the width of the measurement band.
or
Press [band width],
then enter the desired band width with the numeric entry keys.
The display should appear as 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 Initialize the analyzer:
Press [**Preset**].

2 Supply a signal from the internal source:
Connect the SOURCE output to the CHANNEL 1 input with a BNC cable.
Press [**Source**], [source **on**], [sine freq], 5, [MHz]

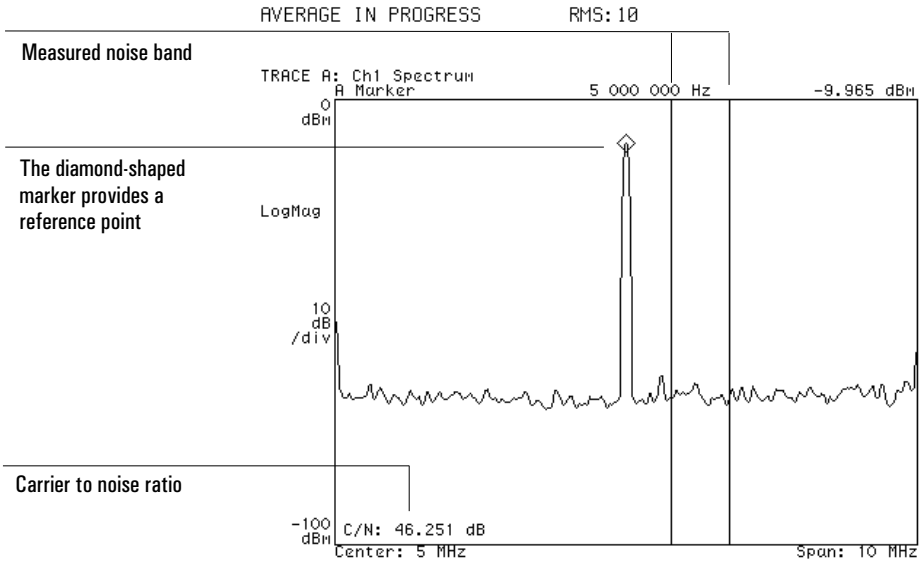
3 Place the marker on the signal peak:
Press [**Marker⇒**], [marker to peak]
or
Press [**Shift**], [**Marker**]

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.

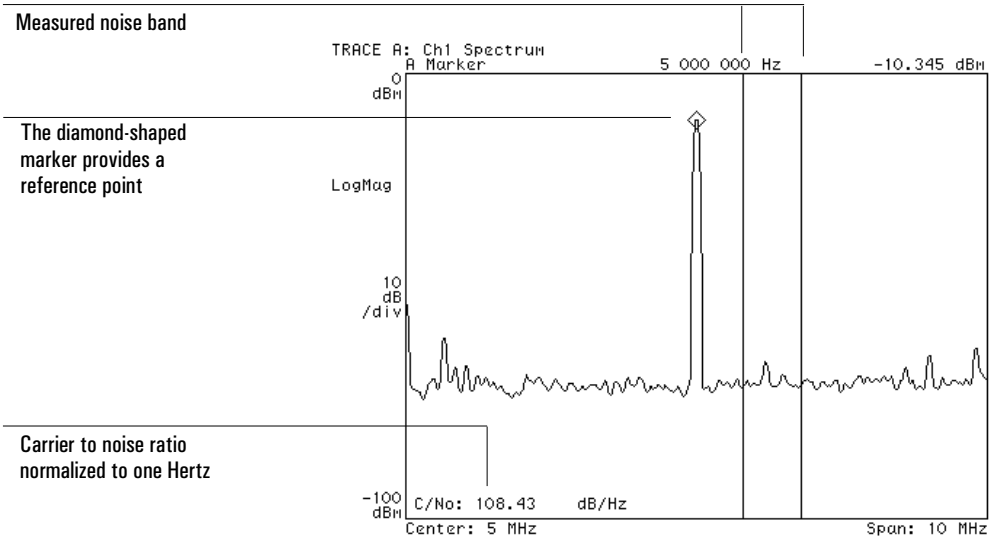
Step 3 above illustrates that there are two ways to perform certain actions—by using the hardkey/softkey sequence or by using the short-cut shift/hardkey sequence.



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.



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.

This type of measurement is often used to measure adjacent-channel power. Another method is shown on the following page.

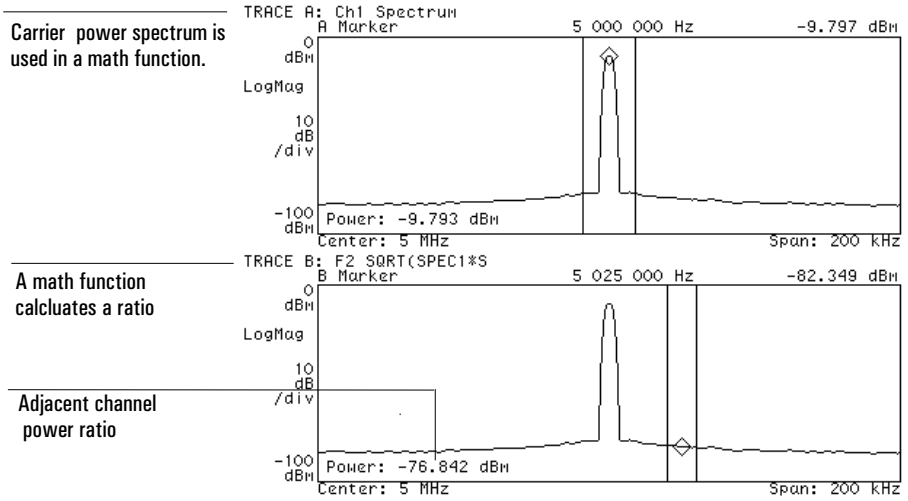
You can perform band power measurements in either Vector or Scalar Mode. If you use Scalar mode and you have selected a combination of resolution bandwidth, window type, and number of frequency points such that the analyzer implements the detector, the analyzer will prompt you to select the sample detector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

To measure adjacent-channel power

This task shows an additional method of measuring adjacent-channel power. The method shown on the previous page is preferred when carriers are represented by a single tone. This second method is used when carriers are heavily modulated or are defined over a band.

1. Use the band power markers, as shown in "To measure band power" to perform an rms (video) averaged measurement of the desired band encompassing the carrier. Save the trace in a register, for example register D1.
2. Create a math function: `F1=SQRT(SPEC1*SPEC1/D1*D1)`. See "To create a math function."
3. Move the band power markers to encompass the desired adjacent-channel and perform an rms averaged measurement.
4. Select the math function as measurement data:
   Press [**Measurement Data**], [math func], [F1]
5. Start a new rms (video) average.
   Press [**Meas Restart**],

In rms averaging the power spectrum is in linear units (volts), rather than power units, with its real part all positive and its imaginary part all zero. Therefore, the spectra must be squared for use in power calculations.



Band power markers and a math function are used to determine the ratio between the carrier power and adjacent-channel power.

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

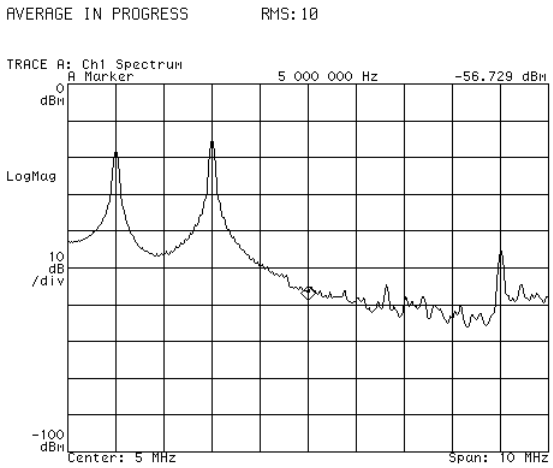
First we'll look at the spectrum of the signal and see that three components exist. Then we'll look at the time display of the burst signal and analyze each burst separately to determine which spectral components exist in each burst.

1 Initialize the analyzer:
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 CHANNEL 1 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].

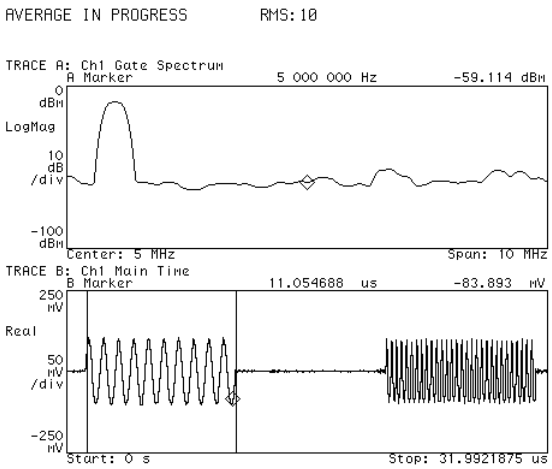
6 Set up the time gating and examine the first burst:

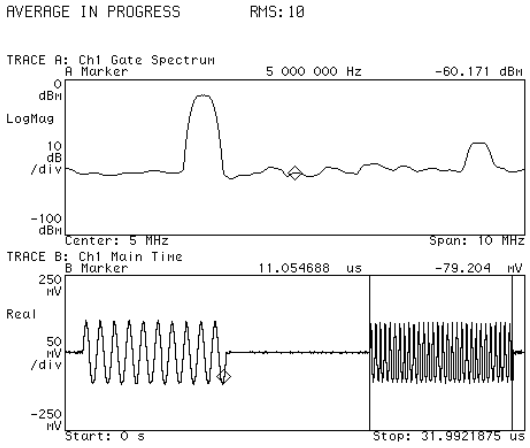
Press [**Time**], [gate **on**], [gate length], 10, [us].
Press [ch1 gate dly], [**Marker**|**Entry**]
Rotate the knob until the gate is at each end of the first burst signal.
The display should now appear as shown to the left below.

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 *Operator's Guide*.

To measure the relative phase of an AM signal

1 Initialize the analyzer:
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 to the CHANNEL 1 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].

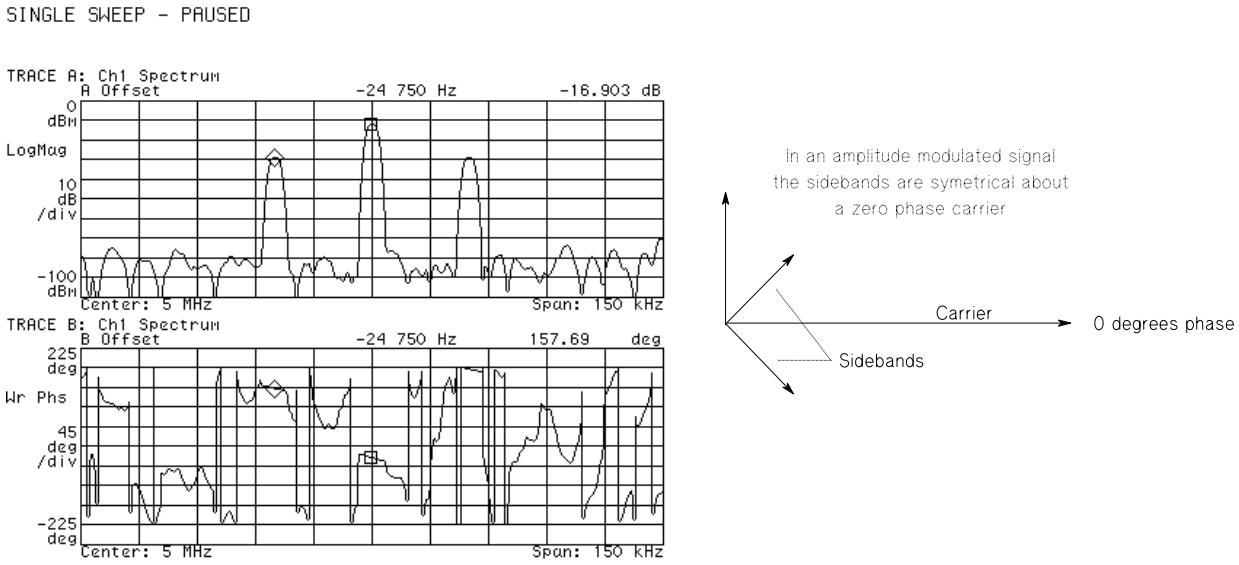
4 Activate a different trace as a phase display:
Press [**Display**], [2 grids],
Press [**B**], [**Measurement Data**], [spectrum] (select **ch1** with a 2-channel analyzer),
Press [**Data Format**], [phase **wrap]**

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

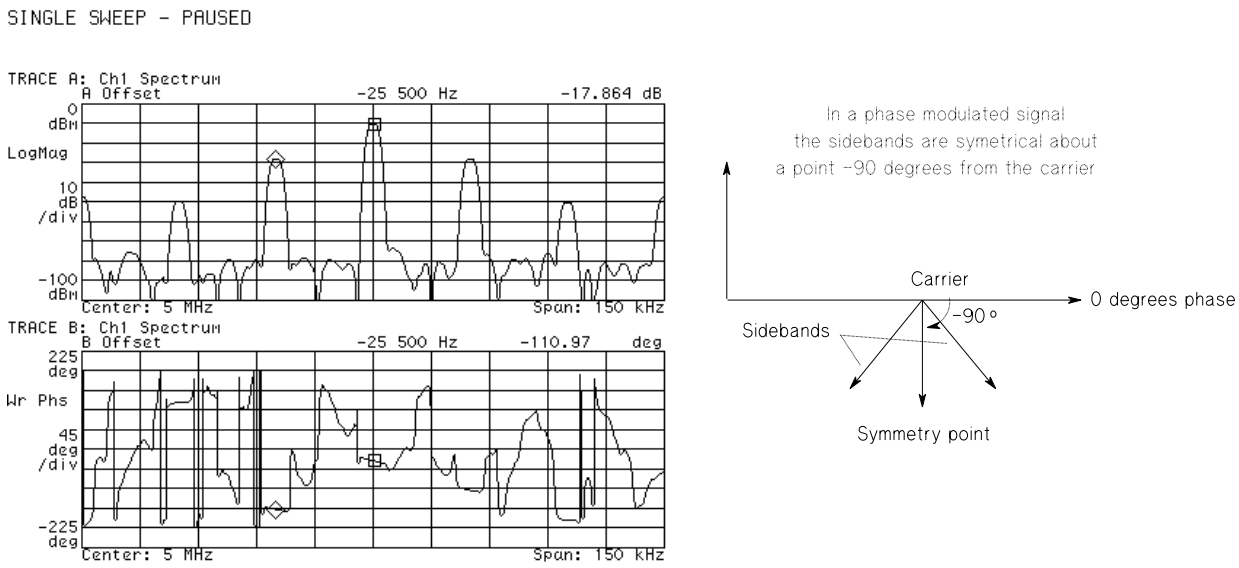
Continue from "To measure the relative phase of an AM signal."

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

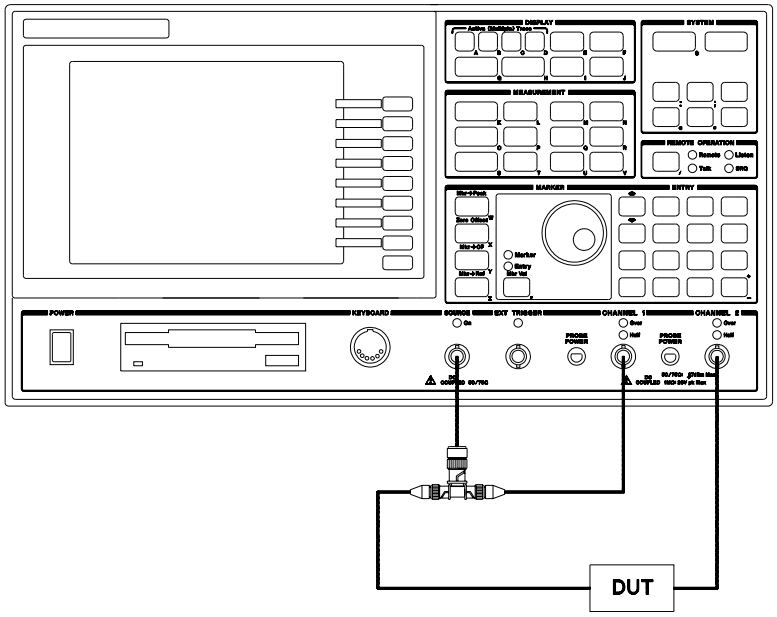
Characterizing a Filter

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.

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. Initialize the analyzer:
   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].

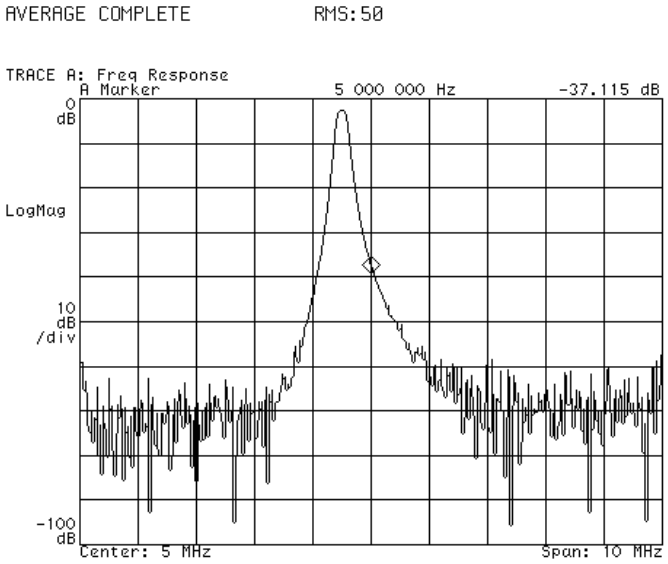
Press [**Average**], [average **on**]
Press [num averages], 50, [enter],
Press [average type], [rms (video)].

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 positioning of the data on the display).



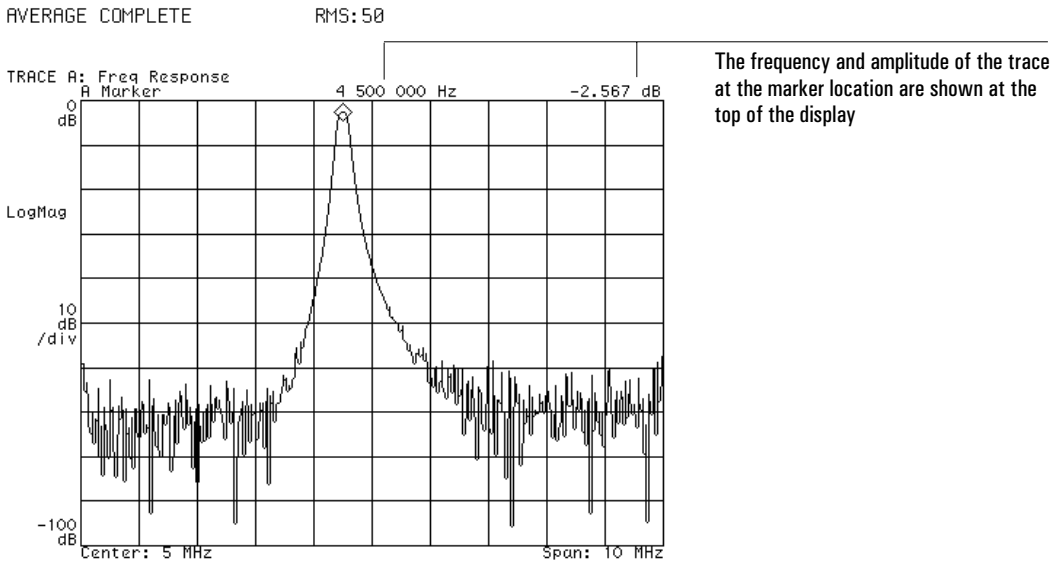
Frequency response data displays the output of a device-under-test divided by the input

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

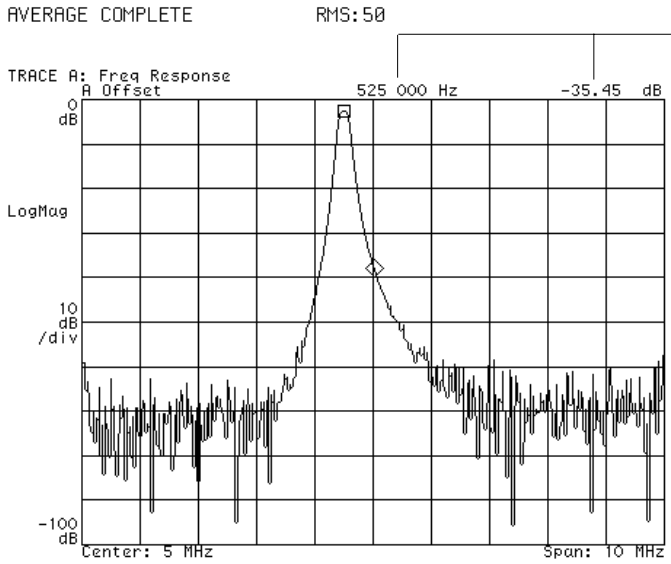
To use the relative marker

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

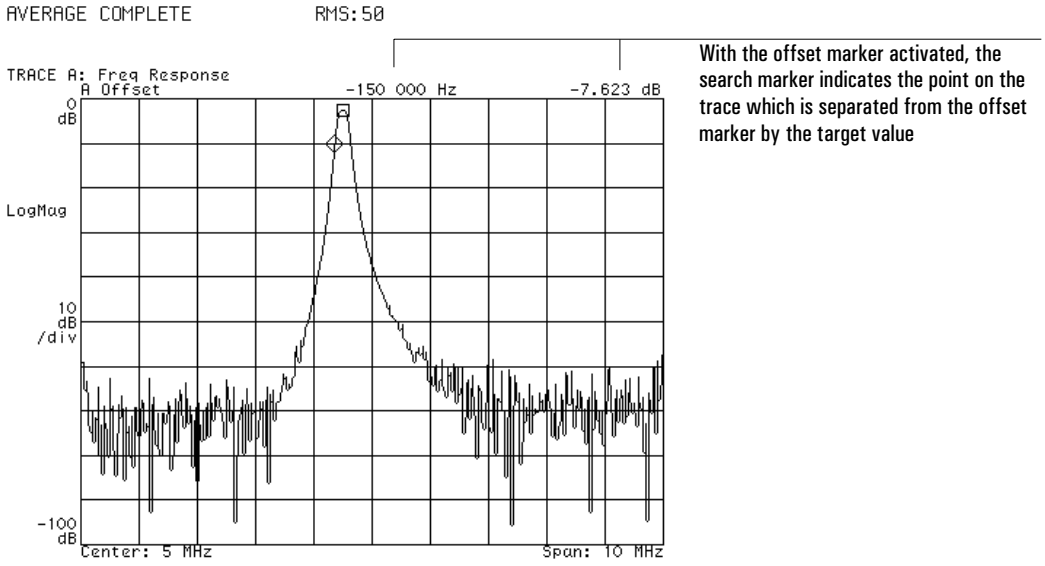
To use the search marker

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 relative 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].

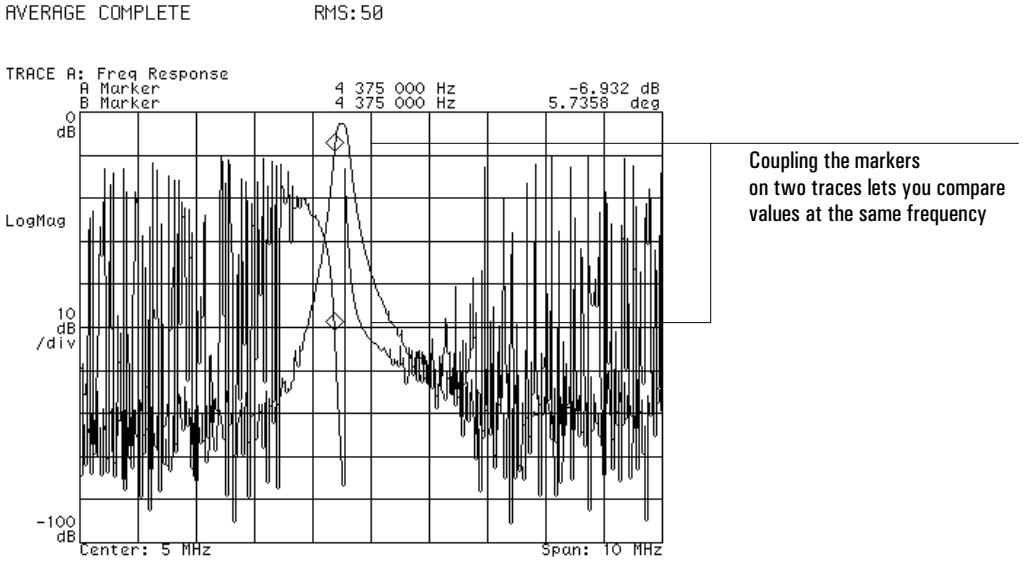
3 Specify phase data for the second trace:
Press [**Data Format**], [phase **wrap**].

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.

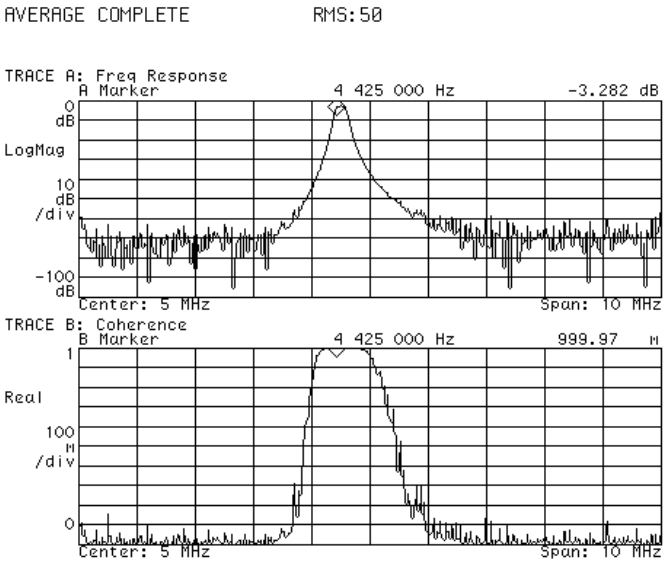


To display coherence

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 four ports—one GPIB port, two serial ports, 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.

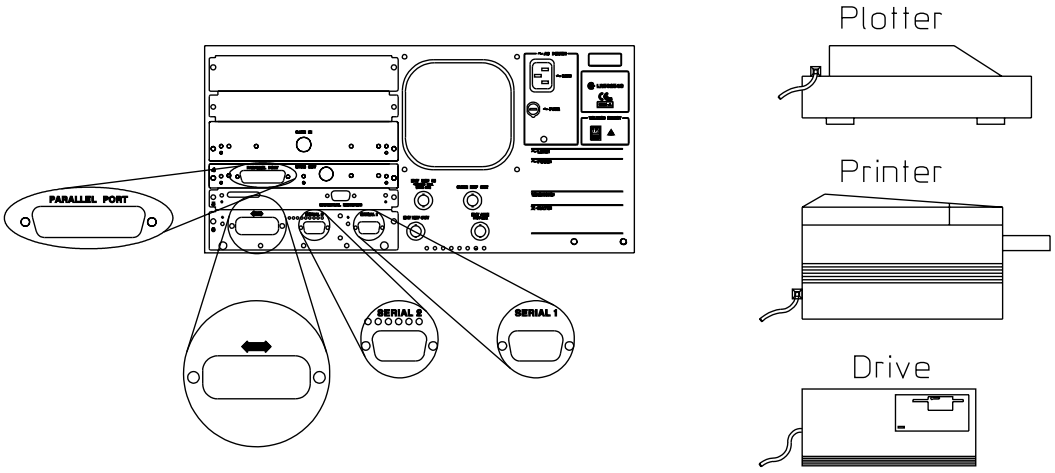
2 Turn on the peripherals.

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] or [Serial 2 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.

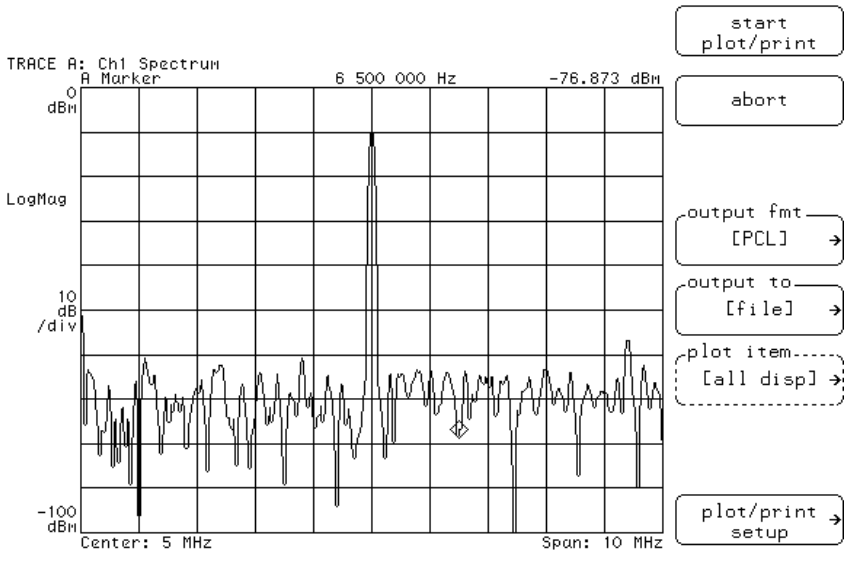


To print or plot screen contents

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 (then select a storage register if you are saving a trace).
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.

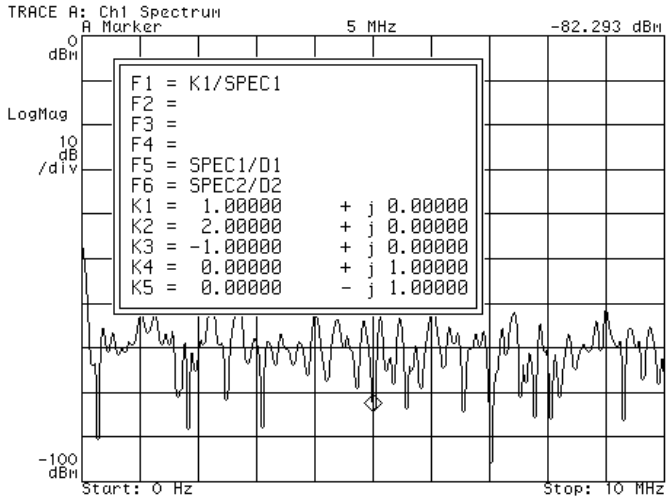
To create a math function

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]
[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

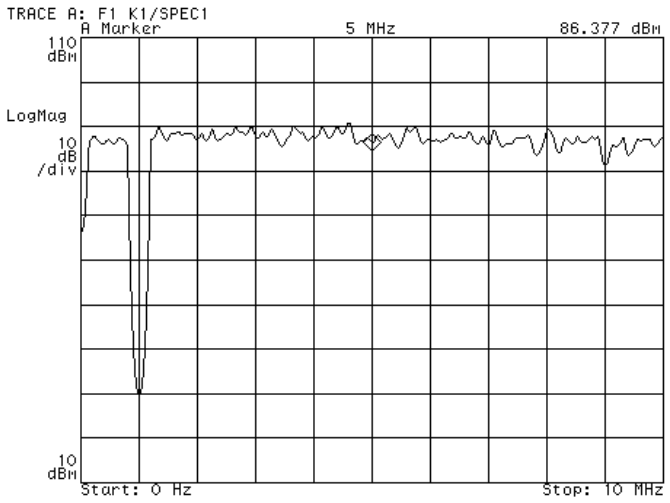
In this section you learn how to apply a a math function to a signal. This task assumes that you have completed "To create a math function."

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

2 Provide an averaged signal from the internal source:
Connect the SOURCE to the CHANNEL 1 input with a BNC cable
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	0 Hz	Center	5 MHz
	Stop	10 MHz	Span	10 MHz
Res Bw/ Window	Rbw	377.51 kHz	Rbw coupling	fixed
	Rbw mode	arb	Time len	10.117 us
	Window	flat top	Num freq pts	401
MainTime	Ch1 delay	0 s	Width	32.031 us
	Ch2 delay	0 s	Gate	on
GateTime	Ch1 delay	21.25 us	Width	10.117 us
	Ch2 delay	0 s		
Average	Status	on	Num averages	10
	Type	rms expo	Repeat avg	off
	Overlap	0 %	Fast avg	off

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

INPUT/SOURCE STATE

Range/ Input	-- Channel 1 --		-- Channel 2 --	
	Status	on	Status	off
	Range	0 dBm	Range	0 dBm
	Autorange	off	Autorange	off
	Input Z	50 Ohm	Input Z	50 Ohm
	1M imped	50 Ohm	1M imped	50 Ohm
	Coupling	AC	Coupling	AC
	Alias LPF	in	Alias LPF	in
Trigger	Type	int source	Level	0 V
	Slope	+		
	Ch1 delay	0 s	Ch2 delay	0 s
	Ext arm	off	Arm level	0 V
	Arm slope	above	Arm delay	0 s
Source	Status	on	Level	-20 dBVpk
	Type	arbitrary	Sine freq	1 MHz
	Output Z	50 Ohm	DC offset	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 HP 89410A DC-10 MHz Vector Signal 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, power consumption is less than 750 VA.

AC Line Voltage

Range	Frequency
90-140 Vrms	47-440 Hz
198-264 Vrms	47-63 Hz

The line-voltage selector switch is set at the factory to match the most commonly used line voltage in the country of destination; the appropriate fuse is also installed. To check or change either the line-voltage selector switch or the fuse, see "To change the line-voltage selector switch" or "To change the fuse."

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 switch is set for the proper line voltage and the correct line fuse is installed in the fuse holder.

Power Cable and Grounding Requirements

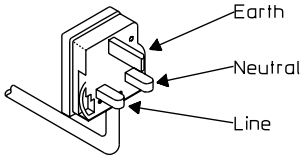
On the GPIB connector, pin 12 and pins 18 through 24 are connected to chassis ground and the GPIB cable shield. The instrument frame, chassis, covers, and the BNC connectors' outer shell for the source, trigger, channel 1, and external arm are connected to chassis ground. If option AY7 (second input channel) is installed, the channel 2 BNC connector's outer shell is connected to chassis ground. If option AY5 (precision frequency reference) is installed, the oven reference output BNC connector's outer shell is connected to chassis ground.

Warning

DO NOT interrupt the protective earth ground or ''float'' the Agilent 89410A DC-10 MHz Vector Signal Analyzer. This action could expose the operator to potentially hazardous voltages.

The analyzer is equipped with a three-conductor power cord which grounds the analyzer when plugged into an appropriate receptacle. 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.

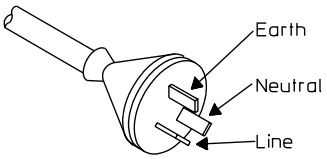
United Kingdom
Option 900



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

220V-5A
OPERATION

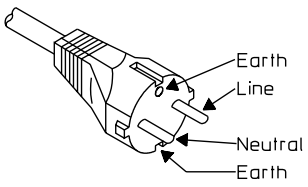
Australia/New Zealand
Option 901



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

220V-6A
OPERATION

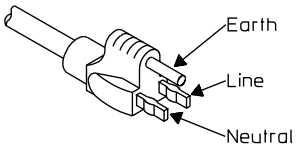
Continental Europe
Option 902



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

220V-6A
OPERATION

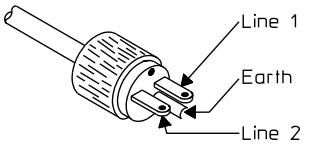
North America
Option 903



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

125V-10A**
OPERATION

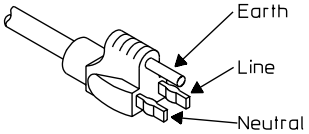
North America
Option 904



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

250V-6A**
OPERATION

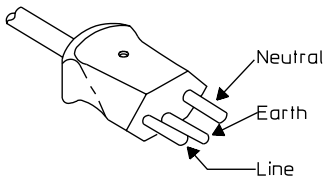
Japan
Option 918



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

125V-12A
OPERATION

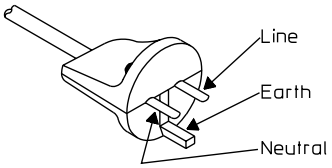
Switzerland
Option 906



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 Agilent 89410A DC-10 MHz Vector Signal 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 switch on the analyzer's rear panel is set for the local line voltage.

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

3 Check that the correct line fuse is installed in the fuse holder.

The fuse is installed at the factory for the most commonly used line voltage in the country of destination. An 8 amp, 250 volt, normal blow fuse is required if the selector switch is set at 115 and a 4 amp, 250 volt, normal blow fuse is required if the selector switch is set at 230. For instructions on removing the fuse or fuse part numbers, see "To change the fuse."

4 Using the supplied power cord, plug the analyzer into an appropriate receptacle.

The analyzer is shipped with a three-conductor power cord that grounds the analyzer when plugged into an appropriate receptacle. The type of power cable plug shipped with each analyzer depends on the country of destination.

5 **Set the analyzer's power switch to on.**
Press the " | " symbol end of the rocker-switch located on the analyzer's lower left-hand corner. The analyzer requires about 15 seconds to complete its power-on routine.

6 **Test the electrical performance of the analyzer using the operation verification or the performance tests in chapter 2, "Verifying Specifications" in the analyzer's *Installation and Verification Guide*.**
The operation verification tests verify the basic operating integrity of the analyzer; these tests take about two 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 three hours to complete.

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 *Agilent 89410A Technical Data* publication in the beginning of the *Installation and Verification Guide*.

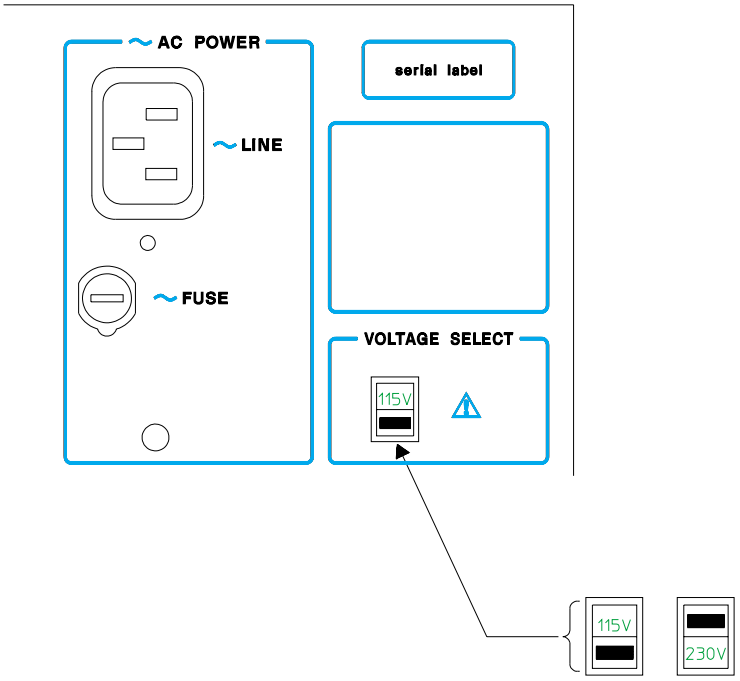
Caution Use of the equipment in an environment containing dirt, dust, or corrosive substances will drastically reduce the life of the disk drive and the flexible disks. The flexible disks should be stored in a dry, static-free environment.

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

To change the line-voltage selector 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 analyzer.
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 fuse."



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

Warning

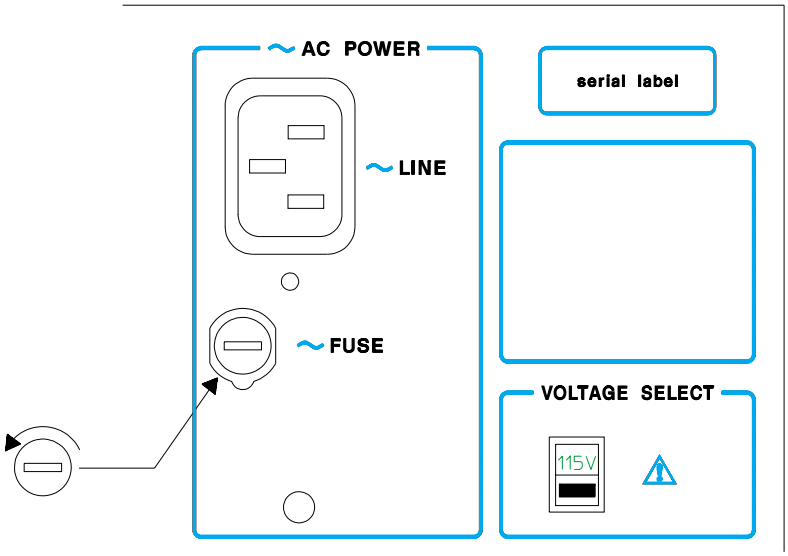
Only a qualified service person, aware of the hazards involved, should measure the line voltage.

To change the 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 analyzer.

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 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 (**I**).
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 Serial 1 and Serial 2 ports are identical, 9-pin, EIA-574 ports. Both ports can interface with printers or plotters. The total allowable transmission path length is 15 meters.

- Connect the analyzer to plotters or printers 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

For additional information, see the *Service Guide*.

To connect the analyzer to a parallel device

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

- **Connect the analyzer's rear panel PARALLEL PORT connector to a plotter or printer using a Centronics interface cable.**
  For additional information, see the *Service Guide*.

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 in the analyzer's online help or the *Service Guide*.

To connect an external frequency reference

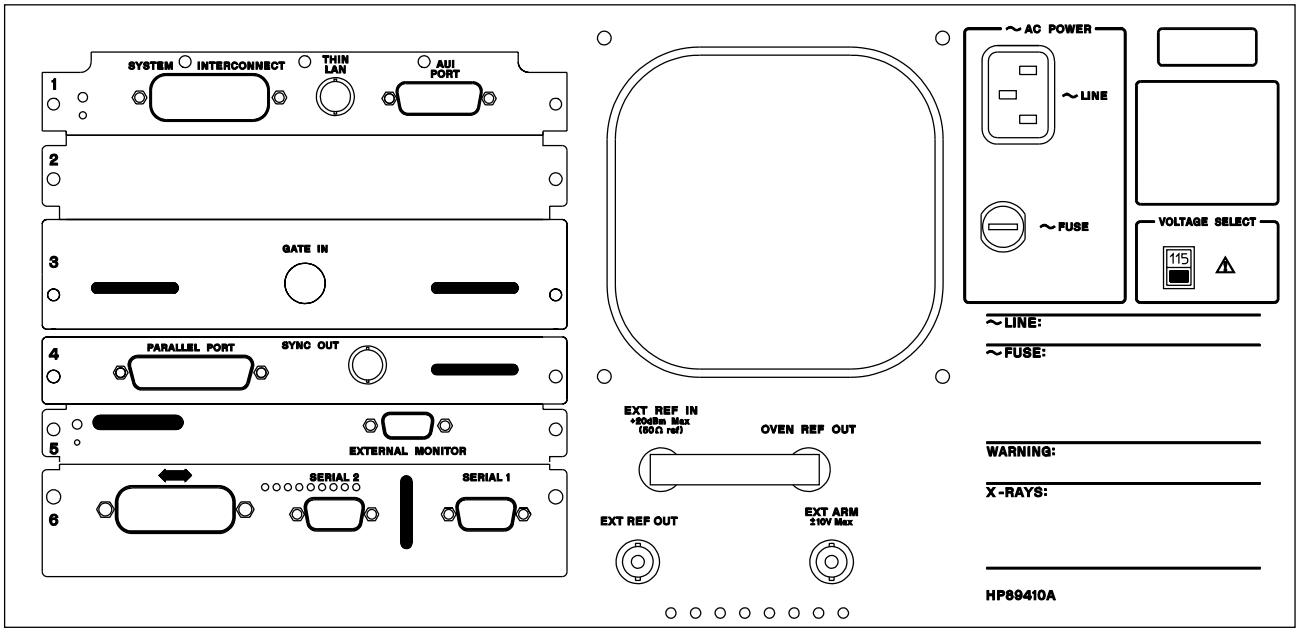
The analyzer may be connected to an external 1, 2, 5, or 10 MHz frequency reference. The amplitude of the 10 MHz external frequency reference must be between –3 dB and +20 dB into 50 ohms.

- **Using a BNC cable, connect the external frequency reference to the rear panel EXT REF IN connector.**
  The analyzer uses its internal frequency reference if an external frequency reference or the optional OVEN REF OUT is not connected to EXT REF IN.

To connect the optional frequency reference

The analyzer may be connected to the precision frequency reference (option AY5). The precision frequency reference is a 10 MHz high stability frequency reference with an amplitude of approximately +5 dBm. For ease of upgrading, the OVEN REF OUT connector is installed even when option AY5 is not installed. To determine if the option is installed, press [**System Utility**] [option setup].

- Connect OVEN REF OUT to EXT REF IN using the supplied coax BNC-to-coax BNC connector (Agilent part number 1250-1499).
  The analyzer uses its internal frequency reference if OVEN REF OUT or an external frequency reference is not connected to EXT REF IN.

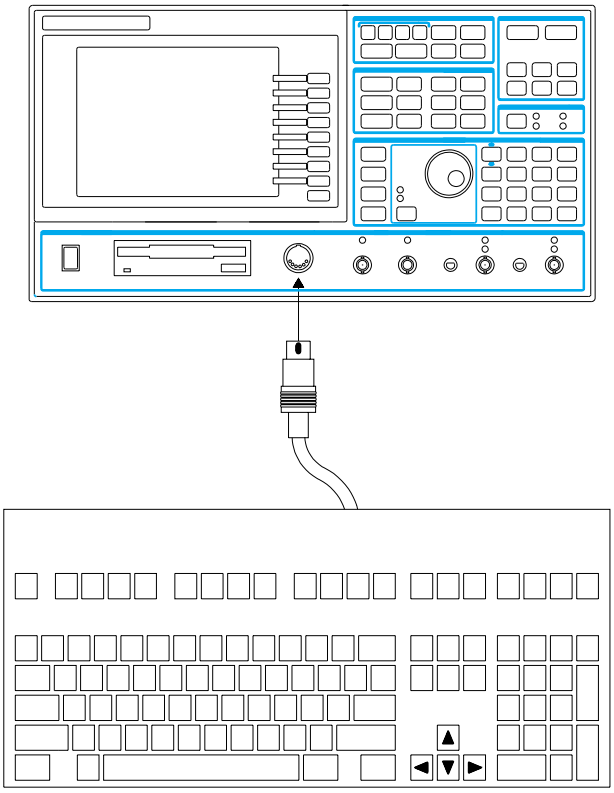


To connect the optional keyboard

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 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 Agilent 89410A DC-10 MHz Vector Signal Analyzer supports U.K. English, German, French, Italian, Spanish, and Swedish. Use only the Agilent Technologies approved keyboard for this product. Agilent Technologies does not warrant damage or performance loss caused by a non-approved keyboard. See the beginning of this guide for part numbers of approved Agilent Technologies keyboards.

4 **To configure your analyzer for a keyboard other than U.S. English, press [System Utility] [more] [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 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 power switch to off (**0**).
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.

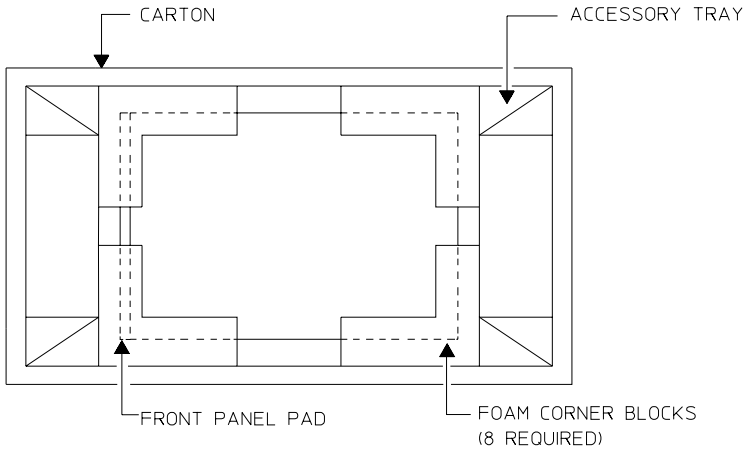
To store the analyzer

- Store the analyzer in a clean, dry, and static free environment.
  For other requirements, see environmental specifications in the *Agilent 89410A Technical Data* publication in the beginning of your *Installation and Verification Guide*.

To transport the analyzer

- **Package the analyzer 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 Agilent Technologies offices.
- **If returning the analyzer to Agilent Technologies for service, attach a tag 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 full serial number.
- **Mark the container FRAGILE to ensure careful handling.**
- **If necessary to package the analyzer in a container other than original packaging, observe the following (use of other packaging is not recommended):**
  - Wrap the analyzer in heavy paper or anti-static plastic.
  - Protect the front panel with cardboard.
  - Use a double-wall carton made of at least 350-pound test material.
  - Cushion the analyzer 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 analyzer will not power up

- ❑ Check that the power cord is connected to the Agilent 89410A 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 line-voltage selector switch" on page 7-8.
- ❑ Check that the fuse is good.
  See "To change the fuse" on page 7-9.
- ❑ Check that the analyzer's air circulation is not blocked.
  Cooling air enters the analyzer through the rear panel and exhausts through both sides. If the analyzer's air circulation is blocked, the analyzer powers down to prevent damage from excessive temperatures. The analyzer 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.

Index

!

16QAM demodulation, example OP 8-1
2-channels
  digital demod OP 6-12
  video demod OP 7-15
32QAM signal, example OP 9-2

A

A,B,C,D LEDs HT
ac line voltage GS 7-2
adjacent-channel power GS 2-6
air circulation GS 7-7
aliasing
  digital demod OP 17-11
  video demod OP 18-11
alpha entry, using HT
alpha, setting HT
AM demodulation
  algorithm OP 15-9
  example OP 1-2
AM demodulation, using HT
amplitude droop (in symbol table) HT
analyzers
  types of OP 13-4
applications softkey HT
arbitrary softkey HT
arbitrary source,example GS 3-2
arbitrary waveforms
  See source
arm
  See external arm
arrow keys HT
AUI connector GS 7-10, HT
auto cal on/off softkey HT
auto sweep, selecting HT
auto zero calibration
  See calibration
autorange softkeys HT
autorange, using HT
autostate file HT
  creating HT
  recalling HT
averaging HT
  about averaging HT
  auto correlation traces HT
  available averaging functions HT
  cross correlation traces HT
  cross spectrum traces HT
  exponential averaging HT
  fast averaging HT
  frequency response traces HT
  in analog demodulation OP 15-13
  in digital demodulation OP 17-12
  instantaneous-spectrum traces HT
  long averages and calibration HT
  overlap processing HT
  pausing HT
  peak-hold averaging HT
  repeat averaging HT
  rms averaging HT
  rms exponential averaging HT
  selecting an averaging function HT
  selecting the number of averages HT
  single-stepping HT
  spectrum traces HT
  time averaging HT
  time exponential-averaging HT
  video demodulation OP 18-14
  with digital demodulation HT
averaging, fast, example GS 2-2
AYA (vector modulation analysis) HT
AYB (spectrogram/waterfall) HT
  spectrogram displays HT
  waterfall displays HT
AYH (video modulation analysis) HT

B

band power measurements GS 2-3, GS 2-6, HT

band-selectable measurements OP 14-3
See also zoom measurements
bandwidth
See information bandwidth
See noise equivalent bandwidth
See resolution bandwidth
See window bandwidth
bandwidth coupling OP 14-4
baseband measurements OP 14-3, HT
baseband signals
digital demod OP 6-12
video demod OP 7-15
BASIC HT
about HP instrument BASIC HT
available utilities HT
creating a program with keystrokes HT
debugging a program HT
deleting a function HT
deleting a program HT
deleting a subprogram HT
deleting multiple functions HT
deleting multiple subprograms HT
displaying a program HT
displaying graphics HT
editing a program HT
executing a single program line HT
indenting nested programs HT
memory allocations HT
printing a program HT
program error messages HT
program variables HT
re-saving programs HT
recalling programs HT
renumbering a program HT
resetting a program HT
running a program HT
saving programs HT
securing a program HT
specifying columns HT
stack space, auto allocation HT
stack space, manual allocation HT
stopping a program HT
beeper on/off softkey HT
bins
See frequency points
bins, defined HT
bit patterns, digital demodulation
See symbol states
block diagrams HT
analog demodulation OP 15-3, HT
arbitrary source HT
ch1 + j*ch2 receiver HT
connectors, front panel HT
connectors, rear panel HT
digital demodulation OP 17-3, HT
FFT overview HT
general OP 13-11
HP IBASIC memory HT
instantaneous spectrums HT
main memory HT
measurement data HT
measurement memory HT
scalar OP 12-3, HT
source block diagram HT
time capture HT
traces HT
vector OP 12-5, HT
video demodulation OP 18-3
block size
See time record size
BPSK/8PSK softkey HT
BT, setting HT
burst modulation
See demodulation, digital

C

C/N (carrier-to-noise) HT
C/No (carrier-to-noise-density) HT
CAL?, definition of HT
calibration HT
about calibration HT
adjusting calibration data HT
analog demodulation, calibrating HT
auto zero calibration HT
auto zero calibration, single HT
performing a single calibration HT
saving calibration data HT
time-domain calibration HT
capture
See time capture
carrier frequency error (in symbol table) HT
carrier locking
analog demod OP 15-8
video demod OP 17-8, OP 18-8
carrier offset (FSK) HT
carrier to noise markers GS 2-4
carrier, auto OP 15-8

center frequency HT
setting center frequency HT
setting with the marker HT
signal tracking HT
centronics port GS 7-11
ch1 + j*ch2 receiver HT
changing numeric parameters HT
channel 1, channel 2
See input channels
channel 1 and 2 connectors HT
circulation, air GS 7-7
cleaning the screen GS 7-16
clear source trip softkey HT
coherence GS 5-8, HT
color index softkey HT
color, adjusting HT
connector
AUI GS 7-10
external monitor GS 7-12
external reference GS 7-12
grounding requirements GS 7-3
HP-IB GS 7-11
keyboard GS 7-14
oven reference GS 7-13
parallel GS 7-11
serial GS 7-10
system interconnect GS 7-11
ThinLAN GS 7-10
connector, front panel connectors HT
connectors, rear panel connectors HT
constellation diagram
example OP 6-5, OP 7-12
using HT
continuing a measurement HT
continuous sweep, selecting HT
cooling GS 7-7
coordinates, trace
See traces
copying files between 3.5 inch diskettes HT
cords, power GS 7-3
correlation HT
auto correlation HT
cross correlation softkey HT
cross-correlation, math function HT
coupling
bandwidth OP 14-4
cross spectrum measurements HT
CW (fixed sine) softkey HT

D

data comment header HT
data format hardkey HT
data registers HT
about data registers HT
displaying data-register contents HT
removing HT
DATA?, definition of HT
date, changing HT
dc measurements OP 14-9
dc offset softkey HT
dc response OP 14-9
decibels HT
DECT (digital european cellular telephone) HT
demodulation, analog HT
carrier locking OP 15-8
about analog demodulation HT
affects on bandwidth HT
AM demodulation HT
auto carrier HT
averaging OP 15-13
block diagram OP 15-3, HT
carrier frequency, displaying HT
FM demodulation HT
gating OP 15-13, OP 16-5
making zero span measurements HT
overview OP 12-6
PM demodulation HT
triggering OP 15-13, HT
two channel measurements HT
See also AM, FM, PM demodulation
demodulation, digital HT
about digital demodulation HT
aliasing, IQ measured spectrum HT
amplitude droop (in symbol table) HT
averaging HT
block diagrams OP 17-3, HT
BPSK/8PSK HT
carrier frequency error (in symbol table) HT
carrier locking HT
connections HT
constellation diagram HT
constellation points, viewing OP 8-5
DQPSK HT
error-vector magnitude (in symbol table) HT

demodulation, digital (continued)
error-vector magnitude trace HT
example OP 8-1
eye diagram HT
filtering OP 17-16, HT
filters, user defined OP 9-6
formatting displays OP 17-7
I/Q measured, displaying HT
I/Q origin offset (in symbol table) HT
I/Q reference, displaying HT
ideal states HT
magnitude error HT
magnitude error, FSK HT
magnitude-error trace HT
maximum time points, setting HT
memory allocation HT
MSK (minimum shift keying) HT
normalization HT
phase error (in symbol table) HT
phase-error trace HT
points-per-symbol, setting HT
power calculation OP 8-4
pulse modulation HT
pulse search OP 6-6
QAM HT
QPSK (quadrature psk) HT
setting up HT
setup OP 6-2, OP 17-6
signal creation OP 9-2
SNR HT
span, for spectrum displays HT
standard setups, example OP 6-4, HT
state definitions, defining HT
state definitions, displaying HT
symbol clock, adjusting HT
symbol rate, setting HT
symbol table HT
sync offset, setting HT
sync pattern, setting HT
sync patterns, pre-defined HT
sync search OP 6-8
sync words, using HT
tips for using digital demodulation HT
trellis diagram HT
troubleshooting HT
See also FSK

demodulation, video HT
about video demodulation HT
block diagram OP 18-3
capabilities OP 18-2
carrier frequency error (in symbol table) HT
carrier locking OP 17-8, OP 18-8, HT
center frequency, setting OP 7-4
constellation diagram HT
constellation points, viewing OP 8-5
DVB QAM 16/32/64 HT
DVB QAM state definitions HT
DVB QAM, example OP 7-10
error-vector magnitude (in symbol table) HT
example OP 8-1
eye diagram HT
filtering HT
filters, user defined OP 9-6
formatting and displaying OP 18-7
formatting displays OP 7-12
hexadecimal, in symbol table HT
I/Q measured, displaying HT
I/Q origin offset (in symbol table) HT
ideal states HT
magnitude error HT
maximum time points, setting HT
mirrored spectrums OP 18-17, HT
normalization HT
phase error (in symbol table) HT
points-per-symbol, setting HT
QAM 16/32/64/256 HT
range, setting OP 18-10
setup OP 7-2
setup, 32 DVB QAM OP 7-8
signal creation OP 9-2
SNR HT
state definitions, defining HT
state definitions, displaying HT
symbol clock, adjusting HT
symbol locking OP 17-8, OP 18-8
symbol rate, setting HT
sync patterns, pre-defined HT
sync search OP 7-13
trellis diagram HT
troubleshooting HT
VSB 8/16 HT
VSB, example OP 7-6

detection OP 14-12, HT
about detection HT
normal detector HT
positive peak detector HT
sample detector HT
deviation (FSK) HT
diagnostics softkey HT
digital demodulation
See demodulation, digital
disk drive
setting up GS 6-2
disk drives HT
about disk drives HT
comparison HT
copying files HT
deleting files HT
displaying contents of HT
external disk drive HT
formatting HT
HP-IB address: external disk drive HT
internal disk drive HT
non-volatile RAM disk HT
packing a disk HT
renaming files HT
selecting a default disk HT
using disk specifiers HT
volatile RAM disk HT
volatile RAM disk, removing HT
display HT
adjusting the color HT
allocating portion for programs HT
blanking HT
changing colors HT
cleaning GS 7-16
connecting external GS 7-12
indicators HT
See also traces
display group hardkeys HT
display points, defined HT
display resolution OP 14-11, OP 14-12
display state definitions OP 8-10
display, digital OP 14-9
documentation HT
DQPSK softkey HT
DVB QAM HT
block diagram OP 18-4
dynamic signal analyzers OP 13-6

E

entry group hardkeys HT
equivalent noise bandwidth HT
error & status messages HT
error analysis
digital demod OP 8-12
video demod OP 8-12
error summaries
video demod OP 8-8
error vector, example OP 8-12
error-vector magnitude (in symbol table) HT
error-vector magnitude, displaying
EVM trace HT
EXT ARM connector HT
EXT REF IN connector HT
EXT REF OUT connector HT
EXT TRIGGER connector HT
external
frequency reference GS 7-12
keyboard GS 7-14
monitor GS 7-12
external arm HT
about external arm HT
trigger, using with external arm HT
turning on/off HT
external disk
See disk drive
EXTERNAL MONITOR connector HT
external receiver
See receiver
external setup softkey HT
external softkey HT
external trigger, overview HT
eye diagram, example OP 6-5, OP 7-12
eye diagram, using HT

F

failure, power up GS 7-18
fault log, displaying HT
FFT OP 13-6
properties of OP 13-7
See also spectrum analyzers
FFT, overview & terminology HT
FILLING TIME RECORD HT
filters
digital demodulation OP 17-16, HT
gaussian OP 17-18
IF OP 14-18
raised cosine OP 17-17
square-root raised cosine OP 17-17
user defined OP 9-6
user defined OP 17-18
video OP 14-3

firmware version, displaying HT
FM demodulation
algorithm OP 15-12
example OP 1-7, OP 3-4
FM demodulation, using HT
fonts HT
formatting a disk GS 6-6
fourier transform OP 13-7
French softkey HT
freq counter softkey HT
frequency HT
about frequency parameters HT
center frequency HT
external reference GS 7-12
frequency counter HT
frequency span HT
manual frequency, setting HT
optional oven reference GS 7-13
signal tracking HT
span, extending to 8 mhz HT
start frequency HT
step size HT
stop frequency HT
using markers to set step size HT
frequency domain overview OP 13-2
frequency error (in symbol table) HT
frequency points OP 14-5, HT
about frequency points HT
and display OP 14-12
memory allocation HT
setting the number of HT
frequency resolution OP 14-11
frequency response measurements HT
frequency response, measuring GS 5-1
frequency span
and display OP 14-5
and information bandwidth OP 14-3
and resolution bandwidth OP 14-14, OP 14-19
video demodulation OP 17-11, OP 18-12
front panel tour HT
FSK
about FSK HT
block diagram OP 17-5, HT
carrier magnitude-error HT
carrier offset (in symbol table) HT
deviation (in symbol table) HT
FSK error (in symbol table) HT
FSK error trace, displaying HT
FSK measured HT
FSK (continued)
FSK reference HT
magnitude error (in symbol table) HT
setting the span to symbol rate ratio HT
state definitions HT
See also demodulation, digital
FTP (File Transfer Protocol) HT
FTP, and LAN OP 10-10
full span softkey HT
fuse GS 7-9

G

gate length softkey HT
gate time-record HT
displaying HT
gate delay HT
gate time HT
gate-delay step size HT
setting the length of HT
turning on/off HT
GATHERING DATA, definition of HT
gating
description OP 16-2
example OP 3-3, OP 4-2, GS 3-1
in analog demodulation OP 15-13
gaussian filters OP 17-18
German softkey HT
ghosted softkeys HT
grids HT
1 grid HT
2 grids HT
4 grids HT
hiding HT
multiple GS 5-7
overlapped GS 5-7
grounding requirements GS 7-3
group delay softkey HT
GSM (Group Service Mobile) HT
guardbands, analog demodulation OP 15-7

H

half LED HT
description of HT
using to set the range HT
hardkeys, defined HT
Help hardkey HT
help, online GS 1-1
hold scale softkey HT
horizontal axis
See X-axis
HP-GL HT

HP-IB
about the HP-IB HT
addressable only HT
devices, setting up GS 6-2
HP-IB address: analyzer HT
HP-IB address: external devices HT
HP-IB address: external disk drive HT
HP-IB address: external receiver HT
HP-IB address: plotter HT
HP-IB address: printer HT
HP-IB connector GS 7-11
HP-IB controllers HT
keys that have HP-IB commands HT
LAN use OP 10-6
system controller HT

I

I-BASIC, instrument BASIC
See BASIC
I/Q information
See demodulation, digital
ideal state softkey HT
IF bandwidth, external receiver HT
IF center frequency, external receiver HT
IF section (0-10 mhz) softkey HT
IF trigger
See trigger
pulse search OP 18-16
incoming inspection GS 7-5
indent softkey HT
indicators, display HT
INF, meaning of HT
information bandwidth OP 14-3, OP 14-10
input channels HT
about input channels HT
channel 2 with rf section HT
clearing input overloads HT
compensating for gain & delay HT
connections HT
coupling: ac or dc HT
dBm calculations HT
disabling HT
disabling the anti-alias filter HT
input impedance HT
input-state table HT
input hardkey HT
input section (ch1 + j*ch2) softkey HT
input state GS 6-9
installation GS 7-7
installing options HT
instantaneous spectrum HT
instrument mode hardkey HT
interface
HP-IB GS 7-11
LAN GS 7-10
parallel GS 7-11
serial GS 7-10
IQ measured signal OP 17-9, OP 18-10
IQ reference signal OP 17-9, OP 18-10
Italian softkey HT

K

keyboard HT
about the keyboard HT
connecting GS 7-14
keyboard connector HT
keyboard type HT
knob HT
about the knob HT
changing the operation of HT

L

LAN GS 7-10
about advanced LAN (option UG7) HT
about the lan HT
activating OP 10-5
addressing OP 10-4
and FTP OP 10-10
connectors, descriptions HT
controlling the analyzer via the lan HT
ethernet address, displaying HT
FTP (File Transfer Protocol), using HT
gateway address, setting HT
HP-IB with OP 10-6
interface, connecting OP 10-1
IP address, setting HT
port, configuring HT
ports, activating HT
ports, selecting HT
subnet mask, setting HT
Telnet, about HT
X-Windows with OP 10-7
X11 display, configuring HT
X11 display, control HT
X11 display, setting the update rate HT
X11 IP address, setting HT
LAN (local area network) HT
leakage OP 14-6
learning products (manuals) HT
LEDs: front panel HT
level softkey HT

line voltage
  required GS 7-2
  selector switch GS 7-8
linear averaging
  See time averaging
lines
  See frequency points
lines, defined HT
listen LED HT
LO feedthrough
  See zero response
loading files
  See recalling
Local Area Network
  See LAN
local oscillator OP 13-12

M

magnitude error
  See demodulation, digital
magnitude log(dB)/linear softkey HT
main length softkey HT
main time vs. gate time HT
main time-record
  displaying HT
  length equal to gate length HT
  main length HT
  main time HT
  setting the length of HT
  See also time record
manual sweep OP 14-13
manual sweep, selecting HT
manuals, for this product HT
Marker Cnt, meaning of HT
marker group hardkeys HT
Marker Man, meaning of HT
marker readout HT
Marker/Entry LED HT
markers HT
  about markers HT
  absolute GS 5-4
  band power GS 2-3, GS 2-6, HT
  band power, rms square-root of HT
  carrier to noise GS 2-4
  carrier-to-noise HT
  carrier-to-noise-density HT
  coupled, example GS 4-3
  frequency counter HT
  marker into center frequency HT
  marker into reference level HT
  marker into span HT
markers (continued)
  marker into start frequency HT
  marker into stop frequency HT
  multiple traces HT
  offset GS 5-5
  offset marker, zeroing HT
  offset markers, repositioning HT
  offset markers, using HT
  peak tracking HT
  polar display markers HT
  power ratio GS 2-4
  relative GS 5-5
  repositioning markers HT
  search GS 5-6
  search functions HT
  trace annotation HT
  turning on markers HT
  using for numeric entry HT
  using to set frequency step size HT
  using to update frequency values HT
  waterfall &spectrogram displays HT
  X-axis, example OP 8-7
  x-axis, scaling with markers HT
markers, polar
  See polar markers
math HT
  about math HT
  cross-correlation math function HT
  defining a math constant HT
  displaying math functions HT
  displaying results HT
  math constants, overview HT
  math function operands HT
  math functions HT
  memory for math-buffers HT
  recalling math functions HT
  saving math functions HT
  user defined GS 6-7
  using waterfall/spectrogram HT
MAU connector HT
measured filter, selecting HT
measured signal
  digital demod OP 17-9
  video demod OP 18-10
measurement calculations,
  disabling HT
measurement data, about HT
MEASUREMENT Group hardkeys HT
measurement points, defined HT
measurement resolution OP 14-11
measurement speed, enhancing HT

measurement state GS 6-9, HT
  recalling HT
  saving HT
measurement time OP 14-2, OP 14-10, OP 14-17
measurements HT
  continuing HT
  displaying the measurement-state table HT
  pausing HT
  single-stepping HT
  starting HT
memory HT
  about memory HT
  capture RAM HT
  erasing HT
  for applications HT
  for frequency points HT
  for temporary math buffers HT
memory limitations OP 14-19
menu HT
mirror freq on/off softkey HT
mirrored spectrums OP 18-17
Mkr Val HT
monitor
  connecting external GS 7-12
MSK softkey HT

N

NADC (North American Digital Cellular) HT
NADC demodulation, example OP 6-4
NAN, meaning of HT
narrowband measurements OP 13-8
network measurements GS 5-1
Network, Local Area
  See LAN
NO DATA, definition of HT
noise equivalent bandwidth OP 14-18
noise, measuring OP 4-1, GS 2-1
non-volatile RAM disk
  See disk drives
normalization OP 8-4, HT
numeric entry softkeys HT

O

offset
  video demod OP 7-13
offset marker
  See markers
offset, in digital demod OP 6-8
online help GS 1-1
  See Help hardkey
options, installing HT
options, temporary HT
origin offset
  See demodulation, digital
output filter on/off softkey HT
output z softkey (source) HT
OV1 or OV2, definition of HT
oven frequency reference GS 7-13
OVEN REF OUT connector HT
over LED HT
  description of HT
  using to set the range HT
overlap processing HT

P

packing a disk HT
parallel devices, setting up GS 6-2
parallel port GS 7-11, HT
pausing a measurement HT
PCL (HP-GL) HT
PCL (printer control language) HT
PDC (Personal Digital Cellular) HT
peak search HT
peak track softkey HT
peak tracking, example OP 3-3
peak-hold averaging
  See averaging
performance test softkey HT
periodic chirp softkey HT
phase GS 5-7
  displayed GS 4-2
  relative, example GS 4-1
  wrap GS 5-7
phase error
  See demodulation, digital
phase noise, analysis example OP 2-1
phase, displaying HT
PHS (PHP) (personal handiphone system) HT
plotter
  setting up GS 6-2
plotter interface GS 7-10
plotting GS 6-3, HT
  aborting HT
  about plotting HT
  changing plotter pen assignments HT
  data and file formats HT
  date and time HT
  default pen assignments HT

plotting (continued)
output to file HT
plot speed HT
selecting an output device HT
selecting display items HT
setting P1/P2 HT
setting the HP-IB address HT
specifying line types HT
starting HT
PM demodulation
algorithm OP 15-10
example OP 1-5, OP 2-3
PM demodulation, using HT
points
See frequency points
points, defined HT
points-per-symbol, setting OP 8-4, HT
polar display, using HT
polar markers
example OP 8-4
units, example OP 8-4
post-trigger delay HT
power HT
adjacent-channel GS 2-6
band power GS 2-4, GS 2-6, HT
band power, rms square-root of HT
carrier-to-noise GS 2-4, HT
carrier-to-noise density GS 2-5
carrier-to-noise-density HT
consumption GS 7-2
cords GS 7-3
power ratio GS 2-4, GS 2-5, GS 2-6, HT
turn on failure GS 7-18
power calculation, digital demodulation OP 8-4
power ratio markers GS 2-4
power spectral density GS 2-2
pre-trigger delay HT
preset hardkey HT
printer
interface GS 7-10
setting up GS 6-2
printing GS 6-3, HT
aborting HT
about printing HT
data and file formats HT
date and time HT
online help, printing HT
output to file HT
selecting an output device HT
selecting display items HT
printing (continued)
setting the HP-IB address HT
starting HT
PROBE POWER connectors HT
problems, digital/video demod HT
PSD measurements HT
PSK (phase shift keying) HT
pulse length, in digital demod OP 6-6
pulse modulation
See demodulation, digital
PULSE NOT FOUND HT
pulse search
in digital demod OP 17-14
setup example OP 6-6
Demodulation, video OP 18-16
pulsed signals, in digital demod OP 17-14

Q

QAM
block diagram, video demod OP 18-4
QAM 16/32 softkey HT
QAM 16/32/64/256 softkey HT
QAM demodulation, example OP 8-1
QPSK softkey HT

R

raised cosine filters OP 17-17
RAM
See memory
RAM disk
See disk drives
random noise softkey HT
range HT
autoranging HT
example GS 5-3
setting optimum range HT
single ranging HT
tracking the reference level HT
range hardkey HT
RBW
See resolution bandwidth
real-time bandwidth HT
rear panel tour HT
recalling HT
about recalling HT
autostate file HT
BASIC programs HT
capture-buffer contents HT
math functions HT
measurement state HT
recalling data GS 6-5

recalling (continued)
spectrogram displays OP 5-16
trace GS 3-2, HT
waterfall displays OP 5-16
receiver HT
about receivers HT
HP-IB address: external receiver HT
using an external receiver HT
receiver softkey HT
REF, definition of HT
reference
external frequency GS 7-12
oven GS 7-13
reference filter, selecting HT
reference level
See reference line
reference line HT
displaying HT
examples of HT
position of HT
setting reference level HT
setting with the marker HT
tracking the range HT
reference signal
digital demod OP 17-9
video demod OP 18-10
references
digital demod OP 17-2
general OP 13-4
Remote LED HT
requirements
grounding GS 7-3
power GS 7-2
resolution
display OP 14-12
frequency OP 14-11
measurement OP 14-5
resolution bandwidth HT
about resolution bandwidth HT
and gating OP 16-5
coupling to frequency span HT
digital demod OP 17-11
effect on noise OP 14-2
entering arbitrary values HT
interaction with other parameters HT
scalar limitations OP 14-11
setting the resolution bandwidth HT
vector limitations OP 14-18
video demod OP 18-11
See also bandwidth coupling
result length
digital demod OP 6-8, OP 17-14
video demod OP 7-13
result length softkey HT
rms averaging
See averaging
root raised cosine filters OP 17-17
RPG
See knob
RS232
See serial port

S

safety
See inside front cover
sample frequency
See sample rate
sample rate OP 14-14
video demodulation OP 17-11, OP 18-12
samples, defined HT
saving HT
about saving HT
autostate file HT
calibration trace HT
capture buffer contents HT
math functions HT
measurement state HT
re-saving BASIC programs HT
saving BASIC programs HT
saving data GS 6-4
traces HT
scalar measurements HT
about scalar mode HT
block diagram HT
block diagrams OP 12-3
limitations OP 14-11
overview OP 12-2
scale at markers softkey HT
scaling HT
auto scaling HT
x-axis HT
x-axis scaling: linear vs. log HT
X-axis, example OP 8-7
y-axis scaling HT
scan time
See sweep time
screen, cleaning GS 7-16
search length HT
digital demod OP 6-8
video demod OP 7-13

search length, in digital demod
OP 17-14
self test HT
long confidence test HT
quick confidence test HT
self-test log HT
serial 1/serial 2 connectors HT
serial devices, setting up GS 6-2
serial number, displaying HT
serial number, location HT
serial port GS 7-10
serial port, configuring & cabling HT
serial x setup softkey HT
shifted functions HT
shipping GS 7-17
signal to noise markers GS 2-4
signal track softkey HT
signal tracking HT
sine freq softkey HT
single measurements, running HT
single range softkeys HT
single ranging HT
single sweep, selecting HT
SNR, digital/video demodulation HT
softkeys HT
about softkeys HT
bracketed softkeys HT
softkeys that toggle HT
source HT
about the source HT
am modulating the output HT
amplitude, setting HT
arbitrary waveforms HT
arbitrary waveforms, duration HT
available source outputs HT
connections HT
CW (fixed sine) output HT
dc offset, setting HT
displaying the source-state table HT
external signals, input to source HT
output filter, disabling HT
output impedance & dBm units HT
output impedance, setting HT
output protection, clearing HT
periodic chirp & frequency span HT
periodic chirp output HT
periodic chirp, duration HT
random noise output HT
sine frequency, setting HT
SOURCE LED HT
turning on and off HT
source hardkey HT
source type softkey HT
source, setup example GS 5-3
span HT
arbitrary spans HT
cardinal spans HT
coupling to main length HT
in analog demodulation OP 15-6
maximum span HT
setting span HT
setting with the marker HT
video demodulation OP 17-11, OP 18-12
See also frequency span
span softkey HT
Spanish softkey HT
spectral displays OP 5-1
spectral map
See waterfall
spectrogram HT
about spectrogram displays HT
colorbar HT
colors, selecting HT
colors, setting the number of HT
displaying OP 5-1
enhancing HT
markers, using HT
number of traces, setting HT
pausing HT
printing/plotting, formats HT
printing/plotting, overview HT
real-time indicator HT
recalling HT
saving HT
threshold, setting HT
trace buffers, removing HT
trace, selecting HT
turning on HT
using in math functions HT
spectrum analyzers
comparisons OP 13-9
types of OP 13-4
spectrum measurements HT
speed, enhancing HT
square-root raised cosine filters
OP 17-17
SRQ LED HT
standard setups
digital demodulation, example OP 6-4

start frequency HT
  setting start frequency HT
  setting with the marker HT
starting a measurement HT
state definitions HT
  See display state definitions
  See input state
  See measurement state
stop frequency HT
  setting stop frequency HT
  setting with the marker HT
storage GS 7-16
suffix menus HT
Swedish softkey HT
sweep speed
  See sweep time
sweep time
  described OP 14-10
  See also measurement time
sweep, manual OP 14-13
sweeping
  about sweeping HT
  auto sweep, selecting HT
  continuous sweep, selecting HT
  manual sweep, selecting HT
  single sweep, selecting HT
symbol clock, adjusting HT
symbol conventions
  See display state definitions
symbol rate OP 17-11, OP 18-12
symbol rate softkey HT
symbol states, example OP 8-8
symbol table
  See demodulation, digital
symbol/error table, example OP 8-8
SYNC NOT FOUND HT
SYNC NOT FOUND, pulse search HT
SYNC OUT connector HT
sync pattern
  digital demodulation OP 6-9
  video demodulation OP 7-14
sync search
  example OP 6-8, OP 7-13
  in digital demod OP 17-13
  video demod OP 18-15
  See also demodulation, digital
  See also demodulation, video
sync word
  digital demodulation OP 6-8
  video demodulation OP 7-13
SYSTEM Group hardkeys HT
system interconnect GS 7-11
SYSTEM INTERCONNECT
  connector HT

T

talk LED HT
TDMA
  See NADC
Telnet, about HT
testing
  See self test
ThinLAN connector GS 7-10, HT
TIFF (tag-based file format)) HT
time averaging OP 14-15
  See averaging
time capture HT
  about time capture HT
  calibration and time-capture HT
  displaying capture information HT
  displaying capture-buffer contents HT
  playback example OP 2-2
  recalling capture-buffer contents HT
  recalling data from disk OP 2-2
  saving capture-buffer contents HT
  starting a time capture HT
  time capture buffer HT
time corrections HT
time corrections, analog demodulation OP 15-5
time data OP 14-15
time data softkey HT
time domain overview OP 13-2
time gating HT
  about time gating HT
  displaying gate time-record HT
  gate delay HT
  gate length HT
  selecting a window HT
  turning on/off HT
  See also gating
time points, digital & video demodulation HT
time record OP 13-7, OP 14-16, HT
  about the time record HT
  applying a window HT
  coupling to span HT
  displaying gate time-record HT
  displaying main time-record HT
  effects of averaging HT
  effects of demodulation HT
  effects of span HT

time record (continued)
FILLING TIME RECORD HT
gate length HT
main length HT
real vs. complex data HT
time record length
and memory OP 14-19
defined OP 14-16
limitations OP 14-19
time resltn softkey HT
time softkey (averaging) HT
time, changing HT
time-domain analysis HT
time-domain data, displaying HT
traces HT
about traces HT
activating multiple traces HT
adding a title HT
adding trace information HT
auto correlation HT
capture buffer contents HT
changing colors HT
coherence HT
coordinates HT
cross correlation HT
cross spectrum HT
data register contents HT
disabling measurement calculations HT
displaying group delay HT
displaying linear magnitude HT
displaying log magnitude HT
displaying multiple traces HT
frequency response HT
hiding HT
imaginary part , displaying HT
instantaneous spectrum HT
marker annotation HT
math functions HT
modifying trace labels HT
multiple GS 5-7
multiple active GS 5-7
overlaid OP 6-10
overlaying HT
phase, displaying HT
PSD HT
real part (real data), dispaying HT
recalling HT
saving HT
scaling data, overview HT
selecting measurement data HT
spectrum HT
traces (continued)
time-domain data HT
trace boxes HT
See also display
See also grids
transporting GS 7-17
trellis diagram, using HT
trigger HT
about trigger HT
analog demodulation OP 15-13, HT
available trigger signals HT
delay HT
EXT TRIGGER LED HT
external arm, using with trigger HT
external trigger HT
free run trigger HT
HP-IB trigger HT
IF channel trigger HT
input channel trigger HT
level HT
slope HT
source trigger HT
trigger holdoff HT
trigger LED HT
trigger line HT
trigger type softkey HT
troubleshooting, digital demod HT
two-channels
digital demod OP 6-12
video demod OP 7-15

U

U.K. English softkey HT
U.S. English softkey HT
UFG (LAN and 4 MB memory option) HT
UG7 (advanced LAN option) HT
UNCAL, definition of HT
units: x-axis HT
units: y-axis HT
user defined filters OP 17-18

V

vector averaging
See time averaging
vector diagram, example OP 6-5, OP 7-12
vector measurements OP 13-8, HT
about vector mode HT
block diagram HT
block diagrams OP 12-5
overview OP 12-4

video averaging OP 14-3
video demodulation
See demodulation, video
video filtering OP 14-3
view state GS 6-9
volatile RAM disk
See disk drives
voltage selector switch GS 7-8
VSB
block diagram OP 18-6
center frequency, setting OP 7-4
VSB 8/16 softkey HT

W

waterfall HT
about waterfall displays HT
baselines, showing HT
displaying OP 5-1
elevation HT
hiding traces HT
markers, using HT
number of traces, setting HT
pausing HT
printing/plotting, formats HT
printing/plotting, overview HT
recalling HT
saving HT
setting a threshold HT
skewing HT
spacing of traces HT
trace buffers, removing HT
trace height HT
trace, selecting HT
traces, position and baseline HT
using in math functions HT
when you can use them HT
y-axis scaling HT
window bandwidth
defined OP 14-18
values OP 14-18
windows HT
about windows HT
comparison HT
equivalent noise bandwidth HT
example GS 5-3
window bandwidth HT
window functions OP 14-6
window shapefactor HT
windows for gate time record HT
windows for main time record HT

X

x-axis scaling
See scaling
X-axis, scaling and markers OP 8-7
x-axis, scaling with markers HT
X-Windows, LAN use OP 10-7
X11 display, using
See LAN

Y

y-axis scaling
See scaling

Z

zero padding OP 14-20
zero response OP 14-9
zero span measurements OP 15-2, HT
zoom measurements OP 13-8, OP 14-3, HT

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.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