HP 35665A Dynamic Signal Analyzer
Operator's Reference

For Instruments with Firmware Revision
A.01.08

**HEWLETT
PACKARD**

Herstellerbescheinigung

Hiermit wird bescheinigt, daβ das Gerät/System

HP 35665A DYNAMIC SIGNAL ANALYZER

in Übereinstimmung mit den Bestimmungen von Postverfügung 1046/84 funkentstört ist.

Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes/Systems angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhaltung der Bestimmungen eingeräumt.

Zusatzinformation für Meβ- und Testgeräte

Werden Meβ- und Testgeräte mit ungeschirmten Kabeln und/oder in offenen Meβaufbauten verwendet, so ist vom Betreiber sicherzustellen, daβ die Funk-Entstörbestimmungen unter Betriebsbedingungen an seiner Grundstücksgrenze eingehalten werden.

Manufacturer's declaration

This is to certify that the equipment

HP 35665A DYNAMIC SIGNAL ANALYZER

is in accordance with the Radio Interference Requirements of Directive FTZ 1046/1984. The German Bundespost was notified that this equipment was put into circulation, the right to check the series for compliance with the requirements was granted.

Additional Information for Test- and Measurement Equipment

If Test- and Measurement is operated with unscreened cables and/or used for measurements on open set-ups, the user has to assure that under operating conditions the Radio Interference Limits are still at the border of his premises.

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Safety Summary

The following general safety precautions must be observed during all phases of operation, service, and repair 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. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements. This is a Safety Class 1 instrument.

Ground The Instrument

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a three-conductor ac power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards.

Do Not Operate In An Explosive Atmosphere

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Keep Away From Live Circuits

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

Do Not Service or Adjust Alone

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

Do Not Substitute Parts or Modify Instrument

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to a Hewlett-Packard Sales and Service Office for service and repair to ensure the safety features are maintained.

Dangerous Procedure Warnings

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

Warning   Dangerous voltages, capable of causing death, are present in this instrument. Use extreme caution when handling, testing, and adjusting.

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Safety Symbols

The following safety symbols are used throughout this manual and in the instrument. Familiarize yourself with each symbol and its meaning before operating this instrument.

General Definitions of Safety Symbols Used On Equipment or In Manuals.

Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the instrument.

Indicates dangerous voltage (terminals fed from the interior by voltage exceeding 1000 volts must be so marked.)

Protective conductor terminal. For protection against electrical shock in case of a fault. Used with field wiring terminals to indicate the terminal which must be connected to ground before operating equipment.

Low-noise or noiseless, clean ground (earth) terminal. Used for a signal common, as well as providing protection against electrical shock in case of a fault. A terminal marked with this symbol must be connected to ground in the manner described in the installation (operating) manual, and before operating the equipment.

Frame or chassis terminal. A connection to the frame (chassis) of the equipment which normally includes all exposed metal structures.

Alternating current (power line).

Direct current (power line).

Alternating or direct current (power line).

| Warning | The WARNING sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which if not correctly performed or adhered to, could result in injury or death to personnel. |

| Caution | The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, condition 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. |

| Note | The NOTE sign denotes important information. It calls attention to procedure, practice, condition or the like, which is essential to highlight. |

Guide to HP 35665A Documentation

If you are thinking about...	And you want to...	Then read...
◆ Unpack and install the HP 35665A	Install the HP 35665A Dynamic Signal Analyzer	*HP 35665A Installation and Verification Guide*
	Do operation verification or performance verification tests	*HP 35665A Installation and Verification Guide*
◆ Getting started	Make your first measurements with your new analyzer	*HP 35665A Quick Start Guide*
	Review measurement basics	*HP 35665A Concepts Guide*
	Learn what each key does	*HP 35665A Operator's Reference* or use the analyzer's [**Help**] key
◆ Making measurements	Learn how to make typical measurements with the HP 35665A	*HP 35665A Operator's Guide*
	Understand each of the analyzer's instrument modes	*HP 35665A Concepts Guide*
◆ Creating automated measurements	Learn the HP Instrument BASIC interface	*Using HP Instrument BASIC with the HP 35665A*
	Record keystrokes for a particular measurement	*HP 35665A Operator's Guide*
	Program with HP Instrument BASIC	*HP Instrument BASIC User's Handbook*
◆ Remote operation	Learn about the HP-IB	*HP–IB Programming with the HP 35665A*
	Learn how to program with HP-IB	*HP–IB Programming with the HP 35665A*
	Find specific HP-IB commands	*HP 35665A HP-IB Commands: Quick Reference*
◆ Servicing the analyzer	Adjust, troubleshoot, or repair the analyzer	*HP 35665A Service Guide*

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Before You Begin

About this Book

This operating manual provides a detailed overview of the analyzer's controls and features. As such, it's the correct book to use if you're already comfortable with the HP 35665A Dynamic Signal Analyzer and what you really need is more in-depth information about specific instrument controls and features.

This book does not teach you how to use the analyzer. If you haven't used the analyzer before—or haven't used it very much—read the *HP 35665A Quick Start Guide*. This contains a few sample measurement tasks and essential background information necessary for you to get comfortable, quickly, with the HP 35665A Dynamic Signal Analyzer. The *HP 35665A Operator's Guide* includes more detailed and advanced measurement tasks.

For more information, see "Where to find Additional Information" later in this chapter.

Firmware Revision Date

This book should be used with HP 35665A Dynamic Signal Analyzers having firmware version
A.01.00. If your analyzer has a significantly different firmware revision, contact your local
HP Sales/Service office to obtain a documentation set that matches your firmware revision date.

Firmware revisions are significant *only if the first two digits in the firmware revision date are changed.*
For example, A.01.00 indicates a significant change from A.00.00. However, a change to A.00.01
from A.00.00 indicates very minor changes that do not affect the documentation set.

To check the firmware revision date of your instrument, press [System Utility] and then [S/N VERSION].

Need Assistance?

If you need assistance, contact your nearest Hewlett-Packard Sales and Service Office listed in the
HP Catalog, or contact your nearest regional office listed at the back of this guide. If you are
contacting Hewlett-Packard about a problem with your HP 35665A Dynamic Signal Analyzer, please
provide the following information:

- Model number: HP 35665A
- Serial number:
- Firmware revision date:
- 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?

Notation Conventions

Hardkeys

Throughout this book, hardkeys are printed like this: [Inst Mode]. Hardkeys are front-panel buttons whose functions are always the same. Hardkeys have a label printed directly on the key itself.

Softkeys

Throughout this book, softkeys are printed like this: [FFT ANALYSIS]. 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).

Toggle Keys

Some keys toggle through different settings. Toggle softkeys have a highlighted word in their label that changes with each press of the softkey. Throughout this book, toggle softkeys are depicted as they *appear after you make the keypress.* For example, "toggle to [X-AXIS LIN LOG]" means to press [X-AXIS LIN/LOG] until the word LIN is highlighted.

There is only one toggle hardkey. This is the [Pause-Cont] hardkey.

Ghosted Softkeys

Occasionally, a softkey may be inactive—this occurs when a softkey is not appropriate for a particular measurement. When this happens, the analyzer "ghosts" the inactive softkey. For example, if you set the analyzer to one-channel mode, and then press [Meas Data], the [FREQUENCY RESPONSE] softkey will be ghosted. This is because frequency response data is only available when the analyzer is in two-channel mode.

Key Press Sequences

When instructions or descriptions include a series of key presses, they are printed like this:

[Inst Mode] → [CAPTURE SETUP]

This example means that you first press the [Inst Mode] hardkey, then the [CAPTURE SETUP] softkey.

Where to find Additional Information

Using the [Help] key

The [Help] key on the analyzer's front panel provides fast, easy-to-read information about specific instrument controls and features. Using [Help] is particularly convenient when you need assistance and you don't have the analyzer's *Getting Started Guide* or *Operating Manual* near at hand.

The [Help] key is also a good way to learn about the analyzer (or to refresh your memory if you don't use the analyzer often). The help facility also has an index that lets you request information by key name or by topic.

The Quick Start Guide

Use the *HP 35665A Quick Start Guide* as an introduction to the HP 35665A. If you haven't read this book yet, you should probably do so. The Quick Start Guide is very short, but it's designed to get you comfortable with the analyzer by helping you make a sample measurement within fifteen minutes.

The Operator's Guide

The *HP 35665A Operator's Guide* shows you how to make typical measurements with the HP 35665A Dynamic Signal Analyzer. In addition, this book shows you how to perform common analysis tasks, such as building limits, using keystroke recording, and using math operations. It also shows you how to do other common tasks, such as plotting or printing your measurement results, and saving, recalling, and copying files.

The Concepts Guide

For a conceptual overview of the analyzer and in-depth discussion of the analyzer's major features, use the *HP 35665A Concepts Guide*. Where appropriate, the *Concepts Guide* includes sample tasks to help you get comfortable with some of these features.

The *Concepts Guide* also contains essential background material to help you understand and use the HP 35665A. This is particularly useful if you haven't used a spectrum/network analyzer before, or if you haven't used an FFT analyzer before. It may also be useful if you just want to review some basic measurement concepts.

Programmer's Reference

To help you operate the analyzer remotely via HP-IB, see *HP-IB Programming with the HP 35665A*. Here you'll find a conceptual overview of the HP-IB and how you can use it to control you instrument remotely. There is also a command reference that lists all HP-IB commands specific to the HP 35665A. This includes a description of each command, its proper syntax, and example statements. Additionally, there are sample programs to help you create your own HP-IB programs.

HP Instrument BASIC

To learn more about using HP Instrument BASIC (a subset of the HP BASIC programming language) with your new analyzer, see *Using HP Instrument BASIC with the HP 35665A*. This shows you how to record and develop programs for the HP 35665A. There are also sample programs to help you get started with HP Instrument BASIC.

For more global information about HP Instrument BASIC, see the *HP Instrument BASIC User's Handbook*. This is a generic handbook for the HP Instrument BASIC language.

Installation and Verification Test Guide.

For specifications, installation instructions, and performance tests, see the *HP 35665A Installation and Verification Guide*.

Service Guide

For service information, see the *HP 35665A Service Guide*. This manual includes adjustments, replaceable parts, circuit descriptions, and troubleshooting.

Demonstration Disc

Consider ordering the *HP Dynamic Signals Demo Disc* (HP part number 35665-95900). This contains captured signals from microphones and vibration transducers for 72 different types of signals. These may be helpful as you learn to use the HP 35665A Dynamic Signal Analyzer—particularly if you are interested in making acoustics or vibration measurements.

To use the demonstration disc, you simply connect a standard audio Compact Disc player to the analyzer's input connectors. Each disk is shipped with documentation to explain the signals and to offer appropriate measurement suggestions. For more information, contact your local Hewlett-Packard Sales and Service Office.

Related Information

Additionally, you will find applications information in numerous Hewlett-Packard application notes. These are available from your local HP Sales and Service Office.

Front-Panel Overview

With few exceptions, individual hardkeys (and their associated softkeys) are not described in this section. For specific information about a particular hardkey or softkey, see chapter 4, "Key Reference," or use the analyzer's [Help] key.

Power Switch
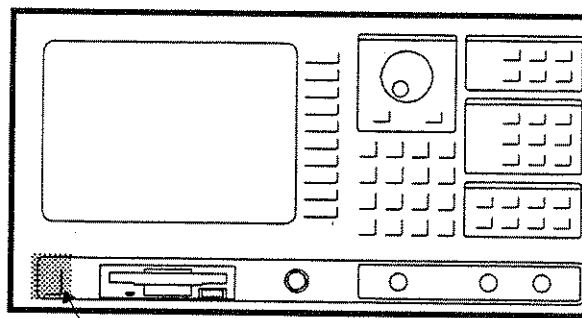
Power Switch

The analyzer's power switch has two positions: on (I) and standby (⏻). In the standby position, the analyzer appears off but line power is still applied to the instrument's power supply.

Keyboard Connector
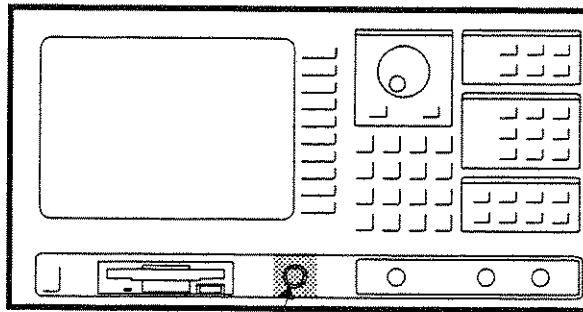
Keyboard Connector

The HP 35665A analyzer has a connector that lets you attach an optional alphanumeric keyboard. You can use the keyboard to perform the same functions as you would using the alpha-shifted front-panel keys—for example, when specifying filenames or when entering a trace title. The external keyboard is most useful for developing HP Instrument BASIC programs. For detailed information, see "Developing Programs" in the *Using HP Instrument BASIC with the HP 35665A* manual.

Note   Some HP 35665A analyzers have the keyboard connector on the rear panel. See the next chapter for more information.

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. See "Keyboard Mapping" later in this chapter for more information.

Caution

Use only the approved keyboard for this product. Hewlett-Packard does not warrant damage or performance loss caused by a non-HP approved keyboard. Currently, approved Hewlett-Packard keyboards are as follows:

- U.S. ASCII (C1405A #ABA)
- U.K. English (C1405A #ABU)
- German (C1405A #ABD)
- French (C1405A #ABF)
- Italian (C1405A #ABZ)
- Spanish (C1405A #ABE)
- Swedish/Finnish (C1405A #ABS)

In addition to the U.S. English keyboard, the HP 35665A Dynamic Signal Analyzer supports French, German, Italian, Spanish, U.K./English, and Swedish/Finnish keyboards. To configure your analyzer for a keyboard other than U.S. English, press [System Utility] → [KEYBOARD SETUP]. Then press the appropriate softkey to select the language.

Configuring your analyzer to use a different keyboard 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.

Special Considerations when Using the Keyboard

Here are some things to keep in mind when using the keyboard:

- The numeric keys 0 through 9, the up arrow and down arrow keys, the backspace key, and the Enter key do the same thing from the keyboard as from the front panel.

- F1 through F10 correspond to the softkeys. F1 is the top softkey; F10 is the bottom softkey.

- F12 corresponds to the [Help] hardkey.

- Right arrow and left arrow keys correspond to turning the knob clockwise and counter-clockwise.

- Pressing Alt, CTRL, and Del simultaneously corresponds to the [Preset] hardkey.

- Print Screen transfers the analyzer screen (without softkey labels) to an appropriate destination—for example, a plotter, a printer, or a file. (This is the equivalent of pressing front panel keys [Plot/Print] → [START PLOT/PRNT].) You can select the destination of the screen data by pressing the appropriate softkeys under the [Plot/Print] menu.

- The alpha keys A through Z correspond to the hardkeys on the analyzer's front panel. You can use either uppercase or lowercase alpha characters.

Keyboard Mapping

You can use the external keyboard to operate the front-panel hardkeys and softkeys when the analyzer is not in alpha entry mode. Pressing the appropriate keyboard key does the same thing as pressing a hardkey or a softkey on the analyzer's front panel. The following tables are helpful for using this feature.

Note	The following keyboard-to-front-panel-hardkey tables apply to *all* approved keyboards—not just to U.S. ASCII keyboards. Because key functions are mapped to the alpha character and not the actual keyboard key location, it makes no difference if you use an external keyboard with a different language option.

Keyboard to front-panel hardkey mapping (alphabetically by keyboard key)

Keyboard	Front Panel	Keyboard	Front Panel
A	Meas Data	N	Pause/Cont
B	Trace Coord	O	Avg
C	Scale	P	Save/Recall
D	Active Trace	Q	Disk Utility
E	Analys	R	System Utility
F	Disp Format	S	BASIC
G	Inst Mode	T	Plot/Print
H	Freq	U	Local/HP-IB
I	Window	V	Marker
J	Input	W	Marker Fctn
K	Source	X	up arrow (↑)
L	Trigger	Y	down arrow (↓)
M	Start	Z	Marker Value

Front-panel key to keyboard mapping (alphabetically by front-panel key)

Front Panel	Keyboard	Front Panel	Keyboard
Active Trace	D	Marker Value	Z
Analys	E	Meas Data	A
Avg	O	Pause/Cont	N
Disk Utility	Q	Plot/Print	T
Disp Format	F	Save/Recall	P
down arrow (↓)	Y	Scale	C
Freq	H	Source	K
BASIC	S	Start	M
Input	J	System Utility	R
Inst Mode	G	Trace Coord	B
Local/HP-IB	U	Trigger	L
Marker	X	up arrow (↑)	V
Marker Fctn	W	Window	I

Source
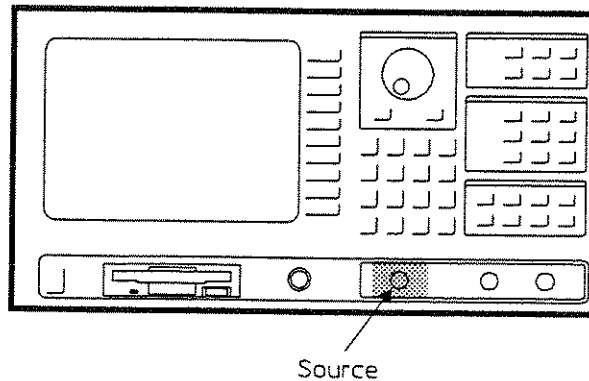
Source

The analyzer has an internal signal source, with a choice of several waveforms:

- Random noise.
- Burst random noise.
- Periodic chirp.
- Burst chirp.
- Pink noise.
- Fixed sine.
- Arbitrary (option 1D4).

The source output impedance is less than 5Ω, so you do not need to terminate the analyzer's source.

Caution	When you turn on the analyzer's power (and when you turn off power), a brief pulse may appear at the source output connector. Therefore, do not cycle power if you have sensitive test devices connected to the analyzer's source.
	Also, during calibration a small ac voltage (around 2 mV) appears at the source output connector.

Inputs
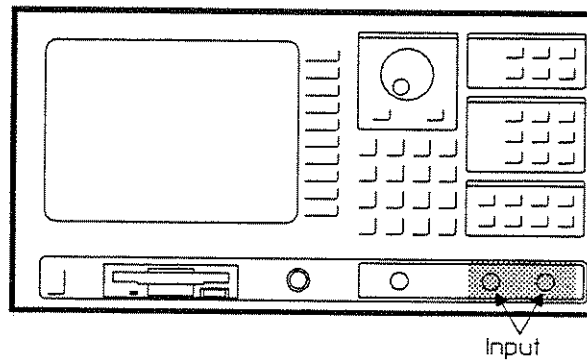
Input

The analyzer has two input connectors. Both have input resistance of 1 MΩ, shunted by less than 100 pF of capacitance.

Grounded Input   Floating Input
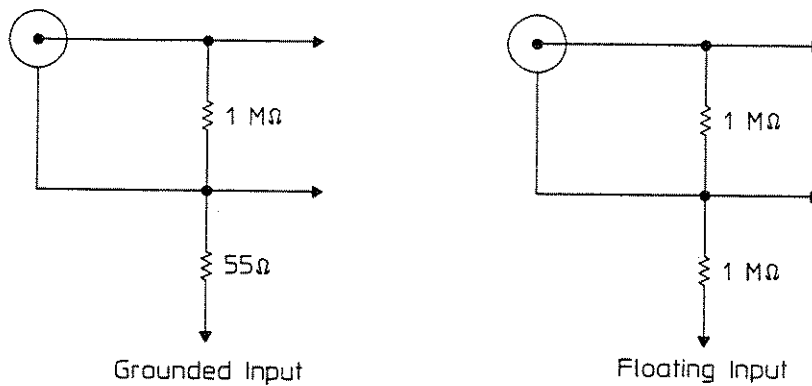
You can select grounded or floating inputs for either input channel. The floating input has a MΩ resistance from the shell of the BNC connector to the analyzer's chassis ground. The grounded input has a 55Ω resistance from the shell of the BNC connector to the analyzer's chassis ground.

The input channels can be ac or dc coupled. With ac coupling, the input signal rolls off 3 dB at 1 Hz. So for very small spans at low frequencies, you should use dc coupling to avoid measurement error.

The HP 35665A Spectrum analyzer has input amplitude ranges from 3.99 mVpk to 31.7 Vpk.

Autoranging

When autoranging is on, the analyzer continuously monitors the amplitude of the input signals and, if necessary, automatically changes the input range. If the input signal increases enough to exceed the current input range, the analyzer changes to a less-sensitive input range. If the input signal decreases enough to compromise the dynamic range of the current measurement, the analyzer does not adjust the range.

When autoranging occurs, you'll see an "Autorange in progress" message on the screen.

Disk Drive
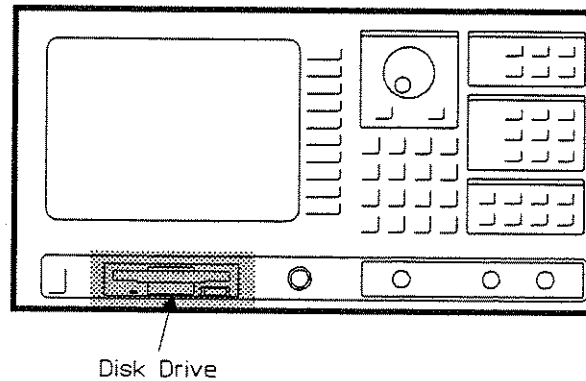
Disk Drive

The analyzer has a built-in 3.5-inch flexible disk drive that you can use to load HP Instrument BASIC programs. You can also use the disk drive to store traces, instrument setup states, limit tests, math functions, and HP Instrument BASIC programs.

The disk drive accepts the standard gray 3.5-inch, 710 kilobyte double-sided flexible disks (for example, the HP 92192A) or high-density disks (for example, the HP 92190X). If you load disks that are already formatted, keep in mind that the disk drive recognizes only those disks that have been formatted using the Logical Interchange Format (LIF) or MS-DOS format (MS-DOS is a U.S. registered trademark of Microsoft Corporation).

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

Display Area
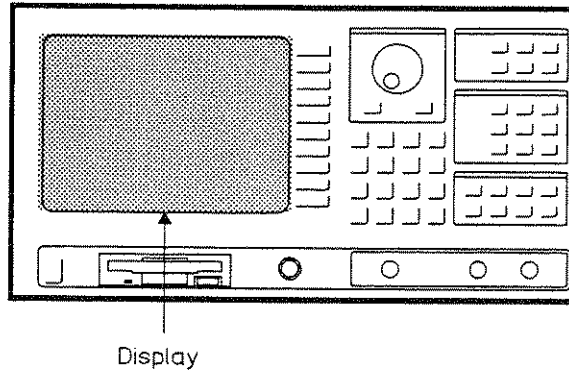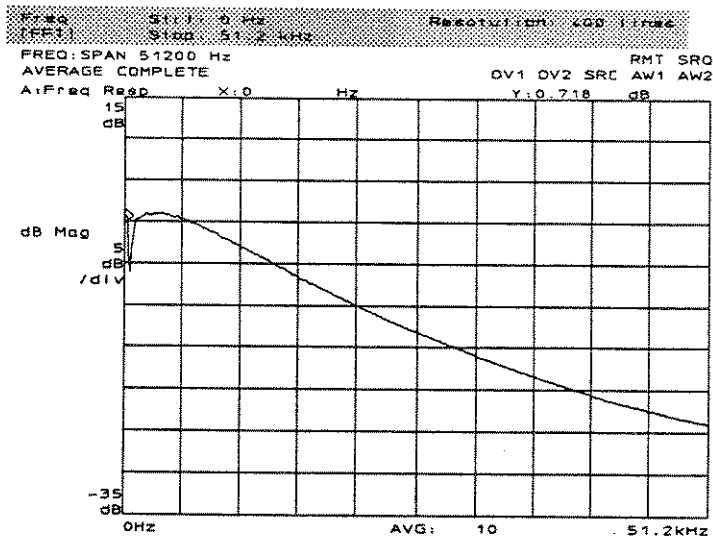
Display

Mini-state

The top two lines of the display show the "mini-state." The mini-state lists several of the analyzer's current settings, including:

- Name of last hardkey pressed.
- Current instrument mode (if softkeys under the hardkey are mode dependent).
- Current values for parameters under the hardkey (such as start, stop, center, and span frequencies for the [Freq] hardkey).

HP-IB Information Area
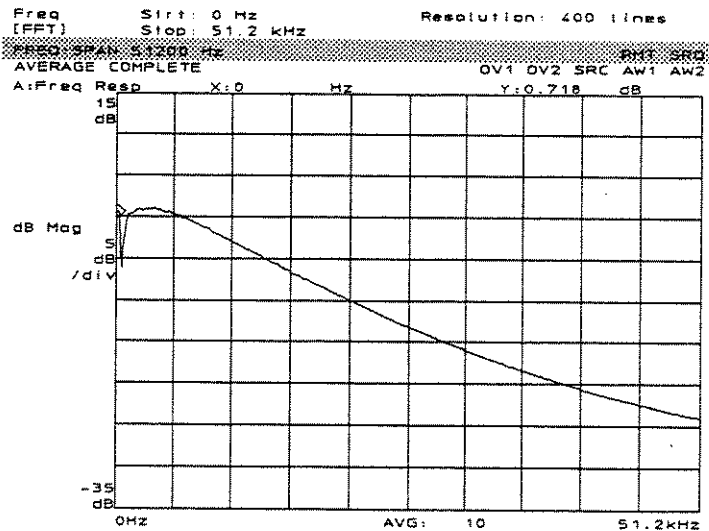
The third line of the display shows HP-IB information. The left side of the line displays HP-IB mnemonics. When you turn on [GPIB ECHO] (under the [Local/HP-IB] hardkey), the analyzer displays the HP-IB command equivalent to keys you press on the front panel.

The right side of the third line contains two HP-IB status indicators. The indicators turn bold only while the conditions they represent remain active. These status indicators are:

- RMT (remote); indicates the presence of an external device that has control of the analyzer's HP-IB.

- SRQ (service request); indicates an analyzer request, via HP-IB, to communicate with the current HP-IB controller.

Measurement Status Area


```
Freq          Strt:  0 Hz                Resolution: 400 lines
[FFT]         Stop: 51.2 kHz
FREQ:SPAN 51200 Hz                                        RMT SRQ
AVERAGE COMPLETE                             OV1 OV2 SRC AW1 AW2
A:Freq Resp         X:0        Hz              Y:0.718   dB
```
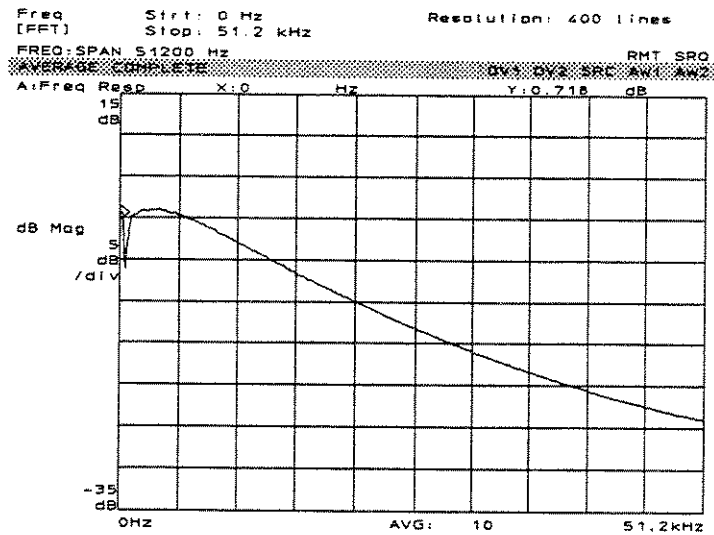
The fourth line of the display is for measurement status information. The left side of the line displays measurement information, such as "AVERAGE COMPLETE" or "MEASUREMENT PAUSED."

The right side of the line contains five measurement status indicators. The indicators turn bold only while the conditions they represent remain active. These status indicators are:

- OV1 (overload channel 1); indicates an overload on the channel 1 input. This message occurs when the input signal exceeds the current channel 1 range.

- OV2 (overload channel 2); indicates an overload on the channel 2 input. This message occurs when the input signal exceeds the current channel 2 range.

- SRC (source); indicates the source is turned on.

- AW1 (A-weight channel 1); indicates the A-weight filter for channel 1 is enabled.

- AW2 (A-weight channel 2); indicates the A-weight filter for channel 2 is enabled.

Trace Box A and Trace Box B

```
Freq         Strt: 0 Hz           Resolution: 400 lines
[FFT]        Stop: 6.4 kHz
FREQ:SPAN 6400 Hz                                    RMT  SRQ
AVERAGE COMPLETE                    OV1 OV2 SRC AW1  AW2
A:Freq Resp        X:16      Hz           Y:-1.845  dB
```

Trace Box A →

```
B:Freq Resp        X:16      Hz           Y:149.422 deg
```
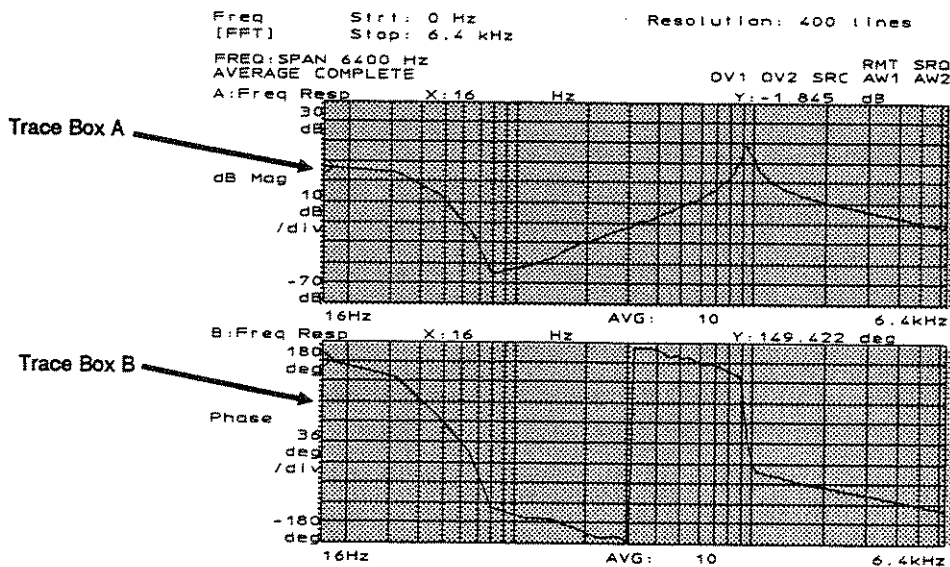
Trace Box B →

The analyzer has two display traces. You can display these two traces several ways—single (one trace at a time), upper/lower (trace A on top, trace B on bottom), front/back (one trace overlaid on the other), or waterfall (one trace in a smaller upper trace box and a waterfall of one or more traces in a larger lower trace box). Each trace shows measurement data with 401 points of resolution, regardless of span.

Both Trace A and Trace B are both independent and are not dedicated to showing specific parameters. Rather, you can display one of several different types of information:

- Current measurement data.

- Functions F1 through F5 (math functions).

- Waveform capture buffer contents.

- Data Registers D1 through D8 (you can save traces, limits, and math functions to a data register and then display them using the [Meas Data] hardkey.

One trace is "active" at any given time (indicated by the highlighted trace title). The active trace is the target of any adjustments you make with the display keys. For example, if you press [Meas Data] and press [DATA REG (D1-D8)] to call up a stored trace, the stored trace will only appear in the currently active trace box.

Pressing [Active Trace] lets you designate, alternately, Trace A or Trace B as the active trace.

The [Marker] and [Marker Fctn] hardkeys are also tied to the active trace. For example, if you press [Marker] and [MARKER TO PEAK], the marker will move to the peak on the active trace only. If the markers are coupled, moving a marker in one trace also moves the marker in the other trace.

Trace Title

```
Freq          Strt: 0 Hz              Resolution: 400 lines
[FFT]         Stop. 51.2 kHz
FREQ:SPAN 51200 Hz                                       RMT SRQ
AVERAGE COMPLETE                        OV1 OV2 SRC AW1 AW2
░░░░░░░░░░░     X:0          Hz          Y:0.718    dB
        15
        dB




dB Mag
        5
        dB
       /div




       -35
        dB
        0HZ                       AVG:    10            51.2kHz
```
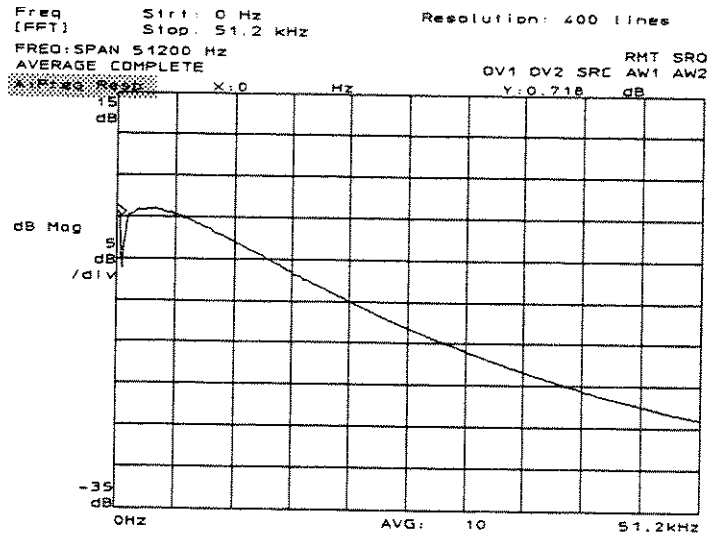
This area normally lists the type of measurement data displayed in the trace. You can change the title for the trace by pressing [**Disp Format**], [MORE], [TRACE TITLE], then using the alpha shift keys and numeric keypad.

Marker Readout


```
Freq          Strt:  0 Hz              Resolution: 400 lines
[FFT]         Stop:  51.2 kHz
FREQ:SPAN 51200 Hz                                         RMT SRQ
AVERAGE COMPLETE                          OV1 OV2 SRC  AW1 AW2
A:Freq Resp
    15
    dB




dB Mag
     5
    dB
   /div




   -35
    dB
  OHz                           AVG:  10           51.2kHz
```
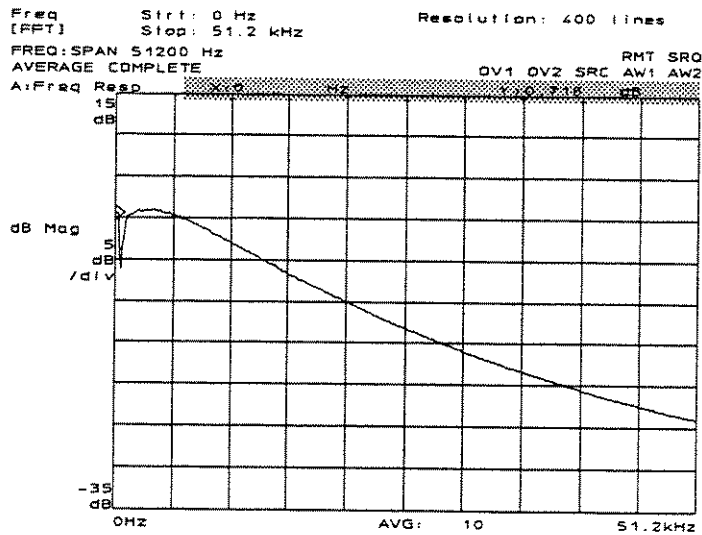
The marker readout provides the X-axis and Y-axis values of the current marker position. When the relative marker is on, the marker readout indicates X-axis and Y-axis values relative to the point where you set the reference marker.

There is a separate marker readout for each trace.

Note	When the units for the amplitude value are too long for the marker readout line, the analyzer puts an asterisk (*) in the marker readout area and prints the units in the top right corner of the trace box.

Pop-up Message Area


```
Freq        Strt:  0 Hz              Resolution: 400 lines
[FFT]       Stop: 51.2 kHz
FREQ:SPAN 51200 Hz                                    RMT SRQ
AVERAGE COMPLETE                     OV1 OV2 SRC AW1 AW2
A:Freq Resp       X:0        Hz          Y:0.718  dB
```
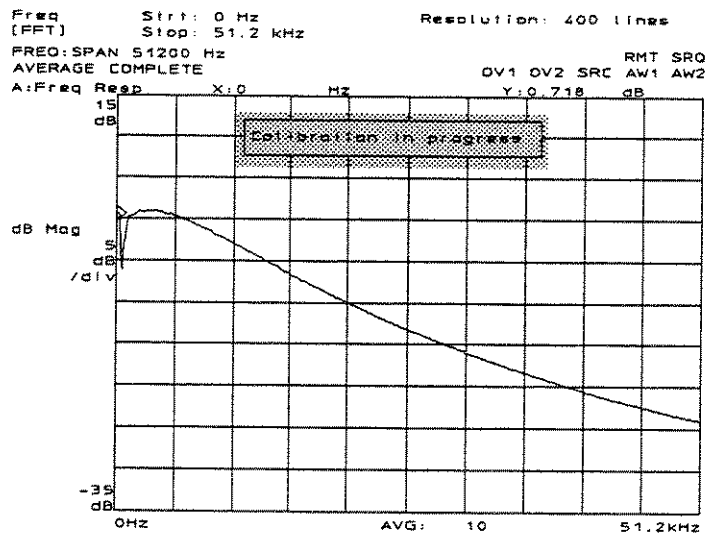
When necessary, the analyzer displays a pop-up message window at the center of the screen. Some examples of these messages are:

- Autorange in progress.
- Calibration in progress.
- User error.
- Hardware errors.

Y-axis Notation


```
Freq          Strt: 0 Hz              Resolution· 400 lines
[FFT]         Stop: 51.2 kHz
FREQ:SPAN 51200 Hz                                        RMT SRQ
AVERAGE COMPLETE                          OV1 OV2 SRC AW1 AW2
A:Freq Resp        X:0         Hz             Y:0.718    dB
```
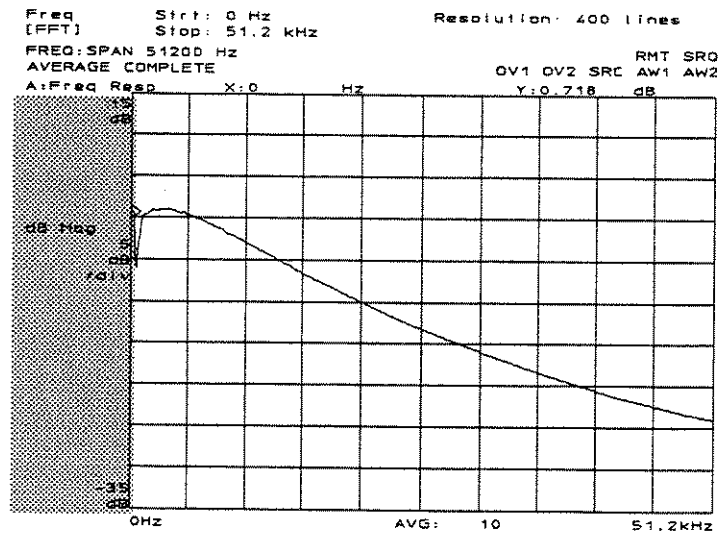
The y-axis notation includes the Trace Coord (such as dB Mag or Real),the top and bottom
amplitude values for the current y-axis scale, and the y-axis units per division.

X-axis Notation


```
Freq         Strt: 0 Hz              Resolution: 400 lines
[FFT]        Stop: 51.2 kHz
FREQ:SPAN 51200 Hz                                    RMT SRQ
AVERAGE COMPLETE                        OV1 OV2 SRC AW1 AW2
A:Freq Resp         X:0        Hz        Y:0.718   dB
```
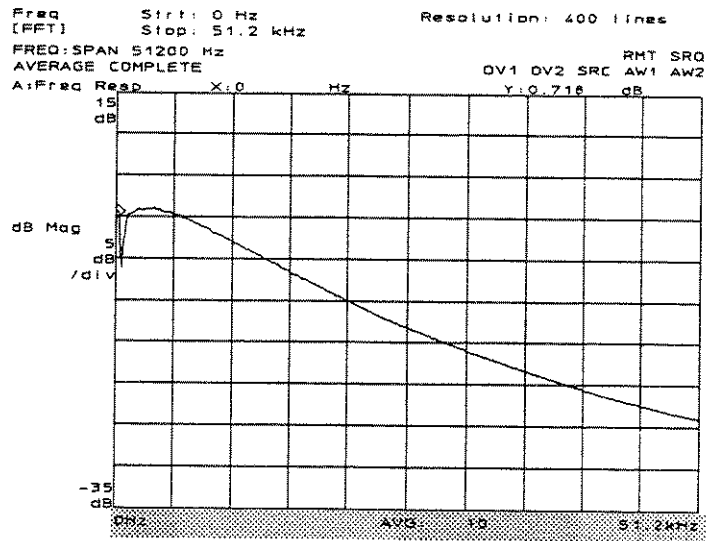
The x-axis notation indicates the range (frequency, time, orders, amplitude, or count).

The center of the line indicates the number of averages completed (if averaging is turned on).

Waterfall Notation
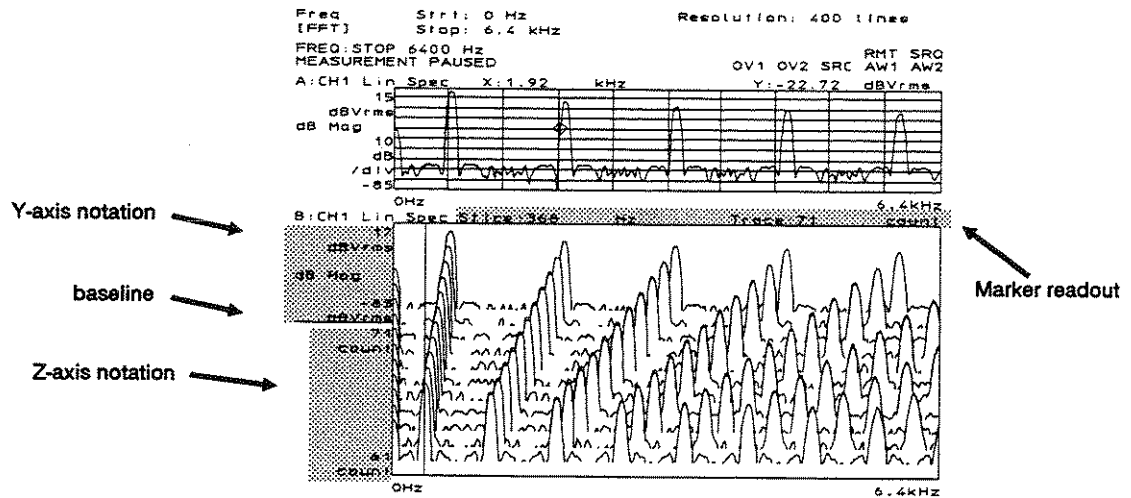
The waterfall is a two-dimensional display of three-dimensional data.

The notation for the upper trace is the same as for other display formats. The notation for the lower trace includes additional information.

The line on the left side of the waterfall trace indicates the baseline of the top trace. The Y-axis notation is above this line. The Z-axis notation is below this line. It includes the values for the first and last traces in the waterfall. The units vary depending on the data displayed.

The marker readout for the waterfall trace lists the slice marker and trace marker values. For more information on these markers, see the [SLICE SELECT] and [TRACE SELECT] softkeys in chapter 4.

CRT care and cleaning

The analyzer's CRT is protected by a plastic screen that also provides RFI shielding. During normal operating conditions, the only cleaning that should be required is an occasional dusting with a soft brush. A household-type tack cloth, or other type of lint remover, may also be used.

If foreign material adheres to the screen, dampen a soft, lint-free cloth moistened with a mild detergent (diluted with water) and carefully wipe the screen.

The plastic screen is not operator replaceable. In the unlikely event that it becomes damaged, contact your nearest Hewlett-Packard Sales/Service office.

Warning	Always clean the screen with the power switch in the standy by position. 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 and may present a shock hazard.
	To clean, dampen a soft, lint-free cloth and carefully wipe the screen. Use only a mild detergent mixed with water.

Hardkeys and Softkeys
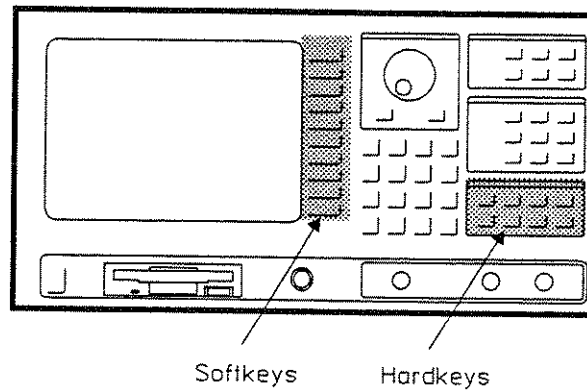
Softkeys   Hardkeys

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

Softkeys are keys whose functions change with the analyzer's current menu selection. There are 10 softkeys in a column just to the right of the screen, marked F1 through F10. A softkey's function is indicated by a video label to the left of the key (on the edge of the analyzer's screen). The set of video labels to the left of the ten softkeys form the *softkey menu*. Throughout this book, softkeys are printed like this: [SOFTKEY].

Some softkeys toggle between two settings. Toggle softkeys have a highlighted word in their label that changes with each press of the softkey. Throughout this book, toggle softkeys are depicted as they appear after you make the keypress. For example, "toggle to [COUPLING **AC** DC]" means to press [COUPLING AC DC] until the word AC is highlighted.

Some softkeys are inactive for particular analyzer setups. The labels for inactive softkeys appear dimmer (or "ghosted"). For example, the [COHERENCE] measurement data softkey is inactive during 1-channel measurements. This is because the coherence computation requires data from two channels.

Marker Keys and Knob
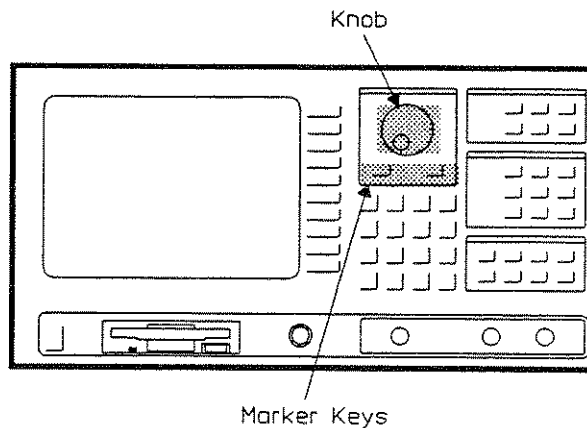
Knob

Marker Keys

The Marker Keys

The marker keys call up menus that let you control the location and movement of the on-screen marker. These controls affect only the markers for the currently-active trace.

The Knob

The *knob* is an RPG (rotary pulse generator) that controls two things—movement of the on-screen marker and continuous entry of numeric values. Usually, the knob simply moves the marker. But after pressing a softkey that requires a numeric entry, the knob becomes dedicated to numeric entry. Turn the knob to the right and the analyzer steps through larger numeric entries. Turn to the left and the analyzer steps through increasingly smaller entries.

When numeric entry is active, an entry box appears at the top of the screen with the currently-selected numeric value. This box remains on screen for several seconds to give you a chance to enter a numeric value. After using the knob (or, alternatively, the numeric entry keypad) this box soon disappears and the knob returns to marker movement.

Although the analyzer uses a default step size to control the "sensitivity" of the knob—that is, the interval between each numeric entry as you turn the knob—you can select your own "step size" for frequency. Press [Freq] and [ENTRY STEP SIZE]. Then use the numeric keypad to enter your own step size.

When numeric entry is active, an entry window appears at the top of the screen with the currently-selected numeric value. This window remains on screen for several seconds to give you a chance to enter a numeric value. If you don't make an entry, the window disappears after several seconds. If you use the knob (or the numeric entry keypad) to make an entry, this window remains on the screen. After you complete your entry, the window soon disappears and the knob returns to marker movement.

Numeric Entry Keys
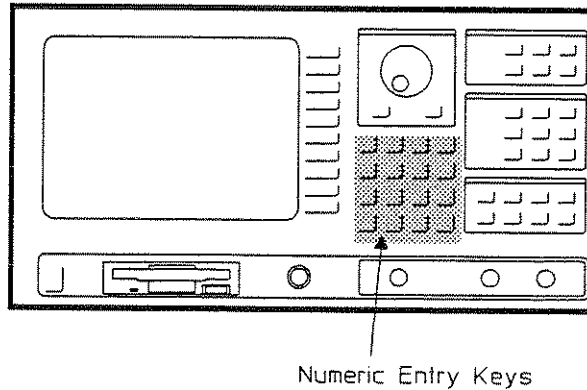
Numeric Entry Keys

The numeric entry keys work the same way as the knob does during numeric entry. Use the numeric entry keys when you need to enter specific values. If you only need approximate values, it may be easier to use the knob instead of the numeric entry keys.

Active Entry

It isn't always necessary to first press a softkey before making a numeric entry. A highlighted softkey is the softkey that is currently dedicated to the numeric keypad.

For example, press [Freq]. If the [CENTER] softkey is highlighted, pressing any of the numeric keypad keys automatically brings up a numeric entry window for center frequency. You don't have to press [CENTER] to set the center frequency.

Note

This is true only for the numeric entry keys. If you want to use the knob, you must first press the appropriate softkey. If you don't, turning the knob moves the marker rather than changing the numeric entry.

The Arrow Keys

Like the knob, you can use the arrow keys to step through larger or smaller numeric entries. Press [↑] to step through increasingly larger numeric entries—for example, to raise the current center frequency). Press [↓] to step through increasingly smaller numeric entries—for example, to lower the current center frequency.

You can use the arrow keys to modify a numeric entry at any time—unlike the knob, which you can use for numeric entry only after pressing a softkey to activate the numeric entry mode.

And like the knob, the analyzer uses the same default step size to control the "sensitivity" of the arrow keys—that is, the interval between each numeric entry as you press an arrow key.

As we mentioned earlier, you can select your own "step size" for frequency entries. Press [Freq] and [ENTRY STEP SIZE]. Then use the numeric keypad to enter your own step size.

Alpha Entry Keys

It is occasionally necessary to specify alpha characters—for example, when entering a trace title or when saving or recalling a specific file. At these times, the analyzer automatically shifts certain front-panel keys to alpha entry keys (note the alpha characters engraved on the front panel below these hardkeys). When it's no longer necessary to enter alpha characters, the analyzer automatically returns these hardkeys to their normal functions.

Meas Data	A		Trace Coord	B		Scale	C
Active Trace	D		Analys	E		Disp Format	F
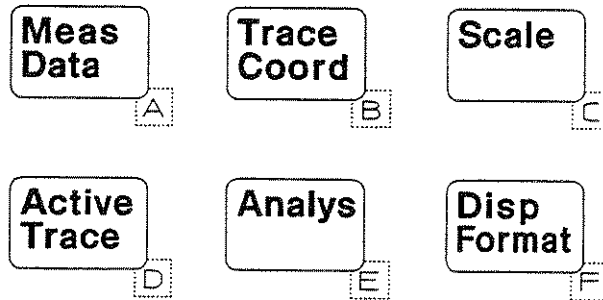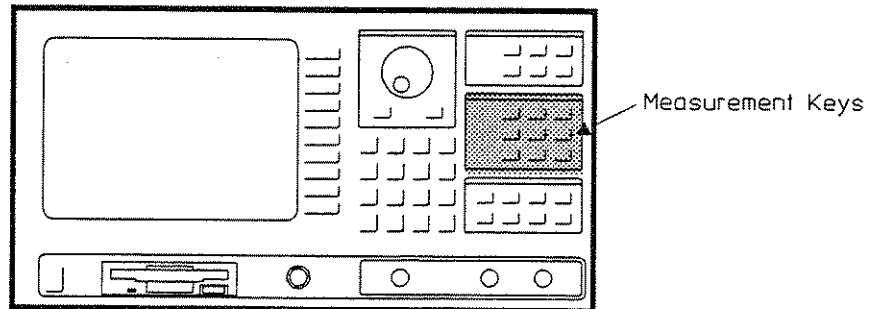
Measurement Keys

Measurement Keys

The Measurement keys let you control the analyzer's input configuration, measurement range, and measurement resolution. Measurement keys change measurement parameter setups. Pressing keys in this area may erase current measurement data.

Here's a brief summary of the Measurement keys and their significant functions:

■ [Inst Mode] determines the kind of measurement the analyzer makes.

■ [Freq] determines the frequency range measured.

■ [Window] determines the window or weighting function applied to the input signals.

■ [Input] sets the current range, coupling, and other input parameters for each channel independently.

■ [Source] controls the analyzer's source output.

■ [Trigger] provides trigger and arming choices.

■ [Start] initiates a new measurement.

■ [Pause/Cont] pauses and continues a measurement.

■ [Avg] determines the type of averaging for measurements.

Display Keys
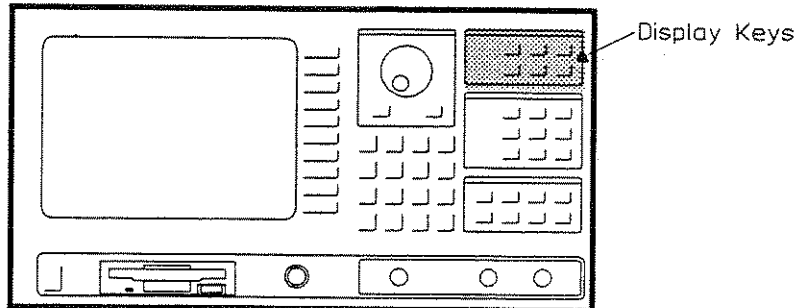
Display Keys

The Display keys let you control what appears on the analyzer's two traces. The Display keys only affect how data is displayed; they do not change any measurement parameters. You can press any softkeys under the Display hardkeys without losing measurement results.

Since only one trace is "active" at any given time, only one trace is the target of any adjustments you make using the display keys. Here's a brief summary of the Display keys and their significant functions:

- [**Meas Data**] determines the measurement results shown on the active display—this can be current measurement data or stored data.

- [**Trace Coord**] selects the Y-axis coordinate system for the displayed data.

- [**Scale**] adjusts the position and size of the displayed data.

- [**Active Trace**] switches the active trace between trace A and trace B.

- [**Analys**] lets you define math functions and constants, perform limit testing, and edit data. The curve fit and synthesis operations are also available under this hardkey *if your analyzer is equipped with option 1D3.*

- [**Disp Format**] selects the number of traces displayed and adjusts their appearance. Pressing [**Disp Format**] also lets you view the analyzer's "setup state"—a listing of the analyzer's current measurement parameters.

System Keys
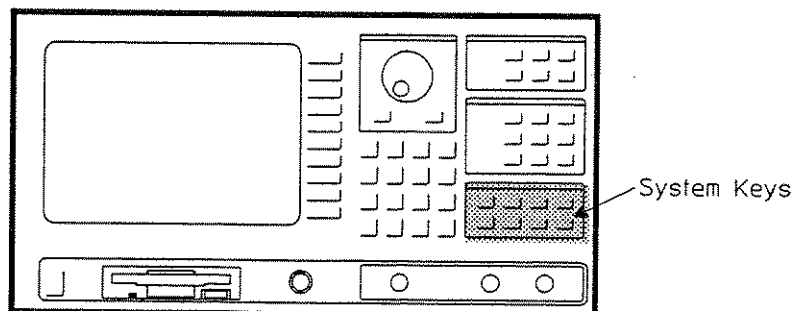
The System keys let you control how the analyzer communicates the external devices, the HP-IB controller, and external measurement programs. Here's a brief summary of the System keys and their significant functions:

- [**Help**] provides information about specific analyzer controls and functions (see "The Help Key" later in this chapter).

- [**Save/Recall**] lets you save and recall traces, instrument states, limits, math operations, and HP INSTRUMENT BASIC programs.

- [**Disk Utility**] provides useful utilities to let you format disks and copy or delete files stored on the mass storage devices (including the internal RAM disks, flexible disk drive, or external disks).

- [**System Utility**] lets you perform a calibration procedure, set the analyzer's internal clock, and perform diagnostic tests.

- [**BASIC**] lets you create (and run) HP Instrument BASIC programs *if your analyzer is equipped with HP Instrument BASIC (option 1C2)*.

- [**Plot/Print**] controls selection and configuration of an external plotter or printer.

- [**Local/HP-IB**] provides HP-IB options when the analyzer is under local (front panel) control.

- [**Preset**] lets you return most of the analyzer settings to their default positions or recall a saved instrument state (see "The Preset Key" later in this chapter).

The Help Key
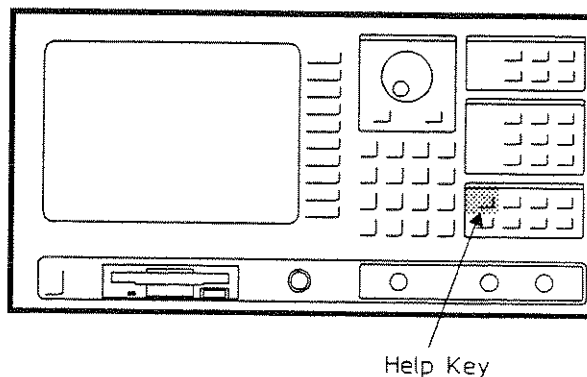
Help Key

The [Help] key provides fast, easy-to-read information about specific instrument controls and features. Using [Help] is particularly convenient when you need assistance and you don't have the analyzer's *Operator's Guide* or *Operator's Reference* near at hand.

The [Help] key is also a good way to learn about the analyzer (or to refresh your memory if you don't use it often). The help facility has an index that lets you request information by key name or by topic.

For information on using the [Help] key, press the key or see the *User's Guide.*

The Preset Key

Preset Key
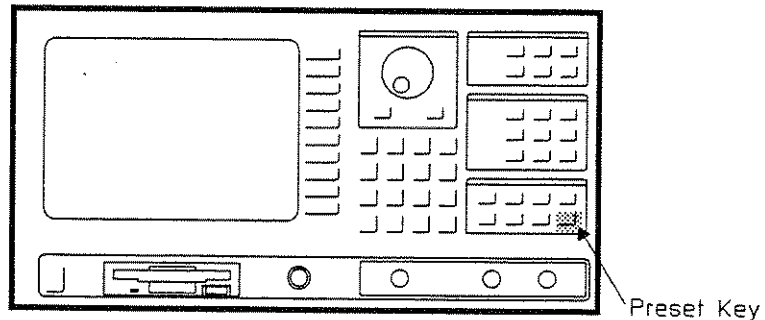
Pressing [**Preset**] → [DO PRESET] returns most of the analyzer settings to their default positions.

Before pressing [DO PRESET], you may want to save the analyzer's settings, particularly if your measurement setup was rather complex. You can save an instrument setup state to disk by pressing [**Save/Recall**] and using [SAVE STATE]. You can recall this setup by pressing [**Preset**] → [RECALL AUTOSTATE]

If you simply want a hardcopy of the instrument setup state, press [**Display Format**]. Then press [MEASURMNT STATE] to view a listing of the analyzer's current setup state. Then press [**Plot/Print**] → [PLOT DATA SELECT] → [ALL] → [RETURN] → [START PLOT/PRNT].

Keep in mind that pressing [DO PRESET] is not the same thing as turning off the analyzer and turning it on again (a power-up cycle). There are some settings that are unaffected by preset but are changed when a power-up cycle occurs. These include:

- Definitions of constants and functions.
- Contents of data registers.
- HP Instrument BASIC programs currently loaded.
- Memory size.
- Scratch option.
- Renumber start and increment.
- Secure start and end line.

Additionally, there are even some settings that survive both [DO PRESET] and power-up. You must change these settings from the front-panel or via HP-IB. These settings include:

- Storage configuration (default disk selection).
- System controller mode (system controller or addressable-only).
- HP-IB, disk, printer, and plotter addresses.
- Disk volume and unit numbers.
- Time and date.

See "[DO PRESET] softkey" in chapter 4 for a list of the settings affected by preset and the default settings.

Rear-Panel Overview

For more detailed information, see chapter 4, "Key Reference," or use the analyzer's [**Help**] key.

Fuse, Voltage Selector, and Line connector

For information about these items, see the *HP 35665A Installation and Performance Test Guide.*

HP-IB connector
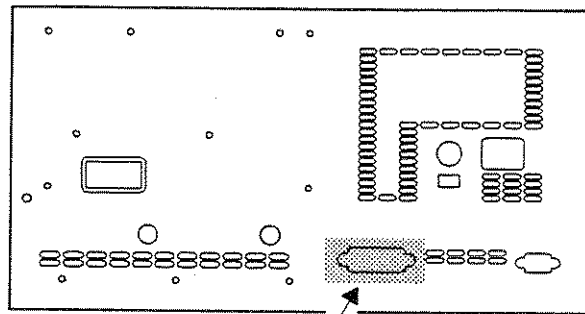
HP-IB Connector

The HP 35665A Dynamic Signal Analyzer is compatible with the Hewlett-Packard Interface Bus (HP-IB). The HP-IB is Hewlett-Packard's implementation of the IEEE Standard 488-2.

To connect the analyzer to a compatible HP-IB device, use an HP-IB interface cable. The 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 HP-IB extender.

To learn more about controlling the analyzer over the HP-IB, see the *HP 35665A HP-IB Programing Reference*.

Caution   The analyzer contains metric-threaded HP-IB cable mounting studs as opposed to English threads. Metric-threaded HP-IB cable lockscrews must be used to secure the cable to the analyzer. Metric-threaded fasteners are colored black while English-threaded fasteners are colored silver.

Port 1 (RS-232 Serial Port)

Port 1
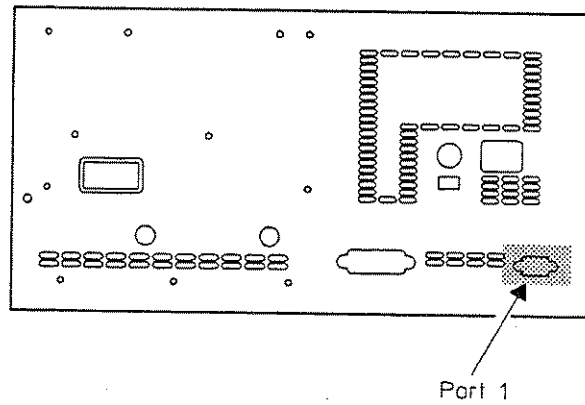
This connector can only be used via HP Instrument BASIC. See the chapter "Interfacing with the RS-232-C Serial Port" in *Using HP Instrument BASIC with the HP 35665A.*

External Trigger Input

External Trigger Input
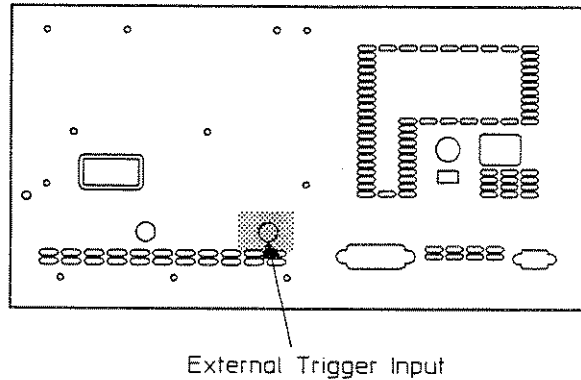
This input lets you synchronize a measurement with an external device. If you've selected the external trigger mode (using the [Trigger] hardkey), the analyzer begins a measurement when the external trigger line goes low (TTL-level signals). A trigger also occurs when you short the center pin to ground (the shell of the EXT TRIG connector).

If you've selected automatic arming, subsequent trigger signals are ignored while the measurement is in progress. If you've selected manual arming, the analyzer ignores trigger signals until you press the [ARM] softkey (or send this command via HP-IB).

Tachometer Input
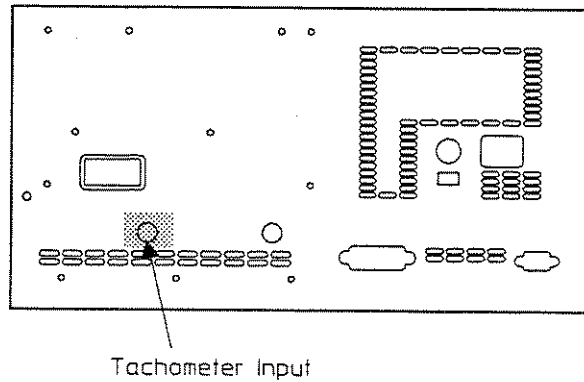
Tachometer Input

The tachometer input is useful for arming in runup or rundown measurements of any kind. This feature virtually eliminates the need for external signal-shaping circuitry for order measurements. The analyzer accepts a signal up to +/– 20 volts.

If you've selected rpm step arming, the analyzer begins a measurement when the tachometer input signal matches the arm parameter settings.

Keyboard Connector
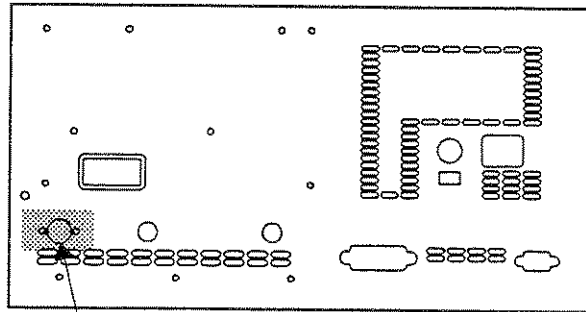
Keyboard Connector

The analyzer allows you to connect an external PC-style keyboard (option 1CL). This is most useful for developing HP Instrument BASIC programs. For detailed information, see "Developing Programs" in the *HP-IB Programming with the HP 35665A* manual.

For more information on the external keyboard, see the previous chapter.

Note

Some HP 35665A analyzers have the keyboard connector on the front panel. See the previous chapter for more information.

Key Reference

How to use this chapter

This chapter contains the same information as the analyzer's online help facility. Like online help, there are definitions here for both hardkeys and softkeys—and information about more general topics. Also included are softkeys that appear when your instrument is equipped with the HP Instrument BASIC option.

This chapter is arranged alphabetically. To find an individual hardkey or softkey, simply use this chapter as you would a dictionary. The topic entries are also arranged alphabetically and are mixed with the hardkey and softkey entries.

If you don't know the name of a hardkey, a softkey, or a topic entry, use the index at the back of this book. The index is where you should go to locate information by concept. The index also guides you to related information in this book.

Chapter 5 is a menu map of the hardkeys and softkeys in the analyzer. It is also helpful for locating a specific key if you are not sure of the key name.

[*jOMEGA() softkey

Key Path: [Analys] → [DEFINE FUNCTION] → [DEFINE Fx] → [OPERATION]

Multiply each data point by $j\omega$, where ω is the frequency at that point in radians per second. The argument must be frequency domain data.

[+ j] softkey

Designate the next value entered as the imaginary part of a complex number. To change $+ j$ to $- j$, press [+/–] after you press [+ j].

For example, to enter the complex number 1 –j 12, press:
[1] [+ j] [+/–] [1] [2] [Enter].

[+ /–] hardkey

This hardkey has two functions:

- When you are changing a numeric parameter: Press this hardkey to toggle your entry between positive and negative values or to change the sign of an exponent.

- When you are changing a text string: Press this hardkey to insert a dash (or minus sign) to the left of the cursor.

[/jOMEGA() softkey

Key Path: [Analys] → [DEFINE FUNCTION] → [DEFINE Fx] → [OPERATION]

Divide each data point by $j\omega$, where ω is the frequency at that point in radians per second. The argument must be frequency domain data.

One application for /jomega is converting frequency domain data from acceleration to velocity. If you are converting data in V (such as a linear spectrum), divide the spectrum by jomega once. If you are converting data in V^2 (such as a power spectrum), divide the spectrum by jomega twice. (For time domain data, use the "INTEG" operation.)

See also: [INTEG( ] softkey

[1 CHANNEL] softkey

Key Path: [Inst Mode]

Specify a one-channel measurement. The analyzer takes data from channel 1 only.

Caution

The maximum specified frequency for a one-channel measurement is 102.4 kHz. Although the analyzer will display data up to 115 kHz, the range from 102.4 kHz to 115 kHz is not calibrated and is significantly affected by the antialias filter. Published specifications do not apply to frequencies above 102.4 kHz.

[1/12 OCTAVE] softkey

(Available only with option 1D1, Real Time Octave)

Key Path: [Freq]

Specify 1/12 octave band measurements.

1/12 octave analysis is the measurement of a frequency spectrum by the use of 144 constant percentage bandwidth filters 1/12 octave wide and spaced at 1/12 octave intervals. The analyzer displays a total RMS power band and up to 144 frequency bands. The center frequency of each 1/12 octave frequency band is $2^{(1/12)}$, or 1.0594, times the center frequency of the previous 1/12 octave band.

You can specify the start and stop frequencies by pressing the [START] and [STOP] softkeys. When you change one of these frequencies, the analyzer changes the other frequency if the specified band if more than 12 octaves.

For 1/12 octave measurements, the maximum stop frequency is 12.34 kHz ; the minimum start frequency is 99.73 mHz.

The exact center frequencies are determined by starting at 1029.3 Hz and multiplying by 1.0594 to get higher bands or dividing by 1.0594 to get lower bands ($1.0594 = 2^{(1/12)}$). The reference frequency is shifted by 1/24 octave so that 1/12 octave bands can be summed to synthesize full octave or 1/3 octave bands.

Note

Markers return the ANSI Standard preferred frequencies.

See also: [START] softkey (octave frequency), [STOP] softkey (octave frequency)

[1/3 OCTAVE] softkey

(Available only with option 1D1, Real Time Octave)

Key Path: [Freq]

Specify 1/3 octave band measurements.

1/3 octave analysis is the measurement of a frequency spectrum by the use of 36 constant percentage bandwidth filters 1/3 octave wide and spaced at 1/3 octave intervals. The analyzer displays a total RMS power band and up to 36 frequency bands. The center frequency of each 1/3 octave frequency band is $2^{(1/3)}$, or 1.2599, times the center frequency of the previous 1/3 octave band.

You can specify the start and stop frequencies by pressing the [START] and [STOP] softkeys. When you change one of these frequencies, the analyzer changes the other frequency if the specified band if more than 12 octaves.

For 1/3 octave measurements, the maximum stop frequency is 31.5 kHz ; the minimum start frequency is 80 mHz.

The exact center frequencies are determined by starting at 1000 Hz (band 30) and multiplying by 1.2599 to get higher bands or dividing by 1.2599 to get lower bands.

Note	Markers return the ANSI Standard preferred frequencies.

See also: [STOP] softkey (octave frequency), [START] softkey (octave frequency)

[2 CHANNEL] softkey

Key Path: [Inst Mode]

Specify a two-channel measurement. The analyzer takes data from channel 1 and channel 2.

Caution	The maximum specified frequency for a two-channel measurement is 51.2 kHz. Data above 51.2 kHz is not calibrated and is significantly affected by the antialias filter. Published specifications do not apply to 2-channel data above 51.2 kHz.

[A WT FLTR ON OFF] softkey

Key Path: [Input] → [CHANNEL x SETUP]

Enable or disable the hardware A-weight filter for the corresponding input channel.

The A-weight filter is normally used with octave measurements. It simulates the frequency response of the human ear.

You cannot enable the A-weight filter without the antialias filter. Turning on the A-weight filter also turns on the antialias filter; turning off the antialias filter also turns off the A-weight filter.

Note

The A-weight filter conforms to ANSI Standard S1.4-1983 and to IEC 651-1979, Type 0 Tolerance.

See also: [ANTIALIAS ON OFF] softkey, [OCTAVE ANALYSIS] softkey

[ABORT CAPTURE] softkey

Key Path: [Inst Mode] → [CAPTURE SETUP]

Stop the time capture process. Data already in the time capture buffer is retained. The actual amount of data will be less than the specified [CAPTURE LENGTH].

See also: [CAPTURE LENGTH] softkey

[ABORT FIT] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [CURVE FIT]

Stop a curve fit operation in process. Trace B displays the last results of the computation.

Caution

The pole and zero values for the current estimate are lost when you press [ABORT FIT]. The table is empty or contains the values from the previous curve fit operation.

[ABORT HP-IB] softkey

Key Path: [Local/HP-IB]

Halt any HP-IB activity initiated by the analyzer.

[ABORT PLOT/PRNT] softkey

Key Path: [Plot/Print]

Stop the current plot or print operation before it is completed.

[ACCEPT TIME REC] softkey

Key Path: [Avg] → [PREVIEW SETUP]

Include the last time record in the measurement data.

When manual preview or timed preview is on, you can decide which data should be included in the measurement results.

After each time record is collected, it is displayed. You must either accept or reject the time record for both channels. That is, you cannot accept the time record for one channel and reject it for the other channel.

When you accept a time record, the analyzer returns to the data displayed before the time record was collected. If the data displayed uses the time record you accepted, the analyzer incorporates the time record and updates the display.

See also: [TIMED PREVIEW] softkey, [MANUAL PREVIEW] softkey

[Active Trace] hardkey

Toggle the active trace between trace A and trace B.

The analyzer has two independent display buffers for trace data: trace A and trace B. The [Active Trace] hardkey toggles between these two buffers, making one active and the other inactive, so you can modify them separately.

With a few exceptions, the softkeys under the [Meas Data], [Trace Coord], [Scale], [Input], [Marker], and [Marker Fctn] hardkeys affect only the active trace.

When you use a two-trace format, annotation fonts and trace line types indicate which trace is active. The active trace uses a plain font and a solid line. The inactive trace uses a ghosted font. For a front/back display, the inactive trace uses a dotted line

See also: Fonts

[ADD VALUE] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [**Analys**] → [CURVE FIT] → [EDIT TABLE]
   or: [**Analys**] → [SYNTHESIS] → [EDIT TABLE]

Add an entry to the curve fit or synthesis table. Enter the new value as follows:

1. Type the real part first, including an exponent if required.

2. If the entry is real, go to step 3. If the entry is complex, press [+ j], then type the imaginary part.

3. Press the appropriate unit key ([kHz], [Hz], or [mHz]) for poles and zeros. For other entries, press [ENTER]. This terminates editing and puts the new entry in the table.

Note	The analyzer requires that complex entries be conjugate pairs for poles and zeros. When you include "+ j" in the entry, the analyzer interprets the complex entry as a conjugate pair.

Note	Residues are also interpreted as conjugate pairs. The sign of the residue imaginary value is significant. Because each residue entry is associated with the pole entry in the same row, the sign indicates which complex residue from the pair is associated with each complex pole.

Added terms are tagged as fixed when you edit a curve fit table.

See also: [FIX VALUE TOGGLE] softkey

[ADDRESSBL ONLY] softkey

See Controller capability softkey group.

[ALL] softkey

See [PLOT DATA SELECT] softkey.

[ALLOCATE CAPTURE] softkey

Key Path: [Inst Mode] → [CAPTURE SETUP]

Force the immediate memory allocation of the time capture buffer based on the defined
[CAPTURE LENGTH], number of channels, and the frequency span.

The analyzer asks you for confirmation before it performs the allocation.

If there is not enough memory for the specified time length, the analyzer allocates as much memory
as possible and displays an error message.

Note   Some instrument modes require more memory than others. For example, FFT
analysis requires more memory than octave analysis. If you allocate the maximum
size for the capture buffer in the octave mode, you may not have enough memory to
run FFT analysis on the captured data.

See also: [CAPTURE LENGTH] softkey

Alpha entry menu

The alpha entry menu and its submenus provide access to special characters and string editing
functions when the analyzer is in the alpha entry mode.

- [ENTER] accepts the current string and exits the alpha entry mode.
- [INSERT SPACE] inserts a space before the cursor.
- [DELETE CHARACTER] deletes the character under the cursor.
- [UPPERCASE lowercase] specifies whether alpha characters (entered by pressing redefined
  hardkeys) should be uppercase (A-Z) or lowercase (a-z).
- The [MORECHARS] softkeys allow you to insert special characters before the cursor.
- [CLEAR ENTRY] deletes the string, but does not exit alpha entry.
- [CANCEL/RETURN] abandons the string and exits alpha entry.

See also: Alpha entry mode

Alpha entry mode

Some analyzer keys ask you to enter a text string. When you press one of these keys, the analyzer enters alpha entry mode and remains there until you accept or abandon the string using the alpha entry menu.

An entry window replaces the mini-state at the top of the screen. The window may include a default entry. You can use the default entry by pressing [ENTER] or delete the default entry by pressing [CLEAR ENTRY].

Most hardkeys are redefined as alpha characters when the analyzer is in alpha entry mode. Engraved letters, adjacent to the lower right corners of these keys, tell you which characters they will insert in a string.

The [+/ –] hardkey inserts a minus (or dash) in the string rather than toggling a number between positive and negative values.

The [**Help**], [**Preset**], number, decimal point, and [**Back Space**] hardkeys are not redefined.

Hint: Use the knob to move the text cursor to the right or left when you edit a string.

See also: Knob, Alpha entry menu

[ALPHA PEN] softkey

Key Path: [**Plot/Print**] → [PLOT PEN SETUP]

Specify which plotter pen should be used for plotting the instrument state and the disk catalog.

When you plot a trace, the alpha pen is used for the state information (at the top of the screen) and for any status or error information.

[AMPLITUDE PEAK RMS] softkey

Key Path: [**Trace Coord**] → [Y UNITS]

Specify whether amplitude is displayed in peak or rms units.

[Analys] hardkey

Access the following analysis tools:

- Define math functions and constants.
- Limit test.
- Curve fit (Option 1D3).
- Synthesis (Option 1D3).
- Data edit.

See also: [DATA EDIT] softkey, [SYNTHESIS] softkey, [CURVE FIT] softkey, [LIMIT TEST] softkey,
[DEFINE CONSTANT] softkey, [DEFINE FUNCTION] softkey

[ANALYSIS REGION] softkeys

Key Path: [Inst Mode] → [CAPTURE SETUP]

Specify the portion of the time capture buffer data to be used for a measurement. You can specify a start time and stop time for each channel individually. The start time and stop time are referenced to the beginning of the capture buffer. If the data is triggered, the times are referenced to the trigger point.

You can examine the capture buffer by selecting [CAPTURE CHANNEL 1] or [CAPTURE CHANNEL 2] under [Meas Data]. Use the axis scale markers to look at the data more closely and identify the start and stop times for the data of interest.

See also: [AXES SCAL MARKERS] softkey, [STOP TIME CHANNEL x] softkey, [STRT TIME CHANNEL x] softkey

[ANALYZER ADDRESS] softkey

Key Path: [Local/HP-IB]

Change the analyzer's HP-IB address. An entry window is displayed so you can enter the new address.

Limits: integers 0 through 30   Default: 11

Note	The analyzer's address is saved in non-volatile memory, so it is retained when you turn the analyzer off and on.

[ANTIALIAS ON OFF] softkey

Key Path: [Input] → [CHANNEL x SETUP]

Enable or disable the antialias filter for the corresponding input channel.

The default is enabled (on) for all measurements except histogram. You cannot turn on the antialias filters for histogram measurements.

The analyzer always applies dc offset correction, regardless of the status of the antialias filters.

The analyzer corrects frequency domain data (magnitude and phase) for front end and digital flatness only when the antialias filter is on.

Caution   If the antialias filter is off, published specifications for the analyzer are not guaranteed.

[ARB SRC SETUP] softkey

(Available only with option 1D4, Arbitrary Source)

Key Path: [Source]

Turn repeat on or off and specify which data register should be used to drive the source output. These setups are used when the source type is set to [ARBITRARY (D1-D8)].

See also: [ARBITRARY (D1-D8)] softkey, [DATA REG Dx] softkey, [REPEAT ON OFF] softkey (source)

[ARBITRARY (D1-D8)] softkey

(Available only with option 1D4, Arbitrary Source)

Key Path: [Source]

Specify that the source output be driven by one of the data registers. The register must contain time domain data.

You can specify which data register should be used by pressing [ARB SRC SETUP] → [DATA REG Dx].

The analyzer scales the data so that its peak voltage corresponds to the current source level in Vpk. Then the analyzer outputs the scaled signal to the source connector.

See also: [DATA REG Dx] softkey

[ARM SETUP] softkey

Key Path: [Trigger]

Set up the arm parameters. The arm options are as follows (some instrument modes do not allow all arming options):

- Automatic arm.
- Manual arm.
- rpm step arm.
- Time step arm.

From this menu you also set up the following arm parameters:

- Start rpm usage.
- Start rpm.
- rpm step size.
- Time step size.
- Number of steps.

For more information on arming and triggering, see the analyzer's *Concepts Guide.*

See also: [WATERFALL STEPS] softkey, [TIME STEP SIZE] softkey, [START RPM USAGE] softkeys,
[START RPM] softkey, [TIME STEP ARM] softkey, [RPM STEP SIZE] softkey,
[RPM STEP ARM] softkey, [MANUAL ARM] softkey, [AUTOMATIC ARM] softkey

[ARM] softkey

Key Path: [Trigger]

Arm the analyzer's trigger—this applies only when you've selected manual arming. After arming, the analyzer makes a measurement when the trigger conditions are met.

Note   You must press [ARM] again for each subsequent measurement.

For more information on arming and triggering, see the analyzer's *Concepts Guide.*

See also: [MANUAL ARM] softkey

Arrow keys

Like the knob, you can use the arrow keys, [↑] and [↓], to step through larger or smaller numeric entries. Press the up arrow key to step through increasingly larger numeric entries—for example, to raise the current center frequency). Press the down arrow key to step through increasingly smaller numeric entries—for example, to lower the current center frequency.

You can use the arrow keys to modify a numeric entry at any time—unlike the knob, which you can use for numeric entry only after pressing a softkey to activate the numeric entry mode.

And like the knob, the analyzer uses the same default step size to control the "sensitivity" of the arrow keys—that is, the interval between each numeric entry as you press an arrow key.

You can select your own "step size" for frequency entries. Press [Freq] → and [ENTRY STEP SIZE]. Then use the numeric keypad to enter your own step size.

See also: [ENTRY STEP SIZE] softkey

[AUTO CAL ON OFF] softkey

Key Path: [System Utility] → [CALIBRATN]

Enable or disable the analyzer's autocalibration function (autocal).

Calibration is done for all amplitude ranges and all frequencies regardless of instrument setup.

Note   Autocal is enabled automatically whenever you turn the analyzer on or press the [Preset] hardkey.

When autocal is enabled, the analyzer automatically calibrates several times during the first two hours of operation. Subsequently, it automatically calibrates at intervals of 2 hours 20 minutes. When autocal is disabled, the analyzer only calibrates when you press [SINGLE CAL].

During calibration a small ac voltage (around 2 mV) appears at the source output connector.

Note   If a calibration occurs while a measurement is paused, the analyzer will start a new measurement when you press [Pause/Cont]. This prevents a measurement using two different sets of calibration data.

For more information on calibration, see the analyzer's *Service Guide*.

See also: [Pause/Cont] hardkey

[AUTO CORR CHANNEL x] softkey

Key Path: [**Meas Data**]

Display the most recent autocorrelation for the specified channel.

Auto correlation displays the similarity between a signal and a time-shifted version of itself. Auto correlation is calculated by multiplying the signal by its time-shifted version and summing over all points. The result is plotted as a function of the time shift value.

Autocorrelation is useful for detecting echoes in a signal. Each echo shows up as a separate peak in the display. The width of each peak is inversely proportional to the bandwidth of the signal. For example, random noise produces a very narrow peak.

This function is also useful for isolating low-level periodic signals from noise. A sine wave signal shows up as a sine wave in autocorrelation. A square wave signals shows up as a triangular wave of the same frequency.

The autocorrelation computation depends on the type of averaging selected.

Average Type		Autocorrelation Computation
Average off	:	IFFT (FFT (time) * conj (FFT (wtime)))
rms	:	IFFT (sum (FFT (time) * conj (FFT (wtime)))) / N
rms exponential	:	IFFT (xavg (FFT (time) * conj (FFT (wtime))))
Vector	:	IFFT (sum (FFT(time)) * conj (sum (FFT (wtime)))) / N
Vector exponential	:	IFFT (xavg(FFT(time)) * conj (xavg(FFT (wtime))))

where: time	=	time for associated channel
wtime	=	time with weighting function applied
N	=	number of averages
xavg	=	(1/N) * new + ((N—1)/N) * old

See also: [**Window**] hardkey, [NUMBER AVERAGES] softkey, [TIME CHANNEL x] softkey, [VECTOR EXPONENTL] softkey, [VECTOR] softkey, [RMS EXPONENTL] softkey, [RMS] softkey

[AUTO MEMORY] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC] → [UTILITIES]

Automatically allocate stack space for your program.

Hint: If you press [MEMORY SIZE], the value displayed in the resulting entry window tells you how many bytes of volatile RAM was allocated.

[AUTO MEMORY] provides a convenient way to allocate stack space for programs you develop in the analyzer or load via the HP-IB. If the automatically-set value is not adequate, use [MEMORY SIZE] to change it.

Note   If you see the message "ERROR 2 Memory overflow" while your program is running, you need to allocate more stack space or increase the memory available by removing such things as time capture data and waterfall registers. The keys are under [**System Utility**] → [MEMORY USAGE].

See also: [MEMORY SIZE] softkey

[AUTO RES ON OFF] softkey

(Available only with option 1D2, Swept Sine)

Key Path: [Freq] → [RESOLUTN SETUP]

Turn autoresolution on or off for a swept sine measurement.

If autoresolution is off, the frequency spacing between measurement points is determined by the sweep resolution and does not change during the sweep.

If autoresolution is on, the analyzer adjusts the frequency spacing between measurement points to finer or coarser steps to accommodate varying response changes. This allows you to make faster measurements without missing critical information.

At each frequency point, the analyzer compares the frequency response to the frequency response at the previous frequency point. The analyzer uses this comparison to determine the size of the next step, as follows:

- If the transfer function change is small, the step size increases.

- If the transfer function change is large but less than ([MAXIMUM % CHANGE] times the square root of 2), the step size decreases.

- If the transfer function change is greater than ([MAXIMUM % CHANGE] times the square root of 2), the measurement backs up and takes the measurement again at a frequency closer to the previous measurement frequency.

The analyzer will not use frequency step sizes smaller than the [MINIMUM RESOLUTN] you specify.

See also: [MINIMUM RESOLUTN] softkey, [MAXIMUM % CHANGE] softkey, [RESOLUTN] softkey, [SWEPT SINE] softkey

[AUTOLEVEL ON OFF] softkey

(Available only with option 1D2, Swept Sine)

Key Path: [Source]

Turn autoleveling on or off. The active selection is highlighted. Autoleveling is available only for swept sine measurements.

The autolevel feature allows the analyzer to adjust the source output level to keep the amplitude of one input channel within a specified range. You can also specify a maximum source level and a maximum input level for the other input channel.

When autolevel is off, the source has a constant amplitude (level) at all measurement points.

When autolevel is on, the amplitude at the measurement frequency is monitored. At each measurement point, the analyzer adjusts the source amplitude until the reference channel amplitude is within a specified tolerance band around the reference level.

See also: [REFERENCE LEVEL] softkey, [MAX INPUT LEVEL] softkey, [MAX SRC LEVEL] softkey,
[REFERENCE TOLERANCE] softkey, [REF CHAN CH1 CH2] softkey, [SWEPT SINE] softkey

[AUTOLEVEL SETUP] softkey

(Available only with option 1D2, Swept Sine)

Key Path: [Source]

Set up the following autolevel parameters for a swept sine measurement:
- Reference channel.
- Reference level.
- Reference tolerance.
- Maximum source output.
- Maximum input level.

The analyzer uses these parameters when you turn on autoleveling.

See also: [AUTOLEVEL ON OFF] softkey, [MAX INPUT LEVEL] softkey, [MAX SRC LEVEL] softkey,
[REF CHAN CH1 CH2] softkey, [REFERENCE LEVEL] softkey, [REFERENCE TOLERANCE] softkey,
[SWEPT SINE] softkey

[AUTOMATIC ARM] softkey

Key Path: [Trigger]
  or: [Trigger] → [ARM SETUP]

Select automatic trigger arming. This means the analyzer will make a measurement as soon as it receives an appropriate trigger signal. After making the measurement, the analyzer automatically rearms the trigger and will make another measurement when triggered again.

Histogram measurements are only armed and triggered once. The measurement runs for the specified [HISTOGRAM LENGTH] and stops.

If you've just turned on the analyzer (or pressed [Preset]), automatic arming will be selected already.

For more information on arming and triggering, see the analyzer's *Concepts Guide.*

See also: [HISTOGRAM LENGTH] softkey, Time record

[AUTOSCALE ON OFF] softkey

Key Path: [Scale]

Turn autoscaling on or off for the active trace. With autoscaling on, the analyzer will vertically scale the active trace to best fit the trace box each time the display updates.

Note   Autoscaling can affect a waterfall display. If the scale changes, the analyzer clears the waterfall display and displays the next traces using the new scale. This affects only the display, not the measurement. The cleared traces are still kept in the waterfall buffer.

See also: [WATERFALL] softkey, Trace boxes, [Active Trace] hardkey

[AVERAGE ON OFF] softkey

Key Path: [Avg]

Turn averaging on or off.

If a measurement is running when you turn on averaging, the analyzer begins an averaged measurement right away, without waiting for you to press [Start].

When you turn averaging off, the analyzer begins an unaveraged measurement.

[AVERAGE TIME] softkey

(Available only with option 1D1, Real Time Octave)

Key Path: [Avg]

Specify the time over which you want to average for octave measurements.

Limits and default vary depending on the stop frequency, number of channels, hold setup, and octave type (1/12, 1/3, or full octave). For example, for 2-channel octave analysis with max hold average, the average time cannot be less than 250 ms.

The analyzer uses your specified average time as follows for each average type:

- Linear: linear integration time.

- Exponential: time constant.

- Equal confidence: not used; average time varies.

- Peak hold: integration time over which to hold peaks (with repeat off).

See [REPEAT ON OFF] for more information on how that parameter affects linear and peak hold averaging.

See also:　[HOLD SETUP] softkeys, [STOP] softkey (octave frequency),
　　　　　[REPEAT ON OFF] softkey (octave), [PEAK HOLD] softkey (octave), [EQUAL CONFID] softkey,
　　　　　[EXPONENTL] softkey, [STABLE] softkey, [OCTAVE ANALYSIS] softkey

[AVERAGE TYPE] softkey (Correlation)

Key Path: [Avg]

Specify the kind of averaging the analyzer should perform for correlation analysis.

- rms averaging.
- rms exponential averaging.
- Vector averaging.
- Vector exponential averaging.

See also: [VECTOR EXPONENTL] softkey, [VECTOR] softkey, [RMS EXPONENTL] softkey, [RMS] softkey

[AVERAGE TYPE] softkey (FFT analysis)

Key Path: [Avg]

Specify the kind of averaging the analyzer should perform for FFT analysis.

- rms averaging.
- rms exponential averaging.
- Vector averaging.
- Vector exponential averaging.
- Peak hold averaging.

See also: [PEAK HOLD] softkey, [VECTOR EXPONENTL] softkey, [VECTOR] softkey,
[RMS EXPONENTL] softkey, [RMS] softkey

[Avg] hardkey

Select averaging appropriate for the type of measurement you want to make. The types of averaging available depend on the instrument mode selected.

For information on averaging for each instrument mode, see the following topics:

- FFT averaging.
- Octave averaging.
- Order averaging.
- Swept sine averaging.
- Correlation averaging.
- Histogram averaging.

See also: [Inst Mode] hardkey, Histogram averaging, Correlation averaging, Swept sine averaging,
Order averaging, Octave averaging, FFT averaging

[AWEIGHT()] softkey

Key Path: [**Analys**] → [DEFINE FUNCTION] → [DEFINE Fx] → [OPERATION]

Apply A-weight filtering to the operand. The argument must be frequency or octave domain data.

[AXES SCAL MARKERS] softkey

Key Path: [**Scale**]

Scale the trace using special markers.

- Specify X-axis or Y-axis scaling.
- Move markers using the knob or numeric entry keys.
- Return to a full-span display.
- Expand the band identified by the markers to fill the display.
- Specify which of the markers should hold its position and which should move.

Note

When you enter a value for the Y-axis, you cannot enter units. The analyzer uses the currently-displayed Y-axis units.

You can use the [EXP] key to enter units in engineering notation. For example, to enter 15 mV, press the following key sequence:

[1] [5] [EXP] [+/−] [3] [ENTER]

The following table explains how the hold keys work.

Pressing this key:	Holds this:	Lets you change:
Hold Right	Right value	Left value
Hold Top	Top value	Bottom value
Hold Center	Center value	Width (distance between markers)
Hold Left	Left value	Right value
Hold Bottom	Bottom value	Top value
Hold Wdth (Scroll)	Width (distance between markers)	Center value

See also: [HOLD BOTTOM] softkey, [HOLD LEFT] softkey, [HOLD CENTER] softkey, [HOLD TOP] softkey, [HOLD RIGHT] softkey, [HOLD WDTH (SCROLL)] softkey, [FULL SCALE] softkey, [AXIS X Y] softkey

[AXIS X Y] softkey

Key Path: [Scale] → [AXES SCAL MARKERS]

Specify whether the axis scale markers apply for the X-axis or the Y-axis.

See also: [AXES SCAL MARKERS] softkey

[Back Space] hardkey

Use [Back Space] to correct mistakes in the following situations:

- When entering or editing a text string: Press [Back Space] to delete the character to the left of the cursor.

- When entering a number: Press [Back Space] to delete the last digit of the number.

- When defining a math function: Press [Back Space] to delete the last operator or operand in the definition.

[BAND CENTER] softkey

Key Path: [Marker Fctn] → [BAND MARKER]

Define the center X-axis value for the band within which you want the analyzer to calculate power.

This also anchors the band center X value, so that when you change the band span the band start and stop X values change.

[BAND MARKER] softkey

Key Path: [Marker Fctn]

Turn on and set up band markers. You can use band markers to define an X-axis band and then calculate the power within this band. From the band marker menu you can do the following things:

- Specify the band.
- Turn off computation.
- Display band power.
- Display rms square root power.

See also: [RMS SQRT (PWR)] softkey, [COMPUTE OFF] softkey, [BAND POWER] softkey, [BAND SPAN] softkey

[BAND POWER] softkey

Key Path: [**Marker Fctn**] → [BAND MARKER]

Compute and display the band power. The value is displayed in the lower left corner of the trace box.

For linear spectra, power spectra, or time domain measurement data, band power is the total power within the specified band. The value will be given in dBVrms or Vrms ^{2}, depending on the current trace coordinate. For all other measurement data, the analyzer simply sums the magnitudes of the points within the band and displays the result in the current Y-axis units.

The band power calculation compensates for the effect of a Hanning or Flat Top window. The correction differs depending on whether the band contains multiple points or just a single point. For this reason, the power in a band containing multiple points will differ from the sum of the power at each point computed separately.

See also: [**Trace Coord**] hardkey

[BAND SPAN] softkey

Key Path: [**Marker Fctn**] → [BAND MARKER]

Define the X-axis span for the band within which you want the analyzer to calculate power.

If the band start is anchored, the band center and band stop change to reflect the new span. If the band center is anchored, the band start and band stop X values change. A box around the [BAND START] or [BAND CENTER] softkey indicates which is anchored.

See also: [BAND STOP] softkey, [BAND CENTER] softkey, [BAND START] softkey

[BAND START] softkey

Key Path: [**Marker Fctn**] → [BAND MARKER]

Define the left (lower) X-axis value for the band within which you want the analyzer to calculate power. The first data point included in the band will be the one whose X value is closest to the band start value.

For example, suppose that one data point has an X value of 10 Hz, the next point is at 15 Hz, and the band start value is 12 Hz. In this case, the point at 10 Hz will be the first point in the band. If the band start value were 13 Hz, the point at 15 Hz would be the first point in the band.

Pressing this key also anchors the band start position, so that when you change the band stop position or span, the band start remains fixed.

[BAND STOP] softkey

Key Path: [**Marker Fctn**] → [BAND MARKER]

Define the left (lower) X-axis value for the band within which you want the analyzer to calculate power. The last data point included in the band will be the one whose X value is closest to the band stop value.

For example, suppose that one data point has an X value of 10 Hz, the next point is at 15 Hz, and the band stop value is 12 Hz. In this case, the point at 10 Hz will be the last point in the band. If the band stop value were 13 Hz, the point at 15 Hz would be the last point in the band.

If the band start position is anchored, changing the band stop position will also change the center and span values. If instead the band center position is anchored, the start position and span will change.

[BASELINE SUPPRESS] softkey

Key Path: [**Disp Format**] → [WATERFALL SETUP]
    or: [**Marker Fctn**] → [WATERFALL MARKERS] → [WATERFALL SETUP]

Specify a percentage of the waterfall traces to be suppressed in the display. The analyzer does not display this percentage of the bottom of each trace. This is useful for removing noise floor clutter from the display.

Limits: 0 to 100%   Default: 0%

For example, if you set baseline suppress to 10%, the lower 10% of each trace is not displayed. If the Y-axis scale is from –100 dB to 0 dB, only amplitudes above –90 db are displayed.

If you set baseline suppress to 0%, the analyzer displays the full trace.

See also: [WATERFALL] softkey

[BASIC] hardkey

Access the HP Instrument BASIC softkeys (except those used to save and recall a program).

If your analyzer does not have HP Instrument BASIC (option 1C2), the analyzer displays an error message when you press this key.

Note

HP Instrument BASIC allows you to automatically load and run a designated program when you turn on the analyzer. To make an autoloading program, save it with the file name "AUTO_BAS" in non-volatile memory or on a floppy disk in the internal drive.

At power-up, and analyzer searches first on the internal disk drive and then the non-volatile drive for the file "AUTO_BAS." If the file is found, HP Instrument BASIC loads and executes the program immediately.

If you do not want to load the AUTO_BAS program when you turn on the analyzer, hold down the [Preset] key while you turn on the analyzer.

[BASIC] has a special purpose in each of the following situations:

- HP Instrument BASIC's keystroke recording feature is enabled. In this situation, you can press [BASIC] to end the current recording session.

- An HP Instrument BASIC program is running. In this situation, you can press [BASIC] to pause the program. (You can also stop a program in other ways.)

For detailed information on HP Instrument BASIC, see the *Using HP Instrument BASIC with the HP 35665A* or *HP Instrument BASIC User's Handbook* manuals.

See also: Stopping a program

[BEEPER ON OFF] softkey

Key Path: [System Utility]

Turn on or off the analyzer's beeper.

The beeper sounds when some messages are displayed. Also, if [FAIL BEEP ON OFF] is ON during limit testing, the beeper sounds when a trace falls outside the specified limits.

See also: [FAIL BEEP ON OFF] softkey

Bins defined

Each trace is divided along its X-axis into a number of evenly-spaced lines. Each line is called a "bin." These bins determine the resolution of the analyzer's X-axis. The number of bins depends on the resolution (number of lines) and the type of data displayed.

The following table shows the number of bins for frequency domain and time domain data from an FFT measurement.

Resolution versus bins

Resolution	Baseband (Start freq = 0)		Zoom (Start freq ≠ 0)	
	Frequency domain (complex points)	Time domain (real points)	Frequency domain (complex points)	Time domain (real points)
100	101	256	100	128
200	201	512	200	256
400	401	1024	400	512
800	801	2048	800	1024

For an octave measurement, each bin is either 1/12 octave, 1/3 octave, or 1 octave wide, depending the current selection under the [Freq] hardkey.

The following description is for frequency domain data.

Each bin has a nominal value. This is the value used for the marker's X-axis readout. For frequency domain data, the nominal value of the first bin (bin 0) is the start frequency. The nominal value of the last bin is the stop frequency.

Each frequency bin represents a band of frequencies, not just the nominal value. The amplitude of the bin is the total power in the band. The width of this band is related to the current frequency span and the number of lines of resolution:

bin bandwidth = span / number of lines

For FFT measurements, a frequency bin represents all frequencies between (NF − 1/2 BBW) and (NF + 1/2 BBW), where NF is the nominal frequency and BBW is the bin bandwidth.

The following table shows the relationship between frequency span, number of lines, and bin
bandwidth (in Hz) for FFT measurement data.

Bin Bandwidths

Span	Resolution (Number of Lines)			
	100	200	400	800
97.65625 uHz	976.6 uHz	488.3 uHz	244.1 uHz	122.1 uHz
195.31 mHz	1.9 mHz	976.6 uHz	488.3 uHz	244.1 uHz
390.625 mHz	3.9 mHz	1.9 mHz	976.6 uHz	488.3 uHz
781.25 mHz	7.8 mHz	3.9 mHz	1.9 mHz	976.6 uHz
1.5625 Hz	15.6 mHz	7.8 mHz	3.9 mHz	1.9 mHz
3.125 Hz	31.3 mHz	15.6 mHz	7.8 mHz	3.9 mHz
6.25 Hz	62.5 mHz	31.3 mHz	15.6 mHz	7.8 mHz
12.5 Hz	125 mHz	62.5 mHz	31.3 mHz	15.6 mHz
25 Hz	250 mHz	125 mHz	62.5 mHz	31.3 mHz
50 Hz	500 mHz	250 mHz	125 mHz	6.3 mHz
100 Hz	1 Hz	500 mHz	250 mHz	125 mHz
200 Hz	2 Hz	1 Hz	500 mHz	250 mHz
400 Hz	4 Hz	2 Hz	1 Hz	500 mHz
800 Hz	8 Hz	4 Hz	2 Hz	1 Hz
1.6 kHz	16 Hz	8 Hz	4 Hz	2 Hz
3.2 kHz	32 Hz	16 Hz	8 Hz	4 Hz
6.4 kHz	64 Hz	32 Hz	16 Hz	8 Hz
12.8 kHz	128 Hz	64 Hz	32 Hz	16 Hz
25.6 kHz	256 Hz	128 Hz	64 Hz	32 Hz
51.2 kHz	512 Hz	256 Hz	128 Hz	64 Hz
102.4 kHz	1024 Hz	512 Hz	256 Hz	128 Hz

See also: [RESOLUTN (LINES)] softkey, [STOP] softkey (frequency), [START] softkey (frequency),
[SPAN] softkey (frequency)

[BLANK ANNOTATN] softkey

Key Path: [Disp Format] → [MORE]

Turn off the trace annotation.

Each trace box is surrounded by fields that define the trace within that box. These fields are collectively referred to as "trace annotation."

When trace annotation is turned off, trace information is not displayed on the screen and it is not printed or plotted.

Note

You must preset the analyzer to turn on blanked annotation from the front panel. You must send DISP:ANN ON over the HP-IB to turn on blanked annotation without presetting.

See also: Trace boxes

[BLANK DISPLAY] softkey

Key Path: [Disp Format] → [MORE]

Blank (turn off) all information on the analyzer's screen except the softkey labels.

When the screen is blanked, the message "DISPLAY BLANKING ON" replaces all other information. Only this message is plotted or printed.

Caution

You must preset the analyzer (or cycle power) to turn on a blanked screen from the front panel. You must send DISP:ENAB ON over the HP-IB to turn on a blanked screen without presetting.

[BODE DIAGRAM] softkey

Key Path: [Disp Format]

Display a Bode diagram. For a transfer function, a Bode diagram is a plot of log gain and phase vs. log frequency. This display mode is available only for FFT analysis and swept sine.

When you select the Bode diagram display format, the following changes are made in the display:

- The measurement data for traces A and B is changed to frequency response.

- The trace coordinate for trace A is changed to dB magnitude.

- The trace coordinate for trace B is changed to phase.

- The X-axis scale is changed to log.

- Markers are enabled and coupled.

Note   To change the X-axis back to linear spacing, press the following keys:
[Trace Coord] → [X-AXIS LIN LOG].

See also: [FFT ANALYSIS] softkey, [SWEPT SINE] softkey, [X-AXIS LIN LOG] softkey (trace coord), [COUPLED ON OFF] softkey, [Trace Coord] hardkey, [Meas Data] hardkey

[BOTTOM REFERENCE] softkey

Key Path: [Scale]

Select a reference value for the bottom of the scale. Then use the appropriate softkeys and the numeric keypad to enter this value. When you change the [Y PER DIV] value, the bottom of the scale remains fixed and the top changes.

The ratio between the reference value and the [Y PER DIV] value cannot be greater than 1e15.

Note

When you enter a value for the Y-axis, you cannot enter units. The analyzer uses the currently-displayed Y-axis units.

You can use the [EXP] key to enter units in engineering notation. For example, to enter 15 mV, press the following key sequence:

[1] [5] [EXP] [+/−] [3] [ENTER]

See also: [Y PER DIV (DECADES)] softkey

[BURST CHIRP] softkey

Key Path: [Source]

Select the burst chirp waveform. Chirp is a fast sine sweep across the current frequency span that repeats with the same period as the time record.

Burst chirp allows you to specify the percentage of the time record that the source is active. The analyzer rounds your entry to the closest valid value.

Limits: 0% to 100%   Default: 50%

Note	The analyzer uses the same burst percentage for burst random and burst chirp. If you change the percentage for one burst waveform, the analyzer also changes the percentage for the other burst waveform.

Because the burst chirp output is periodic, it's best to use the Uniform window when making measurements using this waveform. Also, source triggering is recommended for burst source outputs.

In time capture mode with source triggering, the source outputs a single burst at the beginning of the capture rather than a burst for each time record. With input triggering, the source outputs a burst at the trigger time.

The timing of the source output is slightly different in different trigger modes. In source trigger mode, the output begins at trigger time. In external trigger, HP-IB trigger, or input trigger modes, the output will be delayed slightly (less than 30 usec).

See also: [CHANNEL x TRIGGER] softkey, [START CAPTURE] softkey, [SOURCE TRIGGER] softkey, [UNIFORM] softkey, Time record

[BURST RANDOM] softkey

Key Path: [Source]

Select the burst random waveform. In this mode, the source outputs a random noise waveform during the specified percentage of the time record and nothing during the remainder of the record.

You can specify the percentage of the time record by pressing [BURST RANDOM] and entering the percent from the numeric keys. The analyzer rounds your entry to the closest valid value.

Limits: 0% to 100%   Default: 50%

Note

The analyzer uses the same burst percentage for burst random and burst chirp. If you change the percentage for one burst waveform, the analyzer also changes the percentage for the other burst waveform.

Because the burst random output is periodic, it's best to use the Uniform window when making measurements using this waveform. Also, source triggering is recommended for burst source outputs.

The timing of the source output is slightly different in different trigger modes. In source trigger mode, the output begins at trigger time. In external trigger, HP-IB trigger, or input trigger modes, the output will be delayed slightly (less than 30 usec).

The bandwidth of burst random noise is set so that most of the energy in the source signal is within the measured span.

In time capture mode with source triggering, the source outputs a single burst at the beginning of the capture rather than a burst for each time record. With input triggering, the source outputs a burst at the trigger time.

See also: [CHANNEL x TRIGGER] softkey, [START CAPTURE] softkey, [SOURCE TRIGGER] softkey, [UNIFORM] softkey, Time record

[BWEIGHT(] softkey

Key Path: [Analys] → [DEFINE FUNCTION] → [DEFINE Fx] → [OPERATION]

Apply B-weight filtering to the operand. The argument must be frequency or octave domain data.

[CAL CONST ON OFF] softkey

Key Path: [System Utility] → [SERVICE TESTS] → [SPCL TEST MODES] → [MORE SPCL MODES]

Turn on an off the use of calibration constant.

If cal const is on, the analyzer uses the results of the last calibration cycle as correction for measurement data. If cal const is off, the analyzer saves the calibration results but does not apply the correction to measurement data.

Caution   If you turn cal const off, correction is not applied to the measured data and published specifications are not guaranteed.

See also: [AUTO CAL ON OFF] softkey

[CALIBRATN] softkey

Key Path: [System Utility]

Access the calibration utilities:

- Single calibration.
- Turn autocalibration on or off.
- Save the calibration trace for either channel to a data register.

For more information on calibration, see the analyzer's *Service Guide*.

See also: [SAVE CHx CAL TRACE] softkey, [AUTO CAL ON OFF] softkey, [SINGLE CAL] softkey

[CAPTURE CHANNEL x] softkey

Key Path: [**Meas Data**]
  or: [**Meas Data**] → [MORE]

Display the contents of the time capture buffer for the specified channel.

If the capture buffer contains more than one record (1024 points), the analyzer samples the data based on the X-axis scale and displays the sampled data. Information that falls between the sampled points (such as transients) is not displayed.

If you want to look at more of the points in the buffer, you can scale the X-axis as follows:

1. Press [**Scale**] → [AXES SCAL MARKERS].

2. Press [HOLD CENTER] and turn the knob to adjust the distance between markers.

3. Press [HOLD WDTH (SCROLL)] → [SCALE AT MARKERS].

4. Turn the knob to scroll through the captured data.

If you want to zoom in more on the data, repeat from [HOLD CENTER].

[CAPTURE HEADER] softkey

Key Path: [**Inst Mode**] → [CAPTURE SETUP]

Display the following header information for the time capture buffer:
- Length, both in seconds and number of 1024-point records.
- File size (in bytes).
- Number of channels.
- Start, stop, center, and span frequencies.
- Record length.
- Delta T.
- Input setup information for the active channel or channels.
- Tach data setting. If tach data is on (or the instrument mode is order analysis) and tach data present, the following information is also displayed:
  - rpm at beginning of capture data (not the min rpm).
  - rpm at end of capture data (not the max rpm).

The capture header display remains until you press [RETURN].

See also: [TACH DATA ON OFF] softkey

[CAPTURE LENGTH] softkey

Key Path: [**Inst Mode**] → [CAPTURE SETUP]

Specify the length of the time capture buffer. You can specify seconds, number of records, or number of points.

For time capture, a record is always 1024 points. If you set a record length that is not an integral multiple of 1024 points, the analyzer captures the next higher multiple of 1024 point. The mini-state reflects the number you enter, not the larger number that the analyzer uses.

The limits for capture length vary depending on such things as the amount of memory available, the number of channels, and the frequency span.

Memory is not allocated until you press [START CAPTURE] or [ALLOCATE CAPTURE].

To calculate the amount of memory required:

2 bytes per point (2048 bytes per record) per channel
  + 4 bytes per record
  + 5088 bytes 1 channel or 9228 bytes 2 channel for SDF overhead and correction vectors
  + extra for tach data

For example, if you want to capture 10 time records for 1 channel, (tach data off) you need 25608 bytes:

10 records x 2048 bytes/record	=	20480 bytes
10 records x 4 bytes/record	=	40 bytes
5088 bytes overhead	=	5088 bytes
total	=	25608 bytes

[CAPTURE ON OFF] softkey

Key Path: [Inst Mode]

Specify whether measurement data comes from the time capture buffer or the input channels.

When capture is on, the analyzer takes data from the time capture buffer. When capture is off, the analyzer takes data from the input channels.

Note	When you start a measurement with capture on, the analyzer turns off the source. When the measurement is complete, the analyzer returns the source to its original on/off state.

When you start a time capture, the analyzer automatically toggles Capture On Off to On when the capture is complete.

You can select what part of the time capture data should be used for the measurement by specifying a start time and stop time for each channel.

Note	The message "End of CAPTURE data" appears when the analyzer reaches the end of the time capture data. This message also appears if there is no time capture data or the [CAPTURE LENGTH] is less than the [RECORD LENGTH].

See also: [STRT TIME CHANNEL x] softkey, [STOP TIME CHANNEL x] softkey, [CAPTURE LENGTH] softkey, [RECORD LENGTH] softkey

[CAPTURE SETUP] softkey

Key Path: [Inst Mode]

Set up time capture parameters.

Time capture allows you to record real-time data containing frequencies up to 51.2 kHz (2 channel) or 102.4 kHz (1 channel).

The analyzer stores the data to memory. The amount of data you can capture depends on the amount of memory available in your analyzer. To find out how much memory is available, press [System Utility] → [MEMORY USAGE]. You can free up more memory by removing waterfall displays, HP Instrument BASIC programs, and RAM disk from memory.

After the capture is complete, you can save the captured data to disk, using [Save/Recall] → [SAVE DATA] → [SAVE CAPTURE].

You must set up the following parameters *before* capturing data:

- Instrument Mode (you can change this when you analyze the data).
- Number of channels.
- Capture length.
- Tach data on/off.
- Frequency settings.
- Triggering.
- Source (if using internal source).
- Input setup.

You can setup or change the following parameters *after* capturing data:

- Instrument Mode.
- Averaging.
- Windowing.
- Analysis region.
- Resolution.

See also: [Inst Mode] hardkey, [RESOLUTN (LINES)] softkey, [ANALYSIS REGION] softkeys, [Window] hardkey, [Avg] hardkey, [Input] hardkey, [Freq] hardkey, [Source] hardkey, [Trigger] hardkey, [TACH DATA ON OFF] softkey, [CAPTURE LENGTH] softkey, [1 CHANNEL] softkey, [Inst Mode] hardkey, [SAVE CAPTURE] softkey

[CARRIER FREQ] softkey

Key Path: [**Marker Fctn**] → [SIDEBAND MARKER]

Specify the carrier frequency for the sidebands you want to examine. The analyzer needs the carrier frequency to find the appropriate sidebands and to make the sideband marker calculations.

Note	The carrier frequency you specify does not have to be within the current frequency span.

See also: [SIDEBAND MARKER] softkey

[CATALOG ON OFF] softkey

Key Path: [**Save/Recall**]
    or: [**Disk Utility**]

Turn the disk catalog on and off. The catalog describes the contents of the default disk in a tabular format.

The catalog header includes the disk label and the space available The file descriptions include each file's name, size (in bytes), type, and the date and time that each file was last changed. It also indicates if the file is open by an HP Instrument BASIC program (indicated by a " > ") or a LIF protected file (indicated by a " * ").

You can simplify many file operations by turning the catalog on. When the catalog is on, you can select one of the listed files by turning the knob. Then when you request a file operation that asks for a filename, the name of the selected file is automatically placed in the entry window.

The analyzer automatically updates the catalog whenever you perform a save or disk utility operation.

The catalog is turned off automatically when you do any of the following:
- Eject a flexible disk whose catalog is being displayed (for the internal disk drive only).
- Press any hardkey in the MARKER, DISPLAY, or MEASUREMENT group.
- Press any hardkey other than [**Save/Recall**] or [**Disk Utility**] in the SYSTEM group.

See also: [DEFAULT DISK] softkey

[CDF CHANNEL x] softkey

Key Path: [**Meas Data**]

Display the Cumulative Density Function for the specified channel. This shows the probability that a level equal to or less than a specific level occurred. It is computed by integrating the probability density function (PDF).

The analyzer uses the Real Part trace coordinate and scales the Y-axis from 0 to 1 to display CDF.

See also: [PDF CHANNEL x] softkey

[CENTER REFERENCE] softkey

Key Path: [**Scale**]

Select a reference value for the center of the scale. Then use the appropriate softkeys and the numeric keypad to enter this value. When you change the [Y PER DIV] value, the center of the scale remains fixed and the top and bottom change.

The ratio between the reference value and the [Y PER DIV] value cannot be greater than 1e15.

Note

When you enter a value for the Y-axis, you cannot enter units. The analyzer uses the currently-displayed Y-axis units.

You can use the [EXP] key to enter units in engineering notation. For example, to enter 15 mV, press the following key sequence:

[1] [5] [EXP] [+/−] [3] [ENTER]

See also: [Y PER DIV (DECADES)] softkey

[CENTER] softkey (frequency)

Key Path: [Freq]

Specify the center frequency for the frequency band that you want to analyze.

Limits: 98 mHz to 25.6 kHz (2 channel)   Default: 25.6 kHz
           98 mHz to 51.2 kHz (1 channel)   51.2 kHz
(limits depend on the instrument mode and span selected)

This also anchors the center frequency. If you change the span frequency or record length, the center frequency remains constant and the start and stop frequencies change.

The analyzer does not display any frequency data less than 0 Hz. Therefore, if you specify a start value of less than zero, you won't see anything displayed to the left of 0 Hz. Nor does the analyzer display frequency data greater than 115 kHz.

Caution   Although the analyzer will display data up to 115 kHz, the range from 102.4 kHz to 115 kHz is not calibrated and is significantly affected by the antialias filter.

See also: [RECORD LENGTH] softkey, [SPAN] softkey (frequency)

[CENTER] softkey (swept sine frequency)

(Available only with option 1D2, Swept Sine)

Key Path: [Freq]

Specify the center of the band of frequencies to be analyzed for a swept sine measurement.

Limits: 23.438 mHz to (51.2 kHz − 15.625 mHz)
Default: 25.6 kHz

The center frequency will be held constant (and selected as the new anchor for span); start and span will change to appropriate values.

See also: [SWEPT SINE] softkey

[CHANGE VALUE] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [**Analys**] → [CURVE FIT] → [EDIT TABLE]
    or: [**Analys**] → [SYNTHESIS] → [EDIT TABLE]

Modify the value highlighted by the cursor.

When you press a number key, an edit box appears. Type in the new value as follows:

1. Type the real part first, including an exponent if required.

2. If the entry is real, go to step 3. If the entry is complex, press [+ j], then enter the imaginary part.

3. Press the appropriate unit key, [kHz], [Hz], or [mHz]. This terminates editing and puts the modified entry in the table.

Note

The analyzer requires that complex entries be conjugate pairs for poles and zeros. When you include [+ j] in the entry, the analyzer interprets the complex entry as a conjugate pair.

Note

Residues are also interpreted as conjugate pairs. The sign of the residue imaginary value is significant. Because each residue entry is associated with the pole entry in the same row, the sign indicates which complex residue from the pair is associated with each complex pole.

Changing numeric parameters

You can change the value of numeric parameters in the following ways:

- Enter a value using the number keys.
- Step the current value up or down using the arrow keys.
- Scroll the current value up or down using the knob.

Note

Scrolling a value is similar to stepping a value with one important exception: the numeric entry softkey's entry window *must* be displayed before you turn the knob.

Some numeric parameters can also be changed using the [**Marker Value**] hardkey.

See also: [**Marker Value**] hardkey, Knob, Arrow keys

[CHANNEL x DELAY] softkey

Key Path: [**Trigger**] → [TRIGGER SETUP]

Set a pre- or post-trigger delay for the input channel.

You can enter a time delay in seconds, milliseconds, or microseconds.

Limits: –8191 samples to 0 pre-trigger   Default: 0
             0 to 16,384 seconds post-trigger
             (Pre-trigger is span-dependent; post-trigger is span-independent.)

Note   For time capture, pre-trigger delay is limited to 1 time record.

For a pre-trigger delay, enter a negative value (as in –10 ms). For a post-trigger delay, enter a positive value (as in 10 ms). The amount of trigger delay possible varies with the width of the frequency span.

The maximum trigger delay difference between channels varies depending on the resolution as follows:

Resolution	Max delay difference
800 lines	3 time records
400 lines	7 time records
200 lines	15 time records
100 lines	31 time records

For more information on triggering, see the analyzer's *Concepts Guide.*

See also: Time record, [CAPTURE SETUP] softkey, [RESOLUTN (LINES)] softkey

[CHANNEL x FORCE EXPO] softkey

Key Path: [Window]

Toggle between the force window and exponential window for the corresponding channel.

Note	When you specify the force window, the analyzer applies both the force and exponential weighting functions for that channel.

The force window passes the first part of the time record (specified by the force width) and sets the last part to the average value of the time record's remaining data.

The force window is often used in impact testing to minimize unwanted signals occurring after the actual impact.

The exponential window attenuates the input signal at a decaying exponential rate determined by the specified time constant.

The exponential window is often used in lightly damped systems with frequency responses that do not decay within one time record.

To learn more about the force and exponential windows and their applications, see the analyzer's *Concepts Guide.*

See also: [FORCE WIDTH] softkey, [EXPO DECAY] softkey

[CHANNEL x RANGE] softkey

Key Path: [Input]

To manually set the range for an input channel, press [CHANNEL 1 RANGE] or [CHANNEL 2 RANGE]. Then use the numeric keypad to enter an input range value. This also changes the range mode for the channel to fixed range

Limits: –51 dBVrms to 27 dBVrms   Default:–51 dBVrms
Steps: 2 dB

Note

The analyzer rounds up your entered value to the next valid range. You can also use the arrow hardkeys to step through the valid ranges.

You should set the input range manually when you want to maintain a specific input range setting. Ideally, the signal peak should fall within the upper half of the input range.

If you set the input range too low (more sensitive than necessary), the analyzer's input circuitry introduces distortion into the measurement. But if you set the input range too high (less sensitive than necessary), the resulting loss of dynamic range introduces additional noise—in some cases, the increase in the noise floor may even obscure low-level frequency components.

See also: [CHx FIXED RANGE] softkey

[CHANNEL x SETUP] softkey

Key Path: [Input]

Set up the following input parameters for the corresponding input channel:
- Specify the grounding mode.
- Specify ac or dc coupling.
- Turn the antialias filter on or off.
- Turn the A-weight filter on or off.
- Turn the ICP power supply on or off.
- Specify engineering units label and multiplier.

See also: [ICP SUPLY ON OFF] softkey, [ENG UNIT MULTIPLIER] softkey, [ENG UNIT LABEL] softkey, Engineering units, [A WT FLTR ON OFF] softkey, [ANTIALIAS ON OFF] softkey, [COUPLING AC DC] softkey, [INPUT LOW FLOAT GND] softkey

[CHANNEL x TRIGGER] softkey

Key Path: [Trigger]

Select the specified channel as the input trigger source. This means the analyzer begins a measurement when the input signal meets the trigger conditions you've specified.

For more information on triggering, see the analyzer's *Concepts Guide.*

See also: [TRIGGER SETUP] softkey

[CHx AUTO RANGE] softkey

Key Path: [Input]

Activate autorange up for the corresponding input channel. When you turn on autoranging, the analyzer sets the input to the most sensitive range, and automatically steps through less-sensitive input ranges until the input channel is no longer overloaded.

Note

Autorange is the default range mode. To turn autorange off, you must either specify a range or press [CHX FIXED RANGE].

If the input signal amplitude increases after the range is set (enough to overload the input), the analyzer begins stepping through even less-sensitive ranges. Again, this stops when the input is no longer overloaded or the analyzer reaches the maximum range (27 dBVrms).

If the input signal amplitude decreases, the analyzer does NOT change to a different range (except in swept sine mode). The input range remains at the highest setting the analyzer found appropriate.

During a swept sine measurement, the analyzer performs an "up-down" autorange at each measurement point. If the analyzer detects an overload, it changes to a less sensitive range. If the signal is below half-range, the analyzer changes to a more sensitive range.

See also: [OVLD REJ ON OFF] softkey, [CHANNEL x RANGE] softkey, [CHx FIXED RANGE] softkey

[CHx FIXED RANGE] softkey

Key Path: [Input]

Disable autoranging for the specified channel.

If you want to change the range for the channel, press the [CHANNEL x RANGE] softkey and use the numeric entry keys or the arrow keys to change the range.

See also: [CHx AUTO RANGE] softkey

[CLEAR TABLE] softkey

Key Path: [Analys] → [CURVE FIT] → [EDIT TABLE]
        or: [Analys] → [SYNTHESIS] → [EDIT TABLE]

Clear the table. The analyzer asks you for confirmation before it clears the table.

Caution   You cannot recover a table after it has been cleared. To save a table for future use, use [SAVE FIT TABLE] or [SAVE SYNTH TABLE] before clearing the table.

Clearing the table also resets the system gain to 1.0, frequency scale to 1.0, and time delay to 0.0 seconds.

See also: [SAVE SNTH TABLE] softkey, [SAVE FIT TABLE] softkey

[CLEAR SCREEN] softkey (BASIC display)

See [DISPLAY SETUP] softkey group.

[CLOCK SETUP] softkey

Key Path: [System Utility]

Set up the time, date, and time stamp options.

See also: [TIMESTAMP SETUP] softkey, [TIME HHMM] softkey, [DATE MMDDYY] softkey

[COHERENCE] softkey

Key Path: [Meas Data]

Display the most recent coherence function on the active trace.

Coherence indicates the similarity between two signals. Coherence is scaled from 0.0 (complete incoherence) to 1.0 (unity, or perfect coherence). Coherence less than unity indicates the presence of external extraneous noise, system nonlinearities, or unexpected input signals.

Coherence is computed only for two-channel measurements and for rms or rms exponential averaging with at least 2 averages.

The analyzer calculates coherence as follows:

coherence   =   (cspec * conj (cspec)) / (pspec1 * pspec2)

where: cspec   =   cross spectrum

pspec   =   power spectrum

For more information on coherence, see the analyzer's *Concepts Guide.*

See also: [PWR SPEC CHANNEL x] softkey, [CROSS SPECTRUM] softkey

[COMP PWR CHANNEL x] softkey

(Available only with opt. 1D0, Computed Order Tracking)

Key Path: [Meas Data] → [MORE]

Display the composite power for the specified channel. This is the sum of the power for all orders (not just the orders you have chosen to track).

You can include dc bins in the calculation by pressing [DC BINS ON OFF] under [Window].

Note   This data is only available if track is on.

See also: [TRACK ON OFF] softkey, Bins defined, [CP DC BINS ON OFF] softkey

[COMPUTE COEFFICNT] softkey

Key Path: [Marker Fctn] → [FREQ & DAMPING]

Compute and display the resonant frequency and the damping ratio for active trace. The values are displayed in the lower left and right corners of the trace box.

The analyzer uses only the data between the start frequency and stop frequency markers for the computation. Frequency and damping are computed using the following equations:

frequency = I

damping = $-R / sqrt (R^2 + I^2)$

where R = real part of the complex pole pair corresponding to the resonance

I = imaginary part of the complex pole pair corresponding to the resonance

The algorithm for frequency and damping computes a conjugate pole pair, implicitly assuming an underdamped resonance. If the frequency response behaves as a critically or overdamped system between markers, the algorithm will return meaningless values. The damping is always less than 1.

Frequency and damping can only be computed for complex frequency-domain data. It cannot be computed for Nyquist trace coordinates.

The damping computation for the HP 35665A is different than that for the HP 3562/3563; the computed frequency is the same for both analyzers. To convert HP 35665A damping to HP 3562/3563 damping, use the following equation:

a = $-b* freq / sqrt (1 - b^2)$

where a = HP 3562/3563 damping

b = HP 35665A damping

See also: [STOP FREQUENCY] softkey, [START FREQUENCY] softkey

[COMPUTE MARGINS] softkey

Key Path: [**Marker Fctn**] → [GAIN PHAS MARGINS]

Compute and display gain and phase margins and crossovers for the active trace. Gain and phase values are shown in the lower left and right corners of the trace box. Crossover frequencies are indicated by solid band markers in the trace box and listed in the mini-state.

The analyzer uses only the data between the start frequency and stop frequency markers for the computation.

The gain margin is defined as the magnitude level (in dB) when the phase crosses below –180 degrees. A value greater than – 6 dB indicates the possibility of an unstable system.

The phase margin is defined as 180 degrees minus the absolute value of the phase angle when the gain is equal to 0 dB or 1. A value less than +/– 10 indicates the possibility of an unstable system.

If the gain or phase crossover occurs between measured data points, the actual crossover is linearly interpolated.

The analyzer begins searching for zero gain and phase at the start and continues until it finds the first gain and phase crossovers. If the analyzer finds no crossovers before reaching the stop marker, the gain and phase are undefined; the mini-state displays this information.

See also: [STOP FREQUENCY] softkey, [START FREQUENCY] softkey

[COMPUTE OFF] softkey

Key Path: [**Marker Fctn**] → [a marker function]

Turn off the computation and display of marker function results.

See also: [**Marker Fctn**] hardkey

[CONFIDNCE LEVEL] softkey

(Available only with option 1D1, Real Time Octave)

Key Path: [Avg]

Specify the acceptable amount by which the measured results can vary from the true mean value for equal confidence averaging.

Choices: 0.25, 0.5, 1, or 2 dB

Default: 0.5 dB

For equal confidence averaging, the analyzer varies the average time so that there is a 68% probability that the measured results will be within the specified confidence level of the true mean value. There is a 96% probability that the results will be within twice the confidence level of the true mean value.

For example, if you specify a confidence level of .5 dB, the probability is 68% that the measured level is less than .5 dB different from the true mean value. The probability is 96% that the measured level is less than 1 dB different from the true mean value.

See also: [EQUAL CONFID] softkey

[CONFIRM ALLOCATE] softkey

See [ALLOCATE CAPTURE] softkey.

[CONFIRM CLEAR] softkey

See [CLEAR TABLE] softkey.

[CONFIRM DELETE] softkey

See [DELETE ALL] softkey.

[CONFIRM REMOVE] softkey

See [REMOVE CAPTURE] softkey.

[CONJ()] softkey

Key Path: [Analys] → [DEFINE FUNCTION] → [DEFINE Fx] → [OPERATION]

Compute the complex conjugate of the operand.

The complex conjugate of a complex value a + jb is defined to be a − jb. In polar form, the complex conjugate of me $^\wedge$ jp is me $^\wedge$ (−jp).

[CONTINUE RECALL] softkey

Key Path: [Save/Recall] → [RECALL MORE]

Continues the recall of a file saved on multiple disks.

When you recall a split file, type the first file in the sequence, such as "WFALL1." The analyzer then tells you which disk to insert next (in this example, "WFALL2").

See also: [CONTINUE SAVE] softkey

[CONTINUE SAVE] softkey

Key Path: [Save/Recall] → [SAVE MORE]

Continues the save operation for a large buffer by splitting it over multiple disks. If the buffer contents will not fit on one disk, the analyzer splits the file and asks you to insert another disk when the current disk is full.

Note	This command only works for flexible disks in the internal or external disk drives. It does not work for non-volatile RAM, volatile RAM, or fixed external disks.

The analyzer keeps track of the order of the disks by appending a number to the file name on each disk. For example, if you enter the filename "WFALL," the analyzer names the first file "WFALL1," the second file "WFALL2," and so on. When you recall a split file, the analyzer tells you which disk to insert next.

[CONTINUE] softkey

(Available only with opt. 1C2, HP Instrument BASIC)

Key Path: [BASIC]
or: [BASIC] → [INSTRUMNT BASIC] → [DEBUG]

Resume execution of a paused program from the point at which the program was paused.

Note

You can only continue a paused program. However, you can restart any program from its first statement by pressing [RUN PROGRAM x].

See also: [RUN PROGRAM x] softkey, Stopping a program

Controller capability softkey group

Key Path: [Local/HP-IB]

Specify whether the analyzer should be the system controller in your HP-IB system. The following general rules will help you decide which key to select:

- Select [SYSTEM CONTROLLR] if you want to initiate plotting or printing from the analyzer's front panel.

- Select [SYSTEM CONTROLLR] if you want to control other HP-IB devices with an HP Instrument BASIC program.

- Select [ADDRESSBL ONLY] if you want to operate the analyzer from an external HP-IB controller.

[CONVERT TABLE] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [SYNTHESIS]

Access the softkeys for converting the synthesis table. Synthesis tables can be in one of three forms:

- Pole-zero.
- Pole-residue (partial fraction).
- Polynomial.

Caution	Table conversions are not exact because of finite precision in the math operations. It may not always be possible to convert from one format to another and back without slight variations.

Note	If you want to copy a table from synthesis to curve fit, you must first convert it to pole-zero form.

See also: [CONVRT TO POLYNMIAL] softkey, [CONVRT TO POLE RESD] softkey,
[CONVRT TO POLE ZERO] softkey

[CONVRT TO POLE RESD] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [SYNTHESIS] → [CONVERT TABLE]

Convert the synthesis table to pole residue form. This is also known as partial fraction form. The table lists poles in the left column and residues in the right column. Complex poles and residues always appear as conjugate pairs.

At the bottom of the table are listed the time delay, frequency scale, and gain.

Residues are the numerator constants in partial fraction form. A residue is always associated with the pole in the same row.

When you convert a blank table in another form to pole residue form, a Laurent term appears. This term represents unity gain. It may not be needed in your desired pole residue representation. If you do not need the Laurent terms, press [CLEAR TABLE] before you add poles and residues. (You cannot directly edit, add, or delete Laurent terms.)

If you need to specifically add Laurent terms, you must do so before adding any poles and residues. To enter Laurent terms, follow these steps:

1. Press [CONVERT TABLE] → [CONVRT TO POLYNMIAL].

2. Press [EDIT TABLE] → [CLEAR TABLE] → [CONFIRM CLEAR].

3. Add the desired Laurent terms as numerator terms.

4. Press [CONVERT TABLE] → [CONVRT TO POLE RESD].

The desired Laurent terms should appear in the table, and you can complete the table by now adding your poles and residues. Remember, there must be a residue for each pole, and the Laurent terms will appear below the residues in the completed table.

For more information on Laurent terms, see the analyzer's *Concepts Guide*.

See also: [GAIN FACTOR] softkey, [FREQUENCY SCALE] softkey, [TIME DELAY] softkey

[CONVRT TO POLE ZERO] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [SYNTHESIS] → [CONVERT TABLE]

Convert the synthesis table to pole-zero form.

The table lists poles and the left column and zeros in the right column. Complex poles and zeros always appear as conjugate pairs in the table.

At the bottom of the table are listed the time delay, frequency scale, and gain.

Pole-zero is the most numerically accurate of the three synthesis formats.

See also: [GAIN FACTOR] softkey, [FREQUENCY SCALE] softkey, [TIME DELAY] softkey

[CONVRT TO POLYNMIAL] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [SYNTHESIS] → [CONVERT TABLE]

Convert the synthesis table to polynomial form.

Polynomial form is the expanded (or "multiplied out") pole-zero form. In this form, the left column lists the numerator coefficients. The right column lists the denominator coefficients. The column headings list the order of each polynomial.

At the bottom of the table are listed the time delay, frequency scale, and gain.

Note

All synthesis calculations are done in terms of Hz. If you want calculations to be done in radians, use [FREQUENCY SCALE] to convert Hz to radians.

For example, consider the following polynomial table:

NUMERATOR 1	SYNTH	DENOMINATOR 2	
-375	s^0	1.578	s^0
1	s^1	-250	s^1
		1	s^2
TIME DELAY = 0 s FREQUENCY SCALE = 1		GAIN = 1	

This table represents the following expression:

$$\frac{s - 375}{s^2 - 250s + 1.578}$$

In this expression, 375 and 250 each has implicit units of Hz, and 1.578 has implicit units of Hz^2. This is because s is taken to be in Hz, and each term of the denominator (or numerator) must have the same units. The units for each term result from multiplying the s-factor by its coefficient. Thus, in this example, each term in the denominator has units of Hz^2, and each term in the numerator has units of Hz.

See also: [FREQUENCY SCALE] softkey, [GAIN FACTOR] softkey, [FREQUENCY SCALE] softkey, [TIME DELAY] softkey

[COPY ALL FILES] softkeys

Key Path: [Disk Utility]

Copy all files from one disk to another disk using the following softkeys:

- [SOURCE DISK] asks you for the disk specifier of the disk you want to copy.
- [DESTIN DISK] asks you for the disk specifier of the disk that will receive the new copy.
- [PERFORM COPY ALL] copies the contents of the source disk to the destination disk.

When a disk entry window is displayed, it already contains the specifier for the default disk. You can use the specifier in the entry window or modify it with the alpha entry keys.

The source disk must be different from the destination disk.

Hint: Although the analyzer does not provide a "Pack Disk" utility, you can accomplish this using the following steps:

1. Delete all files from a NEW disk.

2. Copy all the files from the OLD disk to the NEW disk.

Now the NEW disk is a packed version of the OLD disk.

See also: [DEFAULT DISK] softkey, Alpha entry mode

[COPY FILE] softkeys

Key Path: [Disk Utility]

Create a new copy of a file using these softkeys:

- [SOURCE FILENAME] asks you for the name of the file you want to copy.
- [DESTIN FILENAME] asks you for the name you want to give the new copy.
- [PERFORM FILE COPY] creates a new copy of a file using your entries in the two filename entry windows.

Source and destination files are assumed to be on the default disk unless you precede filenames with disk specifiers. Use disk specifiers when you want to copy files from one disk to another.

Hint: To copy all files from one disk to another, use the [COPY ALL FILES] softkey.

When a filename entry window is displayed, it already contains a name. If the catalog is off, the entry window contains the filename last entered. If the catalog is on, the entry window contains the name of the file currently highlighted. You can use the name in the entry window or modify it with the alpha entry keys.

See also: Alpha entry mode, [CATALOG ON OFF] softkey, [COPY ALL FILES] softkeys, Disk specifiers, [DEFAULT DISK] softkey

[COPY FROM CURVE FIT] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [**Analys**] → [SYNTHESIS]

Copy the curve fit table into the synthesis table.

Caution	When you copy a curve fit table, the analyzer overwrites the current synthesis table without asking you to confirm the action. You cannot recover the previous synthesis table after you copy from curve fit.

Caution	The analyzer does not copy engineering units into the synthesis table. Use [GAIN FACTOR] to simulate engineering units with synthesis.

Note	When you curve fit to a trace with engineering units, the analyzer incorporates the engineering units into the gain of the curve fit model. Subsequent synthesis will give the same magnitude response. The analyzer does not copy engineering unit labels from the curve fit table.

See also: [GAIN FACTOR] softkey, Engineering units

[COPY FROM SYNTHESIS] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [**Analys**] → [CURVE FIT]

Copy the synthesis table into the curve fit table. The synthesis table must be in pole zero format.

Caution	When you copy a synthesis table, the analyzer overwrites the current curve fit table without asking you to confirm the action. You cannot recover the previous curve fit table after you copy from synthesis.

See also: [CONVRT TO POLE ZERO] softkey

Correlation averaging

The average softkeys for correlation measurements allow you to do the following things:

- Choose from several types of averaging.

- Specify the number of averages.

- Select fast average mode —this lets the analyzer make averaged measurements without having to update the screen after every average.

- Specify how often you want the display updated.

- Turn average repeat on or off.

- Specify the percentage of overlap for an averaged measurement.

- Turn on overload reject to prevent overloads from corrupting an average in progress.

Note	The analyzer does not autorange while averaging—so don't change the output of your test device during the averaging procedure. If an over-range condition occurs during averaging, an overload message appears but the analyzer does not abort the averaging procedure.

See also: [OVERLAP PERCENT] softkey, [REPEAT ON OFF] softkey (average), [NUMBER AVERAGES] softkey, [UPDATE RATE] softkey, [AVERAGE TYPE] softkey (FFT analysis), [OVLD REJ ON OFF] softkey, [CHx AUTO RANGE] softkey, [FAST AVG ON OFF] softkey

Correlation frequency keys

For correlation analysis, the following softkeys are under the [Freq] hardkey:

- Record length.
- Resolution (lines).

See also: [RECORD LENGTH] softkey, [RESOLUTN (LINES)] softkey

[CORRELATN ANALYSIS] softkey

Key Path: [Inst Mode]

Specify the correlation analysis instrument mode.

Correlation is a measure of the similarity between two signals. This is useful for extracting synchronous signals hidden by noise.

The following measurement data is available for swept sine measurements:

■ Time record channel 1 or 2
■ Auto correlation channel 1 or 2
■ Cross correlation (2 ch only)
■ Windowed time channel 1 or 2

For more information on correlation measurements, refer to the analyzer's *Concepts Guide*.

See also: [WINDOWED TIME CHANNEL x] softkey (correlation), [CROSS CORRELATN] softkey,
[AUTO CORR CHANNEL x] softkey, [TIME CHANNEL x] softkey

[COUPLED ON OFF] softkey

Key Path: [Marker]

Turn on and off marker coupling. Marker coupling means that the markers for both traces move together.

When you turn coupling on, the marker for the inactive trace moves to the same point as for the active trace.

Note	Coupled markers move to the same X-axis bin, not necessarily the same X-axis value. Coupled markers will not move past the last active trace bin.

Marker coupling is quite useful. For example, if you display frequency response magnitude on the upper trace, and phase on the lower, you can use marker coupling to track both magnitude and phase at each X-axis position.

See also: Bins defined

[COUPLING AC DC] softkey

Key Path: [Input] → [CHANNEL x SETUP]

Select ac or dc coupling for the input channel.

Note   With ac coupling, the input signal rolls off 3 dB at 1 Hz. So for very small spans at low frequencies, you should use dc coupling to avoid measurement error.

[CP DC BINS ON OFF] softkey

(Available only with opt. 1D0, Computed Order Tracking)

Key Path: [Window]

Specify whether the analyzer should use the dc bins in calculating composite power.

If dc bins is on, the analyzer uses the dc bins in the calculation. If dc bins is off, the analyzer excludes the dc bins from the calculation. The number of dc bins excluded depends on the window used.

See also: Bins defined, [COMP PWR CHANNEL x] softkey

[CROSS CORRELATN] softkey

Key Path: [Meas Data]

Display the cross correlation.

Cross correlation displays the similarity between two signals as a function of the time shift between them. Cross correlation is calculated by multiplying one signal by a time-shifted version of the other signal and summing over all points. The result is plotted as a function of the time shift value.

Cross correlation is most useful for determining time delays of a common signal between two different paths.

For example, to determine the speed of sound you could place one microphone at a sound source and another microphone a known distance away. The cross correlation would show a peak at the time delay between the two microphones. It would also show peaks for each path.

The width of each peak is inversely proportional to the bandwidth of the signal. For example, random noise produces a very narrow peak.

The cross correlation computation depends on the type of averaging selected.

Average off	:	IFFT (FFT (time2) * conj (FFT (wtime1)))
rms	:	IFFT (sum (FFT (time2) * conj (FFT (wtime1)))) / N
rms exponential	:	IFFT (xavg (FFT (time2) * conj (FFT (wtime1))))
Vector	:	IFFT (sum(FFT(time2)) * conj (sum(FFT (wtime1)))) / N
Vector exponential	:	IFFT (xavg(FFT(time2)) * conj (xavg(FFT (wtime1))))

where: timex	=	time for channel 1 or 2
wtimex	=	time with weighting function applied
N	=	number of averages
xavg	=	(1/N) * new + ((N–1)/N) * old

See also: [Window] hardkey, [NUMBER AVERAGES] softkey, [TIME CHANNEL x] softkey, [VECTOR EXPONENTL] softkey, [VECTOR] softkey, [RMS EXPONENTL] softkey, [RMS] softkey

[CROSS SPECTRUM] softkey

Key Path: [Meas Data]

Display the most recent cross spectrum on the active trace. The cross spectrum comp0utation depends on the type of averaging.

Averaging off, vector, or vector exponential : linspec2 * conj (linspec1)

rms : crtn2 * conj (crtn1) * sum (linspec2 * conj (linspec1)) / N

rms exponential : crtn2 * conj (crtn1) * xavg (linspec2 * conj (linspec1))

Peak hold : cross spectrum not computed

where: N = number of averages

crtn1 = correction for channel 1

crtn2 = correction for channel 2

linspec1 = linear spectrum channel 1

linspec2 = linear spectrum channel 2

xavg = g(1/N) * new + ((N-1)/N)* old

See also: [NUMBER AVERAGES] softkey, [CAL CONST ON OFF] softkey, [PEAK HOLD] softkey, [RMS EXPONENTL] softkey, [RMS] softkey, [VECTOR EXPONENTL] softkey, [VECTOR] softkey, [AVERAGE ON OFF] softkey

[CURVE FIT REGISTER] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [CURVE FIT]

Specify in which data register the analyzer should store the curve fit FRF results.

The default curve fit register is D6.

Caution

The data registers are cleared each time you turn the analyzer off. Save the curve fit register to a file before power-down or it will be lost.

[CURVE FIT SETUP] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [CURVE FIT]

Brings up the fit setup menu.

These parameters control the behavior of curve fit. The default settings are those for full automation. The options are:

- Order max or fixed.
- Number of poles.
- Number of zeros.
- Weight auto or user.
- Weight register.
- Time delay.
- Frequency scale.

[CURVE FIT] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys]

Access the curve fit utilities. The curve fit feature finds a mathematical model which closely approximates measured or synthesized frequency response data. The model is expressed as a pole zero table. Pole zero values are expressed in Hz.

The curve fit feature also automatically synthesizes the curve fit model into the selected curve fit data register. The analyzer displays this register in trace B as results become available. (If the display format is waterfall, the results are not displayed.)

For detailed information on synthesis, refer to the analyzer's *Concepts Guide*.

The following softkeys are available:

- [START FIT] starts the curve fit process.
- [ABORT FIT] stops the curve fit process.
- [CURVE FIT REGISTER] determines which data register receives the results.
- [EDIT TABLE] allows you to edit the entries in the curve fit table.
- [COPY FROM SYNTHESIS] copies the synthesis table into the curve fit table.
- [FIT REGION] specifies a portion of the trace to be used for the curve fit.
- [CURVE FIT SETUP] allows you to set up curve fit parameters.
- [TABLE ON OFF] turns on or off display of the curve fit table.

[CWEIGHT()] softkey

Key Path: [Analys] → [DEFINE FUNCTION] → [DEFINE Fx] → [OPERATION]

Apply C-weight filtering to the operand. The argument must be frequency or octave domain data.

[DASHED] softkey

See Line type softkeys.

[DATA EDIT] softkey

Key Path: [Analys]

Access the data register editing capabilities. Data editing allows you to change the trace stored in a data register.

You define a line segment by specifying the [START X] and [STOP X] positions, then specifying the [START Y] and [STOP Y] values. The analyzer connects the two points with a straight line.

Note	You must modify start Y or stop Y. If you do not change either Y-value, the analyzer does not change the data between the two points.

You can then move start X and stop X to define a new band.

See also: [MODIFY STOP Y] softkey, [MODIFY START Y] softkey, [STOP X] softkey, [START X] softkey, Data registers

[DATA REG Dx] softkey

Key Path: [Source] → [ARB SRC SETUP]

Specify which data register should drive the source output for a source type of Arbitrary (D1-D8).

See also: [ARBITRARY (D1-D8)] softkey

[DATA REGISTER] softkey (Meas Data)

Key Path: [**Meas Data**]
     or: [**Meas Data**] → [MORE]

Access the [Dx] softkeys. Each [Dx] key displays the contents of one of the analyzer's eight data registers.

You can use [RECALL TRACE] to load any data register.

See also: Data registers, [RECALL TRACE] softkeys

Data registers

The analyzer has eight data registers, D1 through D8. Each register holds a complete trace that you have saved from the current measurement or recalled from a disk. You can display the trace in a register directly or use it as an operand in a math function.

Caution	The data registers are cleared each time you turn the analyzer off. Copy important traces to any disk (except the volatile RAM disk) before power-down or they will be lost.

See also: [COPY FILE] softkeys, [DEFINE FUNCTION] softkey, Operand menu

[DATE MMDDYY] softkey

Key Path: [**System Utility**] → [CLOCK SETUP]

Display the current date at the top of the screen. The date is read from the analyzer's battery-backed clock.

After pressing this softkey, you can enter a new date with the number keys. The date must be entered in the format noted on the softkey label: the first two digits set the month, the second two digits set the day, the last two set the year. Here's an example:

August 3, 1990—Press [DATE MMDDYY] → [0] → [8] → [0] → [3] → [9] → [0] → [ENTER]

[dB Magnitude] softkey

Key Path: [Trace Coord]

Define the Y-axis as magnitude displayed in decibels on a linear scale.

For linear units (volts), the Y-axis value is calculated as 20 times the log of (real part squared plus imaginary part squared).

For power units (volts squared), the Y-axis value is calculated as 10 times the log of (real part squared plus imaginary part squared).

You can specify a reference by pressing [Trace Coord] → [Y UNITS] → [dB REFERENCE].

See also: [dB REF SETUP] softkey

[dB Ref Setup] softkey

Key Path: [Trace Coord] → [Y UNITS]

Specify the reference for the [dB MAGNITUDE] trace coordinate. The dB reference setting applies only for the current measurement data and the active trace.

The options are:
- dBV (dBEU).
- dBm.
- dBSPL.
- User specified.

The analyzer scales the dB magnitude trace based on the option you select. You can change the dB reference setup without modifying or losing measurement data.

The dB reference scaling is in addition to any engineering units that might already be applied to the measurement data.

See also: Engineering units, [dBSPL (20 UPA)] softkey, [dBM] softkey, [dBV (DBEU)] softkey, [USER REFERENCE] softkey, [DB MAGNITUDE] softkey

[dBm Ref Impedance] softkey

Key Path: [**Trace Coord**] → [Y UNITS] → [dB REFERENCE]

Specify the input impedance for [dBM]. The dBm unit is referenced to 1 milliwatt.

Specify a value that matches the impedance of the system under test. For example, the impedance of a telephone system is typically 600 ohms.

See also: [dBM] softkey

[dBm] softkey

Key Path: [**Trace Coord**] → [Y UNITS] → [dB REFERENCE]

Specify that dB magnitude is referenced to a power level of 1 mWatt (1 V $^\wedge$ 2/kohm). This means that 0 dBm is equal to 1 mW, regardless of the impedance of the system.

This unit is valid only for data with units in volts or volts $^\wedge$ 2. If engineering units are on, the engineering unit label should be "V."

Press [dBm REF IMPEDANCE] to specify the input impedance.

See also: [ENG UNIT ON OFF] softkey, [ENG UNIT LABEL] softkey, [dBM REF IMPEDANCE] softkey,
[DB MAGNITUDE] softkey

[dBSPL (20 uPa)] softkey

Key Path: [**Trace Coord**] → [Y UNITS] → [dB REFERENCE]

Specify that dB magnitude is referenced to 20 uPa. This unit is valid only for data with engineering units of Pascals.

See also: Engineering units, [DB MAGNITUDE] softkey

[dBV (dBEU)] softkey

Key Path: [**Trace Coord**] → [Y UNITS] → [dB REFERENCE]

Specify that dB magnitude is referenced to 1V. If engineering units are on, dB is referenced to 1 EU. The analyzer performs no additional scaling before displaying the data.

See also: [DB MAGNITUDE] softkey, [ENG UNIT ON OFF] softkey

[DEBUG] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC]

Locate errors in your HP Instrument BASIC program.

The Debug menu keeps [RUN] and [CONTINUE] from the main HP Instrument BASIC menu and adds the following softkeys:

- [SINGLE STEP] lets you execute your program one line at a time.
- [LAST ERROR] lets you examine the last error number and message generated by your program.
- [EXAMINE VARIABLE] lets you examine the current value of any program variable.
- [RESET] lets you reset HP Instrument BASIC to its default state.

Decimal point [.] hardkey

This hardkey has two functions:

- When you are changing a numeric parameter, press this hardkey to enter a decimal point.
- When you are changing a text string, press this hardkey to insert a period (or decimal point) to the left of the cursor.

[DEFAULT DISK] softkey

Key Path: [**Disk Utility**]
or: [**Save/Recall**] → [DEFAULT DISK]

Select a default disk. Whenever you request operations that require disk access —things like saving and renaming files—the analyzer performs these operations on the default disk.

You can override the default disk selection by including a disk specifier in any filename or device entry window. But if you select the disk you use most often as the default, you won't need to enter specifiers.

You can select one of the following as the default disk:
- Non-volatile RAM disk.
- Volatile RAM disk
- Internal disk.
- External HP-IB disk drive (analyzer must be set up as the system controller).

Caution The volatile RAM disk is cleared each time you turn the analyzer off. Copy important files to another disk before power-down or they will be lost.

See also: Controller Capability softkey group, [EXTERNAL DISK] softkey, [INTERNAL DISK] softkey, [VOLATILE RAM DISK] softkey, [NON-VOL RAM DISK] softkey, Disk specifiers

[DEFAULT PENS] softkey

Key Path: [**Plot/Print**] → [PLOT PEN SETUP]

Return plotter pen assignments to the following preset values:
- [TRACE A PEN] = 2.
- [TRACE B PEN] = 3.
- [MARKER A PEN] = 5.
- [MARKER B PEN] = 6.
- [ALPHA PEN] = 4.
- [GRID PEN] = 1.

[DEFINE CONSTANT] softkey

Key Path: [Analys]

The analyzer has five constant registers, K1 through K5. Each register holds a math constant that you define. The constant is displayed and defined in rectangular coordinates, A + jB.

To change the value of a particular constant or to display its current value, press the corresponding [DEFINE Kx] softkey.

Use the numeric entry keys to change the value of the specified constant. If the constant is complex, first enter the real part, then press [+ j] and enter the imaginary part. If the imaginary part is negative, press [+/-] to change +j to -j.

You can accept the new value by pressing the [ENTER] softkey. Until you press [ENTER], you can reject the new value (and retain the old one) by pressing any hardkey or the [CANCEL/RETURN] softkey.

[DEFINE FUNCTION] softkey

Key Path: [Analys]

Define math functions.

The analyzer has five function registers, F1 through F5. Each register holds a math function that you define. To change the definition of a function or to display its current definition, press the corresponding [DEFINE Fx] softkey.

Note

To display the trace resulting from a function, select the corresponding [Fx] softkey under the [Meas Data] hardkey.

A math function is used to perform simple arithmetic or more complex math functions on some combination of the following: measurement data, stored trace data, constants, and other functions.

For information on units and math, refer to the analyzer's *Concepts Guide.*

You define a function using two alternating menus: an operand menu and an operator menu. The menus appear in an order that defines the function in standard algebraic notation.

When you change a function's definition, the old definition is in effect until you complete the new one by pressing the operator menu's [ENTER] softkey. Until you press [ENTER], you can abandon the new definition (and retain the old one) by pressing any hardkey or a [CANCEL/RETURN] softkey.

The [Back Space] hardkey deletes the last operand or operator in the new definition. Use it to correct mistakes in your entry.

All math operations are performed on linear data—even if the trace coord is logarithmic (log) magnitude. For log traces, math operations are performed *before* the measurement data is converted from linear to log values.

The following table lists the number of points used in math calculations and the number of points displayed. This applies only for the FFT analysis mode. The analyzer does no zero padding in math.

Resolution	Baseband		Zoom	
	Calculated	Displayed	Calculated	Displayed
100 lines	129	101	128	100
200 lines	257	201	256	200
400 lines	513	401	512	400
800 lines	1025	801	1024	800

For baseband data, the analyzer displays the first part of the data. For example, with resolution of 200 lines, baseband, the analyzer displays the first 201 points and does not display the last 56 points.

For zoom data, the analyzer displays the middle part of the data. For example, with resolution of 200 lines, zoom, the analyzer does not display the first 28 points, displays the next 200 points, and does not display the last 28 points.

For more information, refer to the analyzer's *Concepts Guide.*

See also: [FFT ANALYSIS] softkey, Operation menu, Operator menu, Operator menu, Operand menu, [**Meas Data**] hardkey

[DEFINE LOWER LIM] softkey

Key Path: [Analys] → [LIMIT TEST]

Define or alter the lower limit for the active trace.

You define the lower limit as a series of line segments using the following softkeys:

- [MOVE MKR HORIZNTAL]: Define the X-axis value of a segment endpoint.

- [MOVE MKR VERTICAL]: Define the Y-axis value of a segment endpoint.

- [START SEGMENT]: Press this softkey after you have defined the starting point of a segment.

- [FINISH SEGMENT]: Press this softkey after you have defined the ending point of a segment.

- [MOVE ALL VERTICAL]: Alter the amplitude value of all endpoints at once.

- [DELETE SEGMENT]: Delete the segment that is vertically aligned with the limit marker.

- [DELETE ALL]: Delete all segments at once.

- [TRACE TO LIMIT]: Convert the active trace into a limit line.

After you define a lower limit, it is maintained in a file. The amplitude and frequency values of the limit are maintained without units.

Limit files are cleared when you turn off the analyzer. If you do not want to lose the limits lines you have defined, use [SAVE UPPER LIM] and [SAVE LOWER LIM] to save the limits.

[DEFINE UPPER LIM] softkey

Key Path: [Analys] → [LIMIT TEST]

Define or alter the upper limit for the active trace.

You define the upper limit as a series of line segments. Here's how you use the softkeys in this menu to define the segments:

- [MOVE MKR HORIZNTAL]: Define the X-axis value of a segment endpoint.

- [MOVE MKR VERTICAL]: Define the Y-axis value of a segment endpoint.

- [START SEGMENT]: Press this softkey after you have defined the starting point of a segment.

- [FINISH SEGMENT]: Press this softkey after you have defined the ending point of a segment.

- [MOVE ALL VERTICAL]: Alter the amplitude value of all endpoints at once.

- [DELETE SEGMENT]: Delete the segment that is vertically aligned with the limit marker.

- [DELETE ALL]: Delete all segments at once.

- [TRACE TO LIMIT]: Convert the active trace into a limit line.

After you define an upper limit, it is maintained in a file. The amplitude and frequency values of the limit are maintained without units.

Limit files are cleared when you turn off the analyzer. If you do not want to lose the limits lines you have defined, use [SAVE UPPER LIM] and [SAVE LOWER LIM] to save the limits.

[DEFINE (? cm/s)] softkey

See [PLOT PEN SPEED] softkeys.

[DEFINE Fx] softkey

See [DEFINE FUNCTION] softkey.

[DELAY TIME] softkey (time markers)

Key Path: [Marker Fctn] → [TIME PARAMTERS]

Compute and display delay time—the time required for a step response to reach 50% of its steady-state level.

The analyzer uses only the data between the start time and stop time markers in the computation. The delay time is measured from the start time marker.

The analyzer also puts a horizontal line across the display at the steady-state level and displays the steady-state value in the mini-state.

See also: [START TIME] softkey, [STOP TIME] softkey

[DELAY TIME] softkey (triggering)

(Available only with option 1D1, Real Time Octave)

Key Path: [Trigger]

Specify the delay time for triggering.

Limits: 0 to 99,999 s   Default: 0

The analyzer waits the specified amount of time after receiving a trigger before starting the measurement.

This is useful for starting an acoustics measurement at a later time. For example, if you go home at 5:00 and want to start a measurement at 10:00, you can set a delay time of 18,000 s and trigger the measurement before you go home. The analyzer waits 18,000 seconds (5 hours), then begins collecting data.

For more information on arming and triggering, see the analyzer's *Concepts Guide.*

[DELETE ALL FILES] softkey

Key Path: [Disk Utility]

Remove all files from one of the disks. The files are deleted from the default disk unless you change the disk specifier in the entry window.

Hint: To remove just one file from the disk, use the [DELETE FILE] softkey.

When you press [DELETE ALL FILES], you are asked to enter the disk specifier of the disk you want to clear. The specifier of the default disk is automatically placed in the entry window, but you can modify it with the alpha entry keys.

Note	When you press the [ENTER] softkey to complete entry of a disk specifier, the disk is cleared without further asking. Be sure the name is correct before you press [ENTER].

Note	You cannot remove a file if it is a LIF protected file or if the file is currently opened by an HP Instrument BASIC program. These files are indicated by a " * " or " > ", respectively, in the disk catalog.

See also: Alpha entry mode, [DELETE FILE] softkey, Disk specifiers, [DEFAULT DISK] softkey

[DELETE ALL] softkey

Key Path: [Analys] → [LIMIT TEST] → [DEFINE LOWER LIM]
     or: [Analys] → [LIMIT TEST] → [DEFINE UPPER LIM]

Delete an entire limit line.

This deletes the active trace's upper limit if you pressed [DEFINE UPPER LIM] to enter the menu. It deletes the active trace's lower limit if you pressed [DEFINE LOWER LIM] to enter the menu.

The analyzer asks you for confirmation before it deletes the limit.

See also: [DEFINE LOWER LIM] softkey, [DEFINE UPPER LIM] softkey

[DELETE CHARACTER] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [BASIC] → [INSTRUMNT BASIC] → [EDIT]

Delete the character under the text cursor when you are editing a program.

[DELETE FILE] softkey

Key Path: [Disk Utility]

Remove a file from one of the disks. The file is deleted from the default disk unless you include a disk specifier in the filename entry window.

Hint: To remove all files from a disk at once, use the [DELETE ALL FILES] softkey.

It's often easier to delete files when the catalog is on. You can select the file you want to delete by turning the knob. Then when you press [DELETE FILE], the name of the selected file is automatically placed in the entry window.

When the catalog is off, the last-entered filename is placed in the entry window. You can modify the name in the entry window with the alpha entry keys.

Note   You cannot remove a file if it is a LIF protected file or if the file is currently opened by an HP Instrument BASIC program. These files are indicated by a " * " or " > ", respectively, in the disk catalog.

You can use "wild cards" in the entry box to delete more than one file. Here are some examples of how to use wild cards:

A*   Delete all files starting with "A" and having no extension.
* .*   Delete all files.
* .DAT   Delete all files with the extension DAT.

Note   When you press the [ENTER] softkey to complete entry of a filename, the file is deleted without further asking. Be sure the name is correct before you press [ENTER].

See also: Alpha entry mode, [CATALOG ON OFF] softkey, [DELETE ALL FILES] softkey, Disk specifiers, [DEFAULT DISK] softkey

[DELETE LINE] softkey (Instrument BASIC)

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC] → [EDIT]

Delete the line containing the text cursor when you are editing a program.

The deleted line is placed in a one-line buffer. You can recall the deleted line into another part of your program with the [RECALL LINE] softkey.

See also: [RECALL LINE] softkey

[DELETE SEGMENT] softkey

Key Path: [**Analys**] → [LIMIT TEST] → [DEFINE LOWER LIM]
    or: [**Analys**] → [LIMIT TEST] → [DEFINE UPPER LIM]

Delete the upper or lower limit segment that is vertically aligned with the limit marker.

See also: [DEFINE LOWER LIM] softkey, [DEFINE UPPER LIM] softkey

[DELETE TO LINE END] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC] → [EDIT]

Delete the character under the text cursor and all characters to the right of the cursor when you are editing a program.

[DELETE VALUE] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [**Analys**] → [CURVE FIT] → [EDIT TABLE]
    or: [**Analys**] → [SYNTHESIS] → [EDIT TABLE]

Delete the highlighted entry from the table.

The entry is placed onto a delete line stack. You can undelete the entry using the [UNDELETE VALUE] softkey. The analyzer clears the stack when you press the [EDIT TABLE] softkey or any hardkey.

The analyzer has separate stacks for poles, zeros, residues, numerators, and denominators. For example, you cannot delete an entry from the pole column and undelete it in the zeros column.

See also: [UNDELETE LINE] softkey

[DELTA ORDER] softkey

(Available only with opt. 1D0, Computed Order Tracking)

Key Path: [Freq]

Specify the resolution for order domain data.

Limits: 0.0078125 to 1.0   Default value is 0.1
Steps: 0.0001

[MAX ORDER] divided by [DELTA ORDER] must be less than or equal to 400. For example, if
[MAX ORDER] is 10, [DELTA ORDER] must be greater than or equal to .025 orders.

See also: [MAX ORDER] softkey

[DESTIN DISK] softkey

See [COPY ALL FILES] softkeys.

[DESTIN FILENAME]] softkey

See [COPY FILE]] softkeys.

[DEVICE IS PLOT PRNT] softkey

Key Path: [Plot/Print]

Specify whether the output device is a plotter or printer. This determines the format the analyzer
uses for the output.

If the output device is a plotter, you can plot the whole display or selected portions of the display. If
the output device is a printer, you can only print the whole display.

Print information is sent as a bit-mapped graphic, so your printer must have raster-dump capabilities.
Screen pixels are mapped one-to-one to printer pixels.

See also: [PLOT DATA SELECT] softkey

[DFLT TITL ON OFF] softkey

Key Path: [Disp Format] → [MORE]

Toggle the title for the active trace between the default title and a label you create. ON means that the default title is displayed. OFF means that your defined title is displayed. The default title is the name of the measurement data displayed in the trace.

Press [TRACE TITLE] and use the alpha entry keys to enter a trace title or change the current trace title.

The title is displayed above the upper left corner of the trace box.

See also: [Meas Data] hardkey, Alpha entry mode, [TRACE TITLE] softkey

[DIFF(] softkey

Key Path: [Analys] → [DEFINE FUNCTION] → [DEFINE Fx] → [OPERATION]

Perform a first-order approximation to a derivative.

If F1 = DIFF(D1), the value of F1 is defined as follows:

$$F1[i] = (D1[i] - D1[i\text{-}1]) / dx[i]$$

where F1[i] and D1[i] are the values of the ith data point of F1 and D1, respectively, and dx[i] is the width of the ith data point of D1.

[DISK ADDRESS] softkey

Key Path: [Local/HP-IB]

Tell the analyzer what address is currently assigned to your external HP-IB disk drive. (See your disk drive's documentation if you don't know how to determine its HP-IB address.) An entry window is displayed so you can enter the address.

Note

The disk address is saved in non-volatile memory, so it is retained when you turn the analyzer off and on.

Disk specifiers

The analyzer can use four different storage devices (all referred to as disks). When you press a softkey that accesses a disk function, you are asked to specify which disk the function should act on. Use the following disk specifiers:

- "INT:" specifies the internal disk.
- "RAM:" specifies the volatile RAM disk.
- "EXT:" specifies the external disk.
- "NVRAM:" specifies the non-volatile RAM disk.

The disk specifier must end with a colon (:).

When you press a softkey that asks you for a filename, you can prefix the filename with a disk specifier. This allows you to access a file on a disk other than the default disk. For example, enter "INT:MYCONFIG" to access a file named "MYCONFIG" that resides on the internal disk.

See also: [VOLATILE RAM DISK] softkey, [NON-VOL RAM DISK] softkey, [EXTERNAL DISK] softkey, [INTERNAL DISK] softkey

[DISK TYPE LIF DOS] softkey

Key Path: [Disk Utility] → [FORMAT DISK]

Specify whether the disk should be formatted in LIF or MS-DOS format. (MS-DOS is a U.S. registered trademark of Microsoft Corporation.)

Operations on a DOS disk are slower than the same operations on a LIF disk. For best performance, set the [INTRLEAVE FACTOR] to 0.

Note

The default format for volatile RAM when you turn on the analyzer is the non-volatile RAM format. For example, if the non-volatile RAM is LIF format, the analyzer will format RAM in LIF format.

The internal disk uses 3.5-inch flexible disks (double-sided, double-density or high-density); it does not read single-sided disks. The analyzer automatically distinguishes between the two types of disks.

The following table lists the formatted capacity of different LIF and MS-DOS disks.

Format	Double density disk	High density disk
LIF	630 kbytes	1.3 Mbytes
MS-DOS	737 kbytes	1.5 Mbytes

After the disk is formatted, you do not need to specify "LIF" or "DOS" in other file operations. The analyzer automatically determines the disk format.

[DISK UNIT] softkey

Key Path: [Local/HP-IB]

Tell the analyzer what unit number is currently assigned to your external HP-IB disk drive. An entry window is displayed so you can enter the address.

Note	The disk unit number is saved in non-volatile memory, so it is retained when you turn the analyzer off and on.

[Disk Utility] hardkey

The softkeys under [Disk Utility] perform various file and mass storage device operations:

- Renaming files.
- Deleting files.
- Copying files.
- Formatting disks.
- Specifying the default disk.

Note	To save and recall files, use the softkeys under [Save/Recall].

The analyzer displays an entry window and enters alpha entry mode when it's time to identify the file or disk you want to modify. Use the default filename displayed in the entry box or modify the name with the alpha entry keys. When the filename is correct, press [ENTER] to start the operation.

You can do two things to simplify disk and file management operations:

- Designate the disk you use most often as the default disk.
- Display the disk catalog.

To identify a file on the default disk, you only need to enter a filename. To identify a file on any other disk, you must enter a disk specifier and a filename.

When the catalog is displayed, you don't need to type the name of a file you want to modify. Instead, you can select the file with the knob **before** you bring up the filename entry window. The name of the file you select is automatically placed in the entry window.

See also: Disk specifiers, [CATALOG ON OFF] softkey, [DEFAULT DISK] softkey, Alpha entry mode, [Save/Recall] hardkey, [DEFAULT DISK] softkey, [FORMAT DISK] softkey, [COPY FILE] softkeys, [DELETE FILE] softkey, [RENAME FILE] softkeys

[Disp Format] hardkey

Configure the analyzer's display. The analyzer provides the following display formats:

- Single.
- Upper/Lower.
- Front/Back.
- Waterfall.
- Measurement State.
- Input State.
- Bode Diagram.

Not all display formats are appropriate for all instrument modes. Those formats that are inappropriate for a particular mode are unavailable when that instrument mode is active.

You can reduce the amount of information on the screen using the following softkeys under [Disp Format] → [MORE].

- Grid On Off
- Blank Annotatn
- Blank Display
- Trace Title
- Dflt Titl On Off

Display Group

The Display keys let you control what appears on the analyzer's two traces. Since only one trace is "active" at any given time, only one trace is the target of any adjustments you make using the display keys. Here's a brief summary of the Display keys and their significant functions:

- [Meas Data] determines the measurement data displayed on the active display.
- [Trace Coord] determines the Y-axis coordinates.
- [Scale] adjusts the position and size of the displayed data.
- [Active Trace] determines which trace is the target of changes made in the other display keys.
- [Analys] provides math functions and constants, limit lines, curve fit, synthesis, and data edit.
- [Disp Format] selects the number of traces displayed and adjusts their appearance.

Note

Parameters in the Display group do not affect the measurement. You can change any parameters in this group without changing or losing measurement data.

[DISPLAY SETUP] softkey group

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [BASIC] → [DISPLAY SETUP]

Specify which part of the analyzer's screen should be used for HP Instrument BASIC programs. Program statements such as PRINT, MOVE, and DRAW require that some portion of the display be allocated for their use.

- [OFF] allocates no display area to your program.

- [FULL] allocates that portion of the display used by a full-height trace box. The full display is 29 text rows high and 58 columns wide. The lower left corner (for MOVE and DRAW) is (0,0). The upper right corner is (475,355).

- [UPPER] allocates that portion of the display used by the upper half-height trace box. The upper display is 14 text rows high and 58 columns wide. The lower left corner is (0,0). The upper right corner is (475,173).

- [LOWER] allocates that portion of the display used by the lower half-height trace box. The lower display is the same size as the upper display.

- [CLEAR SCREEN] clears the portion of the screen allocated to your HP Instrument BASIC program.

Note

If you select either [UPPER] or [LOWER], the analyzer changes the display format to upper/lower.

See also: Trace boxes

Displaying a related help topic

Many help screens contain underlined text that is linked to other topics. These "links" allow you to move quickly between related topics. To display a linked topic, turn the knob until the underlined text is highlighted, then press [4].

[DO PRESET] softkey

Key Path: [Preset]

Return the analyzer to a known state. This known state provides a convenient starting point when you are setting up a new measurement.

The analyzer's preset state is described in the analyzer's *Operating Reference*. For quick access to the major preset values, perform a preset, change to the desired instrument mode, then display the measurement state.

MARKER Group			
[Marker] hardkey		**[Marker Fctn] hardkey, continued**	
Marker	On	Band Start Frequency	0 kHz
Coupled	OFF	Band Stop Frequency	20 kHz
X Entry	0 Hz	Sideband Carrier Frequency	23 kHz
Marker Value	ABS	Sideband Increment	1 kHz
Peak Tracking	OFF	Number of Sidebands	20
[Marker Fctn] hardkey		Start (Time Parameters)	0 ms
Compute Results	Off	Stop (Time Parameters)	750 us
Harmonic Fundamental Frequency	10 kHz	Start (Gain/Phase)	0 kHz
Number of Harmonics	20	Stop (Gain/Phase)	20 kHz
Band Span Frequency	20 kHz	Start (Freq & Damping)	0 kHz
Band Center Frequency	10 kHz	Stop (Freq & Damping)	20 kHz

DISPLAY Group			
[Meas Data] hardkey		**[Trace Coord] hardkey**	
(FFt analysis, order analysis)		Trace Type	dB Magnitude
Trace A	Pwr Spec Channel 1	Amplitude Peak RMS	RMS
Trace B	Time Channel 1	Phase Deg/Rad	Deg
(Octave analysis)		Y-axis Units	Volts ^ 2
Trace A & B	Pwr Spec Channel 1	X-Axis Lin/Log	Lin
(Swept Sine)		**[Format] hardkey**	
Trace A	Frequency Response	Trace Format	Single
Trace B	Lin Spec Channel 2	Grid	On
(Correlation)		Default Title	On
Trace A	Auto Corr Channel 1	Z-axis Range	16 traces
Trace B	Time Channel 1	Waterfall Trace Height	39%
(Histogram)		Waterfall Hidden Line	On
Trace A	Histogram Channel 1	Baseline Suppress	0%
Trace B	Unfilterd Time Ch 1	**[Active Trace] hardkey**	
[Scale] hardkey		Active Trace	A
Autoscale	Off	**[Analys] hardkey**	
Y Per Div	10 dB	Limit Lines	Off
Reference Mode	Inp Range Tracking		

SYSTEM Group			
[Plot/Print] hardkey		**[Disk Utility] hardkey**	
Plot Speed	Fast (10 cm/s)	Disk Type	DOS
Trace A Pen Num	2	Interleave Factor	0
Trace B Pen Num	3		
Marker A Pen Num	5	**[System Utility] hardkey**	
Marker B Pen Num	6	Auto Cal	On
Alpha Pen Number	4	Beeper	On
Grid Pen Number	1		
Trace A/B Line Type	Solid	**[Local/HPIB] hardkey**	
Time Stamp	On	GPIB Echo	OFF
Page Eject	On		

MEASUREMENT Group	
[Frequency] hardkey (FFT analysis)	**[Input] hardkey**

[Frequency] hardkey (FFT analysis)		[Input] hardkey	
Frequency Span	102.4 kHz	Range	Auto
Center Frequency	51.2 kHz	Range	−51 dBVrms
Start Frequency	0.0 Hz	Input Low	Float
Stop Frequency	102.4 kHz	Coupling	dc
Entry Step Size	2 kHz	Anti Alias Filter	On
Record Length	3.9062 ms	A Weight Filter	Off
Resolution	400 lines	ICP Supply	Off
[Frequency] hardkey (Octave analysis)		Eng Units	Off
Start Frequency	10 Hz		
Stop Frequency	16 kHz	**[Window] hardkey (FFT analysis)**	
Octave Resolution	1/3 Octave	Window Type	Flat Top
[Frequency] hardkey (Order analysis)		Force Width	9.999 kS
Min rpm	600	Expo Decay	9.999 kS
Max rpm	6000	Ch 1 force/expo	FORCE
Max Order	10 ord	Ch 2 force/expo	EXPO
Delta Order	0.1 ord	**[Window] hardkey (Order analysis)**	
Track	Off	Window Type	Uniform
Track 1 Order	1 ord	CP dc Bin	On
Track 2 Order	2 ord		
Track 3 Order	3 ord	**[Window] hardkey (Correlation)**	
Track 4 Order	4 ord	Window Type	Zero Pad -T/4
Track 5 Order	5 ord		
[Frequency] hardkey (Swept Sine)		**[Trigger] hardkey**	
Frequency Span	51.149 kHz	Trigger type	Free Run
Center Frequency	25.6256 kHz	Tach Pulses Per Rev	1
Start Frequency	51.2 Hz	Trg Range	+/- 4
Stop Frequency	51.2 kHz	Tach Level	0 V
Entry Step Size	128 Hz	Holdoff Time	0 s
Sweep Lin/Log	Lin	Tach Slope	Pos
Sweep Direction	Up	Trigger Level	0 %
Sweep Auto/Man	Auto	Trigger Slope	Pos
Manual Freq	51.2 Hz	Channel 1 Delay	0 s
Resolution	101 Pnt/Swp	Channel 2 Delay	0 s
Auto Res	Off	Arm Type	Automatic
Maximum % Change	2.5%	Start rpm Usage	rpm increasing
Minimum Resolution	401 Pnt/Swp	Start rpm	600
[Frequency] hardkey (Correlation)		rpm Step Size	60 rpm
Record Length	3.9062 ms	Time Step Size	500 ms
Resolution	400 lines	Waterfall Steps (FFT analysis)	15
[Frequency] hardkey (Histogram)		Waterfall Steps (Octave analysis)	200
Record Time	3.9062 ms	Waterfall Steps (Order analysis)	20
Sample Time	3.8147 us	Waterfall Steps (Correlation)	15
Histogram Length	1 rec	Waterfall Steps (Histogram)	15
Histogram Bins	512		

MEASUREMENT Group, continued	
[Inst Mode] hardkey	**[Average] hardkey (FFT analysis, Correlation)**
Inst Mode FFT, 1 Channel	Average Off
Capture Off	Number Averages 10
	Average Type rms
[Source] hardkey (FFT, Correlation, Histogram	Fast Average Off
Source Off	Update Rate 5
Level 0 Vpk	Repeat Off
Source Type Fixed sine	Overlap Percent 0 %
Sine Frequency 10.24 kHz	Overload Reject Off
[Source] hardkey (Octave analysis)	Preview Type Off
Source Off	Preview Time 10 s
Level 0 Vpk	**[Average] hardkey (Octave analysis)**
Source Type Pink Noise	Average Type Exponential
Sine Frequency 10.24 kHz	Hold Setup Off
[Source] hardkey (Order analysis)	Average Time 125 ms
Source Off	Confidence Level 0.5 dB
Level 0 Vpk	Impulse Off
Source Type Fixed Sine	Repeat On
Sine Frequency 10.24 kHz	**[Average] hardkey (Order analysis)**
[Source] hardkey (Swept Sine)	Average Off
Level 0 Vpk	Number Averages 1
Ramp Rate 0 Vpk/s	Average Type Time
Autolevel Off	Repeat Off
Ref Chan Ch2	**[Average] hardkey (Swept Sine)**
Reference Level 1 Vpk	Settle Time 5 Cycles
Reference Tolerance 2 dB	Integrate Time 5 Cycles
Max Src Level 2 Vpk	Fast Average Off
Max Input Level 2 Vpk	**[Average] hardkey (Swept Sine)**
	Fast Average On
	Repeat On

Parameters not affected by Preset (stored in non-volatile RAM)	
[Disk Utility] hardkey	**[Plot/Print] hardkey**
Default Disk	Device Is Plot/Print
[System Utility] hardkey	**[Local/HP-IB] hardkey**
Time, Date	System Controller/Addressbl
Keyboard type	HPIB Addresses
Timestamp format	**[Input] hardkey**
[Analys] hardkey	Eng Unit Multiplier
Functions and Constants	Eng Unit Label

The HP-IB command to perform a preset is SYST:PRES.

See also: [Inst Mode] hardkey, [MEASURMNT STATE] softkey

Documentation

The following printed documentation is provided with the analyzer:

- The *Quick Start Guide*. This is an introduction to the HP 35665A analyzer. It contains some simple measurement tasks designed to get you comfortable with the analyzer.

- The *Operator's Guide*. This contains measurement tasks that demonstrate the functionality of the analyzer. It includes each of the measurement modes as well as limit lines, plotting/printing results, and save/recall.

- The *Concepts Guide*. This includes a conceptual overview of the analyzer and in-depth discussion of the major features.

- The *Operator's Reference*. This includes a brief overview of the front and rear panels and descriptions of each hardkey and softkey.

- *HP-IB Programming with the HP 35665A*. This covers remote operation of the analyzer over the HP-IB. It includes a conceptual overview, command descriptions and syntax, and example programs.

- *HP 35665A HP-IB Quick Reference Card*. This lists all HP-IB commands recognized by the analyzer. It also includes information about the HP-IB command syntax and the analyzer's status registers.

- *HP 35665A Installation and Verification Guide*. This includes installation instructions, specifications, and performance tests.

- *Standard Data Format Utilities User's Guide*. This describes a PC-based utility for sharing data between various analyzers.

These two documents are included with option 1C2, HP Instrument BASIC:

- *HP Instrument BASIC User's Handbook*. This contains global information about HP Instrument BASIC.

- *Using HP Instrument BASIC with the HP 35665A*. This shows you how to record and develop programs.

This document is included with option 0B3, service:

- *Service Guide.* This includes adjustments, circuit descriptions, replaceable parts, and troubleshooting information.

Other recommended sources of information are:

- *HP Dynamic Signals Demo Disc.* This compact disc contains captured signals from microphones and vibration transducers for 72 different types of signals. The disk is shipped with documentation to explain the signals and to offer appropriate measurement suggestions.

- Hewlett-Packard applications notes, available from your local HP Sales and Service Office. These include information on specific measurement applications.

- *Spectrum and Network Measurements*, Robert A. Witte (Prentice Hall, Englewood Cliffs, New Jersey, 1991). This book is a good overview of spectrum/network measurements.

[DOTTED] softkey

See Line type softkeys.

[Dx] softkeys

Key Path: [**Meas Data**] → [DATA REGISTER]

Display the contents of the corresponding data register.

You can use [RECALL TRACE] to load any data register.

See also: [RECALL TRACE] softkeys, Data registers

[EDIT Dx] softkey

Key Path: [**Analys**] → [DATA EDIT]

Edit the contents of the specified data register.

See also: Data registers, [DATA EDIT] softkey

[EDIT] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC]

View or edit your HP Instrument BASIC program. The analyzer enters HP Instrument BASIC edit mode and remains in this mode until you press [END EDIT].

Most hardkeys are redefined as alpha characters when the analyzer is in HP Instrument BASIC edit mode. Engraved letters, near the lower right corners of these keys, tell you which characters they will insert in your program.

The [**Help**], [**Preset**], number, decimal point, and [**Back Space**] hardkeys are not redefined, but the [+/−] hardkey is. It inserts a minus (or dash) in your program rather than toggling a number between positive and negative values.

Use the knob to position the text cursor in your program. When you turn the knob clockwise, the cursor moves to the right of a line and then down to the next line. When you turn the knob counter-clockwise, the cursor moves to the left and then up.

Caution	If you change or insert a program line, be sure to press [ENTER] before moving to another line with the knob; otherwise, the change will be lost.

Additional characters and editing function are available from the HP Instrument BASIC edit menu and its submenus.

See also: Knob, [END EDIT] softkey

[EDIT TABLE] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [CURVE FIT]
    or: [Analys] → [SYNTHESIS]

Edit the curve-fit or synthesis table. You can add, delete, or edit the terms in the table. For curve fit, you can also fix the poles and zeros.

The table contains two columns of real and/or complex numbers. One column entry is highlighted. This highlighting acts as the editing cursor.

The knob moves the cursor up and down. When the cursor reaches the first blank line of the left column, it moves to the top line in the right column. Moving up past the top line in the right column brings the cursor back to the last line in the left column.

Note   If an entry window is displayed, wait a few seconds for the window to disappear, then use the knob to move the cursor in the table.

The table is annotated with pole-zero, pole-residue, or numerator-denominator column headings, and an order display next to each column heading. The maximum system order is 20.

For pole-zero and pole-residue tables, you can enter real or complex values. To enter a complex value, first type the real part, then press [+ j] and type the imaginary part. The analyzer interprets the complex entry as a conjugate pair, and lists it in the table with a "+/−" notation.

Note   For poles and zeros, you must enter a positive imaginary value. For residues, you can use the [+/−] hardkey to enter a negative imaginary value. For polynomial tables you can enter only real coefficients for each power of s.

Note   Laurent terms (s^0, s^1, etc.) in pole residue cannot be edited. You can delete Laurent terms by clearing the table.

See also: [CLEAR TABLE] softkey

[ENABLE RECORDING] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [BASIC] → [INSTRUMNT BASIC]

Begin recording front-panel keystrokes.

Keystroke recording allows you to create an HP Instrument BASIC program that mimics a series of keystrokes. It works by converting your keystrokes to equivalent HP-IB commands and then enclosing the commands in BASIC OUTPUT statements.

Hint: You can turn on GPIB Echo to display the commands in the upper left corner of the screen.

Note	Not every keystroke generates an HP-IB command. For example, you must press [Freq], [CENTER], [1], [0], [kHz] before the command "FREQ:CENT 10000" is echoed to the screen.

When you have finished recording keystrokes, press [BASIC] to disable recording. You can view or edit the resulting program by pressing [EDIT]. You can execute the program by pressing [RUN].

Hint: Be sure to record a [Start] keystroke before you record a keystroke that requires good measurement data (such as [MARKER - PEAK]). This ensures that the measurement will be complete before your program uses the data.

The OUTPUT statements created by keystroke recording are entered into the current program. If the program buffer is empty, the analyzer first creates an ASSIGN statement and an END statement. OUTPUT statements are then inserted ahead of the END statement.

If the program buffer already contains a program, OUTPUT statements are inserted ahead of the program line containing the text cursor. You can position the text cursor by pressing [EDIT] and then turning the knob.

You can not record the following front panel operations:

- Redefinition of the analyzer's controller capabilities. HP-IB commands are not allowed to do this.

- Saving or recalling of HP Instrument BASIC programs. A program cannot be saved or recalled while it is running.

- Any other HP Instrument BASIC operation. These operations are all grouped under the [BASIC] hardkey, which disables keystroke recording.

The recorded version of a few front-panel operations may require additional programming—usually to synchronize program execution with the analyzer's measurement sequence. Here is an example:

During manual arming, any attempts to arm the analyzer before it is ready are ignored. When you operate the analyzer from the front panel, you can simply wait until the WAITING FOR ARM message is displayed and then press [ARM].

If you record this operation, you must add a routine that simulates your waiting for the message. The routine should check the RDY_FOR_ARM bit in one of the analyzer's registers and hold off the ARM command until the bit is set.

See your HP Instrument BASIC manual for more information about synchronization.

Note	For real-time octave, order, and FFT measurements, the analyzer may not be able to display results while an HP Instrument BASIC program is running. If you encounter this situation, you can insert a WAIT statement in the program. See the manual *Using HP Instrument BASIC with the HP 35665A* for more information and examples.

See also: [GPIB ECHO ON OFF] softkey

[END EDIT] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC] → [EDIT]

Finish editing or viewing your program.

When you press [END EDIT] you return to the main HP Instrument BASIC menu. You can run the edited program immediately, but it is best to save your changes first.

Caution   You must save an edited program or the changes will be lost when you turn the analyzer off.

See also: [SAVE PROGRAM] softkey

[END LINE #] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC] → [UTILITIES] → [SECURE]

Before you secure a program (protect it against viewing), you must specify the range of lines you want to secure. Press [END LINE #] to specify the last line in the range. An entry window is displayed so you can enter a new value.

After you have specified the first and last lines, press [PERFORM SECURE] to secure those lines and all lines that fall between them. When you edit or print a secured line, you will see an asterisk (*) rather than program statements after the line number.

See also: [START LINE #] softkey (Secure), [SECURE] softkey

[ENG UNIT LABEL] softkey

Key Path: [Input] → [CHANNEL x SETUP]

Assign a name to the engineering units for the designated channel. You can enter up to 4 characters.

The default label is EU. When you turn on engineering units, the engineering unit label appears wherever "V" normally appears in the trace annotation.

See also: Engineering units

[ENG UNIT MULTIPLIER] softkey

Key Path: [Input] → [CHANNEL x SETUP]

Specify the number of volts per engineering unit to be assigned for the designated channel. You can specify a number of volts per engineering unit or number of engineering units per volt. The default is 1 V/EU.

You can also use [ENG UNIT AT MKR] to specify the amplitude in EU at the current marker position.

See also: [ENG UNIT AT MKR] softkey, Engineering units

[ENG UNIT ON OFF] softkey

Key Path: [Input] → [CHANNEL x SETUP]

Enable or disable the use of engineering units for the associated channel.

When engineering units is on, the analyzer does the following things:

- Uses your specified engineering unit label rather than the analyzer's internal label, V. The eng unit label appears anywhere that V normally appears in the trace annotation.
- Multiplies the amplitude by the eng unit multiplier.

Note	You must turn on engineering units before starting a measurement. If you turn on engineering units after taking a measurement, the engineering units are not applied to the current data.

See also: [ENG UNIT MULTIPLIER] softkey, [ENG UNIT LABEL] softkey, [ENG UNIT AT MKR] softkey, Engineering units

Engineering units

The analyzer can interpret the input signal as engineering units. An "engineering unit" is an arbitrary unit to which you can assign any voltage value. The default engineering unit is EU.

To use engineering units, you must enter an EU value (using the [ENG UNIT MULTIPLIER] softkey). The analyzer multiplies the input by this value to obtain the desired EU. You must also enter a descriptive label (using the [ENG UNIT LABEL] softkey). Finally, you must turn on engineering units by pressing [ENG UNIT ON OFF].

For example, if a transducer is calibrated at 10 mV/g, you can enter "g" as the EU label and enter 10 mv as the EU multiplier. The analyzer will then display 1 g for each 10 mV measured for the channel.

By changing the engineering units, you can get the analyzer to show results in non-voltage units, such as mils, inches per second, or g's. This is useful for rotating machinery or vibration measurements.

Engineering units are useful because they allow you to effectively convert a transducer's output voltage to any numerical value—and to assign a label to these units as well. However, the transducer must be a linear device. Engineering units are valid only when the relationship between the engineering unit and the transducer's output voltage is linear.

See also: [ENG UNIT ON OFF] softkey, [ENG UNIT LABEL] softkey, [ENG UNIT MULTIPLIER] softkey

[ENG UNIT AT MKR] softkey

Key Path: [Input] → [CHANNEL x SETUP]

Specify the number of engineering units at the current marker Y-axis position, using the current display units. The analyzer divides the value you enter by the amplitude at the marker to calculate the engineering unit multiplier.

For example, assume you are calibrating a transducer and have introduced a 1 g calibration signal at the transducer, which is connected to channel 1. To set the engineering units, display the channel 1 power spectrum, press [MARKER TO PEAK] → [Input] → [ENG UNIT AT MKR] → [1] → [dBEUrms].

See also: [ENG UNIT MULTIPLIER] softkey, Engineering units

[ENTER] softkey (BASIC)

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC] → [EDIT]

Accept the changes you've made while editing a line of your program. If the editor detects no syntax errors, the line is accepted.

Caution If you move the text cursor off of the line before you press [ENTER], the changes you've made are lost.

If the editor is in insert line mode when you press [ENTER], it creates a blank line below the current line and moves the text cursor to that new line. If the editor is not in insert line mode when you press [ENTER], it just moves the text cursor to the next line of the program.

[ENTRY STEP SIZE] softkey

Key Path: [**Freq**]

Define the effect of the knob and arrow keys on the value of the following frequency parameters:

- [CENTER].
- [START].
- [STOP].

Limits: 15.625 mHz to 10.24 kHz   Default: 2 kHz (FFT)
          128 Hz (Swept sine)

[ENTRY STEP SIZE] defines the following things:

- The smallest frequency change possible when you turn the knob slowly.
- The frequency change that results when you press an arrow key once.

See also: Arrow keys, Knob

[EQUAL CONFID] softkey

(Available only with option 1D1, Real Time Octave)

Key Path: [Avg]

Specify equal confidence averaging for an octave measurement.

For equal confidence the analyzer varies the average time for each band so that the relative confidence in the measurement is equal across bands.

There is a 68% probability that the results will be within +/– the specified confidence level of the true mean value, and a 96% probability that the results will be within twice the specified confidence level of the true mean value.

For example, if you specify a confidence level of 2 dB, there is 68% confidence that the results will be within 2 dB of the true mean value, and 96% confidence that the results will be within 4 dB of the true mean value.

You can specify the confidence level to be .25, .5, 1, or 2 dB.

Note	Before an equal confidence measurement is settled, the instantaneous spectrum is displayed. Averaging proceeds after the settling time has elapsed. This behavior is especially noticeable for the lower frequency bands, where the average times are longer than at higher frequencies.

See also: [CONFIDNCE LEVEL] softkey, [OCTAVE ANALYSIS] softkey

[EXAMINE VARIABLE] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC] → [DEBUG]

Display the contents of a program variable.

Note

Your program must be paused, stopped, or in single-step mode before you can examine a variable.

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When you press [EXAMINE VARIABLE], the analyzer asks you to enter a variable name. You enter a name using the alpha entry keys.

You can examine array variables in one of two ways. Display the entire array by entering <array_name>(*) in the entry window. Display a single element of the array by entering <array_name>(<element_number>).

The analyzer uses up to 10 lines (of 40 characters each) to display variables. Those containing more than 400 characters are truncated.

See also: Alpha entry mode

[EXP(] softkey

Key Path: [**Analys**] → [DEFINE FUNCTION] → [DEFINE Fx] → [OPERATION]

Compute the natural antilog (e^x) of the operand.

The natural antilog (e^x) of a complex number a + jb is defined as

$$e^{(a+jb)} \; = \; e^a * \cos b + j * e^a * \sin b.$$

[EXPO DECAY] softkey

Key Path: [Window]

Specify the exponential window's time constant.

Limits: 3.8147 us to 9.99 Ms   Default: 9.999 ks

This is the rate at which the signal is attenuated for the exponential window. Generally, the time constant should be set to one-fourth of the time record for the window to be effective.

See also: Time record, [CHANNEL x FORCE EXPO] softkey

[EXPONENTL] softkey

(Available only with option 1D1, Real Time Octave)

Key Path: [Avg]

Specify exponential averaging for an octave measurement.

Unlike linear averaging, exponential averaging weights new data more than old data. This is useful for tracking data that changes over time.

The analyzer uses the time constant, [AVERAGE TIME], to smooth the data. A time constant of 0.125 seconds corresponds to an IEC 651 sound level meter "fast" characteristic; 1.0 seconds corresponds to the "slow" characteristic.

The measurement continues until you stop it.

Note   Before an exponential measurement is settled, the instantaneous spectrum is
                displayed. Exponential averaging proceeds after the settling time has elapsed. This
                behavior is especially noticeable for long (1 s) time constants.

See also: [AVERAGE TIME] softkey, [OCTAVE ANALYSIS] softkey

[EXTERNAL DISK] softkey

Key Path: [**Disk Utility**] → [DEFAULT DISK]
or: [**Save/Recall**] → [DEFAULT DISK]

Select an external HP-IB disk as the default disk.

You must have connected the HP-IB disk drive and entered its address under [Local/HP-IB] →
[PERIPHERL ADDRESSES] → [DISK ADDRESS]. The analyzer must be set as the [SYSTEM CONTROLLER].

See also: Controller Capability softkey group, [DEFAULT DISK] softkey

External keyboard user interface

When the analyzer is not in alpha entry mode, you can operate the analyzer using the external
keyboard rather than the front panel.

- The numeric keys 0 through 9, the up arrow and down arrow keys, the Back Space key, and the
  Enter key do the same thing from the keyboard as from the front panel.

- F1 through F10 correspond to the softkeys. F1 is the top softkey; F10 is the bottom softkey.

- F12 corresponds to the [**Help**] hardkey.

- Right arrow and left arrow keys correspond to turning the knob clockwise and counter-clockwise.

- Pressing Alt, CTRL, and DEL simultaneously corresponds to the [**Preset**] hardkey.

- Print Screen corresponds to pressing [**Plot/Print**] and [START PLOT/PRNT].

- The alpha keys A through Z correspond to the hardkeys on the analyzer's front panel. You can
  use either upper case or lower case alpha characters.

The following tables list the keyboard and front panel equivalent keys, first alphabetically by front
panel key, then alphabetically by keyboard key.

This table lists the front panel hardkeys and the equivalent keyboard alpha keys.

Front Panel	Keyboard	Front Panel	Keyboard
Active Trace	D	Marker Value	Z
Analys	E	Meas Data	A
Avg	O	Pause/Cont	N
Disk Utility	Q	Plot/Print	T
Disp Format	F	Save/Recall	P
Down arrow (↓)	Y	Scale	C
Freq	H	Source	K
BASIC	S	Start	M
Input	J	System Utility	R
Inst Mode	G	Trace Coord	B
Local/HP-IB	U	Trigger	L
Marker	V	Up arrow (↑)	X
Marker Fctn	W	Window	I

This table lists the keyboard alpha keys and the equivalent front panel hardkeys.

Keyboard	Front Panel	Keyboard	Front Panel
A	Meas Data	N	Pause/Cont
B	Trace Coord	O	Avg
C	Scale	P	Save/Recall
D	Active Trace	Q	Disk Utility
E	Analys	R	System Utility
F	Disp Format	S	BASIC
G	Inst Mode	T	Plot/Print
H	Freq	U	Local/HP-IB
I	Window	V	Marker
J	Input	W	Marker Fctn
K	Source	X	Up arrow (↑)
L	Trigger	Y	Down arrow (↓)
M	Start	Z	Marker Value

See also: Alpha entry mode

[EXTERNAL TRIGGER] softkey

Key Path: [Trigger]

Select external triggering. This means that the analyzer will trigger when the signal applied to the external trigger input connector goes from logic-low to logic-high (positive slope) or from logic-high to logic-low (negative slope).

For octave or order measurements, you specify TTL high or low level for the external trigger rather than slope.

The external trigger connector is on the rear panel of the analyzer.

Unlike input triggering and source triggering, external triggering requires a digital signal at standard TTL levels.

Note	For octave measurements, you may not be able to use external triggering to capture a transient signal. After receiving the trigger, the analyzer does not display a spectrum until after the settling time. If the transient occurs during the settling time, the analyzer misses it.

For more information on triggering, see the analyzer's *Concepts Guide.*

See also: [LEVEL HIGH LOW] softkey, [SLOPE POS NEG] softkey

[FAIL BEEP ON OFF] softkey

Key Path: [Analys] → [LIMIT TEST]

Enable and disable the limit-fail beeper for the active trace.

The limit-fail beeper emits an audible tone when all of the following conditions are true:

- [FAIL BEEP ON/OFF] is ON.
- [BEEPER ON/OFF] is ON.
- [TEST EVAL ON/OFF] is ON.
- The trace falls outside its current limits.

See also: [TEST EVAL ON OFF] softkey, [BEEPER ON OFF] softkey

[FAST AVG ON OFF] softkey

Key Path: [Avg]

Turn on or off the fast average mode. When fast average is on, the analyzer updates the display once for each N averages, where N is the specified update rate. This may increase measurement speed.

For example, if you specify an update rate of 5, the analyzer updates the display once every 5 averages.

For swept sine measurements (option 1D2), this key specifies whether the analyzer updates the display at each point (Fast Avg Off) or waits until the sweep is complete (Fast Avg On).

For histogram measurements, this key specified whether the analyzer displays intermediate results (Fast Avg Off) or waits until the measurement is complete (Fast Avg On).

See also: [UPDATE RATE] softkey

[FAST (50 cm/s)] softkey

See [PLOT PEN SPEED] softkeys.

[FAULT LOG] softkey

Key Path: [System Utility]

Display the hardware fault log on the screen.

If any hardware failures occur in your analyzer, they are listed in the fault log. Contact your local HP sales and service office for further information or have a qualified service technician refer to the analyzer's *Service Guide*.

You can clear entries in the fault log by pressing [CLEAR FAULT LOG].

[FFT ANALYSIS] softkey

Key Path: [Inst Mode]

Specify the FFT analysis instrument mode.

In the FFT analysis mode, the analyzer uses digital signal processing to sample the input signal and convert it to the frequency domain. A wide variety of measurement results are available from an FFT measurement.

2 channel	1 channel
Power spectrums ch 1 & 2	Power spectrum ch 1
Linear spectrums ch 1 & 2	Linear spectrum ch 1
Time ch 1 & 2	Time ch 1
Frequency response	Windowed time ch 1
Coherence	
Cross spectrum	
Orbit	
Windowed time ch 1 & 2	

The time domain data is uncalibrated and unaveraged.

For more information on measurement data, see the analyzer's *Concepts Guide.*

See also: [ORBIT] softkey, [WINDOWED TIME CH x] softkey, [WINDOWED TIME CH x] softkey,
[CROSS SPECTRUM] softkey, [COHERENCE] softkey,
[FREQUENCY RESPONSE] softkey (FFT analysis), [TIME CHANNEL x] softkey,
[LIN SPEC CHANNEL x] softkey (FFT analysis), [PWR SPEC CHANNEL x] softkey,
[TIME CHANNEL x] softkey, [LIN SPEC CHANNEL x] softkey (FFT analysis),
[PWR SPEC CHANNEL x] softkey, [2 CHANNEL] softkey, [1 CHANNEL] softkey

FFT averaging

The average softkeys for FFT analysis allow you to do the following things:

- Choose from several types of averaging.

- Specify the number of averages.

- Select fast average mode—this lets the analyzer make averaged measurements without having to update the screen after every average.

- Specify how often you want the display updated.

- Turn average repeat on or off.

- Specify the percentage of overlap you want the analyzer to use when making an averaged measurement.

- Turn on overload reject to prevent overloads from corrupting an average in progress.

- Preview each time record collected by the analyzer and decide whether or not to include the time record in the measurement.

Note

The analyzer does not autorange while averaging—so don't change the output of your test device during the averaging procedure. If an over-range condition occurs during averaging, an overload message appears but the analyzer does not abort the averaging procedure.

See also: [OVERLAP PERCENT] softkey, [REPEAT ON OFF] softkey (average), [NUMBER AVERAGES] softkey, [UPDATE RATE] softkey, [AVERAGE TYPE] softkey (FFT analysis), [OVLD REJ ON OFF] softkey, [CHx AUTO RANGE] softkey, Time record, [MANUAL PREVIEW] softkey, [FAST AVG ON OFF] softkey

FFT frequency keys

For FFT analysis, the following softkeys are under the [**Freq**] hardkey:

- Span
- Center
- Start
- Stop
- Zero start
- Full span
- Entry step size
- Record length
- Resolution (lines)

See also: [SPAN] softkey (frequency), [CENTER] softkey (frequency), [START] softkey (frequency), [STOP] softkey (frequency), [ZERO START] softkey, [FULL SPAN] softkey (frequency), [ENTRY STEP SIZE] softkey, [RECORD LENGTH] softkey, [RESOLUTN (LINES)] softkey

[FFT(] softkey

Key Path: [**Analys**] → [DEFINE FUNCTION] → [DEFINE Fx] → [OPERATION]

Perform a Fast Fourier Transform of the operand. If the size of the argument data block is not a power of two, the analyzer pads the data with zeros to the nearest power of two.

When you perform an FFT on time data collected using a Hanning or Flat Top window, the result will differ in phase from a linear spectrum of the same time data. The analyzer corrects the linear spectrum for phase error introduced by the window; the math FFT operation does not correct for phase error.

The analyzer cannot compute the FFT for frequency data with more than 800 lines of resolution. For other domains, the number of data points must not exceed 2048.

If the argument's X-axis units are anything other than frequency or time, the analyzer performs the FFT but does not change the units.

See also: [LIN SPEC CHANNEL x] softkey (FFT analysis), [FLAT TOP] softkey, [HANNING] softkey

[FINISH SEGMENT] softkey

Key Path: [Analys] → [LIMIT TEST] → [DEFINE LOWER LIM]
   or: [Analys] → [LIMIT TEST] → [DEFINE UPPER LIM]

Anchor a line segment's ending point at the position of the limit marker.

Limits are defined as a series of line segments. Press [START SEGMENT] to anchor a segment's starting point. Use [MOVE MKR HORIZNTAL] and [MOVE MKR VERTICAL] to position the limit marker.

When you press [FINISH SEGMENT] to anchor an ending point, the analyzer automatically anchors the starting point of a new segment at the same position. This makes it easier for you to build continuous limit lines.

You can abandon the automatically generated starting point. Just press [START SEGMENT] after you reposition the limit marker.

See also: [START SEGMENT] softkey, [MOVE MKR VERTICAL] softkey, [MOVE MKR HORIZNTAL] softkey

[FIT REGION] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [CURVE FIT]

Specify what portion of trace A should be used by the curve fitter.

You can specify that the curve fitter use the full span or identify a portion of the span to be used.

Note   X-axis scaling has no effect on the curve fit analysis region.

See also: [USER SPAN] softkey, [FULL SPAN] softkey

[FIX VALUE TOGGLE] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [CURVE FIT] → [EDIT TABLE]

Fix or unfix the highlighted pole or zero for a curve fit table.

When a value is "fixed," the curve fitter assumes it is accurate and finds a model which includes the fixed poles and zeros. If poles or zeros are known to exist at the origin of the s-plane, fixing them usually improves the accuracy of the fit.

Fixed values are identified by the label "fxd" at the right side of the line in the table

Terms in the curve fit table which are not fixed are discarded at the end of a new curve fit and have no effect on the curve fitter.

[FIXED SINE] softkey

Key Path: [Source]

Select the fixed sine waveform. Use the numeric entry keys to specify the frequency.

Limits: 0 Hz to 115 kHz   Default: 10.24 kHz
Steps: 15.625 mHz

Press the [LEVEL] softkey to specify the sine wave amplitude.

[FLAT TOP] softkey

Key Path: [Window]

Select the Flat Top window for both input channels. The Flat Top window has better amplitude accuracy, but poorer frequency resolution than the Hanning window. This is the default window type for FFT measurements.

The Flat Top window is useful when you must measure the amplitude of a particular frequency component with great accuracy—for example, when using a fixed-sine source. This window should not be used for burst or chirp source types or other strictly periodic signals.

The Flat Top window is sometimes called a sinusoidal window.

For more information on the Flat Top window and its applications, see the analyzer's *Concepts Guide.*

See also: [HANNING] softkey

Fonts

Fonts provide different ways to display the same character. Here's how the fonts are used in the analyzer:

- Plain font: This is used for most help text, most softkey labels, and for annotation of the active trace.

- Ghosted font (dotted): This is used for annotation of the inactive trace and for inactive softkey labels.

- Highlighted font (inverse video): This is used to indicate the active option for softkeys that toggle, the active numeric entry softkey in a menu, and the active link in help text.

- Underlined font: This is used to indicate inactive links in help text.

[FORCE EXPO] softkey

Key Path: [Window]

Select the force and exponential window combination specified by the [CHANNEL 1 FORCE EXPO] and [CHANNEL 2 FORCE EXPO] softkeys.

Note	When you specify the force window, the analyzer applies both the force and exponential weighting functions for that channel.

To measure frequency response with a hammer test, connect the hammer to channel 1 with a force window and the response transducer to channel 2 with an exponential window. Set the force width so it flattens most of the noise after the hammer hit but doesn't attenuate the hammer hit itself.

For more information on the force and exponential windows and their applications, see the analyzer's *Concepts Guide.*

See also: [FORCE WIDTH] softkey

[FORCE WIDTH] softkey

Key Path: [Window]

Specify the force window's width.

Limits: 3.8147 us to 9.99 Ms   Default: 9.999 ks

The force window passes the first part of the time record (specified by the force width) and sets the last part to the average value of the time record's remaining data.

The width must be less than the time record for the window to be effective.

See also: Time record, [CHANNEL x FORCE EXPO] softkey

[FORMAT DISK] softkey

Key Path: [Disk Utility]

Define some formatting parameters and format a disk using the following softkeys:

- [DISK TYPE LIF DOS]: Lets you specify the disk format.
- [RAM DISK SIZE]: Lets you specify the size for a RAM disk.
- [INTRLEAVE FACTOR] : Lets you define the spacing between sectors (only used for flexible disks).
- [PERFORM FORMAT]: Starts formatting the disk *after* asking you for the disk specifier.

[FREE RUN TRIGGER] softkey

Key Path: [Trigger]

Select free run triggering. This means that the analyzer will process time records (input data) as quickly as possible, without waiting for any kind of triggering signal. The analyzer makes measurements continuously (some analyzers call this continuous triggering).

Free run triggering is useful when you need to take data continuously. It is also useful when you don't need to synchronize your measurements with a particular event or with an external device.

Hint: If you want to take data continuously and the analyzer is not doing so, make sure you've selected both free run trigger and automatic arming.

For information on limit testing over HP-IB, see the analyzer's *HP-Programming with the HP 35665A* manual.

For order measurements or octave measurements (options 1D0 or 1D1), you can specify a delay for free run triggering. When you press [Start], the analyzer waits the specified delay time before triggering the measurement.

For more information on triggering, see the analyzer's *Concepts Guide.*

See also: [AUTOMATIC ARM] softkey, [DELAY TIME] softkey (triggering)

[FRENCH] softkey

See [KEYBOARD SETUP] softkeys.

[FREQ & DAMPING] softkey

Key Path: [Marker Fctn]

Calculate and display the resonant frequency and the damping ratio.

The analyzer uses a 1 degree of freedom curve fitter on data between the start and stop markers. For accurate results, the marker band should cover at least the 3 dB bandwidth.

Frequency and damping are valid only for frequency response data.

See also: [STOP FREQUENCY] softkey, [START FREQUENCY] softkey

[Freq] hardkey

Set the band of frequencies to be analyzed.

The softkeys under the [Freq] hardkey vary depending on the instrument mode selected. The analyzer "remembers" a set of frequency settings for each instrument mode.

See the following topics for the softkeys for each instrument mode:

- FFT frequency keys
- Swept sine frequency keys
- Octave analysis frequency keys
- Order analysis frequency keys
- Correlation analysis frequency keys
- Histogram/time frequency keys

See also: [Inst Mode] hardkey, FFT frequency keys, Swept sine frequency keys, Octave analysis frequency keys, Order analysis frequency keys, Correlation frequency keys, Histogram/Time frequency keys

[FREQ LABEL] softkey

Key Path: [Trace Coord] → [X UNITS] → [User X Setup]

Specify a name for the user-defined X-axis frequency domain units. The name can be up to 5 characters long.

See also: [USER X UNIT] softkey

[FREQUENCY RESPONSE] softkey (FFT analysis)

Key Path: [Meas Data]

Display the most recent frequency response function on the active trace.

Frequency response shows how a system (a "network") responds to a particular input. The network might be electrical (a filter, for example) or mechanical (a model airplane in a wind tunnel).

Frequency response is only available for two-channel measurements. The frequency response computation varies depending on the type of averaging active.

Average off, rms, or rms exponential	:	(cross spectrum) / (power spectrum ch 1)
Vector or vector exponential	:	(linear spectrum ch 2) / (linear spectrum ch 1)
Peak hold	:	no frequency response computed

See also: [LIN SPEC CHANNEL x] softkey (FFT analysis), [PWR SPEC CHANNEL x] softkey, [VECTOR EXPONENTL] softkey, [VECTOR] softkey, [RMS EXPONENTL] softkey, [RMS] softkey, [CROSS SPECTRUM] softkey, [PEAK HOLD] softkey

[FREQUENCY RESPONSE] softkey (swept sine)

(Available only with option 1D2, Swept Sine)

Key Path: [Meas Data]

Display the most recent frequency response function on the active trace. This trace is updated at each sweep point.

For swept sine measurements, the analyzer calculates frequency response by dividing channel 2 linear spectrum by the channel 1 linear spectrum.

See also: [SWEPT SINE] softkey

[FREQUENCY SCALE] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [CURVE FIT] → [CURVE FIT SETUP]
     or: [Analys] → [SYNTHESIS] → [SYNTHESIS SETUP]

Enter the frequency scaling to be used by the curve fitter or synthesis.

Limits: 1×10^{-6} to 1×10^{6} Default: 1.0

The analyzer scales the frequency axis (the X-axis) by f/(frequency scale), where f is frequency in Hz.

If you want the frequency axis to be in radians, enter a frequency scale of $1/(2\pi)$. Then you can make table entries in terms of radians (even though the unit keys still say mHz, Hz, and kHz). The frequency axis is always labeled Hz; however, the X-axis cursor should now be interpreted as radians.

[FRONT BACK] softkey

Key Path: [Disp Format]

Display both traces using one full-height trace box.

The active trace is drawn with a solid line, the inactive trace with a dotted line. Annotation for the active trace is in the plain font; annotation for the inactive trace is in a ghosted font.

Note	If you select either [UPPER] or [LOWER] under the [BASIC] → [DISPLAY SETUP] key, the analyzer changes the display format from front/back to upper/lower.

See also: [Active Trace] hardkey, Fonts, Trace boxes

[FULL OCTAVE] softkey

(Available only with option 1D1, Real Time Octave)

Key Path: [Freq]

Specify a full octave band measurement.

Full octave analysis is the measurement of a frequency spectrum by the use of 12 constant percentage bandwidth filters one octave wide and spaced at one octave intervals.

The analyzer displays a total RMS power band and up to 12 frequency bands. The center frequency of each band is twice the center frequency of the previous band.

Note	Markers return the ANSI Standard preferred frequencies.

You can specify the start and stop frequencies by pressing the [START] and [STOP] softkeys. When you change one of these frequencies, the analyzer changes the other frequency if the specified band if more than 12 octaves.

For full octave measurements, the maximum stop frequency is 16 kHz for 1 channel and 8 kHz for 2 channels. The minimum start frequency is 80 mHz.

The exact center frequencies are determined by starting at 1000 Hz (band 10) and multiplying by 2.0 to get higher bands or dividing by 2.0 to get lower bands.

Note	Markers return the ANSI Standard preferred frequencies.

See also: [STOP] softkey (octave frequency), [START] softkey (octave frequency)

[FULL SCALE] softkey

Key Path: [Scale] → [AXES SCAL MARKERS]

Display all the measured data, scaled to fit the display area. This applies only for the axis you are currently scaling.

If you have scaled either axis using axes scale markers, this is how you return to the full scale display.

See also: [AXES SCAL MARKERS] softkey

[FULL] softkey (BASIC display)

See [DISPLAY SETUP] softkey group.

[FULL SPAN] softkey (curve fit)

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [CURVE FIT] → [FIT REGION]

Specify that the curve fitter use the full data span from trace A.

Note When you set the curve fit analysis region to full span, the analyzer displays "Trace A" as the start and stop frequencies in the mini-state. This means that the analyzer will use the full span of Trace A.

Note X-axis scaling has no effect on the curve fit analysis region.

[FULL SPAN] softkey (frequency)

Key Path: [Freq]

Have the analyzer look at all frequencies from 0 Hz to its upper limit—102.4 kHz for one-channel measurements, 51.2 kHz for two-channel measurements. This softkey also anchors the start frequency.

See also: [START FREQUENCY] softkey

[FUNDAMNTL FREQUENCY] softkey

Key Path: [**Marker Fctn**] → [HARMONIC MARKER]

Specify the fundamental frequency of the harmonic series you want to look at. The analyzer needs the fundamental frequency to find the appropriate harmonics and to make the harmonic marker calculations.

See also: [HARMONIC MARKER] softkey

[Fx] softkeys

Key Path: [**Meas Data**] → [MATH FUNCTION]

Display the result of the corresponding user-defined function.

Note 👆 A function must be defined before it can be displayed. Functions are defined under the [**Analys**] hardkey.

[GAIN FACTOR] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [**Analys**] → [SYNTHESIS] → [SYNTHESIS SETUP]

Specify the desired gain of a synthesized frequency response function.

Limits: 1e–38 to 1e+38 and not = 0   Default: 1.0

Gain is entered as a unitless number. The gain value is displayed in the lower right corner of the table.

[GAIN PHAS MARGINS] softkey

Key Path: [**Marker Fctn**]

Turn on gain and phase margin markers. These allow you to specify a start and stop frequency, then compute and display gain and phase margins and crossovers. Gain and phase margin are valid only for frequency response data.

See also: [COMPUTE MARGINS] softkey, [STOP FREQUENCY] softkey, [START FREQUENCY] softkey

[GERMAN] softkey

See [KEYBOARD SETUP] softkeys.

[GOTO LINE] softkeys

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [BASIC] → [INSTRUMNT BASIC] → [EDIT]

Move the text cursor directly to a particular line of the program you are editing. You can specify the line either by its number or its label.

Use the number keys to specify a line number. Use the hardkeys with engraved letters, the underscore (_) softkey, and the [UPPERCASE/lowercase] softkey to specify a label. Then when you press [ENTER], the text cursor moves to the specified line.

If you enter a line number that doesn't exist, the cursor moves to the closest line. If you enter a label that doesn't exist, the cursor remains on the current line.

Hint: To go to the end of the program, enter a line number greater than that of the last line (for example, 99,999).

[GPIB ECHO ON OFF] softkey

Key Path: [Local/HP-IB]

Enable and disable the echo (display) of HP-IB command mnemonics to the analyzer's screen. (HP-IB is Hewlett-Packard's implementation of GPIB—the General Purpose Interface Bus.) The HP-IB mnemonics are used to operate the analyzer from the HP-IB.

With echo turned on, you can operate the analyzer from the front panel and it will display the command mnemonics you must send over the bus to achieve the same results. Mnemonics are displayed on the third line in the upper-left corner of the screen.

Not every keystroke generates an HP-IB command. For example, you must press the sequence
[Freq] → [CENTER] → [1] → [0] → [kHz]
before the command "FREQ:CENT 10000" is echoed to the screen.

Note	When echo is on, the analyzer also displays valid commands sent to the analyzer over the HP-IB. This is useful when debugging HP Instrument BASIC programs.

[GRID ON OFF] softkey

Key Path: [Disp Format] → [MORE]

Turn on or off the overlay grid (graticule) for the active trace.

Note

If you turn off a trace grid, it will not appear on an external printer/plotter.

[GRID PEN] softkey

Key Path: [Plot/Print] → [PLOT PEN SETUP]

Specify which plotter pen should be used for plotting trace grids.

[GRID] softkey

See [PLOT DATA SELECT] softkey.

[HANNING] softkey

Key Path: [Window]

Select the Hanning window for both input channels. The Hanning window attenuates the input signal at both ends of the time record to zero. This forces the signal to appear periodic. The Hanning window offers better frequency resolution, but poorer amplitude accuracy than the Flat Top window.

The Hanning window is the most commonly-used window, and is particularly useful for random noise measurements. This window should not be used for burst or chirp source types or other strictly periodic signals.

The Hanning window is sometimes called the Hann window or random window.

For more information on the Hanning window and its applications, see the analyzer's *Concepts Guide*.

See also: [FLAT TOP] softkey

Hardkeys

There are five groups of hardkeys on the analyzer's front panel:

- DISPLAY.
- MEASUREMENT.
- SYSTEM.
- MARKER.
- Numeric entry.

The keys in these groups are referred to as hardkeys because the function assigned to each key never changes (except during alpha entry and program editing). In contrast, the function assigned to each softkey can change.

A "hardkey label" is printed directly on each hardkey. The label tells you which function is assigned to that key. In the help text, hardkeys are represented by enclosing hardkey labels in brackets (for example, "The [Help] hardkey is used to..."). The hardkey label is mixed upper case and lower case.

An engraved letter appears at the lower-right corner of most hardkeys. This letter tells you which alpha character will be inserted to the left of the text cursor when you press a hardkey during alpha entry or program editing.

See also: Alpha entry mode

Hardware test softkeys

Key Path: [System Utility]

Enable special setups during self tests and service tests.

You should only use these softkeys as directed in your *HP 35665A Installation and Verification Guide* or *Service Guide.*

[HARMONIC MARKER] softkey

Key Path: [Marker Fctn]

Turn on and set up harmonic markers. This marker shows the harmonics for a particular fundamental frequency. From the harmonic marker menu you can do the following things:

■ Enter the fundamental frequency.
■ Specify the number of harmonic markers you want displayed.
■ Turn off computation.
■ Display total harmonic distortion (THD).
■ Display harmonic power.

Harmonic markers are available only for frequency domain or order domain data.

See also: [HARMONIC POWER] softkey, [THD] softkey, [COMPUTE OFF] softkey,
[NUMBER OF HARMONICS] softkey, [FUNDAMNTL FREQUENCY] softkey

[HARMONIC POWER] softkey

Key Path: [Marker Fctn] → [HARMONIC MARKER]

Compute and display the harmonic power (absolute) for the current fundamental frequency. The value is displayed in the lower left corner of the trace box.

The analyzer calculates harmonic power by measuring the absolute value of the identified harmonics of the fundamental frequency. Noise and other signals at other points along the frequency spectrum are not taken into account (unless they happen to occur at a harmonic frequency).

The harmonic power results reflect the harmonics in the current frequency span. The number of harmonics you specify is the maximum number the analyzer uses in the calculation. For example, if you press [NUMBER OF HARMONICS] and enter 10, the harmonic power calculation does not include all ten harmonics if some of these harmonics are outside the current span.

If the trace coordinate is dB magnitude, the analyzer displays harmonic power in dBVrms. For other trace coordinates, the analyzer displays harmonic power in Vrms ^{2}.

See also: [Trace Coord] hardkey, [NUMBER OF HARMONICS] softkey, [FUNDAMNTL FREQUENCY] softkey

[Help] hardkey

To do this:	Press this key:
Turn help on	[Help]
Turn help off	[0]
Get help on a key	[<key>]
Jump to a topic	[4]
Return to previous topic	[7]
Go to index	[1]
Display next page	[↓]
Display previous page	[↑]
Select help topic or link	Turn the knob
Print the current screen	[8]

Online help is a special operating mode available in the HP 35665A. You enter this mode by pressing [Help]. You exit by pressing [0].

There are two distinct methods you can use to access information while using online help:

■ PRESS ANY KEY for information on that key.

■ SELECT A TOPIC from the online help index.

PRESSING A HARDKEY OR SOFTKEY—When the analyzer is in the online help mode, you can press any hardkey or softkey to display information on that key. Menus remain active so you can get help on any softkey, but the analyzer setup doesn't change when you press keys.

SELECTING AN INDEX ENTRY—You can display the help index by pressing [1]. It contains an alphabetical listing of all help topics (including key descriptions). Turn the knob to select a topic, then press [4] to display it. Use the up and down arrow keys to move backward and forward one page in the index.

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 through the index or links.

Some index entries provide cross-references to the available help topics. These entries end with "(XREF)." The name of an XREF entry does not match the name of the topic it displays.

The basic functions you use to move around in help are assigned to the number keys. A legend at the BOTTOM OF THE SCREEN shows you which function is assigned to each number key. The following topics describe the basic functions:

- Quitting online help.
- Paging through help screens.
- Displaying a related help topic.
- Returning to a previous help topic.

The print function—assigned to [8]—allows you to print topics one screen at a time. But before you can use this function, you must designate the analyzer as the system controller and enter the printer's HP-IB address under the [PRINTER ADDRESS] softkey.

See also: [PRINTER ADDRESS] softkey, Controller Capability softkey group, Returning to a previous help topic, Displaying a related help topic, Paging through help screens, Quitting online help

[HIDN LINE ON OFF] softkey

Key Path: [Disp Format] → [WATERFALL SETUP]
   or: [Marker Fctn] → [WATERFALL MARKERS] → [WATERFALL SETUP]

Turn on or off hidden line removal on the waterfall display.

When hidden line removal is off, the analyzer displays all of every trace. This can clutter the display if you are displaying many traces.

When hidden line removal is on, the analyzer does not display portions of traces that lie behind previous traces.

See also: [WATERFALL] softkey

Histogram averaging

The analyzer does not allow averaging for histogram measurements. The average softkeys for histogram measurements allow you to do the following things:

- Select fast average mode—this specifies whether the analyzer should display intermediate results or wait until the histogram length is complete.

- Turn average repeat on or off. This specifies whether the analyzer should take one histogram length and stop or continue taking measurements.

See also: [HISTOGRAM LENGTH] softkey, [HISTOGRAM LENGTH] softkey, [FAST AVG ON OFF] softkey, [REPEAT ON OFF] softkey (histogram)

[HISTOGRAM BINS] softkey

Key Path: [Freq]

Specify the X-axis resolution for the histogram measurement displays.

Limits: 4 to 1024 in powers of 2   Default: 512

Hint: For an optimal histogram measurement, set the number of bins (in points) equal to the square root of the [HISTOGRAM LENGTH].

The analyzer's X-axis displays from (−1.42 times input range) to (+1.42 times input range) in volts. The resolution is determined by dividing that value by the [HISTOGRAM BINS].

For example, if the input range is +3.9858 Vpk, the analyzer displays from −5.66V to +5.66V, a total of 11.32V. If you specified 512 histogram bins, each point represents (11.32V / 512), or 22.1 mV.

See also: [HISTOGRAM LENGTH] softkey

[HISTOGRAM CHANNEL x] softkey

Key Path: [Meas Data]

Display the number of samples versus amplitude (in volts peak). The Y-axis displays the number of samples at each amplitude.

The following parameters affect the histogram measurement:
- Histogram bins.
- Input range.
- Histogram length.
- Sample time or record length.

The analyzer bypasses the anti-alias filters and digital filters for histogram measurements.

See also: [HISTOGRAM LENGTH] softkey, [CHANNEL x RANGE] softkey, [HISTOGRAM BINS] softkey, [SAMPLE TIME] softkey

[HISTOGRAM LENGTH] softkey

Key Path: [Freq]

Specify how long you want a histogram measurement to be. You can specify a number of points, seconds, or records (a record is 1024 points).

Limits: 1 to 2.8e14 points

Default: 1 record
(1024 points)

Hint: For an optimal histogram measurement, set the histogram length (in points) equal to [HISTOGRAM BINS] squared.

The analyzer collects data for either the specified number of points, records, or time. If repeat is on, the analyzer clears the data and starts another measurement as soon as the specified [HISTOGRAM LENGTH] is complete.

Note   If you specify a [HISTOGRAM LENGTH] that is not an integral multiple of time records, the analyzer collects enough data to complete the last time record. However, it only uses the specified [HISTOGRAM LENGTH] for the histogram computations.

See also: [HISTOGRAM BINS] softkey, [REPEAT ON OFF] softkey (histogram)

Histogram/Time frequency keys

For histogram analysis, the following softkeys are under the [**Freq**] hardkey:

- Record time.
- Sample time.
- Histogram length.
- Histogram bins.

See also: [RECORD TIME] softkey, [SAMPLE TIME] softkey, [HISTOGRAM LENGTH] softkey,
[HISTOGRAM BINS] softkey

[HISTOGRAM/TIME] softkey

Key Path: [**Inst Mode**]

Specify the histogram/time instrument mode.

The histogram measurement shows how the amplitude of the input signal is distributed between its maximum and minimum values. Some of its uses are determining the statistical properties of noise and monitoring the performance of electromechanical positioning systems.

Histogram measurements are only armed and triggered once. The measurement runs for the specified histogram length and stops. If repeat is on, the analyzer then clears the data and performs another histogram over the specified histogram length.

The accuracy of the histogram is dependent on the following parameters:

- Histogram bins.
- Sample time.
- Histogram length.

The following results are available from a histogram measurement:

- Histogram.
- Probability Density Function.
- Cumulative Density Function.
- Unfiltered Time.

For more information on histogram measurements, refer to the analyzer's *Concepts Guide.*

See also: [UNFILTERD TIME CH x] softkey, [HISTOGRAM LENGTH] softkey, [SAMPLE TIME] softkey,
[HISTOGRAM BINS] softkey, [CDF CHANNEL x] softkey, [PDF CHANNEL x] softkey,
[HISTOGRAM CHANNEL x] softkey

[HOLD BOTTOM] softkey

Key Path: [Scale] → [AXES SCAL MARKERS]

Hold the bottom marker for Y-axis scaling. When you turn the knob or enter a value from the numeric keyboard, the top marker moves.

See also: [AXES SCAL MARKERS] softkey

[HOLD CENTER] softkey

Key Path: [Scale] → [AXES SCAL MARKERS]

Hold the center marker for axis scaling. When you turn the knob or enter a value from the numeric keyboard, the right and left or top and bottom markers move toward or away from each other (the width changes). The center value remains unchanged.

See also: [AXES SCAL MARKERS] softkey

[HOLD LEFT] softkey

Key Path: [Scale] → [AXES SCAL MARKERS]

Hold the left marker for X-axis Y-axis scaling. When you turn the knob or enter a value from the numeric keyboard, the right marker moves.

See also: [AXES SCAL MARKERS] softkey

[HOLD RIGHT] softkey

Key Path: [Scale] → [AXES SCAL MARKERS]

Hold the right marker for X-axis Y-axis scaling. When you turn the knob or enter a value from the numeric keyboard, the left marker moves.

See also: [AXES SCAL MARKERS] softkey

[HOLD SCALE] softkey

Key Path: [Scale] → [AXES SCAL MARKERS]

Hold the axis scale constant. Turning the knob moves the markers but does not change the scale. You must use [SCALE AT MARKERS] to change the scale.

The way the markers move depends on the current "hold" selection (right, top, center, left, bottom, or width).

See also: [HOLD WDTH (SCROLL)] softkey, [HOLD LEFT] softkey, [HOLD TOP] softkey,
[HOLD CENTER] softkey, [HOLD RIGHT] softkey, [HOLD BOTTOM] softkey,
[SCALE AT MARKERS] softkey

[HOLD SETUP] softkeys

Key Path: [Avg]

Turn on or off average hold for octave measurements. When you select maximum or minimum, the analyzer displays the maximum or minimum averaged spectrum value for each band. This applies for linear, exponential, and equal confidence octave average types. It does not affect peak hold.

The following softkeys are in the menu:

■ Off — turn off the average hold feature.

■ Maximum — hold the maximum averaged spectrum value.

■ Minimum — hold the minimum averaged spectrum value. This is useful for estimating background noise.

Note	The main difference between hold maximum and peak hold is that Peak Hold displays the absolute maximum within a band, while Hold Maximum displays the maximum averaged value.

Note	When you select maximum or minimum hold, the analyzer effectively sets the number of waterfall steps to 1. If you pause a measurement with a waterfall displayed, the analyzer displays only 1 trace.

See also: [WATERFALL STEPS] softkey, [PEAK HOLD] softkey (octave), [EQUAL CONFID] softkey,
[EXPONENTL] softkey, [STABLE] softkey

[HOLD TOP] softkey

Key Path: [Scale] → [AXES SCAL MARKERS]

Hold the top marker for Y-axis scaling. When you turn the knob or enter a value from the numeric keyboard, the bottom marker moves.

See also: [AXES SCAL MARKERS] softkey

[HOLD WDTH (SCROLL)] softkey

Key Path: [Scale] → [AXES SCAL MARKERS]

Hold the marker width for axis scaling. When you turn the knob or enter a value from the numeric keyboard, the center value changes. The distance between the right and left or top and bottom markers remains unchanged.

See also: [AXES SCAL MARKERS] softkey

[HOLDOFF TIME] softkey

Key Path: [Trigger] → [TACHOMETR SETUP]
    or: [Input] → [TACHOMETR SETUP]

Specify a "tachometer delay" in seconds.

Limits: 0 s to 52.224 ms   Default: 0 s

The analyzer waits this amount of time after receiving a valid tach transition before it will accept another tachometer input. This allows multiple tach transitions to occur within any one tach edge, "cleaning up" the tach edge.

HP-IB controllers

When you connect devices using the HP-IB, one device must coordinate activity on the bus. The coordinating device is called the "controller." The analyzer can act as a controller.

Sometimes, you may have more than one device on the bus that can function as a controller. Only one of these devices can coordinate bus activity at any given time. The device that is currently coordinating bus activity is called the "active controller."

One device on the bus must be designated as the "system controller." The system controller can always take control of the bus—even if it is not currently the active controller. The analyzer is designated as the system controller if you press [SYSTEM CONTROLLR].

The analyzer cannot function as the system controller when [ADDRESSBL ONLY] is selected, but it *can* function as the active controller. The current active controller must simply pass control to the analyzer.

HP-IB overview

HP-IB, the Hewlett-Packard interface bus, allows you to build an integrated test system from individual devices (instruments and computers). If a device complies with the IEEE 488.1 standard, HP-IB cables can link it into a system. This analyzer is such a device.

Each device is assigned a unique HP-IB address. This allows one device, referred to as the controller, to coordinate the activities of all other devices on the bus. The controller can issue an instruction to a particular device by prefacing the instruction with that device's address.

[HP-IB TRIGGER] softkey

Key Path: [Trigger]

Select HP-IB triggering. This lets you synchronize a measurement to a trigger command issued via the HP-IB. To use the HP-IB trigger, make sure the analyzer's HP-IB connector—located on the rear panel—is connected to the controller that issues the trigger command

Once the analyzer is armed, triggering occurs via one of three HP-IB commands:
- Group Execute Trigger (GET)
- *TRG
- TRIG:IMM

After the analyzer is triggered, additional HP-IB trigger commands are ignored until the measurement is complete and the analyzer is re-armed. The controller can detect these conditions by reading the analyzer's status registers. To learn more about HP-IB triggering, see *HP-IB Programming with the HP 35665A*.

Note   HP-IB triggering is not available with Order Analysis mode (Option 1D0).

HP Instrument BASIC edit menu

The HP Instrument BASIC edit menu and its submenus provide access to special characters and editing functions when the analyzer is in the HP Instrument BASIC edit mode.

[ENTER] accepts any changes you have made to the current line. [END EDIT] exits the edit mode and displays the INSTRUMNT BASIC menu.

Three softkeys—[INSERT LINE], [DELETE LINE], and [RECALL LINE]—allow you to reorganize your program one line at a time. Another line-oriented softkey—[GOTO LINE]—lets you move the text cursor quickly to a particular line number or program label.

There are two character-oriented softkeys. [INSERT SPACE] inserts a space character to the left of the text cursor. [DELETE CHARACTER] deletes the character under the text cursor.

The [TYPING UTILITIES] softkey gives you access to additional characters, HP Instrument BASIC keywords, and a case-shifting function.

[HZ (SEC)] softkey

Key Path: [Trace Coord] → [X UNITS]

Specify Hz for frequency domain X-axis units and seconds for time domain X-axis units.

[HZ/ORDER RATIO] softkey

Key Path: [Trace Coord] → [X UNITS] → [Order Setup]

Specify the speed of rotation in Hz/order or rpm/order. The analyzer uses this value as the first order when the X-axis unit is order.

See also: [ORDER (REV)] softkey

[ICP SUPLY ON OFF] softkey

Key Path: [Input] → [CHANNEL x SETUP]

Enable or disable the ICP supply on the corresponding input channel. This connects the internal 4 mA current source to the input connector. The nominal voltage output is 24 V dc (open circuit).

To avoid measurement distortion and maximize the analyzer's dynamic range, use ac coupling when the ICP supply is on.

See also: [COUPLING AC DC] softkey

[IMAG(] softkey

Key Path: [Analys] → [DEFINE FUNCTION] → [DEFINE Fx] → [OPERATION]

Compute the imaginary part of the operand.

The imaginary part of a complex number "a + jb" is "b."

[IMAGINARY PART] softkey

Key Path: [Trace Coord] → [MORE: NYQ REAL IMAG]

Display the imaginary part of the measurement results on the active trace.

Here are some characteristics of the imaginary part trace:

■ If there's no imaginary data, the waveform is a flat line, showing zero magnitude.

■ For complex data, the imaginary trace represents the imaginary part of the complex FFT data.

■ For time waveforms, the imaginary trace represents the imaginary part of the Hilbert transform of the real part. For example, a 2 volt peak sine wave input in zoom mode appears as a frequency-shifted 2 volt peak sine in the real part trace, and as a frequency- and phase-shifted 2 volt peak sine wave in the imaginary part trace.

[IMPULSE] softkey

(Available only with option 1D1, Real Time Octave)

Key Path: [Avg]

Compute and display the IEC 651 impulse characteristic in the overall power band (far right band in the display).

For linear averaging, the analyzer calculates the value of the impulse output over the average time. For other average types, the analyzer calculates the instantaneous value of the impulse vector. The bandwidth of the impulse detector is dc to the value listed in the table below.

Turning on the impulse detector limits the maximum center band frequency and the broadband frequency as listed in the following table:

	Full Octave		1/3 Octave		1/12 Octave	
	Center	Broad	Center	Broad	Center	Broad
1 channel	8.0 kHz	25.6 kHz	16.0 kHz	25.6 kHz	11.313 kHz	12.8 kHz
2 channel	4.0 kHz	12.8 kHz	8.0 kHz	12.8 kHz	5.657 kHz	6.4 kHz

See also: [STOP] softkey (octave frequency), [AVERAGE TIME] softkey

Inactive softkeys

Some softkeys are inactive for particular analyzer setups. For example, the [COHERENCE] measurement data softkey is inactive during 1-channel measurements. This is because the coherence computation requires data from two channels.

The analyzer uses a ghosted font to indicate that a softkey is inactive.

See also: Fonts

[INCREMENT] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC] → [UTILITIES] → [RENUMBER]

Before you renumber a program, press [INCREMENT] to specify the increment between the renumbered lines. An entry window is displayed so you can enter a new value.

After you have specified the starting line number and the increment between line numbers, press [PERFORM RENUMBER] to renumber your program.

See also: [START LINE #] softkey (Renumber), [RENUMBER] softkey, [PERFORM RENUMBER] softkey

[INP RANGE TRACKING] softkey

Key Path: [Scale]

Turn input range tracking on or off for the active trace. In this mode, the analyzer references the scale to the input range according to the trace coordinate you've selected.

- For linear magnitude traces, the bottom reference always stays at zero. The [Y PER DIV] is adjusted so the top of the scale is greater than or equal to the current input range.

- For logarithmic magnitude traces, the top reference always stays at the current input range.

- For real and imaginary traces, the center reference always stays at zero. The [Y PER DIV] is adjusted so the top of the scale is greater than or equal to the current input range.

- Phase traces do not use input range tracking.

Input range tracking is turned off during an autoscale procedure or when you change the [Y PER DIV] for real, imaginary, or linear magnitude traces.

Input range tracking is not available when you display frequency response, coherence, or math functions.

See also: [Y AUTO SCAL ONCE] softkey, [TOP REFERENCE] softkey, [CENTER REFERENCE] softkey,
[Y PER DIV (DECADES)] softkey, [Y·PER DIV (DECADES)] softkey, [BOTTOM REFERENCE] softkey,
[Trace Coord] hardkey

[Input] hardkey

Select an appropriate input configuration.

The softkeys under the [Input] hardkey allow you to do the following things for each input channel:
- Set the range, either manually or automatically (the default is automatically).
- Specify the grounding mode.
- Specify ac or dc coupling.
- Turn the antialias filter on or off.
- Turn the A-weight filter on or off.
- Turn the ICP power supply on or off.
- Specify engineering units label and multiplier.

If you overload the current input range, the "OV1" or "OV2" status indicators at the top of the analyzer's screen become bold.

See also: [ENG UNIT MULTIPLIER] softkey, [ENG UNIT LABEL] softkey, Engineering units,
[ICP SUPLY ON OFF] softkey, [A WT FLTR ON OFF] softkey, [ANTIALIAS ON OFF] softkey,
[COUPLING AC DC] softkey, [INPUT LOW FLOAT GND] softkey, [CHx AUTO RANGE] softkey,
[CHANNEL x RANGE] softkey

[INPUT LOW FLOAT GND] softkey

Key Path: [Input] → [CHANNEL x SETUP]

Select a pseudo-floating or grounded input mode for the input channel's low side (the shell of the BNC connector).

The pseudo-floating input mode has a 1 Mohm resistance from the shell of the BNC connector to the analyzer's chassis ground—that's why it's called a "pseudo-floating" input, since the input connector's low side is not completely isolated from the chassis ground.

The grounded input mode has a 55 ohm resistance from the shell of the BNC connector to the analyzer's chassis ground.

Both pseudo-floating and grounded input modes have a 1 Mohm resistance (shunted by less than 100 pF) from the center conductor to the shell of the BNC input connector.

[INPUT STATE] softkey

Key Path: [Disp Format]

Display the analyzer's current input configuration—how you've set up the input channels and tachometer input. Use this display and one of the plot or print softkeys to document the input setup for a particular measurement.

You can also use this display while you are setting up a measurement. The analyzer updates the display when you change input settings.

Note

The input state is displayed until you select another option under [Disp Format].

If you select either [UPPER] or [LOWER] under the [BASIC] → [DISPLAY SETUP] key, the analyzer changes the display format to upper/lower.

See also: [TACHOMETR SETUP] softkey (Trigger), [CHANNEL x SETUP] softkey

[INSERT KEYWORD] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC] → [EDIT] →
[TYPING UTILITIES]

Insert complete keywords before the text cursor when you are editing a program.

Here's how you insert a keyword:

1. Press [INSERT KEYWORD].

2. Press the hardkey whose engraved letter corresponds to the first character of the keyword you want.

3. Locate the keyword in the resulting menu. (If more than nine keywords begin with the same character, you may need to press a [MORE] softkey to locate the keyword you want.

4. Insert the keyword in your program by pressing the corresponding softkey.

Note

Use the [CANCEL] softkey to return to the Typing Utilities menu without inserting a keyword.

[INSERT LINE] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC] → [EDIT]

Enable and disable insert line mode when you are editing an HP Instrument BASIC program.

When the editor enters insert line mode, it creates a blank line above the current line (the one containing the text cursor) and moves the cursor to that line. When the editor exits insert line mode, it deletes the current line and moves the text cursor to the next line.

Hint: To save the contents of the current line, press [ENTER] before you exit insert line mode.

When the editor is in insert line mode, it adds a new line after the current line each time you press [ENTER] (assuming the current line contains no syntax errors). This continues until you exit insert line mode—either by pressing [INSERT LINE] or by moving the text cursor to another line with the knob.

[INSERT SPACE] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [BASIC] → [INSTRUMNT BASIC] → [EDIT]

Insert a space before the cursor in the program you are editing.

Insert special characters softkeys

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [BASIC] → [INSTRUMNT BASIC] → [EDIT] → [TYPING UTILITIES]

Each of these softkeys gives you access to a special character during program editing. When you press one of these softkeys, the characters listed after "INSERT" are displayed in a menu. You can then insert one of these characters before the text cursor by pressing the corresponding softkey.

Note The [CANCEL/RETURN] softkey allows you to return to the Typing Utilities menu without inserting a special character.

[Inst Mode] hardkey

Specify the type of measurement being made and whether signals applied to the front panel input connectors or previously captured signals are being measured.

The instrument modes available are:
- FFT analysis.
- Octave analysis (with option 1D1).
- Order analysis (with option 1D0).
- Swept sine (with option 1D2).
- Correlation analysis.
- Histogram/Time.
- Time capture.
- 1 channel.
- 2 channel.

Instrument mode is a major selection that changes the "personality" of the analyzer. This means that other parameters and menus change when you change instrument mode.

See also: [2 CHANNEL] softkey, [1 CHANNEL] softkey, [CAPTURE ON OFF] softkey,
[HISTOGRAM/TIME] softkey, [CORRELATN ANALYSIS] softkey, [SWEPT SINE] softkey,
[ORDER ANALYSIS] softkey, [OCTAVE ANALYSIS] softkey, [FFT ANALYSIS] softkey

[INSTRUMNT BASIC] softkey

(Available only with opt. 1C2, HP Instrument BASIC)

Key Path: [BASIC]

Access the softkeys for editing, selecting, printing, debugging, and labeling programs.

See also: [LABEL PROGRAM] softkey, [DEBUG] softkey, [PRINT PROGRAM] softkey,
[SELECT PROGRAM] softkey, [EDIT] softkey

[INTEG(] softkey

Key Path: [Analys] → [DEFINE FUNCTION] → [DEFINE Fx] → [OPERATION]

Perform a first-order approximation to a running integral.

If F1 = INTEG(D1), the value of F1 is defined as follows:

$$F1[i] = (D1[i]* \ dx[i]) + (D1[i-1]* \ dx[i-1]) + (D1[i-2]* \ dx[i-2]) + \ldots$$

where F1[i] and D1[i] are the values of the ith data point of F1 and D1, respectively, and dx[i] is the width of the ith data point of D1.

In other words, the ith point in F1 is the sum of all points in D1, up to and including the ith point, with each point multiplied by its width.

One application for integration is converting time domain data from acceleration to velocity. (For frequency domain data, use the "/jOMEGA" operation.)

See also: [/jOMEGA( ] softkey

[INTEGRATE TIME] softkey (swept sine)

(Available only with option 1D2, Swept Sine)

Key Path: [Avg]

Specify the integrate time for each swept sine measurement point. Integrate time is the amount of time that each point is measured.

Limits: 1 to 234 cycles
or: 250 us to 32,768 s   Default: 5 cycles

The integration filter's effective bandwidth is inversely proportional to the integration time (bandwidth = 1 / integrate time). Increasing integrate time effectively narrows the bandwidth at each measurement point. The result is greater harmonic rejection and increased signal-to-noise ratios but longer measurement times.

If you set the integrate time in cycles, the integration scale is proportional. The integrate time will be longer at lower frequencies; at higher frequencies the same number of cycles occurs in a shorter time.

If you set the integrate time in seconds, the analyzer tries to use a constant integration, with the following exceptions.

The analyzer integrates over an integer multiple of cycles at the measurement frequency. At low frequencies, if the integrate time is less than 1 complete cycle, the analyzer takes a complete cycle.

The integrate time is limited to 3200/filter span, where filter span is the equivalent FFT frequency span. As the sweep goes to higher frequencies, the integrate time may decrease. The following table lists the maximum integrate time for each frequency span.

Equivalent span	Max integrate time	Equivalent span	Max integrate time
51,200 Hz	.0625 s	50 Hz	64 s
25,600 Hz	.125 s	25 Hz	128 s
12,800 Hz	.250 s	12.5 Hz	256 s
6,400 Hz	.500 s	6.25 Hz	512 s
3,200 Hz	1 s	3.125 Hz	1024 s
1,600 Hz	2 s	1.5625 Hz	2048 s
800 Hz	4 s	781.25 mHz	4096 s
400 Hz	8 s	390.625 mHz	8192 s
200 Hz	16 s	195.3125 mHz	16384 s
100 Hz	32 s	97.65625 mHz	32768 s

See also: [SWEPT SINE] softkey

[INTERNAL DISK] softkey

Key Path: [Disk Utility] → [DEFAULT DISK]
 or: [Save/Recall] → [DEFAULT DISK]

Select the analyzer's internal disk as the default disk.

The internal disk uses 3.5-inch flexible disks (double-sided, double-density or high-density) for storage. You must format each flexible disk before you use it.

See also: [FORMAT DISK] softkey, [DEFAULT DISK] softkey

[INTRLEAVE FACTOR] softkey

Key Path: [Disk Utility] → [FORMAT DISK]

Define the sector numbering on the flexible disks you will format in the internal disk drive or an external disk drive.

Limits: 0 to 255

Default: 0

Note

If you enter a 0, the analyzer will use interleave factors of 1 for LIF and 3 for DOS.

Save and recall operations are more efficient (faster) when you select the proper interleave factor. The default interleave factors of 1 for LIF and 3 for DOS are most efficient.

If you enter a value too large for the disk you are formatting, the analyzer uses the largest possible value.

See also: [FORMAT DISK] softkey

[INVERSE FFT(] softkey

Key Path: [**Analys**] → [DEFINE FUNCTION] → [DEFINE Fx] → [OPERATION]

Perform an Inverse Fast Fourier Transform. If the size of the argument data block is not a power of two, the analyzer pads the data with zeros to the nearest power of two.

When you perform the IFFT on a linear spectrum collected using the Hanning or Flat Top window, the result will differ from the original time data. In this case, exchanging the left and right halves of the IFFT result will produce the original windowed time data.

The analyzer cannot compute the FFT for frequency data with more than 800 lines of resolution. For other domains, the number of data points must not exceed 2048.

If the argument's X-axis units are anything other than frequency or time, the analyzer performs the FFT but does not change the units.

See also: [LIN SPEC CHANNEL x] softkey (FFT analysis), [FLAT TOP] softkey, [HANNING] softkey

[ITALIAN] softkey

See [KEYBOARD SETUP] softkeys.

[KEYBOARD SETUP] softkeys

Key Path: [**System Utility**]

Specify what language keyboard you have attached to the analyzer. The analyzer accepts the following keyboards (the default is U.S. English):
- French.
- German.
- Italian.
- Spanish.
- Swedish/Finnish.
- U.K. English.
- U.S. English.

Note

Configuring your analyzer to use a different keyboard **does not** localize the analyzer's help facility or screen annotation; it only ensures that the analyzer recognizes the proper keys for that particular keyboard.

For details on using an external keyboard, refer to the *Using I-BASIC with the HP 35665A* manual.

Knob

The *knob* is an RPG (rotary pulse generator) that controls three things: movement of the on-screen marker, continuous entry of numeric values, and movement of the cursor in the help mode.

Usually, the knob simply moves the marker for the active trace. Turn the knob clockwise and the marker moves to the right. Turn counter-clockwise and the marker moves left. The faster you turn the knob, the faster the marker moves.

After you press a softkey that requires a numeric entry, the knob becomes dedicated to numeric entry. Turn the knob clockwise and the analyzer steps through larger numeric entries. Turn counter-clockwise and the analyzer steps through increasingly smaller entries.

Although the analyzer uses a default step size to control the "sensitivity" of the knob—that is, the interval between each numeric entry as you turn the knob—you can select your own "step size" for frequency entries. Press [**Freq**] and [ENTRY STEP SIZE]. Then use the numeric keypad to enter your own step size.

When numeric entry is active, an entry window appears at the top of the screen with the currently-selected numeric value. This window remains on screen for several seconds to give you a chance to enter a numeric value. If you don't make an entry, the window disappears after several seconds. If you use the knob (or the numeric entry keypad) to make an entry, this window remains on the screen. After you complete your entry, the window soon disappears and the knob returns to marker movement.

When you are using help, the knob scrolls through index entries and links in help text. Turn the knob clockwise to move down through the index or links; turn the knob counter-clockwise to move up.

See also: [ENTRY STEP SIZE] softkey

[LABEL PROGRAM] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC]

Change the softkey label for the active HP Instrument BASIC program. This changes the [RUN PROGRAM x] softkeys and the [PROGRAM x] softkeys under [SELECT PROGRAM].

You are asked to enter the new label. The entry window already contains the current label, but you can modify it with the alpha entry keys.

See also: Alpha entry mode, [PROGRAM x] softkey, [RUN PROGRAM x] softkey

[LAST ERROR] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC] → [DEBUG]

Redisplay the last error message generated by your program.

[LEVEL HIGH LOW] softkey

(Available only with opt. 1D0, Computer Order Tracking, or opt. 1D1, Real Time Octave)

Key Path: [**Trigger**]

Specify whether a high or low TTL signal should trigger the analyzer for octave or order measurements. This applies for external triggering only.

Note	The external trigger input floats to TTL high. If nothing is connected to the trigger input, the analyzer triggers immediately when you set [LEVEL HIGH LOW] to high.

For more information on triggering, see the analyzer's *Concepts Guide.*

See also: [EXTERNAL TRIGGER] softkey

[LEVEL] softkey (source)

Key Path: [Source]

Specify an output level for the analyzer's source—this level applies to all waveforms. You can specify peak volts, true rms volts, peak dBV, or rms dBV. If you don't specify a new output level, the output levels remain at the level you set previously.

Limits: 0 Vpk to 5 Vpk   Default: 0 Vpk
Steps: 200 uVpk

For random noise or periodic chirp the level you set is the total wideband level (in other words, the summation of these waveforms measured at full span). If you're using smaller frequency spans, not all of this energy will appear in the measurement because some of the waveform's power will be outside the selected span.

Unlike most source parameters, the source level is global for all instrument modes (except swept sine and order analysis). This means that if you specify a source level, then change the instrument mode, the source level remains the same.

The analyzer also keeps track of the units you specified for the level. For example, if you set the level in V rms for random noise, the analyzer maintains the rms level when you change to a different source output type. If you set the level in V peak, the analyzer maintains the peak level.

Because the ratio of peak-to-rms values is different for different source output types, the peak value changes when the analyzer maintains the rms value. The source output level is limited to +/– 5 V peak. If the new rms value would require a peak value outside this range, the analyzer sets the rms value to the maximum possible.

For example, the peak-to-rms ratio for random noise is approximately 4.4. The ratio for fixed sine is 1.414. If you set a source level of 1 V rms for random noise and then change the output type to fixed sine, the analyzer maintains the 1 V rms level. The peak voltage required for 1 V rms is 4.4 V for random noise and 1.414 V for fixed sine.

See also: [Inst Mode] hardkey, [PERIODIC CHIRP] softkey, [RANDOM NOISE] softkey

[LEVEL] softkey (swept sine source)

Key Path: [Source]

Specify an output level for the analyzer's source in swept sine mode. You can specify peak volts, true rms volts, peak dBV, or rms dBV. If you don't specify a new output level, the output levels remain at the level you set previously.

See also: [SWEPT SINE] softkey

[LEVEL] softkey (tachometer setup)

Key Path: [Trigger] → [TACHOMETR SETUP]
     or: [Input] → [TACHOMETR SETUP]

Specify the tachometer trigger level.

Limits: Range setting (+/–4 V or +/–20 V)   Default: 0

Choose a level (within the specified range) at which the signal is fairly clean and does not have multiple transitions through the specified level for any one tach edge.

Note	The actual trigger level may vary slightly from the entered level. For this reason, you can enter levels between +/– 4.7 V for the lower range setting and +/– 25 V for the upper range setting.

See also: [TRG RANGE +/- 20 4] softkey

[LEVEL] softkey (trigger setup)

Key Path: [Trigger] → [TRIGGER SETUP]

Set the trigger level as a percentage of the current input range (do not confuse the input range with the vertical scale). When the trigger signal crosses this level, the analyzer makes a measurement.

Limits: –100% to +100%   Default: 0%

Note	The trigger level applies to channel 1 triggering and channel 2 triggering only. Free run, external, source, and HP-IB triggers are independent of the level setting.

The percentage of input range is in terms of *linear units*, not logarithmic units. For example, if your current input range is –5 dBVrms, you must first find the equivalent value in linear units (such as V, not dBV or dBVrms). The equivalent of –5 dBVrms is 795.27 mV. Then find the percentage of this value that approximates the trigger level you want to use. If you want the trigger to occur at 400 mV, set a trigger level of 50% (400 is 50% of 795.27).

You can also use input range tracking to see how the trigger level percentage relates to the input signal.

For more information on triggering, see the analyzer's *Concepts Guide.*

See also: [INP RANGE TRACKING] softkey, [CHANNEL x RANGE] softkey

[LIMIT TEST] softkey

Key Path: [Analys]

Access the softkeys you need to define limits (also called limit lines) and to test trace data against those limits.

- [LINES ON/OFF] enables and disables display of the limits.

- [TEST EVAL ON/OFF] enables and disables evaluation of trace data against the limits.

- [FAIL BEEP ON/OFF] specifies whether the analyzer should beep when a limit test is failed.

- [DEFINE UPPER LIMIT] and [DEFINE LOWER LIMIT] let you define limits interactively from the front panel.

Each limit is defined as a series of line segments and maintained in a file. (These segments need not be joined at their endpoints.)

If you recall limit lines, be sure to set up the same Y-axis units and X-axis units that you used to create the limit lines. The analyzer does not store unit labels with the limit table. For example, an X-axis value of 1.2 kHz is stored as "1200" and a Y-axis value of –35 dBVrms is stored as "–35." If you use different X-axis or Y-axis units, limit testing will not work.

Hint: You can create a limit from a trace. Just display the trace you want to use, then press [TRACE TO LIMIT].

For information on limit testing over HP-IB, see the analyzer's *HP-Programming with the HP 35665A* manual.

Note Limit testing is not available for order track measurement data.

[LIMIT x LINE TYPE] softkeys

Key Path: [Plot/Print] → [PLOT LINE SETUP] → [LIMIT A LINE TYPE]
  or: [Plot/Print] → [PLOT LINE SETUP] → [LIMIT B LINE TYPE]

Specify the line pattern that will be used to plot the limit line for each of the analyzer's two traces.

Line type changes apply only to trace A if you pressed [LIMIT A LINE TYPE] to display these softkeys, or to trace B if you pressed [LIMIT B LINE TYPE].

See also: Line type softkeys

[LIN SPEC CHANNEL x] softkey (FFT analysis)

Key Path: [**Meas Data**]

Display the linear spectrum for the specified channel. The linear spectrum computation depends on the type of averaging active.

Averaging off, rms averaging, rms exponential, or peak hold	:	crtn * fft (windowed time)
Vector averaging	:	sum (crtn * fft (wtime))/N
Vector exponential averaging	:	(1/N) * (crtn * fft (wtime)) + ((N-1)/N) * linspec

where: N	=	number of averages
wtime	=	windowed time
crtn	=	correction for channel x
linspec	=	linear spectrum channel x

See also: [RMS EXPONENTL] softkey, [CAL CONST ON OFF] softkey, [NUMBER AVERAGES] softkey, [WINDOWED TIME CH x] softkey, [VECTOR EXPONENTL] softkey, [PEAK HOLD] softkey, [VECTOR] softkey, [RMS] softkey

[LIN SPEC CHANNEL x] softkey (swept sine)

(Available only with option 1D2, Swept Sine)

Key Path: [**Meas Data**]

Display the most recent swept linear spectrum for the specified channel. The trace is updated at each new sweep point.

Line type softkeys

Specify the line pattern that will be used to plot each of the analyzer's two traces.

- [SOLID] specifies a solid line.
- [DOTTED] specifies a dotted line.
- [DASHED] specifies a dashed line.
- [USER DEFINED] activate the user line type (if supported by your plotter or printer).
- [USER LINE TYPE] allows you to enter the encoded value for a particular line type. See your printer or plotter documentation for information on the lines types available and the codes.

Line type changes apply only to trace A if you pressed [TRACE A LINE TYPE] to display these softkeys. They apply only to trace B if you pressed [TRACE B LINE TYPE].

[LINEAR MAGNITUDE] softkey

Key Path: [Trace Coord]

Display the magnitude of the active trace on a linear Y-axis scale. The Y-axis value is the square root of (real part squared plus imaginary part squared).

See also: [Active Trace] hardkey

[LINEAR] softkey

(Available only with option 1D1, Real Time Octave)

Key Path: [Avg]

Specify linear averaging for an octave measurement.

For linear averaging the analyzer performs a linear integration over time of the magnitude squared power in each measurement band. Specify the integration time by pressing [AVERAGE TIME]

See [REPEAT ON OFF] for information on how that parameter affects linear averaging.

See also: [REPEAT ON OFF] softkey (octave), [AVERAGE TIME] softkey, [OCTAVE ANALYSIS] softkey

[LINES ON OFF] softkey

Key Path: [Analys] → [LIMIT TEST]

Enable and disable the display of limit lines for the active trace.

The analyzer can evaluate a trace against the current limits even when limit lines are not displayed. Just toggle [TEST EVAL ON OFF] to ON.

See also: [TEST EVAL ON OFF] softkey

[LN(] softkey

Key Path: [**Analys**] → [DEFINE FUNCTION] → [DEFINE Fx] → [OPERATION]

Compute the natural logarithm (base e) of the operand.

The natural logarithm (base e) of a complex number a + jb is

$$\ln(sqrt(a\char`^2+b\char`^2)) + j* \ arctan(b/a).$$

The imaginary part of the result is the phase of the original complex number. When computing the logarithm of a block of complex data, the analyzer uses the unwrapped phase in radians.

See also: [UNWRAPPED PHASE] softkey

[Local/HP-IB] hardkey

Press the [Local/HP-IB] hardkey for one of the following reasons:

- To gain access to softkeys that define the analyzer's HP-IB parameters.
- To return the analyzer to local control when it is being operated from the HP-IB.
- To abort a running HP Instrument BASIC program.

The softkeys grouped under this hardkey allow you to do the following things:

- Abort HP-IB operations initiated by the analyzer.
- Specify the analyzer's controller capabilities.
- Set the analyzer's address.
- Tell the analyzer what addresses you are using for attached printer, plotter, and disk drive.
- Specify whether HP-IB mnemonics should be echoed to the display when equivalent keys are pressed.
- Interrupt a controller that is operating the analyzer from the HP-IB.

When you operate the analyzer from the HP-IB, all hardkeys on the analyzer's front panel—except for [Local/HP-IB]—are disabled. You can press [Local/HP-IB] to suspend remote (HP-IB) operation and reenable local (front-panel) operation.

Note	If the analyzer has received the Local Lockout (LLO) command via the HP-IB, *all* hardkeys are disabled. In this case, you can not reenable front-panel operation from the front panel. The analyzer must receive the Go To Local (GTL) command via the HP-IB.

The analyzer cancels any pending *OPC command or query when you suspend remote operation.

See the *HP-IB Programming with the HP 35665A* manual for more information about remote operation of the analyzer.

See also: [HPIB ECHO ON OFF] softkey, [DISK ADDRESS] softkey, [PLOTTER ADDRESS] softkey, [PRINTER ADDRESS] softkey, [ANALYZER ADDRESS] softkey, Controller Capability softkey group, [ABORT HP-IB] softkey

[LOG MAGNITUDE] softkey

Key Path: [Trace Coord]

Display the magnitude of the active trace on a logarithmic Y-axis scale. The Y-axis value is calculated using the following equation:

$$Y = \text{square root } (i\char`\^2 + r\char`\^2)$$

where r is the real part and i is the imaginary part.

See also: [Active Trace] hardkey

[LOWER] softkey (BASIC display)

See [DISPLAY SETUP] softkey group.

[MAG(] softkey

Key Path: [Analys] → [DEFINE FUNCTION] → [DEFINE Fx] → [OPERATION]

Compute the magnitude of the operand.

The magnitude of a complex number a + jb is given by sqrt $(a\char`\^2 + b\char`\^2)$. In polar form, the magnitude of me$\char`\^$jp is simply m.

[MANUAL ARM] softkey

Key Path: [Trigger]
   or: [Trigger] → [ARM SETUP]

Select manual trigger arming. This means the analyzer cannot make a measurement until you manually arm the trigger by pressing the [ARM] softkey. Once you arm the trigger, the analyzer will make a measurement if the trigger conditions are met.

To make additional measurements, you'll have to press [ARM] each time.

Note   For averaged measurements, you must arm each average.

For more information on arming and triggering, see the analyzer's *Concepts Guide.*

[MANUAL FREQ] softkey

(Available only with option 1D2, Swept Sine)

Key Path: [Freq]

Set manual frequency for a swept sine measurement. This is the actual frequency of measurement; it must fall between the start and stop frequencies.

You may make a numeric entry after pressing this key, or perform a manual sweep by pressing the arrow keys in the numeric entry key group. The amount of increment or decrement is determined by the resolution you set up.

This key is only used for manual sweep. A numeric entry made while this key is inactive will be used the next time you select manual sweep.

See also: [RESOLUTN] softkey, [STOP] softkey (swept sine frequency),
  [START] softkey (swept sine frequency), [SWEEP AUTO MAN] softkey

[MANUAL PREVIEW] softkey

Key Path: [Avg] → [PREVIEW SETUP]

Turn on the manual preview feature.

When manual preview is on, you can decide which data should be included in the measurement results.

After each time record is collected, it is displayed. You must either accept or reject the time record for both channels by pressing [REJECT TIME REC] or [ACCEPT TIME REC]. The analyzer waits until you respond.

See also: [ACCEPT TIME REC] softkey, [REJECT TIME REC] softkey

[Marker Fctn] hardkey

Select from the following specialized marker functions:

- Harmonic markers.
- Band markers.
- Sideband markers.
- Waterfall markers.
- Time markers.
- Gain and phase margins and crossovers.
- Resonant frequency and damping.
- Supplemental information.

See also: [SUPLMENTL INFO] softkey, [FREQ & DAMPING] softkey, [GAIN PHAS MARGINS] softkey, [TIME PARAMTERS] softkey, [WATERFALL MARKERS] softkey, [SIDEBAND MARKER] softkey, [BAND MARKER] softkey, [HARMONIC MARKER] softkey

[MARKER FCTN OFF] softkey

Key Path: [Marker Fctn]

Turn off any marker function that is on.

See also: [Marker Fctn] hardkey

Marker Group

This group includes the [Marker] and [Marker Fctn] hardkeys and the knob.

The marker keys call up menus that let you control the location and movement of the on-screen marker. These controls affect only the markers for the currently-active trace.

See also: [Marker Fctn] hardkey, Knob, [Marker] hardkey

[Marker] hardkey

Select markers.

The marker appears as a small diamond.

This marker can be absolute or relative. The absolute marker (or main marker) values reflect the absolute X-axis and Y-axis values. By changing to relative, you can set a marker reference (indicated by a small square) and use the relative marker to find relative values between two points.

You can also search for peaks or move the marker to a specific X-axis location.

The analyzer displays marker readouts just above each trace box.

See also: [MARKER X ENTRY] softkey, Marker search keys, [MKR VALUE ABS REL] softkey, Marker readout

[MARKER ON OFF] softkey

Key Path: [Marker]

Turn the marker on and off.

Each trace has its own marker. To turn on a marker for a particular trace, first make sure the trace is active (use the [Active Trace] hardkey). The marker options you select apply only to the marker on the active trace.

See also: [Active Trace] hardkey

Marker readout

The analyzer displays marker values in the line above the trace box. For absolute markers, the labels are "X" and "Y." For relative markers, the values are "Xr" and "Yr."

For very small or very large values, the annotation is in scientific notation. The prefixes are defined under "Suffix menus."

For the far left band in octave displays, the X marker field reads T, I, B, P, or U:

- T indicates band-limited total power.
- I indicates broadband impulse power.
- B indicates broadband total power.
- P indicates broadband peak power.
- U indicates undefined. This indicates data read in from a different analyzer.

See also: Suffix menus

Marker search keys

Four softkeys allow you to search for peaks on the active trace:

- [MARKER TO PEAK]: Finds the highest peak once.
- [NEXT PEAK RIGHT]: Finds the closest peak to right of marker.
- [NEXT PEAK LEFT]: Finds the closest peak to left of marker.
- [PEAK TRK ON/OFF]: Finds the highest peak each time the trace updates.

A peak is a local maximum on a trace. The slope of a trace is positive to the left of a peak and negative to the right. In addition, the slope on one side of a peak must not change for at least one vertical division (one-half division if the display format is upper/lower).

[MARKER TO PEAK] softkey

Key Path: [Marker]

Move the marker to the largest amplitude on the displayed X-axis portion of the trace. (The marker will find Y-axis values that are above or below the displayed values, but will not find a Y-axis value of infinity).

This moves the marker to the peak only for the active trace (but the marker on the inactive trace will also move if marker coupling is on). Once moved, the marker remains at the new X-axis location until you do one of the following things:

- Turn the knob (with no entry window displayed).
- Press another marker-search key.
- Enter a new X-axis location (using [MARKER X ENTRY]).

The analyzer will not move the marker to a peak at 0 Hz.

Note

If you turn on peak tracking, the analyzer automatically moves the marker to the peak each time the active trace updates.

See also: [COUPLED ON OFF] softkey, [PEAK TRK ON OFF] softkey

[Marker Value] hardkey

Use the current value of the marker readout for the active numeric entry softkey. The analyzer uses the real value (not complex) in the current coordinate system.

The marker has an X-axis value and a Y-axis value. The analyzer tries to match the units for the parameter. For example, if you are displaying a frequency response and press [Freq] → [STOP] → [Marker Value], the analyzer uses the X-axis marker value. The units for stop frequency are Hz, the X-axis value for a frequency response display.

If the parameter has no units, the analyzer uses the Y-axis marker value. If the units do not match, the analyzer displays an error message and does not use the marker value for the numeric entry.

See also: [REAL PART] softkey, [Trace Coord] hardkey, [NUMERIC ENTRY] softkeys

[MARKER X ENTRY] softkey

Key Path: [Marker]

Move the marker to a specific location. Press [X ENTRY] and enter the X-axis coordinate using the numeric keypad.

[MARKER REFERENCE] softkey

See [PLOT DATA SELECT] softkey.

[MATCH X SCALE] softkey

Key Path: [Scale]

Set the X-axis scale for the active trace to match the X-axis scale for the inactive trace.

This is a convenient way to set the same scaling for both traces.

Note	You cannot scale octave data to match data from other instrument modes. The analyzer will display nominally the same frequency span for both traces, but the scaling will not be the same because of the total-power band at the right side of the octave display.

[MATCH Y SCALE] softkey

Key Path: [Scale]

Set the Y-axis scale for the active trace to match the Y-axis scale for the inactive trace. The analyzer changes the scale only if the coordinate systems are compatible.

This is a convenient way to set the same scaling for both traces.

[MATH FUNCTION] softkey

Key Path: [Meas Data]
   or: [Meas Data] → [MORE]

Access the [Fx] softkeys. Each [Fx] key displays the result of a function you have defined.

A function must be defined before it can be displayed. Functions are defined under the [Analys] hardkey.

If you display a math function that cannot be executed, the analyzer displays the grid with no data. For example, if you're in 1 channel mode, the function F1 = FreqResp will be displayed as an empty grid. (Frequency response is a 2-channel measurement.)

See also: [DEFINE FUNCTION] softkey

[MAX INPUT LEVEL] softkey

(Available only with option 1D2, Swept Sine)

Key Path: [Source] → [AUTOLEVEL SETUP]

Specify a maximum input level for the non-reference channel when autolevel is on. The analyzer adjusts the source output so that the amplitude at the measurement frequency does not exceed this level.

Limit: 486 uVpk to 31.6 Vpk   Default: 2 Vpk

See also: [AUTOLEVEL ON OFF] softkey, [REF CHAN CH1 CH2] softkey

[MAX ORDER] softkey

(Available only with opt. 1D0, Computed Order Tracking)

Key Path: [**Freq**]

Specify how many orders you want displayed.

Limits: 3.125 to 200   Default: 10

[MAX ORDER] divided by [DELTA ORDER] must be less than or equal to 200. [MAX ORDER] is further limited by the following equation:

$$(\text{Max Order X Max rpm})/60 \quad \leq \text{ 25.6 kHz (1 channel)}$$
$$\leq \text{ 12.8 kHz (2 channel)}$$

For post-processing of time capture data:

$$(\text{Max Order X Max rpm})/60 \quad \leq \text{ 102.4 kHz (1 channel)}$$
$$\leq \text{ 51.2 kHz (2 channel)}$$

See also: [DELTA ORDER] softkey

[MAX RPM] softkey (Capture Setup)

Key Path: [**Inst Mode**] → [CAPTURE SETUP] → [TACHOMETR SETUP]

Specify the upper limit of the rotation speed range you want to monitor for time capture.

Limits: 5 to 491,519   Default: 6,000

Note	If the instrument mode is order analysis, the analyzer ignores this setting and uses the [MAX RPM] specified under the [**Freq**] key.

[MAX RPM] softkey (Freq)

(Available only with opt. 1D0, Computed Order Tracking)

Key Path: [Freq]

Specify the upper limit of the rotation speed range you want to monitor for order measurements with rpm step arming.

Limits: 5 to 491,519

Default: 6,000

[MAX RPM] is further limited by this equation:

(Max Order X Max rpm)/60   ≤ 25.6 kHz (1 channel)
                              ≤ 12.8 kHz (2 channel)

For post-processing of time capture data:

(Max Order X Max rpm)/60   ≤ 102.4 kHz (1 channel)
                              ≤ 51.2 kHz (2 channel)

For rpm increasing measurements, the measurement starts at [MIN RPM] and stops [MAX RPM]. For rpm decreasing measurements, the measurement starts at [MAX RPM] and continues to [MIN RPM].

See also: [RPM DECREASING] softkey (order analysis), [RPM INCREASING] softkey (order analysis),
              [RPM STEP ARM] softkey (order measurements), [ORDER ANALYSIS] softkey,
              [MIN RPM] softkey

[MAX SRC LEVEL] softkey

(Available only with option 1D2, Swept Sine)

Key Path: [Source] → [AUTOLEVEL SETUP]

Specify the maximum source output level. When autolevel is on, the source output will not go above this level.

Limits: 254 uVpk to 5 Vpk

Default: 2 Vpk

The source level may also be limited by the [MAX INPUT LEVEL].

Hint: To determine if the source level has been limited, display the [LIN SPEC] for channel 1. If it appears "flattened," the analyzer has probably limited the source level.

See also: [MAX INPUT LEVEL] softkey, [AUTOLEVEL ON OFF] softkey

[MAXIMUM % CHANGE] softkey

(Available only with option 1D2, Swept Sine)

Key Path: [Freq] → [RESOLUTN SETUP]

Specify the maximum percent change for the swept sine autoresolution feature.

Limits: .391% to 100%   Default: 2.5%

[MAXIMUM % CHANGE] refers to the difference in frequency response at adjacent measurement points. The analyzer compares the [MAXIMUM % CHANGE] to the magnitude and phase change between two consecutive points. The next frequency step size is proportional to the entered [MAXIMUM % CHANGE] and inversely proportional to the detected magnitude change.

Decreasing the percent change provides better resolution when changes occur, but results in a slower measurement. A larger percent change does not slow down the measurement as much, but it also does not improve the resolution as much.

See also: [AUTO RES ON OFF] softkey, [SWEPT SINE] softkey

[MAXIMUM] softkey (hold setup)

See [HOLD SETUP] softkeys.

[Meas Data] hardkey

Specify what measurement data you want displayed in the active trace. The measurement data available varies for different instrument modes.

The following table lists the data available for each instrument mode. Math Function, Data Register, Waterfall Register, and Capture are also available for each measurement.

Instrument Mode	Measurement Data
FFT Analysis	Linear spectrum channel 1 or 2 Power spectrum channel 1 or 2 Time record channel 1 or 2 Frequency response (2 channel only) Coherence (2 channel only) Cross spectrum (2 channel only) Orbit (2 channel only) Windowed time channel 1 or 2
Octave Analysis	Power spectrum channel 1 or 2
Order Analysis Track off	Power spectrum channel 1 or 2 Time record channel 1 or 2 Orbit (2 channel only) rpm profile
Track on	Composite power channel 1 or 2 Order track channel 1 or 2 rpm profile
Swept Sine	Linear spectrum channel 1 or 2 Time record last point ch 1 or 2 Frequency response Cross spectrum Normalized variance channel 1 or 2
Correlation Analysis	Time record channel 1 or 2 Auto correlation channel 1 or 2 Cross correlation (2 channel only) Windowed time channel 1 or 2
Histogram/Time	Histogram channel 1 or 2 PDF channel 1 or 2 CDF channel 1 or 2 Unfiltered time record chan 1 or 2

Measurement Group

The Measurement keys let you control the analyzer's input configuration, measurement range, and measurement resolution. Here's a brief summary of the Measurement keys and their significant functions:

- [Inst Mode] specifies the kind of measurement you want to make.
- [Freq] determines the frequency range measured.
- [Window] specifies the windowing function applied to the input signal.
- [Input] sets the current input range and coupling.
- [Source] controls the analyzer's source output.
- [Trigger] provides trigger choices and manual arming.
- [Start] initiates a new measurement.
- [Pause/Cont] stops the analyzer in the middle of a measurement. Pressing [Pause/Cont] again continues the measurement where it left off.
- [Avg] provides averaging choices.

[MEASURMNT STATE] softkey

Key Path: [Disp Format]

Display the analyzer's current configuration—how you've set up the analyzer. Use this display and one of the plot or print softkeys to document the instrument setup for a particular measurement.

Note   The measurement state does not include the input settings. Press [INPUT STATE] to display that information.

You can also use this display while you are setting up a measurement. The analyzer updates the display when you change parameter settings.

Note   The measurement state is displayed until you select another option under [Disp Format].

If you select either [UPPER] or [LOWER] under the [BASIC] → [DISPLAY SETUP] key, the analyzer changes the display format to upper/lower.

See also: [INPUT STATE] softkey

[MEMORY SIZE] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [BASIC] → [INSTRUMNT BASIC] → [UTILITIES]

Allocate stack space (in bytes of volatile RAM) for your program.

Limits: 1200 bytes to 3 megabytes   Default: 0
Step: 2 bytes

Stack space is the portion of memory used for temporary storage of program variables that are not stored in COM. It provides the program's "working space."

The analyzer allocates all other memory for program use as it is needed—at run time, when you recall a program, or when you edit a program.

Stack space is set automatically when you recall a program or press [AUTO MEMORY]. However, the automatically generated stack space is not appropriate for some programs. Here are two examples:

■ Programs that call subprograms recursively usually require more stack space.

■ Programs that have many subprograms but don't "nest" them deeply when running usually require less stack space.

Note	If you see the message "ERROR 2 Memory overflow" while your program is running, you need to allocate more stack space or increase the memory available by removing such things as time capture data and waterfall registers. The keys are under [System Utility] → [MEMORY USAGE].

See also: [VOLATILE RAM DISK] softkey, [AUTO MEMORY] softkey

[MEMORY USAGE] softkey

Key Path: [System Utility]

Display a chart showing how much memory is available and how much is used by the following things:

- Time capture buffer.
- Waterfall display.
- Waterfall registers.
- HP Instrument BASIC programs.
- Volatile RAM disk.

The softkeys in the menu allow you to clear any of the items in this list from memory. Press the associated [REMOVE] key, then [CONFIRM REMOVE].

Note

If you remove the RAM disk, you must use [FORMAT DISK] to recreate the volatile RAM disk.

See also: [CAPTURE LENGTH] softkey, [VOLATILE RAM DISK] softkey, [**BASIC**] hardkey, [WATERFALL REGISTER] softkey, [WATERFALL] softkey, [FORMAT DISK] softkey

Menu definition

The term "menu" simply refers to softkey labels that are displayed concurrently. For example, when you press the [Display Format] hardkey, the following softkey labels appear:

[SINGLE]
[UPPER/LOWER]
[FRONT/BACK]
[WATERFALL]
[MEASURMNT STATE]
[INPUT STATE]
[WATERFALL ACT TRACE]
[WATERFALL SETUP]
[BODE DIAGRAM]
[MORE]

These labels are referred to collectively as the Display Format menu.

[MIN RPM] softkey

(Available only with opt. 1D0, Computed Order Tracking)

Key Path: [Freq]

Specify the lower limit of the rotation speed range you want to monitor for order measurements with rpm step arming.

Limits: 5 to 491,519 rpm   Default: 600
Min rpm must be less than [MAX RPM], which is limited by this equation:

$$(\text{Max Order} \times \text{Max rpm})/60 \quad \leq 25.6\ \text{kHz (1 channel)}$$
$$\leq 12.8\ \text{kHz (2 channel)}$$

For rpm increasing measurements, the measurement starts at [MIN RPM] and continues to
[MAX RPM]. For rpm decreasing measurements, the measurement starts at [MAX RPM] and stops at
[MIN RPM].

See also: [RPM DECREASING] softkey (order analysis), [RPM INCREASING] softkey (order analysis),
           [RPM STEP ARM] softkey (order measurements), [ORDER ANALYSIS] softkey,
           [MAX RPM] softkey (Freq)

[MINIMUM RESOLUTN] softkey

(Available only with option 1D2, Swept Sine)

Key Path: [Freq] → [RESOLUTN SETUP]

Specify the minimum resolution for the swept sine autoresolution algorithm. The analyzer will not adjust the resolution any finer than this setting.

Limits: 3 to 801 points/sweep   Default: 401 points/sweep
(You can enter values outside this range; the analyzer checks the values at run time and adjusts them to within the limits.)

You can specify a number of points per sweep, percent of the frequency span, or a specific frequency step.

See also: [AUTO RES ON OFF] softkey, [SWEPT SINE] softkey

[MINIMUM] softkey (hold setup)

See [HOLD SETUP] softkeys.

[MKR VALUE ABS REL] softkey

Key Path: [Marker]

Toggle the marker between absolute and relative.

When the absolute marker is absolute, the X-axis and Y-axis values at the marker position.

When the marker is relative, the X-axis and Y-axis values indicated are those relative to the position of the marker reference (indicated by a small square), not absolute values. The marker labels change from X and Y to Xr and Yr.

To move the marker reference to a specific (absolute location), use the [REFERENCE X ENTRY] and [REFERENCE Y ENTRY] softkeys under [REFERENCE SETUP]. To move the marker reference to the position of the main marker, press [REFERENCE TO MARKER].

[MODIFY START Y] softkey

Key Path: [Analys] → [DATA EDIT] → [EDIT D1 - D8]

Change the start vertical axis value for data edit. The analyzer draws a straight line connecting the point defined by [START X] and start Y with the point defined by [STOP X] and stop Y.

Note	When you enter a value for the Y-axis, you cannot enter units. The analyzer uses the currently-displayed Y-axis units.

You can use the [EXP] key to enter units in engineering notation. For example, to enter 15 mV, press the following key sequence:

[1] [5] [EXP] [+/−] [3] [ENTER]

See also: [STOP X] softkey, [MODIFY STOP Y] softkey, [START X] softkey, [DATA EDIT] softkey

[MODIFY STOP Y] softkey

Key Path: [Analys] → [DATA EDIT] → [EDIT D1 - D8]

Change the stop vertical axis value for data edit. The analyzer draws a straight line connecting the point defined by [START X] and start Y with the point defined by [STOP X] and stop Y.

Note

When you enter a value for the Y-axis, you cannot enter units. The analyzer uses the currently-displayed Y-axis units.

You can use the [EXP] key to enter units in engineering notation. For example, to enter 15 mV, press the following key sequence:

[1] [5] [EXP] [+/–] [3] [ENTER]

See also: [STOP X] softkey, [MODIFY START Y] softkey, [START X] softkey, [DATA EDIT] softkey

[MORE] softkey

Display the second page of options for a menu.

When there are more than 10 options in a menu, the options are split into two pages. Use [MORE] to display the second page, then use [RETURN] to display the first page.

[MORE: NYQ REAL IMAG] softkey

Display the second page of trace coordinate options.

The options include real part, imaginary part, and Nyquist diagram.

See also: [NYQUIST DIAGRAM] softkey, [IMAGINARY PART] softkey, [REAL PART] softkey

[MOVE ALL VERTICAL] softkey

Key Path: [Analys] → [DEFINE LOWER LIM]
    or: [Analys] → [LIMIT TEST] → [DEFINE UPPER LIM]

Specify that you want to move an entire limit line up or down.

The value of [MOVE ALL VERTICAL] specifies an amplitude offset for every segment in the limit. The offset is referenced to the limit's original position.

You can change the current value by turning the knob, pressing an arrow key, or entering a new value with a number key.

Note	Unlike other numeric entries, the entry window stays open until you press another key. Any changes you make in the value are implemented immediately.

[MOVE MKR HORIZNTAL] softkey

Key Path: [Analys] → [LIMIT TEST] → [DEFINE LOWER LIM]
    or: [Analys] → [LIMIT TEST] → [DEFINE UPPER LIM]

Specify that you want to move the limit marker horizontally. The limit marker's horizontal position defines the X-axis value of a segment endpoint.

It's easiest to position the limit marker by turning the knob. You can also position the limit marker by entering a discrete value with the number keys.

When you are ready to anchor a segment endpoint at the position of the limit marker, just press [START SEGMENT] or [FINISH SEGMENT].

Note	Unlike other numeric entries, the entry window stays open until you press [FINISH SEGMENT] or [CANCEL/RETURN]. While you move the marker, the analyzer displays the segment, but the segment is not saved until you press [FINISH SEGMENT].

[MOVE MKR VERTICAL] softkey

Key Path: [Analys] → [LIMIT TEST] → [DEFINE LOWER LIM]
   or: [Analys] → [LIMIT TEST] → [DEFINE UPPER LIM]

Specify that you want to move the limit marker vertically. The limit marker's vertical position defines the Y-axis value of a segment endpoint.

It's easiest to position the limit marker by turning the knob. You can also position the limit marker by entering a discrete value for [MOVE MKR VERTICAL] with the number keys.

When you are ready to anchor a segment endpoint at the position of the limit marker, just press [START SEGMENT] or [FINISH SEGMENT].

Note   Unlike other numeric entries, the entry window stays open until you press [FINISH SEGMENT] or [CANCEL/RETURN]. While you move the marker, the analyzer displays the segment, but the segment is not saved until you press [FINISH SEGMENT].

[NEW FILENAME] softkey

See [RENAME FILE] softkeys.

[NEXT PEAK LEFT] softkey

Key Path: [Marker]

Move the marker left to the next local maximum in the displayed data. (Unlike [MARKER TO PEAK], next peak will not find Y-axis values that are off the display.)

The marker moves to the next left peak only on the trace that's active (but the marker on the inactive trace will also move if marker coupling is on).

A peak is a local maximum on a trace. The slope of a trace is positive to the left of a peak and negative to the right. In addition, the sign of the slope on either side of a peak must not change for at least one vertical division (one-third division for octave displays, or 1/10 division for log Y-axis).

The "next left peak" must be at least one display point to the left of the current marker location. If the peak search algorithm doesn't find a peak, the marker doesn't move.

Hint: Decrease the value of [Y PER DIV] to increase the number of peaks found.

Use any of the marker-search keys with relative marker to quickly measure differences between two signals.

See also: [MARKER TO PEAK] softkey, [MKR VALUE ABS REL] softkey, Marker search keys, [Y PER DIV (DECADES)] softkey, [COUPLED ON OFF] softkey

[NEXT PEAK RIGHT] softkey

Key Path: [Marker]

Move the marker right to the next local maximum in the displayed data. (Unlike [MARKER TO PEAK], next peak will not find Y-axis values that are off the display.)

The marker moves to the next right peak only on the trace that's active (but the marker on the inactive trace will also move if marker coupling is on).

A peak is a local maximum on a trace. The slope of a trace is positive to the left of a peak and negative to the right. In addition, the sign of the slope on either side of a peak must not change for at least one vertical division (one-third division for octave displays, or 1/10 division for log Y-axis).

The "next right peak" must be at least one display point to the left of the current marker location. If the peak search algorithm doesn't find a peak, the marker doesn't move.

Hint: Decrease the value of [Y PER DIV] to increase the number of peaks found.

Use any of the marker-search keys with relative marker to quickly measure differences between two signals.

See also: [MARKER TO PEAK] softkey, [MKR VALUE ABS REL] softkey, Marker search keys,
          [Y PER DIV (DECADES)] softkey, [COUPLED ON OFF] softkey

[NON-VOL RAM DISK] softkey

Key Path: [Disk Utility] → [DEFAULT DISK]
      or: [Save/Recall] → [DEFAULT DISK]

Select the analyzer's battery-backed RAM as the default disk.

The contents of the non-volatile RAM disk are retained when you turn the analyzer off. They will be available when you turn it back on.

The non-volatile RAM disk is initialized at the factory with approximately 31.0 Kbytes of storage space (LIF format). If you change the format from LIF to DOS, the size is approximately 29.7 Kbytes.

You cannot change the size of the non-volatile RAM disk for a given format (LIF or DOS). All format options reformat the disk to the same size.

See also: [DEFAULT DISK] softkey

[NORM VAR CHANNEL x] softkey

(Available only with option 1D2, Swept Sine)

Key Path: [**Meas Data**]

Display the normalized variance for the specified channel.

Variance is an indicator of how much noise power remains in the signal after a desired number of integration cycles have been completed. Variance values equal to 1 indicate the noise component has been successfully averaged out of the signal. Variance values less than 1 indicate the level of noise power left in the signal after the integration process.

To improve variance, increase the number of integration cycles. This improves the signal-to-noise ratio.

[NUMBER AVERAGES] softkey

Key Path: [**Avg**]

Specify the number of averages the analyzer should perform for each measurement.

Limits: 1 to 9,999,999   Default: 10

For exponential averaging, the number of averages you select determines the weighting of old versus new data, not the total number of averages calculated. As the number of averages increases, new data is weighted less.

See also: [RMS EXPONENTL] softkey

[NUMBER OF HARMONICS] softkey

Key Path: [**Marker Fctn**] → [HARMONIC MARKER]

Specify the maximum number of harmonics you want the analyzer to identify with the harmonic marker.

Limits: 0 to 400   Default: 20

The actual number of harmonics identified depends on the fundamental frequency and the analyzer's bandwidth. Higher fundamental frequencies have fewer harmonics displayed, because it takes fewer harmonics to reach the top end of the analyzer's frequency range.

The analyzer displays the harmonics for the fundamental frequency that you specified most recently. To change the fundamental frequency, use the [FUNDAMNTL FREQUENCY] softkey.

See also: [FUNDAMNTL FREQUENCY] softkey, [HARMONIC MARKER] softkey

[NUMBER OF POLES] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [**Analys**] → [CURVE FIT] → [CURVE FIT SETUP]

Specify the number of poles (a conjugate pair is considered 2 poles).

Limits: 0 to 20   Default: 20

The actual number of poles used depends on whether you specify order max or order fixed. If you specify order fixed, the curve fitter finds a system with the number of poles you have specified. If you specify order max, the curve fitter attempts to find the optimum number of poles, without exceeding the number you have specified.

The number of poles can be different than the number of zeros.

[NUMBER OF SIDEBANDS] softkey

Key Path: [**Marker Fctn**] → [SIDEBAND MARKER]

Specify the number of sidebands you want the analyzer to identify with the sideband marker.

Limits: 0 to 200

Default: 20

The actual number of sidebands identified depends on the carrier frequency and the analyzer's bandwidth.

The analyzer displays the sidebands spaced at the sideband increment from the carrier frequency that you specified most recently. To change the carrier frequency, use the [CARRIER FREQ] softkey.

See also: [CARRIER FREQ] softkey, [SIDEBAND MARKER] softkey

[NUMBER OF ZEROS] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [**Analys**] → [CURVE FIT] → [CURVE FIT SETUP]

Specify the number of zeros (a conjugate pair is considered 2 zeros).

Limits: 0 to 20

Default: 20

The actual number of zeros used depends on whether you specify order max or order fixed. If you specify order fixed, the curve fitter finds a system with the number of zeros you have specified. If you specify order max, the curve fitter attempts to find the optimum number of zeros, without exceeding the number you have specified.

The number of zeros can be different than the number of poles.

Numeric entry softkeys

Some softkeys let you change numeric parameters. If a menu contains just one such softkey, the key is active when you enter the menu. If a menu contains two or more of these softkeys, only one of them is active when you enter the menu.

Note

The analyzer indicates that a numeric entry softkey is active by highlighting the whole softkey label.

The active numeric entry softkey is ready to accept a new value at any time. You don't need to press it before entering a new value with the number keys or stepping the old value with the arrow keys.

When you start entering a new value with the number keys, the softkey's entry window is displayed at the top of the screen. The window remains on the screen until you either complete or abort the entry. You complete an entry by pressing the [ENTER] softkey or a suffix softkey. You abort an entry by pressing [CANCEL/RETURN].

When you step the value of a numeric entry softkey with the arrow keys, the entry window is displayed for a couple of seconds so you can see the new value.

You *do* need to press a numeric entry key, even the active one, if you want to change its value by turning the knob. The knob is normally used to move the marker, and can only be used for numeric entry if an entry window is displayed.

When you press a numeric entry key, its entry window is displayed at the top of the screen for a couple of seconds. If you start turning the knob while the window is still up, the window remains up until you stop. You can watch the value change as you turn the knob.

Note

Changes made with the arrow keys and the knob take effect immediately.

See also: Suffix menus, Knob

[NYQUIST DIAGRAM] softkey

Key Path: [**Trace Coord**] → [MORE: NYQ REAL IMAG]

Display a Nyquist diagram, with the real part on the X-axis versus the imaginary part on the Y-axis.

Markers read the real and imaginary parts as well as the implied frequency or time position. Markers hold their frequency (or time) position when you change between Nyquist and other coordinate types.

Octave analysis frequency keys

For octave analysis, the following softkeys are under the [**Freq**] hardkey:

- Start.
- Stop.
- Full octave.
- 1/3 octave.
- 1/12 octave.

See also: [START] softkey (octave frequency), [STOP] softkey (octave frequency),
             [FULL OCTAVE] softkey, [1/3 OCTAVE] softkey, [1/12 OCTAVE] softkey

[OCTAVE ANALYSIS] softkey

(Available only with option 1D1, Real Time Octave)

Key Path: [**Inst Mode**]

Specify the octave analysis instrument mode.

Octave measurements compute power in bands using banks of filters covering 12 octaves. The bandwidth of each of these filters is either one full octave, 1/3 octave, or 1/12 octave (set under the [**Freq**] hardkey).

The analyzer meets the ANSI 1986 specification for 1/3 octave filters.

The display for octave measurements shows one band for each filter band. The far right band shows one of five things, indicated by a letter just below the band:

- T indicates band-limited total power.
- I indicates broadband impulse power.
- B indicates broadband total power.
- P indicates broadband peak power.
- U indicates undefined. This indicates data read in from a different analyzer.

"Broadband" means the power in the frequency span from 0 Hz to the frequency listed in the following table:

	Frequency	
	1 channel	**2 channel**
Full Octave	25.6 kHz	12.8 kHz
1/3 Octave	25.6 kHz	12.8 kHz
1/12 Octave Impulse on Peak Hold on	12.8 kHz 6.4 kHz	6.4 kHz 3.2 kHz

"Band-limited" means the power in the displayed octave bands. For example, if the display is 1/3 octave from 10 Hz to 16 kHz, the bandwidth of total power contains only those bands.

If the input channel A-weight filter is on, it is applied for the total power band. If a math function A-, B-, or C-weight is applied to the data, the weighting function also applied to the total power band.

For more information on octave analysis, refer to the analyzer's *Concepts Guide.*

See also: [PEAK HOLD] softkey (octave), [IMPULSE] softkey, [DEFINE FUNCTION] softkey, [**Freq**] hardkey, [1/12 OCTAVE] softkey, [1/3 OCTAVE] softkey, [FULL OCTAVE] softkey

Octave averaging

The average softkeys for octave measurements allow you to do the following things:

- Choose from four types of averaging:
  - Linear.
  - Exponential.
  - Equal confidence.
  - Peak hold.
- Specify maximum, minimum, or no average hold.
- Specify an average time.
- Specify the confidence level for equal confidence averaging.
- Turn on or off the impulse display.
- Turn average repeat on or off.

See also: [REPEAT ON OFF] softkey (octave), [IMPULSE] softkey, [CONFIDNCE LEVEL] softkey,
[AVERAGE TIME] softkey, [HOLD SETUP] softkeys, [EXPONENTL] softkey,
[EQUAL CONFID] softkey, [STABLE] softkey, [PEAK HOLD] softkey (octave)

[OFF] softkey (BASIC display)

See [DISPLAY SETUP] softkey group.

[OFF] softkey (hold setup)

See [HOLD SETUP] softkeys.

Operand menu

Key Path: [**Analys**] → [DEFINE FUNCTION] → [DEFINE Fx]

Specify the data to be used as the argument in a function.

- [MEAS DATA] allows you to select measurement results as an operand. The results available vary depending on the instrument mode.

- [DATA REG (D1-D8)], [CONSTANT (K1-K5)], and [FUNCTION (F1-F5)] allow you to select the contents of a particular register as an operand. (You cannot use a larger-numbered function in the definition of a smaller-numbered function. For example, you cannot use F2 in defining F1.)

- [OPERATION] allows you to specify what operation should be performed on the argument.

- [( ] specifies the order in which operations should be performed. The close parenthesis, [ )], is available in the operator menu.

- [CANCEL/RETURN] abandons the function definition you are creating and retains the one that already exists.

See also: [**Inst Mode**] hardkey

Operation menu

Key Path: [**Analys**] → [DEFINE FUNCTION] → [DEFINE Fx]

Specify which operations should be performed on the operand (argument) following the operation. The analyzer puts the operation and an opening parenthesis, "(", in the definition. The following operations are available:

■ Conj	Complex conjugate.
■ Mag	Magnitude.
■ Real	Real part.
■ Imag	Imaginary part.
■ Sqrt	Complex square root.
■ FFT	Fast Fourier Transform.
■ Inverse FFT	Inverse Fast Fourier Transform.
■ PSD	Scale a spectrum to display power spectral density.
■ Ln	Complex natural logarithm (base e).
■ Exp	Complex natural antilog ($e^{\wedge}x$).
■ * jomega	Multiply by jw.
■ /jomega	Divide by jw.
■ Aweight	A-weight filtering.
■ Bweight	B-weight filtering.
■ Cweight	C-weight filtering.
■ Diff	Differentiate.
■ Integ	Integrate.

Operator menu

Key Path: [Analys] → [DEFINE FUNCTION] → [DEFINE Fx] → operand

Specify which arithmetic operations a function will perform. The following operators are available: addition [+], subtraction [-], multiplication [*], and division [/].

Note   The analyzer does some limited tracking of units in trace math operations.

Use the closing parenthesis softkey, [ )], in conjunction with the opening parenthesis, [( ], softkey (in the Operand menu) to specify the order in which operations should be performed.

Use [ENTER] to complete a new function definition. If you have used fewer closing parentheses than opening parentheses, [ENTER] adds enough to create a balance.

Use [CANCEL/RETURN] to abandon the function definition you are creating and retain the one that already exists.

[OPTIONS SETUP] softkey

Key Path: [System Utility]

Display the options available and installed in the analyzer.

If you have ordered and received an upgrade from Hewlett-Packard, you can install the software by inserting the disk and following the instructions included with the upgrade kit.

[ORBIT] softkey

Key Path: [Meas Data] → [MORE]

Display an orbit diagram. This is a lissajous figure of channel 2 time versus channel 1 time.

Note   Orbit displays are not averaged or corrected.

This display is useful for balancing and understanding rotor dynamics.

See also: [CAL CONST ON OFF] softkey

[ORDER (REV)] softkey

Key Path: [Trace Coord] → [X UNITS]

Specify orders for frequency domain X-axis units and revolutions for time domain X-axis units. You can specify the speed of rotation by pressing [HZ/ORDER RATIO] under [ORDER SETUP].

Note	The analyzer uses the same speed of rotation for all traces. For a waterfall display, the speed of rotation may actually be different for each trace. Keep this in mind when you interpret the results.

See also: [HZ/ORDER RATIO] softkey

Order analysis frequency keys

For order analysis, the following softkeys are under the [Freq] hardkey:

- Min rpm.
- Max rpm.
- Max order.
- Delta order.
- Track on off.
- Track x order.

See also: [MIN RPM] softkey, [MAX RPM] softkey (Freq), [MAX ORDER] softkey, [DELTA ORDER] softkey, [TRACK ON OFF] softkey, [TRACK x ORDER] softkey

[ORDER ANALYSIS] softkey

(Available only with opt. 1D0, Computed Order Tracking)

Key Path: [Inst Mode]

Specify the order analysis instrument mode.

Order analysis is useful for vibration analysis of rotating machinery. The X-axis is calibrated in orders rather than Hz. One order represents one revolution of the rotating device.

The HP 35665A computed order tracking eliminates the need for external signal-conditioning equipment, such as ratio synthesizers and tracking filters.

The measurement data available for order analysis measurements is listed in the following table.

Track Off	Track On
Power spectrums ch 1 & 2	Composite power ch 1 & 2
Time ch 1 & 2	Order track ch 1 & 2
Orbit	rpm profile

An order tracking spectrum is a measure of the total power in any order (harmonic of shaft rotation frequency) as a function of RPM. It is useful for determining how a particular order of rotation excites the system throughout its operating range.

The computed order tracking algorithm resamples the incoming signal, resulting in extremely stable and repeatable order measurements that were not possible using analog ratio synthesis and filtering. The tachometer input provides a powerful and flexible triggering facility which virtually removes the need for external signal-shaping circuitry.

For more information on order analysis, refer to the analyzer's *Concepts Guide.*

See also: [COMP PWR CHANNEL x] softkey, [ORDER TRK CHANNEL x] softkey, [RPM PROFILE] softkey,
[ORBIT] softkey, [TIME CHANNEL x] softkey (order meas),
[PWR SPEC CHANNEL x] softkey (octave), [TRACK ON OFF] softkey, [TRACK ON OFF] softkey

[ORDER AT MKR] softkey

Key Path: [Trace Coord] → [X UNITS] → [Order Setup]

Specify the number of orders represented by the marker X-axis value.

Order averaging

The average softkeys for order analysis allow you to do the following things:

- Turn averaging on or off.

- Specify a number of averages.

- Choose between time and time exponential averaging.

- Turn average repeat on or off.

Note

When average is on for order analysis, only the time data is averaged. The power spectrum is not averaged; it represents the instantaneous spectrum at the time of the last average.

If you want to display the averaged spectrum, define a math function to be "FFT(TIME1)" and select that function from the Meas Data softkeys.

See also: [DEFINE FUNCTION] softkey, [REPEAT ON OFF] softkey (average), [TIME EXPONENTL] softkey, [TIME] softkey (average, order measurement), [NUMBER AVERAGES] softkey, [AVERAGE ON OFF] softkey

[ORDER MAX FIXED] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [CURVE FIT] → [CURVE FIT SETUP]

Specify whether the curve fitter should use fixed or max order.

If you specify fixed order, the curve-fit routine finds the specified numbers of poles and zeros. Use fixed order if you know the system order.

If you specify max order, the curve fitter estimates the optimum number of poles and zeros for the transfer function to be fitted. It finds the lowest order fit possible, using the specified number of poles and zeros as a maximum. Use max order if you do not know the system order.

Hint: If max order does not yield satisfactory results, use fixed order and try higher or lower system orders. You can control numerator and denominator orders separately.

See also: [NUMBER OF ZEROS] softkey, [NUMBER OF POLES] softkey

[ORDER SETUP] softkey

Key Path: [**Trace Coord**] → [X UNITS]

Specify the rotation speed for order X-axis units by selecting one of the following keys:

- Hz/order ratio.
- Trace rpm.
- Order at marker.

See also: [ORDER (REV)] softkey, [ORDER AT MKR] softkey, NOT ALTER THIS FILE MANUALLY!!
It should only be altered by, [TRACE RPM] softkey, [HZ/ORDER RATIO] softkey

[ORDER TRK CHANNEL x] softkey

(Available only with opt. 1D0, Computed Order Tracking)

Key Path: [**Meas Data**] → [MORE]

Display one of five order tracking spectrums for the specified channel.

An order tracking spectrum is a measure of the total power in any order (harmonic of shaft rotation frequency) as a function of RPM. It is useful for determining how a particular order of rotation excites the system throughout its operating range.

Note   This data is only available if track is on.

See also: [TRACK ON OFF] softkey

[ORIGINAL FILENAME] softkey

See [RENAME FILE] softkeys.

[OUTPUT FILENAME] softkey

Key Path: [Plot/Print]

Enter an output filename using the alpha entry menu. The analyzer plots or prints to this file when you specify output to a file.

You can enter up to 18 characters. When you start to plot to a file, the analyzer checks for a valid file name. Valid file names are different for DOS than for LIF.

DOS file names can be up to 8 characters with a 3-character extension (for example, PLOTFILE.HPG). If you entered too many characters, the analyzer truncates your entry to make it valid and performs the plot. If you enter file name longer than 8 characters, only the first 8 characters are used. Likewise, if you enter an extension longer than 3 characters, only the first 3 characters are used.

LIF file names can be up to 6 characters with a 3-characters extension (for example, PLFILE.HPG). If you enter too many characters, the analyzer displays an error message and does not perform the plot.

The analyzer will also increment file names if you use a number as the last character of the file name or the last character before the extension--for example, "PLOT1" or "PLOT1.HPG." The analyzer will automatically put the name "PLOT2" (or "PLOT2.HPG") in the entry box the next time you save something. This feature only works if the catalog is off.

See also: [OUTPUT TO HPIB FILE] softkey

[OUTPUT TO HPIB FILE] softkey

Key Path: [Plot/Print]

Specify whether you want to print or plot directly to the HP-IB device or to a file on the default disk.

You specify the file name by pressing [OUTPUT FILENAME].

The file will be formatted for the output device specified by the [DEVICE IS PLOT PRNT] softkey.

See also: [OUTPUT FILENAME] softkey, [DEVICE IS PLOT PRNT] softkey

[OVERLAP PERCENT] softkey

Key Path: [**Avg**]

Specify the percentage of overlap you want the analyzer to use when making an averaged measurement.

Limits: 0 to 99%   Default: 0%
Steps: 1%

Overlap only works when the measurement is in real time.

The amount of overlap possible varies with the frequency span. For wide spans (with short time records), little or no overlap is possible—the time record is small compared to the time it takes the analyzer to process the time record. For narrow spans (with long time records), considerable overlap is possible—the time record is long compared to the time it takes the analyzer to process the time record.

If the analyzer indicates that the current measurement is in real time and the specified overlap percentage cannot be achieved, the REAL-TIME status message is removed (if you're averaging and this occurs, no attempt is made to re-enter real time until you start the average again—if averaging is off, real time processing resumes as soon as possible).

To learn more about overlap processing, see the analyzer's *Concepts Guide.*

See also: Real-time bandwidth, [SPAN] softkey (frequency)

[OVERSHOOT] softkey

Key Path: [**Marker Fctn**] → [TIME PARAMTERS]

Compute and display overshoot—the maximum value by which the step response exceeds its steady-state level. The analyzer uses only the data between the start time and stop time markers in the computation.

The analyzer also puts a horizontal line across the display at the steady-state level and displays the steady-state value in the mini-state.

See also: [START TIME] softkey, [STOP TIME] softkey

[OVERWRITE FILE] softkey

Key Path: [**Save/Recall**] → [SAVE DATA] → [INTO FILE]
or: [**Plot/Print**] → [START PLOT/PRINT]

Save information or print/plot data to an existing file.

Caution   Existing information in the file will be lost if you press this key.

[OVLD REJ ON OFF] softkey

Key Path: [**Avg**]

Turn overload reject on or off. The input channels must be set to a fixed range for overload reject.

When overload reject is off, all time records are included in the measurement. If any time records are overloaded, measurement accuracy may decrease.

When overload reject is turned on, data from overloaded input channels is not included in the measurement results.

When overload reject is on, an averaged measurement rejects the time record taken from an overloaded input channel and the time record that was taken concurrently for the other channel. The measurement continues until the analyzer has accepted a number of time records equal to the specified number of averages.

The analyzer will not autorange during an averaged measurement if overload reject is on.

Overload reject is not available for time capture.

See also: [CHx FIXED RANGE] softkey, [CAPTURE ON OFF] softkey, [NUMBER AVERAGES] softkey,
Time record

[P1 P2 SETUP] softkeys

Key Path: [Plot/Print] → [MORE SETUP]

Specify where on the page you want the plot to appear. You can use the plotter's default P1 and P2 settings or specify your own settings. P1 is the lower left corner of the plot, and P2 is the upper right corner of the plot. Refer to your plotter documentation for appropriate P1 and P2 values.

- [USER P1P2 ON OFF] specifies whether the plotter uses its default settings (OFF) or the settings defined by the other four keys in this menu (ON).
- [USER P1 X] defines the horizontal value for the lower left corner of the plot.
- [USER P1 Y] defines the vertical value for the lower left corner of the plot.
- [USER P2 X] defines the horizontal value for the upper right corner of the plot.
- [USER P2 Y] defines the vertical value for the upper right corner of the plot.

[PAGE EJCT ON OFF] softkey

Key Path: [Plot/Print]

Enable and disable your plotter's page-eject feature or your printer's form feed feature. The state you select is used for all plotting and printing operations initiated by the analyzer.

Note

Check your plotter's documentation to be sure that it supports the requested page-eject state.

Paging through help screens

To display the next page of a multi-page help topic, press the down arrow key. To display the previous page, press the up arrow key. A message in the lower-right corner of the screen shows you the current page number.

[Pause/Cont] hardkey

Stop the analyzer in the middle of a measurement. The analyzer displays the measurement as completed so far. Press [**Pause-Cont**] once more to continue the measurement—the analyzer begins where it left off. If you want to clear the data and start the measurement over again, press [**Start**].

Note

Pause/continue behaves differently for swept sine, histogram, octave, and order measurements.

If you're using rms or vector averaging (stable averaging, not exponential averaging), pressing [**Pause-Cont**] after the averages are completed causes the analyzer to take another group of averages. The additional averages are added to the cumulative average results. Pressing [**Pause-Cont**] before the averages are completed simply pauses the measurement.

If you're using exponential averaging (rms or vector) or peak hold averaging, pressing [**Pause-Cont**] pauses the measurement. Pressing [**Pause-Cont**] once more continues the measurement.

Note

If a calibration occurs while a measurement is paused, the analyzer will start a new measurement when you press [**Pause/Cont**].

See also: [**Pause/Cont**] hardkey (octave and order), [**Pause/Cont**] hardkey (octave and order), [CALIBRATN] softkey, [**Pause/Cont**] hardkey (histogram), [**Pause/Cont**] hardkey (swept sine)

[Pause/Cont] hardkey (histogram)

If you pause a histogram measurement before it is complete, the measurement stops. The analyzer does not display incomplete intermediate results.

If you continue a paused histogram measurement, it begins where it was paused and continues to the end of the histogram length.

If you press [**Pause/Cont**] after a histogram measurement is complete, the analyzer collects a new time record and updates the unfiltered time measurement data. The histogram data does not incorporate the new time record.

See also: [HISTOGRAM LENGTH] softkey, [UNFILTERD TIME CH x] softkey

[Pause/Cont] hardkey (octave and order)

For octave and order measurements, pressing the [Pause/Cont] hardkey always clears all measurement data from the analyzer's buffers and starts a new measurement.

[Pause/Cont] hardkey (swept sine)

If you continue a paused, incomplete swept sine measurement, the analyzer begins at the point where you paused the measurement and finishes the sweep.

See also: [TIME CHANNEL x] softkey

[PDF CHANNEL x] softkey

Key Path: [Meas Data]

Display the Probability Density Function for the specified channel. This is the histogram normalized to unit area, or the probability that a specific level occurred. It is computed by dividing the histogram by (number of samples times delta V). The resulting units are 1/V.

See also: [HISTOGRAM CHANNEL x] softkey

[PEAK HOLD] softkey

Key Path: [**Avg**] → [AVERAGE TYPE]

Select the peak hold function. The analyzer takes N time records, where N is the number of averages you specify. The analyzer compares each data point in the measured frequency span with the previous values. Only the largest value for each frequency point is saved.

If you press [**Pause/Cont**] after the measurement is complete, the analyzer compares another N time records with the existing data. If you press [**Start**], the analyzer clears the data and takes N time records.

Technically, peak-hold averaging is not really a type of averaging, since the results are not mathematically averaged. But it's still considered a type of averaging because it combines the results of several measurements into one final measurement result.

With the peak-hold function, the analyzer mathematically compares each data point to its previous peak value. If the data point is larger than its last peak value, the new value is used.

Note

The results of peak hold averaging are seen only in power spectrum displays. All other available measurement data displays only the latest processed time record, not averaged data.

The following measurement data is not available with peak hold averaging:

- Frequency Response
- Coherence
- Cross Spectrum

See also: [NUMBER AVERAGES] softkey, [PWR SPEC CHANNEL x] softkey

[PEAK HOLD] softkey (octave)

Key Path: [Avg] → [AVERAGE TYPE]

Select the peak hold function for an octave measurement. Peak hold averaging is intended for non-coherent signals only.

The analyzer holds the absolute peak power in each displayed octave band. The overall power band (far right band in the display) displays broadband peak power; it has a bandwidth of dc to the value listed in the table below.

Peak hold limits the maximum center band frequency and the broadband peak frequency as listed in the following table:

	Full Octave		1/3 Octave		1/12 Octave	
	Center	Broad	Center	Broad	Center	Broad
1 channel	8.0 kHz	25.6 kHz	16.0 kHz	25.6 kHz	5.657 kHz	6.4 kHz
2 channel	4.0 kHz	12.8 kHz	8.0 kHz	12.8 kHz	2.828 kHz	3.2 kHz

peak detector rise times = $1/(2.56 *$ broadband peak frequency$)$

See [REPEAT ON OFF] for information on how that parameter affects peak hold averaging.

Note	When you select [PEAK HOLD] , the analyzer effectively sets the number of waterfall steps to 1. If you pause a measurement with a waterfall displayed, the analyzer displays only 1 trace.

See also: [REPEAT ON OFF] softkey (octave), [WATERFALL STEPS] softkey

[PEAK TRK ON OFF] softkey

Key Path: [Marker]

Turn on or off peak tracking for the active trace. When peak tracking is on, the analyzer continuously moves the marker to the peak value on the trace.

You can turn on peak tracking for Trace A, Trace B, or both traces. If you turn on peak tracking for both traces, each marker follows the peak for its respective trace (unless marker coupling is on).

Because marker coupling takes priority over peak tracking, the marker will not track the peak value for the inactive trace if both marker coupling and peak tracking are turned on.

See also: [COUPLED ON OFF] softkey

[PERFORM FORMAT] softkey

Key Path: [Disk Utility] → [FORMAT DISK]

Format a disk. After you identify the disk, it is formatted using the current values of
[INTRLEAVE FACTOR] and, for RAM disks, [RAM DISK SIZE].

Note

The analyzer's internal disk drive can only format double-sided, double-density or
high-density flexible disks.

When you press [PERFORM FORMAT], you are asked to enter the disk specifier for the disk you want
to format. The entry window already contains the specifier for the default disk, but you can modify it
with the alpha entry keys. Remember that the disk specifier must end with a colon (:) unless you are
specifying a volume name.

Caution

When you format a disk or RAM, the analyzer erases all data from that device.
Before you perform the format, save any important data to another device.

Note

You cannot remove a file if it is a LIF protected file or if the file is currently opened
by an HP Instrument BASIC program. These files are indicated by a " * " or " ",
respectively, in the disk catalog.

You can append a volume name to the disk specifier when you format a disk. Just position the
cursor after the colon and enter a name of six characters or less. For example, "INT:MYDISK."

Hint: Use a unique volume name for each flexible disk to help you keep track of your data. The
name will be displayed in the upper-left corner of the catalog.

See also: [CATALOG ON OFF] softkey, Volume name, Alpha entry mode, Disk specifiers,
[RAM DISK SIZE] softkey, [INTRLEAVE FACTOR] softkey

[PERFORM RENUMBER] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC] → [UTILITIES] → [RENUMBER]

Renumber the lines of your program.

The number of the first line will be the value specified in [START LINE #]. The increment between lines will be the value specified in [INCREMENT].

See also: [START LINE #] softkey (Renumber), [INCREMENT] softkey

[PERFORM SCRATCH] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC] → [UTILITIES] → [SCRATCH]

Scratch (delete) your program and/or its variables. The selection you made in the scratch options softkey group determines what will be deleted.

See also: [SCRATCH OPTIONS] softkey group

[PERFORM SECURE] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC] → [UTILITIES] → [SECURE]

Secure the portion of your program specified by [START LINE #] and [END LINE #].

Secured lines cannot be viewed in the HP Instrument BASIC editor or printed with [PRINT PROGRAM]. An asterisk (*) replaces program statements on secured program lines.

Caution

Secured program lines can not be unsecured. Be sure to keep an unsecured version of the program for your own records.

See also: [SECURE] softkey, [END LINE #] softkey, [START LINE #] softkey (Secure)

[PERFORM COPY ALL] softkey

See [COPY ALL FILES] softkeys.

[PERFORM FILE COPY] softkey

See [COPY FILE] softkeys.

[PERFORM RENAME] softkey

See [RENAME FILE] softkeys.

[PERIODIC CHIRP] softkey

Key Path: [Source]

Select the periodic chirp waveform. Periodic chirp is a fast sine sweep across the current frequency span that repeats with the same period as the time record.

The effect of the periodic chirp is similar to the random noise waveform, but its spectrum is much flatter than a noise spectrum. The chirp waveform is the same in every time record, so averaging may not be required.

Because the chirp output is periodic, it's best to use the Uniform window when making measurements using this waveform.

See also: [BURST CHIRP] softkey, [UNIFORM] softkey

[PHASE DEG RAD] softkey

Key Path: [Trace Coord] → [Y UNITS]

Specify whether phase is displayed in units of degrees or radians. The default is degrees.

[PHASE] softkey

Key Path: [Trace Coord]

Display wrapped phase on the active trace.

Wrapped phase means that all phase is shifted to between −180 degrees and +180 degrees. If the actual phase is outside this range, it is increased or decreased by a multiple of 360 degrees to put it between −180 and +180 degrees.

For example, +400 degrees is displayed as +40 degrees (400 − 360 = 40), and −190 degrees is displayed as +170 degrees (−190 + 360 = 170).

To display actual phase (not shifted), press [UNWRAPPED PHASE].

See also: [UNWRAPPED PHASE] softkey

[PINK NOISE] softkey

Key Path: [Source]

Select the pink noise waveform. Pink noise is similar to random noise, except that the spectral density is inversely proportional to frequency. This means that the amplitude rolls off at 3 dB/octave.

Pink noise is used for octave measurements. Because the octave bands are wider at higher frequencies but the pink noise density is proportionately lower, the result is a constant amount of energy per octave band. In other words, an octave spectrum of pink noise looks flat.

A typical use for pink noise is microphone calibration.

See also: [OCTAVE ANALYSIS] softkey, [RANDOM NOISE] softkey

[PLOT DATA SELECT] softkey

Key Path: [Plot/Print]

Specify which portion of the display you want to plot. You can plot the following items:

- [ALL] — everything displayed except the status line and softkey menu.
- [TRACE] — only the active trace.
- [TRACE MARKER] — the main marker for the active trace.
- [MARKER REFERENCE] — the marker reference for the active trace.
- [GRID] — the graticule for the active trace.

Note

Your selections from this menu apply only for a plotter. If your output device is a printer, you can only print the whole display.

You can specify different plotter pens for each of these items. Use the softkeys under [PLOT PEN SETUP].

See also: [MKR VALUE ABS REL] softkey, [MKR VALUE ABS REL] softkey, [PLOT PEN SETUP] softkey

[PLOT LINE SETUP] softkey

Key Path: [Plot/Print]

Specify the line pattern that will be used to plot the traces and limit lines.

See also: Line type softkeys, [TRACE x LINE TYPE] softkeys, [LIMIT x LINE TYPE] softkeys

[PLOT PEN SETUP] softkey

Key Path: [Plot/Print]

Assign plotter pens for various items on the analyzer's screen using the following softkeys:

- [TRACE A PEN]: Used for trace A and all of its trace-specific annotation.
- [TRACE B PEN]: Used for trace B and all of its trace-specific annotation.
- [MARKER A PEN]: Used for trace A's markers, marker functions, and limit lines.
- [MARKER B PEN]: Used for trace B's markers, marker functions, and limit lines.
- [ALPHA PEN]: Used for information that is not trace-specific.
- [GRID PEN]: Used for the grids.

One softkey—[DEFAULT PENS]—returns the other softkeys in this menu to their preset values.

See also: [DEFAULT PENS] softkey

[PLOT PEN SPEED] softkeys

Key Path: [Plot/Print] → [DEFINE PLOT] → [PLOT SPEED]

Specify the plotting speed for all plotting operations initiated by the analyzer.

Two softkeys provide the most commonly selected plotting speeds:

- [SLOW (10 cm/s)].
- [FAST (50 cm/s)].

Another softkey lets you request additional plotting speeds that may be supported by your plotter. Press [DEFINE (? cm/s)] to enter a new speed (units are cm/s).

[Plot/Print] hardkey

The softkeys under the [Plot/Print] hardkey control the plotting and printing of screen contents.

Note	You must select the [SYSTEM CONTROLLR] softkey (under [Local/HP-IB]) before plotting or printing. Also, [PLOTTER ADDRESS] and [PRINTER ADDRESS] must be correct.

The softkeys in this menu allow you to do the following things:

- Start and abort plotting or printing.
- Specify which portions of the analyzer's screen should be plotted.
- Specify whether you're plotting over HP-IB or to a file.
- Specify whether the output goes to a printer or a plotter.
- Set up the pens and plotting speed.
- Turn time stamp on or off.

Plots are scaled according to the established limits on the plotter. The analyzer can't redefine these limits; you must change them on the plotter.

Print information is sent as a bit-mapped graphic, so your printer must have raster-dump capabilities. Screen pixels are mapped one-to-one to printer pixels.

The softkeys grouped under [Plot/Print] allow you to plot or print the following things:

- Traces.
- Curve fit/synthesis tables.
- The instrument state.
- The disk catalog.
- Output from an HP Instrument BASIC program.
- Fault or test log (performance tests).

These softkeys do not allow you to plot or print HP Instrument BASIC programs or Help screens. To print a program, press the [PRINT PROGRAM] softkey (in the BASIC menu). To print a displayed Help screen, press [8] when the Help screen is displayed.

See also: [Help] hardkey, [PRINT PROGRAM] softkey, [TIMESTAMP SETUP] softkey,
[PLOT PEN SPEED] softkeys, [PLOT PEN SETUP] softkey, [DEVICE IS PLOT PRNT] softkey,
[OUTPUT TO HPIB FILE] softkey, [PLOT DATA SELECT] softkey, [ABORT PLOT/PRNT] softkey,
[START PLOT PRNT] softkey, [PRINTER ADDRESS] softkey, [PLOTTER ADDRESS] softkey,
Controller Capability softkey group

[PLOTTER ADDRESS] softkey

Key Path: [Local/HP-IB]

Tell the analyzer what address is currently assigned to your HP-IB plotter. (See your plotter's documentation if you don't know how to determine its HP-IB address.) An entry window is displayed so you can enter the address.

Note	The plotter address is saved in non-volatile memory, so it is retained when you turn the analyzer off and on.

When you plot screen contents, the analyzer looks for a plotter at the address specified with this softkey. If there isn't a plotter at the specified address, the plot is aborted.

[Preset] hardkey

The two softkeys in the preset menu allow you to return the analyzer to a known state. [DO PRESET] uses all default settings. [RECALL AUTOSTATE] uses settings you have saved to an autostate file.

Note	If you do not want to load the autostate or auto-basic program when you turn on the analyzer, hold down the [Preset] key while you turn on the analyzer.
	This also prevents the analyzer from performing a calibration.

The HP-IB command to perform a preset is SYST:PRES.

See also: [SINGLE CAL] softkey, [SAVE AUTOSTATE] softkey, [SAVE PROGRAM] softkey,
[RECALL AUTOSTATE] softkey, [DO PRESET] softkey, [SAVE AUTOSTATE] softkey

[PREVIEW OFF] softkey

Key Path: [Avg] → [PREVIEW SETUP]

Turn off manual preview and timed preview. When preview is off, the analyzer includes all time records in the measurement (except as limited by overload reject).

See also: [OVLD REJ ON OFF] softkey, [TIMED PREVIEW] softkey, [MANUAL PREVIEW] softkey

[PREVIEW SETUP] softkey

Key Path: [Avg]

Set up manual preview and timed preview parameters.

When manual or timed preview is active, the analyzer displays each time record. The message "WAITING FOR ACCEPT/REJECT" appears in the measurement status area.

This menu also contains the softkeys for accepting or rejecting a time record during preview.

See also: [ACCEPT TIME REC] softkey, [REJECT TIME REC] softkey, [TIMED PREVIEW] softkey, [MANUAL PREVIEW] softkey

[PRINT PROGRAM] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [BASIC] → [INSTRUMNT BASIC]

Print (list) your HP Instrument BASIC program. The following things must be true in order for your program to print:

- The analyzer must be the system controller.

- The printer must be turned on, attached to the analyzer's HP-IB connector, and set to the address specified under the [PRINTER ADDRESS] softkey.

See also: [PRINTER ADDRESS] softkey, Controller Capability softkey group

[PRINTER ADDRESS] softkey

Key Path: [Local/HP-IB]

Tell the analyzer what address is currently assigned to your HP-IB printer. (See your printer's documentation if you don't know how to determine its HP-IB address.) An entry window is displayed so you can enter the address.

Note	The printer address is saved in non-volatile memory, so it is retained when you turn the analyzer off and on.

When you print screen contents, the analyzer looks for a printer at the address specified with this softkey. If there isn't a printer at the specified address, the print is aborted.

[PROGRAM X] softkey (Option 1C2)

See [SELECT PROGRAM] softkey.

[PSD(] softkey

Key Path: [Analys] → [DEFINE FUNCTION] → [DEFINE Fx] → [OPERATION]

Scale the argument spectrum to give power spectral density. The argument must be a power spectrum from the FFT analysis mode or the octave analysis mode.

After the PSD scaling operation as been performed on a spectrum, any marker function applied to the result will access the scaled data. Similarly, any subsequent math operation will act on the scaled data.

[PWR SPEC CHANNEL x] softkey

Key Path: [**Meas Data**]

Display the most recent channel 1 or channel 2 power spectrum. The power spectrum computation depends on the type of averaging active.

```
Averaging off, vector,
  or vector exponential  :  crtn * linspec * conj (linspec)
                   rms  :  crtn * sum (linspec * conj (linspec)) / N
     rms exponential   :  crtn * xavg (linspec * conjuc (linspec))
         Peak hold     :  crtn * max (pspec
```

```
     where: N  =  number of averages
            crtn  =  correction for channel x
          linspec  =  linear spectrum channel x
          pspec  =  power spectrum channel x
           xavg  =  g(1/N) * new + ((N-1)/N)* old
```

See also: [CAL CONST ON OFF] softkey, [NUMBER AVERAGES] softkey, [PEAK HOLD] softkey, [RMS EXPONENTL] softkey, [RMS] softkey, [VECTOR EXPONENTL] softkey, [VECTOR] softkey, [AVERAGE ON OFF] softkey

[PWR SPEC CHANNEL x] softkey (octave)

(Available only with option 1D1, Real Time Octave)

Key Path: [**Meas Data**]

Display power spectrum results for an octave measurement.

For octave measurements the analyzer uses proportionally spaced filters an octave, 1/3 octave, or 1/12 octave apart. The measurement data displayed is the sum of the power in each filter band.

See also: [OCTAVE ANALYSIS] softkey

[PWR SPEC CHANNEL x] softkey (order)

(Available only with option 1D1, Real Time Octave)

Key Path: [**Meas Data**]

Display power spectrum results for an order measurement.

When average is on for order analysis, only the time data is averaged. The power spectrum is not averaged; it represents the instantaneous spectrum at the time of the last average.

If you want to display the averaged spectrum, define a math function to be "FFT(TIME1)" and select that function from the Meas Data softkeys.

See also: [DEFINE FUNCTION] softkey, [ORDER ANALYSIS] softkey

Quitting online help

To quit (exit) the online help system, press [**0**]. When you quit help, the analyzer restores the menu that was displayed just before you entered help. Other instrument parameters are unchanged.

[RAM DISK SIZE] softkey

Key Path: [**Disk Utility**] → [FORMAT DISK]

Specify the size for the RAM disk you are formatting in 1024 byte increments.

Each time you turn the analyzer on, a 64 kilobyte volatile RAM disk is created. If you need more storage space, you must specify a larger RAM disk size and reformat the disk.

See also: [FORMAT DISK] softkey

[RAMP RATE] softkey

(Available only with option 1D2, Swept Sine)

Key Path: [**Source**]

Specify how fast the source amplitude can change when you start, stop, pause, and continue a swept sine measurement. The source also ramps to a different level if you change the source level during a swept sine measurement or if the autolevel algorithm changes the level.

Note	If you enter a ramp rate of 0 V/S, the analyzer changes the source level instantaneously rather than ramping to the new level.

When you start a swept sine measurement, the source ramps on at the correct frequency. When you stop a measurement, the source ramps off.

If you change to a different instrument mode while the source is still on, the source immediately shuts off without ramping.

See also: [**Inst Mode**] hardkey, [LEVEL] softkey (swept sine source), [SWEPT SINE] softkey

[RANDOM NOISE] softkey

Key Path: [Source]

Select the random noise waveform. Random noise yields a fast, linear estimate of the system under test. Because it is not periodic in the time record, random noise requires windowing (usually the Hanning window).

For FFT analysis, correlation analysis, and histogram/time measurements, the bandwidth of the random noise is set so that most of the energy in the source signal is within the measured span.

For octave analysis, the bandwidth of the random noise is based on the stop frequency as follows:

Stop frequency	Bandwidth
Full octave	stop frequency * 3.2
1/3 octave	stop frequency * 1.6
1/12 octave	stop frequency * 1.13

For order analysis, the random noise bandwidth is the FFT frequency span closest to the result of the following equation:

Max rpm x Max order / 60

See also: [SPAN] softkey (frequency), [ORDER ANALYSIS] softkey, [STOP] softkey (octave frequency), [OCTAVE ANALYSIS] softkey, [HISTOGRAM/TIME] softkey, [CORRELATN ANALYSIS] softkey, [FFT ANALYSIS] softkey, Time record, [HANNING] softkey

[RCL FIT TABLE] softkey

Key Path: [Save/Recall] → [RECALL MORE]

Replace the current curve fit table with a saved curve fit table.

For instructions on recalling, see "Recalling information."

[RCL SYNTH TABLE] softkey

Key Path: [Save/Recall] → [RECALL MORE]

Replace the current synthesis table with a saved synthesis table.

For instructions on recalling, see "Recalling information."

[RE-SAVE PROGRAM] softkey

Key Path: [Save/Recall] → [SAVE MORE]

Save an edited HP Instrument BASIC program. You can not use [SAVE PROGRAM] for this purpose, because it doesn't allow you to overwrite an existing program (in this case, the last-saved version of the program you are editing).

Caution

The volatile RAM disk is cleared each time you turn the analyzer off. Copy important programs to another disk before power-down or they will be lost.

For instructions on saving, see "Saving information."

See also: [SAVE PROGRAM] softkey

[REAL PART] softkey

Key Path: [Trace Coord] → [MORE: NYQ REAL IMAG]

Display the real part of the measurement results on the active trace.

[REAL(] softkey

Key Path: [Analys] → [DEFINE FUNCTION] → [DEFINE Fx] → [OPERATION]

Compute the real part of the operand.

The real part of a complex number "a + jb" is "a."

Real-time bandwidth

Real-time bandwidth is a specification used to characterize the performance of an FFT analyzer. The real-time bandwidth is the frequency span at which the FFT processing time equals the time record length—this means all input data is included in the average (in other words, there is no gap between the end of one time record and the beginning of the next).

However, if you increase the span past the real-time bandwidth, the record length becomes shorter than the FFT processing time. Time records are no longer contiguous, and some data is missed. Therefore, you can overlap records only when measuring below the real-time bandwidth, because the time record length must be longer than the FFT processing time to achieve any overlap.

The actual real-time bandwidth achieved varies with the amount of processing time the analyzer needs. As with overlap processing, this depends on the current frequency span, the type of average selected, and how busy the analyzer is servicing the HP-IB and marker functions and key presses. The typical real-time bandwidth for the HP 35665A (with fast average on) is 6.4 kHz for two channels and 12.8 kHz for one channel.

[RECALL AUTOSTATE] softkey

Key Path: [Save/Recall]
     or: [Preset]

Recall the instrument state from the saved auto state file.

The analyzer looks for the file AUTO_ST, first on the internal disk, then in non-volatile memory.

The instrument state does not include traces, limit lines, math functions, math constants, or data registers.

See also: [SAVE AUTOSTATE] softkey, [NON-VOL RAM DISK] softkey, [INTERNAL DISK] softkey

[RECALL CAPTURE] softkey

Key Path: [Save/Recall] → [RECALL MORE]

Replace the current time capture buffer contents with a saved time capture file.

For instructions on recalling, see "Recalling information."

[RECALL DATA] softkey

Key Path: [Save/Recall]

Display softkeys for recalling the following types of data:

- Individual trace.
- Time capture buffer contents.
- Waterfall buffer contents.

For instructions on recalling, see "Recalling information."

See also: [RECALL WATERFALL] softkey, [RECALL CAPTURE] softkey, [RECALL TRACE] softkeys

[RECALL LINE] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [BASIC] → [INSTRUMNT BASIC] → [EDIT]

Recall the last line you deleted when you are editing a program.

A line is always recalled with its original line number. You must change this number if you want the recalled line to remain at its new location when you press [ENTER]. The new line number must fall between the line numbers of adjacent program lines.

Hint: If you press [INSERT LINE] before [RECALL LINE], you will be able to see the line numbers of both adjacent lines.

See also: [INSERT LINE] softkey

[RECALL LOWER LIM] softkey

Key Path: [Save/Recall] → [RECALL MORE]

Recall a limit line into the lower limit register of the active trace.

Caution

If you recall limit lines, be sure to set up the same Y-axis units and X-axis frequency span that you used to create the limit lines. If you use different X-axis or Y-axis values, limit testing will not work.

For instructions on recalling, see "Recalling information."

[RECALL MATH] softkey

Key Path: [**Save/Recall**] → [RECALL MORE]

Recall a complete set of math definitions—all functions and constants—from one of the disks.

For instructions on saving, see "Recalling information."

[RECALL PROGRAM] softkey

Key Path: [**Save/Recall**] → [RECALL MORE]

Load an HP Instrument BASIC program into the analyzer.

For instructions on recalling, see "Recalling information."

[RECALL STATE] softkey

Key Path: [**Save/Recall**]

Replace the current instrument state with a saved state.

Note	If you recall an instrument state from an earlier version of HP 35665A firmware, parameters not included in the earlier version are set to their default states.

For instructions on recalling, see "Recalling information."

[RECALL TRACE] softkeys

Key Path: [**Save/Recall**]

Load a saved trace without its original scaling information into one of the analyzer's data registers.

You can display a recalled trace by selecting the corresponding data register under the [Meas Data] hardkey. When you display a trace recalled with [RCL TRACE], it is displayed using the current scaling of the corresponding data register.

For instructions on recalling, see "Recalling information."

[RCL TRACE AND SCALE] softkeys

Key Path: [Save/Recall]

Load a saved trace and its original scaling information into one of the analyzer's data registers.

You can display a recalled trace by selecting the corresponding data register under the [Meas Data] hardkey. When you display a trace recalled with [RCL TRACE AND SCALE], it is displayed with its original scaling.

For instructions on recalling, see "Recalling information."

Note	To display the recalled trace, you must select the corresponding data register under the [**Meas Data**] hardkey.

For instructions on recalling, see "Recalling information."

See also: [**Meas Data**] hardkey

[RECALL UPPER LIM] softkey

Key Path: [**Save/Recall**] → [RECALL MORE]

Recall a limit line into the upper limit register of the active trace.

Caution	If you recall limit lines, be sure to set up the same Y-axis units and X-axis frequency span that you used to create the limit lines. If you use different X-axis or Y-axis values, limit testing will not work.

For instructions on recalling, see "Recalling information."

[RECALL WATERFALL] softkey

Key Path: [**Save/Recall**] → [RECALL MORE]

Recall a saved waterfall into a waterfall register.

The analyzer keeps track of the order of additional disks by appending a number to the file name for each disk. For example, if you enter the filename "WFALL," the analyzer labels additional disks "WFALL1," "WFALL2," and so on. When you recall a split file, the analyzer tells you which disk to insert next.

For instructions on recalling, see "Recalling information."

Recalling information

The analyzer displays an entry window and enters alpha entry mode when it's time to identify the file you want to recall. Use the default filename displayed in the entry window or modify the name with the alpha entry keys. When the filename is correct, press [ENTER] to start the recall operation.

You can do two things to simplify recall operations:

■ Designate the disk you use most often as the default disk.
■ Display the disk catalog.

You only need to enter a filename to identify a file on the default disk. You must enter a disk specifier and a filename to identify a file on any other disk.

The analyzer can recall files from one of four disks:

■ Non-volatile RAM disk (NVRAM).
■ Volatile RAM disk (RAM).
■ Internal disk (INT).

External HP-IB disk drive (EXT).

When the catalog is displayed, you don't need to type the name of a file you want to overwrite. Instead, you can just select the file with the knob before bringing up the filename entry window. The name of the file you select is automatically placed in the entry window.

See also: Alpha entry mode, [EXTERNAL DISK] softkey, [INTERNAL DISK] softkey,
[VOLATILE RAM DISK] softkey, [NON-VOL RAM DISK] softkey, [CATALOG ON OFF] softkey,
Disk specifiers, [DEFAULT DISK] softkey

[RECORD LENGTH] softkey

Key Path: [Freq]

Specify the time record length in seconds.

Limits: 1.9531 ms to 8192 s (2 chan)   Default: 7.8125 ms
         976.56 us to 4096 s (1 chan)   3.9062 ms
(limits depend on the instrument mode, resolution, and span selected)

When you change the record length, the frequency span changes to (resolution / record length). If start is anchored, the center and stop frequencies change accordingly. If center is anchored, the start and stop frequencies change accordingly. When you change the frequency span, the record length changes to (resolution / span).

The number of points in each record is related to the resolution as follows:

Resolution	Number of pointsper record
100	256
200	512
400	1024
800	2048

For correlation measurements, record length and resolution are independent—changing one does not change the other.

For correlation measurements, the record length, T, represents the length of the raw time record collected. This record length, T, is used in the correlation weighting functions –T/4 to T/4, 0 to T/2, and –T/2 to T/2.

See also: [RESOLUTN (LINES)] softkey, [ZERO PAD 0, T/2] softkey, [UNIFORM -T/2, T/2] softkey, [ZERO PAD -T/4, T/4] softkey, [CORRELATN ANALYSIS] softkey, [SPAN] softkey (frequency), Time record

[RECORD TIME] softkey

Key Path: [Freq]

Specify the time record length in seconds for a histogram measurement.

Limits: 7.8125 ms to 4096 s (2 chan)   Default: 7.8125 ms
          3.906 ms to 2048 s (1 chan)   3.906 ms
(limits depend on the instrument mode and span selected)

This is another way of setting the [SAMPLE TIME] for a histogram measurement. The [SAMPLE TIME] and [RECORD TIME] are related as shown in the following equation:

Record Time = Sample Time x 1024

See also: [SAMPLE TIME] softkey, Time record

[REF CHAN CH1 CH2] softkey

(Available only with option 1D2, Swept Sine)

Key Path: [Source] → [AUTOLEVEL SETUP]

Specify a reference channel for the autolevel facility. The analyzer uses the [REFERENCE LEVEL] and [REFERENCE TOLERANCE] values for the reference channel, and the [MAX INPUT LEVEL] for the non-reference channel.

See also: [MAX INPUT LEVEL] softkey, [REFERENCE TOLERANCE] softkey, [REFERENCE LEVEL] softkey, [AUTOLEVEL ON OFF] softkey

[REFERENCE LEVEL] softkey

(Available only with option 1D2, Swept Sine)

Key Path: [Source] → [AUTOLEVEL SETUP]

Specify the amplitude which the analyzer will try to maintain for the input reference channel when autolevel is on.

Limits: 486 uVpk to 31.6 Vpk   Default: 1 Vpk

When the amplitude varies more than the specified [REFERENCE TOLERANCE], the source output level changes to compensate.

See also: [REFERENCE TOLERANCE] softkey, [AUTOLEVEL ON OFF] softkey, [REF CHAN CH1 CH2] softkey

[REFERENCE SETUP] softkey

Key Path: [Marker]

Specify that you want to move the marker reference. You can set the marker reference to any X-axis or Y-axis value; unlike the absolute or relative markers, the marker reference is not restricted to displayed values.

- [REFERENCE TO MARKER] moves the marker reference to the main marker.
- [REFERENCE X ENTRY] moves the marker reference to a specific X-axis value
- [REFERENCE Y ENTRY] moves the marker reference to a specific Y-axis value

[REFERENCE TOLERANCE] softkey

(Available only with option 1D2, Swept Sine)

Key Path: [Source] → [AUTOLEVEL SETUP]

Specify the amount that the input reference channel amplitude can change before the source output level is adjusted when autolevel is on.

Limits: 0.1 dB to 20 dB   Default: 2 dB

See also: [AUTOLEVEL ON OFF] softkey, [REF CHAN CH1 CH2] softkey

[REFERENCE TO MARKER] softkey

See [REFERENCE SETUP] softkey.

[REFERENCE X ENTRY] softkey

See [REFERENCE SETUP] softkey.

[REFERENCE Y ENTRY] softkey

See [REFERENCE SETUP] softkey.

[REJECT TIME REC] softkey

Key Path: [Avg] → [PREVIEW SETUP]

Do not include the last time record in the measurement data.

When manual preview or timed preview is on, you can decide which data should be included in the measurement results.

After each time record is collected, it is displayed. You must either accept or reject the time record for both channels. That is, you cannot accept the time record for one channel and reject it for the other channel.

If you reject the time record, the analyzer does not return to the previous display; rather, it leaves the rejected time record displayed until you change the display, take another time record, or restart the measurement.

See also: [TIMED PREVIEW] softkey, [MANUAL PREVIEW] softkey

[REMOVE CAPTURE] softkey

Key Path: [Inst Mode] → [CAPTURE SETUP]
     or: [System Utility] → [MEMORY USAGE]

Deallocate the memory reserved for time capture.

The analyzer asks you for confirmation before it deallocates the memory.

[REMOVE PROGRAMS] softkey

See [MEMORY USAGE] softkey.

[REMOVE RAM DISK] softkey

See [MEMORY USAGE] softkey.

[REMOVE WATERFALL] softkey

See [MEMORY USAGE] softkey.

[REMOVE WTRFL REGS] softkey

See [MEMORY USAGE] softkey.

[RENAME FILE] softkeys

Key Path: [Disk Utility]

Rename a file using the following softkeys:

- [ORIGINAL FILENAME] asks you for the file's current name.
- [NEW FILENAME] asks you for the file's new name.
- [PERFORM RENAME] renames a file based on your entries in the two filename entry windows.

When you press [PERFORM RENAME], the analyzer renames a file on the default disk. To rename a file on one of the other disks, you must enter that disk's specifier in both filename entry windows.

A name is automatically entered into each filename entry window. If the catalog is off, each entry window contains the filename last entered. If the catalog is on, each entry window contains the name of the file currently highlighted. You can use the name in the entry window or modify it with the alpha entry keys.

See also: Alpha entry mode, [CATALOG ON OFF] softkey, Disk specifiers, [DEFAULT DISK] softkey

[RENUMBER] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [BASIC] → [INSTRUMNT BASIC] → [UTILITIES]

Allows you to do three things:

- Specify the first line number of a renumbered program.
- Specify the increment between renumbered lines.
- Renumber a program based on the specified first line number and increment.

See also: [PERFORM RENUMBER] softkey, [INCREMENT] softkey, [START LINE #] softkey (Renumber)

[REPEAT ON OFF] softkey (average)

Key Path: [Avg]

Turn average repeat on or off.

When repeat is on, the analyzer takes N averages (N is the specified number of averages), then clears the data and takes another N averages. The analyzer continues taking measurements until you turn repeat off, turn averaging off, or press [Pause/Cont].

This is useful for observing signals that change slowly over time. You can average enough to reduce the noise and still compare the signal over time. The best way to observe this is to set up the analyzer for a waterfall display and set the average parameters like this:

- Average On
- Fast Avg On
- Update Rate = Number Averages

The analyzer takes N averages and displays the results as the first line in the waterfall. Then it takes another N averages and displays the results as the second line in the waterfall, and so forth.

You can also turn repeat on to get a set of averages at each arm in manual arm, time step arm, or rpm step arm mode.

See also: [RPM STEP ARM] softkey, [TIME STEP ARM] softkey, [MANUAL ARM] softkey,
[NUMBER AVERAGES] softkey, [UPDATE RATE] softkey, [FAST AVG ON OFF] softkey,
[AVERAGE ON OFF] softkey, [WATERFALL] softkey, [AVERAGE ON OFF] softkey,
[NUMBER AVERAGES] softkey

[REPEAT ON OFF] softkey (histogram)

Key Path: [Avg]

When repeat is on, the analyzer performs a histogram over the specified histogram length, then clears the data and performs another histogram over the specified histogram length. The analyzer continues taking measurements until you turn repeat off or press [Pause/Cont].

This is useful for observing signals that change slowly over time. You can include enough samples to reduce the noise and still compare the signal over time. The best way to observe this is to set up the analyzer for a waterfall display and turn on fast average.

See also: [FAST AVG ON OFF] softkey, [WATERFALL] softkey, [HISTOGRAM LENGTH] softkey

[REPEAT ON OFF] softkey (octave)

Key Path: [Avg]

The effect of this key varies depending on the type of averaging and triggering used.

Exponential or equal confidence averaging are not affected by repeat on off.

For linear averaging with external or HP-IB trigger, repeat works like this:

- If repeat is on, the analyzer waits for an external or HP-IB trigger and then repeatedly outputs linear averages after each average time, with no dead time between averages.

- If repeat is off, the analyzer waits for a trigger, computes and displays one linear average, and then waits for another trigger. The analyzer continues to wait for new triggers until you pause the measurement. This mode allows you to collect a waterfall of externally triggered linear averages into one waterfall for later post-processing. The filters settle between each average

For peak hold averaging with external or HP-IB trigger, repeat works like this:

- If repeat is on, the analyzer waits for a trigger and then captures the peak amplitude until you pause the measurement.

- If repeat is off, the analyzer waits for a trigger and captures peak amplitude information for a time equal to the average time.

  In this mode, average time can be thought of as peak hold integration time. After this time has elapsed, the analyzer waits for another trigger. After the next trigger, the analyzer compares the new peaks to the existing held peaks and holds the greater of the two. You must press [Start] to reset the peak hold display.

  Note that if the peak hold average time is not long enough, some of the lower peak hold bands will never be updated since they have not settled. Peaks are held for each band as they become settled.

For linear averaging with free run trigger, repeat works like this:

- If repeat is on, the analyzer waits for start and then repeatedly outputs linear averages after each linear average integration time.

- If repeat is off, the analyzer, waits for start, then computes and displays one linear average.

For peak hold averaging with free run trigger, repeat works like this:

- If repeat is on, the analyzer waits for start and then captures the peak amplitude until the measurement is paused.

- If repeat is off, the analyzer waits for start and captures peak amplitude information for a time equal to the average time. In this mode, average time can be thought of as peak hold integration time. Note that if the peak hold average time is not long enough, then some of the lower peak hold bands will never be updated since they have not settled. Peaks are held for each band as they become settled.

See also: [AVERAGE TIME] softkey, [AVERAGE TIME] softkey, [AVERAGE TIME] softkey

[REPEAT ON OFF] softkey (source)

Key Path: [Source] → [ARB SRC SETUP]

Turn repeat on or off for the arbitrary source output.

When repeat is on, the analyzer outputs data to the source connector continuously, without interruption.

When repeat is off, the source behavior is affected by trigger mode. In free run trigger mode, source output is continuous, just as it is with repeat on. For any other trigger mode, the source begins its output only when a trigger occurs and shuts off after all the data in the register has been output. This happens each time a trigger occurs.

The timing of the source output is slightly different in different trigger modes. In source trigger mode, the output begins at trigger time. In external trigger, HP-IB trigger, or input trigger modes, the output will be delayed slightly (less than 30 usec).

See also: [ARBITRARY (D1-D8)] softkey

[RESET] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [BASIC] → [INSTRUMNT BASIC] → [DEBUG]

Reset your program.

When you reset a program, all HP-IB interfaces it has used are reset and all open files are closed. You can not continue a program that has been reset. If you use [SINGLE STEP] after [RESET], execution begins at the first line of the program.

Note	[RESET] does not affect your program's variables or HP Instrument BASIC's display area.

See also: [SINGLE STEP] softkey

[RESOLUTN (LINES)] softkey

Key Path: [Freq]

Specify the resolution for an FFT or correlation measurement. You can select 100, 200, 400, or 800. The default is 400.

If you specify lower resolution (smaller number), it takes less time for the analyzer to collect and process the data. Specify fewer lines for faster measurements, or more lines for better frequency resolution.

When you change the resolution, the analyzer changes the record length rather than the span.

See "Bins defined" for a table showing the relationship between number of lines and the number of points for an FFT measurement.

The following table shows the relationship between the number of points and resolution for different weighting functions in the correlation mode.

Resolution	0 to T/2 (real)	-T/2 to T/2 (real)	-T/4 to T/4 (real)
100	128	256	128
200	256	512	256
400	512	1024	512
800	1024	2048	1024

See also: [SPAN] softkey (frequency), [RECORD LENGTH] softkey, Bins defined

[RESOLUTN SETUP] softkey

(Available only with option 1D2, Swept Sine)

Key Path: [**Freq**]

Enter the following resolution information for a swept sine measurement:

- Specify the resolution.
- Turn autoresolution on or off.
- Specify the maximum percent change.
- Specify the minimum resolution.

See also: [MINIMUM RESOLUTN] softkey, [MAXIMUM % CHANGE] softkey, [AUTO RES ON OFF] softkey, [RESOLUTN] softkey

[RESOLUTN] softkey

(Available only with opt. 1D2, Swept Sine)

Key Path: [**Freq**] → [RESOLUTN SETUP]

Set the resolution of the frequency points used in a swept sine measurement.

Limits: 15.625 mHz to SPAN Default: 101 points/sweep
(or 3 to 801 points/sweep)

For a linear sweep, you may set the resolution in number of frequency points per sweep, percent of the frequency span, or a specific frequency step size (Hz). For a log sweep, you may set the resolution in number of frequency points per sweep, percent of the frequency span, number of frequency points per decade, or number of frequency points per octave.

After the sweep is complete, the analyzer redistributes the data (if necessary) to 401 points or 801 points, interpolating between actual measurement points. This is the data that is displayed and saved. The analyzer does this so that you can perform math on swept sine data.

See also: [SPAN] softkey (swept sine frequency), [SWEEP LIN LOG] softkey, [SWEEP LIN LOG] softkey, [SWEPT SINE] softkey

Returning to a previous help topic

The analyzer remembers the last 20 topics displayed. To return to a previous topic, press [7] one or more times. This function is especially useful if you have displayed a related topic—by pressing [4]—and want to return to the original topic.

See also: Displaying a related help topic

[RISE TIME] softkey

Key Path: [**Marker Fctn**] → [TIME PARAMTERS]

Compute and display the rise time—the time required for a step response to rise from 10% to 90% of its steady-state level. The analyzer uses only the data between the start time and stop time markers in the computation.

The analyzer uses the lowest steady-state value and approximate highest steady-state value between start time and stop time. The start time should be at least 5 bins before the transition for the computation to be accurate.

The analyzer also puts a horizontal line across the display at the highest steady-state level and displays the steady-state value in the mini-state.

See also: [START TIME] softkey, [STOP TIME] softkey

[RMS EXPONENTL] softkey

Key Path: [**Avg**] → [AVERAGE TYPE]

Select exponential rms (power) averaging. Unlike linear (normal) averaging, exponential averaging weights new data more than old data. This is useful for tracking data that changes over time.

For exponential averaging, the number of averages you specify determines the weighting of old versus new data, not the total number of averages calculated. If you increase the [NUMBER AVERAGES], new data is weighted less.

With exponential averaging, it's especially important to set the number of averages carefully—if there are too few averages in the measurement, the averaging does not smooth out variances. But if there are too many averages, the analyzer may not track subtle changes occurring within the data.

To calculate the exponential average, the analyzer uses this formula:

$$[(1/N)* \ (\text{new})] + [((N-1)/N)* \ (\text{old})],$$

where N is a weighting factor (the [NUMBER AVERAGES] you've specified).

When you start an exponential average, N equals 1 for the first analysis, N equals 2 for the second analysis, and so on—until N equals the [NUMBER AVERAGES] you've specified. This reduces the variance quickly during the startup of an exponential average.

Once you start a measurement using exponential averaging, the measurement continues indefinitely. To stop it, press [**Pause/Cont**]. This is different than linear averaging—linear averaging stops automatically after the specified number of averages are completed.

Until the measurement reaches the specified number of averages, there is no difference between rms exponential averaging and rms averaging.

Note

The results of rms exponential averaging are displayed only for the following measurement data (and math functions using these data types):
- Power spectrum.
- Frequency response.
- Cross spectrum.

Linear spectrum and time measurement data show only the last processed time record, not averaged data.

See also: [RMS] softkey, [NUMBER AVERAGES] softkey [PWR SPEC CHANNEL x] softkey, [FREQUENCY RESPONSE] softkey (FFT analysis), [CROSS SPECTRUM] softkey

[RMS] softkey

Key Path: [**Avg**] → [AVERAGE TYPE]

Select rms (power) averaging. This is the default average type. The analyzer averages N time records, where N is the number of averages you specify.

If you press [**Pause/Cont**] to continue the measurement after the measurement is complete, the analyzer averages another N time records with the existing data. If you press [**Start**], the analyzer clears the data and averages a new N time records.

Remember that rms averaging does not eliminate noise, but simply produces an approximation of the actual noise level. Increasing the number of rms averages provides a better statistical approximation of the noise, but does not actually reduce the noise.

Note

The results of rms averaging are displayed only for the following measurement data (and math functions using these data types):
- Power spectrum.
- Frequency response.
- Cross spectrum.

Linear spectrum and time measurement data show only the last processed time record, not averaged data.

See also: [NUMBER AVERAGES] softkey, [PWR SPEC CHANNEL x] softkey, [FREQUENCY RESPONSE] softkey (FFT analysis), [CROSS SPECTRUM] softkey

[RMS SQRT (PWR)] softkey

Key Path: [**Marker Fctn**] → [BAND MARKER]

Compute and display the square root of band power. Band power is the total power within the specified frequency band. The value is displayed in the lower left corner of the trace box.

If the trace coordinate is dB magnitude, the analyzer displays band power in dBVrms. For other trace coordinates, the analyzer displays band power in Vrms.

See also: [**Trace Coord**] hardkey, [BAND SPAN] softkey

[RPM (SEC)] softkey

Key Path: [**Trace Coord**] → [X UNITS]

Specify rpm for frequency domain X-axis units and seconds for time domain X-axis units. One Hz is equal to 60 rpm.

[RPM DECREASING] softkey (order analysis)

Key Path: [Trigger] → [ARM SETUP]

For time step arming the first arm occurs when the tachometer input rpm value reaches a value less than [START RPM].

For rpm step arming the first arm occurs when the tachometer input rpm value passes through the [MAX RPM] value (or integral multiples of [RPM STEP SIZE] below [MAX RPM]) in a negative (rpm decreasing) direction.

See also: [TIME STEP ARM] softkey (order measurements),
[RPM STEP ARM] softkey (order measurements), [MAX RPM] softkey (Freq),
[START RPM] softkey

[RPM INCREASING] softkey (order analysis)

Key Path: [Trigger] → [ARM SETUP]

For time step arming the first arm occurs when the tachometer input rpm value reaches a value greater than [START RPM].

For rpm step arming the first arm occurs when the tachometer input rpm value passes through the [MIN RPM] value (or integral multiples of [RPM STEP SIZE] above [MIN RPM]) in a positive (rpm increasing) direction.

See also: [TIME STEP ARM] softkey (order measurements),
[RPM STEP ARM] softkey (order measurements), [MIN RPM] softkey, [START RPM] softkey

[RPM PROFILE] softkey

(Available only with opt. 1D0, Computed Order Tracking)

Key Path: [Meas Data] → [MORE]

Display the time history of RPM.

If order track is on, the display has RPM on the vertical axis and time on the horizontal axis. If order track is off, the display has RPM on the vertical axis and counts on the horizontal axis.

See also: [TRACK ON OFF] softkey

[RPM STEP ARM] softkey

Key Path: [Trigger]
     or: [Trigger] → [ARM SETUP]

Select rpm step arming. (See separate help topic for rpm step arming with order analysis.) Arming works like this:

- The first arm occurs when the tachometer input rpm value passes through the [START RPM] value in a positive direction for [RPM INCREASING] or in a negative direction for [RPM DECREASING].

- Subsequent steps occur at intervals of [RPM STEP SIZE].

- The number of steps is equal to the [WATERFALL STEPS] value with the following exception:

The analyzer sets a "stop rpm" based on one of the following equations:

    for rpm increasing
        stop = start rpm + (rpm step size x waterfall steps)

    for rpm decreasing
        stop = start rpm - (rpm step size x waterfall steps)

If the tach input sweep rate is too fast for the analyzer to make measurements at "rpm step size" intervals, the analyzer cannot obtain all the rpm steps. The analyzer stops at the calculated "stop rpm" and displays the message "WATERFALL COMPLETE."

If this happens, you can either slow down the tach ramp rate, increase the rpm step size, or use time capture to ensure that each step is measured.

For more information on arming and triggering, see the analyzer's *Concepts Guide.*

See also: [RPM STEP ARM] softkey (order measurements), [START RPM] softkey,
            [START RPM USAGE] softkeys, [RPM STEP SIZE] softkey, [WATERFALL STEPS] softkey,
            [CAPTURE SETUP] softkey

[RPM STEP ARM] softkey (order measurements)

Key Path: [Trigger]

Select rpm step arming for an order measurement.

- The first arm occurs when the tachometer input rpm value passes through the [MIN RPM] value in a positive ([RPM INCREASING]) direction or the [MAX RPM] value in a negative ([RPM DECREASING]) direction.

- Subsequent steps occur at intervals of [RPM STEP SIZE].

- The number of steps is:
  ((Max rpm – Min rpm)/rpm step size) + 1
  The analyzer sets [WATERFALL STEPS] to this value, and you cannot change it. The actual number of steps may be further limited by the ramp speed of the tach input.

The analyzer sets a "stop rpm" based on one of the following equations:

for rpm increasing
stop = start rpm + (rpm step size x waterfall steps)

for rpm decreasing
stop = start rpm - (rpm step size x waterfall steps)

If the tach input sweep rate is too fast for the analyzer to make measurements at "rpm step size" intervals, the analyzer cannot obtain all the rpm steps. The analyzer stops at the calculated "stop rpm" and displays the message "WATERFALL COMPLETE."

If this happens, you can either slow down the tach ramp rate, increase the rpm step size, or use time capture to ensure that each step is measured.

For more information on arming and triggering, see the analyzer's *Concepts Guide.*

See also: [CAPTURE SETUP] softkey, [RPM STEP SIZE] softkey, [MAX RPM] softkey (Freq),
[MIN RPM] softkey, [RPM INCREASING] softkey (order analysis),
[RPM DECREASING] softkey (order analysis), [WATERFALL STEPS] softkey

[RPM STEP SIZE] softkey

Key Path: [Trigger] → [ARM SETUP]

Specify the rpm step size for rpm step arming.

Limits: 1 to 500,000 rpm   Default: varies depending on instrument mode

For more information on arming and triggering, see the analyzer's *Concepts Guide.*

See also: [RPM STEP ARM] softkey

[RPM DECREASING] softkey

See [START RPM USAGE] softkeys.

[RPM INCREASING] softkey

See [START RPM USAGE] softkeys.

[RUN PROGRAM] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [BASIC] → [INSTRUMNT BASIC]

Begin execution of the current HP Instrument BASIC program. After all variables not in COM are initialized, execution begins with the first statement.

To pause a running program, press [BASIC].

To stop a running program, press [Local/HP-IB].

Note   If the program is paused, you can resume execution by pressing the [CONTINUE]
                  softkey.

See also: [CONTINUE] softkey (BASIC), Stopping a program

[RUN PROGRAM X] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [BASIC]
or: [BASIC] → [SELECT PROGRAM]

Begin execution of the specified program. After all variables not in COM are initialized, execution begins with the first statement.

Note	HP Instrument BASIC allows you to automatically load and run a designated program when you turn on the analyzer. See [SAVE PROGRAM] for instructions.

To pause a running program, press [BASIC].

To stop a running program, press [Local/HP-IB].

If you have changed the labels for programs, the softkeys list the program labels rather than the program numbers.

Note	If the program is paused, you can resume execution by pressing the [CONTINUE] softkey.

Hint: The softkey labels disappear when you press this softkey while in help mode. You can press [BASIC] to display the softkey labels.

See also: [SAVE PROGRAM] softkey, [CONTINUE] softkey (BASIC), [LABEL PROGRAM] softkey

[S/N VERSION] softkey

Key Path: [System Utility]

Display your analyzer's serial number and firmware version.

This is useful if you need to know the serial number and the rear panel of your analyzer is not easily accessible.

[SAMPLE TIME] softkey

Key Path: [Freq]

Specify the sample time for a histogram measurement. Sample time is the time between points in the display.

Limits: 7.6294 us to 4 s (2 ch)   Default: 7.6294 us
         3.8147 us to 2 s (1 ch) ·   3.8147 us

This is another way of setting the [RECORD TIME] for a histogram measurement. The [SAMPLE TIME] and [RECORD TIME] are related as shown in the following equation:

Sample Time = Record Time / 1024

Note

Time capture taken in the histogram mode uses the full frequency span rather than the specified [SAMPLE TIME].

See also: [RECORD TIME] softkey

[SAVE AND DISP DATA] softkey

Key Path: [Marker Fctn] → [WATERFALL MARKERS]

Save the selected waterfall trace or slice to the specified data register and display the data in the upper trace box.

See also: [SELECT SAVE REGISTER] softkey, [SLICE SELECT] softkey, [TRACE SELECT] softkey

[SAVE AUTOSTATE] softkey

Key Path: [Save/Recall] → [MORE]

Save the current instrument state to the auto state file. When you turn on the analyzer, the analyzer uses the instrument state from this file.

Note	If you do not want to load the autostate program when you turn on the analyzer, hold down the [Preset] key while you turn on the analyzer.

The analyzer does not ask you to enter a file name for the auto state file. The auto state is always saved to the same file (NVRAM:AUTO_ST). (You can copy the file to an internal disk. When you recall the autostate, the analyzer looks for the file AUTO_ST first on the internal disk, then in non-volatile memory.)

The instrument state does not include traces, limit lines, math functions, math constants, or data registers.

See also: [INTERNAL DISK] softkey, [NON-VOL RAM DISK] softkey

[SAVE CAPTURE] softkey

Key Path: [Save/Recall] → [SAVE DATA]

Save the contents of the time capture buffer.

If the buffer is too large to fit on one disk, the analyzer displays a message telling you it must split the file and instructs you to press [CONTINUE SAVE]. The analyzer fills the first disk, then prompts you to insert another disk and press [CONTINUE SAVE] again until the entire buffer has been saved.

Caution	The volatile RAM disk is cleared each time you turn the analyzer off. Copy important time capture data to another disk before power-down or it will be lost.

For instructions on saving, see "Saving information."

[SAVE CHx CAL TRACE] softkey

Key Path: [System Utility] → [CALIBRATN]

Save the calibration trace for the specified channel to a data register.

See also: Data registers

[SAVE DATA] softkeys

Key Path: [Save/Recall]

Display softkeys for saving the following types of data:

- Individual trace.
- Time capture buffer contents.
- Waterfall buffer contents for the active trace.

For instructions on saving, see "Saving information."

See also: [SAVE WATERFALL] softkey, [SAVE CAPTURE] softkey, [SAVE TRACE] softkeys

[SAVE FIT TABLE] softkey

Key Path: [Save/Recall] → [SAVE MORE]

Save the curve fit table.

Caution

The volatile RAM disk is cleared each time you turn the analyzer off. Copy important tables to another disk before power-down or it will be lost.

For instructions on saving, see "Saving information."

[SAVE LOWER LIM] softkey

Key Path: [**Save/Recall**] → [SAVE MORE]

Save the lower limit line of the active trace to one of the disks.

Caution
The volatile RAM disk is cleared each time you turn the analyzer off. Copy important limit files to another disk before power-down or they will be lost.

For instructions on saving, see "Saving information."

[SAVE MATH] softkey

Key Path: [**Save/Recall**] → [SAVE MORE]

Save a complete set of math definitions—all functions and constants—to one of the disks.

Caution
The volatile RAM disk is cleared each time you turn the analyzer off. Copy important math files to another disk before power-down or they will be lost.

For instructions on saving, see "Saving information."

[SAVE PROGRAM] softkey

Key Path: [**Save/Recall**] → [SAVE MORE]

Save the selected HP Instrument BASIC program.

HP Instrument BASIC allows you to automatically load one or more programs and run a designated program when you turn on the analyzer. To make an autoloading program, save it to the non-volatile RAM disk or to a floppy disk in the internal drive with one of the following names:

- AUTO_BAS
- AUTO_BA1
- AUTO_BA2
- AUTO_BA3
- AUTO_BA4
- AUTO_BA5

At power-up, the analyzer searches the internal disk drive and then the non-volatile RAM disk for files with these special names. It searches for files in the order listed above, but it does not search for AUTO_BA1 if AUTO_BAS is found.

If AUTO_BAS is found, it is loaded into the first program buffer and executed after all other programs have been loaded. If AUTO_BA1 through AUTO_BA5 are found, they are loaded into the first through fifth program buffers, but they are not executed.

If you do not want to load any AUTO_BA* program, you can hold down [**Preset**] while you turn on the analyzer.

Caution	The volatile RAM disk is cleared each time you turn the analyzer off. Copy important programs to another disk before power-down or they will be lost.

For instructions on saving, see "Saving information."

See also: [RE-SAVE PROGRAM] softkey

[SAVE SNTH TABLE] softkey

Key Path: [**Save/Recall**] → [SAVE MORE]

Save the synthesis table.

Caution	The volatile RAM disk is cleared each time you turn the analyzer off. Copy important tables to another disk before power-down or it will be lost.

For instructions on saving, see "Saving information."

[SAVE STATE] softkey

Key Path: [Save/Recall]

Save the current instrument state to one of the disks.

The instrument state does not include traces, limit lines, math functions, math constants, or data registers.

Caution

The volatile RAM disk is cleared each time you turn the analyzer off. Copy important state files to another disk before power-down or they will be lost.

For instructions on saving, see "Saving information."

[SAVE TO DATA REG] softkey

Key Path: [Marker Fctn] → [WATERFALL MARKERS]

Save the selected waterfall trace or slice to the specified data register.

See also: [SELECT SAVE REGISTER] softkey, [SLICE SELECT] softkey, [TRACE SELECT] softkey

[SAVE TRACE] softkey

Key Path: [Save/Recall] → [SAVE DATA]

Save the active trace to one of the following places:

[INTO Dx] lets you save into data register x.

[INTO FILE] lets you save to the default disk (or to any disk if you include a disk specifier).

The analyzer saves only the active trace and its trace title. If you want to save other measurement data, you must first display it in the active trace, then save the trace.

Caution

The volatile RAM disk and all data registers are cleared each time you turn the analyzer off. Copy important trace files to another disk before power-down or they will be lost.

For instructions on saving, see "Saving information."

See also: [DEFAULT DISK] softkey, Disk specifiers, Data registers

[SAVE UPPER LIM] softkey

Key Path: [Save/Recall] → [SAVE MORE]

Save the upper limit line of the active trace to one of the disks.

Caution	The volatile RAM disk is cleared each time you turn the analyzer off. Copy important limit files to another disk before power-down or they will be lost.

For instructions on saving, see "Saving information."

[SAVE WATERFALL] softkey

Key Path: [Save/Recall] → [SAVE DATA]

Save the waterfall of the measurement data displayed in the active trace. You can save the waterfall to one of two places:

[INTO FILE] lets you save to the default disk (or any disk if you include a disk specifier).

[INTO Wx] lets you save into the specified waterfall register.

The analyzer saves only the measurement data for the currently active trace. It does not save the complete set of measurement results. For example, if the active trace displays coherence and you have set [WATERFALL STEPS] to 10, the analyzer saves the last 10 coherence traces.

[WATERFALL STEPS] must be greater than 1, or the analyzer displays a message and does not save the waterfall.

Caution	The volatile RAM disk is cleared each time you turn the analyzer off. Copy important waterfall data to another disk before power-down or it will be lost.

If the buffer is too large to fit on one disk, the analyzer displays a message telling you it must split the file and instructs you to press [CONTINUE SAVE]. The analyzer fills the first disk, then prompts you to insert another disk and press [CONTINUE SAVE] again until the entire buffer has been saved.

For instructions on saving, see "Saving information."

See also: [WATERFALL REGISTER] softkey, Disk specifiers, [DEFAULT DISK] softkey,
         [WATERFALL STEPS] softkey

[Save/Recall] hardkey

The softkeys under [**Save/Recall**] are used to load traces into the analyzer's data registers and to save and recall the following kinds of files:

- Individual trace.
- Instrument state.
- Limit definition.
- Math definition.
- HP Instrument BASIC program.
- Time capture buffer contents.
- Waterfall buffer contents for the active trace.
- Curve fit table.
- Synthesis table.

Note

When you save to a file, the analyzer displays a message when the save is complete.

When you save to a data register, RAM, or non-volatile RAM, the operation speed does not allow the message to be displayed. When the softkey menu changes, the save is complete.

For instructions on saving, see "Saving information."

Note

To rename, copy, or delete files, use the softkeys grouped under [**Disk Utility**].

See also: [NON-VOL RAM DISK] softkey, [VOLATILE RAM DISK] softkey, Data registers, [SAVE SNTH TABLE] softkey, [SAVE FIT TABLE] softkey, [SAVE WATERFALL] softkey, [SAVE CAPTURE] softkey, [SAVE PROGRAM] softkey, [SAVE MATH] softkey, [SAVE UPPER LIM] softkey, [SAVE STATE] softkey, [SAVE TRACE] softkeys

Saving information

When you save information to a file, the analyzer displays an entry window and enters alpha entry mode. Use the default filename displayed in the entry window or modify the name with the alpha entry keys. When the filename is correct, press [ENTER] to start the save operation.

The analyzer assigns the following extensions to the default file names.

- DAT traces, capture file, waterfalls
- STA states
- LIM upper and lower limits
- MTH math function and constant definitions
- FIT curve fit tables
- SYN synthesis tables

Caution   The volatile RAM disk is cleared each time you turn the analyzer off. Copy important files to another disk before power-down or they will be lost.

You can do two things to simplify save operations:

- Designate the disk you use most often as the default disk.
- Display the disk catalog.

You only need to enter a filename to identify a file on the default disk. You must enter a disk specifier and a filename to identify a file on any other disk.

The analyzer can save files to one of four disks:

- Non-volatile RAM disk (NVRAM).
- Volatile RAM disk (RAM).
- Internal disk (INT).
- External HP-IB disk drive (EXT).

When the catalog is displayed, you don't need to type the name of a file you want to overwrite. Instead, you can just select the file with the knob before bringing up the filename entry window. The name of the file you select is automatically placed in the entry window.

The analyzer will also increment file names if you use a number as the last character of the file name or the last character before the extension--for example, "TRACE1" or "TRACE1.DAT." The analyzer will automatically put the name "TRACE2" (or "TRACE2.DAT") in the entry box the next time you save something. This feature only works if the catalog is off.

If the buffer contents will not fit on one disk, the analyzer splits the file and asks you to insert another disk when the current disk is full. Press [CONTINUE SAVE] to save the next portion of the buffer on the new disk.

Note

[CONTINUE SAVE] only works for flexible disks in the internal or external disk drives. It does not work for non-volatile RAM, volatile RAM, or fixed external disks.

When you try to save to an existing file, the analyzer displays an error message and a new softkey menu. You must press [OVERWRITE FILE] to overwrite the file or [CANCEL/RETURN] to enter a new file name.

See also: [OVERWRIT FILE] softkey, [CONTINUE SAVE] softkey, Alpha entry mode,
[EXTERNAL DISK] softkey, [INTERNAL DISK] softkey, [VOLATILE RAM DISK] softkey,
[NON-VOL RAM DISK] softkey, [CATALOG ON OFF] softkey, Disk specifiers,
[DEFAULT DISK] softkey

[SCALE AT MARKERS] softkey

Key Path: [Scale] → [AXES SCAL MARKERS]

Change the display to show only that part of the trace between the axes scale markers. When you move the markers, the data displayed changes. The way the markers move depends on the current "hold" selection ([HOLD RIGHT], [HOLD TOP], [HOLD CENTER], [HOLD LEFT], [HOLD BOTTOM], [HOLD WDTH (SCROLL)]).

For example, assume you press [SCALE AT MARKERS], then press [HOLD WDTH (SCROLL)]. When you turn the knob, the display scrolls through the data.

See also: [HOLD WDTH (SCROLL)] softkey, [HOLD BOTTOM] softkey, [HOLD LEFT] softkey,
[HOLD CENTER] softkey, [HOLD TOP] softkey, [HOLD RIGHT] softkey,
[AXES SCAL MARKERS] softkey

[Scale] hardkey

Choose an appropriate scale and units for the active trace.

The options available in the menu are:

- Y-axis autoscale.
- Y-axis top reference.
- Y-axis center reference.
- Y-axis bottom reference.
- Y-axis input range tracking.
- Y-axis per division.
- Match the X-axis scale to the other trace.
- Match the Y-axis scale to the other trace.
- Axes scale markers.

Note   The arrow keys and the knob are especially useful in the Scale menu, since they let you quickly change the vertical scaling.

For very small or very large values, the Y-axis scale annotation is in scientific notation. The prefixes are defined under "Suffix menus."

See also: Suffix menus, [MATCH Y SCALE] softkey, [MATCH X SCALE] softkey, Knob,
[AXES SCAL MARKERS] softkey, [Y PER DIV (DECADES)] softkey,
[INP RANGE TRACKING] softkey, [BOTTOM REFERENCE] softkey, [CENTER REFERENCE] softkey,
[TOP REFERENCE] softkey, [Y AUTO SCAL ONCE] softkey, Arrow keys

[SCRATCH OPTIONS] softkey group (Option 1C2)

Key Path: [BASIC] → [INSTRUMNT BASIC] → [UTILITIES] → [SCRATCH]

Press one of the softkeys in this group to specify what will be deleted when you press
[PERFORM SCRATCH].

Each softkey specifies some combination of your HP Instrument BASIC program and its variables:

■ [SCRATCH] specifies the program and all of its variables except those in COM.

■ [SCRATCH C] specifies all program variables — including those in COM — but not the program
itself.

■ [SCRATCH A] specifies the program and all of its variables including those in COM.

See also: [PERFORM SCRATCH] softkey

[SCRATCH] softkey (Option 1C2)

Key Path: [BASIC] → [INSTRUMNT BASIC] → [UTILITIES]

Allows you to do two things:

■ Select which combination of your HP Instrument BASIC program and its variables you want to
delete.

■ Delete the selected combination.

See also: [PERFORM SCRATCH] softkey, [SCRATCH OPTIONS] softkey group

[SCRATCH A] softkey

See [SCRATCH OPTIONS] softkey group.

[SCRATCH C] softkey (Option 1C2)

See [SCRATCH OPTIONS] softkey group.

[SCREEN SAVER DELAY] softkey

Key Path: [Disp Format] → [MORE] → [SCREEN SAVER]

Change the time delay in minutes for the screen saver:
■ Limits: integers 1 through 120
■ Default: 15

| Note | The delay time is saved in non-volatile memory, so it is retained when you turn the analyzer off and on. |

[SCREEN SAVER ON/OFF] softkey

Key Path: [**Disp Format**] → [MORE] → [SCREEN SAVER]

Turn the screen saver on or off.

| Note | The On/Off setting is saved in non-volatile memory, so it is retained when you turn the analyzer off and on. |

[SCREEN SAVER] softkey

Key Path: [**Disp Format**] → [MORE]

Access the softkeys for setting up the screen saver:

- Screen Saver On/Off
- Screen Saver Delay

The screen saver blanks the display after a user-specified time if a front panel key or an external keyboard key has not been pressed.

The display can be turned back on by pressing a front panel key or an external keyboard key.

[SCROLL DOWN] softkey

Key Path: [**Marker Fctn**] → [WATERFALL MARKERS]

More traces may be stored in a waterfall than are currently displayed. This key displays a group of traces above (newer than) the currently displayed traces.

[SCROLL UP] softkey

Key Path: [**Marker Fctn**] → [WATERFALL MARKERS]

More traces may be stored in a waterfall than are currently displayed. This key displays a group of traces below (older than) the currently displayed traces.

[SECURE] softkey (Option 1C2)

Key Path: [**BASIC**] → [INSTRUMNT BASIC] → [UTILITIES]

Allows you to do two things:

- Specify a range of lines in your program that you want to secure.
- Secure (protect against viewing) the specified range of lines.

Caution Secured program lines can not be unsecured. Be sure to keep an unsecured version
of the program for your own records.

See also: [PERFORM SECURE] softkey, [START LINE #] softkey (Secure)

[SELECT PROGRAM] softkey (Option 1C2)

Key Path: [**BASIC**] → [INSTRUMNT BASIC]

Specify which of the 5 HP Instrument BASIC programs you want to run. You can select from
programs 1 through 5. If you have changed the labels for programs, the softkeys list the program
labels rather than the program numbers.

See also: [LABEL PROGRAM] softkey

[SELECT SAVE REGISTER] softkey

Key Path: [**Marker Fctn**] → [WATERFALL MARKERS]

Specify the data register for saving waterfall traces or slices.

See also: [SLICE SELECT] softkey, [TRACE SELECT] softkey

[SETTLE TIME] softkey (Option 1D2)

Key Path: [**Avg**]

Specify the settling time for a swept sine measurement.

Settling time is the delay between changing the source frequency and starting the measurement at
each point. This allows the transient response of the device under test to die out before data
collection begins.

You can enter the settling time in seconds or as a number of cycles.

See also: [SWEPT SINE] softkey

[SETTLING TIME] softkey

Key Path: [Marker Fctn] → [TIME PARAMTERS]

Compute and display settling time—the time required for a step response to reach steady-state level and stay within +/– 5% of the difference between the initial and steady-state levels.

For example, for a step response from 0V to 1V would accept a steady-state band of .95V to 1.05V (1 +/- .05(1-0)). A step response from .5V to 1V would accept a steady-state band of .975V to 1.025V (1 +/- .05(1-.5)).

The analyzer uses only the data between the start time and stop time markers in the computation. The settling time is measured from the start time marker.

The analyzer also puts a horizontal line across the display at the steady-state level and displays the steady-state value in the mini-state.

See also: [START TIME] softkey, [STOP TIME] softkey

[SIDEBAND INCREMENT] softkey

Key Path: [Marker Fctn] → [SIDEBAND MARKER]

Specify the frequency increment (difference) between sidebands and the carrier frequency.

See also: [SIDEBAND MARKER] softkey, [CARRIER FREQ] softkey

[SIDEBAND MARKER] softkey

Key Path: [Marker Fctn]

Turn on the sideband marker. This marker shows the sidebands (and sideband power) for a particular carrier frequency. From the sideband marker menu you can do the following things:

- Specify the carrier frequency.
- Specify the sideband increment.
- Specify the number of sidebands.
- Turn off computation.
- Display sideband power.

See also: [SIDEBAND POWER] softkey, [COMPUTE OFF] softkey, [NUMBER OF SIDEBANDS] softkey, [SIDEBAND INCREMENT] softkey, [CARRIER FREQ] softkey

[SIDEBAND POWER] softkey

Key Path: [**Marker Fctn**] → [SIDEBAND MARKER]

Compute and display the sideband power. The sideband power value represents the rms summation of all marked sidebands. The value is displayed in the lower left corner of the trace box.

If the trace coordinate is dB magnitude, the analyzer displays sideband power in dBVrms. For other trace coordinates, the analyzer displays sideband power in Vrms $^\wedge$ 2.

See also: [**Trace Coord**] hardkey, [SIDEBAND MARKER] softkey

[SINGLE CAL] softkey

Key Path: [**System Utility**] → [CALIBRATN]

Calibrate the analyzer one time. Calibration starts as soon as you press the key, interrupting any measurement in progress.

Note   If you do a calibration while a measurement is paused, the analyzer will start a new measurement when you press [**Pause/Cont**].

Calibration is done for all amplitude ranges and all frequencies regardless of instrument setup.

During calibration a small ac voltage (around 2 mV) appears at the source output connector.

Note   Enable the analyzer's autocalibration function if you want calibrations to occur automatically.

See also: [**Pause/Cont**] hardkey, [AUTO CAL ON OFF] softkey

[SINGLE] softkey

Key Path: [Disp Format]

Display only the currently active trace using a single, full-height trace box. All trace annotation applies to the active trace.

Note

If you select either [UPPER] or [LOWER] under the [BASIC] → [DISPLAY SETUP] key, the analyzer changes the display format from single to upper/lower.

See also: Trace boxes

[SINGLE STEP] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [BASIC] → [INSTRUMNT BASIC] → [DEBUG]

Execute one line of your program.

The first time you press [SINGLE STEP], the analyzer performs a pre-run operation and then displays the first line to be executed. On subsequent presses, the analyzer executes the displayed line and then displays the next line to be executed. (Program lines are displayed at the top of the screen.)

If your program is paused, single-stepping begins with the line following the last-executed line. If your program has been stopped or reset, single-stepping begins with the first line.

Note

If you change (edit) a paused program, it is reset automatically.

You can use [EXAMINE VARIABLE] to see what has happened after each line is executed.

See also: [EXAMINE VARIABLE] softkey

[SKEW ANGLE] softkey

Key Path: [**Disp Format**] → [WATERFALL SETUP]
or: [**Marker Fctn**] → [WATERFALL MARKERS] → [WATERFALL SETUP]

Specify the offset angle (in degrees) for skewed waterfall display.

Limits: 0 to 45 degrees   Default: 30

The skew angle determines how much each trace is offset from the previous trace, as shown in the illustration. The display on the left has no skew (0 degrees). The display on the right has a skew of 30 degrees.
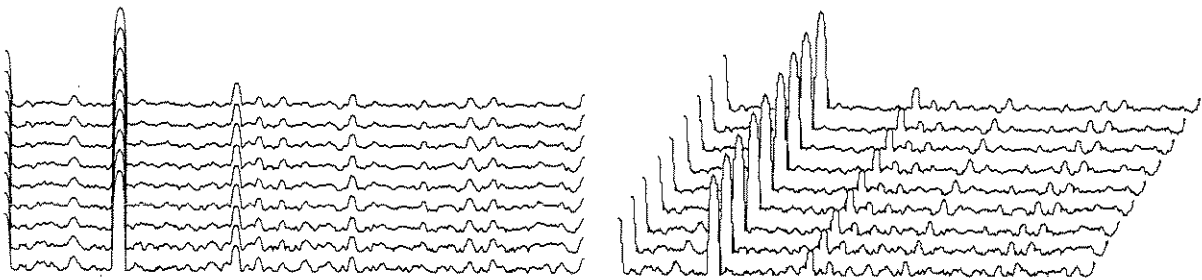
If you specify 0, the effect is the same as turning skew off--each trace begins at the left edge of the trace box and ends at the right edge.

See also: [SKEW ON OFF] softkey

[SKEW ON OFF] softkey

Key Path: [**Disp Format**] → [WATERFALL SETUP]
or: [**Marker Fctn**] → [WATERFALL MARKERS] → [WATERFALL SETUP]

Turn skewed waterfall display on or off.

When skew is off, each trace begins at the left edge of the trace box and ends at the right edge.

When skew is on, the beginning of each trace added to the display is offset to the right from the previous trace. Specify the offset by pressing [SKEW ANGLE]. The end of each trace is offset to the left so that each trace is completely displayed. The skewed display is especially useful for octave displays.

See also: [SKEW ANGLE] softkey

[SLICE SELECT] softkey

Key Path: [Marker Fctn] → [WATERFALL MARKERS]

Turn on the slice select marker. Use the numeric keys or the knob to identify the slice you want to save.

A slice is a vertical line through the collection of waterfall traces at the same X-axis value. The number of points in the slice is equal to the number of traces in the waterfall buffer. Each point is the amplitude for the corresponding trace.

The slice is limited to 2048 points. If there are more than 2048 traces in the waterfall, the slice begins with the selected trace and ends 2048 traces later.

You can save the selected slice to a data register by pressing [SAVE TO DATA REG]. To view the slice, press [SAVE AND DISP DATA]. This saves the slice to the data register and displays the data register on trace A.

Note	You must pause a running measurement before you can use the slice select marker.

See also: [SAVE AND DISP DATA] softkey, [SAVE TO DATA REG] softkey, [TRACE SELECT] softkey

[SLOPE POS NEG] softkey

Key Path: [Trigger] → [TRIGGER SETUP]
    or: [Trigger] → [TACHOMETR SETUP]
    or: [Input] → [TACHOMETR SETUP

Select triggering on a rising (positive) or falling (negative) trigger signal.

Note	The slope setting applies to channel 1 triggering, channel 2 triggering, and external triggering only. Free run, source, and HP-IB triggers operate independently of the slope setting.

For more information on triggering, see the analyzer's *Concepts Guide.*

[SLOW (10 cm/s)] softkey

See [PLOT PEN SPEED] softkeys.

Softkeys

The analyzer has ten softkeys arranged in a column to the right of the screen. They are referred to as softkeys because the function assigned to each key can change. In contrast, the function assigned to each hardkey never changes.

For example, when you press the [Source] hardkey, the first softkey is used to turn the analyzer's source on and off. But when you press the [Plot/Print] hardkey, the first softkey is used to initiate a plot of the analyzer's screen.

A softkey's current meaning is determined by its "softkey label." The label is displayed on the screen, to the left of the softkey. In the help text, softkeys are represented by enclosing softkey labels in brackets (for example, "The [CROSS SPECTRUM] softkey is used to..."). Softkey labels are all upper case.

Special types of softkeys include the following: those that can toggle between two states, those that are part of a bracketed group, and those that are inactive for some analyzer setups.

See also: Softkeys in bracketed groups, Softkeys that toggle, [INACTIVE] softkeys

Softkeys in bracketed groups

Some softkeys are grouped together with a bracket.

The keys in such a group select options that are mutually exclusive—at any given time, only one of the options can be active. The analyzer indicates which option is active by drawing a box around that option's softkey label.

Softkeys that toggle

Some softkeys control analyzer functions that have only two states (for example, on and off). Each time you press one of these keys, the associated function toggles (switches) from one state to the other.

Here is an example of a toggling softkey:

[X-AXIS LIN **LOG**]

The analyzer indicates which state is active by highlighting the corresponding text on the softkey label. In the example above, log X-axis is active. If you were to press this example softkey, the state would toggle to linear X-axis.

[SOLID] softkey

See Line type softkeys.

[Source] hardkey

Select a source waveform appropriate for the type of measurement you want to make, turn the source on or off, or set the output level for each waveform.

For FFT analysis, correlation analysis, and histogram/time, the analyzer provides these source output types:

- Random noise.
- Burst random.
- Periodic chirp.
- Burst chirp.
- Pink noise.
- Fixed sine.
- Arbitrary data register D1-D8 (with Option 1D4).

For octave and order measurements, the analyzer provides these source output types:

- Random noise.
- Pink noise.
- Fixed sine.

For swept sine measurements, fixed sine is the only output type available. The menu includes:

- Ramp rate
- Autoleveling parameters.

Caution

When you turn on the analyzer's power (and when you turn off power), a brief pulse may appear at the source output connector. Do not cycle power if you have sensitive test devices connected to the analyzer's source.

The analyzer remembers a separate set of source parameters for each instrument mode. The exceptions are source on/off and source level. The source always shuts off when you change instrument modes, but its level remains unchanged.

The source output impedance is less than 5Ω, so you do not need to terminate the analyzer's source.

See also: [SOURCE ON OFF] softkey, [LEVEL] softkey (source), [SOURCE ON OFF] softkey,
[**Inst Mode**] hardkey, [AUTOLEVEL ON OFF] softkey, [RAMP RATE] softkey,
[FIXED SINE] softkey, [PINK NOISE] softkey, [RANDOM NOISE] softkey,
[ARBITRARY (D1-D8)] softkey, [FIXED SINE] softkey, [PINK NOISE] softkey,
[BURST CHIRP] softkey, [PERIODIC CHIRP] softkey, [BURST RANDOM] softkey,
[RANDOM NOISE] softkey, [LEVEL] softkey (source)

[SOURCE ON OFF] softkey

Key Path: [Source]

Turn the analyzer's source on or off. When you first turn on the analyzer (or press [Preset]), the source selected will be fixed sine, and it will be turned off.

The source will also be turned off whenever you change instrument modes, unless the new mode is swept sine. The source is always on in swept sine mode. This means that if you turn on the source, then change the instrument mode, the source remains on. The analyzer does not remember a different source on/off state for each instrument mode.

Note

If you turn off the source and turn it on again, the output level will automatically return to the level you set previously—even if you've selected a different source waveform.

Note

When you start a measurement with capture on, the analyzer turns off the source. The highlight of the [SOURCE ON OFF] key does not change. The source status is indicated by the SRC status indicator above the trace. When the measurement is complete, the analyzer returns the source to its original on/off state.

See also: [CAPTURE ON OFF] softkey, [Inst Mode] hardkey

[SOURCE TRIGGER] softkey

Key Path: [Trigger]

Select internal triggering from the analyzer's source.

For source triggering, you can specify pre- or post-trigger delay, but not trigger level or slope.

Source triggering is used with waveforms that are periodic (periodic chirp and fixed sine). For periodic chirp, triggering occurs at the beginning of each time record. For fixed sine, triggering occurs at a consistent (but not predictable) point within the time record.

If you use the fixed sine waveform as the source trigger signal (and the span starts at zero), you should set the fixed sine frequency as a multiple of the frequency span/400. This ensures that the sine wave is periodic within that particular time record—otherwise, the analyzer won't trigger at the same point on the sine wave during subsequent time records (a problem if you're making phase measurements). If the span does not start at zero (zoomed measurements), you should make sure the center frequency is also a multiple of the frequency span/400.

There are fewer restrictions when using the periodic chirp with sine source triggering, but if the span does not start at zero (zoomed measurements), make sure the center frequency is a multiple of the frequency span/400.

The analyzer triggers regularly with random noise, but there is no relationship between the trigger and any particular component of the random noise signal.

For more information on triggering, see the analyzer's *Concepts Guide.*

See also: [CHANNEL x DELAY] softkey, [FIXED SINE] softkey, [PERIODIC CHIRP] softkey

[SOURCE DISK] softkey

See [COPY ALL FILES] softkeys.

[SOURCE FILENAME] softkey

See [COPY FILE] softkeys.

[SPAN] softkey (frequency)

Key Path: [Freq]

Specify the frequency bandwidth to be measured. Use the numeric keypad to enter this value. You can enter any value, but the analyzer will automatically switch to the nearest acceptable value. You can also use the arrow keys in the numeric entry group or the knob to step through available values for the frequency span

The following frequency spans are available:

102,400 Hz *	800 Hz	6.25 Hz
51,200 Hz	400 Hz	3.125 Hz
25,600 Hz	200 Hz	1.5625 Hz
12,800 Hz	100 Hz	.78125 Hz
6,400 Hz	50 Hz	.390625 Hz
3,200 Hz	25 Hz	.1953125 Hz
1,600 Hz	12.5 Hz	.09765625 Hz **

* For 1-channel measurements only.
** For 2-channel measurements only.

The span doesn't change when you change the start frequency. This is convenient, because it lets you look at different places in the frequency spectrum while still maintaining the same bandwidth.

When you change the frequency span, the length of the time record changes also—the exact length of the time record (measured in seconds) is resolution/span. And conversely, when you change the time record length, the frequency span changes. The time record length and the frequency span are simply different ways of expressing the same information.

The analyzer's frequency resolution depends on the span you select. To summarize:

- Frequency resolution = Span / Resolution
- Frequency resolution = 1 / (time record length)
- Frequency span = Resolution / (time record length)
- Time record length = Resolution / Span

See also: [RESOLUTN (LINES)] softkey, [RECORD LENGTH] softkey, Time record, Knob, Arrow keys

[SPAN] softkey (swept sine frequency)

(Available only with option 1D2, Swept Sine)

Key Path: [Freq]

Specify the width of the band of frequencies to be analyzed for a swept sine measurement.

Limits: 15.625 mHz to 51.149 kHz   Default: 51.149 kHz

For log sweep, you can also enter the span in decades or octaves.

If you enter a span that is too large, the analyzer uses the largest span possible for the current start frequency or center frequency (whichever is anchored).

See also: [CENTER] softkey (swept sine frequency), [START] softkey (swept sine frequency),
[SWEPT SINE] softkey

[SPANISH] softkey

See [KEYBOARD SETUP] softkeys.

[SQRT(] softkey

Key Path: [Analys] → [DEFINE FUNCTION] → [DEFINE Fx] → [OPERATION]

Compute the square root of the operand.

The square root of a complex number "a + jb" is given by the formula:

sqrt((a+sqrt(a^2+b^2))/2) +/-j* sqrt((a-sqrt(a^2+b^2))/2)
where the sign of the imaginary part is the same as the sign of b. In polar form, the square root of
me^jp is sqrt(m)* e^j(p/2).

[START CAPTURE] softkey

Key Path: [Inst Mode] → [CAPTURE SETUP]

Begin collecting data from the inputs and store it in the time capture buffer. If memory was not previously allocated for the time capture buffer, it is allocated now.

Note	The analyzer always captures an integral number of 1024point records. All references to "records" for time capture are for a 1024point record.

If there is not enough memory for the specified time length, the analyzer allocates as much memory as possible and displays an error message.

When the capture is complete, the analyzer toggles [CAPTURE ON/OFF] to ON.

Note	Triggering occurs only once for time capture acquisition. Once the capture starts, it continues until the specified capture length has been reached.

Note	If [TACH DATA ON OFF] is on, the analyzer does not allow time for the digital filters to settle before capturing data.
	For FFT analysis, Correlation analysis, and Histogram analysis, you may want to set the analysis region start time to at least 68 points to eliminate the settling time from the measurement data. (The analyzer allows the digital filters to settle for 68 points.)

See also: [ANALYSIS REGION] softkeys, [TACH DATA ON OFF] softkey, [CAPTURE ON OFF] softkey, [ALLOCATE CAPTURE] softkey

[START FIT] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [CURVE FIT]

Start the curve fit process.

The analyzer performs the following actions:
- Places the pole zero results in the curve fit table when the fit is complete.
- Turns off the table (if it is displayed) and returns to the display format.
- Stores the synthesized frequency response of the curve fit model in the specified curve fit data register.
- Displays the specified data register in trace B if the display format is upper/lower or front/back.
- Places the weighting function used for the fit in the selected weight register.

Use [ABORT FIT] to stop a curve fit in progress.

Before starting the curve fit, be sure that you have done the following things:
- Display frequency response data in trace A.
- Display coherence data in trace B, if you want the curve fit to use the measured coherence.
- Set fixed terms or cleared the curve fit table to remove unwanted fixed terms.
- Completed the setup under [CURVE FIT SETUP].

When you start the curve fit, the analyzer displays intermediate results in trace B. When the curve fit is complete, the analyzer displays the frequency response of the curve fit model.

The analyzer uses coherence in a curve fit if trace A contains frequency response data and trace B contains coherence data obtained with four or more averages. Overlap processing will increase the number of averages required. If coherence is not displayed in trace B, the analyzer calculates and uses a pseudo-coherence instead.

For swept sine data, the analyzer always uses the calculated pseudo-coherence. For synthesized traces, the analyzer uses no coherence—coherence is assumed to be 1.0 for all data points.

See also: [CURVE FIT SETUP] softkey, [FIX VALUE TOGGLE] softkey, [WEIGHT REGISTER] softkey,
[CURVE FIT REGISTER] softkey, [COHERENCE] softkey,
[FREQUENCY RESPONSE] softkey (FFT analysis), [OVERLAP PERCENT] softkey

[START FREQUENCY] softkey

Key Path: [**Marker Fctn**] → [GAIN PHAS MARGINS]
    or: [**Marker Fctn**] → [FREQ & DAMPING]

Move the start marker to a specified location. Use the numeric entry keys or the knob to specify the location. The default is the measurement start frequency.

The analyzer uses only the data between the start and stop markers for computations.

[Start] hardkey

Begin a measurement.

If the analyzer is already making a measurement, press [**Start**] to start the measurement over again.

If the analyzer is paused, press [**Pause-Cont**] to continue the measurement.

Note

When you start a measurement with capture on, the analyzer turns off the source. When the measurement is complete, the analyzer returns the source to its original on/off state.

[**Start**] clears all measurement data from the analyzer's buffers; [**Pause-Cont**] does not clear the buffers.

Hint: If you want to see several measurements in a waterfall display, see the instructions under the [REPEAT ON/OFF] key (under [**Avg**]).

If you're in manual arm mode, pressing [**Start**] does not arm the trigger (you'll have to press [ARM] in the trigger menu to do that).

Pressing [**Start**] does not provide a trigger signal. If you want to select a trigger signal, press [**Trigger**] and select an appropriate trigger option.

See also: [CAPTURE ON OFF] softkey, [REPEAT ON OFF] softkey (average), [**Pause/Cont**] hardkey, [MANUAL ARM] softkey

[START LINE #] softkey (Renumber)

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC] → [UTILITIES] → [RENUMBER]

Before you renumber a program, press [START LINE #] to specify the new line number for the first line. An entry window is displayed so you can enter a new value.

Note

Renumbering acts on the entire program. [START LINE #] is used for the first program line after renumbering. It does not specify where renumbering should begin in the original program.

After you have specified the starting line number and the increment between line numbers, press [PERFORM RENUMBER] to renumber your program.

See also: [PERFORM RENUMBER] softkey, [INCREMENT] softkey, [RENUMBER] softkey

[START LINE #] softkey (Secure)

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [**BASIC**] → [INSTRUMNT BASIC] → [UTILITIES] → [SECURE]

Before you secure a program (protect it against viewing), you must specify the range of lines you want to secure. Press [START LINE #] to specify the first line in the range. An entry window is displayed so you can enter a new value.

After you have specified the first and last lines, press [PERFORM SECURE] to secure those lines and all lines that fall between them. When you edit or print a secured line, you will see an asterisk (*) rather than program statements after the line number.

See also: [SECURE] softkey, [END LINE #] softkey

[START PLOT PRNT] softkey

Key Path: [**Plot/Print**]

Begin plotting or printing. Be sure all the plot/print parameters and your printer or plotter are set up correctly before you press this key.

[START RPM OFF] softkey (order analysis)

Key Path: [Trigger] → [ARM SETUP]

When you select [START RPM OFF] with time step arming the first arm occurs when you press [START].

For rpm step arming, selecting [START RPM OFF] has the same effect as selecting [RPM INCREASING].

See also: [RPM STEP ARM] softkey (order measurements), [RPM INCREASING] softkey (order analysis), [WATERFALL STEPS] softkey, [TIME STEP ARM] softkey (order measurements)

[START RPM] softkey

Key Path: [Trigger] → [ARM SETUP]

Specify the rpm start value for rpm step arming. For [RPM DECREASING], this specifies the highest rpm. For [RPM INCREASING], it specifies the lowest rpm.

Limits: 5 to 491,520 rpm   Default: 600 rpm

For more information on arming and triggering, see the analyzer's *Concepts Guide.*

See also: [RPM STEP ARM] softkey

[START RPM] softkey (order analysis)

Key Path: [Trigger] → [ARM SETUP]

Specify the rpm start value for time step arming.

Limits: 5 to 491,520 rpm   Default: 600 rpm

This key works with [START RPM OFF], [RPM INCREASING], and [RPM DECREASING] as follows:

- For [START RPM OFF], the first arm occurs as soon as you start the measurement.

- For [RPM INCREASING], the first arm occurs when the tachometer input rpm value reaches a value greater than [START RPM].

- For [RPM DECREASING], the first arm occurs when the tachometer input rpm value reaches a value less than [START RPM].

Subsequent steps occur at time intervals [TIME STEP SIZE] after the first arm. The number of steps is determined by the [WATERFALL STEPS] setting.

This key has no effect for automatic arming or rpm step arming.

For more information on arming and triggering, see the analyzer's *Concepts Guide.*

[START RPM USAGE] softkeys

Key Path: [Trigger] → [ARM SETUP]

The two softkeys in this group, [RPM INCREASING] and [RPM DECREASING] work with rpm step arming.

If you select [RPM INCREASING], the first arm occurs when the tachometer input rpm value passes through the [START RPM] value in a positive direction.

If you select [RPM DECREASING], the first arm occurs when the tachometer input rpm value passes through the [START RPM] value in a negative direction.

Subsequent arms occur at rpm intervals [RPM STEP SIZE] measured from this point.

For more information on arming and triggering, see the analyzer's *Concepts Guide.*

[START SEGMENT] softkey

Key Path: [Analys] → [LIMIT TEST] → [DEFINE LOWER LIM]
or: [Analys] → [LIMIT TEST] → [DEFINE UPPER LIM]

Anchor a line segment's starting point at the position of the limit marker.

Limits are defined as a series of line segments. Press [FINISH SEGMENT] to anchor a segment's ending point. Use [MOVE MKR HORIZNTAL] and [MOVE MKR VERTICAL] to position the limit marker.

[START] softkey (curve fit frequency)

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [CURVE FIT] → [FIT REGION]

Specify the start frequency for the portion of the trace to be used by the curve fitter.

Note	If the start frequency you specify is outside the data boundary, the analyzer uses the first point in the data on point A.

[START] softkey (frequency)

Key Path: [Freq]

Specify the start frequency of the frequency band you want analyzed.

Limits: 0 Hz to 57.5 kHz (2 channel)   Default: 0 Hz
       0 Hz to 115 kHz (1 channel)   (FFT measurement)
(limits depend on the instrument mode and span selected)

Selecting a start frequency does not change the frequency span. The size of the span remains at its previous setting.

This also anchors the start frequency. If you change the span frequency or record length, the start frequency remains constant and the center and stop frequencies change.

The analyzer does not display any frequency data less than 0 Hz. Therefore, if you specify a start value of less than zero, you won't see anything displayed to the left of 0 Hz.

Caution   Although the analyzer will display data up to 115 kHz, the range from 102.4 kHz to 115 kHz is not calibrated and is significantly affected by the antialias filter.

See also: [RECORD LENGTH] softkey, [SPAN] softkey (frequency)

[START] softkey (octave frequency)

(Available only with option 1D1, Real Time Octave)

Key Path: [Freq]

Specify the start frequency or lowest band number of the frequency band you want analyzed.

Limits: 80 mHz to 10 kHz (2 chan)   Default: 10 Hz
              80 mHz to 20 kHz (1 channel)   10 Hz
(for 1/3 octave; limits vary for full and 1/12 octave)

You can display up to 12 octaves. When you specify a start frequency, the analyzer changes the stop frequency if the specified band includes more than 12 octaves.

See also: [STOP] softkey (octave frequency)

[START] softkey (swept sine frequency)

(Available only with option 1D2, Swept Sine)

Key Path: [Freq]

Specify the start (lowest) frequency to be analyzed for a swept sine measurement.

Limits: 15.625 mHz to (51.2 kHz – 15.625 mHz)
Default: 51.2 Hz

The start frequency becomes the new anchor for span; center and stop will change to appropriate values.

See also: [SWEPT SINE] softkey

[START SYNTHESIS] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [SYNTHESIS]

Create a frequency-response curve based on the current synthesis table. When finished, the analyzer stores the synthesized frequency response in the specified synthesis data register and displays that data register in the active trace.

The synthesis calculation uses $s = jf$ in $H(s)$, where f is frequency in Hz. The analyzer interprets table pole zero entries as being in Hz.

The synthesis uses the current measurement frequency span, set under the [Freq] hardkey.

Synthesis requires the analyzer to be in either FFT analysis or swept sine instrument mode.

In the FFT analysis instrument mode, synthesis produces the same number of frequency bins as a measurement. This allows you to perform math between synthesis and measurement results.

The following table lists the number of bins created by synthesis. Synthesis creates the number of bins listed in the left columns under baseband and zoom, then zero pads the rest of the bins for the total number of bins listed in the right columns under baseband and zoom.

Resolution	Baseband		Zoom	
	Created	Total	Created	Total
100 lines	101	129	100	128
200 lines	201	257	200	256
400 lines	401	513	400	512
800 lines	801	1025	800	1024

If you specify a log X-axis for synthesis, the synthesis produces true log data spacing.

In the swept sine instrument mode, synthesis results are compatible with measurement results for math if the two results have the same number of bins. Swept sine data has either 401 or 801 bins. Measurement data can have 101, 201, 401, or 801 bins, depending on the resolution specified.

See also: [RESOLUTN (LINES)] softkey, Bins defined, [X-AXIS LIN LOG] softkey (synthesis), [Inst Mode] hardkey, [SYNTHESIS REGISTER] softkey

[START TIME] softkey

Key Path: [**Marker Fctn**] → [TIME PARAMTERS]

Move the start time marker to the specified location. Use the numeric entry keys or the knob to specify the location.

See also: [TIME PARAMTERS] softkey

[START X] softkey

Key Path: [**Analys**] → [DATA EDIT] → [EDIT D1 - D8]

Define the horizontal axis location of the left band marker for data edit.

Note

You cannot set Start X to a value greater than Stop X.

See also: [DATA EDIT] softkey

[START RPM OFF] softkey

See [START RPM USAGE] softkeys.

[STOP FREQUENCY] softkey

Key Path: [**Marker Fctn**] → [GAIN PHAS MARGINS]
or: [**Marker Fctn**] → [FREQ & DAMPING]

Move the stop marker to a specified location. Use the numeric entry keys or the knob to specify the location. The default is the measurement stop frequency.

The analyzer uses only the data between the start and stop markers for computations.

[STOP] softkey (curve fit frequency)

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [CURVE FIT] → [FIT REGION]

Specify the stop frequency for the portion of the trace to be used by the curve fitter.

Note

If the stop frequency you specify is outside the data boundary, the analyzer uses the last point in the data on point A.

[STOP] softkey (frequency)

Key Path: [Freq]

Set the stop frequency to the specified value. The analyzer sets the stop frequency using the closest span that includes the frequency band described by the start and stop frequencies. This is because the analyzer has fixed frequency spans.

Limits: 195.31 mHz to 51.2 kHz (2 ch)   Default: 51.2 kHz
          195.31 mHz to 115 kHz (1 ch)   102.4 kHz
(limits depend on the instrument mode and span selected)

For example, if the start frequency is 0 Hz and you enter a stop frequency of 5 kHz, the analyzer sets the stop frequency to 6.4 kHz. The 6.4 kHz span is the smallest span that includes 0 Hz and 5 kHz.

The start frequency remains constant (and selected as the new anchor for span); center frequency, frequency span, and record length change to appropriate values.

Caution

Although the analyzer will display data up to 115 kHz, the range from 102.4 kHz to 115 kHz is not calibrated and is significantly affected by the antialias filter.

See also: [START] softkey (frequency), [SPAN] softkey (frequency)

[STOP] softkey (octave frequency)

(Available only with option 1D1, Real Time Octave)

Key Path: [Freq]

Specify the stop frequency of the frequency band you want analyzed.

Limits: 125 Hz to 16 kHz (2 channel)   Default: 16 kHz
125 Hz to 31.5 kHz (1 channel)   16 kHz
(for 1/3 octave; limits vary for full and 1/12 octave)

You can display up to 12 octaves. When you specify a stop frequency, the analyzer changes the start frequency if the specified band includes more than 12 octaves.

See also: [START] softkey (octave frequency)

[STOP] softkey (swept sine frequency)

(Available only with option 1D2, Swept Sine)

Key Path: [Freq]

Specify the stop (highest) frequency to be analyzed for a swept sine measurement.

Limits: 31.25 mHz to 51.2 kHz   Default: 51.2 kHz

The start frequency will be held constant (and selected as the new anchor for span); center and span will change to appropriate values.

See also: [SWEPT SINE] softkey

[STOP TIME CHANNEL x] softkey

Key Path: [Inst Mode] → [CAPTURE SETUP]

Specify where in the time capture buffer data a measurement should stop processing data. You can specify a stop time for each channel individually. The stop time is referenced to the beginning of the capture buffer. If the data is triggered, the times are referenced to the trigger point.

[STOP TIME] softkey

Key Path: [Marker Fctn] → [TIME PARAMTERS]

Move the stop time marker to the specified location. Use the numeric entry keys or the knob to specify the location.

See also: [TIME PARAMTERS] softkey

[STOP X] softkey

Key Path: [**Analys**] → [DATA EDIT] → [EDIT D1 - D8]

Define the horizontal axis location of the right band marker for data edit.

Note	You cannot set stop X to a value less than start X.

See also: [DATA EDIT] softkey

Stopping a program

You can press one of three hardkeys to stop an HP Instrument BASIC program that is running. Each key stops program execution in a different way:

- Press [**BASIC**] to PAUSE the program.
- Press [**Local/HP-IB**] to STOP the program.
- Press [**Preset**] → [DO PRESET] to STOP the program and preset the analyzer.

Note	Programs also pause when they encounter a a PAUSE statement.

When you pause a program, execution stops after completing the current statement. You can resume execution of a paused program by pressing [CONTINUE]. You can restart the program from the first line by pressing [RUN].

When you stop a program, execution stops immediately, all HP-IB interfaces are reset, and any open files are closed. You cannot resume execution from the point at which it was stopped, but you can restart the program from the first line by pressing [RUN].

An HP Instrument BASIC program works by sending HP-IB commands to the analyzer. Generally, the analyzer can't execute these commands as fast as they are sent, so they accumulate in the HP-IB input buffer.

If you pause or stop a program, commands in the buffer will continue to execute.

[STRT TIME CHANNEL x] softkey

Key Path: [Inst Mode] → [CAPTURE SETUP]

Specify where in the time capture buffer data a measurement should begin processing data. You can specify a start time for each channel individually. The start time is referenced to the beginning of the capture buffer. If the data is triggered, the times are referenced to the trigger point.

If you use a different frequency span than was used to capture the data, the digital filter step response corrupts part of the first time record. To correct for this, set the start time to:

(capture span / playback span) * 0.1 record

This delay allows the digital filter to settle before analyzing the data.

See also: [SPAN] softkey (frequency), [CAPTURE HEADER] softkey

Suffix menus

For many numeric entries there are suffix softkeys that allow you to choose units for the entry. For some entries, the suffix menu includes units with prefixes, such as "kHz" or "ms." For example, you could enter 123 ms either as ".123 s" or "123 ms."

Other entries must be made in engineering notation, such as "100e–3" (100×10^3). For example, you could enter a Y Per Div of 12.5 mdB as "125 EXP +/– 2" or ".0125."

Some values are shown in scientific notation, such as "10.3 kHz." The prefixes for scientific notation are listed in the following table:

Letter	Prefix	Multiple	Letter	Prefix	Multiple
a	atto	10^{-18}	k	kilo	10^3
f	femto	10^{-15}	M	mega	10^6
p	pico	10^{-12}	G	giga	10^9
n	nano	10^{-9}	T	tera	10^{12}
u	micro	10^{-6}	P	peta	10^{15}
m	milli	10^{-3}	E	exa	10^{18}

See also: [NUMERIC ENTRY] softkeys

[SUPLMENTL INFO] softkey

Display the following information about the data in the active trace (for all displays except waterfall):

- The Z-axis label for the trace. This is the value that would be displayed for a waterfall display. It may be the number of averages, the time from when the measurement started, the "count" (number of time records since the measurement started), or rpm.

- What type of weighting was applied to the data—none, A-weight, B-weight, or C-weight.

  The analyzer has a hardware A-weight filter for each channel. There are also A-weighting, B-weighting, and C-weighting operations available in math functions. (The supplemental marker field does not distinguish between hardware and math function A-weight filtering.)

Note

If you display a slice of the total power band from an octave measurement, the supplemental info displays a frequency value rather than "total power." The frequency listed is the next band above the measurement stop frequency.

See also: [DEFINE FUNCTION] softkey, [A WT FLTR ON OFF] softkey, [WATERFALL] softkey

[SWEDISH] softkey

See [KEYBOARD SETUP] softkeys.

[SWEEP AUTO MAN] softkey

(Available only with option 1D2, Swept Sine)

Key Path: [Freq]

Toggle between auto and manual sweep modes.

In auto sweep mode the sweep is internally controlled by the analyzer, using your measurement setup.

In manual sweep mode you control the sweep by changing manual frequency in this menu. It is easiest to change the frequency by rotating the knob, but you can also use the numeric entry key group. Manual frequency cannot exceed the sweep's start and stop frequencies.

Note   The analyzer displays and saves only the most recent measurement for each frequency point (bin).

If a measurement is in progress at the time that you select manual sweep mode, the analyzer sets the manual frequency to the current sweep point.

If you start a measurement after selecting manual sweep mode, the analyzer uses the previously set manual frequency. If the previous manual frequency is less than the start frequency or greater than the stop frequency, the analyzer sets the manual frequency to the start or stop frequency, depending on which is closest to the previously set value.

To use the knob or the arrow keys to change the frequency, you must first press [MANUAL FREQ]. This causes the entry window for manual frequency to remain until you change to auto sweep or press another key requiring numeric entry.

See also: Bins defined, [MANUAL FREQ] softkey, [MANUAL FREQ] softkey, Arrow keys, Knob

[SWEEP LIN LOG] softkey

(Available only with option 1D2, Swept Sine)

Key Path: [Freq]

Select either linear or logarithmic spacing between measurement frequencies for a swept sine measurement.

In the linear sweep mode, the frequency step size is constant throughout the sweep.

In the log sweep mode, the frequency domain measurements are made at logarithmically (or proportionately) spaced frequency points. The ratio of consecutive step sizes is held constant, rather than the frequency step size.

See also: [SWEPT SINE] softkey

[SWEEP UP DOWN] softkey

(Available only with option 1D2, Swept Sine)

Key Path: [Freq]

Specify the direction of a swept sine measurement.

Sweep Up selects a sweep that begins at the start frequency, sweeps to the stop frequency, and ends.

Sweep Down selects a sweep that begins at the stop frequency, sweeps to the start frequency, and ends.

While a measurement is in progress, the current sweep point is marked with a marker and the current sweep frequency is shown on the screen centered above the trace box.

See also: [SWEPT SINE] softkey

Swept sine averaging

The average softkeys for swept sine measurements allow you to do the following things:

■ Specify settle time—the delay between changing the source frequency and starting the measurement at each point.

■ Specify integrate time—the amount of time that each point is measured.

■ Select fast average mode —this lets the analyzer make averaged measurements without having to update the screen after every average.

See also: [FAST AVG ON OFF] softkey, [INTEGRATE TIME] softkey (swept sine), [SETTLE TIME] softkey

Swept sine frequency keys

For swept sine analysis, the following softkeys are under the [**Freq**] hardkey:
■ Span.
■ Center.
■ Start.
■ Stop.
■ Entry step size.
■ Sweep lin/log.
■ Sweep up/down.
■ Sweep auto/man.
■ Manual freq.
■ Resolutn setup.

See also: [SPAN] softkey (swept sine frequency), [CENTER] softkey (swept sine frequency),
[START] softkey (swept sine frequency), [STOP] softkey (swept sine frequency),
[ENTRY STEP SIZE] softkey, [SWEEP LIN LOG] softkey, [SWEEP UP DOWN] softkey,
[SWEEP AUTO MAN] softkey, [MANUAL FREQ] softkey, [RESOLUTN SETUP] softkey

[SWEPT SINE] softkey

(Available only with option 1D2, Swept Sine)

Key Path: [Inst Mode]

Specify the swept sine instrument mode.

In a swept sine measurement, the sine source "sweeps" through a specified range of frequencies—actually, this sweep is a series of very small discrete steps. You can vary the speed of the sweep, its resolution (how many steps are used to form one sweep), and the direction of the sweep. You can also specify that a sweep have linear-spaced or logarithmic-spaced steps.

At each discrete frequency point during the sweep, the analyzer measures and displays the relative magnitudes and phase of the DUT's sinusoidal responses.

Swept sine measurements provide extremely good signal-to-noise ratios and can characterize nonlinear systems. Input autoranging during the measurement process increases dynamic range to a maximum of 120 dB.

The following measurement data is available for swept sine measurements:
- Linear spectrum channel 1 or 2
- Time record last point ch 1 or 2
- Frequency response
- Cross spectrum
- Normalized variance channel 1 or 2

For more information on swept sine measurements, refer to the analyzer's *Concepts Guide*.

See also: [NORM VAR CHANNEL x] softkey, [CROSS CORRELATN] softkey,
[FREQUENCY RESPONSE] softkey (swept sine), [TIME CHANNEL x] softkey (swept sine),
[LIN SPEC CHANNEL x] softkey (swept sine)

[SYNTHESIS REGISTER] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [SYNTHESIS]

Specify in which data register the analyzer should store the synthesis results.

The default synthesis register is D8.

See also: Data registers

Synthesis Setup Softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [SYNTHESIS]

Access the softkeys for specifying the following synthesis parameters:

■ Gain factor.
■ Time delay.
■ Frequency scale.
■ X-axis lin log.

See also: [X-AXIS LIN LOG] softkey (synthesis), [FREQUENCY SCALE] softkey, [TIME DELAY] softkey,
[GAIN FACTOR] softkey

[SYNTHESIS] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys]

Access the synthesis utilities.

Synthesis allows you to create a frequency response trace based on the transfer function of a system.
To perform synthesis, you enter parameters from your transfer function into the analyzer's synthesis
table. Parameters can be represented in pole-zero, pole-residue, or polynomial forms.

For detailed information on synthesis, refer to the analyzer's *Concepts Guide.*

The following softkeys are available:

■ Start Synthesis starts the synthesis process.
■ Synthesis Register determines which data register receives the results.
■ Edit Table allows you to edit the entries in the synthesis table.
■ Copy from Curve Fit copies the curve fit table into the synthesis table.
■ Convert Table allows you to convert the synthesis table between pole zero, pole residue, and
polynomial formats.
■ Synthesis Setup allows you to set up synthesis parameters.
■ Table On Off turns on or off display of the curve fit table.

See also: [TABLE ON OFF] softkey, [SYNTHESIS SETUP] softkey, [CONVERT TABLE] softkey,
[COPY FROM CURVE FIT] softkey, [EDIT TABLE] softkey, [SYNTHESIS REGISTER] softkey,
[START SYNTHESIS] softkey, [CONVRT TO POLYNMIAL] softkey,
[CONVRT TO POLE RESD] softkey, [CONVRT TO POLE ZERO] softkey

System Group

The System keys let you control how the analyzer communicates with the external devices, the HP-IB controller, and external measurement programs. Here's a brief summary of the System keys and their significant functions:

- [Help] provides information about specific analyzer controls and functions.

- [Save/Recall] lets you save and recall stored traces, instrument states, limits, math operations, and HP Instrument BASIC programs

- [Disk Utility] provides useful utilities to let you format, delete, and examine files stored on the currently-selected mass storage device (including the analyzer's internal RAM disks and flexible disk drive or external disks).

- [System Utility] lets you perform a calibration procedure and set the analyzer's internal clock.

- [BASIC] lets you create (and run) HP Instrument BASIC programs *if your analyzer is equipped with the HP Instrument BASIC option (1C2).*

- [Plot/Print] controls selection and configuration of an external plotter or printer.

- [Local/HP-IB] provides HP-IB options when the analyzer is under local (front panel) control.

- [Preset] returns most of the analyzer settings to their default positions.

[System Utility] hardkey

[System Utility] groups infrequently used softkeys under one hardkey. The softkeys allow you to do the following things:

- Calibrate the analyzer.
- Turn the beeper on and off.
- Set the battery-backed clock's time and date.
- Display the analyzer's options configuration and install new options.
- Display the analyzer's memory usage and remove items from memory.
- Indicate if you are using a different language keyboard.
- Display the analyzer's serial number.
- Enable special hardware setups during performance tests. Run these test only as directed in the analyzer's *Installation and Verification Guide* or the *Service Guide.*

See also: [KEYBOARD SETUP] softkeys, Hardware test softkeys, [S/N VERSION] softkey, [MEMORY USAGE] softkey, [OPTIONS SETUP] softkey, [CLOCK SETUP] softkey, [BEEPER ON OFF] softkey, [CALIBRATN] softkey

[SYSTEM CONTROLLR] softkey

See Controller capability softkey group.

[TABLE ON OFF] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [CURVE FIT]
     or: [Analys] → [SYNTHESIS]

Turn on or off the curve fit or synthesis data table.

When table is on, the screen displays the two-column table for curve fit or synthesis. When table is off, the screen displays the normal traces.

The analyzer updates the table only at the end of a curve fit; it does not display intermediate results in the table.

[TACH DATA ON OFF] softkey

Key Path: [Inst Mode] → [CAPTURE SETUP]

Specify whether or not you want the capture buffer to include the tachometer input signal.

If the instrument mode is order analysis, the analyzer automatically includes the tachometer signal even if you turn tach data off.

Note   You must set up the tachometer parameters *before* capturing the data.

See also: [TACHOMETR SETUP] softkey (Trigger), [TACHOMETR SETUP] softkey (Trigger)

[TACH PULS PER REV] softkey

Key Path: [Trigger] → [TACHOMETR SETUP]
     or: [Input] → [TACHOMETR SETUP]

Specify the number of tachometer pulses that occur in one revolution of the shaft.

Limits: 0.5 to 2048   Default: 1

[TACHOMETR SETUP] softkey (Capture Setup)

Key Path: [Inst Mode] → [CAPTURE SETUP]

Turn tachometer data on or off.

You can also specify the maximum RPM from this menu.

Note

If the instrument mode is order analysis, the analyzer ignores these settings and uses the max rpm specified under the [Freq] key.

See also: [MAX RPM] softkey (Freq), [TACH DATA ON OFF] softkey

[TACHOMETR SETUP] softkey (Trigger)

Key Path: [Trigger]
         or: [Input]

Set up the following tachometer parameters:

- Tach pulses per revolution.
- Range high low.
- Level.
- Hold off.
- Slope.

See also: [SLOPE POS NEG] softkey, [HOLDOFF TIME] softkey, [LEVEL] softkey (tachometer setup), [TRG RANGE +/- 20 4] softkey, [TACH PULS PER REV] softkey

[TEST EVAL ON OFF] softkey

Key Path: [Analys] → [LIMIT TEST]

Enable and disable testing of the active trace against its current limits.

A trace fails a limit test if any of its points fall outside the current limits. Results of the test are displayed in the lower-left corner of the trace box.

If you want limit lines to be displayed during the test, toggle [LINES ON /OFF] to ON.

See also: [LIMIT TEST] softkey, [LINES ON OFF] softkey

[THD] softkey

Key Path: [**Marker Fctn**] → [HARMONIC MARKER]

Compute and display the total harmonic distortion (THD) for the current fundamental frequency and number of harmonics. The value is displayed in the lower left corner of the trace box.

The analyzer displays THD as a percentage of the amplitude at the fundamental frequency.

The analyzer calculates THD by comparing the energy of the fundamental to the energy of the harmonics. Noise and other signals at other points along the frequency spectrum are not taken into account (unless they happen to occur at the fundamental frequency or at the harmonics).

The THD results reflect the harmonics found in the current frequency span. The number of harmonics you specify is the maximum number the analyzer uses in the THD calculation. For example, if you press [NUMBER OF HARMONICS] and enter 10, the THD calculation does not include all ten harmonics if some of these harmonics are outside the current span.

See also: [NUMBER OF HARMONICS] softkey, [FUNDAMNTL FREQUENCY] softkey

[TIME CHANNEL x] softkey

Key Path: [**Meas Data**]

Display the most recent channel 1 or channel 2 time record on the active trace. Look at time records when you want to verify the presence of an input signal, or when setting input ranges manually.

If averaging is on, the analyzer displays the most recent time record added to the average. The analyzer does not show an averaged time waveform, since all averaging is done after the time data has been transformed to the frequency domain.

Time record displays are not corrected. Therefore, amplitude measurements made while viewing time record displays may not be accurate. For accurate amplitude measurements, use measurements that display data in the frequency domain.

See also: [CAL CONST ON OFF] softkey, Time record

[TIME CHANNEL x] softkey (order meas)

Key Path: [**Meas Data**]

Display channel 1 or channel 2 time on the active trace. If average is on, averaged time is displayed.

[TIME CHANNEL x] softkey (swept sine)

Key Path: [**Meas Data**]

Display the baseband time record from the last sweep point. The trace is updated at each new sweep point.

The data displayed is the actual time data used for the integration, determined by the integrate time and the frequency span. If there are less than 1024 points, the last part of the time record is truncated to zero.

See also: [SPAN] softkey (swept sine frequency), [INTEGRATE TIME] softkey (swept sine)

[TIME DELAY] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [**Analys**] → [CURVE FIT] → [CURVE FIT SETUP]
or: [**Analys**] → [SYNTHESIS] → [SYNTHESIS SETUP]

Enter time delay values.

Limits: -100 s to $+100$ s   Default: 0.0 s

If the system you wish to fit has a time delay or transport delay, enter the value before starting the curve fit process to obtain an accurate fit.

The purpose is to remove phase ramps from the frequency response before fitting. A phase ramp cannot be modeled by a pole or zero, and must be handled separately.

At the beginning of a curve fit process, trace A data is internally multiplied by $e^{(sT)}$ to cancel delay. "T" is the entered time delay.

In synthesis, $e^{(-sT)}$ is multiplied into the synthesis to simulate the addition of time delay. "T" is the entered time delay.

[TIME EXPONENTL] softkey

(Available only with opt. 1D0, Computed Order Tracking)

Key Path: [Avg] → [AVERAGE TYPE]

Select time exponential averaging for an order measurement. The analyzer updates the display after each new average.

Unlike linear (normal) averaging, exponential averaging weights new data more than old data. This is useful for tracking data that changes over time.

When using exponential averaging, the number of averages you select determines the weighting of old versus new data—not the total number of averages calculated. As the number of averages increases, new data is weighted less.

With exponential averaging, it's especially important to set the number of averages carefully—if there are too few averages in the measurement, the averaging will not smooth out variances. But if there are too many averages, the analyzer may not track subtle changes occurring within the data.

To calculate the exponential average, the analyzer uses this formula:

$$[(1/N)* \ (new)] + [((N-1)/N)* \ (old)],$$

where N is a weighting factor (the number of averages you've specified).

When starting an exponential average, the analyzer sets N equal to 1 for the first analysis, then sets N equal to 2 for the second analysis, and so on—until N equals the number of averages you've specified. Until the measurement reaches the specified number of averages, there is no difference between time exponential averaging and time averaging.

Once you start a measurement using exponential averaging, the measurement continues indefinitely. To stop it, press [Pause/Cont].

See also: [TIME] softkey (average, order measurement), [NUMBER AVERAGES] softkey

[TIME HHMM] softkey

Key Path: [System Utility] → [CLOCK SETUP]

Display the current time at the top of the screen. The time is read from the analyzer's battery-backed clock.

After pressing this softkey, you can enter a new time with the number keys. The time must be entered in a 24-hour format: the first two digits set the hour, the second two digits set the minute. Here are a couple of examples:

8:05 am—Press [TIME HHMM] → [0] → [8] → [0] → [5] → [ENTER]

3:42 pm—Press [TIME HHMM] → [1] → [5] → [4] → [2] → [ENTER]

[TIME LABEL] softkey

Key Path: [Trace Coord] → [X UNITS] → [User X Setup]

Specify a name for the user-defined X-axis time domain units. The name can be up to 5 characters long.

See also: [USER X UNIT] softkey

[TIME PARAMTERS] softkey

Key Path: [Marker Fctn]

Turn on and set up time markers.

You can specify a start and stop time, then compute and display the following time domain values for the specified time:

- Overshoot.
- Rise time.
- Settling time.
- Delay time.

The analyzer also puts a horizontal line across the display at the steady-state level and displays the steady-state value in the mini-state.

See also: [DELAY TIME] softkey (time markers), [SETTLING TIME] softkey, [RISE TIME] softkey, [OVERSHOOT] softkey, [STOP TIME] softkey, [START TIME] softkey

Time record

A *time record* is the sample of input data required for one FFT operation—essentially, the basic building block for all FFT analyzers. The time record length is measured in seconds (or microseconds or milliseconds) and changes with the size of the frequency span.

For some instrument modes you can specify the record length as well as a frequency span.

See also: [SPAN] softkey (frequency), [RECORD LENGTH] softkey

[TIME] softkey (average, order measurement)

(Available only with opt. 1D0, Computed Order Tracking)

Key Path: [Avg] → [AVERAGE TYPE]

Select time averaging for an order measurement. The analyzer averages N time records, where N is the specified number of averages. The averaged time record is not displayed until after the average is complete. As you increase the number of averages, the display update rate decreases.

Note   When you select time averaging, the analyzer effectively sets the number of waterfall steps to 1. If you pause a measurement with a waterfall displayed, the analyzer displays only 1 trace.

See also: Time record, [NUMBER AVERAGES] softkey, [WATERFALL STEPS] softkey

[TIME] softkey (preview)

Key Path: [Avg] → [PREVIEW SETUP]

Specify how long the analyzer should wait for a response before automatically including the time record in the measurement results. This only applies when the analyzer is the timed preview mode.

Limits: 0.1 to 3600 s   Default: 10 s

See also: [TIMED PREVIEW] softkey

[TIME STEP ARM] softkey

Key Path: [Trigger]
    or: [Trigger] → [ARM SETUP]

Select time step arming. This means that the analyzer waits for all hardware to settle and the elapsed time value to reach the next step (last value plus the specified time step size). Then the analyzer starts a measurement as soon as trigger conditions are met.

Subsequent arms occur at equal intervals (specified by [TIME STEP SIZE]) referenced to the start time. The analyzer performs the number of arms specified by [WATERFALL STEPS], then stops, with the following exception:

The analyzer sets a "stop rpm" based on one of the following equations:

> for rpm increasing
> > stop = start rpm + (time step size x waterfall steps)

> for rpm decreasing
> > stop = start rpm - (time step size x waterfall steps)

If the tach input sweep rate is too fast for the analyzer to make measurements at "time step size" intervals, the analyzer cannot obtain all the time steps. The analyzer stops at the calculated "stop rpm" and displays the message "WATERFALL COMPLETE."

If this happens, you can either slow down the tach ramp rate, increase the time step size, or use time capture to ensure that each step is measured.

For more information on arming and triggering, see the analyzer's *Concepts Guide.*

See also: [WATERFALL STEPS] softkey, [START RPM USAGE] softkeys, [TIME STEP SIZE] softkey

[TIME STEP ARM] softkey (order measurements)

Key Path: [Trigger]
      or: [Trigger] → [ARM SETUP]

Select time step arming for an order measurement.

Time step arming works with [START RPM OFF], [RPM INCREASING], and [RPM DECREASING] like this:

- For [START RPM OFF], the first arm occurs as soon as you start the measurement.

- For [RPM INCREASING], the first arm occurs when the tachometer input rpm value reaches a value greater than [START RPM].

- For [RPM DECREASING], the first arm occurs when the tachometer input rpm value reaches a value less than [START RPM].

Subsequent steps occur at time intervals [TIME STEP SIZE] after the first arm. The number of steps is determined by the [WATERFALL STEPS] setting with the following exception:

The analyzer sets a "stop rpm" based on one of the following equations:

    for rpm increasing
      stop = start rpm + (time step size x waterfall steps)

    for rpm decreasing
      stop = start rpm - (time step size x waterfall steps)

If the tach input sweep rate is too fast for the analyzer to make measurements at "time step size" intervals, the analyzer cannot obtain all the time steps. The analyzer stops at the calculated "stop rpm" and displays the message "WATERFALL COMPLETE."

If this happens, you can either slow down the tach ramp rate, increase the time step size, or use time capture to ensure that each step is measured.

For more information on arming and triggering, see the analyzer's *Concepts Guide*.

See also: [CAPTURE SETUP] softkey, [WATERFALL STEPS] softkey, [TIME STEP SIZE] softkey,
       [START RPM] softkey, [START RPM] softkey, [START RPM OFF] softkeys (order analysis),
       [RPM DECREASING] softkey (order analysis), [RPM INCREASING] softkey (order analysis)

[TIME STEP SIZE] softkey

Key Path: [Trigger] → [ARM SETUP]

Specify the time step size for time step arming.

Limits: 0 to 500 ks   Default: 0.5 s

For more information on arming and triggering, see the analyzer's *Concepts Guide.*

See also: [START RPM USAGE] softkeys, [TIME STEP ARM] softkey

[TIME STMP ON OFF] softkey

Key Path: [Plot/Print] → [CLOCK SETUP] → [TIMESTAMP SETUP]

Turn time stamp on or off for plotting and printing.

When time stamp is turned on, the analyzer plots the date and time the displayed data was taken along with the screen data you specify under [PLOT DATA SELECT].

Specify the format for the time stamp information using the softkeys under [System Utility] → [CLOCK SETUP] → [TIMESTAMP SETUP].

See also: [TIMESTAMP SETUP] softkey

[TIMED PREVIEW] softkey

Key Path: [Avg] → [PREVIEW SETUP]

When timed preview is on, you can decide which data should be included in the measurement results. After each time record is collected, it is displayed. You must either accept or reject the time record for both channels by pressing [REJECT TIME REC] or [ACCEPT TIME REC].

Unlike manual preview, the analyzer waits only a specified amount of time. If you do not respond, the data is automatically accepted.

See also: [TIME] softkey (preview), [ACCEPT TIME REC] softkey, [REJECT TIME REC] softkey

[TIMESTAMP SETUP] softkey

Key Path: [**System Utility**] → [CLOCK SETUP]

Specify the date and time format for the time stamp feature. The analyzer uses this format wherever time and date are displayed.

The date and time are saved in battery-backup memory. They are saved even when the analyzer is turned off.

You can specify that the analyzer include the time stamp information when print or plot the display.

See also: [TIME STMP ON OFF] softkey

[TITLE LINE X] softkeys

Key Path: [**Plot/Print**] → [MORE SETUP]

Specify plot and print output title lines.

The title lines allow you to place two lines of arbitrary text at the top of the plot or print output. Each line can be up to 31 characters long. You can use these lines for information about the data displayed.

If you enter text for either line, the mini-state disappears and the new title is displayed. If you want the two top lines to be blank, enter a space for either line.

[TOP REFERENCE] softkey

Key Path: [Scale]

Select a reference value for the top of the scale. Then use the numeric keypad and appropriate softkeys to enter this value. When you change the [Y PER DIV] value, the top of the scale remains fixed and the bottom changes.

The ratio between the reference value and the [Y PER DIV] value cannot be greater than 1e15.

Note

When you enter a value for the Y-axis, you cannot enter units. The analyzer uses the currently-displayed Y-axis units.

You can use the [EXP] key to enter units in engineering notation. For example, to enter 15 mV, press the following key sequence:

[1] [5] [EXP] [+/ −] [3] [ENTER]

See also: [Y PER DIV (DECADES)] softkey

[TRACE A MKR PEN] softkey

Key Path: [Plot/Print] → [PLOT PEN SETUP]

Specify which plotter pen should be used for plotting trace A's markers.

The marker A pen is also used to plot the X- and Y-axis coordinates of trace A markers (when you use the [TRACE MARKER] and [MARKER REFERENCE] softkeys under [PLOT DATA SELECT]), and to plot limit lines, limit test results, and marker function results..

See also: [PLOT DATA SELECT] softkey

[TRACE A PEN] softkey

Key Path: [Plot/Print] → [PLOT PEN SETUP]

Specify which plotter pen should be used for plotting trace A and all of its trace-specific annotation.

Trace-specific annotation includes the following items:
- Trace title.
- Marker readout.
- X-axis annotation.
- Y-axis annotation.

[TRACE B MKR PEN] softkey

Key Path: [Plot/Print] → [PLOT PEN SETUP]

Specify which plotter pen should be used for plotting trace B's markers.

The marker B pen is also used to plot the X- and Y-axis [TRACE MARKER] and [MARKER REFERENCE] softkeys under [PLOT DATA SELECT]), and to plot limit lines, limit test results, and marker function results..

See also: [PLOT DATA SELECT] softkey

[TRACE B PEN] softkey

Key Path: [Plot/Print] → [PLOT PEN SETUP]

Specify which plotter pen should be used for plotting trace B and all of its trace-specific annotation.

Trace-specific annotation includes the following items:

- Trace title.
- Marker readout.
- X-axis annotation.
- Y-axis annotation.

Trace boxes

A trace box is a bounded area of the screen that is used to display trace data. There are three trace box sizes: full-height, half-height, and those used for waterfall displays.

A full-height trace box is used for the single and front/back trace formats. The grid for this box is ten divisions high and ten divisions wide.

Note   When you use the front/back trace format, the vertical dimension of the full-height box is slightly compressed to make room for the second trace's annotation.

Two half-height trace boxes are used for the upper/lower trace format. The grids for these boxes are still ten divisions high and ten divisions wide. However, the spacing between vertical grids is smaller than for a single trace box.

For waterfall displays, the lower trace box is about 3/4 height and the upper trace about 1/4 height. The grid for the upper box is ten divisions high and ten divisions wide. There is no grid in the lower (waterfall) trace box.

[Trace Coord] hardkey

Select Y-axis trace coordinates for the active trace. These are different ways of looking at measurement data displayed on the active trace. Looking at the data in different ways can reveal much more information.

These are the trace coordinates in the analyzer:

- Linear magnitude.
- Log magnitude.
- dB magnitude.
- Phase.
- Unwrapped phase.
- Real part of the data.
- Imaginary part of the data.
- Nyquist diagram.

The softkey menu also lets you specify:

- X-axis units.
- Y-axis units.
- X-axis linear/log scale.

See also: [Y UNITS] softkey, [X UNITS] softkey, [X-AXIS LIN LOG] softkey (trace coord), [NYQUIST DIAGRAM] softkey, [IMAGINARY PART] softkey, [REAL PART] softkey, [UNWRAPPED PHASE] softkey, [PHASE] softkey, [DB MAGNITUDE] softkey, [LOG MAGNITUDE] softkey, [LINEAR MAGNITUDE] softkey

[TRACE HEIGHT] softkey

Key Path: [**Disp Format**] → [WATERFALL SETUP]
    or: [**Marker Fctn**] → [WATERFALL MARKERS] → [WATERFALL SETUP]

Specify the height of each trace displayed in the waterfall display area as a percentage of trace box height.

Limits: 1 to 100 percent   Default: 39 percent

The top (most recent) trace in the waterfall uses the top "trace height" percent of the trace box. The base of the top trace is indicated by a line at the left edge of the display. The bases of the other traces displayed are spread evenly in the rest of the trace box.

For example, if you specify a trace height of 50 percent, each trace will be half the height of the trace box. If you display two traces, the traces will each take half of the trace box with no overlap. If you display more than two traces, the traces will overlap.

Note

If you set the trace height less than 29% or greater than 75%, some of the waterfall annotation is not displayed.

See also: Trace boxes, [WATERFALL] softkey

[TRACE RPM] softkey

Key Path: [**Trace Coord**] → [X UNITS] → [Order Setup]

Set the first order to the rpm value for the displayed trace.

This key is only valid with rpm step arming.

See also: [RPM STEP ARM] softkey

[TRACE SELECT] softkey

Key Path: [Marker Fctn] → [WATERFALL MARKERS]

Turn on the trace select marker. Use the numeric entry keys or the knob to choose the waterfall trace of interest.

You can save the selected trace to a data register by pressing [SAVE TO DATA REG]. If you want to view the trace, press [SAVE AND DISP DATA]. This saves the trace to the data register and displays the data register on trace A.

The trace you select is also used as the starting point for slice select.

Note	You must pause a running measurement before you can use the trace select marker.

See also: [SAVE AND DISP DATA] softkey, [SAVE TO DATA REG] softkey, [SLICE SELECT] softkey

[TRACE] softkey

See [PLOT DATA SELECT] softkey.

[TRACE TITLE] softkey

Key Path: [Disp Format] → [MORE]

Assign a title for the active trace. Use the numeric keypad and the alpha keys to enter an appropriate name (up to 13 characters long). The title appears above the upper left corner of the trace box. Entering a trace title is useful for labeling results to be plotted.

Note	You can enter more than 13 characters for the trace title, but the analyzer truncates the title to 13 characters.

When you enter a trace title, the [DFLT TITL ON OFF] key toggles to highlight OFF. To display the default trace title, press [DFLT TITL ON OFF] to highlight ON.

See also: [DFLT TITL ON OFF] softkey, Alpha entry mode

[TRACE TO LIMIT] softkey

Key Path: [Analys] → [LIMIT TEST] → [DEFINE LOWER LIM]
    or: [Analys] → [LIMIT TEST] → [DEFINE UPPER LIM]

Convert the active trace into a limit line.

You can edit the converted trace just as you would a limit line, using the keys under
[DEFINE UPPER LIMIT] or [DEFINE LOWER LIMIT].

Note

When you convert an octave trace to a limit line, the limit line does not look like the octave trace. The analyzer connects the value at the center frequency of each octave band, rather than drawing a bar for each band.

[TRACE X LINE TYPE] softkeys

Key Path: [Plot/Print] → [TRACE A LINE TYPE]
    or: [Plot/Print] → [PLOT LINE SETUP] → [TRACE A LINE TYPE]
    or: [Plot/Print] → [TRACE B LINE TYPE]
    or: [Plot/Print] → [PLOT LINE SETUP] → [TRACE B LINE TYPE]

Specify the line pattern that will be used to plot each of the analyzer's two traces.

Line type changes apply only to trace A if you pressed [TRACE A LINE TYPE] to display these softkeys, or to trace B if you pressed [TRACE B LINE TYPE].

See also: Line type softkeys

[TRACE MARKER] softkey

See [PLOT DATA SELECT] softkey.

[TRACK ON OFF] softkey

(Available only with opt. 1D0, Computed Order Tracking)

Key Path: [Freq]

Toggle between order track and order spectrum measurements. When track is on, the analyzer makes order track measurements. When track is off, the analyzer makes order spectrum measurements.

[TRACK POINTS] softkey (order analysis)

Key Path: [Trigger] → [ARM SETUP]

Limits: 1 to 32,768

Default: varies depending on
instrument mode and memory availability

The behavior of this key in order analysis depends on the arming mode and whether track is on or off.

- In general, this key specifies the capacity of the waterfall—the total number of traces that are stored in the waterfall buffer.

- If track is on, this key specifies the number of points in the measurement.

- For time step arming, this key specifies the number of steps in the arming sequence.

- For rpm step arming, you cannot change the value for [TRACK POINTS]. The analyzer automatically sets [TRACK POINTS] to the value:
  ((Max rpm − Min rpm)/rpm step size) + 1.

Caution   When you start a new measurement, all current data in the waterfall buffer is lost.

See also: [TRACK ON OFF] softkey, [RPM STEP SIZE] softkey, [MIN RPM] softkey,
[MAX RPM] softkey (Freq), [RPM STEP ARM] softkey (order measurements),
[TIME STEP ARM] softkey (order measurements), Waterfall buffer

[TRACK X ORDER] softkey

(Available only with opt. 1D0, Computed Order Tracking)

Key Path: [Freq]

Specify the orders you want to track.

Limits: Delta Order to Max Order   Default: 1,2,3,4,5
Steps: .0001

For example, if you want to track orders 3, 6, 8.5, 11, and 15, set Track 1 Order to 3, Track 2 Order to 6, Track 3 Order to 8.5, Track 4 Order to 11, and Track 5 Order to 15.

See also: [DELTA ORDER] softkey, [MAX ORDER] softkey

[TRACK X] softkey

(Available only with opt. 1D0, Computed Order Tracking)

Key Path: [**Meas Data**] → [MORE] → [ORDER TRK CHANNEL X]

Specify which of the five order tracks you want to display for the channel.

[TRG RANGE +/- 20 4] softkey

Key Path: [**Trigger**] → [TACHOMETR SETUP]
     or: [**Input**] → [TACHOMETR SETUP]

Toggle the tachometer input range between +/- 20 volts and +/- 4 volts.

You can set the actual level within the range by pressing [LEVEL] and entering a value.

See also: [LEVEL] softkey (tachometer setup)

[Trigger] hardkey

Specify a trigger signal appropriate for the type of measurement you want to make:

- Free run.
- External.
- Channel 1.
- Channel 2.
- Source.
- HP-IB.

You can use triggering with all instrument modes except swept sine (option 1D2). Not all types of triggering are available for each instrument mode.

This menu also contains softkeys for setting up the following parameters:

- Tachometer parameters.
- Trigger parameters.
- Arm parameters.

For more information on triggering, see the analyzer's *Concepts Guide.*

See also: [ARM SETUP] softkey, [TRIGGER SETUP] softkey, [TACHOMETR SETUP] softkey (Trigger),
      [HP-IB TRIGGER] softkey, [SOURCE TRIGGER] softkey, [CHANNEL x TRIGGER] softkey,
      [CHANNEL x TRIGGER] softkey, [EXTERNAL TRIGGER] softkey, [FREE RUN TRIGGER] softkey

[TRIGGER SETUP] softkey

Key Path: [Trigger]

Specify the following trigger conditions:

- Level.
- Slope.
- Delay.

For more information on triggering, see the analyzer's *Concepts Guide*.

See also: [SLOPE POS NEG] softkey, [LEVEL] softkey (trigger setup), [CHANNEL x DELAY] softkey

[TYPING UTILITIES] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [BASIC] → [INSTRUMNT BASIC] → [EDIT]

Lets you do the following things when you are editing a program:

- Insert special characters.
- Insert keywords.
- Shift the case of alpha characters.

The Typing Utilities menu also repeats the [ENTER], [INSERT SPACE], and [DELETE CHARACTER] softkeys, which are all available in the main editing menu.

Note	The [CANCEL/RETURN] softkey in the Typing Utilities menu just returns you to the main editing menu. It has no effect on the current line of your program.

See also: [DELETE CHARACTER] softkey, [INSERT SPACE] softkey, [ENTER] softkey (BASIC),
[UPPERCASE LOWERCASE] softkey, [INSERT KEYWORD] softkey,
[INSERT SPECIAL CHARACTERS] softkeys

[U.K. ENGLISH] softkey

See [KEYBOARD SETUP] softkeys.

[U.S. ENGLISH] softkey

See [KEYBOARD SETUP] softkeys.

[UNDELETE VALUE] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [CURVE FIT] → [EDIT TABLE]
        or: [Analys] → [SYNTHESIS] → [EDIT TABLE]

Take the top entry off of the delete value stack and insert it just above the highlighted position in the table.

Entries come off the stack in the reverse order that they were added to the stack. For example, if you delete entries 1, 2, and 3 (in that order) and then press [UNDELETE VALUE], the first entry is 3, then 2, then 1.

The analyzer has separate stacks for poles, zeros, residues, numerators, and denominators. For example, you cannot delete an entry from the pole column and undelete it in the zeros column.

If the stack is empty this key does nothing.

See also: [DELETE VALUE] softkey

[UNFILTERD TIME CH x] softkey

Key Path: [Meas Data]

Display the unfiltered time record for the specified channel.

Unfiltered time is a time-domain trace that shows the input time record without anti-alias filtering, bandwidth-limiting filtering, or averaging. Otherwise, unfiltered time channel data is similar to time channel data available with the analyzer's other instrument modes. You may have to adjust the frequency span (by specifying the time record length) to avoid visual distortion of the time trace.

Note

The analyzer displays the first time record for the histogram measurement. The unfiltered time display is not updated as the analyzer collects additional time records.

See also: Time record

[UNIFORM -T/2, T/2] softkey

Key Path: [Window]

Specify the uniform weighting function for a correlation measurement. This weighting function has a value of 1 for all points in the time record.

Be sure to use the correct window for your data. Use the uniform window for transient and exactly periodic signals only. Use the zero pad windows for all other signals. If you use the uniform window with a slightly non-periodic signal, you can see a tapering of the correlation results.

For example, look at the autocorrelation of a 10.1 kHz sine wave with a 3.9 us record length. Compare what you see with the uniform window to the zero pad -T/4 to T/4 window. The zero pad window gives the correct results.

See also: [CORRELATN ANALYSIS] softkey

[UNIFORM] softkey

Key Path: [Window]

Select the Uniform window for both input channels. The Uniform window's rectangular shape does not attenuate any portion of the time record—it weights all parts of the time record equally. This is the default window for order measurements.

Because the Uniform window does not force the signal to appear periodic in the time record, it is generally used only with functions that are already periodic within a time record, such as transients and bursts. For sinewaves that are exactly periodic within a time record, the Uniform window measures the amplitude exactly (to within hardware specifications).

The Uniform window is sometimes called a transient or box car window.

For more information on the Uniform window and its applications, see the analyzer's *Concepts Guide.*

[UNWRAPPED PHASE] softkey

Key Path: [Trace Coord]

Display unwrapped phase on the active trace.

Unwrapped phase means that the actual phase referenced to the lowest measured frequency is displayed; it is not shifted to between −180 and +180 degrees.

To display wrapped phase, press [PHASE].

See also: [PHASE] softkey

[UPDATE RATE] softkey

Key Path: [Avg]

Specify how often you want the display to update when fast average is turned on.

Limits: 1 to 99,999

Default: 5

For example, if you enter 5, the analyzer will update the display once every 5 averages.

See also: [FAST AVG ON OFF] softkey

[UPPER LOWER] softkey

Key Path: [Disp Format]

Display both traces using two half-height trace boxes. Trace A is displayed in the upper box and trace B in the lower box.

The annotation for each trace box applies for the trace displayed in the box. The annotation for the active trace is in a plain font; the annotation for the inactive trace is in a ghosted font.

See also: [Active Trace] hardkey, Fonts, Trace boxes

[UPPER] softkey (BASIC display)

See [DISPLAY SETUP] softkey group.

[UPPERCASE LOWERCASE] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [BASIC] → [INSTRUMNT BASIC] → [EDIT] →
       [TYPING UTILITIES]

Toggle between uppercase (A-Z) and lowercase (a-z) alpha characters for editing HP Instrument BASIC programs.

[USER FREQ FACTOR] softkey

Key Path: [Trace Coord] → [X UNITS] → [User X Setup]

Specify the conversion factor for frequency domain user-defined X-axis units. When you select user-defined X-axis units, the analyzer divides the X-axis values in Hz by the conversion factor to obtain X-axis values in user-defined units.

For example, if you want X-axis units of cpm (cycles per minute), specify a factor of 0.01667. The analyzer divides the Hz value by .01667 to convert it to cpm. A value of 10 Hz is interpreted as 600 cpm.

See also: [USER X UNIT] softkey

[USER LABEL] softkey

Key Path: [Trace Coord] → [Y UNITS] → [dB REFERENCE]

Enter the label for [USER REFERENCE]. The analyzer attaches a prefix of "dB" to the name. For example, if you enter a label of "g", the Y-axis unit label will be "dBg."

See also: [USER REFERENCE] softkey

[USER REF LEVEL] softkey

Key Path: [Trace Coord] → [Y UNITS] → [dB REFERENCE]

Specify the dB reference level for [USER REFERENCE].

See also: [USER REFERENCE] softkey

[USER REFERENCE] softkey

Key Path: [Trace Coord] → [Y UNITS] → [dB REFERENCE]

Specify that dB magnitude is referenced to a level you enter by pressing [USER REF LEVEL]. You can also specify a name for the units by pressing [USER LABEL].

See also: [USER LABEL] softkey, [USER REF LEVEL] softkey, [DB MAGNITUDE] softkey

[USER SPAN] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [CURVE FIT] → [FIT REGION]

Specify that the curve fitter use only the portion of the trace defined by [START] and [STOP].

See also: [STOP] softkey (curve fit frequency), [START] softkey (curve fit frequency)

[USER TIME FACTOR] softkey

Key Path: [Trace Coord] → [X UNITS] → [User X Setup]

Specify the conversion factor for time domain user-defined X-axis units. When you select user-defined X-axis units, the analyzer multiplies the X-axis values in seconds by the conversion factor to obtain X-axis values in user-defined units.

For example, if you specified a label of feet and enter a time factor of 25, the analyzer multiplies the seconds by 25. A value of 100 ms is interpreted as 2.5 ft.

See also: [USER X UNIT] softkey

[USER X AT MKR] softkey

Key Path: [Trace Coord] → [X UNITS] → [User X Setup]

Specify the number of user-defined X-axis units at the current marker position. The analyzer uses the marker value and the number you enter to calculate the user frequency factor or user time factor.

See also: [USER TIME FACTOR] softkey, [USER FREQ FACTOR] softkey, [X UNITS] softkey

[USER X SETUP] softkey

Key Path: [Trace Coord] → [X UNITS]

Set up the following parameters for user X-axis units:

- Frequency multiplier.
- Time multiplier.
- User value at marker.
- Label for frequency data.
- Label for time data.

See also: [USER TIME FACTOR] softkey, [USER FREQ FACTOR] softkey, [TIME LABEL] softkey, [FREQ LABEL] softkey, [USER X AT MKR] softkey, [USER X UNIT] softkey

[USER X UNIT] softkey

Key Path: [Trace Coord] → [X UNITS]

Specify user-defined units for the X-axis. You can enter a name for the units and a multiplier by pressing [USER X SETUP] and selecting from the softkeys in that menu.

See also: [USER X SETUP] softkey

[USER DEFINED] softkey

See Line type softkeys.

[USER LINE TYPE] softkey

See Line type softkeys.

[USER P1P2 ON OFF] softkey

See [P1 P2 SETUP] softkeys.

[USER P1 X] softkey

See [P1 P2 SETUP] softkeys.

[USER P1 Y] softkey

See [P1 P2 SETUP] softkeys.

[USER P2 X] softkey

See [P1 P2 SETUP] softkeys.

[USER P2 Y] softkey

See [P1 P2 SETUP] softkeys.

[UTILITIES] softkey

(Available only with option 1C2, HP Instrument BASIC)

Key Path: [BASIC] → [INSTRUMNT BASIC]

The softkeys under [UTILITIES] let you do the following things for your HP Instrument BASIC program:

- Allocate a specific amount of memory for the program's stack.
- Let the analyzer automatically allocate the amount of stack space it determines the program needs.
- Scratch (delete) the program and its variables.
- Renumber its lines.
- Secure some or all of its lines.

See also: [AUTO MEMORY] softkey, [MEMORY SIZE] softkey, [SECURE] softkey, [RENUMBER] softkey, [SCRATCH] softkey

[V/RTHZ] softkey

Key Path: [Trace Coord] → [Y UNITS]

Display the trace in volts divided by the square root of equivalent filter bandwidth (square root power spectral density). This is useful for wideband, continuous signals.

[V ^ 2/HZ (PSD)] softkey

Key Path: [Trace Coord] → [Y UNITS]

Display the trace in volts squared divided by the equivalent filter bandwidth. This provides power normalized to a 1 Hz bandwidth, or power spectral density (PSD). This is useful for wideband, continuous signals.

[V ^ 2S/HZ (ESD)] softkey

Key Path: [Trace Coord] → [Y UNITS]

Display the trace in volts squared seconds divided by the equivalent filter bandwidth. This provides energy normalized to a 1 Hz bandwidth, or energy spectral density (ESD). This is useful for wideband, transient signals.

[VECTOR EXPONENTL] softkey

Key Path: [Avg]

Select exponential vector averaging. You'll need to provide a trigger signal—from the analyzer's source or from an external signal.

Unlike linear (normal) averaging, exponential averaging weights new data more than old data. This is useful for tracking data that changes over time.

When using exponential averaging, the number of averages you select determines the weighting of old versus new data—not the total number of averages calculated. As the number of averages increases, new data is weighted less.

With exponential averaging, it's especially important to set the number of averages carefully—if there are too few averages in the measurement, the averaging will not smooth out variances. But if there are too many averages, the analyzer may not track subtle changes occurring within the data.

To calculate the exponential average, the analyzer uses this formula:

$$[(1/N)* \ (new)] + [((N-1)/N)* \ (old)],$$

where N is a weighting factor (the number of averages you've specified).

When starting an exponential average, the analyzer sets N equal to 1 for the first analysis, then sets N equal to 2 for the second analysis, and so on—until N equals the number of averages you've specified.

Once you start a measurement using exponential averaging, the measurement continues indefinitely. To stop it, press [Pause/Cont]. This is different than linear averaging—linear averaging stops automatically after the specified number of averages are completed.

Until the measurement reaches the specified number of averages, there is no difference between vector exponential averaging and vector averaging.

The results of vector exponential averaging affect only frequency domain measurement results. Vector exponential averaging does not affect time domain measurement data or the results of math functions on time domain data.

See also: [VECTOR] softkey, [NUMBER AVERAGES] softkey

[VECTOR] softkey

Key Path: [**Avg**]

Select vector averaging.

With vector-averaging, the analyzer averages complex values, point-by-point, in the frequency domain. This lowers noise because the real and imaginary components of the random signals are not in phase and therefore cancel each other—increasingly so with each average. Frequency components that are periodic do not cancel and therefore do not diminish with successive averages.

For mechanical applications, vector averaging is often used during vibration measurements to resolve low-level frequency components from background noise.

The results of vector averaging affect only frequency domain measurement results. Vector averaging does not affect time domain measurement data or the results of math functions on time domain data.

Vector averaging produces results similar to time averaging (time averaging means that the analyzer averages all time records first, then performs a single FFT on an averaged time record). Vector averaging accomplishes the same thing as time averaging, since the averaged linear spectrum derived from a series of vector-averaged linear spectra is equivalent to a single linear spectrum of time-averaged time records.

Although measurements made with vector averaging have better signal-to-noise ratios than rms averaging, there are some restrictions:

- The input signal must be periodic. In other words, the frequency components you want to measure must repeat with each time record. If these components are not periodic (not in phase with the start of each new time record), their real and imaginary values will cancel and the analyzer will not resolve these components.

- If you select vector averaging, you'll need to provide a trigger signal—from the analyzer's source or from an external signal. Of course, the analyzer will still make a measurement with continuous triggering (no trigger signal), but the amplitude of periodic signals will diminish with each successive average (since even periodic components have random phase with continuous triggering).

[VOLATILE RAM DISK] softkey

Key Path: [Disk Utility] → [DEFAULT DISK]
   or: [Save/Recall] → [DEFAULT DISK]

Select the analyzer's volatile RAM as the default disk.

Caution   The volatile RAM disk is cleared each time you turn the analyzer off. Copy important files to another disk before power-down or they will be lost.

Each time you turn the analyzer on, a 64 Kbyte volatile RAM disk is created. If you need more storage space, you must specify a different [RAM DISK SIZE] and reformat the disk.

File operations are much faster on the volatile RAM disk than on the internal disk. This makes the volatile RAM disk very useful for HP Instrument BASIC programs.

See also: [RAM DISK SIZE] softkey, [DEFAULT DISK] softkey

[VOLTS] softkey

Key Path: [Trace Coord] → [Y UNITS]

Display the trace in volts. This is useful for narrow band signals.

[VOLTS ^ 2] softkey

Key Path: [Trace Coord] → [Y UNITS]

Display the trace in volts squared. This is useful for narrow band signals.

Volume name

Volume names allow you to uniquely identify each of your flexible disks. The volume names are displayed in the upper-left corner of the disk catalog.

A volume name can be up to six characters long. You assign it to a disk before formatting. Just append the name to the disk specifier in the [PERFORM FORMAT] entry window.

See also: [CATALOG ON OFF] softkey

[WATERFALL ACT TRACE] softkey

Key Path: [Disp Format]

Change the display format to waterfall. Display the measurement data for the active trace in the waterfall trace and make trace B active.

This provides quick access to a waterfall display of the current measurement data.

See also: [Meas Data] hardkey, [WATERFALL] softkey

Waterfall buffer

The analyzer temporarily stores traces in a waterfall buffer in RAM. The number of traces stored is determined by the [WATERFALL STEPS] softkey.

The amount of memory available limits the size of the waterfall buffer. You can clear other things from memory by pressing the softkeys under [MEMORY USAGE]. This makes more memory available for the waterfall buffer.

The waterfall buffer is cleared when you start a new measurement, preset the analyzer, or turn off the analyzer.

Note	The waterfall buffer is not the same thing as the waterfall registers. The analyzer automatically stores traces in the waterfall buffer. You must save data to the waterfall registers by pressing the [SAVE WATERFALL] softkey.

See also: [SAVE WATERFALL] softkey, [WATERFALL REGISTER] softkey, [WATERFALL STEPS] softkey, [MEMORY USAGE] softkey, [Preset] hardkey

[WATERFALL MARKERS] softkey

Key Path: [Marker Fctn]

Turn on and set up waterfall markers.

Waterfall markers are valid only for waterfall displays and when trace B is the active trace.

From the waterfall markers menu, you can do the following things:
- Scroll up or scroll down in the waterfall trace buffer.
- Select a trace or slice from the waterfall.
- Display a trace or slice in the upper trace.
- Save a trace or slice to a data register.
- Specify the data register for saving a trace or slice.
- Save and display a trace.
- Set up the waterfall display.

See also: [SELECT SAVE REGISTER] softkey, [SAVE AND DISP DATA] softkey, [WATERFALL SETUP] softkey,
[SAVE TO DATA REG] softkey, [SAVE AND DISP DATA] softkey, [WATERFALL] softkey,
Data registers, [SLICE SELECT] softkey, [TRACE SELECT] softkey, [SCROLL DOWN] softkey,
[SCROLL UP] softkey

[WATERFALL REGISTER] softkey

Key Path: [Meas Data]
     or: [Meas Data] → [MORE]

Access the [Wx] softkeys. Each [Wx] key displays the contents of one of the analyzer's eight waterfall registers.

You can use [RECALL WATERFALL] to load any waterfall register.

See also: [RECALL WATERFALL] softkey, [Wx] softkeys

[WATERFALL SETUP] softkey

Key Path: [Disp Format]
  or: [Marker Fctn] → [WATERFALL MARKERS]

Access the softkeys for setting up the following waterfall display characteristics:

- Specify the Z-axis range.
- Specify the trace height.
- Turn hidden lines on or off.
- Suppress the baseline.
- Turn skew on or off.
- Specify the skew angle.

Note   You specify the number of traces stored for a waterfall by pressing
                  [WATERFALL STEPS] under [Trigger] → [ARM SETUP].

See also: [SKEW ANGLE] softkey, [SKEW ON OFF] softkey, [WATERFALL STEPS] softkey,
            [BASELINE SUPPRESS] softkey, [HIDN LINE ON OFF] softkey, [TRACE HEIGHT] softkey,
            [MAX TRACES DISPLAYED] softkey, [WATERFALL] softkey

[WATERFALL] softkey

Key Path: [Disp Format]

Select the waterfall display format. You can display measurement data from any measurement (except swept sine or order track) in a waterfall display. You cannot display data registers in a waterfall display.

This format provides a small upper trace box and a larger lower trace box. The lower trace box displays trace B in a waterfall or map. The traces are scrolled down the display (the newest trace is at the top). The upper trace box displays trace A.

Note	You specify the number of traces stored for a waterfall by pressing [WATERFALL STEPS] under [Trigger] → [ARM SETUP].

Trace A and trace B are independent in a waterfall display. You can assign any available measurement data to either trace. This is different from some other analyzers that assign the same measurement data for both traces.

The softkeys controlling the behavior of the waterfall display are accessed by pressing [WATERFALL SETUP].

Special waterfall markers are available under the [Marker Fctn] hardkey. You can use these markers to select a trace or slice from the lower trace box to be displayed in the upper trace box.

Note	The waterfall display format is not available for swept sine measurements or order track mode in order measurements. If you select either of these instrument modes when the current display selection is waterfall, the display format changes to single.

Note	If you select either [UPPER] or [LOWER] under the [BASIC] → [DISPLAY SETUP] key, the analyzer changes the display format from waterfall to upper/lower.

See also: [TRACK ON OFF] softkey, Data registers, [WATERFALL STEPS] softkey, [SWEPT SINE] softkey, [WATERFALL MARKERS] softkey, [WATERFALL SETUP] softkey, [Meas Data] hardkey, Trace boxes

[WATERFALL STEPS] softkey

Key Path: [Trigger] → [ARM SETUP]
    or: [Disp Format] → [WATERFALL SETUP]
    or: [Marker Fctn] → [WATERFALL MARKERS] → [WATERFALL SETUP]

Limits: 1 to 32,768   Default: varies depending on
instrument mode and memory availability

The behavior of this key depends on the arming mode and the instrument mode. (See separate help topics for waterfall steps with octave analysis and order analysis.)

- In general, this key specifies the capacity of the waterfall—the total number of traces that are stored in the waterfall buffer.

- For rpm step or time step arming, this key specifies the maximum number of steps in the arming sequence.

The number of traces the analyzer can store depends on the amount of memory available and the size of the data. For example, octave traces take much less memory than frequency response traces. If the analyzer cannot store the number of traces you specify, it sets the value to the highest possible number and displays a message.

Caution   When you start a new measurement, all current data in the waterfall buffer is lost.

See also: [WATERFALL STEPS] softkey (octave analysis), [WATERFALL STEPS] softkey (order analysis), Waterfall buffer, [RPM STEP ARM] softkey, [TIME STEP ARM] softkey

[WATERFALL STEPS] softkey (octave analysis))

Key Path: [**Trigger**] → [ARM SETUP]
    or: [**Disp Format**] → [WATERFALL SETUP]
    or: [**Marker Fctn**] → [WATERFALL MARKERS] → [WATERFALL SETUP]

Limits: 1 to 32,768
                       Default: varies depending on
                      instrument mode and memory availability

The behavior of this key in octave analysis depends on the arming mode and the type of averaging.

- In general, this key specifies the capacity of the waterfall—the total number of traces that are stored in the waterfall buffer.

- For rpm step or time step arming, this key specifies the maximum number of steps in the arming sequence.

- For octave measurements, when you select [MAXIMUM] or [MINIMUM] hold or [PEAK HOLD], the analyzer effectively sets the number of waterfall steps to 1. The analyzer stores only the most recent trace in the waterfall buffer. If you pause a measurement with a waterfall displayed, the analyzer displays only 1 trace.

Caution   When you start a new measurement, all current data in the waterfall buffer is lost.

See also: [PEAK HOLD] softkey (octave), [HOLD SETUP] softkeys, [RPM STEP ARM] softkey, [TIME STEP ARM] softkey, Waterfall buffer

[WATERFALL STEPS] softkey (order analysis)

Key Path: [**Trigger**] → [ARM SETUP]
    or: [**Disp Format**] → [WATERFALL SETUP]
    or: [**Marker Fctn**] → [WATERFALL MARKERS] → [WATERFALL SETUP]

In the order analysis mode, the [WATERFALL STEPS] softkey behaves like the [TRACK POINTS] softkey.

See also: [TRACK POINTS] softkey

[WEIGHT AUTO USER] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [CURVE FIT] → [CURVE FIT SETUP]

Specify which portions of the input frequency response should be emphasized during the curve fit.

The weighting function is a real function of frequency whose values vary between 0 and 1, where 1 represents maximum emphasis.

If you select auto weight, the curve fitter will automatically generate a weighting function and store this in the selected weight register when it has finished. Usually the auto weighting function only needs to emphasize small portions of the frequency response to obtain a good fit.

If you select user weight, the curve fitter uses whatever weighting function is stored in the specified weight register. The analyzer does not generate and store a new weighting function. You can edit the weighting function using the [DATA EDIT] softkeys.

See also: [WEIGHT REGISTER] softkey, [WEIGHT REGISTER] softkey

[WEIGHT REGISTER] softkey

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [Analys] → [CURVE FIT] → [CURVE FIT SETUP]

Specify which data register should be used for the curve fitter's weighting function.

If you selected auto weight, the curve fitter generates a weighting function and stores it in the selected data register.

If you selected user weight, the curve fitter uses the data stored in the selected data register as the weighting function for further curve fit operations. The analyzer does not generate and store a new weighting function.

The default weight register is D7.

You can save user or auto weighting functions on disk by saving the data register containing the function.

[Window] hardkey

Select the type of input window you want.

A "window" is a time-domain weighting function applied to the input signal—essentially, a way to filter out signals that are not periodic (and therefore spurious) within the input time record. Depending on the window, the analyzer attenuates certain parts of the input time record, to prevent "leakage"—a smearing of energy across the frequency spectrum, caused by transforming signals that are not periodic within the time record.

You can display windowed time data in FFT analysis and correlation analysis instrument modes.

The window functions available for each instrument mode are:

- FFT Analysis:
  - Hanning.
  - Flat Top.
  - Uniform.
  - Force Expo.
  - Channel 1 Forc Expo.
  - Channel 2 Forc Expo.
  - Force Width.
  - Expo Decay.

- Order Analysis:
  - Hanning.
  - Flat Top.
  - Uniform.

- Correlation Analysis (weighting functions):
  - Zero Pad –T/4, T/4.
  - Zero Pad 0, T/2.
  - Uniform –T/2, T/2.

- Octave Analysis, Swept Sine, or Histogram:
  - No windowing.

See also: [UNIFORM -T/2, T/2] softkey, [ZERO PAD 0, T/2] softkey, [ZERO PAD -T/4, T/4] softkey, [EXPO DECAY] softkey, [FORCE WIDTH] softkey, [CHANNEL x FORCE EXPO] softkey, [CHANNEL x FORCE EXPO] softkey, [FORCE EXPO] softkey, [UNIFORM] softkey, [FLAT TOP] softkey, [HANNING] softkey, [UNIFORM] softkey, [FLAT TOP] softkey, [HANNING] softkey, Time record

[WINDOWED TIME CH x] softkey

Key Path: [**Meas Data**] → [MORE]

Display the most recent time record after the currently active window function has been applied.

This is most useful for directly observing the effects of force and exponential windows.

See also: [**Window**] hardkey, Time record

[WINDOWED TIME CH x] softkey (correlation)

Key Path: [**Meas Data**]

Display the most recent time record after the currently active window function has been applied.

This is most useful for correlation with transient signals. Be sure that you set trigger delay so that the signal appears in the windowed time data.

For example, if you are triggering without a trigger delay and using the zero pad –T/4 to T/4 window, the windowing process will clear the first quarter of the time record. This deletes your signal, and it will not show up in the windowed time. You can correct this by using a pretrigger delay of at least a quarter of the time record. ...

Be sure to use the correct window for your data. Use the uniform window for transient and exactly periodic signals only. Use the zero pad windows for all other signals. If you use the uniform window with a slightly non-periodic signal, you can see a tapering of the correlation results.

For example, look at the autocorrelation of a 10.1 kHz sine wave with a 3.9 us record length. Compare what you see with the uniform window to the zero pad -T/4 to T/4 window. The zero pad window gives the correct results.

See also: [UNIFORM -T/2, T/2] softkey, [ZERO PAD -T/4, T/4] softkey, [CHANNEL x DELAY] softkey, [**Window**] hardkey, Time record

[Wx] softkeys

Key Path: [**Meas Data**] → [WATERFALL REGISTER]

Display the contents of the corresponding waterfall register.

You can use [RECALL WATERFALL] to load any waterfall register.

Note	If you display a waterfall register in a non-waterfall trace box, only the first trace in the waterfall is displayed.

See also: Trace boxes, [RECALL WATERFALL] softkey, [Wx] softkeys

[X UNITS] softkey

Key Path: [**Trace Coord**]

Specify the following units attributes for the X-axis:

- Hz (Seconds)
- rpm (Seconds)
- Orders (Revolutions)
- User defined

You can specify X-axis units for all measurement data in the FFT analysis, swept sine, and correlation analysis instrument modes, and for time data in the histogram/time instrument mode. You cannot specify X-axis units for measurement data in the octave analysis or order analysis instrument modes.

The units you specify apply only for the active trace, independent of instrument mode.

For example, if you specify rpm for power spectrum data, linear spectra will also use rpm for the X-axis. If you specify rpm for time data in the FFT analysis instrument mode, time data in the correlation analysis mode will also use rpm for the X-axis.

To specify X-axis units for a data register, waterfall register, or math function, you must first display the register in the active trace, then specify the X-axis units.

See also: [USER X UNIT] softkey, [RPM (SEC)] softkey, [ORDER (REV)] softkey, [HZ (SEC)] softkey

[X-AXIS LIN LOG] softkey (synthesis)

(Available only with option 1D3, Curve Fit/Synthesis)

Key Path: [**Analys**] → [SYNTHESIS] → [SYNTHESIS SETUP]

Specify whether the synthesis computation produce linear or logarithmic X-axis data spacing.

For example, linear X-axis data spacing is based on start frequency and delta frequency. Logarithmic X-axis data spacing is based on start frequency and the ratio between adjacent frequency points.

Note   This is not the same as specifying the X-axis display scale to lin or log.

[X-AXIS LIN LOG] softkey (trace coord)

Key Path: [**Trace Coord**]

Specify a linear or a logarithmic scale for the X-axis.

This parameter affects only how the data is displayed. For the same span and resolution, frequency resolution for both linear and log scales is identical—both have a the same number of points per display. The logarithmic scale simply displays these points on a logarithmic X-axis.

For baseband measurements (spans that start at 0 Hz) the logarithmic scale shows the actual start frequency (the first bin) of the current span—not the nominal value of 0 Hz. So if you're looking at a 51.2 kHz frequency span, the first frequency shown on the logarithmic scale is 128 Hz (the analyzer does not show a value at 0 Hz since the log of 0 is minus infinity).

See also: Bins defined

[Y PER DIV (DECADES)] softkey

Key Path: [Scale]

For linear Y-axis, specify the number of units per vertical scale division. For a log Y-axis, specify the number of decades displayed.

When you select a new scale spacing, the currently-active reference (top reference, center reference, or bottom reference) is held the same and the rest of the scale adjusted around this level. The reference softkey with a box around it is the currently-active reference.

Note

When you enter a value for the Y-axis, you cannot enter units. The analyzer uses the currently-displayed Y-axis units.

You can use the [EXP] key to enter units in engineering notation. For example, to enter 15 mV, press the following key sequence:

[1] [5] [EXP] [+/ −] [3] [ENTER]

See also: [LOG MAGNITUDE] softkey, [LINEAR MAGNITUDE] softkey, [BOTTOM REFERENCE] softkey, [CENTER REFERENCE] softkey, [TOP REFERENCE] softkey

[Y UNITS] softkey

Key Path: [Trace Coord]

Specify the following units attributes for the vertical axis:
- Peak or rms amplitude.
- Degree or radian phase.
- Volts.
- Volts ^{2}.
- V/rtHz.
- V ^{2}/Hz.
- V ^{2}S/Hz.
- a reference for dB magnitude.

See also: [dB REF SETUP] softkey, [V ^{2}S/Hz (ESD)] softkey, [V ^{2}/Hz (PSD)] softkey, [V/rtHz] softkey, [VOLTS ^{2}] softkey, [VOLTS] softkey, [AMPLITUDE PEAK RMS] softkey, [PHASE DEG RAD] softkey

[Z AXIS RANGE] softkey

Key Path: [**Disp Format**] → [WATERFALL SETUP]
 or: [**Marker Fctn**] → [WATERFALL MARKERS] → [WATERFALL SETUP]

Specify the range of complete traces you want displayed on the waterfall.

Limits and default vary depending on the data displayed.

You specify the range in one of the following units, depending on the type of data displayed:

- Number of counts
- Number of averages
- Seconds
- rpm

Note

If you specify a counts or averages, the analyzer displays one more than that number. You are specifying a range, not a number of traces. For example, if you specify "15 counts" the analyzer actually displays 16 traces.

See also: [WATERFALL] softkey

[ZERO PAD -T/4, T/4] softkey

Key Path: [**Window**]

Specify the −T/4 to T/4 weighting function for a correlation measurement. ("T" refers to the time record length.) This weighting function has a value of 0 for the first quarter and last quarter of the time record and a value of 1 for the second quarter and third quarter.

Use this weighting function for periodic signals with positive delays (lags) and negative delays (leads) from channel 1 to channel 2.

For information on how this weighting function affects computation, see autocorrelation and cross correlation.

For more information on correlation weighting functions, refer to the analyzer's *Concepts Guide.*

See also: [RECORD LENGTH] softkey, [CROSS CORRELATN] softkey, [AUTO CORR CHANNEL x] softkey, [CORRELATN ANALYSIS] softkey

[ZERO PAD 0, T/2] softkey

Key Path: [Window]

Specify the 0 to T/2 weighting function for a correlation measurement. ("T" refers to the time record length.) This weighting function has a value of 1 for the first half of the time record and 0 for the second half.

Use this weighting function for periodic signals with only positive delays (lags) from channel 1 to channel 2.

For information on how this weighting function affects computation, see autocorrelation and cross correlation.

For more information on correlation weighting functions, refer to the analyzer's *Concepts Guide.*

See also: [RECORD LENGTH] softkey, [CROSS CORRELATN] softkey, [AUTO CORR CHANNEL x] softkey, [CORRELATN ANALYSIS] softkey

[ZERO START] softkey

Key Path: [Freq]

Set the start frequency to 0 Hz (baseband). This softkey also anchors the start frequency.

See also: [START FREQUENCY] softkey

Menu Map

This chapter lists the hardkeys in the left column and the softkey menus associated with each hardkey in the right column. The softkeys under some of the hardkeys vary depending on the instrument mode selected. For these keys, the left column lists the instrument mode, and the right column lists the softkey menus for that instrument mode.

Measurement group

Inst Mode	
	[FFT ANALYSIS]
	[OCTAVE ANALYSIS]
	[ORDER ANALYSIS]
	[SWEPT SINE]
	[CORRELATN ANALYSIS]
	[HISTOGRAM / TIME]
	[CAPTURE ON OFF]
	[1 CHANNEL]
	[2 CHANNEL]
	[CAPTURE SETUP]
	[START CAPTURE]
	[ABORT CAPTURE]
	[CAPTURE LENGTH]
	[ALLOCATE CAPTURE]
	[CONFIRM ALLOCATE]
	[REMOVE CAPTURE]
	[CONFIRM REMOVE]
	[TACHOMETR SETUP]
	[TACH DATA ON OFF]
	[MAX RPM]
	[ANALYSIS REGION]
	[STRT TIME CHANNEL 1]
	[STOP TIME CHANNEL 1]
	[STRT TIME CHANNEL 2]
	[STOP TIME CHANNEL 2]
	[CAPTURE HEADER]

Freq	The softkeys vary depending on the instrument mode.

FFT Analysis	[SPAN]
	[CENTER]
	[START]
	[STOP]
	[ZERO START]
	[FULL SPAN]
	[ENTRY STEP SIZE]
	[RECORD LENGTH]
	[RESOLUTN (LINES)]

Octave Analysis	[START]
	[STOP]
	[FULL OCTAVE]
	[1/3 OCTAVE]
	[1/12 OCTAVE]

Order
Analysis

[MIN RPM]
[MAX RPM]
[MAX ORDER]
[DELTA ORDER]
[TRACK ON OFF]
[TRACK 1 ORDER]
[TRACK 2 ORDER]
[TRACK 3 ORDER]
[TRACK 4 ORDER]
[TRACK 5 ORDER]

Swept
Sine

[SPAN]
[CENTER]
[START]
[STOP]
[ENTRY STEP SIZE]
[SWEEP LIN LOG]
[SWEEP UP DOWN]
[SWEEP AUTO MAN]
[MANUAL FREQ]
[RESOLUTN SETUP]
  [RESOLUTN]
  [AUTO RES ON OFF]
  [MAXIMUM % CHANGE]
  [MINIMUM RESOLUTN]

Correlation
Analysis

[RECORD LENGTH]
[RESOLUTN (LINES)]

Histogram/
Time

[RECORD TIME]
[SAMPLE TIME]
[HISTOGRAM LENGTH]
[HISTOGRAM BINS]

| Window |

The softkeys vary depending
on the instrument mode.

FFT
Analysis

[HANNING]
[FLAT TOP]
[UNIFORM]
[FORCE EXPO]
[CHANNEL 1 FORC EXPO]
[CHANNEL 2 FORC EXPO]
[FORCE WIDTH]
[EXPO DECAY]

Order
Analysis

[HANNING]
[FLAT TOP]
[UNIFORM]
[CP DC BIN ON OFF]

Correlation
Analysis

[ZERO PAD -T/4, T/4]
[ZERO PAD 0, T/2]
[UNIFORM -T/2, T/2]

Correlation
Analysis

None

Input	

[CHANNEL 1 RANGE]
[CH1 FIXED RANGE]
[CH1 AUTO RANGE]
[CHANNEL 1 SETUP]
  [INPUT LOW FLOAT GND]
  [COUPLING AC DC]
  [ANTIALIAS ON OFF]
  [A WT FLTR ON OFF]
  [ICP SUPLY ON OFF]
  [ENG UNIT ON OFF]
  [ENG UNIT MULTIPLER]
  [ENG UNIT AT MKR]
  [ENG UNIT LABEL]
[CHANNEL 2 RANGE]
[CH2 FIXED RANGE]
[CH2 AUTO RANGE]
[CHANNEL 2 SETUP]
[TACHOMETR SETUP]
  [TACH PULS PER REV]
  [TRG RANGE +/- 20 4]
  [LEVEL]
  [HOLDOFF TIME]
  [SLOPE POS NEG]

Source	

The softkeys vary depending on the instrument mode.

FFT Analysis, Correlation Analysis, Histogram/ Time

[SOURCE ON OFF]
[LEVEL]
[RANDOM NOISE]
[BURST RANDOM]
[PERIODIC CHIRP]
[BURST CHIRP]
[PINK NOISE]
[FIXED SINE]
[ARBITRARY (D1-D8)]
[ARB SRC SETUP]
  [REPEAT ON OFF]
  [DATA REG D1]
  . . .
  [DATA REG D8]

Octave Analysis, Order Analysis

[SOURCE ON OFF]
[LEVEL]
[RANDOM NOISE]
[PINK NOISE]
[FIXED SINE]

Swept Sine

[LEVEL]
[RAMP RATE]
[AUTOLEVEL ON OFF]
[AUTOLEVEL SETUP]
  [REF CHAN CH1 CH2]
  [REFERENCE LEVEL]
  [REFERENCE TOLERANCE]
  [MAX SRC LEVEL]
  [MAX INPUT LEVEL]

| Trigger |

The softkeys vary depending
on the instrument mode.

FFT
Analysis,
Correlation
Analysis,
Histogram/
Time

[FREE RUN TRIGGER]
[EXTERNAL TRIGGER]
[CHANNEL 1 TRIGGER]
[CHANNEL 2 TRIGGER]
[SOURCE TRIGGER]
[HP-IB TRIGGER]
[TACHOMETR SETUP]
[TACHOMETR SETUP]
   [TACH PULS PER REV]
   [TRG RANGE +/- 20 4]
   [LEVEL]
   [HOLDOFF TIME]
   [SLOPE POS NEG]
[TRIGGER SETUP]
   [LEVEL]
   [SLOPE POS NEG]
   [CHANNEL 1 DELAY]
   [CHANNEL 2 DELAY]
[ARM SETUP]
   [AUTOMATIC ARM]
   [MANUAL ARM]
   [RPM STEP ARM]
   [TIME STEP ARM]
   [START RPM USAGE]
     [RPM INCREASNG]
     [RPM DECREASNG]
   [START RPM]
   [RPM STEP SIZE]
   [TIME STEP SIZE]
   [WATERFALL STEPS]
[ARM]

Octave
Analysis

[FREE RUN TRIGGER]
[EXTERNAL TRIGGER]
[HP-IB TRIGGER]
[LEVEL HIGH LOW]
   :

(continued)

[AUTOMATIC ARM]
[RPM STEP ARM]
[TIME STEP ARM]
[ARM SETUP]
   [RPM INCREASNG]
   [RPM DECREASNG]
   [START RPM]
   [RPM STEP SIZE]
   [TIME STEP SIZE]
   [WATERFALL STEPS]
[DELAY TIME]
[TACHOMETR SETUP]
[TACHOMETR SETUP]
   [TACH PULS PER REV]
   [TRG RANGE +/- 20 4]
   [LEVEL]
   [HOLDOFF TIME]
   [SLOPE POS NEG]

Order
Analysis

[FREE RUN TRIGGER]
[EXTERNAL TRIGGER]
[LEVEL HIGH LOW]
[AUTOMATIC ARM]
[RPM STEP ARM]
[TIME STEP ARM]
[ARM SETUP]
   [START RPM OFF]
   [RPM INCREASNG]
   [RPM DECREASNG]
   [START RPM]
   [RPM STEP SIZE]
   [TIME STEP SIZE]
   [TRACK POINTS]
   [WATERFALL STEPS]
[TACHOMETR SETUP]
[TACHOMETR SETUP]
   [TACH PULS PER REV]
   [TRG RANGE +/- 20 4]
   [LEVEL]
   [HOLDOFF TIME]
   [SLOPE POS NEG]

| Start | No softkeys under this hardkey. |

| Pause Cont | No softkeys under this hardkey. |

| Avg | The softkeys vary depending on the instrument mode. |

FFT
Analysis

[AVERAGE ON OFF]
[NUMBER AVERAGES]
[AVERAGE TYPE]
   [RMS]
   [RMS EXPONENTL]
   [VECTOR]
   [VECTOR EXPONENTL]
   [PEAK HOLD]
[FAST AVG ON OFF]
[UPDATE RATE]
[REPEAT ON OFF]
[OVERLAP PERCENT]
[OVLD REJ ON OFF]
[PREVIEW SETUP]
   [PREVIEW OFF]
   [MANUAL PREVIEW]
   [TIMED PREVIEW]
   [TIME]
   [REJECT TIME REC]
   [ACCEPT TIME REC]

Octave
Analysis

[LINEAR]
[EXPONENTL]
[EQUAL CONFID]
[PEAK HOLD]
[HOLD SETUP]
   [OFF]
   [MAXIMUM]
   [MINIMUM]
[AVERAGE TIME]
[CONFIDNCE LEVEL]
[IMPULSE ON OFF]
[REPEAT ON OFF]

Order
Analysis

[AVERAGE ON OFF]
[NUMBER AVERAGES]
[TIME]
[TIME EXPONENTL]
[REPEAT ON OFF]

Swept
Sine

[SETTLE TIME]
   [S]
   [mS]
   [uS]
   [CYCLES]
[INTEGRATE TIME]
[FAST AVG ON OFF]

Correlation
Analysis

[NUMBER AVERAGES]
[AVERAGE TYPE]
   [RMS]
   [RMS EXPONENTL]
   [VECTOR]
   [VECTOR EXPONENTL]
[FAST AVG ON OFF]
[UPDATE RATE]
[REPEAT ON OFF]
[OVERLAP PERCENT]
[OVLD REJ ON OFF]

Histogram/
Time

[FAST AVG ON OFF]
[REPEAT ON OFF]
[AVERAGE ON OFF]

Display group

Meas Data

The softkeys vary depending on the instrument mode.

FFT
Analysis

[PWR SPEC CHANNEL 1]
[PWR SPEC CHANNEL 2]
[LIN SPEC CHANNEL 1]
[LIN SPEC CHANNEL 2]
[TIME CHANNEL 1]
[TIME CHANNEL 2]
[FREQUENCY RESPONSE]
[COHERENCE]
[CROSS SPECTRUM]
[MORE]
  [ORBIT]
  [WINDOWED TIME CH1]
  [WINDOWED TIME CH2]
  [CAPTURE CHANNEL 1]
  [CAPTURE CHANNEL 2]
  [MATH FUNCTION]
    [F1]
    ...
    [F5]
  [DATA REGISTER]
    [D1]
    ...
    [D8]
  [WATERFALL REGISTER]
    [W1]
    ...
    [W8]

Octave
Analysis

[PWR SPEC CHANNEL 1]
[PWR SPEC CHANNEL 2]
[CAPTURE CHANNEL 1]
[CAPTURE CHANNEL 2]
[MATH FUNCTION]
[DATA REGISTER]
[WATERFALL REGISTER]

Order
Analysis

[PWR SPEC CHANNEL 1]
[PWR SPEC CHANNEL 2]
[TIME CHANNEL 1]
[TIME CHANNEL 2]
[ORBIT]
[CAPTURE CHANNEL 1]
[CAPTURE CHANNEL 2]
[MORE]
  [COMP PWR CHANNEL 1]
  [COMP PWR CHANNEL 2]
  [ORDER TRK CHANNEL 1]
    [TRACK 1]
    [TRACK 2]
    [TRACK 3]
    [TRACK 4]
    [TRACK 5]
  [ORDER TRK CHANNEL 2]
    [TRACK 1]
    [TRACK 2]
    [TRACK 3]
    [TRACK 4]
    [TRACK 5]
  [RPM PROFILE]
  [MATH FUNCTION]
  [DATA REGISTER]
  [WATERFALL REGISTER]

Swept
Sine

[LIN SPEC CHANNEL 1]
[LIN SPEC CHANNEL 2]
[TIME CHANNEL 1]
[TIME CHANNEL 2]
[FREQUENCY RESPONSE]
[CROSS SPECTRUM]
[NORM VAR CHANNEL 1]
[NORM VAR CHANNEL 2]
[MORE]
    [MATH FUNCTION]
    [DATA REGISTER]
    [WATERFALL REGISTER]
[TIME CHANNEL 1]
[TIME CHANNEL 2]
[AUTO CORR CHANNEL 1]
[AUTO CORR CHANNEL 2]
[CROSS CORRELATN]
[WINDOWED TIME CH1]
[WINDOWED TIME CH2]
[CAPTURE CHANNEL 1]
[CAPTURE CHANNEL 2]
[MORE]
    [MATH FUNCTION]
    [DATA REGISTER]
    [WATERFALL REGISTER]
[HISTOGRAM CHANNEL 2]

Correlation
Analysis

[PDF CHANNEL 1]
[PDF CHANNEL 2]
[CDF CHANNEL 1]
[CDF CHANNEL 2]
[UNFILTERD TIME CH 1]
[UNFILTERD TIME CH 2]
[MORE]
    [CAPTURE CHANNEL 1]
    [CAPTURE CHANNEL 2]
    [MATH FUNCTION]
    [DATA REGISTER]
    [WATERFALL REGISTER]

Histogram/
Time

[HISTOGRAM CHANNEL 1]

Trace
Coord

[LINEAR MAGNITUDE]
[LOG MAGNITUDE]
[dB MAGNITUDE]
[PHASE]
[UNWRAPPED PHASE]
[MORE: NYQ REAL IMAG]
    [REAL PART]
    [IMAGINARY PART]
    [NYQUIST DIAGRAM]
[X UNITS]
    [HZ (SEC)]
    [RPM (SEC)]
    [ORDER (REV)]
    [USER X UNIT]
    [ORDER SETUP]
        [HZ/ORDER RATIO]
        [TRACE RPM]
        [ORDER AT MKR]
    [USER X SETUP]
        [USER FREQ FACTOR]
        [USER TIME FACTOR]
        [USER X AT MKR]
        [FREQ LABEL]
        [TIME LABEL]
[Y UNITS]
    [AMPLITUDE PEAK RMS]
    [PHASE DEG RAD]
    [dB REF SETUP]
        [dBV (dBEU)]
        [dBm]
        [dBSPL (20 uPa)]
        [USER REFERENCE]
        [dBm REF IMPEDANCE]
        [USER REF LEVEL]
        [USER LABEL]
    [VOLTS]
    [VOLTS ^ 2]
    [V/rtHz]
    [V ^ 2/Hz (PSD)]
    [V ^ 2s/Hz (ESD)]
[X-AXIS LIN LOG]

Scale

[AUTOSCALE ON OFF]
[TOP REFERENCE]
[CENTER REFERENCE]
[BOTTOM REFERENCE]
[INP RANGE TRACKING]
[Y PER DIV (DECADES)]
[MATCH X SCALE]
[MATCH Y SCALE]
[AXES SCAL MARKERS]
   [AXIS X Y]
   [FULL SCALE]
   [HOLD SCALE]
   [SCALE AT MARKERS]
   [LEFT (BOTTOM)]
   [WIDTH (HEIGHT)]
   [RIGHT (TOP)]
   [CENTER]

Active Trace

No softkeys under this hardkey.

Analys

[DEFINE FUNCTION]
   [DEFINE F1]
   . . .
   [DEFINE F5]
      [MEAS DATA]
        (same keys as under Meas
        Data for each instrument mode)
          [+]
          [-]
          [*]
          [/]
          [ )]
          [ENTER]
      [OPERATION]
        [CONJ( )]
        [MAG( )]
        [REAL( )]
        [IMAG( )]
        [SQRT( )]
      :

(continued)

[FFT( )]
[INVERSE FFT( )]
[PSD( )]
[MORE]
   [LN( )]
   [EXP( )]
   [*jOMEGA( )]
   [/jOMEGA( )]
   [AWEIGHT( )]
   [BWEIGHT( )]
   [CWEIGHT( )]
   [DIFF( )]
   [INTEG( )]
  [( )]
[DEFINE CONSTANT]
  [DEFINE K1]
  . . .
  [DEFINE K5]
    [ENTER]
    [+ j]
    [EXP]
[LIMIT TEST]
  [LINES ON OFF]
  [TEST EVAL ON OFF]
  [FAIL BEEP ON OFF]
  [DEFINE UPPER LIM]
    [MOVE MKR HORIZNTAL]
    [MOVE MKR VERTICAL]
    [START SEGMENT]
    [FINISH SEGMENT]
    [MOVE ALL VERTICAL]
    [DELETE SEGMENT]
    [DELETE ALL]
      [CONFIRM/ DELETE]
    [TRACE TO LIMIT]
  [DEFINE LOWER LIM]
[CURVE FIT]
  [START FIT]
  [ABORT FIT]

  :

(continued)

[CURVE FIT REGISTER]
  [D1]
  ...
  [D8]
[EDIT TABLE]
  [CHANGE VALUE]
   [kHz]
   [Hz]
   [mHz]
   [+ j]
   [EXP]
  [ADD VALUE]
  [DELETE VALUE]
  [UNDELETE VALUE]
  [FIX VALUE TOGGLE]
  [CLEAR TABLE]
   [CONFIRM CLEAR]
[COPY FROM SYNTHESIS]
[FIT REGION]
  [FULL SPAN]
  [USER SPAN]
  [START]
  [STOP]
[CURVE FIT SETUP]
  [ORDER MAX FIXED]
  [NUMBER OF POLES]
  [NUMBER OF ZEROS]
  [WEIGHT AUTO USER]
  [WEIGHT REGISTER]
   [D1]
   ...
   [D8]
  [TIME DELAY]
  [FREQUENCY SCALE]
  [TABLE ON OFF]
[SYNTHESIS]
  [START SYNTHESIS]
  [SYNTHESIS REGISTER]
   [D1]
   ...
   [D8]
   :
(continued)

[EDIT TABLE]
[COPY FROM CURVE FIT]
[CONVERT TABLE]
  [CONVRT TO POLE ZERO]
  [CONVRT TO POLE RESD]
  [CONVRT TO POLYNMIAL]
[SYNTHESIS SETUP]
  [GAIN FACTOR]
  [TIME DELAY]
  [FREQUENCY SCALE]
  [X-AXIS LIN LOG]
[TABLE ON OFF]
[DATA EDIT]
  [EDIT D1]
  ...
  [EDIT D8]
   [START X]
   [STOP X]
   [MODIFY START Y]
   [MODIFY STOP Y]

Disp Format

[SINGLE]
[UPPER/ LOWER]
[FRONT/ BACK]
[WATERFALL]
[MEASURMNT STATE]
[INPUT STATE]
[WATERFALL ACT TRACE]
[WATERFALL SETUP]
  [Z AXIS RANGE]
   [TRACE NUMBER]
  [TRACE HEIGHT]
  [HIDN LINE ON OFF]
  [SKEW ON OFF]
  [SKEW ANGLE]
  [BASELINE SUPPRESS]
[BODE DIAGRAM]
[MORE]
  [GRID ON OFF]
  [BLANK ANNOTATN]
  [BLANK DISPLAY]
  [TRACE TITLE]
  [DFLT TITL ON OFF]

Marker group

| Marker |

[MARKER ON OFF]
[COUPLED ON OFF]
[MARKER X ENTRY]
[MKR VALUE ABS REL]
[REFERENCE TO MARKER]
[REFERENCE SETUP]
  [REFERENCE TO MARKER]
  [REFERENCE X ENTRY]
  [REFERENCE Y ENTRY]
[PEAK TRK ON OFF]
[NEXT PEAK RIGHT]
[NEXT PEAK LEFT]
[MARKER TO PEAK]

| Marker Fctn |

[MARKER FCTN OFF]
[HARMONIC MARKER]
  [FUNDAMNTL FREQUENCY]
  [NUMBER OF HARMONICS]
  [COMPUTE OFF]
  [THD]
  [HARMONIC POWER]
[BAND MARKER]
  [BAND SPAN]
  [BAND CENTER]
  [BAND START]
  [BAND STOP]
  [COMPUTE OFF]
  [BAND POWER]
  [RMS SQRT(PWR)]
[SIDEBAND MARKER]
  [CARRIER FREQ]
  [SIDEBAND INCREMENT]
  [NUMBER OF SIDEBANDS]
  [COMPUTE OFF]
  [SIDEBAND POWER]
[WATERFALL MARKERS]
  [SCROLL UP]
  [SCROLL DOWN]
  :

(continued)

[TRACE SELECT]
  [S]
  [mS]
  [TRACE NUMBER]
  [RPM]
  [kRPM]
  [TRACE NUMBER]
  [COUNT]
  [kCOUNT]
  [TRACE NUMBER]
  [AVG]
  [kAVG]
  [TRACE NUMBER]
[SLICE SELECT]
[SAVE AND DISP DATA]
[SAVE TO DATA REG]
[SELECT SAVE REG]
  [D1]
  . . .
  [D8]
[WATERFALL SETUP]
[TIME PARAMTERS]
  [START TIME]
  [STOP TIME]
  [COMPUTE OFF]
  [OVERSHOOT]
  [RISE TIME]
  [SETTLING TIME]
  [DELAY TIME]
[GAIN/PHAS MARGINS]
  [START FREQUENCY]
  [STOP FREQUENCY]
  [COMPUTE OFF]
  [COMPUTE MARGINS]
[FREQ & DAMPING]
  [START FREQUENCY]
  [STOP FREQUENCY]
  [COMPUTE OFF]
  [COMPUTE COEFFICNT]
[SUPLMENTL INFO]

System group

Preset

[DO PRESET]
[RECALL AUTOSTATE]

BASIC

[DISPLAY SETUP]
  [OFF]
  [FULL]
  [UPPER]
  [LOWER]
  [CLEAR SCREEN]
[CONTINUE]
[INSTRUMNT BASIC]
  [RUN PROGRAM]
  [SELECT PROGRAM]
  [LABEL PROGRAM]
  [EDIT]
    [ENTER]
    [INSERT SPACE]
    [INSERT LINE]
    [DELETE LINE]
    [RECALL LINE]
    [DELETE CHARACTER]
    [DELETE TO LINE END]
    [TYPING UTILITIES]
      [ENTER]
      [INSERT SPACE]
      [INSERT KEYWORD]
        [CANCEL]
      [DELETE CHARACTER]
      [UPPERCASE lowercase]
      [INSERT +-*^/=()]
      [INSERT '&#;:,@|]
      [INSERT $<>[]{}\ ]
      [INSERT ~%'!?'_]
    [GOTO LINE]
      [ENTER]
      [(_)]
      [UPPERCASE lowercase]
    [END EDIT]
    :

(continued)

[PRINT PROGRAM]
[UTILITIES]
  [MEMORY SIZE]
  [AUTO MEMORY]
  [SCRATCH]
    [SCRATCH]
    [SCRATCH C]
    [SCRATCH A]
    [PERFORM SCRATCH]
  [RENUMBER]
    [START LINE #]
    [INCREMENT]
    [PERFORM RENUMBER]
  [SECURE]
    [START LINE #]
    [END LINE #]
    [PERFORM SECURE]
[ENABLE RECORDING]
[DEBUG]
  [RUN]
  [CONTINUE]
  [SINGLE STEP]
  [LAST ERROR]
  [EXAMINE VARIABLE]
  [RESET]

Help

No softkeys under this hardkey.

Save/
Recall

[SAVE DATA]
  [SAVE TRACE]
    [INTO D1]

    . . .

    [INTO D8]
    [INTO FILE]
      [OVERWRITE FILE]
  [SAVE CAPTURE]
  [SAVE WATERFALL]
    [INTO W1]

    . . .

    [INTO W8]
    [INTO FILE]
  [CONTINUE SAVE]
  [CATALOG ON OFF]
[SAVE STATE]
[SAVE MORE]
  [SAVE UPPER LIM]
  [SAVE LOWER LIM]
  [SAVE MATH]
  [SAVE PROGRAM]
  [RE-SAVE PROGRAM]
  [SAVE FIT TABLE]
  [SAVE SNTH TABLE]
  [SAVE AUTOSTATE]
[RECALL DATA]
  [RECALL TRACE]
    [FROM FILE INTO D1]

    . . .

    [FROM FILE INTO D8]
    [CATALOG ON OFF]
  [RECALL CAPTURE]
  [RECALL WATERFALL]
    [FROM FILE INTO W1]

    . . .

    [FROM FILE INTO W8]
    [CATALOG ON OFF]
  [CONTINUE RECALL]
  [CATALOG ON OFF]
[RECALL STATE]
  :

(continued)

[RECALL MORE]
  [RECALL UPPER LIM]
  [RECALL LOWER LIM]
  [RECALL MATH]
  [RECALL PROGRAM]
  [RCL FIT TABLE]
  [RCL SYNTH TABLE]
[RECALL AUTOSTATE]
[CATALOG ON OFF]
[DEFAULT DISK]
  [NON-VOL RAM DISK]
  [VOLATILE RAM DISK]
  [INTERNAL DISK]
  [EXTERNAL DISK]
  [CATALOG ON OFF]

Disk
Utility

[RENAME FILE]
  [ORIGINAL FILENAME]
  [NEW FILENAME]
  [PERFORM RENAME]
  [CATALOG ON OFF]
[DELETE FILE]
[DELETE ALL FILES]
[COPY FILE]
  [SOURCE FILENAME]
  [DESTIN FILENAME]
  [PERFORM FILE COPY]
  [CATALOG ON OFF]
[COPY ALL FILES]
  [SOURCE DISK]
  [DESTIN DISK]
  [PERFORM COPY ALL]
  [CATALOG ON OFF]
[FORMAT DISK]
  [DISK TYPE LIF DOS]
  [RAM DISK SIZE]
  [INTRLEAVE FACTOR]
  [PERFORM FORMAT]
  [CATALOG ON OFF]
[CATALOG ON OFF]
[DEFAULT DISK]

Local/ HP-IB

[ABORT HP-IB]
[SYSTEM CONTROLLR]
[ADDRESSBL ONLY]
[ANALYZER ADDRESS]
[GPIB ECHO ON OFF]
[PLOTTER ADDRESS]
[PRINTER ADDRESS]
[DISK ADDRESS]
[DISK UNIT]

Plot/ Print

[START PLOT/PRNT]
   [OVERWRITE FILE]
[ABORT PLOT/PRNT]
[PLOT DATA SELECT]
   [ALL]
   [TRACE]
   [TRACE MARKER]
   [MARKER REFERENCE]
   [GRID]
[PLOT PEN SETUP]
   [DEFAULT PENS]
   [TRACE A PEN]
   [TRACE B PEN]
   [TRACE A MKR PEN]
   [TRACE B MKR PEN]
   [ALPHA PEN]
   [GRID PEN]
[PLOT LINE SETUP]
   [TRACE A LINE TYPE]
      [SOLID]
      [DOTTED]
      [DASHED]
      [USER DEFINED]
      [USER LINE TYPE]
   [TRACE B LINE TYPE]
   [LIMIT A LINE TYPE]
   [LIMIT B LINE TYPE]
[TRACE A LINE TYPE]
[TRACE B LINE TYPE]
[OUTPUT FILENAME]
   :

(continued)

[MORE SETUP]
   [OUTPUT TO HPIB FILE]
   [DEVICE IS PLOT PRNT]
   [TIME STMP ON OFF]
   [PAGE EJCT ON OFF]
   [PLOT PEN SPEED]
      [FAST (50 cm/s)]
      [SLOW (10 cm/s)]
      [DEFINE (? cm/s)]
   [P1 P2 SETUP]
      [USER P1P2 ON OFF]
      [USER P1 X]
      [USER P1 Y]
      [USER P2 X]
      [USER P2 Y]
   [TITLE LINE 1]
   [TITLE LINE 2]

System Utility

[CALIBRATN]
   [SINGLE CAL]
   [AUTO CAL ON OFF]
   [SAVE CH1 CAL TRACE]
      [INTO D1]
      . . .
      [INTO D8]
   [SAVE CH2 CAL TRACE]
[BEEPER ON OFF]
[CLOCK SETUP]
   [TIME HHMM]
   [DATE MMDDYY]
   [TIMESTAMP SETUP]
      [24 HR DD/MM/YY]
      [24 HR DD.MM.YY]
      [24 HR YY MM DD]
      [12 HR DD/MM/YY]
      [12 HR MM-DD-YY]
[OPTIONS SETUP]
   [INSTALL]
[MEMORY USAGE]
   [REMOVE CAPTURE]
      [CONFIRM REMOVE]
   :

(continued)

[REMOVE WATERFALL]
   [CONFIRM REMOVE]
[REMOVE WTFL REGS]
   [CONFIRM REMOVE]
[REMOVE PROGRAMS]
   [CONFIRM REMOVE]
[REMOVE RAM DISK]
   [CONFIRM REMOVE]
[KEYBOARD SETUP]
  [FRENCH]
  [GERMAN]
  [ITALIAN]
  [SPANISH]
  [SWEDISH/ FINNISH]
  [U.K. ENGLISH]
  [U.S. ENGLISH]
[FAULT LOG]
  [CLEAR FAULT LOG]
[S/N VERSION]
[SELF TEST]
  see *Service Guide*
[SERVICE TESTS]
  see *Service Guide*

Miscellaneous menus

Suffix menus

[dBVrms]
[Vrms]
[mVrms]
[dBVpk]
[Vpk]
[mVpk]
[kHz]
[Hz]
[mHz]
[DECADES]
[OCTAVES]
[ORDERS]
[EXP]
[dB]
[RPM]
[kRPM]
[kilo- EXP 3]
[milli- EXP -3]
[PERCENT (%)]
[S]
[mS]
[uS]
[RECORDS]
[POINTS]
[POINTS / SWEEP]
[PERCENT (%)]
[POINTS / DECADE]
[POINTS / OCTAVE]
[V/EU]
[mV/EU]
[EU/V]
[mEU/V]
[EU]
[EUrms]
[mEU]
[mEUrms]
[dBEU]
[dBEUrms]
:
(continued)

[mVrms/S]
[Vrms/S]
[mVpk/S]
[Vpk/S]
[OHM]
[Hz PER ORDER]
[RPM PER ORDER]
[COUNT]
[kCOUNT]
[AVG]
[kAVG]
[Rev]
[kRev]

Alpha Entry
menu

[ENTER]
[INSERT SPACE]
[DELETE CHARACTER]
[MORECHARS +-*^/=()]
[MORECHARS \'&#;:,@|]
[MORECHARS $<>[]{}\ ]
[MORECHARS ~%'!?'_]
[UPPERCASE lowercase]
[CLEAR ENTRY]

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