



User's Reference

HP 1660 Series
100-MHz State/500-MHz Timing
Logic Analyzers

User's Reference

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For Safety information, Warranties, and Regulatory
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**HP 1660 Series
100-MHz State/500-MHz Timing
Logic Analyzers**

In This Book

The User's Reference manual contains field and feature definitions which explain the details of the instrument operation. Use this part of the manual set for information on what the menu fields do and what they are used for. This manual covers all HP 1660 Series analyzers.

The User's Reference is divided into chapters covering general product information, probing, and front panel interface operation. In addition, there are separately tabbed chapters for each analyzer menu, a chapter for error messages, and a chapter for instrument specifications. The common menu fields which are found in the majority of menus have been placed in a separate chapter. You will be referenced back to the "Common Menu Fields" chapter when these field are encountered.

How to use this reference

Few engineers and technicians read reference information from start to finish. In most cases the information is needed in a hurry and by specific topic. If you reference by topic, just turn back the tab that identifies the menu you are currently in, then look up the field name in the table of contents which is located at the beginning of each chapter.

Analyzer type considerations

In the Configuration menu you have the choice of configuring an analyzer machine as either a State analyzer or a Timing analyzer. Some menus in the analyzer will change depending on the analyzer type you choose. For example, since a Timing analyzer does not use external clocks, the clock assignment fields in the Format menu will not be available.

If a menu field is only available to a particular analyzer type, the field is designated (Timing only) or (State only) after the field name. If no designation is shown, the field is available for both types.

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General Information

Logic Analyzer Description

The HP 1660 Series Logic Analyzers are part of a new generation of general-purpose logic analyzers. The HP 1660 Series consists of four different models ranging in channel width from 34 channels to 136 channels. All models have 100-MHz state and 500-MHz timing speeds and are designed as full-featured stand-alone instruments for use by digital and microprocessor hardware and software designers. All models have HP-IB and RS-232C interfaces for hard copy printouts and control by a host computer.

- The HP 1660A has 130 data channels and six data/clock channels.
- The HP 1661A has 96 data channels and six data/clock channels.
- The HP 1662A has 64 data channels and four data/clock channels.
- The HP 1663A has 32 data channels and two data/clock channels.

Memory depth is 4 Kbytes per channel in all pod pair groupings, or 8 Kbytes per channel on one pod of a pod pair (half channel mode).

Measurement data is displayed as data listings and waveforms, and can also be plotted on a chart or compared to a reference image. In addition, measurement data and instrument configurations can be stored to a DOS formatted disk.

The 100-MHz state analyzer has master, master/slave, and demultiplexed clocking modes available. Measurement data can be stamped with state or time tags. For triggering and data storage, the state analyzer uses 12 sequence levels with two-way branching, 10 pattern resource terms, 2 range terms, and 2 timers.

The 500-MHz timing analyzer has conventional, transitional, and glitch timing modes with variable width, depth, and speed selections. Sequential triggering uses 10 sequence levels with two-way branching, 10 pattern resource terms, 2 range terms, 2 edge terms and 2 timers.

User Interface

The HP 1660 Series analyzers have several easy-to-use user interface devices: the knob, the front panel arrow keys and keypad, the optional mouse, and the optional keyboard.

Front panel arrow keys move the highlighter to identify the desired field, then a front panel Select key is pressed to activate the field. The knob quickly moves the highlighter (cursor) in certain menus to highlight options to select and to quickly change numeric assignment fields.

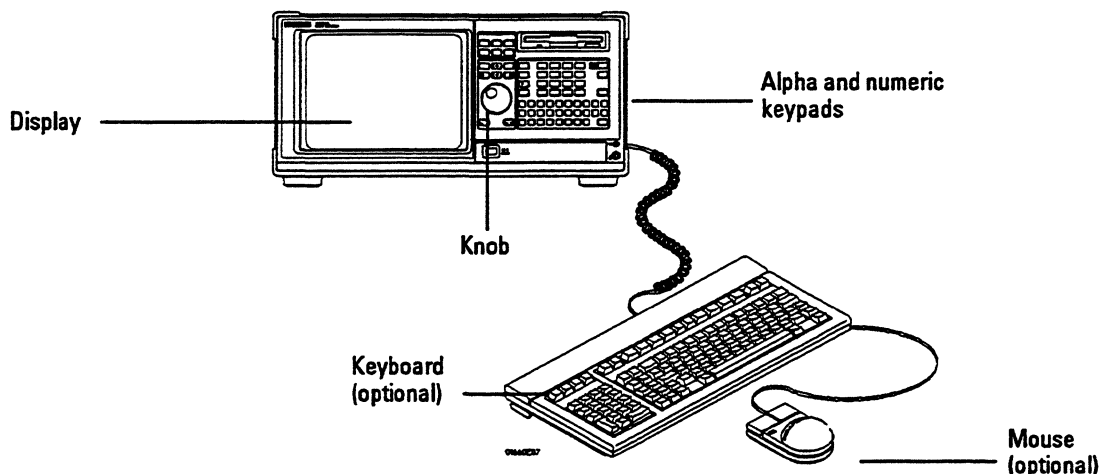
The keypad on the front panel is used to enter alpha and numeric data into assignment fields. An optional full size keyboard and an optional mouse are also available.

To select a field with the optional mouse, position the cursor (+) of the mouse over the desired field and press the button on the upper-left corner of the mouse. The optional keyboard can control all instrument functions by using special function keys, the arrow keys, and the Enter key. Alpha and numeric entry is simply typed in.

See Also

"Using the Optional Keyboard and Mouse" found later in this manual for more information.

"Using the Front-Panel Interface" found later in this manual for more details on using the standard interface devices.



Front-Panel Interface Devices

Configuration Capabilities

The four analyzer models in the HP 1660 Series offer a wide variety of channel widths and memory depth combinations. The number of data channels range from 34 channels with the HP 1663A, up to 136 channels with the HP 1660A. In addition, a half channel acquisition mode is available which doubles memory depth from 4 Kbytes to 8 Kbytes per channel while reducing channel width by half.

The configuration guide below illustrates the memory depth/channel width combinations in all acquisition modes with all analyzer models.

State Analyzer Configurations

	HP 1660A	HP 1661A	HP 1662A	HP 1663A
Half channel 100 MHz	8K-deep / 68 chan. 65 data + 3 data or clock	8K-deep / 51 chan. 48 data + 3 data or clock	8K-deep / 34 chan. 32 data + 2 data or clock	8K-deep / 17 chan. 16 data + 1 data or clock
Full channel 100 MHz	4K-deep / 136 chan. 130 data + 6 data or clock	4K-deep / 102 chan. 96 data + 6 data or clock	4K-deep / 68 chan. 64 data + 4 data or clock	4K-deep / 34 chan. 32 data + 2 data or clock

State Analyzer Configuration Considerations

- Unused clock channels can be used as data channels.
- With Time or State tags turned on, memory depth is reduced by half. However, full depth is retained if you leave one pod pair unassigned.
- Maximum of 6 clocks in the HP 1660A model.

Timing Analyzer Configurations

	HP 1660A	HP 1661A	HP 1662A	HP 1663A
Conventional half channel 500 MHz	8K-deep / 68 chan. 65 data + 3 data or clock	8K-deep / 51 chan. 48 data + 3 data or clock	8K-deep / 34 chan. 32 data + 2 data or clock	8K-deep / 17 chan. 16 data + 1 data or clock
Conventional full channel 250 MHz	4K-deep / 136 chan. 130 data + 6 data or clock	4K-deep / 102 chan. 96 data + 6 data or clock	4K-deep / 68 chan. 64 data + 4 data or clock	4K-deep / 34 chan. 32 data + 2 data or clock
Transitional half channel 250 MHz	8K-deep / 68 chan. 65 data + 3 data or clock	8K-deep / 51 chan. 48 data + 3 data or clock	8K-deep / 34 chan. 32 data + 2 data or clock	8K-deep / 17 chan. 16 data + 1 data or clock
Transitional full channel 125 MHz	4K-deep / 136 chan. 130 data + 6 data or clock	4K-deep / 102 chan. 96 data + 6 data or clock	4K-deep / 68 chan. 64 data + 4 data or clock	4K-deep / 34 chan. 32 data + 2 data or clock
Glitch half channel 125 MHz	4K-deep / 68 chan. 65 data + 3 data or clock	4K-deep / 51 chan. 48 data + 3 data or clock	4K-deep / 34 chan. 32 data + 2 data or clock	4K-deep / 17 chan. 16 data + 1 data or clock

Timing Analyzer Configuration Considerations

- Unused clock channels can be used as data channels
- In Glitch half channel mode, memory is split between data and glitches.

Key Features

Key features of the HP 1660 Series are listed below:

- 100-MHz state and 500-MHz timing acquisition speed.
- Variety of channel widths ranging from 34 channels with the HP 1663A, up to 136 channels with the HP 1660A.
- Lightweight, passive probes for easy hookup and compatibility with previous HP logic analyzers and preprocessors.
- HP-IB and RS-232C interfaces for programming and hard copy printouts.
- Variable setup/hold time in the State analyzer.
- External triggering to/from other instruments through rear-panel BNCs.
- 4 Kbytes-deep memory on all channels with 8 Kbytes-deep in half channel modes.
- Marker measurements.
- 12 levels of trigger sequencing for state and 10 levels of sequential triggering for Timing.
- Both state and timing analyzers can use 10 pattern resource terms, 2 range terms, and 2 timer/counters to qualify and trigger on data. In addition, the timing analyzer has 2 edge terms.
- 100-MHz time and number-of-states tagging.
- Full programmability.
- State/State and mixed State/Timing displays.
- Compare, Chart, and Waveform displays.
- Integral disk drive supporting DOS and LIF formats for storage of instrument setups and measurement data.

Accessories Supplied

The table below lists the accessories supplied with your logic analyzer. If any of these accessories are missing, contact your nearest Hewlett-Packard sales office.

Accessories Supplied

Accessory	HP Part No.	Quantity
Probe tip assemblies	01650-61608	Note 1
Probe cables	16550-61601	Note 2
Grabbers (20 per pack)	5090-4356	Note 1
Probe grounds (2 inch)	5959-9334	Note 1
Demo Training Kit	E2433-60004	1
Software Kit	01660-68704	1
User's Reference	01660-90904	1
Programming Reference	01660-90902	1
Service Guide	01660-90901	1
Accessories pouch	01660-84501	1

Note 1 Quantities :
 8 - 1660A
 6 - 1661A
 4 - 1662A
 2 - 1663A

Note 2 Quantities :
 4 - 1660A
 3 - 1661A
 2 - 1662A
 1 - 1663A

See Also

Accessories for HP Logic Analyzers if you need additional accessories.

Accessories Available

There are a number of accessories available that will make your measurement tasks easier and more accurate. You will find these listed in *Accessories for HP Logic Analyzers*.

Preprocessor Modules

The preprocessor module accessories enable you to quickly and easily connect the logic analyzer to your microprocessor under test.

Included with each preprocessor module is a 3.5-inch disk which contains a configuration file and an inverse assembler file. When you load the configuration file, it configures the logic analyzer for making state measurements on the microprocessor for which the preprocessor is designed.

Configuration files from other analyzers can also be loaded. For information on translating other configuration files into the analyzer, refer to "Preprocessor File Configuration Translation and Pod Connections" in the Probing chapter.

The inverse assembler file is a software routine that will display captured information in a specific microprocessor's mnemonics. The DATA field in the State Listing is replaced with an inverse assembly field. The inverse assembler software is designed to provide a display that closely resembles the original assembly language listing of the microprocessor's software. It also identifies the microprocessor bus cycles captured, such as Memory Read, Interrupt Acknowledge, or I/O Write.

Many of the preprocessor modules require the HP 10269C General-Purpose Probe Interface. The probe interface accepts the specific preprocessor PC board and connects it to five connectors on the general-purpose interface to which the logic analyzer probe cables connect.

See Also

Accessories for Logic Analyzers for a list of preprocessor modules and their descriptions.

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Probing

This chapter contains a description of the probing system for the logic analyzer. It also contains the information you need for connecting the probe system components to each other, to the logic analyzer, and to the system under test.

Probing Options

You can connect the logic analyzer to your system under test in one of the following ways:

- HP 10320C User-Definable Interface (optional).
- Microprocessor and bus specific interfaces (optional).
- Standard general-purpose probing (provided).
- Direct connection to a 20-pin, 3M-Series type header connector using the optional termination adapter.

The HP 10320C User-Definable Interface

The optional HP 10320C User-Definable Interface module combined with the optional HP 10269C General Purpose Probe Interface allows you to connect the logic analyzer to the microprocessor in your target system. The HP 10320C includes a breadboard that you custom wire for your system.

Another option for use with the interface module is the HP 10321A Microprocessor Interface Kit. This kit includes sockets, bypass capacitors, and a fuse for power distribution. Also included are wire-wrap headers to simplify wiring of your interface when you need active devices to support the connection requirements of your system.

See Also

Accessories for HP Logic Analyzers for additional information about the interface module and the microprocessor interface kits.

Microprocessor and Bus Specific Interfaces

There are a number of microprocessor and bus specific interfaces available as optional accessories that are listed in the *Accessories for HP Logic Analyzers*. Microprocessors are supported by Universal Interfaces or Preprocessor Interfaces, or in some cases, both.

Universal Interfaces are aimed at initial hardware turn-on, and will provide fast, reliable, and convenient connections to the microprocessor system.

Preprocessor interfaces are aimed at hardware turn-on and hardware/software integration, and will provide the following:

- All clocking and demultiplexing circuits needed to capture the system's operation.
- Additional status lines to further decode the operation of the CPU.
- Inverse assembly software to translate logic levels captured by the logic analyzer into microprocessor mnemonics.

Bus interfaces will support bus analysis for the following:

- Bus support for HP-IB, RS-232C, RS-449, SCSI, VME, and VXI.

General-Purpose Probing

General-purpose probing involves connecting the logic analyzer probes directly to your target system without using any interface. General-purpose probing does not limit you to specific hookup schemes, for an example, as the probe interface does.

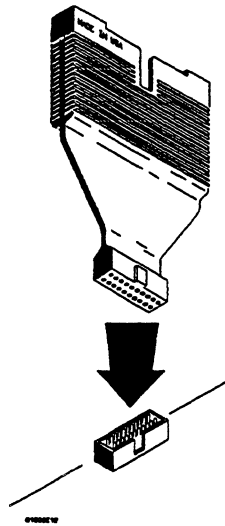
General-purpose probing uses grabbers that connect to both through hole and surface mount components. General-purpose probing comes as the standard probing option. You will find a full description of its components and use later in this chapter.

The Termination Adapter

The optional termination adapter allows you to connect the logic analyzer probe cables directly to test ports on your target system without the probes.

Probing

The termination adapter is designed to connect to a 20 (2x10) position, 4-wall, low-profile, header connector which is a 3M-Series 3592 or equivalent.



Termination Adapter

Preprocessor File Configuration Translation and Pod Connections

The HP 1660-series analyzers can load state configuration files created by HP 1650-series, 16510B, 16540A/D and 16550A analyzers. The following table gives information on the recommended configuration files to use for a number of preprocessors and universal interfaces, in addition to the minimum pod count of a 1660-series analyzer.

If you have version 5.0 or later preprocessor configuration software, the HP 16550 files are usually recommended. An alternate configuration file is given in case your preprocessor software is earlier than version 5.0.

In most cases, the pods will connect as specified in the preprocessor manuals. In the cases where the connection is different, refer to the notes listed at the end of the table.

Software and Hardware Translation Information

Preprocessor Number	Target Microprocessor	HP 16550 File to Load	Alternate File	Minimum Analyzer Required
10314D	80386DX: w/ math Coprocessor:	F80386D_I (6) F80386D_87 (6)	C80386D_I (6) C80386D_87 (6)	1660/1661 1660/1661
E2409B	80286 State: Timing:	F80286S (7) F80286T (9)	C80286S (8) C80286T (10), (11)	1660/1661/1662 1660/1661
10305B	8086: 8088:	F8086_I F8088_I	C8086_I (12) C8088_I (12)	1660/1661/1662 1660/1661/1662
E2426A/B	68020/68EC020	F68020/FEC020 (20)	C68020_IP/None (20)	1660/1661
E2423A	SCSI-2	FSCSI2 (32)	ESCSI2ST	1660/1661/1662/1663
10311B	68000/010 DIP: 68010: GP Probes: 68010:	F68000_I F68010_I F68000_P F68010_P	C68000_I (21) C68010_I (21) C68000_P (21) C68010_P (21)	1660/1661/1662 1660/1661/1662 1660/1661/1662 1660/1661/1662
10311G	68000/010 PGA: 68010:	F68000 F68010	C68000_I (21) C68010_I (21)	1660/1661/1662 1660/1661/1662
10316G	68030	F68030 (19)	C68030_IP (19)	1660/1661
E2403A	80486 UI All Pods: 16-bit status:	UI_486_21 (2) UI_486_20 (4)	UI_486_19 (3) UI_486_15 (5)	1660 1660/1661
E2438A	R4000	F_R4K (42)	None	1660
E2401A	R3000: extended cache: multi-processor:	FR3KA (43) FR3KB (43) FR3KC (43)	R3K_A_D R3K_B_D R3K_C_D	1660 1660 1660
E2420A	68040	F68040 (18)	C68040 (18)	1660/1661
E2406A	68030	F68030 (19)	C68030_I (19)	1660/1661
E2415A	MCS-51 RUPI-44: MCS-51: RUPI-44: MSC-51:	FRUPI44 (17) FMCS51 (17) ARUPI44 AMCS51	CMRUP51_I CMCS51_I CMRUP51_51 CMCS51_51	1660/1661/1662 1660/1661/1662 1660/1661/1662/1663 1660/1661/1662/1663

Preprocessor Number	Target Microprocessor	HP 16550 File to Load	Alternate File	Minimum Analyzer Required
E2418A	TMS32020/C25: 8 K Acq:	C320C25 F320C25 (41)	C320C25_B None	1660/1661/1662 1660/1661
10341B	1553 A/B	F1553	C1553	1660/1661/1662/1663
E2432A	80960CA All Pods: dma: interrupts:	PI960CA_03 (15) PI960CA_03 (15) PI960CA_02 (16)	PI960CA_03 (15) None PI960CA_02 (16)	1660 1660/1661 1660/1661
E2431A	TMS320C30/31 All Pods: primary bus: expansion bus: prim. bus w/exp. status:	R_320C30 (37) P_320C3X Q_320C30 (39) O_320C30	I_320C30 (38) A_320C3X B_320C30 (40) None	1660 1660/1661/1662 1660/1661/1662 1660/1661
10342B	RS232/HPIB HPIB: RS232: RS449:	FHPIB (33) FRS232 FRS449	CHPIB_51 CRS232_51 CRS449_51	1660/1661/1662/1663 1660/1661/1662/1663 1660/1661/1662/1663
10342G	HPIB State: Timing:	FHPIB FHPIB	CHPIB_G CHPIB_G (44)	1660/1661/1662/1663 1660/1661/1662
10300B	Z80	FZ80	CZ80_I	1660/1661/1662/1663
E2413B	68331/2	F68332 (26)	C68332 (27)	1660/1661
E2414B	68302: 8K Acq: Address Ranging:	F68302 (28) F68302 (28) E68302_6 (30)	C68302 (29) None E68302_6 (30)	1660/1661/1662 1660/1661 1660/1661/1662
E2435A	i860XR	i860XR3	i860XR1 (14)	1660
E2412A	i860XP	F_i860XP (13)	None	1660
E2416A	MCS-96: 8 K Acq:	FMCS96 FMCS96D	CMCS96C None	1660/1661/1662 1660/1661
E2424B	68340: evs:	F68340 (23) FEV340 (24)	None C68340 (25)	1660/1661/1662 1660/1661/1662
E2419A	68HC16	FHC16 (31)	None	1660/1661/1662
10315G	68HC11 DIP	F68HC11	None	1660/1661/1662
10315H	68HC11 PLCC	F68HC11	None	1660/1661/1662

Probing

Preprocessor Number	Target Microprocessor	HP 16550 File to Load	Alternate File	Minimum Analyzer Required
E2411B	80486	PI486_04 (1)	None	1662/1661
E2434A	80186/88 EA/XL: Timing:	F80186S F80186T	None None	1660/1661/1662 1660/1661/1662
E2434B	80186/88 EB State: Timing:	F80186S F80186T	None None	1660/1661/1662 1660/1661/1662
E2441B	VME/VXI	FE2441S (34)	None	1660/1661
E2442A	320C50/51: 8 K Acq:	D_320C5x (35) E_320C5x (36)	None None	1660/1661/1662 1660/1661
10310B	68008: GP Probes:	None None	C68008_I (22) C68008_P (22)	1660/1661/1662 1660/1661/1662
10308B	6809/6809E: GP Probes: 6809E:	None None None	C6809_I C6809_P C6809E_P	1660/1661/1662 1660/1661/1662 1660/1661/1662

The following notes give information on special pod-to-pod connections when certain configuration files are used.

Note

(1)	E2411B file PI486_04 2411B probe label to 1660 pod to 1661 pod	P6 BURST 4 4	P5 ADDR 8 6	P4 ADDR 7 5	P3 DATA 3 3	P2 DATA 2 2	P1 STAT 1 1	
(2)	E2403A file UI_486_21 E2403A probe label to 1660 pod	J7 STAT_1 7	J6 STAT_2 8	J5 ADDR 3	J4 STAT_3 5	J3 ADDR 4	J2 DATA 1	J1 DATA 2
(3)	E2403A file UI_486_19 E2403A probe label to 1660 pod	J7 STAT_1 1	J6 STAT_2 4	J5 ADDR 5	J4 STAT_3 7	J3 ADDR 6	J2 DATA 2	J1 DATA 3
(4)	E2403A file UI_486_20 E2403A probe label to 1660 pod to 1661 pod	J7 STAT_1 7 5	J6 STAT_2 8 6	J5 ADDR 3 3	J3 ADDR 4 4	J2 DATA 1 1	J1 DATA 2 2	
(5)	E2403A file UI_486_15 E2403A probe label to 1660 pod to 1661 pod	J7 STAT_1 7 5	J5 ADDR 3 3	J3 ADDR 4 4	J2 DATA 1 1	J1 DATA 2 2		
(6)	10314D files F80386D_1 F80386D_87 C80386D_1 C80386D_87 10269C probe label to 1660 pod to 1661 pod	5 STAT 7 5	4 ADDR 4 4	3 ADDR 3 3	2 DATA 2 2	1 DATA 1 1		

Probing

Note

(7)	E2409B file F80286S					
	10269C probe label	5	4	3	2	1
		T_CONT	T_DATA	STAT/ ADDR	ADDR	DATA
	to 1660	8	7	4	3	1
	to 1661	6	5	4	3	1
	to 1662	-	-	4	3	1
(8)	E2409B file F80286S					
	E2409A file F80286_S					
	10269C probe label	5	4	3	2	1
		T_CONT	T_DATA	STAT/ ADDR	ADDR	DATA
	to 1660	7	4	2	1	3
	to 1661	5	4	2	1	3
	to 1662	-	4	2	1	3
(9)	E2409B file F80286T					
	10269C probe label	5	4	3	2	1
		T_CONT	T_DATA	STAT/ ADDR	ADDR	DATA
	to 1660	8	7	2	1	-
	to 1661	6	5	4	3	-
	to 1662	-	1	4	3	-
(10)	E2409B file F80286T					
	10269C probe label	5	4	3	2	
		T_CONT	T_DATA	STAT/ ADDR	ADDR	
	to 1660	7	4	2	1	
	to 1661	5	4	2	1	
	to 1662	-	4	2	1	
(11)	E2409A file C80286_T					
	10269C probe label	5	4	3	2	
		T_CONT	T_DATA	STAT/ ADDR	ADDR	
	to 1660	6	5	8	7	
	to 1661	6	5	4	3	
	to 1662	4	3	2	1	

Note

(12)	10305B files C8086_I C8088_I 10269C probe label	1 DATA	3 ADDR	2 STAT/ ADDR					
	to all 166x pod	3	2	1					
(13)	E2412A file F_i860XP E2412A probe label	P9 ADDR	P8 ADDR	P7 STAT	P6 DATA_B	P5 DATA_B	P3 DATA	P2 DATA	P1 STAT
	to 1660 pod	6	5	2	8	7	4	3	1
(14)	E2435A file i860XR1 E2435A probe label	P7 DATA_B	P6 DATA	P5 DATA	P4 DATA_B	P3 ADDR	P2 ADDR	P1 STAT	
	to 1660 pod	5	8	7	2	4	3	1	
(15)	E2432A file PI960CA_03 E2432A probe label	P7 DREQ	P6 XINT	P5 ADDR	P4 ADDR	P3 DATA	P2 DATA	P1 STAT	
	to 1660 pod	7	4	6	5	3	2	1	
	to 1661 pod	-	4	6	5	3	2	1	
(16)	E2432A file PI960CA_02 E2432A probe label	P7 DREQ	P6 XINT	P5 ADDR	P4 ADDR	P3 DATA	P2 DATA	P1 STAT	
	to 1660 pod	7	6	4	3	5	2	1	
	to 1661 pod	-	6	4	3	5	2	1	
(17)	E2415A files FRUPI44 FMCS51 10269C probe label	5 PORT1	3 STAT	2 ADDR	1 DATA				
	to 1660 pod	8	7	3	1				
	to 1661 pod	6	5	3	1				
	to 1662 pod	4	2	3	1				

Probing

Note

(18)	E2420B files F68040 C68040 E2420B probe label to 1660 pod to 1661 pod	P5 STAT 7 5	P4 DATA 4 4	P3 DATA 3 3	P2 ADDR 2 2	P1 ADDR 1 1	
(19)	E2406A files F68030 C68030_I 10316G files F68030 C68030_IP probe label to 1660 to 1661	P5 ADDR 4 4	P4 ADDR 3 3	P3 STAT 7 5	P2 DATA 2 2	P1 DATA 1 1	
(20)	E2426A,B files F68020 FEC020 C68020_IP E2426A,B probe label to 1660 pod to 1661 pod	P6 IPL 8 6	P5 STAT 7 5	P4 ADDR 4 4	P3 ADDR 3 3	P2 DATA 2 2	P1 DATA 1 1
(21)	10311B,G files C68000_I C68010_I C68000_P C68010_P 10311B,G probe label to all 166x pod	3 STAT/ ADDR 2	2 ADDR 1	1 DATA 3			
(22)	10310B files C68008_I C68008_P 10269C probe label to all 166x pod	3 STAT/ ADDR 2	2 ADDR 1	1 DATA 3			

Note

(23)	E2424B file F68340					
	E2424B probe	P5	P4	P3	P2	P1
	label	STAT	ADDR	ADDR	-	DATA
	to 1660 pod	7	4	3	-	1
	to 1661 pod	5	4	3	-	1
to 1662 pod	2	4	3	-	1	
(24)	E2424B file FEV340					
	68340 EVS probe	P5	P4	P3	P2	P1
	label	STAT	ADDR	ADDR	-	DATA
	to 1660 pod	7	4	3	-	1
	to 1661 pod	5	4	3	-	1
to 1662 pod	2	4	3	-	1	
(25)	E2424A file C68340					
	68340 EVS probe	P5	P4	P3	P2	P1
	label	STAT	ADDR	ADDR	-	DATA
	to all 166x probe	4	2	1	-	3
(26)	E2413B file F68332					
	E2413B probe	P6	P5	P4	P3	P2
	label	IRQ	STAT	ADDR	ADDR	P2
	to 1660 pod	8	7	4	3	2
	to 1661 pod	6	5	4	3	2
to 1662 pod	-	2	4	3	-	
(27)	E2413B file F68332					
	E2413B probe	P5	P4	P3	P2	P1
	label	STAT	ADDR	ADDR	-	DATA
	to all 166x pod	4	2	1	-	3
(28)	E2414B file F68302					
	E2414 B probe	P4	P3	P1		
	label	STAT/ ADDR	ADDR	DATA		
	to 1660 pod	7	3	1		
	to 1661 pod	5	3	1		
to 1662 pod	3	2	1			
(29)	E2414B file C68302					
	E2414 B probe	P4	P3	P1		
	label	STAT/ ADDR	ADDR	DATA		
	to all 166x pod	2	1	3		

Probing

Note

(30)	E2414B file E68302_6 E2414 B probe label	P6 WDOG	P5 IACK	P4 STAT/ ADDR	P3 ADDR	P2 IPL	P1 DATA
	to 1660 pod	8	4	2	1	7	3
	to 1661 pod	6	4	2	1	5	3
	to 1662 pod	-	4	2	1	-	3
(31)	E2419A file FHC16 E2419A probe label	P6 P6	P5 STAT	P4 ADDR	P3 ADDR	P2 P2	P1 DATA
	to 1660 pod	8	7	4	3	2	1
	to 1661 pod	6	5	4	3	2	1
	to 1662 pod	-	2	4	3	-	1
(32)	E2423A file FSCSI2 E2423A probe label	2 DATA	1 STAT				
	to 1660 pod	3	1				
	to 1661 pod	3	1				
	to 1662 pod	3	1				
	to 1663 pod	2	1				
(33)	10342B file FHPIB 10269C probe label	3 DI08	2 DATA/ STAT				
	to all 166x pod	2	1				
(34)	E2441A file FE2441S E2441A probe label	P6 IRQ	P5 STAT	P4 ADDR	P3 ADDR	P2 DATA	P1 DATA
	to 1660 pod	8	7	4	3	2	1
	to 1661 pod	6	5	4	3	2	1
(35)	E2442A file D_320C5x E2442A probe label	P5 Serial	P4 JTAG	P3 ADDR	P2 STAT	P1 DATA	
	to 1660 pod	4	2	7	3	1	
	to 1661 pod	4	2	5	3	1	
	to 1662 pod	4	-	2	3	1	

Note

(36)	E2442A file E_320C5x E2442A probe label to 1660 pod to 1661 pod	P4 JTAG 5 -	P3 ADDR 7 5	P2 STAT 3 3	P1 DATA 1 1				
(37)	E2431A file R_320C30 E2431A probe label to 1660 pod	P7 STAT/ ADDR_B 7	P6 DATA_B 8	P5 DATA_B 5	P4 STAT/ ADDR 4	P3 ADDR 3	P2 DATA 2	P1 DATA 1	
(38)	E2431A file I_320C30 E2431A probe label to 1660 pod	P7 STAT/ ADDR_B 5	P6 DATA_B 7	P5 DATA_B 6	P4 STAT/ ADDR 2	P3 ADDR 1	P2 DATA 4	P1 DATA 3	
(39)	E2431A file Q_320C30 E2431A probe label to 1660 pod to 1661 pod to 1662 pod	P7 STAT/ ADDR 7 5 1	P6 DATA 4 4 4	P5 DATA 3 3 3					
(40)	E2431A file B_320C30 E2431A probe label to all 166x pod	P7 STAT/ ADDR 3	P6 DATA 2	P5 DATA 1					
(41)	E2418A file F320C25 E2418A probe label to 1660 pod to 1661 pod	J3 STAT 7 5	J2 ADDR 3 3	J1 DATA 1 1					
(42)	E2438A file F_R4K E2438A probe label to 1660 pod	P8 DATA_B 2	P7 DATA_B 1	P6 ADDR 6	P5 ADDR 5	P4 DATA 8	P3 DATA 7	P2 STAT 4	P1 STAT 3

Probing

Note

(43)	E2401A files FR3KA FR3KB FR3KC E2401A probe label to 1660 pod	P7 STAT 5	P6 ADDR 8	P5 ADDR 7	P4 STAT 4	P3 DATA 3	P2 DATA 2	P1 STAT 1
(44)	10342G file CHPIB_G timing to 1660 pod to 1661 pod to 1662 pod	(Either 6 6 4	Probe)					

General-Purpose Probing System Description

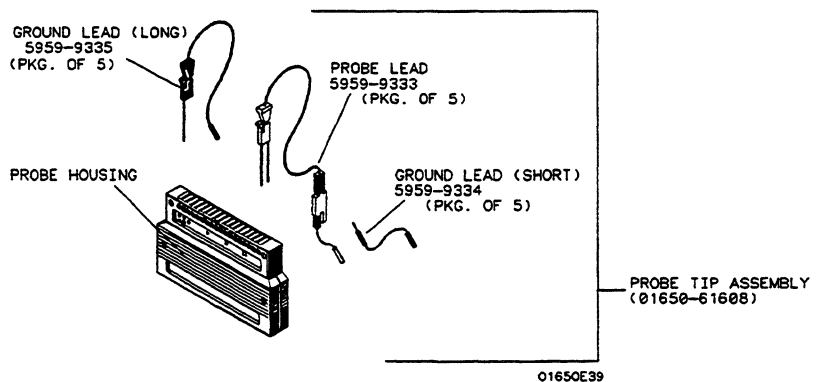
The standard probing system provided with the logic analyzer consists of a probe tip assembly, probe cable, and grabbers. Because of the passive design of the probes, there are no active circuits at the outer end of the cable. The rest of this chapter is dedicated to general-purpose probing.

The passive probing system is similar to the probing system used with high-frequency oscilloscopes. It consists of a series RC network (90 k Ω in parallel with 8 pF) at the probe tip, and a shielded, resistive transmission line. The advantages of this system include the following:

- 250 Ω in series with 8-pF input capacitance at the probe tip for minimal loading.
- Signal ground at the probe tip for high-speed timing signals.
- Inexpensive, removable probe tip assemblies.

Probe Tip Assemblies

Probe tip assemblies allow you to connect the logic analyzer directly to the target system. This general-purpose probing is useful for discrete digital circuits. Each probe tip assembly contains 16 probe leads (data channels), 1 clock lead, a pod ground lead, and a ground tap for each of the 16 probe leads.



Probe Tip Assembly

Probing

General-Purpose Probing System Description

Probe and Pod Grounding

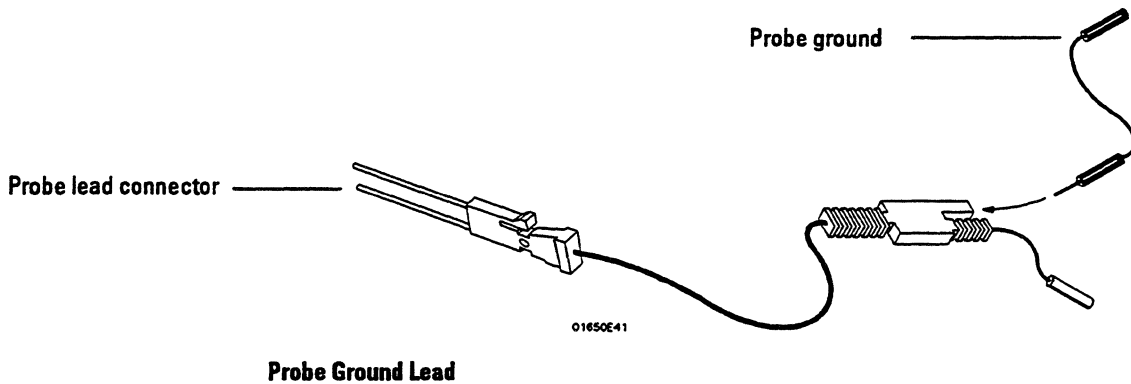
Each pod is grounded by a long, black, pod ground lead. You can connect the ground lead directly to a ground pin on your target system or use a grabber. To connect the ground lead to grounded pins on your target system, you must use 0.63-mm (0.025-in) square pins, or use round pins with a diameter of 0.66 mm (0.026 in) to 0.84 mm (0.033 in). The pod ground lead must always be used.

Each probe can be individually grounded with a short black extension lead that connects to the probe tip socket. You can then use a grabber or the grounded pins on your target system in the same way you connect the data lines.

When probing signals with rise and fall times of ≤ 1 ns, grounding each probe lead with the 2-inch ground lead is recommended. In addition, always use the probe ground on a clock probe.

Probe Leads

The probe leads consists of one 12-inch, twisted-pair cable; one ground tap; and one grabber. The probe lead, which connects to the target system, has an integrated RC network with an input impedance of 100 k Ω in parallel with approximately 8 pF, and all in series with 250 Ω . The probe lead has a two-pin connector on one end that snaps into the probe housing.



Grabbers

The grabbers have a small hook that fits around the IC pins and component leads. The grabbers have been designed to fit on adjacent IC pins on either through hole or surface mount components with lead spacing greater than or equal to 0.050 inches.

Probe Cable

The probe cable contains 18 signal lines, 17 chassis ground lines and two power lines for preprocessor use. The cables are woven together into a flat ribbon that is 4.5 feet long. The probe cable connects the logic analyzer to the pods, termination adapter, HP 10269C General-Purpose Probe Interface, or preprocessor. Each cable is capable of carrying 0.33 amps for preprocessor power.

CAUTION

DO NOT exceed this 0.33 amps per cable or the cable will be damaged.

Preprocessor power is protected by a current limiting circuit. If the current limiting circuit is activated, the fault condition must be removed. After the fault condition is removed, the circuit will reset in one minute.

Minimum Signal Amplitude

Any signal line you intend to probe with the logic analyzer probes must supply a minimum voltage swing of 500 mV to the probe tip. If you measure signal lines with a voltage swing of less than 500 mV, you may not obtain a reliable measurement.

Maximum Probe Input Voltage

The maximum input voltage of each logic analyzer probe is ± 40 volts peak.

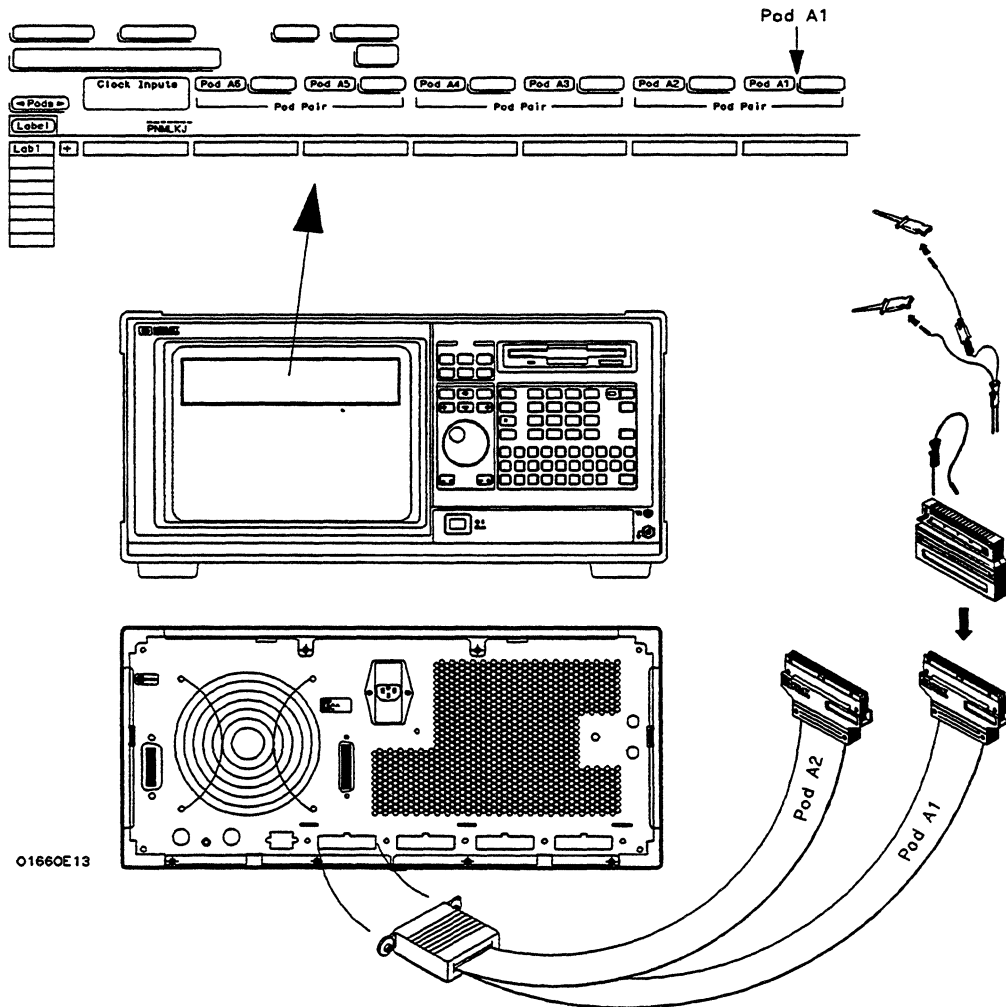
Pod Thresholds

Logic analyzer pods have two preset thresholds and a user-definable pod threshold. The two preset thresholds are ECL (-1.3 V) and TTL ($+1.5$ V). The user-definable threshold can be set anywhere between -6.0 volts and $+6.0$ volts in 0.05 volt increments.

All pod thresholds are set independently.

Assembling the Probing System

The general-purpose probing system components are assembled as shown to make a connection between the measured signal line and the pods displayed in the Format menu.



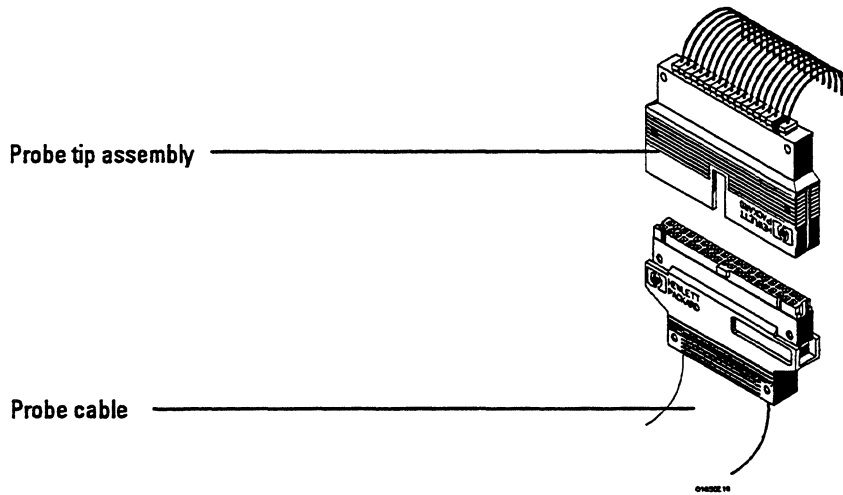
Connecting Probe Cables to the Logic Analyzer

Connecting Probe Cables to the Logic Analyzer

All probe cables are installed at Hewlett-Packard. If you need to replace a probe cable, refer to the Service Guide that is supplied with the logic analyzer.

Connecting the Probe Tip Assembly to the Probe Cable

To connect a probe tip assembly to a cable, align the key on the cable connector with the slot on the probe housing and press them together.



Connecting Probe Tip Assembly

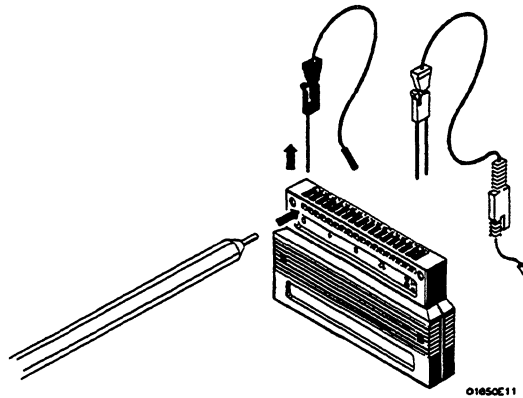
Probing Assembling the Probing System

Disconnecting Probe Leads from Probe Tip Assemblies

When you receive the logic analyzer, the probe leads are already installed in the probe tip assemblies. To keep unused probe leads out of your way during a measurement, you can disconnect them from the pod.

To disconnect a probe, insert the tip of a ball-point pen into the latch opening. Push on the latch while gently pulling the probe out of the pod connector as shown in the figure.

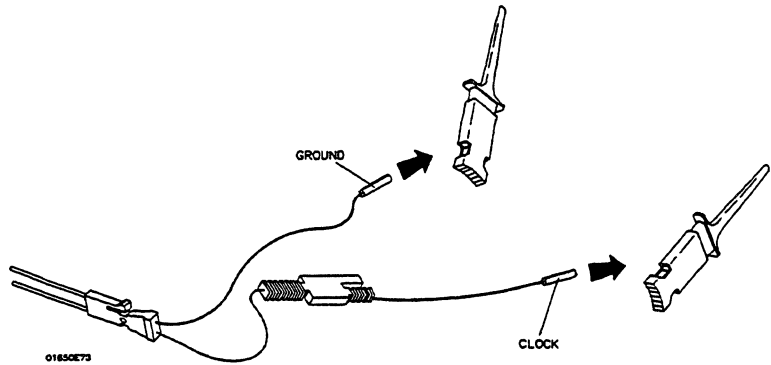
To connect the probes into the pods, insert the double pin end of the probe into the probe housing. Both the double pin end of the probe and the probe housing are keyed so they will fit together only one way.



Installing Probe Leads

Connecting the Grabbers to the Probes

Connect the grabbers to the probe leads by slipping the connector at the end of the probe onto the recessed pin located in the side of the grabber. If you need to use grabbers for either the pod or the probe grounds, connect the grabbers to the ground leads in the same manner.

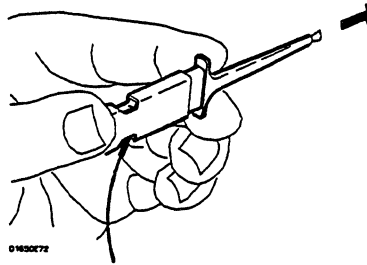


Connecting Grabbers to Probes

Probing
Assembling the Probing System

Connecting the Grabbers to the Test Points

The grabbers have a hook that fits around the IC pins and component leads. Connect the grabber to the test point by pushing the rear of the grabber to expose the hook. Hook the lead and release your thumb as shown.



Connecting Grabbers to Test Points

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Using the Front-Panel Interface

The Front-Panel Interface

This chapter explains how to use the front-panel user interface. The front and rear-panel controls and connectors are explained in the first part of this chapter followed by a series of "How to Use" examples.

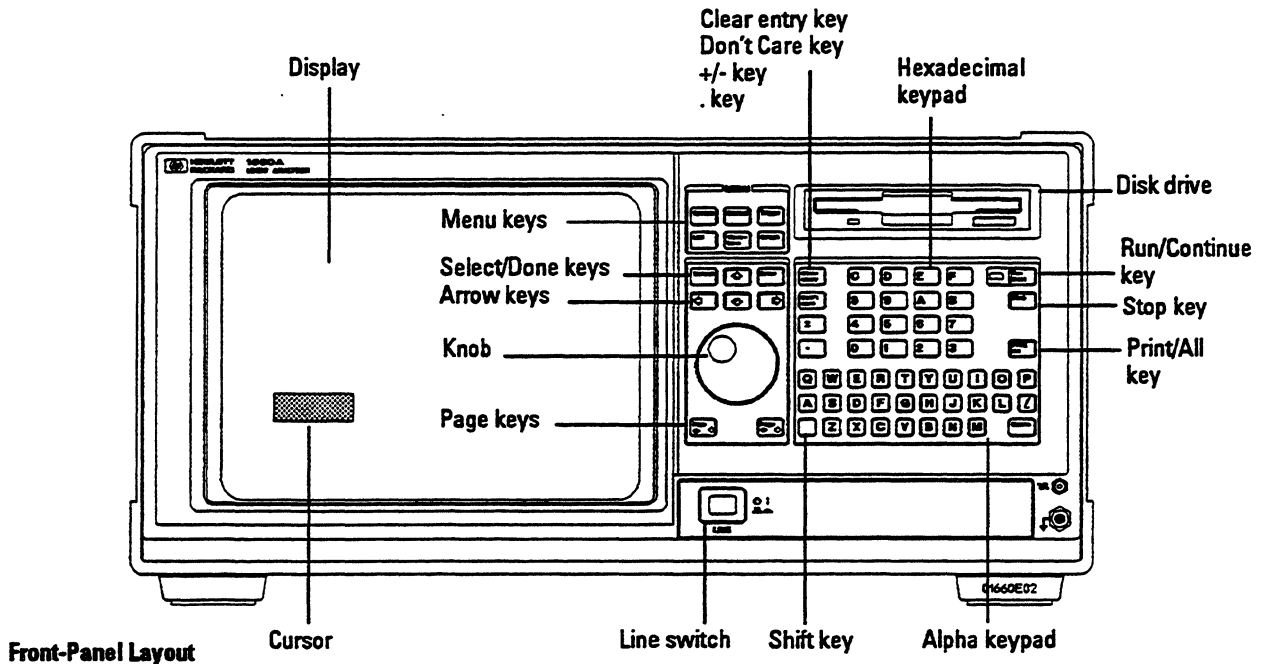
The front-panel interface consists of front-panel keys, a knob, and a display. The interface allows you to configure the instrument by moving between menus and setting parameters within the menus. The interface then displays the measurement results. In general, using the front-panel interface involves the following processes:

- Selecting the desired menu with the MENU keys.
- Placing the cursor on the desired field using the arrow keys and by rotating the knob.
- Selecting and displaying the field options or current data by pressing the Select key.
- If necessary, selecting lower level options or entering new data by using the knob, arrow keys, or the keypad.
- Starting and stopping data acquisition by using the Run and Stop keys.

If you want to step through the examples on using the interface, simply turn the power Off, then back On. Start with the section, "How to Select Analyzer Menu."

Front-Panel Controls

In order to apply the user interface quickly, you should know what the following front-panel controls do.



The Cursor

The cursor (inverse video field) highlights interactive fields within the menus that you want to use. Interactive fields are enclosed in boxes in each menu. When you rotate the knob or press the arrow keys, the cursor moves from one field to another.

MENU Keys

The menu keys allow you to quickly select the main Analyzer menus or the System menus in the logic analyzer. These keys are System, Config, Format, Trigger, List, and Waveform.

System Menu Key The System key allows you to access the System subset menus. The subset menus are the Disk, RS-232 / HP-IB, Utilities, and Test menus.

Config Menu Key The Configuration menu key accesses the Configuration menu. The Configuration menu is used to turn on analyzers, name the analyzers, and assign pod pairs to the analyzers.

Format Menu Key The Format menu key accesses either the Timing Format or State Format menus. The menu accessed depends on the type of analyzers turned on and what analyzer was accessed last. The Format menu is used to select the acquisition mode, assign data channels and clocks within the pod pairs, select the threshold level, and set the clocking arrangement.

Trigger Menu Key The Trigger menu key accesses either the Timing Trigger or State Trigger menus. The menu accessed depends on the type of analyzers turned on and what analyzer was accessed last. The Trigger menu is used to build the data qualifying and trigger instructions.

List Menu Key The List menu key accesses either the Timing Listing or the State Listing menus. In addition, if the List key is pressed a second time, the Compare and Mixed Display menus become available. The available menus depend on the type of analyzers turned on and what analyzer was accessed last. The Listing menu displays state or timing data, in a list format, at each clock cycle in the system under test. Reference markers are also set in the Listing menu.

Waveform Menu Key The Waveform menu key accesses either the Timing Waveform or State Waveform menus. In addition, if the Waveform key is pressed a second time, the Chart and Mixed Display menus become available. The available menus depend on the type of analyzers turned on and what analyzer was accessed last. The Waveform menu displays state or timing data in an oscilloscope-type format with time on one axis and logic highs and lows on the other axis.

Select Key

The Select key initiates an interface action that is dictated by the field currently highlighted. The highlighted field could be an option field within a pop-up, a toggle field, an assignment field, or a Done field. For example, if the field is a Done field, you just press the Select key to finish that task.

When option fields are selected, they either save the highlighted selection into the configuration, or they access other pop-ups requiring another selection or assignment. When you select an option, the pop-up either closes automatically with the Select key or it closes when you select the Done field.

When toggle fields are selected, the field will automatically switch to the other choice.

When you select an assignment field, it opens. When the Select key is pressed in an opened assignment field, either a highlighted option is assigned, or keypad entries are assigned. Then the assignment field closes.

Done Key

The Done key stops any field selection and assignment actions by saving the current selections and closing the opened pop-up. In some fields, its action is the same as the Select key.

Arrow Keys

The arrow keys move the cursor around the menu in a horizontal and vertical direction, according to the direction of the arrow.

Knob

The knob has four major functions, depending on what field or pop-up menu you are in. The knob allows you to do the following:

- Increment/decrement numeric values in numeric pop-up menus. Roll the offscreen display containing such things as data listings, the resource term list, sequence level list, or labels. Depending on what display is rolled, the direction can be left, right, up, or down.
- Move the cursor from option to option within a selection list.
- Move the cursor from field to field within an assignment field.

Page Keys

The Page keys roll offscreen display data such as pods, labels, resource terms, data listings, and waveforms one screen at a time. To roll data in an up and down direction, press the up or down Page keys. To roll data in a left to right direction, press the blue shift key prior to the left or right Page key. When the blue shift key is pressed followed by a left or right arrow key, only one page roll occurs. For multiple left or right paging, you must repeat the two-key process.

If there are multiple items in a menu that need paging, the field containing the item name turns dark indicating it is rollable. The Page keys work independent of the knob. If there are up and down rollable data, simply press the up or down front-panel Page keys. If there are left and right rollable data, press the blue shift key, then the left or right Page key (Shift+Page). This two-key sequence is repeated for each paged screen.

Run/Rep Key

The Run key starts a data acquisition in any run mode you specify. After the acquisition, the analyzer (state or timing) is automatically forced into the last display menu accessed.

To start a single run, press the Run/Rep key. To start a Repetitive run, press the blue shift key, then press the Run/Rep key.

Stop key

The Stop key allows you to stop data acquisition or printing. After the acquisition is stopped, the data displayed onscreen depends on which run mode (single or repetitive) was used to acquire the data. In the repetitive mode, Stop halts acquisition after the last completed single acquisition cycle. In single mode, Stop causes the single data acquisition to be aborted and partial data is displayed. If you print a hard copy, the Stop key stops the print.

Print/All Key

The Print/All key starts a hard copy print of the screen and any data that appears on that screen. To print all data that is offscreen, press the blue shift key prior to pressing the Print/All key.

Don't Care Key

The Don't Care key allows you to enter don't cares (Xs) in binary, octal, and hexadecimal pattern assignment fields. In Alpha Entry fields, this key enters a space and moves the underscore marker to the next space.

Clear Entry Key

The Clear entry key allows you to clear assignment fields of alpha entries, channel assignments, and numeric entries. When you press the Clear entry key in an alpha assignment field, a cursor appears that indicates the start point for new alpha entry.

 \pm Key

The \pm key allows you to change the sign (\pm) of numeric variables.

. (period) Key

The period key allows you to enter a period in a numeric entry, turn off a channel assignment, or enter a period in an alpha assignment.

Hexadecimal Keypad

The hexadecimal keypad allows you to enter numeric values in numeric entry fields. You enter values in the four number bases Binary, Octal, Decimal, and Hexadecimal. The A through F keys are used for both hexadecimal and alpha character entries.

Alpha Keypad

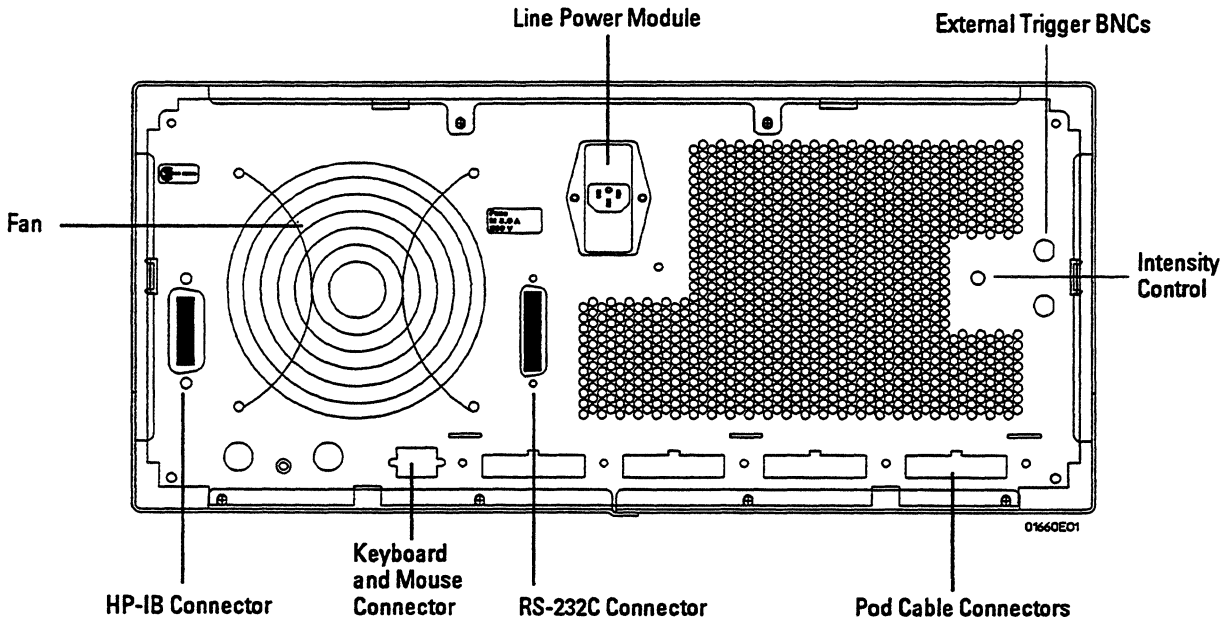
The alpha keypad allows you to enter letters in alpha entry fields. You enter letters in fields where a custom name is desired.

Disk Drive

The disk drive is a 3.5 inch, double-sided, double density drive. Besides loading the operating system, it allows you to store and load logic analyzer configurations and inverse assembler files. There is a disk eject button located on the right side. Press this button to eject a flexible disk from the disk drive. The disk drive also has an indicator light. This light is illuminated when the disk drive is operating. Wait until this light is out before removing or inserting disks.

Rear-Panel Controls and Connectors

In order to apply the user interface quickly, you should know what the following front-panel controls do:



Rear Panel Layout

Line Power Module

Permits selection of 110-120 or 220-240 Vac and contains the fuses for each of these voltage ranges.

External Trigger BNCs

The External Trigger BNCs provide arm out and arm in connections. When the Arming Control is configured in the Trigger menu, the Arm In signal enters through the External Trigger In BNC and the Arm Out signal generated by the analyzer leaves through the External Trigger Out BNC.

Intensity Control

Allows you to set the display brightness to a comfortable level.

Pod Cable Connectors

These are keyed connectors for connecting the pod cables. Depending on the analyzer model, you will see a different number of pod cables.

RS-232C Connector

Standard DB-25 type connector for connecting an RS-232C printer or controller.

HP-IB Connector

Standard HP-IB connector for connecting an HP-IB printer or controller.

Keyboard and Mouse Connector

Standard HP keyboard/mouse connector for connecting an optional keyboard and/or mouse.

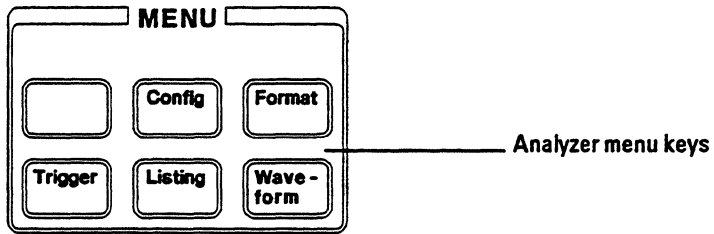
Fan

Provides cooling for the logic analyzer. Make sure air is not restricted from the fan and rear-panel openings.

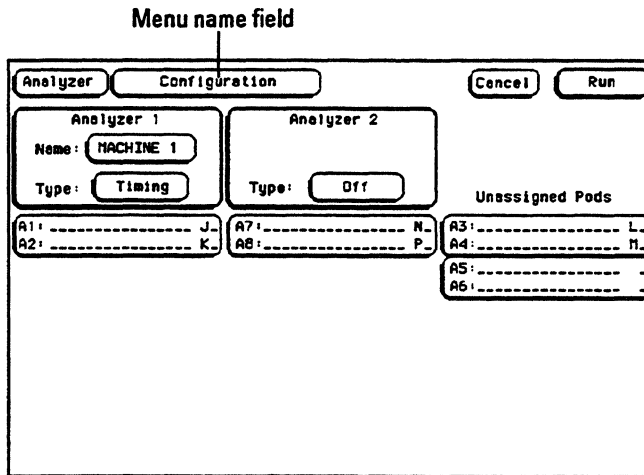
How to Select the Analyzer Menu

There are two ways of selecting the Analyzer menus.

- 1 Press any one of the five front-panel Analyzer MENU keys.



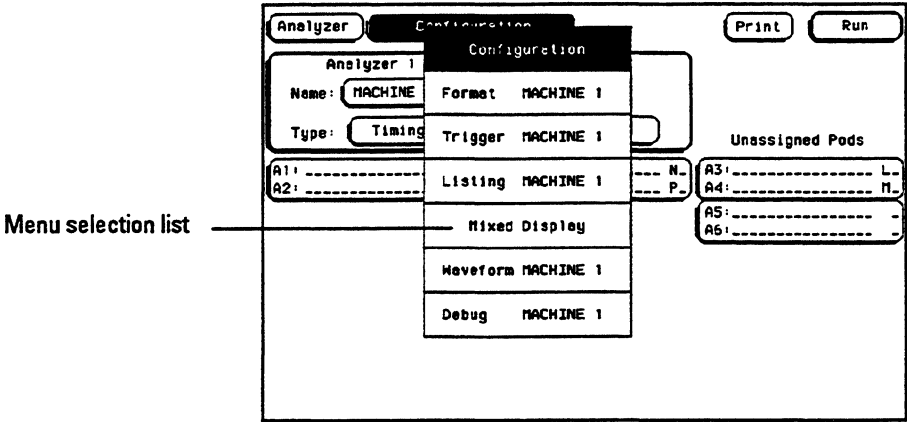
- 2 Or, press the front-panel arrow keys and move the cursor to the menu Name field as shown below, then press the Select key.



Menu Name Field

- 3. Press the **Up/Down arrow keys** or turn the knob to highlight the desired menu name as shown below, then press the **Select** key.

In many applications, both analyzers are turned on. In these cases, if a front-panel MENU key is pressed twice, all corresponding menus for that MENU key become available.

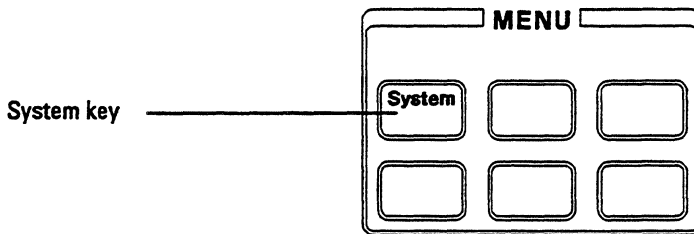


Complete Menu Selection List

How to Select the System Menu

One of the six MENU keys is the System key. You use the System key to access a set of menus that are used to configure system level parameters for the I/O bus, clock, display, and the disk drive operations. To access the menus under the System key, perform the following steps:

- 1 Press the **System MENU** key.



- 2 Press the **arrow** keys to highlight the menu Name field, then press the **Select** key.
- 3 Press the **Up/Down arrow** keys or turn the knob to highlight the desired System menu name as shown below, then press the **Select** key.

Menu name field

System
Print

Disk
 RS-232 / HP-IB

Load
from file
ROM1

Utilities

Execute

Filename	File	e	Description
	Test		
RDH1	166X_system_0	117248	HP166X ROM Software V05.01
SYSTEM1	166X_system_1	214784	HP166X System Software V11.11
SYST_032	166X_020_syst	430848	100MHz State/500MHz Time V05.1C

Disk Space(blocks) - Total: 6077 Free: 3097 Largest: 3097

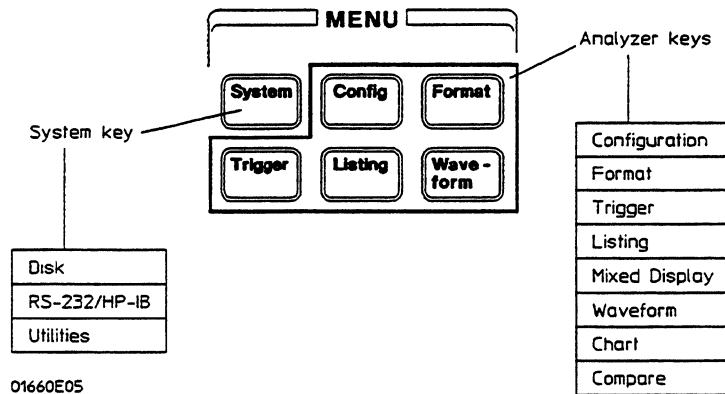
System menu Selection List

System Menus Selection List

To return to one of the Analyzer menus, do the following:

4 Press any of the five Analyzer MENU keys.

Another way to look at the System menu set and the Analyzer menu set is shown.



System vs Analyzer Menu Sets

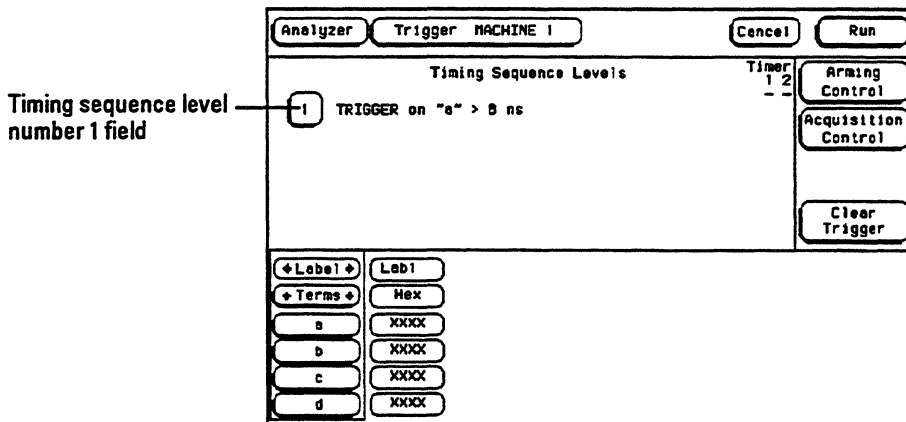
How to Select Fields

The process of selecting individual fields within the main menu is simply to highlight the desired field and then press the Select key. However, depending on what type of field you select, you will either see a pop-up menu appear, or will see an immediate assignment in a toggle type field.

Pop-up Menus

The pop-up menu is the most common type of menu you see when you select a field. When a pop-up appears, you see a list of two or more options. The pop-up closes after at least one of the options are selected. The following example guides you through field selection within a pop-up menu.

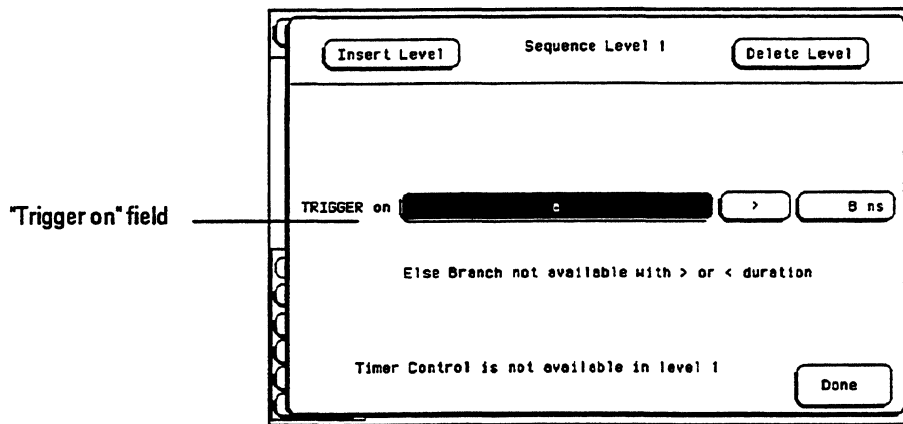
- 1 Press the front panel **Trigger MENU** key.
- 2 Press the **arrow** keys to highlight the sequence level 1 field as shown, then press the **Select** key.



Sequence Level 1

- 3 Press the **arrow** keys to highlight the "Trigger on" field as shown, then press the **Select** key.

A second pop-up appears with all the variable choices for the "Trigger on" field.



"Trigger on" Field

- 4 Press the **arrow** keys or turn the knob to highlight any variable field, then press either the front panel **Done** or **Select** keys.

Pop-up menus of this type do not contain a Done field. They close automatically when you press either the Select key or the Done key, but do not close the original pop-up.

- 5 To Close the original pop-up press the **Done** key.

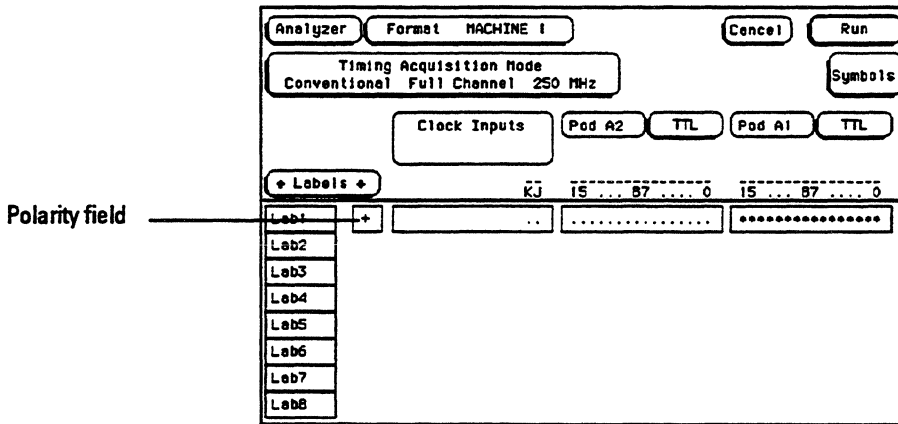
You can also close the original pop-up by moving the cursor to the Done field within the pop-up and pressing the Select key.

Toggle Fields

Some fields will simply toggle between two options (like, On/Off). The following example illustrates a toggle field in the Format menu.

- 1 Press the **Format MENU** key.
- 2 Press the **arrow keys** to highlight the **Polarity** field as shown below, then press the **Select** key.

The **Polarity** field toggles between positive (+) and negative (–) each time you press the **Select** key. You can also toggle this particular field with the front-panel \pm key.

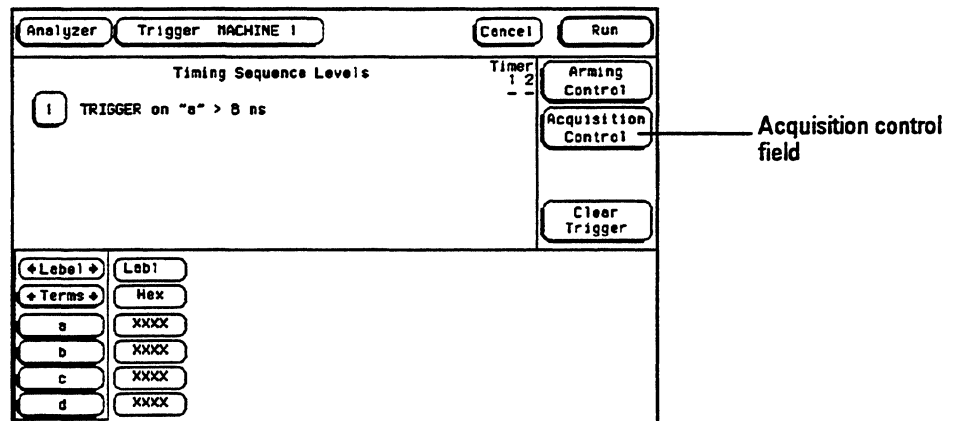


Polarity Toggle Field

How to Configure Options

With one exception, the process of selecting an option within a pop-up menu is the same as selecting any typical field in a main menu. When an option is selected, it may be necessary to access several pop-up menus before all the parameters of an option are configured. An example of selecting options is illustrated in the Trigger menu.

- 1 Press the **Trigger MENU** key.
- 2 Press the **arrow** keys to highlight the **Acquisition Control** field as shown, then press the **Select** key.



Acquisition Control Field

- 3 With the **Acquisition Mode Automatic** field highlighted, press the **Select** key.
By selecting the Acquisition Mode Automatic field, you toggle the field to manual operation where you can configure features like the trigger position and sample rate.
- 4 Press the **arrow** keys to highlight the **Trigger Position Field**, then press the **Select** key.
- 5 Press the **Up/Down arrow** keys or turn the knob to highlight a trigger position setting. Then, press the **Select** key.
- 6 To close the Acquisition Control pop-up, press the **Done** key.

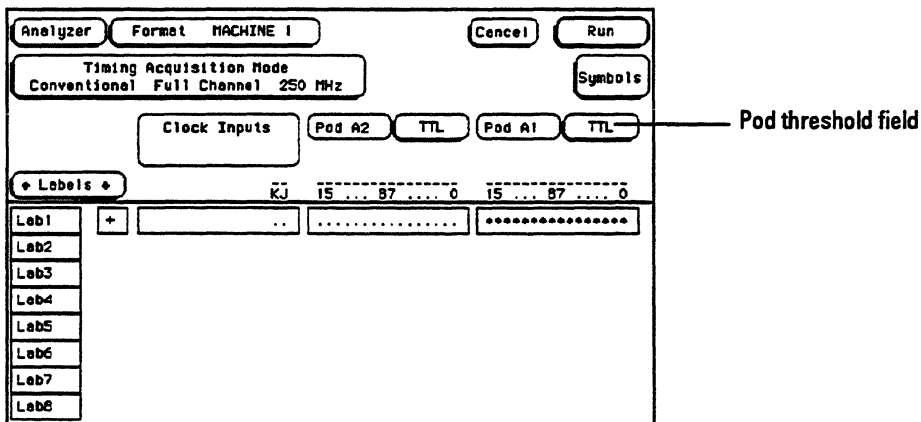
How to Enter Numeric Data

There are a number of pop-up menus in which you enter numeric data. The two major types are as follows:

- Numeric entry with fixed units.
- Numeric entry with variable units (for example, ms and μ s).

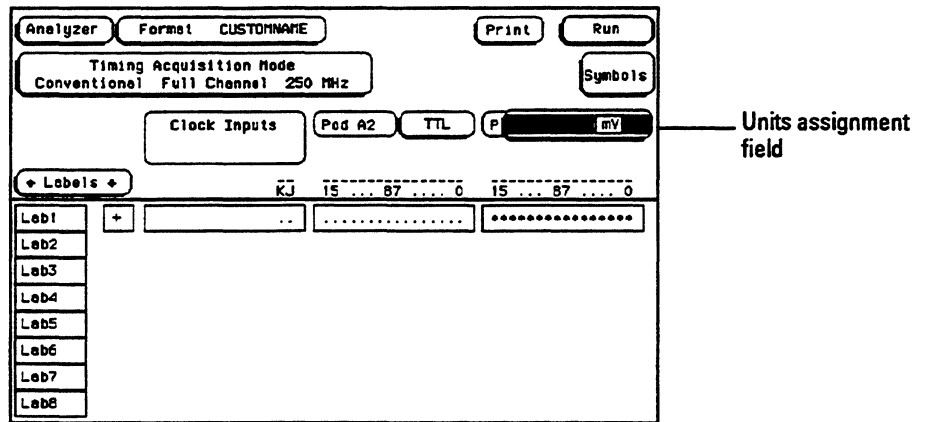
An example of a numeric entry menu in which you enter both the value and the units is the pod threshold pop-up menu.

- 1 Press the **Format MENU** key.
- 2 Press the **arrow** keys to highlight the pod threshold field as shown below, then press the **Select** key.



Pod Threshold Field

- 3 Press the **Up/Down arrow** keys or turn the knob to highlight the **User** field, then press the **Select** key.
- 4 Press the **arrow** keys or turn the knob to set the units assignment field to **V** or **mV** as shown below.



Units Assignment field

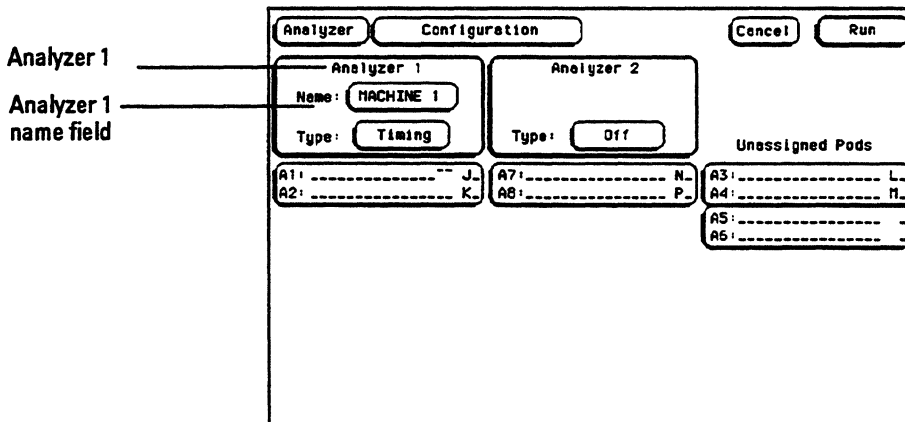
- 5 Enter a value using the Hex keypad. If you want a negative threshold voltage, press the \pm key on the front panel.
- 6 To close the numeric assignment field, press the **Select** or **Done** keys.

How to Enter Alpha Data

You can customize your analyzer configuration by giving names to several items:

- The name of each analyzer.
- Labels.
- Symbols.
- Filenames.
- File descriptions.

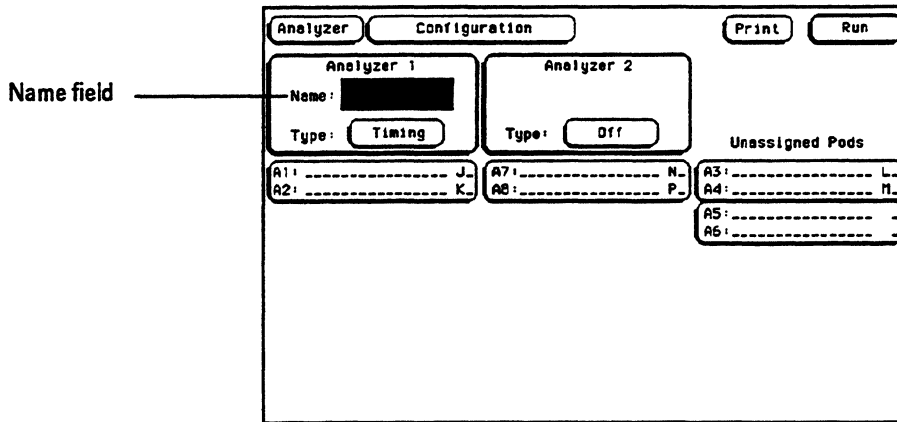
- 1 Press the **Config MENU** key.
- 2 Press the **arrow keys** to move the cursor to the Analyzer 1 "Name" field as shown.



Analyzer Name Field

3 Using the alpha keypad, enter a custom name as shown below.

A custom name can contain up to 10 letters. As you type the new name, the old name is overwritten.



Alpha Entry

4 When you are finished entering a custom name, press the **Done** or **Select** keys.

Changing Alpha Entries If you want to make changes or corrections in the alpha entry field, use the arrow keys or the knob to position the underscore marker under the character you want to change and type the new letters. To quickly clear the Name field, you can press the Clear entry key.

How to Roll Offscreen Data

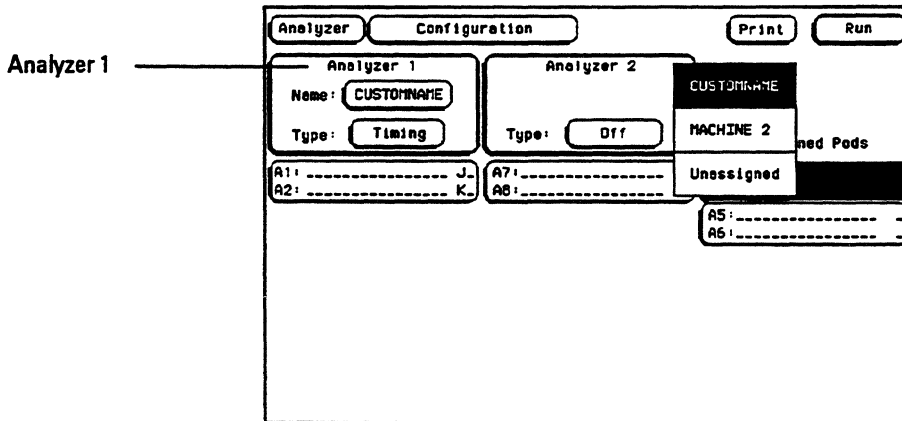
If there is offscreen data, it must be rolled back onscreen before it can be viewed or acted upon. The types of data you typically find located offscreen are Labels, Pods, Terms, Sequence Levels, and data listings. Each of the data types have a roll field. These roll fields indicate offscreen data by becoming a dark selectable field with small arrows showing the direction the data is rolled. In addition, a roll indicator appears that indicates which rollable field is currently active.

There are two ways to roll data. One is with the knob, the other is with the Page keys. The following exercise demonstrates both ways by first having you assign enough data to create offscreen data, then rolling the data.

Using the Knob

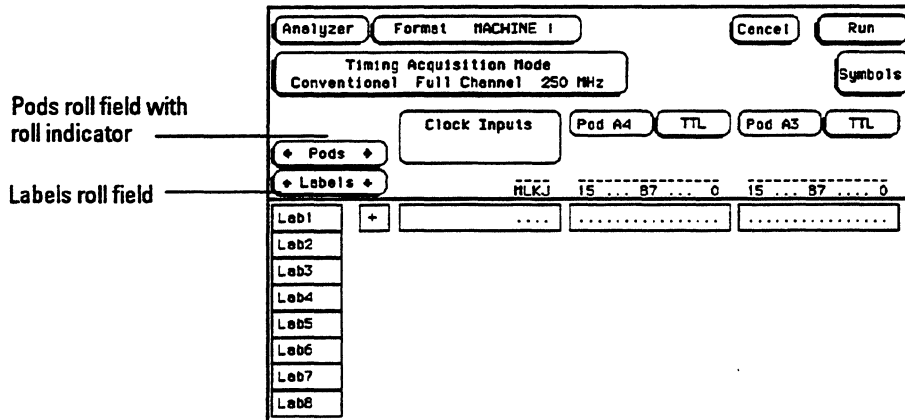
- 1 Press the **Config MENU** key.
- 2 Press the **arrow** keys to move the cursor to the A3/A4 pod pair field in the Unassigned Pods list, then press the **Select** key.
- 3 Press the **Up/Down arrow** keys or rotate the knob to move the cursor to the custom name for Analyzer 1 as shown below, then press the **Select** key.

You should now have pod pairs A1/A2 and A3/A4 assigned to Analyzer 1.



Configuration menu

- 4 Press the **Format MENU** key.
- 5 Notice the roll indicator in the Pods roll field as shown. Rotate the knob and notice how pods A1 through A4 are rolled left and right.



Pods and Labels Roll Field

- 6 Press the **Down arrow** key to move the cursor to the **Labels** roll field directly below the Pods roll field, then press the **Select** key or just turn the knob.
- 7 Notice the roll indicator now switches to the Labels roll field. Rotate the knob and notice how the column of labels roll up and down.

Using the Page Keys

- 8 Press the **Up/Down Page** keys and notice how the column of labels page up and down.
- 9 Press the **Up arrow** key to move the cursor back to the Pods roll field, then press the **Select** key.
- 10 Press the **blue shift** key, then press a **Page** key.

The left and right page keys must be preceded by the blue shift key each time. Repeat this two key sequence to page the Pods left and right.

How to Use Assignment/Specification Menus

There are a number of assignment fields which you must assign or specify what you want the analyzer to do. Menus of this type are as follows:

- Assigning pod channels and clock channels to labels.
- Specifying patterns.
- Specifying edges.

Assigning Pod and Clock Channels

The channel assignment fields in both state and timing analyzers appear in the Format menus and work identically. It should be noted that if you don't see any channel assignment fields, it merely means you do not have any pods assigned to this analyzer or any labels turned on. The convention for channel assignments is as follows:

- * (asterisk) indicates assigned channels
- . (period) indicates un-assigned channels

To assign channels to an analyzer, do the following exercise:

- 1 Press the **Format MENU** key.
- 2 Press the **arrow** keys to move the cursor to the channel assignment field as shown below, then press the **Select** key.

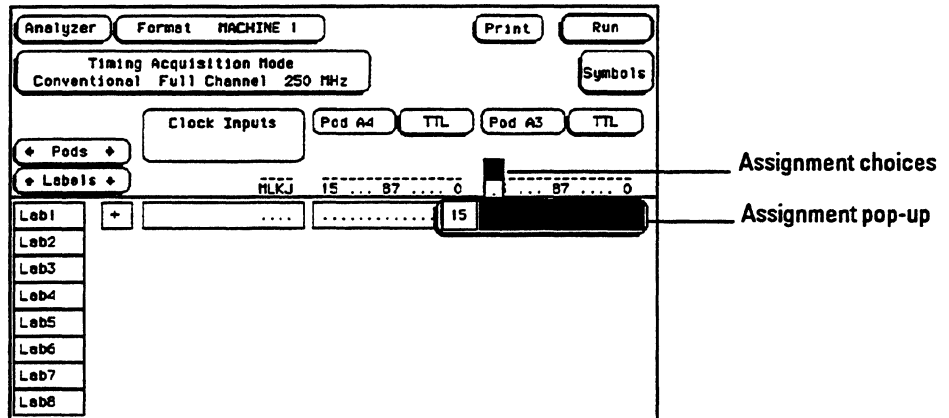
The screenshot shows the 'Format' menu for 'MACHINE 1'. At the top, there are buttons for 'Analyzer', 'Format', 'MACHINE 1', 'Cancel', and 'Run'. Below these, the 'Timing Acquisition Mode' is set to 'Conventional Full Channel 250 MHz', with a 'Symbols' button to the right. Under 'Clock Inputs', there are buttons for 'Pod A4', 'TTL', 'Pod A3', and 'TTL'. Below that are 'Pods' and 'Labels' dropdown menus. The main area contains a table for channel assignment:

	MLKJ	15 ... 87 ... 0	15 ... 87 ... 0
Lab1	+
Lab2			
Lab3			
Lab4			
Lab5			
Lab6			
Lab7			
Lab8			

Channel assignment field

Channel Assignment Field

When the channel assignment field is selected, an assignment pop-up appears showing you the bit or channel to be assigned, and the two choices directly above it.



Channel Assignment Pop-up

- 3 Turn all channels on (assign an asterisk) by either pressing the **Select** key or by pressing the **Up** arrow key.

Individual bits or channels are highlighted by moving the cursor side to side with the left/right arrow keys or by rotating the knob. The **Select** key toggles the current choice. The up arrow assigns a channel, and the down arrow unassigns a channel. In addition, the entire bank of channels are assigned or cleared by pressing the **Clear** entry key.

- 4 When you are finished assigning channels, press the **Done** key.

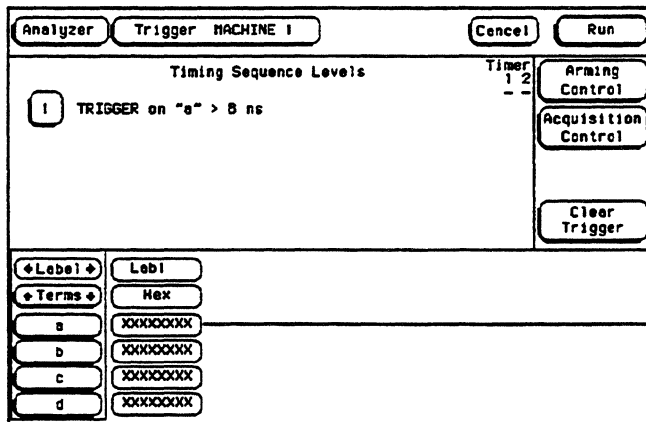
Specifying Patterns

Certain assignment fields require bit patterns to be specified. Patterns can be specified in any one of the available number bases, except ASCII. A pattern can contain a value or a "Don't care."

The convention for "Don't cares" in these menus is an "X" except in the decimal base. If the base is set to decimal after a "don't care" is specified, a \$ character is displayed.

To specify a pattern, perform the following exercise:

- 1 Press the **Trigger MENU** key.
- 2 Press the **arrow** keys to move the cursor to the assignment field for the "a" resource term as shown.



Resource term "a"
assignment field

Resource Term Assignment Field

- 3 Using the Hexadecimal keypad, enter a pattern, then press the **Select** key.

In addition to using the numeric keypad, you can enter "Don't cares" into the entire assignment field by pressing the Clear entry key.

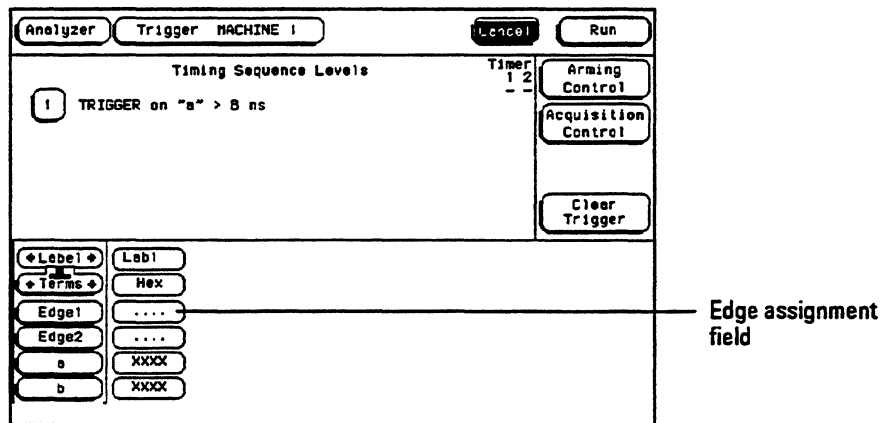
Specifying Edges

Certain assignment fields require edge assignments to be specified. An edge can be specified in any one of the available number bases.

You can select positive-going (\uparrow), negative-going (\downarrow), either edge (\updownarrow) or no edge (\cdot).

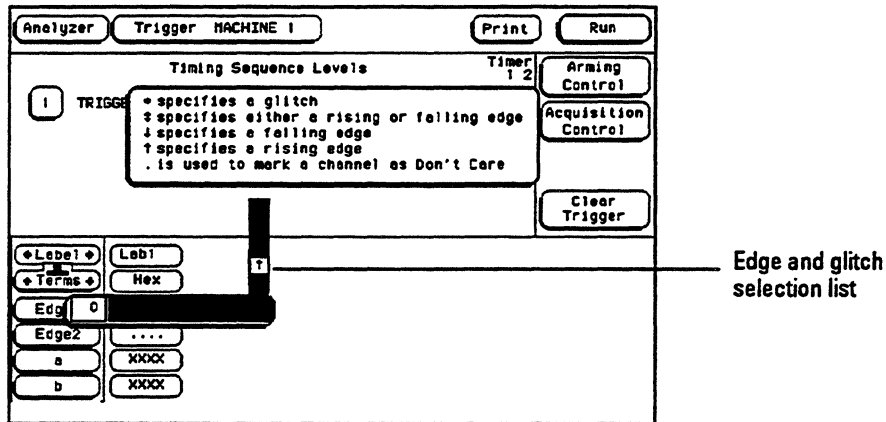
To specify an edge, perform the following exercise:

- 1 Press the **Trigger MENU** key.
- 2 Press the **arrow** keys to move the cursor to the Edge 1 assignment field as shown, then press the **Select** key.



Edge and Glitch Assignment Field

When the Edge and Glitch assignment field is selected, an assignment pop-up appears showing you the bit or channel to be assigned, and the five choices directly above it.



Edge and Glitch Selection List

- 3 Press the **Up/Down arrow** keys to move the cursor to the desired edge assignment, then press the **left/right arrow** key or turn the knob to move the cursor to the next channel. Repeat step 3 until the all desired channels are assigned.
- 4 To close the assignment field, press the **Done** key.

Individual bits or channels are cleared by pressing the front-panel (.) period key. The entire bank of channels are cleared by pressing the Clear entry key.

It should be noted that when you close the pop-up after specifying edges, you see dollar signs (\$ \$...) in the assignment field. This simply indicates the logic analyzer can't display the assignment correctly in the current number base selected.

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Using the Optional Keyboard and Mouse

The Keyboard and Mouse

This chapter explains how to use the optional keyboard interface (HP E2427A Keyboard Kit) and the optional mouse. The keyboard and mouse can be used interchangeably with the knob and front-panel keypad for all menu applications. The keyboard and mouse functions fall into the two basic categories of cursor movement and data entry.

Both the keyboard or mouse can be connected to the keyboard/mouse connector on the rear panel of the logic analyzer. If both are connected at the same time, the keyboard is connected to the analyzer and the mouse is connected to the keyboard.

When the keyboard and/or mouse is connected, a graphic is included in the RS-232 / HP-IB menu to represent the interface options being used.

See Also

The documentation that comes with each interface device for complete details on connecting to each other or, the logic analyzer.

Moving the Cursor

The keyboard cursor is the location on the screen highlighted in inverse video. To move the cursor, follow one of the methods described below.

Keyboard Cursor Movement

There are four cursor keys marked with arrows on the keyboard. These keys perform the following movements:

- Up-pointing arrow moves the cursor up.
- Down-pointing arrow moves the cursor down.
- Right-pointing arrow moves the cursor to the right.
- Left-pointing arrow moves the cursor to the left.

The cursor keys do not wrap. This means that pressing the right-pointing arrow when the cursor is already at the rightmost point in a menu will have no effect. The cursor keys do repeat, so holding the key down is the fastest way to continue keyboard cursor movement in a given direction.

Home Key (or corner arrow) If you want to move the cursor to the first item in a menu, press the Home key. If you want to move the cursor to the last item in a menu, press the Home and Shift keys simultaneously.

Next and Previous Keys The Next and Previous keys are used for paging through listings. The Next key will display the next page of data, if one exists. The Previous key will display the previous page of data, if one exists.

Selecting a Menu Item

To select a menu item using the optional keyboard, position the cursor (the location highlighted in inverse video) on the desired menu item using one of the methods described in the section “Moving the Cursor” and press either the Return or the Select key.

Using the Optional Keyboard and Mouse

Entering Data into a Menu

Mouse Cursor Movement

The mouse pointer (+) is positioned around the screen by moving the mouse about on top of a desktop.

Selecting a Menu Item To select a menu field, simply move the pointer on top of the desired field and press the upper-left button.

To duplicate the front-panel knob, hold down the upper-right button while moving the mouse around the desktop. Moving the mouse up or to the right duplicates turning the knob clockwise. Moving the mouse down or to the left duplicates turning the knob counterclockwise.

Entering Data into a Menu

Keyboard Data Entry

When an assignment field is selected, the cursor is displayed under the leftmost digit in the particular field. When you type in a number or letter, it is displayed in the cursor position, and the cursor is advanced. Cursor keys move the cursor within the assignment field. Pressing either the Return key or the Enter key will terminate data entry for that item.

If you want to erase the data entry, press the Clear Line key, the Clear Display key, or the Delete Line key.

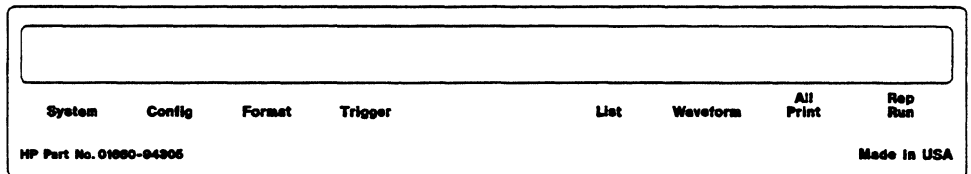
Mouse Data Entry

When an assignment field is selected, a pop-up keypad or assignment menu appears. Use the pop-up menus to assign letters, numbers, symbols, or unit of measure. When the Done field is selected, the pop-up closes and the selected values are entered into the assignment field.

Using the Keyboard Overlays

Two keyboard overlays are included in the HP E2427A Keyboard Kit. The overlays shown below redefined functions of the function keys and the numeric keypad.

Function Key Overlay

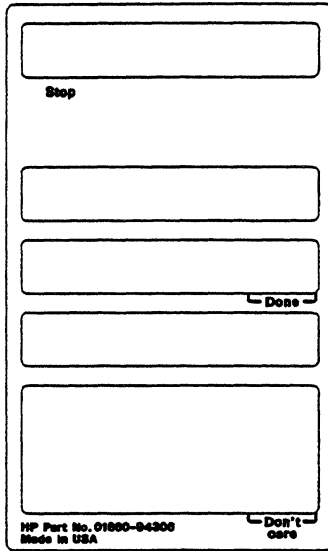


01660E10

Key	Function Performed
F1	Selects System subset menus
F2	Selects the Configuration Menu
F3	Selects the Format Menu
F4	Selects the Trigger Menu
F5	Selects the Listing Menu
F6	Selects the Waveform Menu
F7	Selects the Print All function
F8	Selects the Run Repetitive function

Using the Optional Keyboard and Mouse Using the Keyboard Overlays

Numeric Keypad Overlay



01660E11

Key	Function Performed
Tab	Don't care "X"
Enter	Done
Stop (unlabeled)	Stop

Defining Units of Measure

In addition to the function keys, other keys on the keyboard invoke the unit of measure selections.

Time Units

Key	Time Units
S	Selects the seconds units
M	Selects the milliseconds units
U	Selects the microseconds units
N	Selects the nanoseconds units

Voltage Units

Key	Voltage Units
V	Selects volts
M	Selects millivolts

Assigning Edge Triggers

Several keys invoke edge assignments.

Key	Edge Trigger Assignment
U	Selects the up or rising edge.
D	Selects the down or falling edge.
R	Selects the rising edge.
F	Selects the falling edge.
B	Selects either the rising or falling edge.
* (asterisk)	Assigns a glitch.
. (period)	Assigns a Don't Care

Closing a Menu

To exit a menu, press either the Done or Enter key. The Enter key is mapped to the Done key, so pressing either key closes the menu.

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Connecting a Printer

Connecting a Printer

The logic analyzer can output its screen display to various HP-IB and RS-232C graphics printers. Configured menus as well as waveforms, listings and other data, can be printed for complete measurement documentation.

HP-IB Printers

The logic analyzer interfaces directly with HP PCL printers supporting the printer command language or with Epson printers supporting the Epson standard command set. These printers must also support HP-IB and Listen Always. Printers currently available from Hewlett-Packard with these features include:

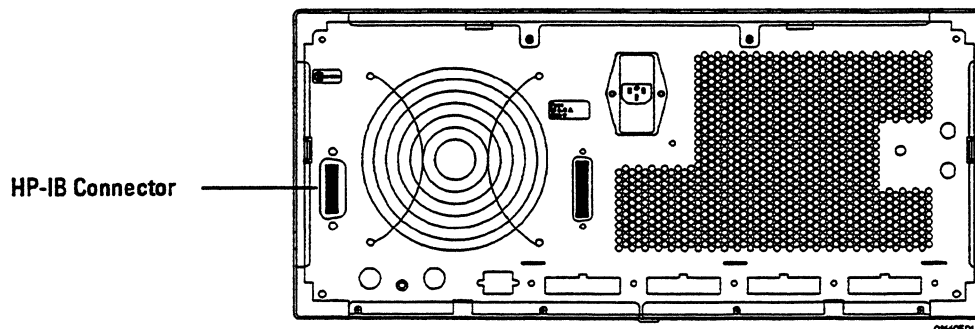
- HP ThinkJet
- HP LaserJet
- HP PaintJet
- HP DeskJet
- HP QuietJet

It should be noted that an HP-IB printer must be in Listen mode, and the analyzer's HP-IB port does not respond to service requests (SRQ) when controlling a printer. The SRQ enable setting for the HP-IB printer has no effect on HP 16500A printer operation.

HP-IB Printer Setup

To set up the HP-IB printer, perform the following steps:

- 1 Turn off the analyzer and connect an HP-IB cable from the printer to the HP-IB connector on the rear panel of the instrument. Turn on the analyzer.

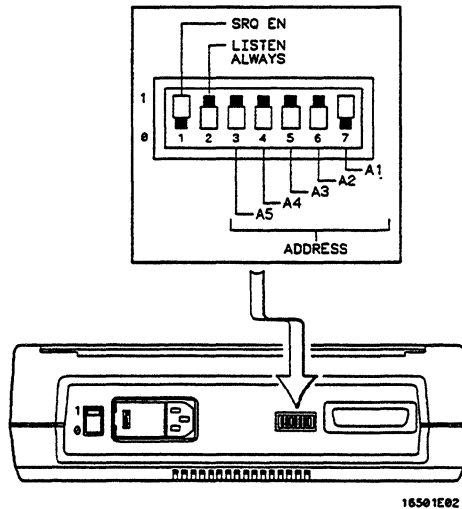


HP-IB Connector

Connecting a Printer HP-IB Printers

- 2 Make sure the printer is in **Listen Always** (or **Listen Only**). For example, the figure below shows the HP-IB configuration switches for an HP-IB ThinkJet printer. For the **Listen Always** mode, move the second switch from the left to the "1" position.

Since the analyzer doesn't respond to SRQ EN (Service Request Enable), the position of the first switch doesn't matter.



16501E02

Listen Always Switch Setting

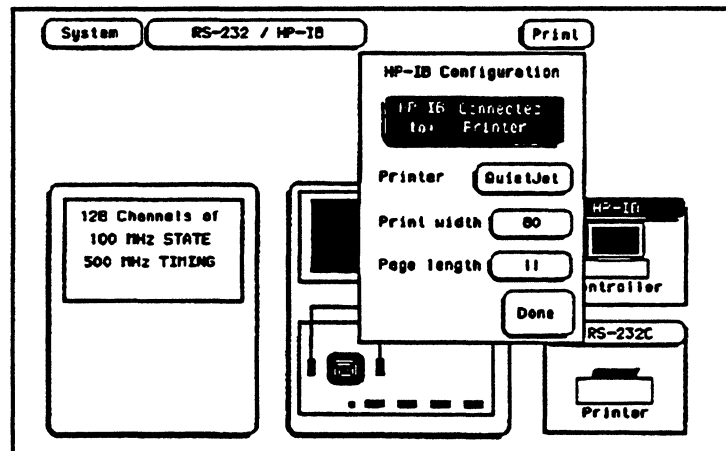
HP-IB Configuration

From the RS-232 / HP-IB menu, perform the following steps to configure the HP-IB interface for printing:

- 1 Select the **HP-IB** field.
- 2 When the pop-up appears, select "HP-IB Connected to" field, and toggle to the **Printer** selection.
- 3 Select the field to the right of "Printer" and when the pop-up appears, select the printer that you're using (like, ThinkJet or QuietJet). If you're using an Epson graphics printer or an Epson-compatible printer, select **Alternate**.
- 4 Select the "Print Width" field. The print width toggles between **80** and **132**. Select the width for your application or leave it at the default of 80.

Print width tells the printer that you are sending up to 80 or 132 characters per line (when you **Print All**) and is totally independent of the printer itself.

HP-IB Configuration Menu



Connecting a Printer HP-IB Printers

If you select 132 characters per line when using other than the QuietJet selection, the listings are printed in a compressed mode. Compressed mode uses smaller characters to allow the printer to print more characters within a given area.

If you select 132 characters per line for the QuietJet selection it can print a full 132 characters per line without going to compressed mode, but the printer must have wider paper.

If you select 80 characters per line for any printer, a maximum of 80 characters are printed per line.

- 5 Select the "Print Length" field. The print length toggles between 11 and 12. Select the length for your application or leave it at the default of 11.

Print length tells the printer the page length for the type of paper you are using.

- 6 Press the front-panel Done key.

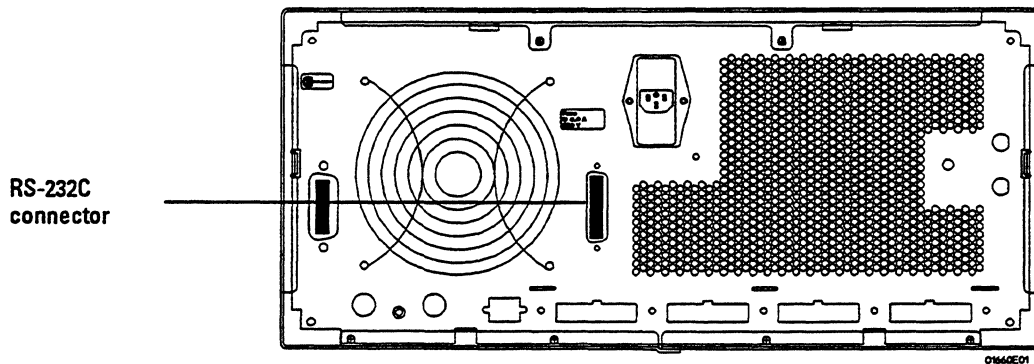
RS-232C Printers

The analyzer interfaces directly with RS-232C printers including the HP ThinkJet, HP QuietJet, HP LaserJet, HP PaintJet, and HP DeskJet printers.

RS-232C Printer Setup

To set up the RS-232C printer, perform the following steps:

- 1 Turn off the analyzer and connect an RS-232C cable from the printer to the RS-232C connector on the rear panel of the instrument. Turn on the analyzer.

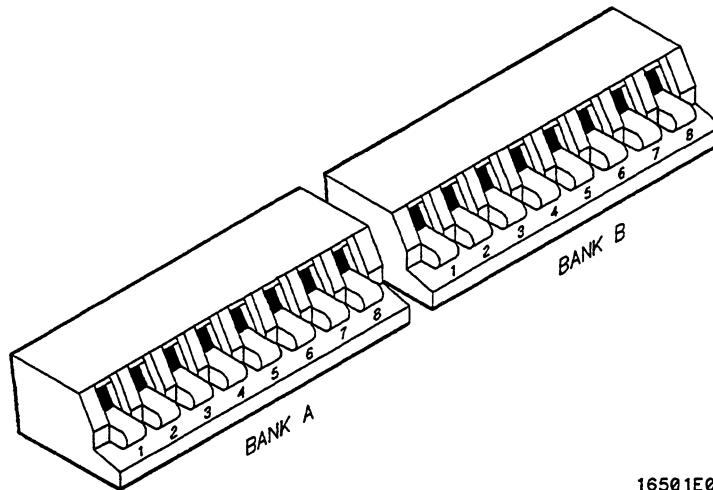


RS-232C Connector

Connecting a Printer RS-232C Printers

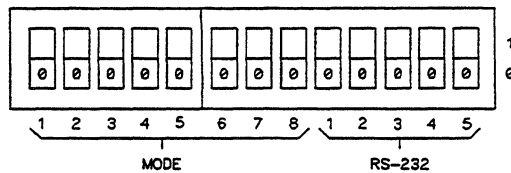
2 Before turning on the printer, locate the mode configuration switches on the printer and configure them as follows:

- The HP QuietJet series printers have two banks of mode function switches inside the front cover. Push all the switches down to the “0” position as shown.



16501E03

- For the HP 2225D (RS-232 HP ThinkJet) printer, the mode switches are on the rear panel of the printer. Push all the switches down to the “0” position as shown .



16500E17

- For the HP LaserJet printer, the switch settings can remain in the factory default settings.

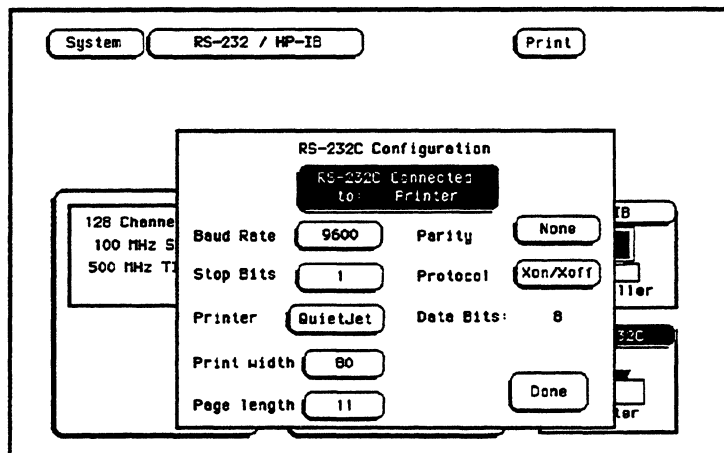
RS-232C Configuration

From the RS-232 / HP-IB menu, perform the following steps to configure the RS-232 interface for printing:

- 1 Select the **RS-232** field.
- 2 When the pop-up appears, select "RS-232 Connected to" field, and toggle to the **Printer** selection as shown below.
- 3 Set the baud rate, stop bits, parity, and protocol to match the setup for the RS-232C printer by selecting the appropriate fields.
- 4 Select the field to the right of "Printer" and when the pop-up appears, select the printer that you're using (like, ThinkJet or QuietJet). If you're using an Epson graphics printer or an Epson-compatible printer, select **Alternate**.

See Also

"RS-232 / HP-IB Interface" chapter for more information.



RS-232 Configuration Menu

Connecting a Printer
RS-232C Printers

- 5** Select the "Print Width" field. The print width toggles between **80** and **132**. Select the width for your application or leave it at the default of **80**.

Print width tells the printer that you are sending up to 80 or 132 characters per line (when you **Print All**) and is totally independent of the printer itself.

- 6** Touch the "Print Length" field and print length toggles between **11** and **12**. Select the length for your application or leave it at the default of **11**.

Print length tells the printer the page length for the type of paper you are using.

- 7** Press the front-panel **Done** key.

Connecting to Other Hewlett-Packard Printers

The analyzer can also be used with other Hewlett-Packard graphics printers. Simply connect the printer to the analyzer using the appropriate cable (HP-IB or RS-232C) and configure the analyzer as shown below.

For this HP Printer	Select this Printer from the pop-up
HP 2631G	QuietJet
HP 2671G	ThinkJet
HP 2673A	ThinkJet
HP 9876A	ThinkJet
HP 2932/34 (option 046)	QuietJet

HP Printer Configuration Guide

Connecting a Printer Connecting to Other Hewlett-Packard Printers

HP-IB printers must support Listen Always to work with the analyzer. The HP 82906A graphics printer is not supported because it does not support Listen Always on HP-IB.

The HP 2932A or HP 2934A option 046 printer is configured from the front panel of the printer, instead of with switches on the rear panel. The correct configuration for the analyzer is shown.

```
***** SETTINGS *****
***** LIST ***** ***** MODIFY *****
***** PRINTER ***** INTERFACE ***** PRINTER ***** INTERFACE
***** LIST INTERFACE *****
HP-IB
SECONDARY COMMANDS LISTEN ALWAYS SERVICE REQUEST ADDRESS SET DEFAULTS
      off                on                off                1
***** END OF SETTINGS *****
```

16501B01

Front Panel Configuration for the HP 2932A or 2934A Option 046

See Also

The Programming Reference Manual for information on setting up an external controller to activate the printer.

Printing the Display

After connecting the printer to the instrument and setting the printer and instrument configurations, apply power to the printer.

Each menu has a **Print** field in the upper-right corner. Select the **Print** field and a pop-up appears, displaying your choices.

- **Cancel** is used to stop the analyzer from sending data.
- **Print Screen** prints everything shown on the screen.
- **Print All** (available only in certain menus) prints all of the information listed for that display, including any listings that do not appear on screen. These listings can be 80 or 132 characters wide, depending on the **Print Width** setting.
- **Print Disk** is used to print measurement data to a DOS[®] or LIF disk, which can then be copied into a computer file. The **Print Disk** function is the same as the **Print All** function except the data is printed to a disk.

To initiate a hard copy print, perform the following steps:

- 1** Using the **arrow** keys highlight the **Print** field, then press the **Select** key.
- 2** Select the **Print Screen** or **Print All** field, then press the **Select** key.

The analyzer does not check the operation of the printer, so no error messages are displayed.

See Also

"Print field" in the Common Menu Fields chapter for more information on **Print Disk**.

The Common Menu Fields 94
 Common Menu Fields Menu Map 95
System / Analyzer Field 96
Menu Field 97
Print Field 98
 Print Screen 98
 Print All 99
 Print Disk 100
Run Field 101
 Single 101
 Repetitive 101
Base Field 102
Label Field 103
 Insert 103
 Replace 103
 Delete 103
 Interleave 104
Label / Base Roll Fields 105

The Common Menu Fields

The Common Menu Fields

There are a number of fields that appear throughout the different menus that have similar operation. These common fields are listed below:

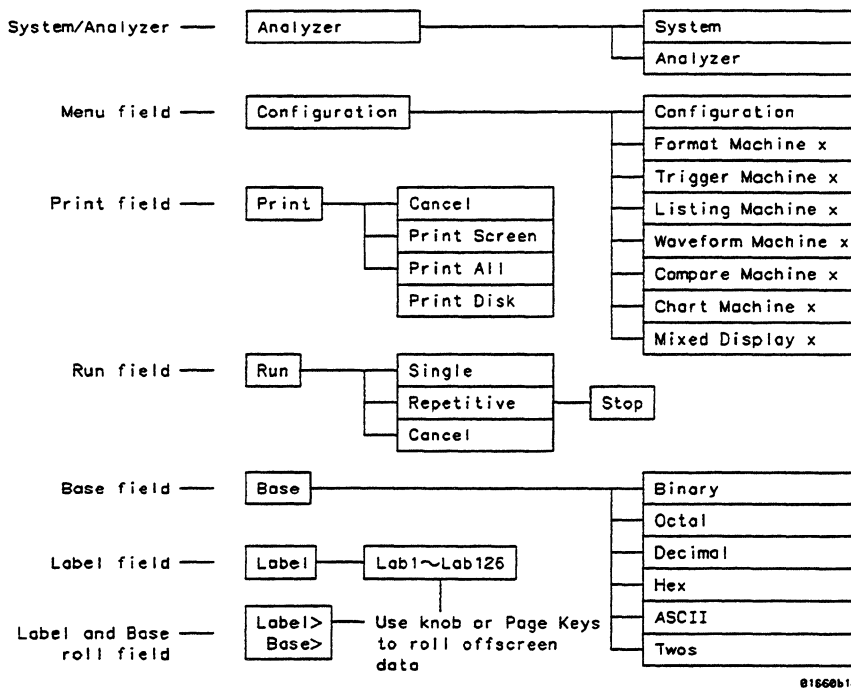
- System/Analyzer field
- Menu field
- Print field
- Run field
- Base field
- Label field
- Label and Base roll field

If there is any unique operation with any of these common fields in a particular menu, supplemental information is given in that menu. In all other cases of common operation, you are referred back to this section.

Common Menu Fields Menu Map

The Common Menu Fields menu map contains fields that appear in most, if not all, main menus. When these fields are discussed in other chapters, you will be referred back to this chapter and this menu map.

This menu map will help you get an overview as well as provide you with a quick reference of what the common menu fields are.



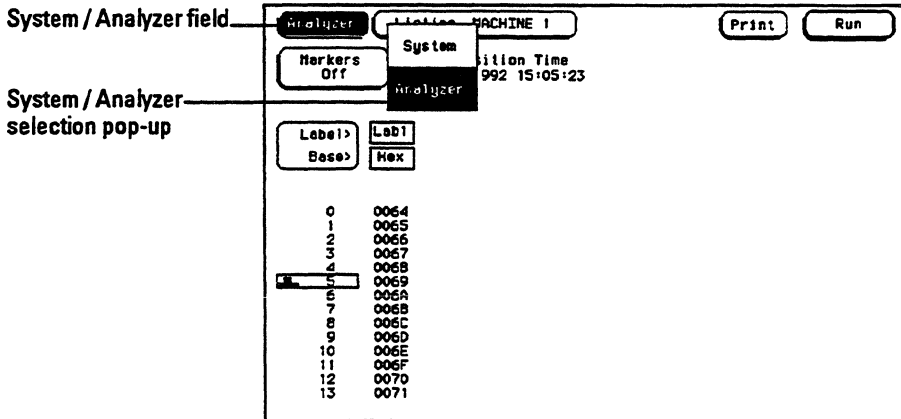
01660b14

Common Menu Fields Menu Map

System / Analyzer Field

The System/Analyzer field is always located in the upper-left corner of all main menus. If you have accessed any of the System configuration menus, this field displays "System." If you have accessed any of the analyzers configuration menus, this field displays "Analyzer." The System/Analyzer field is used to access the following system level menus:

- The **System** configuration menus:
 - Disk
 - RS-232 / HP-IB
 - Utilities
 - Test
- The **Analyzer** configuration menus:
 - Configuration
 - Format
 - Trigger
 - Listing
 - Waveform
 - Mixed Display
 - Compare
 - Chart

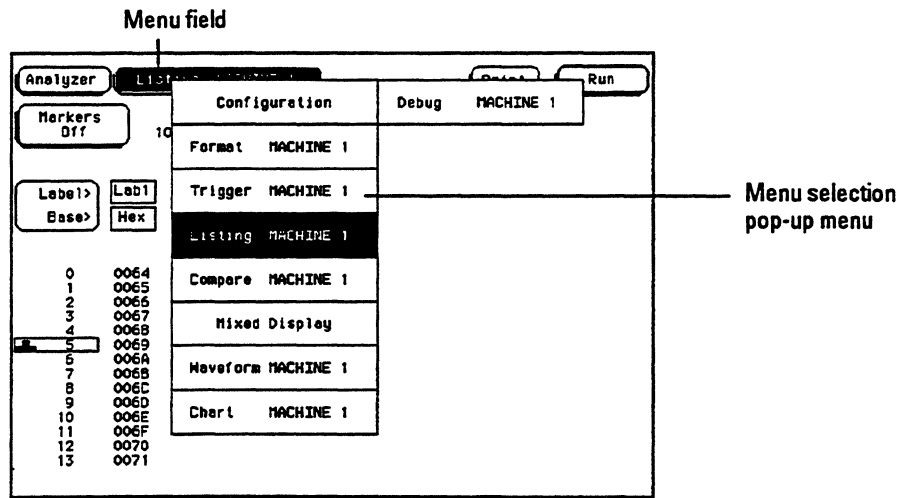


System / Analyzer Field

Menu Field

The Menu field is always the second field from the left, in the top row of fields. The Menu field identifies the System or Analyzer menu you are in, and you use it to access the other analyzer menus.

When a new menu is selected from the menu selection pop-up, the new menu appears and the name in the Menu field changes to the name of the new menu.



Menu Field

Print Field

The Print field allows you to print what is displayed on the screen at the time you initiate the printout. When you select the Print field, a print selection pop-up appears showing you one or more of the following options:

- Cancel
- Print Screen
- Print All
- Print Disk

When you select one of the print options, the information in the display is frozen; then, the Print field changes to Cancel. While the printout is in process, the user interface is not active, with the exception of the Cancel field.

When the printout is complete, the advisory "Print Completed" is displayed and the user interface becomes active again.

Cancel

The Cancel field is used to terminate a printout before it is complete, or if you have changed your mind about printing after selecting the Print field. If a print is canceled before completion, the message "Print Canceled" appears.

Print Screen

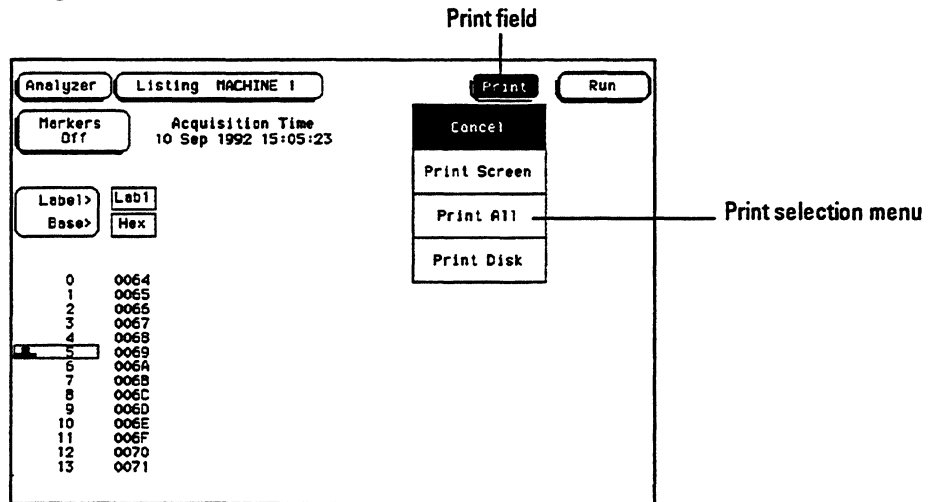
The Print Screen option is used when a printout of just the current screen is desired.

Print All

The Print All option prints not only what data is displayed on the screen, but data that is below the screen in the Listing, Trace, and Compare menus.

When you select the Print All option, the message "Printing All" appears at the top of the display. This message will not appear in your printout.

When you select Print All, make sure the first line you wish to print is in the state location box at the center of the listing area. Lines above this box will not print.



Print Field

Print Field

Print Disk

The Print Disk option is very useful if you want to copy the measurement data in ASCII form to a DOS formatted disk in the disk drive. This operation is identical to the Print All option except the destination for the data is the disk instead of a graphics printer. Once the data is on a DOS disk, the data can be loaded into a computer.

When you select the Print Disk option, the messages "Calculating File Size" and "Writing byte xxx of xxx" appears at the top of the display.

When you select the Print Disk option, make sure the first line in the listing you wish to print is in the state location box at the center of the listing area. Lines above this box will not print.

Run Field

The Run field starts the analyzer measurement. When Run is selected, the acquired data is displayed in the last measurement display menu accessed. If Stop is selected during a single run, the data acquisition is aborted. During a repetitive run, when Stop is selected after the first run cycle, the present single run cycle is completed before data is displayed.

Single

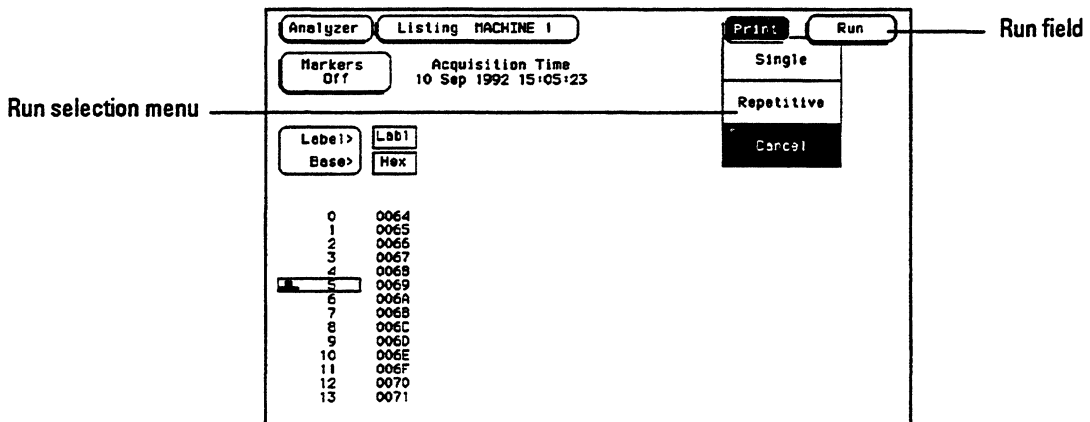
The Single option runs the data acquisition cycle one time.

Repetitive

The Repetitive option runs the single data acquisition cycle repeatedly until the Stop field is selected or until an assigned stop measurement condition is met.

Cancel

The Cancel option enables you to cancel the run without having to select either Single or Repetitive.



Run Field

Base Field

The numeric base for displayed data under each label is set by the Base field. All assigned labels will have a Base field assigned to it. If the numeric base is changed in a menu, the base in other menus may not change accordingly. As an example, the base assigned to symbols is unique, as is the base assigned in the Compare and Listing menus, so you would not want them to change.

The base is changed by selecting the Base field under the desired label, then selecting the new base from a pop-up selection list. The base choices are Binary, Octal, Decimal, Hex, ASCII, Symbol and Twos.

Base fields

The screenshot shows a menu interface with the following elements:

- Buttons: Analyzer, Listing MACHINE 1, Print, Run
- Markers Off
- Acquisition Time: 10 Sep 1992 15:05:23
- Label selection: Label 1, Label 2, Label 3, Label 4, Label 5 (selected), Label 6, Label 7, Label 8, Label 9, Label 10, Label 11, Label 12, Label 13
- Base selection: Hex, Octal, Decimal, Twos, Binary, ASCII, Symbol, Twos
- Base selection list (pop-up): Binary, Octal, Decimal, Hex, ASCII, Symbol, Twos
- Base selection list label: Base selection list

Label	Base	Hex	Octal	Decimal	Twos	Binary	ASCII	Symbol	Twos
0	0064	000144	00100	+00100	00000000				
1	0065	000145	00101	+00101	00000000				
2	0065	000146	00102	+00102	00000000				
3	0067	000147	00103	+00103	00000000				
4	0068	000150	00104	+00104	00000000				
5	0069	000151	00105	+00105	00000000				
6	006A	000152	00106	+00106	00000000				
7	006B	000153	00107	+00107	00000000				
8	006C	000154	00108	+00108	00000000				
9	006D	000155	00109	+00109	00000000				
10	006E	000156	00110	+00110	00000000				
11	006F	000157	00111	+00111	000000001101111	<NUL>			
12	0070	000160	00112	+00112	000000001110000	<NUL>			
13	0071	000161	00113	+00113	000000001110001	<NUL>			

Base Field

Label Field

New label assignments and existing label name changes are done only in the Format menu. However, you can insert, delete, replace, or interleave labels in other menus where assigned labels appear. When you select a label field, a list of label actions appear.

Insert

The Insert option accesses a selection list of assigned labels. The label selected from this list is inserted to the right of the label used to start the label action.

Replace

The Replace option accesses a selection list of assigned labels. The label selected from this list replaces the label used to start the label action.

Delete

The Delete option deletes the label used to start the label action. The label is not deleted from the Format menu.

Label field

The screenshot shows a software interface with a menu titled "Label field". At the top, there are buttons for "Analyzer", "Listing MACHINE 1", "Print", and "Run". Below these, it shows "Markers Off" and "Acquisition Time 10 Sep 1992 15:20:05". The main area contains a table with columns for "Label", "Base", and four "MACH" columns (MACH1, MACH2, MACH1, MACH1), each with a "Hex" sub-column. A vertical line points from the "Label field" title to the "MACH2" column. To the right of the table is a "Label action list" with options: "Insert", "Replace", "Interleave", "Delete", and "Cancel". A horizontal line points from the "Delete" option to the "Delete" column of the table.

Label	Base	MACH1 Hex	MACH2 Hex	MACH1 Hex	MACH1 Hex	
-1			AA	AA		
2	0	AB	AB	AB	AB	
3	1	AB	AB	AB	AB	
4	2	AC	AC	AC	AC	
5	3	AC	AC	AC	AC	200 ns
6	4	AD	AD	AD	AD	248 ns
7	5	AD	AD	AD	AD	248 ns
8	6	AE	AE	AE	AE	296 ns
9	6	AE	AE	AE	AE	352 ns
						352 ns
						400 ns
						400 ns
						448 ns

Label Field

The Common Menu Fields

Label Field

Interleave

With two state analyzers configured, and the Count fields in the respective Trigger menus set to Time, the Interleave option becomes available. The Interleave option allows you to interleave two labels and their data from the two different analyzers in the same column.

The interleaved label is placed directly above the selected label and all interleaved data is displayed in white. In addition, the state numbers of the interleaved data are indented to the right.

The list of available labels to interleave becomes available when the Interleave option is selected from the label action list shown on the previous page.

Interleaved label

Label>	MACH1	MACH2	MACH1	Time
Base>	Hex	Hex	Hex	Absolute
-1		AA	AA	48 ns
2	AB	AB	AB	96 ns
3	0	AB	AB	96 ns
4	1	AB	AB	152 ns
5	2	AC	AC	200 ns
6	3	AC	AC	248 ns
7	4	AD	AD	296 ns
8	5	AD	AD	352 ns
9	6	AE	AE	400 ns
				448 ns

Interleave Option

Label / Base Roll Field

When the number of assigned labels becomes greater than the total number of labels that can be displayed on screen, the analyzer will store them off screen. If there are offscreen labels, the Label/Base roll field turns dark.

To roll label and base fields onto the screen, activate the roll function by selecting the dark Label/Base roll field. When the Label/Base roll field is selected, it turns light and the roll indicator appears in the field as shown. Once the roll indicator appears, rolling is then done by turning the knob.

If there is more than one rollable field, the roll indicator remains with the last rollable field activated. For example, the Listing menu shown below has both the Label/Base field and the state location field, which are both rollable. However, the only field that rolls when turning the knob is the field with the roll indicator.

The Page keys roll data one screen at a time. The data type and direction is determined by which page key is pressed. Rolling data with the Page key works independent of the knob rolling function.

The screenshot shows the Analyzer Listing MACHINE 1 menu. At the top, there are buttons for 'Analyzer', 'Listing MACHINE 1', 'Cancel', and 'Run'. Below these, it says 'Markers Off' and 'Acquisition Time 10 Sep 1992 15:20:05'. The main display is a table with columns for 'Label', 'Base', and several 'MACH' fields. The 'Label' and 'Base' columns are highlighted with a dark background, indicating they are rollable. A roll indicator (a small square with a vertical line) is present in the 'Label' column of the row where the state location is '4'. The state location field is also highlighted with a dark background. The table contains the following data:

	MACH1	MACH2	MACH1	MACH1	MACH1	MACH1	MACH1	MACH1	Tim
Label>	Hex	Hex	Hex	Hex	Hex	Hex	Hex	Hex	Abs
-2	AA	AA	AA	AA	AA	AA	AA	AA	
1 -1	AA	AA	AA	AA	AA	AA	AA	AA	
2 0	AB	AB	AB	AB	AB	AB	AB	AB	
3 0	AB	AB	AB	AB	AB	AB	AB	AB	
4 1	AC	AB	AB	AB	AB	AB	AB	AB	
5 2	AC	AC	AC	AC	AC	AC	AC	AC	
6 3	AC	AC	AC	AC	AC	AC	AC	AC	
7 4	AD	AD	AD	AD	AD	AD	AD	AD	
8 5	AD	AD	AD	AD	AD	AD	AD	AD	
9 5	AE	AD	AD	AE	AE	AE	AE	AE	

Label and Base Roll Field

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Type Field 110
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Unassigned Pods List 111
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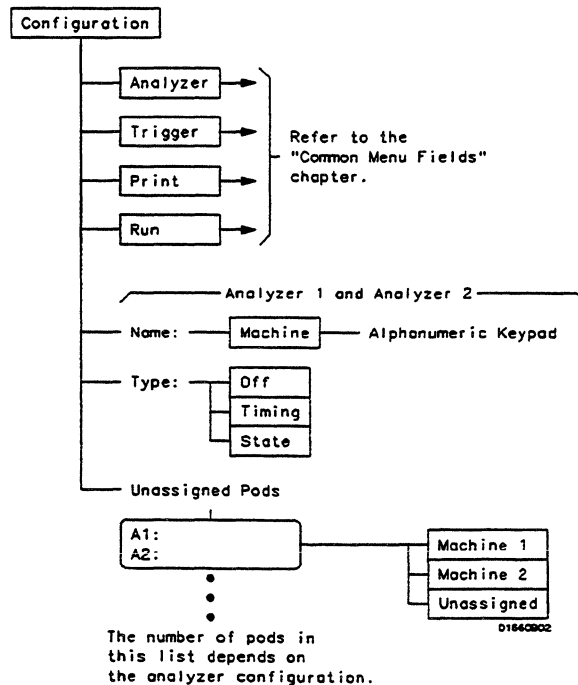
The Configuration Menu

The Configuration Menu

The Configuration menu is one of the analyzer menus that allows you to set analyzer level parameters. For example, in the Configuration menu the pod pair assignments are made. In addition, the type of clocking is selected and a custom analyzer name can be assigned.

Configuration Menu Map

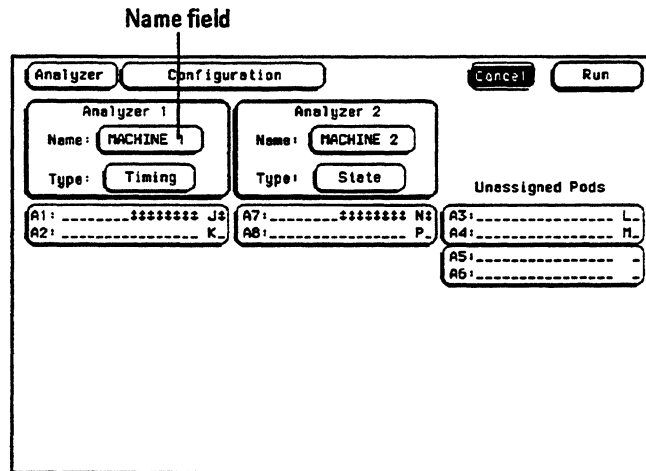
The following menu map illustrates all fields and the available options in the Configuration menu. The menu map will help you get an overview as well as provide you with a quick reference of what the Configuration menu contains.



Configuration Menu Map

Name Field

The Name field allows you to assign a specific name to the analyzer. The name is entered by using the front-panel alpha keypad or the optional keyboard. Simply highlight the Name field and type the new name. When configurations are stored to disk and later reloaded, a specific name can help identify the measurement setup.



Name Field

Type Field

The Type field allows you to configure the logic analyzer with either an external clock or an internal clock. When the Type field is selected, the following choices are available.

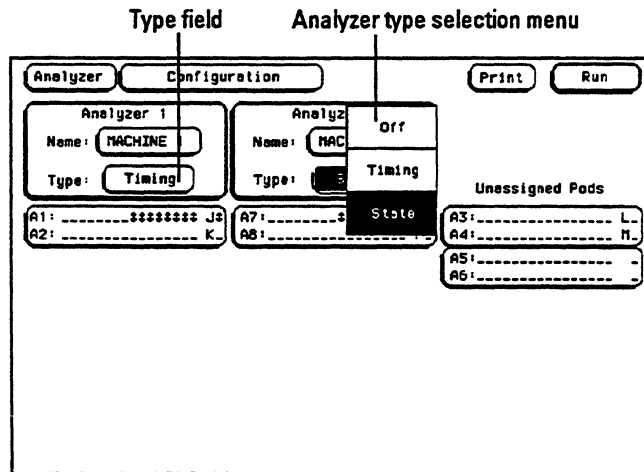
Timing

When Timing is selected, the analyzer uses its own internal clock to clock measurement data into the acquisition memory. This clock is asynchronous to the signals in the target system. When this option is selected, some fields specific to external clocks will not appear in the analyzer menus.

The analyzer can only be configured with one timing analyzer. If two are selected, the first will be turned off.

State

When State is selected, the analyzer uses a clock from the system under test to clock measurement data into acquisition memory. This clock is synchronous to the signals in the target system.



Type Field

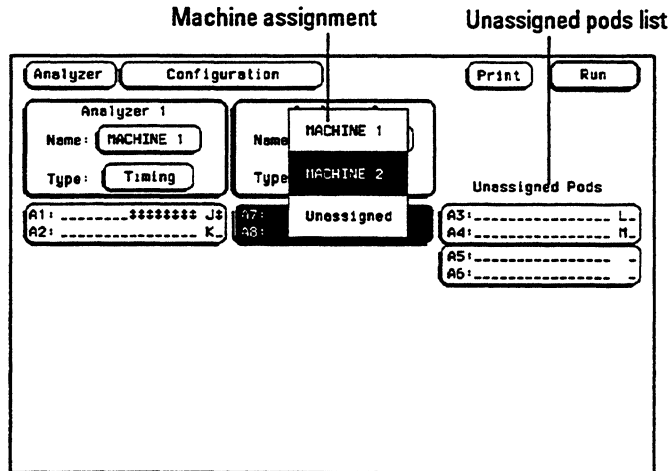
Unassigned Pods List

The list of Unassigned Pods in the Configuration menu shows the available pods for the analyzer configuration. Pod grouping and assignment is by pod pairs. When a pod pair is selected from the Unassigned Pods list, an assignment menu appears. From the assignment menu, select a destination for the pod pair.

Within each pod pair, activity indicators show the integrity of the connected signals.

See Also

"Activity Indicators" in this chapter.



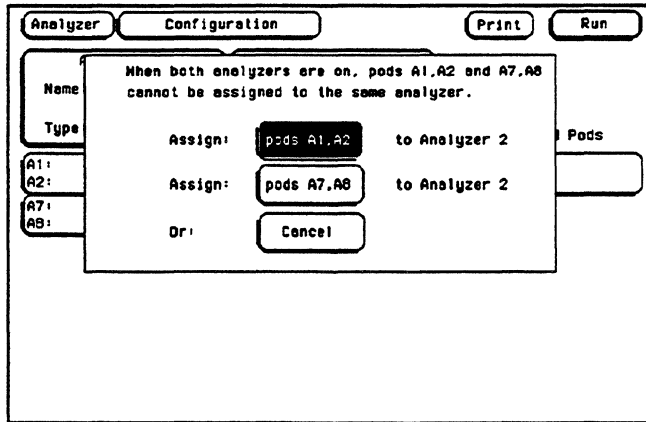
Unassigned Pods Display

The Configuration Menu

Unassigned Pods List

Illegal Configuration

When both analyzers are turned on, the first pod pair 1,2 and the last pod pair (5,6 in the 96 channel model or 7,8 in the 128 channel model) cannot be assigned to the same analyzer machine. If this configuration is set, the analyzer will display a reassignment menu. Use this reassignment menu to configure the pod assignment automatically to a legal configuration.



Configuration Reassignment Menu

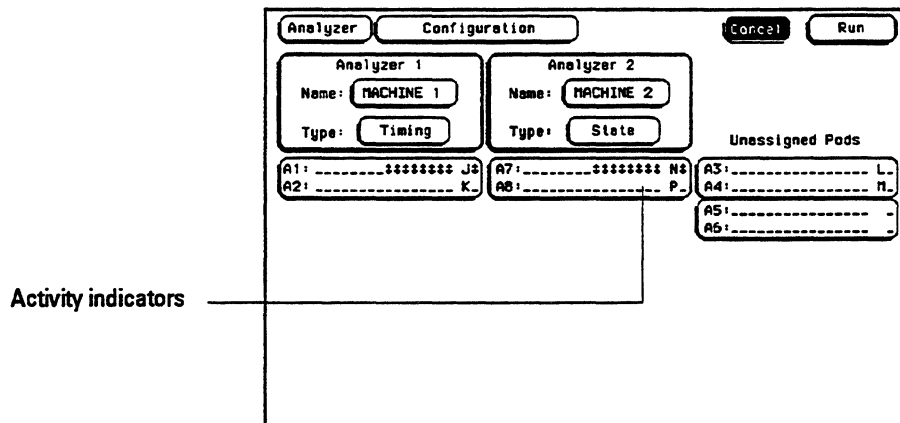
Activity Indicators

A portion of the Configuration menu that is not a selectable field is the Activity Indicators. The indicators appear in two places. One is in the pod pair displays of this Configuration menu. The other place is in the bit reference line in the Format menu just above the pod bit numbers.

When the logic analyzer is properly connected to an active target system, you will see a high-level dash, a low-level dash, or a transitioning arrow in the Activity Indicator displays for each pod pair. These indicators are very useful in showing proper probe connection and that the logic levels are as expected according to the threshold level setting.

See Also

"Bit Assignment Field" in the Format menu chapter for more information on the activity indicators in the Format menu.



Activity Indicators

System / Analyzer Field

The function of the System/Analyzer field is the same in all menus. For a complete definition of the System/Analyzer field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Menu Field

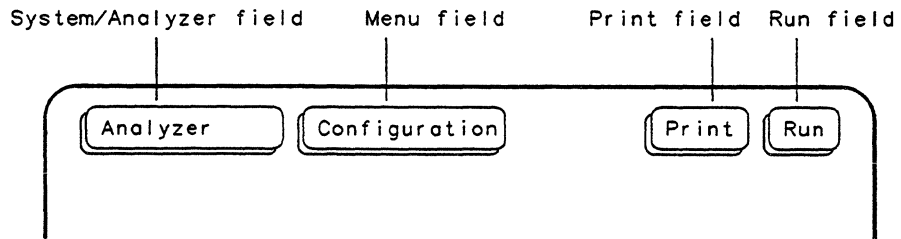
The function of the Menu field is the same in all menus. For a complete definition of the Menu field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Print Field

The function of the Print field is the same in all menus. For a complete definition of the Print field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Run Field

The function of the Run field is the same in all menus. For a complete definition of the Run field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.



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Common Menu Fields

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The Format Menu

The Format Menu

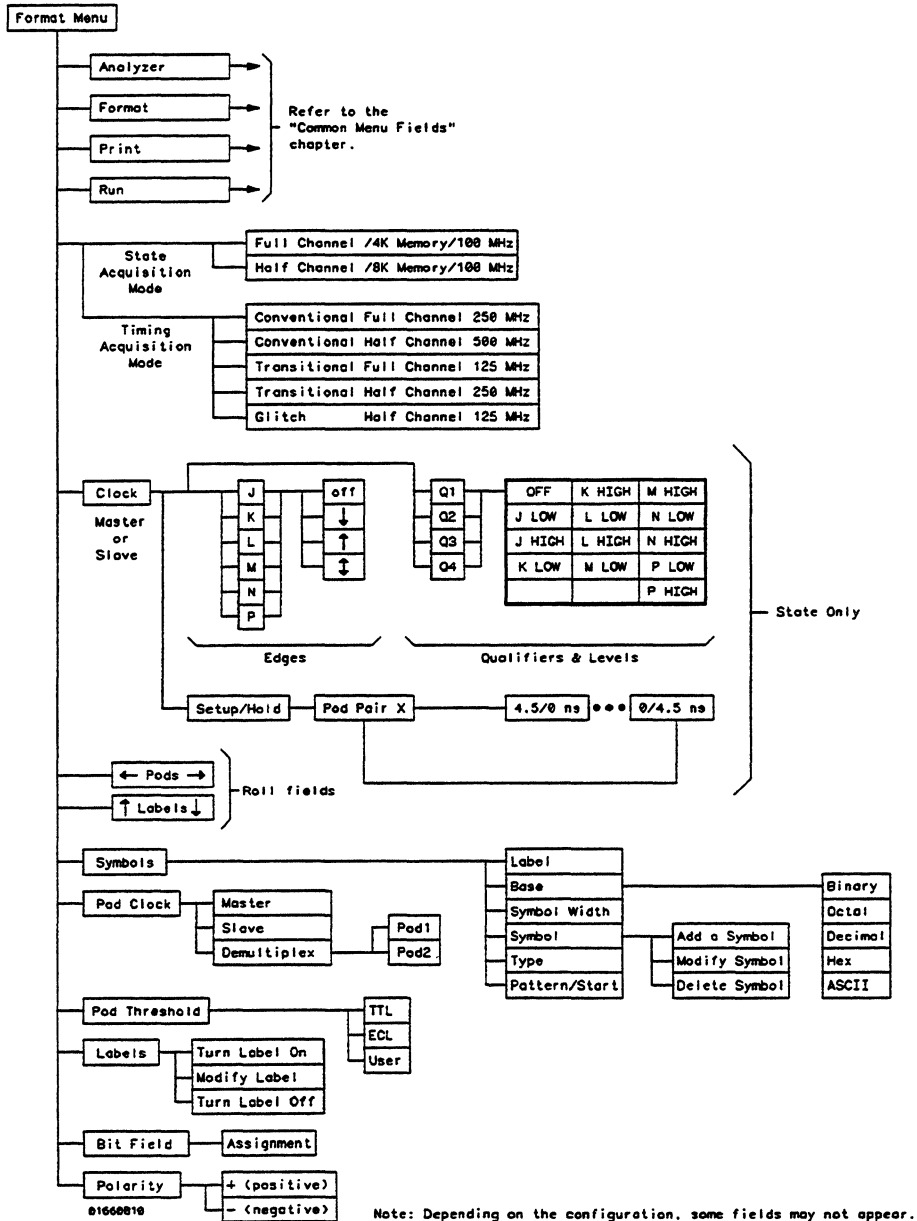
The Format menu is where you assign which data channels are measured and what acquisition mode is used to capture valid data.

The configuration of the Format menu consists of grouping and labeling the data channels from the system under test to fit your particular measurement. For your convenience in recognizing bit groupings, you can specify symbols to represent them.

If the analyzer is configured as a State analyzer, there are master and slave clocks, clock qualifiers and a variable clock setup and hold to further qualify what data is captured.

Format Menu Map

The following menu map graphically illustrates all fields in the Format menu. Use the menu map as an overview and as a quick reference to the available options in the Format menu.



Format Menu Map

State Acquisition Mode Field (State only)

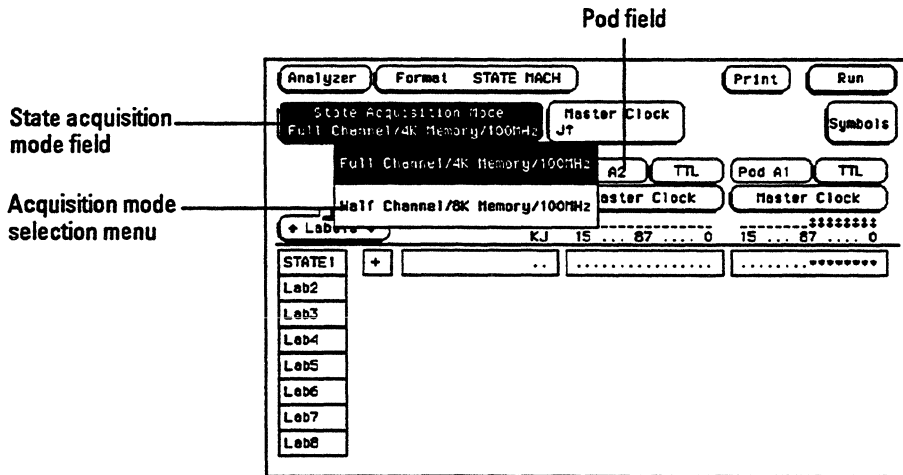
The State Acquisition Mode field identifies the channel width and memory depth of the selected acquisition mode. When the State Acquisition Mode field is selected, two configurations of channel width/memory depth become available. Use the State Acquisition Mode to configure the analyzer for the best use of available memory and channel width.

Full Channel 4K Memory 100 MHz

The Full Channel selection uses both pods in a pod pair for 34 channels of width and a total memory depth of 4 Kbytes per channel. If time or state tags are turned on, the total memory is evenly split between data acquisition storage and time or state tag storage. To maintain the full 4 Kbytes per channel depth, leave one pod pair unassigned. The maximum state clock speed is 100 MHz.

Half Channel 8K Memory 100 MHz

The Half Channel selection cuts the channel width to 17 channels. In this mode, the pod used within the pod pair is selected through the Pod field. In Half Channel mode, the memory depth is increased to 8 Kbytes per channel. Time or state tags are not available in this mode. The maximum state clock speed is 100 MHz.



State Acquisition Mode Field

Timing Acquisition Mode Field (Timing only)

The Timing Acquisition Mode field displays the acquisition type, the channel width, and sampling speed of the present acquisition mode. The Timing Acquisition Mode field is used to access an acquisition mode selection menu.

Conventional Acquisition Mode

In Conventional Acquisition Mode the analyzer stores measurement data at each sampling interval.

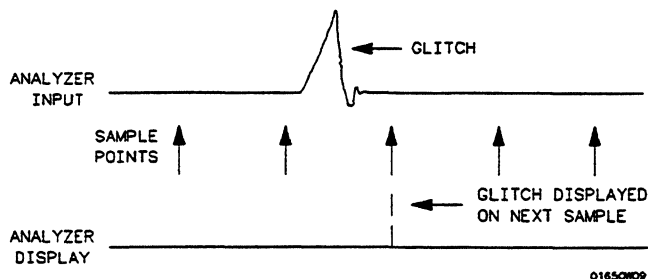
Conventional Full Channel 250 MHz The total memory depth is 4 Kbytes with data being sampled and stored as often as 4 ns.

Conventional Half Channel 500 MHz The total memory depth is 8 Kbytes with data being sampled and stored as often as 2 ns.

Glitch Acquisition Mode

In Glitch Acquisition Mode, a glitch is defined as a pulse with a minimum width of 3.5 ns and a maximum width of 8 ns, or the sample period, whichever is larger. As an example, if the sample period is 8 ns, then a glitch is defined as being between 3.5 ns and 8 ns. One advantage of the glitch mode is that if you expand the sample rate, a pulse that is less than the sample rate will still be displayed as a vertical dashed line.

Glitch Half Channel 125 MHz The total memory depth is split between data storage and glitch storage. Data acquisition memory depth is 2048 per channel. Glitch storage is 2 Kbytes per channel. Data is sampled for new transitions every 8 ns.



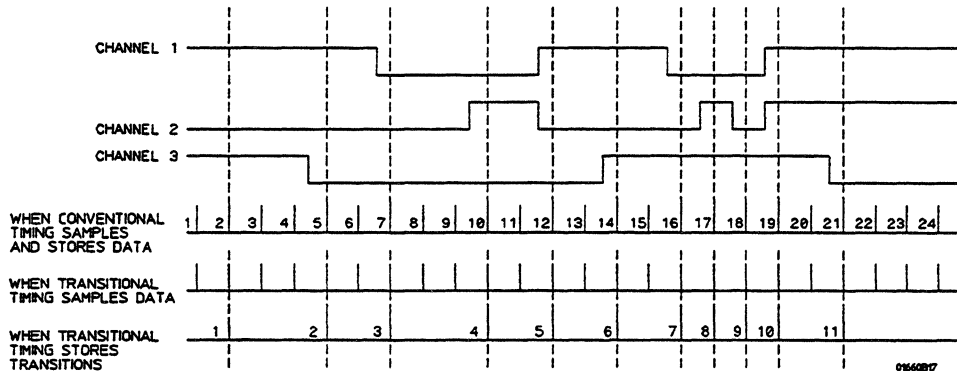
Glitch in a Timing Waveform

The Format Menu

Timing Acquisition Mode Field (Timing only)

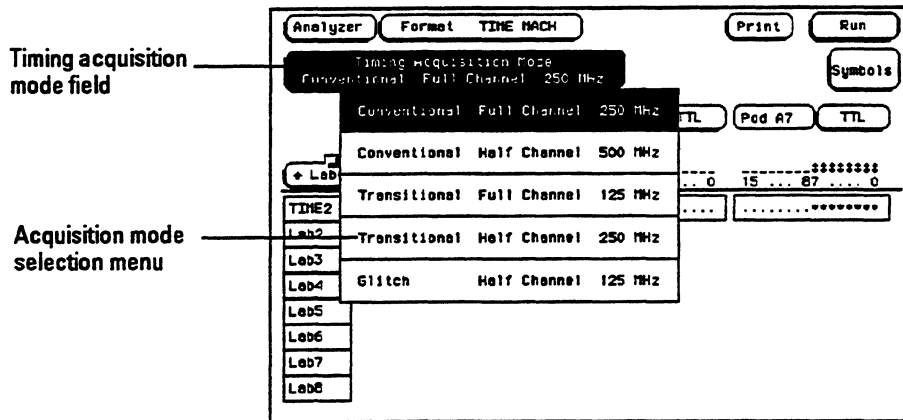
Transitional Acquisition Mode

In Transitional acquisition mode, the timing analyzer samples data at regular intervals, but only stores data when there is a level transition on currently assigned bits of a pod pair. Each time a level transition occurs on any of the bits, all bits of the pod pair are stored. A time tag is stored with each stored data sample so the measurement can be reconstructed and displayed later.



Conventional and Transitional Comparison

One issue when using transitional timing is how many transitions can be stored. The number depends on the mode and frequency of transition occurrence. The following overview explains the number of transitions stored for each transitional timing mode and why.



Timing Acquisition Mode Selection

Transitional Full Channel 125 MHz Mode

The total memory depth is 4 Kbytes per channel with a channel width of 34 channels per pod pair. Data is sampled for new transitions every 8 ns.

When the Timing analyzer runs in the 125 MHz mode, it operates very similar to the State analyzer with count Time turned on. The only exceptions are that the store qualification comes from transition detectors instead of the sequencer. Also, the analyzer uses an internal clock.

With 4 Kbytes of memory per channel and count Time turned on, the analyzer uses half its memory (2 Kbytes) to store time tags. It should be noted that each pod pair must store transitions at its own rate, therefore it must store its own set of time-tags. You do not have the option of using a free pod to retain full memory as you have in the normal state mode.

When a transition is detected after a sample with no detected transition, two samples are stored. One sample is a "before transition sample" and the other is an "after transition sample." Then, as long as there are transitions in the subsequent sample, only 1 sample is stored. When the next sample occurs without a transition, the two stored sample sequence (one before, one after) repeats with the next detected transition.

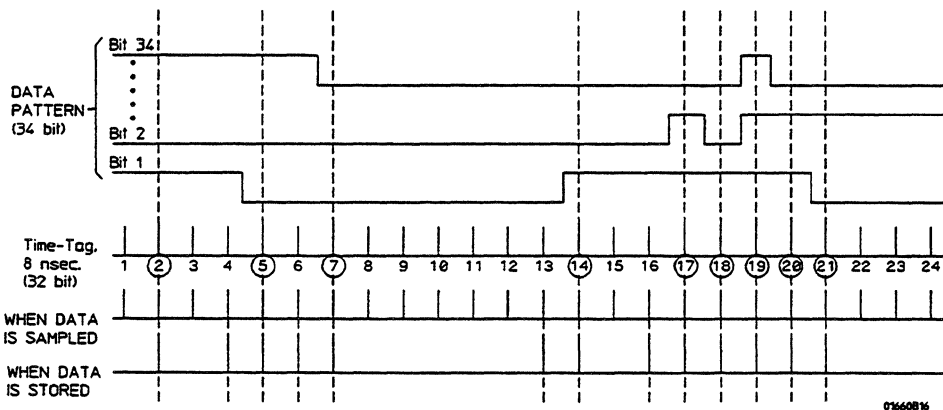
The Format Menu

Timing Acquisition Mode Field (Timing only)

Minimum Transitions Stored Normally, transitions occur at a relatively slow rate. A rate slow enough to insure at least one sample with no transitions between the samples with transitions. This is illustrated below with time-tags 2, 5, 7, and 14. When transitions happen at this rate, two cycles are stored for every transition. This means that with 2 Kbytes of memory, 1 Kbytes of transitions are stored. You must subtract 1, which is necessary for a starting point, for a minimum of 1023 stored transitions.

Maximum Transitions Stored If transitions occur at a fast rate, such that there is a transition at each sample point, only one sample is stored for each transition as shown by time-tags 17 through 21 below. If this continues for the entire trace, the number of transitions stored is 2 Kbytes. Again, you must subtract the starting point sample which then yields a maximum of 2047 stored transitions.

In most cases a transitional timing trace is stored by a mixture of the minimum and maximum cases. Therefore, the actual number of transitions stored will be between 1023 and 2047.



Storing Time-tags and Transitions

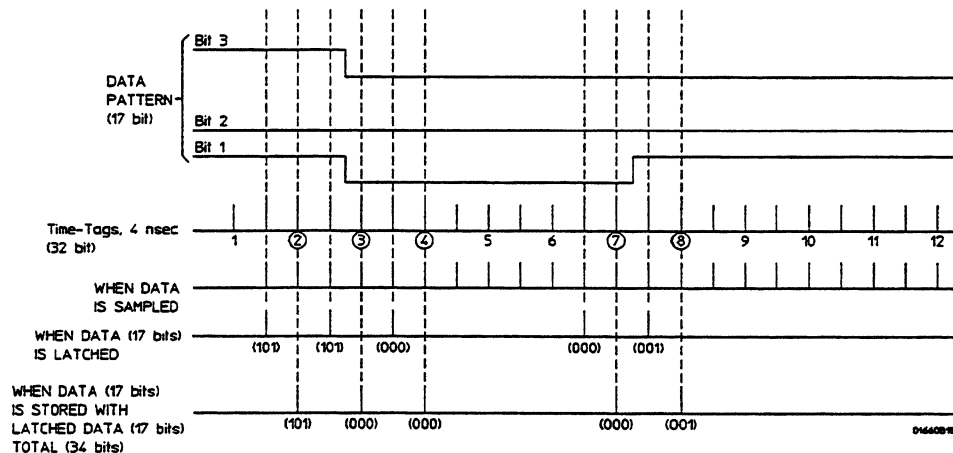
Transitional Half Channel 250 MHz Mode

The total memory depth is 8 Kbytes with a channel width of 17 channels on one pod. The pod used within the pod pair is selectable. Data is sampled for new transitions every 4 ns.

Transitional timing running at 250 MHz is the same as the 125 MHz mode, except that two single pod data samples (17 bits x 2 = 34 bits) are stored instead of one full pod pair data sample (34 bits). This is because in half channel mode, data is multiplexed into the sequencer pipeline in two 17 bit samples. The first 17 bit sample is latched, the next 17 bit sample is sent down the pipeline along with the latched 17 bit sample.

This operation keeps the pipeline frequency down to 125 MHz. It should be noted that the transition detector still looks at a full 34 bits. This means it is looking at two samples at a time instead of one. In this mode, between 682 and 4094 transitions are stored.

Minimum Transitions Stored The following example shows what data is stored from a data stream with transitions that occur at a slow rate (more than 24 ns apart).



Minimum Transitions Stored

The Format Menu

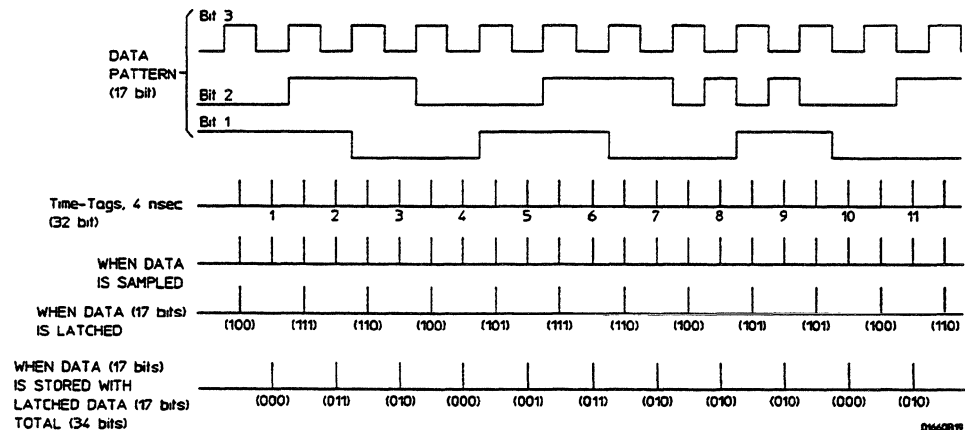
Timing Acquisition Mode Field (Timing only)

As you can see, transitions are stored in two different ways, depending strictly on chance. Remember that the transition detector only looks at the full 34 bits while the data is stored as two 17 bit samples. So, the transition detector will not see time-tag 3 (101/000) as a transition. However, when it compares it to time-tags 2 (101/101) or 4 (000/000), it sees a difference and detects them as transitions. For this first set of time-tags, the transition detector sees more transitions than are really there. This causes the analyzer to store 6 samples per transition (three-34 bit sample pairs), instead of just two, like in the 125-MHz mode. If all the transitions will be stored in this way throughout the trace, the minimum number of stored transitions are 682 ($4096/6$).

However, as you see with time-tags 7 (000/000) and 8 (001/001), transitions can fall between the pairs of samples. When this happens, only one transition is detected and only 4 samples (two sample pairs) are stored. If all transitions will be stored in this way, 1023 ($4096/4$) transitions are stored.

From run to run, the actual number of transitions stored for transitions that occur at a slower rate will fall between these two numbers, based on the probability of a transition falling between a sample pair or falling within a sample pair.

Maximum Transitions Stored The following example shows the case where the transitions are occurring at a 4 ns rate:



Maximum Transitions Stored

In this case, transitions are being detected with each sample. Therefore, they are all being stored. In addition, each sample pair contains a transition. For example, time tag 1 (100/000) contains a transition and is different from time tag 2 (111/011), which also contains a transition. The difference between the two will trigger the transition detector.

If this were to continue throughout the trace, You would store 4 Kbytes – 1 transitions, or 4095. As with the 125-MHz mode, the actual number of transitions stored will fall somewhere between 682 and 4095, depending on the frequency of transitions.

Other Transitional Timing Considerations

Pod Pairs are Independent In single run mode each pod pair runs independently. This means when one pod pair fills its trace buffer it will not shut the others down. Should you have a pod pair with enabled data lines and with no transitions on its lines, you get a message "Storing transitions after trigger for pods nn/nn." In repetitive run mode, a full pod pair waits 2 seconds, then halts all other pod pairs.

The Format Menu

Timing Acquisition Mode Field (Timing only)

Increasing Duration of Storage In the 125-MHz mode a transition on any one of the 34 bits each sample (if they are all turned on) will cause storage. Reducing the number of bits that are turned on for any one pod pair will more than likely increase data storage time.

Separating data lines which contain fast occurring transitions from lines with slow occurring transitions also helps. When doing this, be sure to cross pod pair boundaries. It does not help to move fast lines from pod 1 to pod 2, they must be moved to pod 3, which is a different pod pair.

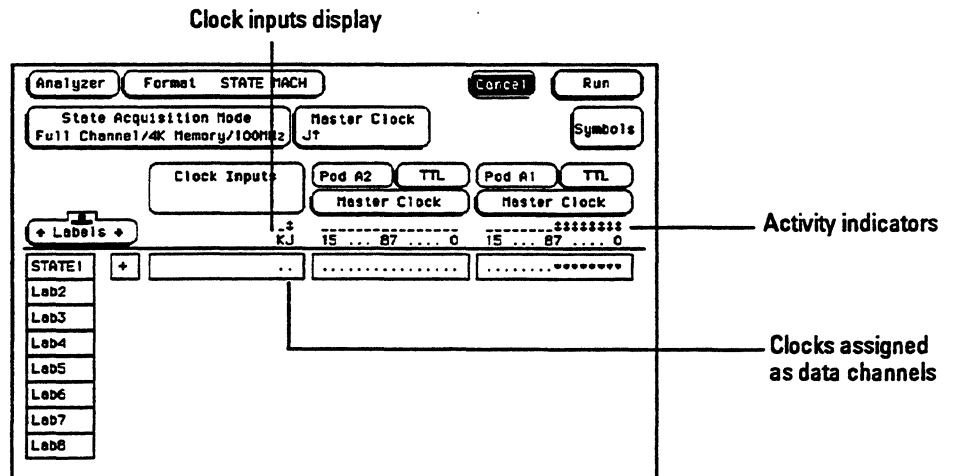
In the 250 MHz mode a transition on any one of 17 bits (half channel) each sample (if they are all turned on) will cause storage.

Invalid Data The analyzer only looks for transitions on data lines that are turned on. Data lines that are turned off store data, but only when one of the lines that is turned on transitions. If the data line is turned on after a run, you would see data, but it is unlikely that every transition that occurred was captured.

Clock Inputs Display

Beneath the Clock Inputs display, and next to the activity indicators, is a display of all clock inputs available in the present configuration. Depending on the model, the number of available clocks vary. The J and K clocks appears with pod pair 1/2, the L and M with pod pair 3/4, and clocks N and P with pod pairs 5/6. In a model with more than three pod pairs, all other clock lines are displayed to the left of the displayed master clocks, and are used as only data channels.

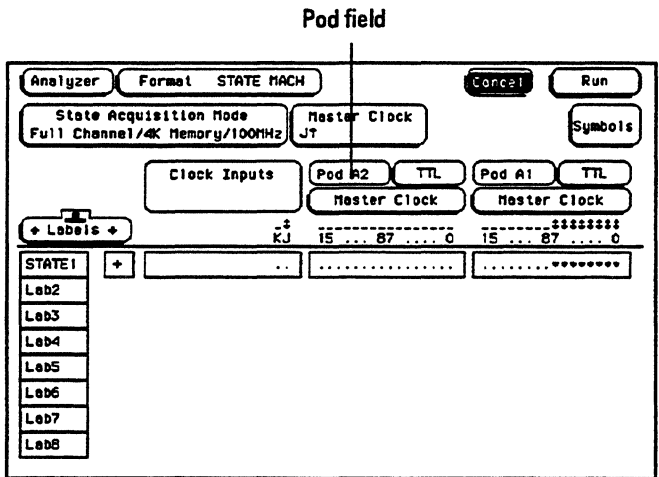
With the exception of the Range resource, all unused clock bits can be used as data channels. If any clock line is used as a data channel, the bit must be assigned. Activity indicators above the clock identifier show clock or data signal activity.



Clock Inputs Display

Pod Field

The Pod field identifies which pod of a pod pair the settings of the bit assignment field, pod threshold field, and pod clock fields effect. In the full channel modes, this field is simply an identifier and is not selectable. However, in the half channel mode, the Pod field turns dark which means it is selectable. It is through the Pod field that you select a pod in the pod pair.



Pod Field

Pod Clock Field (State only)

The Pod Clock field identifies the type of clock arrangement assigned to each pod. When the Pod Clock field is selected, a clock arrangement type menu appears with the choices of Master, Slave, or Demultiplex. Once a pod clock is assigned a clock arrangement, its identity and function follows what is configured in the Master and Slave Clock fields.

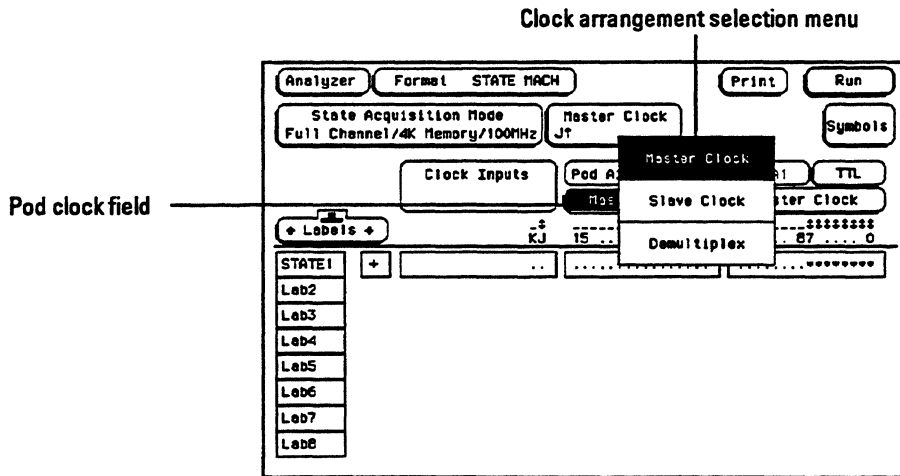
The Pod Clock field and the clocking arrangement is only available in a State analyzer.

Master

This option specifies that data on all pods designated "Master Clock," in the same analyzer, are strobed into memory when the status of the clock lines match the clocking arrangement specified under the Master Clock.

See Also

"Master and Slave Clock Field" found later in this chapter for information about configuring a clocking arrangement.



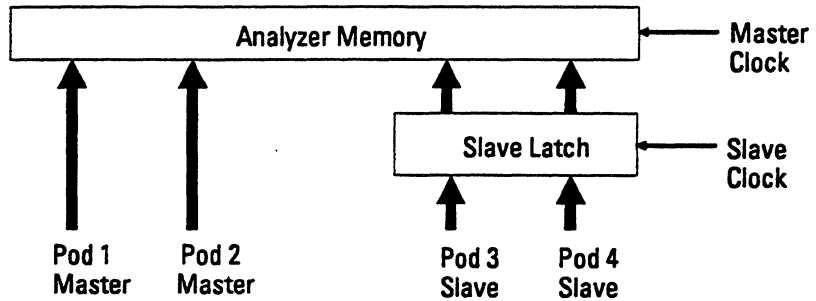
Pod Clock Field

The Format Menu
Pod Clock Field (State only)

Slave

This option specifies that data on a pod designated "Slave Clock" are latched when the status of the slave clock inputs meets the requirements of the slave clocking arrangement. Then, followed by a match of the master clock and the master clock arrangement, the slave data is strobed into analyzer memory along with the master data. See the figure below.

If multiple slave clocks occur between master clocks, only the data latched by the last slave clock prior to the master clock is strobed into analyzer memory.



Latching Slave Data

Slave clock arrangement field

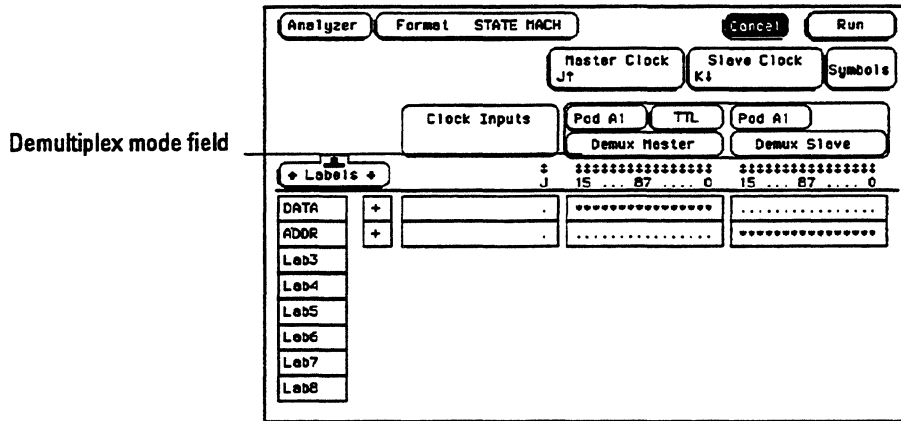
The screenshot shows a software interface for configuring clock inputs. At the top, there are buttons for "Analyzer", "Format", "STATE", "MACH", "Cancel", and "Run". Below these are "State Acquisition Mode" (Full Channel/4K Memory/100MHz), "Master Clock" (J?), and "Slave Clock" (K1) with a "Symbols" button. The "Clock Inputs" section shows "Pod A2" and "Pod A1" each with "TTL" and "Master Clock" (or "Slave Clock") options. Below this is a table with a "Labels" dropdown and a data table.

	DATA	ADDR	Lab3	Lab4	Lab5	Lab6	Lab7	Lab8
+
+

Slave Clock Field

Demultiplex

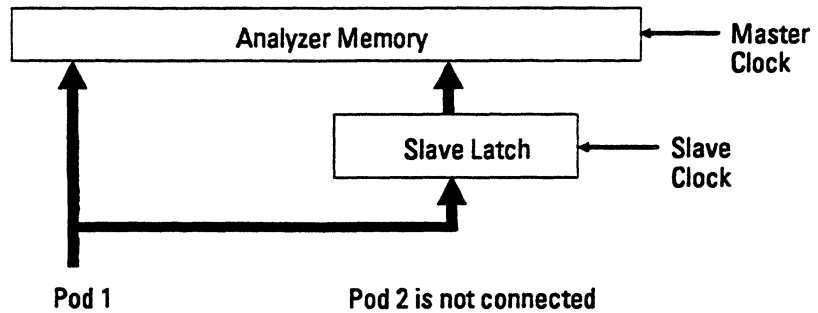
The Demultiplex mode is used to store two different sets of data that occur at different times on the same channels. In Demultiplex mode, only one pod of the pod pair is used, and that pod is selectable. Both the master and slave clocks are used in the Demultiplex mode. Channels assignments are displayed as Demux Master and Demux Slave. For easy recognition of the two sets of data, it is recommended to assign slave and master data to separate labels.



Demultiplex Clocking Mode

The Format Menu
Pod Clock Field (State only)

When the analyzer sees a match between the slave clock input and the Slave Clock arrangement, Demux Slave data is latched. Then, followed by a match of the master clock and the master clock arrangement, the slave data is strobed into analyzer memory along with the master data. If multiple slave clocks occur between master clocks, only the data latched by the last slave clock prior to the master clock is strobed into analyzer memory.



Latching Slave Data In Demultiplex Mode

Pod Threshold Field

The pod threshold field is used to set a voltage level that the data must reach before the analyzer recognizes and displays it as a change in logic levels. You specify a threshold level for each pod in a pod pair. The level specified for each pod is also assigned to the pod's clock threshold.

When the Pod Threshold field is selected, a threshold selection pop-up appears with the following choices:

TTL

When TTL is selected as the threshold level, the data signals must reach +1.5 volts.

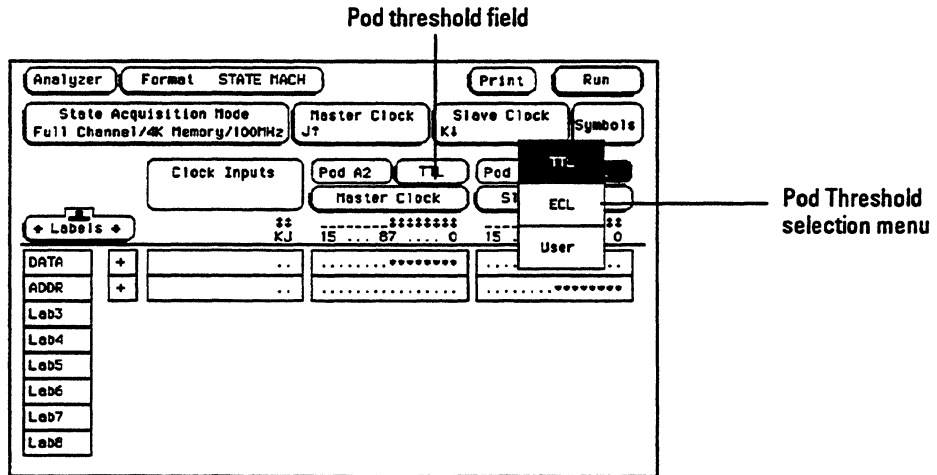
ECL

When ECL is selected as the threshold level, the data signals must reach -1.3 volts.

The Format Menu Pod Threshold Field

USER

When USER is selected as the threshold level, the data signals must reach a user selectable value. The range of this value is between -6.0 volts to $+6.0$ volts.



Pod Threshold Field

Master and Slave Clock Field (State only)

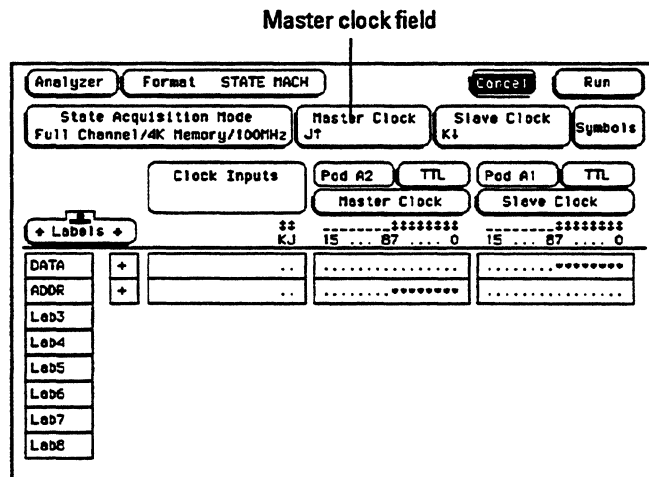
The Master and Slave Clock fields are used to construct a clocking arrangement. A clocking arrangement is the assignment of appropriate clocks, clock edges, and clock qualifier levels which allow the analyzer to synchronize itself on valid data.

Clock Selections

When the Master or Slave Clock field is selected, a clock/qualifier selection menu appears showing the available clocks and qualifiers for a clocking arrangement. Depending on the model, there are up to six clocks available (J through P), and up to four clock qualifiers available (Q1 through Q4). Each pod cable has one clock line. At least one clock edge must be assigned in one of the configured pods. The remaining unassigned clocks can be used as data channels.

See Also

"Pod Clock Field" found earlier in this chapter for information on selecting clocking arrangement types, such as Master, Slave, or Demultiplex.



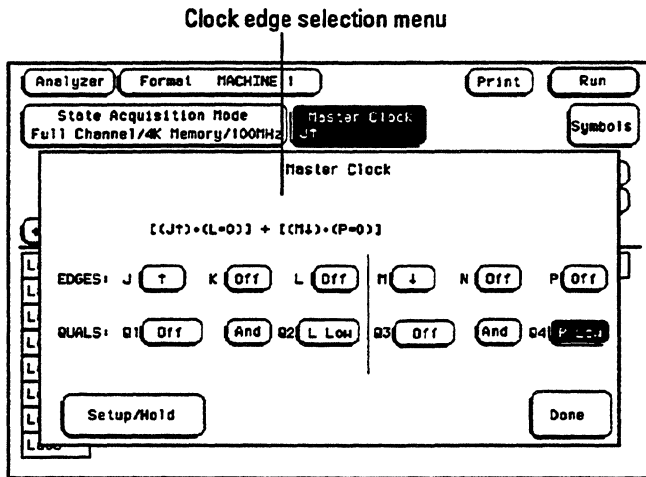
Master Clock Field

The Format Menu

Master and Slave Clock Field (State only)

Clock edges are ORed to clock edges, clock qualifier are ANDED to clock edges, and clock qualifiers can be either ANDED or ORed together. All clock and qualifier combinations on the left side of the graphic line are ORed to all combinations on the right side of the line. For example, in a six-clock model, all combinations of the J, K, and L clock with Q1 and Q2 qualifiers, are ORed to the clock combinations of the M, N, and P clocks with Q3 and Q4 qualifiers.

The clock threshold level is the same as the level assigned in the Pod Threshold field.



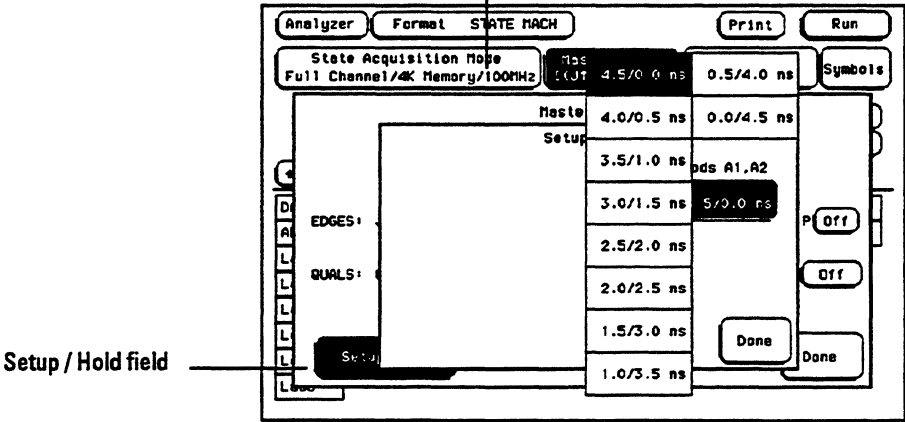
Clock Edges and Levels

Setup/Hold Field (State only)

Setup/Hold adjusts the relative position of the clock edge with respect to the time period that data is valid. When the Setup/Hold field is selected, a configuration menu appears. Use this Setup/Hold configuration menu to select each pod in the analyzer and assign a Setup/Hold selection from the selection list.

With a single clock edge assigned, the choices range from 3.5-ns Setup/0.0-ns Hold to 0.0-ns Setup/3.5-ns Hold. With both edges of a single clock assigned, the choices are from 4.0-ns Setup/0.0-ns Hold to 0.0-ns Setup/4.0-ns Hold. If the analyzer has multiple clock edges assigned, the choices range from 4.5-ns Setup/0.0-ns Hold to 0.0-ns Setup/4.5-ns Hold.

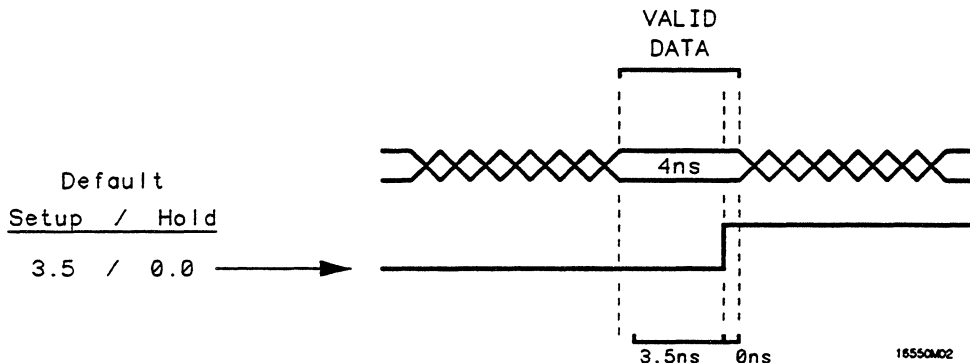
Setup and hold menu



Setup and Hold Menu

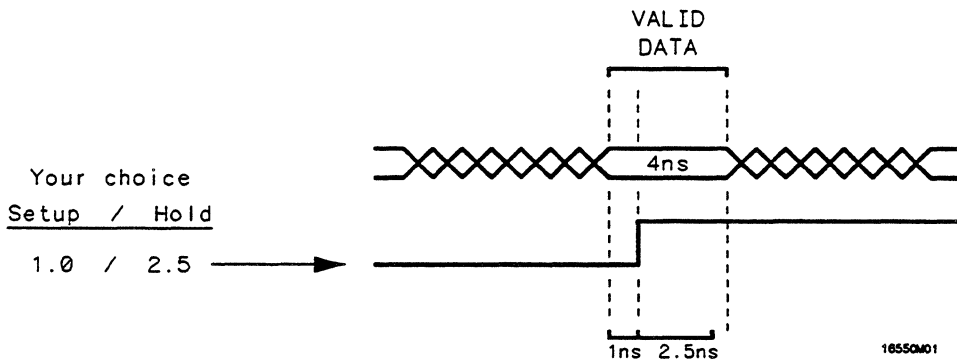
The Format Menu Setup/Hold Field (State only)

The relationship of the clock signal and valid data under the default setup and hold is shown in the figure below.



Default Setup and Hold

If the relationship of the clock signal and valid data is such that the data is valid for 1 ns before the clock occurs and 3 ns after the clock occurs, you will want to use the 1.0 setup and 2.5 hold setting.

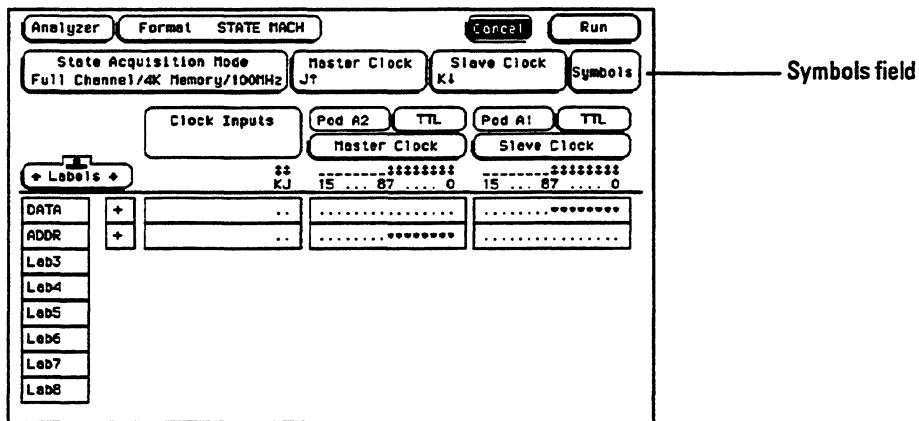


Clock Position in Valid Data

Symbols Field

The Symbols field is located directly below the Run field in the upper right corner of the Format menu. This field is used to access the symbol tables.

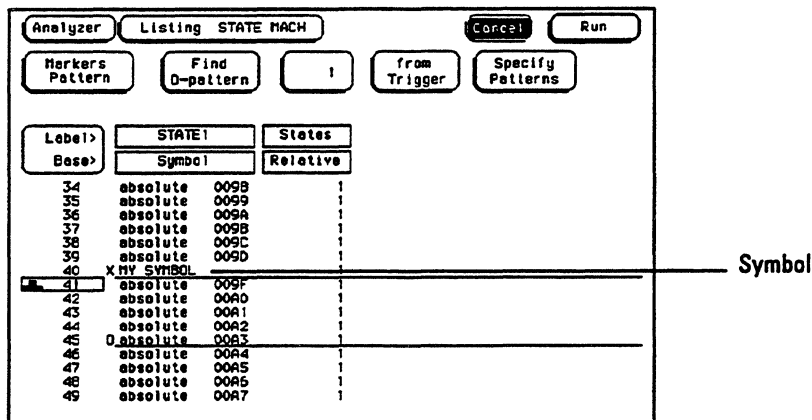
The symbol tables are used to define a mnemonic for a specific bit pattern of a label. You can specify up to 1000 total symbols, and use them freely between available analyzers. When measurements are made, the mnemonic is displayed where the bit pattern occurs using the selected symbol base.



Symbol Field

The Format Menu

Symbols Field



Symbol Located in the Data

Label Field

The Label field identifies the label for which you are specifying symbols. When you select this field, a selection menu appears that lists all the labels turned on for that analyzer. Each label has a separate symbol table, so you can give the same name to symbols defined under different labels. From the label selection menu, select the label for which you wish to specify symbols.

Base Field

The Base field is used to select the numeric base in which the pattern in the symbols menu is displayed. If more than 20 channels are assigned to a label, the Binary option is not offered. As a result, when a symbol is specified as a range, there is only enough room for 20 bits to be displayed on the screen. Decide which base you want to work in and choose that option from the numeric Base pop-up menu.

If you choose the ASCII option, you can see what ASCII characters the patterns and ranges defined by your symbols represent. ASCII characters represented by the decimal numbers 0 to 127 (hex 00 to 7F) are offered on your logic analyzer.

You cannot specify a pattern or range when the base is ASCII. Define the pattern or range in one of the other bases, then switch to ASCII to see the ASCII characters.

Symbol Width Field

The Symbol Width field is used to specify how many characters of the symbol name will be displayed when the symbol is referenced in the Trigger, Waveform, and Listing menus.

To change the Symbol Width, simply highlight the field and turn the knob to set the number of characters in the symbol. You can set the logic analyzer to display from 1 to 16 of the characters in the symbol name.

Symbol Name Field

When you first access the symbol table, there are no symbols specified. The symbol name field reads "New symbol." When this field is selected, a cursor appears and you can then type a symbol name up to a maximum of 16 characters. Press the Done key when you are finished.

When you select Done, a symbol Type field becomes active. The symbol Type field is used to define the symbol type as either a pattern or a range. When you select this field, it toggles between pattern and range.

Pattern Type Field

When the symbol is defined as a pattern, a Pattern/Start field appears to the right of the Type field. Use this field to specify what the pattern is. To assign a pattern, highlight the Pattern/Start field and type in the desired pattern.

Range Type Field

If the symbol is defined as a range, a Pattern/Start field and a Stop field appears. Use these fields to specify the upper and lower boundaries of the range.

To assign pattern values to the boundaries, highlight the fields and type in the pattern with the front-panel keypad. You can specify ranges that overlap or are nested within each other.

The Format Menu

Symbols Field

To add, delete, or modify symbols in the symbol table, select a symbol name and use one of the following options from the pop-up selection list:

Modify Symbol

If you select this option, a cursor appears under the first letter of the symbol name. Make any changes desired, then press the Done key.

Add a Symbol

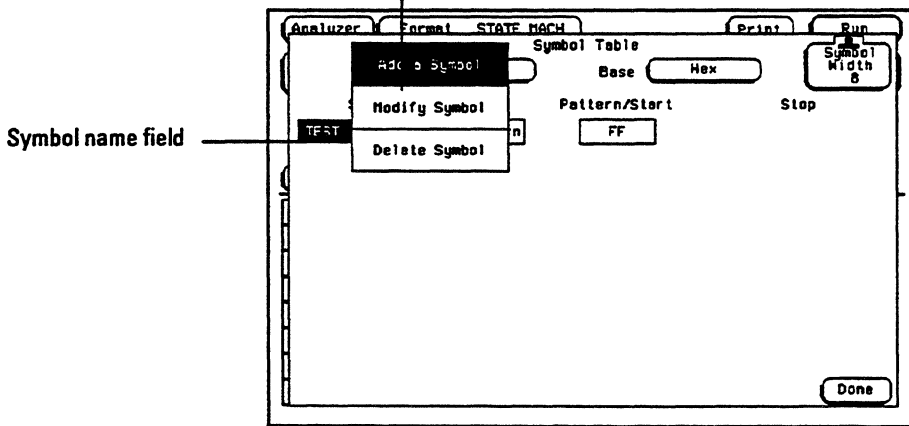
When you select this option, a cursor appears in a blank name field. Type in the new name, then press the Done key. The new symbol name appears directly below the old name in the symbol table.

Delete Symbol

If you select this option, the highlighted symbol will be deleted from the symbol table.

When you have specified all your symbols, you can leave the symbol table menu by pressing the Done key.

Modify symbol selection menu



Modify Symbol Selection Menu

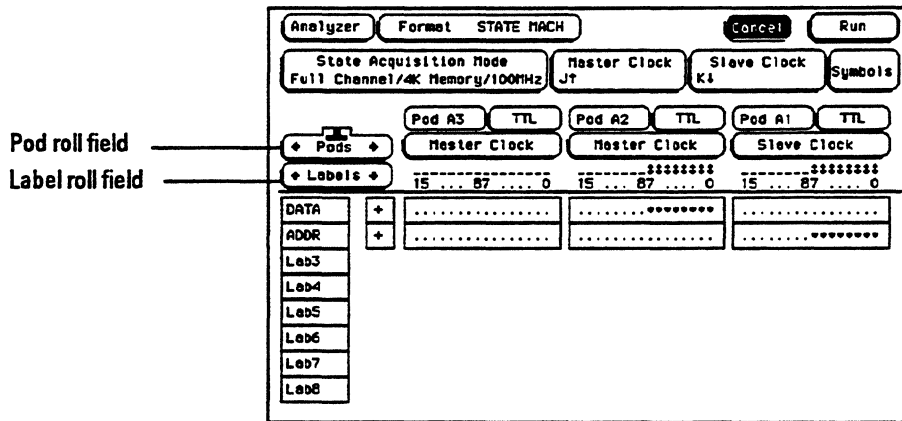
Label and Pod Rolling Fields

The Label and Pod rolling fields allow you to view offscreen labels and pods. To view offscreen labels, select the Labels roll field to place the roll indicator into the field, then rotate the knob. The labels scroll up and down.

The Pods rolling field allows you to view offscreen pods. To view offscreen pods, select the Pods roll field to place the roll indicator in the field, then rotate the knob. Pods are positioned with the lowest numbered pod on the right.

See Also

The rolling function is the same for all items that are stored offscreen. For more information on similar fields, refer to "Label/Base Roll Field" in the Common Menu Fields chapter.



Pod and Label Rolling Fields

Label Assignment Fields

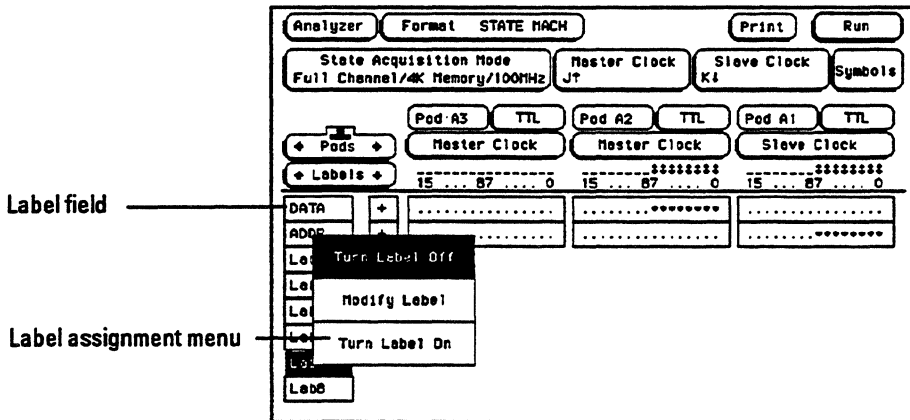
The label assignment fields display the user-defined label names. Custom label names are used when there are different types of data which must be tracked.

The label column contains 126 label fields that you can define. The analyzer displays only 8 labels at any time.

The default label names are Lab1 through Lab126. However, the names can be modified to any six character string by highlighting the field, then typing in the new name. In addition, when any label field is selected, a pop-up menu appears which is used to modify the label list.

See Also

"Label and Pod Rolling Fields" found earlier in this chapter for information on rolling offscreen labels back onscreen.



Label Field

Turn Label Off

The Turn Label Off option turns off the label. When a label is turned off, the label name and the bit assignments are saved by the logic analyzer. This gives you the option of turning the label back on and still having the bit assignments and name if you need them. With labels off, the label names remain displayed for identification and searching purposes. With labels off, memory can be saved if in transitional timing.

Modify Label

If you want to change the name of a label, or want to turn on a label and give it a specific name, you would select the Modify label option. When selected, a cursor appears under the first letter. Type in the new name, then press the Done key. Label names can contain up to six characters.

Turn Label On

The Turn Label On selection is used to activate a label and its accompanying bit assignment field. If a custom name is defined for the label, the name remains with the label. If a custom name is not assigned, the default name remain with the label. In addition, if no channels are turned on in the bit assignment fields, the label is turned off when the Format menu is exited.

See Also

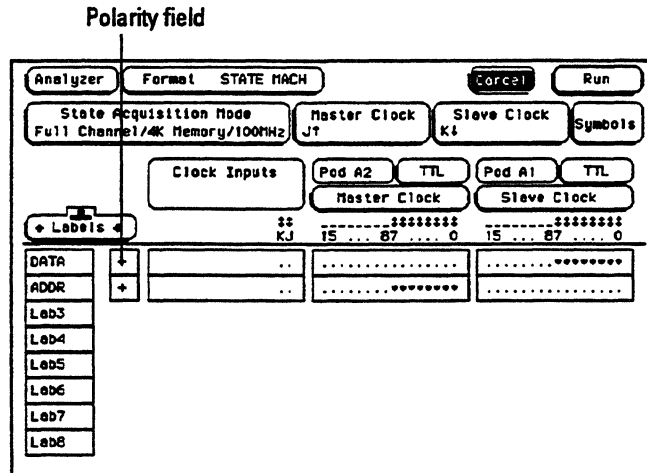
For information on how the Label Field modification works in other menus, refer to "Label Field" in the Common Menu Fields chapter.

Label Polarity Fields

The Label Polarity fields are used to assign a polarity to each label. The default polarity for all labels is positive (+). You change the label polarity by selecting the polarity field, which toggles the polarity between positive (+) and negative (-).

When the polarity is inverted, all data as well as bit pattern specific configurations used for identifying, triggering, or storing data reflect the change of polarity.

In a timing analyzer with the data inverted, the waveform display remains positive true.



Polarity Field

Bit Assignment Fields

The bit assignment fields are used to assign physical channels to labels. The convention for bit assignment is as follows:

- * (asterisk) indicates an assigned bit.
- . (period) indicates an unassigned bit.

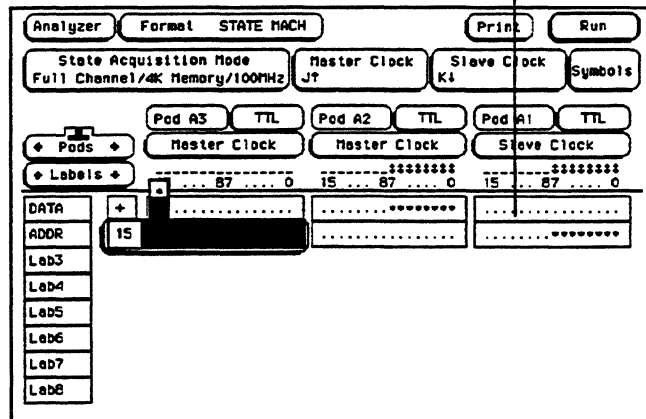
To change a bit assignment, select the bit assignment field and using the knob, move the cursor to the bit you want to change, then select an asterisk or a period. When the bits are assigned as desired, and you close the pop-up, the screen displays the new bit assignment.

To the left of the bit assignment field is a bit reference number that tells you the bit number which is being assigned. In addition, above the bit assignment field, is a reference line with numbers from 0 to 15, with the left bit numbered 15 and the right bit numbered 0. This bit reference line helps you know exactly which assigned bits have a proper connection by displaying activity indicators.

See Also

For more information on the bit reference line and the activity indicators on the bit reference line, refer to "Activity Indicators" in the Configuration menu.

Bit Assignment field



Bit Assignment Field

The Format Menu

Bit Assignment Fields

Labels may have from 1 to 32 channels assigned to them. If you try to assign more than 32 channels to a label, the logic analyzer will beep, indicating an error. A message will appear at the top of the screen telling you that 32 channels per label is the maximum.

Channels assigned to a label are numbered from right to left by the logic analyzer. The least significant assigned bit on the far right is numbered 0, the next assigned bit is numbered 1, and all other bits assigned sequentially up to the maximum of 16 per pod. Since 32 channels can be assigned to one label at most, the highest number that can be given to a channel is 31.

Although labels can contain split fields, assigned channels are always numbered consecutively within a label.

The screenshot shows the 'Format' menu of a logic analyzer. At the top, there are tabs for 'Analyzer', 'Format', and 'STATE MACH', along with 'Cancel' and 'Run' buttons. Below these are settings for 'State Acquisition Mode' (Full Channel/4K Memory/100MHz), 'Master Clock' (J↑), 'Slave Clock' (K↓), and 'Symbols'. There are also sections for 'Clock Inputs' and 'Pod A2 TTL' (Master Clock), and 'Pod A1 TTL' (Slave Clock). A '+ Labels +' button is visible. The main area contains a table for bit assignment:

	
	++
	KJ	15 .. 87 .. 0	15 .. 87 .. 0	15 .. 87 .. 0
DATA	+
ADDR	+
Lab3				
Lab4				
Lab5				
Lab6				
Lab7				
Lab8				

Bit Assignment Example

System / Analyzer Field

The function of the System/Analyzer field is the same in all menus. For a complete definition of the System/Analyzer field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Menu Field

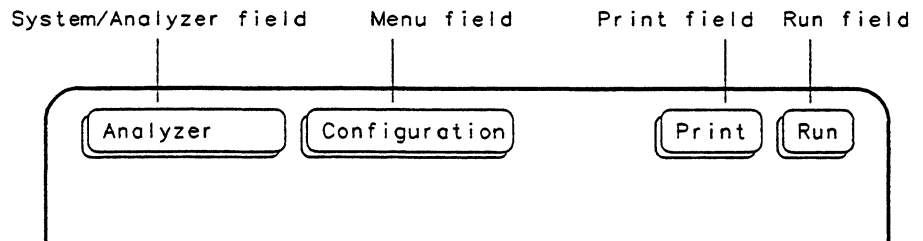
The function of the Menu field is the same in all menus. For a complete definition of the Menu field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Print Field

The function of the Print field is the same in all menus. For a complete definition of the Print field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Run Field

The function of the Run field is the same in all menus. For a complete definition of the Run field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.



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Common Menu Fields

The Trigger Menu	152
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The Trigger Menu

The Trigger Menu

The Trigger menu is used to specify when the analyzer triggers and what the analyzer stores in acquisition memory. The Trigger menu can be viewed as having three, functionally different sections.

One section is the Sequence Levels, located in the large center box. The second section is the Control, which is located to the right of the Sequence Levels box. The third section is the Resource Terms, which is located at the bottom of the menu.

Sequence Levels

The screenshot shows the Trigger menu interface. At the top, there are buttons for 'Analyzer', 'Trigger', 'STATE', and 'HACH'. To the right are 'Cancel' and 'Run' buttons. The main area is divided into three sections:

- Sequence Levels:** A flowchart with two levels. Level 1 is labeled '1' and contains the text 'While storing "no state" TRIGGER on "a" 1 time'. Level 2 is labeled '2' and contains the text 'Store "enystate"'. A vertical line separates this section from the Control section.
- Control section:** Located to the right of the Sequence Levels, it contains a 'Timer' column with values '1' and '2', and four buttons: 'Arming Control', 'Acquisition Control', 'Count Time', and 'Clear Trigger'.
- Resource terms section:** Located at the bottom, it has a 'Label' column with options 'a', 'b', 'c', and 'd', and a 'DATA' column with values 'DATA 1', 'Binary', '10101010', 'XXXXXXXX', 'XXXXXXXX', and 'XXXXXXXX'.

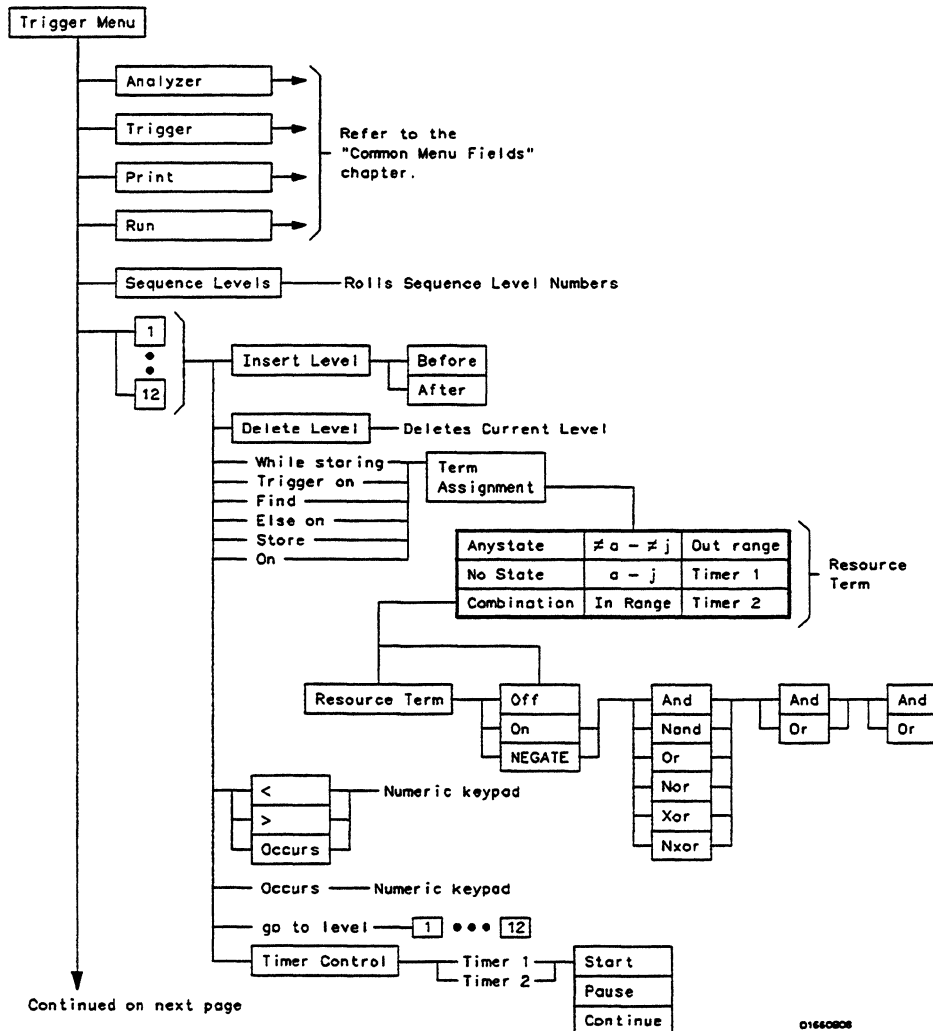
Resource terms section

Control section

The Trigger Menu

Trigger Menu Map

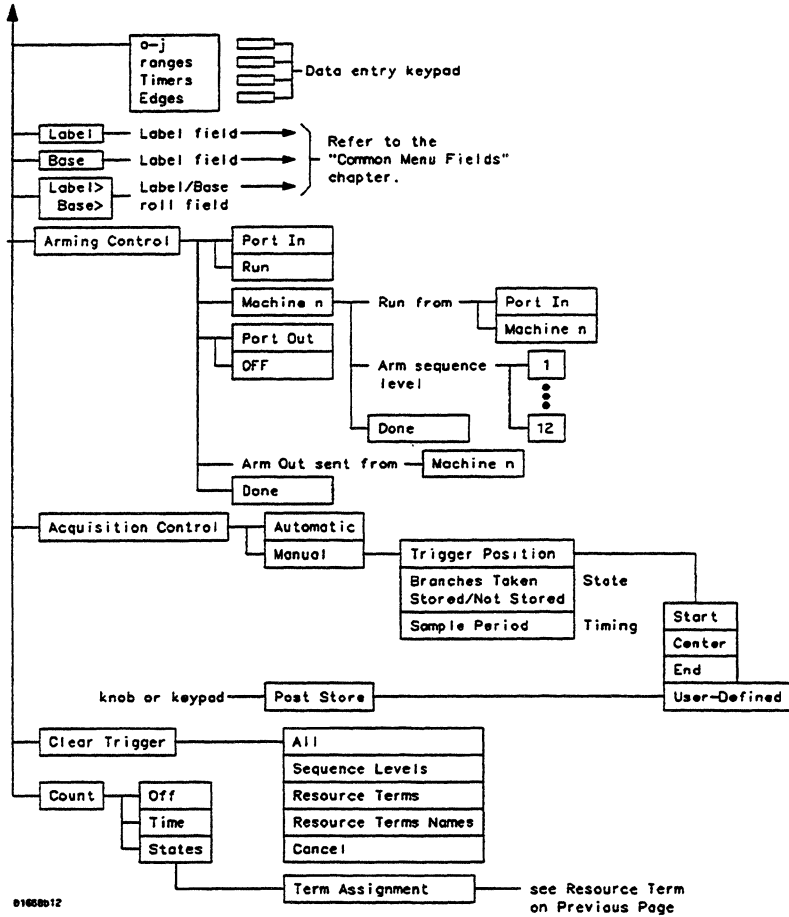
The following menu map illustrates all fields and available options in the Trigger menu. The menu map will help you get an overview as well as provide you with a quick reference of what each menu contains.



Trigger Menu Map

The Trigger Menu

Continued from previous page



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Trigger Menu Map (cont.)

Sequence Levels

The Sequence Levels section controls when the analyzer triggers, what the analyzer triggers on, and what data is stored in memory before and after triggering occurs. By using Sequence Levels, the user creates a sequence of instructions for the analyzer to follow. The instructions contain user-defined resources terms, representing such things as timers, ranges, edges, glitches, and bit patterns.

As the resource terms are evaluated and acted upon by the analyzer, all subsequent branching and storing within the sequence flow is directed by your instructions. The path taken resembles a flow chart, and the end result is the storage of only the data you need.

The State analyzers have up to 12 sequence levels available and the Timing analyzer has up to 10 sequence levels.

Sequence Level Number Field

The Sequence Number field identifies an instruction to be evaluated by the analyzer. In addition, the number field is used to access the Sequence Instruction menu, which is used to construct the sequence instruction.

The sequence instruction for each level is displayed in text and located just to the right of the level number. The timer status in each level is also displayed to the right of the instruction text.

Sequence Level Roll Field

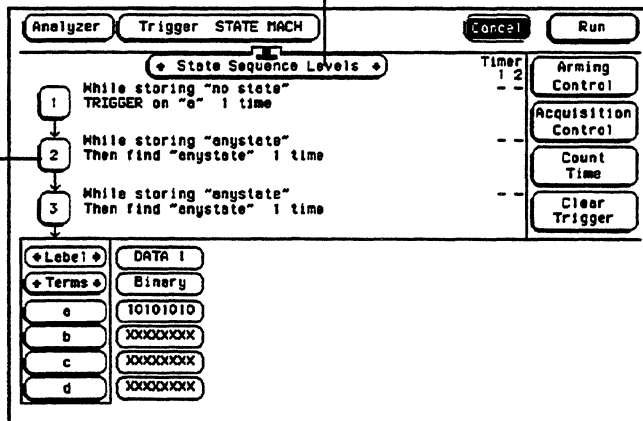
Offscreen sequence levels are rolled back on screen by highlighting the Sequence Levels field, then by turning the knob.

See Also

"Label and Base Roll Field" in the Common Menu Fields chapter for information on how other roll fields work.

Sequence level roll field

Sequence level
number field



Sequence Level Number

Sequence Instruction Menu

When a Sequence Level Number field is selected, a sequence instruction menu appears. Use this menu to create an instruction for the sequence level number, to insert adjacent sequence levels, or to delete the level. The instruction you create will read like a sentence, with the assigned Resource Terms directing how the analyzer qualifies and stores the desired data.

Insert and Delete Level Fields

The Insert Level field is used to add another sequence level. When this field is selected, depending on the analyzer configurations you are given choices to add a field before or after the sequence level you are currently in. The Insert field disappears when all available sequence levels are inserted. The Delete Level field is used to delete the sequence level you are in.

See Also

"Resource Term Fields" later in this chapter for information on assigning a value to the Resource Terms.

The diagram shows a rectangular window titled "Sequence Level 1". At the top left is a button labeled "Insert Level" and at the top right is a button labeled "Delete Level". Below these buttons are three rows of input fields:

- The first row is labeled "While storing" and contains a text box with "no state".
- The second row is labeled "TRIGGER on" and contains a text box with "a", followed by the word "Occurs" and a small control element with the number "1".
- The third row is labeled "Else on" and contains a text box with "no state", followed by the text "go to level" and a small control element with the number "1".

At the bottom of the window, there is a message: "Timer Control is not available in level 1" and a "Done" button on the right. Three labels with lines pointing to the interface are: "Insert level field" pointing to the "Insert Level" button, "Delete level field" pointing to the "Delete Level" button, and "Term assignment field" pointing to the "TRIGGER on" text box.

State Sequence Instruction Menu

The Trigger Menu

Sequence Instruction Menu

Term Assignment Fields

The Term Assignment fields hold user-defined Bit Patterns, Ranges, Timers, and logical Combination resource terms.

You can mix and match the different resource terms to form whatever kind of instruction needed to qualify the trigger and store operations.

Occurrence Counter Field

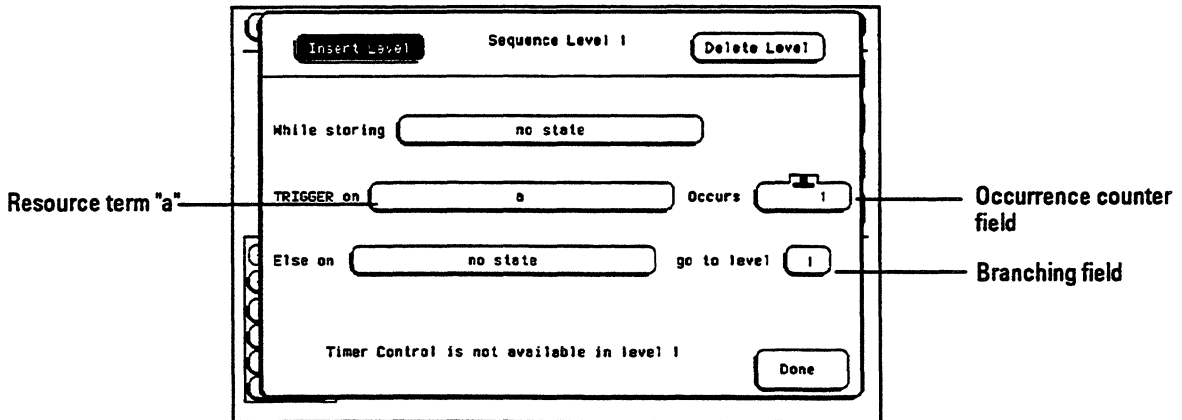
The Occurrence Counter field indicates the number of times the analyzer must see the resource term before the analyzer is allowed to advance to the next sequence level.

To assign an occurrence number, simply turn the knob, or type in the number using the keypad. The maximum number of occurrences is 1048575.

If the "Else on" term is seen before all specified occurrences have taken place, the flow of the sequence instruction goes to the sequence level designated in the Branching field.

See Also

The term types such as Bit Pattern, Range, or Timers later in this chapter for information on selecting resource term choices and how to assign a value to a resource term.



Occurrence Counter Field

Branching Field

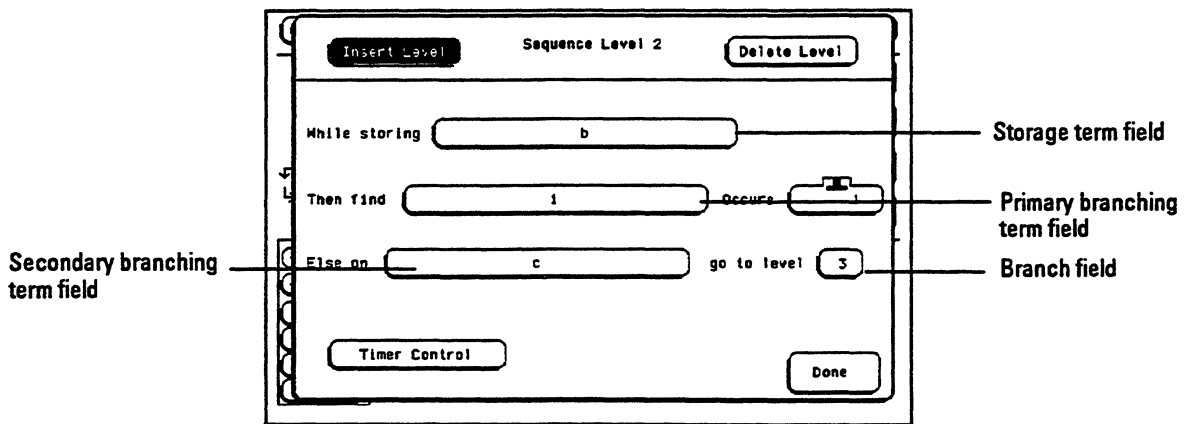
Each sequence level has two-way branching. If the first resource term is found, the branch is to the next sequence level. If the first resource term is not found, the analyzer immediately evaluates the "Else on" secondary branching term.

If the "Else on" term is found, the secondary branch taken is to the designated sequence level in the Branch field. If the "Else on" term is not found, the analyzer continues to loop within the sequence level until one of the two branches are found. If the "Else on" branch is taken, the occurrence counter is reset even if the "go to level" branch is to the same level.

If both terms are found at the same time, the branch is to the next sequence level after the required number of first term occurrences.

Branching across trigger levels is possible. If this occurs, the sequence level evaluation could loop without ever seeing a trigger term. Care should be taken in designing your flowchart and constructing the sequence instructions.

To set a sequence level branch, select the Branch field, then select a destination sequence level number.



Branching in a Sequence Instruction

Duration Counter Field (Timing only)

The Duration Counter field displays a user definable time period that the resource term must be valid before the analyzer continues with the sequence evaluation.

> Field When the Greater Than sign (>) precedes the Duration Counter field, the analyzer continues sequence level evaluation only after the resource term has been true for greater than or equal to the amount of duration specified.

< Field When the Less Than sign (<) precedes the Duration Counter field, the analyzer continues sequence level evaluation only after the resource term has been true for less than or equal to the amount of duration specified. For each (<) assignment, you lose the use of 2 levels from the total number of sequence levels. So, using a less than sign requires three sequence levels.

When < or > duration is assigned, the secondary branching (Else on) is not available. To assign a time duration, simply turn the knob, or select the Duration Counter field and use the keypad.

Occurs Field When "Occurs" is selected, the Duration Counter field changes to an occurrence counter, and the sequence evaluation is delayed until the resource term has occurred by the number of occurrences selected. To assign an occurrence number, simply turn the knob, or highlight the occurrence field, and use the front-panel keypad. The maximum number of occurrences is 1048575.

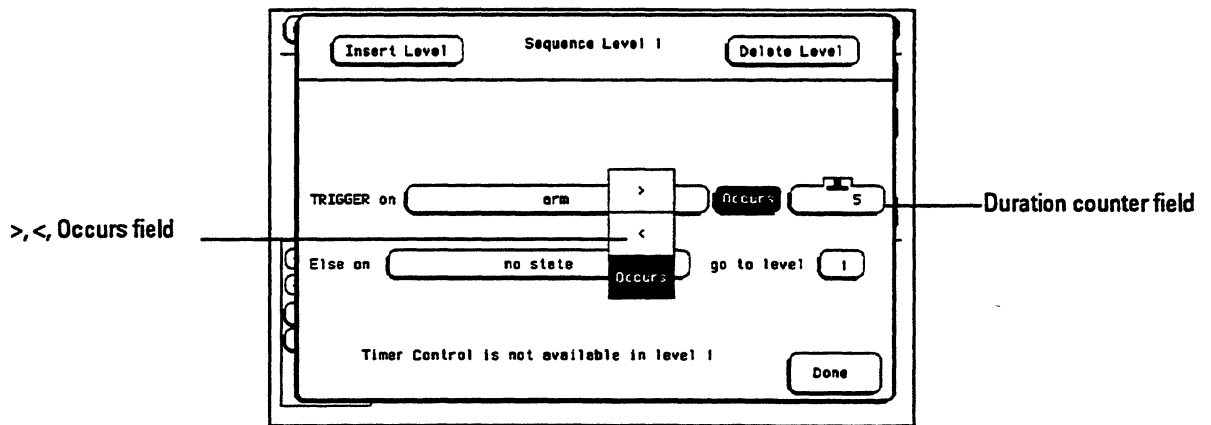
See Also

"Occurrence Counter Field" found earlier in this chapter for information on the occurrence counter for the State analyzer.

When the "Occurs" selection is made, the "Else on" resource term (secondary branch) becomes available for a second branching option. If the first resource term (primary branch) is not found, and the second resource term is, the analyzer branches to the sequence level designated in the Branch field.

See Also

"Branching Field" found earlier in this chapter for more information on branching.



Sequence Level Instruction

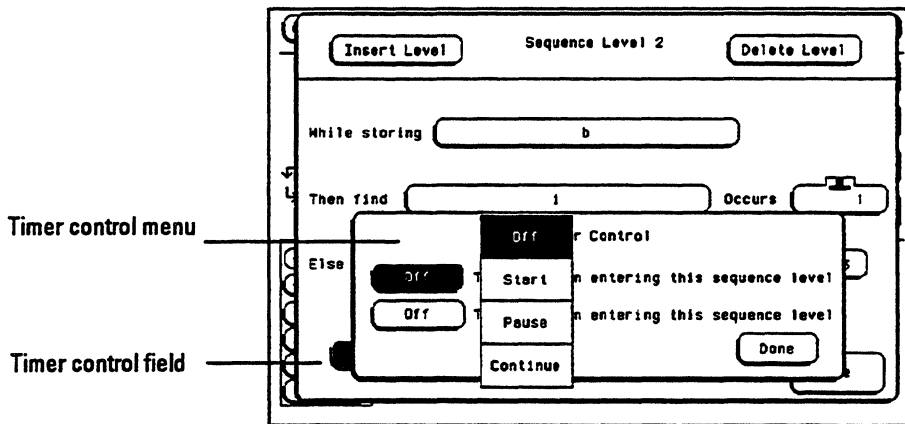
The Trigger Menu Sequence Instruction Menu

Timer Control Field

The Timer Control field is used to access the Timer Control menu. Use the Timer Control menu to Start, Stop, Pause, or Continue timer operation as the analyzer enters a sequence level. Each sequence level has the ability to control the same timer. The default timer condition in all sequence levels is Off.

See Also

"Timer Terms" found later in this chapter for information on how timers work and how to assign a value to a timer.

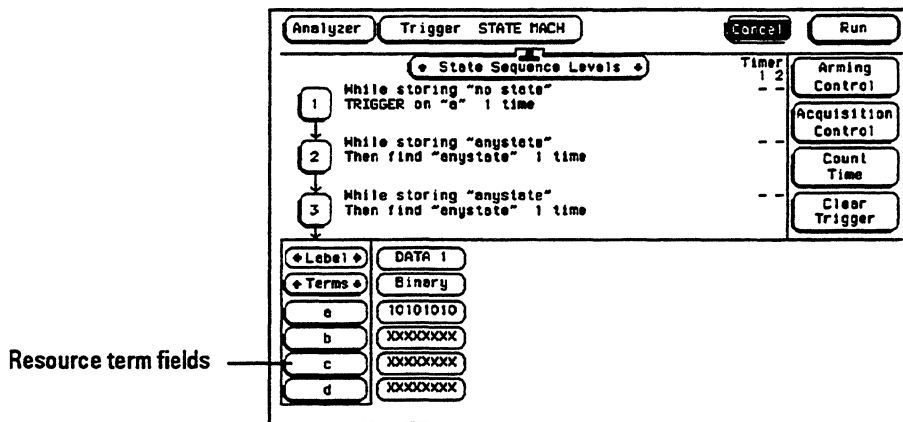


Timer Control Menu

Resource Terms

Resource terms are the user-defined qualifiers that are placed in the Term Assignment fields of the sequence instructions. Resource terms can take the form of Bit Patterns, Ranges, Timers or Edge terms. They can be used separately or in a logical combination with other terms.

The analyzer evaluates the resource terms within the sequence instruction and determines if the instruction is true or false. Depending on a true or false evaluation, the appropriate branching direction occurs.



Resource Term Fields

Resource Term Fields

The Resource Term fields identify the terms available for use within the analyzer. The Resource Term fields are also used to access the Resource Term Configuration menu.

Just to the right of the Resource Term fields are the assignment fields. For each assigned label, there are assignment fields that correspond to a resource term. The assignment fields display the currently assigned values. To assign a new value, highlight the field and type in the new value from the front-panel keypad.

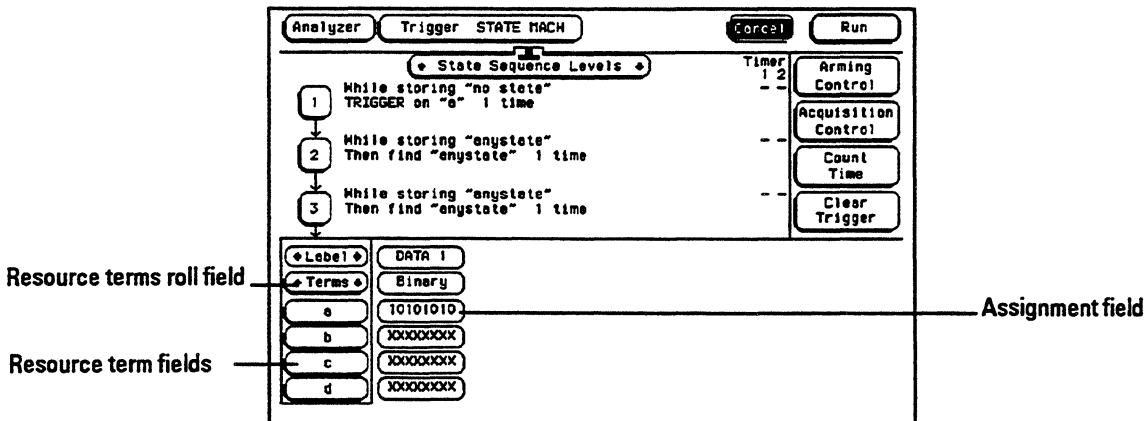
Resource Terms Roll Field

Offscreen resource terms are rolled back on screen by simply highlighting the Terms field, then turn the knob.

See Also

The term types such as Bit Pattern, Range, or Timers found later in this chapter for more information on the assignment fields for each term.

"Label and Base Roll Field" in the Common Menu Fields chapter for information on how other roll fields work.



Resource Term Fields

Resource Term Configuration Menu

When any of the resource term fields are selected, a configuration menu appears. Use this configuration menu to quickly assign a resource term to an analyzer, set the resource term to a preset value, or rename the resource term to a customized name. The following functions can also be accomplished by selecting the assignment field and using the keypad.

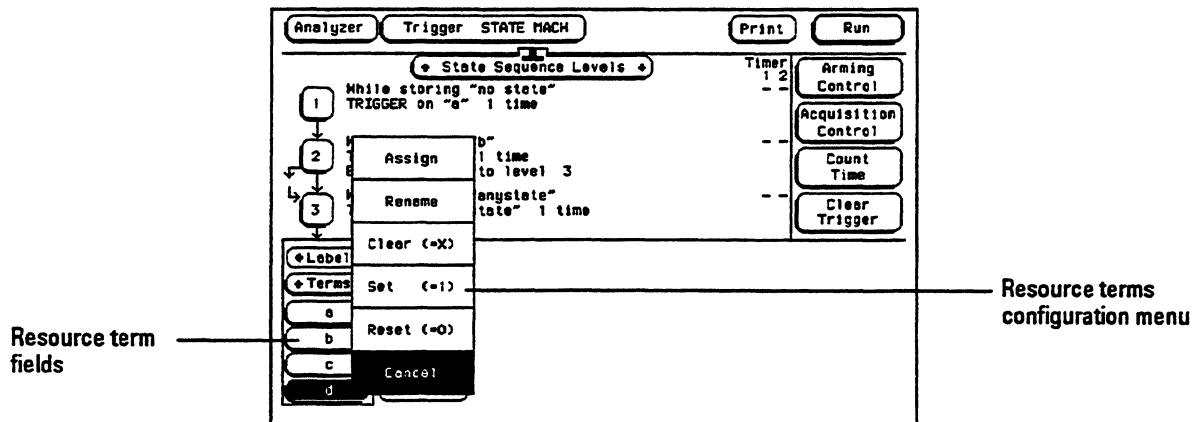
Clear (=X) Sets the Term Assignment fields as follows:

- In Terms a – j, the assignment field is set to all Xs (don't cares).
- In Range 1, 2 terms, the two assignment fields are set to maximum (Fs) and minimum (Os) settings.
- In Timers 1, 2 terms, the assignment field is reset to a minimum time of 400 ns.
- In Edge 1, 2 terms, the assignment field is reset to a period (.).

Set (=1) Sets the Term Assignment fields as follows:

- In Terms a – j, the assignment field is set to all 1s (high).

This option is not available for the two Range, Timer, and Edge terms.



Resource Terms Configuration Menu

The Trigger Menu

Resource Term Fields

Reset (=0) Sets the assignment fields as follows:

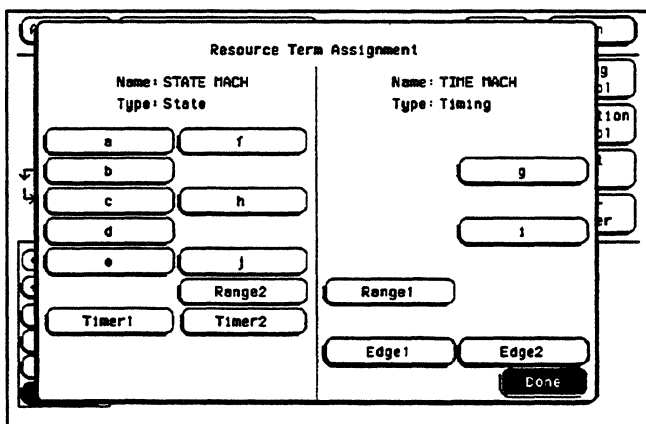
- In Terms a – j, the assignment field is set to all 0s (low).

This option is not available for the two Range, Timer, and Edge terms.

Rename This function places the cursor under the first letter in the resource term's name. Use the keypad to create a custom name for the resource term. This function works for all resource terms.

Assign All of the available resource terms except the Edge terms can be assigned to any analyzer. However, a term can only be assigned to one analyzer at a time. As you select each resource term, it toggles between analyzers.

The Edge terms are only used in a timing analyzer.



The screenshot shows a menu titled "Resource Term Assignment" with two columns of resource terms. The left column is for "STATE MACH" (Type: State) and the right column is for "TIME MACH" (Type: Timing). The left column contains terms a through j, Range2, and Timer1 through Timer2. The right column contains terms g, i, Range1, Edge1, and Edge2. A "Done" button is located at the bottom right of the menu.

Resource Term	Type
a	State
b	State
c	State
d	State
e	State
f	State
g	Timing
h	State
i	Timing
j	State
Range1	Timing
Range2	State
Timer1	State
Timer2	State
Edge1	Timing
Edge2	Timing

Resource Term Assignment Menu

Bit Pattern Terms

Bit Pattern terms are set to match the numeric value or bit pattern of a group of data channels. The ten available Bit Pattern terms are "a" through "j". Each term can be assigned to either of the two analyzers, but not both. The compliment of the bit patterns you specify for "a" through "j" are available by selecting "≠a" through "≠j".

Bit Pattern Assignment

The assignment of a bit pattern to the resource terms "a" through "j" can be done in two ways. If you want a pattern of all 1s, all 0s, or all Xs (don't cares), you can insert these values by selecting the Resource Term field itself, then select your choice from the configuration menu.

In most cases you will simply highlight the assignment field to the right of the term and type in a value from the front-panel keypad.

See Also

"Resource Term Configuration Menu" found earlier in this chapter for information on configuring resource terms.

Label	DATA 1
Terms	Binary
a	10101010
b	XXXXXXXX
c	XXXXXXXX
d	XXXXXXXX

Bit Pattern Resource Term

The Trigger Menu

Bit Pattern Terms

Bit Pattern Selection

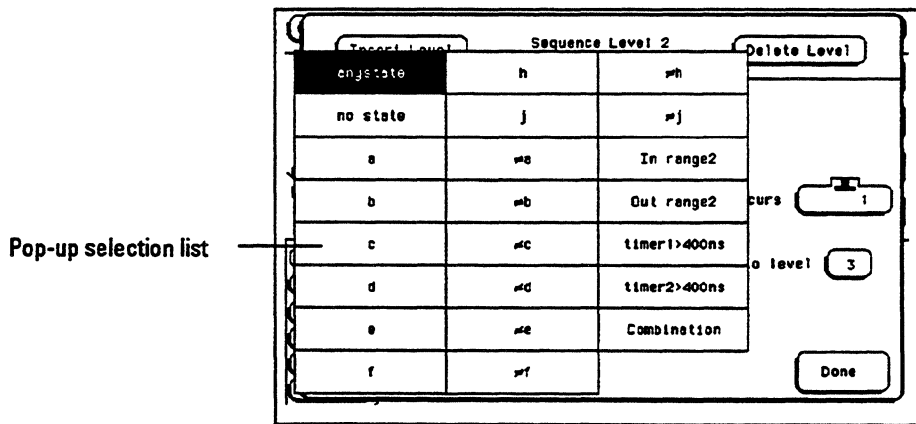
After the resource terms have a value assigned, they can be inserted into the sequence instruction where they direct the flow of that sequence instruction.

Bit Pattern terms are inserted into a sequence instruction by selecting the Term Assignment field, then selecting a term "a" through "j" from the pop-up selection list.

Triggering Considerations using Bit Patterns

When running conventional timing at 250 MHz or 500 MHz, pattern recognition is limited by as much as 13 nsec. This is because samples are being alternately sent through two pipelines in the sequencer in order to keep their rate down to 125 MHz.

There is a technique which can improve this performance. In the sequencer, terms "a" through "e" are evaluated by one pipeline and terms "f" through "j" are evaluated by the other pipeline. Assign the same pattern to a term in the first group and to a term in the second group. Then, OR the two terms together in the term assignment field.



Bit Pattern Term Selection

Range Terms

Range terms bracket groups of bit patterns. There are two available Range terms. Each Range term is assigned to either of the two analyzers, but not both.

You assign an upper and lower bit pattern boundary. The range is recognized as the data that is numerically between or on the two specified boundaries. In addition, the range must be contained in a single pod pair, with no clock bits allowed.

Range Assignment

To assign bit patterns to the upper and lower boundaries of a Range term, highlight the upper or lower assignment fields and type in a value from the front-panel keypad.

You can clear the range boundaries by setting them to all Xs (don't cares) by selecting the Range term field, then selecting the Clear (=X) field from the configuration menu. The Clear (=X) option places zeros and Fs in the upper and lower boundaries respectively.

See Also

"Resource Term Configuration Menu" found earlier in this chapter for information on configuring resource terms.

The screenshot shows the Trigger menu configuration screen. At the top, there are buttons for 'Analyzer', 'Trigger', 'STATE MACH', 'Cancel', and 'Run'. Below these is a section for 'State Sequence Levels' with a dropdown arrow. It contains three levels:

- Level 1: While storing "no state" TRIGGER on "a" 1 time
- Level 2: While storing "b" Then find "anystate" 1 time Else on "c" go to level 3
- Level 3: While storing "anystate" Then find "anystate" 1 time

Below the state sequence levels is a section for 'Range2' with a dropdown arrow. It contains two fields: 'upper' and 'lower'. The 'upper' field contains '11111111' and the 'lower' field contains '00000000'. To the left of the 'Range2' section, there are labels 'Range term field' and 'Range term assignment fields' with arrows pointing to the 'Range2' dropdown and the 'upper'/'lower' fields respectively.

Range Terms

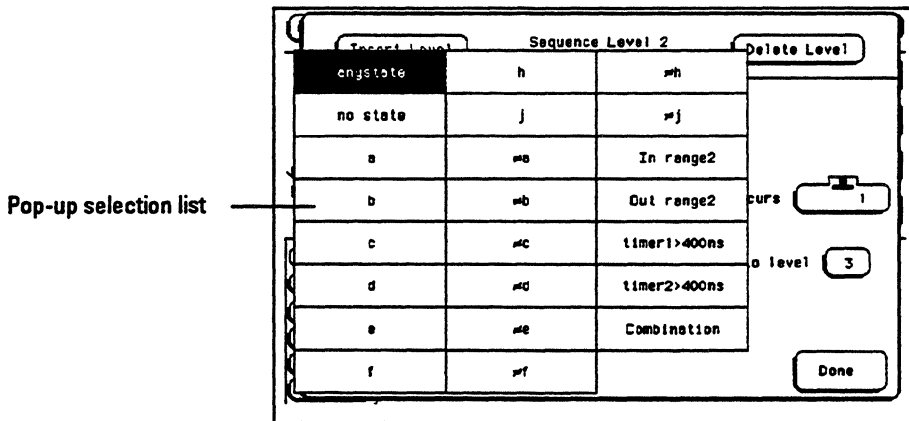
The Trigger Menu

Range Terms

Range Term Selection

With upper and lower range boundaries assigned, you insert the appropriate In range or Out range terms into the sequence instruction. The In range term is true when the analyzer recognizes a bit pattern on or between the assigned range boundaries. The Out range term is true when the In range term is false.

In and Out range term are inserted into a sequence instruction by selecting the Term Assignment field, then selecting an "In range 1,2" or "Out range 1,2" term from the pop-up selection list



Range Term Selection

Timer Terms

There are two available Timer terms. Each Timer term is assigned to either of the two analyzers, but not both. Timers can be used as either the trigger term, the store term, or a branching term, within a sequence level. With timers inserted into sequence levels, you can start a timer in one level, pause it, or stop it in another sequence level.

As with other resource terms, timers are either true or false. Timers start as you enter the sequence level, and when its count expires, it becomes true. If a timer is paused in one level, it must be continued in another level before it can count through and become true. Timers can also be inverted, so it can start as true and become false when its count expires.

Timer Assignment

To assign a time value to the Timer 1, 2 terms, select the assignment field and type in a value from the front-panel keypad. Units of measure are selected by moving the cursor left and right with the front-panel arrow keys.

The screenshot shows the STATE MACH menu interface. At the top, there are tabs for 'Analyzer', 'Trigger', and 'STATE MACH', along with 'Cancel' and 'Run' buttons. Below the tabs is a 'State Sequence Levels' section with three levels:

- Level 1: While storing "no state" TRIGGER on "a" 1 time
- Level 2: While storing "b" Then find "enystate" 1 time Else on "c" go to level 3
- Level 3: While storing "enystate" Then find "enystate" 1 time

On the right side, there are buttons for 'Arming Control', 'Acquisition Control', 'Count Time', and 'Clear Trigger'. Below the sequence levels, there are sections for 'Label', 'Terms', and 'Timer'. The 'Timer' section shows two entries:

- Timer1: 432 ns
- Timer2: 400 ns

Two labels with arrows point to the interface: 'Timer term field' points to the 'Timer1' label, and 'Assignment field' points to the '400 ns' value for 'Timer2'.

Timer Term Assignment

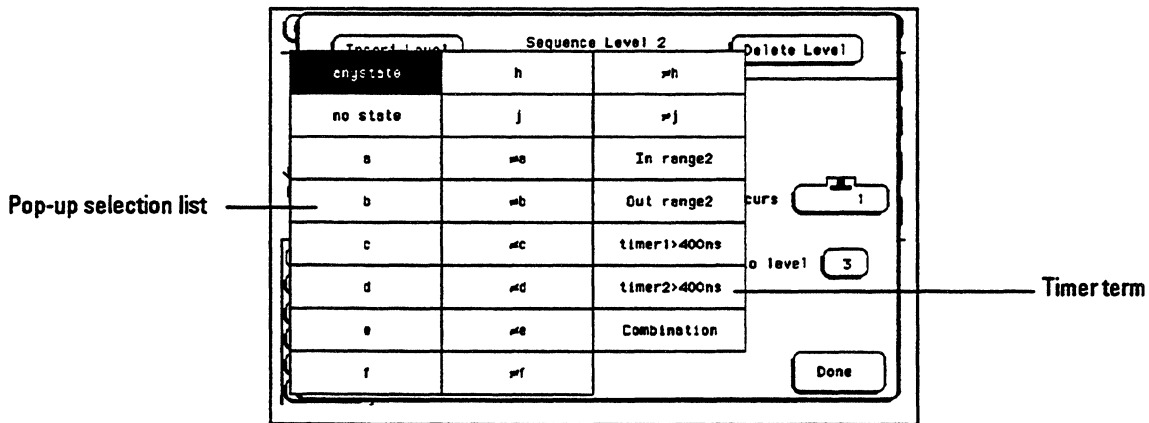
The Trigger Menu

Timer Terms

The minimum value a timer can have is 400 ns, and that value is assigned as default. It must be noted that as more new sequence levels are added, the timer status in the new levels default to Off. Timers must be continued or started in each new level if it is appropriate. When a timer expires or stops, its count resets to zero.

Timer Term Selection

Timer terms are inserted into a sequence instruction by selecting the Term Assignment field, then selecting a "Timer 1, 2" term from the pop-up selection list.



Timer Term Selection

Edge Terms (Timing only)

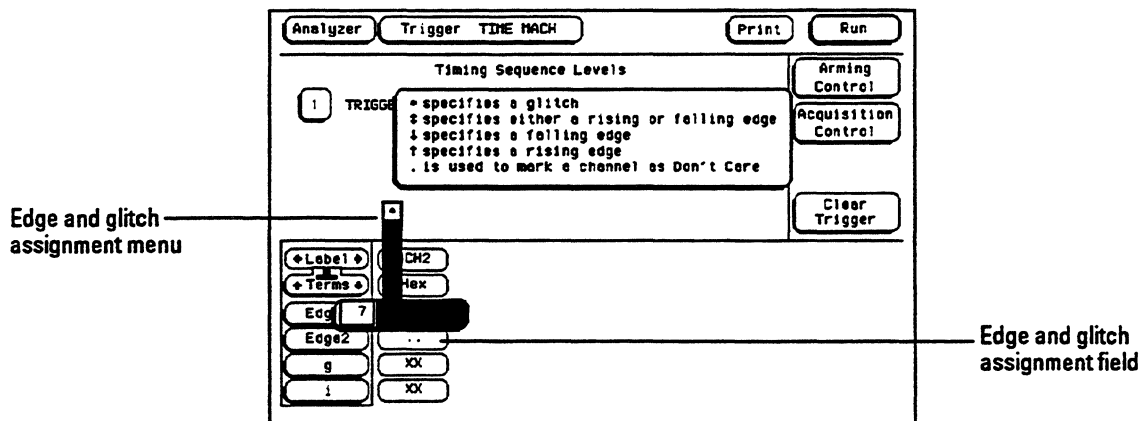
Edges and Glitches can be used to qualify a trigger, store, or branch operation within a sequence instruction. They can be used singular or in combination with each other across all assigned channels. When you specify an edge or glitch on more than one channel, the analyzer ORs the edges and glitches.

If you want to assign a glitch, place an asterisk (*) on the data channel you are evaluating. If you want to select an edge, place the appropriate edge on the data channel you are evaluating. The following edge choices are available:

- Positive edge (↑)
- Negative edge (↓)
- Either positive or negative (↕)
- No edge (.)

Edge and Glitch Assignment

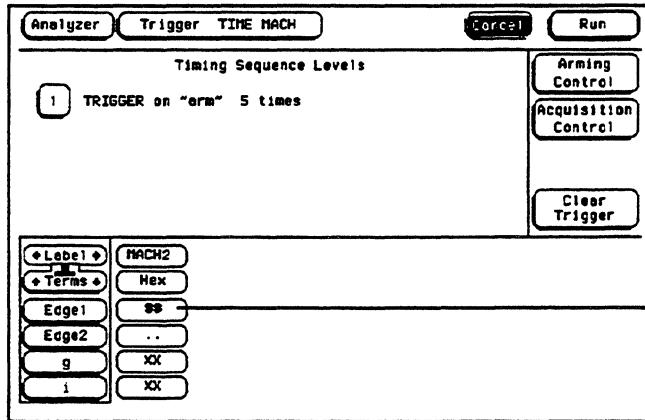
After you select the Edge assignment field, an assignment menu appears. Highlight the bit you want to assign, then select the glitch (*), or an edge arrow.



Edge Term

The Trigger Menu Edge Terms (Timing only)

When you finish assigning edges and glitches, press the Done key. After the assignment menu closes, you will see "\$" and "*" indicators in the assignment field display. These symbols signify an assigned edge (\$) or glitch (*) qualifier. When Binary is selected for the numeric base, you see the actual edge and glitch assignments.



Edge and Glitch Identifiers

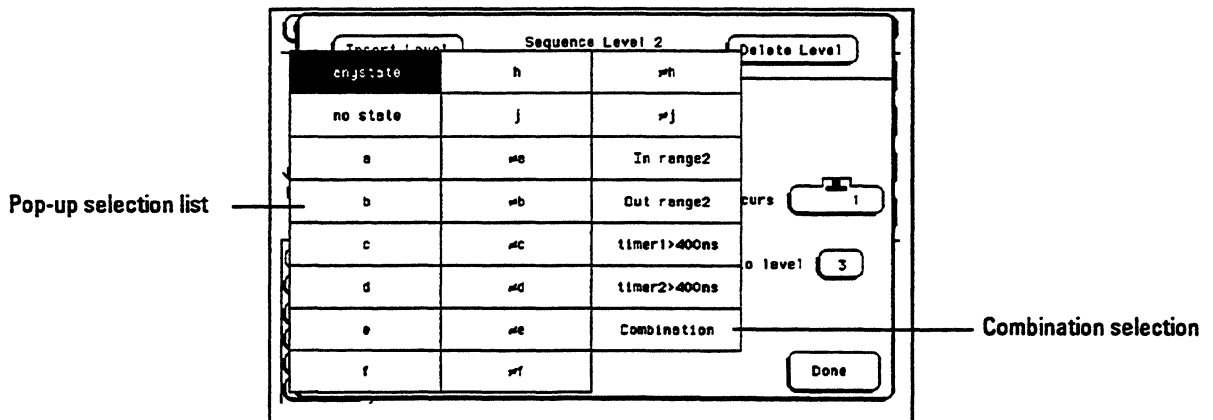
Combination of Terms

The Combination selection in the pop-up selection list allows you to create a resource term with a value that is the result of a combination process. The combination process uses the logical AND, NAND, OR, NOR, XOR, and XOR functions to combine multiple predefined resource terms. All resource terms that have been assigned to the analyzer are available to influence the end value of the combination resource term.

A Combination of terms is used as either the trigger term, the store term, or a branching term, within a sequence instruction.

Combination Assignment

To assign a Combination of terms, first select the "Combination" choice from the selection list, then configure the process that creates the end value for the Combination.



Combination of Terms

The Trigger Menu

Combination of Terms

Combination Creation

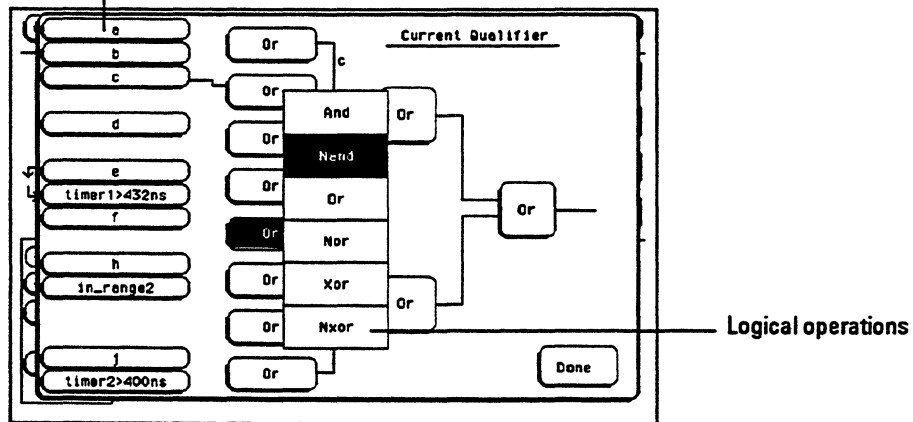
Before a Combination term is inserted into a sequence instruction, the Combination term must be configured. When the Term assignment field is selected, and "Combination" is selected from the pop-up selection list, a Logical Assignment menu appears. Use this menu to select pre-defined resource terms as inputs to a chain of logical operators.

Resource terms are configured into the chain by selecting the desired term, then selecting to either include it (ON), turn it off, or include it in a complimented form (NEGATE).

Logical operators are configured into the chain by selecting the Logical Operation field, then selecting the desired operation from a selection list.

When the configuration process is complete, and the "Done" key is pressed, the created Combination term is then inserted into the Term assignment field in the sequence instruction.

Resource term list



Logical Assignment Menu

Label and Base Fields

The Label and Base fields show up together in all menus except the Format and Configuration menus. When a new label is assigned, a base field is automatically assigned to that label.

Label Field

Labels in the Trigger menu are the same labels assigned in the Format menu. These labels will be displayed throughout the analyzer as they were assigned in the Format menu. For a complete definition of label assignment and modification, go to "Label Assignment Fields" in the Format menu.

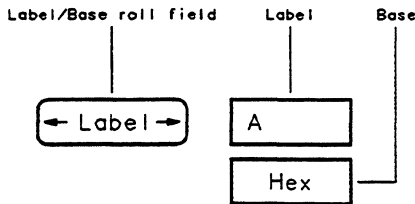
For a complete definition of label display and label reordering, go to the "Label Field" in The Common Menu Fields chapter.

Base Field

The function of the Base field is the same in all menus. For a complete definition of the Base field, go to the "Base Field" in The Common Menu Fields chapter.

Label / Base Roll Field

The function of the Label and Base roll field is the same in all menus. For a complete definition of the Label/Base roll function, go to "Label/Base Roll Field" in The Common Menu Fields chapter.



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Label and Base Fields

Control Fields

The Control fields are located to the right of the Sequence Levels box. These fields control the machine arming, time or states tagging of data, acquisition trigger position, and the clear functions for the resource terms and sequence levels.

Arming Control Field

The Arming Control field shown below accesses an Arming Control menu. The Arming Control menu is used to configure the arm signals between the analyzers and the Port In/Out signals (rear-panel BNCs). By using the Arming signals, you influence the order in which the analyzers trigger in a cross-domain measurement. In addition, by using the Port In/Out signals on the rear-panel BNCs, you can use an external trigger source to start the analyzer then generate a trigger out signal from the analyzer to start another test/measurement entity.

The screenshot displays the 'Arming Control Field' menu. At the top, there are buttons for 'Analyzer', 'Trigger STATE MACH', 'Cancel', and 'Run'. The main area is titled 'State Sequence Levels' and contains a flowchart with two steps:

- Step 1: While storing "no state" TRIGGER on "a" 1 time
- Step 2: Store "anystate"

To the right of the flowchart is a 'Timer' section with '1' and '2' indicators. On the far right, there are four stacked buttons: 'Arming Control', 'Acquisition Control', 'Count Time', and 'Clear Trigger'. A line points from the text 'Arming Control Field' to the 'Arming Control' button.

At the bottom, there is a table for data labels and terms:

Label	DATA 1
Terms	Binary
a	10101010
b	XXXXXXXX
c	XXXXXXXX
d	XXXXXXXX

Arming Control Field

The Trigger Menu

Arming Control Field

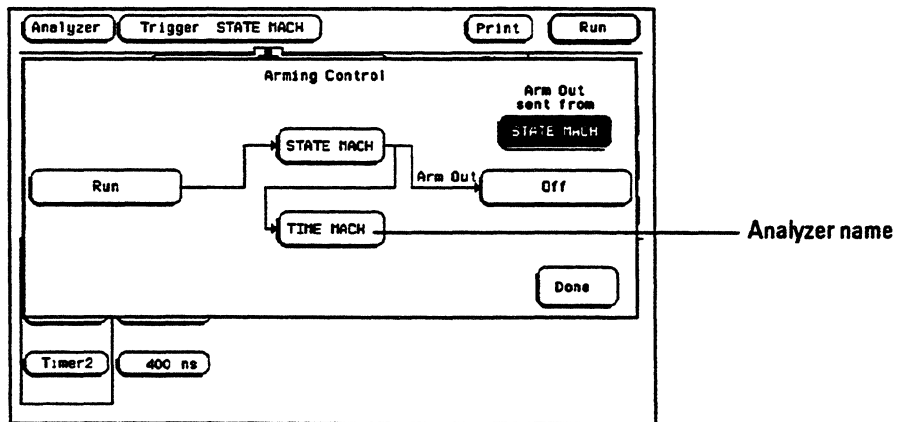
Arming Control Between Analyzers

If both analyzers are turned on, you can configure one analyzer to arm the other. An example of this is when a state analyzer triggers on a bit pattern, then arms a timing analyzer which captures and displays the waveform after it triggers.

When you select the analyzer name field in the Arming Control menu shown below, a pop-up menu appears which you use to select where the Arm In signal is coming from. In addition, a sequence level number field appears which you use to select the sequence level in which an "arm" flag is placed.

When an analyzer receives an Arm In signal, an "arm" term is placed in a user selected sequence level and the analyzer automatically begins evaluating its trigger sequence instruction. If in the sequence evaluation the "arm" term is seen first, the analyzer will trigger. However, if the "arm" term is placed down in the sequence level order, the preceding sequencing could trigger the analyzer before the "arm" term is seen. Generally, the "arm" term is evaluated and used the same as the other resource terms within the sequence instruction.

After you configure the Arming Control menu, a graphical representation of the analyzer arming configuration is displayed.



Two Analyzer Arming

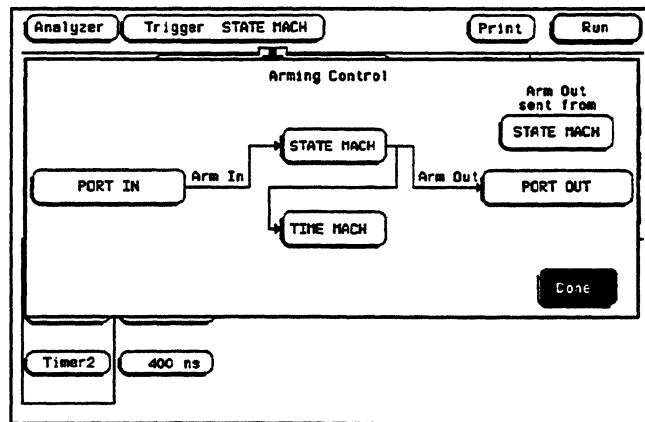
Arming Control Using External BNCs

A more complex arming example involves passing arm signals in and out through the External BNCs on the rear panel.

The first local analyzer is armed by an Arm In signal from an external trigger source or another test/measurement entity. After the first analyzer triggers, it arms the second local analyzer. After the second analyzer triggers, it can send a Port Out signal to the external BNC which can be used to arm another external test/measurement entity.

The Arm Out signal is generated by either one of the two local analyzers which you select.

After you configure the Arming Control menu, a graphical representation of the analyzer arming configuration is displayed as shown below.



Port In/Out Arming

Count Field (State only)

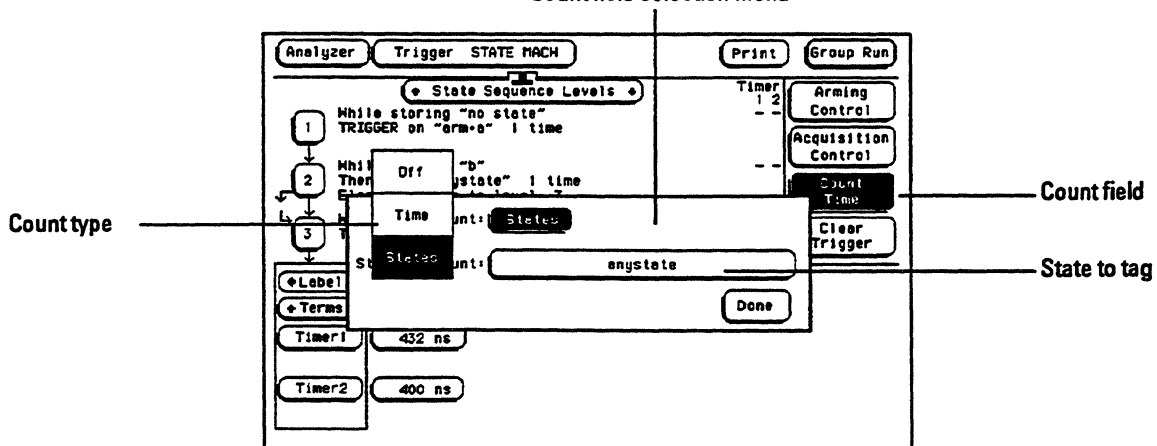
The Count field is used to access a selection menu which is used to stamp the acquisition data at each memory location with either a Time tag or a State count tag.

Storing Time or State tags

If you have all pod pairs assigned, the state acquisition memory is reduced by half, when Time or State tags are turned on. However, you can maintain full memory depth if you leave a specified pod pair unassigned. Refer to "Retaining Full Memory Using Time or State Tags" on the next page.

States States count places numbered tags on all pretrigger and posttrigger data. Data stored before trigger has negative numbers and data stored after trigger has positive numbers. State tag numbering is set to be either relative to the previous memory location or absolute from the trigger point. Selecting the Absolute or Relative option is done by toggling the Absolute/Relative field. When State count is selected in the Trigger menu, the exact state locations tagged can be pre-defined and selectively chosen from the Resource Term selection list.

Count field selection menu



Count Field

Time Time count places time tags on all displayed pretrigger and posttrigger data. Data stored before trigger has negative time numbers and data stored after trigger has positive time numbers. Time tag numbering is set to be either relative to the previous memory location or absolute from the trigger point. Selecting the Absolute or Relative option is done by toggling the Absolute/Relative field. Time tag resolution is 8 ns.

Label	DATA 1	Time
Base	Hex	Absolute
0	AA	0 ns
1	AB	104 ns
2	AC	200 ns
3	AD	304 ns
4	AE	400 ns
5	AF	504 ns
6	B0	600 ns
7	B1	704 ns
8	B2	800 ns
9	B3	904 ns
10	B4	1.000 us
11	B5	1.104 us
12	B6	1.200 us
13	B7	1.304 us

Relative/Absolute Toggle Field

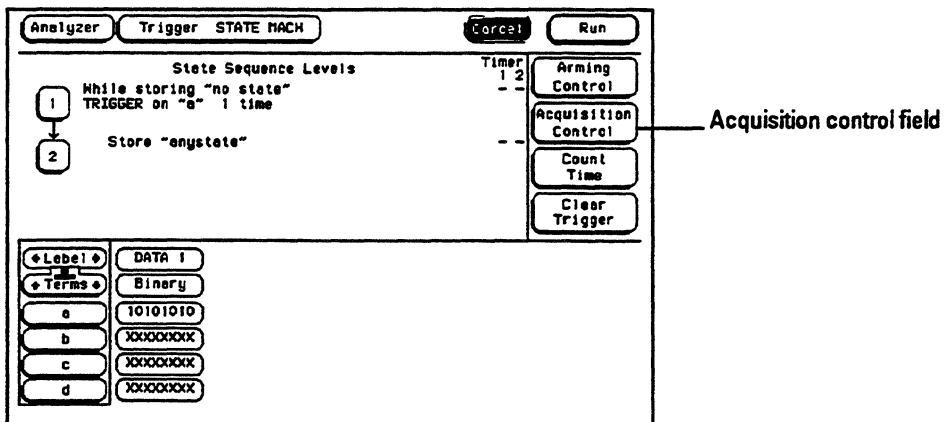
Retaining Full Memory Using Time or State Tags To retain the full memory depth when using time or state tags requires the unassignment of one pod pair. The exact pod pair to unassign in all possible module configurations varies. The table below shows the pod pairs to unassign in most applications.

Model Number	One Configured Analyzer	Two Configured Analyzers
HP 1660A	Pod Pair 3/4, 5/6	Pod Pair 3/4, 5/6
HP 1661A	Pod Pair 3/4	Pod Pair 3/4
HP 1662A	Pod Pair 1/2, 3/4	N/A
HP 1663A	N/A	N/A

Acquisition Control Field

The Acquisition Control field accesses an acquisition control menu. The acquisition control menu is used to set the Acquisition Mode and the Trigger Position within available memory. In a State analyzer you can set whether the data that causes a branch to be taken, are stored into memory or not. In a Timing analyzer, the sample period may be set.

In a State analyzer, the acquisition control settings are imposed on the qualified data after the sequence level evaluation is finished. Depending on what data is qualified in the sequence levels, and when trigger actually occurred, the additional data qualifying using the acquisition control will result in more efficient use of available memory.



Acquisition Control field

Acquisition Mode Field

The Acquisition Mode field toggles between Manual and Automatic. When set to Automatic in a State analyzer, the trigger position is computed based on the sequence specification. In a Timing analyzer, the trigger position and sample period is computed based on the sec/Div and delay settings in the Waveform menu.

When the Acquisition Mode field is set to Manual, additional configuration fields become available. Use these fields to further qualify what data is stored. The additional configuration fields work together with the sequence instructions, in a prioritized manner, to position the memory in relation to the trigger point. In a State analyzer the amount of posttrigger data captured varies depending on first, when all criteria in the sequence instructions are met, then, where the Trigger Position field is set.

Trigger Position Field

In a State analyzer, the exact trigger point placement is determined after the sequence instructions are evaluated. This process could result in a varying portion of available memory being filled with post-trigger data. The remainder of memory is considered free and is filled with less significant data.

In a Timing analyzer, after the specified trigger term is found, memory is filled with posttrigger data starting at the trigger position represented by the graphic bar with the "Trig" indicator line. If the trigger position is set to store prestore data, any true sequence instruction or trigger seen is ignored until the proper amount of prestore has been stored.

The Trigger Position field accesses a selection menu with the options of Start, Center, End, or User Defined. When an option is selected, that point of the available memory is positioned relative to the trigger. In a Timing analyzer you can also select to delay the start of acquisition storage.

Start When the trigger position is set to Start, the starting point of available memory is positioned relative to the trigger point. This results in maximum posttrigger data and minimum pretrigger data.

The Trigger Menu

Acquisition Control Field

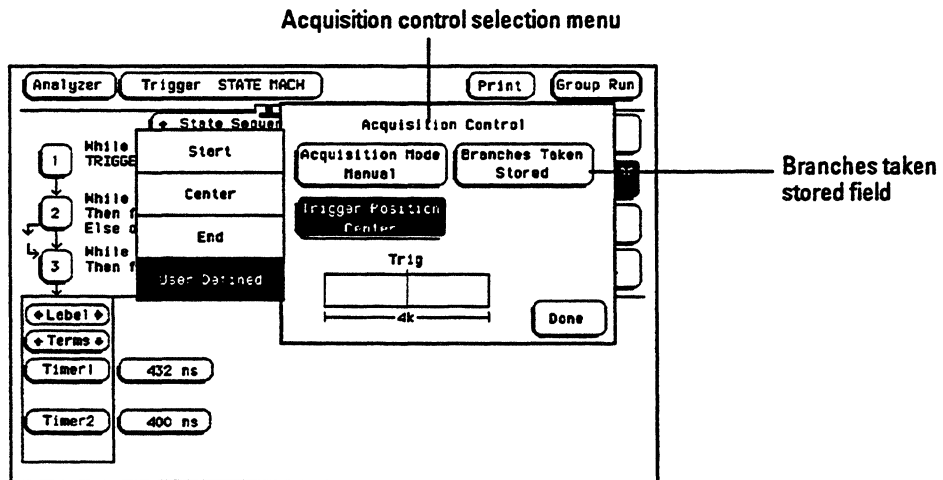
Center When the trigger position is set to Center, the center point of available memory is positioned relative to the trigger point. This results in half pretrigger data and half post-trigger data.

End When the trigger position is set to End, the end point of available memory is positioned relative to the trigger point. This results in maximum pretrigger data and minimum posttrigger data.

User Defined When the trigger position is set to User Defined, a post Store field appears. Use this field to set the trigger position anywhere between 0% and 100%. As the Post Store is adjusted, the graphic bar indicates the trigger position.

Delay In a timing analyzer a Delay option is available. Use the Delay field to delay the start of acquisition storage after the trigger. The range of the delay is effected by the sample period but could range between 16ns to 8ks. It should be noted that there may be a variable number of stored samples displayed prior to the user-defined delayed start point for acquisition storage.

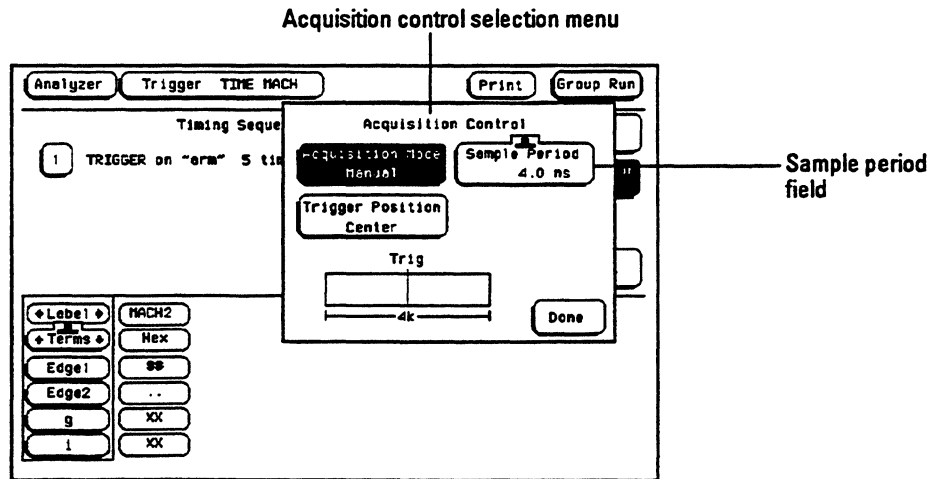
Sample Period Field The Sample Period field is used to set the time period between data samples. Every time a new sample is taken, the analyzer will see updated measurement data.



Acquisition Control Selection Menu (State analyzer)

Branches Taken Stored / Not Stored The Branches Taken field is a toggle field which sets the analyzer to store, or not to store, the resource term that sent the analyzer off on a branch.

As the analyzer steps through the sequence instructions, it may be repeatedly sent off to secondary branches because the first resource term was bypassed (false), and the second "Else" resource term is qualified (true). With Branches Taken set to Stored, both the state data values that caused the secondary branches and the secondary branch is stored into memory.



Acquisition Control Configuration Menu (Timing analyzer)

Clear Trigger Field

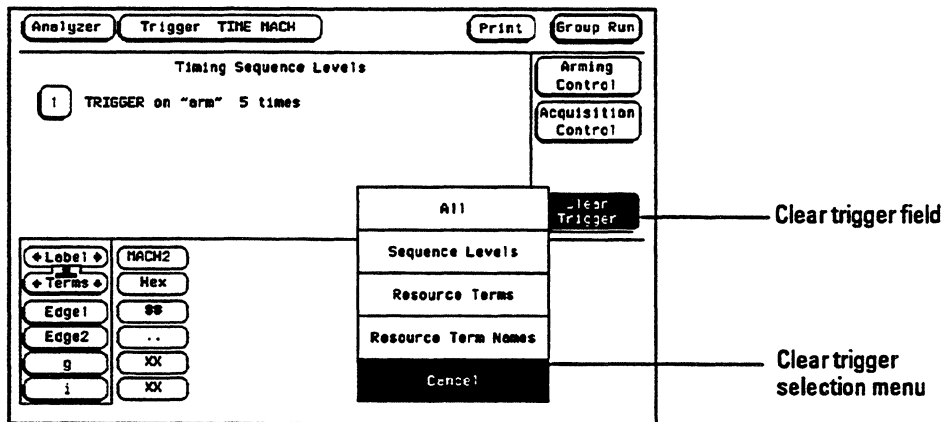
The Clear Trigger field accesses a selection menu used to clear any user-defined values within the trigger condition. These user-defined values appear in the sequence levels and in the Resource Term display fields.

All The All option clears sequence levels, resource terms, and resource term names back to default settings.

Sequence Levels The Sequence Levels option resets all assignment fields in the sequence levels to default. Any custom names assigned to the resource terms will remain.

Resource Terms The Resources Terms option will reset all assignment fields for the resource terms back to default.

Resource Term Names The Resource Term Names option resets all custom names assigned to the resource terms back to default.



Clear Trigger

System / Analyzer Field

The function of the System/Analyzer field is the same in all menus. For a complete definition of the System/Analyzer field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Menu Field

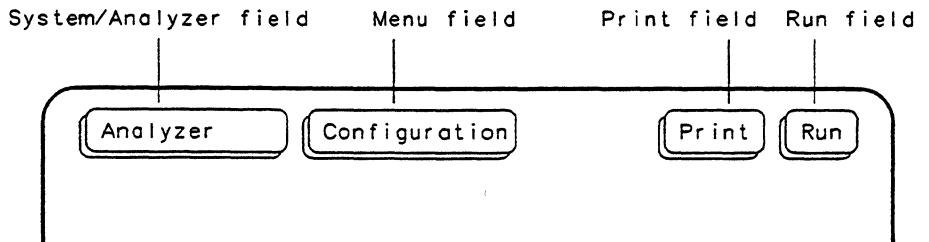
The function of the Menu field is the same in all menus. For a complete definition of the Menu field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Print Field

The function of the Print field is the same in all menus. For a complete definition of the Print field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Run Field

The function of the Run field is the same in all menus. For a complete definition of the Run field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.



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Common Menu Fields

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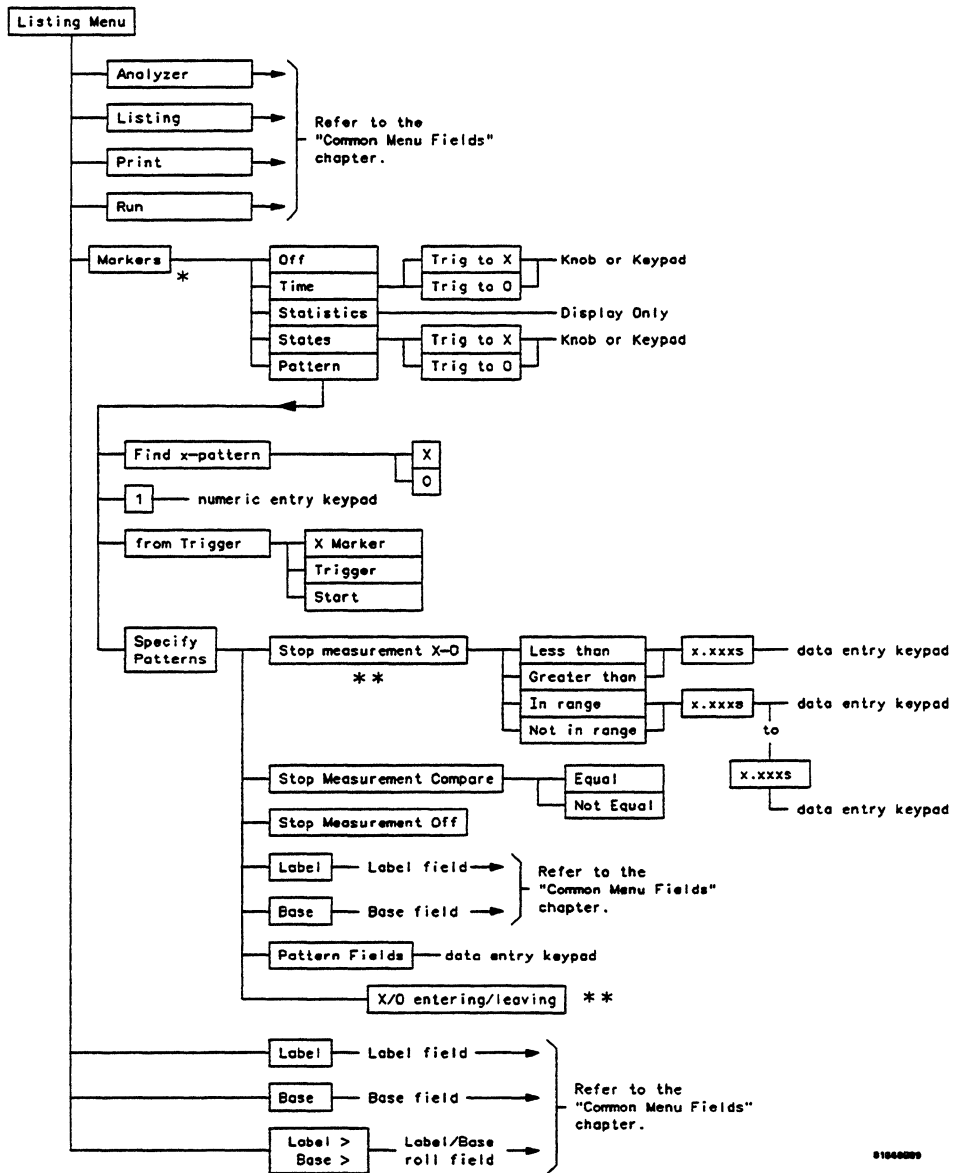
The Listing Menu

The Listing menu is a display menu for state and timing analyzer measurements. The listing is a display of data, address, and control status in memory at each clock cycle in a microprocessor-based system.

The acquired data is displayed in the order the analyzer placed the data into analyzer memory. Data is grouped and displayed by label and in a selectable numeric base. Labeled data from the other state analyzer can be interleaved into the same display.

Listing Menu Map

The menu map on the next page illustrates all fields and the available options in the Listing menu. The menu map will help you get an overview as well as provide you with a quick reference of what the Listing menu contains.



* Different marker types appear depending on analyzer configurations.

** Only available in Timing analyzer or State analyzer with Count set to Time.

Listing Menu Map

Markers Field

The Markers field is used to access the markers selection menu. When the Markers field is selected, a marker selection menu appears with the marker choices available with the present analyzer configuration.

State Analyzer Types

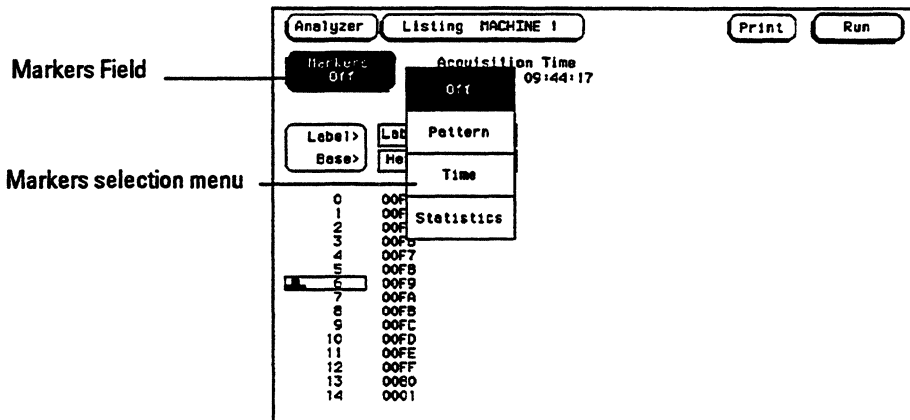
In a state analyzer with count Time and count State turned off in the Trigger menu, only Pattern markers are available. With count Time turned on, additional choices of Time markers and Statistics markers become available. With count States turned on, in addition to Pattern markers there are States markers available.

Timing Analyzer Types

If a timing analyzer you have marker choices of Pattern, Time, or Statistics.

Off

The Off selection turns off marker operations. If a stop measurement was previously specified, and the stop measurement criteria are met, the measurement will stop even though the markers are off.



Markers Field

Pattern Markers

When Pattern markers are selected, two markers labeled X and O become available. Pattern markers identify and mark unique bit patterns in the data listing. Once the unique bit patterns are marked, they can be used as reference points or as criteria for a stop measurement.

The markers are graphically displayed by horizontal lines. In addition, both markers are labeled at the left end of the marker line.

When a marker is positioned in the Listing menu, it is also positioned in the Chart menu and Waveform menu.

See Also

"Specify Patterns Field" found later in this chapter for more information on creating a pattern for the X and O markers.

Find X-pattern / O-pattern Field

The Find X-pattern/O-pattern field is a toggle field. When you toggle the Find X-pattern/O-pattern fields, the functionality of the occurrence and trace start fields switch to the other marker. In addition, when the Find X-pattern/O-pattern field is toggled, the data listing will shift so the data marked will appear at center screen.

Find X-pattern field

Label>	STATE1	Time
Base>	Hex	Relative
218	0096	104 ns
219	0097	96 ns
220	0098	104 ns
221	0099	96 ns
222	009A	104 ns
223	009B	96 ns
224	009C	104 ns
225	009D	96 ns
226	009E	104 ns
227	009F	96 ns
228	00A0	104 ns
229	00A1	96 ns
230	00A2	104 ns
231	00A3	96 ns
232	00A4	104 ns
233	00A5	96 ns

X-pattern at center screen

Find X-pattern / O-pattern Field

Pattern Occurrence Fields

The X-pattern and O-pattern occurrence fields designate which pattern occurrence the marker is placed on. The occurrence field is set by highlighting the field, then turning the knob or entering a number from the front-panel keypad.

The reference point from which the occurrence counter starts is either the trigger point, the start of the trace, or in the case of the O-marker, the X-marker. If a negative occurrence number is set, the analyzer will search for pretrigger occurrences.

Pattern occurrence field

Label>	STATE	Time
Base>	Hex	Relative
218	0096	104 ns
219	0097	96 ns
220	0098	104 ns
221	0099	96 ns
222	009A	104 ns
223	009B	96 ns
224	009C	104 ns
225	009D	96 ns
226	X 009E	104 ns
227	009F	96 ns
228	00A0	104 ns
229	00A1	96 ns
230	00A2	104 ns
231	O 00A3	96 ns
232	00A4	104 ns
233	00A5	96 ns

First occurrence of X pattern after trigger

X-pattern and O-pattern Occurrence Fields

From Trigger / Start / X Marker Field

The from Trigger/Start/X marker field is used to access the selection pop-up for the start point of the X and O marker occurrence counters.

The start points available for the X-marker are either the trace start point or the trigger point. The start points available for the O-marker are the trace start point, trigger point, or the X-marker.

If the marker pattern can not be found, a message appears at the top of the display indicating the search failed. If the O-marker is referenced from the X marker, and the X-marker is not found, the search for both markers will fail.

Trigger / Start / X Marker field

Label>	STATE1	Time
Base>	Hex	Relative
218	0096	104 ns
219	0097	96 ns
220	0098	104 ns
221	0099	96 ns
222	009A	104 ns
223	009B	96 ns
224	009C	104 ns
225	009D	96 ns
226	X 009E	104 ns
227	009F	96 ns
228	00A0	104 ns
229	00A1	96 ns
230	00A2	104 ns
231	O 00A3	96 ns
232	00A4	104 ns
233	00A5	96 ns

First occurrence of X pattern after trigger

Trigger / Start / X-Marker Field

Specify Patterns Field

The Specify Patterns field only appears when the markers are set to Pattern. When the Specify Patterns field is selected, a pop-up menu appears that is used to assign the bit patterns for the X and O markers, the X and O entering/leaving markers, and the stop measurement criteria.

Specify patterns field

Analyzer
Listing STATE MACH
Cancel
Run

Markers Pattern
Find D-pattern
|
from Trigger
Specify Patterns

Label>	STATE1	Time
Base>	Hex	Relative
218	0096	104 ns
219	0097	96 ns
220	0098	104 ns
221	0099	96 ns
222	009A	104 ns
223	009B	96 ns
224	009C	104 ns
225	009D	96 ns
226	009E	104 ns
227	009F	96 ns
228	00A0	104 ns
229	00A1	96 ns
230	00A2	104 ns
231	00A3	96 ns
232	00A4	104 ns
233	00A5	96 ns

Specify Patterns Field

The Listing Menu Specify Patterns Field

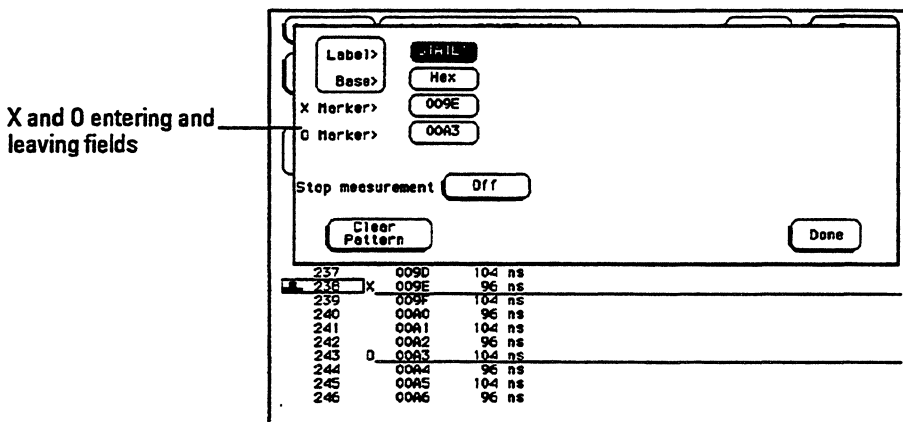
X and O entering / leaving Fields (Timing only)

If the analyzer is configured as Timing, the X and O pattern markers are placed at either the beginning of the pattern occurrence (entering) or at the end of the pattern occurrence (leaving). When the entering/leaving field of either X or O markers is selected, it toggles between the two choices.

Whichever choice you toggle the field to, the pattern you place in the pattern display field will apply to that choice.

X marker and O marker Fields (State only)

If the analyzer is configured as State, X marker and O marker fields replace the X and O entering/leaving fields. The pattern you place in the pattern display field will apply to the marker labeled at the left.



X and O entering / leaving Fields

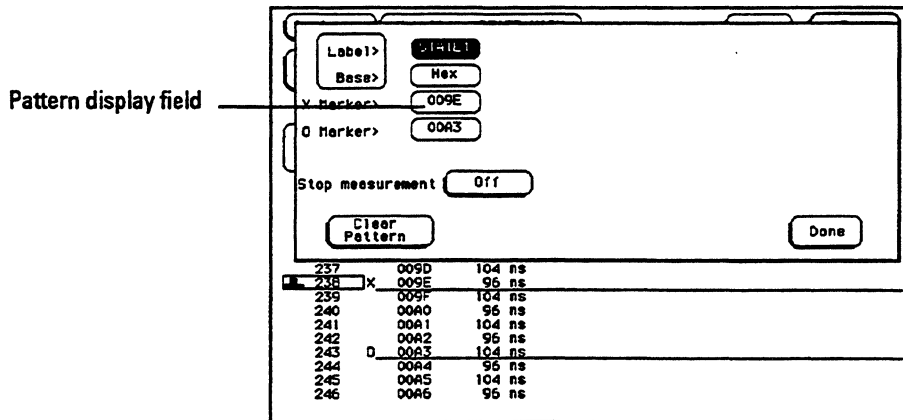
Pattern Display Fields

The pattern display field displays the alphanumeric bit pattern specified for each X and O marker in all designated labels. The bit pattern is displayed in the same numeric base and same order as the data listing. When the pattern display field is highlighted, a bit pattern can be entered using the front-panel keypad.

When there are more labels assigned than can be displayed in a single screen, the pattern display fields are rolled back on screen by the Label / Base roll field.

See Also

"Label/Base Roll Field" in the Common Menu Fields chapter for a complete definition of the Label/Base roll field.



Pattern Display Field

The Listing Menu Specify Patterns Field

Label and Base Fields

The Label and Base fields show up together in all menus except the Format and Configuration menus. When a new label is assigned, a base field is automatically assigned to that label.

Label Field Labels in the Specify Patterns menu are the same labels assigned in the Format menu. These labels will be displayed throughout the analyzer as they were assigned in the Format menu.

To reorder currently displayed Labels, select the label you want to move, then from the selection menu that appears, choose the label you want to switch positions with.

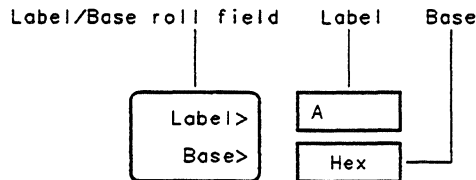
Base Field The function of the Base field is the same in all menus. A complete definition of the Base field appears in the Common Menu Fields chapter.

Label / Base Roll Field

The function of the Label and Base roll field is the same in all menus. A complete definition of the Label/Base roll function appears in the Common Menu Fields chapter.

See Also

"Label Assignment Field" in the Format menu chapter for a complete definition of label assignment and modification.



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Label / Base Roll Field

Stop Measurement Field

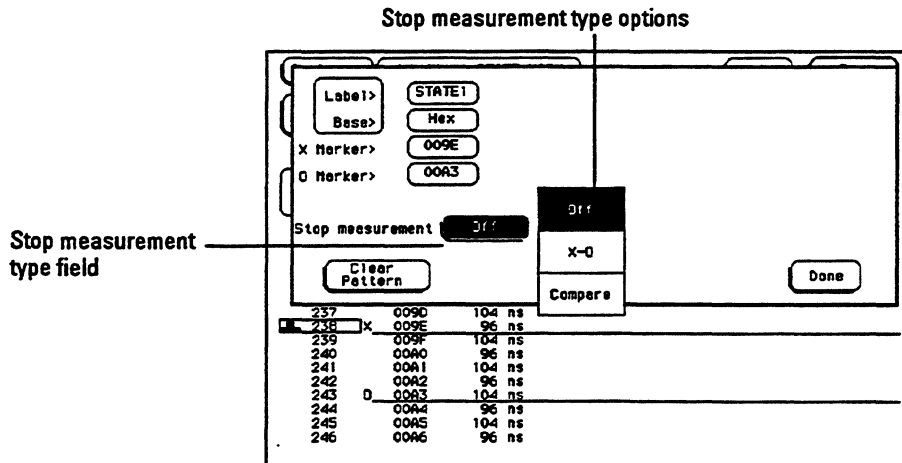
The stop measurement function allows you to specify a condition which stops the analyzer measurement during a repetitive run. If two analyzers are configured, both analyzers stop when either specified stop condition is satisfied.

When the Stop measurement field is selected, a stop measurement type menu appears. Depending on the analyzer configuration, you have the choices of Off, X-O, and Compare.

Off

The Off selection turns all Stop measurement operations off.

If the stop measurement operation is not turned off and the stop measurement criteria are met, the measurement will stop even though the markers are set to other types or turned off.



Stop Measurement Field

The Listing Menu Stop Measurement Field

X-O

The X-O option is available in the Timing analyzer and in the State analyzer with its count set to Time.

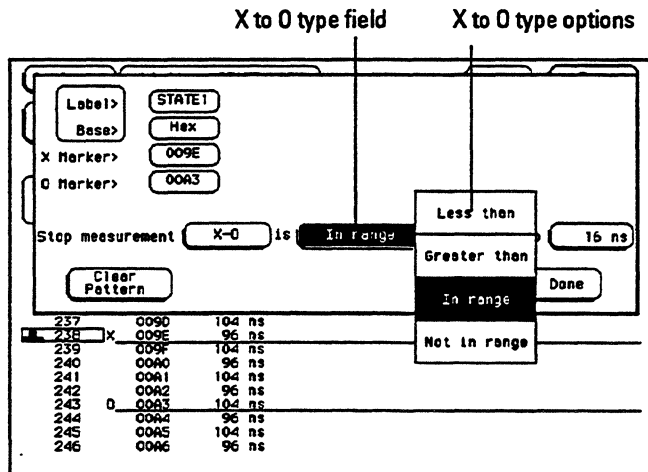
When X-O is selected, a repetitive run is stopped when a comparison of the time period between the X and O markers and one of the following time period options is true:

Less Than X-O time must be less than the time value that you specify in the Time field.

Greater Than X-O time must be greater than the time value that you specify in the Time field.

In Range X-O pattern must be within the time range value that you specify in the two Time fields.

Not in Range X-O pattern must not be within the time range value that you specify in the two Time fields.



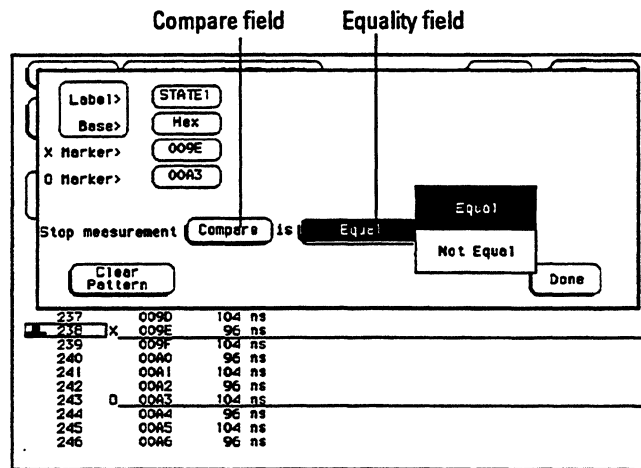
X-O Field

Compare

When you select Compare, a repetitive run is stopped when a comparison of data in the Listing menu and data and criteria in the Reference listing of the Compare menu matches an equality selection. The equality selection is set from the Equal/Not Equal selection pop-up menu.

Equal The data and compare criteria in the Compare menu must be equal to the data in the Listing menu.

Not Equal The data and compare criteria in the Compare menu must not be equal to the data in the Listing menu.

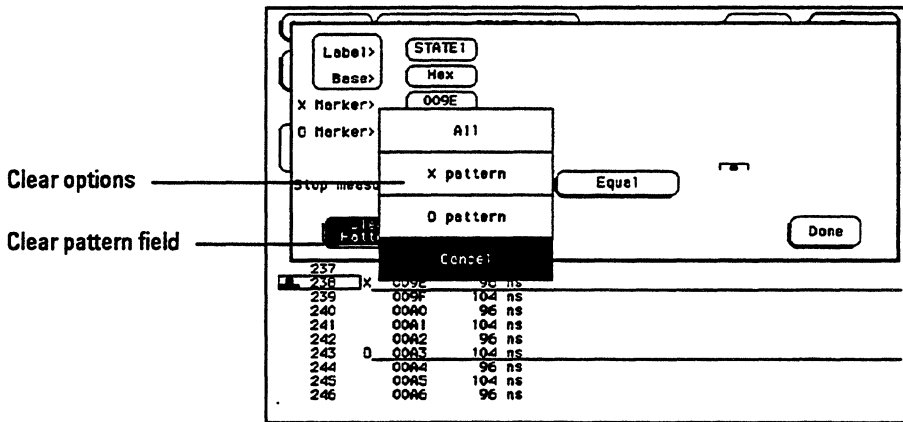


Equal / Not Equal Selection Menu

The Listing Menu Clear Pattern Field

Clear Pattern Field

The Clear Pattern field is used to reset the X and O Marker pattern display fields back to default (don't care = X). The Clear Pattern field accesses a selection menu with the choices of All, X-pattern, or O-pattern.



Clear Pattern

Time Markers

Time markers are indicators located in the data listing that are used as reference marks to obtain time values between each marker, or between each marker and the trigger point.

In a State analyzer, Time markers only become available when the Count field in the Trigger menu is set to Time.

The markers are graphically displayed by horizontal lines. In addition, both markers are labeled at the left end of the marker line.

If Pattern markers have been assigned, the Time markers will be initially placed at the same locations in the data listing.

Trig to X / Trig to O Fields

The Trig to X and Trig to O fields are both display fields as well as configuration fields. The Trig to X and Trig to O fields display the time between the trigger point and the markers.

Marker position is set by selecting the desired field and entering a value using the front-panel keypad. The units are set by turning the knob when the assignment pop-up is open. Marker position can also be set by simply turning the knob when the roll indicator is present.

X to O Display Field

The X to O display field is a "read only" field that displays the time between the X and O markers. As the X and O markers are changed, the display changes accordingly.

Trig to X field

Analyzer Listing STATE MACH Concea Run

Markers Time Trig to X 23.80 us Trig to O 24.30 us X to O 504 ns

Label>	STATE	Time
Base>	Hex	Relative
231	0097	104 ns
232	0098	96 ns
233	0099	104 ns
234	009A	96 ns
235	009B	104 ns
236	009C	96 ns
237	009D	104 ns
238 X	009E	96 ns
239	009F	104 ns
240	00A0	96 ns
241	00A1	104 ns
242	00A2	96 ns
243 O	00A3	104 ns
244	00A4	96 ns
245	00A5	104 ns
246	00A6	96 ns

X to O display

Trig to X/Trig to O Fields

Statistics Markers

After patterns are assigned to the X and O markers, statistical information is available when markers are set to Statistics. The logic analyzer displays the following information:

- Number of valid runs (runs where Pattern markers were able to be placed on specified patterns).
- Minimum time between the X and O Pattern markers.
- Maximum time between the X and O Pattern markers.
- Average time between the X and O Pattern markers.

In a State analyzer, Statistics markers only become available when the Count field, in the Trigger menu, is set to Time.

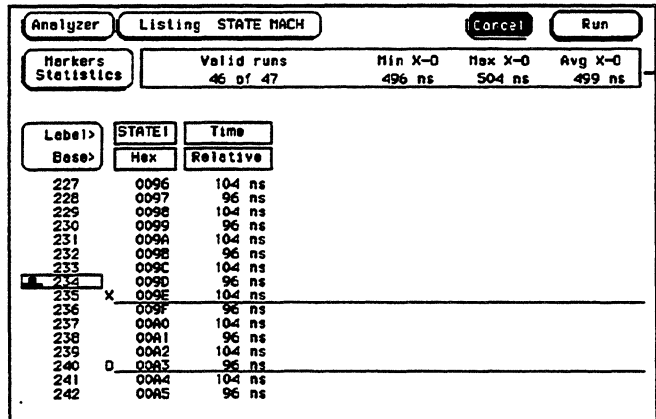
The markers are graphically displayed by horizontal lines. In addition, both markers are labeled at the left end of the marker line.

The Listing Menu Trig to X/Trig to O Fields

Statistics are based on the time between the X and O. Both markers must be found before valid statistical information is displayed.

In repetitive run mode, the display is updated each time a valid run occurs until you select Stop. If you select Run after Stop, the statistics continue to update without loss of information.

In single run mode, each time you select Run an additional valid run will be added to the data and the statistics will be updated. This process continues unless you change the placement of the X and O Pattern markers between runs.



The screenshot shows the Analyzer Listing menu for 'STATE MACH'. At the top, there are buttons for 'Analyzer', 'Listing STATE MACH', 'Cancel', and 'Run'. Below these, a 'Markers Statistics' box displays: 'Valid runs 46 of 47', 'Min X-O 496 ns', 'Max X-O 504 ns', and 'Avg X-O 499 ns'. An arrow points from the text 'Statistics display' to this box. Below the statistics is a table with columns for 'Label', 'Base', 'STATE', 'Hex', and 'Time'. The table lists memory addresses from 227 to 242. Address 234 is highlighted with a cursor. Address 235 has an 'X' marker, and address 240 has an 'O' marker. Horizontal lines separate the table into sections.

Label	Base	STATE	Hex	Time
227			0096	104 ns
228			0097	96 ns
229			0098	104 ns
230			0099	96 ns
231			009A	104 ns
232			009B	96 ns
233			009C	104 ns
234			009D	96 ns
235		X	009E	104 ns
236			009F	96 ns
237			00A0	104 ns
238			00A1	96 ns
239			00A2	104 ns
240		O	00A3	96 ns
241			00A4	104 ns
242			00A5	96 ns

Statistics Display

States Markers (State only)

States markers are indicators located in the data listing that are used as reference marks to obtain the number of states between each marker, or between each marker and the trigger point.

States markers are only available in a state analyzer with the Count field set to State in the Trigger menus.

The markers are graphically displayed by horizontal lines. In addition, both markers are labeled at the left end of the marker line.

Trig to X / Trig to O Fields

The Trig to X and Trig to O fields are both display fields as well as configuration fields. The Trig to X and Trig to O fields display the number of states between the trigger point and the marker.

Marker position is set by selecting the desired field and entering a value using the front-panel keypad. Marker position can also be set by simply turning the knob when the roll indicator is present.

X to O Display Field

The X to O display field is a "read only" field that displays the number of states between the X and O Pattern markers. As the X and O markers are changed, the display changes accordingly.

Trig to X field

The screenshot shows a configuration screen for the Trig to X field. At the top, there are buttons for 'Analyzer', 'Listing STATE MACH', 'Cancel', and 'Run'. Below these are three fields: 'Markers States', 'Trig to X 0', and 'Trig to O 0'. To the right of these fields is the 'X to O display' field, which is highlighted and pointed to by an arrow. Below the fields is a table with columns for 'Label', 'STATE', and 'States'. The table contains the following data:

Label	STATE	States
Base	Hex	Relative
227	0096	
228	0097	
229	0098	
230	0099	
231	009A	
232	009B	
233	009C	
234	009D	
235	009E	X
236	009F	
237	00A0	
238	00A1	
239	00A2	
240	00A3	O
241	00A4	
242	00A5	

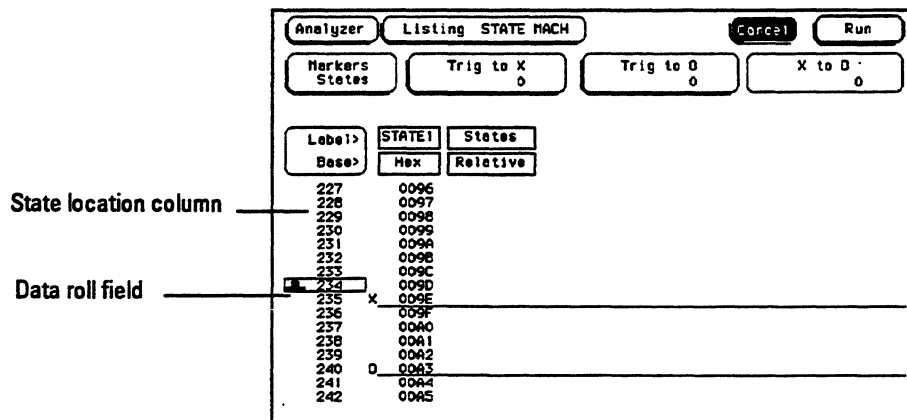
Trig to X / Trig to O Fields

Data Roll Field

The column of numbers at the far left represents the location of the acquired data in the state analyzer's memory. The numbered positions are also known as the state locations and are relative to the trigger state location.

The column of state locations along with its data can be rolled to display offscreen data by using the data roll field. The data roll field is the small rectangular box located in the middle of the state location column.

The data roll field is used to either roll the data listing or to select an exact state for display. When the data roll field is selected, the knob is active and can roll data in either direction. You can also roll the listing by highlighting the data roll field and entering a specific location number using the front-panel keypad.



Data Roll Field

Label and Base Fields

The Label and Base fields show up together in all menus except the Format and Configuration menus. When a new label is assigned, a base field is automatically assigned to that label.

Label Field

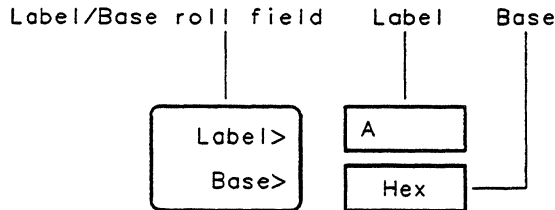
Labels in the Listing menu are the same labels assigned in the Format menu. These labels will be displayed throughout the analyzer as they were assigned in the Format menu. A complete definition of label assignment and modification appears in the Format menu chapter.

Base Field

The function of the Base field is the same in all menus. A complete definition of the Base field appears in the Common Menu Fields chapter.

Label / Base Roll Field

The function of the Label and Base roll field is the same in all menus. A complete definition of the Label/Base roll function appears in the Common Menu Fields chapter.



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Label / Base Roll Field

System / Analyzer

The function of the System/Analyzer field is the same in all menus. For a complete definition of the System/Analyzer field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Menu Field

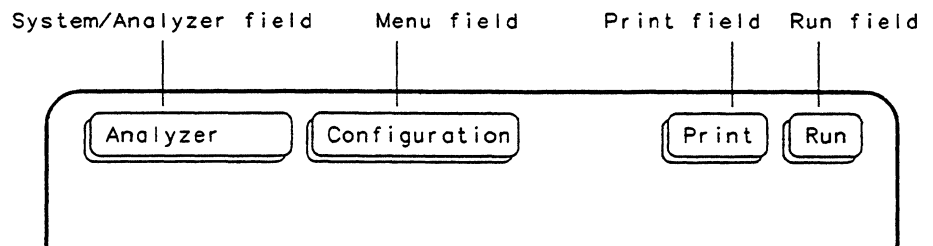
The function of the Menu field is the same in all menus. For a complete definition of the Menu field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Print Field

The function of the Print field is the same in all menus. For a complete definition of the Print field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Run Field

The function of the Run field is the same in all menus. For a complete definition of the Run field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.



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Common Menu Fields

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The Waveform Menu

The Waveform Menu

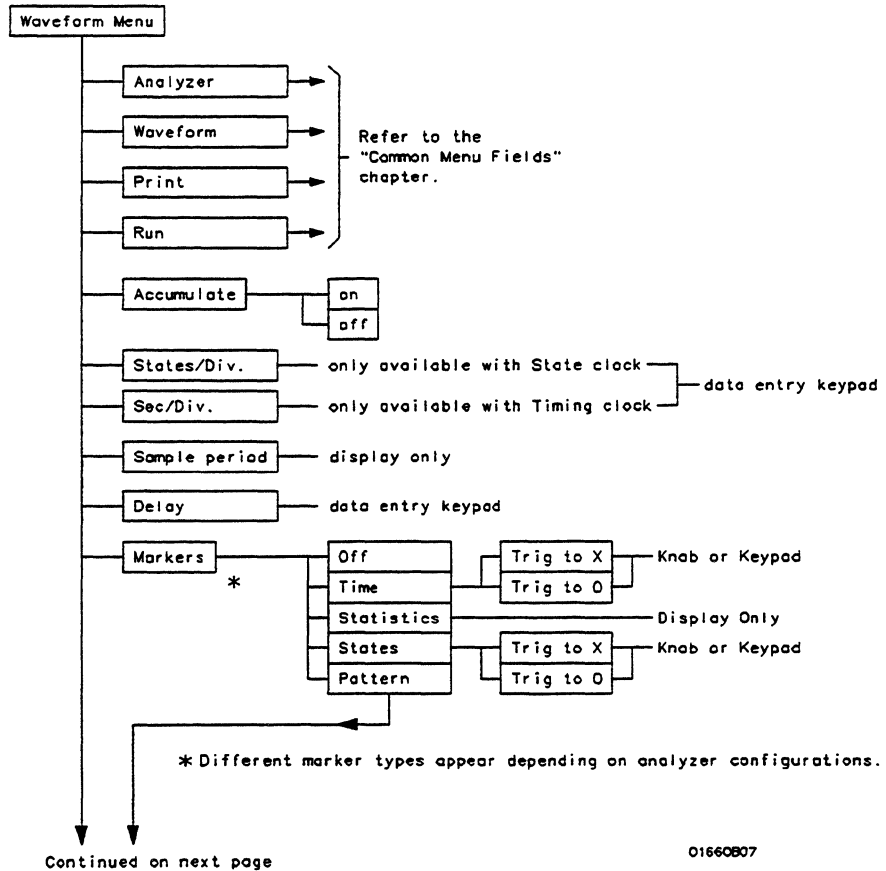
The Waveform menu is one of the analyzer display menus. You use the Waveform menu to view either state or timing data in a format similar to an oscilloscope display. Data is displayed with the horizontal axis representing either states or time, and the vertical axis representing logic highs and lows. The type of data displayed depends on whether the Type field in the Configuration menu is set to State or Timing.

If State is selected, the analyzer displays state relevant activity in reference to the trigger point with the horizontal resolution being states per division.

If Timing is selected, the analyzer displays time relevant activity in reference to the trigger point with the horizontal resolution being time per division.

Waveform Menu Map

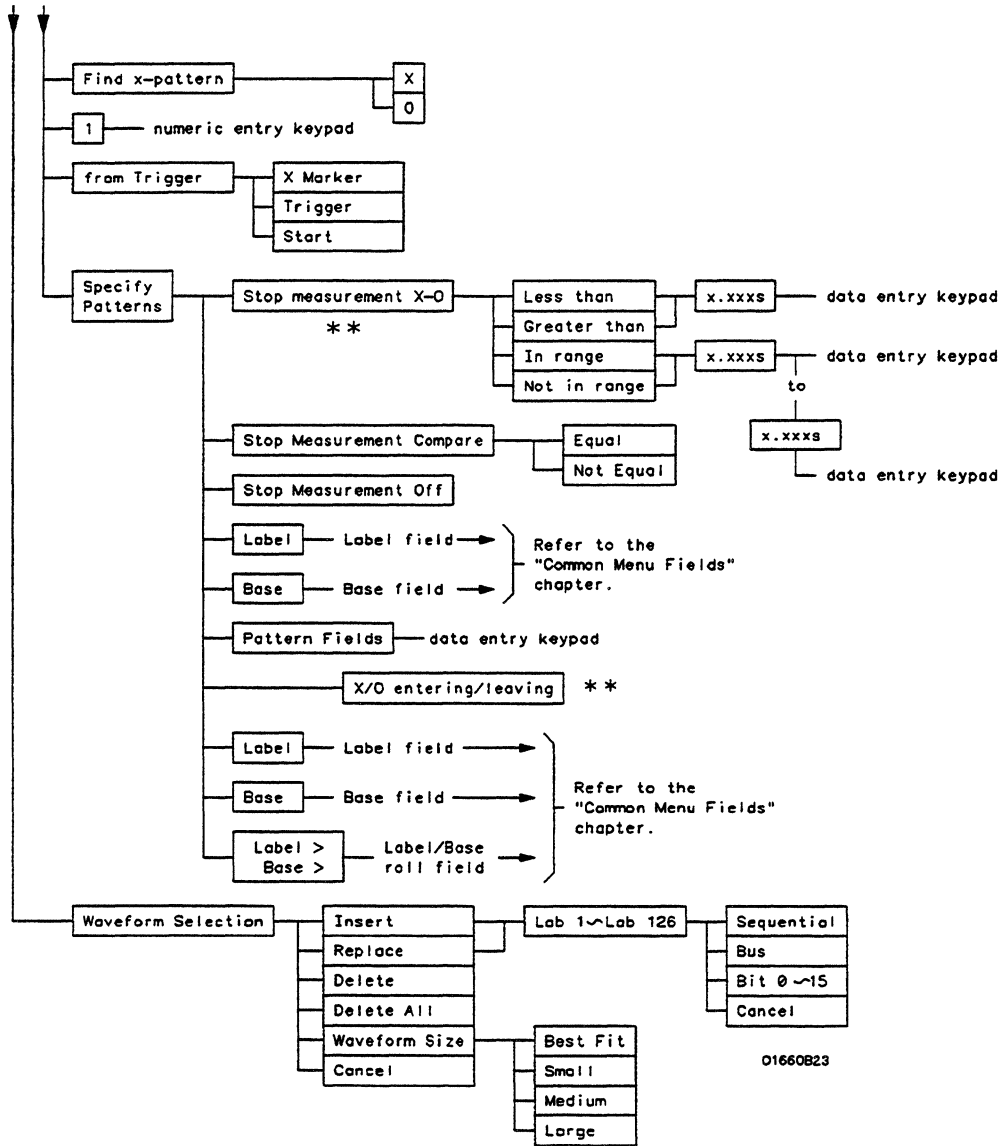
The following menu map illustrates all fields and the available options in the Waveform menu. The menu map will help you get an overview as well as provide you with a quick reference of what the Waveform menu contains.



Waveform Menu Map

The Waveform Menu

Continued from previous page

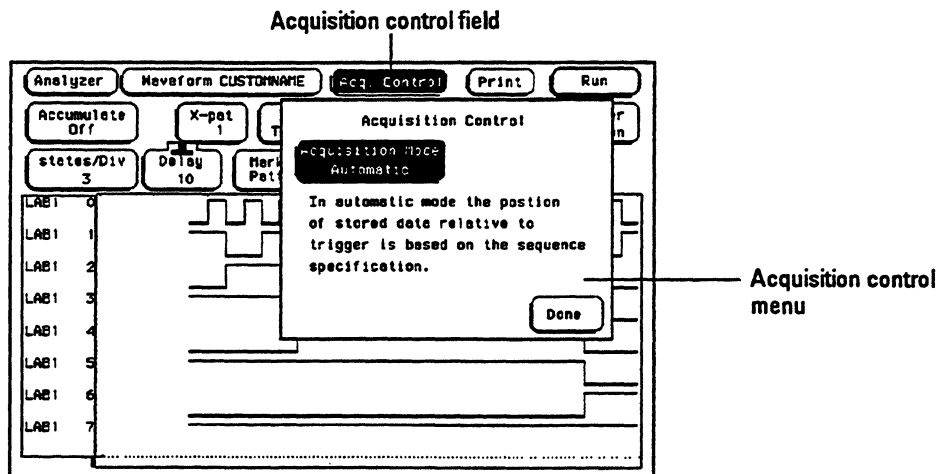


* * Only available in Timing analyzer or State analyzer with Count set to Time.

Waveform Menu Map (cont.)

Acquisition Control Field

The function of the Acquisition Control field in the Waveform menu is the same as in the Trigger menu. Refer to the "Acquisition Control Field" in the Trigger menu for complete details.

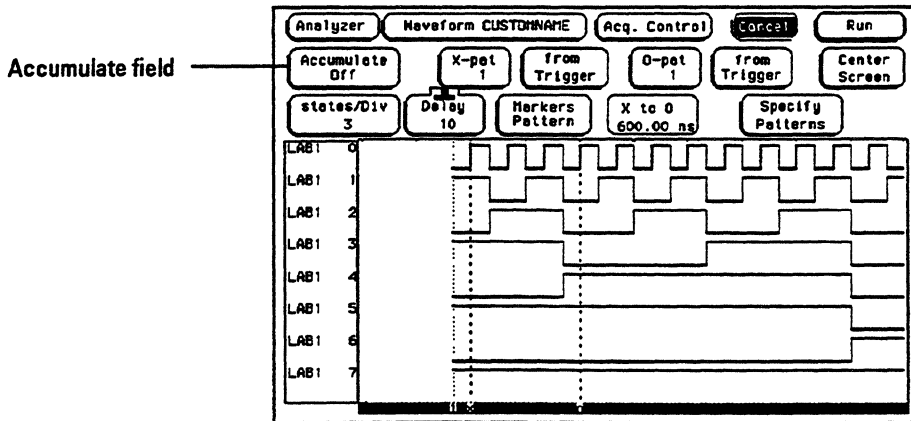


Acquisition Control field

Accumulate Field

The Accumulate field controls whether old data is cleared or displayed along with new data. The Accumulate field will toggle On/Off. When Accumulate is on, the analyzer displays the data from a current acquisition on top of the previously acquired data. When Accumulate is off, the display is cleared before each new run cycle.

If you leave the Waveform menu, or pop up a menu over the waveform display, any accumulated display data is lost and the accumulation process starts over.

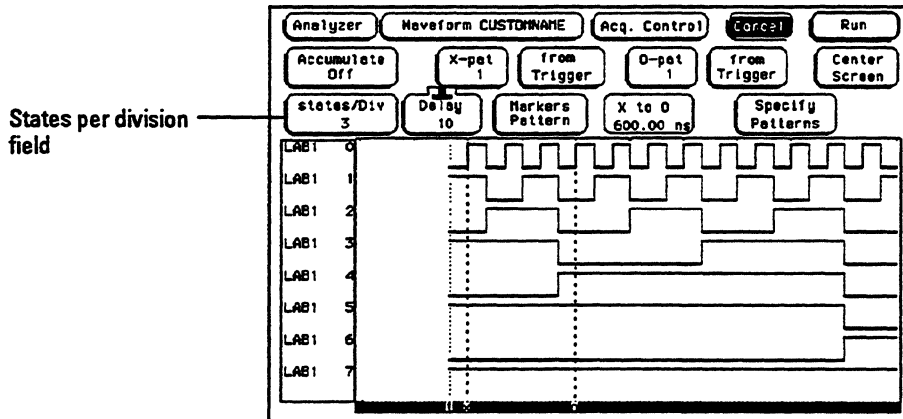


Accumulate Field

States Per Division Field (State only)

When the analyzer Type field in the Configuration menu is set to State, the analyzer uses external clocks from the system under test. In this mode, the X-axis of the waveform display is measured in states per division.

You use the states/Div field to select the states per division resolution of the X-axis. You can specify between 1 and 500 states per division by selecting the states/Div field and rotating the knob, or by highlighting the field and entering a value from the front-panel keypad. By adjusting the states/Div, you can zoom in to view a desired part of the display.



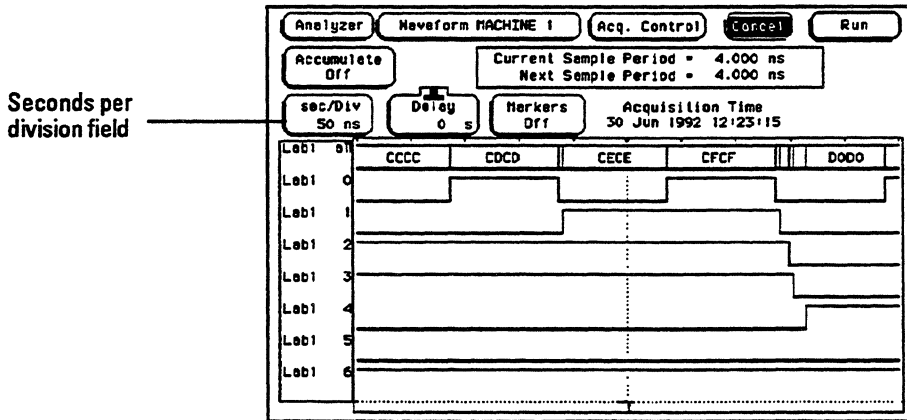
States Per Division Field

Seconds Per Division Field (Timing only)

When the analyzer Type field in the Configuration menu is set to Timing, the analyzer uses its own internal clock. In this mode, the X-axis of the waveform display is measured in seconds per division.

You use the sec/Div field to select the seconds per division resolution of the X-axis. The range of the sec/Div field is 1 ns/Div to 1.0 ks/Div. You set the sec/Div field by either selecting the sec/Div field and rotating the knob, or by highlighting the sec/Div field and entering a value using the front-panel keypad.

When using the knob to set the sec/Div, the value will change in a 1-2-5 sequence. By adjusting the sec/Div, you can zoom in to view a desired part of the display.



Seconds Per Division Field

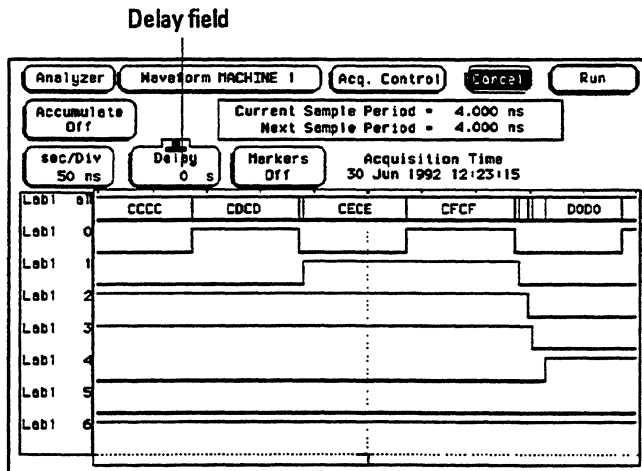
Delay Field

Depending on the analyzer configuration, a positive or negative delay measured in either states or time can be set. The Delay field allows you to scroll the data and place the display window at center screen. Changing the delay will not effect the data acquisition unless it is a timing analyzer and the acquisition mode is automatic.

The delay range of a timing analyzer is from -2500 seconds to $+2500$ seconds. The delay range of a state analyzer is from -8192 states to $+8192$ states.

If you want to move the display window to view data located off screen to the right, enter a positive delay. If you want to move the display window to view data located off screen to the left, enter a negative delay.

You can enter a delay by highlighting the Delay field, then turning the knob. You can also enter a delay by selecting the Delay field, then enter a value from the front-panel keypad.

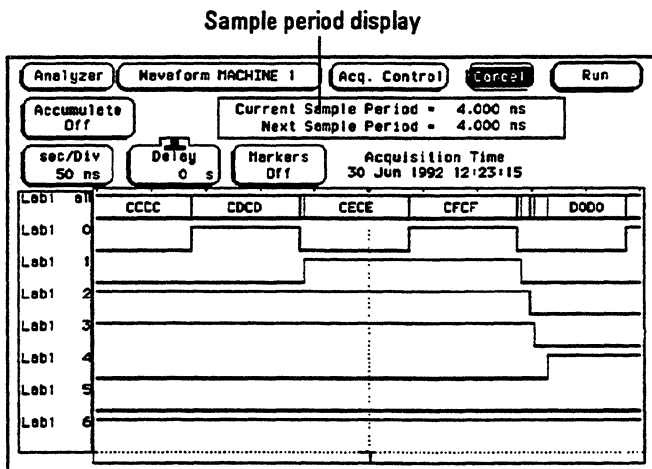


Delay Field

Sample Period Display (Timing only)

The sample period display only appears in a timing analyzer. A sample period is the interval of time between new data samples. Every time a new measurement is taken, the analyzer updates the display.

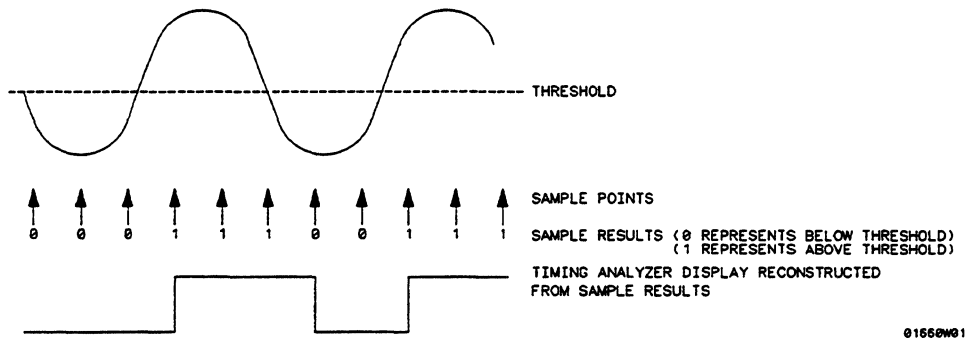
The Current Sample period display is the sample period used for the last acquisition. The Next Sample period is the new sample period to be used at the next acquisition. If the acquisition mode is set to automatic, changing the sec/Div or delay will affect the sample period.



Sample Period Display

Timing waveforms are reconstructed relevant to the sample period. The shorter sample period puts more sample points on the waveform for a more accurate reconstruction but also fills memory more quickly.

If the sec/Div is changed resulting in a change in the next sample period, you must run the analyzer again before the current sample period display is updated.



Sample Points

Markers Field

The Markers field is used to access the markers selection menu. When the Markers field is selected, a marker selection menu appears with the marker choices available under the present analyzer configuration.

State Analyzer Types

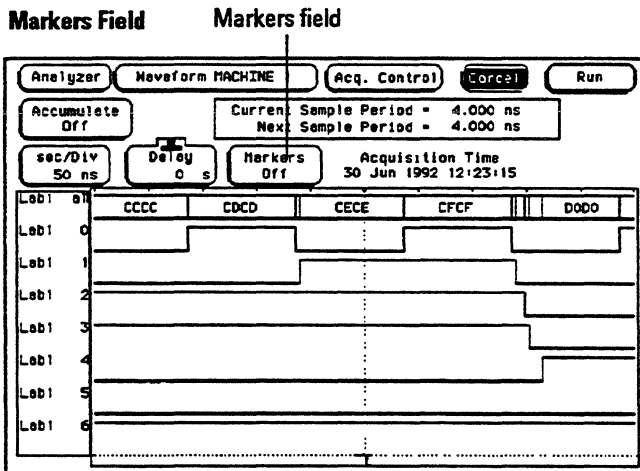
In a state analyzer with count turned off in the Trigger menu, only Pattern markers are available. With count Time turned on, additional choices of Time markers and Statistics markers become available. With count States turned on, in addition to Pattern markers, States markers are available.

Timing Analyzer Types

If a timing analyzer you have marker choices of Off, Pattern, Time, or Statistics.

Off

The Off selection turns marker operations off. If a Stop measurement was previously specified and the Stop measurement criteria are met, the measurement will stop even though the markers are off.



Pattern Markers

When Pattern markers are selected, two markers labeled X and O become available. Pattern markers identify and mark unique bit patterns in the waveform display. Once the unique bit patterns are marked, they can be used as reference points or as criteria for a stop measurement.

The markers are graphically accented in the display by dashed lines. In addition, both markers are labeled at the bottom of the display in the Display Location Reference Line.

When a marker is positioned in the waveform display, it is also positioned in the chart display and data listing.

See Also

"Specify Patterns Field" later in this chapter for information on creating a pattern for the X and O markers.

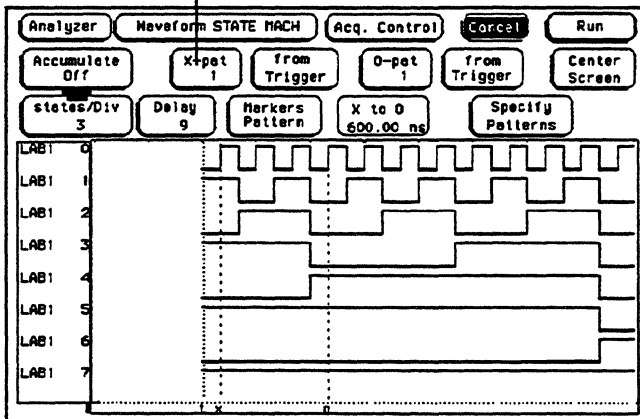
"Display Location Reference Line" later in this chapter.

X-pat / O-pat Occurrence Fields

The X-pat/O-pat occurrence fields designate which pattern occurrence the marker is placed on. The occurrence field is set by first highlighting the field, then turning the knob or entering a number from the front-panel keypad.

The reference point from which the occurrence counter starts is the trigger point, the start of the trace, or, in the case of the O-marker, the X-marker. If a negative number is set, the analyzer will search for pre-trigger occurrences.

Pattern occurrence fields



X-pattern and O-pattern Occurrence Fields

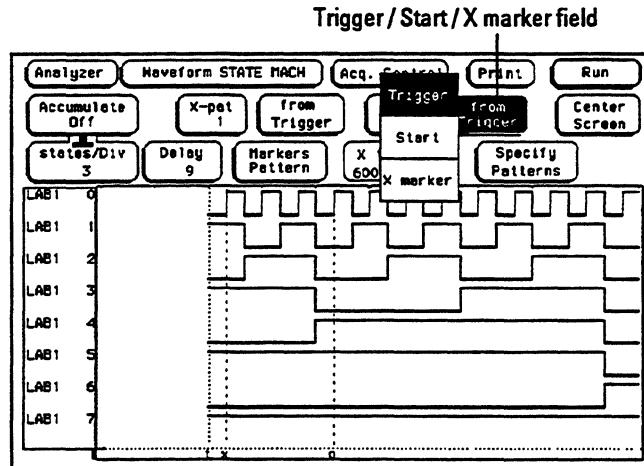
From Trigger / Start / X Marker Field

The from Trigger/Start/X marker field is used to access the selection pop-up for the start point of the X and O marker occurrence counters.

The start points available for the X-marker are either the trace start point or the trigger point.

The start points available for the O-marker are either the trace start point, trigger point, or the X-marker.

If the marker pattern can not be found, a message appears at the top of the display indicating the search failed. If the O-marker is referenced from the X marker, and the X-marker is not found, the search for both markers will fail.

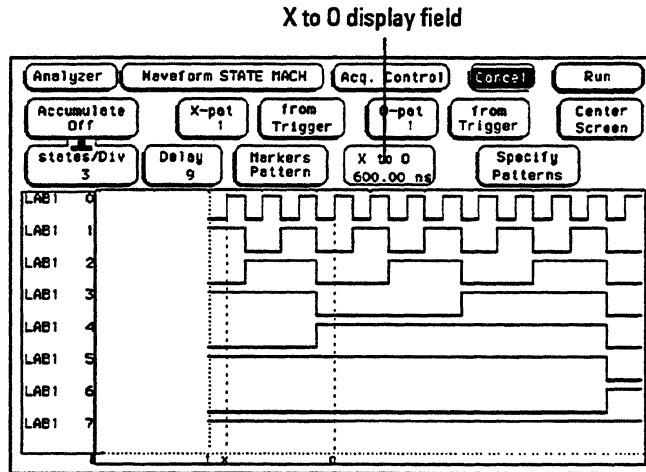


Trigger / Start / X Marker Field

The Waveform Menu
X to O Display Field (Timing only)

X to O Display Field (Timing only)

The X to O display field only appears when the analyzer is configured as Timing. The X to O display field shows the time between the X and O markers.



X to O Display Field

Center Screen Field

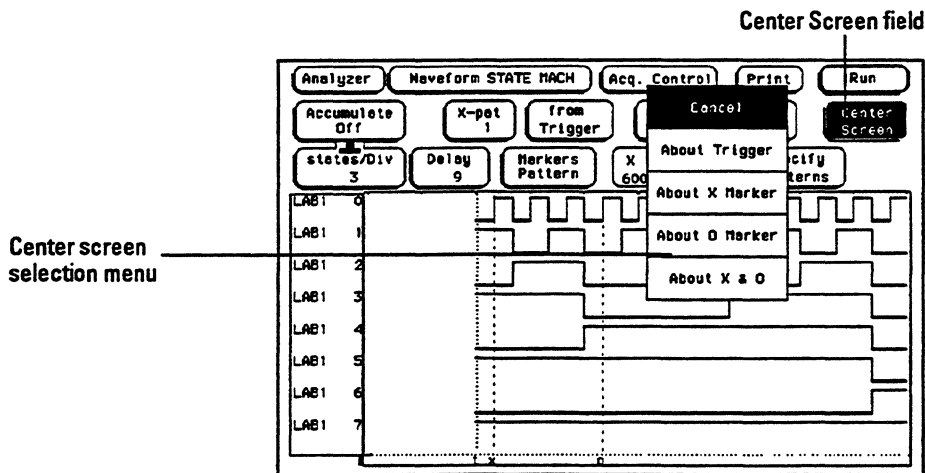
The Center Screen field accessed a menu which allows you to position the marked points of the waveform display relative to the center of the waveform display.

About Trigger The About Trigger selection is the default position. This choice will position the point of the waveform where the trigger occurred, at center screen.

About X Marker This choice adjusts the delay to position the point of the waveform where the X-marker is placed, at center screen.

About O Marker This choice adjusts the delay to position the point of the waveform where the O-marker is placed, at center screen.

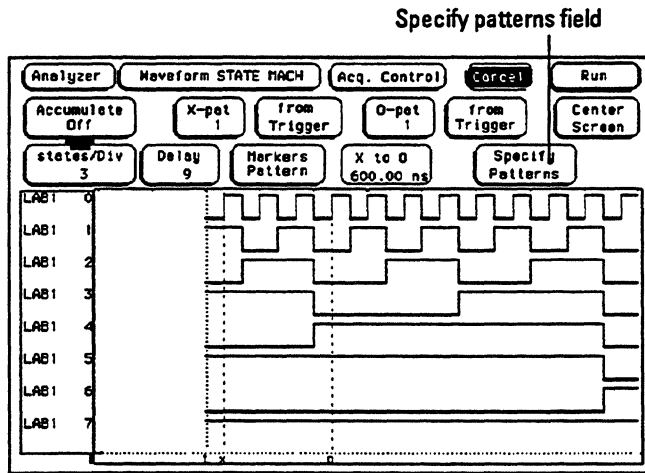
About X & O This choice adjusts the sec/Div to allow both X and O markers to be displayed simultaneously.



Center Screen Field

Specify Patterns Field

The Specify Patterns field only appears when the markers are set to Pattern. When the Specify Patterns field is selected, a pop-up menu appears that is used to assign the bit patterns for the X and O markers, the X and O entering/leaving, and the stop measurement criteria.



Specify Patterns Field

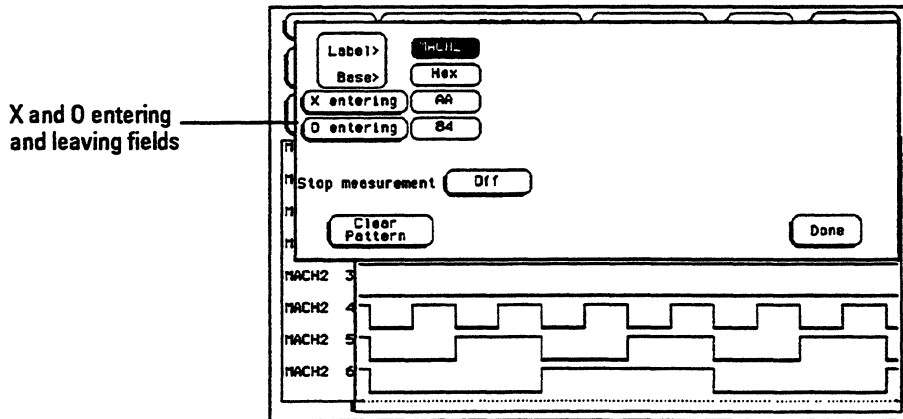
X and O entering / leaving Fields (Timing only)

If the analyzer is configured as Timing, the X and O pattern markers are placed at either the beginning of the pattern occurrence (entering) or at the end of the pattern occurrence (leaving). When the entering/leaving field of either X or O markers is selected, it will toggle between the two choices.

Whichever choice you toggle the field to, the pattern you place in the pattern display field will apply to that choice.

X-marker and O-marker Fields (State only)

If the analyzer is configured as State, X-marker and O-marker fields replace the X and O entering/leaving fields. The pattern you place in the pattern display field will apply to the marker labeled at the left.



Specify Patterns Menu

The Waveform Menu Specify Patterns Field

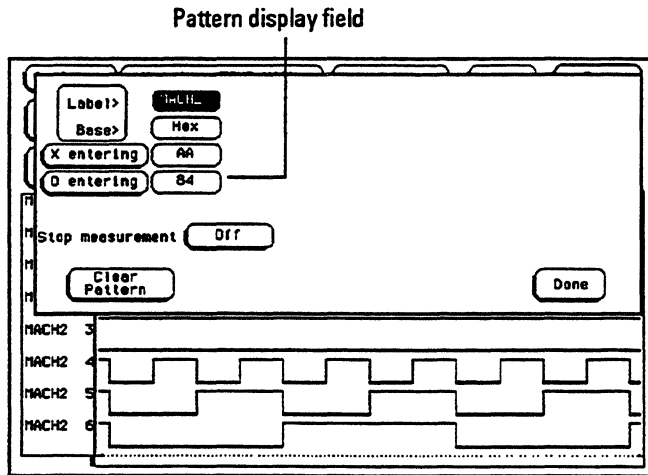
Pattern Display Fields

The pattern display field displays the alpha-numeric bit pattern specified for each X and O marker in all designated labels. The bit pattern is displayed in the same numeric base and same order as the data listing. When the pattern display field is highlighted, the front-panel keypad is used to set the bit pattern.

When there are more labels assigned than can be displayed in a single screen, the pattern display fields are rolled back on screen by the Label/Base roll field.

See Also

"Label/Base Roll Field" in the Common Menu Fields chapter for a complete definition of the Label and Base roll function.



Specify Pattern Menu

Label and Base Fields

The Label and Base fields show up together in all menus except the Format and Configuration menus. When a new label is assigned, a base field is automatically assigned to that label.

Label Field Labels in the Specify Patterns menu are the same labels assigned in the Format menu. These labels will be displayed throughout the analyzer as they were assigned in the Format menu.

See Also

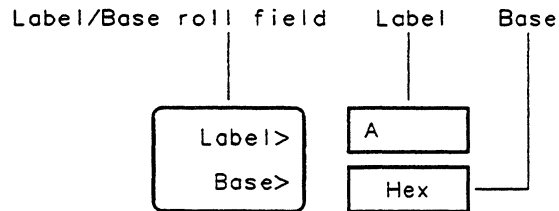
"Label Assignment Field" in the Format menu chapter for a complete definition of label assignment and modification.

To reorder currently displayed Labels, select the label you want to move, then from the selection menu that appears, choose the label you want to switch positions with.

Base Field The function of the Base field is the same in all menus. For a complete definition of the Base field, refer to "Base field" in the Common Menu Fields chapter.

Label / Base Roll Field

The function of the Label and Base roll field is the same in all menus. For a complete definition of the Label/Base roll function, refer to "Label/Base Roll Field in the Common Menu Fields chapter.



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Label / Base Roll Field

Stop Measurement Field

The stop measurement function allows you to specify a condition which stops the analyzer measurement during a repetitive run.

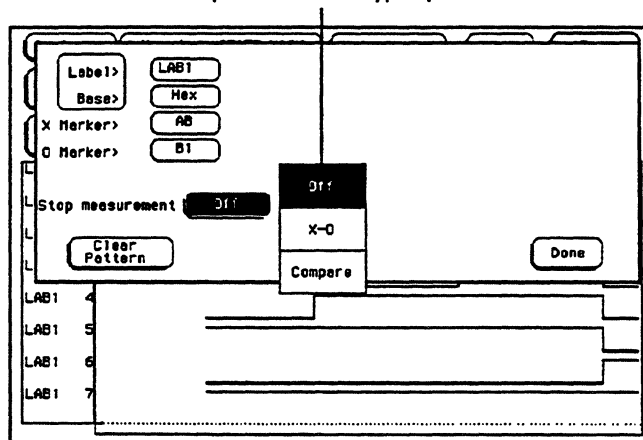
When the stop measurement field is selected, a stop measurement type menu appears. Depending on the analyzer configuration, you have choices of Off, X-O, and Compare.

Off

The Off selection turns off all stop measurement operations.

If the stop measurement operation is not turned off and the stop measurement criteria are met, the measurement will stop even though the markers are set to other types or are turned off.

Stop measurement type options



Stop Measurement Field

X-O

The X-O option is available in the Timing analyzer and in the State analyzer with its count set to Time.

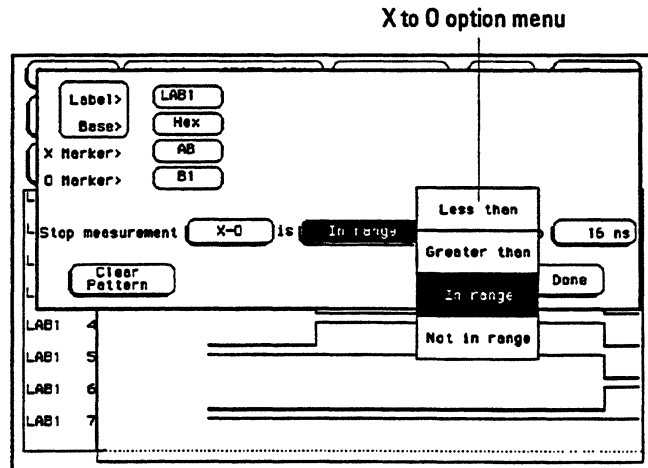
When X-O is selected, a repetitive run is stopped when a comparison of the time period between the X and O markers and one of the following time period options is true:

Less Than X-O time must be less than the time value that you specify in the Time field.

Greater Than X-O time must be greater than the time value that you specify in the Time field.

In Range X-O pattern must be within the time range value that you specify in the two Time fields.

Not in Range X-O pattern must not be within the time range value that you specify in the two Time fields.



X-O Field

The Waveform Menu

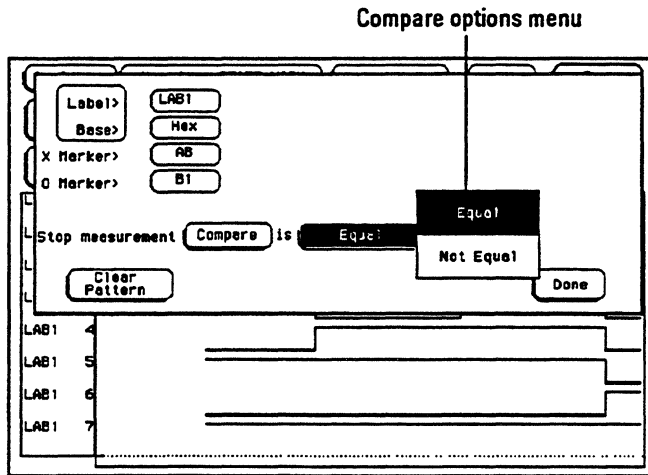
Stop Measurement Field

Compare

When Compare is selected, a repetitive run will be stopped when a comparison of data in the Listing menu and data and criteria in a compare image matches an equality selection. The equality selection is set from the Equal/Not Equal selection pop-up menu.

Equal The data and compare criteria in the Compare menu must be equal to the data in the Listing menu.

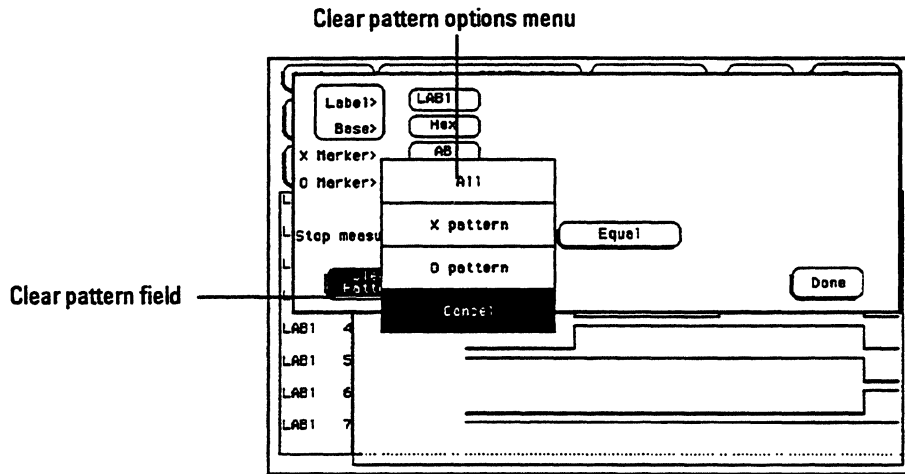
Not Equal The data and compare criteria in the Compare menu must not be equal to the data in the Listing menu.



Equal / Not Equal Selection Menu

Clear Pattern Field

The Clear Pattern field is used to reset the X and O Marker pattern display fields back to default (don't care = X). The Clear Pattern field accesses a selection menu with the choices of All, X-pattern, or O-pattern.



Clear Pattern

Time Markers

Time markers are indicators located in the waveform display that are used as reference marks to obtain time values between each marker, or between each marker and the trigger point.

In a State analyzer, Time markers only become available when the Count field in the Trigger menu is set to Time.

The markers are graphically accented in the display by dashed lines. In addition, both markers are labeled at the bottom of the display in the Display Location Reference Line.

If Pattern markers are assigned, the Time markers are initially placed at the same locations in the data listing.

Trig to X / Trig to O Fields

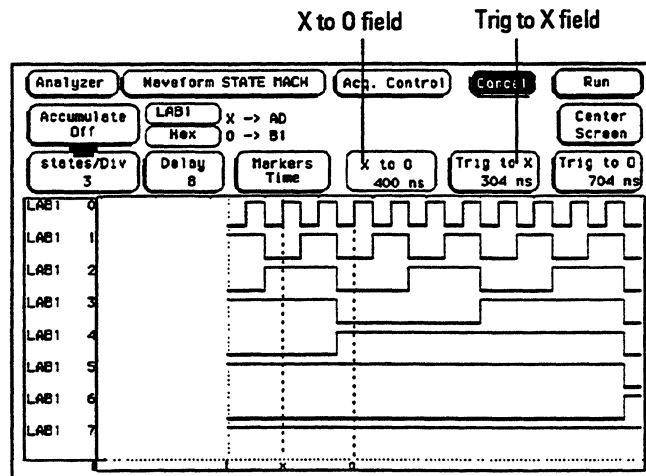
The Trig to X and Trig to O fields display the time between the trigger point and the marker. They are also used to position the markers with reference to the vertical dashed trigger line.

Marker position is set by first selecting the Trig to X and Trig to O fields, then rotating the knob. In addition, values can be entered by highlighting the field, then entering a value from the front-panel keypad.

X to O Field

In a State analyzer configuration, the X to O field is a "read only" field that displays the difference between the X and O markers. As the X and O markers are changed, the display changes accordingly.

In a Timing analyzer configuration, the X to O field can be set. If this field is changed, both X and O markers will move simultaneously with the relative difference remaining unchanged.



Trig to X / Trig to O Fields

Marker Label / Base and Display

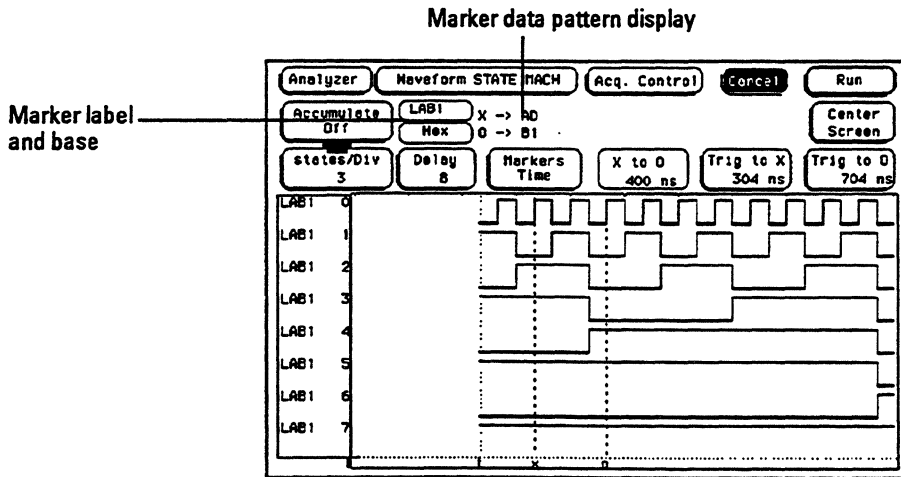
The label field displays the label name for which the X and O marker values are assigned. To display other labels, select the label field and choose the new label from the selection menu that appears. Only preassigned labels are available in the label selection menu.

The base field underneath the label field displays the numeric base the marker values are displayed in. To change the numeric base, select the base field, then choose the desired base from the selection menu.

Data patterns where the markers are currently placed, appear next to the appropriate marker.

See also

"Label Assignment Fields" in the Format menu chapter for information on assigning labels.



Marker Label / Base and Display

Statistics Markers

After patterns are assigned to the X and O markers, statistical information is available when markers are set to statistics. The logic analyzer displays the following information:

- Number of valid runs (runs where Pattern markers were placed on specified patterns).
- Minimum time between the X and O Pattern markers.
- Maximum time between the X and O Pattern markers.
- Average time between the X and O Pattern markers.

In a State analyzer, Statistics markers only become available when the Count field is set to Time in the Trigger menu.

The markers are graphically accented in the display by dashed lines. In addition, both markers are labeled at the bottom of the display in the Display Location Reference Line.

The Waveform Menu Marker Label / Base and Display

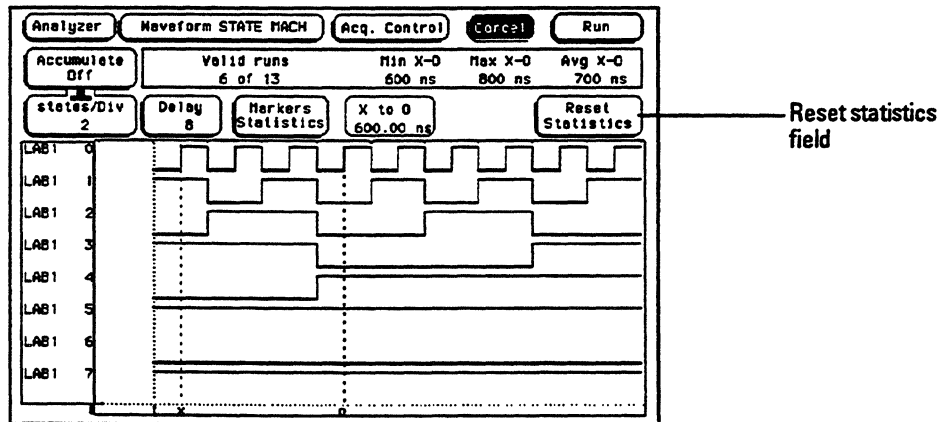
Statistics are based on the time between the X and O. Both markers must be found before valid statistical information is displayed.

In repetitive run mode, the display is updated each time a valid run occurs until you press Stop. If you press Run after Stop, the statistics continue to update without loss of information.

In single run mode, each time you press Run an additional valid run will be added to the data and the statistics will be updated. This process continues unless you change the placement of the X and O Pattern markers between runs.

Reset Statistics

All statistical information can be cleared at any time by selecting the Reset Statistics field. Statistics are also cleared any time the patterns assigned to the X and O markers are changed.



Statistics Display

States Markers (State only)

States markers are indicators located in the waveform display that are used as reference marks to obtain the number of states between each marker, or between each marker and the trigger point.

State markers are only available in a State analyzer with the Count field, in the Trigger menu, set to States.

The markers are graphically accented in the display by dashed lines. In addition, both markers are labeled at the bottom of the display in the Display Location Reference Line.

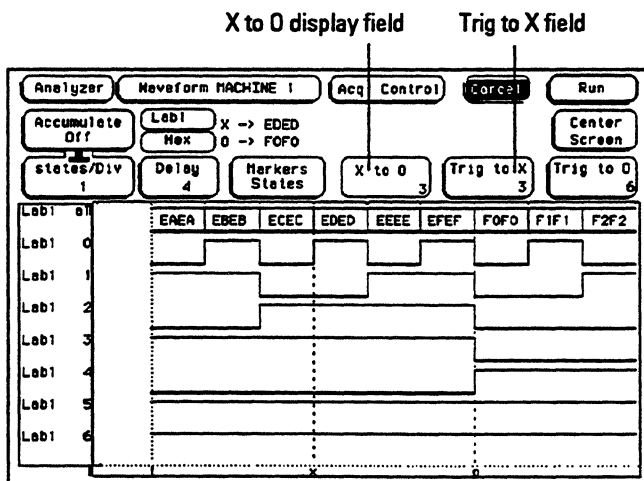
Trig to X / Trig to O Fields

The Trig to X and Trig to O fields display the time between the trigger point and the marker. They are also used to position the markers with reference to the dashed trigger line.

Marker position is set by first highlighting the Trig to X and Trig to O fields, then rotating the knob. In addition, values can be entered by highlighting the field, then entering a value from the front-panel keypad.

X to O Display Field

The X to O display field is a "read only" field that displays the number of states between the X and O markers. As the X and O markers are changed, the display changes accordingly.



Trig to X / Trig to O Fields

Marker Label / Base and Display

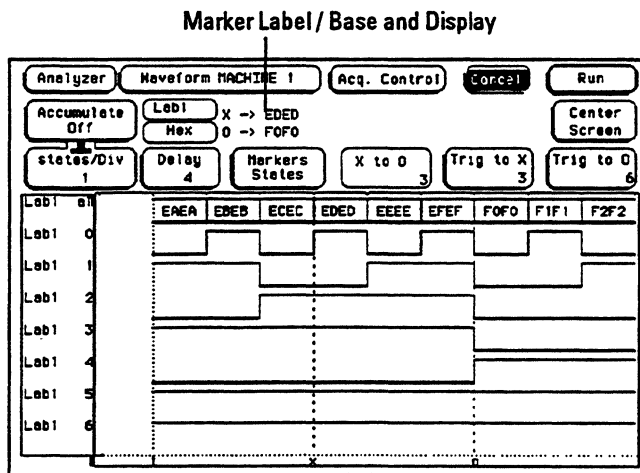
The label field displays the label name for which the X and O marker values are assigned. To display other labels, select the label field and choose the new label from the selection menu that appears. Only preassigned labels are available in the label selection menu.

The base field, underneath the label field, displays the numeric base the marker values are displayed in. To change the numeric base, select the base field, then choose the desired base from the selection menu.

Data patterns, where the markers are currently placed, appear next to the appropriate marker.

See also

"Label Assignment Field" in the Format Menu chapter for information on assigning labels.



Marker Label / Base and Display

Waveform Display

The waveform display area of the Waveform menu displays state and timing waveforms for labels assigned in the Format menu. If the Waveform menu is for a state analyzer, the display is state waveforms. If the Waveform menu is for a timing analyzer, the display is timing waveforms.

The waveform display area also accesses the fields used to select, delete, or modify waveforms. The function of selecting waveforms for display, and modifying or deleting waveforms is identical for both state and timing waveforms.

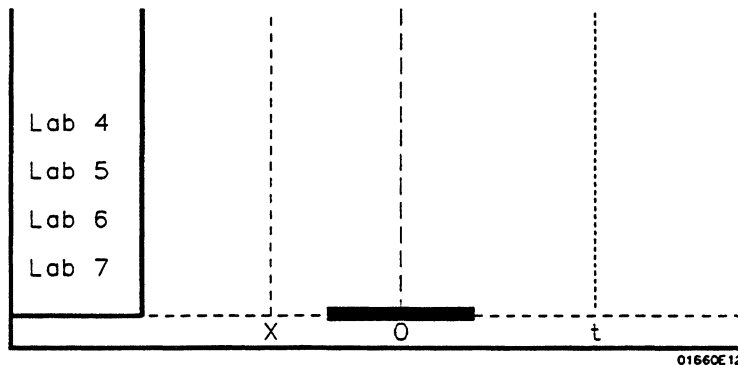
Only waveforms with their bits assigned to a label in the Format menu are displayed. Each waveform is a member of a set of waveforms grouped under a label. The label name you assign in the Format menu is the label name that appears in the any label selection list.

Display Location Reference Line

At the bottom of the Waveform menu is a reference line which displays the relative location of the display window, the markers, and the trigger point with reference to the total memory.

Total memory is represented by a horizontal dotted line. The display window is represented by an overlaid solid line. The markers and trigger point are represented by small dots above the total memory line, and an X, O, and t label, all of which are located below the total memory line. See the figure below.

As you change settings such as delay, sec/Div, states/Div, trigger point and marker placement, all the relative positions change within the Display Location Reference Line.



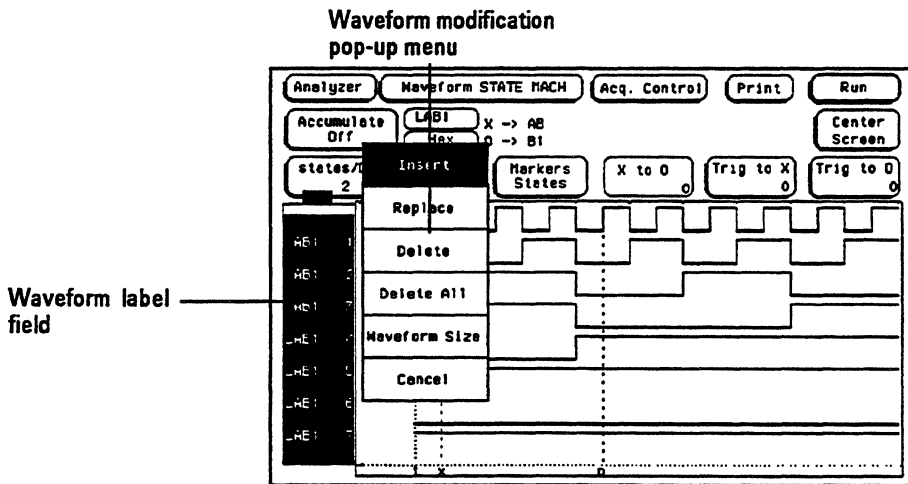
Display Location Reference Line

Waveform Label Field

The waveform label field, located on the left side of the waveform display, is both a display and configuration field. After all desired waveforms are configured for display, they are listed in the waveform label field. If there are more waveforms than can be displayed, the list is rolled by selecting the waveform label field, then after the roll indicator appears, turn the knob.

If the waveform label field is selected a second time, a waveform modification menu appears. Use this menu to configure the waveform display

When the waveform modification menu appears, select the operation to insert, replace, delete, or scale waveforms into the display. You can display up to 24 waveforms on screen at one time.



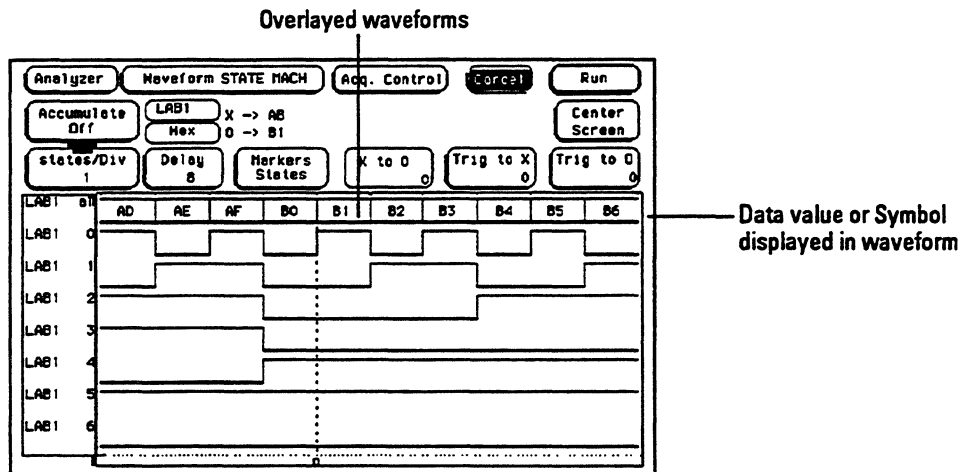
Waveform Selection Options

Insert

When the Insert option is selected, a list of all labels assigned in the Format menu appears. Select the desired label to insert. Select to insert a single bit, all bits in sequential order, or all bits as a Bus in an overlaid form. The new inserted waveform is placed directly below the cursor.

Viewing State Values in the Bus Option When all assigned waveforms in a label are overlaid with the Bus option, the value of the data is displayed to the right of each new transition in the waveform display.

If the sec/Div is set to view a large increment of time, or the waveform scaling is set to small or medium, the state data readout will not fit between transitions. To display the state data readouts within the waveform, expand the sec/Div and use the large waveform setting. If symbols are assigned to represent data values, the symbol is displayed.



State Data or Symbols in Overlaid Waveform

The Waveform Menu

Waveform Label Field

Replace

To replace one waveform with another, select the waveform you wish to replace, then select the Replace field. When the list of bits (waveforms) appears, select the new waveform to replace the old waveform.

Delete and Delete All

The Delete field is used to delete single channels within the group of displayed waveforms. To delete any single channel, select the waveform you wish to delete, then select the Delete field.

To delete all displayed waveforms, select any single waveform to access the options list, then select the Delete All field followed by Continue.

Waveform Size

The Waveform Size field accesses a selection menu which contains choices that scale the displayed waveforms to different sizes. A different waveform size can increase the number of waveforms in the display or make the viewing better for just a few.

Best Fit

When Best Fit is used, the analyzer picks the largest font, either small, medium, or large, that allows all waveforms to be displayed.

Small

The small font will allow 24 waveforms displayed.

Medium

The medium font will allow 16 waveforms displayed.

Large

The large font will allow 8 waveforms displayed. Use this selection if you want to view data values or symbols in the display

System / Analyzer Field

The function of the System/Analyzer field is the same in all menus. For a complete definition of the System/Analyzer field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Menu Field

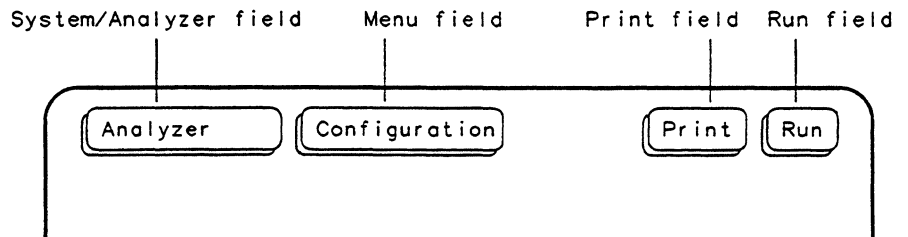
The function of the Menu field is the same in all menus. For a complete definition of the Menu field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Print Field

The function of the Print field is the same in all menus. For a complete definition of the Print field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Run Field

The function of the Run field is the same in all menus. For a complete definition of the Run field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.



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Common Menu Fields

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The Mixed Display Menu

The Mixed Display Menu

The Mixed Display menu is a multidisplay menu which consists of a state listing display located at the top of the menu and a waveform display located at the bottom of the menu. The Mixed Display menu is used to view both state and timing data in the same display.

The Mixed Display menu only becomes available when at least one analyzer is configured as a state analyzer, with its Count field in the Trigger menu set to Time. If two state analyzers are configured, both state listing displays can be interleaved as well as shown separately, however, the listing menus are the best display menus for a two-state analyzer configuration.

The waveform display area shows timing analyzer waveforms from the configured timing analyzer.

For the most part, the operation of the menu fields in the listing and waveform portions of the Mixed Display menu are identical to their operation in their respective menus.

Only the unique functions and features of the Mixed Display menu are described in this chapter. For complete information of the menu fields refer to the Listing menu and Waveform menu chapters found earlier in this manual.

Inserting Waveforms

To insert waveforms use the same procedure for selecting waveforms when in the Waveform menu.

See Also

"Waveform Display" in the Waveform menu chapter for information on the field definitions and the waveform selection functions.

Interleaving State Listings

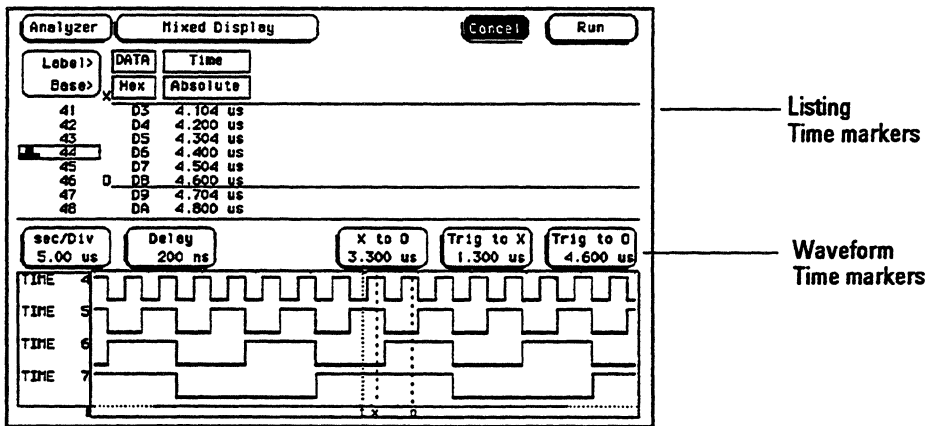
Interleaved state listings allows you to view two labels and their data from different analyzers in the same column. The process of interleaving state listings can be performed in either the Listing menu or the Mixed Display menu. For example, if data is interleaved in the Listing menu, it will be automatically interleaved in the Mixed Display menu.

The interleaved label is placed directly above the selected label and all interleaved data is displayed in white. In addition, the state numbers of the interleaved data are indented to the right. Because of the lack of room available in the listing portion of the Mixed Display menu, the label identifying the interleaved data is not displayed. For this reason, it is recommended that when two state analyzers are configured, the listing menus should be used to display interleaved labels.

Time-Related Displays

Once the Time markers are set in the Waveform display area of the Mixed Display menu, time-correlated X and O Time markers will be displayed in both the listing and the waveform display areas.

The analyzer uses a counter to track time between the triggering of one display and the triggering of the other display. It uses this count to reconstruct time-correlated data.



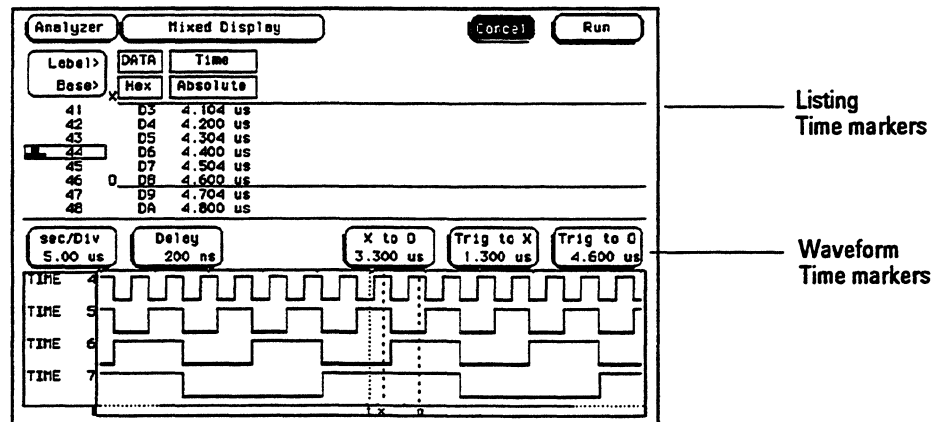
Time Correlated Markers

Markers

The markers in the Mixed Display menu are not the same as in the individual Listing and Waveform menus. You must place new Time markers on your points of interest in the Mixed Display. Even though you have placed markers in the individual listing and waveform displays, the markers will not transfer to the Mixed Display menu.

Time Markers

Only Time markers are available in the Mixed Display menu. You set the Time markers in the waveform display area of the menu. Refer to the chapter "The Waveform Menu" found earlier in this manual for complete information on Time marker operation.



Time Markers

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The Chart Menu

State Chart is a software post-processing feature that provides the ability to build x-y charts of label activity using state data. The Chart menu builds a graphical representation of the system under test. The y-axis always represents data values for a specified label. You can select whether the x-axis represents states (ie. rows in the state listing) or the data values for another label.

Chart Post-Processing Features

When the x-axis is set to State, X and O markers are available which display the current sample relative to the trace point and the corresponding y-axis data value. Marker placement is synchronized with the normal state listing.

An accumulate mode is available that allows the chart display to build up over several runs.

You can generate x-y charts of Label vs Label or Label vs State.

Label Value vs. Label Value Charts

When labels are assigned to both axis, the chart shows how the data acquired under one label varies in relation to the other for a particular measurement. Label values are always plotted in ascending order from the bottom to the top of the chart and in ascending order from left to right across the chart. Plotting a label against itself will result in a diagonal line from the lower left to upper right corner. All markers are disabled when plotting this kind of chart.

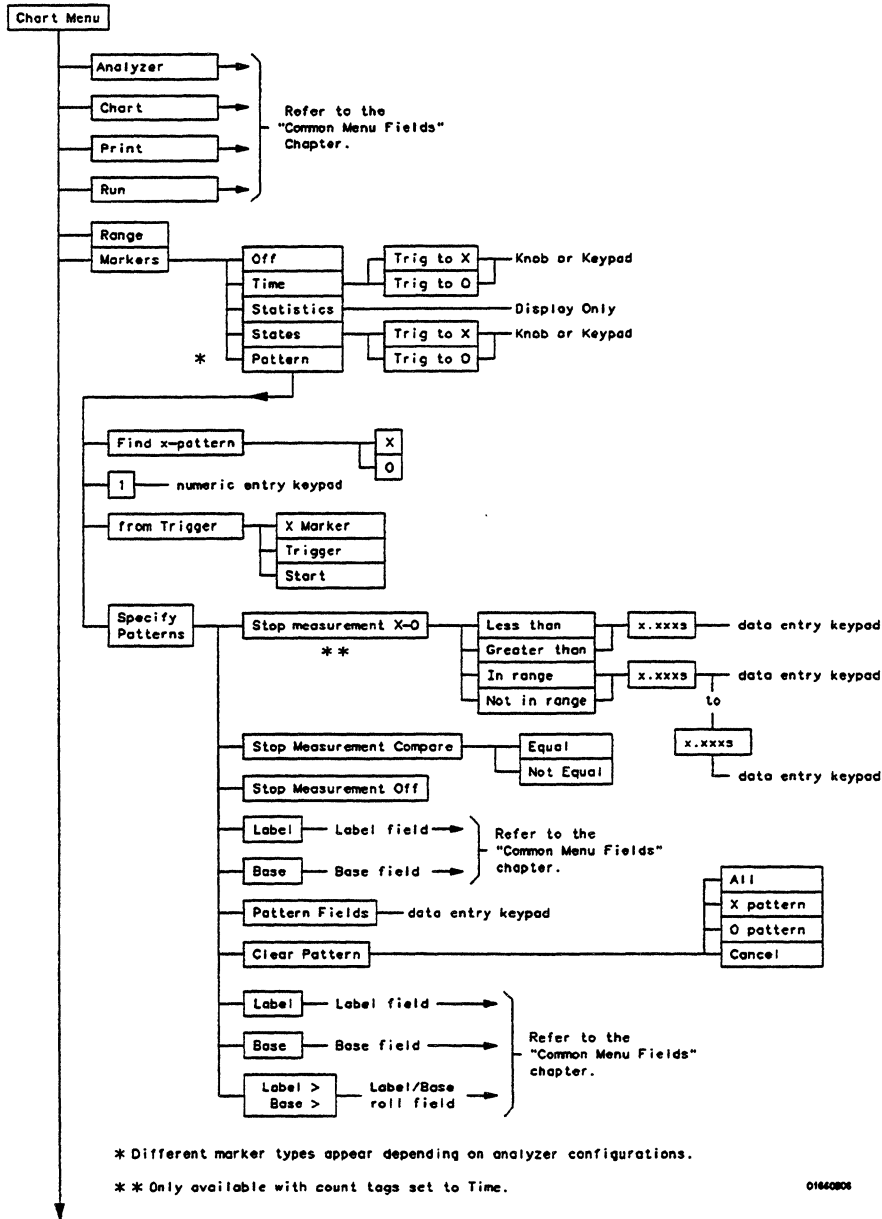
Label Value vs. States Charts

The Label value versus State is a plot of data values acquired under a label versus the memory location of the same data. The label value is plotted against successive memory locations numbers.

Chart Menu Map

The following menu map illustrates all fields and the available options in the Chart menu. The menu map will help you get an overview as well as provide you with a quick reference of what the Chart menu contains.

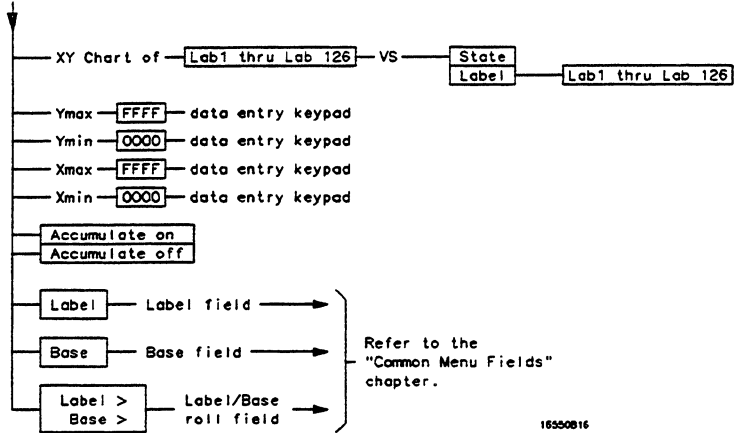
The Chart Menu



Continued on next page

Chart Menu Map

Cont'd from prev page



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Chart Menu Map (cont.)

Selecting the Axes for the Chart

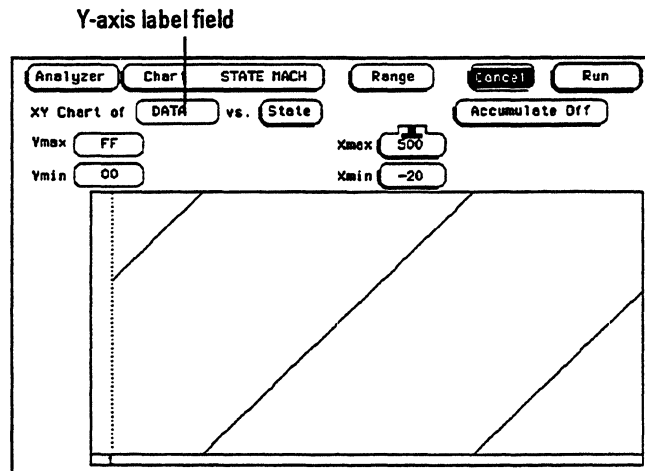
When using the State Chart display, you first select what data you want plotted on each axis. The vertical y-axis will always be the data under a label. The available labels are those which you assigned in the Format menu. The horizontal x-axis can be either the same labels available for the y-axis or state memory location numbers.

Y-axis Label Value Field

The y-axis label field displays the label assigned to the vertical y-axis. Vertical axis labels are assigned by selecting the y-axis label field, then selecting a label from a selection list. The only label choices available are the labels that were defined in the Format menu.

The value plotted is the measured data value represented by that label, and in the numeric base selected.

The placement of the label data on the graph is determined by the scaling of the Ymin and Ymax fields.



The Y-axis Label Field

X-axis Label / State Type Field

The Label/State type field displays the axis type assigned to the horizontal axis. The x-axis represents state data values, or state memory location numbers.

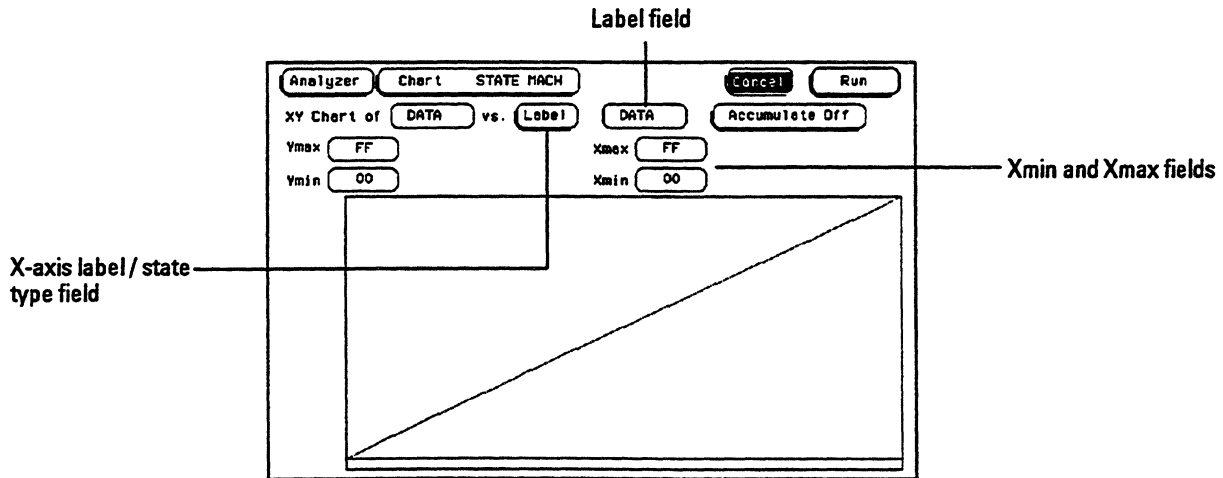
The x-axis type field is just to the right of "vs." text, and toggles between State and Label. The x-axis type field must be set to either Label or State before the chart's x-axis scaling is assigned.

To assign a label, select the x-axis Label field, then select the desired label from a label selection list. The value plotted is the measured data value represented by that label, and in the numeric base previously selected. The only label choices available are the labels that were defined in the Format menu

To assign the axis type to State, toggle the field to State. The value plotted is the state memory location numbers or a range of memory locations assigned by the Xmin and Xmax fields.

See Also

"Scaling the Axes" found later in this chapter for information on setting the Xmin, Xmax, Ymin, and Ymax fields.



The X-axis Label / State Type Field

Scaling the Axes

When the x-axis is set to State, the horizontal axis represents state memory location numbers. The range of the x-axis can be a single memory location, or a range of memory locations.

When the x-axis is set to Label, the horizontal axis represents a range of data values under the selected label.

Use the Xmin and Xmax fields to set the horizontal axis start point and end point, with the difference between them setting the total axis range.

When the y-axis is set to Label, the vertical axis represents a range of data values under the selected label.

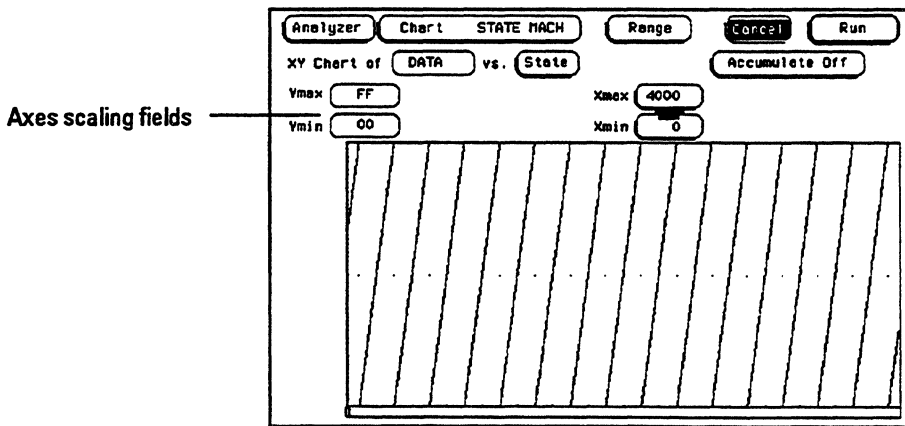
Use the Ymin and Ymax fields to set the vertical axis start point and end point, with the difference between them setting the total axis range.

Min and Max Scaling Fields

Either axis of the x-y chart can be scaled by using the associated vertical or horizontal min (minimum) or max (maximum) value fields. When the scaling fields are selected, minimum and maximum values can then be entered by using the front-panel keypad.

When State is selected for the x-axis, the minimum and maximum values can range from -8192 to +8192 depending on the trace point location.

When Label is selected for the x-axis, the minimum and maximum values range from 00000000 to FFFFFFFF regardless of axis, since labels are restricted to 32 bits.



Axes Scaling Fields

Markers / Range Field

The Marker/Range field is a toggle field that switches between Markers and Range when it is selected. If the field is set to Range, x and y range fields become available to set the chart minimum and maximum range points. The Ymin and Ymax fields display the numeric value of the selected label. The numeric base of the label value is what ever was previously set.

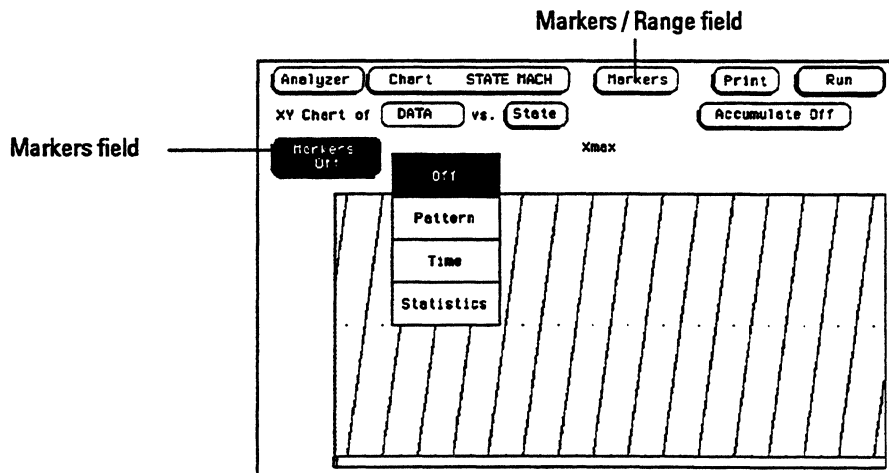
When the Marker/Range field is toggled to Markers, a marker selection menu appears with marker choices available with the present analyzer configuration.

In a state analyzer with Time and State count turned off in the Trigger menu, only Pattern markers are available. With Time count turned on, additional choices of Time markers and Statistics markers become available.

With States count turned on, in addition to Pattern markers, States markers are available.

Off

The Off selection turns marker operations off. If a Stop measurement was previously specified, and the Stop measurement criteria are met, the measurement will stop even though the markers are off.



Markers / Range Field

Pattern Markers

When Pattern is selected from the markers type selection menu, two markers labeled X and O become available. Pattern markers identify and mark unique bit patterns in the data listing. Once the unique bit patterns are marked, they can be used as reference points or as criteria for a stop measurement.

The markers are graphically displayed by dashed vertical lines. In addition, both markers are labeled at the bottom of the display.

When a marker is positioned in the Listing menu, it is also positioned in the Chart menu and Waveform menu.

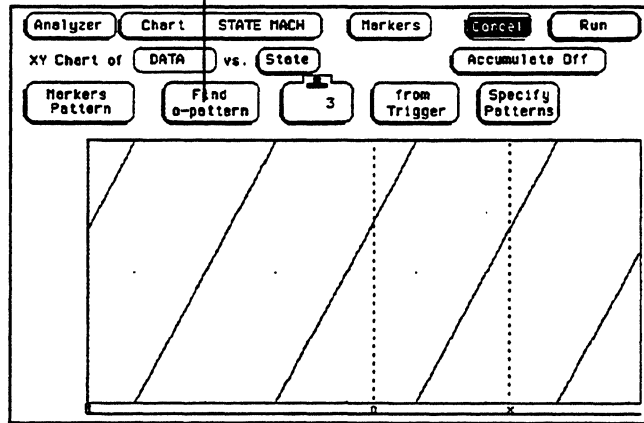
See Also

"Specify Patterns Field" found later in this chapter for more information on creating a pattern for the X and O markers.

Find X-pattern / O-pattern Field

The Find X-pattern / O-pattern Field is a toggle field. When selected, the occurrence and trace start field assignments switches to the other marker. In addition, when this field is selected, the marker identified and the data it marks, will automatically shift to center screen.

Find X-pattern field

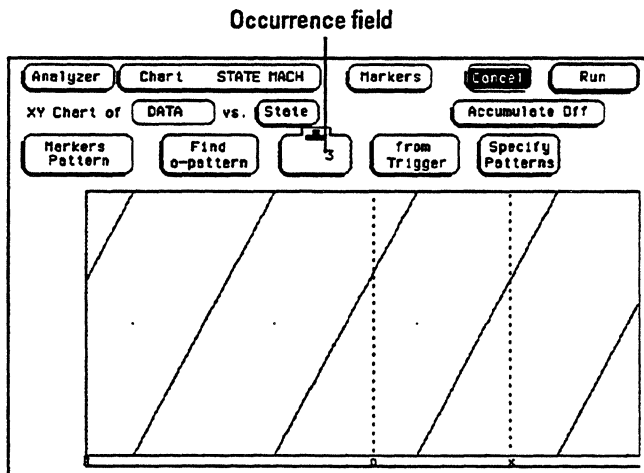


Find X-pattern / O-pattern Field

Pattern Occurrence Fields

The X-pattern and O-pattern occurrence fields designate which pattern occurrence the marker is placed on. The occurrence field is set by first highlighting the field, then turning the knob or entering a number from the front-panel keypad.

The reference point from which the occurrence counter starts is either the trigger point, the start of the trace, or in the case of the O-marker, the X-marker.



X-pattern and O-pattern Occurrence Fields

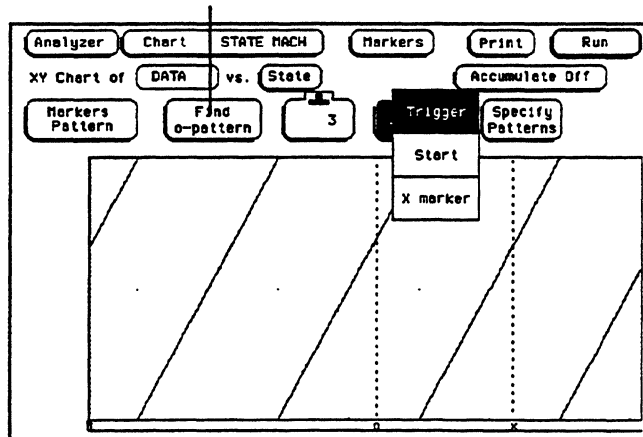
From Trigger / Start / X-Marker Fields

The from Trigger/Start/X-marker field is used to access the selection pop-up for the start point of the X and O marker occurrence counters.

The start points available for the X-marker are either the trace start point or the trigger point. The start points available for the O-marker are either the trace start point, trigger point, or the X-marker.

If the marker pattern can not be found, a message appears at the top of the display indicating the search failed. If the O-marker is reference from the X marker, and the X-marker is not found, the search for both markers will fail.

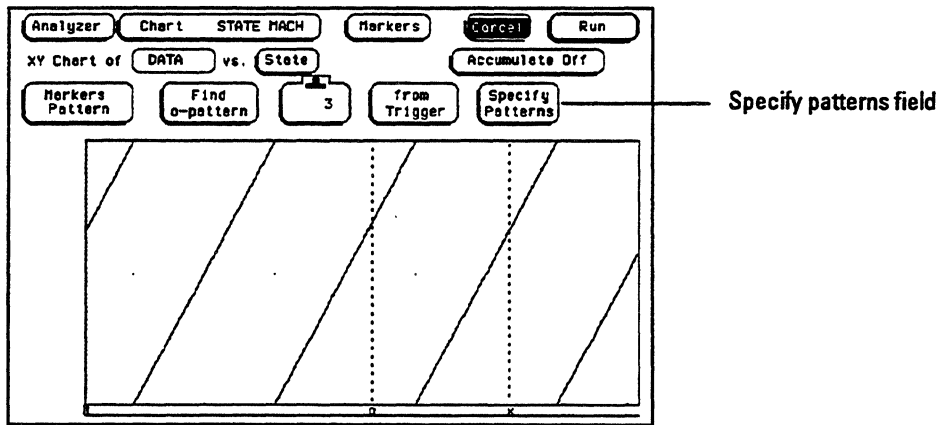
From Trigger / Start / X marker field



Trigger / Start / X Marker Field

Specify Patterns Field

The Specify Patterns field only appears when the markers are set to Pattern. When the Specify Patterns field is selected, a pop-up menu appears that is used to assign the bit patterns for the X and O markers, and the Stop measurement criteria.



Specify Patterns Field

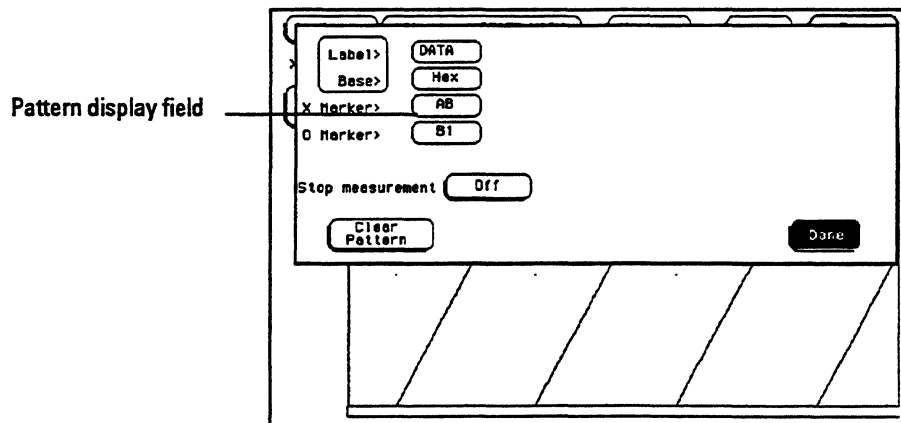
Pattern Display Fields

The pattern display fields display the alpha-numeric bit pattern specified for each X and O marker in all designated labels. The bit pattern is displayed in the same numeric base and same order as the data listing. When the pattern display field is selected, a value can be entered using the front-panel keypad.

When there are more labels assigned than can be displayed in a single screen, the pattern display fields are rolled back on screen by the Label / Base roll field.

See Also

"Label/Base Roll Field" in the Common Menu Fields chapter for a complete definition of the Label/Base roll field.



Pattern Display Field

The Chart Menu

Specify Patterns Field

Label and Base Fields

The Label and Base fields show up together in all menus except the Format and Configuration menus. When a new label is assigned, a base field is automatically assigned to that label.

Label Field Labels in the Specify Patterns menu are the same labels assigned in the Format menu. These labels will be displayed throughout the analyzer as they were assigned in the Format menu.

To reorder currently displayed Labels, select the label you want to move, then from the selection menu that appears, choose the label you want to switch positions with.

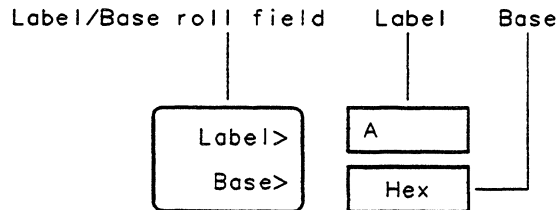
Base Field The function of the Base field is the same in all menus. For a complete definition of the Base field, refer to "Base field" in the Common Menu Fields chapter.

Label / Base Roll Field

The function of the Label and Base roll field is the same in all menus. For a complete definition of the Label/Base roll function, refer to "Label/Base Roll Field" in the Common Menu Fields chapter.

See Also

"Label Assignment Field" in the Format menu chapter for a complete definition of label assignment and modification.



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Label / Base Roll Field

Stop Measurement Field

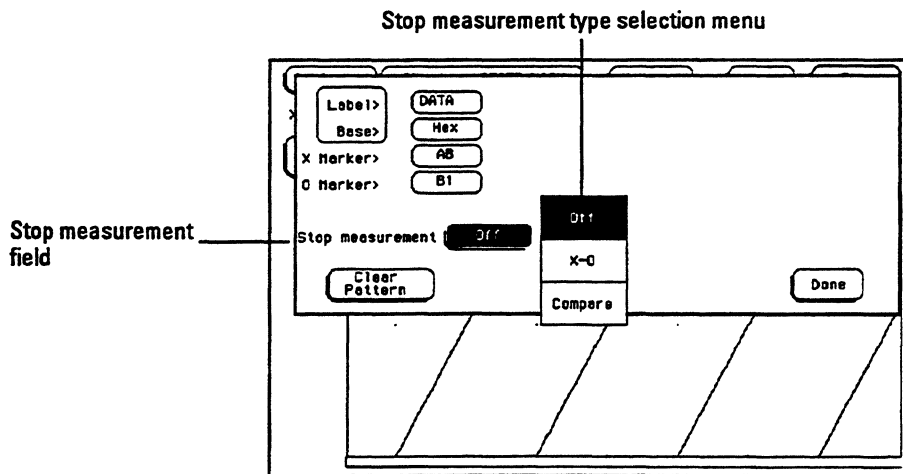
The Stop measurement function allows you to specify a condition which stops the analyzer measurement during a repetitive run.

When the Stop measurement field is selected, a stop measurement type menu appears. Depending on the analyzer configuration, you have the choices of Off, X-O, and Compare.

Off

The Off selection turns all Stop measurement operations off.

If the Stop measurement operation is not turned off and Stop measurement criteria are met, the measurement will stop even though the markers are off.



Stop Measurement Field

The Chart Menu

Stop Measurement Field

X-O

The X-O option is available when the Count field in the Trigger menu is set to Time.

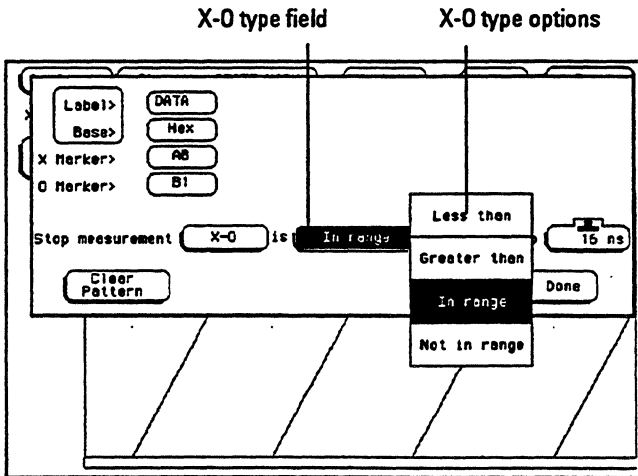
When X-O is selected, a repetitive run is stopped when a comparison of the time period between the X and O markers and one of the following time period options is true:

Less Than X-O time must be less than the time value that you specify in the Time field.

Greater Than X-O time must be greater than the time value that you specify in the Time field.

In Range X-O pattern must be within the time range value that you specify in the two Time fields.

Not in Range X-O pattern must not be within the time range value that you specify in the two Time fields.



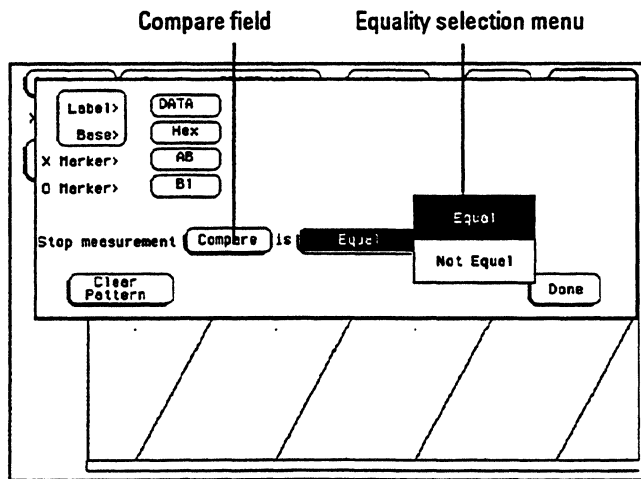
X-O Field

Compare

When Compare is selected, a repetitive run is stopped when a comparison of data in the Listing menu and data and criteria in a compare image matches an equality selection. The equality selection is set from the Equal/Not Equal selection pop-up menu.

Equal The data and compare criteria in the Compare menu must be equal to the data in the Listing menu.

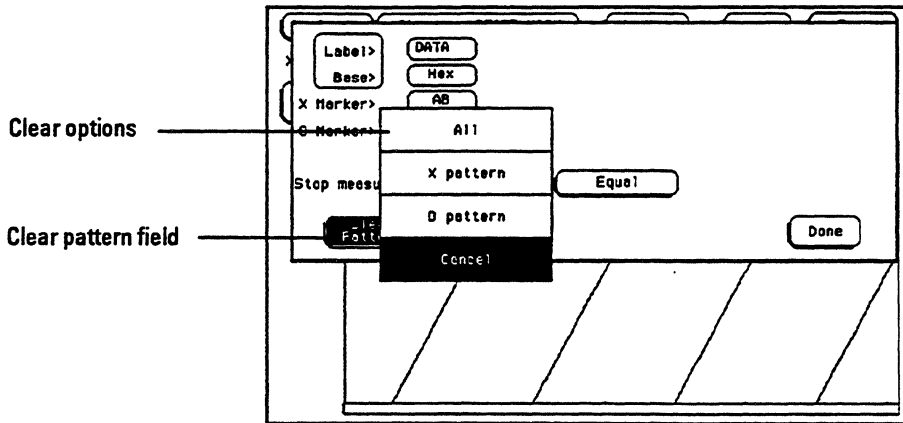
Not Equal The data and compare criteria in the Compare menu must not be equal to the data in the Listing menu.



Equal / Not Equal Selection Menu

Clear Pattern Field

The Clear Pattern field is used to reset the X and O Marker pattern display fields back to default (don't care = X). The Clear Pattern field accesses a selection menu with the choices of all, X pattern, or O pattern.



Clear Pattern

Time Markers

Time markers are indicators located in the x-y chart that are used as reference marks to obtain time values between each marker, or between each marker and the trigger point.

Time markers only become available when the Count field, in the Trigger menu, is set to Time.

The markers are graphically displayed by dashed vertical lines. In addition, both markers are labeled at the bottom of the display.

If Pattern markers have been assigned, the Time markers will be initially placed at the same locations as in the data listing.

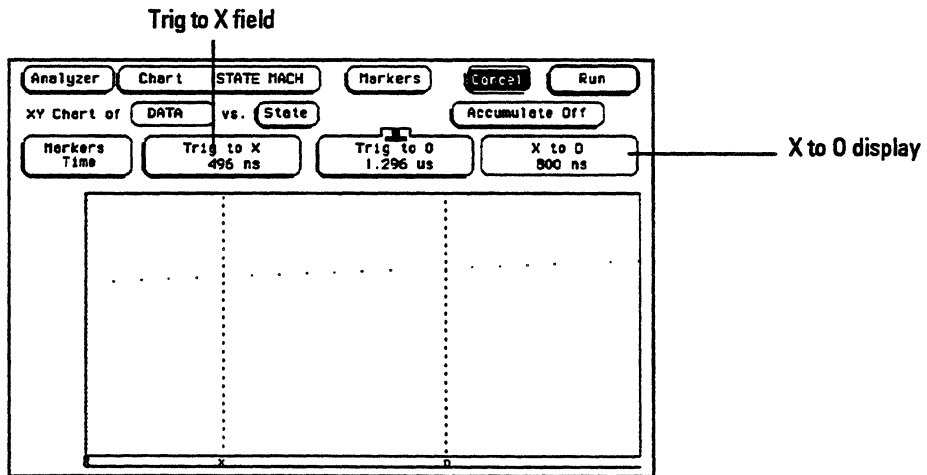
Trig to X / Trig to O Fields

The Trig to X and Trig to O fields are both display fields as well as configuration fields. The Trig to X and Trig to O fields display the time between the trigger point and the marker.

Marker position is set by selecting the desired field and entering a value using the front-panel keypad. The units are set by turning the knob when the assignment pop-up is open. Marker position can also be set by simply turning the knob when the roll indicator is present.

X to O Display Field

The X to O display field is a "read only" field that displays the time between the X and O markers. As the X and O markers are changed, the display changes accordingly.



Trig to X / Trig to O Fields

Statistics Markers

After patterns are assigned to the X and O markers, statistical information is available when markers are set to Statistics. The logic analyzer displays the following information:

- Number of valid runs (runs where Pattern markers were able to be placed on specified patterns).
- Minimum time between the X and O Pattern markers.
- Maximum time between the X and O Pattern markers.
- Average time between the X and O Pattern markers.

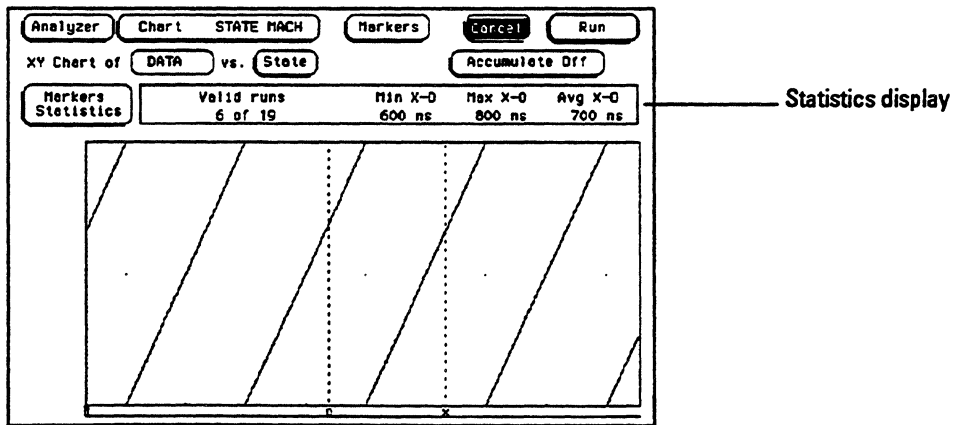
Statistics markers only become available when the Count field in the Trigger menu is set to Time.

The markers are graphically displayed by dashed vertical lines. In addition, both markers are labeled at the bottom of the display.

Statistics are based on the time between the X and O markers. Both markers must be found before valid statistical information is displayed.

In repetitive run mode, the display is updated each time a valid run occurs until you select Stop. If you select Run after a Stop, the statistics continue to update without loss of information.

In single run mode, each time you select Run, an additional valid run will be added to the data and the statistics will be updated. This process continues unless you change the placement of the X and O markers between runs.



Statistics Display

States Markers

States markers are indicators located in the x-y chart that are used as reference marks to obtain the number of states between each marker, or between each marker and the trigger point.

States markers are only available in a State analyzer with the Count field in the Trigger menu set to States.

The markers are graphically displayed by dashed vertical lines. In addition, both markers are labeled at the bottom of the display.

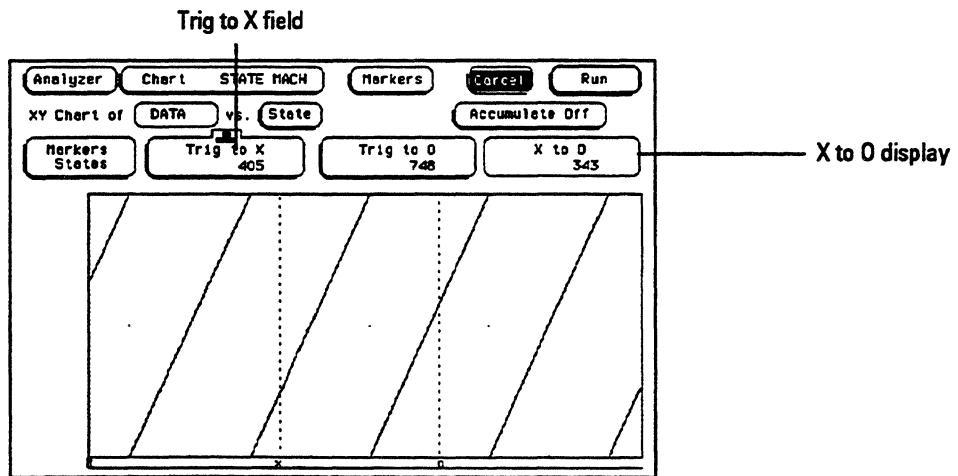
Trig to X / Trig to O Fields

The Trig to X and Trig to O fields are both display fields as well as configuration fields. The Trig to X and Trig to O fields display the number of states between the trigger point and the marker.

Marker position is set by simply turning the knob when the roll indicator is present.

X to O Display Field

The X to O display field is a "read only" field that displays the number of states between the X and O Pattern Markers. As the X and O markers are changed, the display changes accordingly.



Trig to X / Trig to O Fields

System / Analyzer Field

The function of the System/Analyzer field is the same in all menus. For a complete definition of the System/Analyzer field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Menu Field

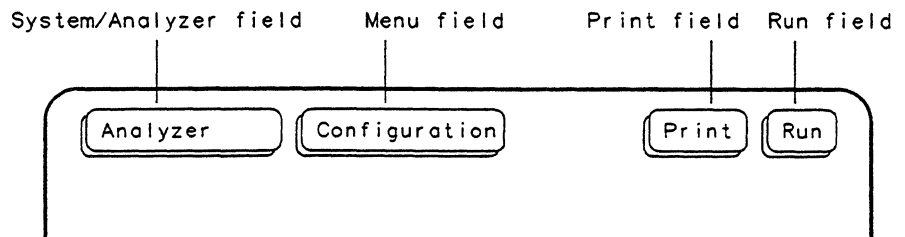
The function of the Menu field is the same in all menus. For a complete definition of the Menu field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Print Field

The function of the Print field is the same in all menus. For a complete definition of the Print field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Run Field

The function of the Run field is the same in all menus. For a complete definition of the Run field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.



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Common Menu Fields

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The Compare Menu

The Compare Menu

State Compare is a software postprocessing feature that provides the ability to do a bit by bit comparison between the acquired state data listing and a reference listing.

The comparison between the acquired state listing data and the data in the reference listing is done relative to the trigger points. This means that the two data records are aligned at the trigger points and then compared bit by bit.

Any bits in the acquired data that do not match the bits in the compare image are treated as unequal.

Compare Post-Processing Features

You can view in separate listings the acquired data, your reference listing, and a listing that highlights the bits in the acquired data that do not match the corresponding bits in the reference listing.

You can edit the reference listing for unique comparisons.

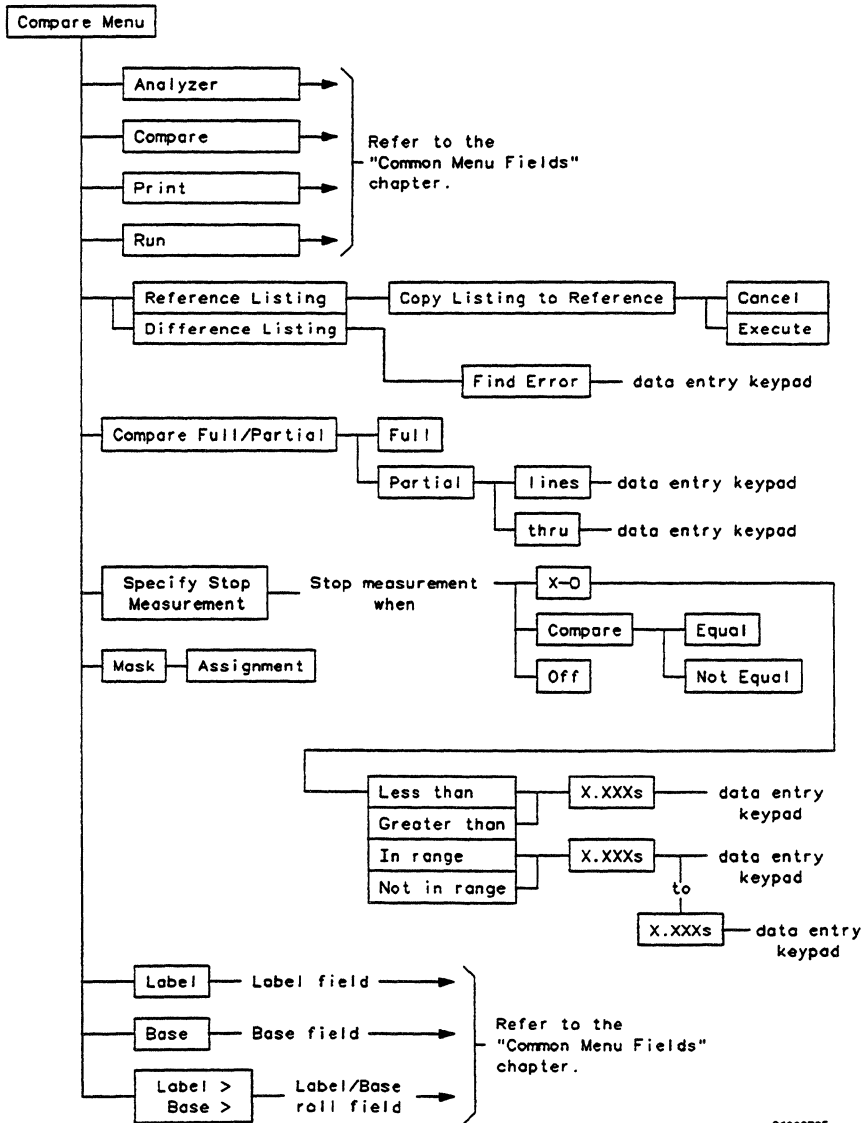
You can mask specific bits that you do not want to compare. These "Don't compare" bits can be specified individually for a given label and state row, or specified by channel across all state rows.

You can select a range of states to compare. When a range is selected, only the bits in states on or between the specified boundaries are compared. Also, you can save the reference listing along with the analyzer configuration to disk.

Compare Menu Map

The following menu map graphically illustrates all fields in the Compare menu. Use the menu map as an overview and as a quick reference to the available options in the Compare menu.

The Compare Menu



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Compare Menu Map

Reference Listing Field

The Reference listing and Difference listing field is a toggle field that switches the listing type between the Reference image listing and the Difference listing.

The Reference listing is a display of the image (or template) that acquired data is compared to during a comparison measurement. The boundaries of the image (or size of the template) is controlled by using the channel masking and compare range functions. Any bits in the reference listing displayed as "X" have been set to don't care bits during bit editing.

When the data listing is rolled, the difference data listing and the data listing in the Listing menu are also rolled.

Reference listing field

The screenshot shows a software interface for a reference listing. At the top, there are buttons for 'Analyzer', 'Compare STATE MACH', 'Cancel', and 'Run'. Below these are 'Reference listing', 'Copy Listing To Reference', 'Compare Full', and 'Specify Stop Measurement'. The 'Reference listing' field is highlighted with a line from the text 'Reference listing field'. Below the buttons, there are input fields for 'Mask>' (containing '*****'), 'Label>' (with 'DATA' and 'Time' options), and 'Base>' (with 'Binary' and 'Absolute' options). A list of bit positions from 0 to 14 is shown, each with a binary value and the text 'Not avail'. Bit 6 is highlighted with a mouse cursor.

Bit	Value	Status
0	10101010	Not avail
1	10101011	Not avail
2	10101100	Not avail
3	10101101	Not avail
4	10101110	Not avail
5	10101111	Not avail
6	10110000	Not avail
7	10110001	Not avail
8	10110010	Not avail
9	10110011	Not avail
10	10110100	Not avail
11	10110101	Not avail
12	10110110	Not avail
13	10110111	Not avail
14	10111000	Not avail

Reference Listing Field

Difference Listing Field

The Reference listing and Difference listing field is a toggle field that switches the listing type between the Reference image listing and the Difference listing.

The Difference listing is a display of the acquired data listing with the data that differs, if any, from the Reference listing, highlighted with inverse video. If the base is inverse assembled symbols, the entire line is highlighted with inverse video.

Difference listing field

The screenshot shows a menu titled 'Compare STATE MACH' with buttons for 'Analyzer', 'Conceal', and 'Run'. The 'Difference listing' field is highlighted. Below it are buttons for 'Find Error 0', 'Compare Full', and 'Specify Stop Measurement'. The 'Mask' field is set to '*****'. The 'Label' field is set to 'DATA' and the 'Time' field is set to 'Time'. The 'Base' field is set to 'Binary' and 'Absolute'. A list of data points is shown below, with the 6th row highlighted in inverse video.

	Mask	Label	Base
0	10101010		
1	10101011		
2	10101100		
3	10101101		
4	10101110		
5	10101111		
6	10110000		
7	10110001		
8	10110010		
9	10110011		
10	10110100		
11	10110101		
12	10110110		
13	10110111		
14	10111000		

Time measurements (ns/us):

Index	Time
0	0 s
1	96 ns
2	200 ns
3	296 ns
4	400 ns
5	496 ns
6	600 ns
7	696 ns
8	800 ns
9	896 ns
10	1.000 us
11	1.096 us
12	1.200 us
13	1.296 us
14	1.400 us

Difference Listing Field

The controls that roll the listing in all three menus, the normal State listing, the Reference listing, and the Difference listing are synchronized unless the number of pretrigger states differ between the Reference listing and the acquired data.

This means that when you change the current row position in the Difference listing, the analyzer automatically updates the current row in the acquired State listing, Reference listing and vice-versa.

If the three listings are synchronized and you re-acquire data, the Reference listing may have a different number of pretrigger states depending on the trigger criteria. The Reference listing can be resynchronized to the State and Difference listings by entering the desired state (acquisition memory) location from the front-panel keypad.

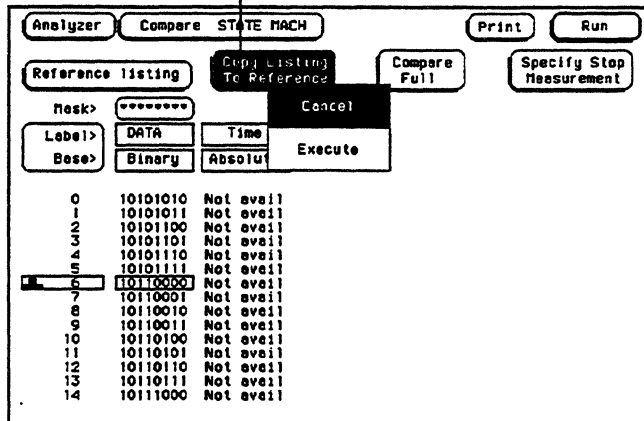
This allows you to view corresponding areas of all lists, to cross check alignment, and to analyze the bits that do not match.

Copy Listing to Reference Field

The initial Reference image is generated by either copying the data listing from the listing menu or by loading an analyzer configuration file which contains a Reference listing. You should be aware that if you load an analyzer configuration to get a Reference image, the other menu setups will change.

When the Copy Listing to Reference field is selected, the contents of the acquisition data structure (Listing menu display) is copied to the Reference image buffer. The previous Reference image is lost if it has not been saved to a disk.

Copy trace to compare field



Copy Trace to Compare Field

Find Error Field

The Find Error field allows you to easily locate any patterns that did not match in the last comparison. Occurrences of differences, or errors, are found in numerical ascending order from the start of the listing. The first occurrence of an error has the numerical value of one.

You select which error number to find by highlighting the Find Error field and entering a number from the front-panel keypad. If the roll indicator is in the Find Error field, simply turn the knob. The listing is then scanned sequentially until the specified occurrence is found and rolled into view.

Find error field

The interface shows a control panel with the following elements:

- Buttons: Analyzer, Compare, STATE, RACH, Cancel, Run
- Options: Difference listing, Find Error (set to 0), Compare Full, Specify Stop Measurement
- Mask: Mask> *****
- Label: Label> DATA, Time
- Base: Base> Binary, Absolute

Error No.	Binary Data	Time
0	10101010	0 s
1	10101011	96 ns
2	10101100	200 ns
3	10101101	296 ns
4	10101110	400 ns
5	10101111	496 ns
6	10110000	600 ns
7	10110001	696 ns
8	10110010	800 ns
9	10110011	896 ns
10	10110100	1,000 us
11	10110101	1,096 us
12	10110110	1,200 us
13	10110111	1,296 us
14	10111000	1,400 us

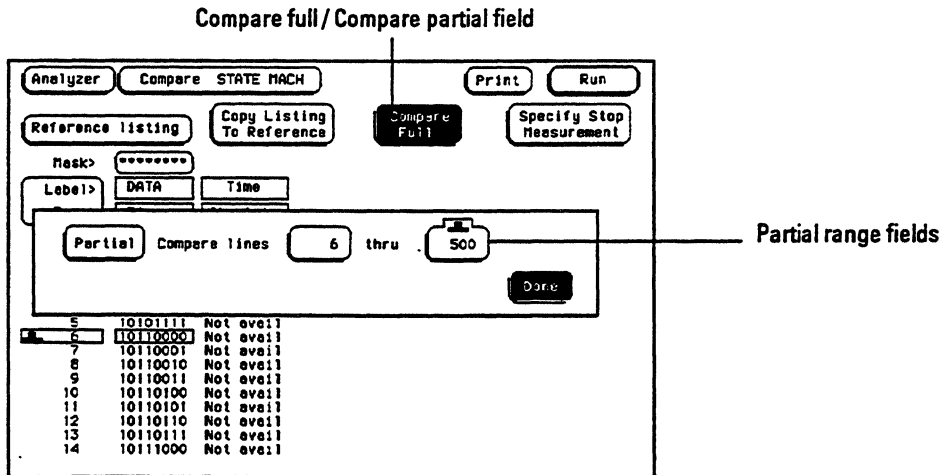
Find Error Field

Compare Full / Compare Partial Field

The Compare Full / Compare Partial field is a toggle field which allows you to compare either the full range of states or define a subset of the total number of states in the Reference image to be used in the comparison.

The Compare mode is accessed by selecting the Compare Full/Compare Partial field in either the Compare or Difference listing menus. When selected, a pop-up appears in which you select either the Full or Partial option.

When you select the Partial option, fields appear for setting the start state and stop state values. Only bits in states (lines) on or between the boundaries are compared against the acquired data.



Compare Full / Compare Partial Field

Mask Field

The channel masking field is used to specify a bit, or bits in each label that you do not want compared. This causes the corresponding bits in all states to be ignored in the comparison. The Reference data image itself remains unchanged on the display.

When you select the Mask field an assignment pop-up appears in which you specify which channels are to be compared and which channels are to be masked. A "." (period) indicates a don't compare mask for that channel and an "*" (asterisk) indicates that channel is to be compared.

Mask field

Analyzer Compare STATE MACH Corcal Run

Difference listing Find Error 0 Compare Full Specify Stop Measurement

Mask> *****

Label>	DATA	Time
Base>	Binary	Absolute
0	10101010	0 s
1	10101011	96 ns
2	10101100	200 ns
3	10101101	296 ns
4	10101110	400 ns
5	10101111	496 ns
6	10110000	600 ns
7	10110001	696 ns
8	10110010	800 ns
9	10110011	896 ns
10	10110100	1.000 us
11	10110101	1.096 us
12	10110110	1.200 us
13	10110111	1.296 us
14	10111000	1.400 us

Mask Field

Specify Stop Measurement Field

The Stop measurement function allows you to specify a condition which stops the analyzer measurement during a repetitive run. When the Specify Stop Measurement field is selected, a Stop measurement menu appears which is used to set the stop criteria.

When the Stop measurement type field is selected, a selection menu appears. Depending on the analyzer configuration, you will have the choices of Off, Compare, and X-O.

Off

The Off selection turns all Stop measurement operations off.

If the stop measurement operation is not turned off and the stop measurement criteria are met, the measurement will stop even though the markers are turned off.

Stop measurement selection menu

Stop measurement type field

5	10101111	Not avail
6	10110000	Not avail
7	10110001	Not avail
8	10110010	Not avail
9	10110011	Not avail
10	10110100	Not avail
11	10110101	Not avail
12	10110110	Not avail
13	10110111	Not avail
14	10111000	Not avail

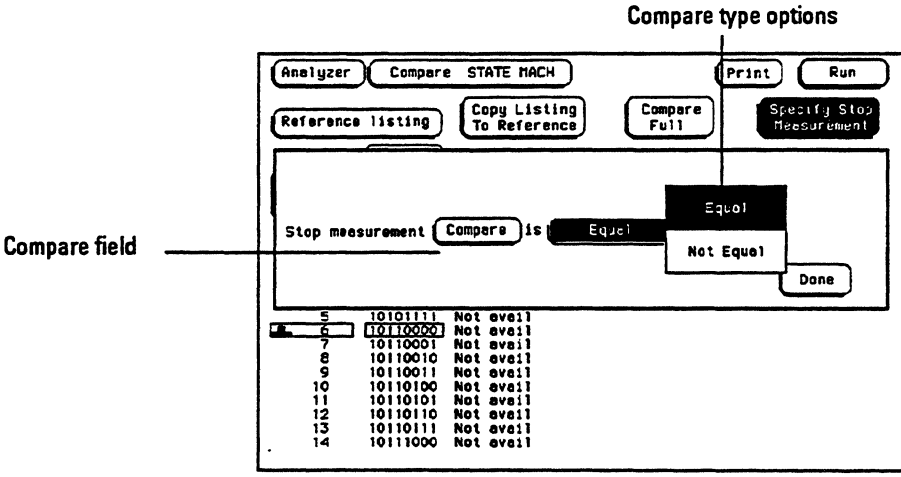
Stop Measurement Fields

Compare

When Compare is selected, a repetitive run is stopped when a comparison of data in the Listing menu and data and criteria in a Reference image matches an equality selection. The equality selection is set from the Equal/Not Equal selection pop-up menu.

Equal The data and compare criteria in the Compare menu must be equal to the data in the Listing menu.

Not Equal. The data and compare criteria in the Compare menu must not be equal to the data in the Listing menu.



Compare Stop Measurement Type Fields

The Compare Menu Specify Stop Measurement Field

X-O

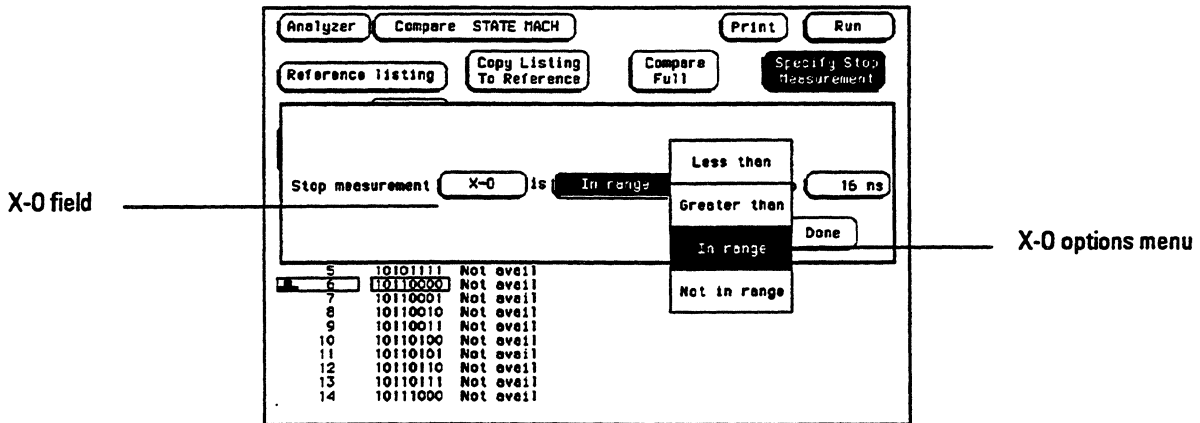
The X-O option is available in the State analyzer with its count set to Time. When X-O is selected, a repetitive run is stopped when a comparison of the time period between the X and O markers and one of the following time period options is true.

Less Than X-O time must be less than the time value that you specify in the Time field.

Greater Than X-O time must be greater than the time value that you specify in the Time field.

In Range X-O pattern must be within the time range value that you specify in the two Time fields.

Not in Range X-O pattern must not be within the time range value that you specify in the two Time fields.



X-O Stop Measurement Type Fields

Data Roll Field

The column of numbers at the far left represents the location of the acquired data in the state analyzer's memory. The numbered positions are also known as the state locations.

The column of state locations along with its data can be rolled to display off-screen data by using the data roll field. The data roll field is the small rectangular box located in the middle of the state location column.

The data roll field is used to either roll the data listing or to select an exact state for display. When the data roll field has the roll indicator in the field, the knob is active and can roll data in either direction.

If you want a specific location, highlight the data roll field, then type in a number from the front-panel keypad. When the keypad is used, the data listing shifts, leaving the selected state in the data roll box.

The screenshot shows the 'Compare STATE MACH' menu. At the top are buttons for 'Analyzer', 'Compare STATE MACH', 'Cancel', and 'Run'. Below these are 'Reference listing', 'Copy Listing To Reference', 'Compare Full', and 'Specify Stop Measurement'. The main display area shows a list of state locations (0-14) with their corresponding binary data and status ('Not avail'). A small rectangular box, the 'Data roll field', is positioned over the state location '6'. To the left of the screen, two labels with arrows point to the state location column and the data roll field.

State location	Binary Data	Status
0	10101010	Not avail
1	10101011	Not avail
2	10101100	Not avail
3	10101101	Not avail
4	10101110	Not avail
5	10101111	Not avail
6	10110000	Not avail
7	10110001	Not avail
8	10110010	Not avail
9	10110011	Not avail
10	10110100	Not avail
11	10110101	Not avail
12	10110110	Not avail
13	10110111	Not avail
14	10111000	Not avail

Data Roll Field

Bit Editing Field

The bit editing fields are located in the center of the Reference listing display. A bit editing field exists for every label in the display unless the label's base is ASCII or inverse assembled symbols. Bit editing field allows you to modify the values of individual bits in the Reference image or specify them as don't compare bits.

You access data in the Reference listing by rolling the data listing using the knob until the data is located in the bit editing field. To enter a desired pattern or don't compare (X) for a bit, select the field and use the front-panel keypad.

The screenshot shows a terminal-style interface for a compare menu. At the top, there are buttons for 'Analyzer', 'Compare STATE MACH', 'Cancel', and 'Run'. Below these are 'Reference listing', 'Copy Listing To Reference', 'Compare Full', and 'Specify Stop Measurement'. A 'Resk>' field contains '*****'. Below that are 'Label>' and 'Base>' fields with options 'DATA', 'Time', 'Binary', and 'Absolute'. The main area is a table of 15 rows, each with a label (0-14), a binary value, and a status 'Not avail'. Row 6 is highlighted with a black bar, and a line points from the text 'Bit editing field' to this row.

Label>	DATA	Time
0	10101010	Not avail
1	10101011	Not avail
2	10101100	Not avail
3	10101101	Not avail
4	10101110	Not avail
5	10101111	Not avail
6	10110000	Not avail
7	10110001	Not avail
8	10110010	Not avail
9	10110011	Not avail
10	10110100	Not avail
11	10110101	Not avail
12	10110110	Not avail
13	10110111	Not avail
14	10111000	Not avail

Bit editing field

Bit Editing Field

Label and Base Fields

The Label and Base fields show up together in all menus except the Format and Configuration menus. When a new label is assigned, a base field is automatically assigned to that label.

Label Field

Labels in the Compare menu are the same labels assigned in the Format menu. These labels will be displayed throughout the analyzer as they were assigned in the Format menu. For a complete definition of label assignment and modification, go to "Label Assignment Fields" in the Format menu.

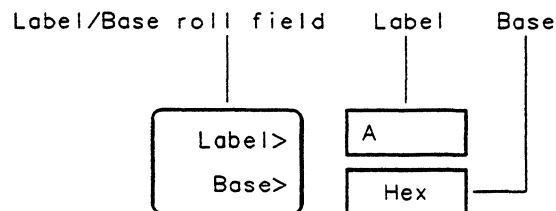
For a complete definition of label display and label reordering, go to "Label Field" in the Common Menu Fields chapter.

Base Field

The function of the Base field is the same in all menus. For a complete definition of the Base field, go to "Base Field" in the Common Menu Fields chapter.

Label / Base Roll Field

The function of the Label and Base roll field is the same in all menus. For a complete definition of the Label / Base roll function, go to "Label / Base Roll Field" in the Common Menu Fields chapter.



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Label / Base Roll Field

System / Analyzer Field

The function of the System/Analyzer field is the same in all menus. For a complete definition of the System/Analyzer field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Menu Field

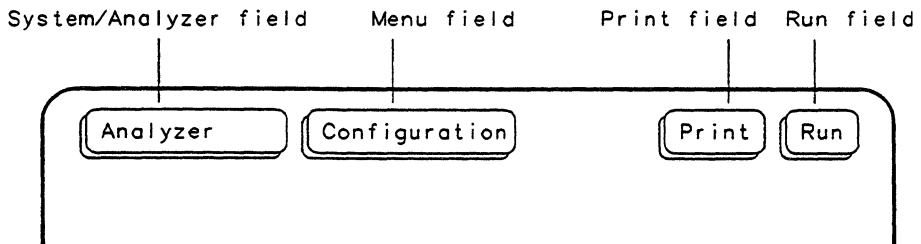
The function of the Menu field is the same in all menus. For a complete definition of the Menu field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Print Field

The function of the Print field is the same in all menus. For a complete definition of the Print field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.

Run Field

The function of the Run field is the same in all menus. For a complete definition of the Run field, go to "The Common Menu Fields" chapter at the beginning of this User's Reference.



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Common Menu Fields

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Disk Drive Operations

Disk Drive Operations

The logic analyzer has a built in 3.5 inch, double-sided, high-density or double-density, flexible disk drive. The disk drive is compatible with both LIF (Logical Interchange Format) and DOS (Disk Operating System) formats.

This chapter describes the disk operations available in the logic analyzer and how to use them. It is organized into separate "How to" examples demonstrating the use of the Disk menu and all the disk operations.

The Disk Operations

Nine disk operations are available:

- **Autoload**

Designates a set of configuration files to be loaded automatically the next time the analyzer is turned on.

- **Copy**

Any file can be copied from one disk to another or to the same disk.

- **Duplicate Disk**

All volume labels, directories, and file positions from one disk are copied exactly to another disk. The new disk is formatted to match the source disk if it is required. All files on the destination disk will be destroyed with this operation.

- **Format Disk**

Any double-sided, double-density, 3.5-inch flexible disk can be formatted in either LIF or DOS format. The directory and all files on the disk will be destroyed with this operation.

- Load

Instrument system configurations, analyzer measurement setups, including measurement data, and inverse assembler files for the analyzer can be loaded from the disk drive.

- Pack Disk

This function packs files on a LIF disk. Packing removes all empty or unused sectors between files on a disk so that more space is available for files at the end of the disk.

- Purge

Any file on a disk can be purged (deleted) from the disk.

- Rename

Any filename on a disk can be changed to another name.

- Store

Instrument system configurations and analyzer measurement setups including measurement data can be stored to the disk drive.

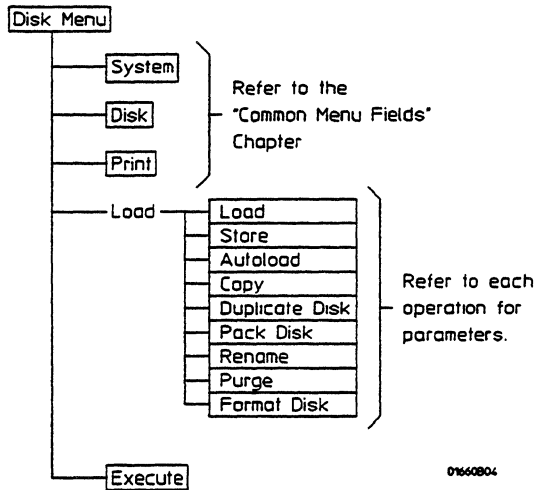
Disk Operation Safeguards

If there is a problem or additional information is needed to execute an operation, a pop-up appears near the center of the screen displaying the status of the operation (for example, it displays an error message or prompts you to swap disk).

If executing a disk operation could destroy or damage a file, a pop-up appears when you select Execute. If you don't want to complete the operation, select Cancel to cancel the operation. Otherwise, select Continue and the operation will be continued.

Menu Map

The figure below displays a menu map for the System Disk menu.



Disk Drive Menu Map

How to Access the Disk Menu

To access the System Disk menu, perform the following steps:

1 Press the System MENU key.

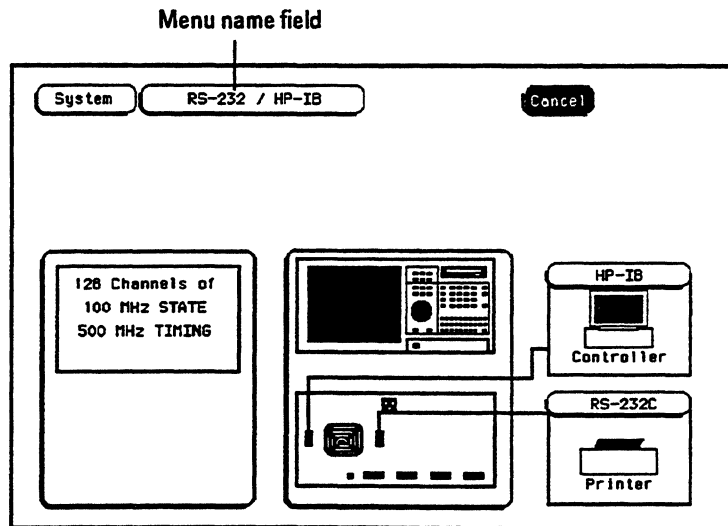
If you have just turned on the instrument, or if you have not accessed any System menus since powerup, the first menu displayed is the Disk menu.

If you are not in the Disk menu, continue with steps 2 and 3.

2 Press the arrow keys to move the cursor to the menu name field as shown below, then press the Select key.

3 Press the arrow keys or turn the knob to highlight the Disk field, then press the Select key.

If you have a disk installed when the Disk menu is accessed, the analyzer automatically reads and displays all files on the disk.



Menu Name Field

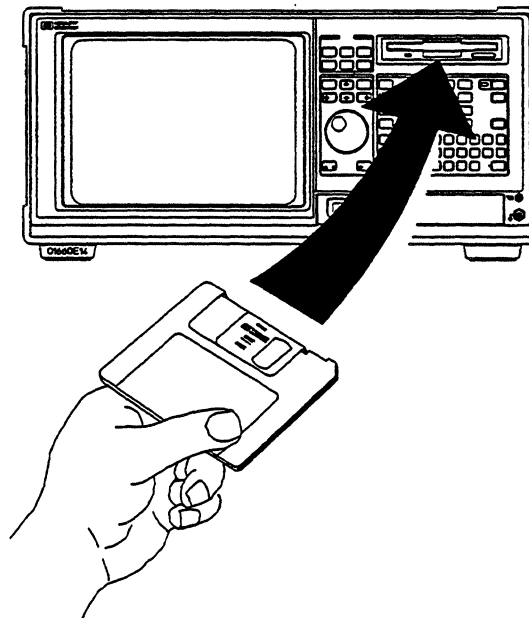
How to Install a Disk

To install a flexible disk into the disk drive, perform the following steps:

- 1** Hold the disk so the disk label is on top and the metal auto-shutter is away from you. See the figure below.
- 2** Push the disk gently, but firmly, into the disk drive until it clicks into place.

You can use double-sided, double-density and double-sided, high-density disks.

To display all files on any disk, insert the disk into the drive, then turn the knob.



Installing a Disk

How to Select a Disk Operation

Although some default values are provided for disk operations, a disk operation may require additional information from the user. This information is entered in the appropriate fields within each disk operation.

To select a disk operation, perform the following steps:

- 1 Press the **arrow** keys to highlight the disk operation field shown in the figure below. Then press the **Select** key.

Disk operation field

LIF Filename	Date	Time	Blocks	File Description
DEFAULT_A			102	DEFAULT CONFIG MENUS W/PRT
DEFAULT_			5	DEFAULT CONFIG MENUS W/PRT
STATE	10Jan30	16:06:06	909	DEND STATE CONFIGURATION

LIF Disc Space(blocks) - Total: 6077 Free: 5061 Largest: 5061

Disk Operation Field

- 2 Turn the knob to highlight the desired disk operation field, then press the **Done** or **Select** key.

How to Load a File

The Load operation allows you to load prestored configuration files. Use this operation when you want to quickly restore the analyzer to a configuration used in a previous measurement or condition.

When configurations are stored to the disk, you are given the option to store System only, Analyzer only, or All (System and Analyzer). So, when you load a file into the analyzer, you are given the same options.

To load a file from the disk, perform the following steps:

- 1 Insert the source disk into the disk drive.
- 2 Select the Load disk operation.

When the Load selection is made, the analyzer reads the disk directory and displays a list of all files on the disk.

- 3 Press the **arrow** keys to move the cursor to the file type field shown below, then press the **Select** key.

File type field

LIF Filename	Date	Time	Blocks	File Description
DEFAULT_A			102	DEFAULT CONFIG
DEFAULT_			5	DEFAULT CONFIG
STATE	10Jan30	16:06:06	909	DEMO STATE CONFIGURATION

LIF Disc Space(blocks) - Total: 6077 Free: 5061 Largest: 5061

File Type Parameter Field

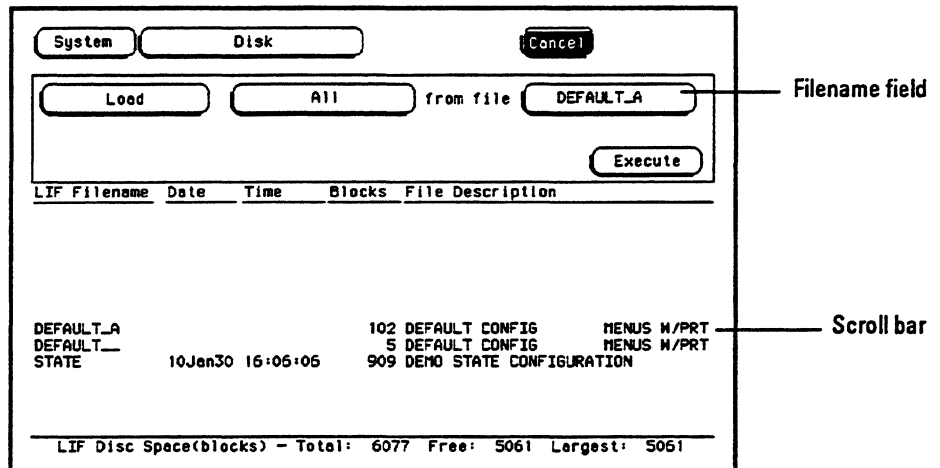
- Turn the knob to highlight the file type you want to load, then press the **Select** key.

The System choice loads things like Bus, clock, and display configurations.
The 100/500 MHz choice loads analyzer menus and measurement data.
The All choice loads System and 100/500 MHz analyzer types.

- Turn the knob and notice the changing filenames in the filename field shown below, and how the cursor bar scrolls the list of available files.

Using the knob, scroll to the filename you want to load.

The two spaces(_ _) after the filename designates that this file is for the system. One space and a letter (for example, "_A") after the filename designates that the file is for the analyzer.



Filename Selection

- Press the arrow keys to highlight the Execute field, then press the **Select** key.

The disk drive indicator light illuminates as the file is being loaded.

How to Format a Disk

The Format operation allows you to initialize new disks for use in the logic analyzer. The analyzer will format double-sided, double density or high density disks in both LIF and DOS formats. The analyzer does not support any single-sided formats.

The logic analyzer does not support track sparing during formatting. If a bad track is found, the disk is considered bad. If a disk has been formatted elsewhere with track sparing, it will be read successfully.

To format a disk, perform the following steps:

- 1 Insert the disk to format into the disk drive.
- 2 Select the Format Disk operation.

When the Format Disk selection is made, the analyzer reads the disk directory and displays all files. The DISK ERROR message appears if the disk is a new un-formatted disk. This is normal, continue the format process.

- 3 Press the **arrow** keys to move the cursor to the format type field, then press the **Select** key.

The screenshot shows a menu with 'System' and 'Disk' at the top. Below them are 'Format Disk' and 'LIF Format' buttons. An 'Execute' button is at the bottom right. A table of files is shown below the menu. A label 'Format type field' points to the 'LIF Format' button.

LIF Filename	Date	Time	Blocks	File Description
DEFAULT_A			102	DEFAULT CONFIG
DEFAULT_			5	DEFAULT CONFIG
STATE	10Jan30	16:06:06	909	DEMO STATE CONFIGURATION

LIF Disc Spece(blocks) - Total: 6077 Free: 5061 Largest: 5061

LIF or DOS Format Selection

- 4 Highlight the LIF or DOS format field, then press the **Select** key.

The logic analyzer will recognize a variety of sector sizes for LIF disks.

When formatting LIF disks, the logic analyzer creates 1024 byte sectors.

DOS disks always have 512 byte sectors.

- 5 Press the **arrow** keys to move the cursor to the **Execute** field, then press the **Select** key.

It should be noted that once Executed, the Format Disk operation

permanently erases all existing information from the disk. After that, there is no way to retrieve the original information.

- 6 Highlight the **Continue** field, then press the **Select** key.

How to Store Files on a Disk

The Store operation allows you to store instrument configurations and measurement data. Use this operation when you want to save the present analyzer setup to recall at a later time.

When configurations are stored to the disk, you are given the option to store System only, Analyzer only, or All (System and Analyzer).

To store a file, perform the following steps:

- 1 Insert the destination disk into the disk drive.
- 2 Select the Store disk operation.

When the Store selection is made, the analyzer reads the disk directory and displays a list of all files on the disk. If there are no files, NO FILES is displayed.

- 3 Press the **arrow** keys to move the cursor to the file type field, then press the **Select** key.

File type field

System Disk Cancel

Store All to file DEFAULT_A

file description : DEFAULT CONFIG MENUS H/PRT Execute

LIF Filename	Date	Time	Blocks	File Description
DEFAULT_A			102	DEFAULT CONFIG MENUS H/PRT
DEFAULT_			5	DEFAULT CONFIG MENUS H/PRT
STATE	10Jan30	16:06:06	909	DEND STATE CONFIGURATION

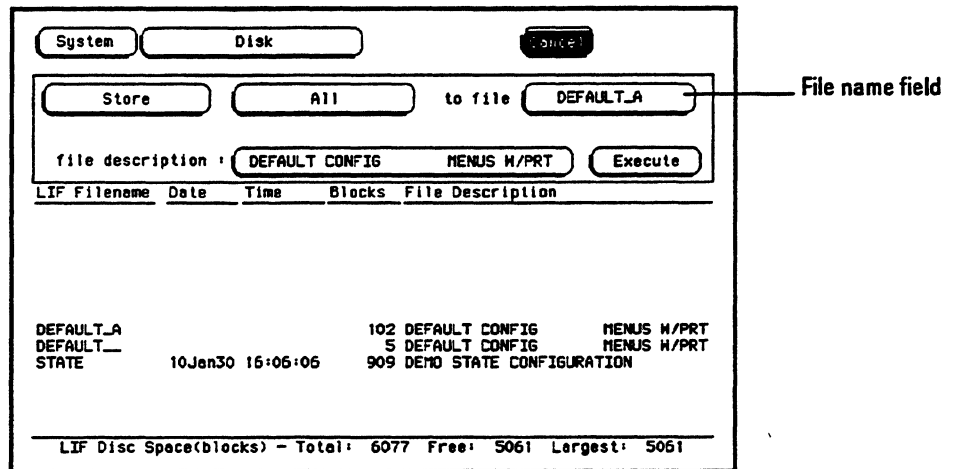
LIF Disc Space(blocks) - Total: 6077 Free: 5061 Largest: 5061

File Type Parameter Field

- 4 Turn the knob to highlight the file type you want to store, then press the **Select** key.

The System choice stores things like Bus, clock, and display configurations.
The 100/500 MHz choice stores analyzer menus and measurement data.
The All choice stores System and 100/500 MHz types.

- 5 Press the **arrow** keys to move the cursor to the file name field.



File Name Field

- 6 Using the front-panel keypad, type in a filename to assign to the new file, then press the **Select** key.

The filename must start with a letter and may contain up to eight characters. It can be any combination of letters and numbers, but there can be no blank spaces between any of the characters.

If you want to select an existing filename, simply turn the knob to scroll existing filenames through the field. Also, notice how the cursor bar highlights the same name in the list of filenames.

The two spaces(_ _) after the filename designates that this file is for the system. One space and a letter (for example, "_A") after the filename designates that the file is for the analyzer.

Disk Drive Operations

How to Store Files on a Disk

- 7 Press the **arrow** keys to move the cursor to the file description field.

File description field

The screenshot shows a menu-driven interface for disk operations. At the top, there are buttons for 'System', 'Disk', and 'Cancel'. Below these are buttons for 'Store', 'All', and 'to file', followed by a field containing 'DEFAULT_A'. The 'file description' field is highlighted and contains 'DEFAULT CONFIG' and 'MENUS W/PRT', with an 'Execute' button to its right. Below this is a table with columns for 'LIF Filename', 'Date', 'Time', 'Blocks', and 'File Description'. The table contains three rows of data. At the bottom, there is a status line: 'LIF Disc Space(blocks) - Total: 6077 Free: 5061 Largest: 5061'.

LIF Filename	Date	Time	Blocks	File Description
DEFAULT_A			102	DEFAULT CONFIG MENUS W/PRT
DEFAULT_			5	DEFAULT CONFIG MENUS W/PRT
STATE	10Jan30	16:06:06	909	DEMO STATE CONFIGURATION

LIF Disc Space(blocks) - Total: 6077 Free: 5061 Largest: 5061

File Description Field

- 8 Using the front-panel keypad, type in a description of the file, then press the **Select** key.
A file description can contain up to 32 characters, but also can be left blank. This field is for your convenience to make it easier to identify the type of data in each file.
- 9 Press the **arrow** keys to move the cursor to the **Execute** field, then press the **Select** key.
- 10 Highlight the **Continue** field, then press the **Select** key.

How to Rename a File

The Rename operation allows you to give a new name to a previously stored file. The only restriction is that you cannot rename a file to an already existing filename.

To rename a file, perform the following steps:

- 1 Select the Rename disk operation.
- 2 Turn the knob until the filename you want to rename is scrolled into the file field.

File field

Type field

LIF Filename	Date	Time	Blocks	File Description
DEFAULT_A			102	DEFAULT CONFIG MENUS W/PRT
DEFAULT___			5	DEFAULT CONFIG MENUS W/PRT
STATE	10Jan30	16:06:05	909	DEMO STATE CONFIGURATION

LIF Disc Space(blocks) - Total: 6077 Free: 5061 Largest: 5061

File Field

- 3 Press the **arrow** keys to move the cursor to the type field, then press the **Select** key.
- 4 Turn the knob to highlight the file type you want to rename, then press the **Select** key.

The All selection allows you to rename both the system and analyzer types. The analyzer selection allows only the analyzer type to be renamed.

Disk Drive Operations
How to Rename a File

- 5 Press the **arrow keys** to move the cursor to the new filename field.

New filename field

System Disk Cancel

Rename file DEFAULT_A type 16550A_config

to NEW_NAME Execute

LIF Filename	Date	Time	Blocks	File Description
DEFAULT_A			102	DEFAULT CONFIG MENU M/PRT
DEFAULT_			5	DEFAULT CONFIG MENU M/PRT
STATE	10Jan30	16:06:06	909	DEMO STATE CONFIGURATION

LIF Disc Space(blocks) - Total: 6077 Free: 5061 Largest: 5061

New Filename Field

- 6 Using the front-panel keypad, type in the new filename , then press the **Select** key.
- 7 Press the **arrow keys** to move the cursor to the **Execute** field, then press the **Select** key.

How to Autoload a File

The Autoload operation allows you to designate a set of configuration files to be loaded automatically the next time the instrument is turned on. This allows you to change the default configuration of certain menus to a configuration that better fits your needs.

To enable the Autoload operation, perform the following steps:

- 1 Select the Autoload disk operation.
- 2 Press the **arrow** keys to move the cursor to the Enable/Disable selection field, then press the **Select** key.
- 3 Highlight the Enable field, then press the **Select** key.
- 4 Press the **arrow** keys to move the cursor to the autoload filename field.

Enable/Disable field

Autoload filename field

LIF	Filename	Date	Time	Blocks	File Description
	DEFAULT_A			102	DEFAULT CONFIG MENUS W/PRT
	DEFAULT__			5	DEFAULT CONFIG MENUS W/PRT
	STATE	10Jan30	15:05:05	909	DEMO STATE CONFIGURATION

LIF Disc Space(blocks) - Total: 6077 Free: 5061 Largest: 5061

Autoload Filename Parameter Field

Disk Drive Operations

How to Autoload a File

- 5 Turn the knob until the filename you want to autoload is scrolled into the filename parameter field.
- 6 Press the arrow keys to move the cursor to the Execute field, then press the Select key.

An autoload file is created and placed at the top of the list of files. The file description contains the filename to be autoloaded and indicates whether or not the Autoload operation is enabled.

System Disk Cancel

Autoload Enable DEFAULT_A

Current AUTOLOAD status : ENABLED
Current AUTOLOAD file : DEFAULT_?

Execute

LIF Filename Date Time Blocks File Description

AUTOLOAD				1 status: ENABLED file: DEFAULT_?
DEFAULT_A			102	DEFAULT CONFIG MENUS W/PRT
DEFAULT_?			5	DEFAULT CONFIG MENUS W/PRT
STATE	10Jan30	16:06:06	909	DEMO STATE CONFIGURATION

LIF Disc Space(blocks) - Total: 6077 Free: 5060 Largest: 5060

Autoload Filename Field

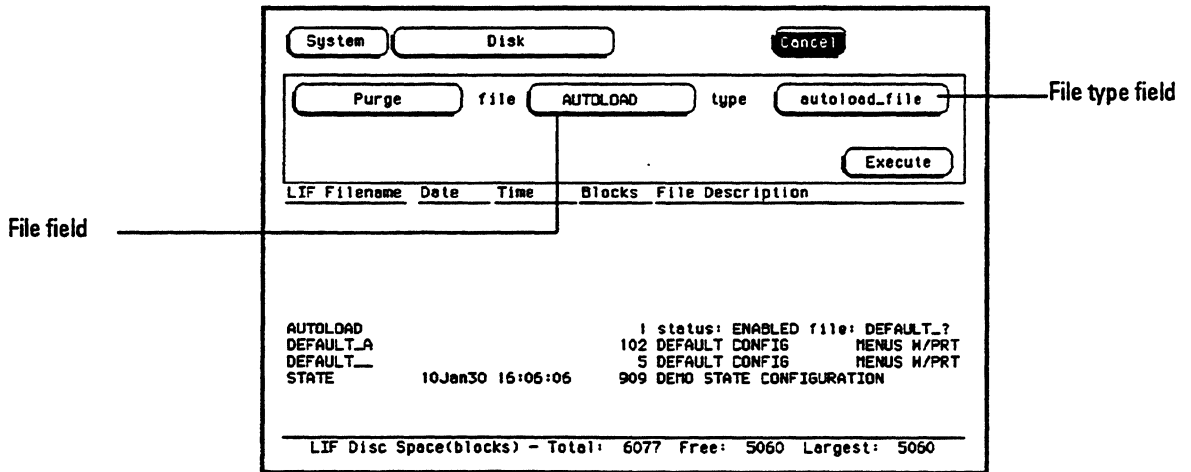
It should be noted that Autoload loads all of the files for a given filename. If you want to load only the file for a type, rename that file to separate it from the other files and enable it as the current Autoload file.

As long as Autoload is enabled before the instrument is shut off, Autoload will remain enabled when you powerup the instrument and load the configuration files.

How to Purge a File

The Purge operation allows you to delete a file from the list of filenames. The file type can be either the analyzer type or All types. To purge a file from the disk, perform the following steps:

- 1 Select the Purge disk operation.
- 2 Turn the knob to scroll the filename into the file field.



File Field

- 3 Press the **arrow** keys to move the cursor to the file type field, then press the **Select** key.
- 4 Highlight the file type to purge, then press the **Select** key.
The All selection allows you to purge both the system and analyzer types. The analyzer selection allows only the analyzer type to be purged.
- 5 Press the **arrow** keys to move the cursor to the Execute field, then press the **Select** key.
- 6 Highlight the Continue field, then press the **Select** key.

How to Copy a File

The Copy operation allows you to make a duplicate copy of an existing file on the same disk or a different disk. If you copy the file to the same disk, the only restriction is that you must give the copied file a new name. You can specify to copy All types or just the analyzer part of a file.

To make copies of a file, perform the following steps:

- 1 Select the Copy disk operation.
- 2 Turn the knob until the filename you want to copy is scrolled into the file field.

File field

The screenshot shows a menu with the following elements:

- Buttons: System, Disk, Cancel
- Copy file: AUTOLOAD type autoloa_file
- to: DEFAULT_A
- Execute

LIF Filename	Date	Time	Blocks	File Description
AUTOLOAD				1 status: ENABLED file: DEFAULT_?
DEFAULT_A				102 DEFAULT CONFIG MENU W/PRT
DEFAULT_				5 DEFAULT CONFIG MENU W/PRT
STATE	10Jan30	16:06:06		909 DEMO STATE CONFIGURATION

LIF Disc Spece(blocks) - Total: 6077 Free: 5060 Largest: 5060

Copy Filename Parameter Field

- 3 Press the arrow keys to move the cursor to the type field, then press the Select key.

- 4 Highlight the file type to copy, then press the **Select** key.
The All selection allows you to copy both the system and analyzer parts of a configuration file set. The analyzer selection allows only the analyzer part to be copied.
- 5 Press the **arrow** keys to move the cursor to the new filename field.

New filename field

The screenshot shows a terminal-style interface for a disk drive. At the top, there are buttons for 'System', 'Disk', and 'Cancel'. Below these, there are fields for 'Copy' (set to 'file'), 'file' (set to 'AUTOLOAD'), 'type' (set to 'autoload_file'), and 'to' (set to 'NEW_NAME'). An 'Execute' button is located to the right of the 'to' field. Below the input fields is a table with columns: LIF Filename, Date, Time, Blocks, and File Description. The table contains three rows of data. At the bottom of the interface, there is a status line: 'LIF Disc Space(blocks) - Total: 6077 Free: 5060 Largest: 5060'.

LIF Filename	Date	Time	Blocks	File Description
AUTOLOAD			1	status: ENABLED file: DEFAULT_?
DEFAULT_A			102	DEFAULT CONFIG MENUS W/PRT
DEFAULT_	10Jan30	16:06:06	5	DEFAULT CONFIG MENUS W/PRT
STATE			909	DEMO STATE CONFIGURATION

LIF Disc Space(blocks) - Total: 6077 Free: 5060 Largest: 5060

New filename Field

- 6 Using the front-panel keypad, type in the new filename, then press the **Select** key.
- 7 Press the **arrow** keys to move the cursor to the **Execute** field, then press the **Select** key.
- 8 Highlight the **Continue** field, then press the **Select** key.

It is highly recommended that you complete the Copy operation in its entirety. Selecting **Cancel** during a Copy operation may result in a corrupted file copy.

How to Pack a Disk

By purging files from the disk and adding other files, you may end up with blank areas on the disk (between files) that are too small for the new files you are creating. On LIF disks, the Pack Disk operation packs the current files together, removing unused areas from between the files so that more space is available for files at the end of the disk. On DOS disks, the Pack Disk operation does nothing.

To pack the disk, perform the following steps:

- 1 Select the Pack Disk operation.
- 2 Press the **arrow** keys to move the cursor to the Execute field, then press the **Select** key.

LIF	Filename	Date	Time	Blocks	File Description
AUTLOAD				1	status: ENABLED file: DEFAULT_?
DEFAULT_A				102	DEFAULT CONFIG HENUS H/PRT
DEFAULT_				5	DEFAULT CONFIG HENUS H/PRT
STATE		10Jan30	16:05:06	909	DEMO STATE CONFIGURATION

LIF Disc Space(blocks) - Total: 6077 Free: 5060 Largest: 5060

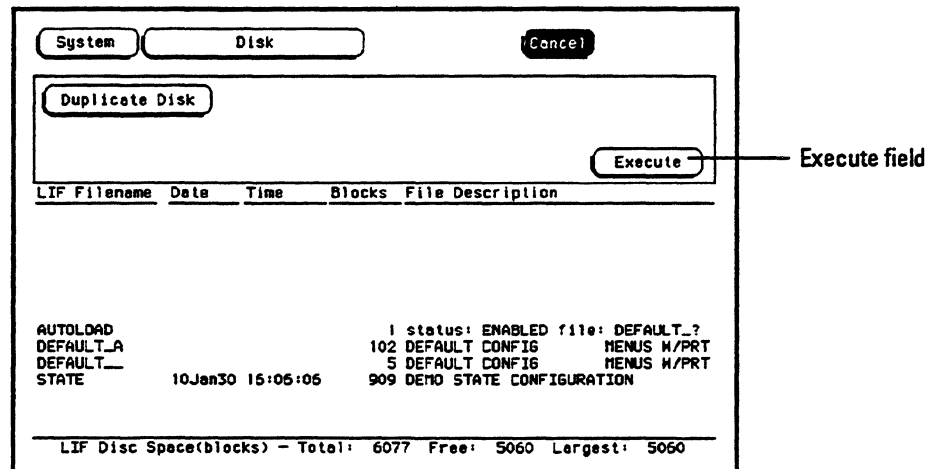
Pack Disk Operation

How to Duplicate a Disk

The Duplicate Disk operation copies the volume labels and directories from one disk to another. If necessary, the new disk is formatted to match the source disk. This operation allows you to make a back-up copy of your important disks so you won't lose important data in the event that a disk wears out, is damaged, or a file is accidentally deleted.

To duplicate the disk, perform the following steps:

- 1 Select the Duplicate Disk operation.
- 2 Press the **arrow** keys to move the cursor to the Execute field, then press the **Select** key.



The Duplicate Disk Operation

Disk Drive Operations
How to Duplicate a Disk

3 Highlight the Continue field, then press the Select key.

When "Insert DESTINATION disk" appears, insert the destination disk into the disk drive, and when "Insert SOURCE disk" appears, remove the destination disk and reinstall the source disk. The number of times you need to change the disks depends on whether you have a double-density or high-density disk. Simply follow the instructions and select Continue to continue.

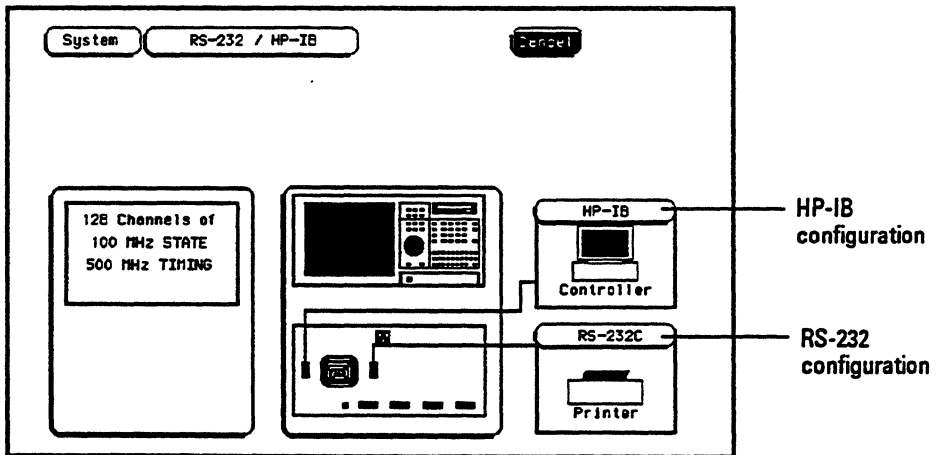
It should be noted that the original directory and files on the destination disk are destroyed by the Duplicate Disk operation.

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The RS-232C and HP-IB Interface

The RS-232C and HP-IB Interface

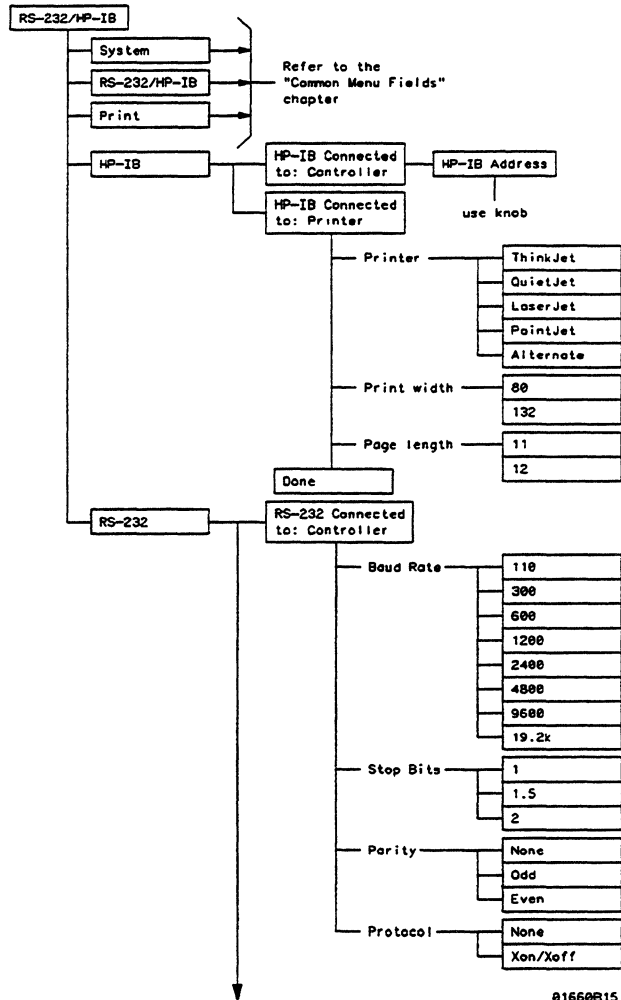
This chapter describes the controller and printer interfaces and their configuration. It defines the HP-IB interface and describes how to select any one of the 31 different HP-IB addresses available. It also defines the RS-232C interface and tells you how to select a baud rate, how to change the stop bits, how to set the parity and data bits, and how to change the protocol.



RS-232 / HP-IB Interface Menu

RS-232 / HP-IB Menu Map

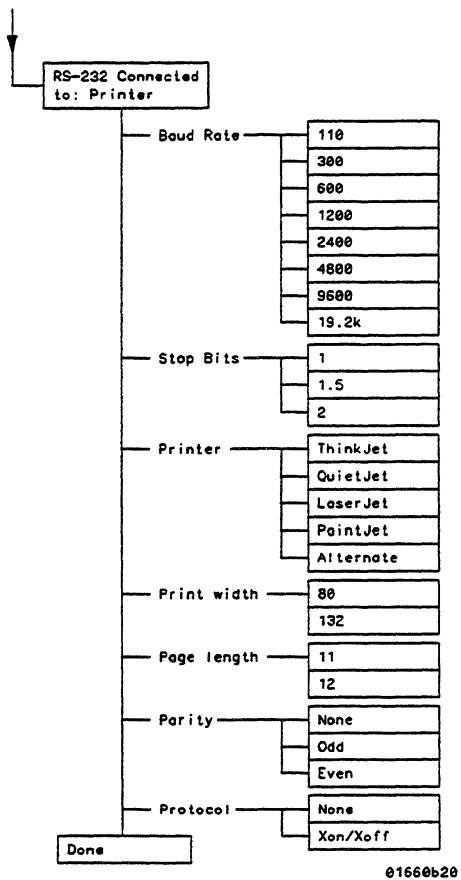
The following menu map illustrates all fields and the available options in the RS-232 / HP-IB menu. The menu map will help you get an overview as well as provide you with a quick reference of what the RS-232 / HP-IB menu contains.



01660B15

RS-232 / HP-IB Menu Map

The RS-232C and HP-IB Interface



RS-232 / HP-IB Menu Map (Cont).

The Controller Interface

The logic analyzer is equipped with a standard RS-232C interface and an HP-IB interface that allow you to connect to a controller. Either interface gives you remote access for running measurements, for up-loading and down-loading configurations and data, for outputting to a printer, and more.

The Printer Interface

The logic analyzer can output its screen display to various HP-IB and RS-232C graphics printers. Configured menus as well as waveforms and other data can be printed for complete measurement documentation.

See Also

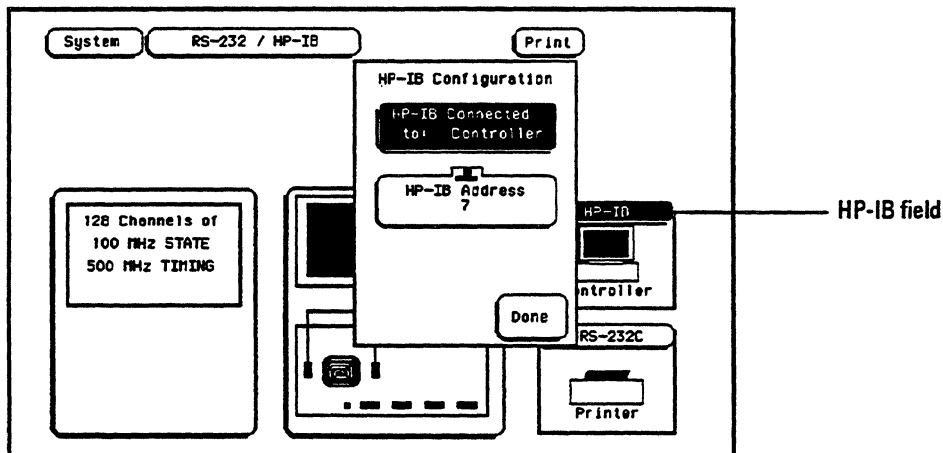
"Connecting a Printer" for more details.

HP 1660A Series Logic Analyzers Programming Manual for more information on the controller interface.

The HP-IB Interface

The Hewlett-Packard Interface Bus (HP-IB) is Hewlett-Packard's implementation of IEEE Standard 488-1978, "Standard Digital Interface for Programmable Instrumentation." The HP-IB is a carefully defined interface that simplifies the integration of various instruments and computers into systems.

The HP-IB interface uses an addressing technique to ensure that each device on the bus (interconnected by HP-IB cables) receives only the data intended for it. To accomplish this, each device is set to a different address and this address is used to communicate with other devices on the bus.



HP-IB Configuration Pop-up Menu

Selecting an Address

The HP-IB address can be set to 31 different HP-IB addresses, from 0 to 30. Simply choose a compatible address of your device and software.

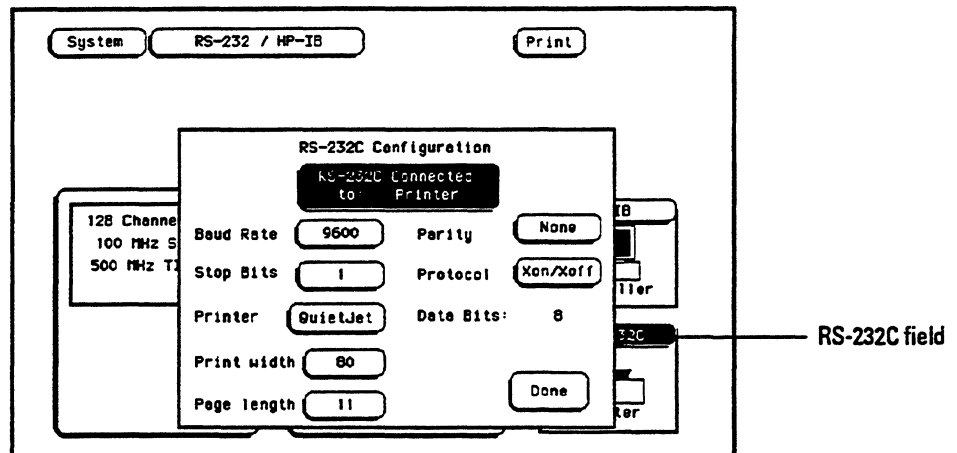
To select an HP-IB address perform the following steps:

- 1 From the RS-232 / HP-IB menu, select the **HP-IB field**.
- 2 Turn the front-panel knob to select the HP-IB Address, then press the **Done** key.

The RS-232C Interface

The RS-232C interface is Hewlett-Packard's implementation of EIA Recommended Standard RS-232C, "Interface Between Data Terminal Equipment and Data Communications Equipment Employing Serial Binary Data Interchange."

With this interface, data is sent one bit at a time and characters are not synchronized with preceding or subsequent data characters. Each character is sent as a complete entity without relationship to other events.



RS-232C Configuration Pop-up Menu

The RS-232C and HP-IB Interface

The RS-232C Interface

Band Rate

The baud rate is the rate at which bits are transferred between the interface and the peripheral. The baud rate must be set to transmit and receive at the same rate as the peripheral.

To set the baud rate, select the Baud Rate field. Then, select the desired rate from the pop-up selection list.

Stop Bits

Stop Bits are used to identify the end of a character. The number of Stop Bits must be the same for the controller as for the logic analyzer.

To change the Stop Bits, select the Stop Bits field, then select the desired stop bit from the pop-up selection list.

Parity

The parity bit detects errors as incoming characters are received. If the parity bit does not match the expected value, the character is assumed to be incorrectly received. The action taken when an error is detected depends on how the interface and the device program are configured.

Parity is determined by the requirements of the system. The parity bit may be included or omitted from each character by enabling or disabling the parity function.

To set the parity bit, select the Parity field, then select the desired Parity bit from the pop-up selection list.

Data Bits

Data bits are the number of bits sent and received per character that represent the binary code of that character. The HP 16500A supports the 8-bit binary code.

Protocol

Protocol governs the flow of data between the instrument and the external device.

To change the protocol, select the Protocol field, then select the desired the desired option from the pop-up selection list

With less than a 5-wire interface, selecting None does not allow the sending or receiving device to control how fast the data is being sent. No control over the data flow increases the possibility of missing data or transferring incomplete data.

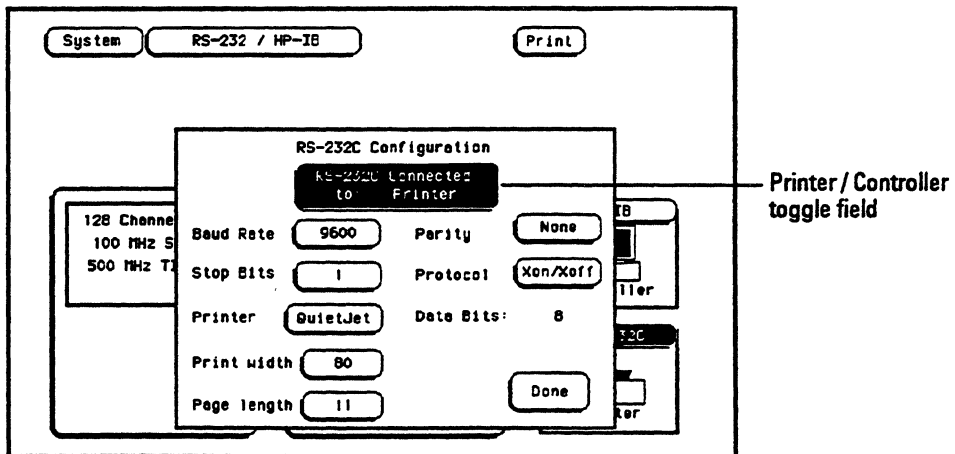
With a full 5-wire interface, selecting None allows a hardware handshake to occur. With a hardware handshake, hardware signals control data flow. The HP 13242G cable allows the logic analyzer to support hardware handshake.

Xon/Xoff Xon/Xoff stands for Transmit On/Transmit Off. With this mode, the receiver controls the data flow and can request that the printer stop data flow at any time.

Configuring the Interface for a Controller or a Printer

To configure the HP-IB or RS-232C interfaces for a controller or a printer, perform the following steps:

- 1 From the RS-232 / HP-IB menu, highlight either the **HP-IB** or **RS-232** field.
- 2 Highlight the "RS-232 Connected to" field and toggle it to either **Printer** or **Controller** as shown.



Printer Configuration for RS-232

Whenever you change the configuration for one interface, the other interface automatically changes to the opposite configuration.

The HP-IB printer must be set to Listen Always for the HP-IB interface. In this mode, no HP-IB addressing is necessary, so the HP-IB address field is not displayed.

When the configuration is set for Printer, three additional fields appear to allow you to select the printer type, character width, and page length.

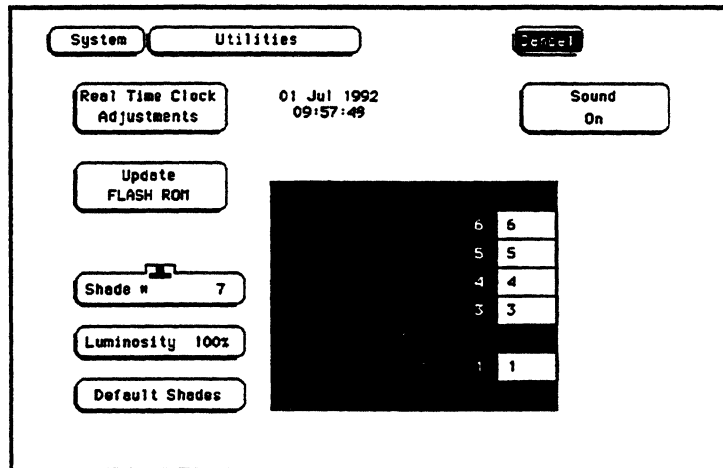
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The System Utilities

The System Utilities

The System Utilities menu is used for setting system level parameters such as the system clock, display intensity for each grey shade and turning the sound on and off. In this menu you can also reflash the "read only memory" chips with any new revisions of the operating system.

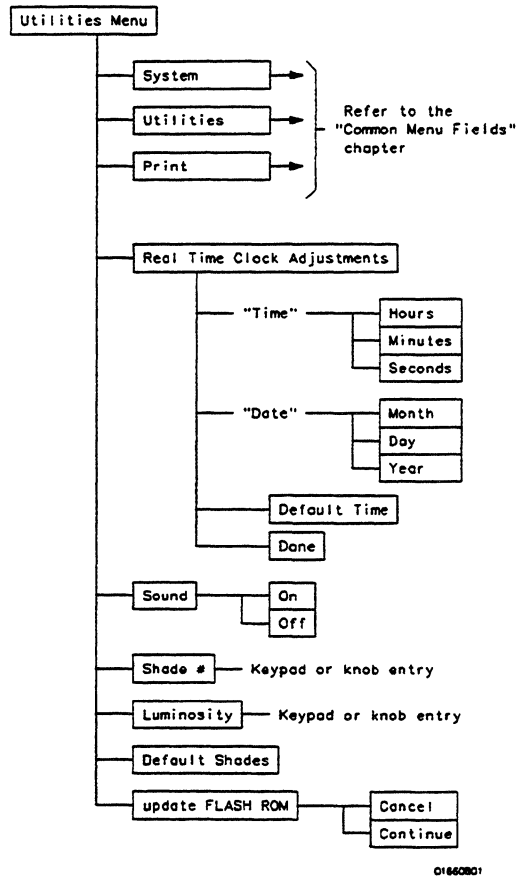
The Utilities menu is one of the System subset menus and is accessed through the System field in the upper left corner of the display.



System Utilities Menu

The Utilities Menu Map

The following menu map illustrates all fields and the available options in the Utilities menu. The menu map will help you get an overview as well as provide you with a quick reference of what the Utilities menu contains.



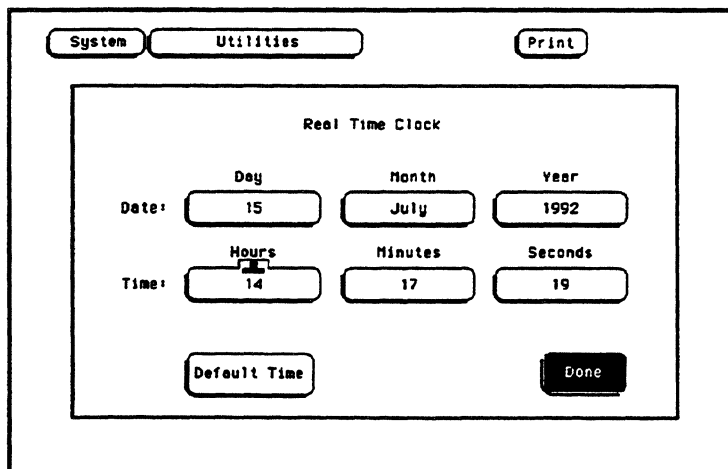
The Utilities Menu Map

Real Time Clock Adjustments

A real time clock is displayed in the Waveform and Listing display menus. When you print a screen, the current clock and date appears on the hard copy.

To set the clock select the Real Time Clock Adjustments field. A Real Time Clock menu appears with fields to set the time of day and the date. To set the Time (24 hour clock) highlight the hour, minute, and seconds fields and turn the knob.

To set the Date select the data, month, and year fields. When selected, a pop-up list appears with the appropriate choices of dates, months, and years.



The screenshot shows a menu titled "Real Time Clock" within a larger window. At the top of the window are three buttons: "System", "Utilities", and "Print". The "Real Time Clock" menu contains the following elements:

- Date:** Three fields for "Day", "Month", and "Year". The values are "15", "July", and "1992" respectively.
- Time:** Three fields for "Hours", "Minutes", and "Seconds". The values are "14", "17", and "19" respectively.
- At the bottom of the menu are two buttons: "Default Time" and "Done".

Real Time Clock Adjustment Menu

Update FLASH ROM

For quick and easy updates to the operating system, the logic analyzer uses flash ROMs. To update the flash ROMs, simply insert the floppy disk containing the required update files into the disk drive, then select the Update FLASH ROM field. If you want to continue with the update process, select Continue. All current setups are lost after update.

If you are not sure which files are required for the update procedure, a list will be provided onscreen when you select Continue.

Display Grey Shade Adjustments

The shades of grey that are used to create the display, can be adjusted to different levels of intensity. The adjustment procedure involves two parts. First you select the shade number, then you adjust the luminosity of that shade. Both the shade and the luminosity fields are adjusted by highlighting the field, then turning the knob.

Shade #

The Shade # field is used to select the shade number of which the luminosity adjustment effects. Shade numbers range from 1 to 7.

Luminosity

The Luminosity field is used to increase or decrease the intensity of the selected shade number. Luminosity ranges from 0 to 100 percent.

Default Shades

The Default Shades field is used to restore all shade intensity levels to the default factory settings.

Sound On / Off

Each time the cursor is moved or rolled from one field to another, an audible "click" is heard. The Sound field toggles the sound On or Off.

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Introduction

This chapter lists the online messages that appear when using the analyzer. Depending on the measurement or configuration circumstance, they could indicate an error, warning, or simply an advisory. Generally, an error message indicates that the measurement, or a part of the measurement, will not occur until the problem is fixed. Warning or advisory messages inform the user of conditions or status.

For more information

If a message is encountered while running Self Tests, you can refer to the Service guide for information on test descriptions and troubleshooting procedures.

If a message is encountered during analyzer configuration or general operation, there could be more than one cause for generating the message. In most cases, the analyzer is configured improperly.

Error Messages

Must have at least 1 edge specified. You must assign at least one clock edge to one of the available clocks in the Master clocking arrangement. In addition, if the Slave clock is being used, it must have at least one clock edge assigned. The analyzer will not let you close the clock assignment pop-up until an edge is specified.

Time correlation of data is not possible. Before time correlation of data is possible, time tags must be placed on the data. If you want time correlated data, set the Count field in the Trigger menu to Time.

Maximum of 32 channels per label. This message appears when you try to assign more than 32 channels to a single label. The logic analyzer will only allow 32 channels to be assigned to any single label.

Timer is off in sequence level "n" where it is used. At least one sequence level has specified a timer as part of the sequence instruction and that timer is not turned on. The timer must be set to either Start, Pause, or Continue.

Timer is specified in sequence, but never started. A timer is specified somewhere in the sequence, but was not started. The timer must be set to Start. The timer can be set to Start in any sequence level.

Problems reading file. The user is trying to translate a configuration file that can not be opened a second time.

Inverse assembler not loaded - bad object code. Corrupt inverse assemble file. Try getting another copy of the inverse assembler file and loading that.

Insufficient memory to load IAL - load aborted. There is not a block of free memory large enough to load inverse assembler.

ASCII entry not available. The ASCII base is not available. You must use another base selection.

Measurement Initialization Error Hardware failed calibration prior to start of measurement. User should run PV.

Warning Messages

Waiting for Prestore. This message is displayed for a timing analyzer waiting for prestore.

Search failed - X pattern not found. The X pattern specified could not be found, therefore the pattern marker could not be placed in the data.

Search failed - O pattern not found. The O pattern specified could not be found, therefore the pattern marker could not be placed in the data.

Warning: Run HALTED due to variable change. This message appears when certain analyzer settings are changed during a repetitive run. When this occurs, the analyzer stops.

Compare not available - Insufficient Memory. There is not enough memory available to store a compare image.

Error not found. The Find Error number specified in the Compare mwnu could not be found.

s/Div set to limit. The s/Div field is set to its limit.

Delay set to limit. The Delay field is set to its limit.

Machine name: "ial name" inverse assembler not found. This message appears when the inverse assembler file could not be found.

Data was acquired without time tags Time tag values will not be displayed because data was stored without time tags. If you want time tags stamped on the data, set Count in the Trigger menu to Time.

Data was acquired without state tags State tag values will not be displayed because data was stored without state tags. If you want state tags stamped on the data, set Count in the Trigger menu to State.

Count Time/States not available when in 8K Memory Mode. When the state mode is changed to Half Channel/8K mode, the time or state tags are not available.

Two pod pairs are needed to use both timers. If both timers are being used in a single chip analyzer, and there are no spare chips, this message is shown when Run is selected. Timer2 references in the sequencer will not be valid.

No active analyzer. This message is displayed if Run is selected with no analyzers turned on.

Cannot read unrecognized data. The user is trying to translate a configuration from a foreign module.

Demultiplexed clocking cannot be translated. The user is trying to translate a configuration that has demultiplexed or mixed clocks.

User thresholds have been truncated. The user is trying to translate a configuration having thresholds greater than 6 Volts or less than -6 Volts.

Slave clocks may need manual adjustment. The user is trying to translate an HP 16540/41A,D configuration which has slave clocks specified. This message appears when the translation is not direct.

Clock Qualifiers not fully restored. The user is trying to translate a configuration that has more than two qualifiers.

No state machines for this module. The user is trying to load an inverse assembler into a module with no state machines.

Error loading Display1. User is loading a configuration with a corrupt Display1 section.

Pods have been truncated. User is loading a configuration with number of chips greater than the current system's number of chips.

Clock pod and least significant pods have been preserved. User is loading a configuration with number of chips greater than the current system's number of chips

< Duration requires two unused sequisation levels. For each sequence level with a "<" assigned, you must leave two sequence levels free. To free up two levels, simply delete two levels.

Mixed Mode not available User is trying to show mixed mode incorrectly.

Error Messages
Warning Messages

Ymin is greater than Ymax. The value assigned to Y minimum is greater than the value assigned to Y maximum.

Xmin is greater than Xmax. The value assigned to X minimum is greater than the value assigned to X maximum.

Ymin is equal to Ymax. The value assigned to Y minimum is equal to the value assigned to Y maximum.

Xmin is equal to Xmax. The value assigned to X minimum is equal to the value assigned to X maximum.

Cannot read unrecognized data During the load operation, data does not match expected values or size.

Insert failed - Maximum of 60 entries. 60 listing columns is the maximum number allowed. This advisory appears when you try to configure more than 60 columns.

No valid data. Reference memory cleared. This advisory appears when the Copy Listing To Reference field is selected in the Compare menu and there is no listing data to copy.

Advisory Messages

Computing chart information. Please Wait. This message is displayed when the analyzer is busy computing the data to be charted. When the computing is finished, the new chart will be displayed.

Slow or missing clock. This message indicates a slow or missing clock. This is displayed for a state analyzer only until the first clock occurs.

Occurrences Remaining in Level "n". The analyzer is waiting for the specified level to be satisfied. This advisory is used in analyzers that use the Occurs parameter.

Waiting in Level "n". The analyzer is waiting for the specified level to be satisfied. This advisory is used in analyzers that use the > or < parameter.

Filling Memory after Trigger. This message is displayed for a transitional timing analyzer that has triggered but has not yet finished storing data. This message is also displayed for a conventional timing analyzer with a very slow sample rate.

"n.nnn" s remaining to delay. This advisory is displayed for a conventional/glitch timing analyzer that is doing a long hardware delay (after trigger and during the delay).

Trigger inhibited during timing prestore. This message is displayed while timing analyzer is waiting to satisfy prestore requirements

Storing transitions after trigger for pod "n". This message is displayed for transitional timing analyzer that has triggered, but has not finished storing data.

Trigger occurred before prestore completed. This message is displayed for a state analyzer while in manual acquisition mode, that has not acquired the requested number of states prior to trigger.

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**Installation,
Maintenance and
Calibration**

Preparing For Use

This chapter gives you instructions for preparing the logic analyzer for use. It has information about the operating environment, cleaning the analyzer, and testing for proper operation. The following information also appears in the HP 1660 Series Service Guide.

Power Requirements

The logic analyzer requires a power source of either 115Vac or 230 Vac, -22 % to +10 %, single phase, 48 to 66 Hz, 200 Watts maximum.

Operating Environment

Specifics of the proper operating environment are listed in chapter 1 of the Service Guide. Note the noncondensing humidity limitation. Condensation within the instrument can cause poor operation or malfunction. Provide protection against internal condensation.

The logic analyzer will operate at all specifications within the recommended temperature and humidity range. However, reliability is enhanced within the following ranges:

- Temperature: +20 °C to +35 °C (+68 °F to +95 °F)
- Humidity: 20% to 80% noncondensing

Storage

Store or ship the logic analyzer in environments within the following limits:

- Temperature: -40 °C to + 75 °C
- Humidity: Up to 90% at 65 °C
- Altitude: Up to 15,300 meters (50,000 feet)

Protect the logic analyzer from temperature extremes which cause condensation on the instrument.

Inspecting the Analyzer

1 Inspect the shipping container for damage.

If the shipping container or cushioning material is damaged, keep them until you have checked the contents of the shipment and checked the instrument mechanically and electrically.

2 Check the supplied accessories.

Accessories supplied with the logic analyzer are listed in "Accessories Supplied" in the General Information chapter.

3 Inspect the product for physical damage.

Check the logic analyzer and the supplied accessories for obvious physical or mechanical defects. If you find any defects, contact your nearest Hewlett-Packard Sales Office. Arrangements for repair or replacement are made, at Hewlett-Packard's option, without waiting for a claim settlement.

Installing a Disk

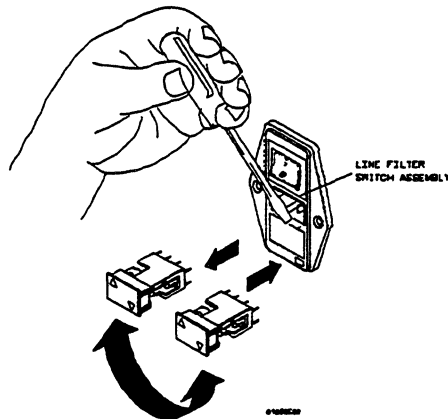
A yellow protective disk is shipped in the disk drive.

- **Before applying power to the instrument, remove the protective disk from the disk drive.**
- **Install the desired disk after power is applied to the instrument.**
- **Reinstall the protective disk whenever the instrument is to be transported.**

Setting the Line Voltage

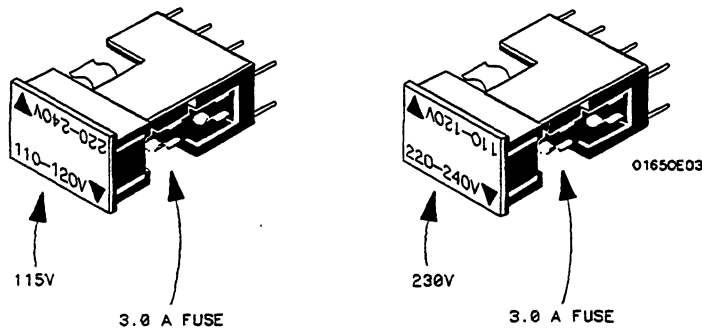
When shipped, the line voltage selector is set and an appropriate fuse is installed for operating the instrument in the country of destination. To operate the instrument from a power source other than the one set, perform the following steps.

- 1 Turn the rear power switch to the Off position, then remove the power cord from the instrument.
- 2 Remove the fuse module by carefully prying at the top center of the fuse module until you can grasp it and pull it out by hand.



Removal of Fuse Module

- 3 Reinsert the fuse module with the arrow for the appropriate line voltage aligned with the bar on the line filter assembly switch.



Setting Appropriate Line Voltage

- 4 Reconnect the power cord, then set the rear power switch to the On position.

Applying Power to the Analyzer

CAUTION

Electrostatic discharge can damage electronic components. Use grounded wriststraps and mats when performing any service to the logic analyzer.

- 1 Remove the yellow shipping disk from the disk drive.
- 2 Check that the line voltage selector, located on the rear panel, is on the correct setting and the correct fuse is installed.

- 3 Connect the power cord to the instrument and to the power source.**
This instrument is equipped with a three-wire power cable. When connected to an appropriate ac power outlet, this cable grounds the instrument cabinet. The type of power cable plug shipped with the instrument depends on the country of destination.
 - 4 Turn on the instrument power switch located on the front panel.**
-

Degaussing the Display

- If the logic analyzer has been subjected to strong magnetic fields, the CRT might become magnetized and display data might become distorted. To correct this condition, degauss the CRT with a conventional external television type degaussing coil.
-

Cleaning the Analyzer

- Use mild soap and water to clean the front and cabinet of the logic analyzer. Harsh soap might damage the water-base paint.
-

Testing the Analyzer

The logic analyzer does not require calibration or adjustment. After preparing the logic analyzer for use, you can test and use it.

- If you require a test to verify the specifications, start at the beginning of chapter 3, "Testing Performance" in the Service Guide.
- If you require a test to initially accept the operation, perform the self-tests in chapter 3 in the Service Guide.
- If the logic analyzer does not operate correctly, go to the beginning of chapter 5, "Troubleshooting" in the Service Guide.

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Specifications and
Characteristics

Specifications and Characteristics

This chapter lists the specifications and characteristics. The specifications are the performance standards against which the product is tested.

The characteristics are not specifications, but are included as additional information.

For complete information on the test procedures to verify product performance, refer to the Service Guide.

Specifications

Maximum State Speed 100 MHz

Minimum State Clock Pulse Width [2] 3.5 ns

Minimum Master to Master Clock Time [2] 10.0 ns

Minimum Glitch Width 3.5 ns

Threshold Accuracy +/- (100 mV +3% of threshold setting)

Setup/Hold [2]	one clock one edge	3.5/0 ns to 0/3.5 ns (in 0.5 ns increments)
	one clock both edges	4.0/0 ns to 0/4.0 ns (in 0.5 ns increments)
	multi clock multi edge	4.5/0 ns to 0/4.5 ns (in 0.5 ns increments)

Specifications and Characteristics

Probes

Input Resistance 100 kohm +/-2%

Input Capacitance ~8pF (see Figure 1)

Minimum Input Voltage Swing 500 mV peak to peak

Minimum Input Overdrive 250 mV or 30% of input amplitude, whichever is greater

Threshold Range -6.0 V to +6.0 V in 50 mV increments

Threshold Setting Threshold levels may be defined for pods (17 channel groups) on an individual basis .

Threshold Accuracy* +/- (100 mV +3% of threshold setting)

Input Dynamic Range +/- 10 V about the threshold

Maximum Input Voltage +/- 40 V peak

+ 5V Accessory Current 1/3 amp maximum per pod

Channel Assignment Each group of 34 channels (a pod pair) can be assigned to Analyzer 1, Analyzer 2 or remain unassigned.

State Analysis

Maximum State Speed* 100 MHz

Channel Count [1]	HP 1660A	136/68
	HP 1661A	102/51
	HP 1662A	68/34
	HP 1663A	34/17

Memory Depth per Channel [1] 4096/8192

State Clocks Six clocks are available and can be used by either one or two state analyzers at any time. Clock edges can be ORed together and operate in single phase, two phase demultiplexing, or two phase mixed mode. Clock edge is selectable as positive, negative, or both edges for each clock.

State Clock Qualifier The high or low of up to 4 of the 6 clocks can be ANDed or ORed with the clock specification.

Setup/Hold* [2]	one clock	3.5/0 ns to 0/3.5 ns
	one edge	(in 0.5 ns increments)
	one clock	4.0/0 ns to 0/4.0 ns
	both edges	(in 0.5 ns increments)
	multi clock	4.5/0 ns to 0/4.5 ns
	multi edge	(in 0.5 ns increments)

Minimum State Clock Pulse Width* [2] 3.5 ns

Minimum Master to Master Clock Time* [2] 10.0 ns

Minimum Slave to Slave Clock Time [2] 10.0 ns

Specifications and Characteristics

Specifications and Characteristics

Minimum Master to Slave Clock Time [2] 0.0 ns

Minimum Slave to Master Clock Time [2] 4.0 ns

Clock Qualifiers Setup/Hold [2] 4.0/0 ns (fixed)

State Tagging [3] Counts the number of qualified states between each stored state. Measurement can be shown relative to the previous state or relative to trigger. Max. count is 4.29×10^9 .

State Tag Count 0 to 4.29×10^9 (+/- 0 counts)

State Tag Resolution 1 count

Time Tagging [3] Measures the time between stored states, relative to either the previous state or to the trigger. Max. time between states is 34.4 sec. Min. time between states is 8 ns.

Time Tag Count 8 ns to 34.3 s +/- (8 ns + 0.01% of time tag value)

Time Tag Resolution 8 ns or 0.1% (whichever is greater)

Timing Analysis

Conventional Timing [1] Data stored at selected sample rate across all timing channels.

Maximum Timing Speed 250 MHz / 500 MHz

Channel Count	HP 1660A	136/68
	HP 1661A	102/51
	HP 1662A	68/34
	HP 1663A	34/76

Sample Period 4 ns/2 ns minimum, 8.38 ns maximum

Memory Depth per Channel 4096/8192

Time Covered by Data Sample period x Memory depth 16.3 us min, 34.3 s/68.6 s max

Transitional Timing [1] Sample is stored in acquisition memory only when the data changes. A time tag stored with each sample allows reconstruction of waveform display. Time covered by a full memory acquisition varies with the frequency of pattern changes in the data.

Maximum Timing Speed 125 MHz/250 MHz

Channel Count	HP 1660A	136/68
	HP 1661A	102/51
	HP 1662A	68/34
	HP 1663A	34/17

Sample Period 8 ns/4 ns

Time Covered by Data 16.3 us minimum, 9.7 hrs/6.5 hrs maximum

Maximum Time Between Transitions 34.3 s

Number of Captured Transitions 1023-2047/682-4094 Depending on input signals

Glitch Capture Mode sample period Data samples and glitch information are stored every sample period.

Maximum Timing Speed 125 MHz

Channel Count	HP 1660A	68
	HP 1661A	51
	HP 1662A	34
	HP 1663A	17

Sample Period 8 ns minimum, 8.38 ns maximum

Minimum Glitch Width 3.5 ns

Maximum Glitch Width Sample Period - 1 ns

Memory Depth per Channel 2048

Time Covered by Data Sample Period x 2048 16.3 us minimum, 17.1 s maximum

Specifications and Characteristics

Specifications and Characteristics

Time Interval Accuracy

Sample Period Accuracy +/- 0.01 %

Channel-to-Channel Skew 2 ns typical

Time Interval Accuracy

+/- (Sample Period + channel-to-channel skew + 0.01% of time interval reading)

Maximum Delay After Triggering Sample Period 2-8 ns: 8.389 ms.
Sample Period > 8 ns: 1,048,575 x sample period.

Trigger Specification

Pattern Recognizers Each recognizer is the AND combination of bit (0,1, or X) patterns in each label.

Pattern Recognizers 10

Pattern Width	HP 1660A	136
	HP 1661A	102
	HP 1662A	68
	HP 1663A	34

Minimum Pattern and Range Recognizer Trigger Pulse Width
250 MHz and 500 MHz Timing Modes: 13 ns + channel-to-channel skew.
125 MHz Timing Modes: 1 sample period + 1 ns + channel-to-channel skew + 0.01%.

Range Recognizers Recognize data which is numerically between or on two specified patterns (AND'd combination of zeros and/or ones).

Range Recognizers 2

Range Width 32 channels.

Glitch/Edge Recognizers Trigger on glitch or edge on any channel. Edge can be specified as rising, falling or either.

Glitch/Edge Recognizers 2 (in timing mode only)

Glitch/Edge Width	HP 1660A	136
	HP 1661A	102
	HP 1662A	68
	HP 1663A	34

Glitch/Edge Recovery Time Sample period 2-8 ns: 28 ns.
Sample period > 8 ns: 20 ns + sample period.

Greater than Duration (timing only) Sample period 2-8 ns: 8 ns to 8.389 ms. Accuracy is -2 ns to +10ns.
Sample period > 8 ns: $(1 \text{ to } 2^{20}) \times \text{sample period}$. Accuracy is -2 ns to +sample period + 2 ns +/- 0.01%.

Less than Duration (timing only) Sample period 2-8 ns: 16 ns to 8.389 ms. Accuracy is +2 ns to -10 ns.
Sample period > 8 ns: $(1 \text{ to } 2^{20}) \times \text{sample period}$. Accuracy is 2 ns to -sample period - 2 ns +/- 0.01%.

Qualifier A user-specified term that can be any state, no state, any recognizer, (patterns ranges or glitch/edges), any timer, or the logical combination (NOT, AND, NAND, OR, NOR, XOR, NXOR) of the recognizers and timers.

Branching Each sequence level has a branching qualifier. When satisfied, the analyzer will branch to the sequence level specified.

Occurrence Counters Sequence qualifier may be specified to occur up to 1,048,575 times before advancing to the next level. Each sequence level has its own counter.

Maximum Occurrence Count 1,048,575

Storage Qualification (state only) Each sequence level has a storage qualifier that specifies the states that are to be stored.

Maximum Sequencer Speed 125 MHz

State Sequence Levels 12

Timing Sequence Levels 10

Specifications and Characteristics

Specifications and Characteristics

Timers Qty. 2. Timers may be Started, Paused, or Continued at entry into any sequence level after the first.

Timer Range 400 ns to 500 s

Timer Resolution 16 ns or 0.1% whichever is greater

Timer Accuracy +/- 32 ns or +/- 0.1%, whichever is greater

Timer Recovery Time 70 ns

Data In to TriggerOut BNC Port 110 ns typical

Measurement and Display Functions

Arming Each analyzer can be armed by the Run key, the other analyzer, or the Port In.

Trace Mode Single mode acquires data once per trace specification; repetitive mode repeats single mode acquisitions until stop is pressed or until pattern time interval or compare stop criteria are met.

Labels Channels may be grouped together and given a 6-character name. Up to 126 labels in each analyzer may be assigned with up to 32 channels per label. Trigger terms may be given an 8-character name

Activity Indicators Provided in the Configuration, State Format, and Timing Format menus for monitoring device-under-test activity while setting up the analyzer.

Markers Two markers (X and O) are shown as dashed lines in the display.

Trigger Displayed as a vertical dashed line in the timing waveform, state waveform and X-Y chart displays and as line 0 in the state listing and state compare displays.

Measurement Functions

Run Starts acquisition of data in specified trace mode.

Stop In single trace mode or the first run of a repetitive acquisition, Stop halts acquisition and displays the current acquisition data. For subsequent runs in repetitive mode, Stop halts acquisition of data and does not change current display.

Time Interval The X and O markers measure the time interval between events occurring on one or more waveforms or states (only available when time tagging is on).

Delta States The X and O markers measure the number of tagged states between any two states.

Patterns The X or O marker can be used to locate the nth occurrence of a specified pattern before or after trigger, or after the beginning of data. The O marker can also find the nth occurrence of a pattern before or after the X marker.

Statistics X to O marker statistics are calculated for repetitive acquisitions. Patterns must be specified for both markers, and statistics are kept only when both patterns can be found in an acquisition. Statistics are minimum X to O time, maximum X to O time, average X to O time, and ratio of valid runs to total runs.

Compare Mode Functions Performs a post-processing bit-by-bit comparison of the acquired state data and Compare Image data.

Compare Image Created by copying a state acquisition into the compare image buffer. Allows editing of any bit in the Compare Image to a 1, 0 or X.

Compare Image Boundaries Each channel (column) in the compare image can be enabled or disabled via bit masks in the compare Image. Upper and lower ranges of states (rows) in the compare image can be specified. Any data bits that do not fall within the enabled channels and the specified range are not compared.

Specifications and Characteristics

Specifications and Characteristics

Stop Measurement Repetitive acquisitions may be halted when the comparison between the current state acquisition and the current Compare Image is equal or not equal.

Compare Mode Displays Compare Listing display shows the Compare Image and bit masks; Difference Listing display highlights differences between the current state acquisition and the Compare Image.

Data Entry/Display

Display Modes State listing, State Waveforms, State Chart, State Compare Listing, Compare Difference Listing, Timing Waveforms, Timing Listings, interleaved time-correlated listing of two state analyzers (time tagging on), time-correlated State Listing and Timing Waveform on the same display.

State X-Y Chart Display Plots value of a specified label (on y-axis) versus states or another label (on x-axis). Both axes can be scaled.

Markers Correlated to state listing, state compare, and state waveform displays. Available as pattern, time, or statistics (with time counting) and states (with state counting on).

Accumulate Chart display is not erased between successive acquisitions.

State Waveform Display Displays state acquisitions in waveform format.

States/division 1 to 1000 states.

Delay -8191 to +8192 states.

Accumulate Waveform display is not erased between successive acquisitions.

Overlay Mode Multiple channels can be displayed on one waveform display line.

Displayed Waveforms 24 lines maximum on one screen. Up to 96 lines may be specified and scrolled through.

Timing Waveform Display Displays timing acquisition in waveform format.

Sec/div 1 ns to 1000 s; 0.01% resolution.

Delay -2,500 s to +2,500 s.

Accumulate Waveform display is not erased between successive acquisitions.

Overlay Mode Multiple channels can be displayed on one waveform display line. When waveforms size set to large, the value represented by the waveforms is displayed inside the waveforms in selected base.

Displayed Waveforms 24 lines maximum on one screen. Up to 96 lines may be specified and scrolled through.

Bases Binary, Octal, Decimal, Hexadecimal, ASCII (display only), User-defined symbols, two's complement.

Symbols

Pattern Symbols User can define a mnemonic for the specific bit pattern of a label. When data display is SYMBOL, mnemonic is displayed where the bit pattern occurs.

Range Symbols User can define a mnemonic covering a range of values. When data display is SYMBOL, values within the specified range are displayed as mnemonic + offset from base of range.

Number of Symbols 1000 maximum.

Specifications and Characteristics

Specifications and Characteristics

NOTES:

* Warranted Specification

[1] Full Channel / Half Channel Modes

[2] Specified for an input signal $V_H = -0.9V$,
 $V_L = -1.7V$, slew rate = $1V/ns$, and threshold = $-1.3V$

[3] Time or state tagging is not available in double-memory state mode. With tagging on, the acquisition memory is halved if there are no unassigned pods.

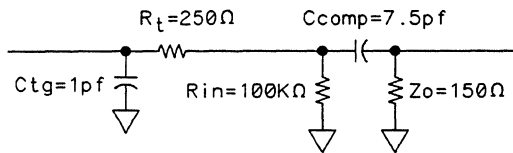


Figure 1 - Equivalent Probe Input Circuit

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Safety

This apparatus has been designed and tested in accordance with IEC Publication 348, Safety Requirements for Measuring Apparatus, and has been supplied in a safe condition. This is a Safety Class I instrument (provided with terminal for protective earthing). Before applying power, verify that the correct safety precautions are taken (see the following warnings). In addition, note the external markings on the instrument that are described under "Safety Symbols."

Warning

- Before turning on the instrument, you must connect the protective earth terminal of the instrument to the protective conductor of the (mains) power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. You must not negate the protective action by using an extension cord (power cable) without a protective conductor (grounding). Grounding one conductor of a two-conductor outlet is not sufficient protection.
- Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuseholders. To do so could cause a shock or fire hazard.

- Service instructions are for trained service personnel. To avoid dangerous electric shock, do not perform any service unless qualified to do so. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

- If you energize this instrument by an auto transformer (for voltage reduction), make sure the common terminal is connected to the earth terminal of the power source.

- Whenever it is likely that the ground protection is impaired, you must make the instrument inoperative and secure it against any unintended operation.

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

- Do not install substitute parts or perform any unauthorized modification to the instrument.

- Capacitors inside the instrument may retain a charge even if the instrument is disconnected from its source of supply.

- Use caution when exposing or handling the CRT. Handling or replacing the CRT shall be done only by qualified maintenance personnel.

Safety Symbols



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



Hazardous voltage symbol.



Earth terminal symbol: Used to indicate a circuit common connected to grounded chassis.

WARNING

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

CAUTION

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



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