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Agilent Technologies

State and Timing Analyzers for the HP 16500C Logic Analysis System

The HP 16550 series—depth and performance to match the needs of the entire digital design team

Logic Analyzers That Meet the Needs of the Entire Digital Design Team

The HP family of modular logic analyzers offers the depth, speed, and channel width to meet the needs of the entire digital design team. As part of an HP 16500C logic analysis system, the logic analyzer modules help engineers debug their designs faster. Throughout the family, each logic analyzer module offers a powerful set of features at a very affordable price. The family of modular logic analyzers offers the flexibility to grow and adapt to a design team's needs today and in the future.

Choose the Logic Analyzer Module That Best Fits Your Design Team's Application

For 8 and 16-bit microcontroller-based designs, the HP 16550A is the perfect entry level logic analyzer module into the HP 16500C platform.

For applications that occasionally require deep memory, the HP 16555A offers 1M memory per channel at an affordable price.

For designs that require many channels, the HP 16556A offers deep memory and high channel counts at a reasonable price.

For complex 32-bit microcontroller-based designs, the HP 16555D has 2M memory at 110 MHz state acquisition rate.

For multiprocessor or other channel-intensive systems, the HP 16556D combines up to 340 channels on a single logic analyzer.

For analysis of data intensive systems like imaging or video systems, the HP E2485A memory expansion interface enables you to capture up to 40 M-deep across 16 channels.

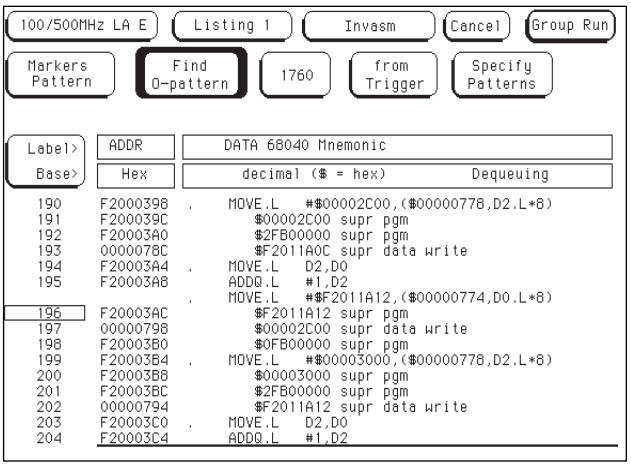
The HP 16500C (right) is the mainframe for measurement modules, such as the HP 16550-series. The HP 16505A prototype analyzer (atop the HP 16500C) combines a large windowed interface with powerful analysis tools. The HP E2485A (foreground) converts up to five HP 16556D modules for up to 40 Mb/channel memory depth.

High-Performance Features Help You Solve Your Toughest Problems Today and Tomorrow

State Analysis

Up to 110-MHz State Analysis
View system activity at full speed with up to 110-MHz state analysis on all channels.

Full-speed Time or State Counting
Count states or time between samples with 8-ns resolution while acquiring clocked data at rates up to 110-MHz.



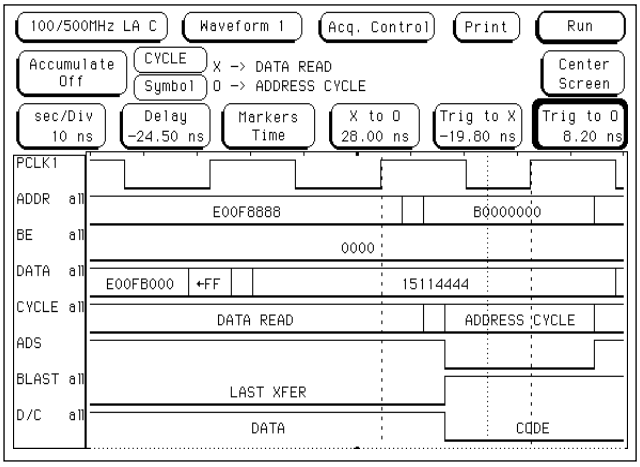
State Analysis

Timing Analysis

Up to 500-MHz Conventional Timing Analysis
Verify critical edge times with measurements requiring up to 2-ns timing resolution.

125-MHz or 250-MHz Transitional Timing Analysis
Analyze timing events that are seconds apart while maintaining 4-ns resolution in half-channel mode, or 8-ns resolution in full-channel mode. Available with the HP 16550A only.

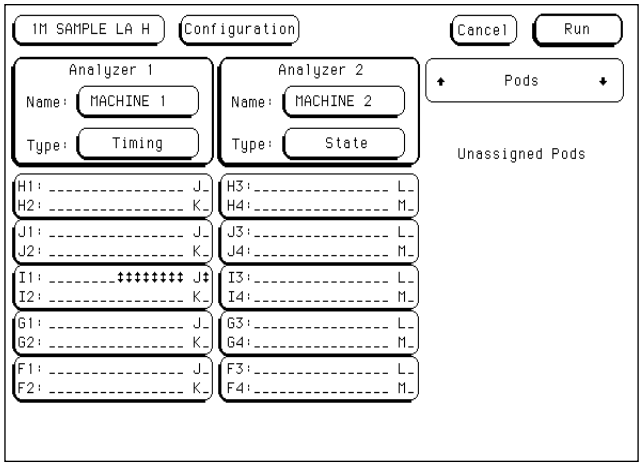
125-MHz Timing Analysis with Glitch Detection
Detect intermittent problems or glitches without reprobing. Capture glitches as narrow as 3.5 ns in half-channel mode. Available with the HP 16550A only.



Timing Analysis

Wide Channel Count Up to 340 2 M-Deep Channels

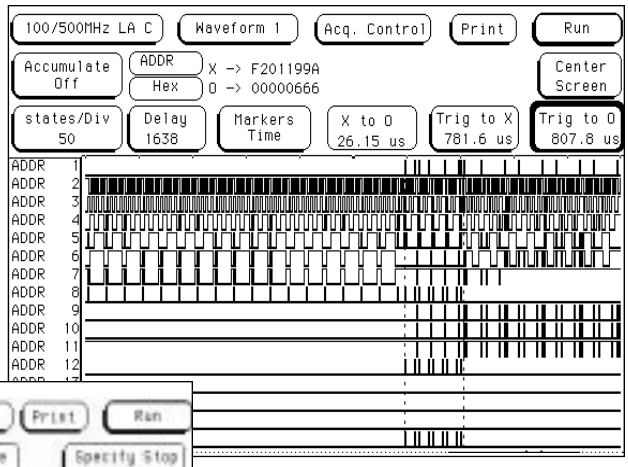
Debug 64-bit microprocessor systems or ASICs, or other applications requiring large channel counts. Connect five HP 16556A or 16556D modules together for measurements requiring up to 340 deep-memory channels. Three HP 16555A or 16555D modules connected together provide 204-deep memory channels. The HP 16555D and HP 16556D provide 2 M of memory depth; while the HP 16555A and 16556A provide 1 M memory depth per channel. Trace depth for all modules doubles in half-channel timing mode.



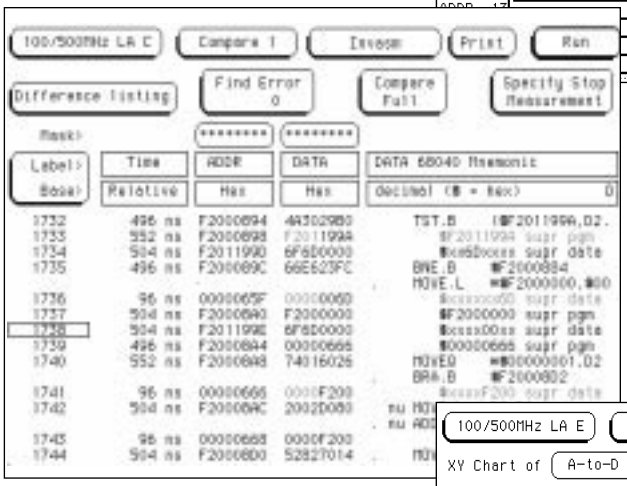
Wide Channel Count

A Variety of Display Options Helps You Identify Problems Quickly

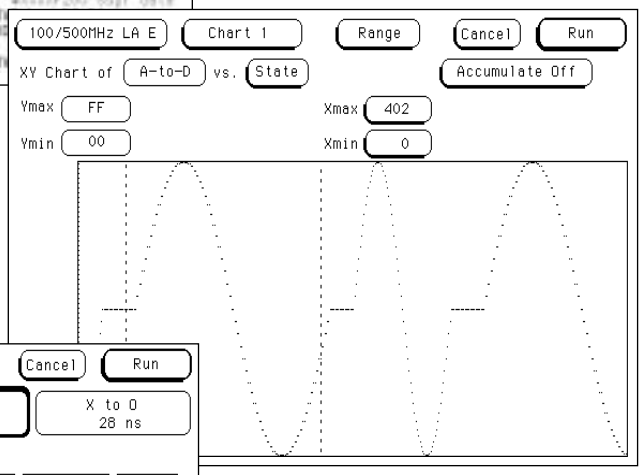
In addition to the traditional state listing and timing waveform display modes, the HP 16550-series also provides state waveforms, state chart, state compare, and timing listings.



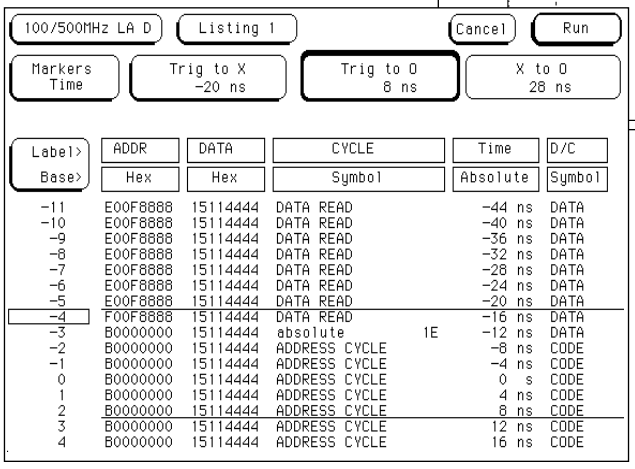
State Waveforms: View the entire state acquisition at a glance.



State Compare: Find differences between acquisitions easily.



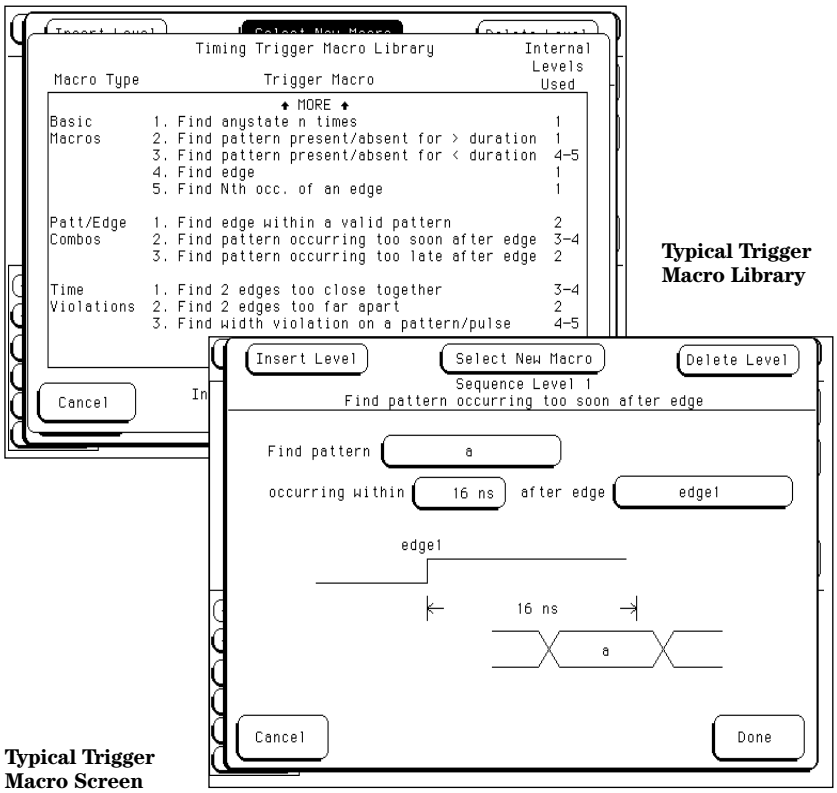
State X-Y Chart : Verify A/D performance or track code flow graphically.



Timing Listing : Observe bus values or other timing activities in listing format with time tags.

Advanced Trigger Macros Make It Easy to Capture Elusive Problems

Trigger Macro Library
Both basic and complex macros are available. The state library includes 11 macros, the timing library 12 macros. You can also combine macros to create custom trigger setups.



Typical Trigger Macro Library

Typical Trigger Macro Screen

A Large Variety of Trigger Resources Helps You Find Your Most Complex Problems

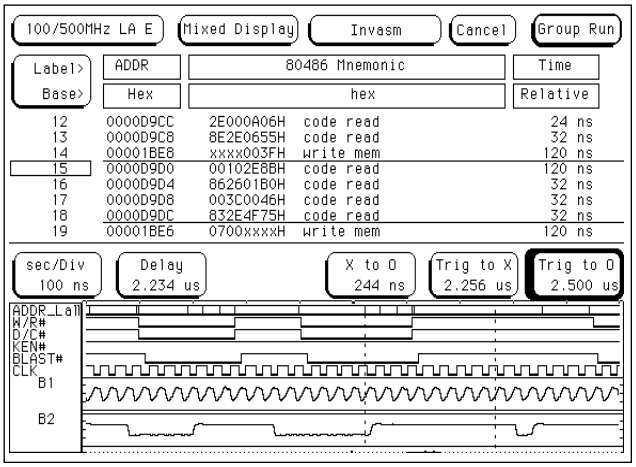
The following trigger resources combined with powerful macros help you develop trigger sequences quickly and find problems faster:

- 12-level, up to 125-MHz trigger sequencer
- 10 pattern terms
- Two range terms
- Two timers
- Two timing glitch or edge terms

Combined Measurements Bring Together the Full Power of the HP 16500 Modules

Track Problems in Multiprocessor Systems or Between a Processor and Its Interface Bus
Configure any HP 16550-series module as two independent state analyzers that sample data using separate clocks. Then, view both time-correlated state listings interleaved on the same screen.

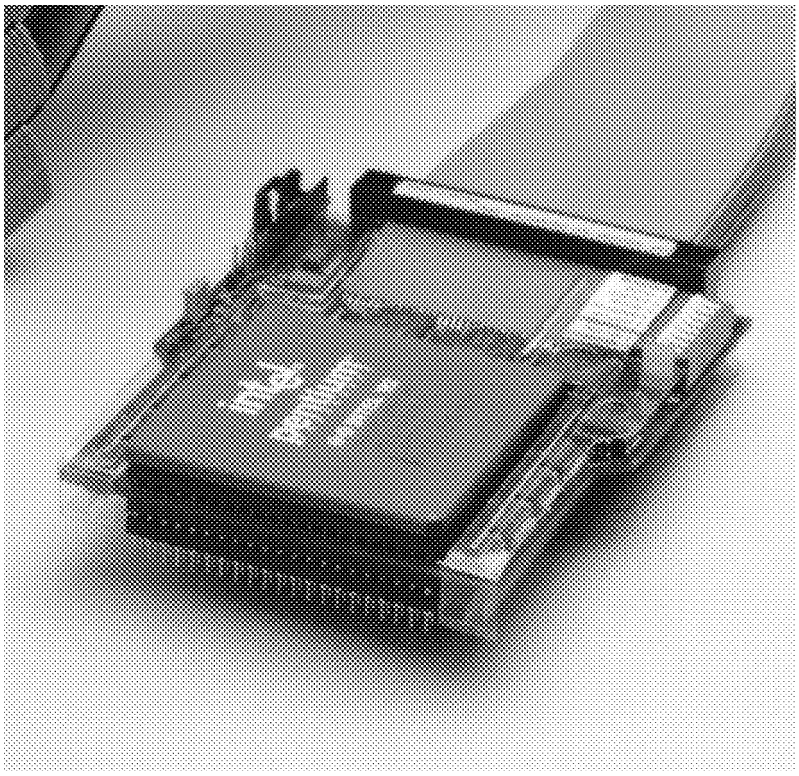
Find Whether the Problem is in Software or Hardware
Arm the timing analyzer with the state analyzer to capture system behavior between states. Display both measurements on one screen, and use the time-correlated markers to identify the cause of problem states.



State/timing with Oscilloscope

Capture the Analog Behavior of a Signal at the Critical Time
Trigger the 2-GSa/s digitizing oscilloscope from either the state or timing analyzer. Observe relationships among all three time-correlated measurements by displaying them together on the same screen. An HP 16533A or 16534A oscilloscope module is also required for this measurement.

Complete Support for Your CISC or RISC Microprocessor System Analysis Needs



HP microprocessor adapters are compact in design. This Pentium® adapter provides over 160 signal connections to the logic analyzer.

Support for Popular Industry-Standard Buses, Including:

- SCSI I, II, and III
- IEEE-448 (HP-IB)
- Universal Serial Bus
- PCI
- ISA
- EISA
- FDDI
- RS-232
- VME, VXI
- 72-pin-SIMM
- PCMCIA
- APIC

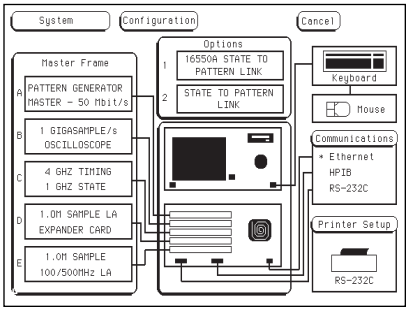
Support for Over 180 Processors, Including:

- Intel 80386, 80486, 80960, Pentium, Pentium Pro, Pentium II
- Motorola 68000, 68020, 68030, 68040, 68360, 68340, 68302, 68332
- MIPS R3000, R4000/4400PC
- Power PC 5XX, 6XX, 8XX
- TI TMS 320C50/51/52/53
- ARM 7 TDMI
- Siemens C166/167

Meeting Your Evolving Digital Design Needs

Configuration

The HP's modular 16500-series modules let you configure your mainframe with the modules you need today, while providing the room to grow with your evolving digital design needs. The HP 16500C logic analysis system mainframe provides five slots for any of the HP 16550-series measurement modules. The HP 16501A expansion frame adds an additional five slots, for a total of ten modules in one system. For more information on ways to configure the HP 16500C, please refer to *HP 16500C Logic Analysis System and Measurement Modules and HP 16505A Prototype Analyzer and Tool Sets* configuration guide, publication number 5965-3185E.



Intuitive User Interface

If you are already familiar with one HP logic analyzer interface, you'll be able to start making measurements right away on HP 16550 logic analyzer modules. A mouse or optional keyboard provides the most flexible user interface available on any logic analyzer.

Broadest Preprocessor Support in the Industry

HP offers the widest range of interfaces for processors and buses. HP is committed to providing support for major new processors at their introduction.

Start Your High-Performance Measurements Right Away

No Need to Reconfigure

The HP 16550-series automatically translates configuration files from the HP 16510A/B, 16511B, 16550A, 16540A/D, 16541A/D, 1650-series, 1660-series; and 1670-series logic analyzers.

No Need to Relearn

The HP 16550-series uses the same friendly, familiar menus and controls as current HP logic analyzers.

Consistent Probing

The HP 16550-series uses the same probes and accessories as the HP 16510A/B, 16540A/D, 16541A/D, and 16542A, 1650-series, 1660-series, and 1670-series logic analyzers.

	HP 16550A	HP 16555A	HP 16556A	HP 16555D	HP 16556D
Maximum State Clock Rate	100 MHz	110 MHz	100 MHz	110 MHz	100MHz
Maximum Conventional Timing Rate (1/2 channel)	500 MHz	500 MHz	400 MHz	500 MHz	400 MHz
Maximum Conventional Timing Rate (full channel)	250 MHz	250 MHz	200 MHz	250 MHz	200 MHz
Maximum Transitional Timing Rate (1/2 channel)	250 MHz	N/A	N/A	N/A	N/A
Maximum Transitional Timing Rate (full channel)	125 MHz	N/A	N/A	N/A	N/A
Channel Count Per Board	102	68	68	68	68
Maximum Channel Count on One Time Base	204	204	340	204	340
Memory Depth (full channel)	4 K	1 M	1 M	2 M	2 M
Memory Depth (1/2 channel)	8 K	2 M *	2 M*	4 M*	4 M*

* For the HP 16555A, 16555D, 16556A, and 16556D, memory depth doubles in timing mode only.

HP 16550-Series Supplemental Characteristics

Probes

Input Resistance	100 kΩ ± 2%
Input Capacitance	~8 pF
Minimum Voltage Swing	500 mV peak-to-peak
Threshold Range	± 6.0 V adjustable in 50-mV increments

State Analysis

Setup/Hold Time [1]	0/3.5 ns through 3.5/0 ns, adjustable in 500-ps increments
Minimum State Clock Width	3.5 ns
State Clock/Qualifiers	6 (HP 16550A) 4 (HP 16555A, 16555D, 16556A, and 16556D)
Time Tag Resolution [2]	8 ns
Maximum Time Count Between States	34 seconds
Maximum State Tag Count [2]	4.29×10^9 states

Timing Analysis

Sample Period Accuracy	0.01% of sample period
Channel-to-Channel Skew	2 ns, typical
Time Interval Accuracy	± (sample period + channel-to-channel skew + 0.01% of time interval reading)
Minimum Detectable Glitch	3.5 ns

Triggering

Sequencer Speed	
125 MHz, maximum	HP 16550A, 16555A, 16555D
100 MHz, maximum	HP 16556A,16556D
State Sequence Levels	12
Timing Sequence Levels	10
Maximum Occurrence Counter	1,048,575
Pattern Recognizers [3]	10
Range Recognizers	2
Range Width	32 bits each
Timers	2
Timer Value Range	400 ns to 500 seconds
Glitch/Edge Recognizers	2 (timing only)

[1] Minimum setup/hold time specified for single-edge, single-clock acquisition. Single-clock, multi-edge setup/hold window is 4.0 ns. Multiclock, multi-edge setup/hold window is 4.5 ns. All setup/hold windows are adjustable in 500-ps increments.

[2] Maximum state clock rate with or without time or state tags on is 100 MHz (HP 16550A, HP 16556A, and 16556D), and 110 MHz (HP 16555A, and 16555D). When all pods are assigned to a state or timing machine, enabling time or state tags cuts memory in half.

[3] Eight pattern recognizers are available in HP 16555A and HP 16555D timing and 110-MHz state analysis modes.

[4] The HP E2485A operates as an accessory to the HP 16555A, 16555D, 16556A, and 16556D modules in state mode only. 40 Mb/channel across 16 channels is achieved using five HP 16556D modules. Clocking and triggering features of the modules are reduced when using the HP E2485A.

HP E2485A Memory Expansion Interface Characteristics

Maximum Memory Depth	40 M [4]
Memory Depth per Card	
HP 16555A, 16556A	4M
HP 16555D, 16556D,	8M
Channel Count	16
Maximum State Clock Rate	100 MHz
Setup/Hold Time	3.5 ns/0 ns
Minimum Clock Pulse Width	5 ns
Clocking	1 edge, rising or falling
Input Resistance	100 kohms ± 2%
Input Capacitance	~8 pF

Ordering Information

HP 16550A
4 K Sample,100-MHz state/500-MHz timing logic analyzer module

HP 16555A
1 M-Sample, 110-MHz state, 500-MHz timing logic analyzer module (Requires an HP 16500B or 16500C mainframe)

HP 16555D
2 M-Sample 110-MHz state/500-MHz timing logic analyzer module (Requires an HP 16500B or HP 16500C mainframe)

HP 16556A
1 M-Sample, 100-MHz state/400-MHz timing logic analyzer module (Requires an HP 16500B or 16500C mainframe)

HP 16556D
2 M-Sample 100-MHz state/400-MHz timing logic analyzer module (Requires an HP 16500B or HP 16500C mainframe)

HP E2485A
Memory Expansion Interface

HP 16500C
Logic Analyzer System Mainframe

HP 16505A
Prototype Analyzer System

HP B4600A
System Performance Tool Set

HP B4620
Software Analyzer Tool Set

HP B4601A
Serial Analysis Tool Set

HP E2479A
Upgrades an HP 16500A or 16500B mainframe to an HP 16500C mainframe

Warranty

All Hewlett-Packard products described in this document are warranted against defects in material and workmanship for a period of one year from date of shipment. Option W03 provides a three-month on-site warranty in lieu of the standard one-year return-to-HP warranty. Three-year and five-year return-to-HP repair services are also available. Refer to individual product manuals for detailed descriptions and terms of warranty.

Related HP Literature

HP 16500C Logic Analysis System and HP 16505A Prototype Analyzer	Product Overview	5965-3187E
The HP 16500C Logic Analysis System Frame and HP 16501A Expansion Frame	Technical Specifications	5965-3184E
HP 16500C Logic Analysis System and Measurement Modules/HP 16505A Prototype Analyzer and Tool Sets	Configuration Guide	5965-3185E

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Data subject to change.
Printed in the U.S.A. 10/97
5962-7245E
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