LOGIC ANALYZERS
HP 1660 Series Benchtop Logic Analyzers
HP 1660C, 1661C, 1662C, 1663C, 1660CS, 1661CS, 1662CS, 1663CS, and 1664A

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Benchtop Logic Analyzers to Help You Identify the Root Cause of Difficult Problems Fast

- Features to bridge the hardware and software worlds
- Broad microprocessor support with source code linkage
- Optional Ethernet LAN for networked operation
- 5 modes of timing analysis to capture different kinds of data
- Optional built-in oscilloscope shows the analog perspective
- Upgrade paths to add more channels, LAN, or an oscilloscope

Code listings, timing waveforms, and oscilloscope waveforms can be time correlated and displayed together to speed troubleshooting.

Timing waveforms can be displayed with data values and symbolic information to illustrate bus cycles and data flow.

Seeing a Problem from All Sides Gives the Fastest Answers

Designing hardware and software for embedded microprocessor systems is difficult enough; getting it all to work together can be a real challenge. The HP 1660 series logic analyzers were designed to make things easier by bridging the gap between the hardware and software worlds. They cover a wide application range—from the isolation of elusive hardware flaws to the debugging of real-time code. You can see it all displayed together with time correlation and markers that track between code and waveforms.

## An Excellent Toolset for Hardware Development

Carpenters keep more than one kind of hammer in their toolsets so they can match the task at hand with the right hammer. The HP 1660 logic analyzers have five modes of timing analysis so hardware designers can adapt the analyzer to the speed and type of data they need to capture. Conventional timing analysis resolves time intervals as short as 2 ns between edges. Transitional timing is right for situations when you need to look at data bursts with periods of inactivity between.

Some of the tougher hardware problems can be found only with digital triggering and solved only with an oscilloscope. That's why the CS models come with a built-in, 1-GSa/s oscilloscope that can be triggered by the logic analyzer. Now, you can see what bus lines really look like at critical moments.
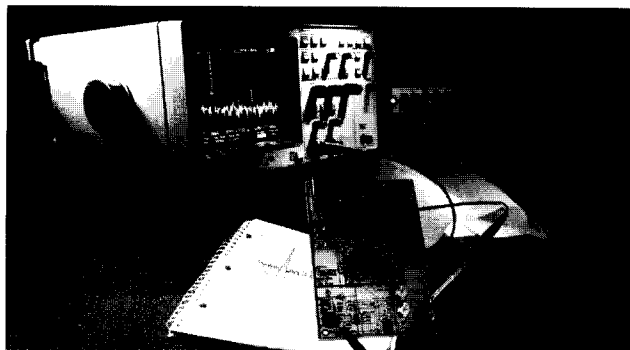
More Functionality than a Software Engineer Would Expect

We've added some important capabilities to our logic analyzers to help software engineers even more. The newly introduced HP 1660 models have functionality that was previously available only with more expensive logic analyzers—symbol and source code links and an Ethernet LAN interface.

A high percentage of the software written for embedded systems today is in C, C++, Ada, or another high-level language. So, the code trace taken by a logic analyzer should be shown at the source level. The HP Software Analyzer package (see page 365) gives you the high-level view required for faster debug by displaying a disassembled state analysis listing with symbolic data in a window alongside your source code listing. That makes finding elusive software defects a lot easier.
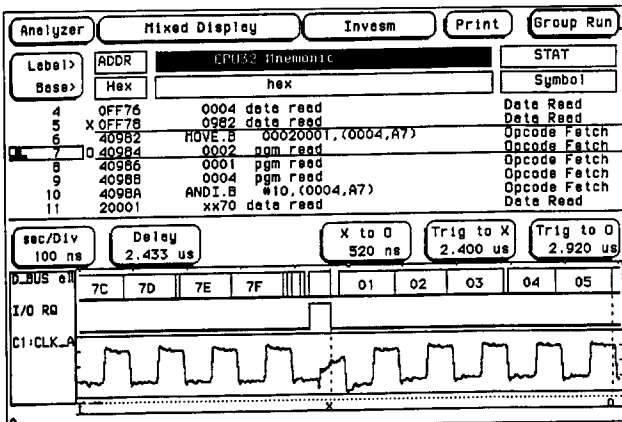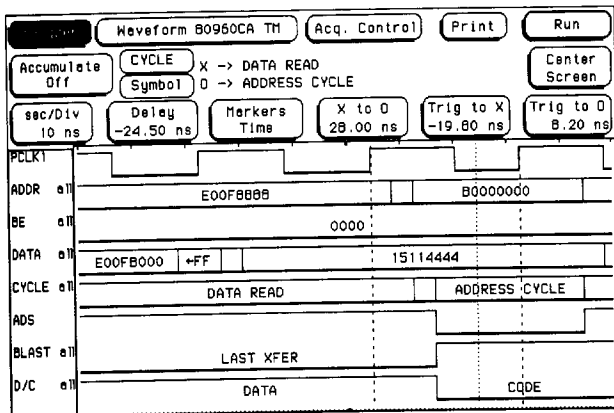
"I don't have the time to teach my students about operating a scope."
HP 54600 series oscilloscopes can help you out of this dilemma, with:
- **HP54654A self-paced training kit.** So you don't have to do the training.
- **Autoscale.** So students can set up the scope instantly, without your help.
- **Real-time display.** For a friendly analog look and feel. Unlike most digital scopes, the HP 54600 series immediately updates the display when you turn a knob. That means real-time feedback for your students.
- **Plug-on modules** for capability you can either add now, or later after the next budget cycle. Our HP 54657A measurement/storage module adds HPIB and an FFT processor. It's like having an inexpensive spectrum analyzer inside the scope.
- **A growth path.** Start the students with benchtop experiments, then show them how to automate those experiments, on the same type of equipment they will actually be using once they graduate.
- **Three-year warranty.** Yes, even in a sophomore teaching lab.

Electronic Test Instruments and *Spectrum and Network Measurements* are easy-to-read explanations of fundamental measurements.

Electronic Instruments Handbook, 2nd Ed. Over 33 HP and academic experts collaborated to write this valuable resource, taking the mystery out of test equipment design and operation.

HP Has a Complete Line of Products and Programs for the Education Market.
Use HP's whole family of BASIC Instruments in the classroom. For example, combine the new low-cost HP 54603B oscilloscope and HP 33120A function generator/arb to perform hundreds of experiments: frequency domain plots, transient analysis of events that happen before the trigger, swept response, DTMF, noise effects, digital "glitches", etc.

More Than Instruments
HP has a number of programs just for colleges and universities: Educational discounts, books, prewritten experiments, training material, posters, and more.

Generate Reports
HP BenchLink software's graphical Windows interface can help you program almost any waveform and dump a scope waveform into a word processor, for stunning reports at the click of a mouse.

Books from HP
- *Electronic Test Instruments*
- *Spectrum and Network Measurements*
- *Electronic Instruments Handbook,* 2nd Ed.
Each of these books would be a great reference for any classroom.

We Can Help You Get Your Students Ready for the Real World
If you're an educator and you don't think you can afford HP, you may be in for a big surprise. Try us.

For more details on BASIC Instruments, see the table of contents in this catalog. Here are just some of the HP products you can use for classroom instruction:

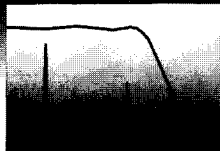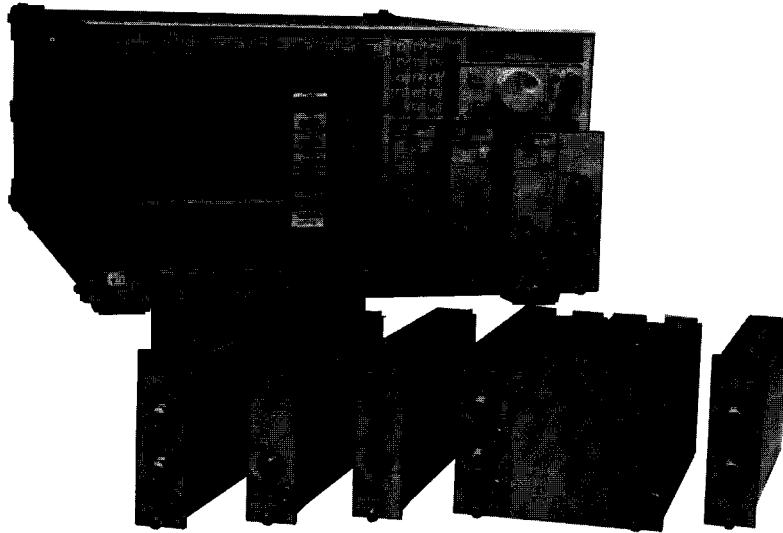| Ordering Information	Price*
HP 54603B 60 MHz 2-Ch Oscilloscope	$1,995 ☎
HP 54600B 100 MHz 2-Ch Oscilloscope	$2,495 ☎
HP 54657A Measurement/Storage Module w/HP-IB	$765 ☎
HP 54654A Operator's Training Kit	$204 ☎
HP 33120A 15 MHz Function/Arb Generator	$1,725 ☎
HP 34401A 6 1/2 Digit DMM	$995 ☎
HP 34820A BenchLink/Suite Software	$395
HP 34811A BenchLink Arb Software	$295 ☎
HP 34812A BenchLink Meter Software	$150 ☎
HP 53181A 225 MHz RF Counter	$1,500 ☎
HP E3630A Triple-Output Power Supply	$500 ☎
5960-5718 *Spectrum & Network Measurements*	$54
E5801A *Electronic Test Instruments*	$46
E5800A *Electronic Instruments Handbook,* 2nd Ed.	$80
* Educational discounts available to qualified schools	

☎ For off-the-shelf shipment, call 800-452-4844.
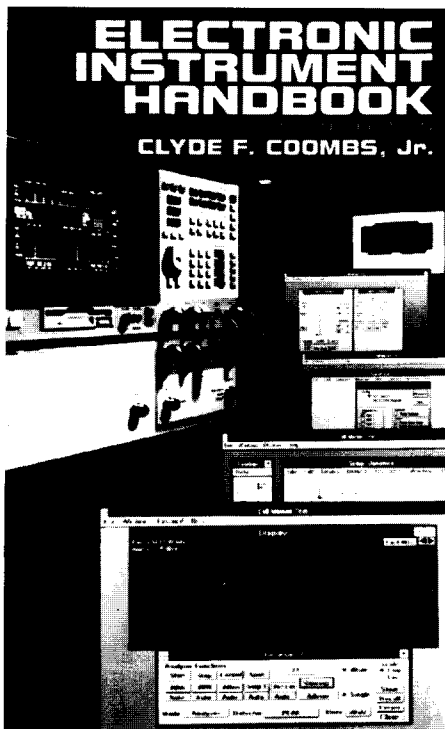
- Max sample rate 8 GSa/s
- 25-ps time-interval accuracy, real-time (RT) mode
- 2.0-GHz bandwidth
- FFT, measurement limit test, color graded display, histograms

- Modular design
- 3½-in MS-DOS®-compatible disk drive
- Flash ROM firmware memory
- Up to 8 channels

HP-IB SYSTEMS
DESIGNED FOR

A unique technology called sample-and-filter is responsible for the unprecedented performance of the HP 54720.

HP 54720D 8-GSa/s
Modular Oscilloscope

When You Have Only One Chance, You Need the Most Accurate Real-Time Oscilloscope
When an electronic or electrical event occurs only once, you need to capture and analyze the parametric nature of the event accurately, the first time. The high sample rate, the industry-leading accuracy, and the powerful features of the HP 54720 give you the clearest picture of the event possible.

The HP 54700 Series: Key Contributions
- Four channels with 2-GSa/s ADCs and 64K memory per channel (HP 54720D)
- Two channels with 4-GSa/s ADCs and 128K memory per channel (HP 54720D)
- One channel with 8-GSa/s ADCs and 256K memory per channel (HP 54720D)
- 8 bits vertical resolution (RT)
- 9 to 12 bits vertical resolution with averaging
- 1% vertical gain accuracy
- ±30-ps time interval measurement accuracy (ET)
- 500-ps glitch capture
- Advanced logic triggering
- User-selectable sample rate and memory depth
- High, 177 waveforms/s max capture and display update rate

A Scope You Configure Today . . . Enhance Tomorrow
Because of the modularity, you choose the combination of preamplification, gain vernier, attenuation, trigger pickoff, external trigger, input coupling, and impedance that provides you with optimum accuracy. The powerful hardware can be enhanced by upgrading the scope's firmware via a 3½-inch disk drive and flash ROM.

MS-DOS® is a U.S. registered trademark of Microsoft Corporation.

A Scope Designed for You
Understand Your High-Speed Digital System Problems
In digital logic designs, analog problems—such as glitches, ground bounce, timing violations, reflections, ringing, and crosstalk—are becoming more difficult to solve as computer architecture complexity and MIPS increase.

Capture all narrow glitches with a 500-ps glitch trigger. Then accurately analyze whether the glitch has the capability of violating a logic threshold. Measure glitch amplitude and pulse width more accurately than ever before with a 8-GSa/s sample rate and a 2.0-GHz bandwidth.

Utilize the HP 54720's four channels, deep memory, and pre-trigger acquisition to locate the cause of a glitch. Trigger the HP 54720 with a logic analyzer for added diagnostic capability.

Improve the reliability of your fastest CMOS designs by making precise amplitude and duration measurements on worst-case ground bounce caused by intermittent simultaneous switching.

The 50-ps single-shot time interval accuracy will help you troubleshoot clock skew problems.

Faithfully Reproduce and Nonintrusively Load Your DUT's Signal
Probes must faithfully reproduce the signal under test and not load the device that generates the signal. With 2.5-GHz bandwidth and 0.6-pF input capacitance, the HP 54701A measures signals more accurately and introduces less loading than any other active probe.

Capture and Analyze Your High-Energy Physics Phenomena
At 8 GSa/s, the higher frequency harmonics of the phenomena you are investigating can now be accurately measured. With nonvolatile memory backup and fast re-trigger time, feel secure that you will capture, record, and transfer your data with ample integrity.

Investigate Fast Rise Time ESD Pulses with Confidence
Characterize ESD waveforms with greater confidence because the 8-GSa/s sample rate provides greater insight about higher frequency components in the pulse.

Discover Unseen Characteristics of Your Laser's Impulse Response
With 8 GSa/s, 256K memory depth, and fast throughput, you can capture and analyze a larger number of slow-rep rate laser pulses more accurately than ever before possible.

Price*
| $1,995 |
| $2,495 |
| $765 |
| $204 |
| $1,725 |
| $995 |
| $395 |
| $295 |
| $150 |
| $1,500 |
| $500 |
| $54 |
| $46 |
| $80 |