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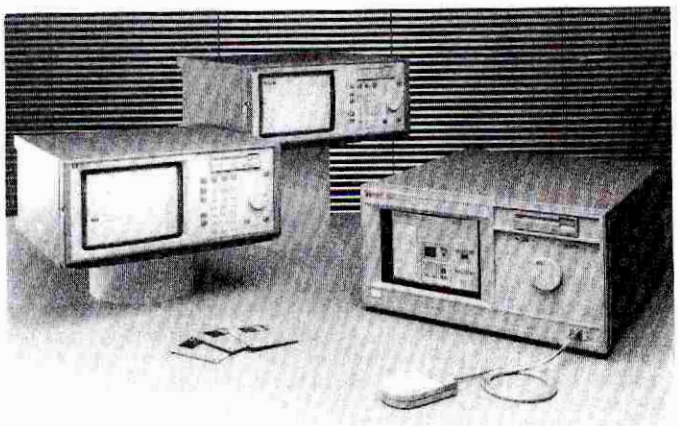
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# LOGIC ANALYZERS

## State, Timing, Analog, and Stimulus/Response Analysis

**Model 1631A/D, 1650A, 1651A, 16500A, 16510A, 16515A/16A, 16520A/21A, 16530A/31A**



HP-IB SYSTEMS

### Introducing HP's New Family of Logic Analyzers and Logic Analysis Systems . . .

#### Performance

- Up to 400 channels of general-purpose logic analysis.
- Up to 80 channels of 1 GHz timing analysis.
- Up to 204 channels of 50 Mbit/s pattern generation.
- Up to 8 channels of 400 Msample/s digitizing oscilloscope capability.

#### Ease-of-use

- Save time and avoid errors using the HP 16500A's color touch screen or mouse.
- Make measurements quickly with the HP 1650A/1651A's simplified user-interface.
- Give the knob a spin to change values quickly or move measurement markers.

#### Value

- Rely on HP's traditional reliability and quality for low cost-of-ownership.
- With Option W30, get 3 year protection for your HP 1650A/1651A/16500A.
- These products come with a one year standard warranty. Option W30 adds two additional years of return-to-HP service.
- Get assistance when and where you need it with HP's worldwide sales and support organization.

#### Setup Convenience

- Set up your digitizing oscilloscope or your timing analyzer with push button ease using HP's Auto-Scale.
- Connect to your circuit with new lightweight passive probes and flexible cables.
- Hook up quickly to today's most popular 8-, 16-, and 32-bit microprocessors with HP's preprocessors.
- Store and recall configurations from built-in disc drives for fast setup.

| | HP 1650A | HP 1651A |
|---|---|---|
| Timing | 100 MHz on ALL 80 channels | 100 MHz on ALL 32 channels |
| State | 25 MHz on ALL 80 channels | 25 MHz on ALL 32 channels |
| Memory | 1 Kbit/channel | 1 Kbit/channels |
| Microprocessor support | Today's most popular 8-, 16-, and 32-bit microprocessors | Today's most popular 8-bit microprocessors |

| | LOGIC ANALYSIS | 1 GHz TIMING | PATTERN GENERATION | DIGITIZING OSCILLOSCOPE |
|---|---|---|---|---|
| **Module** | HP 16510A** | HP 16515A/ HP 16516A | HP 16520A/ HP 16521A | HP 16530A/ HP 16531A |
| **Channels Per Card** | 80 | 16 | 12/48 | 2 |
| **Maximum Channels Per Frame** | 400 | 80 | 204 | 8 |
| **Memory Depth** | 1K | 8K | 4K | 4K |
| **Maximum Rate** | 25 MHz State 100 MHz Timing | 1 GHz Timing | 50 Mbits/s | 400 Msamples/s 100 MHz Bandwidth |

***The HP 16510A has the same capabilities as the HP 1650A and contains 5 of HP's Logic-Analyzer-on-a-Chip.*

#### Simple, Yet Does the job . . . and More

- Lengthen your timing window with transitional timing on ALL channels.
- Capture elusive glitches with glitch detection on ALL channels.
- Configure the HP 1650A/1651A in four ways: one state analyzer, one timing analyzer, or one state and one timing analyzer.
- Store setups and measurement results with the built-in disc drive for fast recall or permanent records.
- Generate report-quality documentation with push button ease.
- Program the HP 1650A/1651A with easily understood commands through the built-in RS-232C interface.

#### Fits Where You Need It . . . Goes Where You Want It

- Compact: With its small footprint, the HP 1650A/1651A fits easily on your bench, within the same field of vision as what you're working on.
- Portable: At only 22 lbs., the HP 1650A/1651A can be easily carried with its built-in handle or the HP 1540-1066 soft carrying case.
- One Piece: Keep everything together, in one place; the probes and cables fit conveniently into the pouch attached to the top of the instrument.

#### Solutions for Individual Requirements and Group Needs

- Customize your own system by adding cards to the HP 16500A's five card slots.
- Make time-correlated measurements between cards using the HP 16500A's Intermodule Bus.
- Compare measurement data from hardware with design simulation data using the HP Electronic Design System and the HP 16500A Logic Analysis System.
- Program the HP 16500A with easily understood commands through HP-IB or RS-232C built-in interfaces.
- Store setups and measurement results in either of two built-in disc drives for fast recall or permanent record.
- Generate report-quality documentation with push button ease.

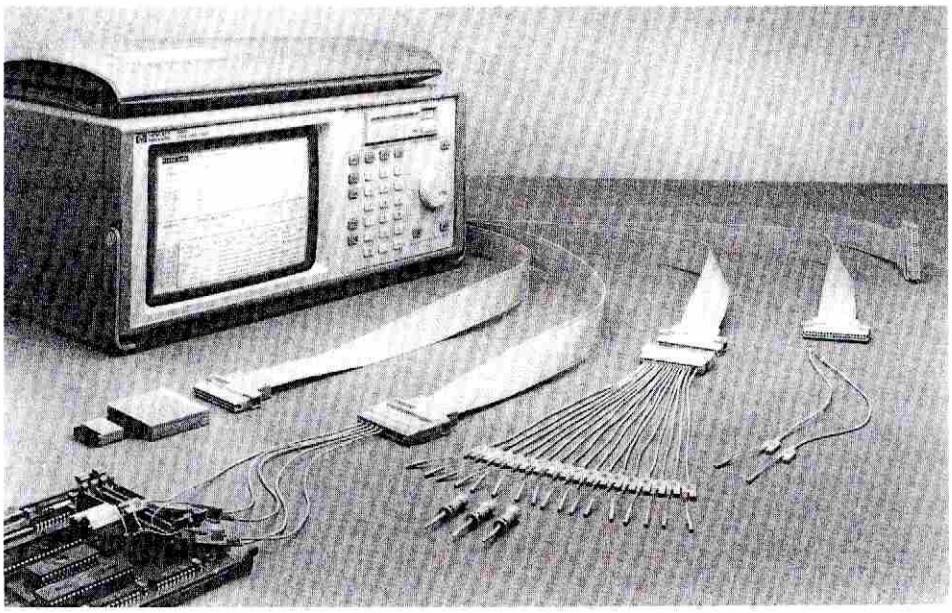
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# LOGIC ANALYZERS

## Today's Best Value in General-purpose Logic Analyzers

**Model 1650A, 1651A**

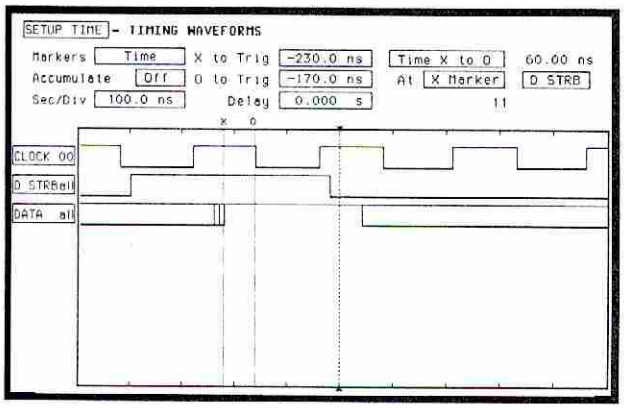
- HP 1650A - 80 channels, HP 1651A - 32 channels of 25 MHz state or 100 MHz timing
- Transitional timing for deep effective memory
- Supports most popular 8-, 16-, and 32-bit microprocessors
- Lightweight passive probing
- Simultaneous state/state, simultaneous state/timing



HP 1650A

### Hook Up Quickly and Reliably to Your Circuit

HP's new passive probes are small and lightweight. With an input impedance at the probe tip of 100k ohms in parallel with 8 pF, these probes won't load down your circuit. Individual probes and cables can be removed when they get in the way. Additionally, the HP 01650-63201 Terminating Adaptor enables you to connect your logic analyzer directly to PC boards with 2x10, 0.1″ center connectors.




Overlap all data channels on the display to measure when all lines are stable.

### Extend the Memory of Your Timing Analyzer with Transitional Timing

Traditionally, a timing analyzer samples the input channels based on its own internal clock and then stores every sample in memory. The HP 1650A/1651A/16510A store data only when there is a transition, thus avoiding redundant data. This effectively extends the memory by lengthening the time covered by an acquisition. The timing analyzer samples at full speed so that events that are seconds or even minutes apart are captured with 10 ns resolution.

### Debug Quickly with up to 80 Channels

The HP 1650A/1651A/16510A's 5 ns minimum glitch capture on all channels looks for activity between samples. Pattern search helps you to find a specific event quickly. Overlay mode places several timing signals on one display line, so that you can see where timing violations occur. Infinite persistence shows the changes in waveforms during repetitive acquisitions. When more channels means spending less time to find the problem, use up to 80 channels.

### Capture the Data You Want to See

Trigger on a pattern across the full 80 channels. Or you can qualify a pattern by specifying a duration, glitch, or edge. Specify a pattern duration to capture error conditions indicated by a pattern that exceeds a specified limit. When you need to see what is happening around a troublesome glitch or hardware interrupt signal, use glitch or edge triggering.

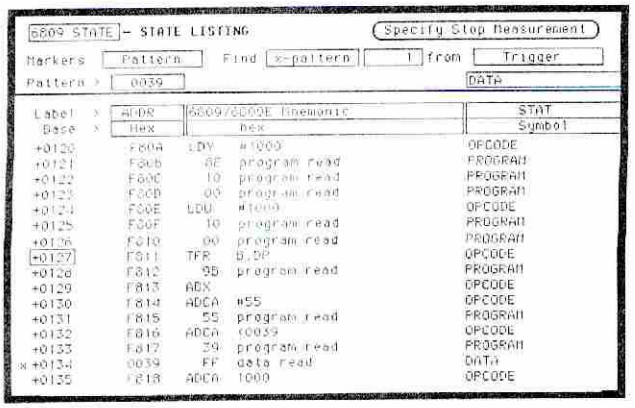
### Focus on the Information You Need

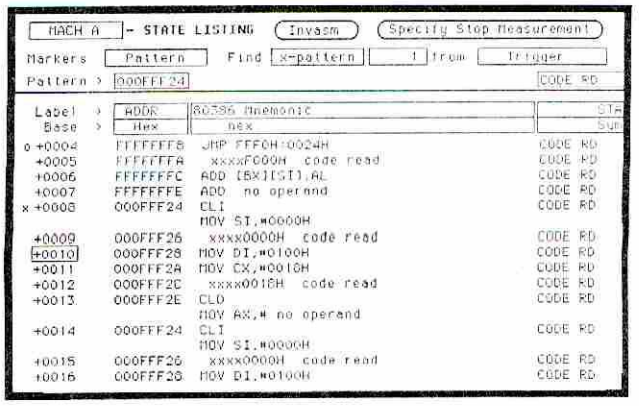
The HP 1650A/1651A/16510A's complex state triggering filters out unnecessary data and provides a listing of the crucial data:

- 5 clock inputs/clock qualifiers allow your system to determine when the analyzer takes a sample.
- Storage qualification allows you to specify which states are stored in memory.
- 8 sequence levels determine the sequence of states required for trigger and help you to focus on a specific area of code execution.
- 8 pattern recognizers, 1 range recognizer or logical combinations of these are used to identify states that are stored.
- Tagging keeps track of the amount of time or the number of states between stored states.
- Enable/Disable can be used to restrict storage to the activity of a specific routine.
- Prestore stores two qualified states that precede the states that are normally stored.

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**Model 1650A, 1651A**




Motorola 6809 state listing and Intel 80386 state listing, both with inverse assembly.

### Debug Designs that Use Today's Most Popular Microprocessors

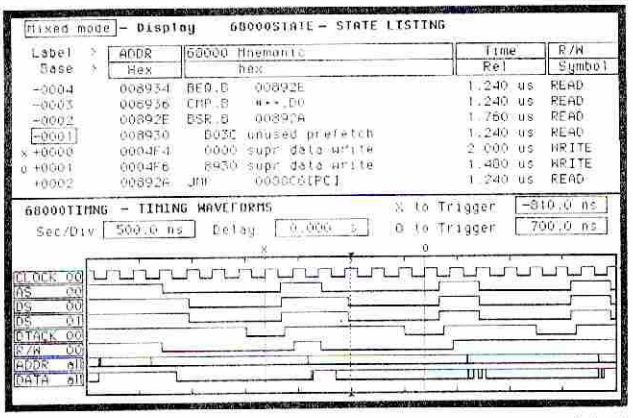
HP's preprocessors tailor the HP 1650A/1651A/16510A to microprocessors from Intel, Motorola, Zilog, and National. These preprocessors simplify hookup by plugging directly into the CPU's socket. Companion software converts the acquired state data into microprocessor mnemonics, making it easy to monitor program execution.

For designs that use custom or proprietary CPUs, you can use the HP 10320C User-definable Interface to connect the HP 1650A/1651A/16510A to your system. The HP 10391A Inverse Assembler Development Package can be used to develop custom software that converts the acquired state data into your CPU's mnemonics.

### View Time-correlated Activity of Two Parts of Your System

The HP 1650A/1651A/16510A can be configured into two independent state analyzers, or one state and one timing analyzer. Measurements that might have required two instruments before can now be made with one instrument.

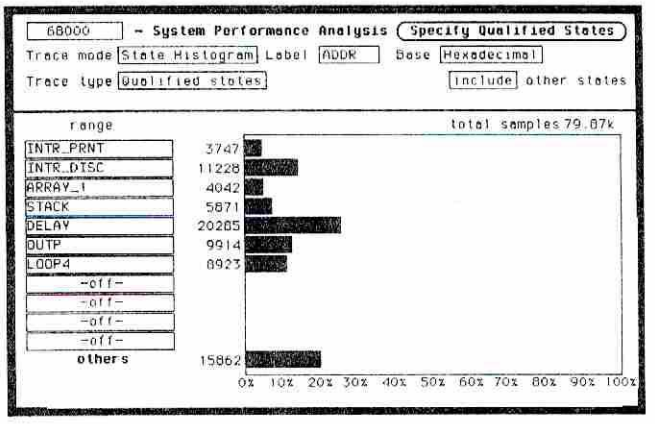
For example, by using the state analyzer to focus on a specific I/O routine, you can watch both the program execution and the activity on the I/O lines with a time correlated display. Or, when you need to examine the interaction of two microprocessors, the HP 1650A/1651A/16510A can display time-correlated state listings.




Make simultaneous measurements in both the state and timing domains.

### Identify Performance Bottlenecks with System Performance Analysis

The HP 10390A System Performance Analysis software adds three measurements to the HP 1650A/1651A/16510A. The State Histogram and State Overview measurements can display the intensity of activity in specific areas of memory or identify modules that are prime targets for optimization. The Time Interval measurement can be used to measure execution time of a module, time between calls to a module, or time between two different modules.




State Histogram . . . for characterizing the usage of software modules.

### Use Cross-Domain Triggering For Complex Measurements.

Use state to arm timing, or use timing to arm state when the symptom of a problem is best isolated with one analyzer and the cause is best isolated with the other. For example, track a microprocessor's program flow around a hardware interrupt by using the timing analyzer to find the edge of the interrupt signal. Then the timing analyzer can arm the state analyzer to acquire data.

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