HP 16600A and 16700A Series Logic Analysis System Mainframes

Product Overview

The Advantage of Insight

Debugging today’s digital systems is tougher than ever. Increased product requirements, complex software, and innovative hardware technologies make it difficult to meet your time-to-market goals.

As a digital designer, you need test equipment that quickly provides reliable insight into your toughest problems. That is why HP has combined logic analysis, emulation and software tools into one integrated system — to give you a complete view of your prototype, from signals to source code.

HP has a solution to help you completely outfit your team while providing budgetary flexibility. With HP’s scalable systems, you won’t waste money on features you’ll never use. And you won’t be faced with scrapping recently bought tools just because you changed microprocessors.

Figure 1. (left to right) The HP 16700A, 16702A and 16600A logic analysis systems.
## Key Features Overview

<table>
<thead>
<tr>
<th>Features</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scalable System</td>
<td>• Room to grow</td>
</tr>
<tr>
<td>• State/timing analyzers</td>
<td>• Select the optimum combination of performance, features, and price that you need for your specific application today, with the flexibility to add to your system as your measurement needs change.</td>
</tr>
<tr>
<td>• Oscilloscopes</td>
<td>• View system activity from signals to source code.</td>
</tr>
<tr>
<td>• High-speed timing</td>
<td></td>
</tr>
<tr>
<td>• Pattern generator</td>
<td></td>
</tr>
<tr>
<td>• Emulation module</td>
<td></td>
</tr>
<tr>
<td>Scalable System</td>
<td>• Room to grow</td>
</tr>
<tr>
<td>• State/timing analyzers</td>
<td>• Select the optimum combination of performance, features, and price that you need for your specific application today, with the flexibility to add to your system as your measurement needs change.</td>
</tr>
<tr>
<td>• Oscilloscopes</td>
<td>• View system activity from signals to source code.</td>
</tr>
<tr>
<td>• High-speed timing</td>
<td></td>
</tr>
<tr>
<td>• Pattern generator</td>
<td></td>
</tr>
<tr>
<td>• Emulation module</td>
<td></td>
</tr>
<tr>
<td>Timing Zoom Technology</td>
<td>• Simultaneously acquire data at up to 2 GHz timing and 333 MHz state through the same connection.</td>
</tr>
<tr>
<td>VisiTrigger Technology</td>
<td>• Use graphical views and sentence-like structure to help you define a trace event.</td>
</tr>
<tr>
<td></td>
<td>• Select trigger functions as individual trigger conditions or as building blocks to easily customize a trigger for your specific task.</td>
</tr>
<tr>
<td>Processor and Bus Support</td>
<td>• Get control over your microprocessor’s internal and external data.</td>
</tr>
<tr>
<td></td>
<td>• Quickly and reliably connect to the device under test. (See pg 10-11)</td>
</tr>
<tr>
<td>Post-Processing Analysis Tools</td>
<td>• Rapidly consolidate large amounts of data into displays that provide insight into your system’s behavior. (See pg 10)</td>
</tr>
<tr>
<td>Setup Assistant</td>
<td>• Quickly configure the logic analysis system for your target microprocessor. (See pg 5).</td>
</tr>
<tr>
<td>Tabbed Interface</td>
<td>• Groups like tasks together so you can quickly find and complete the task you want to perform.</td>
</tr>
<tr>
<td></td>
<td>• Spend your time solving problems, not setting up a measurement.</td>
</tr>
<tr>
<td>Multi-Windowed View of</td>
<td>• View your cross-domain measurements, time-correlated on the same screen. (See pg 5)</td>
</tr>
<tr>
<td>Target System Activity</td>
<td>• Debug faster because you can view system activity at a glance.</td>
</tr>
<tr>
<td>Global Markers</td>
<td>• Track a symptom in one domain (timing) to its cause in another domain (analog).</td>
</tr>
</tbody>
</table>

![Figure 2. Acquire state data at 333 MHz and timing data at up to 2 GHz through the same connection.](image)

![Figure 3. Configure your HP 16700A Series system for your specific application with modular mainframes.](image)
## Key Features Overview (cont.)

<table>
<thead>
<tr>
<th>Features</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Resizable Windows and Data Views             | - Magnify your view or zoom in on a boxed area of interest.  
- Resize waveforms and data or quickly change colors to highlight areas of interest.                                                                                                              |
| Web-Enabled System                            | - Directly access the instrument’s web page from your web browser. (See pgs. 6 & 7)  
- Remotely check the instrument’s measurement status without disturbing the acquisition.  
- Remotely access, monitor and control your logic analysis system.                                                                                                                                  |
| Direct Link to Microsoft® Excel via HP BenchLink XL 16700 | - Automatically move your data from the logic analyzer into Microsoft Excel with just a click of the mouse. (See pg 7)  
- Use Microsoft Excel's powerful functions to post-process captured trace data to get the insight you need.                                                                                     |
| Direct Links to Industry Standard Debuggers and High-Level Language Tools | - Debuggers provide visibility into software execution for systems running software written in C and C++ as well as active microprocessor execution control (run control). (See pg. 11)  
- Import symbol files created by your language tools. Symbols allow you to set up trigger conditions and review waveform and state listings in easily recognized terms that relate directly to the names used for signals on your target and the functions and variables in your code. |
| Direct Links to EDA Tools                     | - Use captured logic analysis waveforms to generate simulation test vectors.  
- Easily find problems by comparing captured waveforms with simulated waveforms.                                                                                                                   |
| Transfer Data for Offline Analysis - Data Export | - Fast binary (compressed binary) from the FileOut tool provides highest performance transfer rate.  
- ASCII format provides same format as listing display, including inverse-assembled data.                                                                                                          |
| Transparent File System Access               | - Access, transfer, and archive files.  
- Stay synchronized with your source code by mapping shared directories and file systems from your Windows 95/98/NT-based PC directly onto the logic analyzer and vice versa.  
- Move data files to and from the logic analyzer for archive or use elsewhere.                                                                                                                        |
| Documentation Capability                      | - Save graphics in standard TIFF, PCX, and EPS formats.  
- Print screen shots and trace listings to a local or networked printer.  
- Save your lab notes and trace data in the same file by entering relevant information in the Comments tab of the display.                                                                               |
| Remote Programming with Microsoft's COM Using Microsoft Visual Basic or Visual C++ | - Perform pass/fail analysis, stimulus response tests, data acquisition for offline analysis, and system verification and characterization tests.  
- Powerful-yet-efficient command set focuses on your programming tasks, resulting in a shorter learning curve while maintaining necessary functionality. (See pg. 14 for more information) |
| Network Security                              | - Protect your networked assets and comply with your company's security requirements with individual user logins that provide system integrity.                                                               |
Key Features

Modularity is the key to the HP 16600A and 16700A Series logic analysis systems’ long term value. You purchase only the capability you need now, then expand as your needs evolve. All modules are tightly integrated to provide time-correlated, cross-domain measurements.

Module Choices

State/Timing
HP offers a wide variety of state/timing modules to help you match your debug tools to your specific measurement needs. These modules include high-speed acquisition to capture glitches, wide channel counts to monitor all of the signals from a high-end processor system, and deep memory to capture elusive system crashes. See page 9.

Oscilloscope
Identify signal integrity issues and characterize signals quickly with automatic measurements of rise time, voltage, pulse width, and frequency.

High-Speed Timing
Precisely characterize setup/hold times over a wide channel count. Capture data over many clock cycles while retaining the highest multi-channel accuracy.

Pattern Generation
Use stimulus to substitute for missing system components or provide a stimulus-response test environment.

Emulation
The emulation module connects to the debug port (BDM or JTAG) on your target. You have full access to processor execution control features of the module through the built-in emulation control interface or a third-party debugger.

Table 1. HP 16600A and 16700A Series Supported Measurement Modules

<table>
<thead>
<tr>
<th>Measurement Module Category</th>
<th>HP Model Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>State and Timing</td>
<td>16717A</td>
<td>333 MHz state, 667 MHz timing, 2 GHz Timing Zoom, 2/4 M memory depth</td>
</tr>
<tr>
<td></td>
<td>16715A</td>
<td>1 GHz state, 500 MHz timing, 1/2 GHz Timing Zoom, 1/4 M memory depth</td>
</tr>
<tr>
<td></td>
<td>16716A</td>
<td>167 MHz state, 667 MHz timing, 2 GHz Timing Zoom, 512K memory depth</td>
</tr>
<tr>
<td></td>
<td>16715A</td>
<td>167 MHz state, 667 MHz timing, 2/4 M memory depth</td>
</tr>
<tr>
<td></td>
<td>16710A</td>
<td>1 GHz state, 500 MHz timing, 1/2 GHz Timing Zoom, 1/4 M memory depth</td>
</tr>
<tr>
<td></td>
<td>16712A</td>
<td>1 GHz state, 500 MHz timing, 2/4 M memory depth</td>
</tr>
<tr>
<td></td>
<td>16557A</td>
<td>1 GHz state, 500 MHz timing, 2/4 M memory depth</td>
</tr>
<tr>
<td></td>
<td>16556A/D</td>
<td>1 GHz state, 500 MHz timing, 2/4 M memory depth</td>
</tr>
<tr>
<td></td>
<td>16555A/D</td>
<td>1 GHz state, 500 MHz timing, 2/4 M memory depth</td>
</tr>
<tr>
<td></td>
<td>16554A</td>
<td>1 GHz state, 250 MHz timing, 512K memory depth</td>
</tr>
<tr>
<td></td>
<td>16550A</td>
<td>1 GHz state, 250 MHz timing, 4/8K memory depth</td>
</tr>
<tr>
<td>Oscilloscopes</td>
<td>16534A</td>
<td>2 channel, 500 MHz bandwidth</td>
</tr>
<tr>
<td></td>
<td>16533A</td>
<td>2 channel, 250 MHz bandwidth</td>
</tr>
<tr>
<td>High-Speed Timing</td>
<td>16517A/16518A</td>
<td>4 GHz timing, 1 GHz synchronous state, 64K memory depth (master/expander)</td>
</tr>
<tr>
<td>Pattern Generator</td>
<td>16522A</td>
<td>200 M vector/second pattern generator</td>
</tr>
<tr>
<td>Emulation</td>
<td>E9601A</td>
<td>Processor-specific device provides code download, register/memory modification, and processor control (including break, run, reset, single step)</td>
</tr>
</tbody>
</table>

1 Currently only supported in the HP 16700A Series.
Key Features (Cont.)

System Setup Is As Easy As a Mouse Click

Setup Assistant gets you up and running quickly.

<table>
<thead>
<tr>
<th>Target Manufacturer</th>
<th>Target Model Number</th>
<th>Product Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMD</td>
<td>EGA 256</td>
<td>5120</td>
</tr>
<tr>
<td>DEC</td>
<td>DEC 100</td>
<td>5120</td>
</tr>
<tr>
<td>IBM</td>
<td>3000</td>
<td>5120</td>
</tr>
<tr>
<td>Konrad &amp; Associates</td>
<td>K408</td>
<td>5120</td>
</tr>
<tr>
<td>Mosaic</td>
<td>Mosaic</td>
<td>5120</td>
</tr>
<tr>
<td>Vax</td>
<td>Vax 11</td>
<td>5120</td>
</tr>
</tbody>
</table>

If your target processor is not listed, click here.

Setup Assistant is a guided menu system that helps you configure the logic analysis system for your target microprocessor or bus. Online information guides you through the setup. (See Figure 5)

System Admin allows you to set up the instrument on your network, establish printers, set up user accounts for security, or update software quickly.

Demo Center provides simple demos of the most commonly-used features.

Help enables you to access the online User's Guide and measurement examples. The Help system includes full search and hypertext link capabilities.

See the Big Picture of Your Prototype System's Behavior

The large display with multiple, resizable windows on the HP 16600A and 16700A allows you to see at a glance more of your target system's operation. A built-in, flat-panel display in the HP 16702A fits in environments with limited space. Color lets you highlight critical information so you can find it quickly.

Use one tool to examine target operation from different perspectives. Multiple time-correlated views of data let you confirm both signal integrity and software execution flow. This is invaluable in solving cross-domain problems.

Demo Center provides simple demos of the most commonly-used features.

Figure 5. Setup Assistant gets you up and running quickly.

Figure 6. Icons in the power-up screen give you quick access to common tasks.

Figure 7. You can quickly isolate the root cause of system problems by examining target operation across a wide analysis domain, from signals to source code.
Expanding Possibilities with Network Connectivity

View and analyze the data anywhere, anyplace, anytime

Web-enabled instrumentation gives you the freedom to access the system—anywhere, anytime. Have you ever needed to check on a measurement's status while you were in a remote location? Now you can!

With a Web Enabled Logic Analysis System You Can...

...access the logic analysis system's web page from your browser by typing in the logic analysis system's URL (hostname or IP address).

...access HP's web site for the latest online manuals and technical information.

...quickly check instrument status to determine if the analyzer is available for use.

...remotely check current measurement status to find out if the system has triggered.

...access the analyzer's user interface directly from within your browser, giving you full control of all analyzer functions.

...install HP Benchlink XL 16700 to seamlessly transfer data from the analyzer to the PC.

When your logic analysis system is connected to your company's Intranet, you can directly access its web page from your web browser, whether you're in the office, at home, or at another site. Working from multiple locations has never been this convenient.

The HP 16700A Series Logic Analysis System

Welcome to the home page for your HP Logic Analysis System. Once connected, you can remotely control the instrument as well as upload measurement data into PC applications for further post-processing and analysis.

Current Status
Instrument: 16512b
IP address: 13.6.252.141
User name: aplogic

Current Measurement Status

Connect To Shared Remote Front Panel

The logic analyzer allows you to control and manipulate the front panel user interface remotely. Clicking on either the "browser" button or "X-window" button below (depending on how you would like the remote front panel to be displayed) allows you to do this. Note: When controlled via a remote connection, the logic analyzer automatically allows others to share the front panel view. This makes it easy for you to have colleagues connect to your logic analyzer from their computers to view your analysis results.

Browser
Your instrument's interface is displayed in a Java applet window. Use this if you are running on a PC and want to remotely control your instrument using either Netscape 4.0 or Internet Explorer 4.0 (or later). Please see the hardware requirements for a recommended PC hardware configuration.

X-Window
By pressing the "X Window" button, your instrument's interface is displayed in an X-Window. Use this if you have a UNIX workstation and want to remotely control your instrument. You may also choose this option if you have an X-Window software package on your PC and wish to use it.

Install HP Benchlink XL 16700

HP BenchLink XL 16700 gives you the ability to quickly transfer data from your logic analyzer into Microsoft Excel spreadsheet. This software can be installed directly from this analyzer onto your PC.

Advanced

The Advanced page has useful functions for advanced users. You can contact a service to abort the analyze from the page.
Remote Control Helps to Improve the Efficiency of Your Debug Efforts.

Check up on long duration measurements to determine if you need to change a trigger specification or save captured data to a file.

Simultaneously share your measurement results with other team members in different locations. Work concurrently to make real-time decisions and solve problems.

Remotely access the target control port to reset the target, then set up a different measurement and start another acquisition.

**Figure 9.** From your web browser, you have full remote control of all logic analyzer functions.

---

HP BenchLink XL 16700 Moves Your Data Automatically into Microsoft Excel for Advanced Offline Analysis

Use the HP BenchLink XL 16700 tool bar to connect to an HP logic analysis system. Select from the available labels and specify the destination cell location in Excel.

Import data from the current acquisition or data previously saved to a file via the File Out tool.

Use Microsoft Excel’s powerful functions to post-process captured trace data for the insight you need.

**Figure 10.** Transfer data into Excel with just a click of the mouse.
Table 2. Top-Level Comparison of the HP 16700A and 16600A Series Mainframes

<table>
<thead>
<tr>
<th>Mainframe–HP Model</th>
<th>16700A</th>
<th>16702A</th>
<th>16600A/16601A/16602A/16603A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slots for measurement modules</td>
<td>5 (10 total with HP 16701A expansion frame)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Built in state/timing channels</td>
<td>None</td>
<td>None</td>
<td>204, 136, 102, 68</td>
</tr>
<tr>
<td>Number of emulation module slots</td>
<td>2 (4 total with HP 16701A expansion frame)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>HP 16701A expansion frame support</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Built-in display</td>
<td>No</td>
<td>800 x 600, 10.3&quot;</td>
<td></td>
</tr>
<tr>
<td>External monitor supported</td>
<td>1280 x 1024 std., 1600 x 1200 opt. 003, or remote via web browser or X-windows</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Built-in Logic Analysis Capability of the HP 16600A Series Analyzers

<table>
<thead>
<tr>
<th>HP Models</th>
<th>16600A</th>
<th>16601A</th>
<th>16602A</th>
<th>16603A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum state clock</td>
<td>100 MHz</td>
<td>100 MHz</td>
<td>100 MHz</td>
<td>100 MHz</td>
</tr>
<tr>
<td>Maximum timing sampling rate (full/half channels)</td>
<td>125/250 MHz</td>
<td>125/250 MHz</td>
<td>125/250 MHz</td>
<td>125/250 MHz</td>
</tr>
<tr>
<td>Memory depth (full/half channels)</td>
<td>64/128 K</td>
<td>64/128 K</td>
<td>64/128 K</td>
<td>64/128 K</td>
</tr>
<tr>
<td>Channels supported</td>
<td>204</td>
<td>136</td>
<td>102</td>
<td>68</td>
</tr>
<tr>
<td>Supports context store</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Setup/hold time</td>
<td>0/4.5 ns to 4.5/0 ns adjustable in 500 ps increments</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Increased memory depth in half channel timing mode only.

Selecting a System that’s Right for You

The following pages describe the components available to configure a system that meets your digital debug needs. For a list of all supported measurement modules for the HP 16600A and 16700A Series mainframes, refer to page 4.

Your mainframe and measurement module selection depends on:
- Desired mainframe form factor
- Availability of extra slots for future measurement capabilities
- Number of state/timing analysis channels needed
- Additional measurement/analysis capabilities: oscilloscope, pattern generator, high-speed timing, emulation, microprocessor and bus support, and post-processing analysis software
- Accessories
- Service and support
- Budget

Available Mainframes

The HP 16700A Series platform is a modular system that can change as your needs grow. You decide which state and timing analysis module(s) you want, then you add other measurement modules to meet your debug needs.

The HP 16600A Series logic analysis system offers built-in state and timing capabilities from 68 to 204 channels. These channel configurations are fixed. However, each frame contains one expansion slot for additional measurement capability, such as an oscilloscope, pattern generator, or analysis module.

With Context Store, Capture Infrequent Problems Every Time They Occur

The HP 16600A Series mainframes and the HP 16710A, 16711A, and 16712A measurement modules support advanced state and timing acquisition technology, including context store.

Using context store, you can store the events that occur before and after a specific trigger condition in a time window centered approximately around an event. Trace memory is filled only with data that is specific to the measurement you want to make.

Hardware engineers can use context store when searching for the cause of events that occur infrequently or randomly in time, but that seem to be correlated to specific conditions, such as interrupts or writes to certain address ranges.

When you are debugging software or trying to determine if the cause of a problem is in the hardware or software, context store makes it easy to identify the cause of memory and pointer corruption problems without having to sort through large amounts of trace data.
Available State and Timing Analysis Measurement Modules

HP offers logic analysis modules that vary in channel count, acquisition speed, and memory depth so that you can select the capability that meets your needs as well as your budget.

The Speed and Triggering You Need for Tomorrow, Available Today

HP Timing Zoom Technology (HP 16716A and 16717A) Enables You To:
• Simultaneously acquire up to 2 GHz timing and 333 MHz state data across all channels, all the time, through the same connection
• Vary the Timing Zoom sample rate from 250 MHz to 2 GHz
• Capture 16K memory depth
• Vary the placement of Timing Zoom data around the trigger point
• Efficiently characterize hardware with 500 ps resolution

HP VisiTrigger Technology (HP 16715A, 16716A and 16717A) Lets You:
• Use graphical views and sentence-like structure to help you define a trace event.
• Select trigger functions as individual trigger conditions or as building blocks to easily customize a trigger for your specific task.
• Set global counters to count events such as the number of times a function executes, or the number of accesses to an I/O port.
• Set, clear or evaluate flags by any module in the frame. Flags allow you to set up a trigger that is dependent on activity from more than one bus in the system.
• Specify four-way arbitrary IF/THEN/ELSE branching.

Table 4. New State and Timing Modules

<table>
<thead>
<tr>
<th>NEW HP Models</th>
<th>16715A</th>
<th>16716A</th>
<th>16717A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum state clock (MHz)</td>
<td>167</td>
<td>167</td>
<td>333</td>
</tr>
<tr>
<td>Maximum state clock sample rate (full/half channels)</td>
<td>333/667 MHz</td>
<td>333/667 MHz</td>
<td>333/667 MHz</td>
</tr>
<tr>
<td>Memory depth (full/half channels)</td>
<td>2/4 M</td>
<td>512K/1 M</td>
<td>2/4 M</td>
</tr>
<tr>
<td>Channels/module</td>
<td>68</td>
<td>68</td>
<td>68</td>
</tr>
<tr>
<td>Maximum channels on a single time base</td>
<td>340</td>
<td>340</td>
<td>340</td>
</tr>
<tr>
<td>Maximum channels in an HP 16700 Series system with an HP 16701A</td>
<td>880</td>
<td>880</td>
<td>880</td>
</tr>
<tr>
<td>Setup/hold time</td>
<td>4.5/-2.0 ns to -2.0/4.5 ns in 100 ps increments</td>
<td>4.5/-2.0 ns to -2.0/4.5 ns in 100 ps increments</td>
<td>4.5/-2.0 ns to -2.0/4.5 ns in 100 ps increments</td>
</tr>
</tbody>
</table>

1 Increased memory depth in half channel timing mode only.
2 Minimum setup/hold time specified for single edge, single clock acquisition. Multi-clock, multi-edge add 0.5 ns.
3 Minimum setup/hold time specified for single edge, single clock acquisition. Single clock, multi-edge setup/hold window is 5.0 ns. Multi-clock, multi-edge setup/hold window is 5.5 ns.
Post-Processing Tool Sets Provide Rapid Insight Into Your Toughest Debug Problems

When you want to really understand what your target is doing and why, you need to be able to view acquisition results in a format that quickly guides you to problem identification.

Each tool set described in Table 6 is an optional post-processing software package for the HP 16600A and 16700A Series logic analysis systems. The tool sets offer you a variety of views of the same real-time data to give you insight into your specific application.

Speed Problem Solving with Off-the-Shelf Solutions for Many Common Microprocessors

To help you design and debug your microprocessor-based target systems, HP offers different microprocessor specific products that let you get control and visibility over your microprocessor’s internal and external data.

An analysis probe allows you to quickly connect an HP logic analyzer to your target system. The analysis probe provides non-intrusive capture and disassembly of microprocessor and bus activity.

Analysis probes are available for over 200 microprocessors and microcontrollers. Bus probes allow probing of popular bus architectures such as PCI, AGP, USB, VXI, SCSI, and many others.

Flexible physical probing schemes give quick and reliable connections to almost any device on your prototype.

Table 6. Optional Software Tool Sets for the HP 16600A and 16700A Series Mainframes.

<table>
<thead>
<tr>
<th>Application</th>
<th>Product Name</th>
<th>HP Model Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debug your real-time code at the source level.</td>
<td>Source Correlation Tool Set</td>
<td>B4620B</td>
</tr>
<tr>
<td>Correlate the logic analyzer trace with the high-level source code that produced it. Set up the logic analyzer trace by simply pointing and clicking on a line of source code.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customize your trace for greater insight.</td>
<td>Tool Development Kit</td>
<td>B4605B</td>
</tr>
<tr>
<td>Create custom tools using the C programming language. Custom tools can analyze captured data and present it in a form that makes sense to you. Analysis systems do not require the Tool Development Kit to run generated tools.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optimize your system’s performance.</td>
<td>System Performance Analysis Tool Set</td>
<td>B4600B</td>
</tr>
<tr>
<td>Profile your system’s performance to identify system bottlenecks and to identify areas needing optimization.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solve your serial communication problems.</td>
<td>Serial Analysis Tool Set</td>
<td>B4601B</td>
</tr>
<tr>
<td>Convert serial bit streams to parallel format for easy viewing and analysis. Supports serial data with or without an external clock reference and protocols that use bit stuffing to maintain clock synchronization. Works at speeds up to 1 GHz.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 11. HP analysis probes (formerly known as preprocessors) make it easy to connect a logic analyzer to your target system.
On-Chip Emulation Tools Make Fixing Bugs Easier

For specific microprocessor families that feature on-chip emulation, you can add an emulation module to your system to connect the on-board debugging resources of the microprocessor to the logic analysis system.

The microprocessor’s BDM or JTAG technology provides control over processor operation even if there is no software monitor on the target system. This feature is particularly helpful during the development of your target system’s boot code.

Emulation Control Interface

The emulation control interface is accessed from the power up screen of the HP 16600A or 16700A Series system. The interface is included standard for those microprocessors supported with the HP E5901A emulation module.

Designed for hardware engineers, this generic graphical user interface provides the following features:

- Control over processor execution: run/break/reset/step
- Register display/modification
- Memory display/modification in various formats including disassembly for code visualization. Memory modification or memory block fill can be done to check processor memory access or to reinitialize memory areas.
- Multiple breakpoint configuration: hardware, software, and processor internal breakpoint registers.
- Code download to the target
- Command scripts to reproduce test sequences.
- The ability to trigger a measurement module on a processor break or receive a trigger from the logic analysis system’s measurement modules.

Integrated Debugger Support

When the hardware turn-on phase is completed, the same HP emulation module can be connected to high-level debuggers for C or C++ software development.

You can achieve the functionality of a full-featured emulator by using a third-party debugger to drive the installed HP emulation module. This gives you active and complete microprocessor execution control (run control).
HP 1184A Testmobile

The HP 1184A testmobile gives you a convenient means of organizing your HP logic analysis system mainframes and accessories.

The testmobile includes the following:
• Drawer for accessories (probes, cables, power cords)
• Keyboard tray with adjustable tilt and height
• Mouse extension on keyboard tray accommodates either right or left hand operation
• Locking casters for safety on uneven surfaces
• Strap provided to stabilize the monitor
• Load limits:
  Top tray: 68.2 kg (150.0 lb.)
  Lower tray: 68.2 kg (150.0 lb.)
  Total: 136.4 kg (300.0 lb.)

Figure 13. HP 1184A testmobile cart

Weight

<table>
<thead>
<tr>
<th>Max Net</th>
<th>Max. Shipping</th>
</tr>
</thead>
<tbody>
<tr>
<td>48.0 kg (106.0 lb)</td>
<td>59.0 kg (130.0 lb)</td>
</tr>
</tbody>
</table>

Figure 14. HP 1184A testmobile cart dimensions. Dimensions: mm (inches).

HP Support and Services

HP’s family of support services complements your logic analysis system to provide a complete solution. HP’s expertise allows you to concentrate on your particular design projects and applications, rather than your debug tools, resulting in increased productivity.

HP can provide consulting to assist in making specific measurements, applying debug techniques, and understanding the issues related to specific processors. On-site assistance can be provided for initial turn-on of your target system. Contact your local HP representative for more information on HP consulting services available in your area.

HP training courses include extensive hands-on and are designed to pay off immediately in real-world situations. HP training can be delivered through scheduled classes, on-site classes, or one-on-one consulting. For training offered in your geography and language, consult the HP test and measurement education web site: http://www.hp.com/go/tmeducation

HP on-line support professionals can help you better use digital system debug tools to maximize your investment and minimize your debug time. Operational verification and standard measurement assistance can be provided via various methods including phone, fax, e-mail, or web.

The standard warranty for your system may be enhanced via a return-to-HP warranty extension, a conversion to on-site warranty, installation services, and calibration services.
System Software

All features and functionality described in this document are available with system software version A.01.40.00

Mass Storage

- Hard Disk Drive - 4 GB formatted disk drive
  - Floppy Disk Drive - 1.44 MB formatted floppy media
  - Formats: MS-DOS (Read, write, format), LIF (Read only)

Internal System RAM

- Standard - 64 MB
  - Option 003 (Must be ordered at time of frame purchase) - 160 MB total

Supported Monitor Resolutions

- Standard - 640 x 480 through 1280 x 1024
  - (The HP 16702A has a built-in 800 x 600, 10.3" (26.2mm) diagonal monitor.)
  - Option 003 (Must be ordered at time of frame purchase) - Adds support for up to 1600 x 1200

LAN, IEEE 802.3

- Physical Connectors: 10BaseT (Ethernet RJ-45), 10Base2 (Thinlink): BNC
- Protocols Supported: TCP/IP, NFS, CIFS (Windows® 95/98/NT)
- FTP, NTP, PCNFS

X-Window Support

- X Window system version 11, release 6, as a client and server

Web Server

Measurement status check, remote display, installation of PC application software, link to HP's Test and Measurement site

PC Requirements

- Pentium® (family) PC (200 MHz, 32 MB RAM) running Windows 95, Windows 98, or Windows NT 4.0 with service pack 3 or higher

Supported Web Browsers (on Your PC or Workstation)

- Internet Explorer 4.0 or higher, Netscape 4.0 or higher

HP BenchLink XL 16700 Support

Installation of PC Application Software

- Directly from instrument web page

Microsoft Excel 97

- Version 7.0 or higher
- Excel limits maximum trace depth to 64K per sheet.

Available Data Formats

- Fast Binary (Compressed Binary Format)
- Uncompressed Binary
  - Includes utility routines. Available via RPI.
- ASCII
  - Provides same format as listing display, including inverse-assembled data. Available via RPI and File Out.

Intermodule Bus (IMB)

- Time Correlation
  - 2ns (HP 16704A and 16702A only)

Port In/Out

- Connectors: 9 pin

Port In

- Levels: TTL, ECL, or user defined
- Input Resistance: 4.7 kΩ
- Input Voltage: -6V at -1.5 mA to +6V at 1.6 mA

Port Out

- Levels: 3V TTL compatible into 50Ω
- Functions: Latched (latch operation is module dependent)
  - Pulsed, width from 66 ns to 143 ns

Target Control Port

- Number of signals: 8
- Levels: 3V TTL compatible
- Connector: 2 rows of 5 pins, 0.1-inch centers

Operating Environment

- Temperature: 0 °C to 50 °C (32 °F to 122 °F)
- Disk Media: 10 °C to 40 °C (50 °F to 104 °F)
- Probes/cables: 0 °C to 65 °C (32 °F to 149 °F)
- Altitude: To 3000m (10,000 ft)
- Humidity: 8 to 90% relative humidity at 40 °C (104 °F)

Printing

- Printer Interface: Parallel interface for Centronics compatible printers
- Supported Printers: PostScript® printers and printers that support the HP Printer Control Language (PCL)
- Graphics: Graphics can be printed directly to the printer or to a file. Graph files can be created in black-and-white or color TIFF format, PostScript, PCX, or XWD formats.

1 User and share level control supported for Windows NT 4.0. Share level control only supported for Windows 95/98.
## HP Remote Programming Interface (RPI)

### HP RPI Overview

**Typical Applications**
- Manufacturing Test
- Data Acquisition for Offline Analysis
- System Verification and Characterization
- Pass/Fail Analysis
- Stimulus Response Tests

**Remote Programming Steps**
1. Set up the logic analyzer and save the test configuration.
2. Create a program that remotely enables you to:
   - Load a test configuration
   - Start the acquisition process
   - Check measurement status (verify completion)
   - Act on the results of the data acquisition
     - Save configuration and captured data
     - Export data
     - Execute a compare
     - Modify the trigger setup or trigger value for the next acquisition
     - Access oscilloscope’s automatic measurements

### Physical Connection
Remote programming is done via the LAN connection.

### Requirements

#### HP 16600A and 16700A Series
- HP RPI is standard with HP 16600X-700X system software version 16700A Series A.01.30.00 or higher

#### PC
- Programming is done via Microsoft® ActiveX/COM automation
  - Pentium (family) PC with one of the following:
    - Windows 95
    - Windows 98
    - Windows NT 4.0 w/ Service Pack 3 or higher
    - Visual Basic or Visual C++ (Version 5.0 or higher)

#### Unix
- Programming is done via procedural commands

### Command Set Overview

#### System
- System Configuration Query,
- Load/Save Configuration and Data,
- Start/Stop Measurement,
- Current Run Status

#### Logic Analysis Modules
- Load/Save Configuration and Data,
- Trigger Setup,
- Acquisition Data and Parameters

#### Oscilloscope Modules
- Load/Save Configuration and Data,
- Trigger Setup,
- Acquisition Data and Parameters,
- Query Automatic Measurements

#### Pattern Generator
- Load/Save Configuration and Data,
- Load ASCII file (vectors),
- Modify Vector

#### Emulation Module
- Reset Processor,
- Run Processor,
- Break Processor,
- Single Step

#### Listing Tool
- Status,
- Acquisition Data and Parameters,
- Transfer Data (includes inverse assembled information)

#### Compare Tool
- Execute Compare,
- Set Compare Mask,
- Query Compare Result

#### File Out Tool
- Transfer Data to File

### Additional Information

#### Instrument Online Help
- Programming information in instrument online help

#### Web Sites
- Full remote programming documentation (pdf) available on the hard drive.
  - Sample programs are provided.
Supplemental Characteristics for the HP 16600A, 16601A, 16602A, and 16603A

Probes

<table>
<thead>
<tr>
<th>Minimum voltage swing</th>
<th>500 mV peak-to-peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threshold range</td>
<td>±6.0 V, adjustable in 50 mV increments</td>
</tr>
</tbody>
</table>

State Analysis

| Setup/hold time | 4.5/0 ns through 0/4.5 ns adjustable in 500 ps increments |
| Minimum state clock width | 3.5 ns |
| State clock/qualifiers | 6/6 (HP 16600A/16601A/16602A) |
| 4/4 (HP 16603A) |
| Time tag resolution | 8 ns |
| Maximum time count between states | 39 hours |
| Number of machines available | 2 state or 1 state/1 timing (HP 16600A, 16601A, 16602A) |
| 1 state or 1 timing (HP 16603A) |
| Context Store block sizes | 16/32/64 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) |

Triggering

| Maximum sequencer speed | 100 MHz |
| State sequence levels | 12 |
| Timing sequence levels | 10 |
| Maximum occurrence counter value | 1,048,575 |
| Pattern recognizers | 10 |
| Range recognizers | 2 |
| Range width | 32 bits each |
| Timers | 2 |
| Timer value range | 400 ns to 500 seconds |

1 Minimum setup/hold time specified for single-edge, single clock acquisition. Single-clock multi-edge setup/hold window is 5 ns. Multi-clock, multi-edge setup/hold window is 5.5 ns. All setup/hold windows are adjustable in 500 ps increments.

---

Figure 15. Equivalent probe load for the general-purpose lead set.
HP 16600A Series
Physical Characteristics

Figure 16. HP 16600A Series front panel

Figure 17. HP 16600A Series rear panel

Figure 18. HP 16600A Series exterior dimensions. Dimensions: mm (inches).

Power

<table>
<thead>
<tr>
<th>Model</th>
<th>Voltage Range</th>
<th>Power Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP 16600A</td>
<td>115/230 V, 48 to 66 Hz</td>
<td>285 W max</td>
</tr>
<tr>
<td>HP 16601A</td>
<td>115/230 V, 48 to 66 Hz</td>
<td>285 W max</td>
</tr>
<tr>
<td>HP 16602A</td>
<td>115/230 V, 48 to 66 Hz</td>
<td>285 W max</td>
</tr>
<tr>
<td>HP 16603A</td>
<td>115/230 V, 48 to 66 Hz</td>
<td>285 W max</td>
</tr>
</tbody>
</table>

Weight*

<table>
<thead>
<tr>
<th>Model</th>
<th>Max Net</th>
<th>Max Shipping</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP 16600A</td>
<td>10.0 kg (22.1 lb)</td>
<td>25.2 kg (55.6 lbs)</td>
</tr>
<tr>
<td>HP 16601A</td>
<td>10.0 kg (22.1 lb)</td>
<td>25.2 kg (55.6 lbs)</td>
</tr>
<tr>
<td>HP 16602A</td>
<td>10.0 kg (22.1 lb)</td>
<td>25.2 kg (55.6 lbs)</td>
</tr>
<tr>
<td>HP 16603A</td>
<td>10.0 kg (22.1 lb)</td>
<td>25.2 kg (55.6 lbs)</td>
</tr>
</tbody>
</table>

* Weight of module ordered with mainframes will add 0.9 kg (2.0 lb) per module.
HP 16700A Series
Physical Characteristics

Power

<table>
<thead>
<tr>
<th>Model</th>
<th>Voltage</th>
<th>Frequency</th>
<th>Wattage</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP 16700A</td>
<td>115/230 V, 48 to 66 Hz</td>
<td></td>
<td>545 W max</td>
</tr>
<tr>
<td>HP 16701A</td>
<td>115/230 V, 48 to 66 Hz</td>
<td></td>
<td>610 W max</td>
</tr>
<tr>
<td>HP 16702A</td>
<td>115/230 V, 48 to 66 Hz</td>
<td></td>
<td>610 W max</td>
</tr>
</tbody>
</table>

Weight*

<table>
<thead>
<tr>
<th>Model</th>
<th>Net Weight</th>
<th>Shipping Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP 16700A</td>
<td>12.7 kg (27.0 lb)</td>
<td>34.2 kg (75.4 lbs)</td>
</tr>
<tr>
<td>HP 16701A</td>
<td>10.4 kg (23.0 lb)</td>
<td>32.0 kg (70.6 lbs)</td>
</tr>
<tr>
<td>HP 16702A</td>
<td>15.2 kg (32.4 lb)</td>
<td>36.7 kg (80.8 lbs)</td>
</tr>
</tbody>
</table>

* Weight of modules ordered with mainframes will add 0.9 kg (2.0 lb) per module.

Figure 19. HP 16702A front panel

Figure 20. HP 16700A and 16702A rear panel

Figure 21. HP 16700A, 16701A and 16702A exterior dimensions. Dimensions: mm (inches).
## Table 7. Mainframes and Testmobile

<table>
<thead>
<tr>
<th>Product #</th>
<th>Description</th>
<th>Includes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HP 16700A 1</strong></td>
<td>Modular frame with five measurement module slots and two emulation module slots.</td>
<td>One DIN keyboard, One three-button DIN mouse, One ten-conductor, flying-lead cable for target control port, Training kit, Two 17-conductor flying-lead probe cables (HP 16600A Series only)</td>
</tr>
<tr>
<td><strong>HP 16702A 1</strong></td>
<td>Modular frame with built-in 800 x 600 LCD display, five measurement module slots and two emulation module slots.</td>
<td></td>
</tr>
<tr>
<td><strong>HP 16600A Series 1, 2</strong></td>
<td>Built-in logic analyzer, 1 measurement module slot, 1 emulation module slot, HP 16600A – 204 channels, HP 16601A – 136 channels, HP 16602A – 102 channels, HP 16603A – 68 channels</td>
<td></td>
</tr>
<tr>
<td><strong>HP 16701A</strong></td>
<td>Expansion frame with five measurement module slots and two emulation module slots. Requires HP 16700A or 16702A</td>
<td>1 ft. and 3 ft. interface cables</td>
</tr>
<tr>
<td><strong>HP 1184A</strong></td>
<td>Testmobile†</td>
<td>Drawer, keyboard tray, mouse tray, strap for stabilizing monitor</td>
</tr>
</tbody>
</table>

**RECOMMENDATIONS:**

1. For HP 16700A and all 16600A Series mainframes, order a monitor (option 001) and at least one CD-ROM drive (option 004). For the HP 16702A, order at least one CD-ROM drive (option 004). The CD-ROM drive is necessary to install future system software upgrades.
2. Each HP 16600A Series mainframe includes two sets of 17-channel probe leads (34 channels total). If you require additional pairs of probe leads, order option 010.

## Table 8. Mainframe Options

<table>
<thead>
<tr>
<th>Option #</th>
<th>Description</th>
<th>HP 16700A or 16702A</th>
<th>HP 16701A</th>
<th>HP 16600A Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>Add 17-inch 1280 x 1024 monitor and cable</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>003</td>
<td>Performance system upgrade — 160 Mbyte total system RAM, 2 Mbyte total video RAM. (Must order at time of frame purchase)</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>004</td>
<td>Add CD-ROM drive</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>010</td>
<td>Add two sets of 17-channel probe leads (34 channels)</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>083</td>
<td>Add service guide</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1CM</td>
<td>Add rack-mount kit</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>A6J</td>
<td>Japanese Localization</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>W17</td>
<td>Convert one year return-to-HP warranty to one year on-site warranty</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>W30</td>
<td>Extend standard warranty to three year return-to-HP warranty</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>W50</td>
<td>Extend standard warranty to five year return-to-HP warranty</td>
<td></td>
<td></td>
<td>√</td>
</tr>
</tbody>
</table>
Table 9. Related HP Literature

Refer to the documents below for more information on HP logic analysis systems and accessories.

<table>
<thead>
<tr>
<th>Publication Title</th>
<th>Publication Type</th>
<th>HP Publication Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>State and Timing Analyzers for HP Logic Analysis Systems</td>
<td>Product overview</td>
<td>5966-3367E</td>
</tr>
<tr>
<td>Oscilloscope Modules for HP Logic Analysis Systems</td>
<td>Product overview</td>
<td>5966-3150E</td>
</tr>
<tr>
<td>HP 16522A 200 MVector/sec Pattern Generator Module</td>
<td>Product overview</td>
<td>5964-2250E</td>
</tr>
<tr>
<td>Processor and Bus Support for HP Logic Analyzers</td>
<td>Configuration guide</td>
<td>5966-4365E</td>
</tr>
<tr>
<td>Post-processing Tool Sets</td>
<td>Product overview</td>
<td>5966-3147E</td>
</tr>
<tr>
<td>Probing Solutions for HP Logic Analysis Systems</td>
<td>Product overview</td>
<td>5968-4632E</td>
</tr>
</tbody>
</table>

Warranty

HP hardware products are warranted against defects in materials and workmanship for a period of one year from date of shipment. If you send us a notice of such defects during the warranty period, we will either repair or replace hardware products that prove to be defective. Some newly manufactured HP products may contain remanufactured parts, which are equivalent to new in performance.

HP software and firmware products that are designated by HP for use with a hardware product are warranted for a period of one year from date of shipment to execute their programming instructions when properly installed. If you send us notice of defects in materials workmanship during the warranty period, we will repair or replace these products, so long as the defect does not result from buyer-supplied hardware or interfacing. The warranty period is controlled by the warranty statement included with the product and begins on the date of shipment.
For more information about the HP 16600A and 16700A Series logic analysis systems, visit our web site at: http://www.hp.com/go/las-data
For more information about Hewlett-Packard Test & Measurement products, applications, services, and for a current sales office listing, visit our web site at: http://www.hp.com/go/tmdir
You can also contact one of the following centers and ask for a test and measurement sales representative.

**United States:**
Hewlett-Packard Company
Test and Measurement Call Center
P.O. Box 4026
Englewood, CO 80155-4026
1 800 452 4844

**Canada:**
Hewlett-Packard Canada Ltd.
5150 Spectrum Way
Mississauga, Ontario
L4W 5G1
(905) 206 4725

**Europe:**
Hewlett-Packard
European Marketing Centre
P.O. Box 999
1180 AZ Amstelveen, The Netherlands
(31 20) 547 9900

**Japan:**
Hewlett-Packard Japan Ltd.
Measurement Assistance Center
9-1, Takakura-Cho, Hachioji-Shi,
Tokyo 192, Japan
Tel: (81) 426 56 7832
Fax: (81) 426 56 7840

**Latin America:**
Hewlett-Packard
Latin American Region Headquarters
5200 Blue Lagoon Drive
9th Floor
Miami, Florida 33126
U.S.A.
Tel: (305) 267-4245/4220
Fax: (305) 267-4288

**Australia/New Zealand:**
Hewlett-Packard Australia Ltd.
31-41 Joseph Street
Blackburn, Victoria 3130, Australia
Tel: 1 800 629 485 (Australia)
0800 738 378 (New Zealand)
Fax: (61 3) 9210 5489

**Asia Pacific:**
Hewlett-Packard Asia Pacific Ltd.
17-21/F Shell Tower, Times Square,
1 Matheson Street, Causeway Bay,
Hong Kong
Tel: (852) 2599 7777
Fax: (852) 2506 9285

Netscape is a U.S. trademark of Netscape Communications Corp.
Microsoft is a U.S. registered trademark of Microsoft Corp.
Pentium is a U.S. registered trademark of Intel Corp.
PostScript is a trademark of Adobe Systems Incorporated.
Windows 95, 98 and NT are U.S. registered trademarks of Microsoft Corp.
Unix is a registered trademark of the Open Group.

Technical information in this document is subject to change without notice.

Printed in the U.S.A. 05/99
5966-3107E