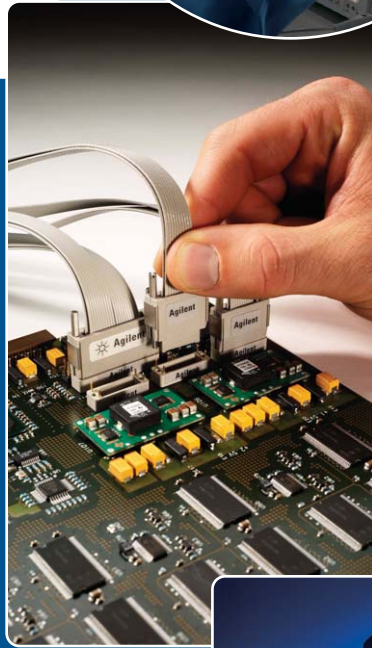




# Agilent Technologies 16900 Series Logic Analysis Systems



**Exceptional  
Performance**

**Intuitive User  
Interface**

**State of the  
Art Probing**

**All within  
Budget**



**Agilent Technologies**

## Get your leading-edge designs to market faster

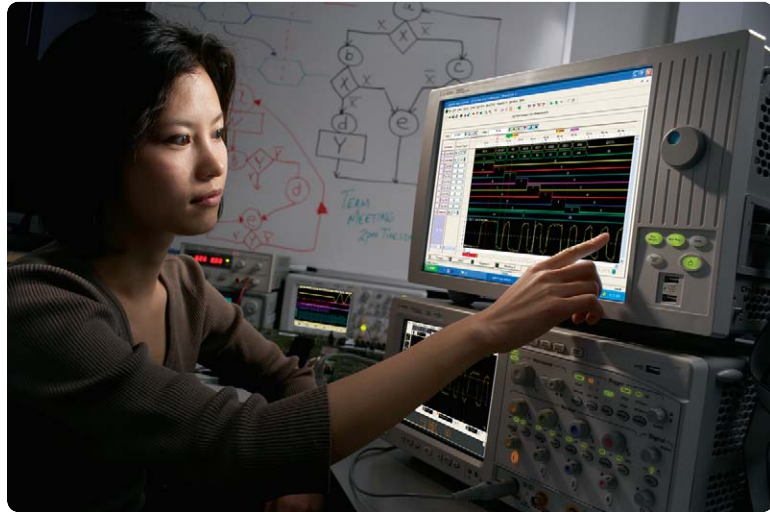
Debugging today's digital systems is tougher than ever. You need high-performance, reliable tools to help you overcome the difficult engineering challenges you face.

The 16900 Series logic analysis systems help you solve tough debug problems, minimize your project risk, and get your leading-edge products to market faster.

These systems provide excellent performance and accurate, reliable measurements – priced to match your budget. And, because you can't measure what you can't probe, we've used innovative probing technologies so you can access critical signals in your designs. These analyzers include the familiarity of Windows®, an intuitive graphical user interface and straightforward triggering capability – so you spend more time on design and debug and less time learning how to use them.

From our HP test and measurement foundation, Agilent's leadership in logic analysis spans four decades. Beginning with the creation of the logic analyzer in the 1970s, Agilent consistently delivers high-value products that keep pace with your latest designs and set the standard of price-performance and ease of use in the logic analysis market.

Now a new generation of logic analyzers, the Agilent 16900 Series logic analysis systems, deliver what you've come to expect from the industry leader in logic analysis...and more.



**Figure 1. Conquer your toughest debug problems with an Agilent 16900 Series logic analysis system.**

## Get the performance you need at a price to match your budget

The Agilent 16900 Series logic analysis systems deliver the power and performance you need to conquer your toughest debug problems.

The mainframe you select is the foundation of your system. The 16900 Series mainframes' multithreading software architecture takes full advantage

of gigabit local area networks (Gbit LANs) and the latest in multi-processor, large memory computer technology to achieve the fastest performance in the industry. They provide you with extremely rapid zooming, searching and scrolling updates for deep memory, high-channel count acquisitions.



**Figure 2. The 16900 Series logic analysis systems provide exceptional performance, usability and superior probing at prices to match your budget.**

Performance doesn't end with the mainframe. Agilent's 4 GHz timing zoom and eye finder technologies make accurate measurements on high-speed signals, so you can find critical problems that occur on the industry's fastest buses. You get accurate and reliable measurements, all time-correlated, for today's complex circuits, with expandability and performance headroom to cover future technology trends.

Agilent Model Number	16901A	16902B
Number of Slots	2	6
Multiframe Pro Expandability	Yes	Yes
Display Type(s) and Resolution	Built-in color touch screen display, 15 inch (38.1 cm), 1024 x 768; supports up to four external monitors up to 1600 x 1200 (with PCI video card)	Built-in color touch screen display, 15 inch (38.1 cm), 1024 x 768; supports up to four external monitors up to 1600 x 1200 (with PCI video card)
PCI Expansion Slots	1 full profile	1 full profile

**Table 1. Agilent modular 16900 Series mainframes.**

## Easily integrate the analyzer into your debug environment

In addition to performance, usability and excellent pricing, you also get flexibility. You can make measurements and analyze, store and share data according to your work style. Whether you work alone at a bench or with team members distributed around the world, the 16900 Series provides a use model that easily integrates into your debug environment.



Figure 3. Get the most comprehensive view of your data with extended desktop viewing using up to four monitors.

**Work at your bench** – operate the analyzer via touch screen or keyboard and mouse.

**Expand view across multiple monitors** – get the most comprehensive view of your data with extended desktop viewing using up to four monitors.

**Remotely control and monitor the logic analyzer** – access a remote logic analyzer over the network with hosted power mode or via built-in Windows desktop sharing. Receive an e-mail when the logic analyzer triggers.

**Comply with your company's network standards** – add anti-virus software to the open Windows-based analyzer.

**Use the power of your latest multiprocessor, deep memory PC or server** – increase your analyzer's usage and team's productivity. Use any Windows-based computer on the network to host the logic analyzer application software and remotely control the logic analyzer. View and analyze captured data on the PC while the logic analyzer makes additional measurements. You can also create setups for your next round of measurements.

**Run automated tests** – execute a series of tests via the ASCII remote programming interface or Microsoft® DCOM.

**Offload data for custom analysis** – move data quickly over the Gbit LAN connection to an external computer.

**Share results and setups easily, anywhere in the world** – transfer files to USB flash drives or to shared drives over high-speed LAN to share or archive results and setups with team members worldwide. Copy and paste data into other applications and document your findings.

**Combine mainframes to expand measurement capability** – use mainframes individually, then connect them together when you need to analyze complex, multiple-bus problems.

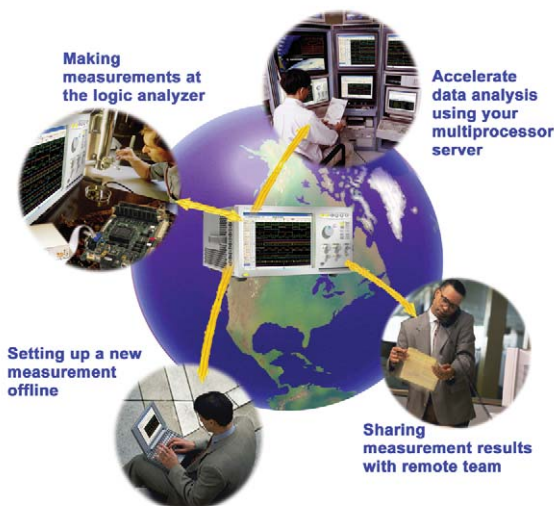


Figure 4. Whether you work alone at a bench or with team members distributed around the world, the 16900 Series provides a use model that easily integrates into your debug environment.



## Easily configure your 16900 Series system

### Configuring a 16900 Series modular system is as easy as 1, 2, 3.

Select the probing, measurement modules and analysis options that are best suited for your specific application.

**1 connect** → create the physical and electrical connection between the logic analyzer and your device under test with innovative probing.

**2 acquire** → obtain accurate and reliable measurements, with power to support future technology trends.

**3 view & analyze** → consolidate large amounts of data rapidly into displays that provide views of your system's behavior in a format you understand.



Figure 5. Soft touch connectorless probes provide a powerful combination of easy, reliable connection with high performance.



Figure 6. Choose from a family of logic analyzer and pattern generator modules to meet your requirements.

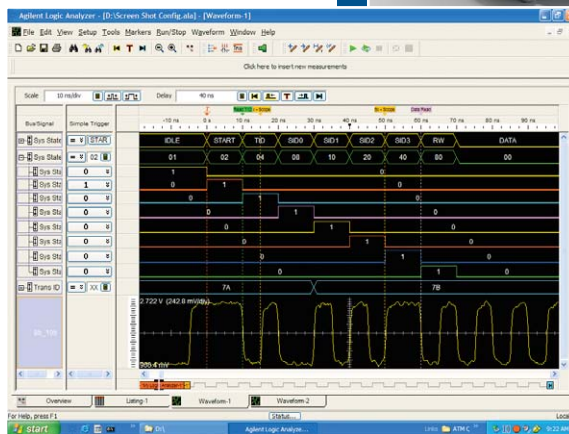


Figure 7. Get instant insight into your design with multiple views and analysis tools.

## Get accurate measurements with reliable probing

Agilent Technologies offers a wide variety of probing accessories that support general-purpose and application-specific measurement needs.

Agilent consistently delivers the leading edge in probing hardware and techniques to give designers like you access to the very signals that hold the key to your system's problems.

## Quickly debug your Xilinx or Altera FPGA and surrounding system

FPGAs play an increasingly important role in your digital designs. The high level of features and integration available in today's FPGAs allows you to use them in ways that weren't envisioned just a few years ago. It's likely that your FPGA design contains a subsystem or system that formerly would have occupied an entire board.

These higher levels of integration present new challenges for designers. Signals that were previously available on the board may exist exclusively as nodes inside the FPGA. Getting visibility across critical internal interactions can be time-consuming. This makes integration of the FPGA and the surrounding system challenging.

Logic analyzer measurements are particularly effective in debug of FPGAs and the surrounding systems. Combined with an Agilent logic analyzer, the FPGA dynamic probe provides the most effective solution for debugging complex and elusive problems.



Figure 8. The FPGA dynamic probe dramatically increases debug productivity.

**View internal FPGA activity.** With a logic analyzer, you are normally limited to measuring signals at the periphery of the FPGA. With the dynamic probe, you get the additional benefit of being able to look at signals internal to the FPGA. Access up to 256 internal FPGA signals for every debug pin.

**Make multiple measurements in seconds.** Moving probe points internal to an FPGA used to be time consuming. Now, in less than a second you can easily measure a different group of internal signals — without changing your design.

**Leverage the work you did in your design environment.** The FPGA dynamic probe is the first tool on the market that maps internal signal names from your FPGA design tool to your logic analyzer. Eliminate mistakes and speed the setup of signal and bus names and connections on logic analyzers.



## Accurate measurements start with reliable probing

### Soft touch connectorless probing

Agilent's soft touch probing advantages include quick, easy connection, minimal loading on your target system and no need for a connector designed into your target circuit board.

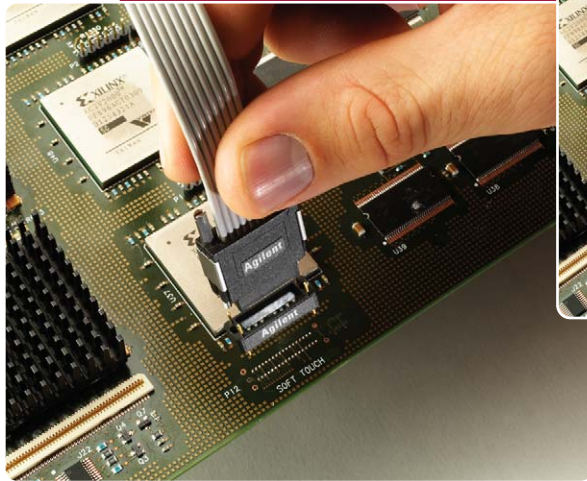


Figure 9. The compact 17-channel soft touch probe is ideal for tight spaces or times when fewer signals need to be probed.

### Connector probing

Connector probes are a proven industry standard for probing many signals in one easy connection.

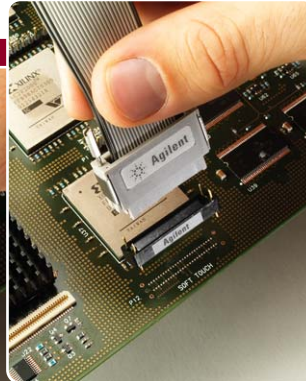


Figure 10. Soft touch connectorless probes have 1/4 the capacitive loading of connector probes and are the industry's most reliable connectorless solution.

### Flying-lead probing

Flying-lead probes provide flexibility for solving a variety of probing problems. They offer connection to individual signals so you can measure ones you may not be able to measure otherwise.



Figure 11. Use Agilent's high-performance flying-lead probes when you need the most flexibility in probing.

## Save time analyzing your unique design with a turnkey setup

Agilent Technologies and our partners provide an extensive range of bus and processor analysis probes. They provide non-intrusive, full-speed, real-time analysis to accelerate your debugging process.

**Save time making bus- and processor-specific measurements with application-specific analysis probes that quickly and reliably connect to your device under test.**

**Display processor mnemonics, bus cycle decode, or protocol packets.**

**Get support for a comprehensive list of industry-standard processors and buses.**

#### Agilent and Third-Party Processor Support

AMCC	Infineon
AMD	Intel®
ARM®	Motorola
Freescala	Siemens
IBM	Xilinx

#### Agilent and Third-Party Bus, Protocol or FPGA Support

Advanced Switching Interface	PCI
Altera: Stratix II GX, Stratix II, Stratix GX, Stratix, Cyclone II, Cyclone, Max II, APEX 20K, APEX II, Excalibur	PCI Express®
CAN	PCI-X®
DDR1, DDR2, DDR3	RS-232, RS-449
Fibre Channel	Serial ATA
Fully buffered DIMM	Serial Attached SCSI
GDDR3	SPI (Serial Peripheral Interface)
HyperTransport	SPI-4.2/PL4
I²C	(System Packet Interface)
InfiniBand	USB
	Xilinx: Virtex-5, Virtex-4, Virtex-II Pro Series, Virtex-II Series, Spartan-3/3A/3E



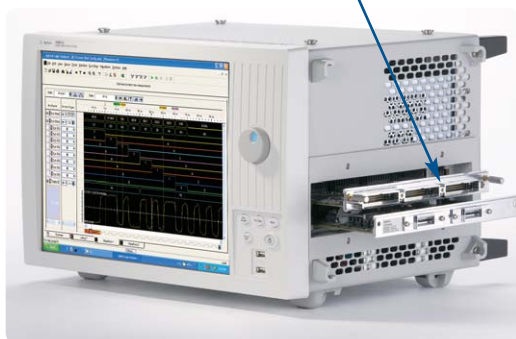
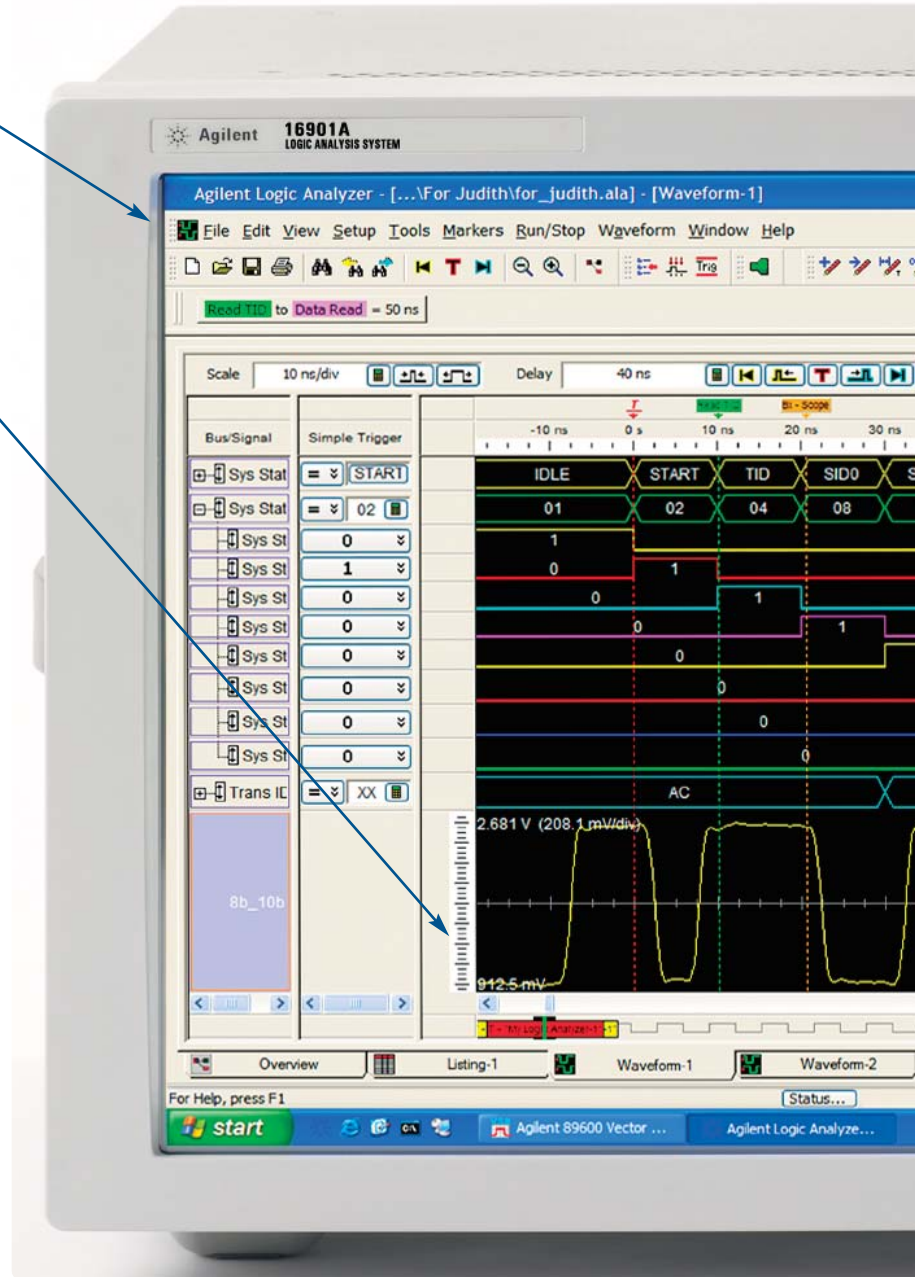
## Get exceptional performance, usability and superior probing at a price to match your budget

**15-inch (38.1 cm) color touch screen display**, allows you to see more data. Viewing relationships between large numbers of signals and buses helps you identify a problem sooner.

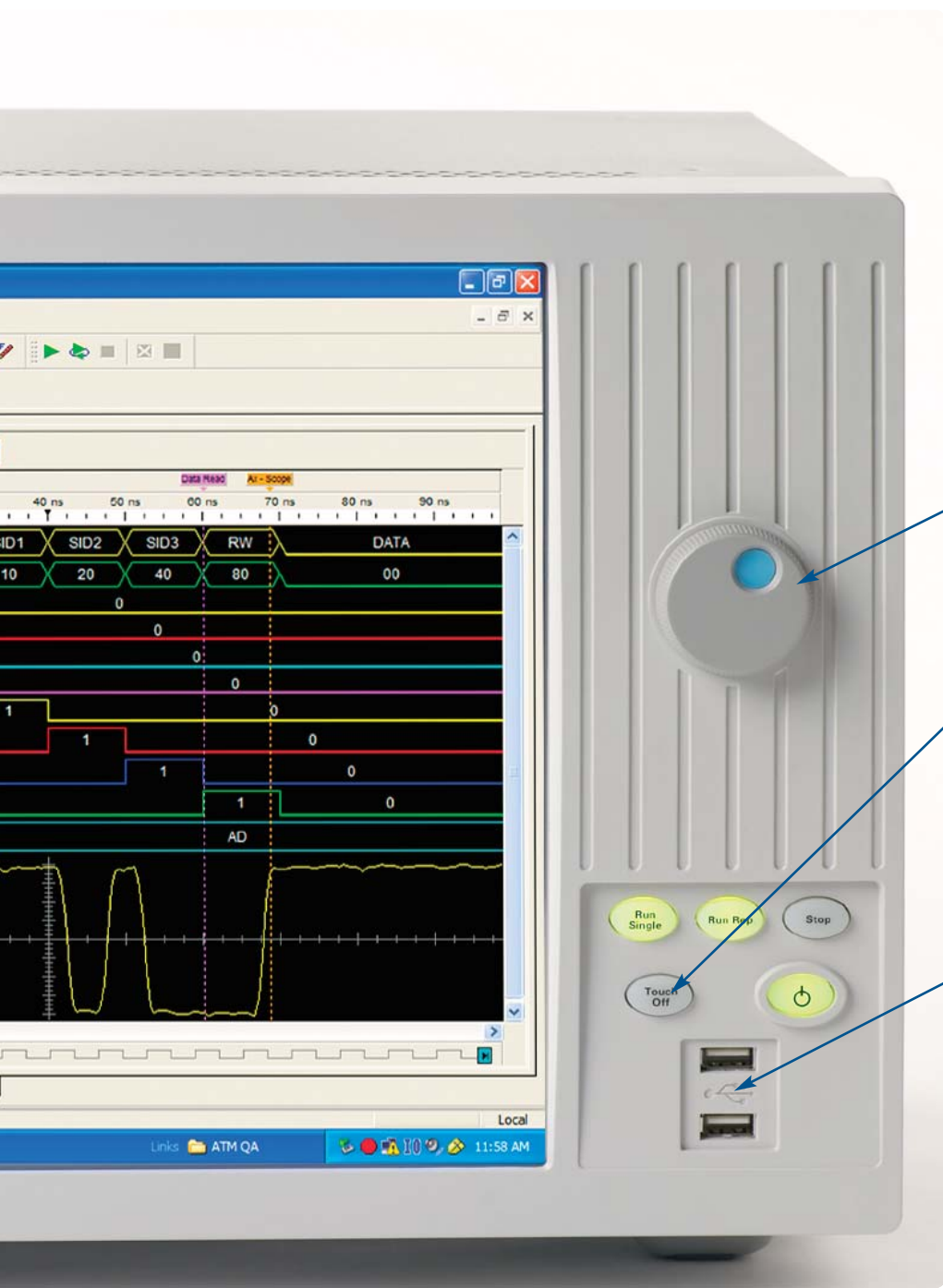
**View Scope** lets you quickly validate signal integrity and timing relationships between analog and digital domains by seamlessly integrating your scope and logic analyzer waveforms into a single display. Synchronized sampling clocks keep the logic analyzer and oscilloscope measurements tightly time-correlated across deep acquisitions.

Up to **256 M deep memory** for identifying the root cause of a problem and symptom that are widely separated in time

**Modularity** provides configuration flexibility to meet your measurement needs – now and in the future







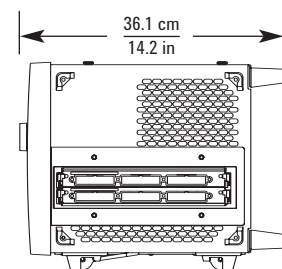
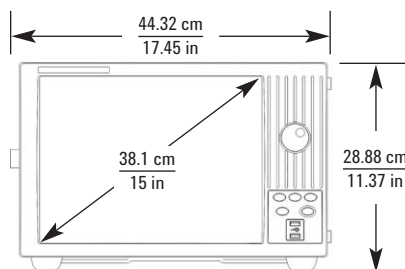
**General-purpose knob** lets you quickly adjust your viewing and measurement parameters. Select a modifiable variable, then turn the knob to quickly step through values for the variable.

**Touch screen** gives you direct access to all logic analyzer functionality so you can stay focused on your measurement. "Touch Off" key disables the touch screen and allows you to point out anomalies to a colleague without altering the display settings.

**Six 2.0 USB ports**, two in front, four in the rear, let you "hot connect" a mouse, keyboard or USB storage drives.

### 16901A dimensions

See the 16900 Series mainframe data sheet (5989-0421EN) for 16902B dimension details.



## Choose the modules that meet your specific needs

Modular expandability is the key to the long-term value of the Agilent 16900 Series logic analysis systems. Purchase the capability you need now, then expand as your needs evolve. Configure a custom logic analysis system with modules to fit your performance and price needs. Protect your investment by upgrading analyzer module memory depths or state speeds as your needs change.

Only Agilent enables you to split each logic analyzer module into two separate time bases. You can correlate activity across multiple buses using a single module with this capability.

- Create higher-channel-count systems by combining modules.
- Find elusive cause and effect problems separated in time by using deep memory.

### Make accurate high-speed state measurements

Eye finder automates the process of finding the precise moment to sample each signal relative to the clock.

- Save time during measurement setup with automated threshold and sample position adjustments.
- Quickly determine which signals have activity.
- Compensate for skew induced by variances in signal path lengths.

### Accurately measure precise timing relationships

A parallel acquisition architecture provides up to 4 GHz high-speed timing zoom simultaneously with other state or timing measurement. Timing zoom stays active all the time with no tradeoffs.

- Gain confidence in your system, whether you're making timing or state measurements.

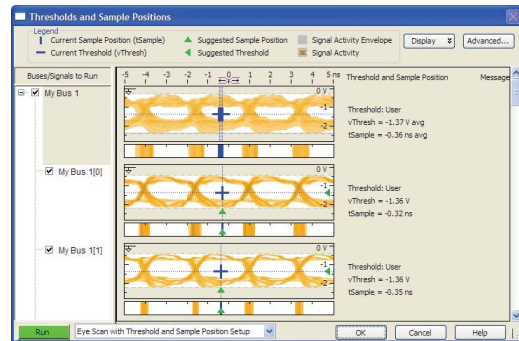


Figure 12. Identify problem signals quickly by viewing eye diagrams across all buses and signals simultaneously.

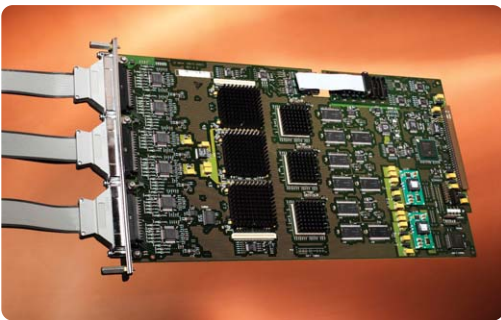


Figure 13. Combine multiple acquisition modules when you need to measure across many channels.



Figure 14. Modularity provides configuration flexibility to meet your measurement needs—now and in the future.

## Choose the modules that meet your specific needs (continued)

Agilent Model Number	Ultra Performance 16950B <sup>2</sup> /16951B <sup>2</sup>	High Performance 16910A <sup>2</sup> / 16911A <sup>2</sup>
Channels Per Module	68	102 / 68
Max Channels on Single Time Base and Trigger	340	510 / 340
High-Speed Timing Zoom <sup>1</sup>	4 GHz (250 ps) with 64 K depth	4 GHz (250 ps) with 64 K depth
Max Timing Sample Rate (Half/Full Channels)	1.2 GHz (833 ps)/ 600 MHz (1.67 ns)	1.0 GHz (1.0 ns)/ 500 MHz (2.0 ns)
Max State Clock Rate	667 MHz	450 MHz with option 500, 250 MHz with option 250
Max State Data Rate	1066 Mb/s	500 Mb/s with option 500 250 Mb/s with option 250
Memory Depth	256 M (16951B) 1 M up to 64 M (16950B)	256 K up to 32 M
Supported Signal Types	Single-ended and differential	Single-ended
Automated Threshold/ Sample Position, Simultaneous Eye Diagrams, All Channels	Yes	Yes
Probe Compatibility	90-pin cable connector	40-pin cable connector

1. All channels, all the time, simultaneous state and timing through same probe.

2. Probes are ordered separately. Please specify probes when ordering to ensure the correct connection between your logic analyzer and the device under test. Specify desired memory depth, state clock and data rate using available options. Feature also available via software upgrade to existing module.

**Table 2. Select the analyzer modules that best suit your requirements.**

Agilent 16720A <sup>1</sup>	Half Channels	Full Channels
Max Clock Speed	300 MHz	180 MHz
Max Memory Depth	16 M Vectors	8 M Vectors
Channels Per Module	24	48
Max Number of Channels Per Time Base	120	240
Stimulus Commands	Initialize, Block, Repeat, and Break Macros	
Logic Levels Supported	5 V TTL, 3 state TTL, 3 state CMOS, 3 state 3.3 V ECL, 5 V PECL, 3.3 V LVPECL, 3 state 2.5 V, 3 state 1.8 V, LVDS	

1. Order at least one clock pod for each module used as a master and at least one data pod for every 8 output channels.

**Table 3. Add a pattern generator module to drive down risk early in product development.**

### Support for other modules

The 16900 Series also support the following measurement modules:

#### Timing/State Modules

- 16950A
- 16760A
- 16753A, 16754A, 16755A, 16756A
- 16750A/B, 16751A/B, 16752A/B
- 16740A, 16741A, 16742A

#### Pattern Generator Module

- 16720A

### Headroom for your future needs (Extend the life of your equipment)

Easily upgrade your 16900 Series modules. “Turn on” additional memory depth and state speed when you need more. Purchase the capability you need now, then upgrade as your needs evolve.

16910A	Upgrade max. state speed from 250 MHz to 450 MHz and max. data rate from 250 Mb/s to 500 Mb/s
16911A	Memory depth options 256 K, 1 M, 4 M, 16 M or 32 M
16950A	Memory depth options 256 K, 1 M, 4 M, 16 M, 32 M or 64 M
16950B	Memory depth options 1 M, 4 M, 16 M, 32 M or 64 M

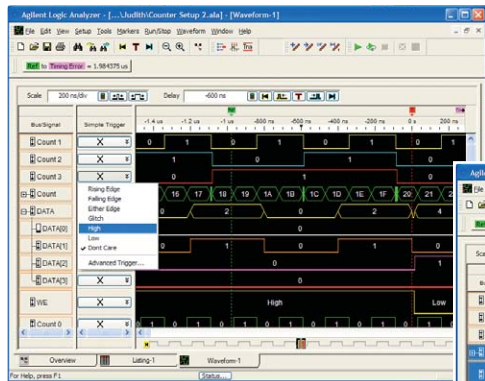
### Unleash the complementary power of a logic analyzer and an oscilloscope

Effectively track down problems across the analog and digital portions of your design. Easily make time-correlated measurements between an Agilent 16900 Series logic analyzer and 80000, 8000, 6000, or 5000 Series oscilloscope.



# Simplify debug with intuitive triggering

Agilent's intuitive triggering helps you identify the cause of elusive problems in less time – so you can debug and validate your design more quickly.

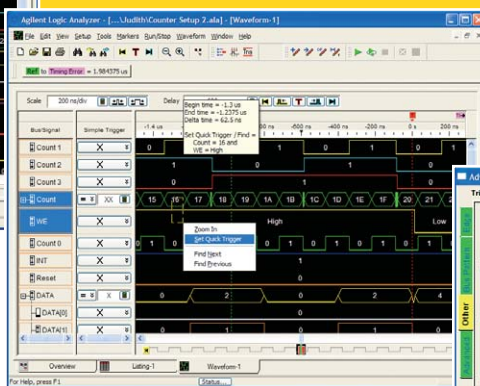


**Figure 16. Define a single trigger event as a combination of levels, edges, patterns or glitches across multiple signals and buses.**

## Simple Trigger

Set the trigger according to how you think about your target signals. Use standard events, such as rising edge, falling edge, glitch or pattern to define a trigger event. These events are accessible via an easy pull-down menu without leaving the waveform display.

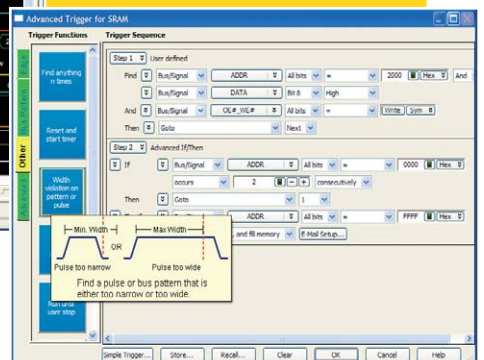
You can set the trigger for an event on the basis of activity on one or more buses or signals. Simply select the patterns, edge or levels for the signals that apply.



**Figure 17. Create a trigger by simply drawing a box around an event in the current trace.**

## Set "Quick Trigger"

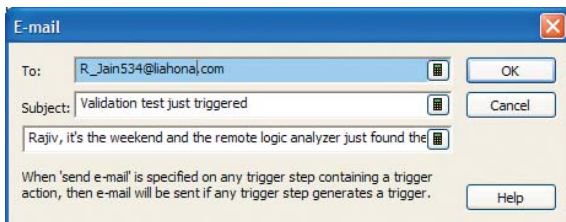
See something you didn't expect in the current trace? Simply draw a box around the questionable event and select **Set Quick Trigger** to see if it occurs again. You don't have to spend time defining the trigger. The analyzer does the work for you.



**Figure 18. Customize a trigger to specify the sequence of events leading up to a trigger event.**

## Advanced Trigger

With the **Advanced Trigger** feature, you can customize a trigger for your specific situation. You can use modifiable trigger functions as individual trigger events or as building blocks for complex scenarios.

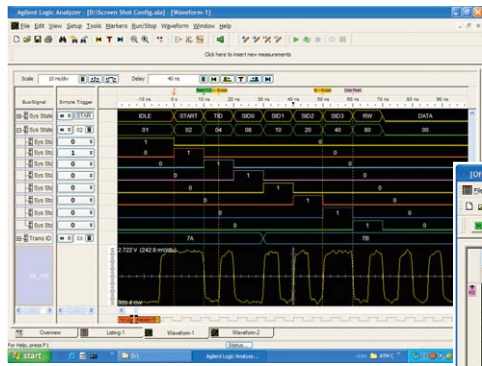


**Figure 19. Working remotely? Tell the analyzer to send you an e-mail when it finds a trigger condition and acquires a snapshot of your system.**

Icons provide a graphical representation for each trigger function. Simply drag-and-drop an icon into the trigger sequence. To fully define the trace event, fill in the blanks with values or select standard options from the pull-down menu.

# Get instant insights into your design with multiple views and analysis tools

The 16900 Series' navigation, data view and analysis features provide instant insights into your system's operation.



**Figure 20. View timing relationships to validate hardware operation with the Waveform window.**

## Waveform/Chart View

Validate correct hardware operation by viewing timing relationships between multiple buses and signals, including waveforms imported from a scope.

Track a symptom on one bus to its cause on another bus or signal using time-correlated global markers.

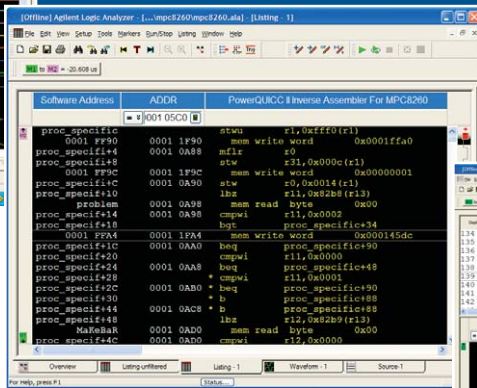
Verify that all of the signals in your target are functioning with a quick glance at the activity indicators.

Highlight and differentiate signals of interest by individually coloring and sizing signals/buses.

Compare signals/buses directly with the Overlay feature.

Graphically validate digitized signals to and from A/D converters by charting a bus's values over time.

Make quick, precise measurements using snap-to-edge marker placement.



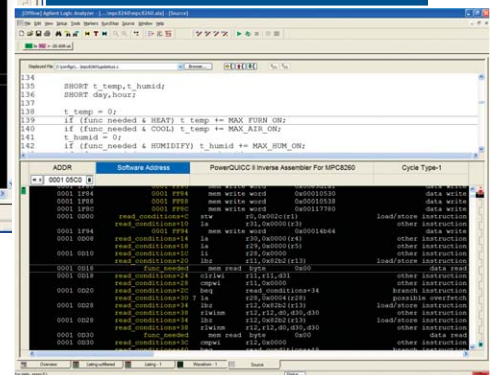
**Figure 21. The Listing window is typically used to view states.**

## Listing Window

Examine data patterns and sequences of events in the same order they were captured and placed into memory.

View data in a format that has meaning to you – binary, hex, octal, decimal, signed decimal (twos complement), ASCII, symbols, or processor mnemonics.

Mark and navigate to points of interest with individually colored, named and annotated markers.



**Figure 22. The split Source window displays the source code on top and the inverse-assembled trace below. The two traces are time-correlated and track as you scroll.**

## Source Correlation Window

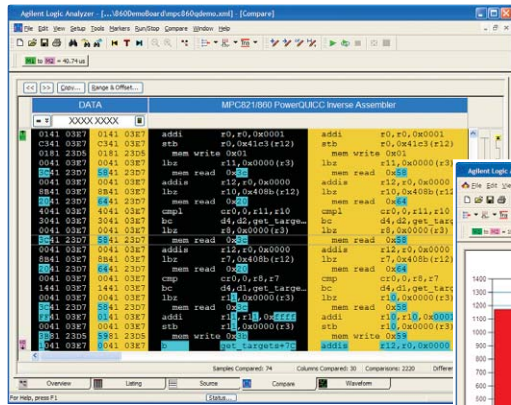
Correlate your logic analyzer trace to the high-level source code that produced it.

Locate the cause of a problem by “stepping backward” from the point where you see a problem to its root cause.

Set up your next logic analyzer acquisition by simply pointing and clicking on a line of source code.

Determine the cause of data corruption by acquiring all activity relative to a variable.

# Get instant insights into your design with multiple views and analysis tools (continued)



**Figure 23. The Compare window lets you quickly identify differences between two traces.**

## Compare Window

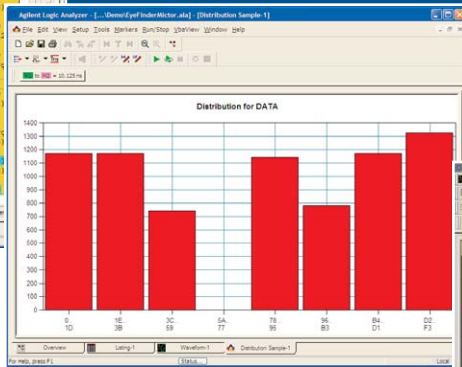
Find functional differences between a known good device and one that has a problem by comparing traces from each device.

Determine how your device will respond differently under varying operating conditions like temperature or frequency changes.

Find intermittent errors. Stop a repetitive run when a compare difference or number of differences is found.

Work remotely and let the analyzer notify you via e-mail when a new acquisition has more than a specified number of compare differences.

Compare traces of different lengths or just a specific range of the trace. Offset the reference data so that the samples being compared are properly aligned.



**Figure 24. Customize your data view with the Filter/Colorize tool and Agilent's exclusive VBA view.**

## Filter/Colorize Tool

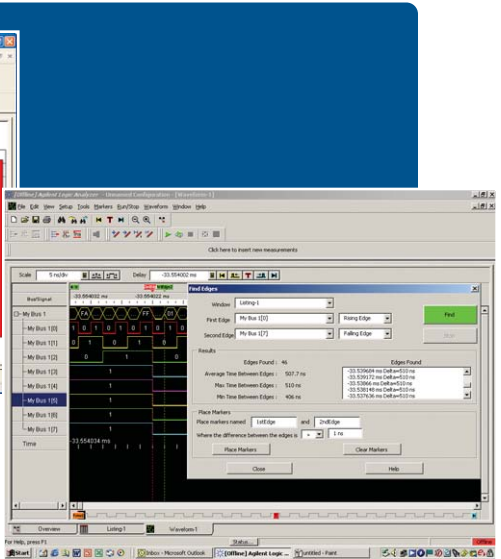
Perform multiple analysis scenarios without re-acquiring data when you're not sure what you're looking for.

View data in an easy to understand format that provides insight and answers. The VBA view charting function is seamlessly integrated, providing multiple ways to categorize data - line charts, XY scattergrams (I/Q plots), horizontal and vertical bar charts, pie charts and more.

Focus on just the information you need. Filter uninteresting data such as idle states and cache fills from deep, complex acquisition traces.

Gain quick insight into the frequency of an event. Scroll through the trace with the filter tool's color highlighting enabled.

Save time performing your favorite analysis scenarios. Store, recall and share your favorite search/filter conditions and VBA views, each individually named for easy recognition.



**Figure 25. Extend your measurement results with customized data analysis.**

## Making Measurements and Customizing Analysis

Save time by creating custom dialogs that perform repetitive tasks and analysis.

Create an automated test suite that modifies the trigger for the next run based on the analysis results of previous runs.

Perform further analysis using the analysis functions of other COM-enabled PC applications by launching and transferring data to an application like MathWork's MATLAB®.

Customize your measurement by developing your own inverse assemblers or analysis tools with the Analysis API.



# Get instant insights into your design with multiple views and analysis tools (continued)

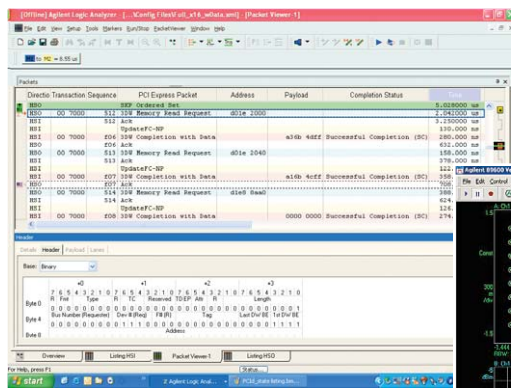


Figure 26.

## Packet Viewer

Save time debugging your system when you trigger, search, view and analyze at the packet level.

View summarized and detailed packet information simultaneously. The upper pane displays decoded packets and fields. The lower pane contains tabs for viewing selected packet details, header, payload, and lane information.

Use Agilent’s solutions for industry standard protocols like PCI Express or use our B4641A Protocol Development Kit to create a solution for your proprietary protocol.

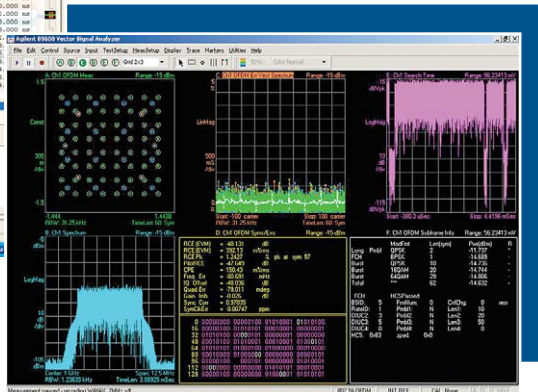


Figure 27.

## Digital Vector Signal Analysis

Perform in-depth time, frequency and modulation domain analysis on your digital baseband and IF signals.

See your signal as it changes from a train of perfect symbols to a signal with filtering, pre-distortion, re-sampling, or other potential sources of error.

Eliminate writing custom software to analyze your data. The 89600 Vector Signal Analysis software provides a wealth of display formats, measurements, and digital modulation analysis – all using consistent, industry-tested algorithms.

For current promotions and special offers on logic analyzers, including trade-up offers, visit [www.agilent.com/find/logic-offer](http://www.agilent.com/find/logic-offer)

## Related literature and CD-ROMS

Publication title	Publication type	Publication number
Agilent Technologies 16900 Series Logic Analysis Systems	Data Sheet	5989-0421EN
Agilent Technologies Timing and State Modules for the 16900 Series Logic Analysis System	Data Sheet	5989-0422EN
Agilent Technologies 16800 Series Portable Logic Analyzers	Data Sheet	5989-5062EN
Agilent Technologies 16800 Series Portable Logic Analyzers	Data Sheet	5989-5063EN
Agilent Technologies FPGA Dynamic Probe for Xilinx	Data Sheet	5989-0423EN
Agilent Technologies FPGA Dynamic Probe for Altera	Data Sheet	5989-5595EN
Probing Solutions for Agilent Technologies Logic Analyzers	Catalog	5968-4632E
Application Support for Agilent Logic Analyzers	Configuration Guide	5966-4365E
Innovative Digital Debug Solutions CD with Videos	CD-ROM	5980-0941EN

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