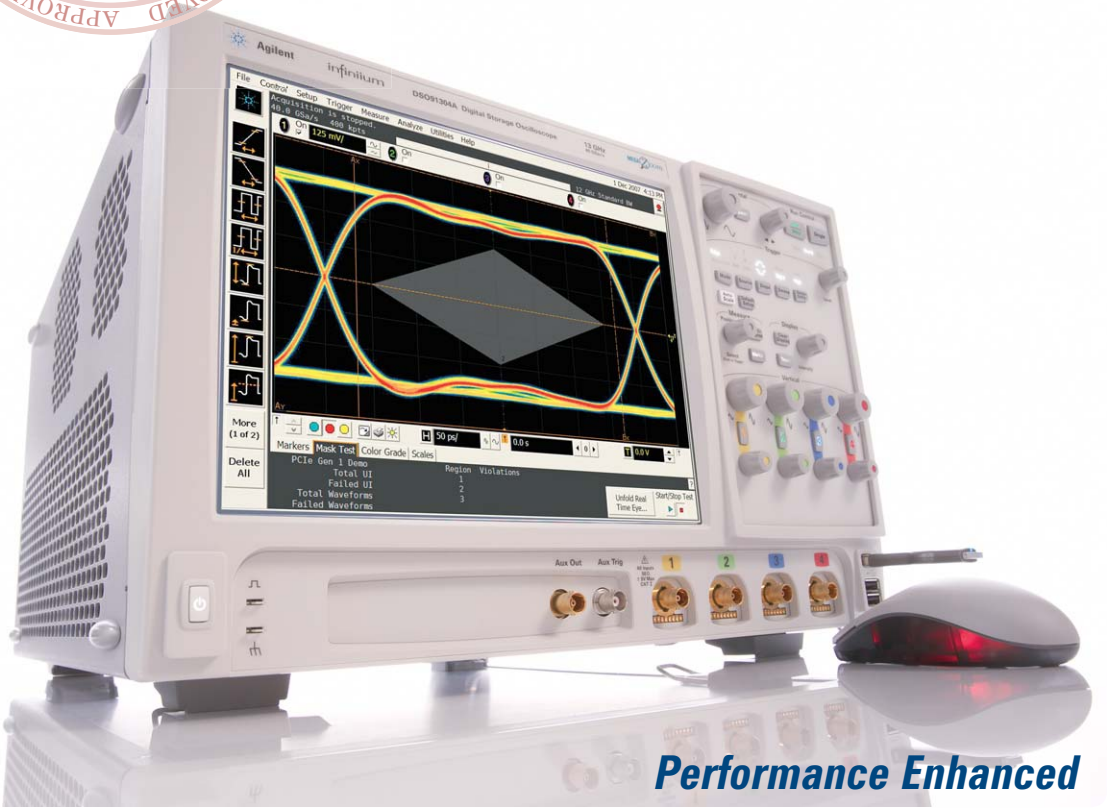
Agilent Technologies Infiniium 90000 Series Oscilloscopes

Data Sheet



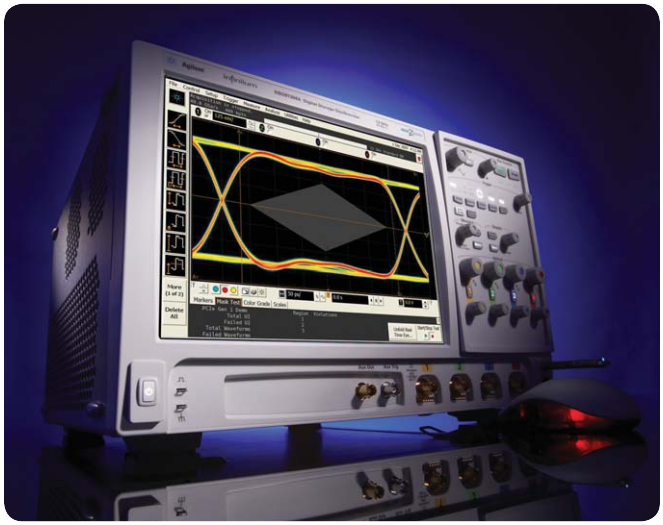


Engineered for unmatched real-time measurement accuracy

Agilent Technologies

Why choose Agilent oscilloscopes for your toughest high-speed measurement challenges?

As an engineer you're no stranger to tough challenges that help you to deliver high standards and meet your customer's needs better than anyone else can. But deploying your next design successfully is even more difficult when you're incorporating today's high-speed technologies. Signal eyes become smaller, and measurement error from your oscilloscope becomes less tolerable. Agilent is committed to providing the best measurement solutions for those tough challenges.



The Agilent Infiniium 90000 Series oscilloscopes are engineered to give you unmatched real-time measurement accuracy so you can:

1. **Use your jitter budget in your design, not on your oscilloscope.**
2. **Pass today's demanding compliance tests more quickly.**
3. **Debug your toughest designs with confidence.**

90000A Series Infiniium oscilloscopes

Model	Real-time bandwidth on 4 ch	Maximum sampling rate on 4 ch	Standard memory	Maximum memory	Noise floor at 100 mV/div
91304A	13 GHz	40 GSa/s on 4 ch	20 Mpts on 4 ch	1 Gpts on 4 ch	3.37 mVrms
91204A	12 GHz	40 GSa/s on 4 ch	20 Mpts on 4 ch	1 Gpts on 4 ch	2.80 mVrms
90804A	8 GHz	40 GSa/s on 4 ch	20 Mpts on 4 ch	1 Gpts on 4 ch	2.22 mVrms
90604A	6 GHz	20 GSa/s on 4 ch*	20 Mpts on 4 ch	1 Gpts on 4 ch	1.92 mVrms
90404A	4 GHz	20 GSa/s on 4 ch*	20 Mpts on 4 ch	1 Gpts on 4 ch	1.56 mVrms
90254A	2.5 GHz	20 GSa/s on 4 ch*	20 Mpts on 4 ch	1 Gpts on 4 ch	1.27 mVrms

*DSA model numbers come standard with 50 Mpts of memory on 4 ch.

How much time span can I capture?

Sampling Rate	20 Mpts of memory	50 Mpts of memory	100 Mpts of memory	200 Mpts of memory	500 Mpts of memory	1 Gpts of memory
40 GSa/s	500 µs	1.25 ms	2.5 ms	5.0 ms	12.5 ms	25.0 ms
20 GSa/s	1 ms	2.5 ms	5.0 ms	10.0 ms	25.0 ms	50.0 ms

Note: time span capture = memory depth x 1/ sampling rate

Elektra 08 European Electronics Industry Awards WINNER

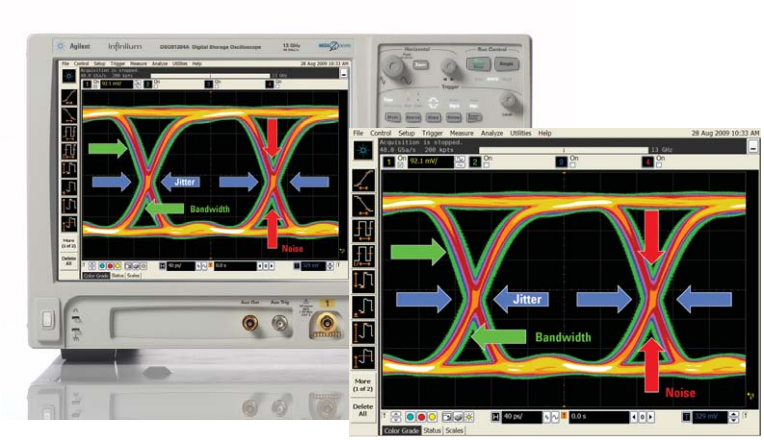
2008 design news GOLDEN MOUSETRAP Finalist

EDN INNOVATION Honoring Excellence in Electronics WINNER 2008

Engineered for unmatched real-time measurement accuracy

How can Agilent say we have unmatched real-time measurement accuracy?

It's a bold claim to state that Agilent has unmatched real-time measurement accuracy when there are scopes with higher bandwidths available. But for many of today's existing and emerging applications it's true. Accurate jitter measurements depend on accurate representation of the signal under test to determine the precise point at which the signal crosses a defined threshold.



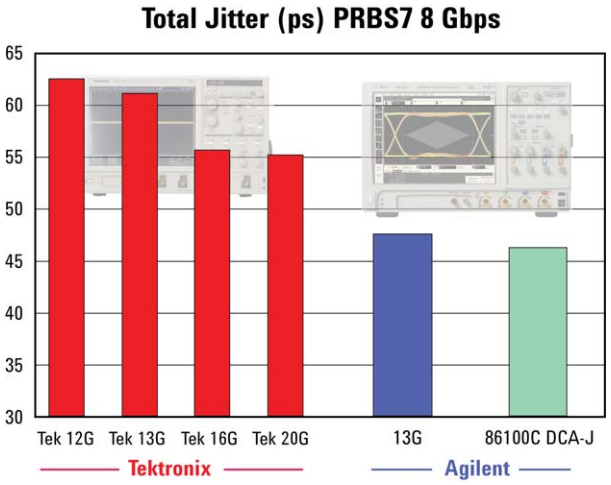
This figure illustrates the two major characteristics that impact a jitter measurement.

1. **Oscilloscope Bandwidth:** The first is bandwidth, which fundamentally allows the signal rise time to be accurately represented thus impacting the precise positioning of the threshold point.
2. **Oscilloscope Noise Floor:** The second is the inherent noise of the oscilloscope which impacts the accuracy of the measured voltage level and the precise determination of the signal threshold point.

This discussion specifically refers to the hardware characteristics of the oscilloscope. The measurement accuracy of the oscilloscope is a direct result of the interplay of these factors. You can see how this impacts actual measurements in the following comparison.

For our measurements, all of our scopes had adequate bandwidth to represent the 40 ps rise time accurately. You can see total jitter decreasing with bandwidth on the Tek scope, but the results are clearly dominated by the impact of the oscilloscope noise floor.

When your signal speeds and rise times can be adequately represented with lower oscilloscope bandwidth, which is true for most data rates today, it pays to carefully weigh your purchase decision. Investing more money for incremental bandwidth to the detriment of measurement accuracy may have unexpected impact to your design schedule



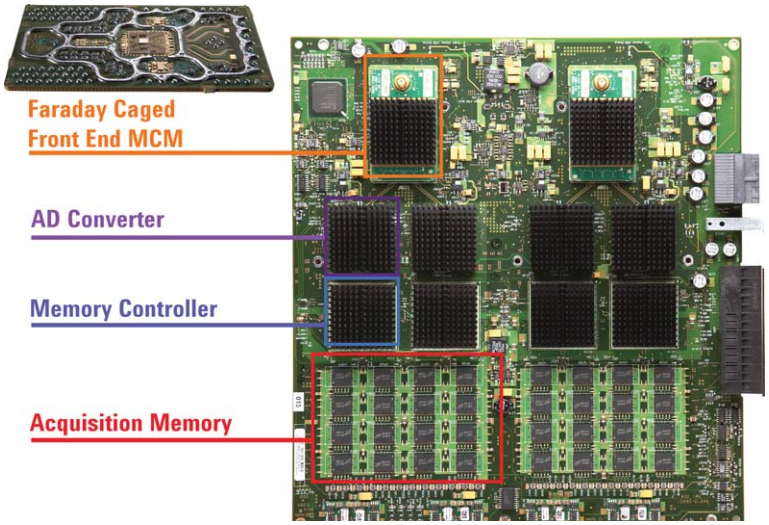
Notice that regardless of the bandwidth of the Tektronix oscilloscope, Agilent measures lower Tj than Tektronix.

We compared Tektronix 70000B series oscilloscopes to Agilent 90000 series oscilloscopes with the 86100C DCA-J sampling scope measurement included as the "gold standard". Measurements were made using a Rosenburg SMA cable connection to a proprietary demo board that generates the compliance pattern. Agilent real-time scopes use EZJIT Plus software for jitter measurements, while Tek scopes use DPOJET software with interpolation on and high performance eye rendering off. Identical clock recovery algorithms were used.

Engineered for unmatched real-time measurement accuracy.

Use your jitter budget in your design, not on your oscilloscope.

With the lowest noise floor in the industry, Agilent's Infiniium 90000 scopes offer the most accurate real-time jitter measurements available today on real-time oscilloscopes. Complete with full-bandwidth probing solutions and hardware-accelerated de-embedding and equalization techniques, Agilent oscilloscopes are the best oscilloscope solution for today's demanding high-speed measurements.



The industry's lowest noise floor

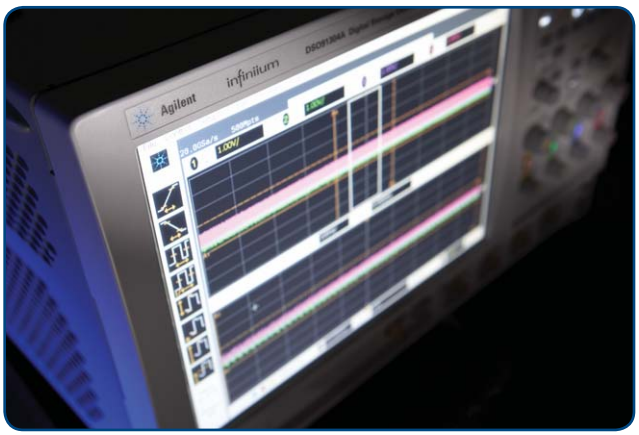
Leveraging the company expertise in RF design, Agilent has invested in key technology blocks like our proprietary Faraday caged front end to significantly reduce our inherent scope noise floor.

The industry's deepest memory

With 1 Gbyte of memory, low-frequency jitter components can be more quickly resolved in a single measurement. Statistical accuracy is improved with more data collection. Agilent's integrated deep memory remains responsive and allows more comprehensive testing, supporting pattern lengths up to PRBS23 for accurate transmitter and receiver results.

We add full bandwidth probing and accurate de-embedding and equalization software

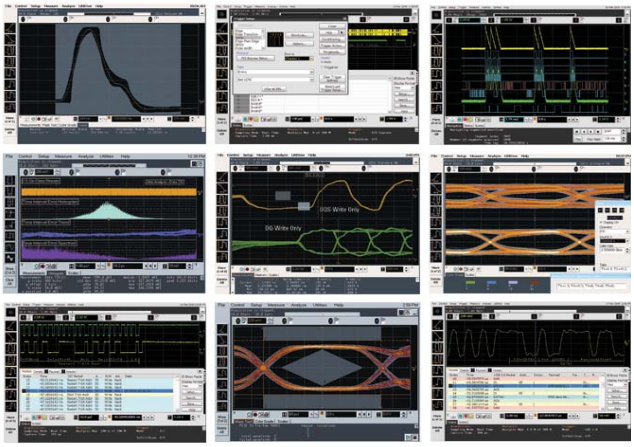
The performance of Agilent's oscilloscopes is matched by the superiority of our probing, de-embedding and equalization offerings. Maintain full bandwidth performance to the probe tip with our InfiniiMax probing solutions. Render waveforms anywhere in the digital serial link with our hardware-accelerated N5465A InfiniiSim Waveform Transformation Toolset. Configurable system modeling allows you to remove the deleterious effects of unwanted channel elements, simulate waveforms with channel models inserted, view waveforms in physically unprobeable locations, and compensate for loading of probes and fixtures. The N5461A Serial Data Equalization software allows you to model equalization techniques in real time.



Engineered for unmatched real-time measurement accuracy.

Pass today's demanding compliance tests more quickly.

Offering the industry's widest range of available compliance applications to provide fast setup for complete, automated compliance and margin testing and reporting, the Agilent 90000 Series scopes have become the go-to tool for test houses worldwide. Our experts serve on the industry standards committees, and our oscilloscopes are certified on today's fastest interfaces including SATA 6G, PCIe Gen 2.0, and USB 3.0. Plus our 1G memory supports real-time testing to pattern lengths of PRBS23 to stress your design to the max. New performance enhanced 90000 Series allows for even faster time to insight.



Choose from a wide range of complete compliance applications

Choose from the industry's widest range of complete applications for the Infiniium 90000 Series to ensure compliance to the leading industry standards, including SATA, PCI Express®, Ethernet, USB, and more. Comprehensive set-up wizards and full automation of the required testing take the guesswork out of demonstrating compliance quickly. Get further insight with our protocol and analysis decode available on PCI Express, SATA and USB.

Put Agilent's experts on your team

Agilent's measurement experts sit on the industry standards committees and help define the compliance requirements. They make sure our tools deliver exactly to the standards. You get the benefit of years of training and experience on every measurement you make.

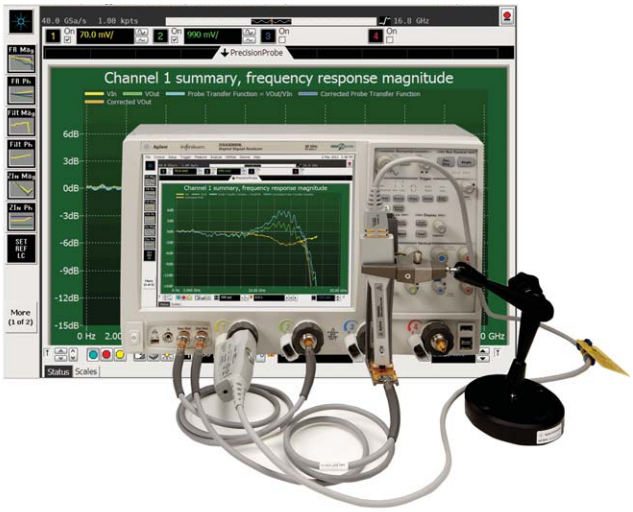
Free up valuable engineering resources

Set-up wizards combined with intelligent test filtering make it simple to ensure the right tests are being run. Comprehensive HTML reports with visual documentation and pass/fail results guarantee that critical information is retained on each test. Technicians can run complete and accurate testing on their own, freeing valuable engineering resources.

PrecisionProbe

Agilent's N2809A PrecisionProbe software quickly characterizes and compensates the frequency response of any path to the 90000 Series input. PrecisionProbe's patented technology uses the <15ps edge from the 90000 Series oscilloscope to:

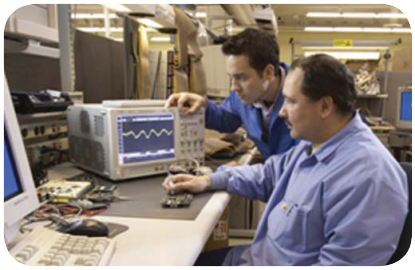
- Measure input impedance and response of any probe and the loss of any cable
- Quickly correct from probe and cable loss(without extra instruments such as VNA or TDR)
- Correct probing issues such as phase nonlinearity, magnitude non-flatness, and see the effect of probe loading
- Quickly gain insight into impedance/capacitance that defines your connection



Agilent's PrecisionProbe uses its 200 GHz indium phosphide process to create a fast edge for characterization with PrecisionProbe.

Engineered for unmatched real-time measurement accuracy.

Debug your toughest designs with confidence.

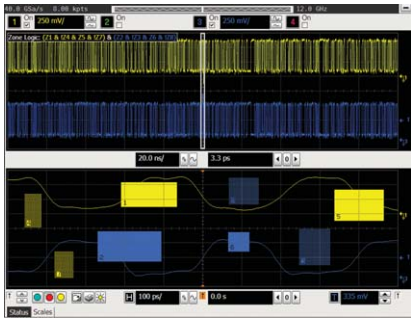


The 90000 series boasts an ever-expanding set of measurement applications for serial debugging and protocol viewing, jitter testing, advanced triggering, measurement customization, and rapid automation. Put the power of the scope to work for your unique debug and analysis challenges.



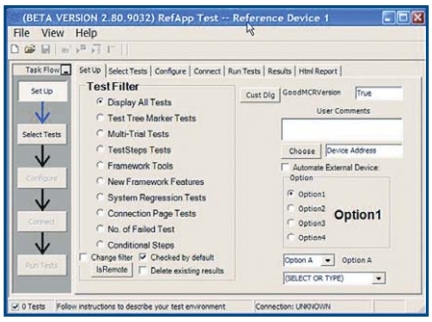
Streamline your debug and analysis tasks with the industry's widest range of application software

Whether you need to trigger and decode serial buses, iron out the kinks in your memory designs, or see FFT based spectrum analysis of your signal, the Infiniium 90000 Series has application software to help. Our serial protocol views are unique to oscilloscopes, and our DDR debug tools support multiple generations of the standard. Quickly access additional features from the scope's standard menus.



Customize your scope for even more efficiency

The N5414B InfiniiScan Event Identification software makes unique capabilities like Zone Qualify and Generic Serial triggering possible. Rapidly automate any scope measurement using the N5467A User Defined Application and have it appear seamlessly in your scope's menu. Customize your Infiniium further by taking full advantage of MyInfiniium (standard on all 90000A Series oscilloscopes). Use MyInfiniium to deliver automated measurements, execute customized scripts, save screenshots, or load your favorite setup.

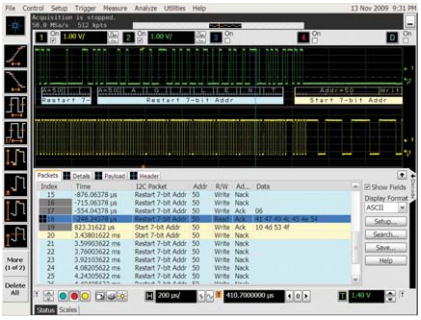


Add measurement capability with MATLAB compatibility

If we haven't provided exactly what you need, take customization to a new level with MATLAB (Option 062) - a data analysis software environment and scripting language with over 1,000,000 users today. Use MATLAB to design and apply your own filters to oscilloscope signals, graphically visualize oscilloscope signals in 2-D and 3-D plots, automate measurements, and build test applications. Add the N5430A User Defined Function software to your scope to seamlessly integrate your custom functionality into the Infiniium 90000 menus so results are displayed on the scope screen. Agilent is the only T&M manufacturer today that sells and supports MATLAB as its own product as part of a complete T&M solution.

Engineered for unmatched real-time measurement accuracy.

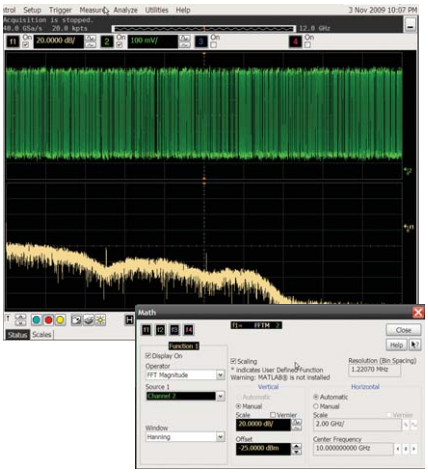
Debug your toughest designs with confidence.



Trigger and view on-screen serial decode of I2C packets

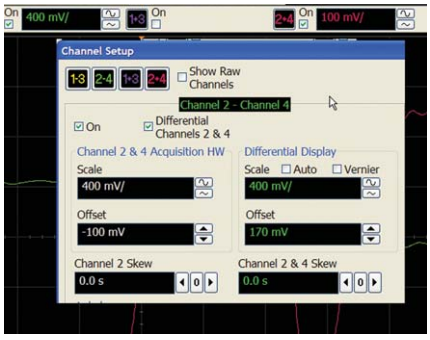
I2C/SPI serial trigger and decode (N5391A or Option 007 on new scope purchases)

Given even further insights with protocol decode capability. Quickly move between physical and protocol layer information using the time-correlated tracking marker. Display protocol content using waveform symbols and the industry's first multi-tab protocol viewer. The packets tab shows a high level view of the packet over time.



Frequency Domain Analysis

Infiniium built-FFT, allows users to quickly and easily analyze the frequency components of their signals. Both FFT magnitude and Phase can be displayed and can be combined with other built-in math functions or Matlab based measurements. A resolution bandwidth of 6kHz is supported with the standard 10 Megabytes of acquisition memory. With optional acquisition memory installed resolution bandwidths of 2kHz can be obtained. Standard windowing of Hanning, Flattop and Rectangular are supported along with cursor based power measurements. When more powerful frequency domain measurements are required including modulation analysis, consider the Agilent 89601A Vector Signal Analyzer software.



Hardware Accelerated Differential and Common Mode Math

Select the channel menu and enable differential mode to enable hardware accelerated math capability. Enjoy full channel functionality including InfiniiScan triggering and jitter analysis. Save time, by using the hardware acceleration for even faster update rates with your differential and common mode math needs.

Debug your toughest designs with confidence



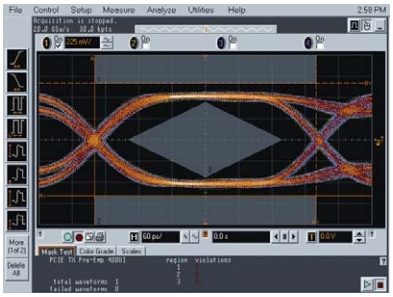
Conduct jitter analysis.

EZJIT analysis software (E2681A or option 002 on new scope purchases)

Quickly characterize and evaluate most commonly needed jitter measurements, including cycle-cycle, N-cycle, period, time-interval, error, setup and hold time, histograms, measurement trending and jitter spectrum.

This application is supported on all models and is standard on DSA models.

For more information: **www.agilent.com/find/EZJIT**



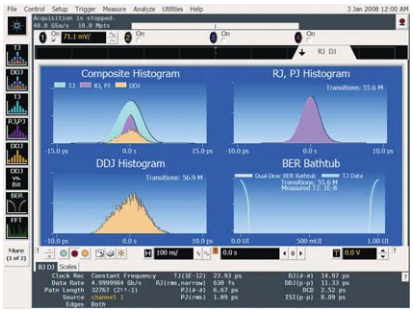
Recover embedded clocks with serial data analysis (SDA).

High-speed serial data analysis software (E2688A or Option 003 on new scope purchases)

Quickly validate signal integrity for high-speed serial interfaces with embedded clocks. Recover embedded clocks synchronized with the analog waveform view. Build and validate eye diagrams.

The SDA package also includes software-based bit-level triggering and decode for 8B/10B. This application is supported on all models and comes standard on DSA models.

For more information: **www.agilent.com/find/SDA**



Analyze jitter plus RJ/DJ separation.

EZJIT Plus analysis software (N5400A or Option 004 on new scope purchases. To upgrade from EZJIT to EZJIT Plus, order N5401A.)

EZJIT Plus adds additional compliance views and an expanded measurement setup wizard to simplify and automate RJ/DJ separation for testing against industry standards.

This application is supported on all models and is standard on DSA models.

For more information: **www.agilent.com/find/EZJITPlus**



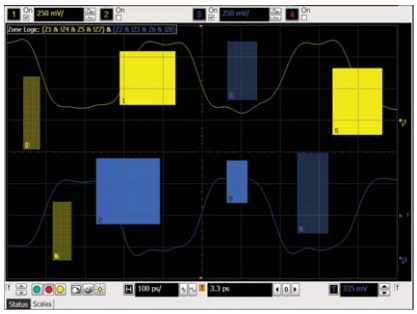
Quickly characterize and correct for any input to your oscilloscope

PrecisionProbe software (N2909A or Option 001 on new scope purchases)

Make more accurate measurements independent of what probes or cables used. Agilent's N2908A PrecisionProbe software characterizes and corrects for the loss in your specific cable or probe. PrecisionProbe removes the uncertainty about the input connected to your oscilloscope by allowing you to see its characteristics in less than five minute. PrecisionProbe gives you design and debug confidence by allowing you to quickly de-embed probe and cable loss to make more accurate measurements.

For more information: **www.agilent.com/find/PrecisionProbe**

Debug your toughest designs with confidence



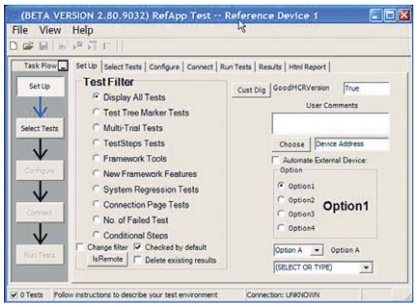
Identify signal integrity issues with InfiniiScan Zone – Qualify triggering.

InfiniiScan event identification (N5414B or Option 009 on new scope purchases)

Rapidly trigger on complex events and identify signal integrity issues. This innovative software quickly scans through thousands of acquired waveform cycles and isolates anomalous signal behavior.

This application is supported on all models.

For more information: **www.agilent.com/find/infiniiScan**



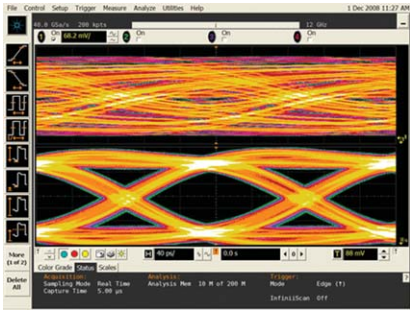
Control your applications remotely.

Infiniium Remote Programming interface (N5452A or Option 011 on new scope purchases)

Operate your Infiniium compliance and validation applications remotely using .NET languages.

This application is supported on all models.

For more information: **www.agilent.com/find/RPI**



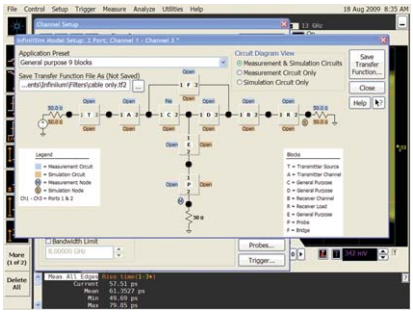
Reduce receiver errors by opening tightly shut eyes.

Serial Data Equalization (N5461A or Option 012 on new scope purchases)

Measure at the pin and use equalization to see a virtual eye on the other side of an equalizer. Model equalization techniques such as DFE, FFE, and CTLE.

This application is supported on all models.

For more information: **www.agilent.com/find/SDE**



Model channel effects including reflection.

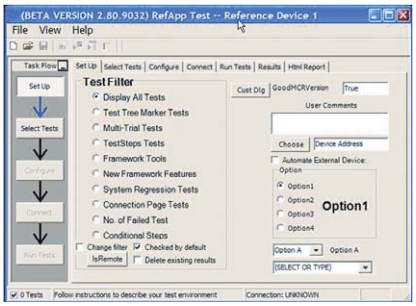
InfiniiSim Waveform Transformation Toolset (N5465A or option 013, and 014 on new scope purchases)

Use the InfiniiSim toolset to combine measurements and models to view simulated scope measurement results at any location in your design. Import design models (s-parameters or transfer functions), acquire real-time scope data, and transform to measurement locations you need.

This application is supported on all models.

For more information: **www.agilent.com/find/InfiniiSim**

Debug your toughest designs with confidence

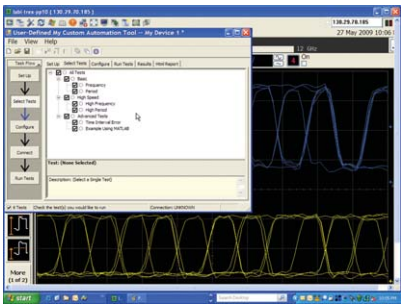


Control your applications remotely.

MATLAB® data analysis software (Option 061 or 062 on new scope purchases)

MATLAB is a data analysis software environment and scripting language used by over 1,000,000 users in aerospace/defense, automotive, communications, electronics, and other applications. MATLAB is now available directly from Agilent as in instrument option with the purchase of your Agilent 90000 Series oscilloscope. Install MATLAB on your oscilloscope or remote PC to make customized measurements, design and apply your own filters to oscilloscope signals, graphically visualize signals in 2-D or 3-D plots, automate measurements, or build test applications. Purchase MATLAB with your Agilent 90000 Series oscilloscope to ensure version compatibility and so that your MATLAB software
license is always available when you need it.

For more information: **www.agilent.com/find/matlab_oscilloscopes**

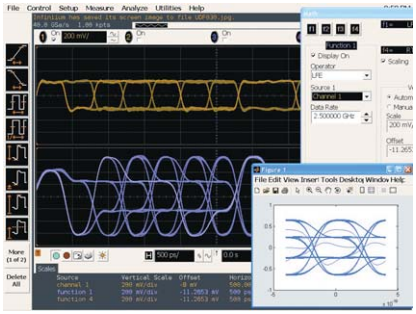


Quickly automate oscilloscope measurements.

User-definable application (N5467A or Option 040 on new scope purchases)

Rapidly develop your own automated measurements and tests. This application provides the framework you need to quickly program and automate any single or set of measurements the oscilloscope can make. The application also provides full control of other Agilent instruments and HTML reporting capabilities.

For more information: **www.agilent.com/find/UDA**



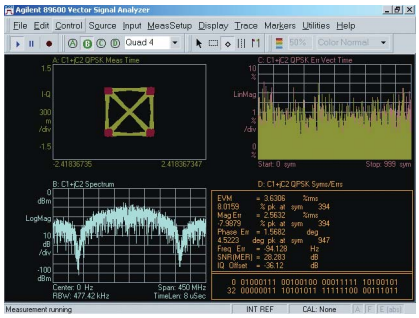
Signal equalization using user-defined function.

User-defined function (N5430A or Option 010 on new scope purchases)

If we haven't provided exactly what you need, use the N5430A User Defined Function software to create it yourself. Develop your own math functions or filters using MATLAB. Your custom functionality is seamlessly integrated into the Infiniium 90000 menus and results are displayed on the scope screen. This requires MATLAB (available as Option 062) to be installed directly on the oscilloscope. Agilent is the only T&M manufacturer today that sells and supports MATLAB as its own product.

This application is supported on all models and requires MATLAB software (not included with UDF)

For more information: **www.agilent.com/find/UDF**



Use vector signal analysis software to see FFT-based spectrum analysis.

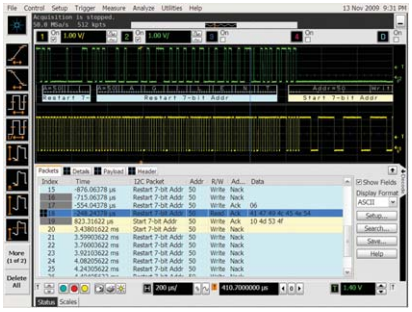
Vector signal analysis software (89601A)

Expand the measurement capability of your scope with the 89601A vector signal analysis software. This advanced DSP-based software takes the digitized signal data from the scope and displays FFT-based spectrum analysis and wide-bandwidth digital modulation analysis for wireless communication signals such as WCDMA and cdma2000 and wireless networking signals such as 802.11 WiFi and 802.16 WiMax.

Take advantage of the super-wide bandwidth of your scope to capture and evaluate radar signals.

For more information: **www.agilent.com/find/VSA**

Debug your toughest designs with confidence



Trigger and view on-screen serial decode of I^2C packets.

I^2C/SPI serial trigger and decode (N5391A or Option 007 on new scope purchases)

This application displays real-time time-aligned decode of I2C and SPI packets. View decode in waveform area or in protocol lister.

This application works on all models.

For more information: **www.agilent.com/find/90000_I2C-SPI**



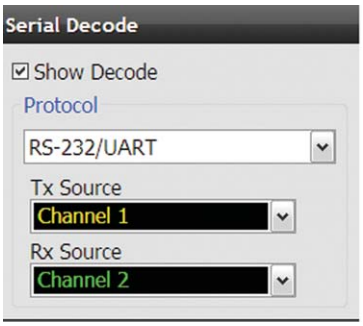
Trigger on and decode JTAG packets.

JTAG (IEEE 1149.1) triggering and decode (N8817A or Option 042 on new scope purchases)

This application displays real-time time-aligned decode of JTAG (IEEE 1149.1) TDI and TDO signals. The application eliminates the difficult task of manually determining JTAG TAP controller states, instruction and data register decode, and flags error conditions. The application includes scan chain description features including the ability to import .bsdl files for each device and displays device names and opcodes in the protocol listing.

This application works on all models and can use any combination of scope or logic acquisition channels.

For more information: **www.agilent.com/find/90000_JTAG**



Trigger on and decode RS-232/UART transmission.

RS-232/UART serial decode and trigger (N5462A or Option 015 on new scope purchases)

This application eliminates the need to manually decode bus traffic. Using data captured on the scope channels, the application lets you easily view the information sent over an RS-232

Display real-time time-aligned decode of transmit and receive lines.

This application works on all models.

For more information: **www.agilent.com/find/90000_RS-232**



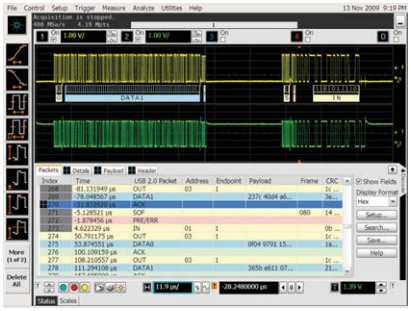
Isolate signal integrity problems from logic-level coding errors on bidirectional serial data streams.

N8805A USB 3.0 Protocol Triggering and Decode (N8805A)

Trigger on and view USB 3.0 with the industry's first oscilloscope-based protocol analyzer with time-correlated views of physical layer and transaction layer errors. The multi-tab protocol viewer includes correlation between the waveforms and the selected packet, enabling you to quickly move between the physical and protocol layer using the time-correlated tracking marker.

For more information: **www.agilent.com/find/usb3decode**

Pass today's demanding compliance tests more quickly



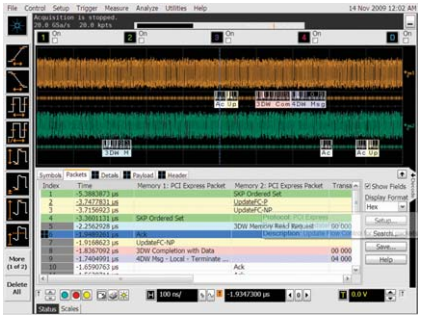
Trigger on and decode USB packets.

USB serial trigger and protocol viewer (N5464A or Option 016 on new scope purchases)

Trigger on and quickly view USB 2.0 packets, payload, header and detail information. Powerful time-correlated views of waveform and symbol, to the bit level, make it easy to isolate communication faults.

This application is supported on all models.

For more information: **www.agilent.com/find/90000_USB_protocol_viewer**



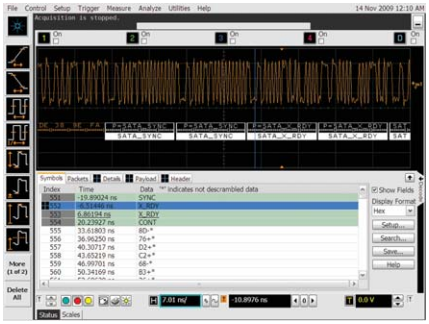
Trigger on and decode PCIe serial packets.

PCI Express® serial trigger and protocol viewer (N5463A or Option 017 on new scope purchases)

This application provides protocol-level triggering and viewing of a PCIe® lane. Quickly view packets, payload, header, and detail information. Powerful time-correlated views of waveform, symbol, character, link and transaction layer packet data down to the bit level make it easy to isolate communication faults to logic or analog sources.

This application is supported on all 4 GHz and greater models.

For more information: **www.agilent.com/find/90000_PCI_protocol_viewer**



Trigger on and decode SAS/SATA serial packets.

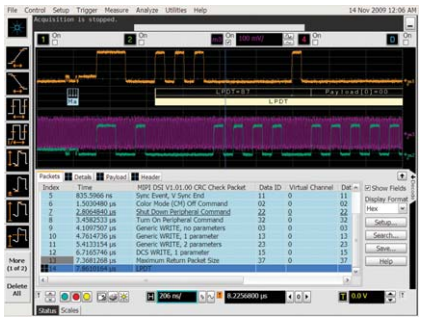
SATA triggering and decode (N8801A or option 018 on new scope purchases)

Trigger on and view both protocol layer information and physical layer signal characteristics for SATA 1.5 Gb/s, 3.0 Gb/s, and 6.0 Gb/s. Numerical decode values are automatically displayed and synchronizes below the capture signal or seen in protocol viewer.

This application works on all models.

For more information: **www.agilent.com/find/N8801A**

Pass today's demanding compliance tests more quickly



Trigger on and decode MIPI packets.

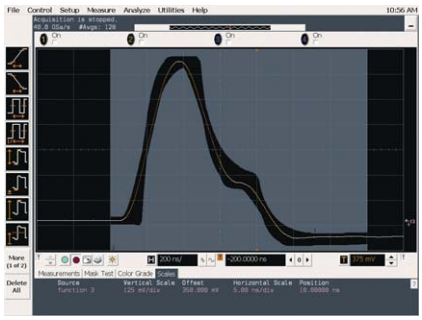
MIPI D-phy trigger and decode (N8802A or Option 019 on new scope purchases)

This application eliminates the need to manually decode bus traffic. Using data captured on the scope, the application lets you easily view the information sent over MIPI serial buses.

The application also enables software based protocol triggering.

This application is supported on all models >=4 GHz bandwidth.

For more information: **www.agilent.com/find/N8802A**



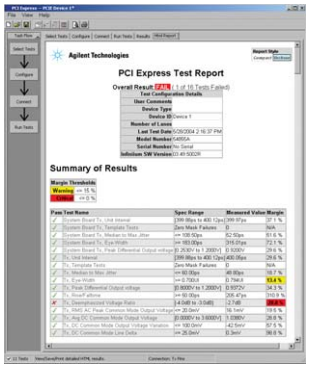
Validate Ethernet compliance.

Ethernet compliance testing (N5392A or Option 021 on new scope purchases)

Perform a wide range of electrical tests for 10-, 100-, and 1000-Base-T systems. An N5395B or N5395C test fixture and N5396A jitter test cable speed compliance testing.

This application is supported on all models.

For more information: **www.agilent.com/find/N5392A**



Quickly verify and debug your PCI EXPRESS® designs

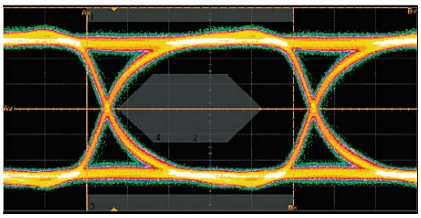
PCI EXPRESS® Electrical Performance Validation and Compliance Software (N5393B or Option 022 on new scope purchases)

Provides fast and easy way to verify and debug your PCI EXPRESS designs. Allows you to automatically execute PCI EXPRESS electrical checklist tests, and displays the results in a flexible report format. Ensures that your Gen2 measurements will have absolute consistency with measurements made using the PCI-SIG's standalone Sigtest software.

This application is supported on all models >=8 GHz bandwidth.

For more information: **www.agilent.com/find/N5293B**

Pass today's demanding compliance tests more quickly



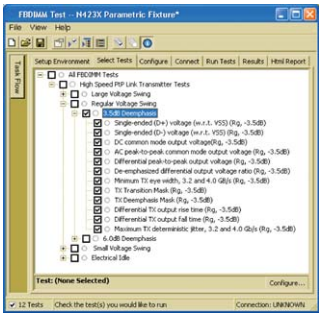
Verify and debug your HDMI designs.

HDMI™ Electrical Performance Validation and Compliance Software (N5399A or Option 023 on new scope purchases)

Quickly verify and debug your High Definition Multi-media Interface (HDMI) designs. The N1080A fixture provides access to the compliance points for the electrical measurements required for the transmitter compliance testing.

This application is support on all models >=8 GHz bandwidth.

For more information: **www.agilent.com/find/N5399A**



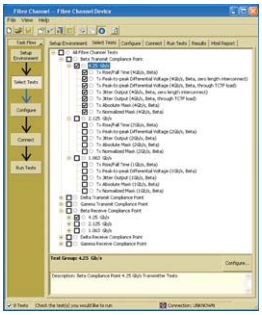
Characterize and evaluate the signal integrity of both your high speed FB-DIMM signals as well as your reference clock.

Fully Buffered DIMM Compliance Application (N5409A or Option 024 on new scope purchases)

Quickly characterize and evaluate the signal integrity of both your high speed FB-DIMM signals as well as your reference clock. All tests are based on the JEDEC High Speed Point-to-Point Link Specification.

This application is supported on all models >=10 GHz bandwidth

For more information: **www.agilent.com/find/N5409A**



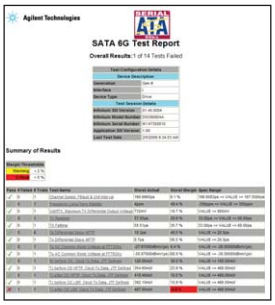
Characterize and evaluate the signal integrity of your electrical Fibre-Channel devices

Fibre Channel Compliance Application (N5410A or Option 025 on new scope purchases

Quickly characterize and evaluate your electrical Fibre-Channel devices. Specify the measurement point at which you are probing your signal (delta, gamma, etc.). All tests performed are based on the FC-PH (ANSI X3.230-1994) and FC-PH-2 Fibre Channel - Physical and Signaling Interface specification.

This application is supported on all models >=4 GHz bandwidth

For more information: **www.agilent.com/find/fibre-channel**



Simplify the validation of SATA designs

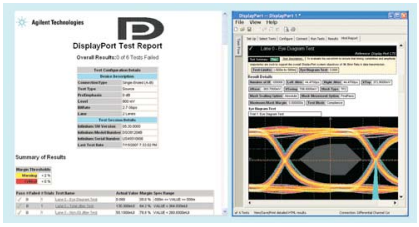
SATA 6G Compliance Test Software (N5411B or Option 038 on new scope purchases)

Rapidly validate and debug your SATA 1.5Gb/s (Gen 1), 3.0 Gb/s (Gen2) and 6.0 Gb/s (Gen3) silicon, host bus adapter, port multiplier, high-density disk drive, solid-state disk drive or optical disk drive. Provides automated compliance test support for the i (internal), m(eSATA) and x(SAS attachment) interfaces points, and displays the results in a flexible report format.

This application is supported on all models >= 12 GHz bandwidth

For more information: **www.agilent.com/find/n5411b**

Pass today's demanding compliance tests more quickly



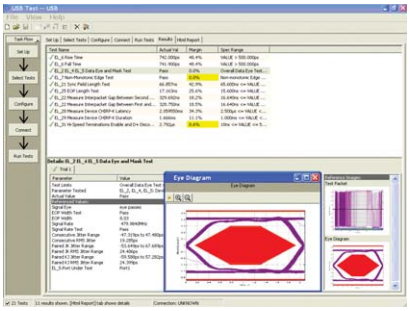
Full suite of DisplayPort source tests.

U7232A DisplayPort Compliance Test Software (U7232A or Option 028 on new scope purchases)

Sets the benchmark for ease-of-use, and offers complete testing without compromise. The software guides the user sequentially through the tasks ensuring minimal setup error, executes the tests specified by the standard and conveys the test information through a convenient software generated report. The three modes of physical layer test allow for automated measurements based on the customizable configuration of compliance and characterization testing. To make the test signal connection, the Agilent W2641A DisplayPort test point access adaptor completes the DisplayPort source solution.

The application is supported on all models >= 8 GHz

For more information: **www.agilent.com/find/U7232A**



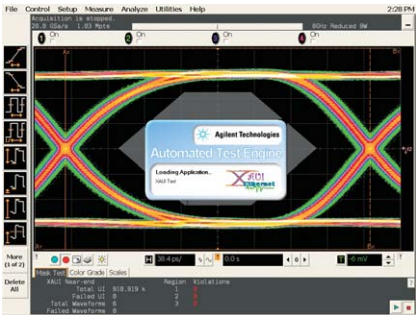
Check for USB compliance

USB 2.0 Compliance Test Software (N5416A or Option 029 on new scope purchases)

Quickly determine USB compliance with this USB-IF recognized solution. A setup wizard guides you through test selection and configuration.

This application is supported on all models.

For more information: **www.agilent.com/find/n5416a**



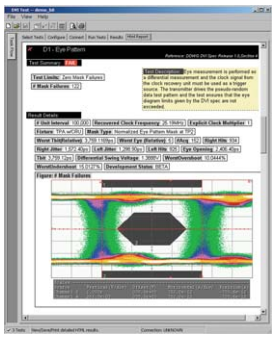
Perform automated testing and margin analysis for XAUI and XAUI-derived specifications

XAUI Electrical Validation with 10GBASE-CX4, CPRI, OBSAI, and Serial RapidIO Support (N5431A or Option 030 on new scope purchases)

Improve your efficiency by confirming that your devices conform to the XAUI specifications as defined by the IEEE 802.3-2005 10-gigabit Ethernet specification. Provides support for the XAUI-derived 10GBASE-CX4 specification.

The application is supported on all models

For more information: **www.agilent.com/find/N5431A**



Verify and debug your DVI designs more easily.

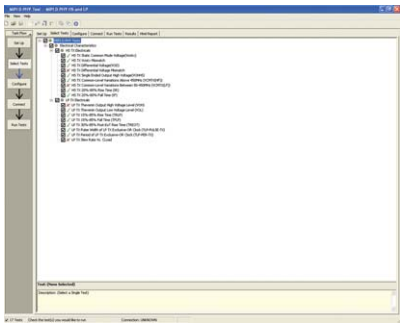
DVI Electrical Performance Validation & Compliance Software (N5394A or Option 034 on new scope purchases)

Automatically execute DVI electrical checklist tests and display the results in a flexible report format. In addition to the measurement data, the report provides a margin analysis that shows how closely your device passed or failed each test.

The application is supported on all models >= 4GHz

For more information: **www.agilent.com/find/90000**

Pass today's demanding compliance tests more quickly



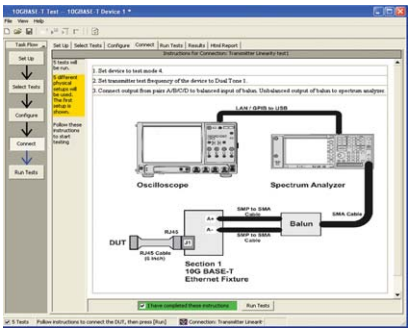
Automatically execute D-PHY electrical checklist tests for CSI and DSI architectures.

MIPI D-PHY Compliance Test Software (U7238A or Option 035 on new scope purchases)

Automatically execute D-PHY electrical checklist tests for CSI and DSI architectures. Displays the results in a flexible report format.

The application is supported on all models.

For more information: **www.agilent.com/find/d-phy_compliance**



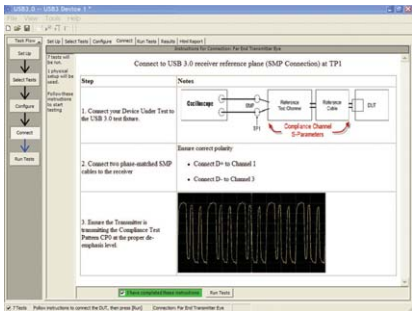
Automatically execute 10GBASE-T Ethernet physical-layer (PHY) electrical tests

10GBASE-T Ethernet Electrical Conformance Application for Infiniium Oscilloscopes (U7236A or Option 036 on new scope purchases)

Takes care of the tedious task of instrument control and configures the oscilloscope, spectrum analyzer, or vector network analyzer as needed by each 10GBASE-T test to provide rapid, accurate, and repeatable test execution.

The application is supported on all models.

For more information: **www.agilent.com/find/10gbase-t**



Validate and debug your USB 3.0 silicon, host, hub or device

USB 3.0 Compliance Test Software (U7243A or Option 041 on new scope purchases

Provides industry leading automated test support for USB 3.0 products and displays the test results in a comprehensive test report. For best measurement accuracy use the Agilent U7242A USB 3.0 transmitter and receiver test fixtures. Agilent's USB 3.0 test solution is designed from the ground up with the needs of the test engineer in mind.

The application is supported on models >= 12 GHz

For more information: **www.agilent.com/find/USB3**



Test DDR memory.

DDR1 and LPDDR/DDR2 and LPDDR2/DDR3 compliance testing (U7233A/N5413B/U7231A or Options 031/032/033 on new scope purchases) or N5459A Opt 001 for all memory applications

Quickly and easily evaluate and characterize your memory designs. Automated test-ingbased on JEDEC specifications saves time. The application also includes additional debug and compliance capabilities.

This application is supported on all models. However, the DDR technology you are using may dictate the minimal bandwidth required for your scope.

For more information: **www.agilent.com/find/DDR**

Agilent Infiniium portfolio

Agilent's Infiniium lineup includes 9000 and 90000A Series oscilloscopes. These share a number of advanced hardware and software technology blocks. Use the following selection guide to determine which best matches your specific needs.



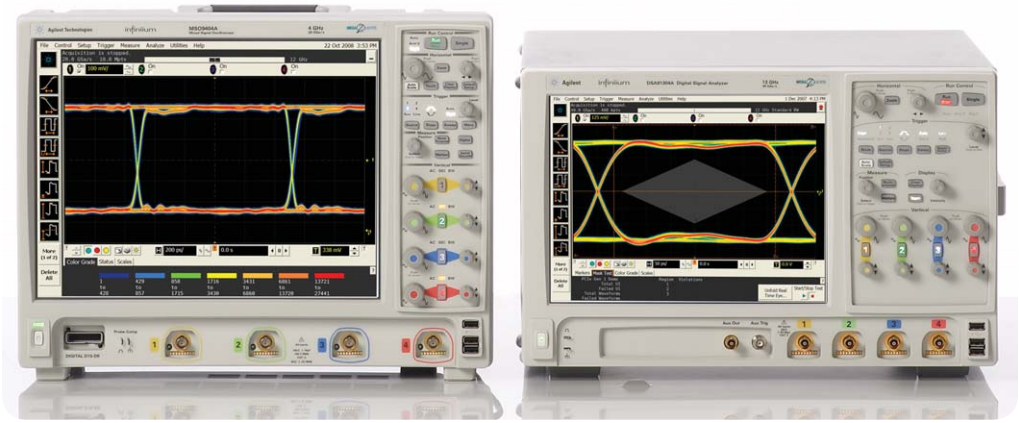
Lowest noise, highest bandwidth



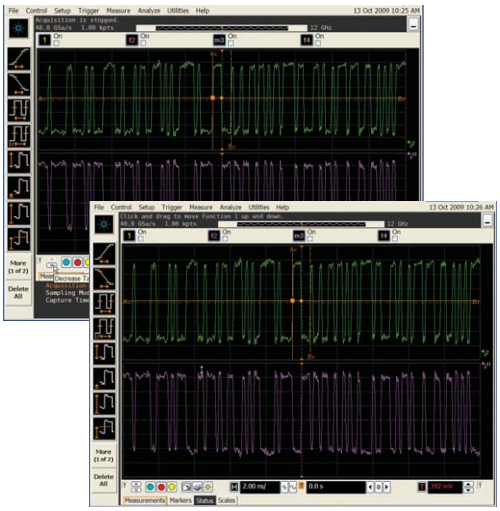
Widest range of applications.
Biggest display plus thin depth

	90000 Series Oscilloscope		9000 Series Oscilloscope
Bandwidth	2.5 GHz,4 GHz, 6 GHz	8 GHz,12 GHz, 13 GHz	600 MHz,1 GHz, 2.5 GHz, 4 GHz
Bandwidth upgradability	●	●	●
50 Ω & 1 MΩ inputs	50 Ω	50 Ω*	Both
MSO models			●
Max 4-channel sample rate	20 GSa/s	40 GSa/s	10 GSa/s
Built-in GPIB available	Yes	Yes	N4865A adapter
Rackmount height	7U	7U	8U
Display size	12.1″	12.1″	16″
Footprint (HxWxD)	11.1 ″ x 17″ x 19.9″ 12.9 ″ x 16.8″ x 9″	11.1 ″ x 17″ x 19.9″ 12.9 ″ x 16.8″ x 9″	12.9 ″ x 16.8″ x 9″ 33 cm x 43 cm x 23 cm

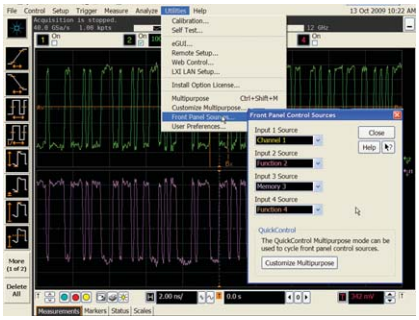
* 1 MΩ available by purchasing the E2697A



Infiniium 90000A Series



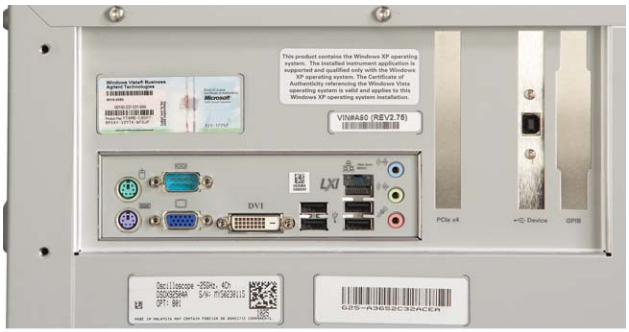
Click on the icon at the bottom left of the Infiniium screen to minimize the status and scales tab for full screen viewing. Maximize your viewing needs.



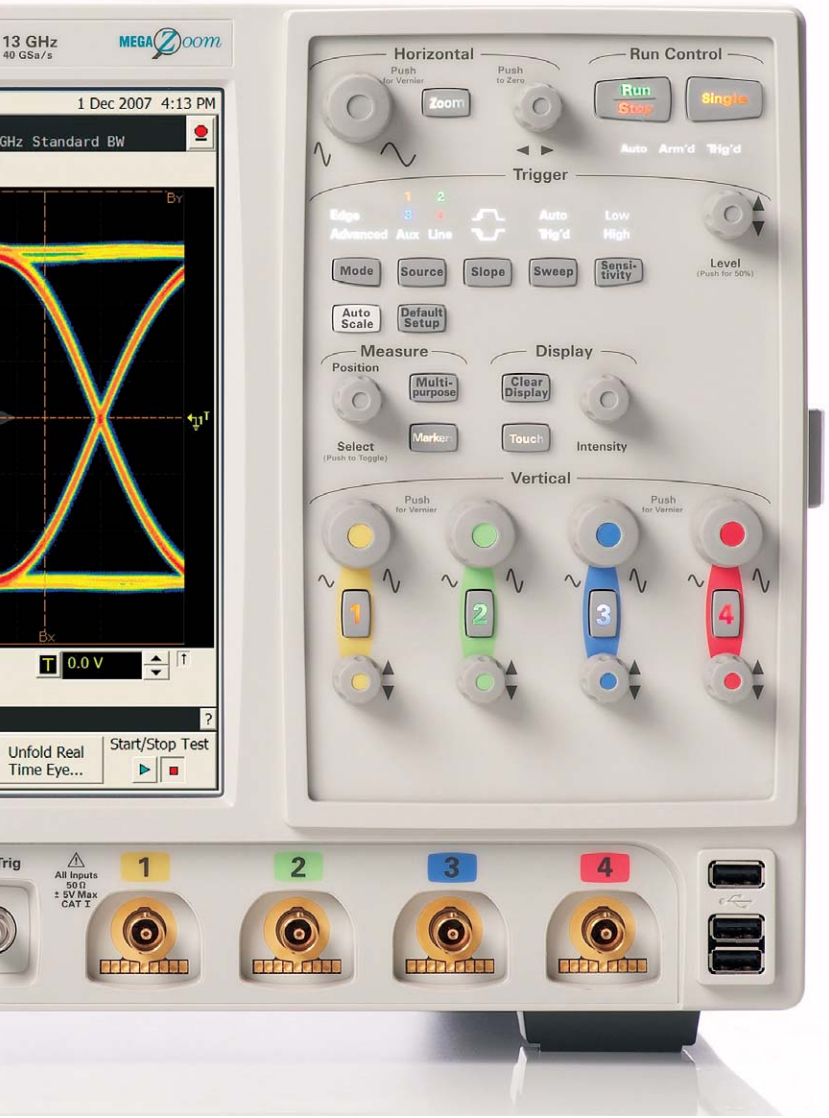
Ever wanted to change the scale or offset of a function or waveform memory? If you have, you know that it requires multiple menus and key strokes. In Infiniium software version 2.01 and later, you can now map functions and waveform memories to the front panel controls of the oscilloscope!

Starting with an **18-GHz, BNC-compatible connector**, an **ultra-low noise floor** front end design using **Faraday cage** technology ensures high signal integrity in its signal path.





AutoProbe interface completely configures your scope for use with the InfiniiMax probing system and previous-generation Agilent active probes.



Simply press the **horizontal delay knob** to set the delay value to zero. A **zoom button** provides quick access to two screen zoom mode.

Dedicated **single acquisition button** provide better control to capture an unique event.

Customizable **Multipurpose** key gives you any five automated measurements with a push of a button. You can also configure this key to execute a script, print/save screen shots, save waveforms, or load a favorite setup.

Measure section including a **toggling marker** button and a **dedicated marker knob** provides quick access to your marker control.

Quick access to fine/vernier control by pressing the horizontal and vertical sensitivity knobs.

Increase your productivity with a familiar Infiniium graphical user interface, like your favorite drag-and-drop measurement icons. Infiniium's analog-like front panel has a full set of controls color coded to the waveforms and measurements, making your tasks simple.

Optional USB external DVD-RW drive allows you to install your favorite third-party software conveniently and can be used to back up your critical measurement data.

Install third-party software packages on **Windows XP Pro** operating system such as Excel, LabVIEW, Agilent VEE, MATLAB®, anti-virus software, and more, to perform customized processing and automation of your oscilloscope or to make the scope compliant to the network environment of your company.

InfiniiMax II: The World's best high-speed probing system just keeps getting better

InfiniiMax offers you the highest performance available for measuring differential and single-ended signals, with flexible connectivity solutions for today's high-density ICs and circuit boards.

InfiniiMax probes have fully characterized performance for all of their various probe heads. This includes:

- Swept frequency response plot
- Common mode rejection versus frequency plot
- Impedance versus frequency plot
- Time-domain probe loading plot
- Time-domain probe tracking plot

One-year standard warranty on active probes and a variety of Agilent support options to choose from.

Controlled impedance transmission lines in every probe head deliver full performance versus the performance limitations introduced by traditional wire accessories.

Probe interface software allows you to save the calibration information for up to 10 different probe heads per channel and will automatically retrieve calibration data for a probe amplifier as it is attached to the scope.

High-input impedance active probes minimize loading, support differential measurements and DC offset, and can compensate for cable loss.

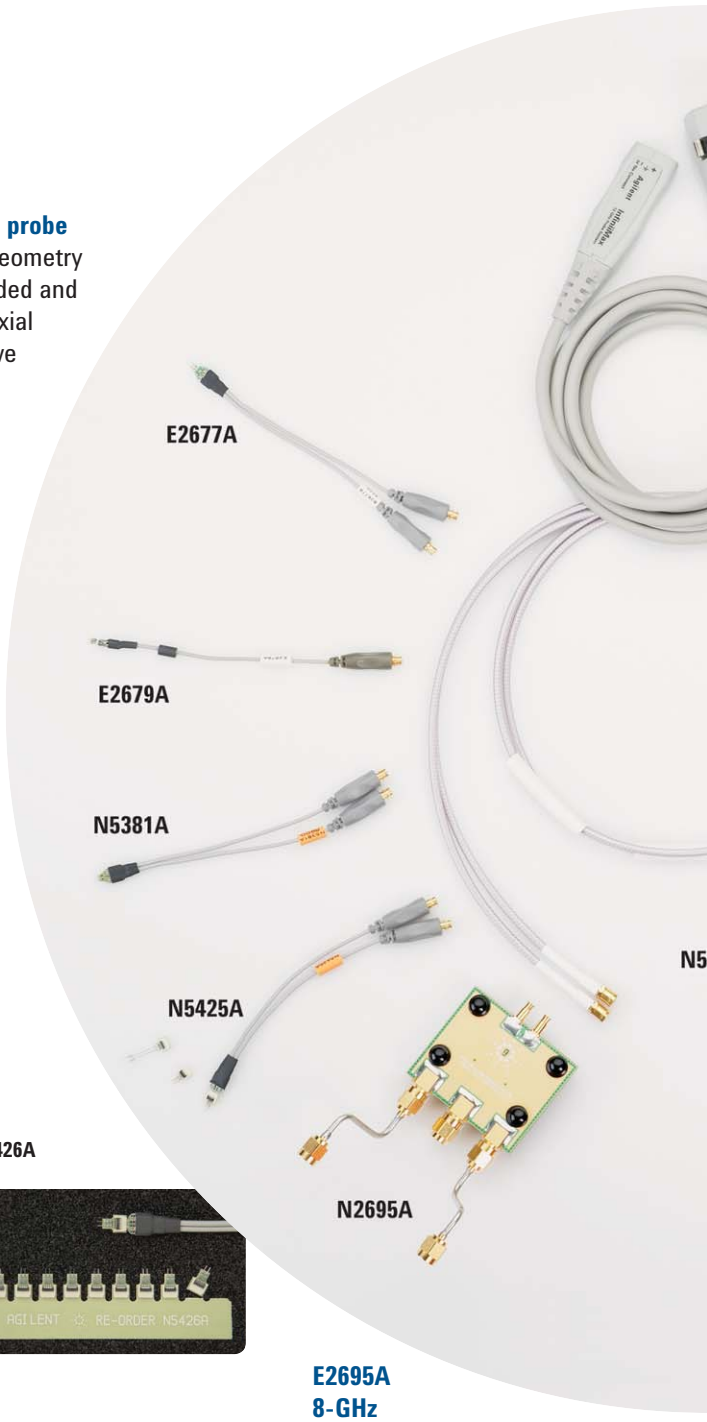
Probe calibration software delivers the most accurate probe measurements and linear phase response and allows various probe combinations to be deskewed to the same reference time.

A flat frequency response over the entire probe bandwidth eliminates the distortion and frequency-dependent loading effects that are present in probes that have an in-band resonance.

E2677A 12-GHz solder-in differential probe head can be attached to very-small-geometry circuits for measuring both single-ended and differential signals. External mini-coaxial resistors facilitate wider span but have increased high-frequency response variation relative to N5381A.

E2679A 6-GHz extremely small single-ended, solder-in probe heads
for probing even the hardest-to-reach single-ended signals.

N5381A 13-GHz high-bandwidth solder-in differential probe head provides maximum bandwidth and minimizes capacitive loading to ≤ 210 fF. Variable spacing from 0.2 to 3.3 mm (8 to 130 mills).

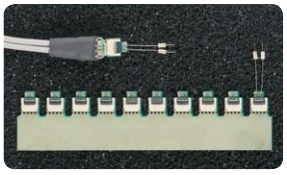


N5425A 13-GHz high-bandwidth solder-in differential ZIF probe head and N5426A ZIF tip provides maximum bandwidth with industry's first lead-free solder-in probe solution in an economical replaceable tip form factor.

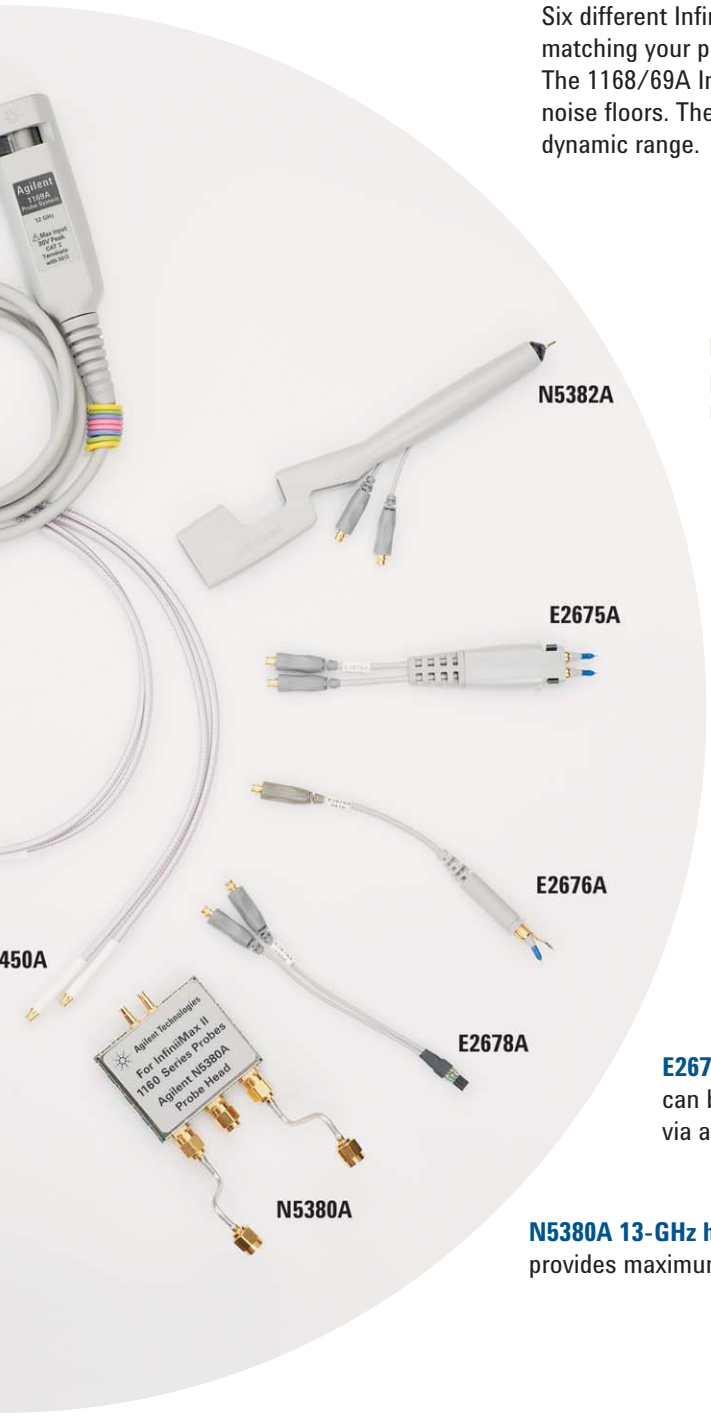
N5426A

N5451A 9-GHz/5-GHz long-wire ZIF tip provides high-bandwidth economical replaceable solder-in tip with extra reach (9 GHz with 7 mm and 5 GHz with 11 mm wire).

N5451A



E2695A 8-GHz differential SMA probe head allows you to connect two SMA cables to make a differential measurement on a single scope channel.



Six different InfiniiMax probe amplifiers from 1.5 GHz to 13 GHz are available for matching your probing solution to your performance and budget requirements. The 1168/69A InfiniiMax II amplifiers offer the highest bandwidth and the lowest noise floors. The 1134/32/31/30A offer a more cost effective solution and wider dynamic range.

N5382A 13-GHz high-bandwidth differential browser provides maximum bandwidth for hand-held or probe holder use. Variable spacing from 0.2 to 3.3 mm (8 to 130 mills).

E2675A 6-GHz differential browser is the best choice for general-purpose trouble shooting of differential or single-ended signals with z-axis compliance and variable spacing from 0.25 - 5.80 mm (10 - 230 mills).

E2676A 6-GHz single-ended browser is the best choice for general-purpose probing of single-ended signals when small size of the probe head is the primary consideration.

E2678A 12-GHz differential socket probe head can be used to measure either differential or single-ended signals via a plug-on socket connection.

N5380A 13-GHz high-bandwidth differential SMA probe head provides maximum bandwidth for SMA-fixtured differential pairs.

N5450A InfiniiMax extreme temperature extension cable provides extra reach into environmental chambers.

Probe performance plots available
The InfiniiMax II probe manuals contain an extensive set of performance plots (bandwidth, probe tracking, CMRR, step response, impedance) for various probe configurations. See the following Web site for this information **www.agilent.com/find/probes**

Infiniium 90000A Series Oscilloscopes
Performance characteristics

Vertical

Input channels	Four					
Analog bandwidth (–3 dB)*, 10	**90254A** 2.5 GHz	**90404A** 4 GHz	**90604A** 6 GHz	**90804A** 8 GHz	**91204A** 12 GHz	**91304A** 12 GHz
DSP enhanced bandwidth[3]	91304A: 13-GHz real-time, user-selectable DSP enhanced bandwidth					
Rise time/fall time[11]	**90254A**	**90404A**	**90604A**	**90804A**	**91204A**	**91304A**
10 - 90%	140 ps	105 ps	70 ps	54 ps	35 ps	32 ps
20 - 80%	105 ps	79 ps	53 ps	38 ps	25 ps	23 ps
Input impedance[12]	50 Ω, ± 3%					
Sensitivity[1]	1 mV/div to 1 V/div					
Input coupling	DC					
Vertical resolution[2]	8 bits, ≥ 12 bits with averaging					
Channel to channel isolation (any two channels with equal V/div settings)	DC to 3 GHz: 90804A/91204A/91304A: 60 dB (≥ 1000:1) 90254A/90404A/90604A: 50 dB (≥ 316:1) 3 GHz to 8 GHz: 40 dB (≥ 100:1) 8 GHz to BW: 35 dB (≥ 56:1)					
DC gain accuracy*, 1	± 2% of full scale at full resolution channel scale (± 2.5% for 5mV/div)					
Maximum input voltage*	± 5 V					

Offset range	**Vertical sensitivity**	**Available offset**
	0 mV/div to ≥ 40 mV/div	± 0.4 V
	> 40 mV/div to ≥ 75 mV/div	± 0.9 V
	> 75 mV/div to ≥ 130 mV/div	± 1.6 V
	> 130 mV/div to ≥ 240 mV/div	± 3.0 V
	> 240 mV/div	± 4.0 V

Offset accuracy*, 1	≤ 3.5 V: ± (2% of channel offset + 1% of full scale) + 1 mV > 3.5 V: ± (2% of channel offset + 1% of full scale)					
Dynamic range	± 4 div from center screen					
DC voltage measurement accuracy*, 1	Dual cursor: ± [(DC gain accuracy) + (resolution)] Single cursor: ± [(DC gain accuracy) + (offset accuracy) + (resolution/2)]					
RMS noise floor (scope only)						
Volts/div	**90254A**	**90404A**	**90604A**	**90804A**	**91204A**	**91304A**
5 mV	153 µV	199 µV	259 µV	322 µV	435 µV	467 µV
10 mV	183 µV	232 µV	295 µV	358 µV	483 µV	536 µV
20 mV	275 µV	342 µV	424 µV	498 µV	650 µV	758 µV
50 mV	645 µV	799 µV	985 µV	1.15 mV	1.45 mV	1.73 mV
100 mV	1.27 mV	1.56 mV	1.92 mV	2.22 mV	2.80 mV	3.37 mV
200 mV	2.47 mV	3.03 mV	3.71 mV	4.28 mV	5.41 mV	6.58 mV
500 mV	6.48 mV	8.00 mV	9.91 mV	11.5 mV	14.7 mV	17.4 mV
1 V	12.5 mV	15.6 mV	19.2 mV	22.3 mV	28.5 mV	34.1 mV

* Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period, and ±5 °C from annual calibration temperature.

1 Full scale is defined as 8 vertical divisions. Magnification is used below 5 mV/div. Below 5 mV/div, full-scale is defined as 40 mV. The major scale settings are 5 mV, 10 mV, 20 mV, 50 mV, 100 mV, 200 mV, 500 mV, 1 V.

2 Vertical resolution for 8 bits = 0.4% of full scale, for 12 bits = 0.024% of full scale.

3 13 GHz DSP enhanced bandwidth not applicable at 5 mV/div.

10 11.8 GHz analog bandwidth at 5 mV/div for DSO91304A and DSO91204A models.

11 Calculated from the bandwidth.

12 Input impedance is valid when V/div scaling is adjusted to show all waveform vertical values within the scope display.

Vertical (continued)

RMS noise floor (scope with probe) Volts/div	90254A with 1131A	90404A with 1132A	90604A with 1134A	90804A with 1168A	91204A with 1169A	91304A with 1169A
20 mV	3.2 mV	3.5 mV	4.0 mV	2.2 mV	2.5 mV	2.7 mV
50 mV	3.3 mV	3.6 mV	4.0 mV	2.3 mV	2.8 mV	3.1 mV
100 mV	3.4 mV	3.8 mV	4.3 mV	2.9 mV	3.5 mV	4.2 mV
200 mV	4.0 mV	4.6 mV	5.3 mV	4.7 mV	5.9 mV	7.5 mV
500 mV	7.1 mV	8.6 mV	10 mV	12 mV	15 mV	19 mV
1 V	13 mV	16 mV	19 mV	23 mV	28 mV	37 mV

Horizontal

Main timebase range	5 ps/div to 20 s/div real-time, 5 ps/div to 500 ns/div equivalent-time
Main timebase delay range	–200 s to 200 s real-time, –25 µs to 200 s equivalent-time
Zoom timebase range	1 ps/div to current main time scale setting
Channel deskew	± 25 µs range, 100 fs resolution
Time scale accuracy*	± (0.4 + 0.5 * YrsSinceCal) ppm pk
Delta-time measurement accuracy[6a, 6b, 7]	
Absolute, averaging disabled	$\sqrt{\left(\frac{5.0 \cdot Noise}{SlewRate}\right)^2 + 20x10^{-24}} + \frac{TimeScaleAccy \cdot Reading}{2}$ sec pk
Absolute, >- 256 averages	$\sqrt{\left(\frac{0.35 \cdot Noise}{SlewRate}\right)^2 + 0.1x10^{-24}} + \frac{TimeScaleAccy \cdot Reading}{2}$ sec pk
Standard deviation, averaging disabled	$\sqrt{\left(\frac{1.4 \cdot Noise}{SlewRate}\right)^2 + 0.6x10^{-24}}$ sec $_{rms}$
Standard deviation, >- 256 averages	$\sqrt{\left(\frac{0.1 \cdot Noise}{SlewRate}\right)^2 + 0.01x10^{-24}}$ sec $_{rms}$
Jitter measurement floor[6a, 6b]	
Time interval error[6c]	$\sqrt{\left(\frac{1.0 \cdot Noise}{SlewRate}\right)^2 + 0.3x10^{-24}}$ sec $_{rms}$
Period jitter	$\sqrt{\left(\frac{1.4 \cdot Noise}{SlewRate}\right)^2 + 0.6x10^{-24}}$ sec $_{rms}$
N-cycle, cycle-cycle jitter	$\sqrt{\left(\frac{2.4 \cdot Noise}{SlewRate}\right)^2 + 1.7x10^{-24}}$ sec $_{rms}$

Infiniium 90000A Series Oscilloscopes
Performance characteristics

Acquisition

Maximum real-time sample rate	91304A/91204A/90804A: 40 GSa/s (4 channels simultaneously) 90604A/90404A/90254A: 20 GSa/s (4 channels simultaneously)						
Memory depth per channel							
Standard	20 Mpts on 4 channels						
Option 50M	50 Mpts on 4 channels (standard on DSA models)						
Option 100	100 Mpts on 4 channels						
Option 200	200 Mpts on 4 channels						
Option 500	500 Mpts on 4 channels						
Option 01G	1 Gpts on 4 channels						
Maximum acquired time at highest real-time resolution	**91304A/91204A/90804A**			**90604A/90404A/90254A**			
Resolution	25 ps (40 GSa/s)			50 ps (20 GSa/s)			
Standard	0.5 ms			1.0 ms			
Option 50M	1.25 ms			2.5 ms			
Option 100	2.5 ms			5.0 ms			
Option 200	5.0 ms			10.0 ms			
Option 500	12.5 ms			25.0 ms			
Option 01G	25.0 ms			50.0 ms			
Data transfer speed							
Gigabit Ethernet	Samples:	1 k	64 k	1 M	16 M	32 M	128 M
	MSa/s (Word):	0.1	1.88	9.25	12.00	12.80	12.80
	MSa/s (Byte):	0.11	1.88	12.60	19.70	20.30	22.00
USB 2.0 hi-speed (device)	Samples:	1 k	64 k	1 M	16 M	32 M	128 M
	MSa/s (Word):	0.11	1.88	8.34	8.55	9.07	11.38
	MSa/s (Byte):	0.11	1.88	11.60	14.40	14.90	18.10
Sampling modes							
Real-time	Successive single-shot acquisitions						
Real-time with averaging	Selectable from 2 to 65534						
Real-time with peak detect	91304A/91204A/90804A: 40 GSa/s 90604A/90404A/90254A: 20 GSa/s						
Real-time with hi resolution	Real-time boxcar averaging reduces random noise and increases resolution						
Equivalent-time	Resolution: 100 fs Full bandwidth on all 4 channels, 262,144 sample points maximum memory						
Segmented memory	Captures bursting signals at maximum sample rate without consuming memory during periods of inactivity Number of segments: Up to 131,072 segments (depending on installed memory depth and model number) Minimum intersegment time: 91304A / 91204A / 90804A: 2.7 µs 90604A / 90404A / 90254A: 2.5 µs (the time between the end of the previous acquisition and the beginning of the next acquisition) Maximum number of segments:						
	Sample rate:	**10 M**	**20 M**	**50 M**	**100 M**	**200 M**	**500 M**	**1 G**
		2048	4096	8192	16384	32768	65536	131072
Roll mode	Scrolls sequential waveform points across the display in a right-to-left rolling motion. Works at sample rates up to 10 MSa/s with a maximum record length of 40MS.						
Filters Sin(x)/x Interpolation	On/off selectable FIR digital filter. Digital signal processing adds points between acquired data points to enhance measurement accuracy and waveform display quality.						

Hardware trigger

Sensitivity[1]	91304A/91204A/90804A: Internal low[1]: 2.0 div p-p 0 to 5 GHz Internal high[1]: 0.3 div p-p 0 to 4 GHz, 1.0 div p-p 4 to 7.5 GHz 90604A/90404A/90254A[12]: Internal low[1]: 2.0 div p-p 0 to 5 GHz Internal high[1]: 0.3 div p-p 0 to 3 GHz, 1.0 div p-p 3 to 5 GHz Auxiliary: DC to 100 MHz: 200 mV p-p into 50 Ω 100 MHz to 1 GHz: 500 mV p-p into 50 Ω
Level range	
Internal	± 4 div from center screen or ± 4 Volts, whichever is smallest
Auxiliary	± 5 V, also limit input signal to ± 5 V
Sweep modes	Auto, triggered, single
Display jitter (displayed trigger jitter)[6a, 8]	90804A, 91204A, 91304A: $\sqrt{\left(\frac{0.9 \bullet Noise}{SlewRate}\right)^2 + 0.3x10^{-24}}$ sec $_{rms}$ 90254A, 90404A, 90604A: $\sqrt{\left(\frac{0.9 \bullet Noise}{SlewRate}\right)^2 + 0.3x10^{-24}}$ sec $_{rms}$
Trigger sources	Channel 1, channel 2, channel 3, channel 4, aux, and line
Trigger modes	
Edge	Triggers on a specified slope (rising, falling or alternating between rising and falling) and voltage level on any channel or auxiliary trigger.
Edge transition	Trigger on rising or falling edges that cross two voltage levels in > or < the amount of time specified. Edge transition setting from 250 ps.
Edge then edge (time)	The trigger is qualified by an edge. After a specified time delay between 10 ns to 10 s, a rising or falling edge on any one selected input will generate the trigger.
Edge then edge (event)	The trigger is qualified by an edge. After a specified delay between 1 to 16,000,000 rising or falling edges, another rising or falling edge on any one selected input will generate the trigger.
Glitch	Triggers on glitches narrower than the other pulses in your waveform by specifying a width less than your narrowest pulse and a polarity. Triggers on glitches as narrow as 125 ps. Glitch range settings: < 250 ps to < 10 s.
Line	Triggers on the line voltage powering the oscilloscope.
Pulse width	Trigger on a pulse that is wider or narrower than the other pulses in your waveform by specifying a pulse width and a polarity. Triggers on pulse widths as narrow as 125 ps. Pulse width range settings: 250 ps to 10 s. Trigger point can be “end of pulse” or “time out”.
Runt	Triggers on a pulse that crosses one threshold but fails to cross a second threshold before crossing the first again. Can be time qualified with minimum setting of 250 ps.
Timeout	Trigger when a channel stays high, low, or unchanged for too long. Timeout setting: from 250 ps to 10 s.
Pattern/pulse range	Triggers when a specified logical combination of the channels is entered, exited, present for a specified period of time or is within a specified time range or times out. Each channel can have a value of High (H), Low (L) or Don’t care (X).
State	Pattern trigger clocked by the rising, falling or alternating between rising and falling edge of one channel.
Setup/hold	Triggers on setup, hold, or setup and hold violations in your circuit. Requires a clock and data signal on any two inputs (except aux or line) channels as trigger sources. Setup and/or hold time must then be specified.

Hardware trigger (continued)

Trigger modes (continued)	
Window	Triggers on an event associated with a window defined by two-user adjustable thresholds. Event can be window "entered," "exited," "inside (time qualified)," or "outside (time qualified)" voltage range. Trigger point can be "cross window boundary" or "time out." Time qualify range: from 250 ps to 10 s.
Video	Triggers from negative sync composite video, field 1, field 2, or alternating fields for interlaced systems, any field, specific line, or any line for interlaced or non-interlaced systems. Supports NTSC, PAL-M (525/60), PAL, SECAM (625/50), EDTV (480p/60), EDTV (576p/50), HDTV (720p/60), HDTV (720p/50), HDTV (1080i/60), HDTV (1080i/50), HDTV (1080p/60), HDTV (1080p/50), HDTV (1080p/30), HDTV (1080p/25), HDTV (1080p/24), and user-defined formats.
Trigger sequences	Three stage trigger sequences including two-stage hardware (Find event (A) and Trigger event (B)) and one-stage InfiniiScan software trigger. Supports all hardware trigger modes except "edge then edge" and "video," and all InfiniiScan software trigger modes. Supports "delay (by time)" and "reset (by time or event)" between two hardware sequences. The minimum latency between "find event (A)" and "trigger event (B)" is 3 ns.
Trigger qualification AND qualifier	Single or multiple channels may be logically qualified with any other trigger mode
Trigger holdoff range	100 ns to 10 s
Trigger actions	Specify an action to occur and the frequency of the action when a trigger condition occurs. Actions include e-mail on trigger and execute "multipurpose" user setting.
Trigger shortcuts	Provides easy shortcuts to all trigger features

Software trigger (requires InfiniiScan event identification software – Option 009)

Trigger modes	
Generic serial	Software triggers on NRZ-encoded data up to 8.0 Gbps, up to 80-bit pattern. Support multiple clock data recovery methods including constant frequency, 1st-order PLL, 2nd-order PLL, explicit clock, explicit 1st-order PLL, explicit 2nd-order PLL, Fibre Channel, FlexRay receiver, FlexRay transmitter (requires E2688A except for the constant frequency clock data recovery mode).
Measurement limit	Software triggers on the results of the measurement values. For example, when the "pulse width" measurement is turned on, InfiniiScan measurement software trigger triggers on a glitch as narrow as 75 ps. When the "time interval error (TIE)" is measured, InfiniiScan can trigger on a specific TIE value.
Non-monotonic edge	Software triggers on the non-monotonic edge. The non-monotonic edge is specified by setting a hysteresis value.
Runt	Software triggers on a pulse that crosses one threshold but fails to cross a second threshold before crossing the first again. Unlike hardware runt trigger, InfiniiScan runt trigger can be further qualified via a hysteresis value.
Zone qualify	Software triggers on the user defined zones on screen. Zones can be specified as either "must intersect" or "must not intersect." Up to four zones can be defined.

Measurements and math

Maximum measurement update rate	> 42,000 measurement/sec (one measurement turned on) > 122,000 measurement/sec/measurement (five measurements turned on)
Measurement modes	Standard, Measure All Edges mode

Measurements and math (continued)

Waveform measurements	
Voltage	Peak to peak, minimum, maximum, average, RMS, amplitude, base, top, overshoot, preshoot, upper, middle, lower
Time	Rise time, fall time, period, frequency, positive width, negative width, duty cycle, burst width, Tmin, Tmax, Tvolt, setup time (requires Option 002 or 004, standard on DSA models), hold time (requires Option 002 or 004, standard on DSA models), channel-to-channel delta time, channel-to-channel phase
Mixed	Area, slew rate
Frequency domain	FFT frequency, FFT magnitude, FFT delta frequency, FFT delta magnitude
Level qualification	Any channels that are not involved in a measurement can be used to level-qualify all timing measurements
Eye-diagram measurements	Eye height, eye width, eye jitter, crossing percentage, Q factor, and duty-cycle distortion
Jitter analysis measurements	Requires Option 002 (or E2681A) or 004 (or N5400A). Standard on DSA Series.
Clock	Time interval error (TIE) clock with TIE band, high, low-pass filter, cycle-cycle jitter, N-cycle jitter, cycle-cycle + width, cycle-cycle width, cycle-cycle duty cycle
Data	Time interval error (TIE) data with TIE band, high, low-pass filter, data rate, unit interval, clock recovery rate, burst time, burst period, burst interval
Timing	Two sources: Setup time, hold time, phase, advanced One source: Period, frequency, + width, width, duty cycle, burst width, rise time, fall time, slew rate
Statistics	Displays the current, mean, minimum, maximum, range (max-min), standard deviation, number of measurements value for the displayed automatic measurements
Histograms	
Source	Waveform or measurement[13]
Orientation	Vertical (for timing and jitter measurements) or horizontal (noise and amplitude change) modes, regions are defined using waveform markers
Measurements	Mean, standard deviation, mean ± 1, 2, and 3 sigma, median, mode, peak-to-peak, min, max, total hits, peak (area of most hits), X scale hits, and X offset hits
Mask testing	Allows pass/fail testing to user-defined or Agilent-supplied waveform templates. Automask lets you create a mask template from a captured waveform and define a tolerance range in time/voltage or screen divisions. Test modes (run until) include test forever, test to specified time or event limit, and stop on failure. Executes "multipurpose" user setting on failure. "Unfold real time eye" feature will allow individual bit errors to be observed by unfolding a real time eye when clock recovery is on. Communications mask test kit option provides a set of ITU-T G.703, ANSI T1.102, and IEEE 802.3 industry-standard masks for compliance testing.
Waveform math	
Number of functions	Four
Hardware Accelerated Math	Differential and Common Mode
Operators	Absolute value, add, average, Butterworth[9], common mode, differentiate, divide, FFT magnitude, FFT phase, FIR[9], high pass filter, integrate, invert, LFE[9], low pass filter (4th-order Bessel Thompson filter), magnify, max, min, multiply, RT Eye[9], smoothing, SqrtSumOfSquare[9], square, square root, subtract, versus, and optional user defined function (Option 010)
FFT	
Frequency range[4]	DC up to 20 GHz (at 40 GSa/s) or 10 GHz (at 20 GSa/s)
Frequency resolution	Sample rate/memory depth = resolution
Best resolution at maximum sample rate	91304A/91204A/90804A: 800 Hz 90604A/90404A/90254A: 400 Hz
Frequency accuracy	(1/2 frequency resolution) + (1 x 10-6)(signal frequency)

Measurements and math (continued)

FFT (continued)	
Signal-to-noise ratio[5]	60 dB to > 100 dB depending on settings
Window modes	Hanning, flattop, rectangular, Blackman-Harris
Measurement modes	
Automatic measurements	Measure menu access to all measurements, ten measurements can be displayed simultaneously
Multipurpose	Front-panel button activates ten pre-selected or ten user-defined automatic measurements
Drag-and-drop measurement toolbar	Measurement toolbar with common measurement icons that can be dragged and dropped onto the displayed waveforms
Snapshot	Takes 29 snap shot measurements (customizable).
Marker modes	Manual markers, track waveform data, track measurements

Display

Display	
Display	12.1-inch color XGA TFT-LCD with touch screen
Intensity grayscale	256-level intensity-graded display
Resolution XGA	1024 pixels horizontally x 768 pixels vertically
Annotation	Up to 12 labels, with up to 100 characters each, can be inserted into the waveform area
Grids	One, two or four waveform grids, each with 8 bit vertical resolution
Waveform styles	Connected dots, dots, infinite persistence, color graded infinite persistence. Includes up to 256 levels of intensity-graded waveforms.
Waveform update rate	
Maximum waveform update	> 400,000 waveforms per second (when in the segment memory mode)

Computer system and peripherals, I/O ports

Computer system and peripherals	
Operating system	Windows 7 Embedded Standard
CPU	Intel® Core 2 Duo 3.06 GHz
PC system memory	4GB DDR2 (standard)
Drives	≥ 250-GB internal hard drive Optional removable hard drive (Option 801) Optional USB external DVD-RW drive (Option 820)
Peripherals	Logitech optical USB mouse, compact USB keyboard and stylus supplied. All Infiniium models support any Windows-compatible input device with a serial, PS/2 or USB interface.
File types	
Waveforms (supported max memory size)	Compressed internal format (*.wfm (200 Mpts)), comma-separated values (*.csv (1 Gpts)), tab separated values (*.tsv (1 Gpts)), public binary format (.bin (500 Mpts)), Y value files (*.txt (1 Gpts)), hierarchal data file (*.hf5(1 Gpts)),
Images	BMP, PNG, TIFF, GIF or JPEG
I/O ports	
LAN	RJ-45 connector, supports 10Base-T, 100Base-T, and 1000Base-T. Enables Web-enabled remote control, e-mail on trigger or demand, data/file transfers and network printing (VXI-11). Recommended Web remote control tool: Ultra VNC (**http://www.ultravnc.com/**).

Computer system and peripherals, I/O ports (continued)

I/O ports (continued)	
PCI Express	PCI Express x4 link, enabled by sockets (optional- Option 823)
GPIB	IEEE 488.2, fully programmable (optional – Option 805)
RS-232 (serial)	COM1, printer and pointing device support
Parallel	Centronics printer port
PS/2	Two ports. Supports PS/2 pointing and input devices.
USB 2.0 hi-speed (host)	Three USB 2.0 hi-speed host ports on front panel plus four USB 2.0 Hi-Speed host ports on rear panel
USB 2.0 hi-speed (device)	One USB 2.0 hi-speed device port on rear panel that enables USB instrument control
Dual-monitor video output	15 pin XGA (1024x768), full color output of scope waveform display or dual monitor video output
Auxiliary output	DC (± 2.4 V); square wave (~715 Hz and ~456 MHz); trigger output (255 mV p-p into 50)
Trigger output	5 V 50 Ω back-terminated
Time base reference output	10 MHz filtered sine wave with all harmonics ≤ –40 dBc. Amplitude into 50 Ω: 800 mV p-p to 1.26 V p-p (4 dBm ± 2 dB) if derived from internal reference. Tracks external reference input amplitude ± 1 dB if applied and selected.
Time base reference input	Must be 10 MHz, input Z0 = 50 Ω. Minimum 500 mV p-p (–2 dBm), maximum 2.0 V p-p (+10 dBm).
LXI compliance	Functional Class C

General characteristics

Temperature[11]	Operating: 5 °C to +40 °C; Non-operating: –40 °C to +65 °C
Humidity	Operating: up to 95% relative humidity (non-condensing) at +40 °C; Non-operating: up to 90% relative humidity at +65 °C
Altitude	Operating: up to 4,000 meters (12,000 feet); Non-operating: up to 15,300 meters (50,000 feet)
Vibration	Under vibration: for operating random the 0.3 g(rms) should be 0.21 g(rms), for non-operating random the 2.41 g(rms) should be 2.0 g(rms) and for swept sins the (0.75g) should be (0.50g).
Power	100 - 240 VAC at 50/60 Hz; maximum input power 800 Watts
Weight	Net: 20 kg (44 lbs.) Shipping: 27.4 kg (60 lbs.)
Dimensions (excluding handle)	Height: 283 mm (11.13 inch); Width: 432 mm (17.02 inch); Depth: 506 mm (19.91 inch)
Safety	Meets IEC 61010-1 +A2, CSA certified to C22.2 No.1010.1, self-certified to UL 3111

* Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period, and ±5 °C from annual calibration temperature.

1 Full scale is defined as 8 vertical divisions. Magnification is used below 5 mV/div. Below 5 mV/div, full-scale is defined as 40 mV. The major scale settings are 5 mV, 10 mV, 20 mV, 50 mV, 100 mV, 200 mV, 500 mV, 1 V.

2 Vertical resolution for 8 bits = 0.4% of full scale, for 12 bits = 0.024% of full scale.

3 13 GHz DSP enhanced bandwidth not applicable at 5 mV/div.

4 FFT amplitude readings are affected by scope and probe bandwidth limitations and input amplifiers roll-off (e.g. 3 dB roll-off at specified bandwidth of scope/probe).

5 The FFT signal to noise ratio varies with volts/division setting, memory depth and use of time or frequency averaging.

6a Noise is the displayed noise floor. SlewRate is the displayed slew rate of the signal at the threshold crossings. Sample rate = max, sin(x)/x interpolation enabled.

6b Measurement threshold = fixed voltage at 50% level.

6c Time ranges ≤ 10 µs.

7 Values represent time error between two edges on a single channel. Standard deviation value refers to the standard deviation of 256 consecutive measurements performed using an individual instrument. Reading is the displayed DTMA measurement value. TimeScaleAccy is the oscilloscope's specified time scale accuracy.

8 Internal edge trigger mode. Trigger threshold = fixed voltage at 50% level. The slew rate independent value in the formula represents the traditional trigger jitter.

9 Requires Option 010 user defined function.

10 11.8 GHz analog bandwidth at 5 mV/div for DSO91304A and DSO91204A models.

11 Calculated from the bandwidth.

12 Typically triggers as low as 5 mV/div sensitivity.

13 Measurment histograms require EZJIT license

InfiniiMax II Series
Performance characteristics

	1169A, 1168A	
Bandwidth*	1169A: > 12 GHz (13 GHz typical)	1168A: > 10 GHz
Rise and fall time		
Probe only	1169A: 28 ps (20 - 80%), 40 ps (10 - 90%)	1168A: 34 ps (20 - 80%), 48 ps (10 - 90%)
When phase compensated by 90000A Series oscilloscope	1169A w/91204A: 25 ps (20 - 80%) 36 ps (10 - 90%) 1169A w/91304A: 23 ps (20 - 80%) 33 ps (10 - 90%)	1168A w/90804A: 38 ps (20 - 80%) 54 ps (10 - 90%)
System bandwidth (–3 dB)	1169A w/91304A: 13 GHz (typical) 1169A w/91204A: 12 GHz	1168A w/90804A: 8 GHz
Input capacitance[1]	Cm = 0.09 pF Cm is between tips Cg = 0.26 pF Cg is to ground for each tip Cdiff = 0.21 pF Differential mode capacitance = Cm + Cg/2 Cse = 0.35 pF Single-ended mode capacitance = Cm + Cg	
Input resistance*	Differential mode resistance = 50 kΩ ± 2% Single-ended mode resistance = 25 kΩ ± 2%	
Input dynamic range	3.3 V peak to peak, ± 1.65 V	
Input common mode range	6.75 V peak to peak dc to 100 Hz; 1.25 V peak to peak > 100 Hz	
Maximum signal slew rate	25 V/ns when probing a single-ended signal 40 V/ns when probing a differential signal	
DC attenuation	3.45:1	
Zero offset error referred to input	± 1.5 mV	
Offset range	± 16.0 V when probing single-ended	
Offset gain accuracy	< ± 1% of setting when probing single-ended	
Noise referred to input	2.5 mV rms, probe only	
Propagation delay	~6 ns (this delay can be deskewed relative to other signals)	
Maximum input voltage	30 V peak, CAT I	
ESD tolerance	> 8 kV from 100 pF, 300 Ω HBM	
Temperature	Operating: 5 °C to +40 °C Non-operating: 0 °C to +70 °C	

* Denotes warranted specifications, all others are typical.

1 Measured using the probe amplifier and N5381A solder-in differential probe head.





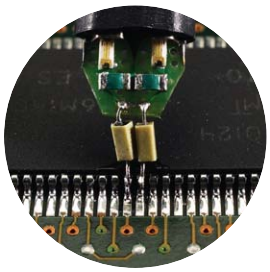


InfiniiMax I Series
Performance characteristics

	1134A, 1132A, 1131A, 1130A
Bandwidth*	1134A: > 7 GHz 1131A: > 3.5 GHz 1132A: > 5 GHz 1130A: > 1.5 GHz
Rise and fall time (10% to 90%)	1134A: 60 ps 1131A: 100 ps 1132A: 86 ps 1130A: 233 ps
System bandwidth (–3 dB)	1134A w/90604A: 6 GHz 1132A w/90404A: 4 GHz 1131A w/90254A: 2.5 GHz
Input capacitance[1]	Cm = 0.10 pF Cm is between tips Cg = 0.34 pF Cg is to ground for each tip Cdiff = 0.27 pF Differential mode capacitance = Cm + Cg/2 Cse = 0.44 pF Single-ended mode capacitance = Cm + Cg
Input resistance*	Differential mode resistance = 50 kΩ ± 2% Single-ended mode resistance = 25 kΩ ± 2%
Input dynamic range	5.0 V peak to peak, ± 2.5 V
Input common mode range	6.75 V peak to peak dc to 100 Hz; 1.25 V peak to peak > 100 Hz
Maximum signal slew rate	18 V/ns when probing a single-ended signal 30 V/ns when probing a differential signal
DC attenuation	10:1 ± 3% before calibration on oscilloscope 10:1 ± 1% after calibration on oscilloscope
Zero offset error referred to input	< 30 mV before calibration on oscilloscope < 5 mV after calibration on oscilloscope
Offset range	± 12.0 V when probing single-ended
Offset accuracy	< ± 1% of setting when probing single-ended
Noise referred to input	3.0 mV rms
Propagation delay	~6 ns (this delay can be deskewed relative to other signals)
Maximum input voltage	30 V peak, CAT I
ESD tolerance	> 8 kV from 100 pF, 300 Ω HBM
Temperature	Operating: 5 °C to +40 °C Non-operating: 0 °C to +70 °C

* Denotes warranted specifications, all others are typical.

1 Measured using the probe amplifier and solder-in differential probe head with full bandwidth resistors.



Infiniium 90000 Series ordering information

Infiniium DSA/DSO90000A Series oscilloscopes

Model	Bandwidth	Channels	Sample rate	Standard memory
DSA/DSO91304A	13 GHz	4	40 GSa/s	20 Mpts/50 Mpts (DSA)
DSA/DSO91204A	12 GHz	4	40 GSa/s	20 Mpts/50 Mpts (DSA)
DSA/DSO90804A	8 GHz	4	40 GSa/s	20 Mpts/50 Mpts (DSA)
DSA/DSO90604A	6 GHz	4	20 GSa/s	20 Mpts/50 Mpts (DSA)
DSA/DSO90404A	4 GHz	4	20 GSa/s	20 Mpts/50 Mpts (DSA)
DSA/DSO90254A	2.5 GHz	4	20 GSa/s	20 Mpts/50 Mpts (DSA)

Note: The DSA/DSO91304A uses DSP enhancement software to achieve 13 GHz bandwidth. It also adds a valuable DSP noise reduction and bandwidth control feature to reduce noise at bandwidths of 10, 8, 6, 4, 2, and 1 GHz. The non-DSP enhanced bandwidth of the DSA/DSO91304A is 12 GHz. DSA Series comes with standard 50 Mpts memory, high speed serial data analyzer (Option 003/E2688A), EZJIT plus jitter analysis software (Option 004/N5400A)

Standard accessories

- USB optical mouse
- USB keyboard
- User's quick-start guide
- Detachable accessory pouch
- Power cord
- Stylus pen
- High-performance calibration cable (not included in DSA/DSO90254A)
- E2655B probe deskew and performance verification kit
- Two 54855-67604 BNC-compatible to precision 3.5 mm (f) adapters (not included in DSA/DSO90254A)
- One-year warranty

Note: No probes are included with the DSA/DSO90000A Series oscilloscopes. The InfiniiMax Series probes or any other probes must be purchased separately.

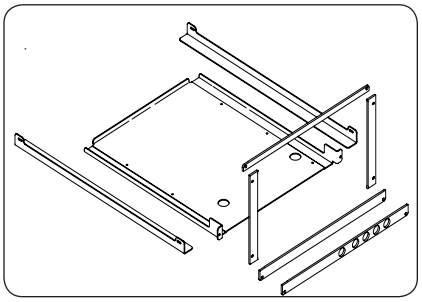
Additional options and accessories

DSO90000A-1CM	Rack Mount Kit
DSO90000A-A61	ANSI Z540 Compliant Calibration
DSO90000A-801	Removable Hard Drive
N5474A (requires Option 801)	Additional removable hard drive for SN lower than MY49470101
N5474B (requires Option 801)	Additional removable hard drive for SN greater than MY49470101 with Windows XP
N5474C (requires Option 801)	Additional removable hard drive for SN greater than MY49470101 with Windows 7
DSO90000A-805	GPIB Card-interface
DSO90000A-807	1 M ohm, adapter with a 500 MHz passive probe
DSO90000A-820	DVD-RW
DSO90000A-821	Additional Precision BNC to SMA adapters, qty 2
DSO90000A-822	External Touchscreen Monitor for Infiniium
DSO90000A-1A7	ISO17025 Compliant Calibration

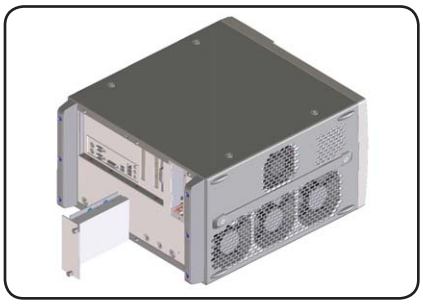
Presales memory options

DSO90000A-20M	20M Memory / CH Upgrade
DSO90000A-100	100M Memory / CH Upgrade
DSO90000A-200	200M Memory / CH Upgrade
DSO90000A-500	500M Memory / CH Upgrade
DSO90000A-50M	50M Memory / CH Upgrade*
DSO90000A-01G	1G Memory / CH Upgrade

* Standard on DSA version oscilloscopes



Mount your 90000 Series scope in a19" (487mm) rack with option 1CM



Quickly remove your hard drive for additional security with option 801

Infiniium 90000 Series ordering information

Factory installed option for new purchases	User installed standalone product number	SW applications
002	E2681A	EZJIT jitter analysis software (standard on DSA Series)
003	E2688A	High-Speed serial data analysis with clock recovery and 8b/10b decoding (standard on DSA Series)
004	N5400A	EZJIT Plus jitter analysis software (standard on DSA Series)
005	N5403A	Noise reduction and bandwidth control option (standard on DSA Series and DSO91304A)
007	N5391A	Protocol triggering and decode I^2C/SPI
008	N5402A	CAN, LIN and FlexRay Protocal triggering and decode
009	N5414B	InfiniiScan event identification software
010	N5430A	Infiniium user-defined function application software
011	N5452A	Infiniium application remote program interface software
012	N5461A	Serial Data Equalization
013	N5465A-001	Basic InfiniiSim Waveform Transformation Toolset
014	N5465A-002	Advanced InfiniiSim Waveform Transformation Toolset
015	N5462A	RS-232/UART Protocol triggering and decode
016	N5464A	USB 2.0 Protocol triggering and decode
017	N5463A	PCI Express® Protocol triggering and decode
018	N8801A	SAS/SATA Protocol triggering and decode
019	N8802A	MIPI D-Phy Protocol triggering and decode
021	N5392A	Ethernet electrical performance validation and compliance software
022	N5393B	PCI EXPRESS electrical performance validations and compliance software
023	N5399A	HDMI electrical performance validation and compliance software
024	N5409A	Fully buffered DIMM compliance applications
025	N5410A	Fibre channel compliance applications
026	N5411A	Serial ATA electrical performance validation and compliance software
027	N5412A	Serial attached SCSI (SAS) electrical performance validation and compliance
028	U7232A	DisplayPort compliance test software
029	N5416A	USB 2.0 compliance test software
030	N5431A	XAUI electrical validation with 10GBASE-CX4, CPRI, OBSAI, and Serial RapidIO
031	U7233A	DDR1 and LPDDR compliance test applications
032	N5413B	DDR2 and LPDDR2 compliance test applications
033	U7231A	DDR3 compliance test applications
034	N5394A	DVI compliance application
035	U7238A	MIPI compliance test application
036	U7236A	10GBASE-T Ethernet Electrical Compliance Application
038	N5411B	SATA 6G Compliance Test Software
040	N5467A	User Definable Application
041	U7243A	USB 3.0 Compliance Test Software
061		MATLAB - Basic Digital Analysis Package
062		MATLAB - Standard Digital Analysis Package

Infiniium 90000 Series ordering information

Oscilloscope bandwidth upgrades

Upgrade	Descriptions
N5471A	DSA/DSO91204A to DSA/DSO91304A upgrade (12 GHz to 13 GHz)
N5471B	DSA/DSO90804A to DSA/DSO91204A upgrade (8 GHz to 12 GHz)
N5471C	DSA/DSO90604A to DSA/DSO90804A upgrade (6 GHz to 8 GHz)
N5471D	DSA/DSO90404A to DSA/DSO90604A upgrade (4 GHz to 6 GHz)
N5471E	DSA/DSO90254A to DSA/DSO90404A upgrade (2.5 GHz to 4 GHz)

Note: Order as many upgrades as needed to reach the desired final bandwidth of the instrument. For example, to upgrade from a DSA/DSO90804A to DSA/DSO91304A order N5471B and N5471A.

Oscilloscope memory upgrades

Upgrade	Descriptions
N5472A	AFTER-PURCHASE 10M TO 20M MEMORY UPGRADE
N5472B	AFTER-PURCHASE 20M TO 50M MEMORY UPGRADE
N5472C	AFTER-PURCHASE 50M TO 100M MEMORY UPGRADE
N5472D	AFTER-PURCHASE 100M TO 200M MEMORY UPGRADE
N5472E	AFTER-PURCHASE 200M TO 500M MEMORY UPGRADE
N5472F	AFTER-PURCHASE 500M TO 1G MEMORY UPGRADE

Operating system upgrades

Upgrade	Descriptions
N2763A	Windows 7 for Infiniium 9000 scope with Windows XP and SN>MY50410100
N2764A Option 001	Window 7 and M890 motherboard for Infiniium 9000 scopes with Windows XP and SN <MY50410100



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