Keysight Technologies
Infiniium 90000 Series Oscilloscopes

Data Sheet

KEYSIGHT
TECHNOLOGIES
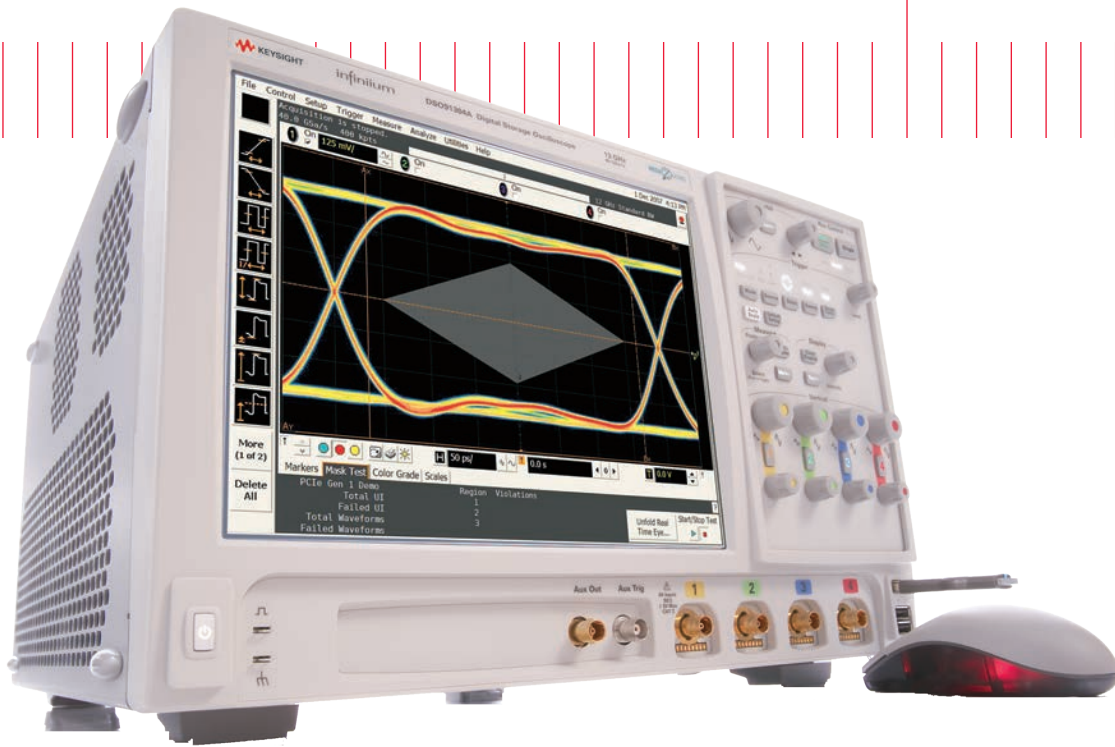
Unlocking Measurement Insights

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

As an engineer you're no stranger to tough challenges that help you exceed your customer's needs and expectations. Deploying your next design successfully is even more difficult with today's high speed technologies. Data signal eye openings become smaller and measurement error from your oscilloscope becomes less tolerable. Keysight Technologies, Inc. is committed to providing the best measurement solutions for these critical challenges.

The Keysight 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 scilloscope.
2. Pass today's demanding compliance tests more quickly.
3. Debug your toughest designs with confidence.

Engineered for unmatched real-time measurement accuracy
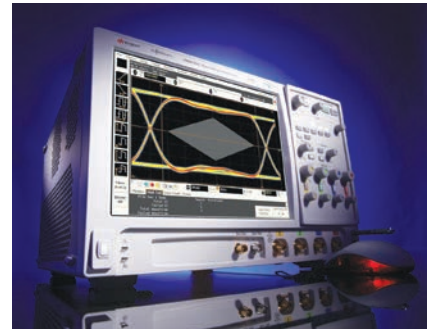
90000A Series Infiniium oscilloscopes

Model	Real-time bandwidth on 4 ch	Maximum sampling rate on 4 ch	Standard memory	Maximum memory	Noise floor at 50 mV/div
91304A	13 GHz	40 GSa/s on 4 ch	20 Mpts on 4 ch	1 Gpts on 4 ch	1.73 mVrms
91204A	12 GHz	40 GSa/s on 4 ch	20 Mpts on 4 ch	1 Gpts on 4 ch	1.45 mVrms
90804A	8 GHz	40 GSa/s on 4 ch	20 Mpts on 4 ch	1 Gpts on 4 ch	1.15 mVrms
90604A	6 GHz	20 GSa/s on 4 ch [1]	20 Mpts on 4 ch	1 Gpts on 4 ch	0.98 mVrms
90404A	4 GHz	20 GSa/s on 4 ch [1]	20 Mpts on 4 ch	1 Gpts on 4 ch	0.79 mVrms
90254A	2.5 GHz	20 GSa/s on 4 ch [1]	20 Mpts on 4 ch	1 Gpts on 4 ch	0.64 mVrms

1. 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.

Engineered for Unmatched Real-Time Measurement Accuracy

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

Keysight's Infiniium 90000 Series oscilloscopes offer the industry's lowest noise floor and most accurate real-time jitter measurements available on scopes of this bandwidth class. Complete with full-bandwidth probing solutions and hardwareaccelerated de-embedding and equalization techniques, Keysight oscilloscopes are the best oscilloscope solution for today's demanding high-speed measurements.

Faraday Caged Front End MCM

AD Converter

Memory Controller

Acquisition Memory
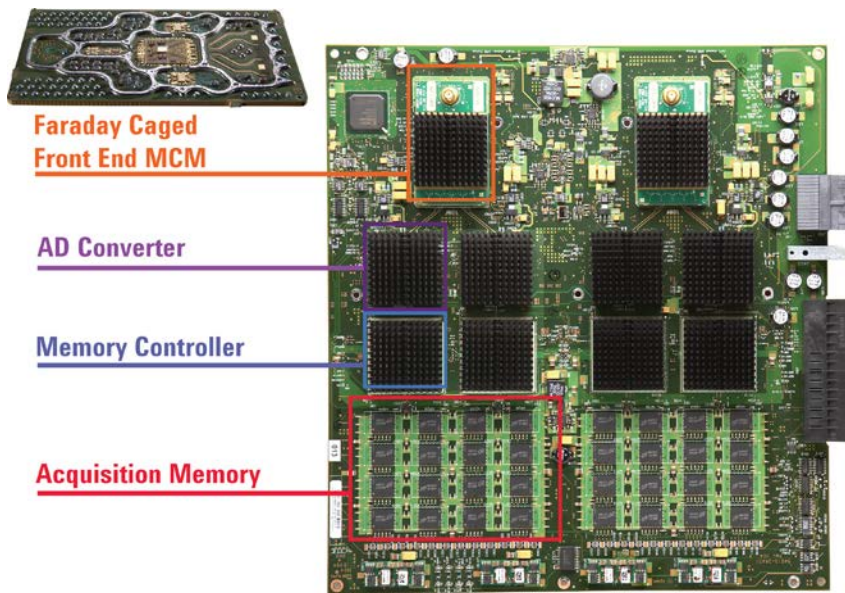
The industry's lowest noise floor

Leveraging the company expertise in RF design, Keysight has invested in key technology blocks like our proprietary Faraday caged front end to significantly reduce our inherent scope noise floor. The result: the lowest noise floor available on any real-time oscilloscope from 2.5 GHz to 12 GHz.

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. Keysight'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 Keysight'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.
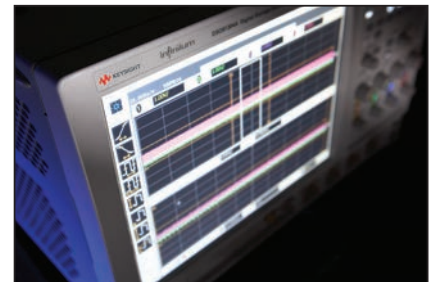
Engineered for Unmatched Real-Time Measurement Accuracy (Continued)

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 Keysight 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 high speed serial data standards. Plus our 1G memory supports real-time testing to pattern lengths of PRBS23 to stress your design to the max.

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 Keysight's experts on your team

Keysight'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

Keysight's N2809A-1NL 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 cableQuickly correct from probe and cable loss(without extra instruments such as VNA or TDR)
– 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
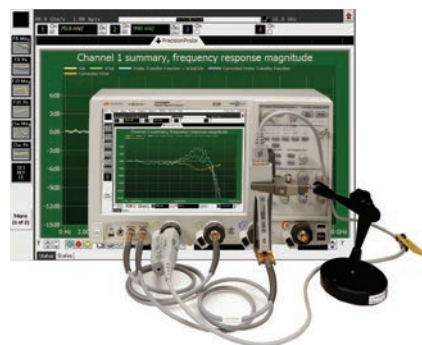

PrecisionProbe uses Keysight's proprietar 200 GHz indium phosphide process to create a fast edge for characterization with PrecisionProbe.

Engineered for Unmatched Real-Time Measurement Accuracy (Continued)

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.
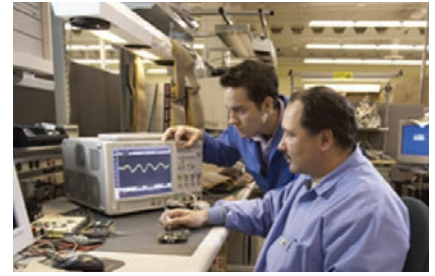

Streamline your debug and analysis tasks with the industry's widest range of application software

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-1NL InfiniiScan Event Identification software makes unique capabilities like Zone Qualify and Generic Serial triggering possible. Rapidly automate any scope measurement using the N5467B-1NL 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.
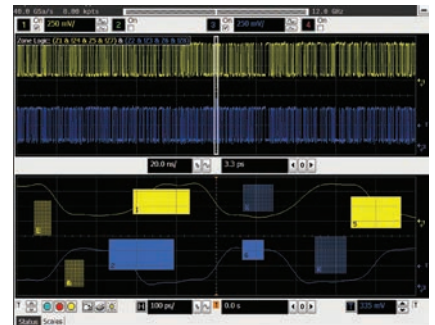
Add measurement capability with MATLAB compatibility

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-1NL 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. Keysight is the only T&M manufacturer today that sells and supports MATLAB as its own product as part of a complete T&M solution.
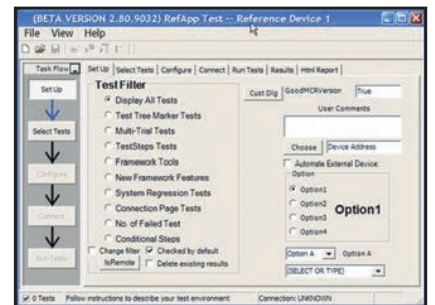
Engineered for Unmatched Real-Time Measurement Accuracy (Continued)

Debug your toughest designs with confidence (Continued)

### I2C/SPI serial trigger and decode (N5391A-1NL 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.
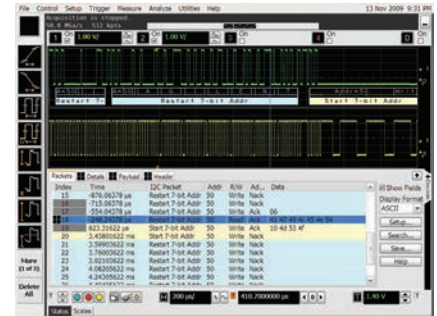
Trigger and view on-screen serial decode of I2C packets

Frequency domain analysis

Infiniium's built-in 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 6 kHz is supported with the standard 10 Megabytes of acquisition memory at the maximum sample rate of 40 GSa/s. With optional acquisition memory installed resolution bandwidths of 2 kHz 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 Keysight 89601A Vector Signal Analyzer software.
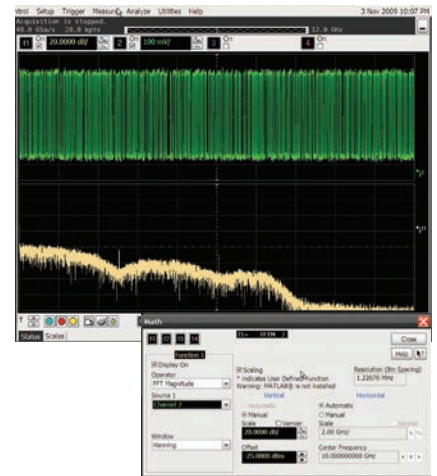
Hardware accelerated differential and common mode math

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.
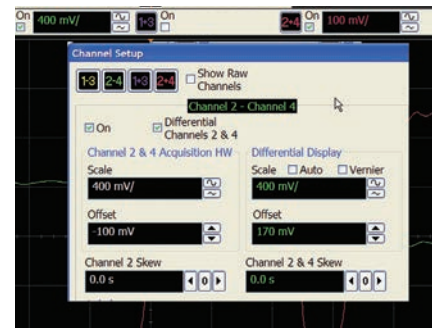
Engineered for Unmatched Real-Time Measurement Accuracy (Continued)

## Debug your toughest designs with confidence (Continued)

EZJIT analysis software (E2681A-1NL 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.

Includes advanced clock recovery options such as constant frequency and PLL. Make measurements on repetitive or arbitrary data.

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

For more information: **www.keysight.com/find/EZJIT**
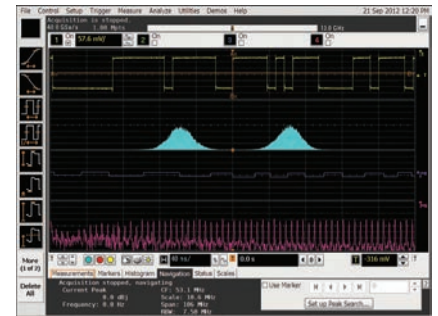
Conduct jitter analysis.

EZJIT Plus analysis software (N5400A-1NL 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.keysight.com/find/EZJITPlus**
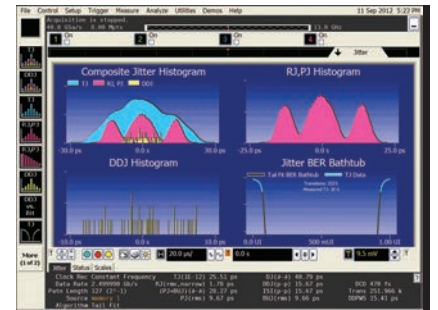
Analyze jitter plus RJ/DJ separation.

EZJIT Complete analysis software (N8813A-1NL or Option 070 on new scope purchases)

EZJIT Complete includes all of the advanced jitter analysis capabilities of EZJIT and EZJIT Plus, and adds advanced analysis of the vertical noise affecting the ones and zeros of your real-time eye. Decomposition of vertical noise provides key insight into degradation of your eye height. In providing advanced decomposition of both horizontal jitter and vertical noise components of your signals, EZJIT Complete represents the most comprehensive analysis software available.

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

For more information: **www.keysight.com/find/EZJITComplete**

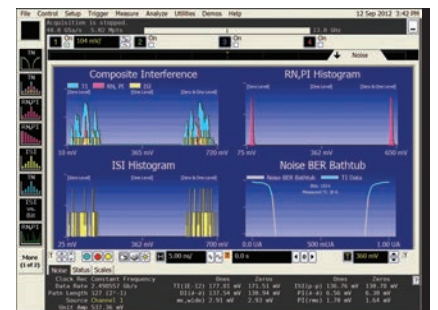EZJIT Complete.

# Engineered for Unmatched Real-Time Measurement Accuracy (Continued)

Debug your toughest designs with confidence (Continued)

InfiniiScan event identification (N5414B-1NL 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.keysight.com/find/infiniiScan
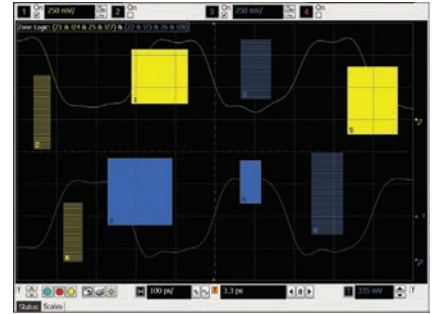
Identify signal integrity issues with InfiniiScan Zone – Qualify triggering.

PrecisionProbe software (N2809A-1NL or Option 001 on new scope purchases)

Make more accurate measurements independent of what probes or cables used. Keysight's N2809A 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.keysight.com/find/PrecisionProbe
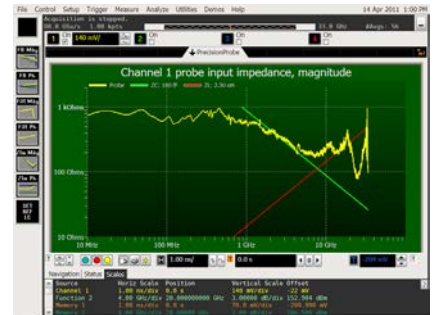
Quickly characterize and correct for any input to your oscilloscope.

High-speed serial data analysis software (E2688A-1NL 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.keysight.com/find/SDA
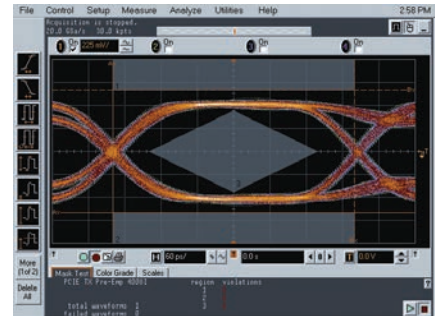
Recover embedded clocks with serial data analysis (SDA).

Engineered for Unmatched Real-Time Measurement Accuracy (Continued)

Debug your toughest designs with confidence (Continued)

Infiniium remote programming interface (Now standard on all Infiniium scopes)

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

This application is supported on all models.

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

Control your applications remotely.

Serial data equalization (N5461A-1NL 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.keysight.com/find/SDE**
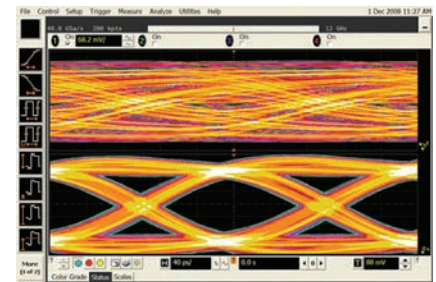
Reduce receiver errors by opening tightly shut eyes.

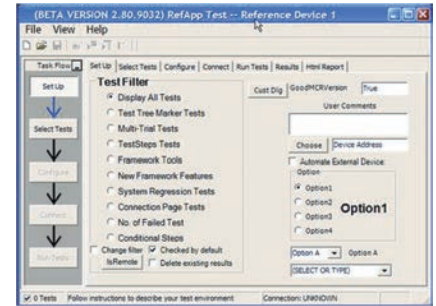### InfiniiSim waveform transformation and de-embedding toolset (Basic: N5465A-3NL or Option 13 on new scope purchases. Advanced: N5465A-1NL or Option 14 on new scope purchases.)

The N5465A InfiniiSim waveform transformation toolset for Infiniium Series oscilloscopes provides the most flexible and accurate means to render waveforms anywhere in the digital serial link. The configurable system modeling allows you to remove the deleterious effects of unwanted channel elements, simulate waveforms with channels models inserted, view waveforms in physically un-probable locations, compensate for loading of probes and other circuit elements, and do so simply and quickly on the real-time oscilloscope.

This application is supported on all models.

For more information: **www.keysight.com/find/InfiniiSim**
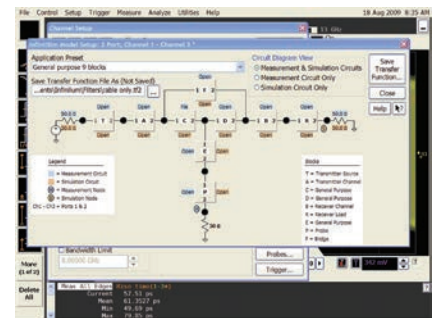
Model channel effects including reflection.

Engineered for Unmatched Real-Time Measurement Accuracy (Continued)

Debug your toughest designs with confidence (Continued)

MATLAB data analysis software (Option 061 or O62 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 Keysight as in instrument option with the purchase of your Keysight 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 Keysight 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.keysight.com/find/matlab_oscilloscopes**

Control your applications remotely.

User-definable application (N5467B-1NL 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 Keysight instruments and HTML reporting capabilities.

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

Quickly automate oscilloscope measurements.

User-defined function (N5430A-1NL 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. Keysight 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.keysight.com/find/UDF**

Signal equalization using user-defined function.

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 W-CDMA 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.keysight.com/find/VSA**

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

Engineered for Unmatched Real-Time Measurement Accuracy (Continued)

Debug your toughest designs with confidence (Continued)

I²C/SPI serial trigger and decode (N5391A-1NL 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.keysight.com/find/90000_I²C-SPI
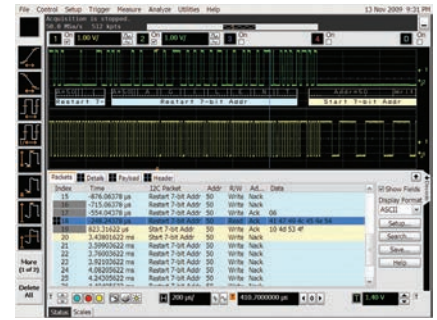
Trigger and view on-screen serial decode of I²C packets.

JTAG (IEEE 1149.1) triggering and decode (N8817A-1NL 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.
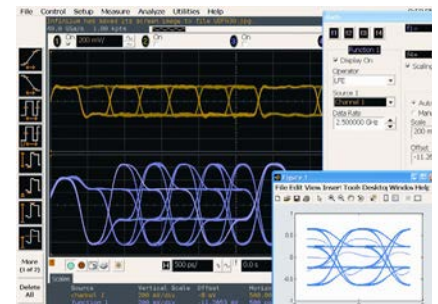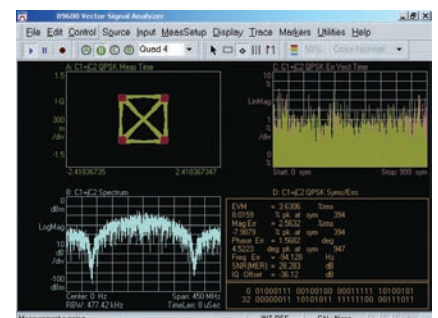
This application works on all models and can use any combination of scope or logic acquisition channels.

For more information: www.keysight.com/find/90000_JTAG
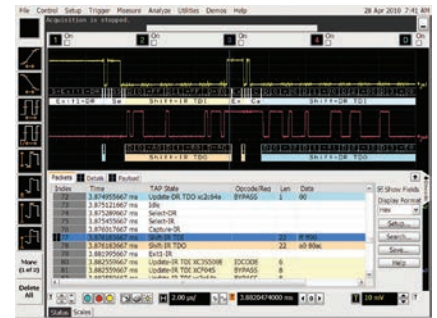
Trigger on and decode JTAG packets.

RS-232/UART serial decode and trigger (N5462A-1NL 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.keysight.com/find/90000_RS-232
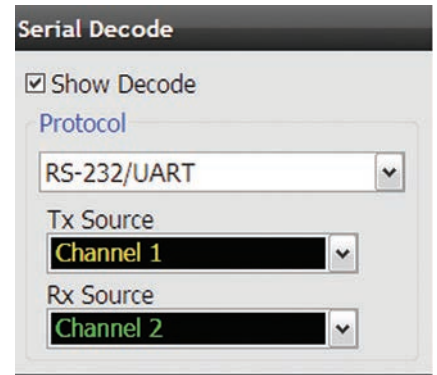
Trigger on and decode RS-232/UART transmission.

N8805A-1NL USB 3.0 protocol triggering and decode

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.keysight.com/find/usb3decode
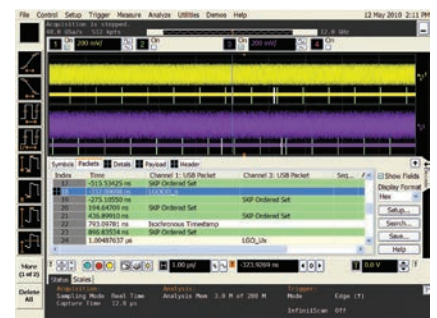
Isolate signal integrity problems from logic-level coding errors on bidirectional serial data streams.

Engineered for Unmatched Real-Time Measurement Accuracy (Continued)

Pass today's demanding compliance tests more quickly

USB serial trigger and protocol viewer (N5464A-1NL 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.keysight.com/find/90000_USB_protocol_viewer
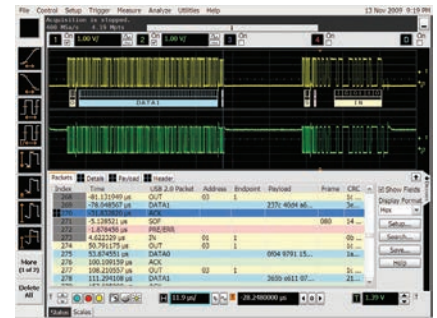
Trigger on and decode USB packets.

PCI EXPRESS serial trigger and protocol viewer (N5463A-1NL 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.keysight.com/find/90000_PCI_protocol_viewer

Trigger on and decode PCIe serial packets.

SATA triggering and decode (N8801A-1NL 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.keysight.com/find/N8801A
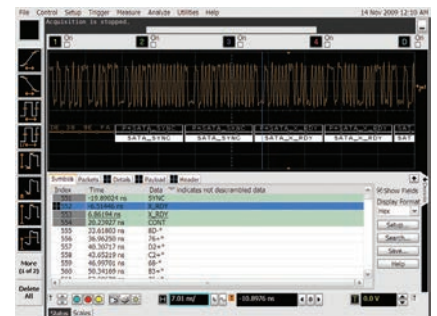
Trigger on and decode SAS/SATA serial packets.

Engineered for Unmatched Real-Time Measurement Accuracy (Continued)

Pass today's demanding compliance tests more quickly (Continued)

### MIPI® D-PHY℠ trigger and decode (N8802A-1NL 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.keysight.com/find/N8802Ar

Trigger on and decode MIPI packets.

Ethernet compliance testing (N5392B-3NL 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.keysight.com/find/N5392B
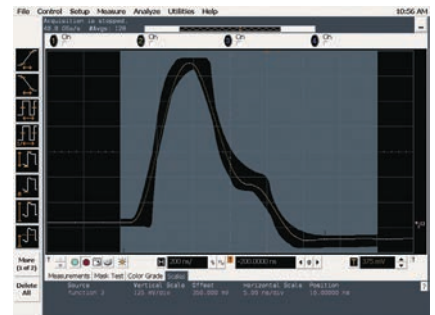
Validate Ethernet compliance.

PCI EXPRESS electrical performance validation and compliance Software (N5393F 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.

For more information: www.keysight.com/find/N5393D

Quickly verify and debug your PCI EXPRESS designs.

HDMI electrical performance validation and compliance software

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.

Switch matrix support is available by ordering N5399C-7NL (Option 702 on new scope purchases). This application is support on all models ≥ 8 GHz bandwidth.

For more information: www.keysight.com/find/N5399C

Verify and debug your HDMI designs.

Engineered for Unmatched Real-Time Measurement Accuracy (Continued)

Pass today's demanding compliance tests more quickly (Continued)

Energy efficient ethernet application (N5392B-1NL or Option 060 on new scope purchases)

Industry leading compliance application that measures 10/100/1000BTe Energy Efficient Ethernet IEEE 802.3az-2010 specification. Exclusive EEE fixture allows you to measure all test modes at all speeds. Detailed reporting with clear measurements and pass/fail results.

This application is supported on all models.

For more information: **www.keysight.com/find/EEE**

Characterize and evaluate the signal integrity of your Energy Efficient Ethernet devices.

SATA 6G compliance test software (N5411B-1NL 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.keysight.com/find/N5411B**

Simplify the validation of SATA designs.

DisplayPort 1.2 compliance test software (U7232C-1NL or Option 045 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 Keysight W2641B DisplayPort test point access adaptor completes the DisplayPort source solution.

DisplayPort 1.2 also comes with switch matrix support to make multi-lane testing significantly easier by ordering U7232C-7NL (Option 701 on new scope purchases). The application is supported on all models ≥ 8 GHz.

For more information: **www.keysight.com/find/U7232C**

Full suite of DisplayPort source tests.

Engineered for Unmatched Real-Time Measurement Accuracy (Continued)

Pass today's demanding compliance tests more quickly (Continued)

USB 2.0 compliance test software (N5416A-1NL 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.keysight.com/find/N5416A
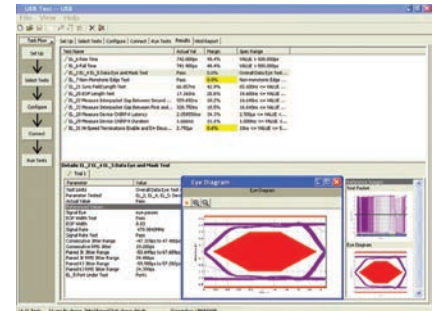
Check for USB compliance.

XAUI electrical validation with 10GBASE-CX4, CPRI, OBSAI, and Serial RapidIO support (N5431A-1NL 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.keysight.com/find/N5431A
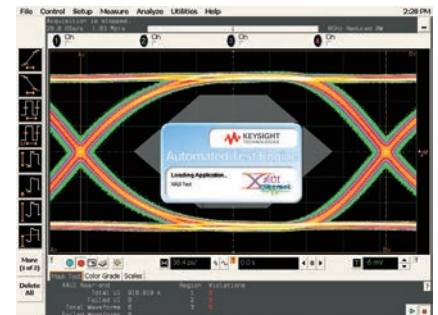
Perform automated testing and margin analysis for XAUI and XAUI-derived specifications.

MIPI D-PHY compliance test software (U7238C-1NL 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.

MIPI D-PHY also supports the ability to test compliance with switches, making your testing faster, by ordering U7238C-7NL (Option 703 on new scope purchases). The application is supported on all models.

For more information: www.keysight.com/find/d-phy_compliance
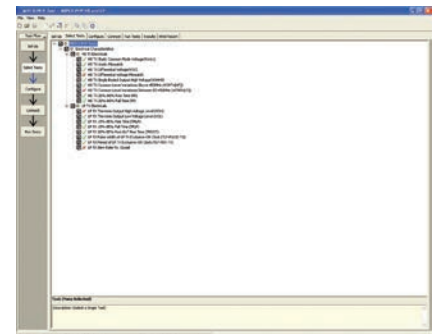
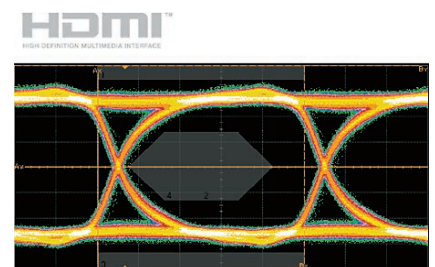Automatically execute D-PHY electrical checklist tests for CSI and DSI architectures.

Engineered for Unmatched Real-Time Measurement Accuracy (Continued)

Pass today's demanding compliance tests more quickly (Continued)

10GBASE-T ethernet electrical conformance application for Infiniium oscilloscopes (U7236A-1NL 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.
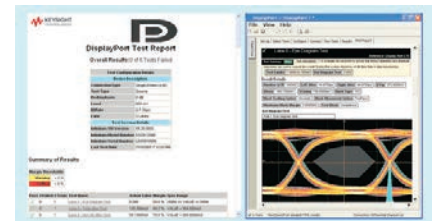
The application is supported on all models.

For more information: **www.keysight.com/find/10gbase-t**
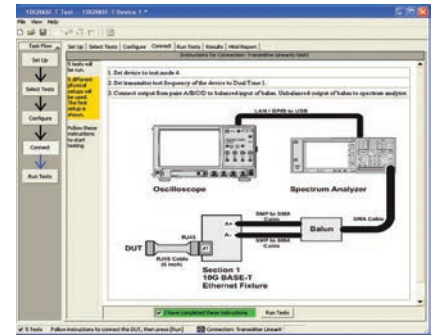
Automatically execute 10GBASE-T Ethernet physical-layer (PHY) electrical tests.

USB 3.0/3.1 compliance test software (U7243B-3NL 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 Keysight U7243B USB 3.0 transmitter and receiver test fixtures. Keysight'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.keysight.com/find/USB3**
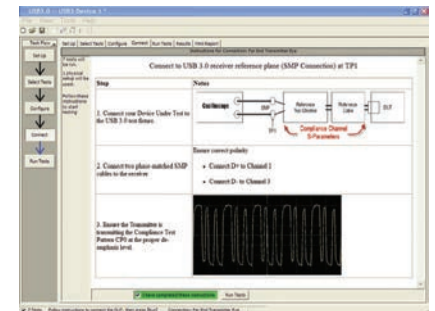
Validate and debug your USB 3.0 silicon, host, hub or device.

DDR1 and LPDDR/DDR2, LPDDR2/DDR3, DDR4 and GDDR5 compliance testing (Options 031/032/033/058 on new scope purchases)

Quickly and easily evaluate and characterize your memory designs. Automated testingbased 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.keysight.com/find/DDR**
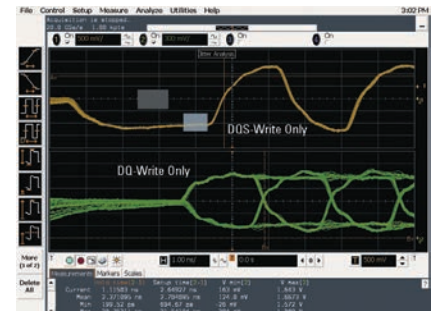
Test DDR memory.

SD UHS-I and SD UHS-II card compliance testing (U7246A-1NL/N6461A-1NL)

The SD card compliance test software gives you a fast, easy way to test, debug and characterize your SD designs up to 1.5 Gb/s in accordance with the SD Specification.

The U7246A with 9000A and 90000A Series oscilloscopes is a certified test tool for SD Card Phy electric tests with the SD Association. Reference is available in SDA official document: SD Test Tool Information Ver1.0 Sep. 13, 2010.

For more information: **www.keysight.com/find/U7246A**
www.keysight.com/find/N6461A

Comprehensive analysis that automates the complex measurements even when you are not there.

Keysight Infiniium portfolio

Keysight's Infiniium oscilloscope lineup includes bandwidths from 500 MHz to 63 GHz. Use the following selection guide to determine which best matches your specific needs. Infiniium real-time oscilloscopes feature the following:

– World's highest bandwidth on 4 channels in a single frame
– Industry's lowest noise floor
– Full PrecisionProbe compatibility

		S-Series	**90000A Series**	**90000 X-Series**	**Z-Series**
Available bandwidths	Up to 4 GHz	500 MHz, 1 GHz, 2.5 GHz, 4 GHz	2.5 GHz, 4 GHz		
	6 to 16 GHz	6 GHz (2 ch), 8 GHz (2 ch)	6 GHz, 8 GHz, 12 GHz, 13 GHz	13 GHz, 16 GHz	
	20 to 63 GHz			20 GHz, 25 GHz, 33 GHz	20 GHz, 25 GHz, 33 GHz, 50 GHz, 63 GHz
Max upgradable bandwidth		8 GHz	13 GHz	33 GHz	63 GHz
Sample rate (2-channel/4-channel)		10/20 GSa/s	40/40 GSa/s	80/40 GSa/s	160/80 GSa/s
Channel inputs and connector types		50 Ω and 1 MΩ, BNCs	50 Ω, BNCs	50 Ω, 2.92 and 3.5 mm SMAs	50 Ω, 1.85 mm, 2.4 mm, 2.92 and 3.5 mm, SMAs
Memory depth (standard/max)		50 M/1 Gpts	20 M/2 Gpts	20 M/2 Gpts	50 M/2 Gpts
MSO models		Yes	No	No	No
Supported InfiniiMax probe families		InfiniiMax 2	InfiniiMax 2	InfiniiMax 3 InfiniiMax 2 with adapter	InfiniiMax 3 InfiniiMax 2 with adapter

Infiniium 90000A Series

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.
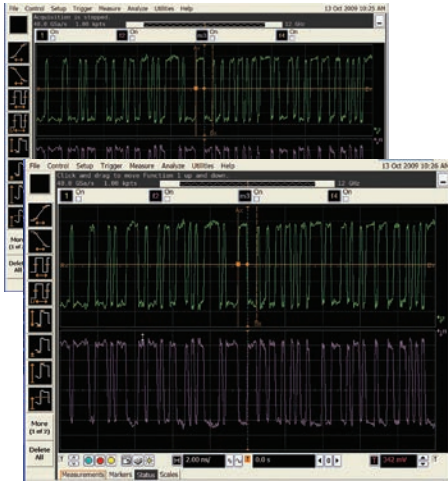
Click on the icon at the bottom left of the Infiniium screen to minimize the status and scales tab for full screen viewing. Maximize your viewing needs.
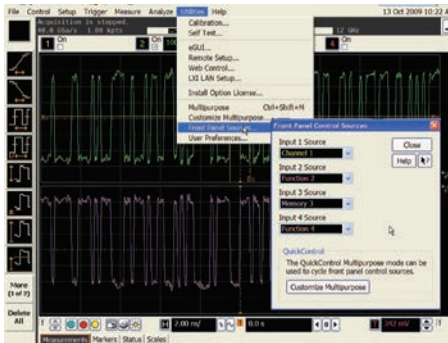
Ever wanted to change the scale or offset of a function or waveform memory? If you have, you know that it requires multiple menus and key strokes. In Infiniium software version 2.01 and later, you can now map functions and waveform memories to the front panel controls of the oscilloscope!
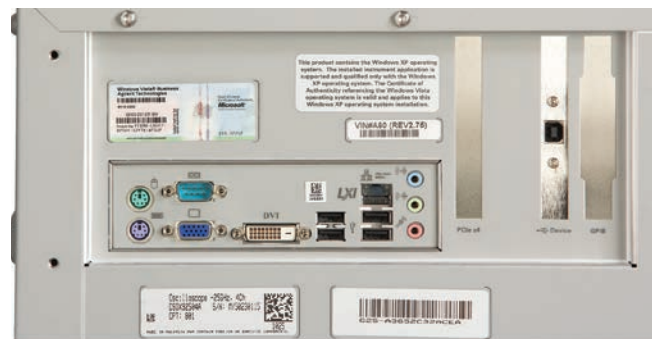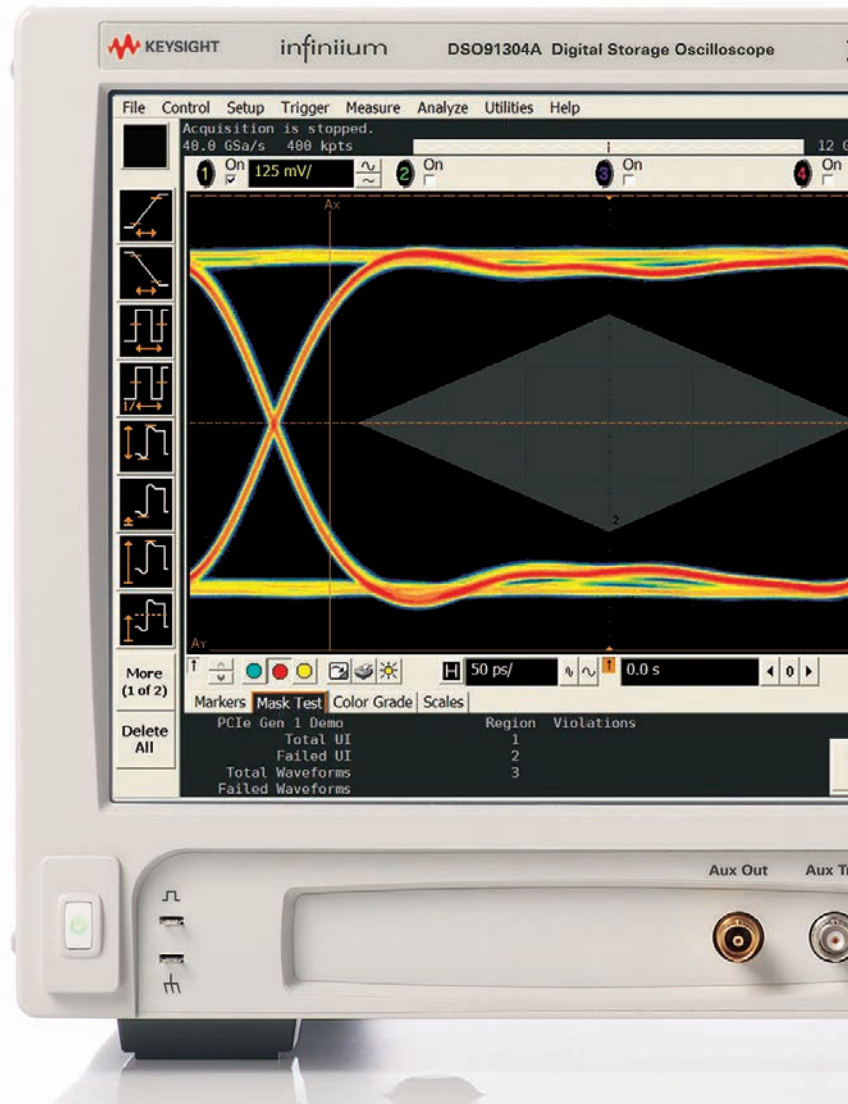
AutoProbe interface completely configures your scope for use with the InfiniiMax probing system and previous-generation Keysight active probes.

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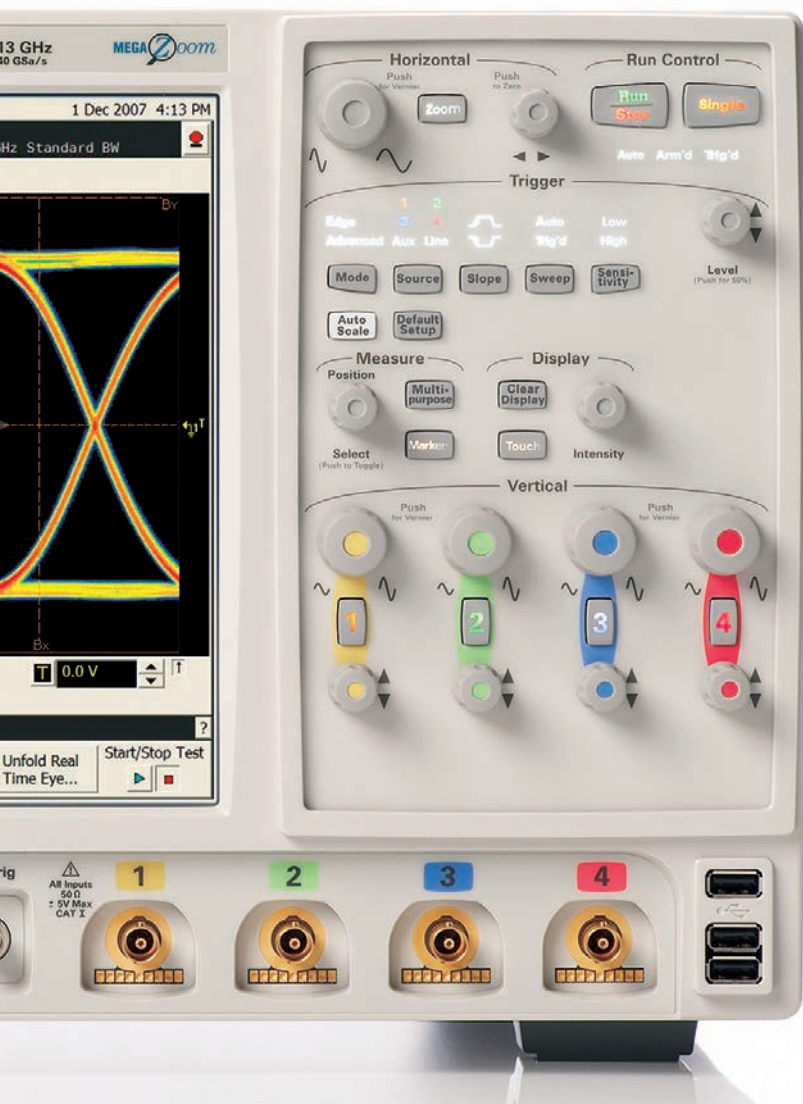
InfiniiMax II: The World's best high-speed probing system just keeps getting better

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 Keysight 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 when 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.

E2695A 8-GHz differential SMA probe head

allows you to connect two SMA cables to make a differential measurement on a single scope channel.

E2679A 6-GHz extremely small single-ended, solder-in probe heads

for probing even the hardest-to-reach single-ended signals.

N5425A 13-GHz high-bandwidth solder-in differential ZIF probe head

and N5426A ZIF tip provides maximum bandwidth with the industry's first lead-free solder-in probe solution in an economical replaceable tip form factor.

N5451A 9-GHz/5-GHz long-wire ZIF tip

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

N5451A 9-GHz/5-GHz long-wire ZIF tip

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E2695A 8-GHz differential SMA probe head

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E2677A
E2679A
N5381A
N5425A
N2695A
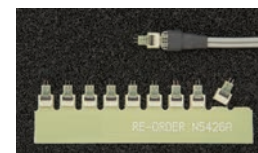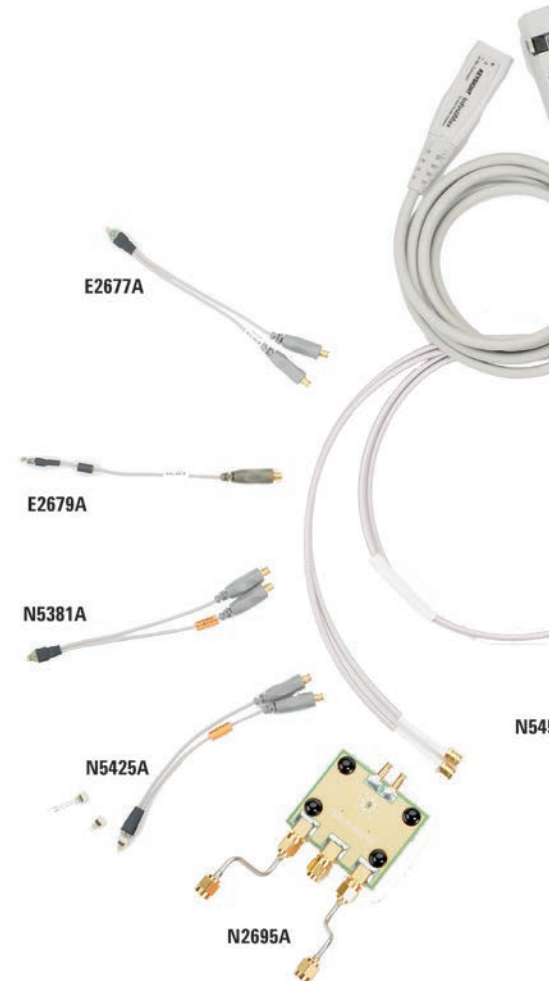
N5426A
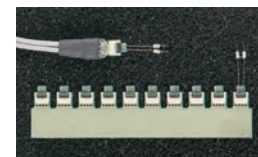
N5451A
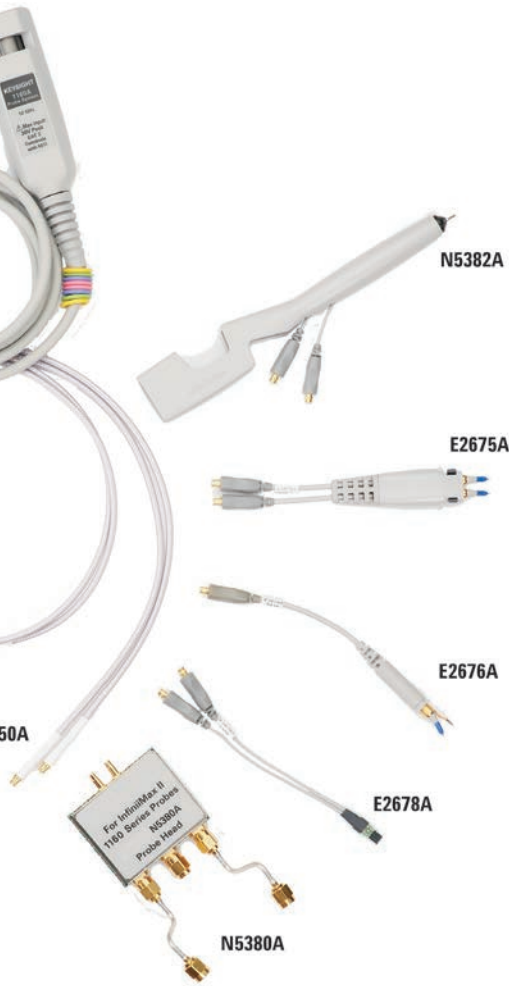
Six different InfiniiMax probe amplifiers from 1.5 GHz to 13 GHz are available for matching your probing solution to your performance and budget requirements. The 1168/69A InfiniiMax II amplifiers offer the highest bandwidth and the lowest noise floors. The 1134/32/31/30A offer a more cost efficient 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 to 5.80 mm (10 to 230 mills).

E2676A 6-GHz single-ended browser

is the best choice for general-purpose probing of single-ended signals when the 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.

N2880A In-line attenuator kit

allows you to increase the dynamic range and the offset range of the InfiniiMax probe without affecting the bandwidth.

N2881A DC blocking capacitors

can be used to in series with the N2880A InfiniiMax in-line attenuators to block out unwanted DC components of the input signal up to 30V.

N5380B 13-GHz high-bandwidth differential SMA

probe head provides maximum bandwidth for SMA-fixtured differential pairs.

N5450B InfiniiMax extreme temperature extension cable

provides extra reach into environmental chambers.

N2884A Differential Fine-wire Probing Tip

InfiniiMax differential fine-wire probing tip is a high fidelity, high bandwidth solution for probing an active IC.

N2887A InfiniiMax soft touch pro probe adapter

adapts from the Keysight pro series (36 ch) soft touch connectorless logic analyzer foot print to the Keysight InfiniiMax I & II series probe amplifier input connectors.

N2888A InfiniiMax Soft touch half-channel probe adapter

adapts from the Keysight half-channel (18 ch) Soft touch connectorless logic analyzer foot print to the Keysight InfiniiMax I & II series probe amplifier input connectors.

Infiniium 90000A Series Oscilloscopes

Performance characteristics

Vertical						
Input channels	Four					
Analog bandwidth (–3 dB) [1,5]	**90254A**	**90404A**	**90604A**	**90804A**	**91204A**	**91304A**
	2.5 GHz	4 GHz	6 GHz	8 GHz	12 GHz	12 GHz
DSP enhanced bandwidth [4]	91304A: 13-GHz real-time, user-selectable DSP enhanced bandwidth					
Rise time/fall time [6]	**90254A**	**90404A**	**90604A**	**90804A**	**91204A**	**91304A**
10 to 90%	140 ps	105 ps	70 ps	54 ps	35 ps	32 ps
20 to 80%	105 ps	79 ps	53 ps	38 ps	25 ps	23 ps
Input impedance [7]	50 Ω, ± 3%					
Sensitivity [2]	1 mV/div to 1 V/div					
Input coupling	DC					
Vertical resolution [3]	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 to 8 GHz: 40 dB (≥ 100:1)					
	8 GHz to BW: 35 dB (≥ 56:1)					
DC gain accuracy [1,2]	± 2% of full scale at full resolution channel scale (± 2.5% for 5mV/div)					
Maximum input voltage [1]	± 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 [1,2]	≤ 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 [1,2]	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

1. Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period, and ± 5 °C from annual calibration temperature.
2. 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.
3. Vertical resolution for 8 bits = 0.4% of full scale, for 12 bits = 0.024% of full scale.
4. 13 GHz DSP enhanced bandwidth not applicable at 5 mV/div.
5. 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).
6. The FFT signal to noise ratio varies with volts/division setting, memory depth and use of time or frequency averaging.
7a. 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.
7b. Measurement threshold = fixed voltage at 50% level.
7c. Time ranges ≤ 10 μs.
8. 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.
9. Internal edge trigger mode. Trigger threshold = fixed voltage at 50% level. The slew rate independent value in the formula represents the traditional trigger jitter.
10. Requires Option 010 user defined function.
11. 11.8 GHz analog bandwidth at 5 mV/div for DSO91304A and DSO91204A models.
12. Typically triggers as low as 5 mV/div sensitivity.

Infiniium 90000A Series Oscilloscopes (Continued)

Performance characteristics (Continued)

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 200 s/div real-time
Main timebase delay range	–200 s to 200 s real-time
Zoom timebase range	1 ps/div to current main time scale setting
Time scale accuracy [1,8]	± (0.4 ppm initial + 0.5 ppm/year aging)
Oscilloscope channel de-skew range	± 25 µs range, 100 fs resolution

Intrinsic jitter [6] (sample clock jitter)	Acquired time range or delta-time delta-time Interval	Internal reference	External reference
	< 100 µs (10 µs/div)	0.5 ps rms	0.5 ps rms
	1 ms (100 µs/div)	1.0 ps rms	1.0 ps rms
	10 ms (1 ms/div)	1.2 ps rms	1.2 ps rms
	100 ms (10 ms/div)	5.0 ps rms	1.2 ps rms

Inter-channel intrinsic jitter [3]	550 fs rms
Inter-channel skew drift [3,7]	< 500 fs rms

Jitter measurement floor [2]

Time interval error

$$\sqrt{\left(\frac{\text{Noise Floor}}{\text{Slew Rate}}\right)^2 + \left(\text{Intrinsic Jitter}\right)^2}$$

Period jitter

$$\sqrt{2} \bullet \sqrt{\left(\frac{\text{Noise Floor}}{\text{Slew Rate}}\right)^2 + \left(\text{Intrinsic Jitter}\right)^2}$$

Cycle-cycle/N-cycle jitter

$$\sqrt{3} \bullet \sqrt{\left(\frac{\text{Noise Floor}}{\text{Slew Rate}}\right)^2 + \left(\text{Intrinsic Jitter}\right)^2}$$

Inter-channel jitter measurement floor [2,3,5]

$$\sqrt{\left(\frac{\text{Time Interval}}{\text{Error (Edge1)}}\right)^2 + \left(\frac{\text{Time Interval}}{\text{Error (Edge2)}}\right)^2 + \left(\frac{\text{Inter channel}}{\text{Intrinsic Jitter}}\right)^2}$$

1. Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period and ± 5 °C from firmware calibration temperature.
2. Sample rate at maximum. Noise and slew rate determined at fixed-voltage measurement threshold, near middle of signal. Displayed signal not vertically clipped. Slew rate of sine wave = (peak signal amplitude) · 2 · π · f, slew rate of fast step ~= (10 to 90% rise time).
3. Intra-channel = both edges on the same channel, inter-channel = two edges on different channels. Time Interval Error(Edge1) = time-interval error measurement floor of first edge, time interval error(Edge2) = time-interval error measurement floor of second edge.
4. Reading is the displayed delta time measurement accuracy measurement value. Do not double the listed time scale accuracy value in delta time measurement accuracy formula.
5. Scope channels and signal interconnect de-skewed prior to measurement.
6. External timebase reference values measured using a Wenzel 501-04608A 10 MHz reference. Intrinsic jitter value depends on acquisition time range for Time Interval Error formula and depends on delta-time between edges for all two-edge formulas.
7. Skew between channels caused by ± 5 °C temperature change.
8. Initial = immediately after factory or user calibration.

Infiniium 90000A Series Oscilloscopes (Continued)

Performance characteristics (Continued)

Horizontal (Continued)

Delta time measurement accuracy [2, 3, 4, 5]

Intra-channel

No averaging

$$\pm \left[5 \bullet \sqrt{\left(\frac{\text{Time Interval}}{\text{Error (Edge1)}} \right)^2 + \left(\frac{\text{Time Interval}}{\text{Error (Edge2)}} \right)^2 + \left(\left(\frac{\text{Time Scale}}{\text{Accuracy}} \right) \bullet \left(\frac{\text{Delta}}{\text{Time}} \right) \right)} \right]$$

256 averages

$$\pm \left[\frac{5}{16} \bullet \sqrt{\left(\frac{\text{Time Interval}}{\text{Error (Edge1)}} \right)^2 + \left(\frac{\text{Time Interval}}{\text{Error (Edge2)}} \right)^2 + \left(\left(\frac{\text{Time Scale}}{\text{Accuracy}} \right) \bullet \left(\frac{\text{Delta}}{\text{Time}} \right) \right)} \right]$$

Inter-channel

No averaging

$$\pm \left[\begin{array}{c} 5 \bullet \sqrt{\left(\frac{\text{Time Interval}}{\text{Error (Edge1)}} \right)^2 + \left(\frac{\text{Time Interval}}{\text{Error (Edge2)}} \right)^2 + \left(\frac{\text{Inter channel}}{\text{Intrinsic Jitter}} \right)^2} \\ + \left(\left(\frac{\text{Time Scale}}{\text{Accuracy}} \right) \bullet \left(\frac{\text{Delta}}{\text{Time}} \right) \right) + \left(\frac{\text{Inter channel}}{\text{Skew Drift}} \right) \end{array} \right]$$

256 averages

$$\pm \left[\begin{array}{c} \frac{5}{16} \bullet \sqrt{\left(\frac{\text{Time Interval}}{\text{Error (Edge1)}} \right)^2 + \left(\frac{\text{Time Interval}}{\text{Error (Edge2)}} \right)^2 +} \\ + \left(\left(\frac{\text{Time Scale}}{\text{Accuracy}} \right) \bullet \left(\frac{\text{Delta}}{\text{Time}} \right) \right) + \left(\frac{\text{Inter channel}}{\text{Skew Drift}} \right) \end{array} \right]$$

1. Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period and ± 5 °C from firmware calibration temperature.
2. Sample rate at maximum. Noise and slew rate determined at fixed-voltage measurement threshold, near middle of signal. Displayed signal not vertically clipped. Slew rate of sine wave = (peak signal amplitude) · 2 · π · f, slew rate of fast step ~= (10 to 90% rise time).
3. Intra-channel = both edges on the same channel, inter-channel = two edges on different channels. Time Interval Error(Edge1) = time-interval error measurement floor of first edge, time interval error(Edge2) = time-interval error measurement floor of second edge.
4. Reading is the displayed delta time measurement accuracy measurement value. Do not double the listed time scale accuracy value in delta time measurement accuracy formula.
5. Scope channels and signal interconnect de-skewed prior to measurement.
6. External timebase reference values measured using a Wenzel 501-04608A 10 MHz reference. Intrinsic jitter value depends on acquisition time range for Time Interval Error formula and depends on delta-time between edges for all two-edge formulas.
7. Skew between channels caused by ± 5 °C temperature change.
8. Initial = immediately after factory or user calibration.

Infiniium 90000A Series Oscilloscopes (Continued)

Performance characteristics (Continued)

Acquisition							
Maximum real-time sample rate	91304A/91204A/90804A: 40 GSa/s (4 channels simultaneously)						
	90604A/90404A/90254A: 20 GSa/s (4 channels simultaneously)						
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			
Option 02G	50.0 ms			100.0 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						
	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)						
	Memory depth: 20 M / 50 M / 100 M / 200 M / 500 M / 1 G / 2 G						
	Max # of segments: 4096 / 8192 / 16384 / 32768 / 65536 / 131072 / 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.						

Infiniium 90000A Series Oscilloscopes (Continued)

Performance characteristics (Continued)

Hardware trigger			
Sensitivity [2]	91304A/91204A/90804A:	Internal low [2]:	2.0 div p-p 0 to 5 GHz
		Internal high [2]:	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 [2]:	2.0 div p-p 0 to 5 GHz
		Internal high [2]:	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
AUX edge trigger bandwidth	200 MHz		
Line edge trigger bandwidth	AC Line frequency dependant		
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 (trigger jitter) [2, 3, 4]	620 fs rms		
Trigger sources	Channel 1, Channel 2, Channel 3, Channel 4		
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.		

1. Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period and ± 5 °C from firmware calibration temperature.
2. Internal edge trigger mode with JitterFree correction. Value depends on scope settings and trigger signal characteristics, and is equal to TIE value expressed in the formula above using the minimum time scale accuracy value.
3. Value shown represents typical Display jitter for 91204A at 100 mV/div triggering on 500 mVpp 6 GHz sin wave signal.
4. Sample rate at maximum. Noise and slew rate determined at fixed-voltage trigger threshold, near middle of signal. Displayed signal not vertically clipped.

Infiniium 90000A Series Oscilloscopes (Continued)

Performance characteristics (Continued)

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

Infiniium 90000A Series Oscilloscopes (Continued)

Performance characteristics (Continued)

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, 004, or 070 standard on DSA models), hold time (requires Option 002, 004, or 070 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	Fast eye rendering increases speed of the eye diagram rendering
Clock	Requires Option 002 (or E2681A), 004 (or N5400A), or 070 (or N8823A). Standard on DSA Series.
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 Keysight-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	16
Hardware accelerated math	Differential and common mode
Operators	Absolute value, add, amplitude modulation, average, Butterworth [10], common mode, delay, differentiate, divide, FFT magnitude, FFT phase, FIR [10], high pass filter, histogram (measurement), horizontal gate, integrate, invert, LFE [10], low pass filter (4th-order Bessel Thompson filter), magnify, max, measurement trend, min, multiply, RT Eye [10], smoothing, SqrtSumOfSquare [10], square, square root, subtract, versus, and optional user defined function (Option 010)
FFT	
Frequency range [5]	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	91304A/91204A/90804A: 800 Hz
maximum sample rate	90604A/90404A/90254A: 400 Hz
Frequency accuracy	(1/2 frequency resolution) + (1×10^{-6})(signal frequency)

1. Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period, and ± 5 °C from annual calibration temperature.
2. 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.
3. Vertical resolution for 8 bits = 0.4% of full scale, for 12 bits = 0.024% of full scale.
4. 13 GHz DSP enhanced bandwidth not applicable at 5 mV/div.
5. 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).
6. The FFT signal to noise ratio varies with volts/division setting, memory depth and use of time or frequency averaging.
7a. 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.
7b. Measurement threshold = fixed voltage at 50% level.
7c. Time ranges ≤ 10 µs.
8. 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.
9. Internal edge trigger mode. Trigger threshold = fixed voltage at 50% level. The slew rate independent value in the formula represents the traditional trigger jitter.
10. Requires Option 010 user defined function.
11. 11.8 GHz analog bandwidth at 5 mV/div for DSO91304A and DSO91204A models.
12. Typically triggers as low as 5 mV/div sensitivity.
13. Measurement histograms require EZJIT license.

Infiniium 90000A Series Oscilloscopes (Continued)

Performance characteristics (Continued)

Measurements and math (Continued)	
FFT (Continued)	
Signal-to-noise ratio [6]	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	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	Up to 16 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	4 GB 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/**).

1. Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period, and ± 5 °C from annual calibration temperature.
2. 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.
3. Vertical resolution for 8 bits = 0.4% of full scale, for 12 bits = 0.024% of full scale.
4. 13 GHz DSP enhanced bandwidth not applicable at 5 mV/div.
5. 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).
6. The FFT signal to noise ratio varies with volts/division setting, memory depth and use of time or frequency averaging.

Infiniium 90000A Series Oscilloscopes (Continued)

Performance characteristics (Continued)

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	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	Operating random 0.21 g(rms), non-operating random 2.0 g(rms), swept sins (0.50 g(rms))
Power	100 to 240 VAC at 50/60 Hz; maximum input power 800 W
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

1. Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period, and ± 5 °C from annual calibration temperature.
2. 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.
3. Vertical resolution for 8 bits = 0.4% of full scale, for 12 bits = 0.024% of full scale.
4. 13 GHz DSP enhanced bandwidth not applicable at 5 mV/div.
5. 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).
6. The FFT signal to noise ratio varies with volts/division setting, memory depth and use of time or frequency averaging.
7a. 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.
7b. Measurement threshold = fixed voltage at 50% level.
7c. Time ranges ≤ 10 µs.
8. 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.
9. Internal edge trigger mode. Trigger threshold = fixed voltage at 50% level. The slew rate independent value in the formula represents the traditional trigger jitter.
10. Requires Option 010 user defined function.
11. 11.8 GHz analog bandwidth at 5 mV/div for DSO91304A and DSO91204A models.
12. Typically triggers as low as 5 mV/div sensitivity.
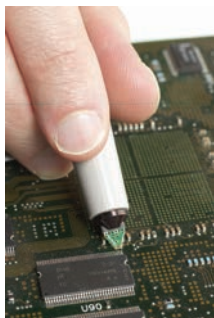13. Measurement histograms require EZJIT license.

InfiniiMax II Series

Performance characteristics

	1169A, 1168A	
Bandwidth [1]	1169A: > 12 GHz (13 GHz typical)	1168A: > 10 GHz
Rise and fall time		
Probe only	1169A: 28 ps (20 to 80%), 40 ps (10 to 90%)	1168A: 34 ps (20 to 80%), 48 ps (10 to 90%)
When phase compensated by	1169A with 91204A: 25 ps (20 to 80%) 36 ps (10 to 90%)	1168A with 90804A: 38 ps (20 to 80%) 54 ps (10 to 90%)
90000A Series oscilloscope	1169A with 91304A: 23 ps (20 to 80%) 33 ps (10 to 90%)	
System bandwidth (–3 dB)	1169A with 91304A: 13 GHz (typical) 1169A with 91204A: 12 GHz	1168A with 90804A: 8 GHz
Input capacitance [2]	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 [1]	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	

1. Denotes warranted specifications, all others are typical.
2. Measured using the probe amplifier and N5381A solder-in differential probe head.

InfiniiMax II Series

Performance characteristics

	1134A, 1132A, 1131A, 1130A	
Bandwidth [1]	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 with 90604A: 6 GHz	
	1132A with 90404A: 4 GHz	
	1131A with 90254A: 2.5 GHz	
Input capacitance [2]	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 [1]	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	

1. Denotes warranted specifications, all others are typical.
2. Measured using the probe amplifier and N5381A solder-in differential probe head.
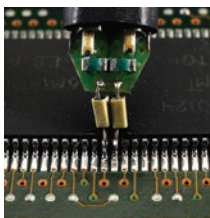
Infiniium 90000 Series Ordering Information

Infiniium DSA/DSO90000A Series oscilloscopes

Model	Bandwidth	Channels	Sample rate	Standard memory per channel
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)

DSA Series comes with standard 50 Mpts memory, high speed serial data analysis (Option 003/E2688A), EZJIT Complete jitter analysis software (Option 070/N8823A), EZJIT Plus jitter analysis software (Option 004/N5400A), and EZJIT jitter analysis software (Option 002/E2681A).

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

Note: No probes are included with the DSA/DSO90000A Series oscilloscopes. The InfiniiMax Series probes or any other probes must be purchased separately.
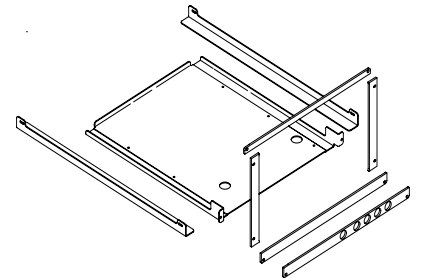
Additional options and accessories	
DSO90000A-1CM	Rack mount kit
DSO90000A-A61	ANSI Z540 compliant calibration
DSO90000A-801	Removable solid state drive
N2892A (requires Option 801)	Additional removable solid state drive for 90000 Series with Windows 7
DSO90000A-805	GPIB card-interface
DSO90000A-807	1 MΩ, 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

Mount your 90000 Series scope in a 19" (487 mm) rack with option 1CM.

Presales memory options	
DSO90000A-20M	20 Mpts memory/CH upgrade
DSO90000A-50M	50 Mpts memory/CH upgrade [1]
DSO90000A-100	100 Mpts memory/CH upgrade
DSO90000A-200	200 Mpts memory/CH upgrade
DSO90000A-500	500 Mpts memory/CH upgrade
DSO90000A-01G	1 Gpts memory/CH upgrade

1. Standard on DSA version oscilloscopes.

Quickly remove your hard drive for additional security with Option 801.

Infiniium 90000 Series Ordering Information (Continued)

Factory installed option for new purchases	User installed standalone product number	SW applications
002	E2681A-1NL	EZJIT jitter analysis software (standard on DSA Series)
003	E2688A-1NL	High-Speed serial data analysis with clock recovery and 8b/10b decoding (standard on DSA Series)
004	N5400A-1NL	EZJIT Plus jitter analysis software (standard on DSA Series)
007	N5391A-1NL	Protocol triggering and decode I^{2}C/SPI
009	N5414B-1NL	InfiniiScan event identification software
010	N5430A-1NL	Infiniium user-defined function application software
012	N5461A-1NL	Serial Data Equalization
013	N5465A-3NL	Basic InfiniiSim Waveform Transformation Toolset
014	N5365A-1NL	Advanced InfiniiSim Waveform Transformation Toolset
015	N5462A-1NL	RS-232/UART Protocol triggering and decode
016	N5464A-1NL	USB 2.0 Protocol triggering and decode
017	N5463A-1NL	PCI EXPRESS Protocol triggering and decode
018	N8801A-1NL	SAS/SATA Protocol triggering and decode
019	N8802A-1NL	MIPI D-PHY Protocol triggering and decode
021	N5392B-3NL	Ethernet electrical performance validation and compliance software
022	N5393F-1FP	PCI EXPRESS electrical performance validations and compliance software
023	N5399C-3NL	HDMI 1.4 electrical performance validation and compliance software
029	N5416A-1NL	USB 2.0 compliance test software
030	N5431A-1NL	XAUI electrical validation with 10GBASE-CX4, CPRI, OBSAI, and Serial RapidIO
031	U7233A-1NL	DDR1 and LPDDR compliance test applications
032	N5413B-1NL	DDR2 and LPDDR2 compliance test applications
033	U7231B-1NL	DDR3 and LPDDR3 compliance test applications
034	N5394A	DVI compliance application
035	U7238A	MIPI compliance test application
036	U7236A	10GBASE-T Ethernet Electrical Compliance Application
038	N5411B-1NL	SATA 6G Compliance Test Software
040	N5467B-1NL	User Definable Application
041	U7243B-3NL	USB 3.1 Compliance Test Software
043	N5412D-3NL	Serial attached SCSI (SAS-2) electrical performance validation and compliance
045	U7232C-1NL	DisplayPort 1.2 compliance test software
058	N6462A-1NL	DDR4 and LPDDR4 compliance test application
060	N5392B	10/100/1000BTe Energy Efficient Ethernet
061		MATLAB - Basic Digital Analysis Package
062		MATLAB - Standard Digital Analysis Package
063	N8803A-1NL	CAN, LIN and FlexRay Protocal triggering and decode
065	N6467A-1NL	BroadR-Reach compliance
070	N8823A-1NL	EZJIT Complete jitter and noise analysis software (Standard on DSA Series)
073	N6466A-1NL	MOST compliance
N8845A-1FP	N8845A-2FP	SPMI protocol trigger and decode
—[1]	—[1]	Generic Raw – NRZ protocol decode
—[2]	—[2]	Generic Raw – PAM-4 protocol decode

1. Standard with SDA option (firmware 6.0 and up).
2. Requires PAM-4 compliance app and SDA option (firmware 6.0 and up).

Infiniium 90000 Series Ordering Information (Continued)

Oscilloscope bandwidth upgrades

Upgrade	Descriptions
N5471A	DSA/DSO91204A to DSA/DSO91304A upgrade (12 to 13 GHz)
N5471B	DSA/DSO90804A to DSA/DSO91204A upgrade (8 to 12 GHz)
N5471C	DSA/DSO90604A to DSA/DSO90804A upgrade (6 to 8 GHz)
N5471D	DSA/DSO90404A to DSA/DSO90604A upgrade (4 to 6 GHz)
N5471E	DSA/DSO90254A to DSA/DSO90404A upgrade (2.5 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 10 Mpts per channel to 20 Mpts per channel memory upgrade
N5472B	After-purchase 20 Mpts per channel to 50 Mpts per channel memory upgrade
N5472C	After-purchase 50 Mpts per channel to 100 Mpts per channel memory upgrade
N5472D	After-purchase 100 Mpts per channel to 200 Mpts per channel memory upgrade
N5472E	After-purchase 200 Mpts per channel to 500 Mpts per channel memory upgrade
N5472F	After-purchase 500 Mpts per channel to 1 Gpts per channel memory upgrade

Operating system upgrades

Upgrade	Descriptions
N2753A	Windows 7 for Infiniium 90000 scope with Windows XP and SN>MY50410100
N2754A-002	Window 7 and M890 motherboard for Infiniium 90000 scopes with Windows XP and SN <MY50410100

Rackmount kit upgrades

Upgrade	Descriptions
N5470A	Rackmount kit for Infiniium 90000A Series oscilloscope. Rackmount is seven rack units long
	For more information please consult the Installation Guide at **literature.cdn.keysight.com/litweb/pdf/N5470-92000.pdf**.
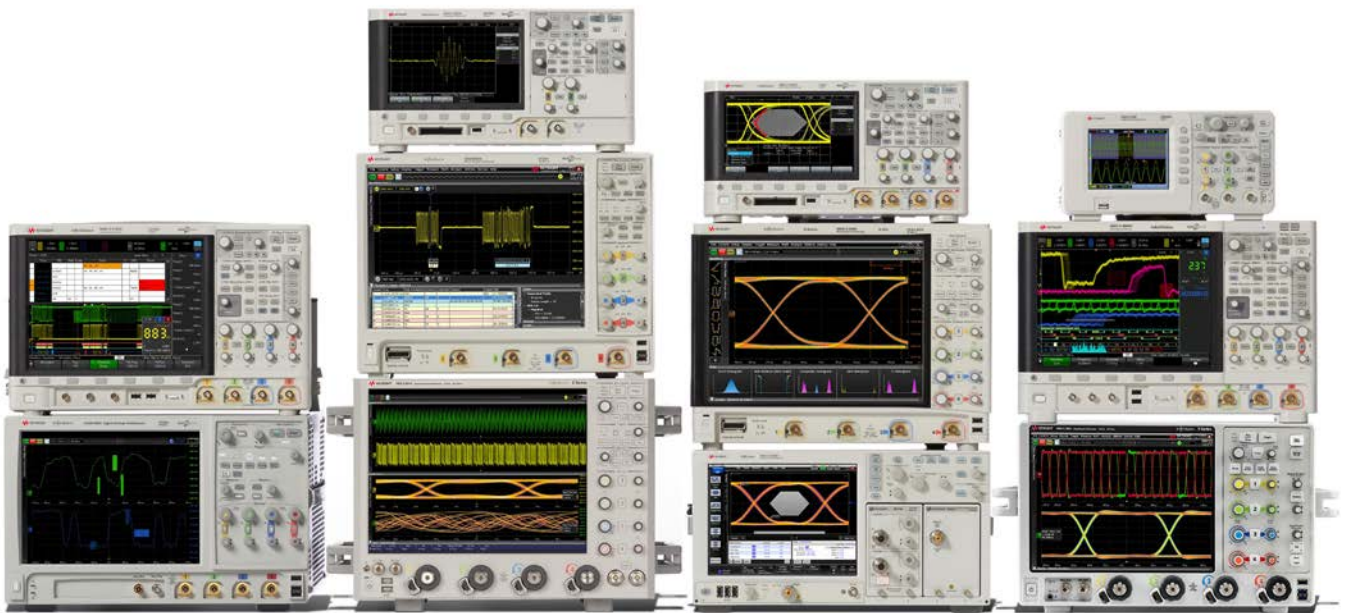
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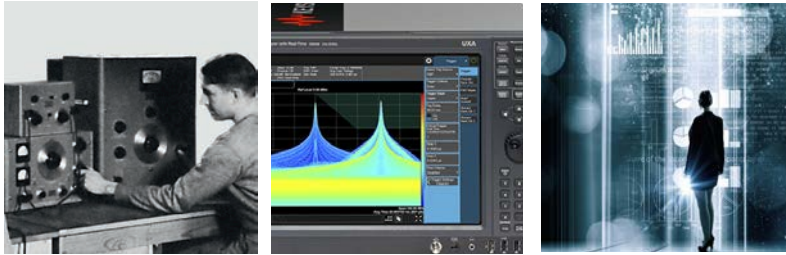- Programming environments
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