



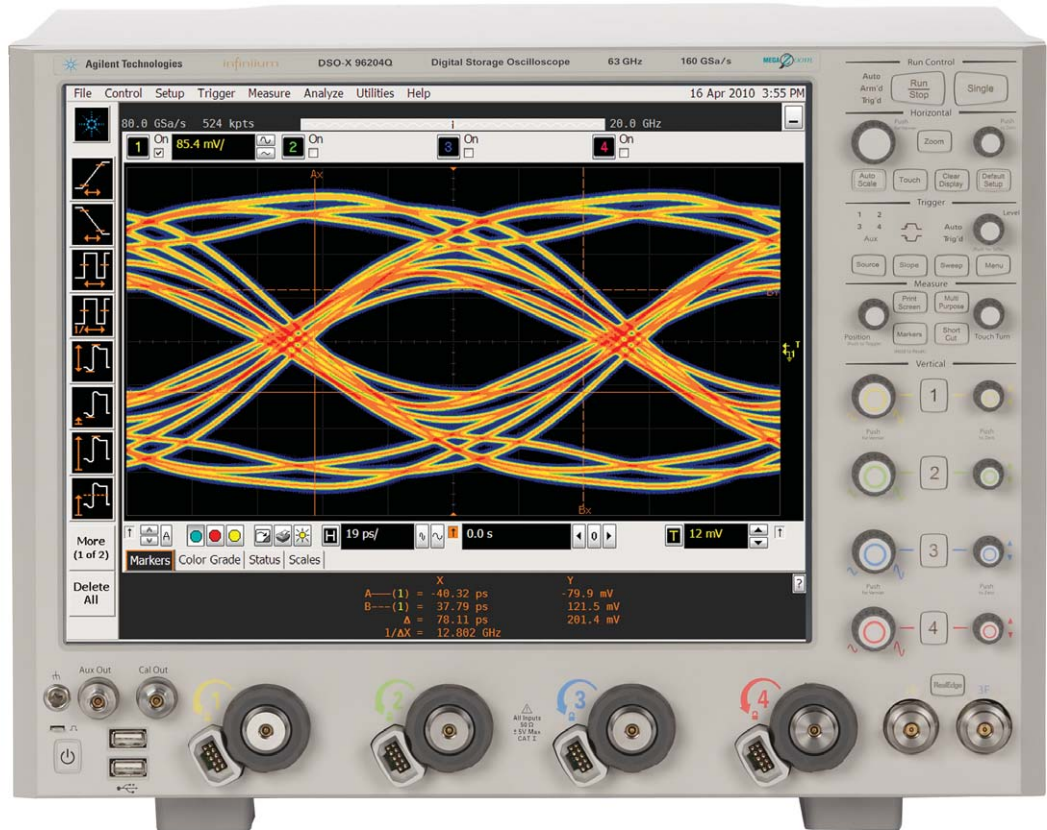
Infiniium 90000 Q-Series Oscilloscopes

Data Sheet

Complimentary scope with every Infiniium 90000 Q-Series...



...Now until September 30, 2013



Achieve Your Real Edge

63 GHz of real-time bandwidth on 2 channels

33 GHz of real-time bandwidth on 4 channels

Anticipate — Accelerate — Achieve



Agilent Technologies

Achieve Your Real Edge

At the extremes of electrical and optical measurements, the right oscilloscope will help you explore the “what” and understand the “why.” That’s the idea behind Q-Series oscilloscopes, our latest step forward in the application of Agilent’s microwave expertise to real-time oscilloscopes. With industry-leading bandwidths, the Q-Series lets you see your fastest signals as they really are. Equip your lab with Q-Series scopes—and achieve your real edge.

Featuring:

- The industry’s highest real-time bandwidth with 63 GHz
- The industry’s highest 4-channel bandwidth with 33 GHz in a single frame
- The industry’s lowest noise and jitter measurement floor
- The industry’s deepest memory



The 90000 Q-Series captures rise times as fast as 5ps (20/80)

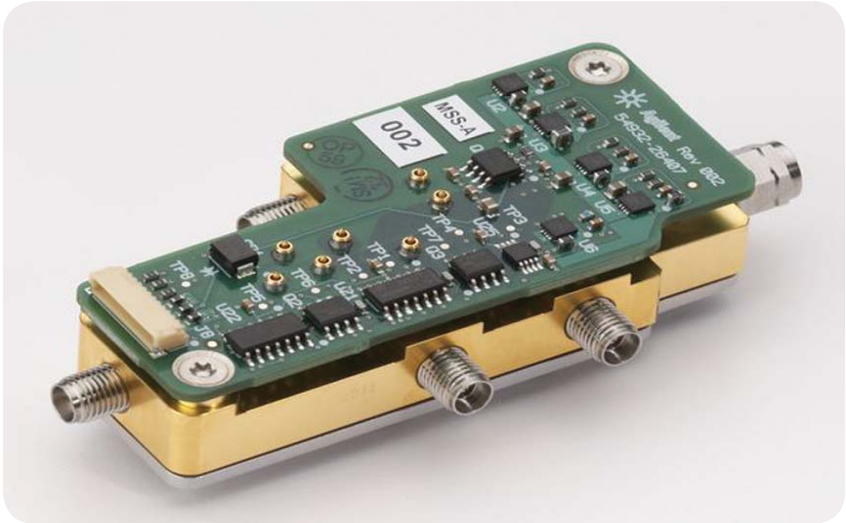
| | Bandwidth | | Sample rate | | Memory depth | |
|------------|-----------|-----------|-------------|-----------|--------------|---------|
| | 2 Channel | 4 channel | 2 channel | 4 channel | Standard | Maximum |
| DSAX96204Q | 63 GHz | 33 GHz | 160 GS/s | 80 GS/s | 50M | 2 Gpts |
| DSOX96204Q | | | | | 20M | 2 Gpts |
| DSAX95004Q | 50 GHz | 33 GHz | | | 50M | 2 Gpts |
| DSOX95004Q | | | | | 20M | 2 Gpts |
| DSAX93304Q | 33 GHz | 33 GHz | | | 50M | 2 Gpts |
| DSOX93304Q | | | | | 20M | 2 Gpts |
| DSAX92504Q | 25 GHz | 25 GHz | 80 GS/s | 80 GS/s | 50M | 2 Gpts |
| DSOX92504Q | | | | | 20M | 2 Gpts |
| DSAX92004Q | 20 GHz | 20 GHz | | | 50M | 2 Gpts |
| DSOX92004Q | | | | | 20M | 2 Gpts |

Advanced IC Design and Technology Help You Solve Your Biggest Problems

At the extremes of electrical and optical measurements ...

You need to make rise time measurements without being limited by scope bandwidth:

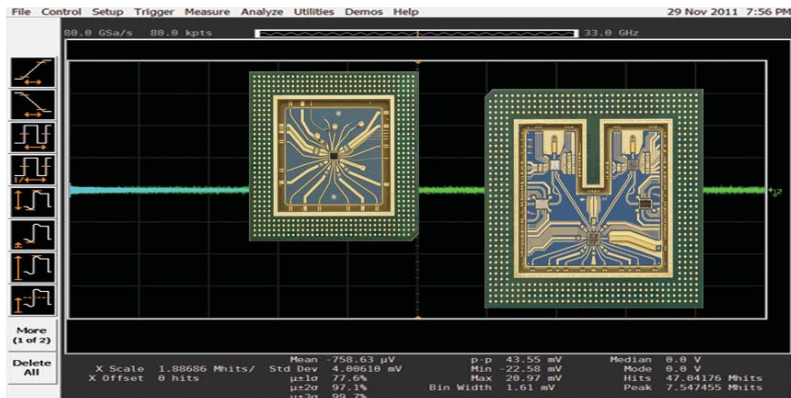
The Q-Series is Agilent's first oscilloscope to use RealEdge technology, which allows for an industry-leading 63 GHz of bandwidth on two channels. RealEdge technology uses custom chips to seamlessly increase the bandwidth of Q-Series oscilloscopes.



Infiniium's new RealEdge technology blocks enable 63-GHz real-time bandwidth

You need to see your signal and not oscilloscope noise:

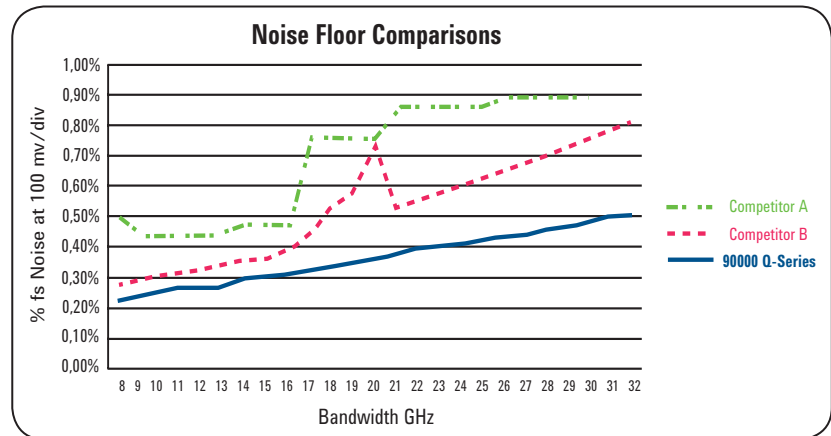
The Q-Series leverages technology from the award-winning Infiniium 90000 X-Series oscilloscope, which provides leading signal integrity specifications. The Q-Series takes advantage of leading-edge indium phosphide chip technology and custom thin film packaging technology, which ultimately leads to the lowest-noise real-time oscilloscope in the world. With industry-leading bandwidths, Q-Series scopes let you see your fastest signals as they really are.



Infiniium's custom multichip modules feature indium phosphide chips and Agilent proprietary packaging technology, enabling high bandwidth and low noise

You need to see your signal and not your measurement system:

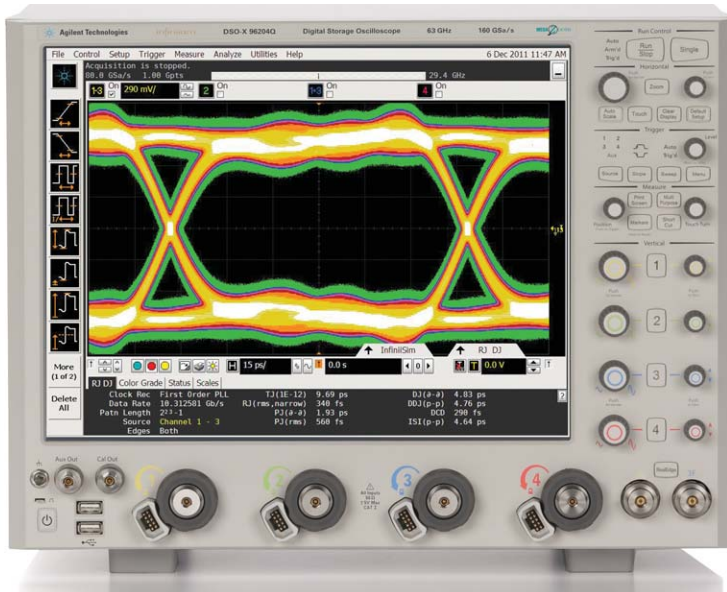
Using Agilent's proprietary indium phosphide technology the N2806A PrecisionProbe Advanced creates a signal edge that is an incredible 5 ps (20/80), which the Q-Series is capable of measuring.



The 90000 Q-Series features the industry's lowest noise floor

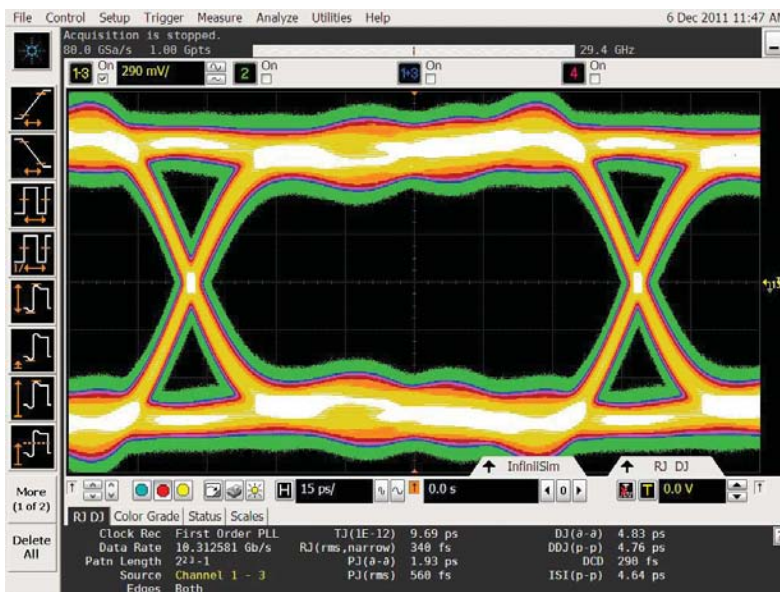
Digital: The Scope

At the extremes of electrical and optical measurements, the right oscilloscope will help you explore the “what” and understand the “why” in ...



With 63 GHz of bandwidth to capture rise times as fast as 5 ps and data rates as fast as 120 Gbit/s the 90000 Q-Series is the worlds fastest real time oscilloscope. Its four channels at 33 GHz make it ideal for 28 and 32 Gbit/s SERDES designs. In addition to providing leading edge bandwidth, the Q-Series helps you to find your real edge, by featuring the industry’s lowest noise and jitter measurement floor, which means less scope noise in your measurements and a truer depiction of your signal.

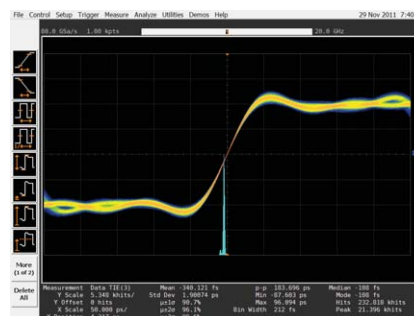
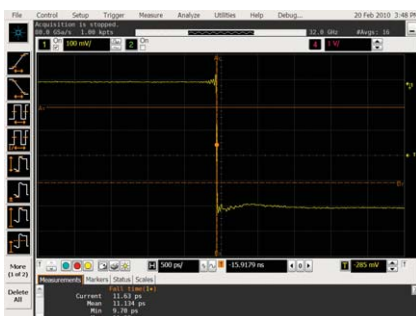
Using the 90000 Q-Series, you can capture sub 500 fs random jitter measurements on your devices



Q-Series scopes help you understand the “why” by providing insight with:

1. Analysis on memory depths up to 2 Gpts of data
2. Clock recovery on data rates as fast as 120 Gb/s, perfect for 28/32-Gb/s SERDES
3. Two unique jitter separation algorithms, including bounded uncorrelated jitter breakdown
4. The only waveform transformation software to properly model difficult solutions such as reflection
5. Full offline analysis

With its flat frequency response and low noise, the 90000 Q-Series is able to accurately measure jitter components such as ISI



Frequency Domain: the Spectrum Analyzer

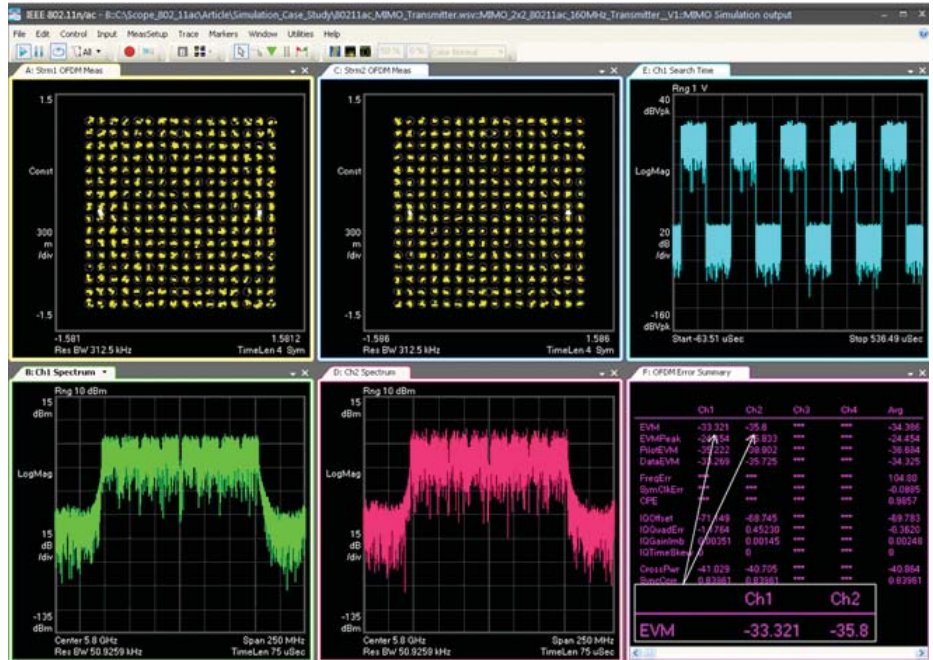
At the extremes of technology measurements, you need more than just an oscilloscope. You need ...

You need to easily compute both magnitude and phase.

Infiniium Q-Series oscilloscopes include a Fast Fourier Transform (FFT) for frequency domain (spectrum) analysis. This feature is especially valuable if you have limited access or no access to a spectrum analyzer, yet you need occasional frequency domain analysis capability. The integrated FFT offers an alternative to a dedicated spectrum analyzer. Use the Q-Series FFT to compute both magnitude and phase and take advantage of several useful features to assist in spectral analysis. Q-Series scopes include controls to adjust memory depth, sampling rate, vertical scale and horizontal scale of the FFT. The FFT can control span and resolution bandwidth. Automatic measurements and markers measure spectral peak frequencies and magnitudes as well as deltas between peaks. Infiniium Q-Series oscilloscopes include peak search capability to ensure quick capture of peak frequencies. The Q-Series is fully compatible with Agilent's vector signal analysis (VSA) and W2650A oscilloscope signal analysis (OSA) software, to provide the deepest analysis capability.

Software features and benefits

- Multiple FFT windows including Hanning, rectangular, Blackman-Harris, flattop, and Hamming
- Peak search and navigation for fast analysis
- Constellation diagram analysis available on the VSA software
- Segmented memory for pulsed and modulation domain signal analysis of radar and EW waveforms (OSA)
- Volts vs. time and power (dBm) vs. time (OSA software)
- CW and modulation measurements



Agilent's 89601B Vector signal analysis software turns the 90000 Q-Series into spectrum analyzer



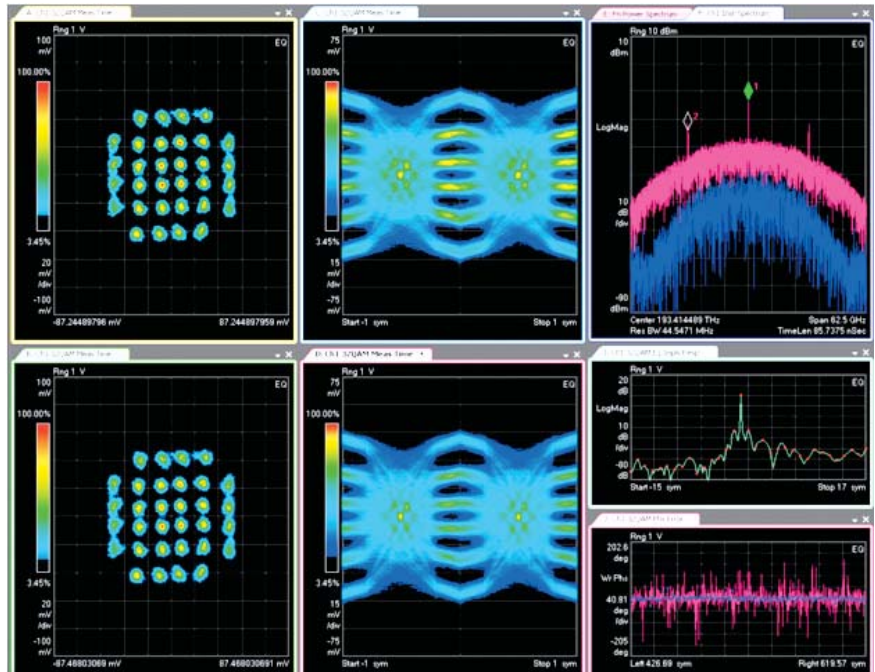
Agilent's InfiniView software provides full off line capability including FFTs

Complex Modulation: Optical Modulation Analyzer

At the extremes of electrical and optical measurements, the right oscilloscope will help you explore the “what” and understand the “why” in ...

Q-Series oscilloscopes are also available in combination with the N4391A optical modulation analyzer as a fully specified turn-key instrument. This compact solution offers the highest bandwidth available on the market and is the most advanced test solution for advanced research on 400-G and terabit transmission. Even for the lower 20-GHz bandwidth range, this compact and easy-to-use solution is a reference system for 100-G transmission required by R&D labs working at 100 G and beyond. By providing four channels of 33 GHz bandwidth, the Q-Series saves you the expense of a second instrument to analyze dual polarization.

If you prefer to operate with your own optical receivers but want to benefit from the enormous analysis capability, you can get the N4391A's analysis software as a standalone package.



The N4391A offers a powerful toolset to debug the most challenging errors, with tools proven by thousands of RF engineers

Features and benefits

- Up to 33 GHz true analog bandwidth on four channels
- 40 GHz support to the N4391A in near future
- Up to 120 Gbaud symbol rate analysis
- Four times better EVM noise floor than typical QPSK transmitter
- Compact four channels in turn-key solution
- 4 x 80-Gs real-time sampling for optimal phase tracking
- Well-defined interface to include your own MATLAB algorithms
- Customer-configurable APSK and OFDM decoders

Network Analysis: Time-Domain Transmissometry (TDT)

At the extremes of technology measurements, you need more than just an oscilloscope. You need...

You need to be able to maximize your margins by removing the effects of cables and fixtures.

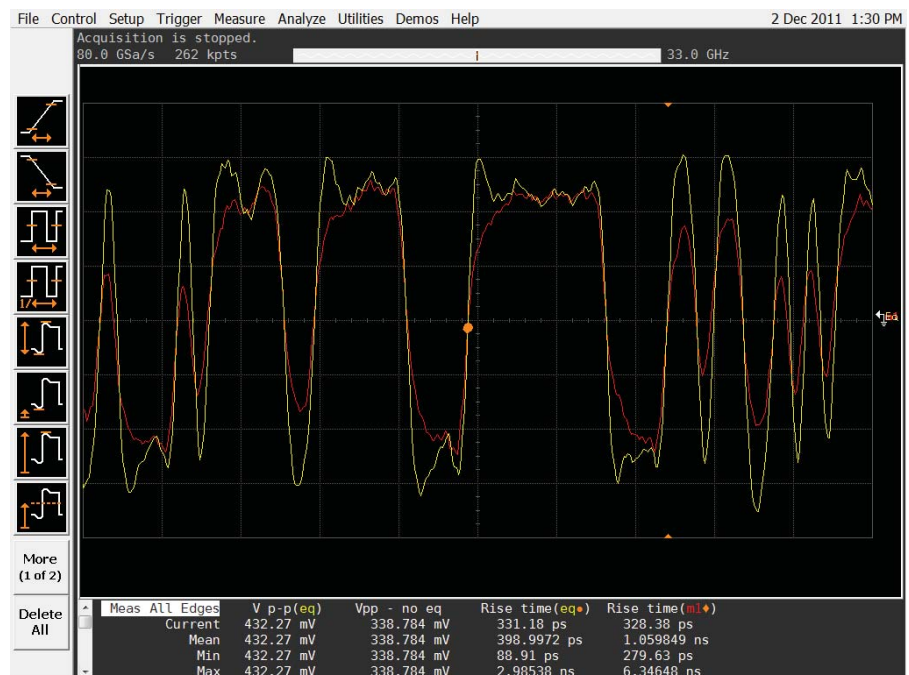
Q-Series oscilloscopes offer award-winning PrecisionProbe Advanced technology. You no longer need to ignore cable loss because you are short on time or budget. Using PrecisionProbe Advanced technology, you can characterize cables as fast as 63 GHz and remove the loss that they create. PrecisionProbe Advanced technology give you one of the world's fastest edges at less than 5 ps and uses this edge to perform a TDT on your cable. Based on the loss of your cable, PrecisionProbe Advanced then compensates your measurement system, gaining back valuable margin typically lost in cables. As bandwidths continue to increase and cable loss becomes more and more of a problem, the Q-Series has the technology to solve this problem.

You need to automate multiple lanes automatically and still maximize margins.

The Q-Series features Agilent's compliance applications which provide full automation of any switch connected to your system. The software is fully compatible with PrecisionProbe Advanced compensation, which allows you to characterize every input using only your Q-Series oscilloscope and then seamlessly automate every measurement in your compliance application. Save valuable time and resources in such technologies as DisplayPort and PCI Express® gen3.



PrecisionProbe software characterizes cables to 63 GHz



By analyzing cables you can increase your margins by removing insertion loss caused by cables

The World's Fastest Probing System for Your Highest Performance Needs

The InfiniiMax III probing system provides the highest bandwidth and incredibly low loading to allow for a completely new level of signal fidelity and accuracy. Four different InfiniiMax III probe amplifiers ranging from 16 to 30 GHz are available for matching your probing solution to your performance and budget requirements. The InfiniiMax III probe system is unmatched by any product in the market. It uses a proprietary 200-GHz fT indium phosphide IC process with backside ground vias and novel thick-film technology to accommodate your highest-performance needs.



Industry's only upgradable probing system

| Description | Probe or accessory | Bandwidth |
|-----------------------------------|--------------------|-----------|
| 30-GHz InfiniiMax III probe amp | N2803A | 30 GHz |
| 25-GHz InfiniiMax III probe amp | N2802A | 25 GHz |
| 20-GHz InfiniiMax III probe amp | N2801A | 20 GHz |
| 16-GHz InfiniiMax III probe amp | N2800A | 16 GHz |
| ZIF probe head | N5439A | 28 GHz |
| Browser (handheld) probe head | N5445A | 30 GHz |
| Solder-In probe head | N5441A | 16 GHz |
| 3.5/2.92/SMA probe head | N5444A | 28 GHz |
| Performance verification fixture | N5443A | 30 GHz |
| 450-ohm ZIF tip kit (set of five) | N5440A | 28 GHz |
| 200-ohm ZIF tip kit (set of five) | N5447A | 28 GHz |
| Browser tip replacement | N5476A | 30 GHz |
| Precision BNC adaptor | N5442A | 13 GHz |
| Sampling scope adaptor | N5477A | 30 GHz |
| 2.9-mm flexible cable | N5448A | 30 GHz |
| High-impedance probe adaptor | N5449A | 500 MHz |
| 35-GHz flexible cable | N2812A | 35 GHz |

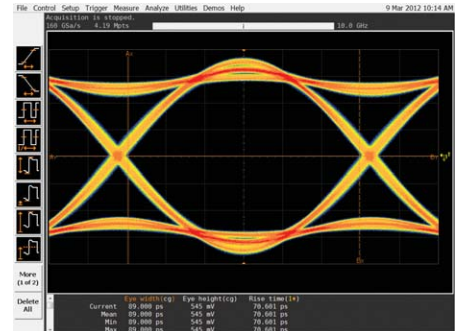


Achieve Your Real Edge

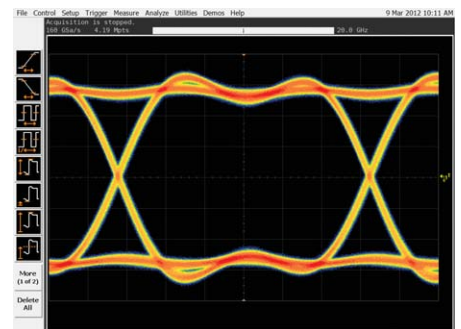
Having the right amount of oscilloscope bandwidth ensures accurate measurements. If you have too much bandwidth, oscilloscope noise becomes a contributor in your measurement. With too little bandwidth, rise times are improperly depicted. Use the chart below to find the correct oscilloscope bandwidth for the devices you are measuring.

Recommended scope bandwidth

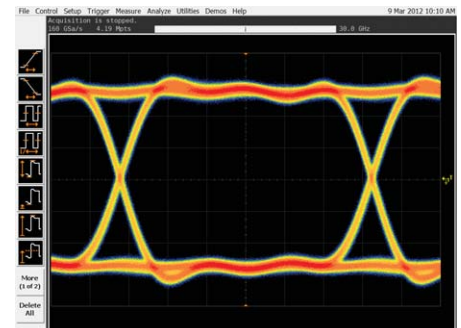
| Technology | Data rate | Fastest rise time | Scope BW |
|---------------------|------------------|-------------------|----------|
| Ethernet 10base-T | 10 Mbps | 30 ns | 600 MHz |
| Ethernet 100base-T | 100 Mbps | 3 ns | 600 MHz |
| Ethernet 1000base-T | 250 Mbps x 4 | 1.2 ns | 1 GHz |
| USB 2.0 | 480 Mbps | 300 ps | 2.5 G |
| USB 3.0 | 5 Gbps | 50 ps | 12 GHz |
| DDR1 | 400 MT/s | 500 ps | 2 GHz |
| DDR2 | 1066 MT/s | 250 ps | 4 GHz |
| DDR3 | 2133 MT/s | 100 ps | 8 GHz |
| DDR4 | 3200 MT/s | 75 ps | 12 GHz |
| GDDR5 | 8 Gbps | 30 ps | 16 GHz |
| SATA 3G | 3 Gbps | 67 ps | 12 GHz |
| SATA 6G | 6 Gbps | 33 ps | 16 GHz |
| SAS-2 | 6 Gbps | 42 ps | 16 GHz |
| SAS-3 | 12 Gbps | 21 ps | 30 GHz |
| 16G FibreChannel | 14.025 Gbps | 24 ps | 35 GHz |
| HDMI 1.4 | 3.4 Gbps | 50 ps | 8 GHz |
| DisplayPort 1.2 | 17.28 Gbps | 50 ps | 13 GHz |
| 10G Ethernet | 10 Gbps | 60 ps | 12 GHz |
| 10Gbase-KR | 10.3125 Gbps | 24 ps | 25 GHz |
| XAUI | 3.75 Gbps | 60 ps | 12 GHz |
| MIPI M-Phy | 5.83 Gbps | 17.2 ps | 24 GHz |
| MIPI D-Phy | 1.5 Gbps | 100 ps | 6 GHz |
| PCI Express 2 | 5 Gbps | 30 ps | 12.5 GHz |
| PCI Express 3 | 8 Gbps | 25 ps (est.) | 16 GHz |
| 28/32G FibreChannel | 28 Gbps | 18 ps | 45 GHz |
| Thunderbolt 10G | 10.3125 Gbps | 22 ps | 25 GHz |
| SFP + | 10 Gbps | 34 ps | 16 GHz |
| MHL | 2.25 Gbps | 75 ps | 8 GHz |
| InfiniiBand II | 2.5 Gbps, 5 Gbps | 75 ps | 8 GHz |



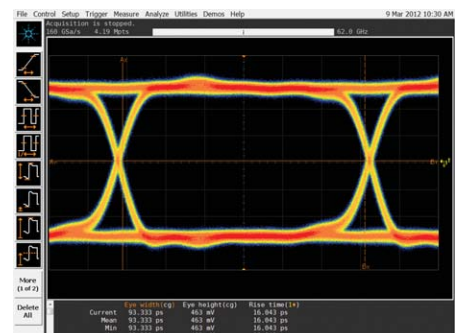
10 Gbps eye captured with 10 GHz of bandwidth



10 Gbps eye captured with 20 GHz of bandwidth



10 Gbps eye captured with 30 GHz of bandwidth



10 Gbps signal captured with 62 GHz of bandwidth, notice the faster rise time and wider eye measurements

Achieve Your Real Edge

Introducing Infiniium 90000 Q-Series oscilloscopes

33 GHz of true analog bandwidth and 80 GS/s on all four channels.

Live indicator shows when the scope is running a long operation.

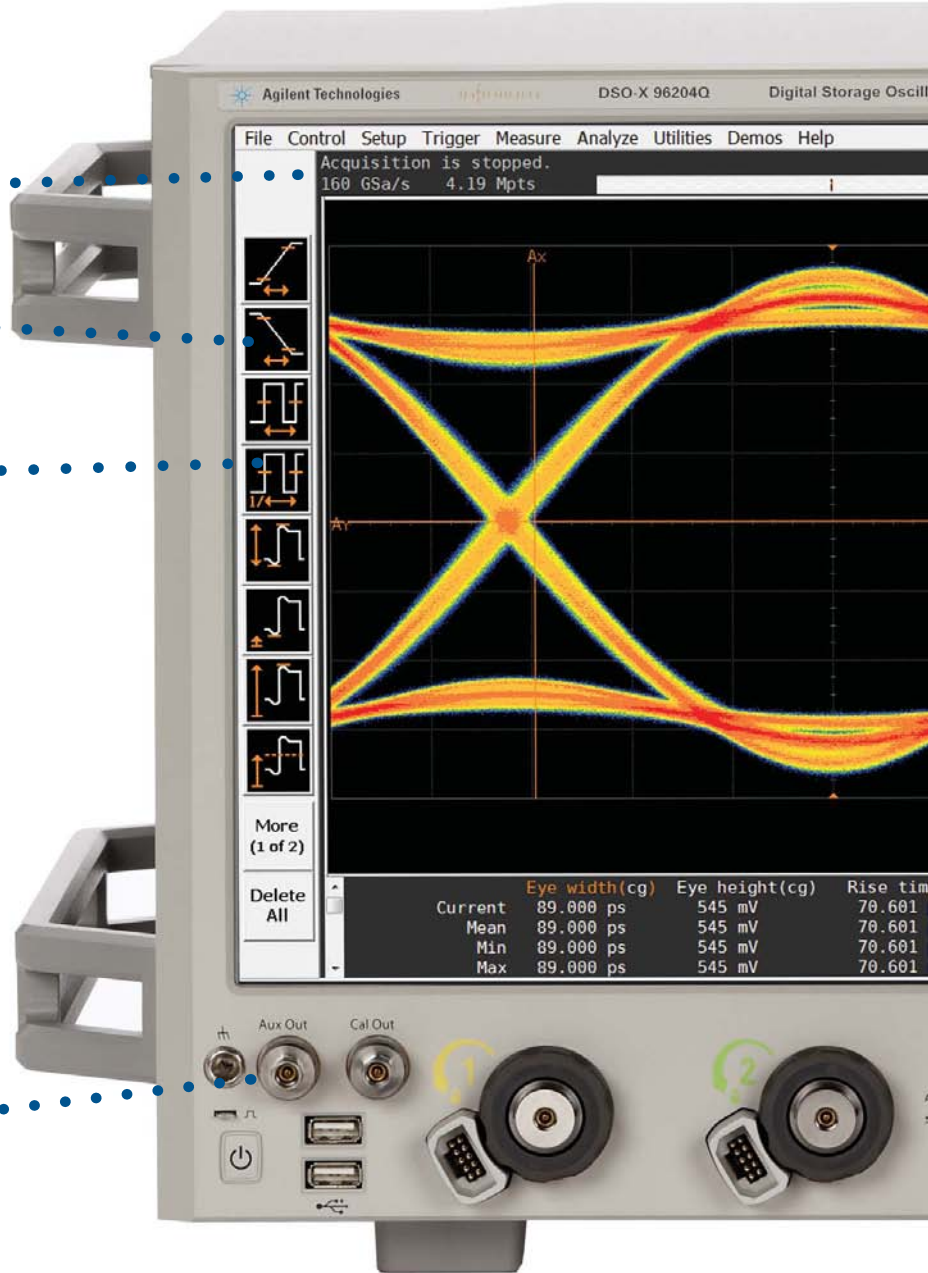
See your signal more clearly with a large 15.4-inch XGA (1024 x 768) high-resolution color touch-screen display.

Identify anomalies easily with a 256-level intensity-graded or color-graded persistence display. Use variable persistence for even more display options.

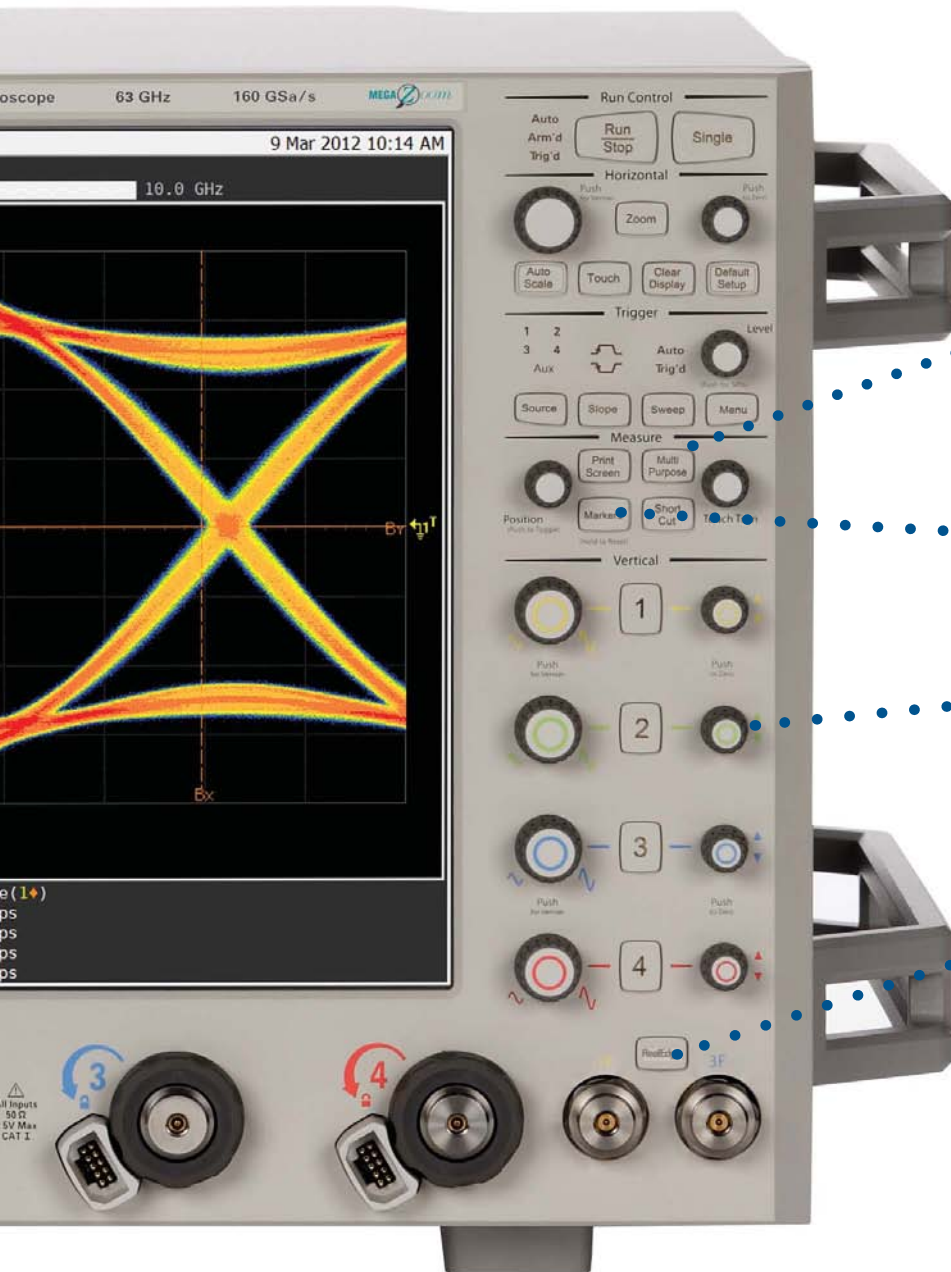
Remote access through 10/100/1000 BaseT LAN interface with Web-enabled connectivity uses ultra-responsive UltraVNC.

USB and LAN provide remote measurements. Infiniium application remote program interface (now a standard feature) allows application/compliance software automation.

Calibration edge with a rise time of less than 15 ps enables TDT calibration with PrecisionProbe. Use the Infiniium calibration source as part of PrecisionProbe Advanced to extend calibration to an unmatched 63 GHz.



Threaded RF connectors ensure the most reliable signal integrity for high-performance instruments. The Autoprobe II interface combines the tried-and-true 3.5-mm threaded RF connector of Agilent sampling scopes with a convenient automatic torque mechanism that ensures a consistent 8 in. lbs. connection without the hassles of a torque wrench.



A new 100-MHz reference clock ties up to ten 90000 Q-Series scopes together with sub 200 fS precision. A 10-MHz clock allows tying multiple instruments together with the 90000 Q-Series.

- Multipurpose knob and button allow you to customize the oscilloscope's front panel to perform the operations you use the most.

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

- The horizontal and vertical knobs can be changed to control functions and waveform memories. Simply right click the channel control in the GUI to change these controls.

- RealEdge button makes changing from 33 GHz inputs to 63 GHz inputs as easy as pushing a button.

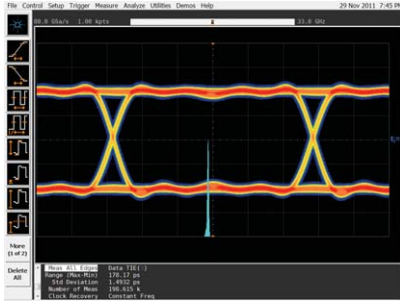
Increase your productivity with a familiar Infiniium graphical user interface, including your favorite drag-and-drop measurement icons. Infiniium's analog-like front panel has a full set of controls color-coded to the waveforms and measurements, making your tasks simple.

The 90000 Q-Series improves upon Agilent's use of custom integrated circuits and multichip module packaging with an exclusive new technology called RealEdge. RealEdge comprises a combination of new architectures, next-generation microcircuits and thin-film components, and advanced application of Agilent's indium phosphide semiconductor process. This new technology enables high-frequency capability while maintaining the industry's lowest noise and jitter measurement floor (75 fs).

Achieve Your Real Edge

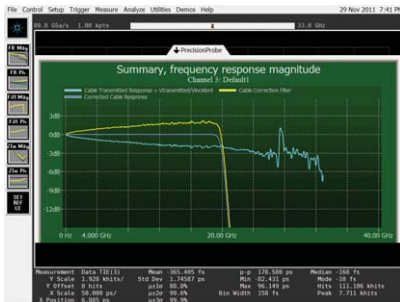
Realize your best design

Low noise and jitter



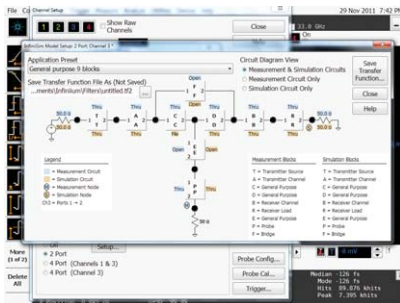
The 90000 Q-Series features the lowest noise floor and jitter measurements, allowing you to truly see your signal and get your device to market faster.

PrecisionProbe

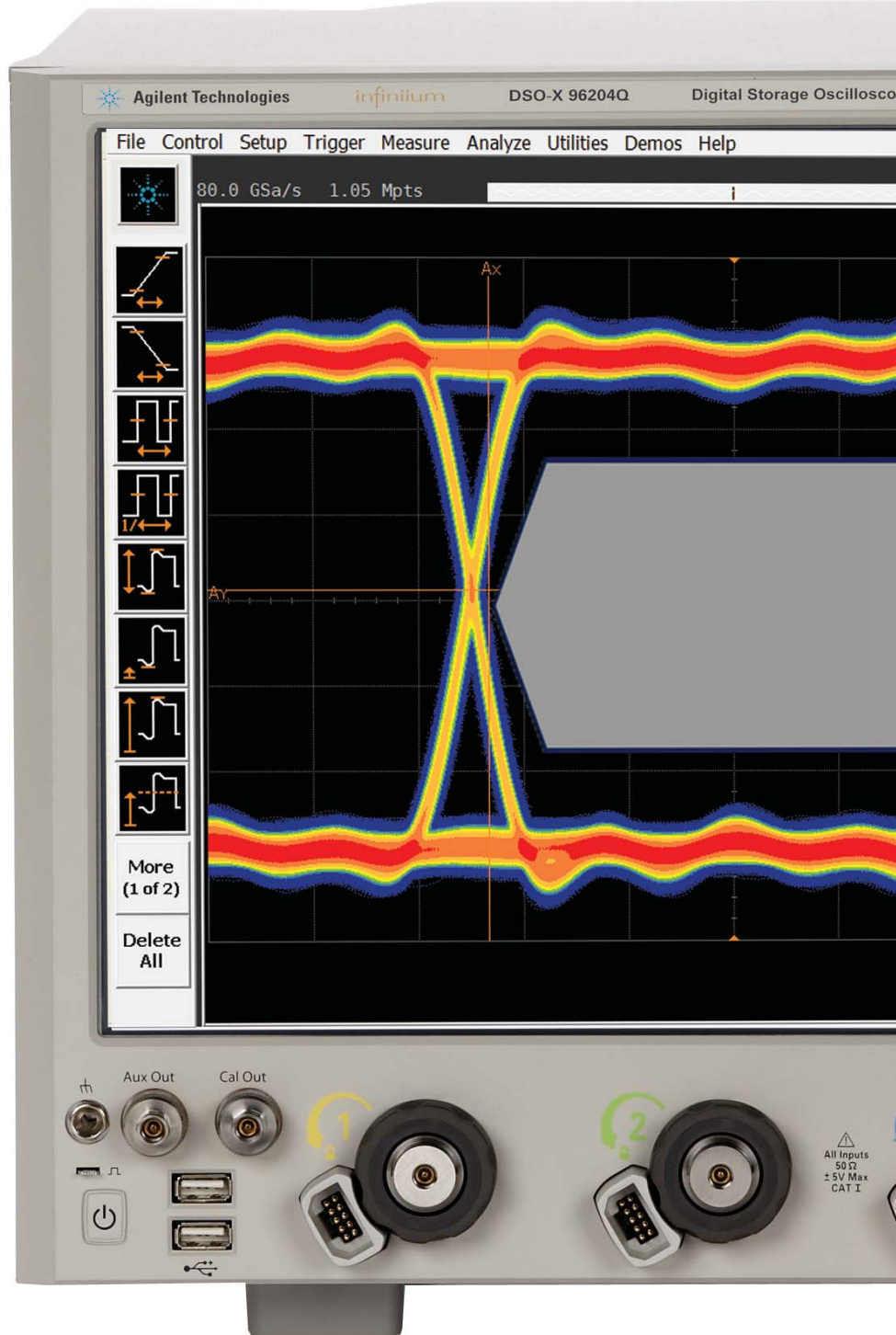


By characterizing and compensating for loss in cables, you can gain significant margin. Agilent's PrecisionProbe software was used to gain 10% margins in this PCI Express gen3 design.

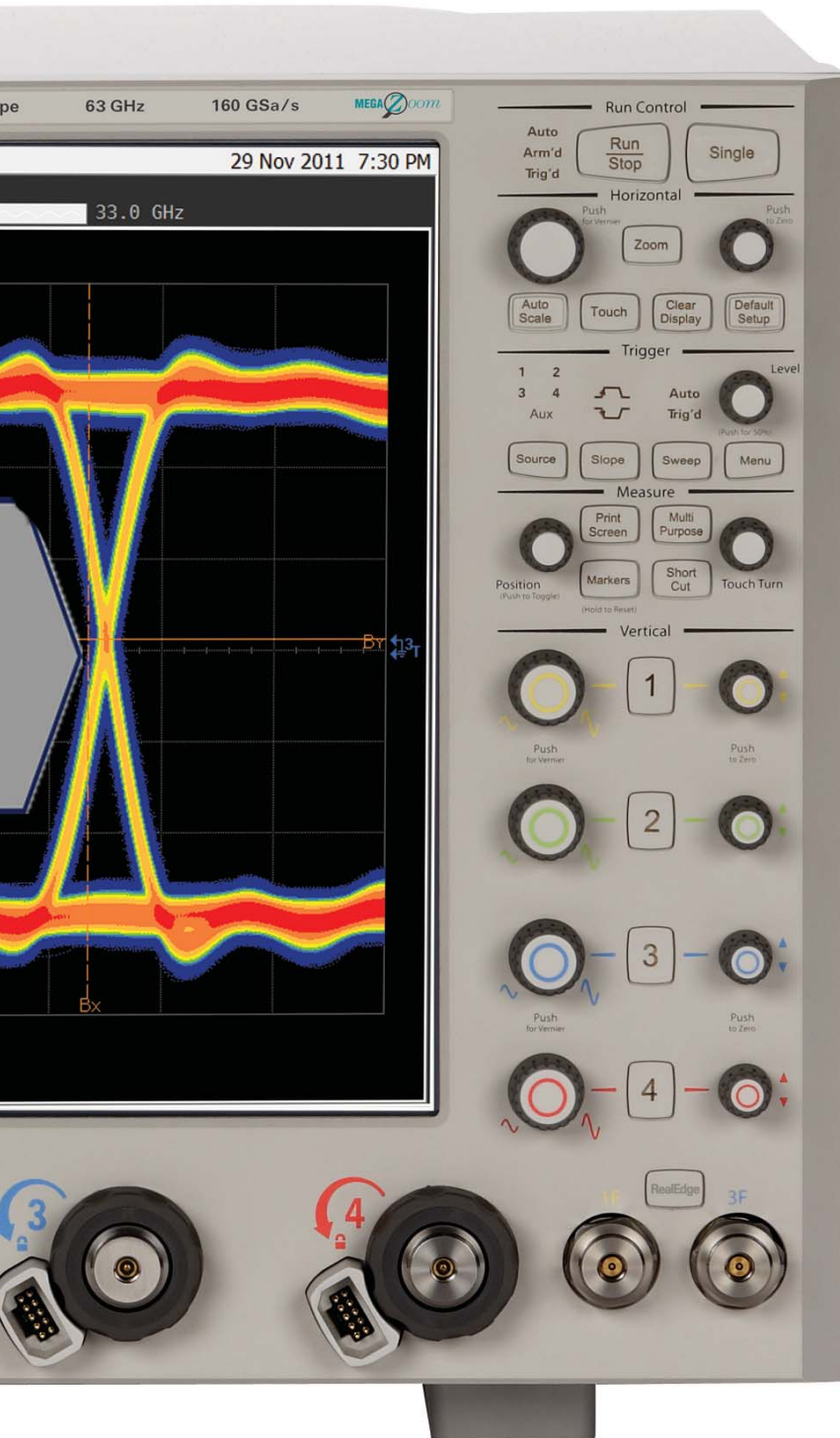
Waveform transformation



Debugging next-generation buses such as PCI Express and Thunderbolt require advanced analysis tools. Agilent's InfiniiSim software helps you model the most difficult situations.

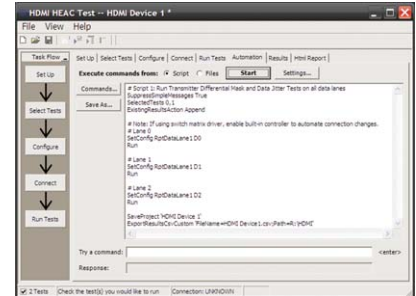


Infiniium 90000 Q-Series oscilloscopes are the world's only 4-channel, 33-GHz real-time oscilloscopes. Q-Series scopes are the only scopes that feature 30-GHz probes, making debugging your system easier and ensuring you aren't missing valuable harmonic content.



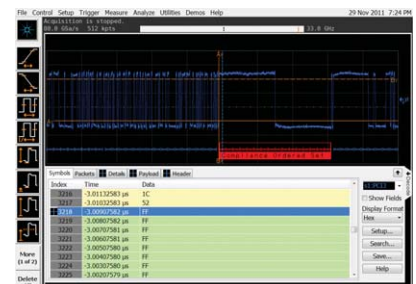
Q-Series oscilloscopes features application-specific software that allows you to gain the insight into your design that you need. Whether you are solving tough jitter or noise problems, removing loss due to cables or probes, or simply looking at protocol, the Q-Series has the tools to help you ensure you realize your best design.

Compliance software



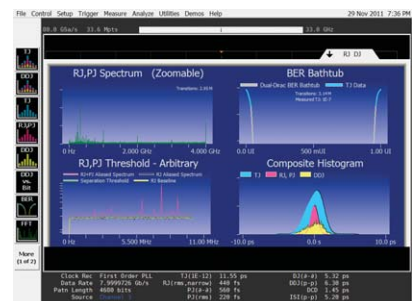
Agilent's compliance software packages are certified by experts and provide assurance when you pass in-house you will pass at your customer site as well.

Protocol analysis



Infiniium protocol tools simplify debugging your design. Infiniium scopes offer full protocol analysis for PCI Express gen 1, 2, and 3. The 128b/130b decoding features a lister that makes alignment between the lister and analog channels simple.

Advanced jitter and noise separation



Infiniium's new noise analysis tools allow you to analyze your data bus completely.

Analysis Tools: PrecisionProbe Basic and Advanced (Options 001 and 066)

Turn your 90000 Q-Series oscilloscope into a time-domain transmissometry (TDT) and quickly characterize and compensate any input into your scope.

PrecisionProbe technology turns your oscilloscope into the ultimate characterization tool. Not only can you do the normal de-embedding through InfiniiSim, PrecisionProbe allows quick characterization of your entire probe system (including cables and switches) without the need for extra equipment. PrecisionProbe takes advantage of the fast “cal output” signal on the 90000 Q-Series to characterize and compensate for loss on the measurement system.

PrecisionProbe technology:

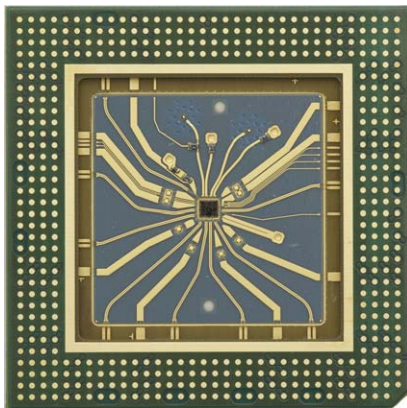
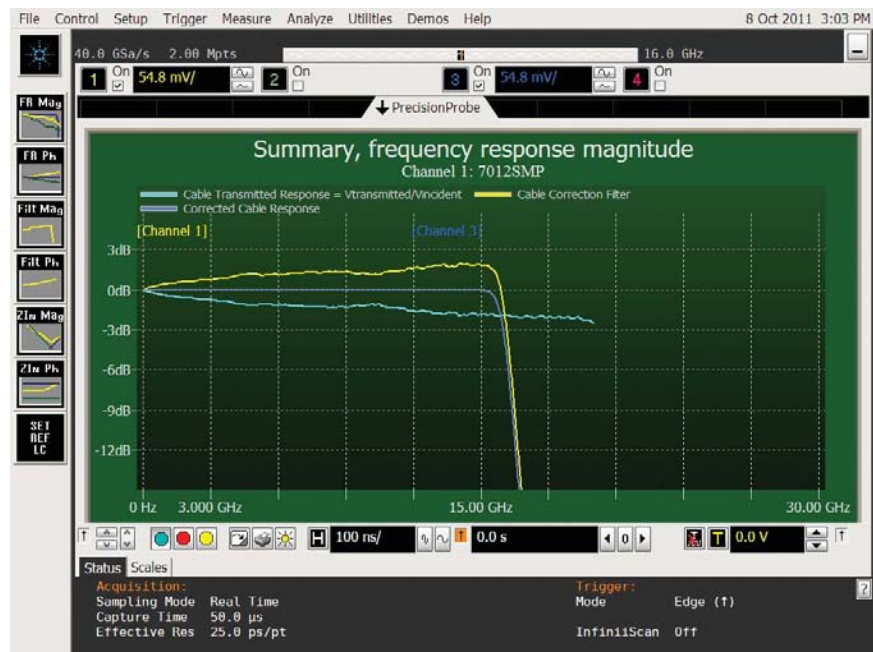
- Properly creates custom probe transfer function = V_{Out} / V_{In}
- Properly characterizes probed system transfer function such that $V_{Out} / V_{Inc} = V_{Out} / V_{Src}$
- Removes unwanted S21 cable loss

Now every probe and cable in the system can have the exact same response – probe to probe or cable to cable – without the inaccuracies

that using one model can produce. Now you can properly characterize custom probes and remove unwanted responses. In addition to characterizing the cables, PrecisionProbe allows for immediate use on the same instrument. PrecisionProbe saves you time and money while increasing your measurement accuracy.

When you combine InfiniiMax probes

with switches between the amplifier and the probe head, PrecisionProbe allows for full correction and automation of each probes path. Full automation is then available to allow for quick swapping of the inputs via Infiniium’s compliance framework. For increased accuracy, purchase PrecisionProbe Advanced for faster edge speeds and true differential measurements.



Every 90000 Q-Series oscilloscope has Agilent’s custom InP fast edge.

PCI Express measurement comparisons

| Root complex device | Eye height (mV) | Eye height PrecisionProbe | Gain |
|----------------------|-----------------|---------------------------|-------|
| 2.5 GT/s 12 GHz | 517.19 | 553.94 | 7.1% |
| 5 GT/s_12 GHz_3.5 dB | 312.22 | 348.19 | 11.5% |
| 5 GT/s_12 GHz_6 dB | 341.1 | 376 | 10.2% |
| 5 GT/s_16 GHz_3.5 dB | 306.6 | 348.33 | 13.6% |
| 5 GT/s_16 GHz_6 dB | 344.4 | 374.41 | 8.7% |
| 8 GT/s_12 GHz_P7 | 96.83 | 103.09 | 6.5% |
| 8 GT/s_12 GHz_P8 | 100.16 | 108.33 | 8.2% |
| 8 GT/s_16 GHz_P7 | 96.92 | 106.01 | 9.4% |
| 8 GT/s_16 GHz_P8 | 100.24 | 108.24 | 8.0% |

By characterizing and compensating for cable loss on the cable connected to the PCI Express test fixture, the designer was able to gain between 6.5% and 13.6% margin that would have been lost otherwise.

Analysis Tools: EZJIT, EZJIT + and SDA (Standard on DSA Models)

Gain insight into the causes of signal jitter to ensure high reliability of your design

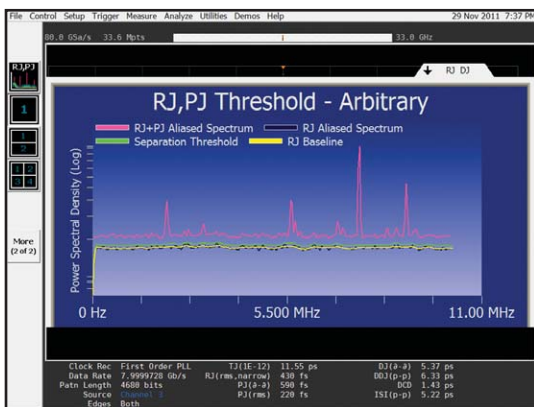
With faster edge speeds and shrinking data-valid windows in today's high-speed digital designs, insight into the causes of jitter has become critical for success. Using EZJIT and EZJIT + jitter analysis software the Q-Series oscilloscopes help you identify and

quantify jitter components that affect the reliability of your design. Time correlation of jitter to the real-time signal makes it easy to trace jitter components to their sources. Additional compliance views and a measurement setup wizard simplify and automate RJ/DJ separation for testing against industry standards.

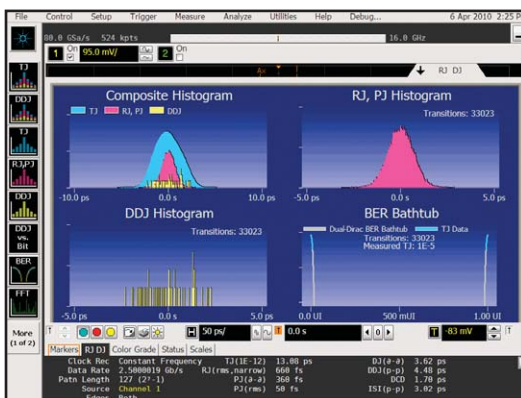
EZJIT Plus automatically detects embedded clock frequencies and repetitive data patterns on the oscilloscope inputs and calculates the level of data-dependent jitter (DDJ) that is contributed to the total jitter (TJ) PDF by each transition in the pattern, a feature not available on any other real-time oscilloscope today.



Use EZJIT software to extract spread spectrum clocks



The RJ/PJ threshold tools, provides more jitter analysis



Jitter separation makes debugging your device easy

Measurement trends and jitter spectrum

EZJIT's simple tools help you quickly analyze the causes of jitter. Measurement trends allow you to see deeper views of factors affecting measurements. Jitter spectrum is a fast method to find the causes of jitter.

Two ways to separate jitter

EZJIT + comes with two ways to separate jitter: the industry standard Dual-Dirac method and the emerging tail-fit method. Both methods allow for simple separation of RJ and DJ, but the tail-fit method provides jitter separation in the unique case of non-symmetrical histograms.

Unique RJ/DJ threshold view

EZJIT + also provides a unique spectral view of the jitter spectrum with the threshold drawn on the chart. The spectral view provides insight into the decision point of the separation and allows for narrow or wide, tail-fit or Dual-Dirac.

Real-time eye and clock recovery

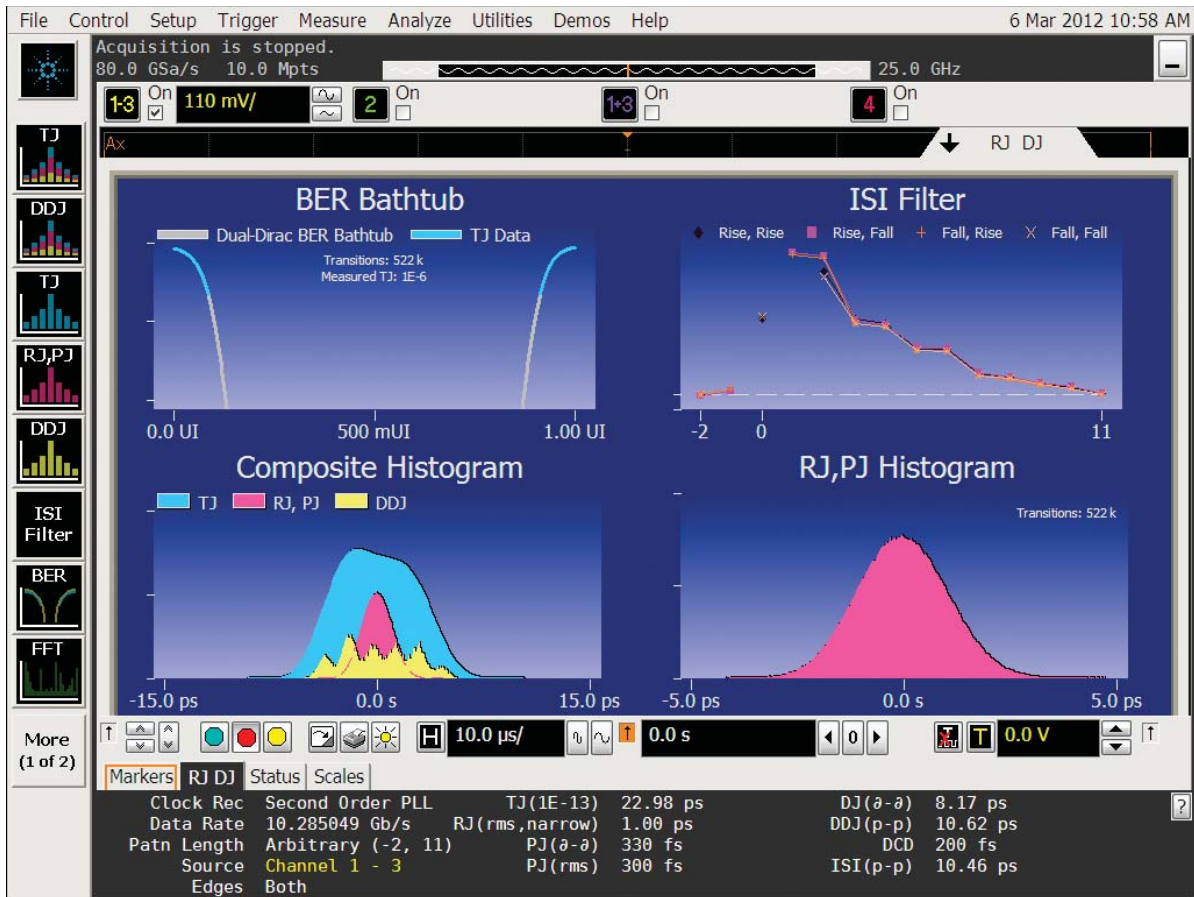
Serial data analysis (SDA) software provides flexible clock recovery including 1st and 2nd-order PLL and constant algorithms. With a stable clock, you can look at real-time eyes of transition and non-transition bits. Q-Series scopes with SDA software also provide a new unique view of bits preceding an eye.

8b/10b protocol

Serial data analysis software comes complete with 8b/10b protocol and decoding. The analysis allows you to search and trigger on the event you are looking for.

Analysis Tools: EZJIT Complete (Option 057)

Discover signal anomalies to the noise of the waveform



More than your standard jitter package

In order to efficiently determine root cause for any type of signal degradation in the amplitude domain, you must first determine whether the problem is caused by random or deterministic sources. In order to help you accomplish this task, EZJIT Complete takes analysis techniques used in the time domain (jitter analysis) and extends them into the amplitude domain.

More than just an eye contour

EZJIT Complete is an in-depth view into impairments related to signal levels – either logic ones or logic zeroes – deviating from their ideal positions. Some tools simply provide a view of an eye contour, but provide no real measurement data other than nice graphics.

EZJIT Complete uses separation techniques to allow each bit to be examined to determine correlated effects and to make multiple measurements on individual bits to determine uncorrelated effects. Use FFTs to analyze the frequency domain and extract random components. Dual-Dirac modeling techniques are also carried from the jitter domain and used in the interference domain.

Key measurements

With EZJIT Complete, Q-Series scopes offer the following unique measurements:

- Total interference (TI)
- Deterministic interference (DI)
- Random noise (RN)
- Periodic interference (PI)
- Inter-symbol interference (ISI)
- RIN (dBm or dB/Hz)
- Q-factor

Analysis Tools: InfiniiSim (Options 014 and 015)

The most advanced waveform transformation software helps you render waveforms anywhere in a digital serial data link

InfiniiSim waveform transformation toolset provides the most flexible and accurate means to render waveforms anywhere in a digital serial data link. The highly configurable system modeling enables you to remove the deleterious effects of unwanted channel elements, simulate waveforms with channel models inserted, view waveforms in physically improbable locations, compensate for loading of probes and other circuit elements, and do so simply and quickly on your tool of choice, the 90000 Q-Series at up to 63 GHz of bandwidth.

Circuit models to define your setup

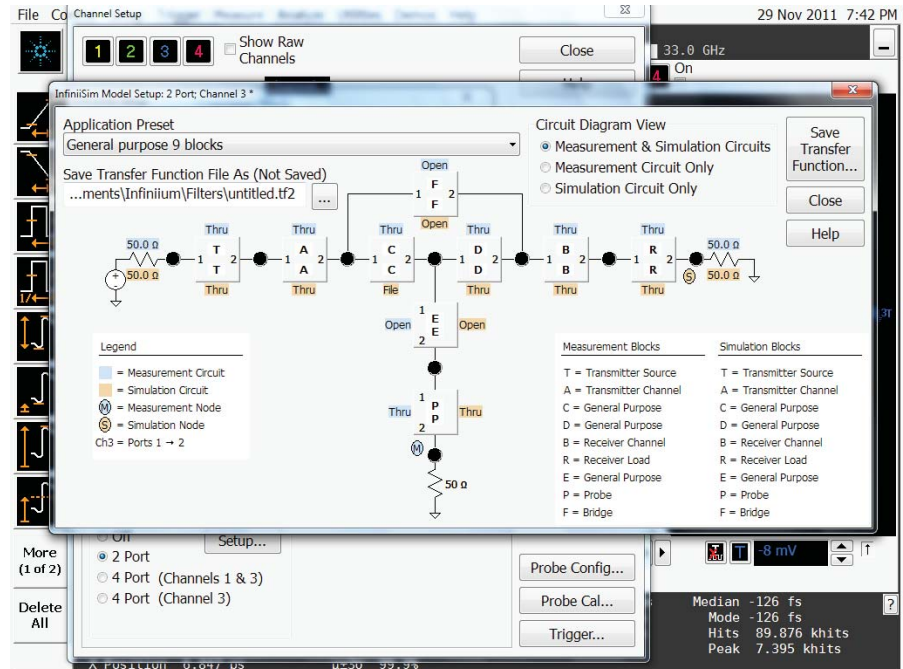
The InfiniiSim waveform transformation toolset provides a graphical user interface for you to define your system as you understand it and even make it arbitrarily complex. You do this by selecting topologies and defining circuit blocks.

Model reflections

With the InfiniiSim waveform transformation toolset, you can transform signals with confidence, whether you are inserting or removing channel elements or relocating the measurement plane. InfiniiSim's advanced toolset lets you model up to 27 different elements at once and model the interaction between elements. Only toolsets with the ability to model more than one element will properly reflect a model including the oscilloscope's input. The 90000 Q-Series scopes provide their own s11 parameter to allow modeling of their own input.

Model your system with as much detail as you need

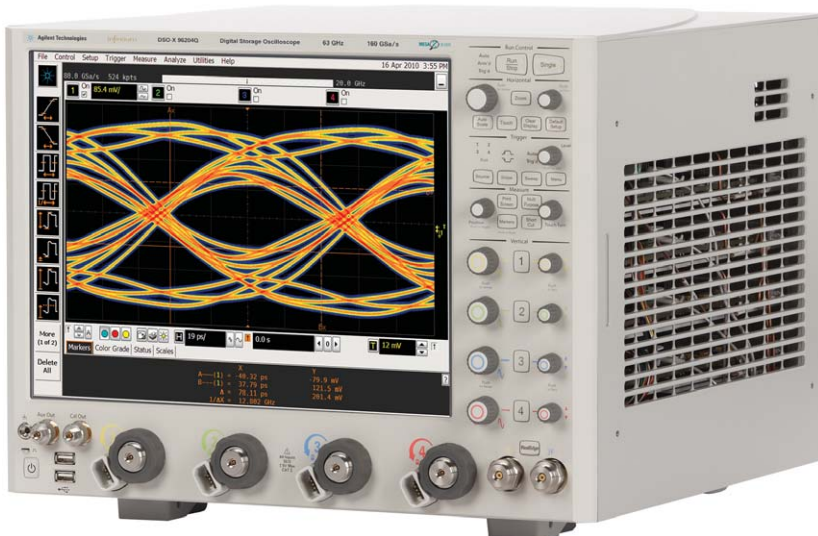
InfiniiSim features the model setup that best matches your design. Whether it is a simple single-element model or an advanced general-purpose model with up to 27 elements in the link, you can perfectly model your design and simulate the exact probing point you want.



Analysis Tools: Serial Data Equalization (Option 012)

Significantly reduce receiver errors by opening even tightly shut eyes through equalization emulation

Serial data equalization for the 90000 Q-Series provides fast and accurate equalization using decision feedback equalization (DFE), feed-forward equalization (FFE), and continuous-time linear equalization (CTLE) modeling in real time. Serial data equalization software allows you to input your own self-designated tap values to verify your design. If you prefer, the software will find the optimal tap values for you. CTLE allows DC gain and two-pole modeling.



Analysis Tools: InfiniiScan (Option 009)

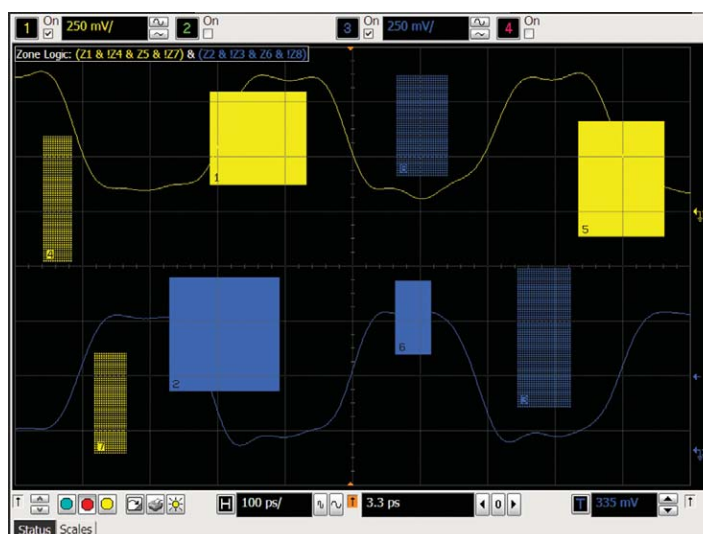
Trigger on events that hardware triggers can't handle.

InfiniiScan software allows you to use an oscilloscope to identify signal integrity issues that hardware triggering is unable to find in your electronic designs. This innovative software scans through thousands of acquired waveforms per second to help you isolate signal anomalies, saving you time and improving designs.

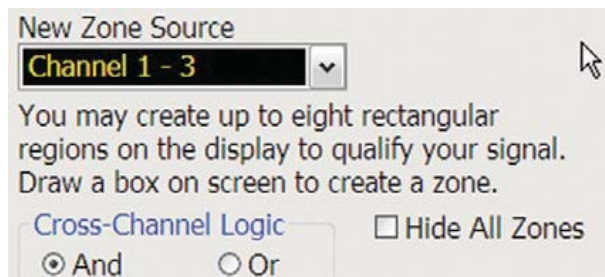
Innovative triggers

The *zone qualify finder* allows you to draw a "must pass" or "must not pass" zone on the oscilloscope screen to visually determine the event identify condition. If you can see the event of interest on the screen, you can create a trigger that will isolate it, saving significant time over some complicated hardware triggers.

Other triggers include non-monotonic edge, measurement limit search, runt and pulse width.



Draw zones on your screen for a unique triggering experience



By combining InfiniiScan and hardware-accelerated math, you can even trigger on differential math signals

Analysis Tools: N8900A InfiniiView Oscilloscope Analysis Software

View and analyze away from your scope and target system



InfiniiView software works with all of Infiniiium's applications

Ever wish you could do additional signal viewing and analysis away from your scope and target system? Now you can. Capture waveforms on your scope, save to a file, and recall into Agilent's InfiniiView application.

View and analyze anywhere your PC goes

Take advantage of large high-resolution and multiple displays found in your office. Use familiar scope controls to quickly navigate and zoom in to any event of interest. Use auto measurements and functions for additional insight.

Share scope measurements more easily across your team

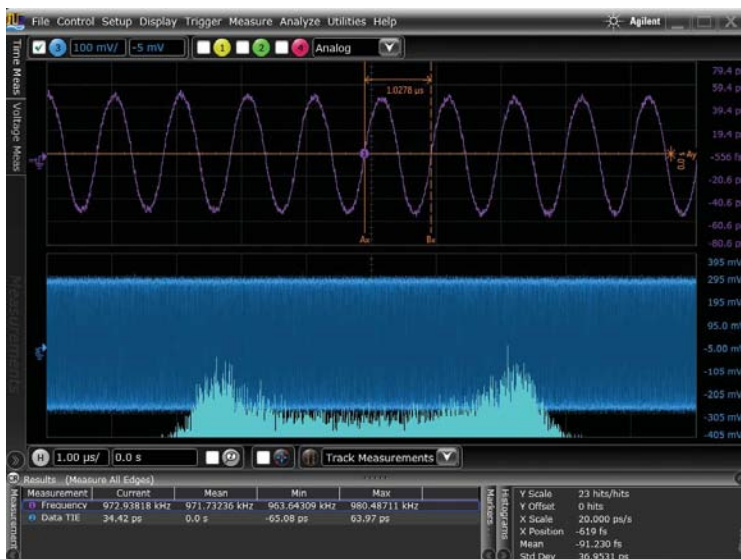
You can share entire data records instead of being limited exclusively to static screen shots.

Create more useful documentation

Use features such as right-click cut-and-paste to move screen images between applications, without ever having to save the image to a file. Add up to 100 bookmark annotations and up to 20 simultaneous measurements.

Need advanced analysis capability?

InfiniiView includes a variety of upgrade options including serial decode upgrades for a variety of serial buses, jitter analysis, and serial data analysis.



Use InfiniiView to find signal anomalies, such as power supply coupling

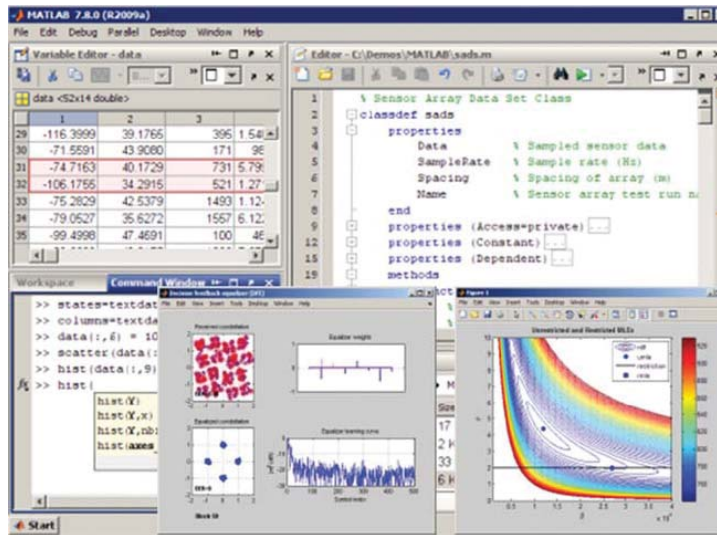


Peak search capability makes InfiniiView a frequency domain tool

Analysis Tools: User-Defined Function (Option 065)

Combine Infiniium and MATLAB for even more analysis

Enhance the Q-Series with a seamless gateway to powerful MATLAB analysis functionality. User-defined function software adds new analysis capabilities to the Q-Series, beyond traditional math/analysis features. Now you have the freedom to develop your own math functions or filters using MATLAB and its Signal Processing Toolbox. With a seamless integration to MATLAB, Agilent Infiniium oscilloscopes allow you to display your math and analysis functions live on the oscilloscope screen, just like any other scope's standard functions.



Analysis Tools: complete list of analysis software

| Analysis Tools | Description | Option | Standalone |
|-----------------------------------|--|--------|------------|
| PrecisionProbe | Characterize and compensate for loss from your input to your oscilloscope to 33 GHz | 001 | N2809A-001 |
| PrecisionProbe Advanced | Go a step further, characterize and compensate for loss from your input to your oscilloscope to 63 GHz | 827 | N2807A |
| InfiniiScan | Trigger on unique events including using zones on multiple channels and non-monotonic edges | 009 | N5414B |
| EZJIT | Basic jitter analysis with measurement trending, time interval error and many more measurements | 002 | E2681A |
| EZJIT + | Get in-depth analysis of your jitter by decomposing your jitter | 004 | N5400A |
| EZJIT complete | Understand your full real time by decomposing the noise that is impacting your margins | 057 | N8813A |
| Serial data analysis | Recover clocks to 120 Gbs/s and view real-time eyes. Run mask testing. | 003 | E2688A |
| Serial data equalization | Properly emulate your design equalizers including FFE, CTLE and DFE | 012 | N5461A |
| InfiniiSim Basic | Waveform transformation software to remove or add three elements in your link | 013 | N5465-001 |
| InfiniiSim Advanced | Waveform transformation software to remove or add 27 elements in your link | 014 | N5465A-002 |
| InfiniiView | Put your scope onto your PC and maximize Infiniium's analysis tools with a true offline analysis engine | - | N8900A |
| User-defined function | Create custom functions that run live on your oscilloscope with MathWorks MATLAB software | 010 | N5430A |
| MATLAB Basic | Purchase an introductory MATLAB software package to acquire scope measurements into the MATLAB environment | 061 | - |
| MATLAB Standard | Purchase a typical MATLAB software package, signal processing and filter design toolboxes on the same PO as your scope | 062 | - |
| User-defined function with MATLAB | Create and excute custom fuctions that run live on your oscilloscope. Includes MATLAB standard software (option 062) | 065 | N8806A |

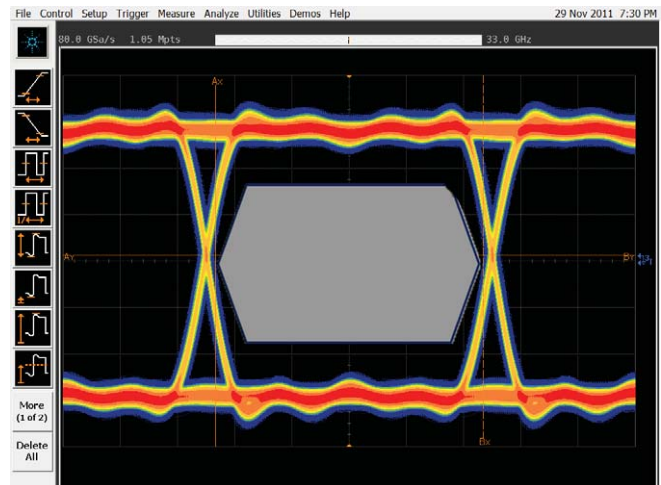
Compliance and Automated Testing

Today's demanding environment means you have much less time to understand the intricacies of the technologies you are testing. You also have less time to develop and test automation software that is designed to increase measurement throughput and decrease time to market. Agilent's compliance applications save you time and money with measurement automation built into the compliance application. No longer do valuable resources need to be exclusively tied to writing automation software – instead they can be deployed to designing the next big project.

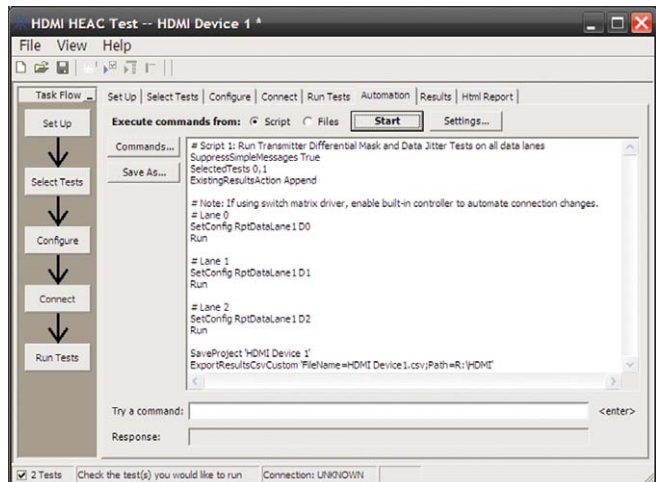
Compliance applications that run on Q-Series oscilloscopes are certified to test to the exact specifications of each technology standard. If a test passes on the Q-Series scope in your lab, you can be assured that it will pass in test labs and at plug fests worldwide. Agilent experts on technology boards and industry standards committees help define compliance requirements. As a result, you can be sure that Q-Series oscilloscope tools deliver to critical specifications. Setup wizards combined with intelligent test filtering give you confidence you're running the right tests. Comprehensive HTML reports with visual documentation and pass/fail results guarantee that critical information is retained on each test.

Quick and easy automated switching

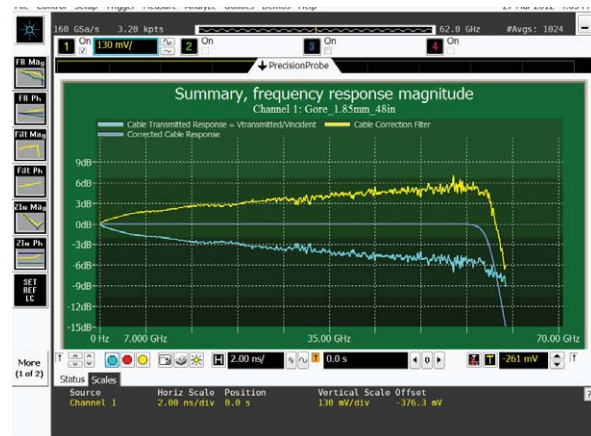
Only Agilent's Q-Series oscilloscopes feature compliance applications with both the user-defined application's add-in capability and integrated PrecisionProbe compensation. Switch paths can vary in their characteristics and have unwanted loss. By enabling PrecisionProbe in its compliance applications, Q-Series scopes allows you to characterize and compensate for every path in the switch, making every path's frequency response identical in both magnitude and phase. These tools makes switch automation quick and painless. The Q-Series and its compliance applications make automation more automated than ever. Your technicians no longer need to spend valuable time physically changing connections.



Compliance applications make testing to today's technologies standards easy



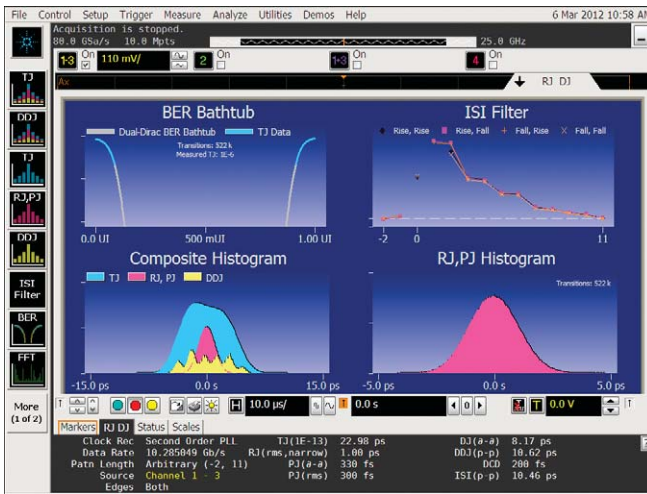
The remote programming interface makes it easy to control automation applications via your PC



PrecisionProbe is fully integrated in Q-Series automation applications

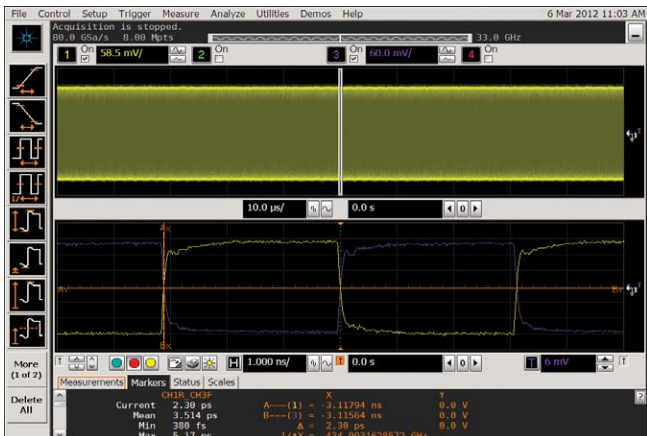
Compliance and Automation Testing: Thunderbolt

Verify and debug your Thunderbolt designs more easily and ensure compliance.



Thunderbolt is becoming increasingly popular as an interface for connecting devices to a computer through a bus. Thunderbolt combines PCI Express and DisplayPort into a serial data port that can be transmitted longer distances with less expensive cables.

Thunderbolt technology must work with other devices and must pass compliance. Agilent provides full compliance for the Thunderbolt technology and the 90000 Q-Series is a key part of transmitter compliance. Use the Thunderbolt software to debug your Thunderbolt designs and ensure compliance. With 4 channels of real time oscilloscope bandwidth at 33 GHz, the 90000 Q-Series is ideal for looking at two differential pairs for the Thunderbolt technology.



Agilent's Thunderbolt compliance application features to test the following specifications:

1. Eye pattern testing
2. Jitter testing
3. TJ, DJ, RJ
4. AC common mode
5. Rise and fall times

Compliance and Automation Testing: DisplayPort (Option 045)

Verify and debug your DisplayPort and HDMI designs more easily.

The Agilent DisplayPort electrical performance validation and compliance software for Infiniium Series oscilloscopes provides you with a fast and easy way to verify and debug your DisplayPort interface designs for sink and source ICs, motherboard systems, computers and graphics cards. The DisplayPort electrical test software is designed for use in DisplayPort authorized compliance test houses, so you can confidently use it to execute DisplayPort electrical checklist tests as well as employ it as a development tool. It displays the measurement data results in a flexible report format, and the report also provides a margin analysis that shows how closely your device passed or failed each test.

The DisplayPort electrical performance validation and compliance software performs a wide range of tests required to meet the DisplayPort electrical specifications for various computer system components (sink and source ICs, motherboard systems, computers and graphics cards) as documented in section 3.5.2 and 3.5.3 of the base DisplayPort specification by VESA1.



The DisplayPort electrical test software results report documents your test, indicates the pass/fail status, the test specification range, the measured values and the margin

| Test Name | Actual Val | Margin | Spec Range |
|---|------------|--------|---------------------------------|
| ✓ Lane 0 - Eye Diagram Test | 0.000 | 50.0% | -500m <= VALUE <= 500m |
| ✓ Lane 0 - Total Jitter Test | 130.300mUI | 64.2% | VALUE < 364.000mUI |
| ✓ Lane 0 - Non-ISI Jitter Test | 55.1000mUI | 78.8% | VALUE < 260.0000mUI |
| ✓ Lane 0 - Rise Time Test (Informative) | 107.982ps | 42.0% | 50.000ps <= VALUE <= 150.000ps |
| ✓ Lane 0 - Fall Time Test (Informative) | 109.329ps | 40.7% | 50.000ps <= VALUE <= 150.000ps |
| ✓ Lane 0 - Non-PreEmphasis Level Test | 756.6000mV | 29.0% | 690.0000mV < VALUE < 920.0000mV |

Details: (Select an individual result)

6 Tests 6 results shown. [Html Report] tab shows details Connection: Differential Channel Cor

Compliance and Automation Testing: User-Defined Application (Option 040)

Custom automation for your Q-Series oscilloscope

The user-defined application is the only fully customizable automated environment made for an oscilloscope by an oscilloscope designer. It provides full automation, including the ability to control other Agilent instruments, external applications such as MATLAB and your DUT software.

Simplify your automation

The user-defined application (UDA) makes automation simple. The application takes the Infiniium compliance application framework and gives you full access to its interface. UDA allows for automation testing in as little as one minute. Use UDA to control other Agilent instruments such as signal generators and network analyzers to create a full suite of measurements.

Full measurement report

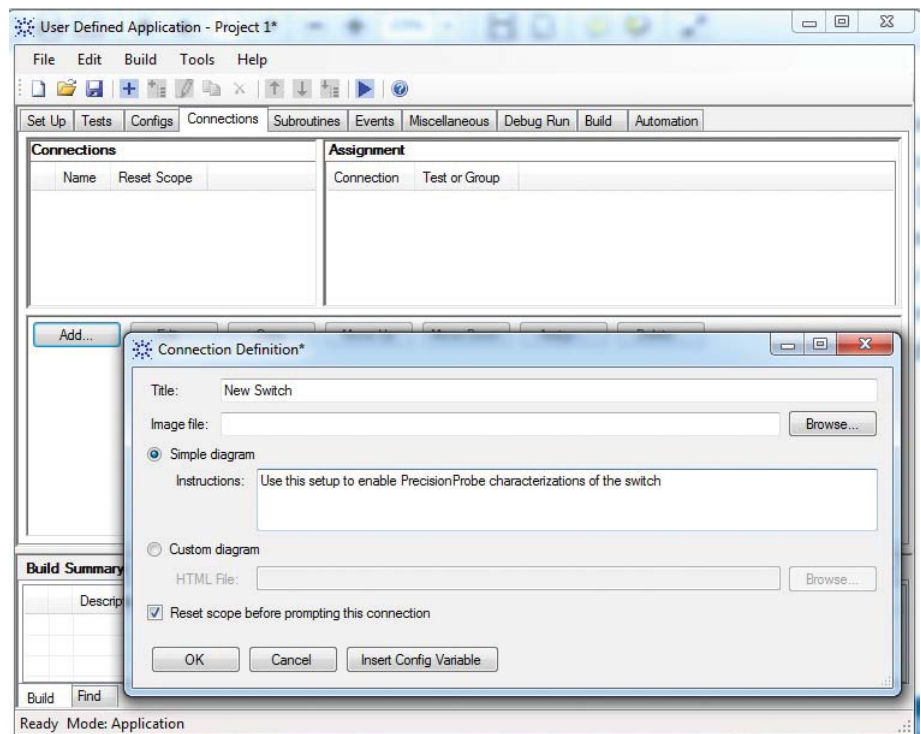
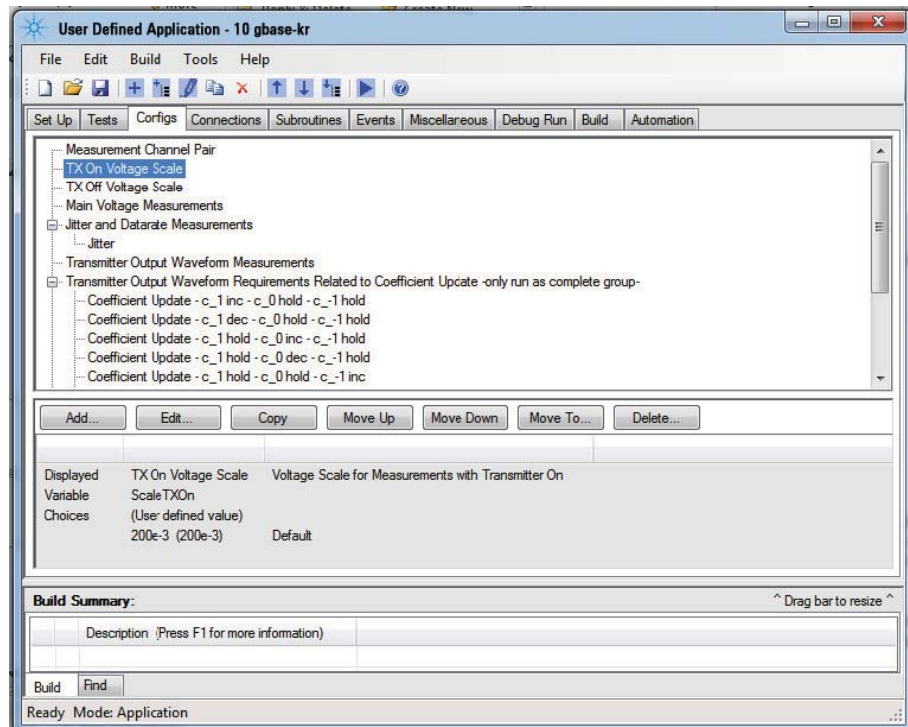
No automation would be complete without a simple-to-view and easy-to-understand report. UDA provides a full report of the pass/fail criteria you have provided.

Add-in capability

Ever wanted to add testing to your compliance applications? All Infiniium compliance applications support the industry's most flexible testing mechanism with UDA add-in capability. Create the custom testing you need and then plug it into your compliance application to expand the application to your testing needs. UDA add-in capability is only available on Infiniium oscilloscopes.

PrecisionProbe and switch compatibility

UDA makes automation of switches in your system simple and accurate. Use PrecisionProbe to characterize the path of the switch and then let UDA's



unique GUI switch between every input in your switch system. Every input can

look identical in its frequency response thanks to this advanced technology.

Compliance and Automation Testing: Other options on Q-Series Oscilloscopes

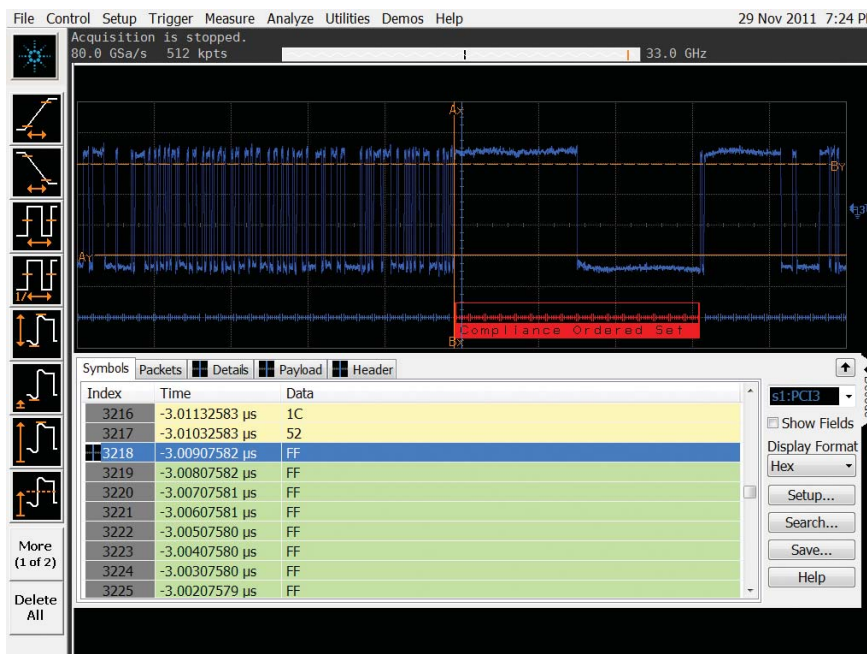
In the previous pages we have highlighted a few of the key technologies that benefit from the industry's only four-channel oscilloscope with more than 20 GHz bandwidth. The Q-Series offers over 20 compliance applications and the list continues to grow. All applications are fully compatible with InfiniiSim, PrecisionProbe and UDA's unique add-in capability.

| Compliance tools | Description | Option | Standalone |
|-------------------------------|---|--------|------------|
| PCI Express gen 1/2 | Fast and easy way to debug your PCI Express designs | 022 | N5393B |
| PCI Express gen 1/2/3 | Guarantee your PCI Express gen3 designs | 044 | N5393C |
| HDMI compliance | Quickly verify and debug your high-definition multimedia interface | 023 | N5399A |
| SAS -2 compliance | The SAS electrical test software allows you to automatically execute SAS electrical checklist tests at each of the IT, CT, IR and CR interface points | 043 | N5412A |
| DisplayPort source compliance | Verify and debug your DisplayPort interface designs for sink and source ICs, motherboard systems, computers and graphics cards | 045 | U7232B |
| DDR1 verification | Save time with automated testing based on JEDEC DDR1 and LPDDR1 specifications | 031 | U7233A |
| DDR3 verification | Save time with automated testing based on JEDEC DDR3 specifications | 032 | U7231B |
| DDR2 verification | Save time with automated testing based on JEDEC DDR2 and LPDDR2 specifications | 033 | N5413B |
| MIPI D-Phy verification | Execute D-PHY electrical checklist tests for CSI and DSI architectures | 035 | U7238A |
| MIPI M-Phy verification | Execute M-Phy electrical tests | 047 | U7249A |
| Ethernet compliance | Debug your 1000BASE-T, 100BASE-TX and 10BASE-T Ethernet designs | 021 | N5392A |
| 10 Gbase-T compliance | Coverage of the 10GBASE-T transmitter electrical specifications as described in section 55.5.3 of IEEE 802.3an-2006 | 036 | U7236A |
| XAUI compliance | XAUI validation with 10GBASE-CX4, CPRI, OBSAI and Serial RapidIO support | 030 | N5431A |
| SATA 6G compliance | Automated compliance testing for 1.5-Gbps, 3.0-Gbps and 6.0-Gbps SATA and eSATA transmitter (PHY/TSG/OOB tests) | 038 | N5411B |
| User-defined application | Fully customizable automated application for your Infiniium oscilloscope | 040 | N5461A |
| USB 2.0 compliance | USB-IF recognized compliance for low/full and low/full/high-speed USB automated electrical test | 029 | N5416A |
| USB 3.0 compliance | Validate and debug your USB 3.0 silicon, host, hub or device | 041 | U7243A |
| USB HSIC | Validate and debug USB high speed inter-connect devices | 046 | U7248A |
| MHL compliance | Validates MHL source designs as found in portable products such as cell phones and tablets according to the MHL 1.2 standard | 054 | N6460A |
| Thunderbolt compliance | Measure the transmitter with the accuracy of the 90000 Q-Series | - | N8812A |

Protocol Analysis

Q-Series oscilloscopes comes with more than 15 protocol decoders, including the industry's only 64/66b decoder. The Q-Series protocol tools feature time-correlated markers that let you easily move between the listing window and the waveform. Protocol tools can be used on up to four lanes simultaneously.

These unique tools feature search and trigger capability that lets you scan through the waveform to find the trigger condition that interests you. Protocol tools are fully compatible with Infiniium's serial data analysis and are available on the Infiniium offline tool .



pci express proto with sparky.tif

| Protocol | Description | Option | Part number |
|------------------------|---|--------|-------------|
| PCI Express gen3 | Time-correlated views of physical and transaction layer errors. 128/130-bit decoding on gen3 traffic. | 049 | N8816A |
| Ethernet 10Gbase-KR | World's only protocol tool for 10Gbase-KR 64/66-bit decoder | 048 | N8815A |
| USB 3.0 | Set up your scope to show USB 3.0 SuperSpeed protocol decode in less than 30 seconds | | N8805A |
| SATA/SAS | Simplify the validation of your SATA/SAS designs with the full-capability protocol viewer for 3 G, 6 G and 12 Gbit/s | 018 | N5436A |
| DigRF v4 | Extend your scope capability with DigRF v4 triggering and decode | 051 | N8807A |
| I ² C/SPI | Extend your scope capability with I ² C and SPI triggering and decode | 007 | N5391A |
| RS232/UART | Easily view the information sent over an RS-232 RS-422, RS-485 or other UART serial buses | 015 | N5462A |
| USB 2.0 | Trigger on and quickly view USB packets, payload, header and detailed information | 016 | N5464A |
| PCI Express gen1 and 2 | Quickly view packets, payload, header, and detailed information | 017 | N5463A |
| MIPI D-Phy | Easily view the information sent over MIPI serial buses | 019 | N8802A |
| CAN/FlexRay | View both protocol-layer information and physical-layer signal characteristics for CAN, LIN and FlexRay buses | 063 | N8803A |
| JTAG | Eliminate the difficult task of manually determining JTAG TAP controller states, instruction and data register decode | 042 | N8817A |
| SVID | Decode and search on SVID technology | 056 | N8812A |
| Unipro decode | Decode at the protocol level | 052 | -- |

Agilent Infiniium Oscilloscope Portfolio

Agilent's Infiniium oscilloscope lineup includes bandwidths from 600 MHz to 63 GHz. Use the following selection guide to determine which best matches your specific needs. All 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



| | 9000 Series | 90000A Series | 90000 X-Series | 90000 Q-Series |
|-------------------------------------|-----------------------|-----------------------------------|--|---|
| Available bandwidths | Up to 4 GHz | 600 MHz, 1 GHz, 2.5 GHz, 4 GHz | 2.5 GHz, 4 GHz, | |
| | 6 to 16 GHz | | 6 GHz, 8GHz 12 GHz, 13 GHz | 16 GHz |
| | 20 to 63 GHz | | | 20 GHz, 25 GHz, 33 GHz |
| Max upgradable bandwidth | 4 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 | 50Ω and 1 MΩ, BNCs | 50 Ω, BNCs | 50 Ω, 2.92 and 3.5 mm SMAAs | 50Ω, 1.85 mm, 2.4, mm 2.92 and 3.5 mm, SMAAs |
| Memory depth (standard/max) | 20 M/1 Gpts | 20 M/2 Gpts | 20 M/2Gpts | 20 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 |

Achieve Your Real Edge

Configure your high-performance real-time oscilloscope solution today

Get the most out of your oscilloscope investment by choosing options and software to speed your most common tasks. Configure your Infiniium Q-Series oscilloscope in three easy steps. Use option numbers when ordering at time of purchase. Use model numbers to add to an existing scope.

Choose your oscilloscope

| Oscilloscope | Description |
|--------------|------------------------------------|
| DSAX96204Q | 63-GHz signal analyzer* |
| DSOX96204Q | 63-GHz digital signal oscilloscope |
| DSAX95004Q | 50-GHz signal analyzer* |
| DSOX95004Q | 50-GHz digital signal oscilloscope |
| DSAX93304Q | 33-GHz signal analyzer* |
| DSOX93304Q | 33-GHz digital signal oscilloscope |
| DSAX92504Q | 25-GHz signal analyzer* |
| DSOX92504Q | 25-GHz digital signal oscilloscope |
| DSAX92004Q | 20-GHz signal analyzer* |
| DSOX92004Q | 20-GHz digital signal oscilloscope |

* DSA models come standard with 50 Mpts memory, EZJIT, EZJIT+, and serial data analysis software.

All models come with power cord, keyboard, mouse, stylus, calibration cable, ESD strap and (5) coax adapters. (5061-5311)
50 and 63 GHz models come with (2) additional 1.85 f to f adaptors (54932-68712)

| Description | Options | Model number |
|--------------------|---------------|--------------|
| 50 Mpts/ch memory | DSOX90000-050 | N2810-050 |
| 100 Mpts/ch memory | DSOX90000-100 | N2810-100 |
| 200 Mpts/ch memory | DSOX90000-200 | N2810-200 |
| 500 Mpts/ch memory | DSOX90000-500 | N2810-500 |
| 1 Gpt/ch memory | DSOX90000-01G | N2810-01G |
| 2 Gpts/ch memory | DSOX90000-02G | N2810-02G |




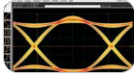
| Description | Options | Model number |
|---|---------------|--------------|
| ANSI Z540 compliant calibration | DSOX90000-A6J | — |
| ISO17025 calibration | DSOX90000-1A7 | — |
| DVD RW | DSOX90000-820 | N5473A |
| GPIB card-interface | — | 82350B |
| Performance verification de-skew fixture for InfiniiMax III probe | DSOX90000-808 | N54443A |
| Rackmount kit option | DSOX90000-1CM | N2759A |
| Transit case | — | N2748A |

Achieve Your Real Edge

Configure your high-performance real-time oscilloscope solution today

InfiniiMax III probe heads

InfiniiMax III probe heads are recommended for InfiniiMax III N2800A/01A/02A/03A probe amplifiers.

| Probe Heads | Model Numbers | BW and Input Loading | Key Features |
|--|---|--|---|
| Differential browser head  | N5445A | 30 GHz, Cdiff = 35fF, Cse = 50 fF, Rdiff = 100 kΩ, Rse = 50 kΩ | Z axis compliance and variable spacing from 20 mil to 125 mils, integrated LED lighting |
| ZIF probe head/tips  | N2838A 450 Ω ceramic PCB tip, N5439A head, N5440A 450 Ω tip set, N5447A 200 Ω tip ceramic | 28 GHz, Cdiff = 95fF, Cse = 130 fF, with N2838A: Cdiff = 32fF, Cse = 44 fF, with N5440A: Rdiff = 100 kΩ, Rse = 50 kΩ With N5447A: Rdiff = 50 kΩ, Rse = 25 kΩ | Extremely low loading, Variable spacing from 5 mil to 80mil, User replaceable damping resistor tips (N2838A only) |
| 2.92mm/3.5mm/SMA  | N5444A | 28 GHz, N/A, 55 Ω to Vterm | Provides termination voltage of ±4V controlled by scope or externally |
|  | N5441A N2836A | 16 GHz, Cdiff = 77 fF, Cse = 105 fF, Rdiff=100kΩ, Rse=50kΩ 26 GHz, Cdiff = 108 fF, Cse = 140 fF, Rdiff=100kΩ, Rse=50kΩ | Economical and semi-permanent connection, variable span of leads ranges from 5 mil to 80 mil |

Upgrade your oscilloscope

| Description | Model numbers |
|--|--|
| 90000 X-Series to 90000 Q-Series Upgrades*** | |
| N2764AU-016 | 16 GHz 90000 X to 20 GHz 90000 X-Series Upgrade* |
| N2764AU-020 | 20 GHz 90000 X to 20 GHz 90000 Q-Series Upgrade |
| N2764AU-025 | 25 GHz 90000 X to 32 GHz 90000 X-Series Upgrade** |
| N2764AU-028 | 28 GHz 90000 X to 33 GHz 90000 Q-Series Upgrade** |
| N2764AU-033 | 32 GHz 90000 X to 33 GHz 90000 Q-Series Upgrade |
| Upgrades within the 90000 Q-Series family | |
| N2764BU-025 | Bandwidth Upgrade -20 GHz to 25 GHz 90000 Q-Series |
| N2764BU-033 | Bandwidth Upgrade -25 GHz to 33 GHz 90000 Q-Series |
| N2764BU-050 | Bandwidth Upgrade -33 GHz to 50 GHz 90000 Q-Series |
| N2764BU-062 | Bandwidth Upgrade -50 GHz to 62 GHz 90000 Q-Series |

* Requires the purchase of N2764AU-020

** Requires the purchase of N2764AU-033

*** Upgrade will have a new serial number

Specifications

| Vertical | 92004Q | 92504Q | 93304Q | 95004Q | 96204Q |
|---|--|--------------|-------------------------|--------------|-------------|
| Typical analog bandwidth (3 dB) | 20 GHz | 25 GHz | 33 GHz | 50 GHz | 63 GHz |
| Analog bandwidth (3 dB)* | 20 GHz | 25 GHz | 32 GHz | 50 GHz | 62 GHz |
| 2 channel sample rate | 80 | 80 | 80 | 160 | 160 |
| 4 channel sample rate | 80 | 80 | 80 | 80 | 80 |
| Rise time/fall time | 92004Q | 92504Q | 93304Q | 95004Q | 96204Q |
| 10 - 90% ⁴ | 22.5 ps | 18 ps | 13 ps | 9 ps | 7 ps |
| 20 - 80% | 17.5 ps | 14 ps | 10.6 ps | 7 ps | 5 ps |
| Input impedance ³ | 50 Ω, +/- 3% | | | | |
| Sensitivity ² | 1 mV/div to 1 V/div | | | | |
| Input coupling | DC | | | | |
| Vertical resolution ¹ | 8 bits, ≥ 12 bits with averaging | | | | |
| Channel to channel isolation (any two channels with equal V/div settings) | DC to 3 GHz: 60dB (≥ 1000:1) | | | | |
| | 3 GHz to 8 GHz: 40 dB (≥ 100:1) | | | | |
| | 8 GHz to BW: 35dB (≥ 56:1) | | | | |
| DC gain accuracy* | ± 2% of full scale at full resolution channel scale (± 2.5% for 5mV/div) | | | | |
| Maximum input voltage | ± 5V for steady state and transient measurements | | | | |
| Offset range | Vertical sensitivity | | Available offset | | |
| | 0 mV/div to ≥ 40 mV/div | | ± 0.4V | | |
| | > 40 mV/div to ≥ 75 mV/div | | ± 0.9V | | |
| | > 75 mV/div to ≥ 130 mV/div | | ± 1.6V | | |
| | > 130 mV/div to ≥ 240 mV/div | | ± 3.0V | | |
| | > 240 mV/div | | ± 4.0V | | |
| Offset accuracy* | ≤ 3.5V: ± (2% of channel offset + 1% of full scale) + 1 mV > 3.5V: ± (2% of channel offset + 1% of full scale) | | | | |
| Dynamic range | ± 4 div from center screen | | | | |
| DC voltage measurement accuracy | Dual cursor: ± [(DC gain accuracy) + (resolution)] Single Cursor: ± [(DC gain accuracy) + (offset accuracy) + (resolution/2)] | | | | |
| RMS noise floor (scope only) | | | | | |
| Volts / div | 92004Q | 92504Q | 93304Q | 95004Q | 96204Q |
| 10 mV | 0.41 mV(rms) | 0.48 mV(rms) | 0.60 mV(rms) | 0.90 mV(rms) | 1.0 mV(rms) |
| 50 mV | 1.46 mV(rms) | 1.7 mV(rms) | 2.00 mV(rms) | 2.90 mV(rms) | 3.3 mV(rms) |
| 100 mV | 2.90 mV(rms) | 3.3 mV(rms) | 3.90 mV(rms) | 5.70 mV(rms) | 6.4 mV(rms) |
| 1 V | 28.6 mV(rms) | 32.5 mV(rms) | 38.1 mV(rms) | 56.7 mV(rms) | 63 mV(rms) |

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

1. Vertical resolution for 8 bits = 0.4% of full scale, for 12 bits = 0.024% of full scale
2. Full scale is defined as 8 vertical divisions. Magnification is used below 7.5 mV/div. Below 7.5 mV/div, full-scale is defined as 60 mV/div. The major scale settings are 5mV, 10mV, 20mV, 50mV, 100mV, 200mV, 500mV, and 1V.
3. Input impedance is valid when V/div scaling is adjusted to show all waveform vertical values within scope display.
4. Rise time calculated by using 0.45/BW for (10-90%) rise time

Specifications

| Horizontal | |
|---------------------------|---|
| Main timebase range | 2 ps/div to 20 s/div real-time (RealEdge is 1 ps/div to 20 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 |
| Channel deskew | ± 1 ms range, 10 fs resolution |
| Time scale accuracy* | ± [0.1 ppm (immediately after calibration) ± 0.1 ppm/year (aging)]te |

Delta-time measurement accuracy
$$5 \cdot \sqrt{\left(\frac{\text{Noise}}{\text{SlewRate}}\right)^2 + \text{SampleClock Jitter}^2} + \frac{\text{TimeScaleAccy} \cdot \text{Reading}}{2} \text{ sec rms}$$

Delta-time measurement accuracy
$$0.35 \cdot \sqrt{\left(\frac{\text{Noise}}{\text{SlewRate}}\right)^2 + \text{SampleClock Jitter}^2} + \frac{\text{TimeScaleAccy} \cdot \text{Reading}}{2} \text{ sec rms}$$

ABSOLUTE

> 256 averages

| Sample clock jitter | Acquired time range | Internal Timebase Reference | External Timebase Reference |
|---------------------|---------------------|-----------------------------|-----------------------------|
| | 10 ms | 75 fs rms | 75 fs rms |
| | 10 ms - 100 ms | 190 fs rms | 190 fs rms |
| | 100 ms - 1 sec | 500 fs rms | 190 fs rms |
| | > 1 sec | | 190 fs rms |

Jitter measurement floor (6a,6b,6c)

TIE:

$$\sqrt{\left(\frac{\text{Noise}}{\text{SlewRate}}\right)^2 + \text{SampleClock Jitter}^2} \text{ sec rms}$$

Periodic jitter:

$$\sqrt{2} \cdot \sqrt{\left(\frac{\text{Noise}}{\text{SlewRate}}\right)^2 + \text{SampleClock Jitter}^2} \text{ sec rms}$$

Cycle-cycle:

$$\sqrt{3} \cdot \sqrt{\left(\frac{\text{Noise}}{\text{SlewRate}}\right)^2 + \text{SampleClock Jitter}^2} \text{ sec rms}$$

Specifications

| Acquisition | 92004Q | 92504Q | 93304Q | 95004Q | 96204Q |
|---|--|--------|--------|-----------------------------------|--------|
| Maximum real-time sample rate | | | | | |
| (2 channels) | 80 GSa/s | | | 160 GSa/s 2ch | |
| (4 Channels) | 80 GSa/s | | | 80 GSa/s | |
| Memory depth per channel | | | | | |
| Standard | 4 channels (all models) | | | 2 channels (all models) | |
| Option 050M | 20 Mpts | | | 40 Mpts | |
| Option 100 | 50 Mpts (standard on DSA models) | | | 100 Mpts (standard on DSA models) | |
| Option 200 | 100 Mpts | | | 200 Mpts | |
| Option 500 | 200 Mpts | | | 400 Mpts | |
| Option 01G | 500 Mpts | | | 1 Gpt | |
| Option 02G | 1 Gpt | | | 1 Gpt | |
| | 2 Gpts | | | 2 Gpts | |
| Maxium acquired time at highest real time resolution | | | | | |
| Real-time resolution | 80 GSa/s | | | 160 GSa/s | |
| Resolution | 12.5 pS | | | 6.25 pS | |
| Standard (20M) | 0.25 mS | | | 0.125 mS | |
| Option 50M | 0.625 mS | | | 0.3125 mS | |
| Option 100 | 1.25 mS | | | 0.625 mS | |
| Option 200 | 2.5 mS | | | 1.25 mS | |
| Option 500 | 6.25 mS | | | 3.125 mS | |
| Option 01G | 12.5 mS | | | 6.25 mS | |
| Option 02G | 25 mS | | | 12.5 mS | |
| Sampling modes | | | | | |
| Real-time | Successive single shot acquisitions | | | | |
| Real-time with averaging | Selectable from 2 to 65534 (up to 200,000 with function) | | | | |
| Real-time with peak detect | 80 GSa/s (unavailable on RealEdge channels) | | | | |
| Real-time with hi resolution | Real-time boxcar averaging reduces random noise and increases resolution (unavailable on RealEdge channels) | | | | |
| Gaussian magnitude, linear phase | Slower filter roll off while maintaining linear phase | | | | |
| 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 40 Mpts | | | | |
| Segmented memory ⁵ | Captures bursting signals at max sample rate without consuming memory during periods of inactivity Number of segments (Up to 131,072 with >500M of memory depth) Maximum time between triggers is 562,950 seconds Re-arm time: 2.5 µs Maximum memory depth: Up to 8 Gpts in 1/2 channel mode with option 02G | | | | |
| Filters | | | | | |
| Sin(x)/x Interpolation | On/off selectable FIR digital filter (2x, 4x, 8x 16x settings). Digital Signal Processing adds points between acquired data points to enhance measurement accuracy and waveform display | | | | |

5. Segmented memory is currently not supported on 50 and 63 Ghz models of the 90000 Q-Series

Specifications

| Hardware trigger | |
|---|---|
| Sensitivity | Internal low: 2.0 div p-p 0 to 22 GHz Internal high: 0.3 div p-p 0 to 18 GHz, 1.0 div p-p 0 to 22 GHz |
| Edge trigger bandwidth | >20 GHz |
| Minimum pulse width trigger | |
| Hardware | 250 ps |
| Software (InfiniiScan) | 40 ps |
| Level range | |
| Internal | ± 4 div from center screen or ± 4 Volts, whichever is smallest |
| Auxillary | ± 5 V, also limit input signal to ± 5 V |
| Sweep modes | Auto, triggered, single |
| Display jitter (displayed trigger jitter) | Equal to the TIE Jitter Measurement Floor (internal edge triggering with JitterFree) |
| Trigger sources | Channel 1, Channel 2, Channel 3, Channel 4, aux, and line |
| Trigger modes | |
| Edge | Triggers on a specified slope (rising, falling or alternating between rising and falling) and voltage level on any channel or auxiliary trigger. Edge trigger bandwidth is > 20 GHz. |
| 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) | |
| Edge then edge (Event) Glitch | 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 |
| | 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. |
| Pulse width | 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. |
| | 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. |

Specifications

| Hardware trigger (continued) | |
|--|---|
| 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 |
| 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 | 100nS to 10s |
| 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. |
| Software trigger (requires InfiniiScan event identification software – Option 009) | |
| Trigger modes | |
| 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 eight zones can be defined across multiple channels. |
| 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. |

Specifications

| | |
|--------------------------------------|---|
| Maximum measurement update rate | > 50,000 measurement/sec (one measurement turned on) > 250,000 measurement/sec/measurement (ten measurements turned on) |
| Measurement modes | Standard, Measure all edges mode |
| Waveform measurements voltage | Peak to peak, minimum, maximum, average, RMS, amplitude, base, top, overshoot, preshoot, upper, middle, lower, overshoot, V preshoot, crossing, Pulse base, pulse amplitude, burst interval |
| Time | Rise time, fall time, positive width, negative width, burst width, Tmin, Tmax, burst period, Tvolt, + pulse count, - pulse count, burst and burst interval |
| Clock | Period, frequency, duty cycle to duty cycle |
| Data | Setup time, hold time |
| Mixed | Area, slew rate, |
| Frequency domain | FFT frequency, FFT magnitude, FFT delta frequency, FFT delta magnitude, peak detect mode |
| Level qualification | Any channels that are not involved in a measurement can be used to level-qualify all timing measurements |
| Eye-diagram measurements | Eye height, eye width, eye jitter, crossing percentage, Q factor, and duty-cycle distortion |
| Jitter analysis measurements | Requires Option 002 (or E2681A) or 004 (or N5400A). Standard on DSA Series. |
| Clock | Time interval error, N-period, period to period, positive width to positive width, neg width to neg width, and duty cycle to duty cycle |
| Data | Time interval error, unit interval, N Unit Interval, unit interval to unit interval, Data rate, CDR, de-emphasis |
| 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 |
| 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 \pm 1, 2, and 3 sigma, median, mode, peak-to-peak, min, max, total hits, peak (area of most hits), X scale hits, and X offset hits |
| Mask testing | Allows pass/fail testing to user-defined or Agilent-supplied waveform templates. Automask lets you create a mask template from a captured waveform and define a tolerance range in time/voltage or screen divisions. Test modes (run until) include test forever, test to specified time or event limit, and stop on failure. Executes "multipurpose" user setting on failure. "Unfold real time eye" feature will allow individual bit errors to be observed by unfolding a real time eye when clock recovery ison. Communications mask test kit option provides a set of ITU-T G.703, ANSI T1.102, and IEEE 802.3 industry-standard masks for compliance testing. |
| Waveform math | |
| Number of functions | Four |
| Hardware accelerated math operations | Differential and Common Mode Absolute value, add, histogram, measurement trend, average, Butterworth*, common mode, differentiate, divide, FFT magnitude, FFT, phase, FIR*, high pass filter, integrate, invert, LFE*, low pass filter (4th-order Bessel Thompson filter),magnify, max, min, multiply, RT Eye*, smoothing, SqrtSumOfSquare*, square, square root, subtract,versus, and optional user defined function (Option 010) |
| FFT | |
| Frequency range | DC to 80 GHz (at 160 GSa/s) or 40 GHz (at 80 GSa/s) or 20 GHz (at 40 GSa/s) |
| Frequency resolution | Sample rate/memory depth = resolution |
| Window modes | Hanning, flattop, rectangular, Blackman-Harris |

Specifications

| | |
|-----------------------------------|--|
| Measurement modes | |
| Automatic measurements | Measure menu access to all measurements, up to ten measurements can be displayed simultaneously |
| Multipurpose | Front-panel button activates up to ten pre-selected or up to 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 |
| Marker modes | Manual markers, track waveform data, track measurements |

Display

| | |
|----------------------|---|
| Display | 15.4-inch color XGA TFT-LCD with touch screen |
| Intensity grayscale | 256-level intensity-graded display |
| Resolution XGA | 1024 pixels horizontally x 768 pixels vertically |
| Annotation | Up to 12 labels, with up to 100 characters each, can be inserted into the waveform area |
| Grids | One, two or four waveform grids, each with 8 bit vertical resolution |
| Waveform styles | Connected dots, dots, infinite persistence, color graded infinite persistence. Includes up to 256 levels of intensity-graded waveforms., variable persistence |
| Waveform update rate | |
| Maximum update rate | > 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® Seven |
| CPU | Intel® Core 2 Duo 3.06 GHz |
| PC system memory | 4GB DDR2 |
| Drives (SSD) | ≥ 250-GB internal hard drive Optional removable hard drive (Option 801) |
| Peripherals | Optional USB external DVD-RW drive (Option 820) 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 | Compressed internal format (*.wfm (200 Mpts)), comma-separated values (*.csv (2 Gpts)), tab separated values (*.tsv (2 Gpts)), public binary format (.bin (500 Mpts)), Y value files (*.txt (2 Gpts)), hierarchal data file (*.hf5 (2 Gpts)) |
| Images | BMP, PNG, TIFF, GIF, JPEG or osc file format |

Specifications

| | |
|-----------|---|
| I/O ports | RS-232 (serial), Parallel, PS/2, USB 2.0 hi-speed (host), USB 2.0 hi-speed (device), Dual-monitor video output, Auxiliary output, Trigger output, Time base reference output |
|-----------|---|

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: 00.21 g(rms) Non-operating random: 2.0 g(rms) Swept sines: (0.50g). |
| Power | 100-240 VAC ± 10% at 50/60 Hz Maximum input power 1350 Watts Typical input power 1200 Watts Well regulated power is required for 100 - 120 VAC operation |
| Weight | 71 lbs |
| Dimensions | 20" wide, 13.3" tall, and 19.4" deep |
| Safety | Meets IEC 61010-1 +A2, CSA certified to C22.2 No.1010.1, self-certified to UL 3111 |



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(BP2-19-13)

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© Agilent Technologies, Inc. 2012, 2013
Published in USA, April 17, 2013
5990-9712EN



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