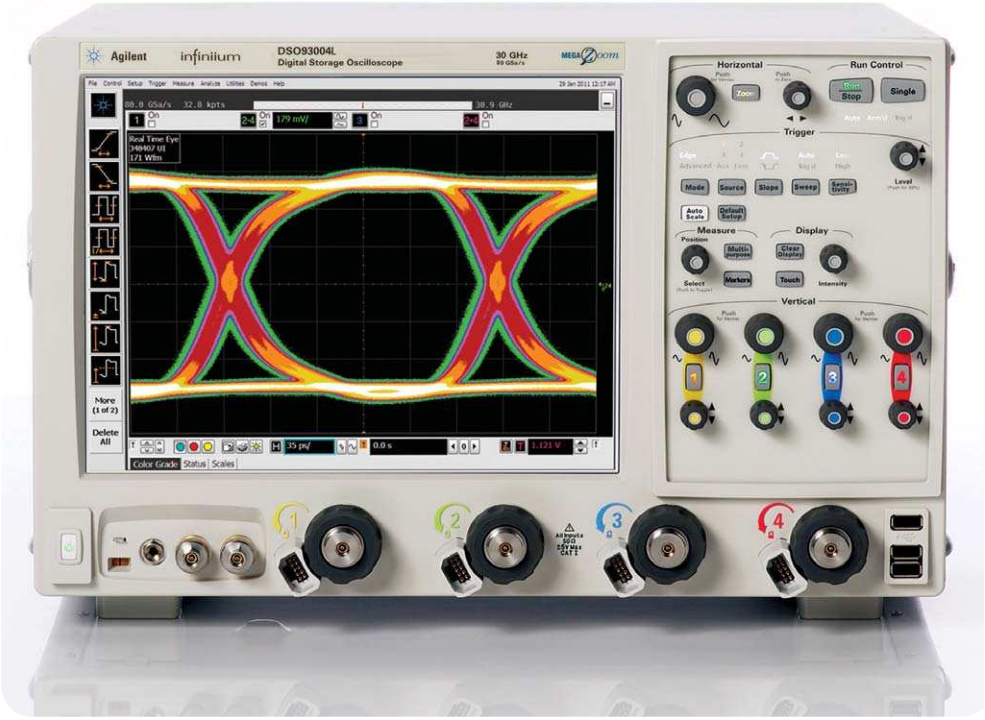
Agilent Technologies Infiniium 90000L Series Oscilloscopes

Data Sheet



Real-time oscilloscope models available at 30 GHz

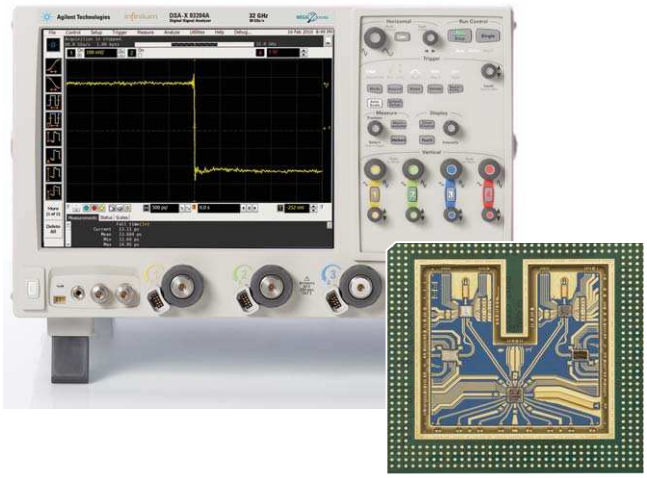
Agilent Technologies

30 GHz real time oscilloscope

Need bandwidth?

When you're deploying leading edge high-speed serial bus designs like FibreChannel, SAS 12 G, or 10 Gb Ethernet KR, jitter matters and picoseconds count. When you're doing spectral analysis of wide-bandwidth RF signals or investigating transient phenomena, bandwidth is critical. You need the most accurate real-time oscilloscope you can get. Agilent Infiniium 90000L Series scopes are engineered for **30 GHz** of real time bandwidth featuring:

- High real-time scope measurement accuracy
- The industry's only 30 GHz oscilloscope probing system
- The industry's most comprehensive application-specific measurement software



Custom front end technology requiring over five years of design effort yields the fastest real-time oscilloscope hardware available today.

30 GHz real time analog bandwidth with lower price

The quest for higher real-time scope bandwidth involves pushing against the physical limitations of state-of-the-art integrated circuit technology. We define true analog bandwidth as performance achieved directly through the hardware of the real-time oscilloscope, and we've achieved breakthrough performance of **32 GHz** with the Infiniium 90000 X-Series. Other vendors, limited to 16 or 20 GHz hardware, employ various techniques to boost the bandwidth specification of their scopes. However, these methods introduce noise and distortions that negatively impact measurements.

The 90000L Series offers 30 GHz of real time oscilloscope bandwidth with lower signal fidelity than the 90000 X-Series for a lower price

	Analog bandwidth		Sample rate		Max Memory
Model number	2 channel	4 channel	2 channel	4 channel	depth 4 channel
DSA93000L	30 GHz	16 GHz	80 GSa/s	40 GSa/s	500 Mpt
DSO93004L	30 GHz	16 GHz	80 GSa/s	40 GSa/s	500 Mpt

Upgradeable to a 32 GHz 90000 X-Series

Need the world's best signal integrity? Purchase the 90000 X-Series upgrade and benefit from more than 30% less oscilloscope noise and 2 extra GHz of bandwidth

30 GHz real time oscilloscope bandwidth:

High real-time scope measurement accuracy

When you're designing with faster signals, shrinking eyes and tighter jitter budgets mean that error introduced by your oscilloscope can seriously impact your measurement results. The 90000L features the following characteristics:

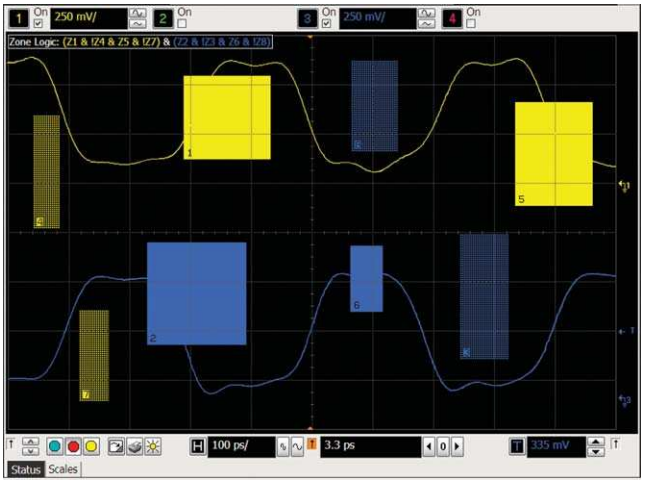
- 30 GHz analog bandwidth
- Oscilloscope noise floor of 2.7mV at 50 mV/div at 30 GHz
- Jitter measurement floor (200 fs)

With its low noise floor and deep memory separate jitter on patterns as long as PRB523

Industry's first and only 30 GHz oscilloscope probing system.

No matter how good your scope is, if your probes can't operate at sufficient bandwidths your measurements are compromised. The Agilent Infiniium 90000L scopes offer probing solutions that are up to the tough challenges of high-speed signal capture with the following:

- Fully-integrated probe amplifier s-parameter correction
- The industry's first bandwidth-upgradable probe amplifier



Easily isolate signals of interest with zone qualified view using InfiniiScan software triggering, just one of over 40 application-specific software options

The industry's most comprehensive application-specific measurement software.

When time is of the essence, you need tools that can speed true understanding of your signal activity. From serial bus debug and compliance testing to jitter measurements to sophisticated triggering capability, Agilent stays on top of the test standards and your requirements by working to ensure that you get accurate results more quickly. The Agilent Infiniium 90000L Series scopes offer the following

- The broadest range of jitter, triggering, analysis and display tools
- Pre-built compliance testing software based on the expertise of our engineers on the standards committees
- Support for emerging technologies including FibreChannel, SAS 12G, or MIPI-MPhy

30 GHz of real time oscilloscope bandwidth and 80 GSa/s sample rate

Capture up to 6.125ms of data using up to 500 Mpts of acquisition memory at 80 GSa/s.

See your signal more clearly with a 12.1-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 that provides a three dimensional view of your signals

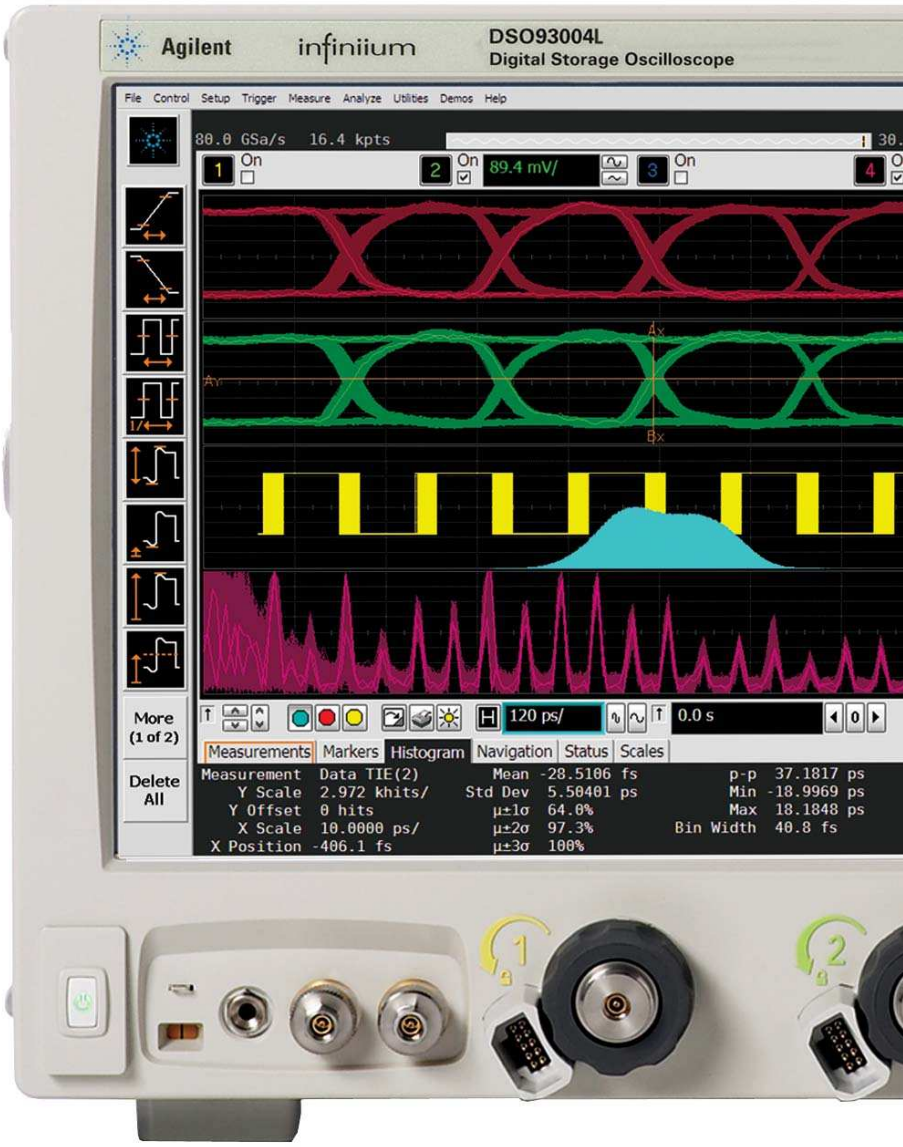
Live indicator shows when the scope is running a long operation.

Remote access through 10/100/1000 BaseT LAN interface with web-enabled connectivity uses ultra-responsive Ultra VNC.

GPIB and LAN provide remote measurements. Optional Infiniium application remote program interface allows application/compliance software automation. LXI class C compliant. MATLAB support.

Removable hard disk drive option is available for added data security.

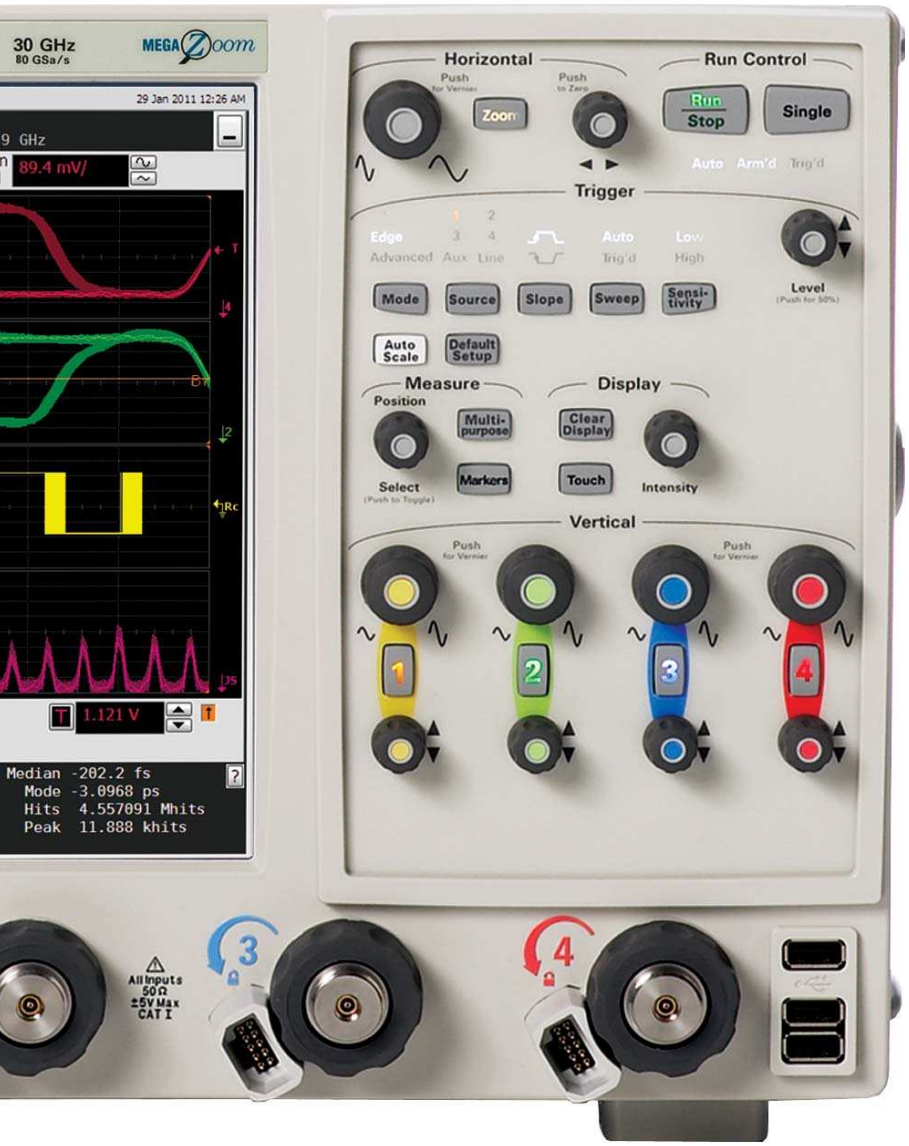
Optional USB external DVD-RW drive allows you to install your favorite third-party software conveniently and can be used to back up your critical measurement data



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

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

10 MHz reference clock can be input to or output from the scope to allow precise timebase synchronization with RF instruments or logic analyzers



Dedicated single acquisition button provides better control to capture a 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, 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.

Three front panel USB 2.0 host ports match your USB keyboard, mouse, and USB memory drive connection for saving setup and data files and screen shots.

An additional four USB 2.0 host ports and a USB 2.0 device port on the back panel. Perfect for extra connectivity including an optical drive. A USB 2.0 device port lets you control the scope and transfer data via a USB 2.0 480-Mbpts connection.

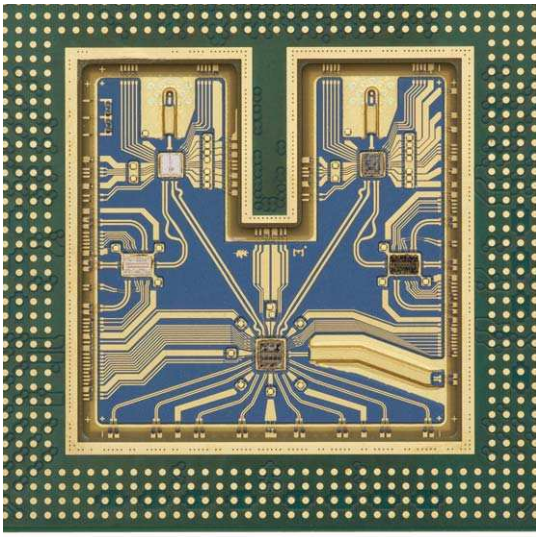
Optional x4 PCIExpress slot speeds up offload times by a factor of 5, using socket drivers. Use this option (823) for faster deep offloads of the waveforms.

High real time measurement accuracy

Whether you're deploying emerging high speed bus technology, identifying spectral content of wide-bandwidth RF signals, or analyzing transient physical phenomena, you need the truest representation of your signals under test. Agilent invested in leading edge technology to bring you the highest real-time oscilloscope measurement accuracy available today.

New custom integrated circuits using a proprietary Indium Phosphide (InP) process and breakthrough packaging technology enable industry-leading performance, including the:

- 30 GHz real time oscilloscope bandwidth
- Lower oscilloscope noise floor
- Lower oscilloscope jitter measurement floor

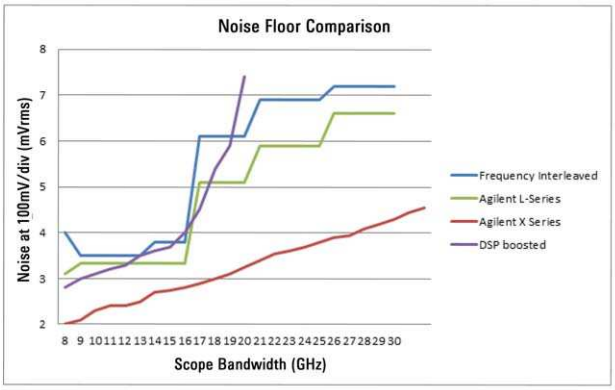


30 GHz real time oscilloscope bandwidth

The engineering of a high-performance real-time oscilloscope front end requires designing pre-amplifiers, triggering capability, and sampling technology. But putting it all together might be the toughest challenge. Using fine line microcircuit processes and relying extensively on years of experience with RF design, Agilent developed the front end multi-chip modules shown here for the Infiniium 90000L Series oscilloscopes. Packaging technology provides excellent high-frequency electrical properties along with superior heat dissipation.

Low oscilloscope noise floor

One of the keys to measurement accuracy at high bandwidths is minimizing the noise generated by the oscilloscope itself. Agilent utilizes a proprietary Indium Phosphide (InP) integrated circuit process in the design of the Infiniium 90000L Series oscilloscopes because other oscilloscope techniques just can't deliver the necessary combination of high-bandwidth and low noise. Not only does that mean you're purchasing the best tool today, but it also means you can count on technology leadership from Agilent in the future.



Industry's first 30 GHz oscilloscope probing system

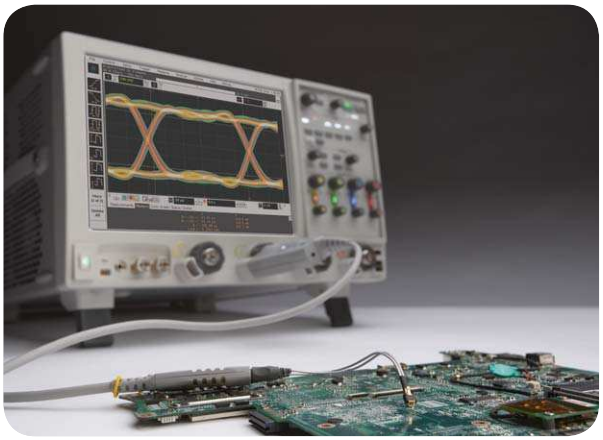
To take advantage of your investment in a high bandwidth oscilloscope, you must have a probing system that can deliver bandwidth to the probe tip. Agilent rises to the challenge of high speed signal reproduction with these probing innovations:

- InfiniiMax III high-frequency probes with automatic AC calibration (PrecisionProbe)
- The industry's first bandwidth upgradable probe amplifier
- Fully-integrated probe amplifier s-parameter correction

Model	Description
N2803A	30 GHz probe amp
N2802A	25 GHz probe amp
N2801A	20 GHz probe amp
N2800A	16 GHz probe amp

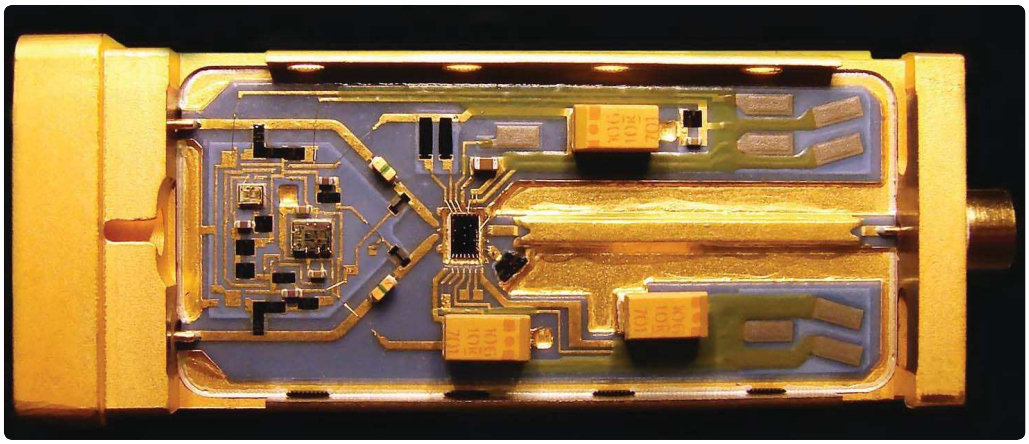
The InfiniiMax III 30 GHz probing system includes accessories to enable probing with a ZIF tip, browsing, or connecting to 3.5 mm inputs.

Industry's first 30 GHz oscilloscope probing system



Fully-integrated probe amplifier s-parameter correction

Each InfiniiMax III probe amplifier comes pre-packaged with its own customized characteristics via s-parameter files. The InfiniiMax III probing system and the 90000L Series communicate via an I^2C bus. This communication allows the 90000L Series to download the customized s-parameter files from the InfiniiMax III probing amplifier to the scope for greater accuracy.



The InfiniiMax III probing system uses the same InP technology that enables high bandwidth and low noise oscilloscope measurements.

Industry's only bandwidth upgradable probes

Purchase the probing performance you need today with confidence that you have headroom for the future with Agilent's InfiniiMax III bandwidth upgradable probes. Upgrade to higher performance at a fraction of the cost of new probes as your needs evolve.

Bandwidth upgrades	
N5446A-001	16 GHz to 20 GHz Bandwidth Upgrade
N5446A-002	20 GHz to 25 GHz Bandwidth Upgrade
N5446A-003	25 GHz to 30 GHz Bandwidth Upgrade
N5446A-004	16 GHz to 25 GHz Bandwidth Upgrade
N5446A-005	16 GHz to 30 GHz Bandwidth Upgrade
N5446A-006	20 GHZ to 30 GHz Bandwidth Upgrade

The industry's most comprehensive application-specific measurement software

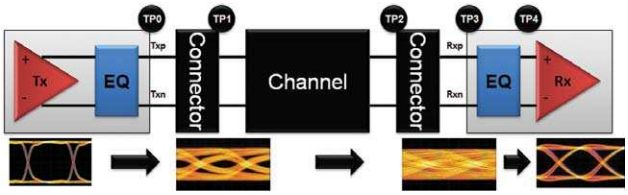
To get the most out of your Agilent Infiniium 90000L Series oscilloscope, choose from a wide array of application specific software options that speed your measurement tasks including:

- A broad range of jitter, triggering, measurement, analysis and display tools
- Pre-built compliance testing software based on the expertise of our engineers on the standards committees
- Support for emerging high speed serial buses including SAS 12G, FibreChannel, and PCIe™ gen3.

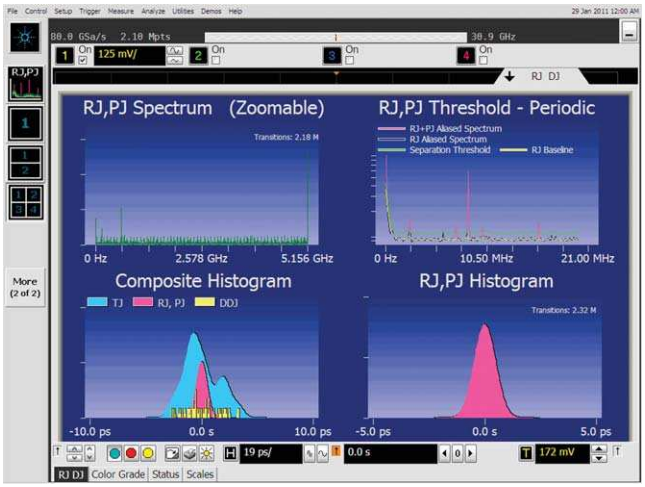
A broad range of jitter, trigger, measurement, analysis, and display tools

When time is of the essence you need your scope to acquire and present data in the most usable form so you can get to answers quickly.

The Agilent Infiniium 90000L Series oscilloscopes offer the industry's widest range of supporting software with an intuitive interface to simplify learning curves. Can be found in the configuration guide.



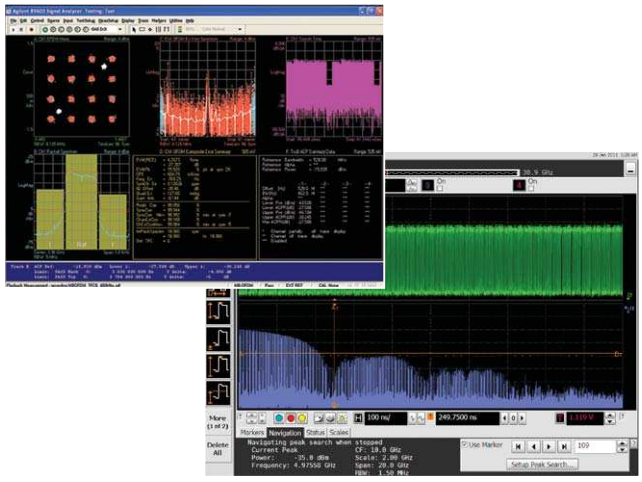
Agilent's InfiniiSim waveform translation toolset provides efficient de-embedding of probe and circuit element loading, enables measurement translation from accessible probe points to other locations in the system, and simulates waveforms with channel models inserted. Combine measurements and models for accurate characterization of design performance, all done with hardware acceleration for fast update rates.



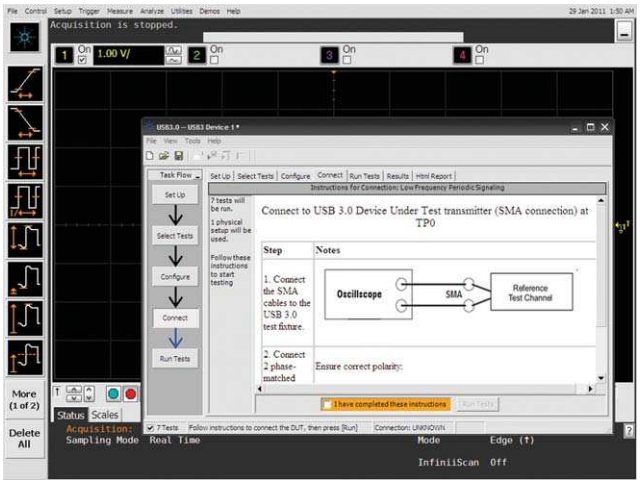
Quickly characterize jitter and display histograms, measurement trending, and jitter spectrum.

Not just a tool for the digital world

Infiniium 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. Standard windowing of Hanning, Blackman Harris, Flattop and Rectangular are supported along with cursor based power measurements. When more powerful frequency domain measurements are required, including modulation analysis, consider the Agilent 89601A Vector Signal Analyzer software.



The industry's most comprehensive application-specific measurement software

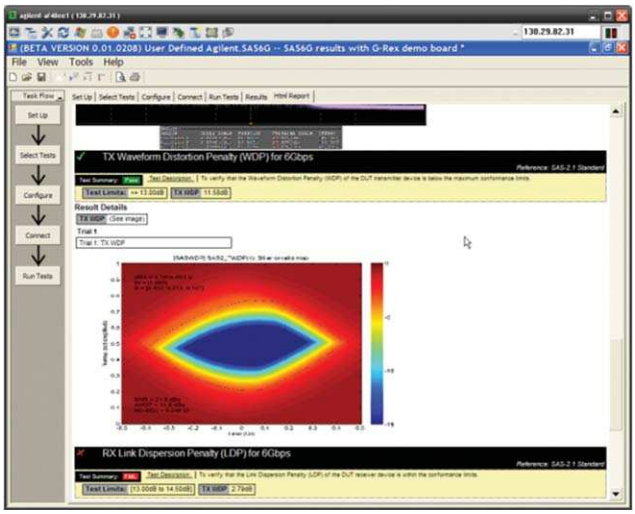


Pre-built compliance testing software with Agilent expertise

Choose from the industry's widest range of complete applications for compliance and margin testing for high speed serial buses, including SATA, SAS, PCI Express, Ethernet, USB, JEDEC and more. Agilent's measurement experts sit on the industry standards committees and help define compliance requirements. They ensure that our tools deliver to the standards. Set up 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. Technicians can run complete and accurate testing on their own, freeing valuable engineering resources.

Support for proprietary and emerging high speed serial buses

Agilent engineers hold key positions within the governing bodies defining test requirements for interoperability on emerging high speed serial buses. We provide tools as quickly as possible on emerging standards.



User Defined Application software allows automated compliance testing on proprietary buses or while emerging test standards solidify.

Rapidly develop automated measurements for compliance testing with Agilent's User Defined Application software. This tool provides the framework you need to quickly program and automate any set of measurements with an interface similar to that provided in our standard compliance test software. Full control of other Agilent instrumentation is possible, along with automated HTML reporting capabilities

Applications are available today for:

- MIPI M-Phy
- MDDI
- GDDR5
- SAS 6G

Agilent Infiniium Portfolio

Agilent's Infiniium lineup includes bandwidths from 600 MHz to 32 GHz. Use the following selection guide to determine which best matches your specific needs.

Oscilloscope	90000 Series	90000L Series	90000 X-Series
Type	Real time	Real time	Real time
Bandwidth	2.5 GHz to 13 GHz	30 GHz	16 GHz to 32 GHz
Sampling Rate (2 ch/4 ch)	40/40 GSa/s	80/40 GSa/s	80/40 GSa/s
Memory Depth	Up to 1 Gpt	Up to 500 Mpt	Up to 2 Gpts
Size (H x W x D)	11.1" x 17" x 19.9" 28cm x 43cm x 51cm	10.5"x16.75"x18.7" 27cm x 43cm x 48cm	10.5"x16.75"x18.7" 27cm x 43cm x 48cm
De-embedding	YES	YES	YES
Noise at 30 GHz			
Noise at 13 GHz			
Data sheet	5989-7819EN	5990-7368EN	5990-5271EN

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 90000L Series oscilloscope in three easy steps. Use option numbers when ordering at time of purchase. Use model numbers to add to an existing scope.

1. Choose your oscilloscope, memory and options

Mainframe:

Oscilloscopes	Description
DSA93004L	30 GHz Digital Signal Analyzer
DSO93004L	30 GHz Digtial Signal Oscilloscope

All models come with power cord, keyboard, mouse, stylus, calibration cable, wrench and (5) coax adapters.**

*DSA models come with 50 Mpts memory, EZJIT, EZJIT+, Noise Reduction, and Serial Data Analyisis standard.

Memory:

Description	Options	Model number
20 Mpts/ch memory	Standard	N2810A-020
50 Mpts/ch memory	DSOX90000A-050	N2810A-050
100 Mpts/ch memory	DSOX90000A-100	N2810A-100
200 Mpts/ch memory	DSOX90000A-200	N2810A-200
500 Mpts/ch memory	DSOX90000A-500	N2810A-500

Options:

Description	Options	Model number
GPIB Card-interface	DSOX90000-805	82350B
PCI Express card-interface	DSOX90000-823	N4866A
Performance verification de-skew fixture	DSOX90000-OC-PROBES	N5443A
Rack mount kit option	DSOX90000-1CM	N5470A
Removable hard drive	DSOX90000-801	N5474A

Engineered for 32 GHz true analog bandwidth that delivers

Configure your high performance real-time oscilloscope solution today

2. Choose your probes and accessories

Description	Oscilloscopes
30 GHz InfiniiMax III probe amp	N2803A
25 GHz InfiniiMax III probe amp	N2802A
20 GHz InfiniiMax III probe amp	N2801A
16 GHz InfiniiMax III probe amp	N2800A
ZIF probe head	N5439A
Browser (hand held) probe head	N5445A
Solder-in probe head	N5441A
3.5 mm/2.92-mm/SMA probe head	N5444A
450 Ω ZIF tip replacement (set of 5)	N5440A
250 Ω ZIF tip replacement (set of 5)	N5447A
Browser tip replacement (set of 4)	N5476A
PV/deskew fixture	N5443A
Precision BNC adapter (50 ohm)	N5442A
Sampling scope adapter	N5477A
2.92 mm head flex cable	N5448A
High impedance probe adapter	N5449A
35 GHz differential cable pair	N5412A

For more information about Agilent's InfiniiMax III probing system, check out the InfiniiMax III data sheet with the Agilent literature number, 5990-5653EN.

3. Choose your measurement-specific application software

Measurement, Analysis and Decode Software Packages

Description	Product number	Model number
CAN/FlexRay decode	DSOX90000-063	N8803A
EZJIT jitter analysis software	DSOX90000-002	E2681A
EZJIT Plus jitter analysis software	DSOX90000-004	N5400A
High-Speed SDA and clock recovery	DSOX90000-003	E2688A
I^2C/SPI Decode	DSOX90000-007	N5391A
InfiniiScan software triggering	DSOX90000-009	N5414B
InfiniiSim basic signal de-embedding	DSOX90000-013	N5465A-001
InfiniiSim advanced signal de-embedding	DSOX90000-014	N5465A-002
Serial data equalization	DSOX90000-012	N5461A
MATLAB - Basic digital analysis package	DSOX90000-061	
MATLAB - Standard digital analysis package	DSOX90000-062	
MIPI D-PHY protocol	DSOX90000-019	N8802A
PCI-Express protocol	DSOX90000-017	N5463A
Remote programming interface	DSOX90000-011	N5452A
RS-232/UART decode	DSOX90000-015	N5462A
SATA/SAS protocol	DSOX90000-018	N8801A
USB protocol	DSOX90000-016	N5464A
User-defined function	DSOX90000-010	N5430A

Engineered for 32 GHz true analog bandwidth that delivers

Configure your high performance real-time oscilloscope solution today

Compliance Testing and Validation Software Packages

Description	Product Number	Model number
DDR1 and LPDDR compliance	DSOX90000A-031	U7233A
DDR2 and LPDDR2 compliance	DSOX90000A-033	N5413B
DDR3 up to 1660 MHz compliance	DSOX90000A-032	U7231A
DisplayPort compliance application	DSOX90000A-028	U7232A
Ethernet compliance application		N5392A
HDMI compliance application	DSOX90000A-023	N5399A
MIPI D-PHY compliance application	DSOX90000A-035	U7238A
PCI EXPRESS compliance application	DSOX90000A-022	N5393B
SAS compliance application	DSOX90000A-027	
SATA 6Gb/s Compliance	DSOX90000A-038	N5411B
USB 3.0 Compliance Software	DSOX90000A-041	U7243A
User Defined Application	DSOX90000A-040	N5467A
Xaui compliance application		N5431A
10GBASE-T Ethernet Automated Test Application	DSOX90000A-036	U7236A

Choose your application-specific software packages (see pages 20 to 24) for details.

Infiniium 90000L Series Oscilloscopes

Performance characteristics

Vertical				
Input channels	Four			
Analog bandwidth (–3 dB)*,	**93004L**			
2 channel	30 GHz			
4 channel	16 GHz			
Rise time/fall time[1]	**93004L**			
10 - 90%	13.5 ps			
20 - 80%	11 ps			
Input impedance	50 Ω, ± 3%			
Sensitivity[3]	1 mV/div to 1 V/div			
Input coupling	DC			
Vertical resolution[2]	8 bits, ≥ 12 bits with averaging			
Channel to channel isolation (any two channels with equal V/div settings)	DC to 3 GHz: 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*	± 5 V			
Offset range	**Vertical sensitivity**	**Available offset**		
	0 mV/div to ≥ 49 mV/div	± 0.4 V		
	> 50 mV/div to ≥ 100 mV/div	± 0.7 V		
	> 100 mV/div to ≥ 199 mV/div	± 1.2 V		
	> 200 mV/div to ≥ 499 mV/div	± 2.2 V		
	> 500 mV/div	± 2.4 V		
Offset accuracy	≤ 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	Dual cursor: ± [(DC gain accuracy) + (resolution)] Single cursor: ± [(DC gain accuracy) + (offset accuracy) + (resolution/2)]			
RMS noise floor (scope only)				
Volts/div (mVrms)	**16 GHz**	**20 GHz**	**25 GHz**	**30 GHz**
20	1	1.1	1.2	1.4
50	2.3	2.6	2.9	3.2
100	4.6	5.1	5.7	6.3
200	9.6	10.7	12.1	13.3

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

3. Full scale is defined as 8 vertical divisions. Magnification is used below 10mV/div. Below 10 mV/div, full-scale is defined as 80 mV/div. The major scale settings are 5mV, 10mV, 20mV, 50mV, 100mV, 200mV, 500mV, and 1V.

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

1. Calculated from the bandwidth using 0.42/bandwidth

Infiniium 90000L Series Oscilloscopes

Performance characteristics

Horizontal	
Main timebase range	2 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*	[± 0.075 ppm (immediately after calibration), ± 0.1 ppm/year (aging)]
Delta-time measurement accuracy Absolute, averaging disabled	$5 \cdot \sqrt{\left(\frac{Noise}{SlewRate}\right)^2 + SampleClock\ Jitter^2} + \frac{TimeScaleAccy \cdot Reading}{2}$ sec rms
Absolute, >- 256 averages	$0.35 \cdot \sqrt{\left(\frac{Noise}{SlewRate}\right)^2 + SampleClock\ Jitter^2} + \frac{TimeScaleAccy \cdot Reading}{2}$ sec rms

Sample Clock Jitter

Acquired Time Range	Internal Timebase Reference	External Timebase Reference
10 ms	150 fs rms	150 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:

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

Periodic Jitter:

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

Cycle-Cycle:

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

Infiniium 90000L Series Oscilloscopes

Performance characteristics

Acquisition		
Maximum real-time sample rate	**93004L**	
(2 channels)	80 GSa/s	
(4 Channels)	40 GSa/s	
Memory Depth per Channel		
Standard	20 Mpts on 4 channels	40 Mpts on 2 channels
Option 050	50 Mpts on 4 channels (standard on DSA models)	100 Mpts on 2 channels
Option 100	100 Mpts on 4 channels	100 Mpts on 2 channels
Option 200	200 Mpts on 4 channels	400 Mpts on 2 channels
Option 500	500 Mpts on 4 channels	1 Gpt on 2 channels

Maxium acquired time at highest real time resolution		
Real-Time Resolution	40 Gsa/s	80 Gsa/s
Standard	0.5 mS	0.5 mS
Option 050	1.25 mS	1.25 mS
Option 100 M	2.5 mS	2.5 mS
Option 200 M	5 mS	5 mS
Option 500 M	12.5 mS	12.5 mS

Sampling Modes	
Real-Time	Successive single shot acquisitions
Real-Time with Averaging	Selectable from 2 to 65534
Real-Time with Peak Detect	80 GSa/s in half channel mode, 40 GSa/s in full channel mode
Real-Time with Hi Resolution	Real-time boxcar averaging reduces random noise and increases resolution
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	Captures bursting signals at max sample rate without consuming memory during periods of inactivity Number of segments (Up to 524,288 with option 026) Maximum time between triggers is 562,950 seconds Re-arm time: 4.5µs Maximum memory depth: Up to 4 Gpts in 1/2 channel mode with option 02G
Filters Sin(x)/x Interpolation	On/off selectable FIR digital filter. Digital Signal Processing adds points between aquired data points to enhance measurement accuracy and waveform display

Infiniium 90000L Series Oscilloscopes

Performance characteristics

Hardware Trigger	
Sensitivity	Internal low Internal high Auxiliary
Edge Trigger Bandwidth	>20 GHz
Minimum Pulse Width Trigger	
Hardware	250 ps
Software (InfiniiScan)	40 ps
Level Range Internal Auxillary	 ± 4 div from center screen or ± 4 Volts, whichvever is smallest ± 5 V, also limit input signal to ± 5V
Sweep Modes	Single, segmented, and continuous.
Display jitter (displayed trigger jitter)	50 fs
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)	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.

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.

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Performance characteristics

Hardware Trigger (continued)	
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	Peak to peak, minimum, maximum, average, RMS, amplitude, base, top, overshoot, preshoot,
Voltage	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, bursy period, Tvolt, + pulse count, - pulse count,
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 ± 1, 2, and 3 sigma, median, mode, peak-to-peak, min, max, total hits, peak (area of most hits), X scale hits, and X offset hits
Mask Testing	Allows pass/fail testing to user-defined or Agilent-supplied waveform templates. Automask lets you create a mask template from a captured waveform and define a tolerance range in time/voltage or screen divisions. Test modes (run until) include test forever, test to specified time or event limit, and stop on failure. Executes "multipurpose" user setting on failure. "Unfold real time eye" feature will allow individual bit errors to be observed by unfolding a real time eye when clock recovery is on. Communications mask test kit option provides a set of ITU-T G.703, ANSI T1.102, and IEEE 802.3 industry-standard masks for compliance testing.
Waveform Math	
Number of Functions	Four
Hardware Accelerated Math	Differential and Common Mode
Operations	Absolute value, add, 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 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

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Performance characteristics

Measurement modes	
Automatic measurements	Measure menu access to all measurements, up to ten measurements can be displayed simultaneously
Multipurpose	Front-panel button activates five pre-selected or five 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	One, two or four waveform grids, each with 8 bit vertical resolution
Waveform styles	Connected dots, dots, infinite persistence, color graded infinite persistence. Includes up to 256 levels of intensity-graded waveforms.
Waveform Update Rate	
Maximum 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® XP Pro
CPU	Intel® Core 2 Duo 3.06 GHz
PC system memory	4GB DDR2
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	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 or JPEG
I/O ports	PCIe x4, GPIB, 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 +70 °C
Vibration	For operating random the 0.3 g(rms) should be 0.21 g(rms), for non-operating random the 2.41 g(rms) should be 2.0 g(rms) and for swept sins the (0.75g) should be (0.50g).
Power	100 - 240 VAC at 50/60 Hz; maximum input power 800 Watts
Weight	45.1 lbs (20.5 kg)
Dimensions	10.5”x16.75”x18.7” (27cm x 43cm x 48cm)
Safety	Meets IEC 61010-1 +A2, CSA certified to C22.2 No.1010.1, self-certified to UL 3111

Infiniium 90000L Series Oscilloscopes

Performance characteristics

Measurement modes	
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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, bursy period, Tvolt, + pulse count, - pulse count,
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

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Revised: June 8, 2011

Product specifications and descriptions in this document subject to change without notice.

Published in USA, September 16, 2011
5990-7368EN

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