

## Infiniium 54850 Series Oscilloscopes InfiniiMax 1130 Series Probes

### 7 GHz, 20 GSa/s Differential and Single-Ended Oscilloscope Measurement System

Data Sheet

- 7, 6, 4, 2.5 and 2 GHz bandwidth real-time oscilloscopes with up to 20 GSa/s sample rate on all four channels simultaneously
- Up to 1 Mpts MegaZoom deep memory at all sample rates and 32 Mpts MegaZoom deep memory at 2 GSa/s and slower sample rates
- Electronic attenuators eliminate the reliability and repeatability concerns associated with mechanical attenuator relays
- Trigger jitter 1.0 ps rms
- Easy-to-use, easy-to-understand jitter analysis options
- InfiniiMax 7 GHz, 5 GHz, 3.5 GHz, and 1.5 GHz probing systems
- Each InfiniiMax probe amplifier supports both differential and single-ended measurements for a more cost-effective solution
- Unrivaled InfiniiMax probing accessories support browsing, solder-in, and socket use models at the maximum performance available
- Award-winning user interface based on Microsoft Windows® XP Pro supports CD-RW, dual-monitor, and third-party software packages



#### The highest-performance end-to-end measurement system available

If you are an experienced scope user, you know that your measurements are only as good as your probing system. And as bandwidth increases, it's increasingly important to ask the question: am I measuring my circuit or my scope probe? Nothing is more frustrating than chasing down an apparent design problem, only to find that it was caused by an inferior scope probe.

Together, the newest Agilent Infiniium scopes and the breakthrough Agilent InfiniiMax

high-performance probing systems offer an end-to-end measurement system with unmatched performance, accuracy, and connectivity. The result is measurements you can trust and better insight into your circuit behavior.

#### InfiniiMax: The Worlds Best High-Speed Probing System

EDN Magazine has awarded Agilent's InfiniiMax active probe system the 2002 Innovation of the Year Award.



Agilent Technologies

# Benefits

## 54850 Series Infiniium oscilloscopes

| Model  | Bandwidth | Channels | Sample rate per channel | Standard acquisition memory | Optional acquisition memory   |
|--------|-----------|----------|-------------------------|-----------------------------|---|
| 54855A | 6 - 7 GHz | 4        | 20 GSa/s                | 262 kpts per channel        | 1 Mpts per channel up to 20 GSa/s<br>32 Mpts per channel $\leq$ 2 GSa/s |
| 54854A | 4 GHz     | 4        | 20 GSa/s                | 262 kpts per channel        | 1 Mpts per channel up to 20 GSa/s<br>32 Mpts per channel $\leq$ 2 GSa/s |
| 54853A | 2.5 GHz   | 4        | 20 GSa/s                | 262 kpts per channel        | 1 Mpts per channel up to 20 GSa/s<br>32 Mpts per channel $\leq$ 2 GSa/s |
| 54852A | 2 GHz     | 4        | 10 GSa/s                | 262 kpts per channel        | 1 Mpts per channel up to 10 GSa/s<br>32 Mpts per channel $\leq$ 2 GSa/s |

## 1130 Series InfiniiMax probe amplifier

| Model                   | Bandwidth | Description  |
|-------------------------|-----------|--|
| 1134A                   | 7 GHz     | Probe amplifier – order one or more probe heads or connectivity kits     |
| 1132A                   | 5 GHz     | Probe amplifier – order one or more probe heads or connectivity kits     |
| 1131A                   | 3.5 GHz   | Probe amplifier – order one or more probe heads or connectivity kits     |
| 1130A                   | 1.5 GHz   | Probe amplifier – order one or more probe heads or connectivity kits     |
| E2669A differential kit |           | Each connectivity kit includes browser, solder-in and socket probe-heads |
| E2668A single-ended kit |           | Each connectivity kit includes browser, solder-in and socket probe-heads |

InfiniiMax probe amplifier specifications: Dynamic range =  $\pm 2.5$  V, DC offset range =  $\pm 12$  V, maximum voltage =  $\pm 30$  V

## 1130 Series InfiniiMax probe system specifications (1134A probe amplifier with probe head)

| Probe head             | Model number | Differential measurement (BW, input C, input R) | Single-ended measurement (BW, input C, input R) |
|------------------------|--------------|---|---|
| Differential solder-in | E2677A       | 7 GHz, 0.27 pF, 50 k $\Omega$                   | 7 GHz, 0.44 pF, 25 k $\Omega$                   |
| Differential socket    | E2678A       | 7 GHz, 0.34 pF, 50 k $\Omega$                   | 7 GHz, 0.56 pF, 25 k $\Omega$                   |
| Differential browser   | E2675A       | 6 GHz, 0.32 pF, 50 k $\Omega$                   | 6 GHz, 0.57 pF, 25 k $\Omega$                   |
| Differential SMA       | E2695A       | 7 GHz   | 7 GHz   |
| Single-ended solder-in | E2679A       | N/A   | 5.2 GHz, 0.50 pF, 25 k $\Omega$                 |
| Single-ended browser   | E2676A       | N/A   | 5.5 GHz, 0.67 pF, 25 k $\Omega$                 |

## Benefits (continued)

### How much bandwidth and sample rate do I need?

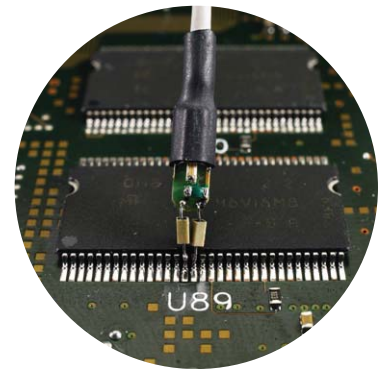
| <b>Bandwidth required to measure risetime with 3% error</b>        | <b>Example: 100 ps rise time (20-80%)</b> |
|--|---|
| Maximum signal frequency content = $0.4/\text{rise time}$ (20-80%) | Maximum signal frequency = 4 GHz          |
| Scope bandwidth required = $1.4 \times$ maximum frequency          | Required scope bandwidth = 5.6 GHz        |
| Minimum scope sample rate required = $2.5 \times$ bandwidth        | Required scope sample rate = 14 GSa/s     |

### Key trends in the electronics market

- Technologies with dramatically increased clock speeds and edge rates have emerged.
- Very fast serial differential buses are being used to save board space, reduce power and provide better noise immunity.
- Densely packed circuit boards, often with stacked daughter boards, increase the need to probe in very hard-to-reach places.

### Key benefits of the 54850 and InfiniiMax Series

- Up to 7 GHz bandwidth can track even the fastest signal speeds.
- A sample rate of 20 GSa/s on all four channels can measure high-speed differential buses correlated with other signals.
- The innovative InfiniiMax probing system supports even the most demanding mechanical access requirements without sacrificing performance.



## Benefits (continued)

### Infiniium 8000A Series support for industry bus standards

| Bus standard  | Bit rate        | Recommended BW <sup>1</sup> | Jitter analysis <sup>2</sup> | Serial data analysis (E2688A) |               |              | Compliance testing  | Test fixtures  |
|---------------|-----------------|-----------------------------|------------------------------|-------------------------------|---------------|--------------|---------------------|----------------|
|               |                 |                             |                              | SW clock recovery             | 8b/10b decode | Mask testing |                     |                |
| Ethernet      | 250 Mbs         | 2 GHz                       | Yes                          | Yes                           | N/A           | Yes          | N5392A              | N5395B         |
| USB 2.0       | up to 480 Mbs   | 2 GHz                       | Yes                          | Yes                           | N/A           | Yes          | N5416A              | E2649A         |
| DDR I/II      | up to 800 MTs   | 4 GHz                       | Yes                          | N/A                           | N/A           | No           | N5413A              | No             |
| SATA 1.5 Gbps | 1.5 Gbps        | 6 GHz                       | Yes                          | Yes                           | Yes           | Yes          | N5411A              | Crescent Heart |
| SAS 150       | 1.5 Gbps        | 6 GHz                       | Yes                          | Yes                           | Yes           | Yes          | N5412A              | N5421A         |
| DVI           | 1.65 Gbps       | 4 GHz                       | Yes                          | Yes                           | Yes           | Yes          | N5394A              | Silicon Image  |
| HDMI          | up to 1.65 Gbps | 4 GHz                       | Yes                          | Yes                           | Yes           | Yes          | N5399A              | N5405A         |
| Fibre Channel | 2.125 Gbps      | 4 GHz                       | Yes                          | Yes                           | Yes           | Yes          | N5410A              | No             |
| PCI Express I | 2.5 Gbps        | 6 GHz                       | Yes                          | Yes                           | Yes           | Yes          | N5393A <sup>3</sup> | PCI-Sig        |
| ExpressCard   | 2.5 Gbps        | 6 GHz                       | Yes                          | Yes                           | Yes           | Yes          | N5393A <sup>3</sup> | PCMCIA.org     |
| InfiniBand    | 2.5 Gbps        | 6 GHz                       | Yes                          | Yes                           | Yes           | Yes          | No                  | Fujikura       |
| Advanced TCA  | 2.5 Gbps        | 6 GHz                       | Yes                          | Yes                           | Yes           | Yes          | No                  | No             |

1 Recommended bandwidth is derived from a combination of data rate and edge speed

2 Jitter analysis solutions: EZJIT (E2681A), EZJIT Plus (N5400A), oscilloscope tools (E2690B)

3 Requires E2688A serial data analysis

# Overview of Infiniium 80000A Series Application Software

## Jitter

### Application software package

|        |   |
|--------|---|
| E2681A | EZJIT jitter analysis (option 002)      |
| N5400A | EZJIT Plus jitter analysis (option 004) |
| E2690B | Amherst oscilloscope tools              |

## Analysis

### Application software package

|        |  |
|--------|--|
| E2688A | SDA high-speed serial data analysis (option 003)       |
| N5391A | I <sup>2</sup> C/SPI serial data analysis (option 021) |
| N5402A | CAN serial data analysis                               |
| 89601A | Vector signal analysis                                 |

## Compliance

### Application software package

|        |  |
|--------|--|
| N5392A | Ethernet compliance                        |
| N5393A | PCI Express compliance                     |
| N5394A | DVI compliance                             |
| N5399A | HDMI compliance                            |
| N5409A | Fully Buffered DIMM compliance             |
| N5410A | Fiber channel compliance                   |
| N5411A | SATA I/II compliance                       |
| N5412A | SAS compliance                             |
| N5413A | DDR2 clock characterization                |
| N5416A | USB compliance                             |
|        | Fire-wire compliance (Quantum Parametrics) |

## Utilities

### Application software package

|        |   |
|--------|---|
| N5403A | Noise reduction (option 005)                  |
| E2625A | Communications mask test kit                  |
| E2699A | My Infiniium integration package (option 006) |
| E2682A | Voice control option                          |

**Infiniium: “It’s like someone who sits down and actually uses a scope designed this one.”**

Steve Montgomery, Director of Engineering, Linx Technologies

**20 GSa/s sample rate on all four channels** significantly reduces the chances of aliasing, increases measurement accuracy, and delivers the full real-time bandwidth of the oscilloscope on every channel simultaneously.

**Get fast answers to your questions** with the built-in information system. Infiniium’s task-oriented Setup Guide provides step-by-step instructions for several advanced measurements and procedures.

**See your signal more clearly** with a large (8.4-inch) high-resolution color display. Infiniium’s bright TFT display with anti-glare coating lets you see the details of your signal from all angles.

**20 GB hard drive, 3.5” 1.44 MB floppy drive and rear USB port** make it easy to save setup files, data files, screen shots, etc.

**Identify anomalies easily** with color-graded persistence, a colorful visual representation of waveform distribution.

**Label waveforms** and add notes to your screen captures — Infiniium’s keyboard makes it easy.

**Drag and drop markers with your mouse** or use the arrow keys.

**Easy access to advanced features** like math functions and FFTs, is provided by the Windows-based graphical user interface. This GUI also gives you unique capabilities like drag-and-drop measurements and zooming, and offers a graphical equivalent to all front panel controls.

**Remote access** with Web-enabled connectivity, e-mail on trigger, and GPIB over LAN allows you to access your scope from remote locations.

**Infiniium: Award-winning scopes**

Infiniium has received eight industry awards to date, including EDN’s “Innovation of the Year” award (twice) and T&M World’s “Best in Test.” Agilent is committed to breaking new ground and providing tools that bring unique value to our customers.

**32 Mpts acquisition memory** at 2 GSa/s or slower sample rates allows you to capture long time windows at high resolution – such as identifying glitches due to a power supply start-up from reset.



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

**Zoom and search with instant response.** Zoom into your signal using the horizontal scale knob and search through your waveform with the position knob. MegaZoom technology allows you to find your area of interest quickly and easily – even with 32 Mpts waveforms.

**Built-in CD-R drive** on rear panel allows you to update the system software conveniently and can be used to install third-party application packages.



**Hands-free operation** with the Infiniium VoiceControl option. Just speak into the microphone to operate front-panel controls.

**Segmented memory acquisition mode** captures bursting signals at maximum sample rate without consuming memory during periods of inactivity.

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

**Install third-party software packages** such as Excel, LabView, Agilent Vee, MATLAB®, anti-virus software, and more to perform customized processing and automation of your oscilloscope or to make the scope compliant to the network environment of your company.

**An external monitor** allows you to run third-party applications on a large, high-resolution display while using the scope's built-in monitor for high-speed waveform display.

**Windows® XP Pro** operating system.

**A familiar interface makes simple tasks simple.** Infiniium's analog-like front panel has a full set of controls color coded to the waveforms and measurements, making simple tasks simple.

**Three-year standard warranty** and a variety of Agilent support options protect your investment for the long term.

**A new 18 GHz, BNC-compatible connector** provides a high signal fidelity connection to Agilent active probes, SMA adapters, and standard BNCs.

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

**10/100 Mbps LAN interface** lets you easily print waveforms on networked printers, save your results on your office PC, share information with others, and control the scope over the Web.

# InfiniiMax: The Worlds Best High-Speed Probing System

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

**Variable spacing** via the tab on the side of the differential browser allows the probe tips to be adjusted for different circuit geometries from 0.25-5.80 mm (10-230 mills).

**Z-axis compliance** allows both probe tips of the differential browser to spring, supporting various probing angles and target system characteristics.

**Differential browser** is the best choice for general-purpose trouble-shooting of differential or single-ended signals up to 6 GHz bandwidth.

**Solder-in differential probe head** provides 7 GHz bandwidth and can be attached to very small geometry circuits for measuring both single-ended and differential signals.

**The differential socket probe head** can be used to measure either differential or single-ended signals to 7 GHz bandwidth.

**Extremely small single-ended, solder-in probe heads** support 5.2 GHz measurements of even the hardest-to-reach single-ended signals.

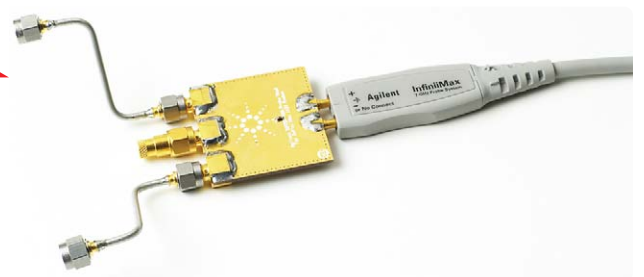
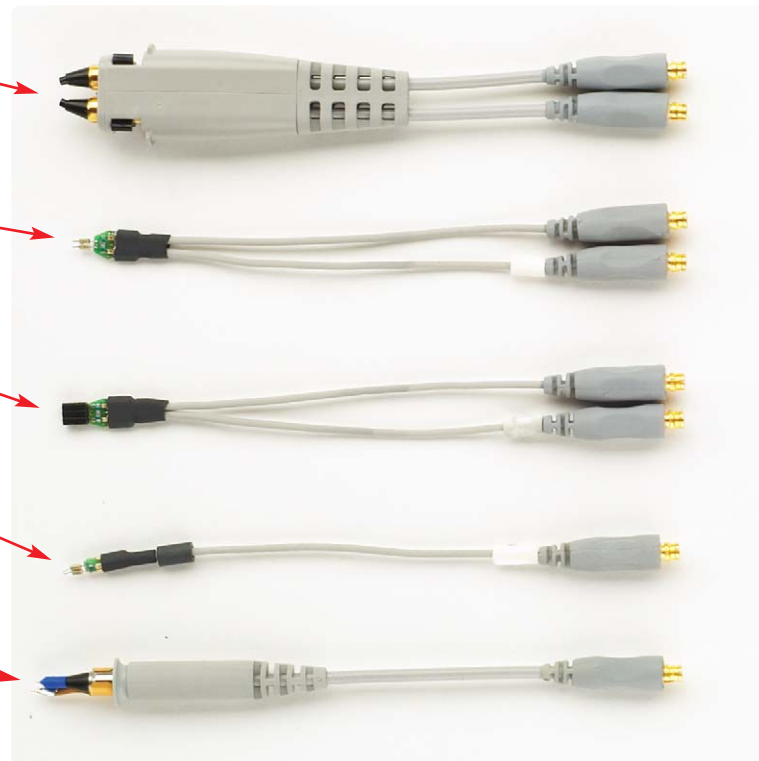
**Single-ended browser** is the best choice for general purpose probing of single-ended signals when small size of the probe head is the primary consideration. Bandwidths up to 5.5 GHz can be obtained in this configuration.

**Differential SMA probe head** provides 7 GHz bandwidth and allows you to connect two SMA cables to make a differential measurement on a single scope channel.

**The 54006A 7.5 GHz resistive divider probe** is available as a low-cost probing alternative for casual inspection of signals.

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

**Ergonomic sleeves** make hand browsing comfortable even over long periods of time.







**Supplied axial lead resistors**, when trimmed to the appropriate length, allow user to trade off bandwidth and reach. Values and trimming templates are supplied for measurements from 2.8 GHz to 7 GHz.

**The damped-wire accessory** provides maximum connection reach and flexibility without introducing an in-band resonance for signals up to 1.2 GHz bandwidth.

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

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

**See page 16 for an example.**

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

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

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

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

**InfiniiMax is the world's best high-speed probe**

- InfiniiMax's bandwidth is greater than the scope's bandwidth.
- Each use model (browsing, solder-in, socket) is optimized for maximum performance.
- Supports both differential and single-ended measurements with a single probe amplifier.



EDN Magazine has awarded Agilent's InfiniiMax active probe system the 2002 Innovation of the year award. This exclusive award program, now in its 13<sup>th</sup> year, awards truly outstanding products in the electronics industry.

# Infiniium 54850 Series Performance Characteristics

## Vertical

|  |   |                |                 |                |
|--|---|----------------|-----------------|----------------|
| Input channels   | 4   |                |                 |                |
| Analog bandwidth (–3 dB)*  | 54855A: 6 GHz   | 54854A: 4 GHz  | 54853A: 2.5 GHz | 54852A: 2 GHz  |
| Rise time (10% to 90%)   | 54855A: 70 ps<br>54855A with option 008: 62 ps                            | 54854A: 105 ps | 54853A: 168 ps  | 54852A: 210 ps |
| Input impedance  | 50 Ω ± 2.5%   |                |                 |                |
| Sensitivity <sup>1</sup>   | 1 mV/div to 1 V/div   |                |                 |                |
| Input coupling   | DC  |                |                 |                |
| Vertical resolution <sup>2</sup>   | 8 bits, ≥ 12 bits with averaging  |                |                 |                |
| Channel to channel isolation<br>(any two channels with equal V/div settings) | DC to 100 MHz: 40 dB<br>100 MHz to 1 GHz: 28 dB<br>> 1 GHz to 6 GHz: 24dB |                |                 |                |
| DC gain accuracy* <sup>1</sup>   | ± 1% of full scale at full resolution channel scale                       |                |                 |                |
| Maximum input voltage*   | ± 5 V   |                |                 |                |
| Offset range   | > ± 12 div or ± 4 Volts, whichever is smallest                            |                |                 |                |
| Offset accuracy* <sup>1</sup>  | ± (2% of channel offset + 1% of full scale)                               |                |                 |                |
| Dynamic range  | ± 4 div from center screen  |                |                 |                |
| DC voltage measurement accuracy* <sup>1</sup>                                |   |                |                 |                |
| Dual cursor  | ± [(DC gain accuracy)+(resolution)]                                       |                |                 |                |
| Single cursor  | ± [(DC gain accuracy)+(offset accuracy)+(resolution/2)]                   |                |                 |                |

## Horizontal

|  |  |                    |  |                     |
|--|--|--------------------|--|---------------------|
| Main timebase range                            | 54855A and 54854A: 5 ps/div to 20 s/div                  |                    | 54853A and 54852A: 10 ps/div to 20 s/div |                     |
| Main timebase delay range                      | –200 s to 200 s  |                    |  |                     |
| Delayed timebase range                         | 1 ps/div to current main time scale setting              |                    |  |                     |
| Channel deskew                                 | –50 μs to 150 μs range, 100 fs resolution                |                    |  |                     |
| Time scale accuracy <sup>3</sup>               | ± 1 ppm pk   |                    |  |                     |
| Delta-time measurement accuracy <sup>6,7</sup> |  |                    |  |                     |
| ≥ 256 Averages, rms                            | 54855A: 70 fs rms  | 54854A: 90 fs rms  | 54853A: 110 fs rms                       | 54852A: 160 fs rms  |
| ≥ 256 Averages, peak                           | ± [ (0.5 ps) + (1 × 10 <sup>–6</sup> ×  reading ) ] peak |                    |  |                     |
| Averaging disabled, rms                        | 54855A: 2.0 ps rms                                       | 54854A: 2.5 ps rms | 54853A: 3.0 ps rms                       | 54852A: 4.5 ps rms  |
| Averaging disabled, peak                       | ± [ (X ps) + (1 × 10 <sup>–6</sup> ×  reading ) ] peak   |                    |  |                     |
|  | 54855A: X = 7.0 ps                                       | 54854A: X = 8.0 ps | 54853A: X = 10.0 ps                      | 54852A: X = 15.0 ps |
| Jitter measurement floor <sup>6</sup>          |  |                    |  |                     |
| Time interval error                            | 54855A: 1.4 ps rms                                       | 54854A: 1.8 ps rms | 54853A: 2.0 ps rms                       | 54852A: 3.0 ps rms  |
| Period jitter                                  | 54855A: 2.0 ps rms                                       | 54854A: 2.5 ps rms | 54853A: 3.0 ps rms                       | 54852A: 4.5 ps rms  |
| N-cycle, cycle-cycle jitter                    | 54855A: 3.0 ps rms                                       | 54854A: 3.8 ps rms | 54853A: 4.5 ps rms                       | 54852A: 6.8 ps rms  |

# Infiniium 54850 Series Performance Characteristics (continued)

## Acquisition

|                                   |                  |                  |                  |                  |
|-----------------------------------|------------------|------------------|------------------|------------------|
| Real time sample rate per channel | 54855A: 20 GSa/s | 54854A: 20 GSa/s | 54853A: 20 GSa/s | 54852A: 10 GSa/s |
|-----------------------------------|------------------|------------------|------------------|------------------|

### Memory depth per channel

|            |   |
|------------|---|
| Standard   | 262,144 at all sample rates                                       |
| Option 001 | 1,025,000 at all sample rates<br>32,800,000 ≤ 2 GSa/s sample rate |

### Sampling modes

|                            |   |
|----------------------------|---|
| Real time                  | Successive single-shot acquisitions   |
| Real time with averaging   | Selectable from 2 to 4096   |
| Real time with peak detect | 2 GSa/s peak detect, for less than 2 GSa/s sample rates (option 001 only)   |
| Segmented memory           | Captures bursting signals at maximum sample rate without consuming memory during periods of inactivity. Selectable number of segments up to 16,384 with Option 001 deep memory installed. Minimum intersegment time (the time between the end of the previous acquisition and the beginning of the next acquisition) of 20 μs. See the table below for various performance points. The serial number breaks on the 54850 Series models that support segmented memory are:<br>54852A: MY44000301 and greater<br>54853A: MY43001701 and greater<br>54854A: MY42001701 and greater<br>54855A: MY42001701 and greater |

### Infiniium 54850A Series

#### Maximum number of segments

|                    | Standard memory | Optional memory |
|--------------------|-----------------|-----------------|
| Sample rate        |                 |                 |
| 20 GSa/s           | 64              | 4096            |
| 5 GSa/s - 10 GSa/s | 64              | 8192            |
| ≤ 4 GSa/s          | 128             | 16384           |

#### Maximum trigger rate (typical)

| Sample rate        | 1 channel on |          | 2 channel on |          |
|--------------------|--------------|----------|--------------|----------|
|                    | 1 k pts      | 10 k pts | 1 k pts      | 10 k pts |
| 20 GSa/s           | 32 kHz       | 15 kHz   | 29 kHz       | 15 kHz   |
| 5 GSa/s - 10 GSa/s | 39 kHz       | 16 kHz   | 36 kHz       | 15 kHz   |
| 2 GSa/s            | 52 kHz       | 43 kHz   | 43 kHz       | 36 kHz   |

### Filters

|                        |  |
|------------------------|--|
| Sin(x)/x Interpolation | On/off selectable FIR digital filter. Digital signal processing adds points between acquired data points to enhance measurement accuracy and waveform display quality. |
|------------------------|--|

## Infiniium 54850 Series Performance Characteristics (continued)

### Trigger

|                               |   |
|-------------------------------|---|
| Sensitivity <sup>1</sup>      |   |
| Internal Low <sup>1</sup>     | 54855A: 0.5 div p-p 0 to 2 GHz, 1.0 div p-p 2 to 4 GHz, < 2.5 div @ 5 GHz<br>54854A: 0.5 div p-p 0 to 2 GHz, 1.0 div p-p 2 to 4 GHz<br>54853A: 0.5 div p-p 0 to 2 GHz, 1.0 div p-p 2 to 2.5 GHz<br>54852A: 0.5 div p-p 0 to 2 GHz   |
| Internal High <sup>1</sup>    | 54855A: 0.2 div p-p 0 to 6 GHz<br>54854A: 0.2 div p-p 0 to 4 GHz<br>54853A: 0.2 div p-p 0 to 2.5 GHz<br>54852A: 0.2 div p-p 0 to 2 GHz  |
| Auxiliary                     | DC to 500 MHz: 500 mV p-p   |
| Level range                   |   |
| Internal                      | ± 8 div from center screen or ± 4 Volts, whichever is smallest  |
| Auxiliary                     | ± 5 V   |
| Sweep modes                   | Auto, triggered, single   |
| Trigger jitter <sup>6,8</sup> | 54855A: 1.0 ps rms    54854A: 1.3 ps rms    54853A: 1.7 ps rms    54852A: 1.8 ps rms  |
| Trigger holdoff range         | 80 ns to 320 ms   |
| 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 QuickMeas+.   |
| Trigger modes                 |   |
| Edge                          | Triggers on a specified slope and voltage level on any channel or auxiliary 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 500 ps. Glitch range settings: < 1.5 ns to < 160 ms.  |
| Line                          | Triggers on the line voltage powering the oscilloscope.   |
| Pattern                       | 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. Each channel can have a value of High (H), Low (L) or Don't care (X). Triggers on patterns as narrow as 500 ps. |
| State                         | Pattern trigger clocked by the rising or falling edge of one channel.<br>Logic type: AND or NAND.   |
| Delay by time                 | The trigger is qualified by an edge. After a specified time delay between 30 ns to 160 ms, a rising or falling edge on any one selected input will generate the trigger.  |
| Delay by events               | 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.   |
| Violation triggers            |   |
| 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 500 ps. Pulse width range settings: 1.5 ns to 160 ms.   |
| Setup/hold                    | Triggers on setup, hold or setup and hold violations in your circuit. Requires a clock and data signal on any two input channels as trigger sources. High and low thresholds and setup and/or hold time must then be specified.   |
| Transition                    | Trigger on pulse rising or falling edges that do not cross two voltage levels in > or < the amount of time specified.   |

## Infiniium 54850 Series Performance Characteristics (continued)

### Measurements and math

|   |  |
|---|--|
| Waveform measurements   |  |
| Voltage   | Peak to peak, minimum, maximum, average, RMS, amplitude, base, top, overshoot, preshoot, upper, middle, lower, area.   |
| Time  | Period, frequency, positive width, negative width, duty cycle, delta time, rise time, fall time, Tmin, Tmax, channel-to-channel phase.   |
| Frequency domain  | FFT frequency, FFT magnitude, FFT delta frequency, FFT delta magnitude, FFT phase.   |
| Statistics  | Displays the mean, standard deviation, minimum, maximum and number of measurements value for the displayed automatic measurements.   |
| Histograms  | Vertical (for timing and jitter measurements) or horizontal (noise and amplitude change) modes, regions are defined using waveform markers. Measurements included: mean, standard deviation, peak-to-peak value, median, min, max, total hits, peak (area of most hits), and mean $\pm$ 1, 2, and 3 sigma.   |
| Eye-diagram measurements  | Eye-diagram measurements include eye height, eye width, eye jitter, crossing percentage, Q factor, and duty-cycle distortion.  |
| Jitter analysis measurements<br>(E2681A EZJIT or N5400A EZJIT Plus<br>Jitter Analysis software) | Cycle-cycle jitter, N-cycle jitter, cycle-cycle + width, cycle-cycle – width, cycle-cycle duty cycle, data rate, unit interval, time interval error data, time interval error clock, setup time, hold time, phase, period, frequency, + width, – width, duty cycle, rise time, fall time.  |
| 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 percentage. Test modes include test forever, test to specified time or event limit, and stop on failure. 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   | Four functions, select from add, average, differentiate, divide, FFT magnitude, FFT phase, integrate, invert, magnify, min, max, multiply, subtract, versus, common mode, smoothing.   |
| FFT   |  |
| Frequency range <sup>4</sup>  | DC to 10 GHz.  |
| Frequency resolution  | Sample rate/memory depth = Resolution.   |
| Best resolution at maximum sample rate  | 54855A, 54854A, 54853A: 20 GSa/s / 1 Mpts = 20 kHz.<br>54852A: 10 GSa/s / 1 Mpts = 10 kHz.   |
| Frequency accuracy  | $(1/2 \text{ frequency resolution}) + (1 \times 10^{-6})(\text{signal frequency})$ .   |
| Signal-to-noise ratio <sup>5</sup>  | 60 dB at 32k memory depth.   |
| Window modes  | Hanning, flattop, rectangular.   |
| Measurement modes   |  |
| Automatic measurements  | Measure menu access to all measurements, five measurements can be displayed simultaneously.  |
| QuickMeas+  | 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.  |
| Marker modes  | Manual markers, track waveform data, track measurements.   |

## Infiniium 54850 Series Performance Characteristics (continued)

### Display

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|                 |   |
|-----------------|---|
| Display         |   |
| Display         | 8.4 inch diagonal color TFT-LCD.  |
| Resolution      | 640 pixels horizontally x 480 pixels vertically.  |
| Annotation      | Up to 12 labels, with up to 100 characters each, can be inserted into the waveform area.            |
| Grids           | Can display 1, 2 or 4 waveform grids.   |
| Waveform styles | Connected dots, dots, persistence (minimum, variable, infinite), color-graded infinite persistence. |

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### Computer system and peripherals, I/O ports

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|                                 |  |
|---------------------------------|--|
| Computer system and peripherals |  |
| Operating system                | Windows® XP Pro.   |
| CPU                             | Intel® Pentium® III 1 GHz microprocessor.  |
| PC system memory                | 512 MB.  |
| Drives                          | ≥ 20 GB internal hard drive, CD-R drive on rear panel, standard 3.5 inch 1.44 MB floppy drive.   |
| Peripherals                     | Logitech optical USB mouse and compact keyboard supplied. All Infiniium models support any Windows-compatible input device with a serial, PS/2 or USB interface. |

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|            |  |
|------------|--|
| File types |  |
| Waveforms  | Compressed internal format, comma and tab separated X and Y pairs or voltage values. |
| Images     | BMP, PCX, TIFF, GIF or JPEG.   |

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|                            |  |
|----------------------------|--|
| I/O ports                  |  |
| LAN                        | RJ-45 connector, supports 10Base-T and 100Base-T. Enables Web-enabled remote control, e-mail on trigger or demand, data/file transfers and network printing. |
| GPIB                       | IEEE 488.2, fully programmable.  |
| RS-232 (serial)            | COM1, printer and pointing device support.   |
| Parallel                   | Centronics printer port.   |
| PS/2                       | 2 ports. Supports PS/2 pointing and input devices.   |
| USB                        | 2 ports. Allows connection of USB peripherals like storage devices and pointing devices while the oscilloscope is on.  |
| Video output               | 15 pin VGA, full color output of scope waveform display.   |
| Dual-monitor video output  | 15 pin XGA, full color output for using third-party applications.  |
| Auxiliary output           | DC (±2.4 V); square wave (~715 Hz and 456 MHz); trigger output (255 mV p-p into 50 Ω).   |
| Trigger output             | 5 V 50 Ω back-terminated.  |
| Time base reference output | 10 MHz, 5V 50Ω back-terminated.  |

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# Infiniium 54850 Series Performance Characteristics (continued)

## General characteristics

|                               |  |
|-------------------------------|--|
| Temperature                   | Operating: 5° C to +40° C.<br>Non-operating: -40° C to +70° C.   |
| Humidity                      | Operating: Up to 95% relative humidity (non-condensing) at +40°C.<br>Non-operating: Up to 90% relative humidity at +65°C.  |
| Altitude                      | Operating: Up to 4,600 meters (15,000 feet).<br>Non-operating: Up to 15,300 meters (50,000 feet).  |
| Vibration                     | Operating: Random vibration 5-500 Hz, 10 minutes per axis, 0.3 g(rms).<br>Non-operating: Random vibration 5-500 Hz, 10 minutes per axis, 2.41 g(rms);<br>resonant search 5-500 Hz, swept sine, 1 octave/minute sweep rate, (0.75g),<br>5 minute resonant dwell at 4 resonances per axis. |
| Power                         | 100-240 VAC, ± 10%, Cat II, 47 to 440 Hz; max power dissipated: 475 W.   |
| Weight                        | Net: 13 kg (28.5 lbs.).<br>Shipping: 16 kg (35.2 lbs.).  |
| Dimensions (excluding handle) | Height: 216 mm (8.5 in).<br>Width: 437 mm (17.19 in).<br>Depth: 440 mm (17.34 in).   |
| Safety                        | Meets IEC 61010-1 +A2, CSA certified to C22.2 No.1010.1, self-certified to UL 3111.  |

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

1 Full scale is defined as 8 vertical divisions. Vertical divisions are defined by the major scale settings above non-major scale settings. The major scale settings are 10 mV, 20 mV, 50 mV, 100 mV, 200 mV, 500 mV, 1 V.

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

3 Within one year of previous calibration.

4 FFT amplitude readings are affected by input amplifier roll-off.

54855A: -3 dB at 6 GHz, with amplitude decreasing as frequency increases above 6 GHz.

54854A: -3 dB at 4 GHz, with amplitude decreasing as frequency increases above 4 GHz.

54853A: -3 dB at 2.5 GHz, with amplitude decreasing as frequency increases above 2.5 GHz.

54852A: -3 dB at 2 GHz, with amplitude decreasing as frequency increases above 2 GHz.

5 The noise floor varies with memory depth and averaging.

6 Test signal peak-to-peak amplitude ≥ 5 divisions; vertical scale ≥ 10 mV/div; test signal rise time ≤ 415 ps (54852A), 335 ps (54853A), 225 ps (54854A), 150 ps (54855A); sample rate = 20 GSa/s (10 GSa/s for 54852A); sin(x)/x interpolation enabled; measurement threshold = fixed voltage at 50 % level.

7 Between two edges on a single channel. Rms value refers to the standard deviation of 256 consecutive measurements performed using an individual instrument.

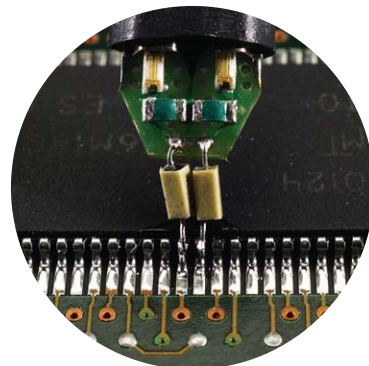
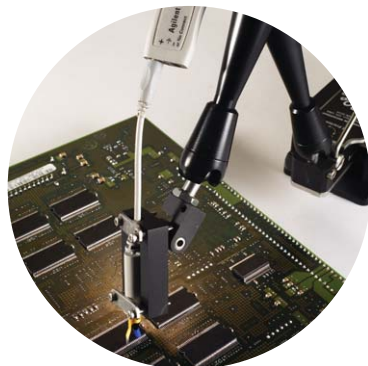
8 Internal trigger. Trigger level contained within full scale display range of trigger channel.

# InfiniiMax 1130 Series Performance Characteristics

|                                     | <b>1134A, 1132A, 1131A, 1130A</b>  |   |
|-------------------------------------|--|---|
| Bandwidth*                          | 1134A: > 7 GHz<br>1132A: > 5 GHz   | 1131A: > 3.5 GHz<br>1130A: > 1.5 GHz  |
| Rise and fall time (10% to 90%)     | 1134A: 60 ps<br>1132A: 86 ps   | 1131A: 100 ps<br>1130A: 233 ps  |
| System bandwidth (-3 dB)            | 1134A with 54855A: 6 GHz<br>1132A with 54854A: 4 GHz<br>1131A with 54853A: 2.5 GHz<br>1131A with 54846B: 2.25 GHz<br>1131A with 54852A: 2 GHz<br>1130A with 54832B/D, 33A/D: 1 GHz |   |
| Input capacitance <sup>1</sup>      | C <sub>m</sub> = 0.10 pF<br>C <sub>g</sub> = 0.34 pF<br>C <sub>diff</sub> = 0.27 pF<br>C <sub>se</sub> = 0.44 pF   | C <sub>m</sub> is between tips<br>C <sub>g</sub> is to ground for each tip<br>Differential mode capacitance = C <sub>m</sub> + C <sub>g</sub> /2<br>Single-ended mode capacitance = C <sub>m</sub> + C <sub>g</sub> |
| Input resistance*                   | Differential mode resistance = 50 kΩ ± 2%<br>Single-ended mode resistance = 25 kΩ ± 2%   |   |
| Input dynamic range                 | 5.0 V peak to peak, ± 2.5 V  |   |
| Input common mode range             | 6.75 V peak to peak dc to 100 Hz; 1.25 V peak to peak > 100 Hz   |   |
| Maximum signal slew rate            | 18 V/ns when probing a single-ended signal<br>30 V/ns when probing a differential signal   |   |
| DC attenuation                      | 10:1 ± 3% before calibration on oscilloscope<br>10:1 ± 1% after calibration on oscilloscope  |   |
| Zero offset error referred to input | < 30 mV before calibration on oscilloscope<br>< 5 mV after calibration on oscilloscope   |   |
| Offset range                        | ± 12.0 V when probing single-ended   |   |
| Offset accuracy                     | < ± 1% of setting when probing single-ended  |   |
| Noise referred to input             | 3.0 mV rms   |   |
| Propagation delay                   | ~6 ns (this delay can be deskewed relative to other signals)   |   |
| Maximum input voltage               | 30 V peak, CAT I   |   |
| ESD tolerance                       | > 8 kV from 100 pF, 300 Ω HBM  |   |

\* Denotes warranted specifications, all others are typical.

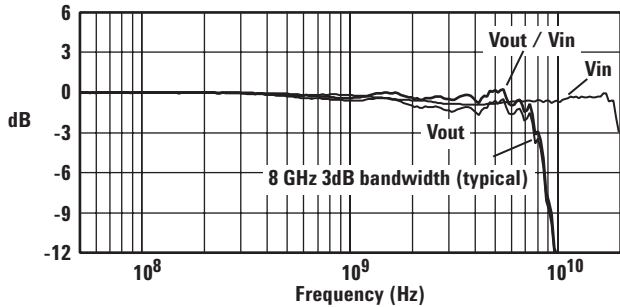
<sup>1</sup> Measured using the probe amplifier and solder-in differential probe head with full bandwidth resistors.



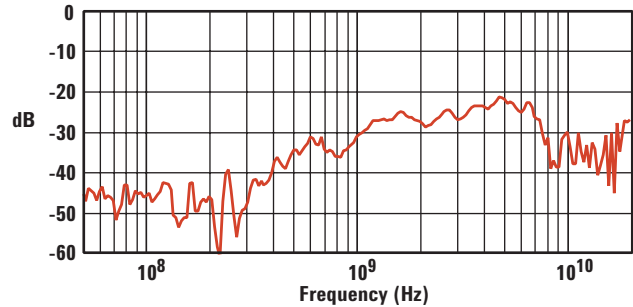


# InfiniiMax 1130 Series Performance Characteristics (continued)

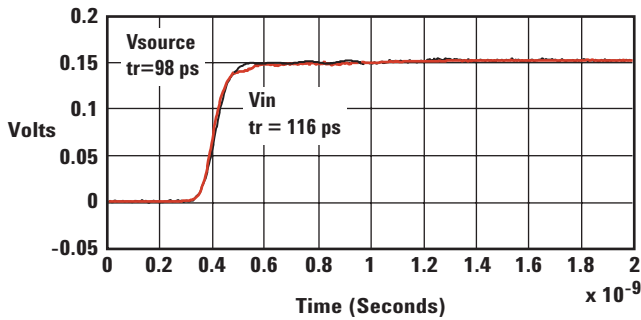
## Example of characterized performance plots: differential solder-in probe head



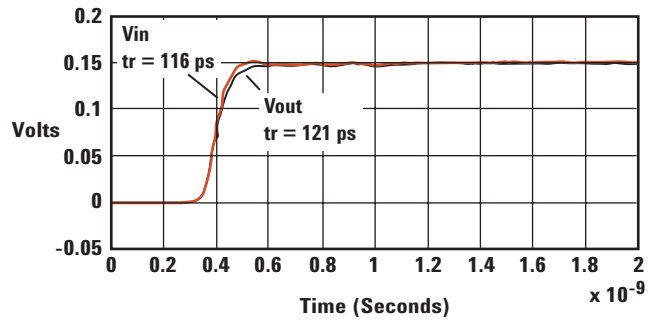
Swept frequency response



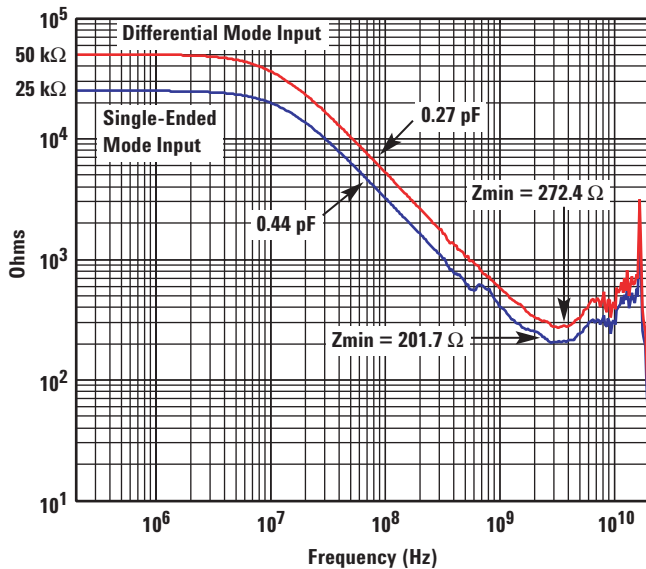
Common mode rejection vs. frequency



Time-domain probe loading



Time-domain probe tracking of 100 ps 10-90% step



Impedance vs. frequency

The electrical properties of the oscilloscope's probe head or probe accessory can often be the limiting factor in the measurement bandwidth or measurement accuracy that can be realized in practical use. The InfiniiMax probing system is the only high-bandwidth probing system that provides characterized performance plots for each of its probe heads. This allows you to see the measurement capability you can achieve for a given use model.

Additional InfiniiMax probe information including input impedance SPICE models (and corresponding SPICE decks) for InfiniiMax probes can be found online at [www.cos.agilent.com/manuals/scopes.html](http://www.cos.agilent.com/manuals/scopes.html).

# Ordering Information

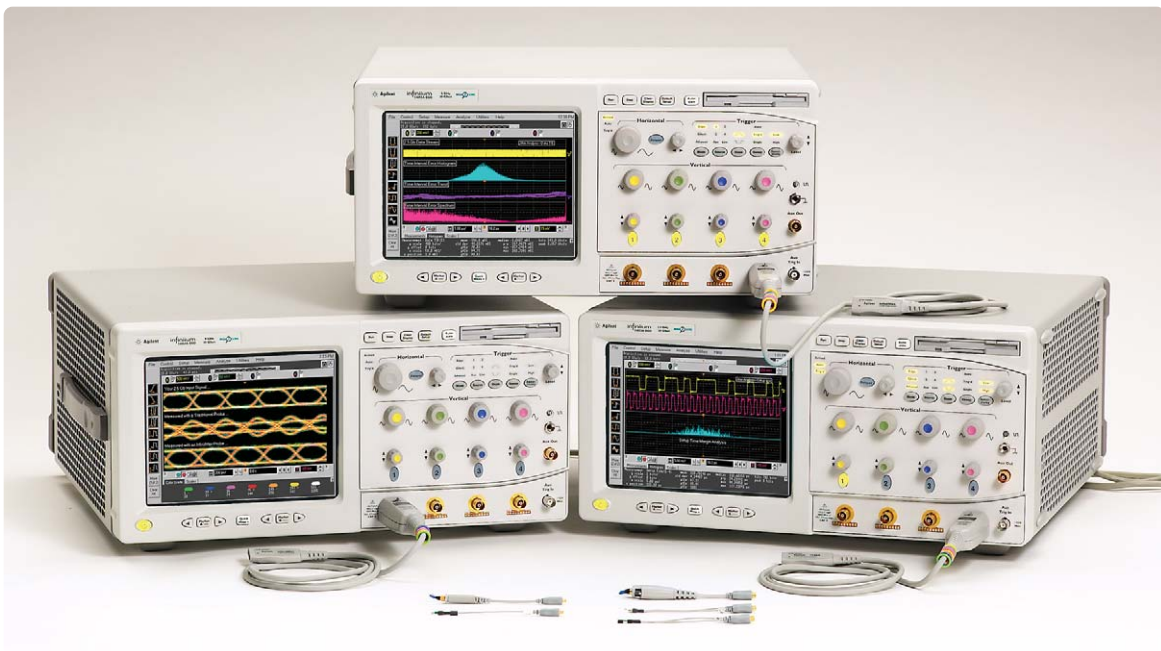
## Infiniium 54850 Series oscilloscopes

| Model  | Bandwidth | Channels | Sample rate per channel | Standard acquisition memory |
|--------|-----------|----------|-------------------------|-----------------------------|
| 54855A | 6 - 7 GHz | 4        | 20 GSa/s                | 262 kpts per channel        |
| 54854A | 4 GHz     | 4        | 20 GSa/s                | 262 kpts per channel        |
| 54853A | 2.5 GHz   | 4        | 20 GSa/s                | 262 kpts per channel        |
| 54852A | 2 GHz     | 4        | 10 GSa/s                | 262 kpts per channel        |

### The above models include:

- Optical USB mouse
- Compact keyboard
- User's quick-start guide
- Documentation CD (service guide, programmer's guide, programmer's quick reference guide)
- Accessory pouch
- Power cord
- High-performance calibration cable (54855A only)
- E2655B probe deskew and performance verification kit
- Two 54855-67604 BNC-compatible to precision 3.5 mm (f) adapters (54855A, 54854A only)
- One-year warranty.

Note: No probes are included with the 54850 Series oscilloscopes. The InfiniiMax 1130 Series probes must be purchased separately.





## Ordering Information (continued)

### Infiniium 54850 Series oscilloscope options and accessories

| <b>Options</b>            | <b>Description</b>  |
|---------------------------|---|
| 001                       | 1M/ch memory upgrade for Infiniium 5485xA oscilloscopes (32M/ch for sample rates $\leq$ 2 GSa/s).   |
| 002                       | EZJIT jitter analysis software for Infiniium 5485xA oscilloscopes (installed at the factory).   |
| 003                       | High-Speed Serial Data Analysis/Mask Testing with clock recovery and 8b/10b decoding (installed at the factory).  |
| 004                       | EZJIT Plus jitter analysis software (installed at the factory).   |
| 006                       | My Infiniium Integration Package (installed at the factory).  |
| 008                       | 7 GHz enhanced bandwidth software for the 54855A oscilloscope. Increase measurement bandwidth to 7 GHz (typical) or reduce scope bandwidth to 1 GHz to reduce system noise.               |
| 017                       | 20 GB removable hard disk drive for Infiniium 5485xA oscilloscopes<br>Replaces internal hard disk with a removable hard disk. Order the N5390A for additional hard disk drive cartridges. |
| 021                       | Low-Speed Serial Data Analysis for Infiniium 548xx oscilloscopes (installed at the factory).  |
| <b>Instrument options</b> | <b>Description</b>  |
| 1CM (E2609B)              | Rack-mount kit.   |
| <b>Service options</b>    | <b>Description</b>  |
| A6J                       | ANSI Z540-compliant calibration.  |

## Ordering Information (continued)

### Infiniium 54850 Series oscilloscope options and accessories (continued)

| Accessories | Description  |
|-------------|--|
| E2680A      | After-purchase memory upgrade for Infiniium 5485xA oscilloscopes.<br>Order 5485xA option 001 when purchasing a new Infiniium 5485xA oscilloscope. The E2680A is for customers who own a 5485xA scope and wish to upgrade the acquisition memory.   |
| N5390A      | Additional 20 Gb hard disk drive cartridge for Infiniium option 017.   |
| 54855-67604 | 18 GHz BNC-compatible to precision 3.5 mm (f) adapter.<br>Allows highest fidelity connection of 3.5 mm or SMA cables.  |
| E5850A      | Logic analyzer/oscilloscope time-correlation fixture<br> <p>Now you can more effectively verify and track down problems between the analog and digital portions of a design. Easily make time-correlated measurements between an Agilent 16900 Series logic analysis system and an Infiniium Series oscilloscope. With the E5850A time-correlation fixture, you can trigger the Infiniium from the logic analyzer (or vice versa), and automatically deskew the waveforms. The Infiniium time markers and the 16900 Series time markers are time-correlated and track each others. You can relate information on the oscilloscope and the logic analyzer precisely.</p> |
| Foot Switch | Kinesis Savant 3-action programmable foot switch P/N FS004PS2<br><br>Allows you to easily program the 3-action foot pedals to perform the following scope functions: run, stop, toggle between run and stop, save waveform, save screenshot, measure any five waveform parameters and recall an instrument setup.<br><br>See <a href="http://www.kinesis-ergo.com/">http://www.kinesis-ergo.com/</a> for additional information and ordering instructions.   |
| 1184A       | Testmobile<br> <p>Agilent's 1184A testmobile provides a convenient solution for your portability and storage needs. The 1184A includes a drawer for accessories and a keyboard tray with a mouse extension for either right- or left-handed operation.</p>  |

## Ordering Information (continued)

### InfiniiMax 1130 Series probing system

| Probe amplifiers model | Description  |
|------------------------|--|
| 1134A                  | 7 GHz InfiniiMax probe amp – order one or more probe heads or connectivity kits.   |
| 1132A                  | 5 GHz InfiniiMax probe amp – order one or more probe heads or connectivity kits.   |
| 1131A                  | 3.5 GHz InfiniiMax probe amp – order one or more probe heads or connectivity kits. |

| Connectivity kits model | Description   |
|-------------------------|---|
| E2669A                  | InfiniiMax connectivity kit for differential/single-ended measurements. Includes a differential browser, four solder-in differential probe heads and two socketed differential probe heads. Includes all necessary accessories. |
| E2668A                  | InfiniiMax connectivity kit for single-ended measurements. Includes one single-ended browser, one solder-in probe head and one socketed probe head. Includes all necessary accessories.   |

| Individual probe heads | Description   |
|------------------------|---|
| E2675A                 | InfiniiMax differential browser probe head and accessories. Includes 20 replaceable tips and ergonomic handle. Order E2658A for replacement accessories.  |
| E2676A                 | InfiniiMax single-ended browser probe head and accessories. Includes 2 ground collar assemblies, 10 replaceable tips, a ground lead socket and ergonomic browser handle. Order E2663A for replacement accessories.  |
| E2677A                 | InfiniiMax differential solder-in probe head and accessories. Includes 20 full bandwidth and 10 medium bandwidth damping resistors. Order E2670A for replacement accessories.   |
| E2678A                 | InfiniiMax single-ended/differential socketed probe head and accessories. Includes 48 full bandwidth damping resistors, 6 damped wire accessories, 4 square pin sockets and socket heatshrink. Order E2671A for replacement accessories. Order E5381-82103 for 34 damped wire accessories only. |
| E2679A                 | InfiniiMax single-ended solder-in probe head and accessories. Includes 16 full bandwidth and 8 medium bandwidth damping resistors and 24 zero ohm ground resistors. Order E2672A for replacement accessories.   |
| E2695A                 | Differential SMA probe head. Includes semi-rigid coax to change span between SMA cables. Works with InfiniiMax 1130 series probe amplifiers.  |

| Adapters | Description  |
|----------|--|
| N1022A   | Adapts 113x/115x active probes to 86100 Infiniium DCA. |

## Ordering Information (continued)

### InfiniiMax probing system

| Accessories | Description  |
|-------------|--|
| E2654A      | EZ Probe Positioner <sup>®</sup> : includes base, joystick, and articulating arm |
| E2655B      | Additional probe deskew/performance verification kit for InfiniiMax probes       |
| E2697A      | High impedance adapter (includes 500 MHz passive probe)                          |



The E2697A high impedance adapter allows connection of probes that require a high impedance input (e.g., passive probes, current probes) to the Infiniium 80000 Series of high-performance oscilloscopes. The E2697A high impedance adapter extends the capability of Agilent Infiniium high-performance oscilloscopes, making them ideal for a variety of general-purpose measurements such as power supplies, inverters, semiconductor measurements, etc. The E2697A provides switchable ac/dc coupling, as well as 10:1 and 1:1 attenuation settings.

#### Specifications/Characteristics

|   |   |  |
|---|---|--|
| Bandwidth                                     | Analog BW (–3 dB)                               | 500 MHz (with supplied 10073C passive probe)   |
|   | System Bandwidth                                | 500 MHz (with 10073C passive probe and 80000 Series oscilloscope)  |
| DC attenuation                                | 1.16:1  | E2697A internal attenuator at 1:1 (at scale settings > 200 mV/div signal size limited by input dynamic range)  |
|   | 11.6:1  | E2697A internal attenuator at 10:1 (at scale settings > 200 mV/div signal size limited by input dynamic range) |
| Input dynamic range                           | E2697A internal attenuator setting of 1:1       | ± 0.8 V  |
|   | E2697A internal attenuator setting of 10:1      | ± 8 V  |
| Input dynamic range with 10073C passive probe | E2697A internal attenuator setting of 1:1       | ± 8 V  |
|   | E2697A internal attenuator setting of 10:1      | ± 80 V   |
| Input impedance*                              | 1 MΩ ± 1% (~12 pF)                              |  |
| Input coupling                                | dc, ac (7 Hz)                                   |  |
| Maximum input voltage                         | ± 100V [dc + ac] [ac < 10 kHz], CAT I           |  |
| Offset range                                  | E2697A internal attenuator setting of 1:1       | ± 5 V  |
|   | E2697A internal attenuator setting of 10:1      | ± 50 V   |
| Dc gain accuracy <sup>1</sup>                 | ± 1.5% of full scale                            |  |
| Offset accuracy <sup>1</sup>                  | ± (1.5% of channel offset + 1.5% of full scale) |  |

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

<sup>1</sup> Full scale is defined as 8 vertical divisions.

## Ordering Information (continued)

### InfiniiMax 1130 Series probing system (continued)

| Other compatible probes | Description  |
|-------------------------|--|
| 1144A                   | 800 MHz active probe. Requires 1142A probe power supply when used with Infiniium scopes. Requires 01144-61604 probe power extender when using two or more 1144A active probes. |
| 1145A                   | 2-channel, 750 MHz active probe. Requires 1142A power supply when used with Infiniium oscilloscopes.   |
| 1156A                   | 1.5 GHz single-ended active probe for Infiniium scopes.  |
| 1157A                   | 2.5 GHz single-ended active probe for Infiniium scopes.  |
| 1158A                   | 4 GHz single-ended active probe for Infiniium scopes.  |
| 54006A                  | 7.5 GHz (typical) passive resistive divider probe – 10:1 (500 ohms) or 20:1 (1 kohms).   |

## Ordering Information (continued)

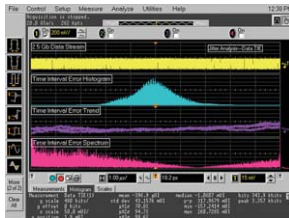
### Infiniium 54850 Series oscilloscope options and accessories (continued)

#### Accessories

#### Description

E2681A

EZJIT jitter analysis software



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. EZJIT jitter analysis software, combined with Agilent's Infiniium oscilloscopes, is a key tool for identifying and quantifying 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. Includes the following key measurements: cycle-to-cycle jitter, n-cycle jitter, period jitter, time interval error, setup and hold time, measurement histograms, measurement trending, and jitter frequency spectrum.

#### Features:

- Easy-to-use jitter measurements on high-speed signals
- PLL clock recovery
- Real-time trend, histogram, and spectrum displays

N5400A

EZJIT Plus jitter analysis software



Building on the capabilities of the EZJIT software, EZJIT Plus adds additional compliance views and an expanded measurement setup wizard for simplifying and automating RJ/DJ separation for testing against industry standards.

EZJIT Plus automatically detects embedded clock frequencies and repetitive patterns of the data 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.

Order N5401A to upgrade E2681A EZJIT to N5400A EZJIT Plus analysis software.

#### Features:

- Automated data rate and pattern detection of repetitive data signals
- New arbitrary data analysis mode allows for RJ/DJ separation on non-repetitive data waveforms
- PLL clock recovery (1st order, 2nd order or explicit clock)
- Real-time trend, histogram and spectrum displays
- Composite histogram views of separated RJ, PJ, DJ, DDJ, DCD and ISI jitter subcomponents
- Bathtub curve of total jitter versus eye-opening down to  $10^{-18}$  BER
- Simple, automated setup wizards for full user control over measurement type, clock recovery method and jitter measurement voltage threshold
- 1-, 2- and 4-grid displays maximize information available in one screen



## Ordering Information (continued)

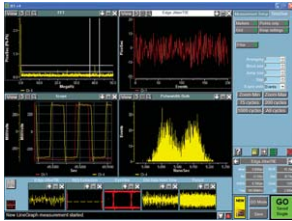
### Infiniium 54850 Series oscilloscope options and accessories (continued)

#### Accessories (continued)

#### Description

E2690B

Oscilloscope tools



ASA's Oscilloscope Tools, licensed from Amherst Systems Associates (ASA), comprise the most powerful suite of analysis, debug, collaboration, and automation tools for Agilent real-time oscilloscopes. ASA's Oscilloscope Tools work in tandem with Agilent's mixed-signal oscilloscopes to provide measurements never before possible.

Learn more about ASA Corp and Download the E2690B Oscilloscope Tools™ 7-day Demo.

#### Features:

- AutoMeasure® automatically detects which scope channels have signals, scales the signals, and sets the analysis software up to make the most frequently used set of measurements
- Make measurements across analog and digital domains for unprecedented insight (with Agilent mixed-signal oscilloscopes)
- Decompose jitter into random and deterministic jitter, including all components of jitter (Rj, Dj, Pj, DDj, DCD, and ISI)
- Locate repetitive phenomena with repetition interval analysis tools
- TestScript enables you to record repetitive sequences of measurements, button pushes, and limit comparisons
- Record/playback console allows you to collect full record-length acquisitions over hours or days, then replay and analyze them

## Ordering Information (continued)

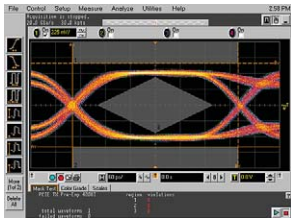
### Infiniium 54850 Series oscilloscope options and accessories (continued)

#### Accessories (continued)

#### Description

E2688A

High-speed serial data analysis/mask testing with clock recovery



Easily perform mask testing and characterize serial data streams that employ embedded clocks. The E2688A provides mask templates and clock recovery for verifying compliance to computer, communication and datacom standards. You can even characterize proprietary serial buses with the built-in, general purpose golden PLL clock recovery.

Features include:

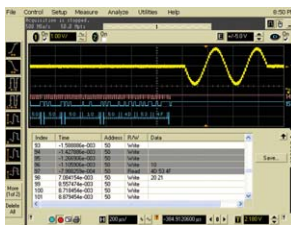
- Golden PLL clock recovery
- Set up wizard to configure the clock recovery
- Real-time eye diagram display with eye-mask unfolding
- Recovered clock display
- Time interval error (TIE) jitter measurement with statistics on the data stream
- Mask template loading
- 8b/10b decode with symbol trigger and search
- Serial listing window for tabular view and navigation of 8b/10b codes

Standard masks include:

- PCI Express (2.5 Gbps)
- Serial ATA (1.5 Gbps)
- Fibre Channel Electrical (1.0625, 2.125, 4.25 Gbps)
- Ethernet IEEE 802.3 (10/100/1000Base-T)
- Serial Attached SCSI, XAUI

N5391A

I<sup>2</sup>C/SPI serial data analysis software\* (option 021)



The N5391A low-speed serial data analysis (SDA) software provides a fast and easy way to debug Inter-Integrated Circuit (I<sup>2</sup>C) and 2-wire or 3-wire Serial Peripheral Interface (SPI) serial communication busses. The low-speed SDA software provides the ability to capture and automatically display decoded serial data in numerical format synchronized with the analog or digital waveform view of I<sup>2</sup>C or SPI serial data streams. The low-speed SDA software also features a listing window view with automatic click and zoom capability that contains a protocol decode list of all I<sup>2</sup>C or SPI packets that have been captured.

\* This product works with all DSO80000 Series and 54850 Series Infiniium oscilloscopes and requires version A.03.50 or higher without the listing window capability, and version A.04.20 or higher with the listing window capability.

N5402A

CAN serial data analysis software\*



The Agilent N5402A CAN serial data analysis (SDA) software allows engineers to view both protocol layer information and physical layer signal characteristics inside a single instrument, the Infiniium oscilloscope. Numerical decode values are automatically displayed and synchronized below the captured signal's waveform. A listing window view with automatic click and zoom capability shows the index number, time stamp value, address, data/remote/error frame type, and data content of all CAN packets that have been captured.

\* This product works with all DSO80000 Series and 54850 Series Infiniium oscilloscopes and requires version A.04.20 system software or higher.

## Ordering Information (continued)

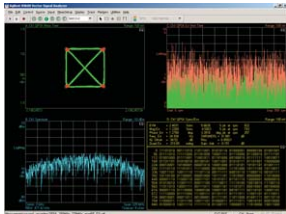
### Infiniium 54850 Series oscilloscope options and accessories (continued)

#### Accessories (continued)

#### Description

89601A

Vector signal analysis software



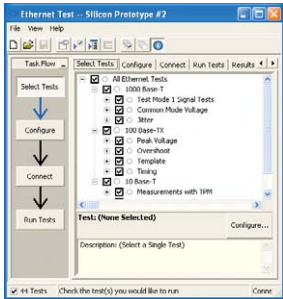
Agilent Infiniium oscilloscopes team up with the 89601A vector signal analysis software to provide powerful, flexible, wideband signal analysis with up to 13 GHz bandwidth for applications including wideband communications and modulated radar.

Features include:

- Measurement bandwidth up to 13 GHz
- Flexible analog and digital demodulation supports the most advanced, complex modulation formats
- Deep memory in the Infiniium oscilloscopes allows excellent dynamic range and frequency resolution
- Flexible, powerful displays including spectrogram provide rapid insight into dynamic signal behavior
- For signal integrity and jitter measurements up to 13-GHz bandwidth the high performance Infiniium DSO 80000 Series digital oscilloscopes offer InfiniiMax active probes, MegaZoom deep memory, and 40 GSa/s sample rates

N5392A

Ethernet electrical performance validation and compliance software for Infiniium 54830, 54850, and 80000 Series oscilloscopes



The Agilent N5392A Ethernet electrical performance validation and compliance software for Infiniium 54830 and 54850 Series oscilloscopes provides you with a fast and easy way to verify and debug your 1000Base-T, 100Base-TX and 10Base-T Ethernet designs. The Ethernet electrical test software allows you to automatically execute Ethernet physical-layer (PHY) electrical tests, and it displays the results in a flexible report format. In addition to the measurement data, the report provides a margin analysis that shows how closely your device passed or failed each test.

The Ethernet electrical performance validation and compliance software performs a wide range of electrical tests to meet the Ethernet electrical specifications for 1000Base-T, 100Base-TX and 10Base-T systems as documented in the IEEE 802.3-2002 and ANSI X3.263-1995 standards.

Features:

- Test setup wizard guides you through test selection, configuration, connection, execution, and results reporting
- Wide-range of electrical tests are performed for 1000Base-T, 100Base-TX and 10Base-T standards
- Measurement connection setups are displayed when you must change the test setup
- Oscilloscope setup is automatically configured for each test
- Test results report formally documents your test configuration, measurements made, pass/fail status, and waveforms
- Pass/fail margin analysis provides an indication of how close your device is to meeting a test specification
- The updated N5395B test fixture simplifies signal connections and supports all the tests of the N5392A Ethernet compliance test software including the new return loss and disturbing signal tests as specified in the standard

# Ordering Information (continued)

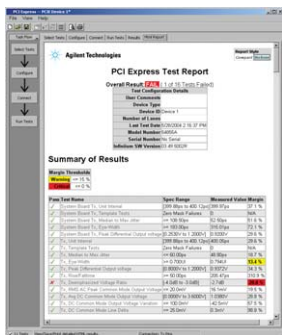
## Infiniium 54850 Series oscilloscope options and accessories (continued)

### Accessories (continued)

### Description

N5393A

PCI Express electrical performance validation and compliance software



The Agilent N5393A PCI Express electrical performance validation and compliance software provides you with a fast and easy way to verify and debug your PCI Express designs. The PCI Express electrical test software allows you to automatically execute PCI Express electrical checklist tests, and it displays the results in a flexible report format.

The N5393A PCI Express electrical test software utilizes the clock recovery method used in the official PCI-SIG Signal Quality Test Methodology (“SigTest”) application, ensuring that your test results are consistent with results from the SigTest application.

The PCI Express electrical performance validation and compliance software performs a wide range of electrical tests as per the PCI Express 1.0a electrical specifications for add-in cards and motherboard systems as documented in section 4 of the base specification and section 4 of the card electromechanical specification.

Requires the E2688A serial data analysis software and one of the PCI-SIG approved compliance test fixtures (CBB or CLB).

#### Features:

- Test setup wizard guides you through test selection, configuration, connection, execution, and results reporting
- Wide-range of electrical tests are performed, significantly more than SigTest
- PCI-SIG SigTest clock recovery algorithm is used to ensure consistency with SigTest
- Measurement connection setups are displayed when you must change the test setup
- Oscilloscope setup is automatically configured for each test
- Test results report formally documents your test configuration, measurements made, pass/fail status, and waveforms
- Pass/fail margin analysis provides an indication of how close your device is to meeting a test specification





## Ordering Information (continued)

### Infiniium 54850 Series oscilloscope options and accessories (continued)

#### Accessories (continued)

#### Description

N5411A

SATA compliance test software



The N5411A SATA electrical performance validation and compliance software for Infiniium 80000 Series oscilloscopes provides you with a fast and easy way to validate and debug your SATA 1.5 Gbps (Gen 1) and 3.0Gbps (Gen 2) silicon, host bus adapter, port multiplier, high-density disk drive or optical disk drive. The SATA electrical test software allows you to automatically execute SATA II electrical checklist tests at each of the i, m and x interface points, and displays the results in a flexible report format. In addition to the measurement data, the report provides a margin analysis that shows how closely your device passed or failed each test.

Simplify your SATA measurement process by using the TF-SATA-NE/XP SATA electrical test fixture board from Crescent Heart Software, Inc. The fixture provides access to the electrical measurement points required for the transmitter compliance testing. More information on the TF-SATA-NE/XP test fixture can be obtained from SATA compliance test fixture data sheet

Requires the E2688A serial data analysis software and the N5400A EZJIT Plus jitter analysis software.

#### Features:

- Test setup wizard for ease-of-use
- Complete set of SATA transmitter electrical tests
- Measurement process configurability
- Automated scope measurement setup
- Test results report generation
- Debug mode provided
- Pass/fail margin analysis

# Ordering Information (continued)

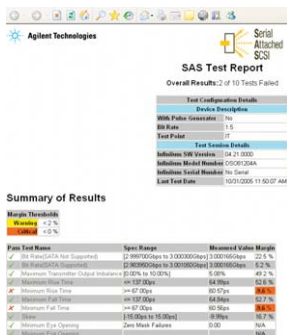
## Infiniium 54850 Series oscilloscope options and accessories (continued)

### Accessories (continued)

### Description

N5412A

Serial Attached SCSI (SAS)



Agilent's N5412A Serial Attached SCSI (SAS) electrical performance validation and compliance software for Infiniium 80000 Series oscilloscopes provides you with a fast and easy way to validate and debug your SAS 1.5 Gbps (SAS 150) and 3.0 Gbps (SAS 300) silicon, host bus adapter, initiator, high-density disk drive or enclosure backplane. 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, and displays the results in a flexible report format. In addition to the measurement data, the report provides a margin analysis that shows how closely your device passed or failed each test.

To make measurements with the N5412A SATA electrical test software, you will also need a method of connecting to the SAS compliance interface on the electrical mating surfaces of your SAS connector. Agilent currently provides a full set of compliance test fixtures for the SFF-8482, SAS x2 Internal Drive/Backplane connector interfaces. The N5421A SAS SFF-8482 compliance test fixture kit offers connectivity from the SFF-8482 primary and secondary transmitter and receiver differential ports to SMA for connection to Agilent Infiniium 80000 Series ultra-high performance oscilloscopes. The N5421A kit also includes the necessary Transmitter Compliance Transfer Function (TCTF) for emulating the worst-case backplane loss function for far-end (IR and CR) physical layer compliance testing, as well as the TX and RX Transient Circuit Test Loads. Each of these test circuits is defined in Section 5.3.2, Test Loads, in the "Project T10/1601-D: Serial Attached SCSI 1.1 Working Draft, Revision 9, March 18, 2005."



#### Features:

- User configurable test setup wizard for ease-of-use
- Complete set of SAS IT/CT and IR/CR transmitter electrical tests
- Time-saving oscilloscope test setup automation
- Graphical HTML test results report generation
- Trials test capability for quick comparison of multiple port configurations
- Pass/fail margin analysis for simple characterization



## Ordering Information (continued)

### Infiniium 54850 Series oscilloscope options and accessories (continued)

| Accessories (continued)   | Description  |
|---|--|
| N5413A  | DDR2 clock characterization application  |
|  | <p>The Agilent N5413A DDR2 clock characterization application tool provides you with a fast and easy way to characterize and evaluate your reference clock in your DDR2 design. The tests performed by the N5413A are based on the Intel DDR2 667/800 JEDEC specification addendum 0.7.</p> <p>Features:</p> <ul style="list-style-type: none"><li>• Automated test executive saves you time and ensures you get accurate repeatable result</li><li>• Automatic HTML report generation speeds the documentation of worst case conditions</li><li>• Performance tuned algorithms speed the analysis of 50 million clock cycles</li><li>• Configuration menu allows you to optimize the tool for your application needs</li></ul>  |
| N5416A  | USB compliance test software   |
|  | <p>The N5416A USB 2.0 compliance test software makes USB signal integrity testing as simple as capturing the signals with your oscilloscope; eliminating the need to transfer scope waveforms to a PC.</p> <p>Features:</p> <ul style="list-style-type: none"><li>• MATLAB scripts used with the N5416A USB 2.0 test software come from the USB-IF organization and are incorporated into a convenient test setup wizard</li><li>• The USB-IF recognizes Infiniium as a recommended scope for use in compliance testing</li><li>• Compatible with Infiniium 5483xB/D 4 and 4 + 16 ch, 5485xA 4-ch, and DS080000 Series 4-ch oscilloscopes with the Windows® XP Pro operating system</li><li>• Included with the N5416A are the USB-IF MATLAB scripts and wizard based test executive that not only simplifies the measurements but provides extra information such as margin analysis</li><li>• Ordering Information: For USB 2.0 hi-speed testing, order the N5416A test software as well as the E2649A for a complete set of six hi-speed test fixtures and power supply. For low/full speed testing order the Signal Quality inrush Droop/Drop (SQiDD) E2646A. For USB 2.0 hi-speed testing, a differential probe is required. Please order either the InfiniiMax 1131A 3.5 GHz, 1132A 5 GHz or 1134A 7 GHz probe amplifiers, along with the E2669A differential connectivity kit. See N5416A data sheet for complete ordering details.</li></ul> |
| Partner product   | IEEE-1394 pre-compliance test option   |
|   | <p>A pre-compliance test solution is available from Quantum Parametrics for use in conjunction with Agilent 80000 Series oscilloscopes. This test solution automates the compliance test process for the IEEE-1394 standard.</p> <p>See <a href="http://www.quantumparametrics.com">http://www.quantumparametrics.com</a> for additional information.</p>  |

## Ordering Information (continued)

### Infiniium 54850 Series oscilloscope options and accessories (continued)

#### Accessories (continued)

#### Description

E2625A

Communication mask test kit

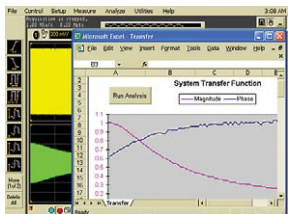


Take the frustration out of communications testing and prove your designs conform to industry standards with the E2625A communications mask test kit option. Infiniium's familiar Windows interface makes it easy for you to access the masks you need and configure your tests.

In addition, the E2625A communication mask test kit comes with a set of electrical communication adapters to ensure convenient, reliable and accurate connections to your device under test. Included are more than 20 industry standard ANSI T1.102 and ITU-T G.703 communication signal mask templates.

E2699A

My Infiniium integration package



My Infiniium allows you to extend the power of your Windows XP-based Infiniium oscilloscope by letting you launch customized applications, such as those written for Agilent VEE Pro, NI LabVIEW, MATLAB® or Microsoft Excel, directly from the oscilloscope's front panel or graphical user interface.

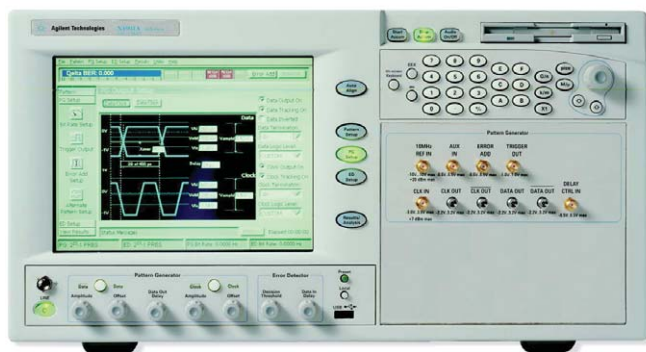
For more detailed information, please request Agilent publication number 5988-9934EN.

E2682A

VoiceControl option



If you're making measurements on target systems with densely packed ICs, your hands are tied up holding probes, making it difficult to turn knobs and press buttons on the front panel of your scope. Infiniium's award-winning VoiceControl option solves this problem. Just speak into the collar-mounted microphone to operate your Infiniium's front-panel controls without using your hands. Simply tell the scope what you want it to do, using natural English-language commands, such as "set channel one to 1 volt per division." The VoiceControl system does not require the scope to be trained to understand a particular user.



The Agilent Serial BERT generator N4901B (N4902B) option 200 provides high speed digital stimulus to your device with PRBS or memory based pattern from 150 Mb/s up to 13.5 Gb/s (7 Gb/s). For more information, see [www.agilent.com/find/pulse-generators](http://www.agilent.com/find/pulse-generators).

## Ordering Information (continued)



The Agilent 81134A pulse/pattern generator provides high speed stimulus to your devices, with pulses, patterns and PRBS data from 15 MHz to 3.35 GHz. You can also perform stressed eye diagram measurements with jitter on PRBS, data and clock signals.

### Related Literature

| Publication Title   | Publication Type    | Publication Number |
|---|---------------------|--------------------|
| <i>Infiniium 80000 Series Oscilloscopes</i>   | Data Sheet          | 5989-1487EN        |
| <i>Infiniium 54830 Series Oscilloscopes</i>   | Data Sheet          | 5988-3788EN        |
| <i>N5400 EZJIT Plus Jitter Analysis Software</i>  | Data Sheet          | 5989-0109EN        |
| <i>E2681A EZJIT Jitter Analysis Software</i>  | Data Sheet          | 5989-0109EN        |
| <i>E2690B Advanced Time Interval &amp; Jitter Analysis Software</i>                                   | Data Sheet          | 5989-3525EN        |
| <i>E2688A High-Speed Serial Data Analysis Software</i>  | Data Sheet          | 5989-0108EN        |
| <i>N5391A I<sup>2</sup>C and SPI Analysis Software</i>  | Data Sheet          | 5989-1250EN        |
| <i>N5402A CAN Analysis Software</i>   | Data Sheet          | 5989-3632EN        |
| <i>89601A Vector Signal Analysis Software</i>   | Data Sheet          | 5989-0947EN        |
| <i>N5392A Ethernet Compliance Test Package</i>  | Data Sheet          | 5989-1527EN        |
| <i>N5393A PCI-Express Test Package</i>  | Data Sheet          | 5989-1240EN        |
| <i>N5394A DVI Compliance Test Software</i>  | Data Sheet          | 5989-1526EN        |
| <i>N5399A HDMI Compliance Test Software</i>   | Data Sheet          | 5989-3047EN        |
| <i>N5409A FBD Compliance Test Software</i>  | Data Sheet          | 5989-4128EN        |
| <i>N5410A Fibre Channel Compliance</i>  | Data Sheet          | 5989-4209EN        |
| <i>N5411A SATA Compliance Test Software</i>   | Data Sheet          | 5989-3662EN        |
| <i>N5412A SAS Compliance Test Software</i>  | Data Sheet          | 5989-4208EN        |
| <i>N5413A DDR2 Clock Characterization</i>   | Data Sheet          | 5989-3195EN        |
| <i>N5416A USB Compliance Test Software</i>  | Data Sheet          | 5989-4044EN        |
| <i>E2699A My Infiniium Integration Package</i>  | Data Sheet          | 5988-9934EN        |
| <i>Using Agilent InfiniiMax Probes with Test Equipment other than Agilent Infiniium Oscilloscopes</i> | Configuration Guide | 5989-1869EN        |
| <i>Infiniium 54800 Series Oscilloscope Probes, Accessories and Options</i>                            | Selection Guide     | 5968-7141EUS       |

### Product Web site

For the most up-to-date and complete application and product information, please visit our product Web site at:

[www.agilent.com/find/infiniimax](http://www.agilent.com/find/infiniimax)

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