Agilent InfiniiVision 5000 Series Portable Oscilloscopes
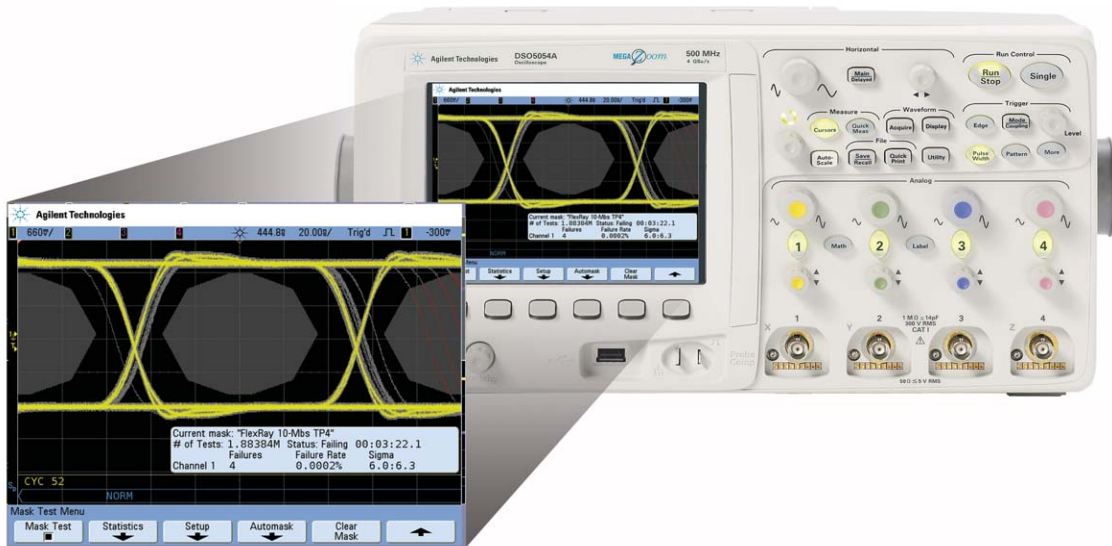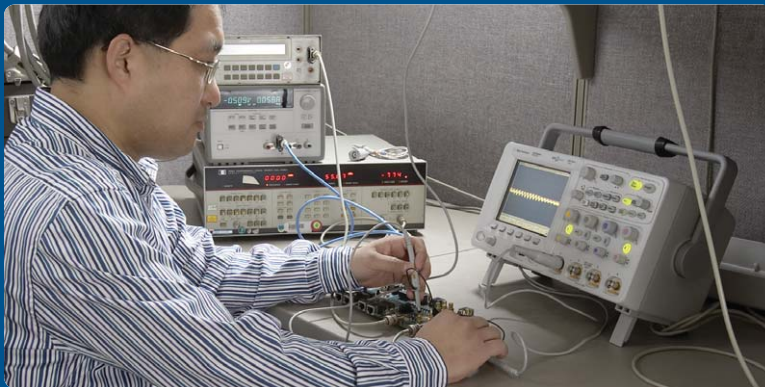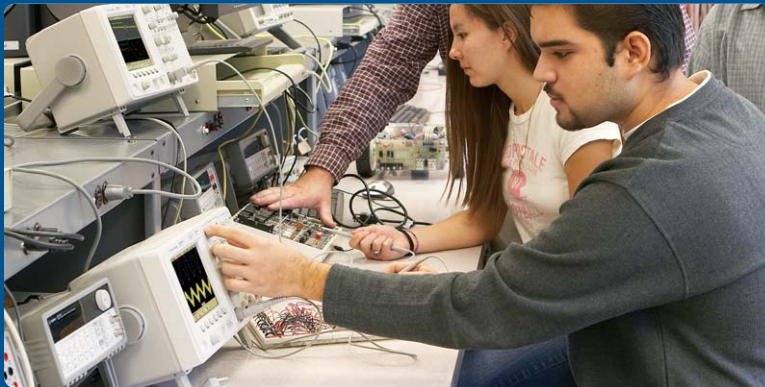
Data Sheet

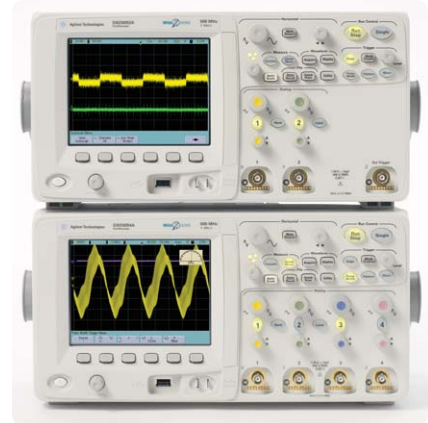## The Next Generation of Portable Oscilloscopes

Agilent Technologies

The new standard for everyday scopes

- 100, 300, and 500 MHz bandwidths

- 2 or 4 channels

- MegaZoom III memory and display technology
  - Up to 8 Mpts acquisition memory
  - Up to 100,000 waveforms per second real-time update rate (page 5)
  - High-definition XGA (1024 x 768) display with 256 levels of intensity grading

- Triggering and hardware accelerated decode for I^2C, SPI, I^2S, CAN, LIN and RS-232/UART (page 6)

- Up to 12 bits of vertical resolution, even in single-shot acquisitions (page 7)

- Complete connectivity – standard (page 6)
  - USB (2 host, 1 device), LAN, GPIB, XGA display out
  - Full remote control, including web browser
  - LXI class C compliant

- Manuals and in-scope help available in 11 languages

Traditional bench scopes are great for characterizing things that you know about. Agilent's MegaZoom III deep memory and fast update rates help you find the bugs you don't know about.

If you haven't purchased an Agilent oscilloscope lately, why should you consider one now?

Leading-edge technology for all scope users

The InfiniiVision 5000 Series oscilloscopes leverage the same third-generation MegaZoom III technology blocks used in our higher performance bench and lab oscilloscopes – **responsive deep memory, fast update rates with minimal "dead time," analog-like display systems, and integrated serial analysis** – and deliver them in a compact package, at a price similar to oscilloscopes with older technology blocks.

Industry-leading customer support

As the world's leading test and measurement vendor, Agilent maintains the largest network of sales engineers, application engineers, support engineers and technicians. From pre-sales collaboration, to calibration, to training and consulting, to repair and servicing, Agilent stands with you throughout the life of your product. It's no accident that Agilent has such loyal customers.

Don't take our word for it

Compare the InfiniiVision 5000 Series with your current bench scope. Or compare it to one of our competitors' newest scopes. You'll see why Agilent has been the **fastest-growing oscilloscope supplier since 1997** (CAGR, source: Prime Data 2006 Test Instrument Industry Service Market Share Analysis).

Model	BW (MHz)	Channels	Maximum sample rate	Memory	Update rate
DSO5012A	100	2	2 GSa/s		
DSO5014A	100	4	2 GSa/s		
DSO5032A	300	2	2 GSa/s	8 Mpts std[1]	Up to 100,000 waveforms per second (page 5)
DSO5034A	300	4	2 GSa/s		
DSO5052A	500	2	4 GSa/s[1]		
DSO5054A	500	4	4 GSa/s[1]		

1   Maximum sample rate and memory are achieved when two channels are interleaved

Why does deep memory matter?

See more time

Seeing more time is the most easily understood use of deep memory. The more samples you acquire, the more time you can see at a particular sample rate.

Long capture times give you better visibility into cause-effect relationships in your design, which greatly simplifies root-cause debugging. It also allows you to capture start-up events (like the start-up sequence in Figure 1) in a single acquisition.

You don't have to stitch together multiple acquisitions or set precise triggering conditions. Spend less time finding events, and more time analyzing them.

See more details

The relationship between memory depth and acquisition rate isn't as obvious. All scopes have a "banner" maximum sample rate specification, but many can only sustain these rates at a few timebase settings.

In the case of an oscilloscope with a 5 GSa/s acquisition rate and 10-Kpts of memory (Figure 2), those 10,000 points can only fill 2 µs of time. Since scopes have 10 time divisions, the sample rate drops at any time/div setting below 200 ns/div.

As a result, if you look at "slow/fast" events like a modulated signal, you run the risk of aliasing your signal. Or you may simply miss out on important signal details when you zoom in on it.

Deep memory oscilloscopes let you sustain a high sample rate over longer periods of time.

Always fast, always on

MegaZoom III is the third generation of the fast and deep memory architecture that Agilent introduced in 1996. It's not a special mode, unlike other deep-memory oscilloscopes. You have access to your MegaZoom memory at all times. And the display will respond instantly to your commands as you scale the +/div setting or pan and zoom in the Delayed (or "zoom") window.

You can learn more about MegaZoom III deep memory in Application Note 1446 - *Deep Memory Oscilloscopes: The New Tools of Choice*.
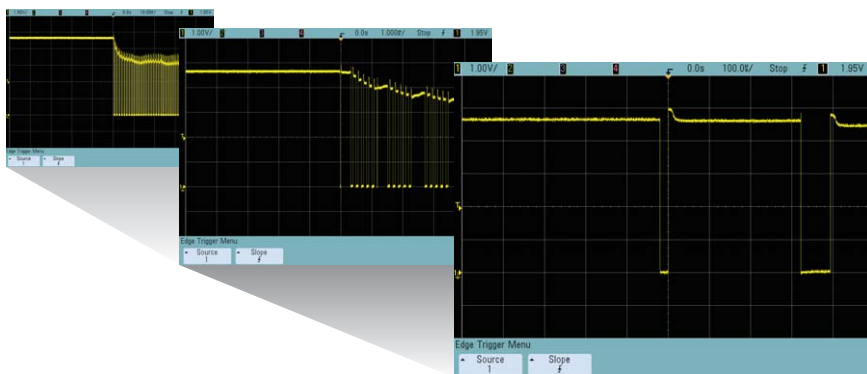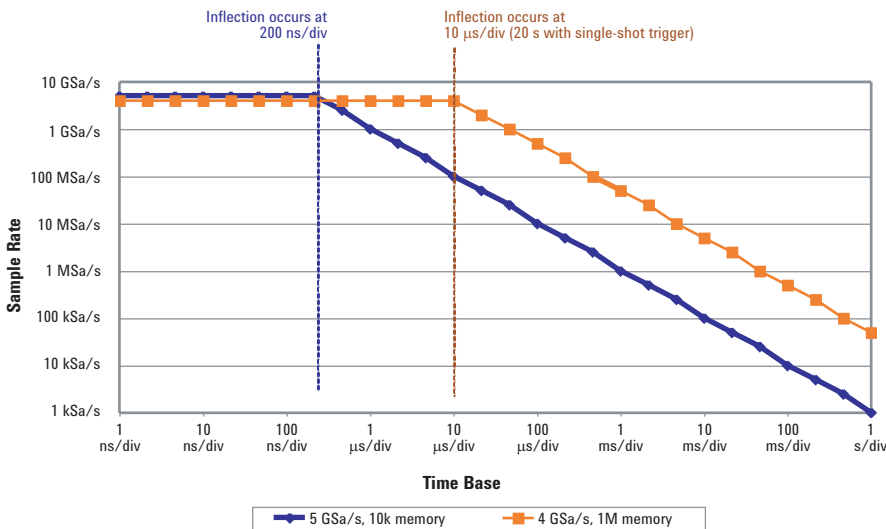

Figure 1.

Figure 2.

Why does a fast update rate matter?

If the human eye has trouble discerning above 30-50 frames per second, **is there really a difference between 3,600 and 100,000 waveforms per second?** If you know what you're looking for, the answer is probably "no." However, if you are hunting for unknown signal anomalies or characterizing jitter, the answer is "yes."
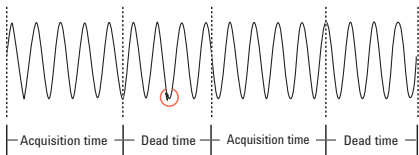
If you know that there is a **glitch in your system**, it's easy to capture it using a pulse-width trigger. However, if you are just browsing through your design, your chances of finding a glitch increase as the oscilloscope's update rate increases. If a glitch occurs during the "dead time" between samples, you miss it (Figure 3). With MegaZoom III technology, the dead time is much smaller (Figure 5). A scope with a slower update rate will capture the glitch eventually (if it recurs), but most engineers and technicians don't have the time or patience to wait for their tools to catch up.

If you are **characterizing signal jitter**, a fast update rate gives you accurate results sooner. And when the fast update rate is combined with the 5000 Series' XGA high-definition display (1024 x 768, 256 intensity levels), subtle differences in these acquisitions become obvious.

And like all other aspects of MegaZoom III technology, this update rate is delivered as a default real-time acquisition mode. **It's always fast, always on.**

Learn more about the benefits of a fast update rate by reading Application Note 1551 - *Improve Your Ability to Capture Elusive Events: Why Oscilloscope Waveform Update Rates Are Important.*

Figure 3. Reducing the dead time between acquisitions ...

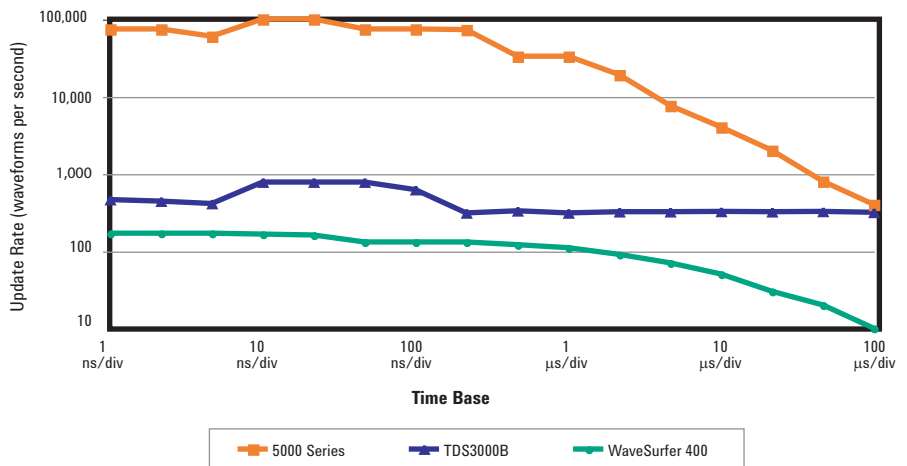**Figure 4. ... improves your chances of finding random events like glitches**

Figure 5. Update rates of popular oscilloscopes using their default real-time acquisition mode

Catch problems sooner and cover more of your debug checklist – our 100,000 waveforms per second update rate helps you find intermittent problems up to 100x faster than competitive scopes
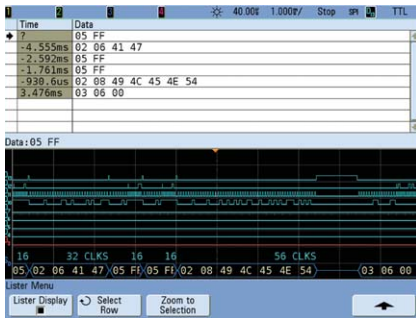
Software options

Figure 6A. On-screen serial decode of an SPI packet

I2C/SPI serial trigger and decode (N5423A or Option LSS on new scope purchases)

This application displays real-time time-aligned decode of I2C and SPI serial buses. Hardware-assisted triggering and decode provide the industries fastest throughput and update rate. Hardware-assisted triggering and decode guarantees you will never miss a trigger event or anomaly – unlike other scopes that have triggering dead time between acquisitions. Listing window shows a tabular view of all captures packets that match the on-screen waveform data.

This application requires a 4-channel DSO.

For more information:
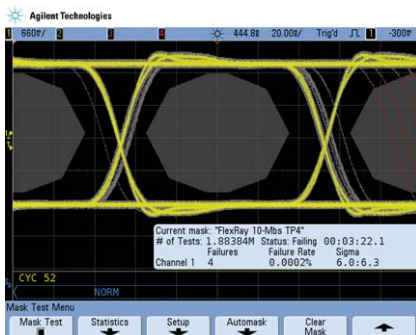**www.agilent.com/find/I2C-SPI**

Figure 6B. Mask testing uncovers infrequent signal anomalies

Mask testing (N5455A or Option LMT)

Agilent's mask test option (Option LMT or N5455A) for InfiniiVision Series oscilloscopes provides a fast and easy way to test your signals to specified standards, and uncover unexpected signal anomalies, such as glitches. Mask testing on other oscilloscopes is based on software-intensive processing technology, which tends to be slow. Agilent's InfiniiVision scopes can perform up to 100,000 real-time waveform pass/fail tests per second.

This provides testing throughput significantly faster than other mask test solutions, making valid pass/fail statistics available almost instantly.

For more information:

www.agilent.com/find/masktest
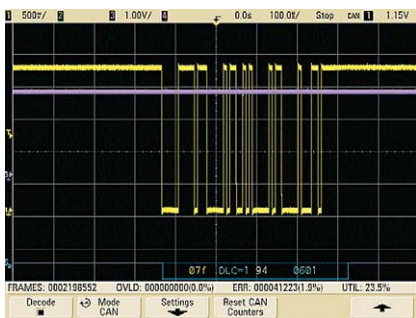
Figure 7. Real-time totalize functions provide CAN bus efficiency and quality measurement statistics

CAN/LIN triggering and decode (N5424A or Option AMS on new scope purchases)

Trigger on and decode serially transmitted data based on CAN and LIN protocols. This application not only provides triggering on complex serial signals, but also provides unique hardware-accelerated decode capabilities. Hardware-assisted triggering and decode guarantees you will never miss a trigger event or anomaly – unlike other scopes that have triggering dead time between acquisitions.

This application requires a 4-channel DSO.

For more information:
www.agilent.com/find/CAN-LIN

Figure 8. I2S Configuration PNG

I2S triggering and decode(N5468A or Option SND)

Find and debug intermittent errors and signal integrity problems faster on I2S audio protocol devices. This application offers powerful triggering and our unique hardware-accelerated decode and lister window so you can more easily find errors you could miss using other serial bus decode tools.

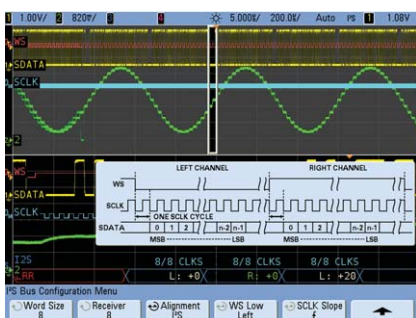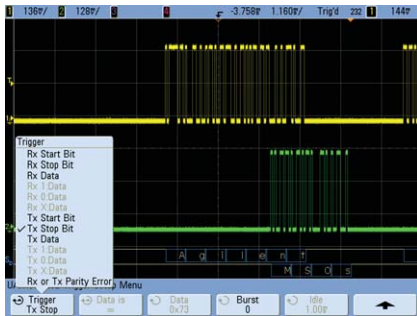# Software options (continued)

Figure 9. Trigger on and decode RS-232/UART transmission

RS-232/UART serial decode and trigger (N5457A or Option 232 on new scope purchases)
The application lets you easily view the information sent over a RS-232 or other UART serial bus. Display real-time time-aligned decode of transmit and receive lines. The application also enables triggering on RS-232/UART conditions.

This application requires a 4-channel DSO and can use any combination of the scope or logic acquisition channels.

For more information:
www.agilent.com/find/RS-232

Figure 10. Use segmented memory to optimize available memory

Segmented memory (N5454A or Option SGM on new scope purchases)
Segmented memory optimizes available memory for data streams that have long dead times between activity. The application is most useful for analyzing signal activity associated with laser pulses, serial buses, and bursty signals such as radar. View an

overlay of all signal segments, including serial decode, while highlighting the current segment. Quickly move between segments to view signal detail associated with a specific segment.

For more information:
www.agilent.com/find/segmented

7

Other nice features

High resolution mode
Offers up to 12 bits of vertical resolution in real-time, single-shot mode. This is accomplished by serially filtering sequential data points and mapping the filtered results to the display when operating at base time settings greater than 10 µs/div.

Help is at your fingertips
An embedded help system – available in 11 languages – gives you quick answers if you don't understand a feature. Simply press and hold the corresponding front-panel key, and a screen pops up to explain its function (Figure 11).

Waveform math with FFT
Analysis functions include subtract, multiply, integrate, and differentiate, as well as Fast Fourier Transforms (FFT).

23 automatic measurements with statistics
Get up to 4 simultaneous measurements with 5 additional statistics beyond the current value. Fast update rate provides statistical data for enabled measurements such as mean, min, max, standard deviation and count.

Pressing **[QuickMeas]** brings up the last four measurements selected. Cursors automatically track the most recently selected measurement.
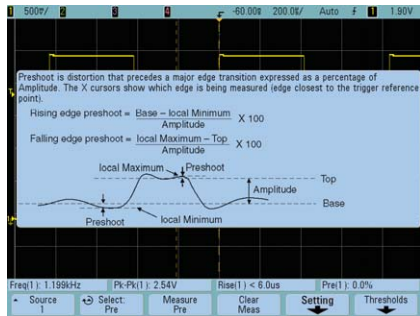

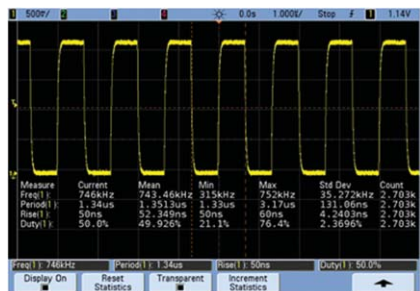**Figure 11. Press and hold a key for instant help**

Figure 12. Measurement statistics allow you to have confidence in your measurements. Statistics can show that a measurement is not only correct at one moment, but that it has stabilized and has a low variance over time, giving it a higher statistical validity.

Other nice features (continued)

Peak detect
250 ps peak detect on 500-MHz models, 500 ps on 300-MHz models and 1 ns on 100-MHz models helps you find narrow glitches.

AutoProbe interface
Automatically sets probe attenuation factors and provides power for selected Infiniium active probes, including the award-winning 1130A 1.5-GHz InfiniiMax differential active probe and 1156A 1.5-GHz single-ended active probe systems.

5-digit hardware counter
Measures frequency up to the bandwidth of the scope.

Trig Out
Provides an easy way to synchronize your scope to other instruments. Use the Trig Out port to connect your scope to a frequency counter for more accurate frequency measurements or to cross trigger other instruments.

Autoscale
Displays all active signals, and automatically sets the vertical, horizontal and trigger controls.

HDTV trigger
The 5000 Series supports analog HDTV/EDTV triggering for standards like 1080i, 1080p, 720p and 480p as well as standard video triggering on any line within a field, all lines, all fields, and odd or even fields for NTSC, SECAM, PAL and PAL-M video signals.

Serial Listing Display
In addition to seeing decoded packet date on the bus waveform itself, you can view all capture packets in a listing view where the decode matches the on-screen waveform data. This feature is also compatible with Agilent's Segmented Memory option (SGM)

Oscilloscope tools
E2690B Oscilloscope tools package, licensed by Agilent Technologies from Amherst Systems Associates (ASA), makes it easy to perform in-depth analysis of captured signals. More information can be found in the *Oscilloscope Tools* data sheet (Agilent publication number 5989-3525EN).

Offline viewing and analysis (B4610A)
Save your scope data to a USB or network drive and import the data into a PC-based offline viewer. Pan and zoom. Use searching and filtering to gain insight on analog and digital buses. Email the data to team members who can use the same tool at their PCs. (**www.agilent.com/find/ InfiniiVisionOffline**)
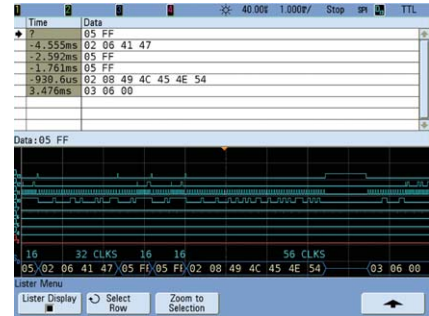
Figure 14. Serial listing display and decoded and all capture packets

Figure 13. View and analyze previously acquired scope data on a PC-based offline tool

Probing

To get the most out of your scope, you need the right probes and accessories for your application. That's why Agilent Technologies offers a complete family of innovative passive and active probes for the 5000 Series scopes to help you get your job done easily. For more comprehensive information, refer to the Agilent 6000 and 5000 Series Oscilloscope Probes and Accessories Data Sheet (Agilent publication number 5968-8153EN/ENUS) or visit **www.agilent.com/find/scope_probes**.
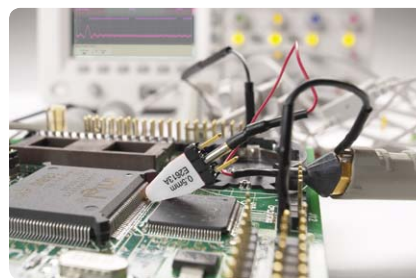
Selection guide

	10070C	N2863A (shipped with 100 MHz and 300 MHz models)	10073C (shipped with 500 MHz models)	10076A high-voltage probe	N2771A high-voltage probe
Probe bandwidth	20 MHz	300 MHz	500 MHz	250 MHz	50 MHz
Probe rise time (calculated)	< 17.5 ns	< 1.16 ns	< 700 ps	< 1.4 ns	< 7 ns
Attenuation ratio	1:1	10:1	10:1	100:1	1000:1
Input resistance (when terminated into 1 MΩ)	1 MΩ	10 MΩ	2.2 MΩ	66.7 MΩ	100 MΩ
Input capacitance	Approx. 70 pF	Approx. 12 pF	Approx. 12 pF	Approx. 3 pF	Approx. 1 pF
Maximum input (dc+peak ac)	400 Vpk CAT I (mains isolated) 400 Vpk CAT II (post receptacle mains)	300 Vrms	500 Vpk CAT I (mains isolated) 400 Vpk CAT II (post receptacle mains)	4000 Vpk	15 kV dc, 10 kVrms, 30 kV dc + peak ac
Compensation range	None	5-30 pF	6-15 pF	6-20 pF	7-25 pF
Probe sense	No	Yes	Yes	Yes	No
U.S. price	$175.00	$135.00	$311.00	$360.00	$1,203.00

Probing (continued)

Selection guide (continued)

Current probes	Description	U.S. price
1147A	50-MHz 115 A current probe, AC/DC	$2,007
1146A	100-kHz current probe, AC/DC	$713
N2780A	2-MHz/500 A current probe, AC/DC	$4,430
N2781A	10-MHz/150 A current probe, AC/DC	$3,689
N2782A	50-MHz/30 A current probe, AC/DC	$2,423
N2783A	100-MHz/30 A current probe, AC/DC	$2,742
N2779A	Power supply for N278xA	$1,041

Active single-ended probes	Description	U.S. price
1141A	200-MHz differential probe	$2,688
1144A	800-MHz active probe	$1,026
1145A	2-channel 750-MHz active probe	$1,277
1142A	Power supply for 1144A/1145A	$935
1156A	1.5-GHz active probe	$2,406

Active differential probes	Description	U.S. price
N2772A	20-MHz differential probe	$780
N2773A	Probe power supply for N2772A	$170
1130A	1.5-GHz InfiniiMax differential probe amplifier (Order one or more InfiniiMax probe heads or connectivity kits per amplifier.)	$2,895

Connectivity

Our customers tell us that oscilloscope connectivity is an increasingly important feature of their test instruments. That's why the 5000 Series scopes come with the most comprehensive hardware and software connectivity tools in their class.

Hardware connectivity

Standard ports include:

- 2 x USB host ports (for external storage and printing devices), one on the front and one on the rear

- 1 x USB device port for high-speed PC connectivity

- 10/100 Mbit LAN for Internet/intranet connectivity

- GPIB to allow easy migration into existing test systems

- XGA out for external monitors and projectors
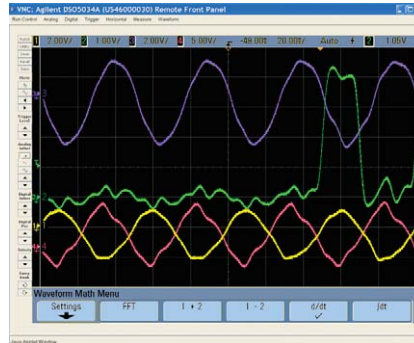
Figure 13. Agilent Remote Front Panel running in a Web browser

LXI class C

LAN eXtensions for Instrumentation (LXI) is a standards-based architecture for test systems. By specifying the interaction of system components, LXI enables fast and efficient test system creation and reconfiguration. The 5000 Series oscilloscopes follow specified LAN protocols and adhere to LXI requirements such as a built-in Web control server, IVI-COM driver, and easy-to-use SCPI commands. The standard Agilent I/O Library Suite makes it easy to configure and integrate instruments in your system.

IntuiLink toolbars

IntuiLink gives you a quick way to move screenshots and data into Microsoft® Word and Excel. These toolbars can be installed from **www.agilent.com/find/intuilink**.

View Scope logic analyzer and oscilloscope correlation

View Scope enables simple time-correlated measurements between an InfiniiVision 5000 Series oscilloscope and an Agilent 1680/90 or 16800/900 logic analyzer. Scope and logic waveforms are integrated into a single logic analyzer waveform display for easy analysis — all with a simple point-to-point LAN connection. You can also cross-trigger the instruments, automatically de-skew the waveforms, and maintain marker tracking between the instruments.

Figure 14. The 5000 Series has just about any connection you might need — standard.

Figure 15. Combine best-in-class instruments with a simple connection.

Performance characteristics

Acquisition

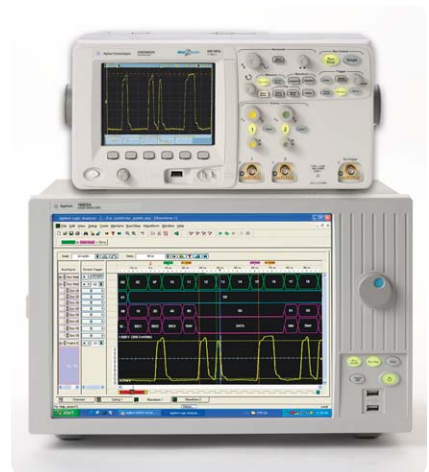|	
Sample rate	DSO501xA/503xA: 2 GSa/a each channel DSO505xA: 4 GSa/s half channel[1], 2 GSa/s each channel
Equivalent-time sample rate	400 GSa/s (when real-time mode is turned off)
Memory depth	Standard 8 Mpts half channel1 , 4 Mpts each channel
Vertical resolution	8 bits, up to 12 in high-resolution or averaging modes
Peak detection	DSO501xA: 1 ns peak detect DSO503xA: 500 ps peak detect DSO505xA: 250 ps peak detect
Averaging	Selectable from 2, 4, 8, 16, 32, 64 ... to 65536
High resolution mode	Average mode with #avg = 1 12 bits of resolution when ≥10 μs/div, at 4 GSa/s or ≥20 μs/div, at 2 GSa/s
Filter	Sinx/x interpolation (single shot BW = sample rate/4 or bandwidth of oscilloscope, whichever is less) with vectors on and in real-time mode

Vertical system

Scope channels	DSO50x2A: 2 Ch 1 and 2 simultaneous acquisition DSO50x4A: Ch 1, 2, 3, and 4 simultaneous acquisition
Bandwidth (–3dB)[2]	DSO501xA: DC to 100 MHz DSO503xA: DC to 300 MHz DSO505xA: DC to 500 MHz
AC coupled	DSO501xA: 3.5 Hz to 100 MHz DSO503xA: 3.5 Hz to 300 MHz DSO505xA: 3.5 Hz to 500 MHz
Calculated rise time (= 0.35/bandwidth)	DSO501xA: 3.5 nsec DSO503xA: 1.17 nsec DSO505xA: 700 psec
Single-shot bandwidth	DSO501xA: 100 MHz DSO503xA: 300 MHz DSO505xA: 500 MHz

1 Half channel is when only one channel of channel pair 1-2 is turned on, or one channel of channel pair 3-4 is turned on.
2 Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period and ±10° C from firmware calibration temperature.

Vertical system (continued)

Range[1]	2 mV/div to 5 V/div (1 MΩ or 50 Ω)
Maximum input	Maximum input voltage for analog inputs: CAT I 300 Vrms, 400 Vpk; transient overvoltage 1.6 kVpk CAT II 100 Vrms, 400 Vpk with N2863A 10:1 probe: CAT I 600 V, CAT II 300 V (DC + peak AC) with 10073C 10:1 probe: CAT I 500 Vpk, CAT II 400 Vpk with 50 Ω input: 5 Vrms, CAT I
Offset range	±5 V on ranges < 10 mV/div; ±20 V on ranges 10 mV/div to 200 mV/div; ±75 V on ranges >200 mV/div
Dynamic range	±8 div
Input impedance	1 MΩ ± 1% || 12 pF or 50 Ω ± 1.0%, selectable
Coupling	AC, DC
BW limit	25 MHz selectable
Channel-to-channel isolation	DC to max bandwidth > 40 dB
Standard probes	DSO501xA: 10:1 N2863A shipped standard for each oscilloscope channel DSO503xA: 10:1 N2863A shipped standard for each oscilloscope channel DSO505xA: 10:1 10073C shipped standard for each oscilloscope channel
Probe ID	Auto probe sense and AutoProbe interface Agilent- and Tektronix-compatible passive probe sense
ESD tolerance	±2 kV
Noise, RMS, input shorted	DSO501xA: 0.5% full scale or 250 µV, whichever is greater DSO503xA: 0.5% full scale or 300 µV, whichever is greater DSO505xA: 0.5% full scale or 360 µV, whichever is greater
DC vertical gain accuracy[2]	±2.0% full scale
DC vertical offset accuracy	≤ 200 mV/div: ±0.1 div ±2.0 mV ±0.5% offset value; > 200 mV/div: ±0.1 div ±2.0 mV ±1.5% offset value
Single cursor accuracy[1]	±{DC vertical gain accuracy + DC vertical offset accuracy + 0.2% full scale (~1/2 LSB)} *Example:* for 50 mV signal, oscilloscope set to 10 mV/div (80 mV full scale), 5 mV offset, accuracy = ±{2.0% (80 mV) + 0.1 (10 mV) + 2.0 mV + 0.5% (5 mV) + 0.2%(80 mV)} = ± 4.785 mV
Dual cursor accuracy[1]	±{DC vertical gain accuracy + 0.4% full scale (~1 LSB)} *Example:* for 50 mV signal, oscilloscope set to 10 mV/div (80 mV full scale), 5 mV offset, accuracy = ±{2.0% (80 mV) + 0.4% (80 mV)} = ±1.92 mV

1   2 mV/div is a magnification of 4 mV/div setting. For vertical accuracy calculations, use full scale of 32 mV for 2 mV/div sensitivity setting.
2   Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period and ±10 °C from firmware calibration temperature.

Performance characteristics (continued)

Horizontal

Range	DSO501xA: 5 nsec/div to 50 sec/div DSO503xA: 2 nsec/div to 50 sec/div DSO505xA: 1 nsec/div to 50 sec/div
Resolution	2.5 psec
Time scale accuracy*	Specification: 25 ppm from 0 °C to 40 °C Characteristic: 25 ppm + 1 ppm per °C from 40 °C to 55 °C
Vernier	1-2-5 increments when off, ~25 minor increments between major settings when on
Delay range	Pre-trigger (negative delay): Greater of 1 screen width or 125 µs Post-trigger (positive delay): 1 s to 500 seconds
Channel delta-t accuracy	Same channel: ±0.0025% reading ±0.1% screen width ±20 ps Channel-to-channel: ±0.0025% reading ±0.1% screen width ±40 ps *Same channel example (DSO505xA):* For signal with pulse width of 10 µs, oscilloscope set to 5 µs/div (50 µs screen width), delta-t accuracy = ±{0.0025% (10 µs) + 0.1% (50 µs) + 20 ps} = 50.27 ns
Modes	Main, delayed, roll, XY
XY	Bandwidth: Max bandwidth Phase error at 1 MHz: < 0.5 degrees Z Blanking: 1.4 V blanks trace (use external trigger on DSO50x2A, channel 4 on DSO50x4A)
Reference positions	Left, center, right
Segmented memory re-arm time	8 µs (minimum time between trigger events)

Trigger system

Sources	DSO50x2A: Ch 1, 2, line, ext DSO50x4A: Ch 1, 2, 3, 4, line, ext
Modes	Auto, normal (triggered), single
Holdoff time	~60 ns to 10 seconds
Trigger jitter	15 ps rms

* Denotes warranted specification. Specifications are valid after a 30 minute warm-up period and ±10 °C from firmware calibration procedure.

Performance characteristics (continued)

Trigger system (continued)

Selections	Edge, pulse width, pattern, TV, duration
Edge	Trigger on a rising, falling, or alternating edge of any source
Pulse width	Trigger when a positive- or negative-going pulse is less than, greater than, or within a specified range on any of the source channels. Minimum pulse width setting: 5 ns (DSO501xA) 2 ns (DSO503xA, DSO505xA) Maximum pulse width setting: 10 s
Pattern	Trigger at the beginning of a pattern of high, low, and don't care levels and/or a rising or falling edge established across any of the channels, but only after a pattern has been established for a minimum of 2 nsec. The channel's high or low level is defined by that channel's trigger level.
Sequence	Arm on Event A, trigger on Event B(edge or pattern), with option to reset on Event C or time delay
TV	Trigger using any oscilloscope channel on most analog progressive and interlaced video standards including HDTV/EDTV, NTSC, PAL, PAL-M or SECAM broadcast standards. Select either positive or negative sync pulse polarity. Modes supported include Field 1, Field 2, all fields, all lines, or any line within a field. TV trigger sensitivity: 0.5 division of sync signal. Trigger holdoff time can be adjusted in half field increments.
Duration	Trigger on a multi-channel pattern whose time duration is less than a value, greater than a value, greater than a time value with a timeout, or inside or outside of a set of time values. Minimum duration setting: 2 ns Maximum duration setting: 10 s
CAN	Trigger on CAN (Controller Area Network) version 2.0A and 2.0B signals. Trigger on the start of frame (SOF) bit (standard). N5424A option supports triggering on remote frame ID (RTR), data frame ID (~RTR), remote or data frame ID, data frame ID and data, error frame, all errors, acknowledge error and overload frame.
LIN	Trigger on LIN (Local Interconnect Network) sync break at beginning of message frame (standard). N5424A option supports triggering on frame ID.
I^2C	Trigger on I^2C (Inter-IC bus) serial protocol at a start/stop condition or user defined frame with address and/or data values. Also trigger on missing acknowledge, address with no acq, restart, EEPROM read, and 10-bit write.
SPI	Trigger on SPI (Serial Protocol Interface) data pattern during a specific framing period. Supports positive and negative Chip Select framing as well as clock Idle framing and user-specified number of bits per frame.
RS-232/UART	View the information sent over a RS-232 serial bus. Display real-time time-aligned decode of transmit and receive lines. The application also enables triggering on RS-232/UART conditions.
AutoScale	Finds and displays all active channels, sets edge trigger mode on highest-numbered channel, sets vertical sensitivity on channels, time base to display ~1.8 periods. Requires minimum voltage > 10 mVpp, 0.5% duty cycle and minimum frequency > 50 Hz.

Performance characteristics (continued)

Channel triggering

Range (internal)	±6 div from center screen
Sensitivity[1]	< 10 mV/div: greater of 1 div or 5mV; ≥ 10 mV/div: 0.6 div
Coupling	AC (~10 Hz), DC, noise reject, HF reject and LF reject (~50 kHz)

1 Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period and ±10° C from firmware calibration temperature.

External (EXT) triggering	DSO50x2A	DSO50x4A
Input impedance	1 MΩ ±3% || 12 pF or 50 Ω ±1%	1.015 kΩ ±5%
Maximum input	CAT I 300 Vrms, 400 Vpk; transient overvoltage 1.6 kVpk CAT II 100 Vrms, 400 Vpk with N2863A 10:1 probe: CAT I 600 V, CAT II 300 V (DC + peak AC) with 10073C 10:1 probe: CAT I 500 Vpk, CAT II 400 Vpk 5 Vrms with 50-Ω input, CAT I	±15 V
Range	DC coupling: trigger level ± 1 V and ± 8 V	±5 V

Sensitivity	For ± 1V range setting:
	   DC to 100 MHz, 100 mV, >100 MHz to bandwidth of
	   the oscilloscope, 200 mV
	For ±8 V range setting:
	   DC to 100 MHz, 250 mV; >100 MHz to bandwidth of
	   the oscilloscope, 500 mV
		DC to 100 MHz, 500 mV

Coupling	AC (~10 Hz), DC, noise reject, HF reject and LF reject (~50 kHz)	
Probe ID	Auto probe sense and AutoProbe interface Agilent- and Tektronix-compatible passive probe sense	

Display system

Display	6.3-inch (161 mm) diagonal color TFT LCD
Display update rate	Up to 100,000 waveforms/sec in real-time mode

Resolution	XGA:
	   768 vertical by 1024 horizontal points (screen area);
	   640 vertical by 1000 horizontal points (waveform area)
	256 levels of intensity scale

Controls	Waveform intensity on front panel. Vectors on/off; infinite persistence on/off, 8 x 10 grid with intensity control
Built-in help system	Key-specific help displayed by pressing and holding key or softkey of interest
Real-time clock	Time and date (user adjustable)

Performance characteristics (continued)

Measurement features

Automatic measurements	Measurements are continuously updated. Cursors track last selected measurement.
Voltage	Peak-to-peak, maximum, minimum, average, amplitude, top, base, overshoot, preshoot, RMS, standard deviation, Ratio (dB)
Time	Frequency, period, + width, – width and duty cycle on any channel. Rise time, fall time, X at max Y (time at max volts), X at min Y (time at min volts), delay, and phase on oscilloscope channels only.
Counter	Built-in 5-digit frequency counter on any channel. Counts up to the oscilloscope's bandwidth.
Threshold definition	Variable by percent and absolute value; 10%, 50%, 90% default for time measurements
Cursors	Manually or automatically placed readout of horizontal (X, ΔX, 1/ΔX) and vertical (Y, ΔY). Tracking Cursors provides an additional mode for cursor positioning beyond the current manual method. When cursor tracking is enabled, changing a cursor's x-axis position results in the y-axis cursor tracking the corresponding y-axis (voltage, current, etc.) value. Additionally logic or scope channels can be displayed as binary or hex values.
Waveform math	f (g(t)) g(t): { 1, 2, 3, 4, 1-2, 1+2, 1x2, 3-4, 3+4, 3x4} f(t): { 1-2, 1+2, 1x2, 3-4, 3+4, 3x4, FFT(g(t)), differentiate d/dt g(t), integrate ∫ g(t) dt, square root √g(t) } Where 1,2,3,4 represent analog input channels 1, 2, 3, and 4 Note: Channels 3 and 4 only available on DSO5xx4A models
Measurement Statistics	Statistical data for enabled measurements such as mean, min, max, standard deviation and count

FFT

Points	Fixed at 1000 points
Source of FFT	1, 2, 1+2, 1-2, 1x2, DSO5xx4A: 3, 4, 3+4, 3-4, 3x4; where 1, 2, 3, 4 represent the analog channel inputs 1, 2, 3, and 4
Window	Rectangular, flattop, hanning, Blackman Herris
Noise floor	–50 to –90 dB depending on averaging
Amplitude	Display in dBV, dBm at 50 Ω
Frequency resolution	0.05/time per div
Maximum frequency	50/time per div

Storage

Save/recall	10 setups and traces can be saved and recalled using internal non-volatile memory. Optional secure environment mode ensures setups and traces are stored to internal volatile memory so data is erased when power is removed. Compliant to NISPOM Chapter 8 requirements.
Storage type and format	USB 1.1 host ports on front and rear panels Image formats: BMP (8-bit), BMP (24-bit), PNG (24-bit) Data formats: X and Y (time/voltage) values in CSV format, ASCII XY format, BIN format Trace/setup formats: Recalled

I/O

Standard ports	USB 2.0 high speed device, two USB 1.1 host ports, 10/100-BaseT LAN, IEEE488.2 GPIB, XGA video output
Max transfer rate	IEEE488.2 GPIB: 500 kbytes/sec USB (USBTMC-USB488): 3.5 Mbytes/sec 100 Mbps LAN (TCP/IP): 1 Mbytes/sec
Printer compatibility	Current printer support can be found at http://agilent.com/find/InfiniiVision-printers

Performance characteristics (continued)

General characteristics

Physical size	35.4 cm wide x 18.8 cm high x 17.4 cm deep (without handle) 38.5 cm wide x 18.8 cm high x 17.4 cm deep (with handle)
Weight	Net: 4.1 kg (9 lbs) Shipping: approximately 9 kgs (20 lbs)
Probe comp output frequency ~	1.2 kHz, amplitude ~2.5 V
Trigger out	0 to 5 V into open circuit (~23 ns delay) 0 to 2.5 V into 50 Ω
Kensington lock	Connection on rear panel for security

Power requirements

Line voltage range	100-120 V, 50/60/400 Hz; 100-240V, 50/60 Hz auto ranging
Line frequency	50/60 Hz, 100-240 VAC; 440 Hz, 100-132 VAC
Power usage	120 W max

Environmental characteristics

Ambient temperature	Operating -10 °C to +55 °C; non-operating –40 °C to +70 °C
Humidity operating	95% RH at 40 °C for 24 hour; non-operating 90% RH at 65 °C for 24 hour
Altitude	Operating to 4,570 m (15,000 ft); non-operating to 15,244 m (50,000 ft)
Vibration	Agilent class GP and MIL-PRF-28800F; Class 3 random
Shock	Agilent class GP and MIL-PRF-28800F (operating 30 g, 1/2 sine, 11-ms duration, 3 shocks/axis along major axis. Total of 18 shocks)
Pollution degree	Normally only dry non-conductive pollution occurs. Occasionally a temporary conductivity caused by condensation must be expected.
Indoor use	Rated for indoor use only

Other

Measurement categories	CAT I
Regulatory information	Safety IEC 61010-1:2001 / EN 61010-1:2001 Canada: CSA C22.2 No. 61010-1:2004 USA: UL 61010-1:2004
Supplementary information	The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC, and carries the CE-marking accordingly. The product was tested in a typical configuration with HP/Agilent test systems. Product specifications, characteristics, and descriptions in this document are subject to change without notice.

Ordering information

Available models

Product number	Description
DSO5012A	100 MHz, 2-channel portable oscilloscope
DSO5014A	100 MHz, 4-channel portable oscilloscope
DSO5032A	300 MHz, 2-channel portable oscilloscope
DSO5034A	300 MHz, 4-channel portable oscilloscope
DSO5052A	500 MHz, 2-channel portable oscilloscope
DSO5054A	500 MHz, 4-channel portable oscilloscope

Standard features

Product number	Description
Warranty	3-year return-to-Agilent warranty
Hardcopy user's guide	
ABA	Printed user's guide in English
ABD	Printed user's guide in German
ABF	Printed user's guide in French
ABZ	Printed user's guide in Italian
ABJ	Printed user's guide in Japanese
AC6	Printed user's guide in Korean
AB9	Printed user's guide in Portuguese
AKT	Printed user's guide in Russian
AB2	Printed user's guide in simplified Chinese
ABE	Printed user's guide in Spanish
AB0	Printed user's guide in traditional Chinese
Power cord	
900	United Kingdom
901	Australia/New Zealand
902	Continental Europe
903	United States/Canada
906	Switzerland
912	Denmark
917	South Africa/India
918	Japan
919	Israel
920	Argentina
921	Chile
922	China
927	Brazil/Thailand
Probes	One probe per channel DSO501x, DSO503x: N2863A DSO505x: 10073C
Software	Agilent IO Libraries
Interface language support	GUI menus: English, simplified Chinese, traditional Chinese, Korean, Japanese
Other documentation	Service guide (CD-ROM, English), Certificate of Calibration, Declaration of Conformance
Miscellaneous	Protective front cover

Ordering information (continued)

Options

Product number	Description
SEC	Secure environment mode – Provides compliance with National Industrial Security Program Operating Manual (NISPOM) Chapter 8 requirements
A6J	ANSI Z540-compliant calibration
080	8 Mpts memory upgrade (from base 1 Mpts)

Serial data analysis applications

Option number – user installed	Option number – factory installed	Description
N5424A	AMS	CAN/LIN automotive triggering and decode (4-channel models only)
N5423A	LSS	I^2C/SPI serial decode option (for 4-channel models only)
N5457A	232	RS-232/UART triggering and decode (4 channel models only)
N5468A	SND	I2S Audio Triggering and decode (4 channel models only)
N5454A	SGM	Segmented memory
N5455A	LMT	Mask limit testing

Available software

Product number	Description
Oscilloscope Tools	
E2690B	Oscilloscope Tools software (U.S. and Canada)
N5385B	Oscilloscope Tools software (International)
E2693B	1 year update subscription for oscilloscope tools (U.S. and Canada)
N5388B	1 year update subscription for oscilloscope tools (International)
	(You will order Option 005 – Scope Guide. High-bandwidth Agilent oscilloscopes support more comprehensive versions of Oscilloscope Tools. Please refer to Agilent Publication 5989-3525EN: *E2690B Oscilloscope Tools* for more details.)
N5427A	Secure environment mode- provides compliance with National Industrial Security Program Operating Manual (NISPOM) Chapter 8 requirements (after purchase option)
N2762A	8 Mpts acquisition memory upgrade

Accessories

Product number	Description
N2916B	Rackmount kit for 6000 and 5000 Series oscilloscopes
N2917B	Transit case for 6000 and 5000 Series oscilloscopes
N2760A	Soft carrying case for 5000 Series oscilloscopes

Cable

Product number	Description
10833A	GPIB cable, 1 m long

Probing

Common probes are listed on page 9. For a more comprehensive list, please refer to the Agilent 6000 and 5000 Series Oscilloscope Probes and Accessories Data Sheet (Agilent publication number 5968-8153EN/ENUS), or **visit www.agilent.com/find/scope_probes**

Related literature

Publication title	Publication type	Publication number
Agilent Technologies Oscilloscope Family Brochure	Brochure	5989-7650ENUS
Agilent Technologies InfiniiVision 5000, 6000 and 7000 Probes and Accessories Series Oscilloscope	Data Sheet	5968-8153EN
Agilent Technologies Infi niiVision 6000 Series Oscilloscopes	Data Sheet	5989-2000EN
N5423A I^{2}C and SPI Triggering and Hardware-Accelerated Decode Options for InfiniiVision 5000, 6000 and 7000 Series Oscilloscopes	Data Sheet	5989-5126EN
CAN/LIN Measurements (Option AMS) for Agilent's InfiniiVision Series Oscilloscopes	Data Sheet	5989-6220EN
Agilent Technologies InfiniiVision 7000 Series Oscilloscopes	Data Sheet	5989-7736EN
RS-232/UART Triggering and Hardware-Accelerated Decode Options for InfiniiVision 5000, 6000 and 7000 Series Oscilloscopes	Data Sheet	5989-7832EN
Segmented Memory Option for InfiniiVision 5000, 6000 and 7000 Series Oscilloscopes	Data Sheet	5989-7833EN
Offline Viewing and Analysis for InfiniiVision 5000, 6000 and 7000 Series Oscilloscopes	Data Sheet	5989-7834EN
Deep Memory Oscilloscopes: The New Tools of Choice	Application Note 1446	5989-9106EN
N5455A Mask/Waveform Limit Testing for InfiniiVision Oscilloscopes	Data Sheet	5990-3269EN
I^{2}S Triggering and Hardware-based Decode (Option SND) for Agilent InfiniiVision Oscilloscopes	Data Sheet	5990-4198EN

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