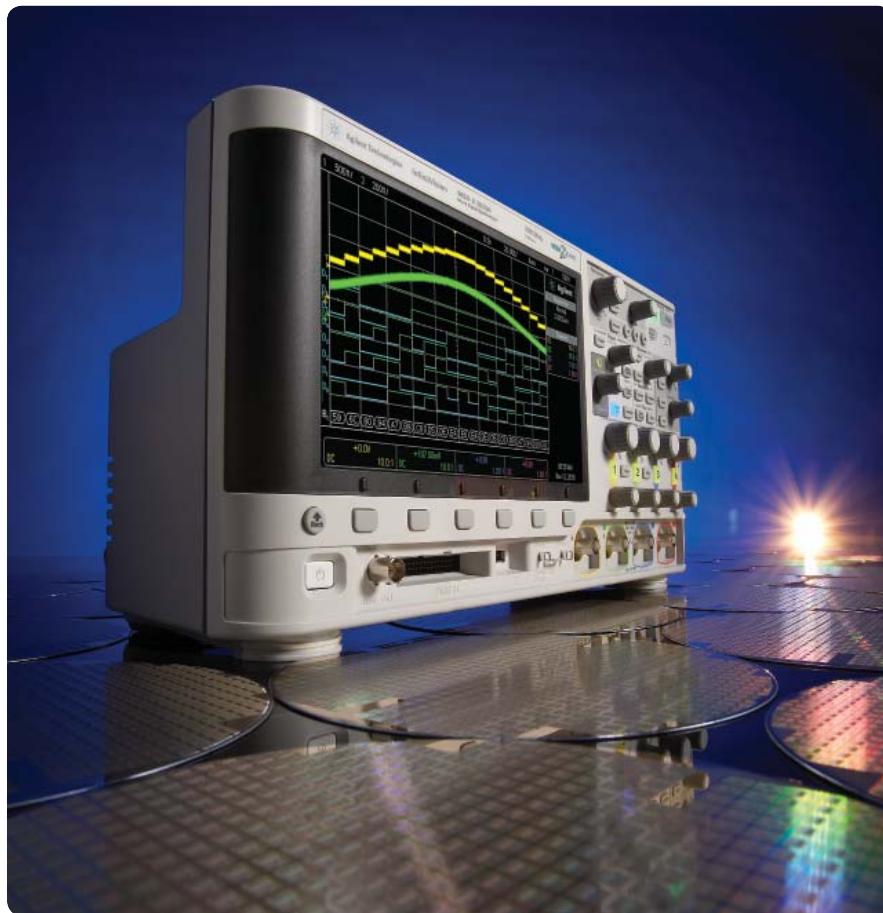


# InfiniiVision 2000 X-Series Oscilloscopes

## Data Sheet



Oscilloscopes redefined:  
Breakthrough technology delivers  
more scope for the same budget



Agilent Technologies

# Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

## Breakthrough technology for budget conscious customers

Agilent Technologies is the fastest growing scope vendor in the market for good reason: we deploy our investments in technology to solve your measurement problems. This commitment to superior technology brings you the InfiniiVision X-Series oscilloscopes – engineered to deliver value, functionality and flexibility at prices that fit into

your existing budgets. Whether you are looking for a basic entry-level oscilloscope or a more sophisticated model to get your job done, you want the most you can get for your money. The full line of InfiniiVision X-Series oscilloscopes – 26 models – ensure that you get exactly what you need today with room to grow in the future.

### Overview of the Agilent InfiniiVision X-Series oscilloscopes

	InfiniiVision 2000 X-Series	InfiniiVision 3000 X-Series
Analog channels		2 and 4 analog channels
Digital timing channels	8 on MSO models or with DSOX2MSO upgrade	16 on MSO models or with DSOX3MSO upgrade
Bandwidth (upgradable)	70, 100, 200 MHz	100, 200, 350, 500 MHz
Maximum sample rate	1 GSa/s per channel 2 GSa/s half channel interleaved mode	2 GSa/s per channel 4 GSa/s half channel interleaved mode
Maximum memory depth	100 kpts (standard)	2 Mpts standard, 4 Mpts optional (Option DSOX3MemUp)
Waveform update rate	50,000 waveforms per second	1,000,000 waveforms per second
WaveGen built-in 20 MHz function generator	Yes (Option DSOX2WAVEGEN) No AWG Capability	Yes (Option DSOX3WAVEGEN) with AWG capability
Search and navigate	No	Yes
Serial protocol analysis	No	Yes (multiple options)
Segmented memory	Yes (Option DSOX2SGM)	Yes (Option DSOX3SGM)
Mask limit testing	Yes (Option DSOX2MASK)	Yes (Option DSOX3MASK)
AutoProbe interface	No	Yes

### Need more memory or bandwidth?

See the InfiniiVision 7000B Series oscilloscopes

- 12.1" display - nearly 40% larger than the nearest competitor.
- 100 MHz to 1 GHz DSO and MSO models
- 8 Mpts memory standard.
- Upgradability for MSO channels and Measurement applications
- Hardware-based measurement applications including serial decode
- Xilinx FPGA dynamic probe support
- Altera FPGA dynamic probe support
- Standard LAN, USB, and XGA video out connectivity
- Up to 2000 waveforms with Segmented Memory acquisition

See [www.agilent.com/find/7000](http://www.agilent.com/find/7000) for more details



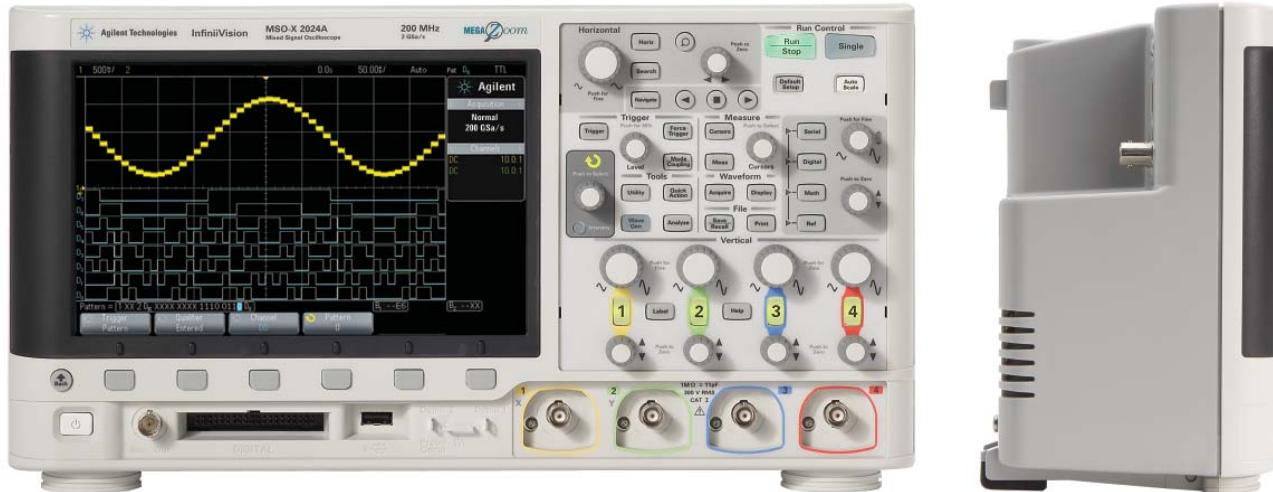
Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

## More scope

The InfiniiVision 2000 X-Series offers entry-level price points to fit your budget with superior performance and optional capabilities that are not available in any other oscilloscope in its class. Agilent's breakthrough technology delivers more scope for the same budget.

With more scope, you can:

- **See more** of your signal more of the time with the largest screen in its class, the deepest memory and the fastest waveform update rates
- **Do more** with the power of 3 instruments in 1: oscilloscope, logic timing analyzer and WaveGen built-in 20 MHz function generator (optional)
- **Get more** investment protection with the industry's only fully upgradable scope, including bandwidth



# Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

## See more of your signal, more of the time

### Largest display

Engineering for the best signal visibility starts with the largest display. Our 8.5-inch WVGA display offers twice the viewing area with five times the resolution (WVGA 800x480 versus QVGA 320x240).



### Fastest update rate

With Agilent-designed *MegaZoom IV* custom ASIC technology, the Infiniivision 2000 X-Series family delivers up to 50,000 waveforms per second. With this speed you can see signal detail and infrequent anomalies more of the time.



Notice that the Agilent 2000 X-Series allows you to see more of your signals, and captures the infrequent glitch that you are unable to see on other oscilloscopes in this class.

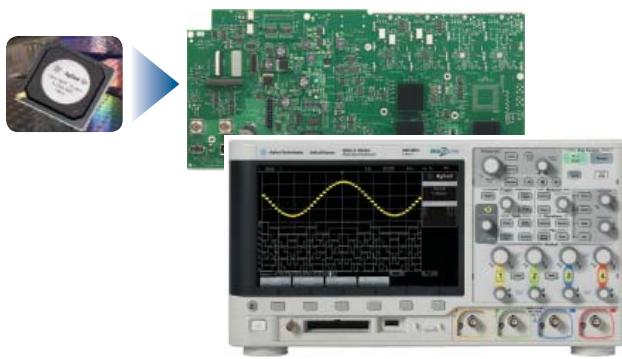
### Deeper memory for longer time capture

With up to 100 kpts of memory you get 40X more than other scopes in this class, enabling you to capture long, non-repeating signals while maintaining a high sample rate, then quickly zoom in on areas of interest. Deep memory lets the scope maintain a high sample rate over longer time spans.



### How does Agilent do that?

Agilent-designed *MegaZoom IV* custom ASIC technology combines the capabilities of an oscilloscope, logic analyzer, and WaveGen built-in function generator in a compact form factor at an affordable price. 4<sup>th</sup> generation *MegaZoom* technology enables the industry's fastest waveform update rate with responsive deep memory acquisitions.

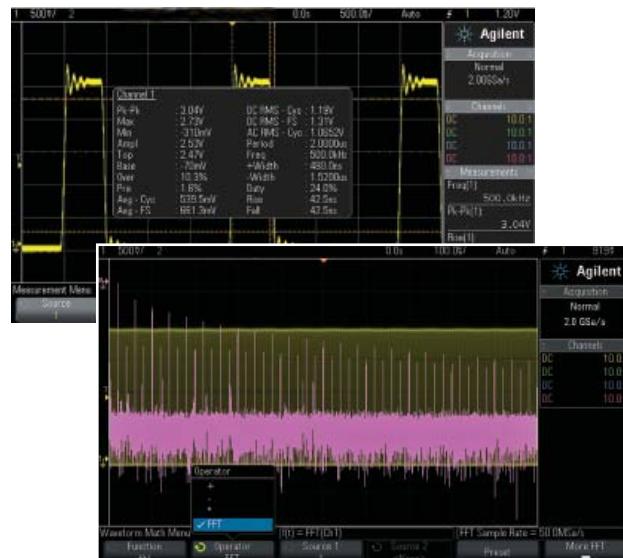


## Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget Do more with the power of 3 instruments in 1

### Best-in-class oscilloscope

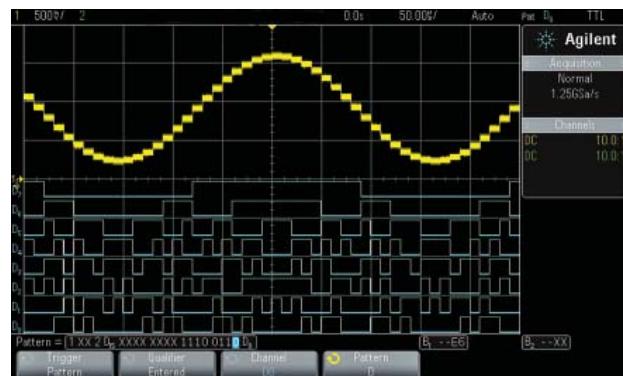
The InfiniiVision 2000 X-Series features the deepest memory in its class with 100 kpts of Agilent's patented *MegaZoom* IV technology that is always enabled and always responsive providing the industry's fastest update rate at up to 50,000 waveforms per second, with no compromise if you turn on measurements or add digital channels.

In addition, the 2000 X-Series offers 23 automated measurements such as voltage, time, and frequency as well as four waveform math functions including FFT. All of this at a comparable price to the Tektronix TDS2000C oscilloscope.



### Industry's first economy-class mixed signal oscilloscope (MSO)

The 2000 X-Series is the first instrument in its class to offer an integrated logic timing analyzer. Up until now oscilloscopes in this class have only come with 2 or 4 analog channel options. However, digital content is everywhere in today's designs and traditional 2 and 4 channel oscilloscopes do not always provide enough channels for the job at hand. With an additional 8 integrated digital timing channels, you now have up to 12 channels of time-correlated triggering, acquisition and viewing on the same instrument. Buy a 2 or 4 channel DSO and at any time, upgrade it yourself to a MSO with a license to turn on those integrated 8 digital timing channels.



### Industry-exclusive WaveGen built-in 20 MHz function generator

An industry first, the 2000 X-Series offers an integrated 20 MHz function generator. Ideal for educational or design labs where bench space and budget are at a premium, the integrated function generator provides stimulus output of sine, square, ramp, pulse, DC and noise waveforms to your device under test. No need to buy a separate function generator when you can get one integrated in your new oscilloscope. Turn on WaveGen at any time by ordering the DSOX2WaveGen option and install the license yourself.



Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

## Get more investment protection with the industry's only fully upgradable oscilloscope

### Upgradability:

Project needs change, but traditional oscilloscopes are fixed – you get what you pay for at the time of purchase. With the 2000 X-Series, your investment is protected. If you need more bandwidth (up to 200 MHz), digital channels, WaveGen or measurement applications in the future, you can easily add them all after the fact.

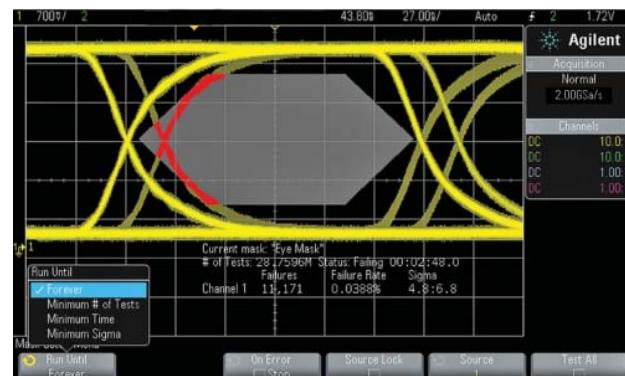
See pages 20-21 for more information on upgradable products.

Add at the time of your purchase or upgrade later:

- Bandwidth
- Digital channels (MSO)
- WaveGen built-in 20 MHz function generator
- Measurement applications
  - Mask testing
  - Segmented memory
  - Educators' lab kit

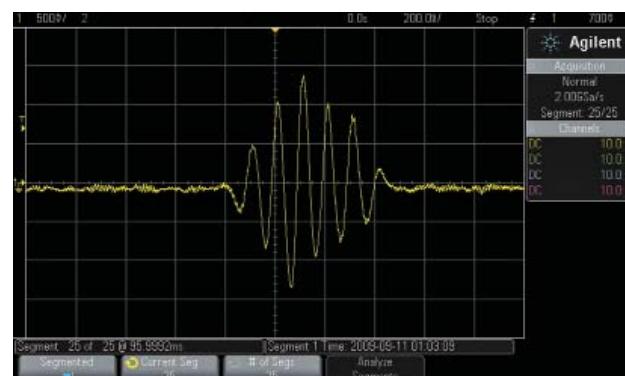
### Mask testing

Whether performing pass/fail tests to specified standards in manufacturing or testing for infrequent signal anomalies in R&D debug, the mask test option can be a valuable productivity tool. The 2000 X-Series features the industry's only hardware-based mask testing and can perform up to 50,000 tests per second.



### Segmented memory

When capturing low-duty cycle pulses or data bursts, you can use segmented memory acquisition to optimize acquisition memory. Segmented memory acquisition lets you selectively capture and store important segments of signals without capturing unimportant signal idle/dead-time. Segmented memory acquisition is ideal for applications including packetized serial pulses, pulsed laser, radar bursts and high-energy physics experiments. Up to 25 segments can be captured on the 2000 X-Series models with a minimum re-arm time under 19  $\mu$ s.

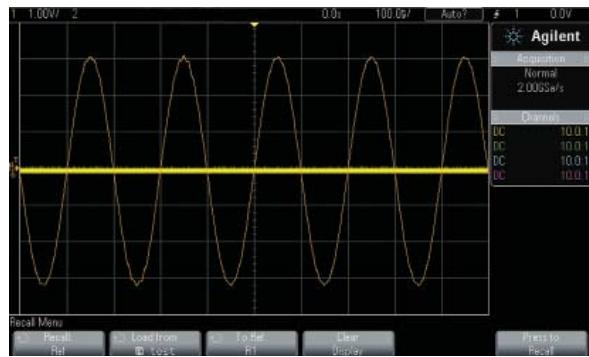


# Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

## Other productivity tools

### Reference waveforms

Store up to two waveforms in the scope's non-volatile reference waveform memory locations. Compare these reference waveforms with live waveforms, and perform post analysis and measurements of stored data. You can also store waveform data on a removable USB memory device that can be recalled back into one of the available two reference memories of the scope for full waveform measurement and analysis. Save and/or transfer waveforms as XY data pairs in a comma-separated values format (\*.csv) for PC analysis. Save screen images to a PC for documentation purposes in a variety of formats including: 8-bit bitmaps (\*.bmp), 24-bit bitmaps (\*.bmp), and PNG 24-bit images (\*.png).



### Localized GUI and help

Operate the scope in the language most familiar to you. The graphical user interface, built-in help system, front panel overlays, and user's manual are available in 11 languages. Choose from: English, Japanese, simplified Chinese, traditional Chinese, Korean, German, French, Spanish, Russian, Portuguese and Italian. During operation, access the built-in help system just by pressing and holding any button.



### Probe solutions

Get the most out of your 2000 X-Series scope, by using the right probes and accessories for your application. Agilent offers a complete family of innovative probes and accessories for the InfiniiVision 2000 X-Series scopes. For the most up-to-date and complete information about Agilent's probes and accessories, please visit our Web site at [www.agilent.com/find/scope\\_probes](http://www.agilent.com/find/scope_probes).



Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

## Other productivity tools

### Autoscale

Quickly display any active signals and automatically set the vertical, horizontal and trigger controls for optimal viewing with the press of the autoscale button. (This feature can be disabled or enabled for the education environment).



### Connectivity and LXI Compatibility

Built-in USB host (one front, one back) and USB device ports make PC connectivity easy. Operate the scope from your PC and save and recall stored waveforms as well as set-up files via LAN. An optional LAN/VGA module gives you network connectivity and complete LXI class C support as well as the ability to connect to an external monitor. An optional GPIB module is also available. Only one module may be used at a time.

Intuilinear toolbars and Data Captive gives you a quick way to Move screen shots and data into Microsoft Word and Excel. These toolbars can be installed from [www.agilent.com/find/intuilinear](http://www.agilent.com/find/intuilinear)

View Scope enables Simple and free time-correlated measurements between a 2000 X-Series oscilloscope and an Agilent 16900, 16800, 1690 or 1680 Series logic analyzer.



### Virtual Front Panel

Use the VNC viewer via your internet browser to remotely control your oscilloscope from your computers web browser. The virtual front panel looks and acts as the real front panel on the oscilloscope with the same associated keys and knobs. Use this capability in cases where remote training and learning of the oscilloscope are required. This instrument is fully LXI compliant with the LAN/VGA connection module.



### Protect your Investment

A built-in storage compartment allows you to easily keep your probes, power cords and other accessories with the oscilloscope.



### Secure environment mode

The -SEC (Secure Environment Mode) comes standard with all Models and provides the highest level of security by ensuring that internal non-volatile memory is clear of all setup and race settings. This option stores setups and traces to internal volatile memory only, and volatile memory is cleared during the power off cycle of the instrument. So this procedure ensures that all setup and trace settings are removed from memory.

# Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

## Designed with education in mind

### Quickly and easily set up or upgrade a teaching lab

Teach your students what an oscilloscope is and how to perform basic measurements with the Educator's Oscilloscope Training Kit (DSOXEDK). It includes training tools created specifically for electrical engineering and physics undergraduate students and professors. It contains an array of built-in training signals, a comprehensive oscilloscope lab guide and tutorial written specifically for the undergraduate student, and an oscilloscope fundamentals PowerPoint slide set for professors and lab assistants. For more information, refer to [www.agilent.com/find/EDK](http://www.agilent.com/find/EDK). Also available are DreamCatcher's full semester application-specific courseware written around Agilent test and measurement equipment: [www.dreamcatcher.asia/cw](http://www.dreamcatcher.asia/cw).



### Get your students to quickly put the scope to work

Intuitive localized front panel design with pushable knobs for quick access to commonly used oscilloscope functions helps students spend more time learning the concepts and less time learning how to use the oscilloscope. Enable your students to answer their own questions with the localized built-in help system that provides quick access by simply pressing and holding any button.

### Stretch your budget over the long term

Save money with an industry-exclusive built-in 20 MHz WaveGen, instead of a separate function generator. Buy what you need today and protect your investment in the future with the only oscilloscopes in this class with upgradable bandwidth, 8 digital channels (MSO), WaveGen and measurement applications. Get long scope life and keep repair costs to a minimum with a standard 3-year warranty, and an instrument reliability you've come to expect from the leader in test and measurement equipment.

### Optimize lab bench space

With 3 instruments in 1, you will save on precious lab bench space by getting an oscilloscope, logic timing analyzer, and WaveGen function generator all in one innovative instrument with a footprint that is only 5.57 inches deep. With the large 8.5-inch WVGA display, you can easily view all signals on one screen with enough viewing area for more than one student to view.



**DSOXEDK Educator's  
Oscilloscope Training Kit**



**Lab Guide and Tutorial for  
Undergraduate Electrical  
Engineering and Physics  
Students**



# Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

## Designed with research and development in mind

### Find more glitches and infrequent events

With the fastest architecture in the industry, up to 50,000 waveforms/sec, you can see jitter, infrequent events, and more subtle signal details that other oscilloscopes miss.

### Capture and view more of your signals at once

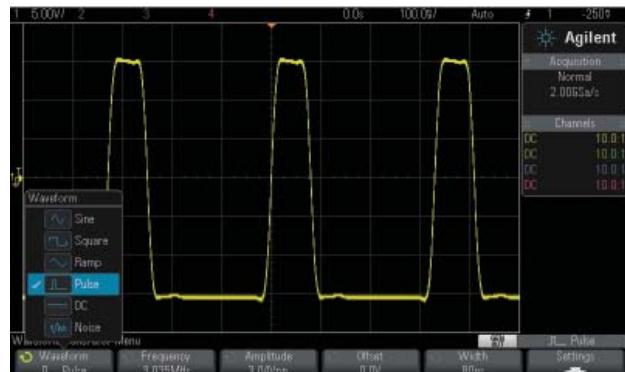
With integrated eight digital timing channels (MSO) models, you can get up to 12 channels of time-correlated triggering, acquisition and viewing on the same instrument with no compromise to the oscilloscopes waveform update rate. Don't need an MSO right now? No problem, just upgrade later when you need it.

### Optimize lab bench space

With 3 instruments in 1, you will save money and precious lab bench space by getting an oscilloscope, logic timing analyzer, and WaveGen function generator all in one innovative instrument with a footprint that is only 5.57 inches deep. With the large 8.5-inch WVGA display, you can easily view all signals on one screen with enough viewing area for more than one engineer to view.

### Make the most of a limited budget

Project needs change, but traditional oscilloscopes are fixed – you get what you pay for at time of purchase. With the 2000 X-Series, your investment is protected. If you need more bandwidth (up to 200 MHz), 8 digital channels (MSO), WaveGen or measurement applications like mask testing and segmented memory in the future, you can easily add them all when you need to.



# Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

## Designed with manufacturing in mind

### Stretch a limited budget

Protect your investment with the 2000 X-Series. If you need more bandwidth (up to 200 MHz) or measurement applications like mask testing in the future, you can easily add them all when you need them.

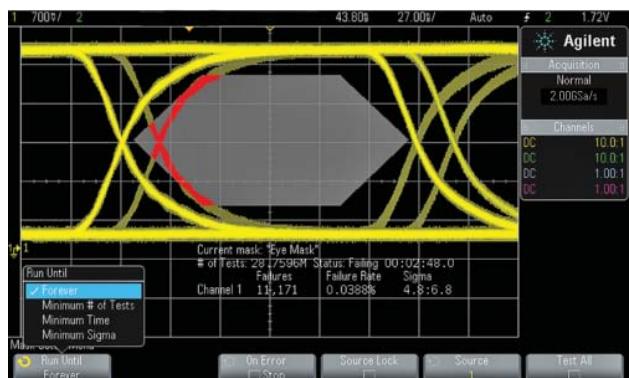
### Get your technicians to quickly put the scope to work

Intuitive localized front panel design and pushable knobs for quick access to commonly used oscilloscope functions allow technicians to spend more time testing and less time learning where the menus are on the oscilloscope. Enable your technicians to answer their own questions with the localized built-in help system that provides quick access by simply pressing and holding any button.



### Faster, low-escape test throughput

With the fastest architecture in its class, featuring up to 50,000 waveforms/sec, you will capture more of those elusive problems you worry about and ensure they don't ship to customers. With the mask limit testing measurement application, you can quickly test up to 50,000 signals per second to a known good waveform with quick go/no-go test results, saving you valuable test time while having more certainty.

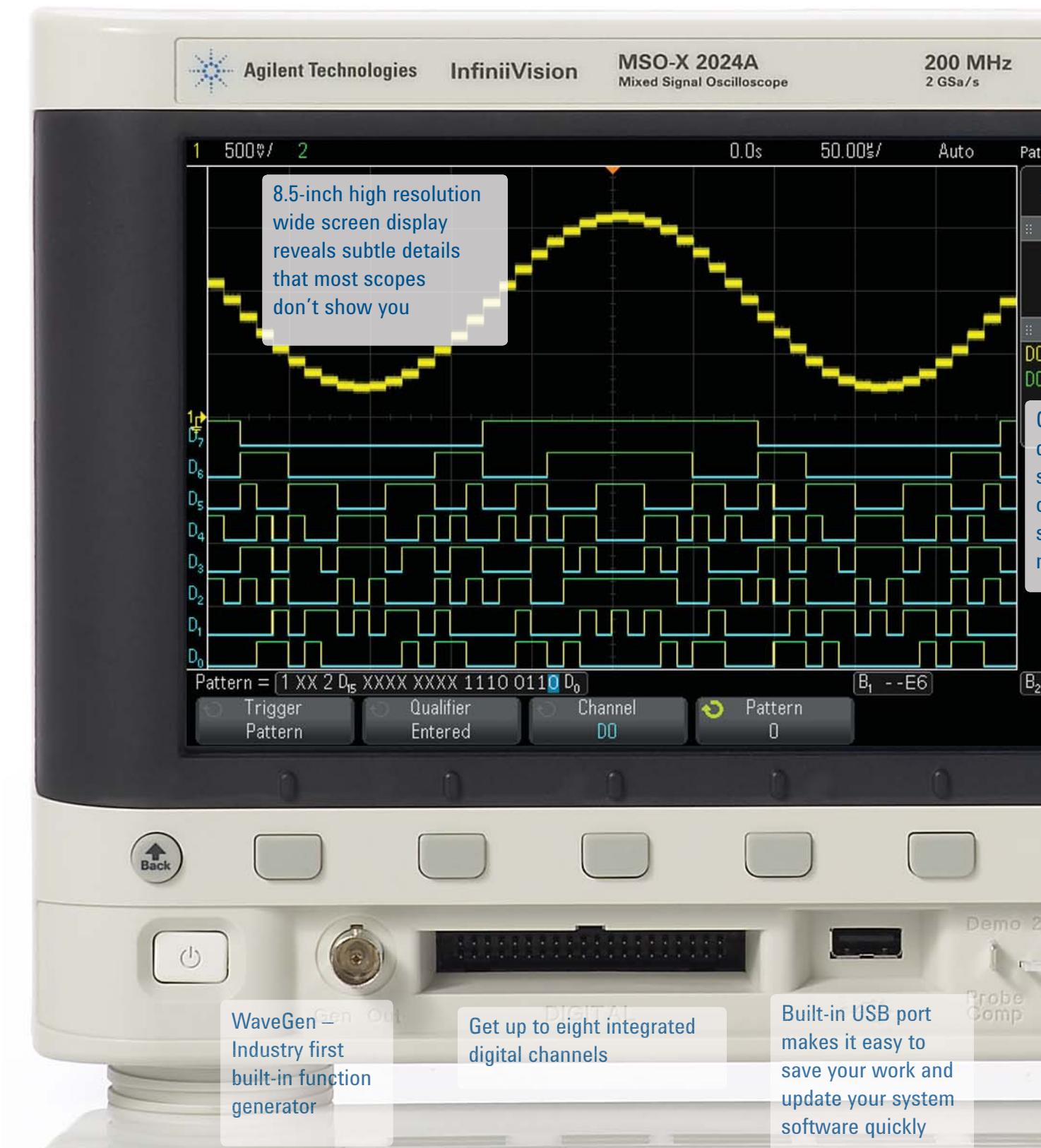


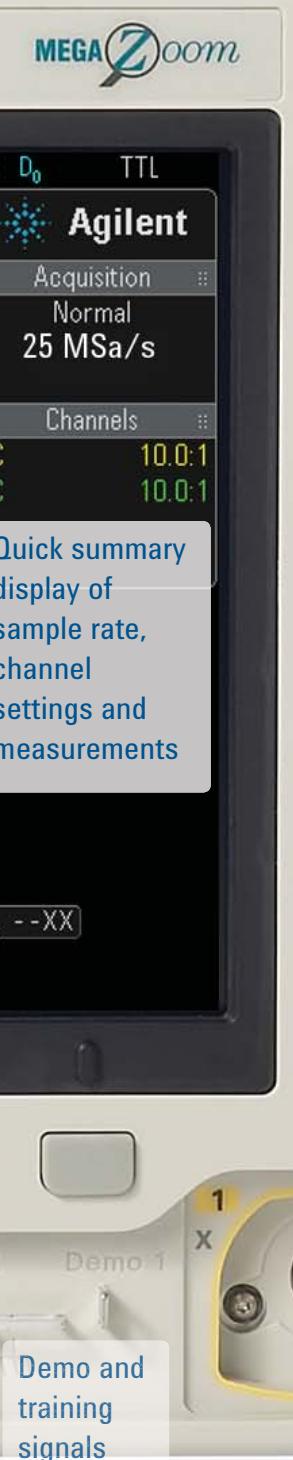
### Optimize test bench space

With 3 instruments in 1, you will save on precious line bench space by getting an oscilloscope, logic timing analyzer, and WaveGen function generator all in one innovative instrument with a footprint that is only 5.57 inches deep. With the large 8.5-inch WVGA display, you can easily view all signals on one screen even when the scope is sitting far away from the operator.

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Oscilloscope shown actual size

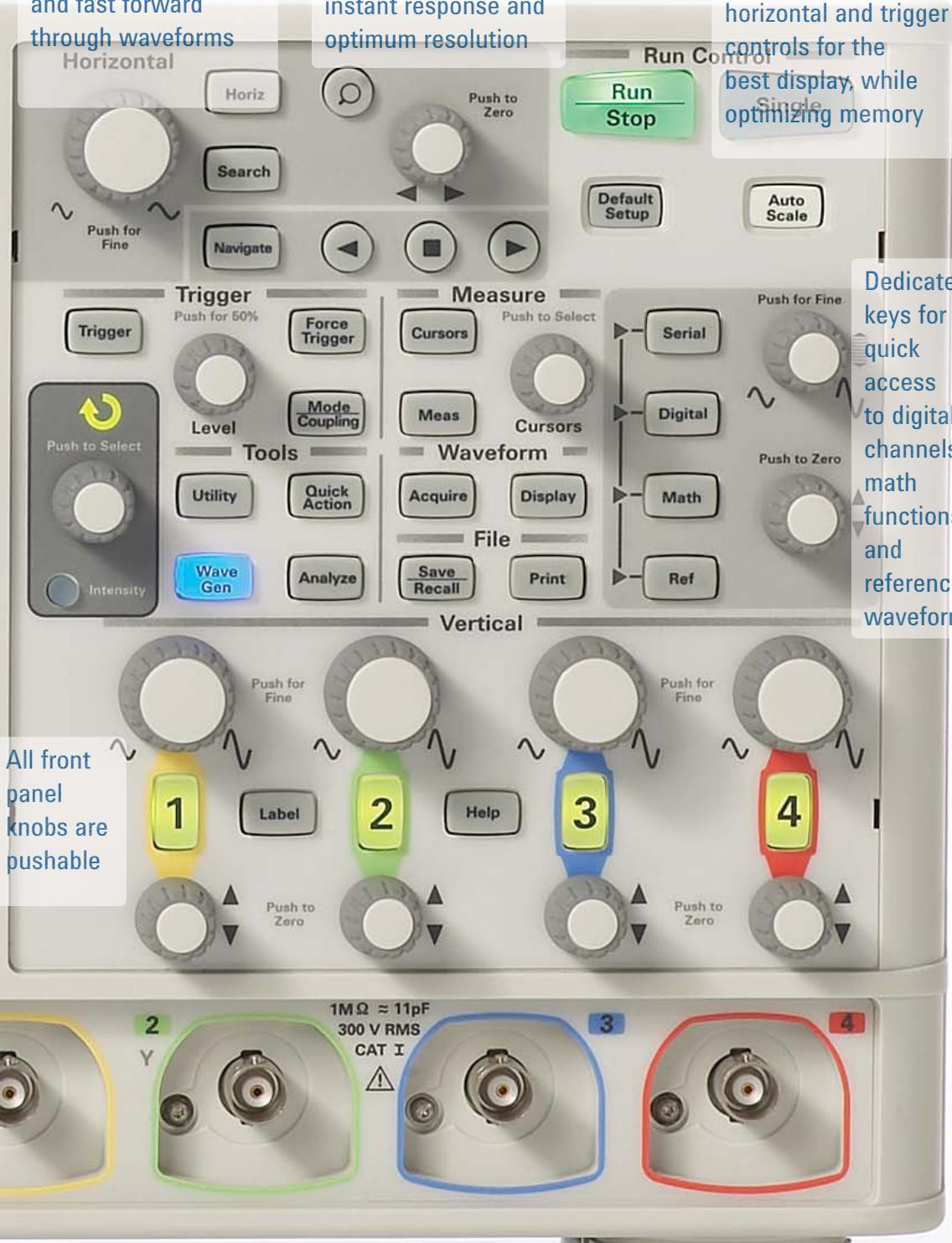




Navigation front panel controls make it easy to play, stop, rewind and fast forward through waveforms

Quickly pan and zoom for analysis with *MegaZoom* IV's instant response and optimum resolution

Autoscale lets you quickly display any analog or digital active signals, automatically setting the vertical, horizontal and trigger controls for the best display, while optimizing memory



Dedicated keys for quick access to digital channels, math functions and reference waveforms

Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

## Configuring your InfiniiVision X-Series oscilloscope

### Step 1. Choose your bandwidth and channel count.

InfiniiVision 2000 X-Series scopes					
	DSOX2002A	DSOX2004A	DSOX2012A	DSOX2014A	DSOX2022A
	MSOX2002A	MSOX2004A	MSOX2012A	MSOX2014A	MSOX2022A
Bandwidth (upgradable)*	70 MHz		100 MHz		200 MHz
Analog channels	2	4	2	4	2
Digital channels (MSO)			8 integrated digital channels (optional) <sup>1</sup>		

1. See pages 20-21 for more detailed information on upgradability.

### Step 2. Tailor your scope with measurement applications to save time and money<sup>2</sup>

Application	2000 X-Series
WaveGen (built-in function generator)	DSOX2WAVEGEN
Educator's kit	DSOXEDK
Mask testing	DSOX2MASK
Segmented memory	DSOX2SGM

2. See pages 20-21 for more detailed information on upgradability, and installation process.

### Step 3. Choose your probes<sup>3</sup>

Probes	2000 X-Series
N2862B 150 MHz 10:1 passive probe	Standard one per channel for 70 and 100 MHz models
N2863B 300 MHz, 10:1 passive probe	Standard one per channel for 200 MHz models
N6459-60001 8-channel logic probe and accessory kit	Standard on MSO models or with DSOX2MSO upgrade
N2889A 350 MHz 10:1/1:1 passive probe	Optional
10070D 20 MHz 1:1 passive probe with probe ID	Optional
10076A 250 MHz 100:1, 4 kV high-voltage passive probe with probe ID	Optional
N2791A 25 MHz, ±700 V high-voltage differential probe	Optional
N2792A 200 MHz 10:1 differential probe	Optional
1146A 100 kHz, 100 A, AC/DC current probe	Optional

3. See page 20 for probe compatibility table. For more information on probes and accessories, see the Agilent literature 5968-8153EN

### Step 4.

#### Add the final touches.

Recommended accessories	2000 X-Series
LAN/VGA connection module	DSOXLAN
GPIB connection module	DSOXGPIB
Rack mount kit	N6456A
Soft carrying case and front panel cover	N6457A
Hard copy manual	N6458A
Front panel cover (only)	N2747A

## Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

### Performance characteristics

	DSOX2000 Series (digital signal oscilloscope)						MSOX2000 Series (mixed signal oscilloscope)											
Characteristic	2002A	2004A	2012A	2014A	2022A	2024A	2002A	2004A	2012A	2014A	2022A	2024A						
Analog Bandwidth* (-3 dB)	70 MHz			100 MHz			200 MHz			70 MHz								
Bandwidth upgrade	YES			YES			NO			YES								
Channels	2			4			2			4								
Maximum sample rate	1 GSa/s per channel, 2 GSa/s half-channel interleaved																	
Maximum memory depth (record length)	50 kpts per channel, 100 kpts half-channel interleaved																	
Display	8.5-inch WVGA with 64 levels of intensity grading																	
Waveform update rate	50,000 waveforms/s																	
External trigger input	Included on all models																	
Vertical resolution	8 bits																	
Horizontal resolution	2.5 ps																	
Vertical sensitivity (range)	1 mV/div to 5 V/div **																	
DC vertical accuracy	$\pm$ [DC vertical gain accuracy + DC vertical offset accuracy + 0.25% full scale] **																	
DC vertical gain accuracy*	$\pm$ 3% full scale ( $\geq$ 10 mV/div); $\pm$ 4% full scale ( $<$ 10 mV/div) **																	
DC vertical offset accuracy	$\pm$ 0.1div $\pm$ 2mV $\pm$ 1% of offset setting																	
Vertical zoom	Ability to scale and position a live or stopped waveform vertically. When the acquisition is stopped, turning the vertical scale and offset (position) knobs will scale and move the signal. Pan and zoom redraws the waveform in < 100 ms.																	
Maximum input voltage	CAT I 300 Vrms, 400 Vpk; transient overvoltage 1.6 kVpkCAT II 300 Vrms, 400 Vpk with N2862A or N2863A 10:1 probe: 300 Vrms																	
Position range/offset	1 mV to 200 mV/div: $\pm$ 2 V >200 mV to 5 V/div: $\pm$ 50V																	
Bandwidth limit	20 MHz selectable																	
Input coupling	AC, DC																	
Input impedance	1 M $\Omega$ $\pm$ 2%																	
Time base range	5 ns/div to 50 s/div	5 ns/div to 50 s/div	2 ns/div to 50 s/div	5 ns/div to 50 s/div	5 ns/div to 50 s/div	2 ns/div to 50 s/div												
Time base accuracy*	25 ppm $\pm$ 5 ppm per year (aging)																	
$\Delta$ Time accuracy (using cursors)	$\pm$ (time base accuracy* reading) $\pm$ (0.0016 * screen width) $\pm$ 100 ps																	
Dynamic range	( $\pm$ 8 divisions from center screen)																	
Horizontal zoom (modes)	Horizontally expand or compress a live or stopped waveform																	

\* Denotes warranted specifications, all others are typical.

Specifications are valid after a 30-minute warm-up period and from  $\pm$ 10 °C firmware calibration temperature.

\*\* 1 mV/div and 2 mV/div is a magnification of 4 mV/div setting. For vertical accuracy calculations, use full scale of 32 mV for 1 mV/div and 2 mV/div sensitivity setting.

# Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

## Performance characteristics

### Acquisition modes

Normal	
Peak detect	Capture glitch as narrow as 500 ps at all timebase settings.
Averaging	Select from 2,4,8,16, 64... to 65,536
High resolution mode	12 bits of resolution when $\geq 20 \mu\text{s}/\text{div}$
Segmented	Re-arm time= 19 $\mu\text{s}$ (minimum time between trigger events)

### Trigger system

Trigger modes	<ul style="list-style-type: none"> <li>Edge (rising/falling alternate, either)—Conventional level-driven trigger.</li> <li>Pulse width (or glitch)—Trigger on a pulse width less than, greater than, or within a time range, with a selectable time limit ranging from 17 ns to 10 s.</li> <li>Pattern-trigger on a logical AND combination of the channels. Each channel can have a value of zero, one, don't care (X), or a rising or falling edge (one channel only).</li> <li>Video—Trigger on all lines or individual lines, odd/even or all fields from composite video or broadcast standards (NTSC, PAL, PAL-M, SECAM).</li> </ul>
Trigger coupling	Coupling selections: AC, DC, noise reject, LF reject and HF reject.
Trigger source	Each analog channel, each digital channel (MSO models or DSOX2MSO upgrade, Ext, WaveGen, line)
Trigger sensitivity (internal)*	< 10 mV/div: greater of 1 div or 5 mV; $\geq 10 \text{ mV}/\text{div}$ : 0.6 div
Trigger sensitivity (external)*	200 mV (DC to 100 MHz); 350 mV (100 MHz - 200 MHz)

### Cursors

Types	Amplitude, time , frequency (FFT), manual, tracking, binary, HEX
Measurements	$\Delta T$ , $1/\Delta T$ , $\Delta V/X$ , $1/\Delta X$ , $\Delta Y$ , Phase and Ratio
Cursors**	<ul style="list-style-type: none"> <li>Single cursor accuracy: <math>\pm[\text{DC vertical gain accuracy} + \text{DC vertical offset accuracy} + 0.25\% \text{ full scale}]</math></li> <li>Dual cursor accuracy: <math>\pm[\text{DC vertical gain accuracy} + 0.5\% \text{ full scale}]^*</math></li> </ul>

### Automatic waveforms measurements

Voltage	Snapshot all, maximum, minimum, peak-to-peak, top, base, amplitude, overshoot, preshoot, average- N cycles, average-full screen, DC RMS- N cycles, DC RMS- full screen, AC RMS- N cycles
Time	Period, frequency, rise time, fall time, + width, - width, duty cycle, delay A→B (rising edge), delay A→B (falling edge), phase A→B (rising edge,) and phase A→B (falling edge)

\* Denotes warranted specifications, all others are typical.

Specifications are valid after a 30-minute warm-up period and from  $\pm 10^\circ\text{C}$  firmware calibration temperature.

\*\* 1 mV/div and 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.

# Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

## Performance characteristics

### Waveform math

Operators	Add, subtract, multiply, FFT
FFT	Windows: Hanning, flat top, rectangular; Blackman-Harris - up to 64 kpts resolution
Sources	Math functions available between any two channels

### Display characteristics

Display	8.5-inch WVGA
Resolution	800 (H) x 480 (V) pixel format (screen area)
Interpolation	Sin(x)/x interpolation (using FIR filter; used when there is less than one sample per column of the display)
Persistence	Off, infinite, variable persistence (100ms-60s)
Intensity gradation	64 intensity levels
Modes	Normal XY - XY mode changes the display from voltage versus time scale to a volts versus volts scale Roll – Displays the waveform moving across the screen from right to left much like a strip chart recorder

### MSO (digital channels)

Upgradable from DSO	Yes
MSO channels	8 channels (D0 to D7)
Maximum sample rate	1 GSa/s
Maximum record length	50kpts per channel (digital channels only) 12.5kpts per channel (analog and digital channels)
Threshold selections	TTL (+1.4 V), CMOS (+2.5 V), ECL (-1.3 V), User-definable ( $\pm 8.0$ V in 10 mV stops)
Threshold accuracy*	$\pm$ (100 mV + 3% of threshold settings)
Maximum input dynamic range	$\pm 10$ V about threshold
Minimum voltage swing	500 mVpp
Input impedance	100 k $\Omega$ $\pm$ 2% at probe tip, $\sim$ 8 pF
Minimum detectable pulse width	5ns
Channel-to-channel skew	2 ns (typical), 3 ns (maximum)

### Environmental and safety

Power line consumption	100 watts
Temperature	Operating: 0 to +55 °C Non-operating: -30 to +71 °C
Humidity	Operating: Up to 80% RH at or below +40 °C; up to 45% RH up to +50 °C Non-operating: Up to 95% RH up to 40 °C; up to 45% RH up to 50 °C
Altitude	Operating and non-operating: up to 4,000 m
Electromagnetic compatibility	Meets EMC Directive (2004/108/EC), meets or exceeds IEC 61326-1:2005/EN 61326-1:2006 Group 1 Class A requirement CISPR 11/EN 55011 IEC 61000-4-2/EN 61000-4-2 IEC 61000-4-3/EN 61000-4-3 IEC 61000-4-4/EN 61000-4-4 IEC 61000-4-5/EN 61000-4-5 IEC 61000-4-6/EN 61000-4-6 IEC 61000-4-11/EN 61000-4-11 Canada: ICES-001:2004 Australia/New Zealand: AS/NZS
Safety	UL61010-1 2nd edition, CAN/CSA22.2 No. 61010-1-04

\* Denotes warranted specifications, all others are typical.

Specifications are valid after a 30-minute warm-up period and from  $\pm 10$  °C firmware calibration temperature.

## Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

### Performance characteristics

#### WaveGen – built-in function generator

Waveforms	Sine, square, pulse, triangle, ramp, noise, DC
Sine	<ul style="list-style-type: none"> <li>Frequency range: 0.1 Hz to 20 MHz</li> <li>Amplitude flatness: <math>\pm 0.5</math> dB (relative to 1 kHz)</li> <li>Harmonic distortion: <math>-40</math> dBc</li> <li>Spurious (non harmonics): <math>-40</math> dBc</li> <li>Total harmonic distortion: 1%</li> <li>SNR (50 ohm load, 500 MHz BW) : 40 dB (<math>V_{pp} \geq 0.1</math> V); 30 dB (<math>V_{pp} &lt; 0.1</math> V)</li> </ul>
Square wave/pulse	<ul style="list-style-type: none"> <li>Frequency range: 0.1 Hz to 10 MHz</li> <li>Duty cycle: 20 to 80%</li> <li>Duty cycle resolution: Larger of 1% or 10 ns</li> <li>Pulse width: 20 ns minimum</li> <li>Pulse width resolution: 10 ns or 5 digits, whichever is larger</li> <li>Rise/fall time: 18 ns (10 to 90%)</li> <li>Overshoot: &lt; 2%</li> <li>Asymmetry (at 50% DC): <math>\pm 1\% \pm 5</math> ns</li> <li>Jitter (TIE RMS): 500 ps</li> </ul>
Ramp/triangle wave	<ul style="list-style-type: none"> <li>Frequency range: 0.1 Hz to 100 kHz</li> <li>Linearity: 1%</li> <li>Variable symmetry: 0 to 100%</li> <li>Symmetry resolution: 1%</li> </ul>
Noise	Bandwidth: 20 MHz typical
Frequency	<ul style="list-style-type: none"> <li>Sine wave and ramp accuracy: <ul style="list-style-type: none"> <li>130 ppm (frequency &lt; 10 kHz)</li> <li>50 ppm (frequency &gt; 10 kHz)</li> </ul> </li> <li>Square wave and pulse accuracy: <ul style="list-style-type: none"> <li>[50+frequency/200] ppm (frequency &lt; 25 kHz)</li> <li>50 ppm (frequency <math>\geq 25</math> kHz)</li> </ul> </li> <li>Resolution: 0.1 Hz or 4 digits, whichever is larger</li> </ul>
Amplitude	<ul style="list-style-type: none"> <li>Range: <ul style="list-style-type: none"> <li>20 mVpp to 5 Vpp into Hi-Z</li> <li>10 mVpp to 2.5 Vpp into 50 ohms</li> </ul> </li> <li>Resolution: 100 <math>\mu</math>V or 3 digits, whichever is larger</li> <li>Accuracy: 2% (frequency = 1 kHz)</li> </ul>
DC offset	<ul style="list-style-type: none"> <li>Range: <ul style="list-style-type: none"> <li><math>\pm 2.5</math> V into Hi-Z</li> <li><math>\pm 1.25</math> V into 50 ohms</li> </ul> </li> <li>Resolution: 100 <math>\mu</math>V or 3 digits, whichever is larger</li> <li>Accuracy: <math>\pm 1.5\%</math> of offset setting <math>\pm 1.5\%</math> of amplitude <math>\pm 1</math> mV</li> </ul>
Trigger output	Trigger output available on Trig out BNC

## Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

### InfiniiVision X-Series physical characteristics

Instrument		
Dimensions	mm	Inches
Width	380.6	14.98
Height	204.4	8.05
Depth	141.5	5.57
Weight	kg	lb
Instrument only	3.85	8.5
With accessories	4.08	9.0
Instrument shipping – package dimensions	mm	Inches
Width	450	17.7
Height	250	9.84
Depth	360	14.17
Rack mount	mm	Inches
Width	481.6	18.961
Height	221.5	8.72
Depth	189.34	7.454

Connectivity	
Standard ports	One USB 2.0 high-speed device port on rear panel Two USB 2.0 high-speed host ports, front and rear panel Supports memory devices and printers
Optional ports	GPIO, LAN, VGA

Nonvolatile storage	
Reference waveform display	2 internal waveforms or USB thumb drive
Waveform storage	Set up, .bmp, .png, .csv, ASCII, XY, reference waveforms, .alb, .bin, lister, mask, HDFS
Max USB flash drive size	Supports industry standard flash drives
Set ups without USB flash drive	10 internal setups
Set ups with USB flash drive	Limited by size of USB drive

Accessories included	
Standard 3- year warranty	
Standard SEC mode (Secure Environment)	
Standard Probe	
N2862B 150 MHz 10:1 passive probe	Standard one per channel for 70 and 100 MHz models
N2863B 300 MHz, 10:1 passive probe	Standard one per channel for 200 MHz models
N6459-60001 8-channel logic probe and accessory kit	Standard on MSO models or with DSOX2MSO upgrade
<b>Built-in help language support</b> for English, Japanese, simplified Chinese, traditional Chinese, Korean, German, French, Spanish, Russian, Portuguese and Italian	
Certificate of Calibration	
Documentation CD	
<b>Interface language support GUI menus:</b> English, Japanese, simplified Chinese, traditional Chinese, Korean, German, French, Spanish, Russian, Portuguese and Italian	
Localized power cord	

## Probe Compatibility Table

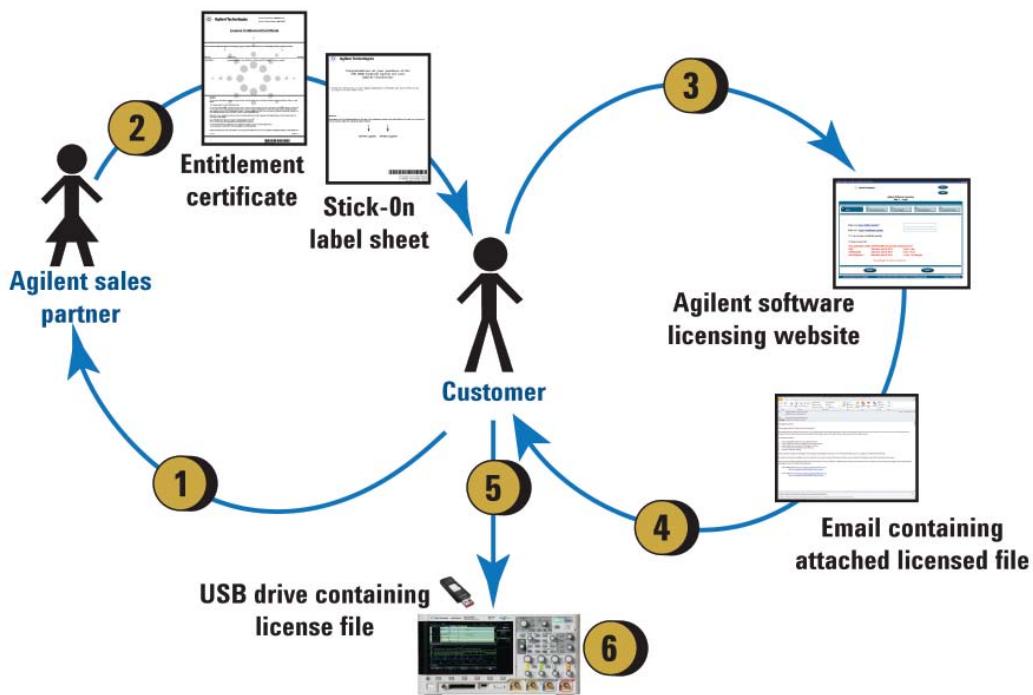
To assist you in selecting the proper probe for your application: Use our probe compatibility table below to find the probes that are recommended for use with your 2000 X, 3000 X, Series InfiniiVision oscilloscope.

Probe Type	Probe Model	MSO/DSO 2000 X-Series <sup>1</sup>	MSO/DSO 3000 X-Series
Passive probes,	N2862B 10:1 150 MHz (included in 70/100 MHz models) N2863B 10:1 300 MHz (included in 200 MHz models) N2890A 10:1 500 MHz (included in 350/500 MHz models)	Recommended	Recommended
	N2889A 1:1/10:1 350 MHz	Recommended	Recommended
High-voltage passive probes,	10076D 4 kV	Recommended	Recommended
	N2771B 30 kV	Recommended	Recommended
Differential active probes,	1130A 1.5 GHz	Incompatible	Compatible
	1141A 200 MHz (use with 1142A)	Incompatible	Recommended
	N2791A 25 MHz	Recommended	Recommended
	N2891A 70 MHz	Recommended	Recommended
	N2790A 100 MHz (with AutoProbe)	Incompatible	Recommended
	N2792A 200 MHz	Recommended	Recommended
	N2793A 800 MHz	Recommended	Recommended
Single-ended active probes,	N2795A 1 GHz (with AutoProbe)	Incompatible	Recommended
	N2796A 2 GHz (with AutoProbe)	Incompatible	Recommended
	1156A 1.5 GHz (with AutoProbe)	Incompatible	Recommended
	1144A 800 MHz (use with 1142A)	Incompatible	Recommended
	1145A 750 MHz (use with 1142A)	Incompatible	Recommended
MSO logic probes,	01650-61607 16-channel	Incompatible	
	N6459-60001 8-channel MSO cable (included in 2000 X-Series MSOs)	Recommended	Compatible
	N6450-60001 16-channel MSO cable (included in 3000 X-Series MSOs)	Incompatible	Recommended
Current probes,	1146A 100 kHz	Recommended	Recommended
	N2780A 2 MHz (use with N2779A)	Recommended	Recommended
	N2781A 10 MHz (use with N2779A)	Recommended	Recommended
	N2782A 50 MHz (use with N2779A)	Recommended	Recommended
	N2783A 100 MHz (use with N2779A)	Recommended	Recommended
	1147A 50 MHz (with AutoProbe)	Incompatible	Recommended
	N2893A 100 MHz (with AutoProbe)	Incompatible	Recommended

1. The 2000 X-Series does not support AutoProbe interface active probes.

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## License-only bandwidth upgrades and measurement applications



### Bandwidth upgrade models

#### 2000 X-Series

DSOX2BW12	70 MHz to 100 MHz, 2 ch, License only
DSOX2BW14	70 MHz to 100 MHz, 4 ch, License only
DSOX2BW22	100 MHz to 200 MHz, 2 ch, License only
DSOX2BW24	100 MHz to 200 MHz, 4 ch, License only

\* See page 2 for the bandwidth upgrade process for these products

### Measurement applications

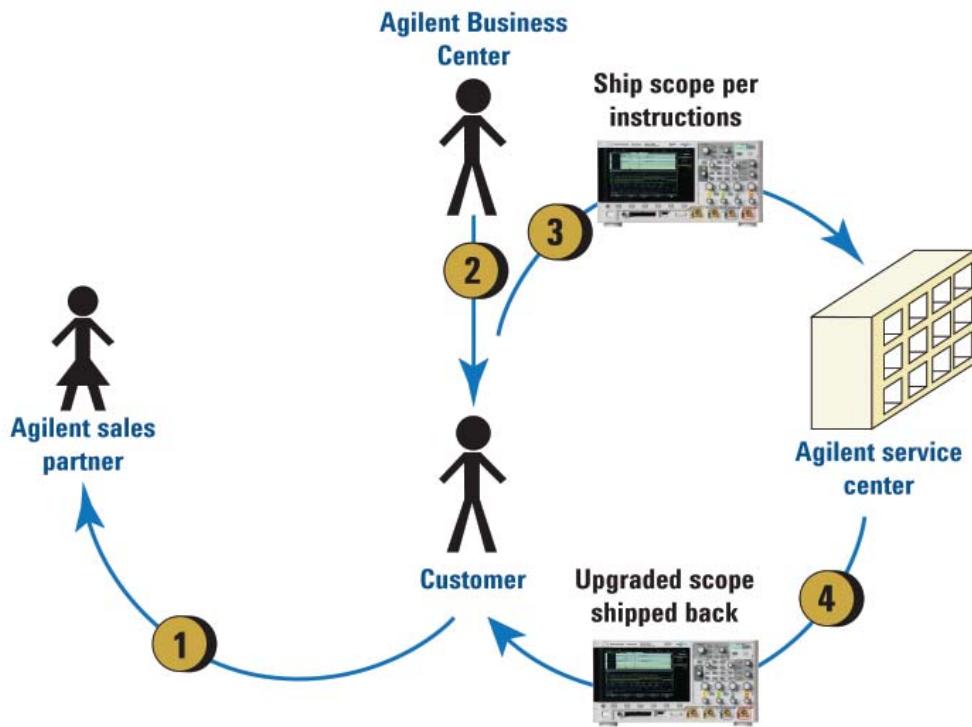
DSOX2WAVEGEN	WaveGen (built-in function generator)
DSOXEDK	Educator's kit
DSOX2MASK	Mask testing
DSOX2SGM	Segmented memory
DSOX2MSO	Upgrade to 8 digital timing channels

### Process description

- Place order for a license only bandwidth upgrade or measurement application product to an Agilent sales partner. If multiple bandwidth upgrade steps are needed, order all the corresponding upgrade products required to get from current bandwidth to desired bandwidth. In the case where the new bandwidth requires higher bandwidth passive probes, they are included with the upgrade. For the DSOX2BW22 and DSOX2BW24, the N2863B 10:1 300 MHz passive probes (1 per channel) will be sent with the upgrade.
- Receive a paper or electronic .pdf Entitlement Certificate document for any of the orderable measurement applications For bandwidth upgrades only, you receive a stick-on label document indicating upgraded bandwidth specification.
- Use Entitlement Certificate or electronic .pdf document containing instructions and certificate number needed to generate a license file for a particular 2000 or 3000 X-Series oscilloscope model number and serial number unit.
- Receive the licensed file and installation instructions via email.
- Copy license file (.lic extension) from email to a USB drive and follow instructions in email to install the purchased bandwidth upgrade or measurement application on the oscilloscope.
- For bandwidth upgrades only, attach bandwidth upgraded stick-on labels to front and rear panels of the oscilloscope. Model number and serial number of the oscilloscope do not change.

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## Return-to-Agilent Service Center Bandwidth Upgrades



### Bandwidth Upgrade Models

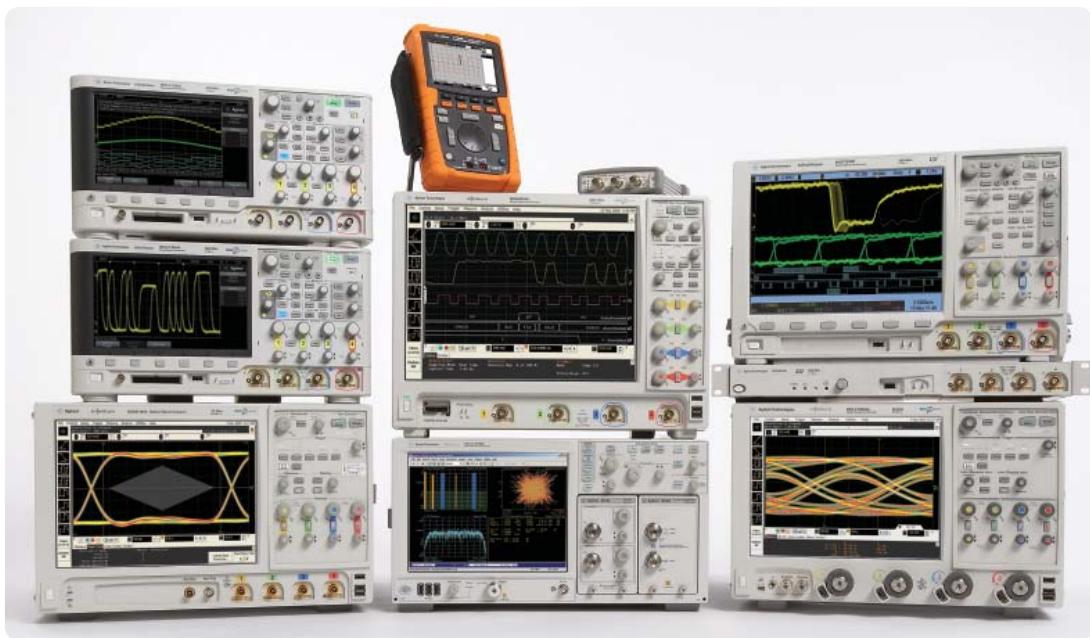
#### 2000 X-Series

DSOX2BW12*	70 MHz to 100 MHz, 2 ch, License only
DSOX2BW14*	70 MHz to 100 MHz, 4 ch, License only
DSOX2BW22*	100 MHz to 200 MHz, 2 ch, License only
DSOX2BW24*	100 MHz to 200 MHz, 4 ch, License only

\* See page 1 for the bandwidth upgrade process for these products

### Process Description

- 1 Place order for a return-to-Agilent Service Center bandwidth upgrade product to an Agilent sales partner. Service Center installation cost is in addition to bandwidth upgrade product price. Service Center calibration is included in the bandwidth upgrade product price. If multiple bandwidth upgrade steps are needed, order all the corresponding upgrade products required to get from current bandwidth to desired bandwidth. In the case where the new bandwidth requires higher bandwidth passive probes, they are included with the upgrade. For the DSOX2BW22 and DSOX2BW24, the N2863B 10:1 300 MHz passive probes (1 per channel) will be sent with the upgrade
- 2 Agilent Business Center will contact you regarding process and timing of the Service Center installation. Continue to use oscilloscope until contacted again later when parts are available at Service Center.
- 3 Ship the oscilloscope per provided instructions (freight paid by Agilent) to Service Center.
- 4 Service Center ships back upgraded oscilloscope with stick-on labels applied to front and rear panels indicating upgraded bandwidth specification. Model number and serial number of the oscilloscope do not change.



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