DATA SHEET

InfiniiVision 2000 X-Series Oscilloscopes



KEYSIGHT TECHNOLOGIES

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Want to Touch Operation and Additional Analysis Capabilities to Discover and Solve your problem?

See the InfiniiVision 3000G X-Series.

- 8.5-inch capacitive touch display
- Zone touch trigger capability
- 100 MHz to 1 GHz DSO and MSO models
- > 1,000,000 waveforms/sec
- Standard segmented memory
- Fully upgradable 7 instrument in 1
    - Digital channels (MSO)
    - Protocol analysis including new CAN-FD and SENT bus support
    - 20 MHz WaveGen with arbitrary waveform and modulation support
    - 3-digit digital voltmeter (DVM)
    - 5-digit counter/8-digit totalizer
    - Frequency Response Analyzer
- N7020A Power Rail Probe and N2820A High Sensitivity Current Probe support
- Standard time gated FFT feature
- Eight additional standard features including:
    - Waveform & measurement histograms
    - Built-in waveform generator
    - I2C, SPI, UART, I2S, and USB PD trigger & decode
    - Mask limit testing
    - Measurement limit testing
    - Frequency response analysis (Bode plots)
    - Enhanced HDTV video analysis
    - LAN/VGA connectivity module



See www.keysight.com/find/3000GX-Series for more details.

Breakthrough Technology for Budget Conscious Customers

Overview of the Keysight InfiniiVision X-Series oscilloscopes

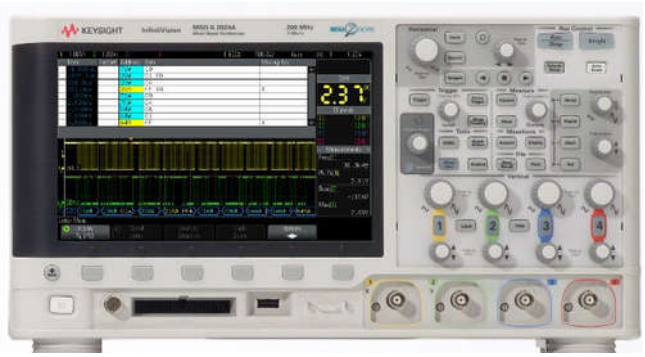
	InfiniiVision 1000 X-Series	InfiniiVision 2000 X-Series	InfiniiVision 3000G X-Series	InfiniiVision 4000 X-Series	InfiniiVision 6000 X-Series
Analog channels	2 and 4	2 and 4	2 and 4	2 and 4	2 or 4
Bandwidth (upgradable)	50, 70, 100, 200 MHz	70, 100, 200 MHz	100, 200, 350, 500 MHz, 1 GHz	200, 350, 500 MHz, 1 GHz, 1.5 GHz	16 (MSO models or upgrade)
Digital channels	External trigger can be used as a 3rd digital channel for 2 channel model	8 (MSO models or upgrade) [1]	16 (MSO models or upgrade)	16 (MSO models or upgrade)	1, 2.5, 4, 6 GHz
Maximum sample rate	2 GSa/s	2 GSa/s	5 GSa/s	5 GSa/s	20 GSa/s
Maximum memory depth	Up to 2 Mpts standard	1 Mpt/channel	4 Mpts	4 Mpts	4 Mpts
Waveform update rate	Up to 200,000 wfms/sec	> 200,000 wfms/sec	> 1,000,000 wfms/sec	> 1,000,000 wfms/sec	> 450,000 wfms/sec
Display	7-inch display	8.5-inch display	8.5-inch capacitive touch display	12.1-inch capacitive touch display	12.1-inch, capacitive touch, gesture enabled display
Zone touch trigger	No	No	Standard	Standard	Standard
Voice Control	No	No	No	No	Standard
WaveGen 20-MHz function/ arbitrary waveform generator	Single-channel function only (standard on G models)	Single-channel function only (option)	Single-channel AWG (standard)	Dual-channel AWG (option)	Dual-channel AWG (option)
Integrated digital voltmeter (standard)	Yes	Yes	Yes	Yes	Yes
Integrated hardware counter (standard)	5-digit frequency counter	5-digit frequency counter (8 digits with external 10 MHz clock reference)	8-digit frequency counter or totalizer	5-digit frequency counter	10-digit frequency, period, or totalizer counter
Serial protocol analysis	I^2C, UART (standard on all models) SPI, CAN/LIN (standard on DSO models)	Yes (optional: CAN, LIN, I^2C, SPI, RS232/UART) [1]	Yes (standard: I^2C, SPI, RS232/422/485/ UART, I^2S, USB PD, optional: ARINC 429, CAN/CAN-dbc/CAN-FD/LIN/LIN symbolic, SENT, FlexRay, LIN, MIL-STD-1553, SPI, CXPI, Manchester/NRZ)	Yes (optional: ARINC 429, CAN/CAN-dbc/CAN-FD/LIN/LIN symbolic, SENT, FlexRay, I^2C, I^2S, LIN, MIL-STD-1553, SPI, UART/RS232, USB 2.0, CXPI, Manchester/NRZ)	Yes (optional:I2C, SPI, UART/RS232, CAN/CAN-dbc/CAN-FD/LIN/LIN symbolic, SENT, FlexRay, I2S, MIL-STD1553, CXPI, ARINC429, USB 2.0, Manchester/NRZ, USB PD)
Segmented memory	Yes (standard on DSO model)	Standard	Standard	Standard	Standard
Mask/limit testing	Yes (standard on DSO model)	Option	Standard	Option	Option
Histograms	No	No	Standard	No	Standard
Power analysis	No	No	Standard	Option	Option

USB 2.0 signal quality test	No	No	No	Option	Option
HDTV analysis	No	No	Standard	Option	Option
Advanced waveform math	No	Standard	Standard	Standard	Standard
Connectivity	Standard USB 2.0, LAN	Standard USB 2.0 (LAN/video option) (GPIB option)	Standard USB2.0 (LAN/video option) (GPIB option)	Standard USB2.0, LAN, video out (GPIB option)	Standard USB2.0, LAN, video out (GPIB option)

1. The digital channels and serial protocol analysis cannot be used simultaneously on 2000 X-Series.

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. This Keysight Technologies, Inc. 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 deep memory and the fastest waveform update rates
- Do more with the power of 5 instruments in 1:Oscilloscope, logic timing analyzer, WaveGen built-in 20 MHz function generator (optional), serial protocol triggering and decode (optional), and digital voltmeter
- Get more investment protection with the classes only fully upgradable scope.

See More of your Signal, More of the Time

Largest display

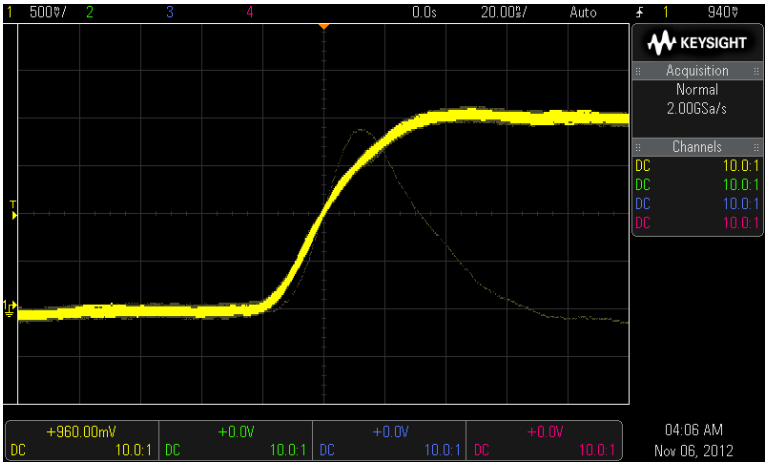
Engineering for the best signal visibility starts with the largest display. Our 8.5-inch WVGA display offers 50% more viewing area with 3.5 times the resolution (WVGA 800 x 480 versus 7-inch WQVGA 480 x 234).



Notice that the Keysight 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.

Fastest update rate

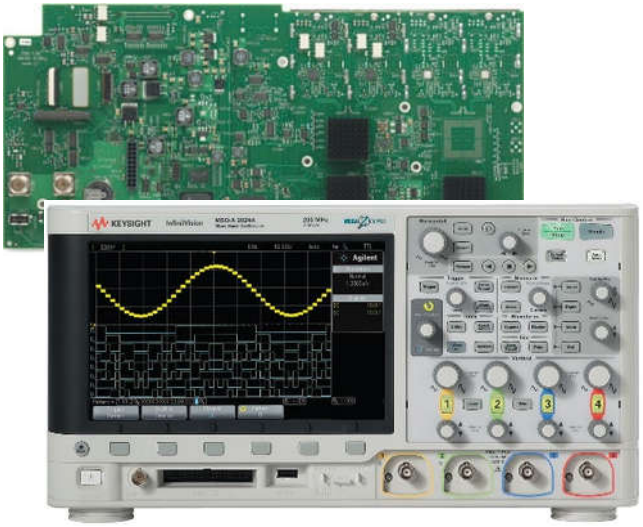
With *Keysight-designed MegaZoom IV* custom ASIC technology, the InfiniiVision 2000 X-Series family delivers up to 200,000 waveforms per second. With this speed you can see signal detail and infrequent anomalies more of the time.



How does Keysight do that?

Keysight-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. 4th generation *MegaZoom* technology enables the industry's fastest waveform update rate with responsive deep memory acquisitions.

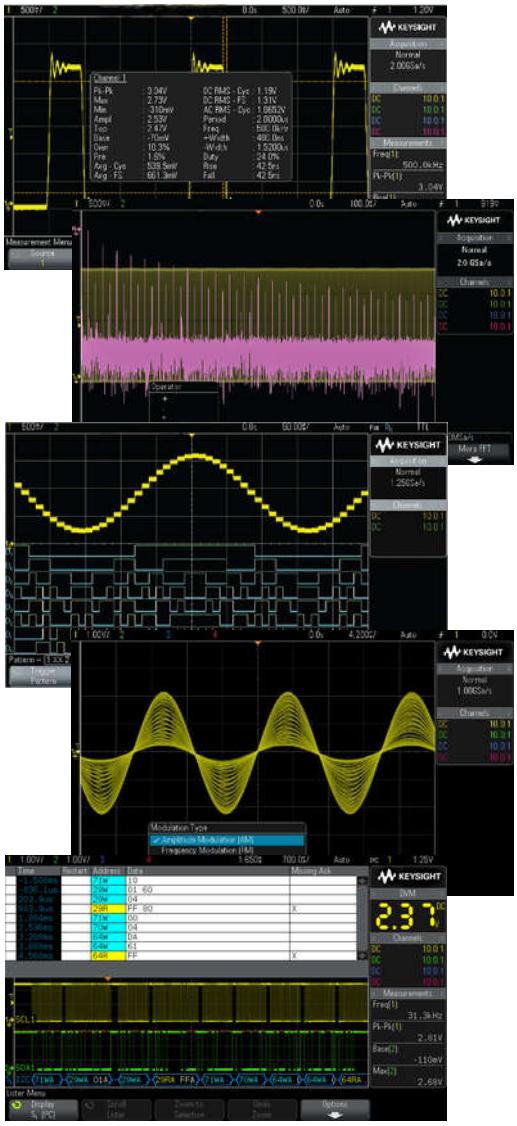




Do More with The Power of 5 Instruments In 1

Best-in-class oscilloscope

The InfiniiVision 2000 X-Series features Keysight's patented MegaZoom IV smart memory technology that is always enabled and always responsive providing the industry's fastest update rate at up to 200,000 waveforms per second, with no compromise if you turn on measurements or add digital channels. In addition, the 2000 X-Series offers 25 automated measurements such as voltage, time, and frequency as well as 18 waveform math functions including add, subtract, multiply, divide, and FFT.



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. Digital content is everywhere in today's designs and 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's first WaveGen built-in 20 MHz function generator with a modulation capability

An industry first, the 2000 X-Series offers an integrated 20 MHz function generator, now available with the signal modulation capability. 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.

Hardware-based serial protocol decode and triggering

- Embedded serial triggering and analysis (I^2C, SPI, UART/RS232/422/485))
- Automotive and industrial serial triggering and analysis (CAN, LIN)

Keysight's InfiniiVision Series oscilloscopes are the industry's first scopes to use hardware-based serial protocol decoding. Other vendors' oscilloscopes use software post-processing techniques that slow down both waveform and decode update rate. That's especially true when using deep memory, which is often required to capture multiple packetized serial bus signals. Faster decoding with hardware-based technology enhances scope usability and, more importantly, the probability of capturing infrequent serial communication errors.

After capturing a serial bus communication, you can easily perform a search-and-navigation operation based on specific criteria of your interest. Note, the digital channels and serial protocol analysis cannot be used simultaneously.

Integrated digital voltmeter

An industry first, the 2000 X-Series offers an integrated 3-digit voltmeter (DVM) and 5-digit frequency counter inside the oscilloscopes. The voltmeter operates through the same probes as the oscilloscope channels, however, the measurements are de-coupled from the oscilloscope triggering system so that both the DVM and triggered oscilloscope measurements can be made with the same connection. The voltmeter results are always displayed, keeping these quick characterization measurements at your fingertips. The DVM is included standard on all InfiniiVision oscilloscopes.

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 serial decodes in the future, you can easily add them all after the fact.

See page 29 for more information on upgradable products.

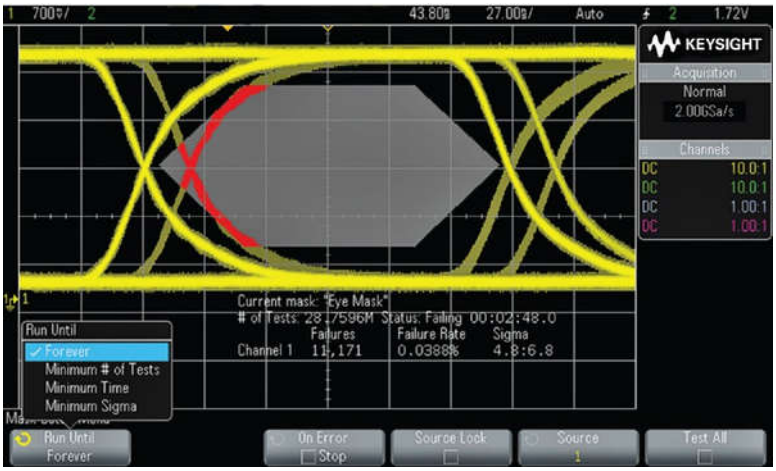


Add at the time of your purchase or upgrade later:

- Bandwidth
- Digital channels (MSO)
- WaveGen built-in 20 MHz function generator
- Serial protocol analysis
- Mask testing

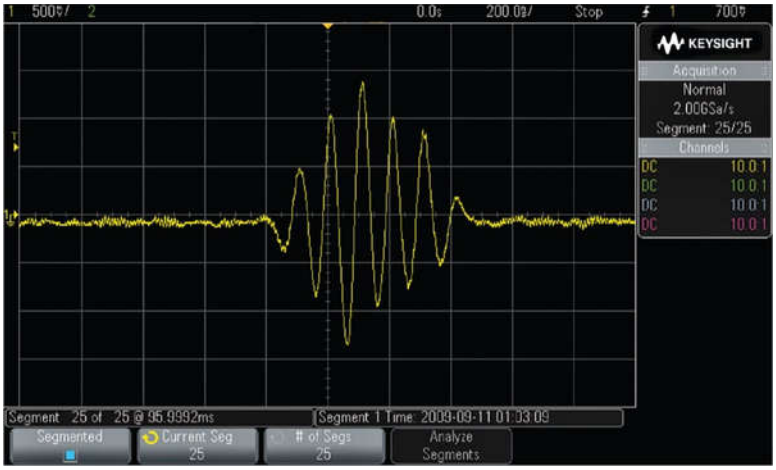
Mask testing

Whether performing pass/fail tests to specified standards in manufacturing or testing for infrequent signal anomalies in R&D debug, mask limit testing (available in all optional software analysis packages) can be a valuable productivity tool. The 2000 X-Series features hardware-based mask testing and can perform up to 200,000 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 250 segments can be captured on the 2000 X-Series models with a minimum re-arm time under 5 µs.



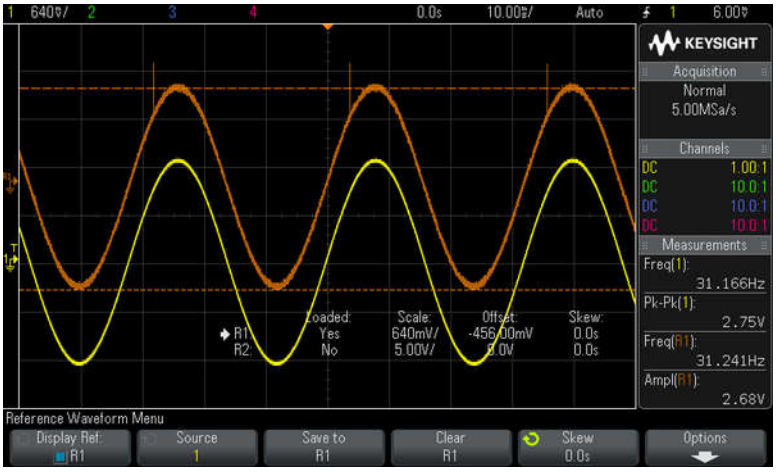
30-day trial license

The 2000 X-Series comes with a one-time 30-day all-optional-features trial license. You can choose to start the 30-day trial at any time. In addition you can redeem individual optional feature 30-day trial licenses at any time by visiting www.keysight.com/find/30daytrial. This enables you to receive in effect 60 days of trial license of each optional feature.

Other Productivity Tools

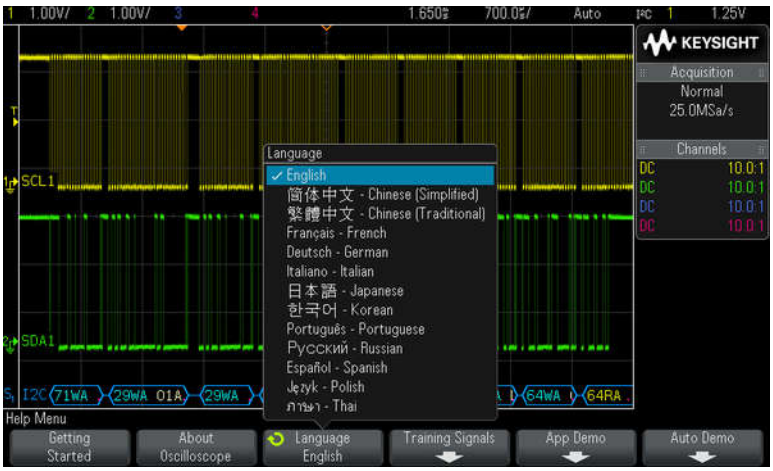
Reference waveforms

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 13 languages. Choose from: English, Japanese, simplified Chinese, traditional Chinese, Korean, German, French, Spanish, Russian, Portuguese, Thai, Polish 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. Keysight 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 Keysight's probes and accessories, please visit our Web site at www.keysight.com/find/scope_probes.



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 via a USB thumb drive file with a SCPI remote command).



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.

A node-locked license for the BV0004B BenchVue Oscilloscope Control and Automation software can be redeemed at no additional cost for each Keysight InfiniiVision X-Series oscilloscope purchased after June 1, 2019. Build automated test sequences just as easy as using your front panel. Save time with the ability to export measurement data to Excel, Word and MATLAB in three clicks. Monitor and control your 2000 X-Series with a mobile device from anywhere. Simplify your testing with BenchVue software. Learn more at www.keysight.com/find/BenchVue.





Virtual front panel

In addition to the traditional VNC virtual front panel remote operation through your favorite PC Web browser, the InfiniiVision X-Series supports remote oscilloscope control from your tablet devices. The tablet virtual front panel looks and acts as the real front panel on the oscilloscope. Control the setting, save/recall data, get image, and more.



Secure erase

The secure erase feature comes standard with all InfiniiVision X-Series models. At the press of a button, internal nonvolatile memory is clear of all setup, reference waveforms, and user preferences, ensuring the highest level of security in compliance with National Industrial Security Program Operation Manual (NISPOM) Chapter 8 requirements.



Infiniium Offline oscilloscope analysis software (D9010BSEO)

Keysight's Infiniium Offline PC-based analysis oscilloscope software allows you to do additional signal viewing, analysis and documentation tasks away from your scope. Capture waveforms on your scope, save to a file, and recall the waveforms into Infiniium Offline. The application supports a variety of popular waveform formats from multiple oscilloscope vendors and includes the following features:

Navigate

- Pan and zoom to anywhere in the data record. Navigate in time, or between bookmarks.

View

- Up to 8 waveforms simultaneously, 1, 2, or 4 grids (stacked, side by side, custom layout, zoom)

Measurements

- Over 50 automated measurements
- View up to 20 simultaneously
- User-customizable result window (size, position, information)
- X & Y markers with dynamic delta values

Analyze

- 20 math operators including FFT and filters
- Up to four independent/cascaded math functions
- Measurement histogram

View windows

- Analog, math, spectral, measurement results (simultaneous, tabbed, or undocked)

Documentation

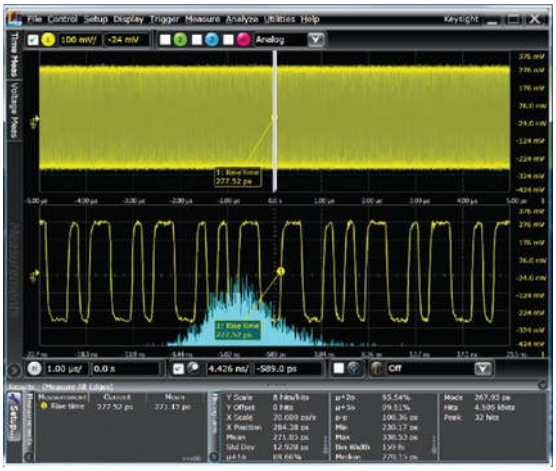
- Right-click to copy
- Up to 100 bookmarks
- Annotated axis values
- Markers with dynamic delta value updates when moved
- One step save/load setup and all waveforms

Analysis upgrades (optional)

- Protocol decode for I^2C/SPI, RS232/UART, CAN/ LIN/FlexRay, SATA, 8B/10B, digRF v4, JTAG, MIPI® D-PHY^{SM}, SVID, Ethernet 10G KR, PCIe 1, 2, 3, USB 2, 3, HSIC
- Jitter analysis
- Serial data analysis



View and analyze away from your scope and target system



Use familiar scope controls to quickly navigate and zoom in to any event of interest.



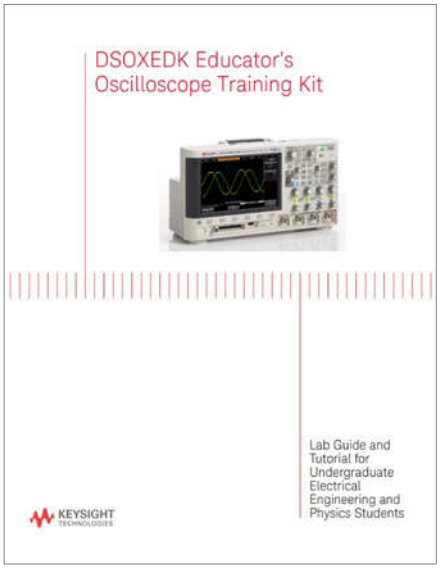
Add bookmarks and call outs to produce friendly and useful documentation.

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 standard. 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.keysight.com/find/EDK. Also available are DreamCatcher's full semester application-specific courseware written around Keysight test and measurement equipment: www.dreamcatcher.asia/cw. With features such as the ability to disable autoscale and the 50-Ω input data path, the InfiniiVision X-Series is a perfect choice for education.





Get your students to quickly put the scope to work

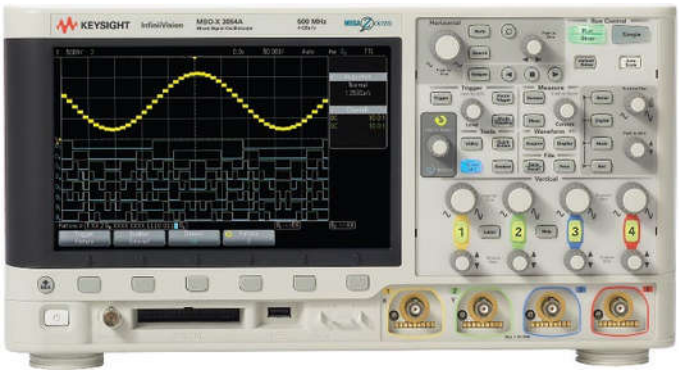
Intuitive localized front panel design with pushable knobs for quick access to commonly used oscilloscope functions helps students spend more time learning the concepts and less time learning how to use the oscilloscope. Enable your students to answer their own questions with the localized built-in help 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, integrated digital voltmeter and measurement applications. Get long scope life and keep repair costs to a minimum, and an instrument reliability you've come to expect from the leader in test and measurement equipment.

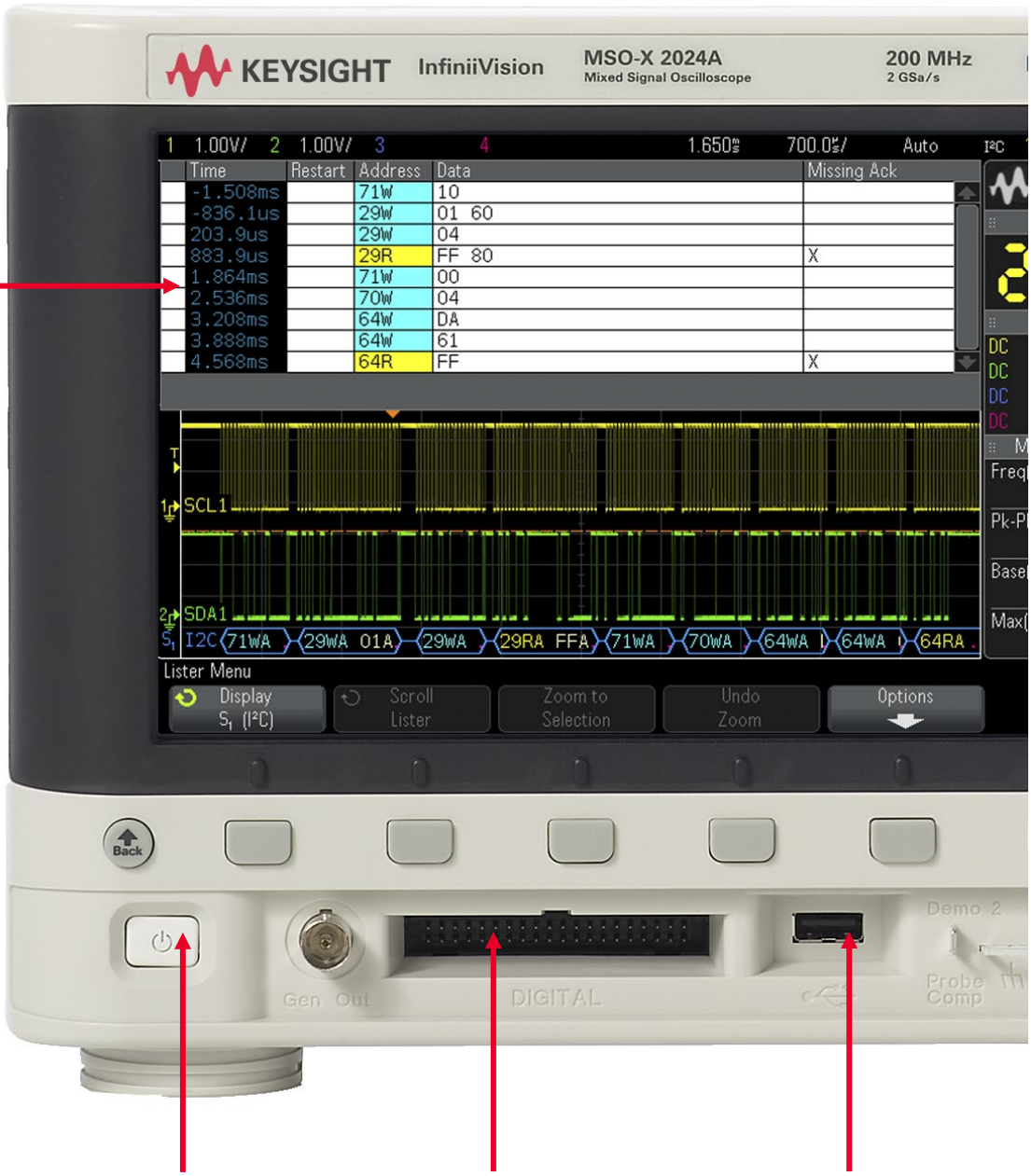
Optimize lab bench space

With 5 instruments in 1, you will save on precious lab bench space by getting an oscilloscope, logic timing analyzer, serial protocol analyzer, WaveGen function generator and integrated digital voltmeter 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.



Oscilloscope Shown Actual Size

8.5-inch high resolution wide screen display reveals subtle details that most scopes don't show you



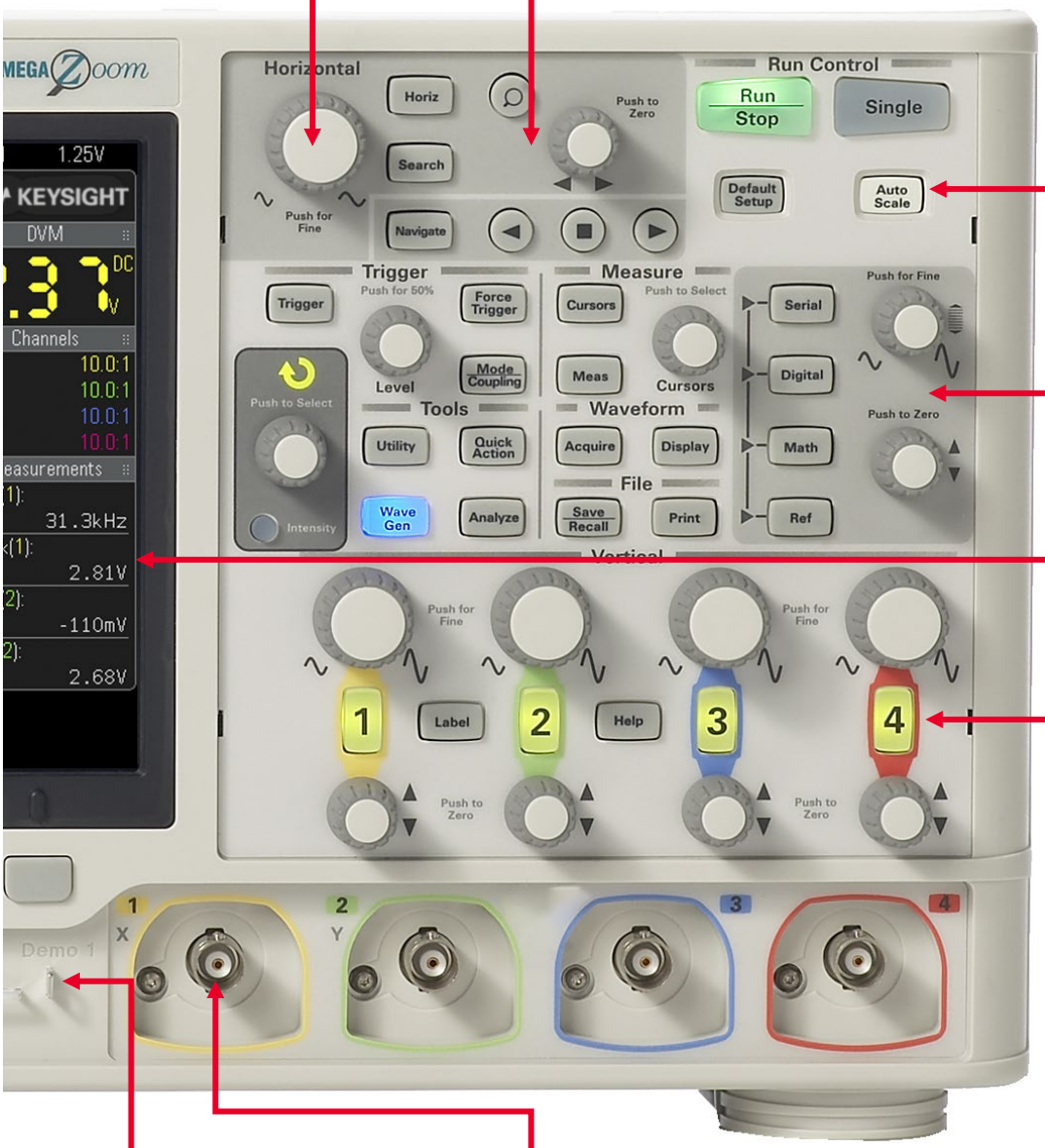
WaveGen – Industry first built-in function generator

Get up to eight integrated digital channels

Built-in USB port makes it easy to save your work and update your system software quickly

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, serial analysis, math functions and reference waveforms

Quick summary display of sample rate, channel settings and measurements

All front panel knobs are pushable

Demo and training signals

Integrated digital voltmeter

Configuring Your InfiniiVision X-Series Oscilloscope

Step 1. Choose your bandwidth and channel count

InfiniiVision 2000 X-Series scopes							
		2002A	2004A	2012A	2014A	2022A	2024A
Bandwidth [1] (–3 dB)		70 MHz	70 MHz	100 MHz	100 MHz	200 MHz	200 MHz
Calculated rise time (10 to 90%)		≤ 5 ns	≤ 5 ns	≤ 3.5 ns	≤ 3.5 ns	≤ 1.75 ns	≤ 1.75 ns
Input channels	DSOX	2	4	2	4	2	4
	MSOX	2 + 8	4 + 8	2 + 8	4 + 8	2 + 8	4 + 8

Step 2. Select hardware upgrades [2]

Hardware upgrades	Description	Model number to order
WaveGen	License for built-in 20 MHz function generator	DSOXWAVEGEN
LAN/VGA module	Plug-in module to support LAN and VGA connectivity	DSOXLAN
GPIB module	Plug-in module to support GPIB connectivity	DSOXGPIB

Step 3. Select licensed software [2]

Licensed software	Description	Model number to order
Embedded software package [3]	I^2C, SPI, and UART (RS232/422/485) serial trigger & decode, plus Mask Limit Testing	D2000GENB
Automotive software package [3]	CAN, LIN serial trigger & decode, plus Mask Limit Testing (CAN mask files available to download)	D2000AUTB
Ultimate bundle software package [3]	I^2C, SPI, and UART, CAN, and LIN serial trigger & decode, plus Mask Limit Testing	D2000BDLB

Step 4. Choose your probes [4]

Probes		2000 X-Series
N2841A	150 MHz 10:1 passive probe	Standard one per channel for 70 and 100 MHz models
N2842A	300 MHz, 10:1 passive probe	Standard one per channel for 200 MHz models
N2755A	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

Probes		2000 X-Series
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
1146A	1146A 100 kHz, 100 A, AC/DC current probe	Optional
N7040A	23 MHz, 3 kA, AC current probe	Optional
N7041A	30 MHz, 600 A, AC current probe	Optional
N7042A	30 MHz, 300 A, AC current probe	Optional

1. For example, if you chose 100 MHz, 2+8 channels, the model number will be MSOX2012A.
2. See page 29 for more detailed information on upgradability and installation process.
3. Serial trigger and decode application will not run simultaneously with digital channels.
4. Refer to Keysight literature 5968-8153EN for additional probes and accessories.

Step 5. Add the final touches

Recommended accessories	2000 X-Series
Rack mount kit	N6456A
Soft carrying case and front panel cover	N6457A
Hard copy manual	N6458A
Front panel cover (only)	N2747A
ANSI Z540-1-1994 Calibration	MSOX or DSOX2000-A6J
BenchVue Oscilloscope application	Standard (if purchased after June 1, 2019)
User-defined Application (UDA) software	D9010UDAA
Infiniium Offline Analysis software	D9010BSEO

Performance Characteristics

Specification overview								
		2002A	2004A	2012A	2014A	2022A	2024A
Bandwidth [1] (–3 dB)		70 MHz		100 MHz		200 MHz	
Calculated rise time (10 to 90%)		≤ 5 ns		≤ 3.5 ns		≤ 1.75 ns	
Input channels	DSOX	2	4	2	4	2	4
	MSOX	2 + 8	4 + 8	2 + 8	4 + 8	2 + 8	4 + 8
Maximum sample rate [1]		2 GSa/s half-channel interleaved, 1 GSa/s per channel					
Maximum memory depth		1M points per channel (standard)					
Display size and type		8.5-inch WVGA with 64 levels of intensity grading					
Waveform update rate		200,000 waveforms per second					
Vertical system analog channels							
Input coupling		AC, DC					
Input sensitivity range		1 mV/div to 5 V/div [2]					
Input impedance		1 MΩ ± 2% (11 pF)					
Vertical resolution		8 bits (measurement resolution is 12 bits with averaging)					
Dynamic range		± 8 divisions from center screen					
Maximum input voltage		135 Vrms; 190 Vpk					
		Probing technology allows testing of higher voltages. For example, the included N2841A or N2842A 10:1 probe supports testing up to 300 Vrms Use this instrument only for measurements within its specified measurement category (not rated for CAT II, III, IV). No transient overvoltage allowed					
DC vertical accuracy		± [DC vertical gain accuracy + DC vertical offset accuracy + 0.25% full scale][2]					
DC vertical gain accuracy [1]		± 3% full scale (≥ 10 mV/div); ± 4% full scale (< 10 mV/div) 2					
DC vertical offset accuracy		± 0.1 div ± 2mV ± 1% of offset setting					
Channel-to-channel isolation		≥ 40 dB from DC to maximum specified bandwidth of each model					
Position/offset range	1 MΩ	1 mV to 200 mV/div: ± 2 V, > 200 mV to 5 V/div: ± 50 V					
Hardware bandwidth limits		Approximately 20 MHz (selectable)					
Horizontal system analog channels							
		2002A	2004A	2012A	2014A	2022A	2024A
Time base range		5 ns/div to 50 s/div				2 ns/div to 50 s/div	
Time base accuracy [1]		25 ppm ± 5 ppm per year (aging)					

Horizontal system analog channels							
		2002A	2004A	2012A	2014A	2022A	2024A
Time base delay time range	Pre-trigger	Greater of 1 screen width or 200 µs (400 µs in interleaving mode)					
	Post-trigger	1 s to 500 s					
Channel-to-channel deskew range		± 100 ns					
Δ Time accuracy (using cursors)		± (time base accuracy [1] reading) ± (0.0016 [1] screen width) ± 100 ps					
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 ≥ 20 µs/div					
Segmented		Re-arm time= 19 µs (minimum time between trigger events)					
Trigger system							
Trigger modes		• Normal (triggered): Requires trigger event for scope to trigger • Auto: Triggers automatically in absence of trigger event • Single: Triggers only once on a trigger event, press [Single] again for scope to find another trigger event, or press [Run] to trigger continuously in either Auto or Normal mode • Force: Front panel button that forces a trigger					
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) [1]		< 10 mV/div: greater of 1 div or 5 mV; ≥ 10 mV/div: 0.6 div					
Trigger sensitivity (external) [1]		200 mV (DC to 100 MHz); 350 mV (100 to 200 MHz)					
External trigger input		Included on all models					
Trigger type selections							
		All 2000 X-Series models					
Edge		Trigger on a rising, falling, alternating or either edge of any source					
Edge then edge (B trigger)		Arm on a selected edge, wait a specified time, then trigger on a specified count of another selected edge					
Pulse width		Trigger on a pulse on a selected channel, whose time duration is less than a value, greater than a value, or inside a time range • Minimum duration setting: 2 to 10 ns (depends on bandwidth) • Maximum duration setting: 10 s					

1. Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period and from ± 10 °C firmware calibration temperature.
2. 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.

Pattern	Trigger when a specified pattern of high, low, and don't care levels on any combination of analog, digital, or trigger channels is [entered | exited]. Pattern must have stabilized for a minimum of 2 ns to qualify as a valid trigger condition.
Video	Trigger on all lines or individual lines, odd/even or all fields from composite video, or broadcast standards (NTSC, PAL, SECAM, PAM-M)
Runt Trigger	on a position runt pulse that fails to exceed a high-level threshold. Trigger on a negative runt pulse that fails to exceed a low-level threshold. Trigger on either polarity runt pulse based on two threshold settings. Runt triggering can also be time-qualified (< or >) with a minimum time setting of 6~10 ns (depending on bandwidth) and maximum time setting of 10 s.
Rise/fall time	Trigger on rise-time or fall-time edge speed violations (< or >) based on user-selectable threshold. Select from (< or >) and time settings range between 3-5 ns (depending on bandwidth) and 10 s
Nth edge burst	Trigger on the Nth (1 to 65535) edge of a pulse burst. Specify idle time (10 ns to 10 s) for framing. Pattern Trigger when a specified pattern of high, low, and don't care levels on any combination of analog, digital, or trigger channels is [entered | exited]. Pattern must have stabilized for a minimum of 2 ns to qualify as a valid trigger condition. Minimum duration setting: 6-10 ns (depending on bandwidth) and 10 s Or: Trigger on any selected edge across multiple analog or digital channels
I²C (optional)	Trigger on I²C (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 ack, restart, EEPROM read, and 10-bit write.
SPI (optional)	Trigger on SPI (Serial Peripheral 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.
CAN (optional)	Trigger on CAN (controller area network) version 2.0A and 2.0B signals. Trigger on the start of frame (SOF) bit (standard). 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 (optional)	Trigger on LIN (Local Interconnect Network) sync break, sync frame ID, or frame ID and data
RS232/422/485/UART (optional)	Trigger on Rx or Tx start bit, stop bit or data content
Cursors	
Types	Amplitude, time, frequency (FFT), manual, tracking, binary, HEX
Measurements	ΔT, 1/ΔT, ΔV/X, 1/ΔX, ΔY, Phase and Ratio
Cursors [2]	• Single cursor accuracy: ± [DC vertical gain accuracy + DC vertical offset accuracy + 0.25% full scale] • Dual cursor accuracy: ± [DC vertical gain accuracy + 0.5% full scale] [1]
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, AC RMS- full screen (std dev)

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), bit rate
Waveform math	
Operators	Add, subtract, multiply, divide, FFT, Ax + B, Square, Absolute, Common Log, Natural Log, Exponential, Base 10 Exponential, LP Filter, HP Filter, Magnify, Measurement Trend, Chart Logic Bus (Timing or State)
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 color TFT LCD
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 (100 ms to 60 s)
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	500 kpts per channel (digital channels only) 125 kpts per channel (analog and digital channels)
Threshold selections	TTL (+1.4 V),CMOS (+2.5 V), ECL (-1.3 V), User-definable (± 8.0 V in 10 mV stops)
Threshold accuracy [1]	± (100 mV + 3% of threshold settings)
Maximum input voltage	± 40 V peak CAT I
Maximum input dynamic range	± 10 V about threshold
Minimum voltage swing	500 mVpp
Input impedance	100 kΩ ± 2% at probe tip, ~8 pF
Minimum detectable pulse width	5 ns
Channel-to-channel skew	2 ns (typical), 3 ns (maximum)

1. Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period and from ± 10 °C firmware calibration temperature.
2. 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.

WaveGen – built-in function generator (Specifications are typical)	
Waveforms	Sine, square, pulse, triangle, ramp, noise, DC
Sine	• Frequency range: 0.1 Hz to 20 MHz • Amplitude flatness: ± 0.5 dB (relative to 1 kHz) • Harmonic distortion: –40 dBc • Spurious (non harmonics): –40 dBc • Total harmonic distortion: 1% • SNR (50 Ω load, 500 MHz BW): 40 dB (Vpp ≥ 0.1 V); 30 dB (Vpp < 0.1 V)
Square wave/pulse	• Frequency range: 0.1 Hz to 10 MHz • Duty cycle: 20 to 80% • Duty cycle resolution: Larger of 1% or 10 ns • Pulse width: 20 ns minimum • Pulse width resolution: 10 ns or 5 digits, whichever is larger • Rise/fall time: 18 ns (10 to 90%) • Overshoot: < 2% • Asymmetry (at 50% DC): ± 1% ± 5 ns • Jitter (TIE RMS): 500 ps
Ramp/triangle wave	• Frequency range: 0.1 Hz to 100 kHz • Linearity: 1% • Variable symmetry: 0 to 100% • Symmetry resolution: 1%
Noise	Bandwidth: 20 MHz typical

Frequency	• Sine wave and ramp accuracy:
	  • 130 ppm (frequency < 10 kHz)
	  • 50 ppm (frequency > 10 kHz)
	• Square wave and pulse accuracy:
	  • [50+frequency/200] ppm (frequency < 25 kHz)
	  • 50 ppm (frequency ≥ 25 kHz)
	• Resolution: 0.1 Hz or 4 digits, whichever is larger

Amplitude	• Range:
	  • 20 mVpp to 5 Vpp into Hi-Z
	  • 10 mVpp to 2.5 Vpp into 50 Ω
	• Resolution: 100 µV or 3 digits, whichever is larger
	• Accuracy: 2% (frequency = 1 kHz)

DC offset	• Range:
	  • ± 2.5 V into Hi-Z
	  • ± 1.25 V into 50 ohms
	• Resolution: 100 µV or 3 digits, whichever is larger
	• Accuracy: ± 1.5% of offset setting ± 1.5% of amplitude ± 1 mV

Trigger output	Trigger output available on Trig out BNC
Modulation	Modulation types: AM, FM, FSK Carrier waveforms: Sine, ramp Modulation source: Internal (no external modulation capability) AM: Modulation waveform: Sine, square, ramp Modulation frequency (1 Hz to 20 kHz) Depth: 0 to 100%

	FM: Modulation: Sine, square, ramp (1 Hz to 20 kHz) Modulation frequency (1 Hz to 20 kHz) Minimum carrier frequency: 10 kHz Minimum deviation: 1 Hz Maximum deviation: 100 kHz or (carrier frequency - 9 kHz), whichever is smaller FSK: Modulation: 50% duty cycle square wave FSK rate: 1 Hz to 20 kHz Minimum carrier frequency: 10 kHz Minimum hop frequency: 2 x FSK rate to 10 MHz
Integrated digital voltmeter (Specifications are typical)	
Functions	ACrms, DC, DCrms, frequency
Resolution	ACV/DCV: 3 digits frequency: 5.5 digits
Measuring rate	100 times/second
Autoranging	Automatic adjustment of vertical amplification to maximize the dynamic range of measurements
Range meter	Graphical display of most recent measurement, plus extrema over the previous 3 seconds
Measurement range (Specifications are typical)	
	Frequency range
ACRms	20 Hz to 100 kHz
DCRms	20 Hz to 100 kHz
DC	NA
Frequency counter	1 Hz – BW of Scope

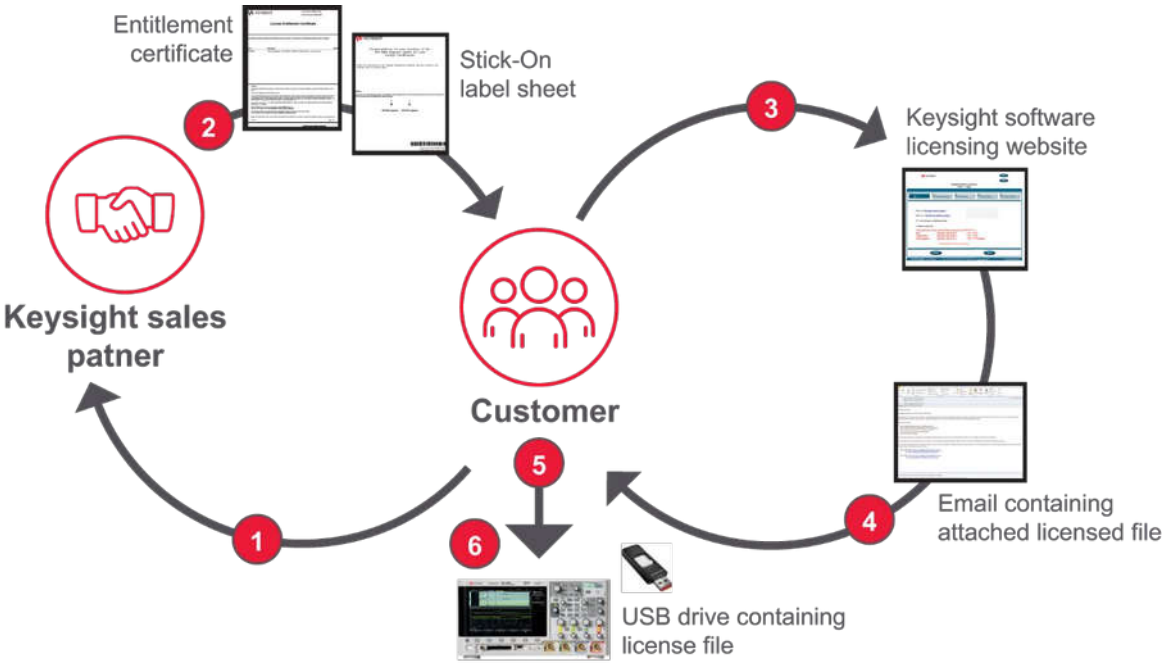
InfiniiVision X-Series Physical Characteristics

Connectivity	
Standard ports	One USB 2.0 hi-speed device port on rear panel. Supports USBTMC protocol Two USB 2.0 hi-speed host ports, front and rear panel Supports memory devices, printers and keyboards
Optional ports	GPIB, LAN, WVGA video out
General and environmental characteristics	
Power line consumption	100 W
Power voltage range	100 to 120 V, 50/60/400 Hz; 100 to 240 V, 50/60 Hz ± 10%

Environmental rating	5 to 50 °C, 4000m max Maximum Relative Humidity (non-condensing): 95%RH up to 40 °C From 40 °C to 50 °C, the maximum % Relative Humidity follows the line of constant dew point
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	ANSI/UL Std. No. 61010-1:2012; CAN/CSA-C22.2 No. 61010-1-12 ANSI/UL Std. No. 61010-2-030:2012; CAN/CSA-C22.2 No. 61010-2-030-12
Dimensions (W x H x D)	381 mm (15 in) x 204 mm (8 in) x 142 mm (5.6 in)
Weight	Net: 3.9 kg (8.5 lbs.), shipping: 4.1 kg (9.0 lbs.)
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
Included standard with oscilloscope	
Calibration	Soft copy of Certificate of Calibration (CoC) downloadable from https://service.keysight.com/infoline/public/details.aspx?i=DOC , 2-year calibration interval
Standard secure erase	
Standard probe	
• N2841A 150 MHz 10:1 passive probe	Standard one per channel for 70 and 100 MHz models
• N2842A 300 MHz, 10:1 passive probe	Standard one per channel for 200 MHz models
• N2755A 8-channel logic probe and accessory kit	Standard on MSO models or with DSOX2MSO upgrade
Built-in help language support for English, Japanese, simplified Chinese, traditional Chinese, Korean, German, French, Spanish, Russian, Portuguese and Italian, Certificate of Calibration, Documentation CD	
Interface language support GUI menus: English, Japanese, simplified Chinese, traditional Chinese, Korean, German, French, Spanish, Russian, Portuguese, Thai, Polish and Italian	
Localized power cord	
Included standard with oscilloscope	

For MET/CAL procedures, click on the Cal Labs solutions link below Cal Labs Solutions https://www.callabsolutions.com/procedures/.

After-purchase Upgrades



Hardware upgrades

Model numbers	Description
DSOX2WAVEGEN	Built-in 20 MHz function generator upgrade
DSOX2MSO	Upgrade to 8 digital timing channels (logic probe included)
DSOX2BW12	Bandwidth upgrade from 70 to 100 MHz, 2-ch models
DSOX2BW14	Bandwidth upgrade from 70 to 100 MHz, 4-ch models
DSOX2BW22	Bandwidth upgrade from 100 to 200 MHz, 2-ch models
DSOX2BW24	Bandwidth upgrade from 100 to 200 MHz, 4-ch models
DSOX2PLUS[1]	Upgrade 2000X oscilloscopes that were purchased before March 5, 2018 to include maximum memory (1M pt), segmented memory, enhanced update rate, advanced triggering, and advanced math function.

1. Enhancement:
   - Waveform update rate increases from 50,000 waveforms/sec to over 200,000 waveforms/sec
   - Memory increase from 100 kpts/ch to 1 Mpts/ch (replaces DSOX2MEMUP)
   - Segmented memory, 250 segments
   - Add advanced trigger: rise/fall time trigger, setup/hold time trigger
   - Add advanced math: Ax + B, Square, Square Root, Absolute Value, Common Logarithm, Natural Logarithm, Differentiate, Integrate, Base 10 Exponential, Exponential, Low-pass Filter, High-pass Filter, Measurement Trend, Magnify, Chart Logic Bus Timing, Chart Logic Bus State

Software upgrades

Model numbers	Description
D2000GENB	Embedded Software Package: I^2C, SPI, and UART (RS232/422/485) serial trigger & decode, plus Mask Limit testing
D2000AUTB	Automotive Software Package: CAN and LIN serial trigger & decode, plus Mask Limit testing
D2000BDLB	Ultimate Bundle Software Package: I2C, SPI, UART, CAN, and LIN serial trigger & decode, plus Mask Limit testing

	Process description
1	Place order for a license only bandwidth upgrade or software package to a Keysight 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 N2842A 10:1 300 MHz passive probes (1 per channel) will be sent with the upgrade.
2	Receive a paper or electronic .pdf Entitlement Certificate document for any of the orderable software packages. For bandwidth upgrades only, you receive a stick-on label document indicating upgraded bandwidth specification.
3	Use Entitlement Certificate or electronic .pdf document containing instructions and certificate number needed to generate a license file for a particular 2000 X-Series oscilloscope model number and serial number unit.
4	Receive the licensed file and installation instructions via email.
5	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.
6	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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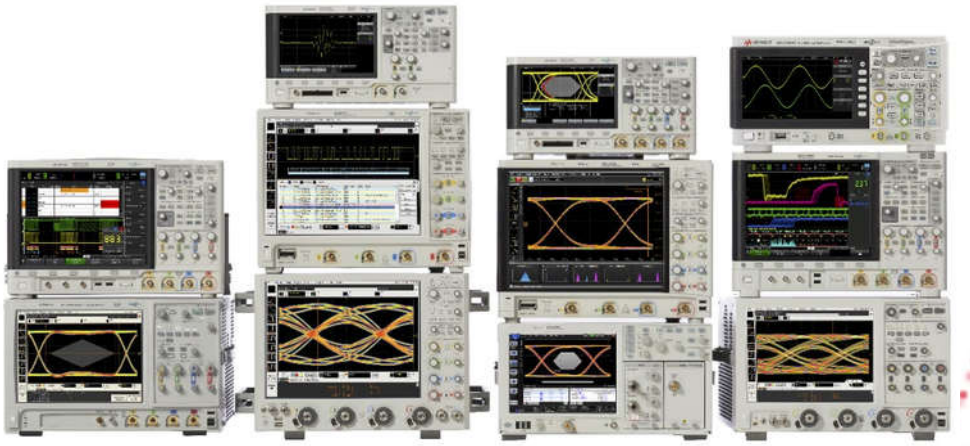
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