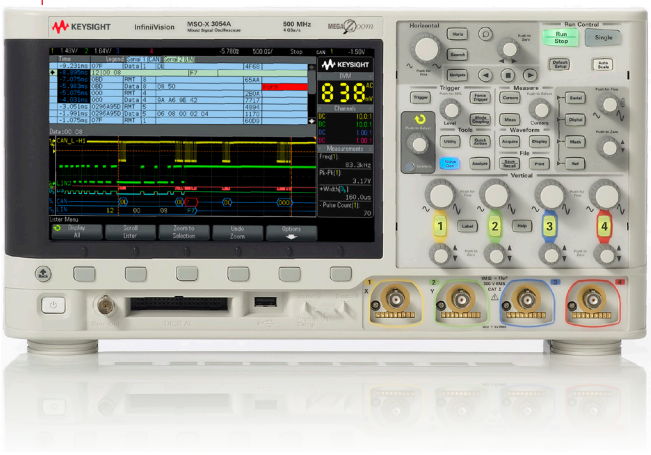
Keysight Technologies InfiniiVision 3000 X-Series Oscilloscopes

Data Sheet



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

KEYSIGHT TECHNOLOGIES

Unlocking Measurement Insights

Breakthrough Technology for Budget Conscious Customers

Overview of the Keysight InfiniiVision X-Series oscilloscopes

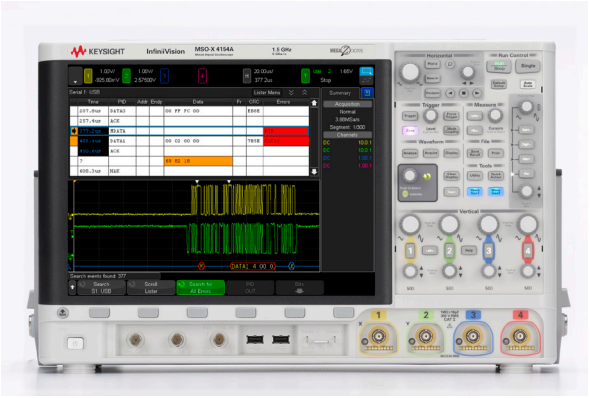
InfiniiVision	6000 X-Series	4000 X-Series	3000 X-Series	2000 X-Series
Analog channels	2 or 4	2 or 4	2 or 4	2 or 4
Digital channels	16 (MSO models or upgrade)	16 (MSO models or upgrade)	16 (MSO models or upgrade)	8 (MSO models or upgrade)
Bandwidth (upgradable)	1, 2.5, 4, 6 GHz	200, 350, 500 MHz, 1, 1.5 GHz	100, 200, 350, 500 MHz, 1 GHz	70, 100, 200 MHz
Max sampling rate	20 GSa/s	5 GSa/s	4 GSa/s (≤ 500 MHz) 5 GSa/s (1 GHz)	2 GSa/s
Max memory depth	4 Mpts	4 Mpts	2 Mpts (standard) 4 Mpts (option)	100 kpts (standard) 1 Mpts (option)
Max waveform update rate	> 450,000 waveforms/sec	> 1,000,000 waveforms/sec	> 1,000,000 waveforms/sec	> 50,000 waveforms/sec
Display	12.1 inches, capacitive, multi-touch, gesture enabled	12.1 inches, capacitive	8.5 inches	8.5 inches
InfiniiScan Zone trigger	Standard	Standard	No	No
Voice control	Standard	No	No	No
WaveGen 20-MHz funtion/ arbitrary waveform generator	Dual-channel AWG (option)	Dual-channel AWG (option)	Single-channel AWG (option)	Single-channel funtion (option)
Integrated digital voltmeter	Option	Option	Option	Option
Integrated hardware counter	5 digits (standard), 10 digits + totalizer (option)	5 digits (standard)	5 digits (standard)	5 digits (standard)
Search and navigate	Standard, lister supported	Standard	Standard	Standard
Segment memory	Standard	Standard	Option	Option
Mask/limit test	Option	Option	Option	Option
Serial protocol analysis options	I^2S/SPI, UART, CAN/LIN, FlexRay, I^2S, MIL-STD1553, ARINC429, USB2.0	I^2S/SPI, UART, CAN/LIN, FlexRay, I^2S, MIL-STD1553, ARINC429, USB 2.0	I^2S/SPI, UART, CAN/LIN, FlexRay, I^2S, MIL-STD1553, ARINC429	I^2S/SPI, UART, CAN/LIN
Advanced analysis options	Power analysis, USB 2.0 signal quality test, HDTV analysis, FPGA	Power analysis, USB 2.0 signal quality test, HDTV analysis, FPGA	Power analysis, HDTV analysis	No
Color grade	Standard	No	No	No
Histogram	Standard	No	No	No
FFT	Standard enhanced FFT	Standard	Standard	Standard
Jitter analysis with clock recovery	Option	No	No	No
Realtime eye diagram	Option	No	No	No
Advanced math	Standard, display four funtions simultaneously	Standard, display one funtion	Option, display one funtion	No
Connectivity	Standard USB 2.0, LAN, video (GPIB option), USB mouse and keyboard support	Standard USB 2.0, LAN, video (GPIB option), USB mouse and keyboard support	Standard USB 2.0 (LAN/video/ GPIB option), USB keyboard support	Standard USB 2.0 (LAN/video/ GPIB option), USB keyboard support

Need a bigger display and state-of-the-art usability?

Consider the InfiniiVision 4000 X-series

- Industry's first 12.1-inch capacitive touch display
- InfiniiScan Zone touch trigger capability
- 200 MHz - 1.5 GHz DSO and MSO models
- 1,000,000 wfms/sec
- Fully upgradable 5 instruments in 1
- 20 MHz dual-channel WaveGen with arbitrary waveform

See **www.keysight.com/find/4000X-series** for more details.



Breakthrough Technology for Budget Conscious Customers: More Scope

The InfiniiVision 3000 X-Series redefined oscilloscopes. It sees the most signal detail, does more functions than any other oscilloscope, and gives you maximum investment protection.

The 3000 X-Series's innovation starts with the industry's only 5-instruments-in-1 integration. The industry-leading one million waveforms per second update rate is 20 times faster than the competition to display the most signal detail. The 3000 X-Series provides maximum investment protection with fully-upgradable 5-instruments-in-1; even bandwidth is upgradable. Our break-through technology delivers more scope for the same budget.

3000 X-Series – oscilloscopes redefined

Key features

- See more:
  - One million waveforms per second update rate
  - MegaZoom IV smart memory technology
  - Large 8.5-inch WVGA display
  - Optional segmented memory
- Do more:
  - Industry's first 5-instruments-in-1 (oscilloscope, digital channels, built-in 20 MHz function/arbitrary waveform generator with modulation, integrated digital voltmeter and protocol analyzer)
- Get more:
  - Investment protection with Industry's only fully-upgradable oscilloscope, including bandwidth to 1 GHz
  - Industry's leading application solutions

InfiniiVision 3000 X-Series with MegaZoom IV smart memory technology

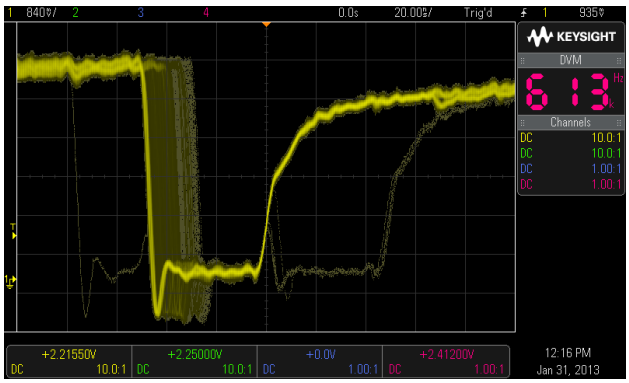
Breakthrough Technology for Budget Conscious Customers: See More of Your Signal, More of The Time

Largest display

The best signal visibility starts with the largest display. The InfiniiVision 3000 X-Series comes with a large 8.5-inch WVGA display so you can view analog, digital and serial signals easily on the screen.

Fastest update rate

If you can't see the problem, it is hard to troubleshoot it. With Keysight's MegaZoom IV smart memory technology, the 3000 X-Series updates waveforms up to 1 million times per second, which gives you the highest probability of capturing random and infrequent events that you would miss on an oscilloscope with a lower waveform update rate.



Fast update rate of the 3000 X-Series displaying the rare metastable signal

Deeper memory for longer time capture

With up to 4 Mpts of MegaZoom IV deep memory, you can capture long, non-repeating signals while maintaining a high sample rate, then quickly zoom in on areas of interest.

The InfiniiVision 3000 X-Series optimizes your deep-memory oscilloscope measurements by using MegaZoom IV technology to make the most effective trade-offs in sample rate, memory depth and waveform update rate automatically. Although many people think deeper memory is always better, usually deep memory means making tradeoffs.

Oscilloscopes with deep memory require additional waveform processing time to acquire deep memory waveforms, which means waveform update rates will be reduced significantly. For this reason, most other oscilloscopes have manual memory-depth selections, and the typical default memory depth setting is usually relatively shallow (10 to 100 kpts). If you want to use deep memory in these other oscilloscopes, you must manually turn it on and deal with the update rate tradeoff.

4M deep memory captured a long time span without losing the details

How does Keysight do that?

The MegaZoom IV smart memory technology combines the capabilities of an oscilloscope, digital channels, protocol analyzer, WaveGen built-in function generator and DVM in a compact form factor. Fourth generation MegaZoom technology enables the industry's fastest waveform update rate with responsive deep memory.

Breakthrough Technology for Budget Conscious Customers: Do More with The Power of 5 Instruments in 1

Best-in-class oscilloscope

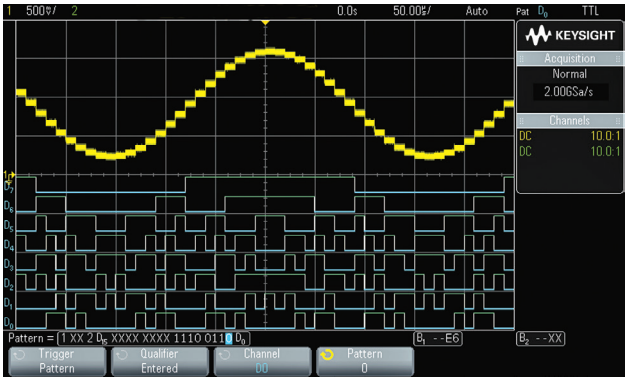
The InfiniiVision 3000 X-Series features up to 4 Mpts of memory with Keysight's patented *MegaZoom* IV technology that is always enabled and always responsive providing the industry's fastest update rate at up to 1 million waveforms per second, with no compromise if you turn on measurements, digital channels or protocol decodes.

In addition, the 3000 X-Series offers 35 (50 with N2820A Series high-sensitivity AC/DC current probe) automated measurements, 10 parametric triggers, serial protocol triggers, as well as waveform math functions including FFT.

Upgradable, integrated mixed signal oscilloscope (MSO)

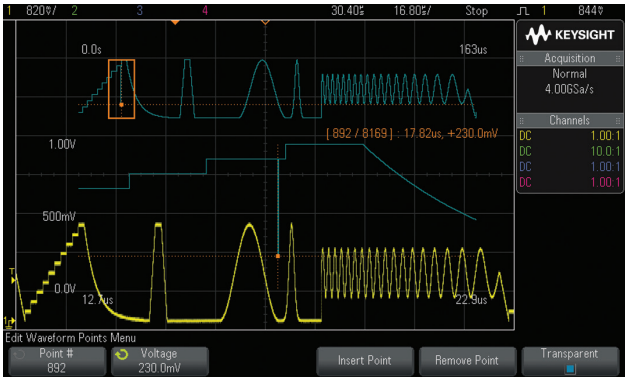
The 3000 X-Series is the first instrument in its class to offer an integrated and upgradable digital channels. Digital content is everywhere in today's designs and traditional 2 and 4 channel oscilloscopes do not always provide enough channels for the job at hand.

With an additional 16 integrated digital channels, you now have up to 20 channels of time-correlated triggering, acquisition and viewing on the same instrument. Buy a 2 or 4 channel DSO and at anytime, and upgrade it yourself to an MSO with a license to turn on those integrated
16 digital channels.



Industry's first WaveGen built-in 20 MHz function/ arbitrary waveform generator

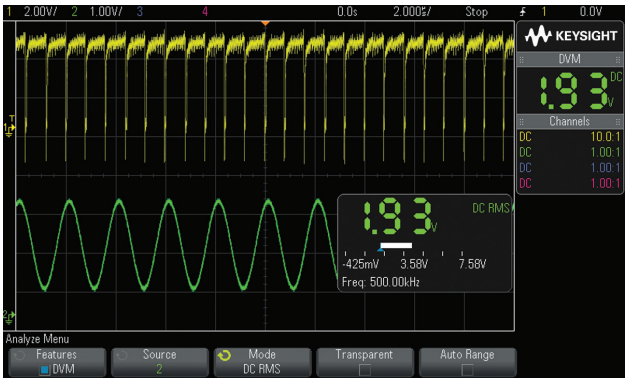
- An industry first, the 3000 X-Series offers an integrated built-in 20 MHz function/arbitrary waveform generator, available with modulation support (DSOX3WAVEGEN). The integrated function generator provides stimulus output of sine, square, ramp, pulse, DC, Sinc (x), exponential rise/fall, cardiac, Gaussian Pulse and noise waveforms to your device under test. The modulation feature supports AM, FM, and FSK modulations with modulation shapes of sine, square, and ramp. With AWG functionality, you can store the waveforms from analog channels or reference memory to the arbitrary memory and output from WaveGen. Easily create/edit the waveform using built-in editor or by using Keysight's free Benchlink Waveform Builder Basic: **www.keysight.com/find/33503.**



Breakthrough Technology for Budget Conscious Customers: Do More with The Power of 5 Instruments in 1

Integrated digital voltmeter

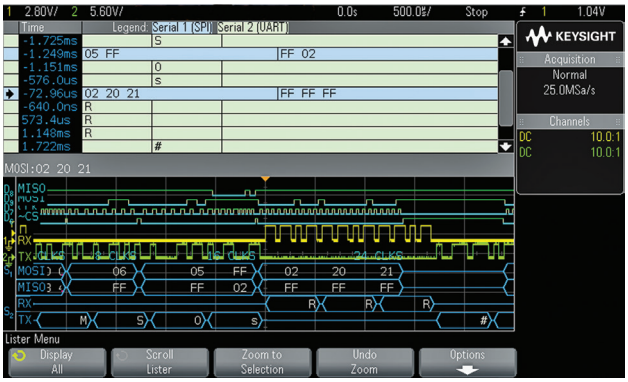
An industry first, the 3000 X-Series offers an integrated 3-digit voltmeter (DVM) and 5-digit frequency counter inside the oscilloscopes (DSOXDVM). The voltmeter operates through the same probes as the oscilloscope channels, however, the measurements are de-coupled from the oscilloscope triggering system 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.



Hardware-based serial protocol decode and triggering

- Embedded serial triggering and analysis (I^2C, SPI)
- Computer serial triggering and analysis (RS232/422/485/UART)
- Automotive and industrial serial triggering and analysis (CAN,LIN)
- FlexRay automotive triggering and analysis
- Audio serial triggering and analysis (I^2S)
- Aerospace and defense serial triggering and analysis (MIL-STD 1553 and ARINC 429)

Keysight's InfiniiVision Series oscilloscopes are the industry's first scopes to use hardware-based serial protocol decoding. Other vendors scopes use software post-processing techniques to decode serial packets/frames. With these software techniques, waveform and decode-update rates tend to be slow (sometimes seconds per update). 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 long record of serial bus communication using the InfiniiVision scope's MegaZoom IV deep memory, you can easily perform a search operation based on specific criteria, and then quickly navigate to bytes/frames of serial data that satisfy that search criteria. Sometimes it may be necessary to correlate data from one serial bus to another. Keysight's InfiniiVision 3000 X-Series oscilloscope can decode and list two serial buses simultaneously using hardware-based decoding. as well as display the captured data in a time interleaved "Lister" display.

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 3000 X-Series, your investment is protected. If you need more bandwidth (up to 1 GHz), digital channels, WaveGen, DVM or measurement applications in the future, you can easily add them all after the fact.

See pages 27 and 28 for more detailed information on available upgrades.

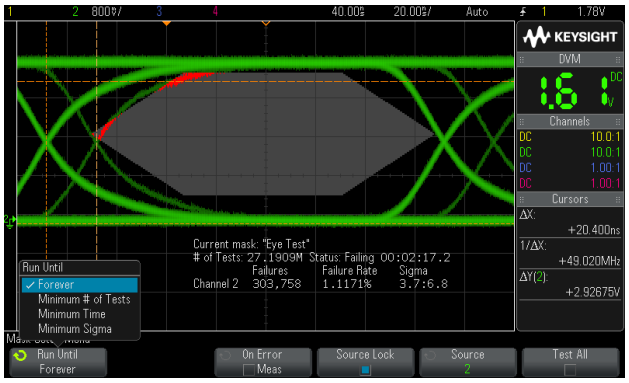
Add at the time of your purchase or upgrade later:

- Bandwidth
- Digital channels (MSO)
- WaveGen built-in 20 MHz function/arbitrary waveform generator
- Integrated digital voltmeter
- Measurement applications
- Serial protocol analysis
- Power measurement analysis
- HDTV video triggering and analysis
- Advanced math analysis
- Mask/limit testing
- Segmented memory
- Educators' lab kit

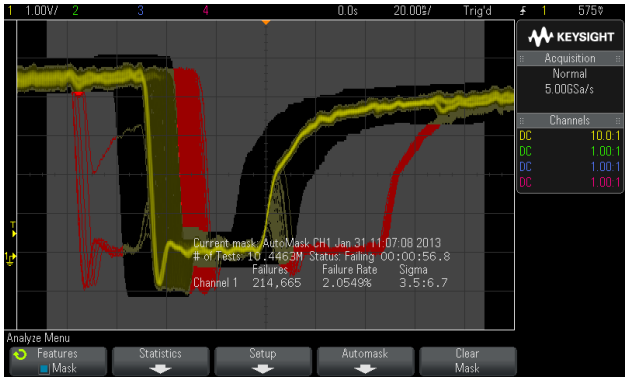
Mask/limit testing

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 3000 X-Series features hardware-based mask testing and can perform up to 270,000 tests per second.

Multiple test criteria can be selected including the ability to run tests for a specific number of acquisitions, time, or until detection of a failure. Pass/fail masks can be automatically created based on an input reference waveform along with user-specified tolerance bands, or can be created on a PC and then imported via a USB memory stick.



Mask test evaluated more than 27 million waveforms in just over two minutes



Limit testing made easy with the "automask" feature

Get More Investment Protection with The Industry's Only Fully upgradable Oscilloscope

Segmented memory

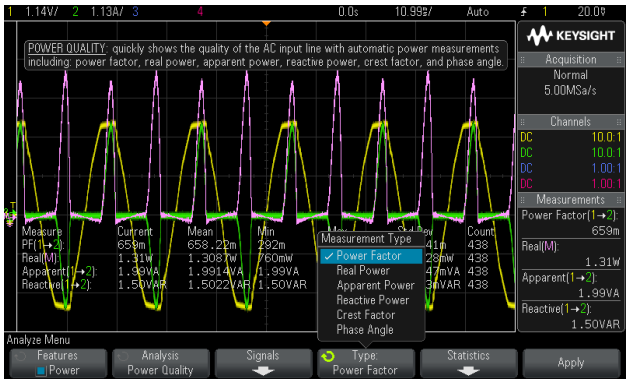
When capturing low-duty cycle pulses or data bursts, you can use segmented memory acquisition to optimize acquisition memory. Segmented memory acquisition not only lets you selectively capture and store important segments of signals without capturing unimportant signal idle/deadtime, but it also allows you to run post-capture inter-segment analysis such as segment play back, waveform measurements, and waveform overlay. Segmented memory acquisition is ideal for applications including packetized serial buses, pulsed laser, radar bursts and high-energy physics experiments. Up to 1000 segments can be captured on the 3000 X-Series models with a minimum re-arm time under 1 µs. Segmented memory works simultaneously with serial bus decodes as well.

Capture 1000 very infrequent glitches over 100 seconds using segmented memory, then run inter-segment measurement and overlay analysis on the 1000 segments.

Power measurement and analysis

When working with switching power supplies and power devices, the DSOX3PWR power measurements application provides a full suite of power measurements and analysis that runs in the oscilloscope. Measurements include:

- Current harmonics
- Efficiency
- Inrush current
- Modulation
- Power quality
- Switching response
- Transient response
- Turn on/turn off
- Output ripple
- Power Supply Rejection Ratio (PSRR)
- Slew rate



An example screen for power quality analysis

Also included at no additional charge is a license for the U1881A PC-based power analysis software package which provides additional offline measurements and report generation. U1881A additional measurements include:

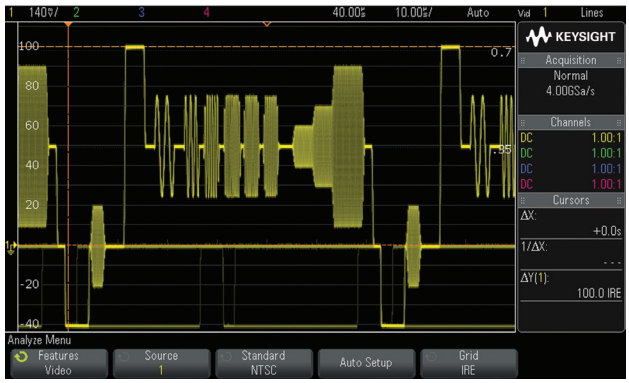
- Safe operating area (SOA)/SOA mask editor
- Dynamic on resistance (Rds)
- On/offline analysis

Get More Investment Protection with The Industry's Only Fully Upgradable Oscilloscope

HDTV video triggering and measurement analysis

Whether debugging consumer electronics with HDTV or characterizing a design, the DSOX3VID measurement application provides support for a variety of HDTV standards including:

- 480p/60
- 567p/50
- 720p/50
- 720p/60
- 1080i/50
- 1080i/60
- 1080p/24
- 1080p/25
- 1080p/30
- 1080p/50
- 1080p/60
- Generic (custom bi-level and tri-level sync video standards)



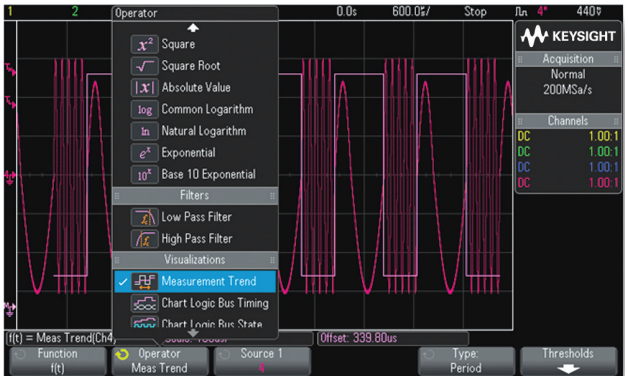
Advanced math analysis

In addition to the standard waveform math functions (add, subtract, multiply, integrate, differentiate, square root, FFT), the optional DSOX3ADVMATH application provides additional advanced waveform transforms, filters, and visualization tools including:

Transforms
- Ax + B
- Square (x^2)
- Absolute value (|x|)
- Common logarithm (log)
- Natural logarithm (ln)
- Exponential (e^x)
- Base 10 exponential (10^x)

Filters
- Low pass filter (4th order Bessel-Thompson filter with selectable -3dB frequency)
- High pass filter (single-pole high pass filter with selectable -3dB frequency)

Visualizations Tools
- Magnify
- Measurement trend
- Chart logic bus timing
- Chart logic bus state



Breakthrough Technology for Budget Conscious Customers: Other Productivity Tools

Infiniium Offline Oscilloscope Analysis Software (N8900A)

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 and view

- Navigate in time or between bookmarks
- Up to eight waveforms simultaneously
- One, two, or four grids

Measurements

- More than 50 automated measurements
- View up to 20 simultaneously

User-customizable result window

Analyze

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

Documentation

- Up to 100 bookmarks
- Markers with dynamic delta value updates when moved
- One step save/load setup and all waveforms

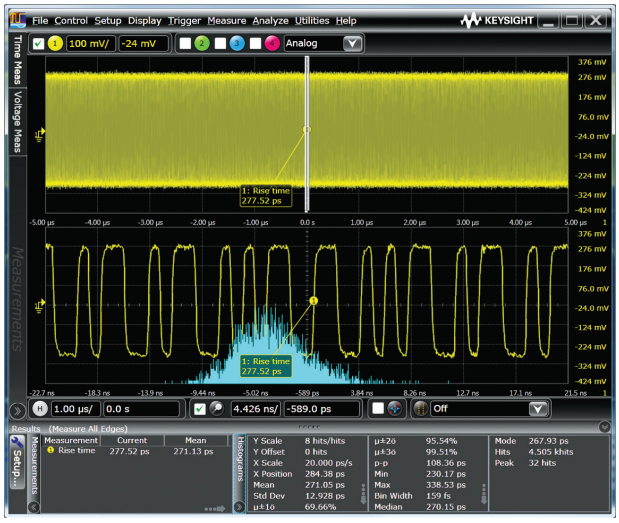
Analysis upgrades (optional)

- Protocol decode

Jitter analysis

- Serial data analysis

For more information, visit
www.keysight.com/find/N8900A

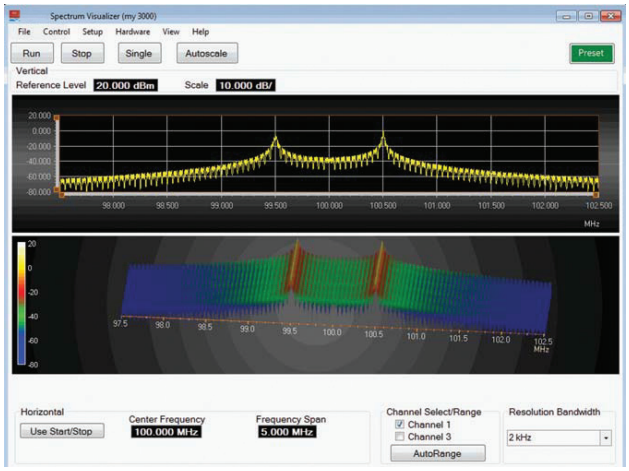


Use familiar scope controls to quickly navigate and zoom in to any event of interest.

Keysight Spectrum Visualizer Software (64997A)

This PC-based software package connects to the scope via USB or ethernet connection and uses the Keysight I/O libraries to communicate. It provides advanced FFT frequency domain analysis at a cost-effective price as well as spectrum and spectrogram analysis with an intuitive user interface that RF engineers are familiar with.

For more information visit
www.keysight.com/find/ASV_InfiniiVision

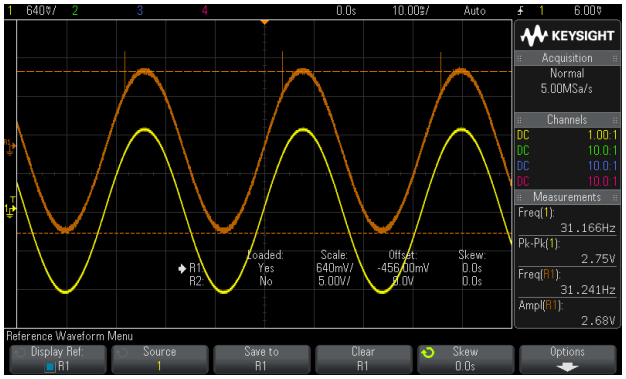


Waterfall view for ASV spectrogram measurement

Breakthrough Technology for Budget Conscious Customers: Other Productivity Tools

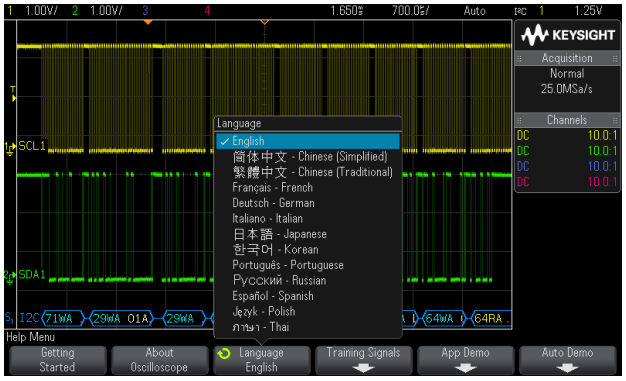
Reference waveforms

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 on stored data. You can also store waveforms on a removable USB memory device in *.h5 format and recall them back into scope's reference waveform memory later. Save and/or transfer waveforms to a PC as XY data pairs in a comma-separated values format (*.csv) or store bitmap images and transfer them to a PC for documentation purposes in a variety of image 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, and front panel overlays are available in 13 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 and compatibility

Get the most out of your 3000 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 3000 X-Series oscilloscopes including the innovative N2820A Series high-sensitivity current probes for ultra-low current measurements. For the most up-to-date and complete information about Keysight's probes and accessories, visit our Web site at www.keysight.com/find/scope_probes.

Also available is the N2744A T2A (Tektronix TekProbe® interface to Keysight AutoProbe) probe interface adapter. This adapter allows users of Tektronix TekProbe active probes to connect directly to the InfiniiVision 3000 X-Series AutoProbe interface BNC input.

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.)

Other Productivity Tools

Connectivity and LXI compatibility

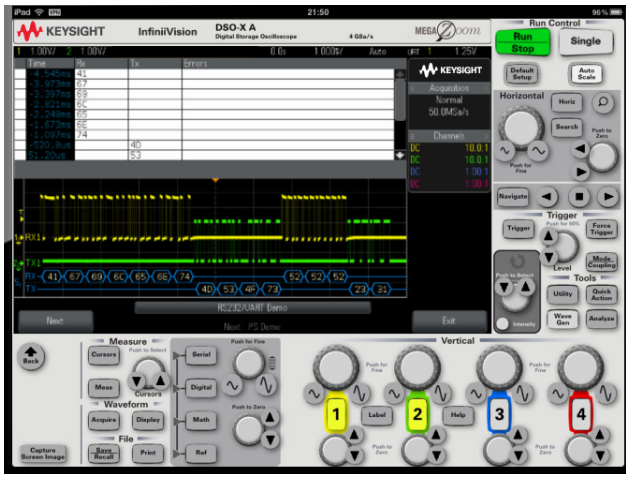
Built-in USB host (one front, one back) and USB device ports make PC connectivity easy. Operate the scope from your PC and save/recall stored waveforms as well as set-up files via LAN. The optional LAN/VGA module gives you network connectivity and complete LXI class C support as well as the ability to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

34840B BenchVue lets you visualize the 3000 X-Series and multiple measurements simultaneously. Save time with the ability to export measurement data to Excel, Word and MATLAB in three clicks. Monitor and control your 3000 X-Series with a mobile device from anywhere. Learn more at **www.keysight.com/find/BenchVue**

Virtual front panel

The traditional VNC connection through your favorite PC browser lets you:

- Operate the 3000 X-Series remotely
- Save/recall data and setup files
- Get screen image
- Get instrument status



In addition to the traditional VNC connection, the 3000 X-Series supports remote oscilloscope control from any html5-enabled browser on your tablet devices. The virtual front panel looks and acts like the real front panel on the oscilloscope with the same associated keys and knobs.

Warranty and calibration

Through improved quality processes and rigorous testing, the Keysight InfiniiVision X-Series oscilloscopes are now able to perform at specification for two years without yearly calibration thereby reducing cost of ownership to you.

Secure erase

The secure erase feature comes standard with all 3000 X-Series models. At the press of a button, internal non-volatile memory is cleared 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.

Breakthrough Technology for Budget Conscious Customers: Other Productivity Tools

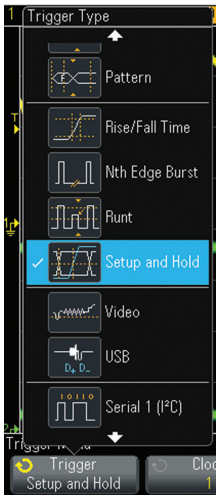
Search and navigation

When capturing long complex waveforms using the scope's deep acquisition memory, manually scrolling through stored waveform data to find specific events of interest can be slow and cumbersome. But with the InfiniiVision 3000 X-Series scope's automatic search & navigation capability, you can easily set up specific search criteria and then quickly navigate to "found and marked" events using the scope's front panel forward and back navigation keys. Available search criteria include: edges, pulse width (time-qualified), rise/fall times (time-qualified), runt pulses (time- and level-qualified), and serial.

The oscilloscope captured 1 ms of a digital data stream. It was able to find, mark, and then quickly navigate to 20 "runt" pulses using the search and navigation feature

Advanced parametric and serial bus triggering

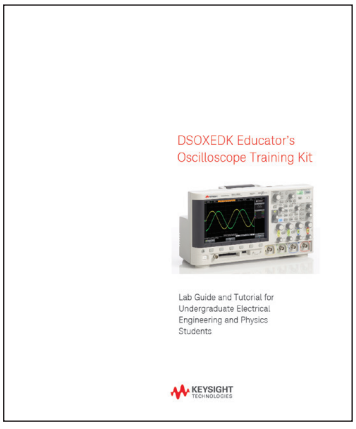
With today's more complex signals, it is also often necessary to trigger on complex signal conditions in order to synchronize the scope's acquisition on specific events of interest. Keysight's InfiniiVision 3000 X-Series scopes can trigger on the following conditions: edge, pulse width (time-qualified), pattern, rise/rall time, Nth edge burst, runt, setup & hold, video, USB 2.0 full/low speed, Serial1, and Serial2.



Examples of advanced triggers

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.keysight.com/find/EDK.**

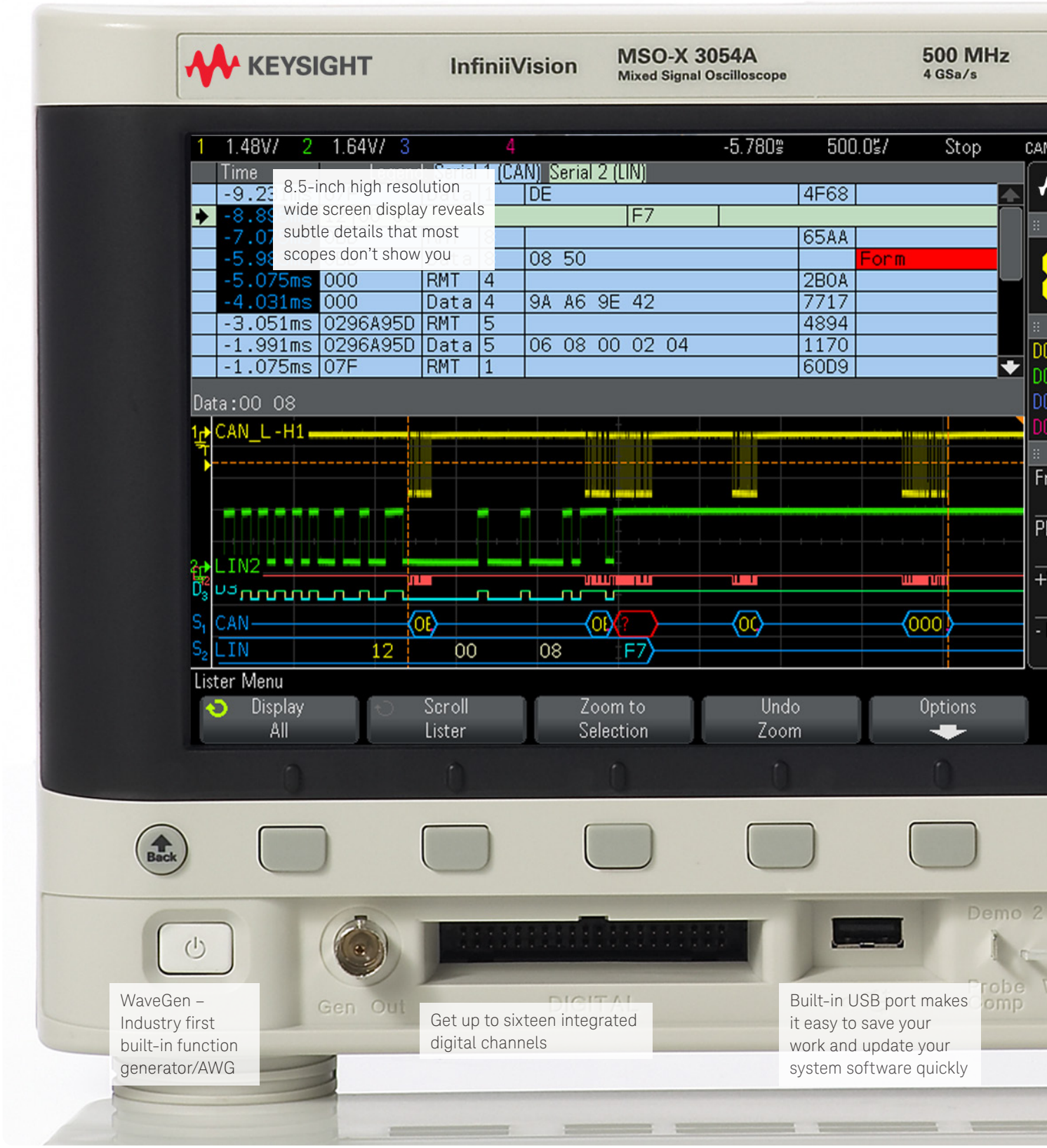


30-day trial license

The 3000 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.

Oscilloscopes Redefined: Breakthrough Technology Delivers More Scope for The Same Budget

Oscilloscope shown actual size



Search and navigate front panel controls make it easy to find and view specific signal activity quickly 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 serial, digital channels, math functions and reference waveforms

All front panel knobs are pushable

Demo and training signals

Integrated digital voltmeter

AutoProbe interface automatically configures the attenuation ratio of the probe and provides the probe power for Keysight's active probes

Configuring Your InfiniiVision X-Series Oscilloscope

Step 1. Choose your bandwidth, number of channels and memory depth.

3000 X-Series specification overview										
		3012A	**3014A**	**3024A**	**3032A**	**3034A**	**3052A**	**3054A**	**3102A**	**3104A**
Bandwidth[1] (– 3 dB)		100 MHz		200 MHz	350 MHz		500 MHz		1 GHz	
Calculated rise time (10-90%)		≤ 3.5 ns		≤ 1.75 ns	≤ 1 ns		≤ 700 ps		≤ 450 ps	
Input channels	DSOX	2	4	4	2	4	2	4	2	4
	MSOX	2 + 16	4 + 16	4 + 16	2 + 16	4 + 16	2 + 16	4 + 16	2 + 16	4 + 16

1. For example, if you choose 500 MHz, 4+16 channels, the model number will be MSOX3054A.

Step 2. Tailor your scope with measurement applications to save time and money. After purchase upgrade model numbers are listed below (values in parentheses are factory-installed option numbers).

Description	**Model number**
Oscilloscope features	
Memory	DSOX3MEMUP (-040)
Segmented memory	DSOX3SGM (-SGM)
MSO upgrade	DSOX3MSO
MSO upgrade for 1 GHz models	DSOXPERFMSO
Serial protocols	
Embedded serial triggering and analysis (I²C, SPI)	DSOX3EMBD (LSS)
Computer serial triggering and analysis (RS232/UART)	DSOX3COMP (-232)
Automotive serial triggering and analysis (CAN/LIN)	DSOX3AUTO (-AMS)
FlexRay serial triggering and analysis	DSOX3FLEX (-FLX)
Audio serial triggering and analysis (I²S)	DSOX3AUDIO (-SND)
MIL-STD 1553 and ARINC 429 serial triggering and analysis	DSOX3AERO (-AER)
Measurement applications	
WaveGen 20 MHz arbitary/function generator	DSOX3WAVEGEN (-001)
Integrated 3-digit digital voltmeter (DVM)	DSOXDVM (-DVM)
Power analysis application	DSOX3PWR (-PWR)
Mask limit testing	DSOX3MASK (-LMT)
Enhanced video/TV application package	DSOX3VID (-VID)
Advanced math	DSOX3ADVMATH (-MAT)
Productivity tools	
Education and training kit	DSOXEDK (-EDK)
Infiniium Offline oscilloscope analysis software	N8900A
Keysight spectrum visualizer	64997A
Vector signal analyzer software	89601B (version 15 and higher)
Benchlink waveform builder pro and basic	33503A

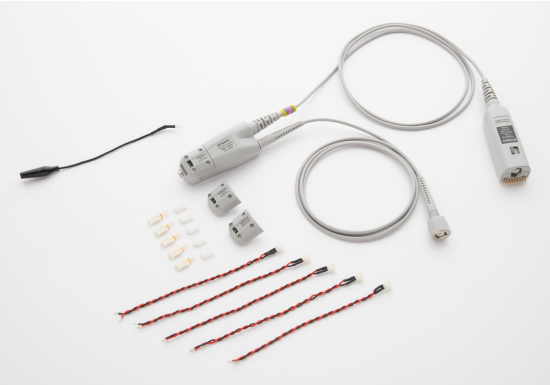
Configuring Your InfiniiVision X-Series Oscilloscope

Step 3. Choose your probes - For complete list of compatible probes, see Keysight document 5968-8153EN and visit **www.keysight.com/find/scope_probes.**

Probes	**3000 X-Series**
N2862B Passive probe 150 MHz 10:1 attenuation	1 per channel included 100 MHz models
N2863B Passive probe 300 MHz, 10:1 attenuation	1 per channel included 200 MHz models
N2890A Passive probe 500 MHz, 10:1 attenuation	1 per channel included 350/500 MHz/1 GHz models
N6450-60001 16 digital channel MSO cable	1 per scope included on all MSO models and MSO upgrades
N2889A Passive probe 350 MHz 10:1/1:1 switchable attenuation	Optional
10076B Passive probe 250 MHz 100:1 attenuation	Optional
N2795A Single-ended active probe 1 GHz ±8 V with AutoProbe	Optional
N2750A InfiniiMode differential probe 1.5-GHz 700-fF 200-kΩ with AutoProbe	Optional
N2790A Differential active probe 100 MHz ±1.4 kV with AutoProbe	Optional
N2791A Differential active probe 25 MHz ±700 V	Optional
N2792A Differential active probe 200 MHz ±20 V	Optional
N2793A Differential active probe 800 MHz ±15 V	Optional
1146A AC/DC Current probe 100 kHz 100 A	Optional
1147B AC/DC Current probe 50 MHz 15 A with AutoProbe	Optional
N2893A AC/DC Current probe 100 MHz 15 A with AutoProbe	Optional
N2820A 2-channel high-sensitivity current probe 50 uA - 5 A with AutoProbe	Optional
N2821A 1-channel high-sensitivity current probe 50 uA - 5 A with AutoProbe	Optional

Step 4. Add the final touches.

Recommended accessories	**3000 X-Series**
LAN/VGA connection module	DSOXLAN
GPIB connection module	DSOXGPIB
Rack mount kit	N6456A
Soft carrying case and front panel cover	N6457A
Hard transit case for 2000 and 3000 X-Series	CaseCruzer 3F1112-1510J (available from **http://www.casecruzer.com/**)
Hard copy manual	N6459A
Front panel cover only	N2747A



N2820A high-sensitivity high-dynamic range current probe

Performance Characteristics

DSO and MSO 3000 X-Series oscilloscopes

3000 X-Series specification overview		3012A	3014A	3024A	3032A	3034A	3052A	3054A	3102A	3104A
Bandwidth[1] (–3 dB)		100 MHz		200 MHz	350 MHz		500 MHz		1 GHz	
Calculated rise time (10 - 90%)		≤ 3.5 ns		≤ 1.75 ns	≤ 1 ns		≤ 700 ps		≤ 450 ps	
Input channels	DSOX	2	4	4	2	4	2	4	2	4
	MSOX	2 + 16	4 + 16	4 + 16	2 + 16	4 + 16	2 + 16	4 + 16	2 + 16	4 + 16
Maximum sample rate		4 GSa/s half channel, 2 GSa/s all channel							5 GSa/s half ch, 2.5 GSa/s all ch	
Maximum memory depth		Standard 2 Mpts, optional 4 Mpts and optional segment memory								
Display size and type		8.5-inch WVGA display								
Waveform update rate		> 1 million waveforms per second								
Number of active probes supported		In general, one for 2-channel models and two for 4-channel models. Contact Keysight for specific configurations.								

Vertical system analog channels	
Hardware bandwidth limits	Approximately 20 MHz (selectable)
Input coupling	AC, DC
Input impedance	Selectable: 1 MΩ ± 1% (14 pF), 50 Ω ± 1.5%
Input sensitivity range	100 MHz ~ 500 MHz models: 1 mV/div to 5 V/div2 (1 MΩ and 50 Ohm) 1 GHz models: 1 mV/div to 5 V/div2 (1 MΩ), 1 mV/div to 1 V/div (50 Ohm)
Vertical resolution	8 bits (measurement resolution is 12 bits with averaging)
Maximum input voltage	300 Vrms, 400 Vpk; transient overvoltage 1.6 kVpk With N2862A, N2863A or N2890A 10:1 probe: 300 Vrms Frequency de-rating (assumes sine wave input): 400 Vpk until 40 kHz. Then de-rates at 20 db/dec until 6 Vpk
DC vertical accuracy	±[DC vertical gain accuracy + DC vertical offset accuracy + 0.25% full scale][2]
DC vertical gain accuracy[1]	± 2.0% full scale[2]
DC vertical offset accuracy	± 0.1 div ± 2 mV ± 1% of offset setting
Channel-to-channel isolation	> 100:1 from DC to maximum specified bandwidth of each model (measured with same V/div and coupling on channels)
Offset range	± 2 V (1 mV/div to 200 mV/div) ± 50 V (> 200 mV/div to 5 V/div)

Vertical system digital channels	
Digital input channels	16 digital (D0 to D15. pod 1: D7 ~ D0, Pod 2: D15 ~ D8)
Thresholds	Threshold per pod
Threshold selections	TTL (+1.4 V), 5V CMOS (+2.5 V), ECL (–1.3 V), user-defined (selectable by pod)
User-defined threshold range	± 8.0 V in 10 mV steps
Maximum input voltage	± 40 V peak CAT I; transient overvoltage 800 Vpk
Threshold accuracy[1]	± (100 mV + 3% of threshold setting)
Maximum input dynamic range	± 10 V about threshold
Minimum voltage swing	500 mVpp
Input impedance	100 kΩ ± 2% at probe tip
Input capacitance	~8 pF
Vertical resolution	1 bit

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.
2. 1 mV/div and 2 mV/div are 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.

Performance Characteristics

Horizontal system analog channels									
		3012A	**3014A**	**3024A**	**3032A**	**3034A**	**3052A**	**3054A**	**3102A**	**3104A**
Time base range		5 ns/div to 50 s/div			2 ns/div to 50 s/div		1 ns/div to 50 s/div		500 ps/div to 50 s/div	
Time base accuracy[1]		25 ppm ± 5 ppm per year (aging)								
Time base delay time range	Pre-trigger	Greater of 1 screen width or 250 µs								
	Post-trigger	1 s to 500 s								
Channel-to-channel deskew range		± 100 ns								
Δ Time accuracy (using cursors)		± (time base acc. x reading) ± (0.0016 x screen width) ± 100 ps								
Modes		Main, zoom, roll, XY								
XY		On channels 1 and 2 only. Z Blanking on ext trigger input, 1.4 V threshold. Bandwidth: Maximum bandwidth. Phase error at 1 MHz: < 0.5 degree.								
Horizontal system digital channels										
Minimum detectable pulse width		5 ns								
Channel-to-channel skew		2 ns (typical); 3 ns (maximum)								

Acquisition system										
		3012A	**3014A**	**3024A**	**3032A**	**3034A**	**3052A**	**3054A**	**3102A**	**3104A**
Maximum analog channels sample rate		4 GSa/s half channel interleaved, 2 GSa/s all channel							5 GSa/s half channel interleaved, 2.5 GSa/s all channel	
Maximum analog channels record length		2 Mpts half channel interleaved, 1 Mpts all channel (standard) 4 Mpts half channel interleaved, 2 Mpts all channel (optional with DSOX3MEMUP (-040))								
Maximum duration of time captured at highest sampling rate (all analog channels)		500 us with 4M memory upgrade							400 us with 4M memory upgrade	
Maximum digital channels sample rate		1 GSa/s							1.25 GSa/s	
Maximum digital channels record length		1 Mpts (standard - with digital channels only) 2 Mpts (optional with DSOX3MEMUP - with digital channels only)								
Modes	Normal	Default mode								
	Peak detect	Capture glitches as narrow as 250 ps at all time base settings								
	Averaging	Selectable from 2, 4, 8, 16, 64, ... to 65,536								
	High resolution	Real time boxcar averaging reduces random noise and effectively increases vertical resolution 12 bits of resolution when ≥ 10 µs/div at 4 GSa/s (5 GSa/s for 1 GHz models) or ≥ 20-µs/div at 2 GSa/s (2.5 GSa/s for 1 GHz models)								
	Segmented	Segmented memory optimizes available memory for data streams that have long dead times between activity. Maximum segments = 1000. Re-arm time = 1 µs (minimum time between trigger events)								

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.

Performance Characteristics

Trigger system	
Trigger sources	Analog channel (1~4), digital channel (D0~D15), line, external, WaveGen (1 or mod) (FM/FSK)
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	DC: DC coupled trigger AC: AC coupled trigger, cutoff frequency: < 10 Hz (internal); <50 Hz (external) HF Reject: High frequency reject, cutoff frequency ~ 50 kHz LF Reject: Low frequency reject, cutoff frequency ~ 50 kHz Noise Reject: Selectable OFF or ON, decreases sensitivity 2x
Trigger holdoff range	40 ns to 10.00 s

Trigger sensitivity

Internal[1]	< 10 mV/div: greater of 1 div or 5 mV; ≥ 10 mV/div: 0.6 div
External[1]	200 mVpp from DC to 100 MHz 350 mVpp 100 MHz to 200 MHz
Trigger level range	
Any channel	± 6 div from center screen
External	± 8 V

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.

Performance Characteristics

Trigger type selections	
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 ns (500 MHz, 1 GHz), 4 ns (350 MHz), 6 ns (200 MHz), 10 ns (100 MHz) Maximum duration setting: 10 s Range minimum: 10 ns
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 2~10 ns and maximum timesetting of 10 s. Minimum time setting: 2 ns (500 MHz, 1 GHz), 4 ns (350 MHz), 6 ns (200 MHz). 10 ns (100 MHz)
Setup and hold	Trigger and clock/data setup and/or hold time violation. Setup time can be set from –7 s to 10 s. Hold time can be set from 0 s to 10 ns.
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 Minimum: 1 ns (500 MHz, 1 GHz), 2 ns (350 MHz), 3 ns (200 MHz), 5 ns (100 MHz) Maximum: 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: 2 ns (500 MHz, 1 GHz), 4 ns (350 MHz), 6 ns (200 MHz), 10 ns (100 MHz) Maximum duration setting: 10 s Range minimum: 10 ns
Or	Trigger on any selected edge across multiple analog or digital channels
Video	Trigger on all lines or individual lines, odd/even or all fields from composite video, or broadcast standards (NTSC, PAL, SECAM, PAM-M)
Enhanced Video (optional)	Trigger on lines and fields of enhanced and HDTV standards (480p/60, 567p/50, 720p/50, 720p/60, 1080p/24, 1080p/25, 1080p/30, 1080p/50, 1080p/60, 1080i/50, 1080i/60).
USB	Trigger on start of packet, end of packet, reset complete, enter suspend, or exit suspend. Support USB low-speed and full-speed.
I2C (optional)	Trigger at a start/stop condition or user defined frame with address and/or data values. Also trigger on missing acknowledge, address with no accq, restart, EEPROM read, and 10-bit write.
SPI (optional)	Trigger on SPI (Serial Peripherial 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. Supports MOSI and MISO data.
RS-232/422/485/UART (optional)	Trigger on Rx or Tx start bit, stop bit or data content or parity error.
I²S (optional)	Trigger on 2's complement data of audio left channel or right channel (=, ≠, <, >, > <, < >, increasing value, or decreasing value)
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.
FlexRay (optional)	Trigger on frame ID, frame type (sync, start-up, null, normal), cycle-repetitive, cycle-base, and errors.
MIL-STD 1553 (optional)	Trigger on MIL-STD 1553 signals based on word type (Data or Command/Status), Remote Terminal Address, data, and errors (parity, sync, Manchester encoding).
ARINC 429 (optional)	Trigger and decode on ARINC429 data. Trigger on word start/stop, label, label + bits, label range, error conditions (parity, word, gap, word or gap, all), all bits (eye), all 0 bits, all 1 bits.

Performance Characteristics

Waveform measurements	
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] – Units: Seconds(s), Hz (1/s), Phase (degrees), Ratio (%)
Automatic measurements	Measurements continuously updated with statistics. Cursors track last selected measurement. Select up to four measurements from the list below: – Voltage: peak-to-peak, maximum, minimum, amplitude, top, base, overshoot, pre-shoot, average- N cycles, average- full screen, DC RMS- N cycles, DC RMS- full screen, AC RMS- N cycles, AC RMS- full screen (standard deviation), ratio (RMS1/RMS2) – Time: period, frequency, counter, + width, - width, burst width, duty cycle, rise time, fall time, delay, phase, X at min Y, X at Max Y – Count: positive pulse count, negative pulse count, rising edge count, falling edge count – Mixed: area- N cycles, area- full screen
Counter	Built-in frequency counter: – Source: on any analog or digital channel – Resolution: 5 digits – Maximum frequency: bandwidth of scope

Waveform math	
Arithmetic	f (g(t)) g(t): { add, subtract, multiply between any 2 channels} f(t): {FFT(g(t)), differentiate d/dt g(t), integrate ∫ g(t) dt, square root √g(t) } Enabled between any combination of two channels
Arithmetic	DSOX3ADVMath advanced waveform math option adds 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	Up to 64 kpts resolution Set FFT Window to: Hanning, Flat Top, Rectangular, Blackman-Harris

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.
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.

Display characteristics	
Display	8.5-inch WVGA
Resolution	800 (H) x 480 (V) pixel format (screen area)
Graticules	8 vertical divisions by 10 horizontal divisions with intensity controls.
Format	YT, XY, and Roll
Maximum waveform update rate	> 1,000,000 wfms/s
Persistence	Off, infinite, variable persistence (100 ms - 60 s)
Intensity gradation	64 intensity levels

Performance Characteristics

WaveGen – Built-in function/arbitrary waveform generator (specifications are typical)	
WaveGen out	Front-panel BNC connector
Waveforms	Sine, Square, Ramp, Pulse, DC, Noise, Sine Cardinal (Sinc), Exponential Rise, Exponential Fall, Cardiac, Gaussian Pulse, and Arbitrary.
Modulation	Modulation types: AM, FM, FSK Carrier waveforms: sine, ramp, sine cardinal, exponential rise, exponential fall, and cardiac. Modulation source: internal (no external modulation capability) AM: Modulation: sine, square, ramp Modulation frequency: 1 Hz to 20 kHz Depth: 0% to 100% FM: Modulation: sine, square, ramp Modulation frequency: 1 Hz to 20 kHz Minimum carrier frequency: 10 Hz Deviation: 1 Hz to carrier frequency or (2e12 / carrier frequency), whichever is smaller FSK: Modulation: 50% duty cycle square wave FSK rate: 1 Hz to 20 kHz Hop frequency: 2 x FSK rate to 10 MHz
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 ohm load, 500 MHz BW) : 40 dB (Vpp > = 0.1 V); 30 dB (Vpp < 0.1V)
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 – Rise/fall time: 18 ns (10 to 90%) – Pulse width resolution: 10 ns or 5 digits, whichever is larger – Overshoot: < 2% – Asymmetry (at 50% DC): ±1% ± 5 ns – Jitter (TIE RMS): 500 ps
Ramp/triangle wave	– Frequency range: 0.1 Hz to 200 kHz – Linearity: 1% – Variable symmetry: 0 to 100% – Symmetry resolution: 1%
Noise	Bandwidth: 20 MHz typical
Sine Cardinal (Sinc)	Frequency range: 0.1 Hz to 1.0 MHz
Exponential Rise/Fall	Frequency range: 0.1 Hz to 5.0 MHz
Cardiac	Frequency range: 0.1 Hz to 200.0 kHz
Gaussian Pulse	Frequency range: 0.1 Hz to 5.0 MHz
Arbitrary	– Waveform length: 1 to 8k points – Amplitude Resolution: 10 bits (including sign bit)*** – Repetition Rate: 0.1Hz to 12 MHz – Sample Rate: 100 MSa/s – Filter Bandwidth: 20 MHz

Performance Characteristics

WaveGen – Built-in function/arbitrary waveform generator (specifications are typical) (Continued)	

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[2]
	  – 10 mVpp to 2.5 Vpp into 50 ohms[2]
	– Resolution: 100 µV or 3 digits, whichever is higher
	– Accuracy: 2% (frequency = 1 kHz)

DC offset	– Range:
	  – ±2.5 V into Hi-Z[2]
	  – ±1.25 V into 50 ohms[2]
	– Resolution: 100 µV or 3 digits, whichever is higher
	– Accuracy (waveform modes): ± 1.5% of offset setting ± 1% of amplitude ± 1 mV
	– Accuracy (DC mode): ± 1.5% of offset setting ± 3 mV

Trigger output	Trigger output available on Trig out BNC
Main Output	– Impedance : 50 ohms typical – Isolation: not available, main output BNC is grounded – Protection: overload automatically disables output

1. Gaussian Pulse: 4 Vpp maximum into Hi-Z; 2 Vpp maximum into 50 ohms
2. Sinc, Cardiac and Gaussian Pulse: ±1.25 V into Hi-Z; +- 625 mV into 50 ohms
3. Full resolution is not available at output due to internal attenuator stepping

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.

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 (10/100Base-T), WVGA video out
Trigger out	BNC connector on the rear panel. Supported modes: triggers, mask, and waveform generator sync pulse

Performance Characteristics

General and environmental characteristics	
Power line consumption	100 watts
Power voltage range	100-120V, 50/60/400 Hz; 100-240V, 50/60 Hz ± 10% auto ranging
Temperature	Operating: 0 to +55 °C Nonoperating: –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: up to 4,000 m, Non-operating 15,300 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
Vibration	Meets IEC60068-2-6 and MIL-PRF-28800; class 3 random
Shock	Meets IEC 60068-2-27 and MIL-PRF-28800; class 3 random; (operating 30 g, ½ sine. 11 ms duration, 3 shocks/axis along major axis, total of 18 shocks
Dimensions	381 mm (15 in) W x 204 mm (8 in) H x 142 mm (5.6 in) D
Weight	Net: 3.9 kg (8.5 lbs), shipping: 4.1 kg (9.0 lbs)

Performance Characteristics

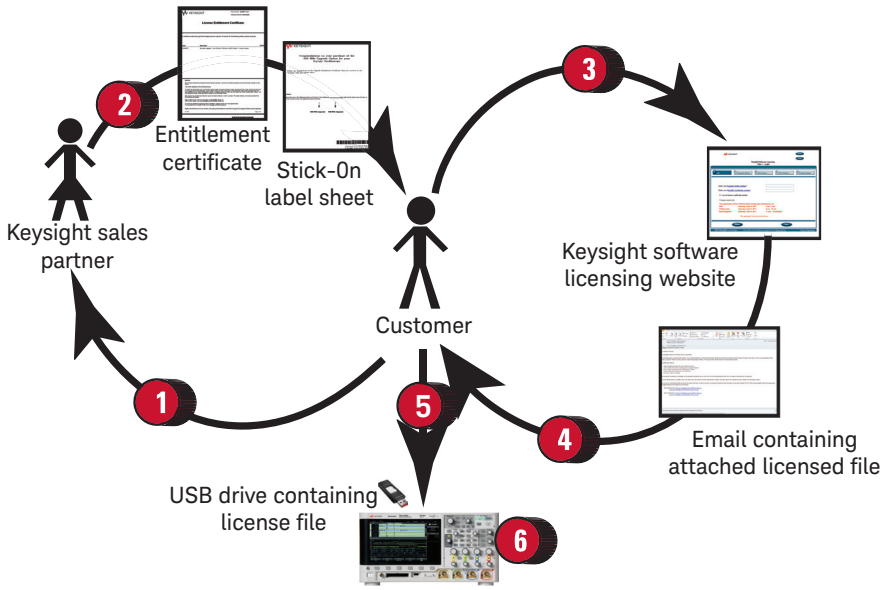
Nonvolatile storage	
Reference waveform display	2 internal waveforms or USB thumb drive
Waveform storage	Setup, .bmp, .png, .csv, ASCII, XY, reference waveforms .alb, .bin, lister, mask, HDFS
Max USB flash drive size	Supports industry standard flash drives
Set ups without USB flash drive	10 internal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

Included standard with oscilloscope	
Factory warranty	3-year warranty (90 days for unserialized accessories such as passive probes)
Calibration	Certificate of calibration, 2-year calibration interval
Standard secure erase	
Probes	
N2862B Passive probe 150 MHz 10:1 attenuation	1 per channel included 100 MHz models
N2863B Passive probe 300 MHz, 10:1 attenuation	1 per channel included 200 MHz models
N2890A Passive probe 500 MHz, 10:1 attenuation	1 per channel included 350/500 MHz and 1 GHz models
N6450-60001 16 digital channel MSO cable	1 per scope included on all MSO models and DSOX3MSO (for 500 MHz models and below) DSOX3PERFMSO (for 1 GHz Models)
Interface and built-in help language support English, Japanese, simplified Chinese, traditional Chinese, Korean, German, French, Spanish, Russian, Portuguese, Italian, Thai, and Polish.	
Localized power cord	

For MET/CAL procedures, click on the Cal Labs solutions link below
http://www.callabsolutions.com/products/Keysight/
These procedures are FREE to customers

Related literature		
Publication title	**Publication type**	**Publication number**
Serial Bus Applications for Keysight InfiniiVision 3000 X-Series Oscilloscopes	Data sheet	5990-6677EN
Power Measurements for Keysight InfiniiVision 3000 X-Series oscilloscope	Data sheet	5990-8869EN
Mask/Waveform Limit Testing For Keysight InfiniiVision Series Oscilloscopes	Data sheet	5990-3269EN

License-only Bandwidth Upgrades and Measurement Applications



License Only Bandwidth Upgrade Models	
3000 X-Series	
DSOX3BW24	100 MHz to 200 MHz, 4 ch, License only
DSOX3BW52	350 MHz to 500 MHz, 2 ch, License only
DSOX3BW54	350 MHz to 500 MHz, 4 ch, License only

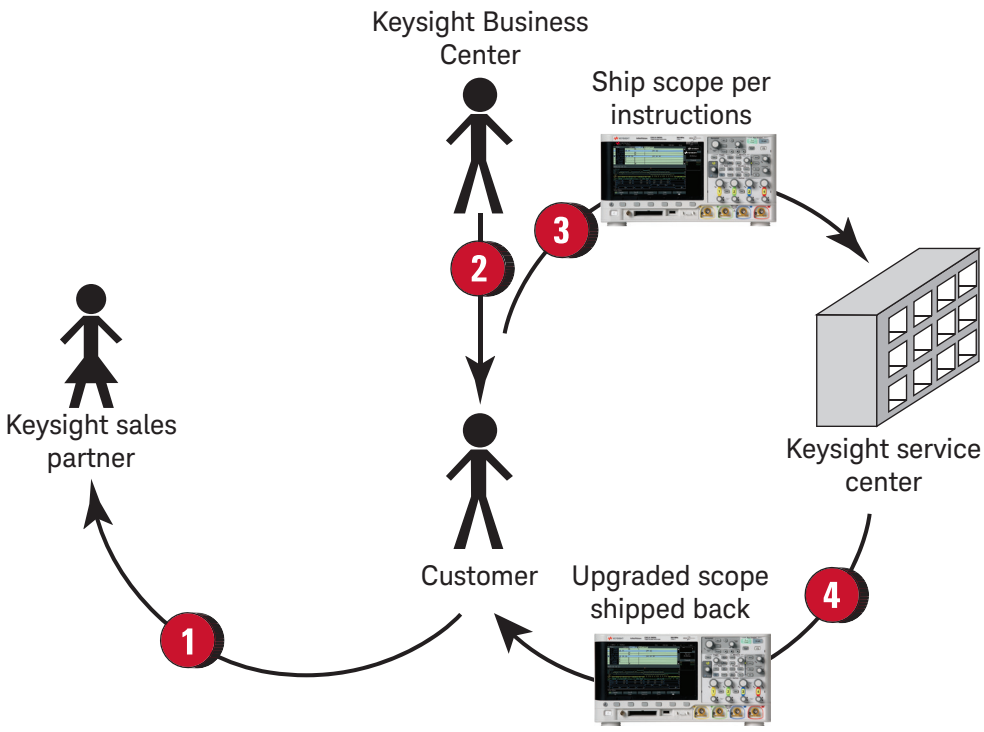
Measurement Applications	
DSOX3WAVEGEN	WaveGen (built -in function generator with AWG)
DSOXDVM	Integrated digital voltmeter
DSOXEDK	Educator's kit
DSOX3MASK	Mask testing
DSOX3SGM	Segmented memory
DSOX3ADVMATH	Advanced waveform math
DSOX3VID	Enhanced video triggering
DSOX3EMBD	Embedded serial triggering and analysis (I2C, SPI)
DSOX3COMP	Computer serial triggering and analysis (RS232/422/485/UART)
DSOX3AUDIO	Audio serial triggering and analysis (I2S)
DSOX3AUTO	Automotive serial triggering and analysis (CAN, LIN)
DSOX3FLEX	FlexRay serial triggering and analysis
DSOX3AERO	Aerospace serial triggering and analysis (MIL-STD 1553, ARINC 429)
DSOX3PWR	Power measurements and analysis
DSOX3MSO	MSO upgrade: add 16 digital timing channels (for 500 MHz and below models)
DSOXPERFMSO	MSO upgrade: add 16 digital timing channels (for 1 GHz models)

Process Description

1. Place order for a license only bandwidth upgrade or measurement application product 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 DSOX3BW24, the N2863B 10:1 300 MHz passive probes (1 per channel) will be sent with the upgrade.
2. For measurement applications, you will receive a paper or electronic .pdf Entitlement Certificate. For bandwidth upgrades only, you will receive a stick-on label document indicating upgraded bandwidth specification in addition to a paper Entitlement Certificate.
3. Use Entitlement Certificate 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.
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 label to front and rear panels of the oscilloscope. Model number and serial number of the oscilloscope do not change.

* See page 30 for return-to-Keysight service center upgrade process for these products

Return-to-Keysight Service Center Bandwidth Upgrades



Return-to-Keysight Bandwidth Upgrade Models	
3000 X-Series	
DSOX3BW32	100 MHz to 350 MHz, 2 ch, Service center
DSOX3BW34	200 MHz to 350 MHz, 4 ch, Service center
DSOX3BW12	500 MHz to 1 GHz, 2 ch, Service center
DSOX3BW14	500 MHz to 1 GHz, 4 ch, Service center

Process Description

1. Place order for a return-to-Keysight Service Center bandwidth upgrade product to a Keysight sales partner. Service Center installation, calibration, shipment costs are in addition to bandwidth upgrade product price. If multiple 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 DSOX3BW32 and DSOX3BW34, the N2890A 10:1 500 MHz passive probe (1 per channel) will be sent with the upgrade.
2. Keysight 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 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.

* See page 29 for license-only upgrade process for these products

From Hewlett-Packard through Agilent to Keysight

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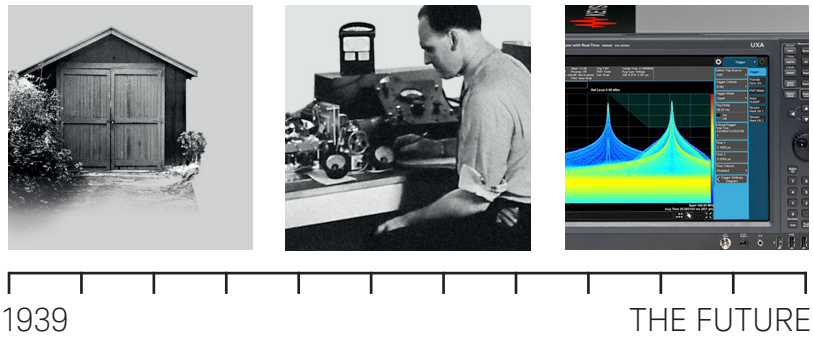

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