

InfiniiVision XR3 Low Profile Oscilloscope

Densely Integrated Performance

Introduction

The Keysight XR3 Series brings high signal integrity into a low-profile, 1U rack-mountable oscilloscope for synchronized, automated, high channel count testing. Designed for engineers who need more channels in less rack space, XR3 helps aerospace and defense, manufacturing, and high-energy physics teams move from bench-level confidence to rack-based scale.



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Meet the InfiniiVision XR3 Low Profile Oscilloscope

Welcome to the InfiniiVision XR3 Low Profile Oscilloscope. Built on Keysight's MegaZoom 5 custom ASIC and a 14-bit ADC, it delivers a $50\text{ }\mu\text{V}_{\text{rms}}$ noise floor and an update rate of 1.3 million waveforms per second in a 1U rack-mount form factor. It provides the signal integrity of a full-size bench oscilloscope while saving rack space and simplifying setup. Using the 10 MHz reference clock, multiple XR3 units can be synchronized to integrate over 100 channels in a single system, giving engineers the channel density large test systems demand.



Figure 1. A stack of four XR3s connected to create a system with 16 analog channels.

Unrivalled Performance

High resolution and low noise

The XR3 has a custom 14-bit ADC combined with a low-noise front end to deliver high signal integrity and low noise performance. With a noise floor of under $50 \mu\text{V}_{\text{rms}}$ at full bandwidth, the XR3 can help visualize and debug the smallest signals. In the frequency domain, this translates to a noise density of under -161 dBm/Hz .

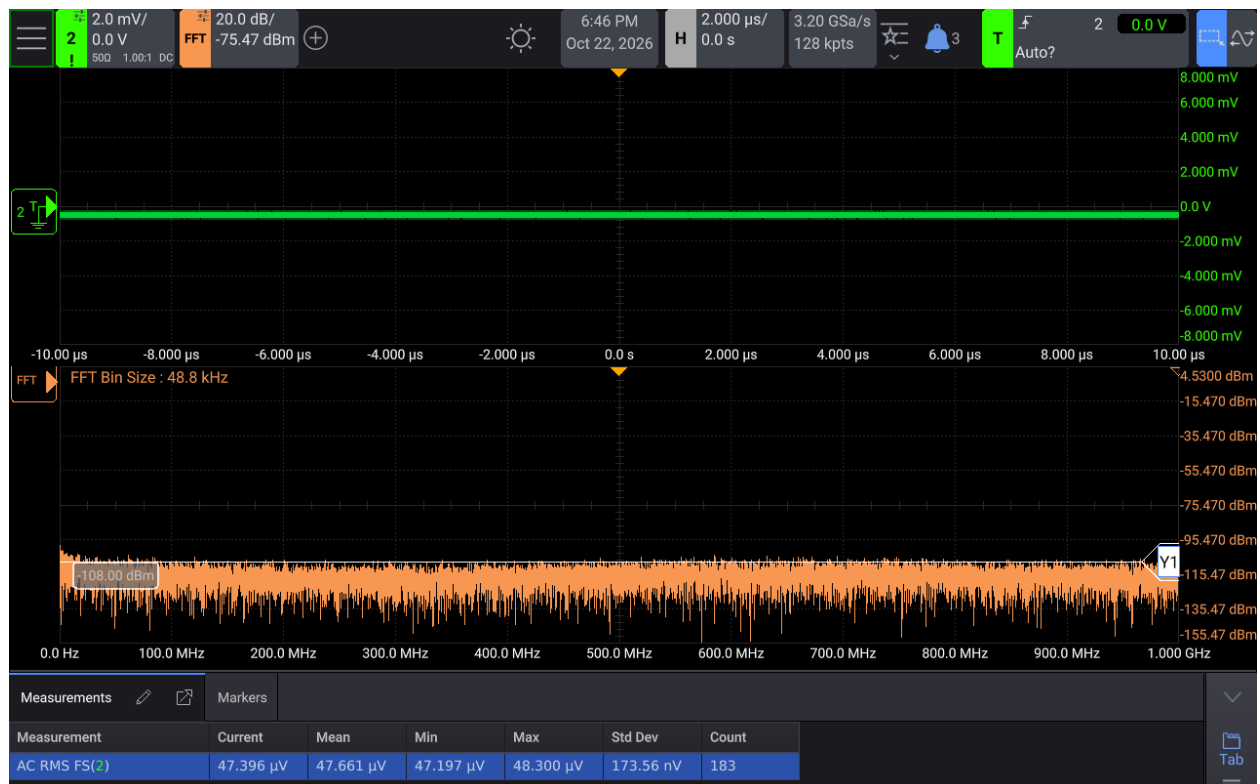


Figure 2. The XR3 has a noise floor of under $50 \mu\text{V}_{\text{rms}}$ at full bandwidth, making it easy to capture low-amplitude signals accurately.

Digital triggers

The XR3 features a fully digital trigger. Unlike a traditional analog trigger that uses separate trigger circuitry, a digital trigger triggers on acquired data. This means that triggers are jitter-free and sensitive enough to trigger on a single LSB of the 14-bit ADC.

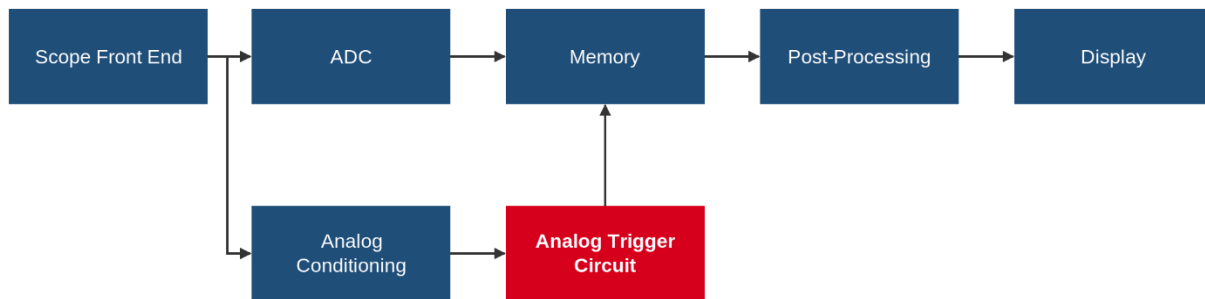


Figure 3. Block diagram of a traditional analog trigger.



Figure 4. Block diagram of a digital trigger.



Figure 5. Digital trigger enabling the XR3 to trigger and display a 100 µV sine wave.

Real-time zone trigger

Real-time zone trigger is the world's fastest trigger, with more than 1.3 million triggers per second. It is implemented in hardware directly on the acquisition path and qualifies signals at 6.4 billion tests per second. That is orders of magnitude faster than qualifying an edge trigger in software or an FPGA. Because every acquired point is evaluated, any signal that passes through a defined zone is always captured, so intermittent events aren't missed.

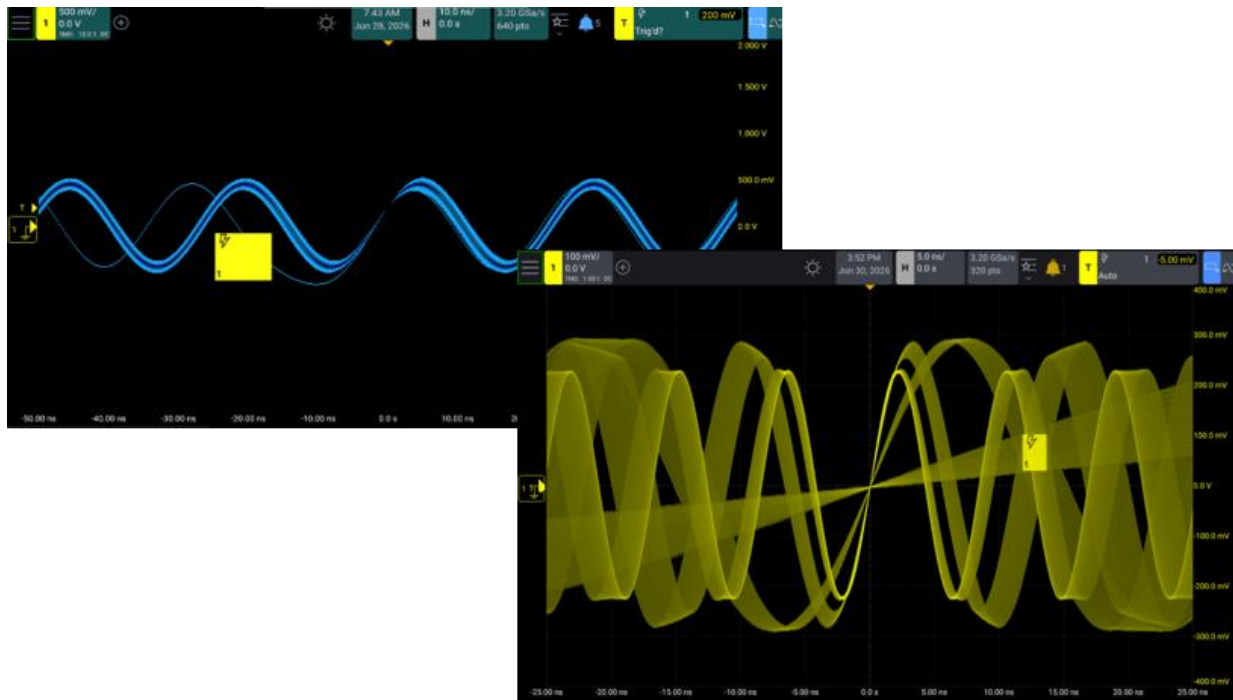


Figure 6. Real-time zone trigger occurs on the acquisition path, ensuring every signal that passes through the designated zone is always captured.

Real-time zoom and floating magnify

Real-time zoom runs on the ASIC data path, so you get the full benefit of 14-bit acquisition without changing acquisition settings. Measurements are automatically gated to the zoomed region, so the results match exactly what's shown on screen.

Floating magnify opens a flexible, floating zoom window that you can place anywhere on the display. It gives you full control over how and where you zoom, so you can inspect signal detail without losing sight of the original waveform.

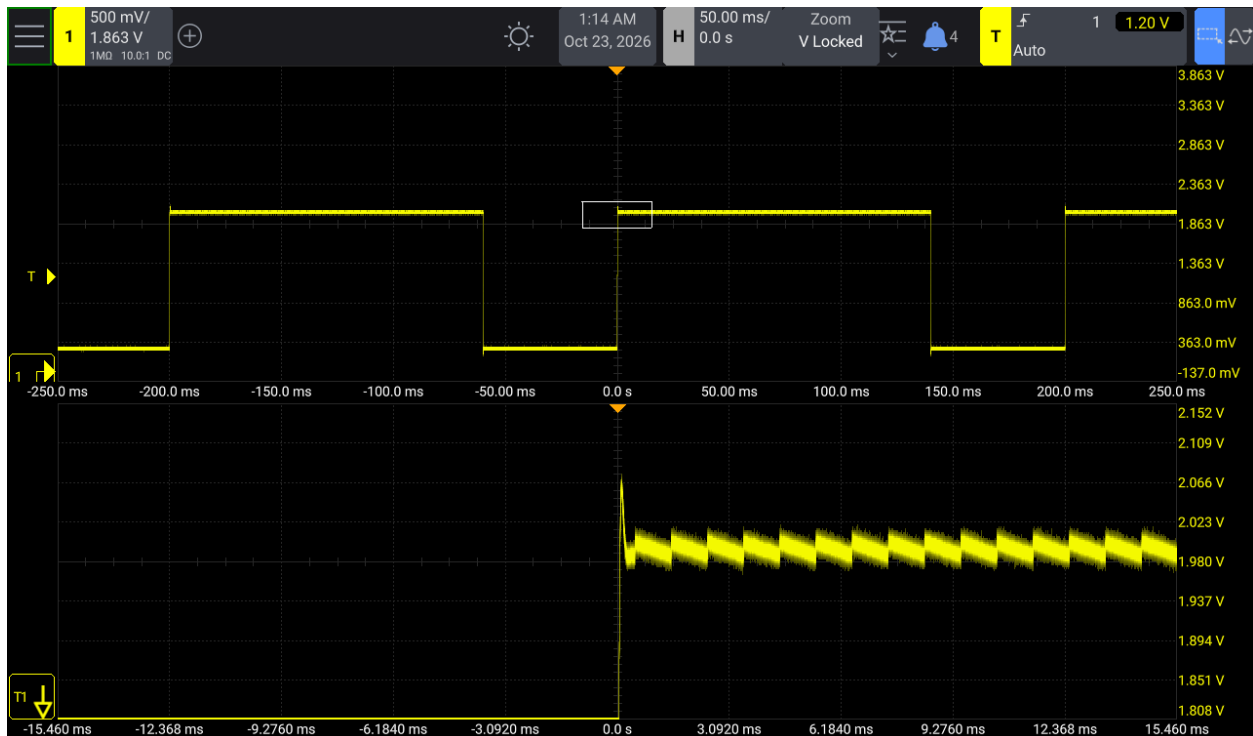


Figure 7. Real-time zoom unleashes the power of the 14-bit ADC, revealing small signals like ripple riding on power rails.

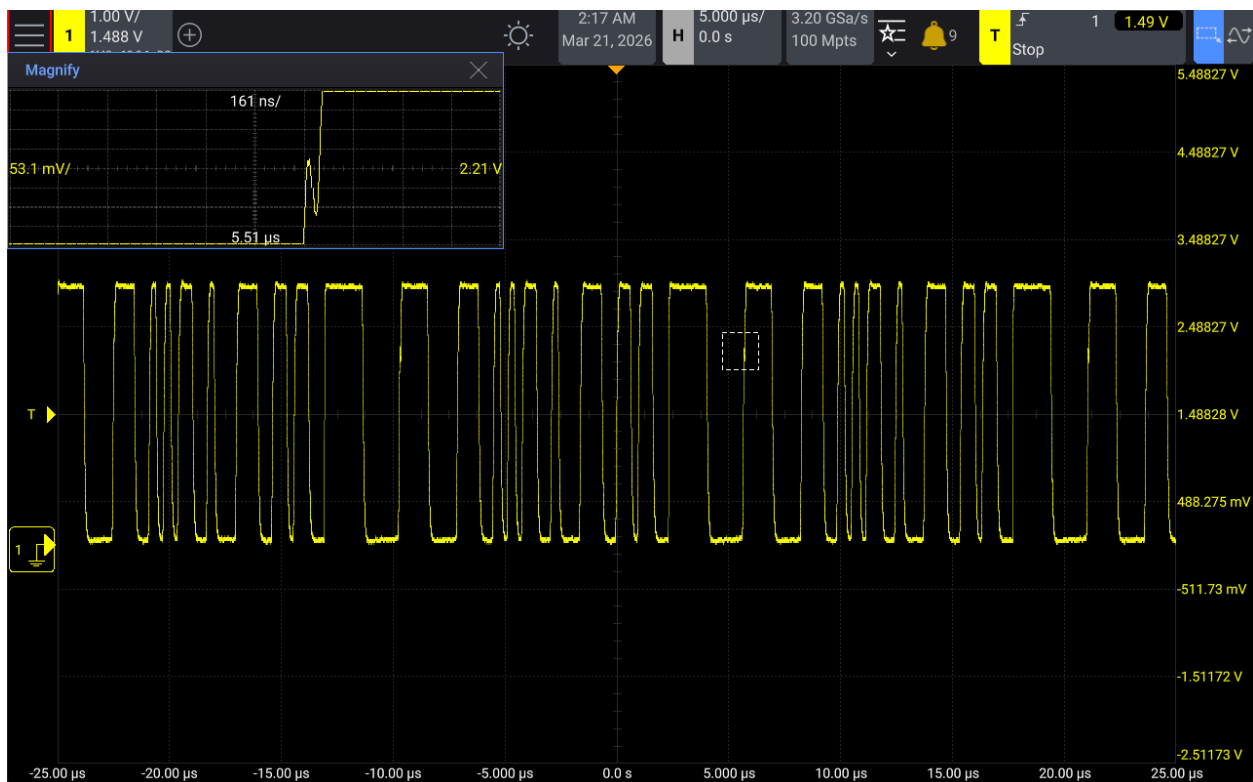


Figure 8. The flexible floating magnify window enables full control over zoom behavior.

Color-graded waveforms and math

Color grading for waveforms and math traces makes subtle signal differences easier to see. You can invert the color scale to highlight the least frequent events. Waveform color grading is processed in the ASIC (real-time color grading), and math traces are color-graded in software.

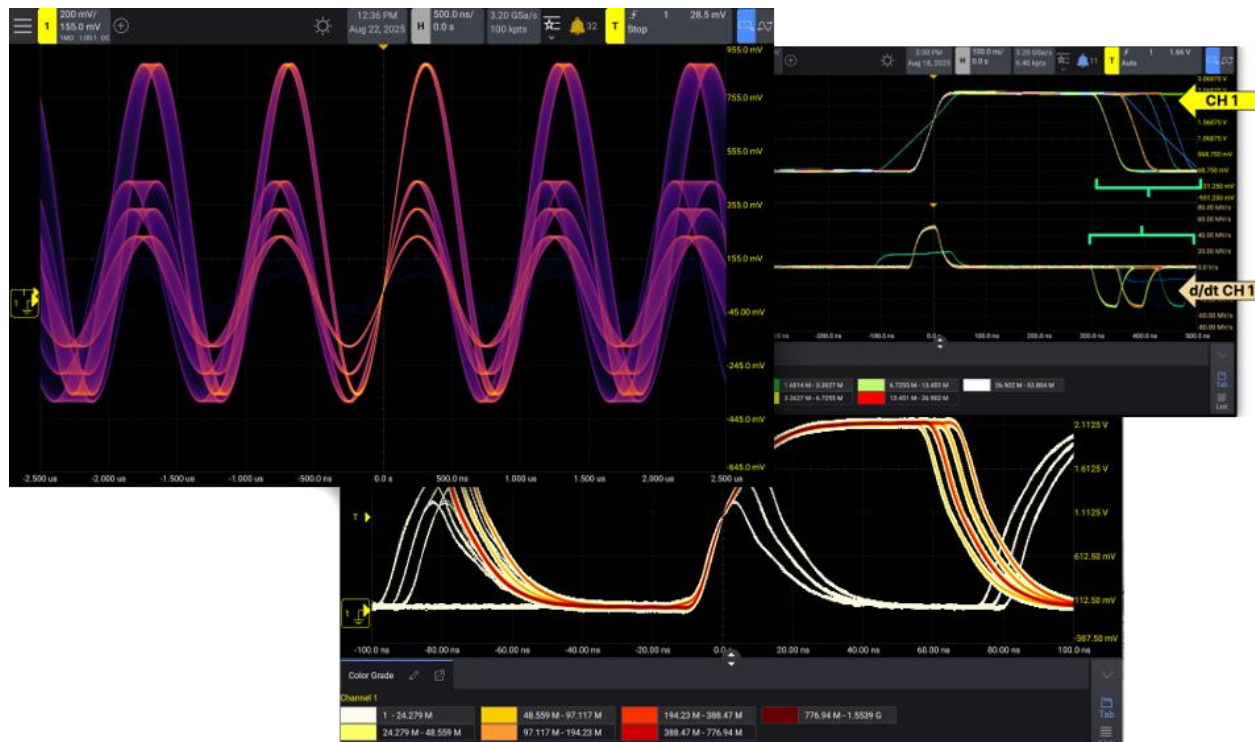


Figure 9. Color-graded waveform shows how often each signal occurs, so rare events stand out.

Segmented memory

Segmented memory acquisition mode on XR3 Series oscilloscopes optimizes the use of acquisition memory for signals that occur in bursts separated by periods of inactivity. Rather than recording one long, continuous waveform, the oscilloscope captures only the segments of interest, each triggered independently and time-stamped for precise correlation.

Segmented memory captures up to 256,000 segments by using the full 100 Mpts of acquisition memory. It supports zone qualification and is ideal for capturing intermittent signals, including serial protocol traffic.

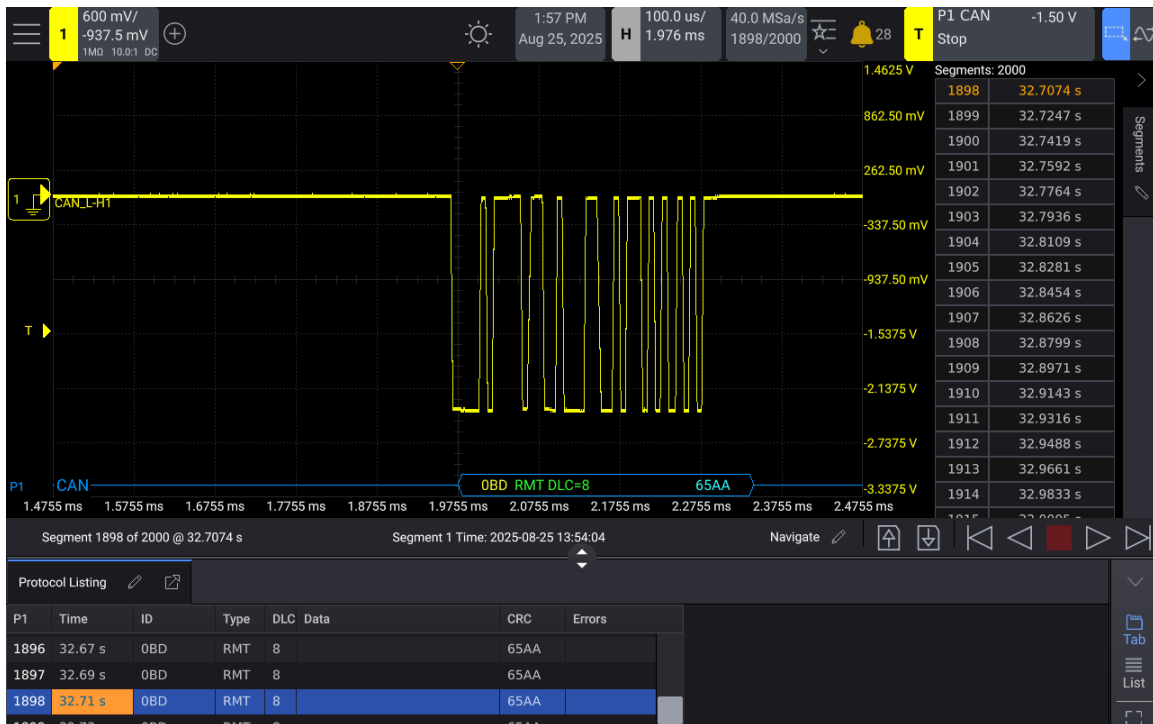


Figure 10. Capture up to 256,000 segments with segmented memory on the XR3.

Fault Hunter

Fault Hunter is an innovative expert system for inspecting digital systems. It automatically evaluates your signal's characteristics against user-definable criteria, quickly finding and saving errors for your review. It's flexible, and you can define the test duration from a few minutes up to two days. Set up your device under test on a Friday afternoon and return Monday morning with a full test report to review, with billions of tests complete.



Figure 11. Fault Hunter tests signal characteristics against defined criteria, speeding up debug.

More than an oscilloscope

The XR3 puts a full bench of test equipment in a single box. Along with a high-performance oscilloscope, you get:

- **Logic analyzer:** 16 digital channels for mixed-signal debug
- **Protocol analyzer:** trigger on and decode serial buses
- **Arbitrary waveform generator:** 100 MHz, 14-bit AWG
- **Counter/totalizers:** five, each with 12-digit resolution
- **Digital voltmeters:** four, each with 4.5-digit resolution
- **Frequency response analyzer:** Bode sweeps spanning up to 10 decades

That means less equipment to buy, configure, and fit on the bench, and one place to work from stimulus through to analysis.

Scalable Channel Density

Scale from a single oscilloscope to a multi-instrument system of more than 100 time-correlated channels. With the autosensing 10 MHz reference in/out, all the instruments share a common clock and trigger so that all channels use the same timebase. Three hardware automations handle multi-instrument setup from start to finish:

- **Auto-discover:** Each scope reports its own IP address, so the system finds and configures connected instruments without manual network setup.
- **Auto-sync:** The 10 MHz reference clocks align instantly across all instruments, locking clock and trigger to one timebase.
- **Auto-deskew:** The MegaZoom 5 ASIC delay lines calibrate automatically to correct skew across the whole system.

Channels can be added as test needs grow, with time correlation maintained across every unit and less time spent on setup and synchronization.



Figure 12. A stack of four XR3s connected to create a system with 16 analog channels.

Seamless Integration

Standalone debug with the native InfiniiVision UI

Each XR3 instrument runs the native InfiniiVision interface, built to get the most from Keysight's MegaZoom 5 ASIC for a fast, responsive scope experience. Built-in protocol decodes, power-supply testing, and jitter analysis handle everyday debug on the instrument itself, with no PC or extra software. Embedded VNC and web servers let engineers see and control the instrument remotely from any browser or VNC client.



Figure 13. Four XR3s synchronized, running the native InfiniiVision software.

Multi-instrument control with Infiniium 2026

Infiniium 2026 software, native to the XR8 oscilloscope, can be downloaded free of charge to a Windows PC. Running on an external controller (PC), it shows signals from multiple XR3 instruments in one UI and adds deep real-time and offline analysis. Engineers can run it locally or through Remote Desktop alongside other Windows apps, and scale channel count for multi-rail, multi-lane, and system-level tests without switching between screens.



Figure 14. Four XR3s synchronized, running Infiniium 2026 software.

Pair XR3 with XR8 for Hi-Z channels

Pair XR3 with Keysight's next-generation XR8 oscilloscope to build one system from two scopes. XR8 handles high-speed signal integrity measurements, and XR3 takes on low-speed debug and power analysis alongside it, adding low-noise, cost-effective high-impedance inputs without converting a high-speed channel with an adapter. XR3 supports AutoProbe 1, passive, and current probes, so engineers can probe power rails, clocks, and control lines while every XR8 channel stays free for high-speed signals. XR3 integrates natively with Infiniium 2026: once it's connected, its channels appear next to the XR8 channels in one UI for time-correlated viewing and analysis. The faceless 1U design fits neatly into a bench or rack setup, and systems scale to 4, 8, or more channels as test needs grow.



Figure 15. Pair the XR3 with an XR8 Pro oscilloscope to add Hi-Z channels and probing support.

Configuring Your Oscilloscope

Step 1. Choose Your Bandwidth

All models come standard with 200 MHz bandwidth, 100 Mpts of memory, and the 16 digital channel MSO interface enabled.

Bandwidth (-3 dB)	Calculated Rise Time (10 to 90%)	XR3L4A
200 MHz (standard)	2.0 ns	XR3L4A-200
350 MHz	1.3 ns	XR3L4A-350
500 MHz	900 ps	XR3L4A-500
1 GHz	450 ps	XR3L4A-01G

Step 2. Select System Upgrades

System Upgrade Options

Feature	XR3L4A
100 MHz WaveGen	XR3LWAVEGEN
Enhanced security	XR3LSECURE

Step 3. Select Software Upgrades

Software Options

License Upgrade	Description	Model Number
Embedded software package	I ² C, SPI, UART (RS232/422/485) serial trigger and decode	XR3LEMBA
Automotive software package	CAN, CAN FD, CAN XL (symbolic with .dbc file), SENT, LIN (symbolic with .ldf file), and 10BASE-T1S serial trigger and decode	XR3LAUTA
Aerospace and defense software package	MIL-STD 1553 and ARINC 429 triggering and analysis	XR3LAERA
Power analysis software package	Power quality, current harmonics, switching loss, turn-on/off time, transient response, loop response, PSRR, and more	XR3LPWRA
USB analysis software package	USB 2.0 and USB PD trigger, decode, and search. USB 2.0 supports low-, full-, and hi-speed signaling rates	XR3LUSBA
Quick jitter analysis software package	Jitter analysis and clock recovery	XR3LQJTA
Ethernet protocol analysis software package	10BASE-T, 100BASE-TX, and 10BASE-T1S serial trigger and decode	XR3LETHA
Ultimate bundle software package	Enables XR3LEMBA, XR3LAUTA, XR3LAERA, XR3LUSBA, XR3LQJTA, XR3LETHA and XR3LPWRA	XR3LBDLA

Step 4. Choose Your Accessories

Recommended Accessories

Model Number	Description	
N3100A	Rackmount kit for InfiniiVision XR3 Low Profile Oscilloscope	Optional

Step 5. Choose Your Probes

For a complete list of compatible probes, visit

<https://www.keysight.com/us/en/lib/resources/selection-guides/oscilloscope-probes.html>

Recommended Probes

Model Number	Description	
N2843A	Passive probe 500 MHz, 10:1, 1 M Ω , 11 pF	Optional
N2756A	16 digital channel MSO cable	Optional
PP0001A	Performance Hi-Z probe for up to 1 GHz, 300 V _{rms} , < 4 pF	Optional
PP0002A	Performance Hi-Z probe for up to 800 MHz, 1200 V _{rms} , < 2 pF	Optional
PP0003A	Performance Hi-Z probe for up to 1 GHz, 30 V _{rms} , < 4 pF, MMCX connector	Optional
N2870A	Passive probe 35 MHz, 1:1, 1 M Ω	Optional
N2795A	1.0 GHz 10:1 single-ended active probe, 1 M Ω / 1 pF, ± 8 V	Optional
N2797A	1.5 GHz 10:1 single-ended active probe, 1 M Ω / 1 pF, ± 8 V, extreme temperature	Optional
N2790A	100 MHz 50:1/500:1 HV differential probe, 8 M Ω / 3.5 pF, $\pm 1,400$ V	Optional
DP0010A	250 MHz 17:1/85:1 differential probe, 1.7 M Ω / 1.5 pF, ± 42 V	Optional
DP0011A	500 MHz 17:1/85:1 differential probe, 1.7 M Ω / 1.5 pF, ± 42 V	Optional
DP0012A	1.0 GHz 17:1/85:1 differential probe, 1.7 M Ω / 1.5 pF, ± 42 V	Optional
DP0013A	1.8 GHz 17:1/85:1 differential probe, 1.7 M Ω / 1.5 pF, ± 42 V	Optional
N2750A	1.5 GHz 2:1/10:1 differential active probe, 200 k Ω / 0.7 pF, ± 5 V	Optional
N7020A	2 GHz 1:1 power rail probe, ± 24 V offset range, 50 k Ω , ± 850 mV ripple range	Optional
1147B	50 MHz, 15 A AC/DC current probe	Optional
N2893A	100 MHz, 15 A AC/DC current probe	Optional
N7026A	150 MHz, 40 A AC/DC high-sensitivity current probe	Optional
N2820A	2-channel high-sensitivity current probe 50 μ A to 5 A	Optional
N2821A	1-channel high-sensitivity current probe 50 μ A to 5 A	Optional

Performance Characteristics

XR3 Specification Overview

Bandwidth ¹ (-3 dB)	200 MHz	350 MHz	500 MHz	1 GHz
Calculated rise time (10 to 90%)	≤ 2.0 ns	≤ 1.3 ns	≤ 900 ps	≤ 450 ps
Maximum sample rate	3.2 GSa/s per channel			
Maximum memory depth	100 Mpts per channel			
Display size and type	3.2-inch user-programmable OLED display			
Waveform update rate	Uncompromised > 1,300,000 waveforms per second			

Vertical System Analog Channels

Hardware bandwidth limits	20, 40, 50, 100, 200, 350 MHz (selectable), per-channel 5, 10, 20, 40, 50, 100, 200, 350 MHz (selectable), global
Input coupling	AC, DC
Input impedance	50 Ω ± 1.5% ² 1 MΩ ± 1% ~24 pF
Input sensitivity range	50 Ω 100 μV/div to 1 V/div 1 MΩ 100 μV/div to 10 V/div
Vertical resolution (ADC resolution)	14 bits (16 bits using HD mode)
Maximum input voltage	1 MΩ: 135 V _{rms} , 190 V _{pk} . Derate at 20 dB/decade from 250 kHz to 10 MHz. Above 10 MHz: 5 V _{rms} 50 Ω: ≤ 104 mV/div: 1.5 V _{pk} > 104 mV/div: 5 V _{rms} , 15 V _{pk} When using Keysight PP0001A, PP0002A, or PP0003A probes, input voltages at the oscilloscope are ≤ 30 V _{rms} For the 1 MΩ input, probing technology allows testing of higher voltages (for example, the included N2843A 10:1 probe supports testing up to 300 V _{rms}). Use this instrument only for measurements within its specified measurement category (not rated for CAT II, III, or IV). No transient overvoltage allowed
DC vertical gain accuracy ¹	±1.5% full scale ³
DC voltage measurement accuracy	Dual cursor: ± [(DC gain accuracy) + 0.16% full scale] ¹ Single cursor: ± [(DC gain accuracy) + (offset accuracy) + 0.08% full scale]
DC vertical offset accuracy	± 0.1 div ± 1 mV ± 1.5% 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	50 Ω: 100 μV/div to 100 mV/div: ±1.5 V > 100 mV/div to 1 V/div: ±5 V 1 MΩ: 100 μV/div to 100 mV/div: ±1.5 V > 100 mV/div to 1 V/div: ±15 V > 1 V/div to 10 V/div: ±150 V
Noise density	Measured at 101 MHz, span 1 MHz and 15 kHz RBW Range (dBm): Noise density (dBm/Hz) -38 dBm: -161.2 dBm/Hz 0 dBm: -141.5 dBm/Hz 6 dBm: -133.1 dBm/Hz
Signal-to-noise dynamic range	96 dB (0 dBm 100 MHz input carrier, 0 dBm input range (80 mV/div), 100 MHz CF, 50 MHz span, 15 kHz RBW, measurement at +15 MHz from CF)

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 Valid for input voltage within ±8 divisions from offset setting.

³ Full scale is defined as 8 vertical divisions. 100 uV/div and 1 mV/div are a magnification of 2 mV/div setting. For vertical accuracy calculations, use full scale of 16 mV for 500 uV/div and 1 mV/div.

Spurious Free Dynamic Range (SFDR)	79 dB (0 dBm 100 MHz input carrier, 0 dBm input range (80 mV/div), 500 MHz span, 300 MHz CF, 150 kHz RBW)
Amplitude accuracy	±0.3 dB (0 to 1 GHz)
Deviation from linear phase	10° (0 to 1 GHz)

Vertical System Digital Channels

Digital input channels	16 digital (D0 to D15; Pod 1: D0–D3, Pod 2: D4–D7, Pod 3: D8–D11, Pod 4: D12–D15)
Thresholds	Threshold per pod
Threshold selections	TTL (+1.4 V), 5 V 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
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

RMS Noise Floor ($V_{rms\ AC}$) on 50 Ω Inputs

Vertical Setting	20 MHz	100 MHz	200 MHz	350 MHz	500 MHz	1 GHz
500 μV/div, 2 mV/div	13 μV _{rms}	20 μV _{rms}	26 μV _{rms}	30 μV _{rms}	35 μV _{rms}	48 μV _{rms}
5 mV/div	16 μV _{rms}	25 μV _{rms}	33 μV _{rms}	38 μV _{rms}	44 μV _{rms}	59 μV _{rms}
10 mV/div	24 μV _{rms}	35 μV _{rms}	49 μV _{rms}	56 μV _{rms}	67 μV _{rms}	87 μV _{rms}
20 mV/div	44 μV _{rms}	63 μV _{rms}	89 μV _{rms}	104 μV _{rms}	124 μV _{rms}	159 μV _{rms}
50 mV/div	92 μV _{rms}	141 μV _{rms}	202 μV _{rms}	239 μV _{rms}	286 μV _{rms}	366 μV _{rms}
100 mV/div	189 μV _{rms}	278 μV _{rms}	399 μV _{rms}	474 μV _{rms}	568 μV _{rms}	723 μV _{rms}
200 mV/div	442 μV _{rms}	638 μV _{rms}	898 μV _{rms}	1.06 mV _{rms}	1.26 mV _{rms}	1.60 mV _{rms}
500 mV/div	942 μV _{rms}	1.41 mV _{rms}	2.03 mV _{rms}	2.41 mV _{rms}	2.88 mV _{rms}	3.66 mV _{rms}
1 V/div	1.78 mV _{rms}	2.82 mV _{rms}	4.04 mV _{rms}	4.79 mV _{rms}	5.74 mV _{rms}	7.26 mV _{rms}

RMS Noise Floor ($V_{rms\ AC}$) on 1 MΩ Inputs

Vertical Setting	20 MHz	100 MHz	200 MHz	350 MHz	500 MHz
500 μV/div, 2 mV/div	21 μV _{rms}	34 μV _{rms}	50 μV _{rms}	76 μV _{rms}	96 μV _{rms}
5 mV/div	24 μV _{rms}	37 μV _{rms}	53 μV _{rms}	80 μV _{rms}	100 μV _{rms}
10 mV/div	31 μV _{rms}	46 μV _{rms}	64 μV _{rms}	92 μV _{rms}	112 μV _{rms}
20 mV/div	51 μV _{rms}	72 μV _{rms}	97 μV _{rms}	132 μV _{rms}	154 μV _{rms}
50 mV/div	150 μV _{rms}	146 μV _{rms}	198 μV _{rms}	263 μV _{rms}	295 μV _{rms}
100 mV/div	204 μV _{rms}	280 μV _{rms}	330 μV _{rms}	505 μV _{rms}	560 μV _{rms}
200 mV/div	454 μV _{rms}	686 μV _{rms}	947 μV _{rms}	1.29 mV _{rms}	1.51 mV _{rms}
500 mV/div	926 μV _{rms}	1.42 mV _{rms}	1.95 mV _{rms}	2.60 mV _{rms}	2.92 mV _{rms}
1 V/div	1.96 mV _{rms}	2.77 mV _{rms}	3.78 mV _{rms}	5.01 mV _{rms}	5.58 mV _{rms}
2 V/div	4.42 mV _{rms}	6.76 mV _{rms}	9.42 mV _{rms}	13.0 mV _{rms}	15.1 mV _{rms}
5 V/div	9.63 mV _{rms}	14.2 mV _{rms}	19.5 mV _{rms}	26.1 mV _{rms}	29.2 mV _{rms}
10 V/div	20.2 mV _{rms}	27.9 mV _{rms}	38.0 mV _{rms}	50.3 mV _{rms}	55.9 mV _{rms}

ENOB (Normal Sample Mode, 100 mV/div) on a 10 MHz 90% Full-Screen Sine Wave

Input	20 MHz	50 MHz	100 MHz	200 MHz	350 MHz	500 MHz	1 GHz
50 Ω	10.2	9.7	9.3	8.8	8.6	8.4	8.1
1 MΩ	10.4	9.6	9.3	8.9	8.5	8.4	N/A

Horizontal System Analog Channels

Timebase range	500 ps/div to 5,000 s/div
Timebase accuracy ¹	±1.6 ppm + aging factor (1 year: ±0.5 ppm, 2 years: ±0.7 ppm, 5 years: ±1.5 ppm, 10 years: ±2.0 ppm)
Timebase delay time range	Pre-trigger: Maximum of 20M/sample rate, no more than 200 s Post-trigger: Up to 500 s
Channel-to-channel deskew range	±100 ns
Δ Time accuracy (using cursors)	Same channel: ± (timebase accuracy × reading) ± (0.0016 × screen width) ±50 ps Channel-to-channel: ± (timebase accuracy × reading) ± (0.0016 × screen width) ±100 ps
Modes	Main, zoom, roll, XY
XY	On channels 1 and 2 only. Z blanking on external trigger input, 1.4 V threshold

Horizontal System Digital Channels

Minimum detectable pulse width	5 ns
Channel-to-channel skew	2 ns (typical); 3 ns (maximum)

Acquisition System

Maximum analog channels sample rate	3.2 GSa/s, all channels
Maximum analog channel record length (per channel)	100 Mpts with standard license
Maximum digital channel sample rate	1.6 GSa/s all pods
Maximum digital channel record length	20 Mpts
High Resolution	As bandwidth is decreased using the built-in per-channel or global bandwidth filters, resolution increases up to 16 bits for high definition. To adjust bandwidth, use the Channel Setup menu.
Acquisition mode	Normal: Default mode Peak detect: Capture glitches as narrow as 156.25 ps at all timebase settings Averaging: Selectable from 2, 4, 8, 16, 64, ... to 65,536 Segmented: Segmented memory optimizes available memory for data streams that have long dead times between activity. Maximum segments = 256,000. Re-arm time: 700 ns (minimum time between trigger events) Manual: Allows independent selection of sample rate and memory depth
Time mode	Normal: Default mode

Trigger System

Trigger sources	Analog channel (1–4), digital channel (D0–D15), line, external
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 the 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) LF reject: Low frequency reject, cutoff frequency ~ 50 kHz HF reject: High frequency reject, cutoff frequency ~ 50 kHz Noise reject: Selectable OFF or ON, decreases sensitivity 2x
Trigger holdoff range	60 ns to 10.00 s

Trigger Sensitivity

Internal (noise reject off)	50 Ω : 1 LSB resolution, subject to the noise floor of the measurement
	1 M Ω : 1 LSB resolution, subject to the noise floor of the measurement
External ¹	200 mVpp from DC to 100 MHz
	350 mVpp 100 MHz to 500 MHz

Trigger Level Range

Any channel	± 6 div from center screen
External	± 5 V

Trigger Type Selections

Zone (HW zone qualifier)	<p>Trigger on user-defined zones drawn on the display. Up to four zones. A single zone can apply to any one analog channel at a time. Specify zones as either "must intersect" or "must not intersect."</p> <p>> 300,000 scans/s update rate</p> <p>Supported modes: normal, peak detect</p> <p>Also works simultaneously with the serial trigger and mask limit test</p>
Real-time zone	Available at timebase settings > 50 ns/div. Enables the full, uncompromised update rate of 1,300,000 waveforms/s
Edge	Trigger on a rising, falling, alternating, or either edge of any source
Edge-then-Edge	Trigger when the trigger edge occurs after an arming edge within the minimum and maximum delay times without any intervening arming or triggering edges (an edge followed by another edge)
Pulse width	<p>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</p> <p>Minimum duration setting: 1 ns (500 MHz, 1 GHz), 4 ns (350 MHz), 6 ns (200 MHz), 10 ns (100 MHz)</p> <p>Maximum duration setting: 10 s</p> <p>Range difference minimum: 5 ns</p>
Runt	<p>Trigger on a positive runt pulse that fails to exceed a high-level threshold. Trigger on a negative runt pulse that fails to exceed a low-level threshold. Runt triggering can also be time-qualified (< or >) with a minimum time setting of 1 ns and maximum time setting of 10 s</p> <p>Minimum time setting: 1 ns (500 MHz, 1 GHz), 4 ns (350 MHz), 6 ns (200 MHz)</p> <p>10 ns (100 MHz)</p>
Setup and hold	<p>Trigger on clock/data setup and/or hold time violations. Setup time can be set from 0 s to 10 s. Hold time can be set from 0 s to 10 s. Minimum setup-and-hold window: 3 ns.</p>
Rise/fall time	<p>Trigger on rise-time or fall-time edge speed violations (< or >) based on user-selectable threshold</p> <p>Select < or >; time settings range from:</p> <p>Minimum: 500 ps (500 MHz, 1 GHz), 2 ns (350 MHz), 3 ns (200 MHz), 5 ns (100 MHz)</p> <p>Maximum: 10 s</p>
Pattern	<p>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</p> <p>Minimum duration setting: 1 ns (500 MHz, 1 GHz), 4 ns (350 MHz), 6 ns (200 MHz), 10 ns (100 MHz)</p> <p>Maximum duration setting: 10 s</p> <p>Range difference minimum: 5 ns</p>
Or	Trigger on any selected edge across multiple analog or digital channels
Window	Trigger on entering/exiting voltage range and inside/outside voltage range
I ² C (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 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.
RS-232/422/485/UART (optional)	Supports MOSI and MISO data
	Trigger on Rx or Tx start bit, stop bit, data content, or parity error

CAN, CAN FD, CAN XL (optional)	Trigger on CAN (controller area network) version 2.0A, 2.0B, CAN FD (Flexible Data-rate), and CAN XL signals. Trigger on the Start of Frame (SOF), the End of Frame (EOF), data frame ID, data frame ID and data (non-FD), data frame ID and data (FD), remote frame ID, remote or data frame ID, error frame, acknowledge error, form error, stuff error, CRC error, spec error (ack or form or stuff or CRC), all errors, BRS bit (FD), CRC delimiter bit (FD), ESI bit active (FD), ESI bit passive (FD), overload frame, message, message and signal (non-FD), message and signal (FD, first 8 bytes only)
LIN (optional)	Trigger on LIN (Local Interconnect Network) sync break, sync frame ID, or frame ID and data, parity error, checksum error, frame (symbolic), frame and signal (symbolic)
SENT (optional)	Trigger on SENT bus. Trigger on start of fast channel message, start of slow channel message, fast channel SC and data, slow channel message ID, slow channel message ID and data, tolerance violation, fast channel CRC error, slow channel CRC error, all CRC errors, pulse period error, successive sync pulses error (1/64)
Ethernet (optional)	Trigger on Ethernet. Trigger on any Ethernet packet, Ethernet errors, generic packet, generic payload, ARP, IPv4, IPv6, 802.1Q, 802.1ad

Waveform Measurements

Markers	Single marker accuracy: $\pm$ [DC vertical gain accuracy + DC vertical offset accuracy + 0.08% full scale]
	Dual marker accuracy: $\pm$ [DC vertical gain accuracy + 0.16% full scale] ⁴
	Units: Seconds (s), Hz (1/s), phase (degrees), ratio (%)
	Modes: Manual, Measure, Track Waveform, Binary, Hex
Automatic measurements	Types: X1, X2, Y1, Y2, ΔX , ΔY
	Measurements continuously updated with statistics. Cursors track last selected measurement. Select up to ten measurements from the list below:
	Vertical: Peak-to-peak, maximum, minimum, amplitude, top, base, 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 deviation), ratio (N cycles), ratio (full screen), Y at X
	Time: Period, frequency, counter, T at edge, + width, - width, burst width, +duty cycle, - duty cycle, bit rate, rise time, fall time, delay, phase, X at min Y, X at max Y
Automatic measurement logging	Count: Positive pulse count, negative pulse count, rising edge count, falling edge count
	Mixed: Area (N cycles), area (full screen), slew rate
Automatic measurement gating	Power: Channel power, occupied bandwidth, adjacent power ratio, total harmonic distortion
	Available via BenchVue
Counter (A, B, C, D, and T)	Main, Zoom, Markers
	Built-in frequency counters – independent of acquisition state (Run/Stop/Single)
	Source: On any analog or digital channel or Trigger Qualified Event (non-Edge Trigger Modes)
	Resolution: 12 digits/second
	Maximum frequency: Bandwidth of scope
	Measurements: Frequency, period, totalize
	Trigger Levels: Selectable by channel

Waveform Math

Number of math functions		Four
Sources		Analog channels CH1-CH4, digital channels D0-D15, math waveforms M1-M4
Arithmetic		Add, subtract, multiply, divide, differentiate, integrate, FFT, $Ax + B$, squared, square root, absolute value, common logarithm, natural logarithm, exponential, base-10 exponential, low-pass filter, high-pass filter, averaged value, smoothing, envelope, magnify, max hold, min hold, measurement trend
Enhanced FFT	Record size	Up to 64 kpts resolution default, can be extended to 32 Mpts

⁴ 500 uV/div and 1 mV/div is a magnification of 2 mV/div setting. For vertical accuracy calculations, use full scale of 16 mV for 500 uV/div and 1 mV/div.

Window types	Hanning, Flat Top, Rectangular, Blackman-Harris, Bartlett
Time gated FFT	Gate the time range of data for FFT analysis in the zoom view. For time- and frequency-domain correlated analysis.
Waveforms	FFT, max hold, min hold, average
Peak search	Max 15 peaks, threshold and excursion control

Search, Navigate, and Lister

Type		Edge, pulse width, rise/fall, runt, frequency peak, serial bus 1, serial bus 2
Copy		Copy to trigger, copy from trigger
Frequency peak	Source	Math functions
	Maximum number of peaks	15
	Control	Results order in frequency or amplitude
Result display		Event lister or navigation. Manual or auto scroll via navigation or touch event lister entry to jump to a specific event

Display Characteristics

Integrated status display	3.2-inch 256 × 64-pixel OLED display, user-programmable
External display output	Full HD (1920 × 1080) using DisplayPort. Touch displays supported
Format	YT, color-graded XY, roll, and Bode
Graticules	8 vertical divisions by 10 horizontal divisions with intensity controls
Maximum waveform update rate	> 1,300,000 waveforms/s
Persistence	Off, infinite, variable persistence (100 ms to 60 s)
Intensity gradation	256 intensity levels

WaveGen – Built-In Function/Arbitrary Waveform Generator (Typical)

WaveGen out	Front-panel SMA 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 Carrier waveforms: Sine Modulation source: internal (no external modulation capability)
	AM: Modulation: Sine Modulation frequency: 1 Hz to 20 kHz Depth: 0% to 100%
	FM: Modulation: Sine 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
Sine	Frequency range: 0.01 Hz to 100 MHz
	Amplitude flatness: ±0.5 dB (relative to 1 kHz)
	Harmonic distortion: –40 dBc
	Spurious (non-harmonics): –40 dBc
	Total harmonic distortion: 1%
Square wave/pulse	SNR (50 Ω load, 500 MHz BW): 40 dB (Vpp ≥ 0.1 V); 30 dB (Vpp < 0.1 V)
	Frequency range: 0.01 Hz to 50 MHz
	Duty cycle: 20% to 80%
	Duty cycle resolution: Larger of 1% or 10 ns
	Pulse width: 10 ns minimum
	Rise/fall time: 2.5 ns (10 to 90%)
	Pulse width resolution: 5 ns
	Overshoot: < 10%
	Asymmetry (at 50% DC): ±1% ±5 ns
Ramp/triangle wave	Frequency range: 0.3 Hz to 5 MHz

	Linearity: 1%
	Variable symmetry: 0 to 100%
	Symmetry resolution: 1%
DC	Precise (-1 to 1 V), Hi-Z
	Wide range (-8 to 8 V)
Noise	Bandwidth: 150 MHz typical
Sine Cardinal (Sinc)	Frequency range: 0.3 Hz to 5 MHz
Exponential Rise/Fall	Frequency range: 0.3 Hz to 5 MHz
Cardiac	Frequency range: 0.3 Hz to 200.0 kHz
Gaussian pulse	Frequency range: 0.3 Hz to 5.0 MHz
Arbitrary	Waveform length: 2 to 500,000 points
	Amplitude resolution: 14 bits (including sign bit) ⁵
	Repetition rate: 0.3 Hz to 12 MHz
	Sample rate: 400 MSa/s
Frequency	Sine wave accuracy: Timebase accuracy ± 1 ppm
Amplitude	Range:
	515 ^{6,7}
	1 mVpp to 5 Vpp into 50 Ω ^{6,7}
	Resolution: 100 μ V or 3 digits, whichever is higher
	Accuracy: 2% (frequency = 1 kHz)
DC offset	Range: ± 8 V into Hi-Z ^{6,7} , ± 4 V into 50 Ω ^{6,7}
	Resolution: 100 μ V or 3 digits, whichever is higher
Trigger output	Trigger output available on Aux Out BNC
Main output	Impedance: 50 Ω typical
	Isolation: Not available, main output BNC is grounded
Output mode	Normal
	Single shot (arbitrary, sine, ramp, sine cardinal, exp rise/fall, cardiac, Gaussian pulse)

Digital Voltmeter (Typical)

Functions	AC _{rms} , DC, DC _{rms}
Number of DVMs	4
Resolution	ACV/DCV: 4.5 digits
Measuring rate	100 times/second
Auto ranging	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
Autonomy	DVMs are independent of the oscilloscope triggering system and are always measuring

Precision Counter/Totalizer (Typical)

	Source	Any analog channel or trigger qualified event (non-edge trigger modes)
	Resolution	12 digits/second maximum
	Max frequency	1 GHz (any analog channel)
	Trigger-qualified events	1/(trigger holdoff time) for trigger qualified events (max 25 MHz, minimum dead time of 40 ns)
Number of Counters		Up to 5 independent counters
Measurement		Frequency, period, totalize
Totalizer	Counter size	64-bit
	Edge	Rise or fall
Autonomy		Counters are independent of the oscilloscope triggering system and are always measuring

⁵ Full resolution is not available at output due to internal attenuator stepping.

⁶ Gaussian Pulse, Sin, Cardiac: 4 Vpp maximum into Hi-Z; 2 Vpp maximum into 50 Ω .

⁷ Maximum high level of 8V and minimum low level of -8V into Hi-Z (4V and -4V into 50 Ω) of combined signal amplitude and offset.

Connectivity

Standard ports	One USB 2.0 Hi-Speed host port on rear panel. Supports USBTMC protocol
	Three USB 3.0 super-speed device ports, 2 front and 1 rear panel. Supports memory devices, mouse, and keyboards
	LAN (10/100/1000Base-T)
Aux out	BNC connector on the rear panel. Supported modes: triggers, mask, and waveform generator sync pulse
Timebase reference input	Timebase reference input Amplitude into 50 Ω : 356 mV _{PP} (-5 dBm) to 5 V _{PP} (+18 dBm) sine, 285 mV _{PP} to 4 V _{PP} square Frequency: 10 MHz $\pm$ 20 ppm
Timebase reference output	Sine wave 580 mV _{rms} when internal timebase reference is selected; Sine wave 515 mV _{rms} when external timebase reference is selected Frequency accuracy is the same as the timebase accuracy when internal timebase reference is selected; Frequency accuracy is the external frequency accuracy when external timebase reference is selected

General and Environmental Characteristics

Power consumption	275 W maximum
Line voltage range	100 to 120 V, 50/60/400 Hz; 100 to 240 V, 50/60 Hz
Environmental rating	0 to 50 °C with 3000 m max Operating: 80% RH, non-condensing, up to +40 °C Non-operating: 95% RH, non-condensing, up to +40 °C; decreasing linearly to 50% RH at +65 °C
Electromagnetic compatibility	Meets EMC directive (2004/108/EC), meets or exceeds IEC 61326-1:2012/EN 61326-1:2013 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
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 (W x H x D)	42.6 cm (16.7 in) x 6.1 cm (2.4 in) x 36.3 cm (14.21 in)
Weight	Net: 4.2 kg (9.3 lb)

Nonvolatile Storage

Reference waveform display		Four internal waveforms
Data/file save	Setup/image	Setup (*.scp 24-bit Bitmap image (*.bmp), PNG 24-bit image (*.png)
	Waveform data	CSV data (*.csv), ASCII XY data (*.csv), Binary data (*.bin), Lister data (*.csv), Reference waveform data (*.h5), multi-channel waveform data (*.h5), Arbitrary Waveform data (*.csv)
	Application data	Mask (*.msk)
	Analysis results (*.csv)	Cursor data, measurement results, mask test statistics, search, segmented timestamps
Max USB flash drive size		Supports industry-standard flash drives
Internal data storage		Up to 10 GB open for data storage of oscilloscope files. Secure Erase and save control are available with XR3LSECURE
Setups 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 , 3-year calibration interval
Interface and built-in help language support	English, Chinese (simplified), Chinese (traditional), French, German, Italian, Japanese, Korean

After-Purchase License-Only Upgrades

Bandwidth Upgrades

Bandwidth Upgrade	Model Number
4-channel XR3L4A from 200 MHz to 350 MHz	XR3LBW-001
4-channel XR3L4A from 200 MHz to 500 MHz	XR3LBW-002
4-channel XR3L4A from 200 MHz to 1 GHz	XR3LBW-003
4-channel XR3L4A from 350 MHz to 500 MHz	XR3LBW-004
4-channel XR3L4A from 350 MHz to 1 GHz	XR3LBW-005
4-channel XR3L4A from 500 MHz to 1 GHz	XR3LBW-006

Software Upgrades

License Upgrade	Description	Model Number
Embedded software package	I ² C, SPI, UART (RS232/422/485) serial trigger and decode	XR3LEMBA
Automotive software package	CAN, CAN FD, CAN XL (symbolic with .dbc file), SENT, LIN (symbolic with .ldf file), and 10Base-T1S serial trigger and decode	XR3LAUTA
Aerospace and defense software package	MIL-STD 1553 and ARINC 429 triggering and analysis	XR3LAERA
Enhanced security	Add more stringent security features, including disabling non-volatile memory, disabling USB and LAN ports, disabling firmware upgrades, and password protection	XR3LSECURE
Power analysis software package	Power quality, current harmonics, switching loss, turn-on/off time, transient response, loop response, PSRR, and more	XR3LPWRA
USB analysis software package	USB 2.0 and USB PD trigger, decode, and search. USB 2.0 supports low-, full-, and hi-speed signaling rates	XR3LUSBA
Quick jitter analysis software package	Jitter analysis and clock recovery	XR3LQJTA
Ethernet protocol analysis software package	10BASE-T, 100BASE-TX, and 10BASE-T1S serial trigger and decode	XR3LETHA
Ultimate bundle software package	Enables XR3LEMBA, XR3LAUTA, XR3LAERA, XR3LUSBA, XR3LQJTA, XR3LETHA and XR3LPWRA	XR3LBDLA

Recommended Services

Maximize your instrument uptime and confidently make accurate measurements by securing technical support, repair, and calibration services with committed response and turnaround times. High-performance instruments include 1 year of KeysightCare Assured. Obtain multi-year KeysightCare up front to eliminate the need for lengthy and tedious paperwork and yearly requests for a maintenance budget. Plus, you benefit from secured service for 2, 3, or 5 years.

Service	Function
KeysightCare Enhanced*	Includes Tech Support, Warranty and Calibration
R-55B-001-1	KeysightCare Enhanced – Upgrade 1 year
R-55B-001-2	KeysightCare Enhanced – Extend to 2 years
R-55B-001-3	KeysightCare Enhanced – Extend to 3 years (Recommended)
R-55B-001-5	KeysightCare Enhanced – Extend to 5 years (Recommended)
KeysightCare Assured	Includes Tech Support and Warranty
R-55A-001-2	KeysightCare Assured – Extend to 2 years
R-55A-001-3	KeysightCare Assured – Extend to 3 years
R-55A-001-5	KeysightCare Assured – Extend to 5 years

* Available in select countries. For details, please view the [datasheet](#). R-55B-001-2/3/5 must be ordered with R-55B-001-1.

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