Infiniium UXR-Series Oscilloscopes

The most advanced oscilloscope on the planet

Introduction

The Infiniium UXR-Series oscilloscopes deliver world-leading performance, ultra-low noise, and high signal fidelity for engineers and scientists to truly see and understand the fastest phenomena – enabling you to develop the next generation of technology and research more quickly.

KEYSIGHT

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NOTE:

For a description of key features, see the Infiniium UXR-Series Oscilloscopes Technical Overview.

For ordering information, see the Infiniium UXR-Series Oscilloscopes Configuration Guide.

Introduction and Model Overview

The UXR has more accurate analysis. Up to four channels of simultaneous 110 GHz of bandwidth, each concurrently sampling at a staggering 256 GSa/s with 10 bits of high-definition analog to digital converter (ADC) resolution.

The UXR runs faster. Up to 100x faster performance for some measurements – enabled by a powerful new measurement acceleration ASIC and memory controller capable of 5 trillion integer operations per second (IOPS).

The UXR is fully upgradeable. The Infiniium UXR-Series is scalable – you can easily upgrade the bandwidth, memory, channel count, and software capabilities to meet your future needs.

The UXR is available in three models based on bandwidth, sample rate and input connector size. Infiniium UXR-Series models offer bandwidths from 5 GHz to 110 GHz with various 1-channel, 2-channel, or 4-channel configurations available. The 3.5mm models are equipped with Keysight AutoProbe II interfaces while 1mm and 1.85 mm models incorporate an advanced high-performance high-bandwidth Keysight AutoProbe III interface.

1 mm input models

1.85 mm input models

3.5 mm input models

Model 4-Channel	2-channel	Bandwidth (maximum)	Connector	Power required		Sample rate (maximum)
				4-channel	2-channel	
UXR1104A	UXR1102A	110 GHz	1 mm	200 to 240 V_{ac} 2615 VA(Max)	110 to 240 V_{ac} 1350 VA (Max)	256 GSa/s
UXR1004A	UXR1002A	100 GHz				
UXR0804A	UXR0802A	80 GHz				
UXR0704AP	UXR0702AP	70 GHz				
UXR0594AP	UXR0592AP	59 GHz				
UXR0404AP	UXR0402AP	40 GHz				
UXR0254AP	UXR0252AP	25 GHz				
N/A	UXR0051AP[1]	5 GHz				
UXR0704A	UXR0702A	70 GHz	1.85 mm			
UXR0594A	UXR0592A	59 GHz				
UXR0504A	UXR0502A	50 GHz				
UXR0404A	UXR0402A	40 GHz				
UXR0334A	N/A	33 GHz	3.5 mm	100 to 240 V_{ac} 1350 VA (Max)	N/A	128 GSa/s
UXR0254A		25 GHz				
UXR0204A		20 GHz				
UXR0164A		16 GHz				
UXR0134A		13 GHz				
UXR0104A		10 GHz				

1. The UXR0051AP includes two channels, but only one channel is licensed for use. The 2nd channel may be activated with purchase of an upgrade license – N2166A Upgrade 1 channel UXR0051AP to 2 channel UXR0254AP.

Vertical System Specifications - 3.5 mm Input Models

Specification	3.5 mm input models	
Sample rate per channel	128 GSa/s (configurable in powers of two)	
Displayed input sensitivity[1]	1 mV/div to 1 V/div	
Hardware sensitivity[1]	32 mV full scale to 8.0 V full scale	
Vertical resolution[1,3]	10 bits, ≥ 14 bits with averaging	
DC gain accuracy[1,2,3,6]	± 1.5% of full scale (typical: ±1% of full scale ≤ 10 mV/div, ±0.5% of full scale > 10 mV/div)	
DC voltage accuracy Dual cursor: Single cursor:	 ± [(DC gain accuracy) + (resolution)] ± [(DC gain accuracy) + (offset accuracy) + (resolution/2)]	
Maximum input voltage	± 8 divisions from center screen (Absolute max ± 6.5 V)	
Input range	± 4 divisions from center screen	
Maximum input power	+6 dB (twice the amplitude) at all ranges (+16 dBm at maximum range)	
Channel to channel isolation	Channel to channel (with equal V/div settings): 1-3, 1-4, 2-3, and 2-4: 60 dB Channel to Channel (with equal V/div settings): 1-2, 3-4: 40 dB	
Offset range	**Vertical sensitivity** 1 mV/div to 54 mV/div 55 mV/div to 93 mV/div 94 mV/div to 172 mV/div 173 mV/div to 306 mV/div 307 mV/div to 1000 mV/div	**Available offset** ± 0.40 V ± 0.70 V ± 1.25 V ± 2.25 V ± 4.00 V
Offset accuracy[1,2,3,6]	±1% of channel offset + 1% of full scale	
Offset accuracy (typical)	±1% of channel offset + 0.5% of full scale	
Amplitude flatness[4]	Any frequency ≤ 33 GHz: < 0.3 dB within any 500MHz span < 0.5 dB within any 10GHz span	
Phase flatness[5]	Any frequency ≤ 33 GHz: < 1 degree within any 500MHz span < 2 degrees within any 10GHz span	

1. Full scale is defined as 8 vertical divisions. Magnification is used below 4 mV/div. Below 4 mV/div, full scale is defined as 32 mV. The major scale settings are 1 mV/div, 2 mV/div, 5 mV/div, 10 mV/div, 20 mV/div, 50 mV/div, 100 mV/div, 200 mV/div, 500 mV/div and 1V/div Magnification major scales of 1mV/div & 2mV/div are not warranted for Offset Accuracy & DC Gain Accuracy.
2. Input impedance is valid when V/div scaling is adjusted to show all waveform vertical values within scope display.
3. Vertical resolution for 10 bits = 0.1% of full scale, for 14 bits = 0.006% of full scale.
4. Measured result using N2127A as reference. Maximum deviation from average in a span.
5. Measured result using N2127A as reference. Maximum deviation from best fit line (degrees) in a span.
6. Denotes warranted specifications, all others are typical. Valid after 30-minute warm up period and ±5 °C from oscilloscope firmware calibration temperature.

Vertical System Specifications – 1mm & 1.85 mm Input Models

Specification	1.85 mm & 1 mm input models	
Sample rate per channel	256 GSa/s (configurable in powers of two)	
Displayed input sensitivity[1]	1 mV/div to 500 mV/div	
Hardware sensitivity[1]	60 mV full scale to 4.0 V full scale	
Vertical resolution[1,3]	10 bits, ≥ 14 bits with averaging	
DC gain accuracy[1,2,3,6]	± 2% of full scale (typical: ±1% of full scale)	
DC voltage accuracy Dual cursor: Single cursor:	 ± [(DC gain accuracy) + (resolution)] ± [(DC gain accuracy) + (offset accuracy) + (resolution/2)]	
Maximum input voltage	± 8 divisions from center screen (Absolute max ± 4V)	
Input range	± 4 divisions from center screen	
Maximum input power	+6 dB (twice the amplitude) at all ranges (+16 dBm at maximum range)	
Channel to channel isolation	60 dB	
Offset range	**Vertical sensitivity** 1 mV/div to 59 mV/div 60 mV/div to 127 mV/div 128 mV/div to 279 mV/div 280 mV/div to 500 mV/div	**Available offset** ± 0.40 V ± 0.86 V ± 1.85 V ± 4.00 V
Offset accuracy[1,2,3,6]	± 2% of channel offset + 1% of full scale	
Offset accuracy (typical)	± 1% of channel offset + 1% of full scale	
Amplitude flatness[4]	Any frequency ≤ 50 GHz: < 0.3 dB within any 500 MHz span < 0.5 dB within any 10 GHz span Frequencies between 50 GHz and 90 GHz < 1 dB within any 10 GHz span Frequencies between 90 GHz and 110 GHz < 2 dB within any 10GHz span	
Phase flatness[5]	Any frequency ≤ 50 GHz: < 1 degree within any 500 MHz span < 2 degrees within any 10 GHz span Frequencies between 50 GHz and 90 GHz < 3 degrees within any 10 GHz span Frequencies between 90 GHz and 110 GHz < 7 degrees within any 10 GHz span	

1. Full scale is defined as 8 vertical divisions. Magnification is used below 7.5 mV/div. Below 7.5 mV/div, full scale is defined as 60 mV. The major scale settings are 1 mV/div, 2 mV/div, 5 mV/div, 10 mV/div, 20 mV/div, 50 mV/div, 100 mV/div, 200 mV/div and 500 mV/div. Magnification major scales of 1mV/div, 2mV/div & 5mV/div are not warranted for Offset Accuracy & DC Gain Accuracy.
2. Input impedance is valid when V/div scaling is adjusted to show all waveform vertical values within scope display.
3. Vertical resolution for 10 bits = 0.1% of full scale, for 14 bits = 0.006% of full scale.
4. Measured result using N2125A as reference. Maximum deviation from average in a span.
5. Measured result using N2125A as reference. Maximum deviation from best fit line (degrees) in a span.
6. Denotes warranted specifications, all others are typical. Valid after 30-minute warm up period and ± 5 °C from oscilloscope firmware calibration temperature

Vertical System – Performance Characteristics by Model - 3.5 mm Input Models

Characteristic	UXR0104A	UXR0134A	UXR0164A	UXR0204A	UXR0254A	UXR0334A
Analog input connector	Ruggedized 3.5 mm male - with AutoProbe II jack					
Input impedance[1]	50 Ω, ± 3%					
Input coupling	DC					
Full bandwidth analog input channels	4	4	4	4	4	4
Analog bandwidth (3 dB)						
Typical bandwidth	10.5 GHz	13.6 GHz	16.8 GHz	21.0 GHz	26.2 GHz	33.0 GHz
Warranted bandwidth[5]	10.0 GHz	13.0 GHz	16.0 GHz	20.0 GHz	25.0 GHz	32.0 GHz
Rise time/fall time						
10 to 90%[2]	44.0 ps	33.8 ps	27.5 ps	22.0 ps	17.6 ps	13.3 ps
20 to 80%[3]	31.2 ps	23.9 ps	19.4 ps	15.6 ps	12.4 ps	9.4 ps
ENOB typical[4]						
at ≥ 400 mV_{fs}	7.0	6.8	6.7	6.5	6.2	5.9
at 40 mV_{fs}	6.4	6.1	6.0	5.8	5.6	5.3

Vertical System – Performance Characteristics by Model - 1.85 mm Input Models

Characteristic	UXR0404A / UXR0402A	UXR0504A / UXR0502A	UXR0594A / UXR0592A	UXR0704A / UXR0702A
Analog input connector	1.85 mm male - with AutoProbe III jack			
Input impedance[1]	50 Ω, ± 3%			
Input coupling	DC			
Full bandwidth analog input channels	4 / 2	4 / 2	4 / 2	4 / 2
Analog bandwidth (3 dB)				
Typical bandwidth	42.0 GHz	52.5 GHz	59.0 GHz	70.0 GHz
Warranted bandwidth[5]	40.0 GHz	50.0 GHz	59.0 GHz	67.0 GHz
Rise time/fall time				
10 to 90%[2]	11.0 ps	8.8 ps	7.5 ps	6.3 ps
20 to 80%[3]	7.8 ps	6.2 ps	5.3 ps	4.4 ps
ENOB typical[4]				
at ≥ 400 mV_{fs}	5.8	5.6	5.5	5.4
at 60 mV_{fs}	5.4	5.2	5.1	5.0

1. Input impedance is valid when V/div scaling is adjusted to show all waveform vertical values within scope display.
2. Calculation based on Tr = 0.44/BW.
3. Calculation based on Tr = 0.31/BW.
4. The average value from DC to full bandwidth of model.
5. Denotes warranted specifications, all others are typical. Specifications are valid after 30-minute warm up period and ± 5°C from oscilloscope firmware calibration temperature.

Vertical System – Performance Characteristics by Model - 1 mm Input AP Models

Characteristic	UXR0051AP	UXR0254AP / UXR0252AP	UXR0404AP / UXR0402AP	UXR0594AP / UXR0592AP	UXR0704AP / UXR0702AP
Analog input connector	1 mm ruggedized male - with AutoProbe III jack				
Input impedance[1]	50 Ω, ± 3%				
Input coupling	DC				
Full bandwidth analog input channels	1	4 / 2	4 / 2	4 / 2	4 / 2
Analog bandwidth (3 dB) Typical bandwidth	5.3 GHz	26.2 GHz	42.0 GHz	59.0 GHz	73.5 GHz
Warranted bandwidth[5]	5.0 GHz	25.0 GHz	40.0 GHz	59.0 GHz	67.0 GHz
Rise time/fall time 10 to 90%[2]	88 ps	17.6 ps	11.0 ps	7.5 ps	6.3 ps
20 to 80%[3]	62 ps	12.4 ps	7.8 ps	5.3 ps	4.4 ps
ENOB typical[4] at ≥ 400 mV_{fs}	8.1	6.2	5.8	5.5	5.4
at 60 mV_{fs}	7.8	5.6	5.4	5.1	5.0

Vertical System – Performance Characteristics by Model - 1 mm Input Models

Characteristic	UXR0804A / UXR0802A	UXR1004A / UXR1002A	UXR1104A / UXR1102A
Analog input connector	1 mm ruggedized male - with AutoProbe III jack		
Input impedance[1]	50 Ω, ± 3%		
Input coupling	DC		
Full bandwidth analog input channels	4 / 2	4 / 2	4 / 2
Analog bandwidth (3 dB) Typical bandwidth	84.0 GHz	105.0 GHz	113.0 GHz
Warranted bandwidth[5]	80.0 GHz	100.0 GHz	110.0 GHz
Rise time/fall time 10 to 90%[2]	5.5 ps	4.4 ps	4.0 ps
20 to 80%[3]	3.9 ps	3.1 ps	2.8 ps
ENOB typical[4] at ≥ 400 mV_{fs}	5.3	5.1	5.0
at 60 mV_{fs}	4.8	4.4	4.2

1. Input impedance is valid when V/div scaling is adjusted to show all waveform vertical values within scope display
2. Calculation based on Tr = 0.44/BW
3. Calculation based on Tr = 0.31/BW
4. The average value from DC to full bandwidth of model
5. Denotes warranted specifications, all others are typical. Specifications are valid after 30-minute warm up period and ± 5°C from oscilloscope firmware calibration temperature

RMS Noise Floor – Performance Characteristics (Measured)

RMS noise floor vertical setting, full scale	UXR0104A	UXR0134A	UXR0164A	UXR0204A	UXR0254A	UXR0334A
32 $mV_{full\ scale\ (fs)}$	129 $\mu V_{(rms)}$	150 $\mu V_{(rms)}$	165 $\mu V_{(rms)}$	188 $\mu V_{(rms)}$	212 $\mu V_{(rms)}$	266 $\mu V_{(rms)}$
80 $mV_{full\ scale\ (fs)}$	185 $\mu V_{(rms)}$	210 $\mu V_{(rms)}$	231 $\mu V_{(rms)}$	262 $\mu V_{(rms)}$	303 $\mu V_{(rms)}$	388 $\mu V_{(rms)}$
100 $mV_{full\ scale\ (fs)}$	216 $\mu V_{(rms)}$	258 $\mu V_{(rms)}$	286 $\mu V_{(rms)}$	313 $\mu V_{(rms)}$	365 $\mu V_{(rms)}$	470 $\mu V_{(rms)}$
160 $mV_{full\ scale\ (fs)}$	322 $\mu V_{(rms)}$	377 $\mu V_{(rms)}$	414 $\mu V_{(rms)}$	469 $\mu V_{(rms)}$	541 $\mu V_{(rms)}$	702 $\mu V_{(rms)}$
400 $mV_{full\ scale\ (fs)}$	701 $\mu V_{(rms)}$	810 $\mu V_{(rms)}$	878 $\mu V_{(rms)}$	975 $\mu V_{(rms)}$	1.16 $mV_{(rms)}$	1.48 $mV_{(rms)}$
800 $mV_{full\ scale\ (fs)}$	1.44 $mV_{(rms)}$	1.58 $mV_{(rms)}$	1.75 $mV_{(rms)}$	1.92 $mV_{(rms)}$	2.24 $mV_{(rms)}$	2.91 $mV_{(rms)}$
1.6 $V_{full\ scale\ (fs)}$	2.97 $mV_{(rms)}$	3.50 $mV_{(rms)}$	3.77 $mV_{(rms)}$	4.31 $mV_{(rms)}$	4.97 $mV_{(rms)}$	6.48 $mV_{(rms)}$
4.0 $V_{full\ scale\ (fs)}$	7.23 $mV_{(rms)}$	7.86 $mV_{(rms)}$	8.74 $mV_{(rms)}$	9.61 $mV_{(rms)}$	11.2 $mV_{(rms)}$	14.7 $mV_{(rms)}$
8.0 $V_{full\ scale\ (fs)}$	14.1 $mV_{(rms)}$	15.5 $mV_{(rms)}$	17.2 $mV_{(rms)}$	19.2 $mV_{(rms)}$	22.3 $mV_{(rms)}$	28.8 $mV_{(rms)}$

RMS noise floor vertical setting, full scale	UXR0254AP / UXR0252AP	UXR0404A / UXR0402A UXR0404AP / UXR0402AP	UXR0504A / UXR0502A	UXR0594A / UXR0592A UXR0594AP / UXR0592AP
60 $mV_{full\ scale\ (fs)}$	290 $\mu V_{(rms)}$	340 $\mu V_{(rms)}$	410 $\mu V_{(rms)}$	460 $\mu V_{(rms)}$
100 $mV_{full\ scale\ (fs)}$	400 $\mu V_{(rms)}$	490 $\mu V_{(rms)}$	560 $\mu V_{(rms)}$	640 $\mu V_{(rms)}$
160 $mV_{full\ scale\ (fs)}$	570 $\mu V_{(rms)}$	720 $\mu V_{(rms)}$	820 $\mu V_{(rms)}$	950 $\mu V_{(rms)}$
400 $mV_{full\ scale\ (fs)}$	1.3 $mV_{(rms)}$	1.6 $mV_{(rms)}$	1.8 $mV_{(rms)}$	2.1 $mV_{(rms)}$
800 $mV_{full\ scale\ (fs)}$	2.6 $mV_{(rms)}$	3.4 $mV_{(rms)}$	3.7 $mV_{(rms)}$	4.3 $mV_{(rms)}$
1.6 $V_{full\ scale\ (fs)}$	5.1 $mV_{(rms)}$	6.7 $mV_{(rms)}$	7.5 $mV_{(rms)}$	8.4 $mV_{(rms)}$
4.0 $V_{full\ scale\ (fs)}$	13 $mV_{(rms)}$	16 $mV_{(rms)}$	18 $mV_{(rms)}$	20 $mV_{(rms)}$

RMS noise floor vertical setting, full scale	UXR0704A / UXR0702A UXR0704AP / UXR0702AP	UXR0804A / UXR0802A	UXR1004A / UXR1002A	UXR1104A / UXR1102A	UXR0051AP
60 $mV_{full\ scale\ (fs)}$	500 $\mu V_{(rms)}$	580 $\mu V_{(rms)}$	770 $\mu V_{(rms)}$	860 $\mu V_{(rms)}$	130 $\mu V_{(rms)}$
100 $mV_{full\ scale\ (fs)}$	680 $\mu V_{(rms)}$	780 $\mu V_{(rms)}$	990 $\mu V_{(rms)}$	1.1 $mV_{(rms)}$	180 $\mu V_{(rms))}$
160 $mV_{full\ scale\ (fs)}$	970 $\mu V_{(rms)}$	1.1 $mV_{(rms)}$	1.4 $mV_{(rms)}$	1.5 $mV_{(rms)}$	260 $\mu V_{(rms)}$
400 $mV_{full\ scale\ (fs)}$	2.2 $mV_{(rms)}$	2.4 $mV_{(rms)}$	2.8 $mV_{(rms)}$	2.9 $mV_{(rms)}$	580 $\mu V_{(rms)}$
800 $mV_{full\ scale\ (fs)}$	4.5 $mV_{(rms)}$	4.8 $mV_{(rms)}$	5.8 $mV_{(rms)}$	6.1 $mV_{(rms)}$	1.2 $mV_{(rms)}$
1.6 $V_{full\ scale\ (fs)}$	9.0 $mV_{(rms)}$	9.7 $mV_{(rms)}$	12 $mV_{(rms)}$	13 $mV_{(rms)}$	2.3 $mV_{(rms)}$
4.0 $V_{full\ scale\ (fs)}$	21 $mV_{(rms)}$	23 $mV_{(rms)}$	27 $mV_{(rms)}$	29 $mV_{(rms)}$	5.7 $mV_{(rms)}$

Vertical System – Performance Measurements – 1 mm & 1.85 mm Input Models

Measurement	Measured performance at 256 GSa/s				
Banded ENOB	20 ns measurement by frequency span bandwidth @ center frequency (CF)				
	CF	113 GHz	10 GHz	5 GHz	2 GHz	1 GHz
	67 GHz	5.0	7.6	8.1	8.7	9.0
	90 GHz	4.8	7.5	8.0	8.4	8.7
	110 GHz	4.9	6.9	7.4	7.9	8.2
Displayed average noise level (DANL)	1 GHz wide span measured at Center Frequency (CF), 1 Hz reference:					
		80 mV_{FS} (-18 dBm range)		1.26 V_{FS} (6 dBm range)		
	1 GHz 10 GHz 25 GHz 50 GHz 75 GHz 100 GHz	-161 dBm/Hz -161 dBm/Hz -159 dBm/Hz -158 dBm/Hz -158 dBm/Hz -156 dBm/Hz		-138 dBm/Hz -138 dBm/Hz -137 dBm/Hz -137 dBm/Hz -138 dBm/Hz -136 dBm/Hz		
Dynamic range [2/3 * (TOI - DANL)]	6 dBm range, 200 mV/div @ 110 GHz BW 25 GHz CF, 100 MHz span, 1 Hz RBW			103 dB		
Signal to noise dynamic range	Measured with FFT: 0 dBm range, -1 dBm signal, 100 MHz span, 1 KHz RBW, at +20 MHz from the center frequency (CF)			1 GHz CF: 115 dB 67 GHz CF: 113 dB		
Phase noise	1 GHz carrier, input signal 90% full scale					
	@ Offset	Single channel phase noise		2 channel x-corelated		
	10 KHz	-120 dBc/Hz		-121 dBc/Hz		
	20 KHz	-124 dBc/Hz		-127 dBc/Hz		
	100 KHz	-137 dBc/Hz		-147 dBc/Hz		
	1 MHz	-143 dBc/Hz		-151 dBc/Hz		
	10 MHz	-143 dBc/Hz		-156 dBc/Hz		
	100 MHz	-142 dBc/Hz		-158 dBc/Hz		
	400 MHz	-141 dBc/Hz		-165 dBc/Hz		
Channel to channel phase / phase coherency	Inter-channel jitter @ 39GHz, 1GHz BW: ± 2.5 deg (0.5 deg rms)					
Two tone third-order intermodulation (TOI)	1.2 V_{fs} (6 dBm range), -12 dBm input/tone, 3 KHz RBW, 400 KHz span: +22.9 dBm @ 3.65 GHz and 3.6501 GHz +18.2 dBm @ 26.5 GHz and 26.5001 GHz					

Measurement	Measured performance at 256 GSa/s		
2nd and 3rd harmonic distortion	60 mV_{FS} (7.5 mV/div), -26 dBm input signal (~50% FS), 100 KHz RBW		
	Fundamental	2nd harmonic	3rd harmonic
	1 GHz	≤ -68 dBc	≤ -61 dBc
	16.5 GHz	≤ -64 dBc	≤ -62 dBc
	25 GHz	≤ -62 dBc	≤ -61 dBc
	50 GHz	≤ -56 dBc	---
	700 mVFS (87.5 mV/div), -1 dBm input signal (~90% FS), 100 KHz RBW		
	Fundamental	2nd harmonic	3rd harmonic
	1 GHz	≤ -55 dBc	≤ -50 dBc
	16.5 GHz	≤ -55 dBc	≤ -50 dBc
	25 GHz	≤ -51 dBc	≤ -46 dBc
	50 GHz	≤ -44 dBc	—
Spurious-free dynamic range (SFDR) (excl. harmonics)	Measured via FFT: 5 GHz center frequency, 10 GHz span, 100 kHz RBW, 0 dBm range, -1 dBm signal @ 700 mV FS (87.5 mV/div) with a 5 GHz input carrier		≤ -65 dBc
	Measured via FFT: 50 GHz center frequency, 20 GHz span, 100 kHz RBW, 0 dBm range, -1 dBm signal @ 700 mV FS (87.5 mV/div) with a 50 GHz input carrier		≤ -61 dBc
Residuals, images, and spurious responses	Signal related (non-harmonic, multiple per 16 GHz interval): -52 dBc @ 0 dBm range Residual responses (major per 16 GHz interval): -65 dB_{FS} @ 0 dBm range -65 dBm clock spur @ 64 GHz		
Error vector magnitude (EVM)	Two-channel bonded 802.11ay (61.56 GHz CF, 3.8 GHz span): 5G NR, 1 CC (100 MHz), measured at 28 GHz: 5G NR, 1 CC (100 MHz), measured at 39 GHz:		1.23% 0.60% 0.90%
S11	< 50 GHz, -15 dB ≥ 50 GHz, -7 dB		
Conducted emissions	Clock emissions conducted out front panel connector @ 64 GHz: -65 dBm		

Horizontal System – Performance Characteristics

Characteristic	Measured performance – All oscilloscope input connector types	
Main timebase range	2 ps/div to 20 s/div real-time (13 GHz to 33 GHz models) 1 ps/div to 20 s/div real-time (40 GHz to 110 GHz models)	
Main timebase delay range	200 s to -200 s real-time	
Reference position	Continuously adjustable across horizontal display range	
Zoom timebase range	1 ps/div to current main timescale setting	
Channel de-skew range	± 1 ms range, 10 fs resolution	
Time scale accuracy*,[1]	± (25 ppb initial + 100 ppb/year aging) first year of manufacture ± (25 ppb initial + 30 ppb/year aging) after first year of manufacture	
Intrinsic jitter[3], acquired time range/delta-time interval	**Internal reference**	**External reference**
< 1 µs (100 ns/div) 10 µs (1 µs/div) 100 µs (10 µs/div) 1 ms (100 µs/div)	15 fs rms 25 fs rms 40 fs rms 50 fs rms	15 fs rms 25 fs rms 40 fs rms 50 fs rms
Inter-channel intrinsic jitter[2,3]	< 10 fs rms	
Inter-scope intrinsic jitter[2,3]	< 20 fs rms	
Inter-channel skew[2]	± 2 ps pk	
Inter-channel skew drift[2,4]	± 100 fs pk (256 GSa/s models)	± 150 fs pk (128 GSa/s models)
Inter-scope skew drift[2,4]	± 200 fs pk (256 GSa/s models)	± 250 fs pk (128 GSa/s models)
Measured time interval error (TIE)	400 mV_{FS}, 70 GHz bandwidth, 90% input signal, 2.2 mV_{rms} noise:37 fs rms@70 GHz	

* Denotes warranted specification, all others are typical. Specs are valid after a 30-minute warm-up period and ± 5 °C from calibration temp.

1. initial = immediately after factory or user calibration.
2. intra-chan = both edges measured on same channel, inter-chan = two edges measured on different channels within the same scope chassis, inter-scope = two edges measured between channels across different scope chassis synchronized to the same time reference
3. Intrinsic Jitter is the time error of a single channel relative to an ideal time reference. External timebase reference values measured using a Wenzel 501-04608A 10 MHz reference. Intrinsic jitter value depends on acquisition time range for TIE formula and depends on delta-time between edges for all two-edge formulas.
4. Scope channels & signal interconnect de-skewed prior to measurement. Skew between channels caused by ± 5 deg C temp change.

Characteristic	All oscilloscope input connector types
Jitter measurement floor[1,2] (sec rms)	
Time interval error (sec rms)	$\sqrt{\left(\frac{\text{Noise floor}}{\text{Slew rate}}\right)^2 + (\text{Intrinsic jitter})^2}$
Period jitter (sec rms)	$\sqrt{2} * \sqrt{\left(\frac{\text{Noise floor}}{\text{Slew rate}}\right)^2 + (\text{Intrinsic jitter})^2}$
Cycle-cycle / N-cycle jitter (sec rms)	$\sqrt{3} * \sqrt{\left(\frac{\text{Noise floor}}{\text{Slew rate}}\right)^2 + (\text{Intrinsic jitter})^2}$
Inter-channel jitter[2,4] (sec rms)	$\sqrt{\left(\begin{matrix}\text{Time interval}\\ \text{error (Edge Chan1)}\end{matrix}\right)^2 + \left(\begin{matrix}\text{Time interval}\\ \text{error (Edge Chan2)}\end{matrix}\right)^2 + \left(\begin{matrix}\text{Inter channel}\\ \text{intrinsic jitter}\end{matrix}\right)^2}$
Inter-scope jitter[2,4] (sec rms)	$\sqrt{\left(\begin{matrix}\text{Time interval}\\ \text{error (Edge Scope1)}\end{matrix}\right)^2 + \left(\begin{matrix}\text{Time interval}\\ \text{error (Edge Scope2)}\end{matrix}\right)^2 + \left(\begin{matrix}\text{Inter scope}\\ \text{intrinsic jitter}\end{matrix}\right)^2}$
Delta-time measurement accuracy[2,3,4,5]	
Intra-channel no averaging	$\pm\left[5 * \sqrt{\left(\begin{matrix}\text{Time interval}\\ \text{error (Edge1)}\end{matrix}\right)^2 + \left(\begin{matrix}\text{Time interval}\\ \text{error (Edge2)}\end{matrix}\right)^2} + \left(\left(\begin{matrix}\text{Time scale}\\ \text{accuracy}\end{matrix}\right) * \left(\begin{matrix}\text{Delta}\\ \text{time}\end{matrix}\right)\right)\right]$
Intra-channel 256 averages	$\pm\left[\frac{5}{16} * \sqrt{\left(\begin{matrix}\textit{Time interval}\\ \textit{error (Edge1)}\end{matrix}\right)^2 + \left(\begin{matrix}\textit{Time interval}\\ \textit{error (Edge2)}\end{matrix}\right)^2} + \left(\left(\begin{matrix}\textit{Time scale}\\ \textit{accuracy}\end{matrix}\right) * \left(\begin{matrix}\textit{Delta}\\ \textit{time}\end{matrix}\right)\right)\right]$
Inter-channel no averaging	$\pm\left[5 * \sqrt{\left(\begin{matrix}\text{Time interval}\\ \text{error (Edge1)}\end{matrix}\right)^2 + \left(\begin{matrix}\text{Time interval}\\ \text{error (Edge2)}\end{matrix}\right)^2 + \left(\begin{matrix}\text{Inter channel}\\ \text{intrinsic jitter}\end{matrix}\right)^2} + \left(\left(\begin{matrix}\text{Time scale}\\ \text{accuracy}\end{matrix}\right) * \left(\begin{matrix}\text{Delta}\\ \text{time}\end{matrix}\right)\right) + \left(\begin{matrix}\text{Inter channel}\\ \text{skew drift}\end{matrix}\right)\right]$
Inter-channel 256 averages	$\pm\left[\frac{5}{16} * \sqrt{\left(\begin{matrix}\text{Time interval}\\ \text{error (Edge1)}\end{matrix}\right)^2 + \left(\begin{matrix}\text{Time interval}\\ \text{error (Edge2)}\end{matrix}\right)^2 + \left(\begin{matrix}\text{Inter channel}\\ \text{intrinsic jitter}\end{matrix}\right)^2} + \left(\left(\begin{matrix}\text{Time scale}\\ \text{accuracy}\end{matrix}\right) * \left(\begin{matrix}\text{Delta}\\ \text{time}\end{matrix}\right)\right) + \left(\begin{matrix}\text{Inter channel}\\ \text{skew drift}\end{matrix}\right)\right]$

1. Specifications are typical and valid after a 30-minute warm-up period and ± 5 °C from calibration temperature.
2. Scope channels and signal interconnect de-skewed prior to measurement.
3. Sample rate set to maximum. Noise and slew rate determined at fixed-voltage measurement threshold, near middle of signal. Displayed signal is not vertically clipped. Slew rate of sine wave = (peak signal amplitude) · 2 · π · f, slew rate of fast step ~= 0.8 · amplitude / (risetime 10-90%).
4. intra-chan = both edges on the same channel, inter-chan = two edges on different channels of the same scope chassis, inter-scope = two edges on different scope chassis. TIE(Edge1) = time-interval error measurement floor of first edge, TIE(Edge2) = time-interval error measurement floor of second edge.
5. Reading is the displayed DTMA measurement value. Do not double the listed TSA value in DTMA formula.

DDC and Frequency Extension Option – Performance Characteristics

DDC and frequency extension characteristic	Performance
DDC center frequency resolution	Center frequency rounded to nearest 6.25 MHz interval
DDC frequency range	With frequency extension option: DC to 113 GHz (1 mm models) DC to 70 GHz (1.85 mm models) DC to 33 GHz (3.5 mm models) Without frequency extension option: DC to max scope bandwidth
DDC sampling rate	50 MSa/s to 3,200 MSa/s (configurable in powers of two)
Max DDC sampling rate	Standard: 50 MSa/s Opt 601: 200 MSa/s Opt 602: 3,200 MSa/s
Max DDC signal analysis bandwidth (±1 dB)	Standard: 40 MHz Opt 601: 160 MHz Opt 602: 2.00 GHz 2.16 GHz ±3 dB (typical)
DDC output	40 bits complex per sample (16 bits I/Q + flags and markers)
30 GHz BW frequency extension range (UXR0000-630)	Min CF: 21 GHz Max CF: 98 GHz (1 mm models) 55 GHz (1.85 mm models) 32 GHz (3.5 mm models)
20 GHz BW frequency extension range (UXR0000-620)	Min CF: 14 GHz Max CF: 103 GHz (1 mm models) 60 GHz (1.85 mm models) 23 GHz (3.5 mm models)
10 GHz BW frequency extension range (UXR0000-610)	Min CF: 7 GHz Max CF: 108 GHz (1 mm models) 65 GHz (1.85 mm models) 28 GHz (3.5 mm models)
5 GHz BW frequency extension range (UXR0000-605)	Min CF: 3.5 GHz Max CF: 110.5 GHz (1 mm models) 67.5 GHz (1.85 mm models) 30.5 GHz (3.5 mm models)
5 GHz BW frequency extension range up to 82GHz (UXR0000-682)	Min CF: 3.5 GHz Max CF: 79.5 GHz (1 mm models) 67.5 GHz (1.85 mm models) 30.5 GHz (3.5 mm models)
Frequency extension channel support	Center frequency configurable per channel, up to 4 channels

DDC option/configuration	Bandwidth range	Capture time @ max sample rate		
		Std Mem 200 Mpts real 50 MSa complex	UXR0000-01G option 1 Gpt real 250 MSa complex	UXR0000-02G option 2 Gpts real 400 MSa complex
No DDC	Up to 110 GHz	780 µs	3.9 ms	7.8 ms
STD DDC 50 MSa/s complex	40 MHz	1 s	5 s	8 s
UXR0000-601/N2163A-601 50 to 200 MSa/s complex	40 MHz to 160 MHz	250 ms	1.25 s	2 s
UXR000-602/N2163A-602 50 to 3200 MSa/s complex	40 MHz to 2.16 GHz	15.6 ms	78 ms	125 ms

Real Time Spectrum Analysis

Real time spectrum analysis

Standard performance	All Infiniium UXR-Series come with a standard 40 MHz RTSA and DDC analysis bandwidth, with a frequency range up to the oscilloscope bandwidth, and all channels can have independent center frequency. The specifications below apply to the paid options that unlock full RTSA performance.						
Frequency pange	0 Hz to oscilloscope bandwidth With frequency extension option: DC to 113 GHz (1 mm models) DC to 70 GHz (1.85 mm models) DC to 33 GHz (3.5 mm models)						
Analysis bandwidth	40, 80, 160[1], or 320 MHz[2]. RTSA total Span is 320 MHz for simultaneously on all channels						
Per-channel control	All channels use the same span, but can each be at different center frequencies. No data is stored; visualization only						
Performance data	Typical passband magnitude flatness: +/- .25 dB from 160 MHz to max Frequency Range						
Minimum signal duration with 100% amplitude accuracy	15 µs						
Minimum detectable signal duration	10 ns						
Available views	Spectral density (color graded)						
Supported triggers	Frequency mask trigger: must intersect, must not intersect, up to 8 zones (AND logic)						
Window types	Rectangular, Hanning, Hamming, Blackman-Harris, Flattop						
Number of markers	200						
Supported marker types	Frequency, amplitude						
FFT rate, 100% POI	Span	FFT/s (RTSA)			POI (RTSA)		
	40 MHz	25,000			122 µs		
	80 MHz	50,000			62 µs		
	160 MHz[1]	100,000			30 µs		
	320 MHz[2]	200,000			15 µs		
Resolution bandwidth			Window Type				
	Span	Sample Rate	Rectangle	Hamming	Hanning	Blackman	Flattop
	40 MHz	50 MSa/s	12.2 KHz	16.7 KHz	18.3 KHz	24.5 KHz	46.6 KHz
	80 MHz	100 MSa/s	24.4 KHz	33.4 KHz	36.6 KHz	48.9 KHz	93.2KHz
	160 MHz[1]	200 MSa/s	48.8 KHz	66.8 KHz	73.2 KHz	97.8 KHz	186 KHz
	320 MHz[2]	400 MSa/s	97.6 KHz	133 KHz	146 KHz	195 KHz	373 KHz

1. 160 MHz analysis bandwidth require option 601 and D9110WSAA)
2. 320 MHz analysis bandwidth require option 602 and D9120WSAA

Acquisition System – Performance Characteristics

Acquisition characteristic	3.5 mm models	1.85 mm and 1 mm models
Maximum real-time sample rate	128 GSa/s	256 GSa/s
Sampling resolution	7.8125 ps/Sample	3.90625 ps/Sample
Memory depth per channel 200 Mpts 1 Gpt 2 Gpts	 Standard UXR0000-01G UXR0000-02G	 Standard UXR0000-01G UXR0000-02G
Memory depth (with RT averaging) Standard Option 01G or 02G	 200 Mpts 320 Mpts	 200 Mpts 335.556 Mpts
Acquisition time at max sampling rate 200 Mpts 1 Gpt 2 Gpts	 1.56 ms 7.8 ms 15.6 ms	 780 µs 3.9 ms 7.8 ms
Sampling modes Real-time	Successive single shot acquisitions	
Real-time with averaging	Selectable from 2 to 1,048,575	
Real-time and segmented[1] with peak detect	128 GSa/s	256 GSa/s
Real-time and segmented with high resolution	Real-time boxcar averaging reduces random noise and increases resolution	
Segmented memory	Captures bursting signals at max sample rate without consuming memory during periods of inactivity	
Max # of segments	Independent of memory option	
High-bandwidth trigger enabled	25,680	20,825
High-bandwidth trigger disabled	134,885	134,885
Min time between triggers		
High-bandwidth trigger enabled	5.0 µs	
High-bandwidth trigger disabled	3.5 µs	
Max time between triggers	> 100,000 years	
Variable length segmented memory	Captures bursting signals with variable lengths in DDC mode without consuming memory during periods of inactivity	
Max # of segments	Dependent on memory depth, pulse width and DDC sample rate	
Min time between triggers	Utilizes pre and post store buffering to enable gapless capture without deadtime (blind spots) between triggers	
Bandwidth filters	Brick wall, 4th order Bessel, Butterworth, bandpass	
Maximum update rate	> 285,700 waveforms per second (when in segment memory mode) When in DDC Variable Length Segmented memory mode: DDC sample rate / Maximum segments[1] 400 MSa/s / > 985k 800 MSa/s / > 965k 1.6 GSa/s / > 750k 3.2 GSa/s / > 605k	
Filters Bandwidth limit	Brick wall, 4th order Bessel or Butterworth, selectable bandwidth value Raised Cosine & Butterworth response (clock > 100 GBd)	
Frequency response	Flat mag and linear phase, Gaussian mag and linear phase: slower filter roll off while maintaining linear phase	
Sin(x)/x interpolation	On/off selectable FIR digital filter with selectable 2-32x ratio: digital signal processing adds points between acquired data points to enhance measurement accuracy & waveform display	

1. Segmented with peak detect extends acquisition time range by compressing un-aliased full-sample rate waveform samples into voltage range values collected over and reported at larger time intervals

Trigger System – Performance Characteristics

Hardware trigger	
Trigger sources	All channel inputs, 1 auxiliary trigger input
Sensitivity	1 div p-p
Edge trigger bandwidth	Equal to acquisition analog bandwidth
Edge trigger bandwidth (50 Ω AUX Input)	DC to 2 GHz @ 150 mV_{pp} 4 GHz @ 175 mV_{pp} 5 GHz @ ≥ 400 mV_{pp}
Minimum pulse width trigger Hardware Software (InfiniiScan)	 50 ps 40 ps
Level range Internal Auxiliary	 ± 4 div from center screen or ± 4 V, whichever is smaller ± 5 V (into 50 Ω), 5 V_{pp} maximum input signal swing
Sweep modes	Auto, triggered, single
Display jitter (trigger jitter)	3.5mm models: 116 fs (rms)[2] 1.85&1mm models: 71 fs (rms)[3]
Trigger holdoff range	Fixed 40 ns to 10 s, random 100 ns to 10 s
Trigger qualification (AND qualifier)	Qualify a trigger setup by logically ANDing or ORing it with signal levels on analog channels
Trigger actions	Specify an action to occur (and the frequency of the action) when a trigger conditions occurs. Actions include email on trigger and execute "multipurpose" user setting.
Trigger sequences	Sequence triggers let you trigger on an event that follows another event. Three stage trigger sequences including two-stage hardware (find event (A) and trigger event (B)) and one-stage InfiniiScan software trigger. Supports all hardware trigger modes except “edge then edge” and “video” and "Gbit serial." Supports “delay (by time)” and “reset (by time or event)” between two hardware sequences.

1. Capturing 20ns pulse with 50ns pre and post store, with 02G memory option
2. Value shown is typical Display jitter for UXR0334A at 100 mV/div triggering on 500 mVpp 16 GHz sin wave signal.
3. Value shown is typical Display jitter for UXR1104A at 100 mV/div triggering on 500 mVpp 55 GHz sin wave signal.

Trigger modes – hardware

Burst	Trigger on the Nth edge of a burst that occurs after an idle time from 1.5 ns to 20 s.
Edge	Triggers on a specified slope (rising, falling, or alternating between rising and falling) & voltage level on any channel or auxiliary trigger.
Edge transition	Trigger on rising or falling edges that cross two voltage levels in > or < the amount of time specified. Edge transition setting from 75 ps.
Edge then edge (time)	The trigger is qualified by an edge. After a specified time-delay between 1.5 ns to 20 s, a rising or falling edge on any one selected input will generate the trigger.
Edge then edge (event)	The trigger is qualified by an edge. After a specified delay between 1 to 65,000,000,000 rising or falling edges, another rising or falling edge on any one selected input will generate the trigger.
Glitch	Triggers on glitches narrower than the other pulses in your waveform by specifying a width less than your narrowest pulse and a polarity. Triggers on glitches as narrow as 50 ps. Glitch range settings: < 75 ps to < 10 s.
High-bandwidth	Edge trigger up to scopes maximum bandwidth (works with edge positive slope and edge negative slope only).
OR'd edges	Identifies a trigger condition by looking for selected edges on up to four channels.
Pattern/state	Identifies a trigger condition by looking for a specified pattern or a pattern and an edge (state) across the input channels.
Pulse width	Trigger on a pulse that is wider or narrower than other pulses in waveform by specifying a pulse width & a polarity. Triggers on pulse widths as narrow as 75 ps. Pulse width range settings 75 ps to 20 s. Trigger point can be configured for "end of pulse" or "time out".
Window	Specify a voltage range and then trigger when the waveform either exits this range, enters this range, stays outside the range for too long or too short, or stays inside the range for too long or too short. Range setting from 75 ps to 20 s.
Runt	Trigger on a pulse that crosses one threshold but fails to cross a second threshold before crossing the first again. Can be time qualified with minimum setting of 75 ps.
Timeout	Triggers the oscilloscope when the waveform has been at a higher voltage than the voltage specified by the Level control for too long (High Too Long), when the waveform has been at a lower voltage than the Level voltage for too long (Low Too Long), or when the waveform has taken too long to pass through the Level voltage (Unchanged Too Long). Timeout settings from 75 ps to 20 s.
Setup and hold	Trigger on violations of Setup time, Hold time, or both. Setup times from 75 ps to 20 s & hold times from 75 ps to 100 ns.
Protocol	Trigger on certain packets or patterns in protocol-based data.

Trigger modes – software	(Requires D9120SCNA InfiniiScan event identification software)
Zone qualify	Software triggers on the user-defined zones on screen. Zones can be specified as either “must intersect” or “must not intersect.” Up to eight zones can be defined across multiple channels.
Generic serial	Software triggers on NRZ-encoded data up to 8.0 Gbps, up to 80-bit pattern. Support multiple clock data recovery methods including constant frequency, 1st-order PLL, 2nd-order PLL, explicit clock, explicit 1st-order PLL, explicit 2nd-order PLL, Fibre Channel, FlexRay receiver, FlexRay transmitter
Measurement limit	Software triggers on the results of the measurement values. For example, when the “pulse width” measurement is turned on, InfiniiScan measurement software trigger triggers on a glitch as narrow as 40 ps. When the “time interval error (TIE)” is measured, InfiniiScan can trigger on a specific TIE value.
Non-monotonic edge	Software triggers on the non-monotonic edge. The non-monotonic edge is specified by setting a hysteresis value.
Runt	Software triggers on a pulse that crosses one threshold but fails to cross a second threshold before crossing the first again. Unlike hardware runt trigger, InfiniiScan runt trigger can be further qualified via a hysteresis value.

Measurements and Math

Oscilloscope measurements	
Measurement update rate	> 50,000 measurement/sec (one measurement turned on) > 250,000 measurement/sec/measurement (ten measurements turned on)
Measurement modes	Standard, measure all edges mode
Statistics	Displays the current, mean, minimum, maximum, range (max-min), standard deviation, number of measurements value for the displayed automatic measurements. Also shows Fail Min and Fail Max when measurement limit test is enabled
Level qualification	Any channels that are not involved in a measurement can be used to level-qualify all timing measurements
Waveform measurements	
Vertical	V peak-peak, V min, V max, V upper, V middle, V lower, V overshoot, V preshoot, V time, peak-peak contrast, average, RMS, amplitude, base, top, overshoot, preshoot, crossing, pulse top, pulse base, pulse amplitude, area, optical mode amp (OMA), level mean, level RMS, level skew, level thickness, outer OMA
Time	Delta time, rise time, fall time, positive width, negative width, burst width, burst period, burst interval, Tmin, Tmax, Tvolt, + pulse count, - pulse count
Clock	Period, frequency, duty cycle, phase, time interval error (TIE), cross-corelated TIE, N-period, period to period, positive width to positive width, neg width to neg width, duty cycle to duty cycle
Data	Time interval error (TIE), hold time, unit interval, N Unit Interval, unit interval to unit interval, noise, data rate, pattern length, CDR clock recovery rate, deemphasis, BER (cumulative), BER (per acq)
Mixed	Area, slew rate
Frequency domain	FFT frequency, FFT magnitude, FFT delta frequency, FFT delta magnitude, FFT channel power, FFT power spectral density, FFT occupied bandwidth, peak detect mode, phase jitter[1]
Eye-diagram	Eye height, eye width, eye one level, eye zero level, eye jitter, eye skew, eye level, crossing percentage, Q factor, duty-cycle distortion, extension ratio (ER), outer ER, vertical eye closure (VEC)
Optical	Optical average power, optical mode amp (OMA), eye one level, eye zero level, extension ratio, outer OMA, outer ER
Jitter analysis measurements – Requires D9120JITA EZJIT complete analysis application	
Clock	Time interval error, N-period, period to period, positive width to positive width, neg width to neg width, duty cycle to duty cycle
Data	Time interval error, noise, unit interval, N Unit Interval, unit interval to unit interval, data rate, clock recovery rate, CDR, de-emphasis
Phase noise	Phase jitter
PAMn measurements – Requires D9120PAMA PAM4 analysis application	
PAMn measurements	Level mean, level RMS, level skew, level thickness, eye height, eye width, eye skew, eye level, VEC, BER (Cumulative), BER (Per Acq), SER (Cumulative), SER (Per Acq), clock recovery rate, pattern length, rise time, fall time, and time interval error (TIE), composite histograms
Edge jitter measurements	PAM-4 12 Edge Jitter, J3U, J4U J5U, Jrms, J6U, and EOJ (PRBS9, PRBS13Q, PRBS31Q, PCIe Gen6 (52 symbols) and user defined pattern support up to PRBS23)
PAM formats	PAM-3, PAM-4, PAM-6, PAM-8, grey coded, uncoded

Oscilloscope measurements (continued)

Histograms	
Source	Waveform or measurement
Orientation	Vertical (for timing and jitter measurements) or horizontal (noise and amplitude change) modes, regions are defined using waveform markers
Measurements (available as a function)	Mean, standard deviation, mean ± 1, 2, and 3 sigma, median, mode, peak-to-peak, min, max, total hits, peak (area of most hits), X scale hits, X offset hits, full width at half maximum (FWHM), bin width
Mask testing	Allows pass/fail testing to user-defined or Keysight-supplied waveform templates. Automask lets you create a mask template from a captured waveform and define a tolerance range in time/voltage or screen divisions. Test modes (run until) include test forever, test to specified time or event limit, and stop on failure. Executes "multipurpose" user setting on failure
Waveform math	
Number of functions	16
Hardware accelerated math operations	Differential and common mode
Math functions	Absolute value, add, amplitude demodulation (radar envelope), average, bus chart, Butterworth[1], common mode, delay, differentiate, divide, envelope, FFT magnitude, FFT phase, FIR[1], gating, high pass filter, histogram, InfiniiSim[2] (2 port, 4 port 1 src, 4 port CM, 4 port diff, 4 port src1, 4 port src2), horizontal gating, integrate, invert, LFE[1], low pass filter (4th-order Bessel Thompson filter), magnify / duplicate, max, measurement trend, measurement log, min, multiply, pattern average, power, power efficiency, RT Eye[1], smoothing, SqrtSumOfSquare[1], square, square root, subtract, versus (XY), versus (XYZ qualified) and optional user defined function[1] [1] Requires MATLAB® software option [2] Requires D9120ASIA software option
Fault Hunter	
Auto Setup	30 second statistical measurement analysis of incoming signal
Result information	Test failure automatically saved in memory. Fault condition can be copied to trigger for further testing.
Test results	Automatic identification of common digital signal errors: Positive glitch, negative glitch, slow rising edge, slow falling edge, positive runt, negative runt
FFT	
Frequency range	DC to scope's maximum bandwidth
Frequency resolution	Sample rate/memory depth = resolution
Window modes	Hanning, flattop, rectangular, Blackman-Harris, Hamming
Measurement modes	
Automatic measurements	Measure menu access to all measurements, up to 20 measurements can be displayed simultaneously
Multipurpose	Front-panel button activates up to ten pre-selected or up to ten user-defined automatic measurements
Drag-and-drop measurement toolbar	Measurement toolbar with common measurement icons that can be dragged and dropped onto the displayed waveforms
Marker modes	Manual markers, track waveform data, track measurements, track RF (on FFT math function waveforms)
Bookmarks and callouts	Supports callouts for measurements and FFT peaks. Supports bookmarks for team collaboration

Platform Characteristics

Computer system, peripherals and accessories	
Operating system	Microsoft Windows 10 64-bit or newer Microsoft Windows release
CPU	Intel i5-3550S quad-core CPU at 3.00 GHz or higher performance CPU
PC system memory	16 GB DDR3 RAM or higher capacity/performance RAM
PC ports	USB 2.0 hi-speed (host), USB 2.0 hi-speed (device), VGA, DisplayPort, USB 3.0 (host), USB 3.0 (device), dual-monitor video output, 10/100/1000 LAN, LXI LAN
Drives (SSD)	960GB Enterprise grade internal SSD removable hard drive or higher capacity/performance SSD
Peripherals	Optical USB mouse, compact USB keyboard supplied. All UXR models support any Windows-compatible input device with a USB interface
File types	
Waveforms	Compressed internal format (*.wfm (200 Mpts)), comma-separated values (*.csv (2 Gpts)), tab-separated values (*.tsv (2 Gpts)), public binary format (.bin (500 Mpts)), Y value files (*.txt (2 Gpts)), hierarchal data file (*.hf5 (2 Gpts))
Images	BMP, PNG, TIFF, GIF, JPG or osc file format
Included accessories	
All models	Country-specific power cord, front cover, open ended torque wrench (5/16 inch 8-in-lb), mini USB keyboard, USB optical mouse, and an ESD mat with wrist and heel straps
3.5 mm input models	Qty (5) 3.5 mm Female-to-Female connector savers and (10) connector saver collars Note: 10 GHz and 13 GHz models additionally include Qty (2) Precision BNC 50 Ω adaptors (N5442A)
1.85 mm input models	One per channel (1.85 mm Female-to-Female connector savers), one 2.92 mm to 2.40 mm Female-to-Female coaxial adapter and one 3.5 mm Female-to-Female connector saver
1 mm input models	One per channel (1 mm Female Ruggedized to 1 mm Female, and 1 mm Female Ruggedized to 1.85 mm Female connector savers), Qty (1) 1 mm Female Ruggedized to 2.92 mm Female connector saver, Qty (1) 3.5 mm Female-to-Female connector saver, and 1mm input specific open-ended torque wrenches (6 mm 4-in-lb, and 14 mm dual-ended: 4-in-lb & 10-in-lb)
I/O ports	
Aux in	5 V_{pp} max signal between -5 V and +5 V, 50 Ω impedance
Aux out	0 V to 5 V, 50 Ω impedance
Cal out	-2.4 V to +2.4 V, 50 Ω impedance
Probe compensation terminal	0 V to 5 V, 50 Ω impedance
Reference clock input	400 MHz, 0.25 V_{pp} to 0.50 V_{pp}, 50 Ω impedance
Reference clock output	400 MHz, 0.25 V_{pp} to 0.50 V_{pp}, 50 Ω impedance
Sample clock input	8 GHz, -5 dBm to +15 dBm, 50 Ω impedance
Sample clock output	8 GHz, +10 dBm to +15 dBm, 50 Ω impedance
Timebase reference input	Input frequency lock range: 10 MHz ±20 ppm, 50 Ω impedance Amplitude, sine wave input: 630 mV_{pp} (0 dBm) min to 3.54 V_{pp} (+15 dBm) max, 50 Ω impedance Amplitude, square wave input: 500 mV_{pp} min to 3.54 V_{pp} max, 50 Ω impedance
Timebase reference output	Amplitude into 50 Ω (internal or external timebase reference selected): 1.1 to 2.0 V_{pp} (+ 5 to + 10 dBm) sine wave Frequency (internal timebase reference selected): ± (25 ppb initial + 100 ppb/year aging) first year of manufacture ± (25 ppb initial + 30 ppb/year aging) after first year of manufacture Frequency, external timebase reference selected: external reference frequency
Trig out	0 V to 5 V, 50 Ω impedance

Display	
Display	15.4-inch color XGA TFT-LCD with capacitive touch screen
Intensity grayscale	256-level intensity-graded display
Resolution XGA	1024 pixels horizontally x 768 pixels vertically
Annotation	Up to 100 bookmarks can be inserted into the waveform window. Each can float or be tied to a specific waveform
Grids	Choose between 1-16 grids per waveform area, 10-bit vertical resolution
Waveform areas	Supports eight waveform areas plus chart mode for EZJIT, InfiniiSim, protocol, and PrecisionProbe
Waveform styles	Connected dots, dots, infinite persistence, color graded infinite persistence. Includes up to 256 levels of intensity-graded waveforms, variable persistence

General Characteristics

General characteristics

Temperature	Operating: 5 to +40 °C up to 2,000 meters, de-rated between 2,000 and 3,000 meters by 1 °C for every 100 meters	
	Non-operating: –20 to +70 °C	
Humidity	Operating: Up to 95% relative humidity (non-condensing) at +40 °C	
	Non-operating: Up to 90% relative humidity at +65 °C	
Altitude	Operating: Up to 3,000 meters (9,842 feet); de-rate maximum temperature by 1 °C for every 100 meters above 2,000 meters	
	Non-operating: Up to 4,600 meters (15,090 feet)	
Vibration	Operating random: 0.21 g (rms)	
	Non-operating random: 2.0 g (rms)	
	Swept sines: 0.50 g (rms)	
Power	UXR0334A, UXR0254A, UXR0204A, UXR0164A, UXR0134A, UXR0104A	100 to 240 VAC at 50/60 Hz Maximum input power 1350 VA
	UXR1102A, UXR1002A, UXR0802A, UXR0702A/AP, UXR0592A/AP, UXR0502A, UXR0402A/AP, UXR0252AP, UXR0051AP	110 to 240 VAC at 50/60 Hz Maximum input power 1370 VA
	Well-regulated power is required for 110-120 V operation: Connect only to a 20-amp outlet or a dedicated 15-amp outlet.	
	UXR1104A, UXR1004A, UXR0804A, UXR0704A/AP, UXR0594A/AP, UXR0504A, UXR0404A/AP, UXR0254AP	200 to 240 VAC at 50/60 Hz Maximum input power 2615 VA
	Connect only to outlets rated for 15 amps or higher.	
Weight	UXR0334A, UXR0254A, UXR0204A, UXR0164A, UXR0134A, UXR0104A	37.56 kg (82.8 lbs.)
	UXR1102A, UXR1002A, UXR0802A, UXR0702A/AP, UXR0592A/AP, UXR0502A, UXR0402A/AP, UXR0252AP, UXR0051AP	36.15 kg (79.7 lbs.)
	UXR1104A, UXR1004A, UXR0804A, UXR0704A/AP, UXR0594A/AP, UXR0504A, UXR0404A/AP, UXR0254AP	42.05 kg (92.7 lbs.)
Dimensions	Width: 435 mm with handles removed (17.126") 530 mm with handles (20.866")	
	Depth: 513 mm main body (20.197") 560 mm including knobs and rear feet (22.047")	
	Height: 311 mm (7U) with feet removed (12.244") Installations with the optional N2156A rackmount kit will take up 8U to allow for airflow and cabling 333 mm with feet (13.11")	
	Inputs: Connectors are 75 mm apart horizontally on the 4-channel frame and 150 mm apart on the 2-channel frame. Centers are: 49 mm above the surface when resting flat (no tilt levers) and 90 mm above the surface when using the front tilt levers.	
	Clearances: Fans draw cool air in from the sides and bottom and blows it out the back of the oscilloscope. Allow at least 8 inches (203 mm) of clearance from the rear. Side handles provide sufficient airflow clearance side to side.	
Safety	CAN/CSA-C22.2 No. 61010-1-12 ANSI/UL Std. No. 61010-1:2012	

Definitions

Measured (meas)
An attribute measured during development for purposes of communicating the expected performance. This data is not warranted, does not include measurement uncertainty, and is measured at room temperature (approximately 23°C).

Nominal (nom)
The mean or average characteristic performance, or the value of an attribute that is determined by design such as a connector type, physical dimension, or operating speed. This data is not warranted and is measured at room temperature (approximately 23°C).

Specification (spec)
The warranted performance of a calibrated instrument that has been stored for a minimum of 2 hours within the operating temperature range of 5 – 40°C and after a 30-minute warm up period.

Typical (typ)
The characteristic performance, which 80% or more of manufactured instruments will meet. This data is not warranted, does not include measurement uncertainty, and is valid only at room temperature (approximately 23°C).

Operating frequency range
The operating frequency range is the frequency range of corrected signal spectral components by deembeding for frequency and phase characteristics of the individual hardware.

Analog bandwidth
The analog bandwidth describes the 3 dB bandwidth of the full opto-electronic input path without any frequency or phase corrections.

Sensitivity
The sensitivity limit corresponds to the received signal power at the input interface for which a 32 GBaud DP-QPSK exhibits an EVM of 32.5% or less. An EVM of 32.5% corresponds to a BER of 1E-3 for assumed added Gaussian white noise (AWGN) according to =0.5*ERFC(1/(SQRT (2)* (EVM²+1))).

Effective Number of Bits (ENOB)
Definition in accordance with IEEE 1057: “For an input sinewave of specified frequency and amplitude, ENOB is the number of bits of an ideal waveform recorder for which the rms quantization error is equal to the rms NAD of the waveform recorder under test.” ENOB is determined by equation.

Confidently Covered by Keysight Services

Prevent delays caused by technical questions, or system downtimes due to instrument maintenance and repairs with Keysight Services. Keysight Services are here to support your test needs with expert technical support, instrument repair and calibration, software support, training, alternative acquisition program options, and more.

A KeysightCare agreement provides dedicated, proactive support through a single point of contact for instruments, software, and solutions. KeysightCare covers an extensive group of instruments, application software, and solutions and ensures optimal uptime, faster response, faster access to experts, and faster resolution.

Keysight Services

Offering	Benefits
KeysightCare	KeysightCare provides elevated support for Keysight instruments and software, with access to technical support experts that respond within a specified time and ensure committed repair and calibration turnaround times (TAT). KeysightCare offers multiple service agreement tiers, including KeysightCare Assured, Enhanced, and Application Software Support. See the KeysightCare data sheet for details.
KeysightCare Assured	KeysightCare Assured goes beyond basic warranty with repair services that include committed TAT and unlimited access to technical experts.
KeysightCare Enhanced	KeysightCare Enhanced includes all the benefits of KeysightCare Assured plus Keysight's accurate and reliable calibration services, accelerated, and committed TAT, and technical response.
Keysight Support Portal & Knowledge Center	All KeysightCare tiers include access to the Keysight Support Portal where you can manage support and service resources related to your assets such as service requests, and status, or browse the Knowledge Center.
Education Services	Build confidence and gain new skills to make accurate measurements, with flexible Education Services developed by Keysight experts. Including Start-up Assistance.
Alternative acquisition options	
KeysightAccess	Reduce budget challenges with a subscription service enabling you to get the instruments, software, and technical support you want for your test needs.

Recommended Services

Maximize your test system up-time by securing technical support, repair, and calibration services with committed response and turnaround times. 1-year KeysightCare Assured is included in every new instrument purchase Obtain multi-year KeysightCare upfront to eliminate the need for lengthy and tedious paperwork and yearly requests for 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
Start-Up Assistance	
PS-S10	Included – instrument fundamentals and operations starter
PS-S20	Optional, technology & measurement science standard learning

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

More Information

Thank you for choosing a Keysight UXR-Series Oscilloscope. Keysight Infiniium UXR-Series oscilloscopes set a new standard for real-time oscilloscope accuracy, performance and upgradability, with models ranging from 5 GHz to 110 GHz. Proven industry best signal integrity, 10-bits of vertical resolution and ultra-low noise floor specifications allow for the truest representation of signals. Invest with confidence today, knowing you have the ability to meet the needs and technology advancements of tomorrow. For more information on the Keysight Infiniium UXR-Series, check out the following:

- UXR Technical Overview
- UXR Configuration Guide