



WAVERUNNER® 104XI AND 204XI

Leading Features

- 1 and 2 GHz Bandwidths
- 5 GS/s Sample Rate (10 GS/s interleaved)
- 10 Mpts/Ch standard
- Large Display and Small (6" deep) footprint
- Most complete "problem solving" oscilloscope with extensive math/measure, multi-domain analysis, and application packages
- I²C and SPI Trigger/Decode options enhance productivity in debugging embedded systems.
- WaveScan™ locates unusual events in a single capture, or scans for events in many acquisitions over long periods of time.
- 10.4" very bright color touch screen
- LeCroy WaveStream™ Fast Viewing Mode provides a lively analog-like display with 256 intensity levels.
- Use with new ZS Series of high impedance, single-ended active FET probes with low circuit load probing.
- Mixed Signal Oscilloscope options (MS-32)
- Vehicle Bus Analyzer versions also available



The WaveRunner 104Xi and 204Xi are high-performance oscilloscopes with extensive "problem-solving" capabilities. They also feature an incredibly small footprint (6" deep) and a large 10.4" display. A perfect fit for any working style or work area.

Performance Reimagined

1 and 2 GHz performance takes on a whole new meaning in the WaveRunner Xi big display/small footprint form factor. Never has this combination of Bandwidth combined with Sample Rate (up to 10 GS/s) been available in such a compact form factor that easily fits into any work area. Add to that the WaveRunner Xi's most complete set of problem solving analytical tools for fast debug, and you have a winning combination.

WaveScan™ Locates Problems Faster

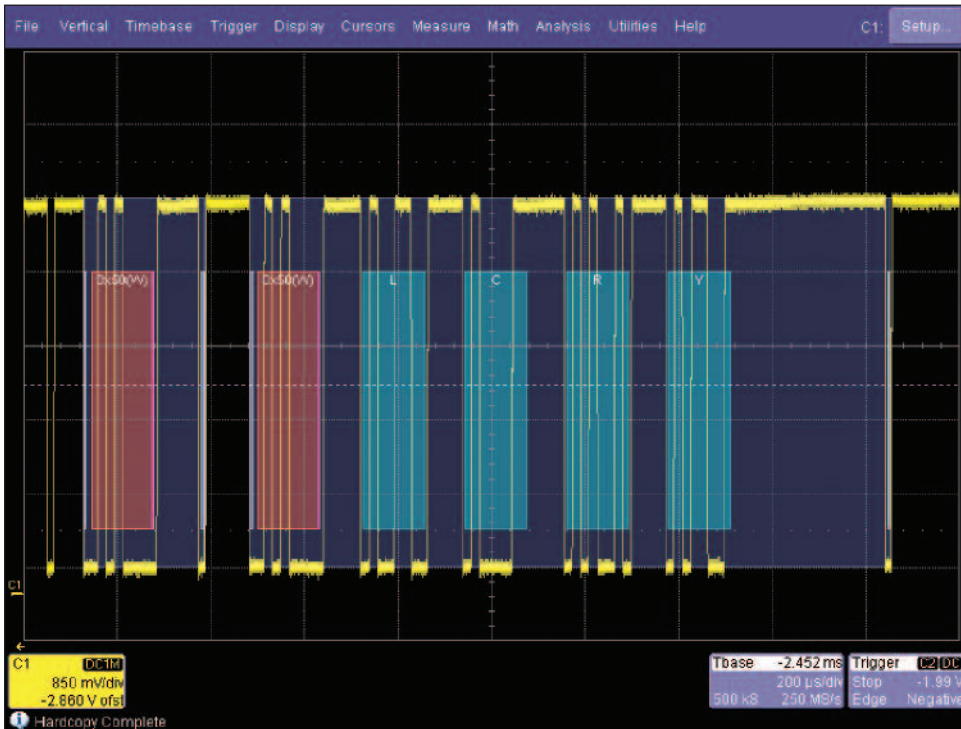
The best trigger won't find all unusual events—a more powerful capability is needed. WaveScan provides the ability to locate unusual events in a single capture; or scan for an event in many acquisitions over a long period of time. Select from nearly 20 search modes (pulse width, runt, duty cycle, etc.), apply a

search condition, and begin scanning. Zoom to view, or apply additional analysis tools for a complete debug.

I²C and SPI Trigger/Decode Options Enhance the Solution

All WaveRunner Xi oscilloscopes are now available with a powerful and flexible I²C or SPI trigger/decode option. The decode is color-coded and overlaid on the waveform, which makes it easy for novices or experts to understand embedded system behavior. The triggers are built into the oscilloscope. I²C triggers offer unique conditional data triggering capability—in addition to "DATA=", a user can specify DATA >, ≥, <, ≤, <>, in range, or out of range. This makes it especially useful for triggering on specific I²C EEPROM memory locations, or verifying safe operating range by monitoring I²C ADC/sensor values.

New Capabilities Add Power to WaveRunner Xi



Use conditional I²C DATA triggering to isolate specific messages.

WaveScan in WaveRunner Xi provides ability beyond triggering—locate unusual events in a single capture, or scan for events in multiple captures. Overlay the found events with ScanOverlay, and gather distribution about events via ScanHistogram. Set the oscilloscope to perform a variety of actions when an event condition is satisfied.



Specifications

Vertical System	WaveRunner 44Xi	WaveRunner 64Xi	WaveRunner 62Xi	WaveRunner 104Xi	WaveRunner 204Xi
Nominal Analog Bandwidth @ 50 Ω, 10 mV–1 V/div	400 MHz	600 MHz	600 MHz	1 GHz	2 GHz
Rise Time (Typical)	875 ps	625 ps	625 ps	400 ps	225 ps
Input Channels	4	4	2	4	4
Bandwidth Limiters	20 MHz; 200 MHz				
Input Impedance	1 MΩ 16 pF or 50 Ω				
Input Coupling	50 Ω: DC, 1 MΩ: AC, DC, GND				
Maximum Input Voltage	50 Ω: 5 V _{rms} , 1 MΩ: 400 V max. (DC + Peak AC ≤ 5 kHz)			50 Ω: 5 V _{rms} , 1 MΩ: 250 V max. (DC + Peak AC ≤ 10 kHz)	
Vertical Resolution	8 bits; up to 11 with enhanced resolution (ERES)				
Sensitivity	50 Ω: 2 mV/div–1 V/div fully variable; 1 MΩ: 2 mV–10 V/div fully variable				
DC Accuracy	±1.0% of full scale (typical); ±1.5% of full scale, ≥ 10 mV/div (warranted)				
Input Connector	ProBus/BNC				

Timebase System

Timebases	Internal timebase common to all input channels; an external clock may be applied at the auxiliary input
Time/Division Range	Real time: 200 ps/div–10 s/div, RIS mode: 20 ps/div to 10 ns/div, Roll mode: up to 1,000 s/div
Clock Accuracy	≤ 5 ppm @ 25 °C (typical) (≤ 10 ppm @ 5–40 °C)
Sample Rate and Delay Time Accuracy	Equal to Clock Accuracy
Channel to Channel Deskew Range	±9 x time/div setting, 100 ms max., each channel
External Sample Clock	DC to 600 MHz; (DC to 1 GHz for 104Xi and 204Xi) 50 Ω, (limited BW in 1 MΩ), BNC input, limited to 2 Ch operation (1 Ch in 62Xi), (minimum rise time and amplitude requirements apply at low frequencies)
Roll Mode	User selectable at ≥ 500 ms/div

Acquisition System

	44Xi	64Xi	62Xi	104Xi	204Xi
Single-Shot Sample Rate/Ch	5 GS/s	5 GS/s	5 GS/s	5 GS/s	5 GS/s
Interleaved Sample Rate (2 Ch)	5 GS/s	10 GS/s	10 GS/s	10 GS/s	10 GS/s
Random Interleaved Sampling (RIS)	200 GS/s				
RIS Mode	User selectable from 20 ps/div to 10 ns/div				
Trigger Rate (Maximum)	1,250,000 waveforms/second				
Sequence Time Stamp Resolution	1 ns				
Minimum Time Between Sequential Segments	800 ns				

Acquisition Memory Options	Max. Acquisition Points (4 Ch/2 Ch, 2 Ch/1 Ch in 62Xi)	Segments (Sequence Mode)
Standard	10M/20M	5000
Option VL	12.5M/25M	10,000

Acquisition Processing

	44Xi	64Xi	62Xi	104Xi	204Xi
Time Resolution (min, Single-shot)	200 ps (5 GS/s)	100 ps (10 GS/s)	100 ps (10 GS/s)	100 ps (10 GS/s)	100 ps (10 GS/s)
Averaging	Summed and continuous averaging to 1 million sweeps				
ERES	From 8.5 to 11 bits vertical resolution				
Envelope (Extrema)	Envelope, floor, or roof for up to 1 million sweeps				
Interpolation	Linear or (Sinx)/x				

Trigger System

Trigger Modes	Normal, Auto, Single, Stop
Sources	Any input channel, External, Ext/10, or Line; slope and level unique to each source, except Line
Trigger Coupling	DC, AC (typically 7.5 Hz), HF Reject, LF Reject
Pre-trigger Delay	0–100% of memory size (adjustable in 1% increments, or 100 ns)
Post-trigger Delay	Up to 10,000 divisions in real time mode, limited at slower time/div settings in roll mode
Hold-off	1 ns to 20 s or 1 to 1,000,000,000 events
Internal Trigger Level Range	±4.1 div from center (typical)
Trigger and Interpolator Jitter	≤ 3 ps rms (typical)

Specifications

Trigger System (continued)	44Xi	64Xi	62Xi	104Xi	204 Xi
Trigger Sensitivity with Edge Trigger (Ch 1–4 + external, DC, AC, and LFrej coupling)	2 div @ < 400 MHz 1 div @ < 200 MHz	2 div @ < 600 MHz 1 div @ < 200 MHz	2 div @ < 600 MHz 1 div @ < 200 MHz	2 div @ < 1 GHz 1 div @ < 200 MHz	2 div @ < 2 GHz 1 div @ < 200 MHz
Max. Trigger Frequency with SMART Trigger™ (Ch 1–4 + external)	400 MHz @ ≥ 10 mV	600 MHz @ ≥ 10 mV	600 MHz @ ≥ 10 mV	1 GHz @ ≥ 10 mV	2 GHz @ ≥ 10 mV
External Trigger Range	EXT/10 ±4 V; EXT ±400 mV				

Basic Triggers

Edge	Triggers when signal meets slope (positive, negative, or Window) and level condition.
------	---

SMART Triggers

State or Edge Qualified	Triggers on any input source only if a defined state or edge occurred on another input source. Delay between sources is selectable by time or events.
Dropout	Triggers if signal drops out for longer than selected time between 1 ns and 20 s.
Pattern	Logic combination (AND, NAND, OR, NOR) of 5 inputs (4 channels and external trigger input – 2 Ch+EXT on WaveRunner 62Xi). Each source can be high, low, or don't care. The High and Low level can be selected independently. Triggers at start or end of the pattern.
TV-Composite Video	Triggers selectable fields (1, 2, 4, or 8), Positive or Negative slope, or Line (up to 1500), for NTSC, PAL, SECAM, or non-standard video (up to 1500 lines).

SMART Triggers with Exclusion Technology

Glitch and Pulse Width	Triggers on positive or negative glitches with widths selectable from 500 ps to 20 s or on intermittent faults (subject to bandwidth limit of oscilloscope).
Signal or Pattern Interval	Triggers on intervals selectable between 1 ns and 20 s.
Timeout (State/Edge Qualified)	Triggers on any source if a given state (or transition edge) has occurred on another source. Delay between sources is 1 ns to 20 s, or 1 to 99,999,999 events.
Runt	Trigger on positive or negative runts defined by two voltage limits and two time limits. Select between 1 ns and 20 s.
Slew Rate	Trigger on edge rates. Select limits for dV, dt, and slope. Select edge limits between 1 ns and 20 s.
Exclusion Triggering	Trigger on intermittent faults by specifying the normal width or period.

LeCroy WaveStream Fast Viewing Mode

Intensity	256 Intensity Levels, 1–100% adjustable via front panel control
Number of Channels	up to 4 simultaneously
Max Sampling Rate	5 GS/s (10 GS/s for WaveRunner 62Xi, 64Xi, 104Xi, 204Xi in interleaved mode)
Waveforms/second (continuous)	up to 8000 waveforms/second
Operation	Front panel toggle between normal real-time mode and LeCroy WaveStream Fast Viewing mode

Automatic Setup

Auto Setup	Automatically sets timebase, trigger, and sensitivity to display a wide range of repetitive signals.
Vertical Find Scale	Automatically sets the vertical sensitivity and offset for the selected channels to display a waveform with maximum dynamic range.

Probes

Probes	One PP008 per channel standard; Optional passive and active probes available.	One PP007 per channel standard; Optional passive and active probes available.
Probe System; ProBus	Automatically detects and supports a variety of compatible probes.	
Scale Factors	Automatically or manually selected, depending on probe used	

Color Waveform Display

Type	Color 10.4" flat-panel TFT-LCD with high resolution touch screen
Resolution	SVGA; 800 x 600 pixels; maximum external monitor output resolution of 2048 x 1536 pixels
Number of Traces	Display a maximum of 8 traces. Simultaneously display channel, zoom, memory, and math traces.
Grid Styles	Auto, Single, Dual, Quad, Octal, XY, Single + XY, Dual + XY
Waveform Styles	Sample dots joined or dots only in real-time mode

Specifications

Zoom Expansion Traces

Display up to 4 Zoom/Math traces with 16 bits/data point)

Internal Waveform Memory

M1, M2, M3, M4 Internal Waveform Memory (store full-length waveform with 16 bits/data point) or store to any number of files limited only by data storage media.

Setup Storage

Front Panel and Instrument Status Store to the internal hard drive, over the network, or to a USB-connected peripheral device.

Interface

Remote Control	Via Windows Automation, or via LeCroy Remote Command Set
GPIB Port (Optional)	Supports IEEE – 488.2
Ethernet Port	10/100/1000Base-T Ethernet interface (RJ-45 connector)
USB Ports	5 USB 2.0 ports (one on front of instrument) supports Windows-compatible devices.
External Monitor Port	Standard 15-pin D-Type SVGA-compatible DB-15; connect a second monitor to use extended desktop display mode with XGA resolution.
Serial Port	DB-9 RS-232 port (not for remote oscilloscope control)

Auxiliary Input

Signal Types	Selected from External Trigger or External Clock input on front panel
Coupling	50 Ω : DC, 1 M Ω : AC, DC, GND

Maximum Input Voltage 50 Ω : 5 V_{rms}, 1 M Ω : 400 V max.
(DC + Peak AC \leq 5 kHz)

50 Ω : 5 V_{rms}, 1 M Ω : 250 V max.
(DC + Peak AC \leq 10 kHz)

Auxiliary Output

Signal Type	Trigger Enabled, Trigger Output, Pass/Fail, or Off
Output Level	TTL, \approx 3.3 V
Connector Type	BNC, located on rear panel

General

Auto Calibration	Ensures specified DC and timing accuracy is maintained for 1 year minimum.
Calibrator	Output available on front panel connector provides a variety of signals for probe calibration and compensation.
Power Requirements	90–264 V _{rms} at 50/60 Hz; 115 V _{rms} (\pm 10%) at 400 Hz, Automatic AC Voltage Selection Installation Category: 300V CAT II; Max. Power Consumption: 300 VA/300 W; 250 VA/250 W for WaveRunner 62Xi

Environmental

Temperature: Operating	+5 °C to +40 °C
Temperature: Non-Operating	-20 °C to +60 °C
Humidity: Operating	5% to 80% RH (non-condensing) up to 30 °C, Upper limit derates linearly to 50% RH (non-condensing) at 40 °C
Humidity: Non-Operating	5% to 95% RH (non-condensing) as tested per MIL-PRF-28800F
Altitude: Operating	3,048 m (10,000 ft.) max.s at \leq 25 °C
Altitude: Non-Operating	12,190 m (40,000 ft.)

Physical

Dimensions (HWD)	260 mm x 340 mm x 152 mm Excluding accessories and projections (10.25" x 13.4" x 6")
Net Weight	6.95 kg. (15.5 lbs.)

Certifications

CE Compliant, UL and cUL listed; Conforms to EN 61326, EN 61010-1, UL 61010-1 2nd Edition, and CSA C22.2 No. 61010-1-04.

Warranty and Service

3-year warranty; calibration recommended annually. Optional service programs include extended warranty, upgrades, calibration, and customization services.

Ordering Information

Product Description

Product Code

WaveRunner Xi Series Oscilloscopes

1 GHz, 4 Ch, 5 GS/s, 10 Mpts/Ch (10 GS/s, 10 Mpts/Ch in interleaved mode) with 10.4" Color Touch Screen Display	WaveRunner 104Xi
---	------------------

2 GHz, 4 Ch, 5 GS/s, 10 Mpts/Ch (10 GS/s, 20 Mpts/Ch in interleaved mode) with 10.4" Color Touch Screen Display	WaveRunner 204Xi
---	------------------

Included with Standard Configuration

±10 HiZ 500 MHz Passive Probe (Total of 1 Per Channel)	
Getting Started Manual and Quick Reference Guide	
CD-ROMs containing Utility Software	
Optical 3-button Wheel Mouse – USB	
Standard Ports; 10/100Base-T Ethernet, USB 2.0 (5), SVGA Video out, Audio in/out, RS-232	
Protective Front Cover	
Accessory Pouch	
Standard Commercial Calibration and Performance Certificate	
3-Year Warranty	

Memory Option

12.5 Mpts/Ch (25 Mpts/Ch Interleaved)	WRXi-VL
---------------------------------------	---------

General Purpose Software Options

Statistics Software Package	WRXi-STAT
Master Analysis Software Package	WRXi-XMAP
Advanced Math Software Package	WRXi-XMATH
Intermediate Math Software Package	WRXi-XWAV
Value Analysis Software Package (Includes XWAV and JTA2)	WRXi-XVAP
Advanced Customization Software Package	WRXi-XDEV
Processing Web Editor Software Package for Functions and Parameter	WRXi-XWEB

Application Specific Software Options

Jitter and Timing Analysis Software Package	WRXi-JTA2
Digital Filter Software Package	WRXi-DFP2
Disk Drive Measurement Software Package	WRXi-DDM2
PowerMeasure Analysis Software Package	WRXi-PMA2
Serial Data Mask Software Package	WRXi-SDM

Product Description

Product Code

Application Specific Software Options (cont'd)

Advanced Optical Recording Measurement Software Package	WRXi-AORM
EMC Pulse Parameter Software Package	WRXi-EMC
Ethernet Test Software Package	WRXi-ENET
USB 2.0 Test Compliance Software Package (204Xi only)	WRXi-USB2

Hardware and Software Application Options

32 Digital Channel Oscilloscope Mixed Signal Option	MS-32
CANbus TDM Trigger, Decode, and Measure/Graph Option	CANbus TDM
CANbus TD Trigger and Decode Option	CANbus TD
I ² C Trigger and Decode Option	I2Cbus TD
SPI Trigger and Decode Option	SPIbus TD

Probes and Amplifiers*

1.5 GHz, 1 MΩ, 0.9 pF Active Probe	ZS1500
1 GHz, 1 MΩ, 0.9 pF Active Probe	ZS1000
2500 V, 50 MHz, High CMRR Differential Amplifier	PWR2500-DA
500 V, 100 MHz, High CMRR Differential Amplifier	PWR500-DA
100 V, 100 MHz, High CMRR Differential Amplifier	PWR100-DA

*A wide variety of other passive, active, and differential probes are also available. Consult LeCroy for more information.

Hardware Accessories Options*

External GPIB Interface	WS-GPIB
Soft Carrying Case	WRXi-SOFTCASE
Hard Transit Case	WRXi-HARDCASE
Mounting Stand – Desktop Clamp Style	WRXi-MS-CLAMP
Rackmount Kit	WRXi-RACK
Mini Keyboard	WRXi-KYBD

*A variety of local language front panel overlays are also available.

Customer Service

LeCroy oscilloscopes and probes are designed, built, and tested to ensure high reliability. In the unlikely event you experience difficulties, our digital oscilloscopes are fully warranted for three years, and our probes are warranted for one year.

This warranty includes:

- No charge for return shipping
- Long-term 7-year support
- Upgrade to latest software at no charge



1-800-5-LeCroy
www.lecroy.com

Local sales offices are located throughout the world.
To find the most convenient one visit www.lecroy.com