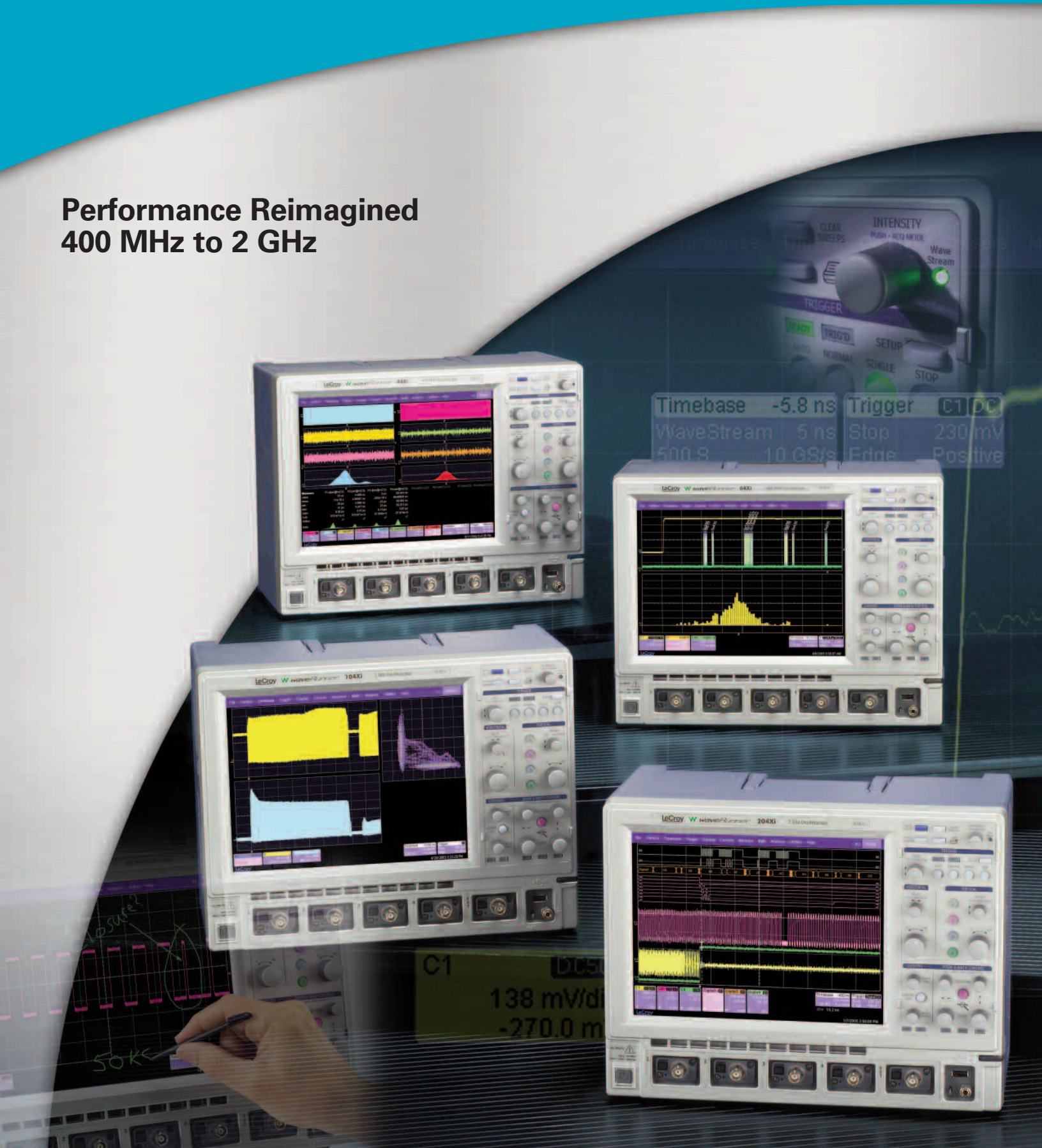
LeCroy

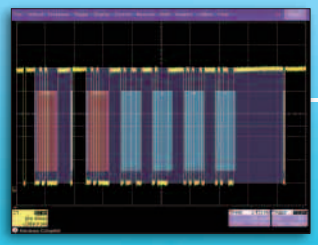
WaveRunner® Xi Series

Performance Reimagined
400 MHz to 2 GHz



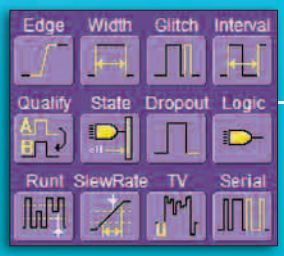
Complete Capability—100% Test Coverage

The LeCroy WaveRunner Xi is the most powerful and capable scope available in its class. Basic system validation using advanced triggers, fast viewing modes, measurement parameters, or serial decodes is simple and easy. Advanced debug, multi-domain analysis, and waveshape analysis are possible with tools unique to WaveRunner Xi. Optional application packages help you make sense of well-defined problems.



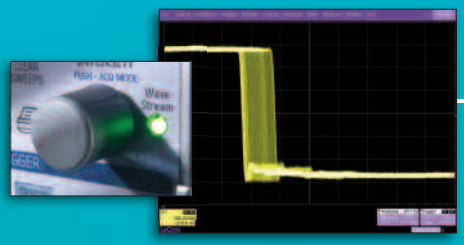
Enhanced Understanding of Serial Data Signals

Trigger on I²C, SPI, UART, or CAN serial data patterns. Intuitively decode values on the oscilloscope grid. Correlate decoded data streams to other events in an embedded control system (optional).



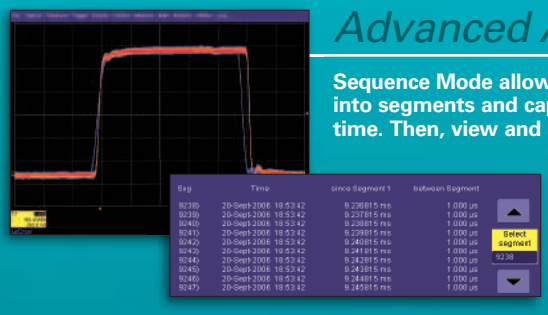
Powerful Triggers Isolate Events

An extensive collection of SMART, Serial, and Digital (MS-32) triggers enables users to quickly and easily isolate events of interest (some optional).



WaveStream™ Fast Viewing Mode

Use the high sampling rate and WaveStream fast viewing mode to characterize signal shape, rise time, overshoot, etc., and verify the presence or absence of high-speed transients.



Advanced Acquisition Modes

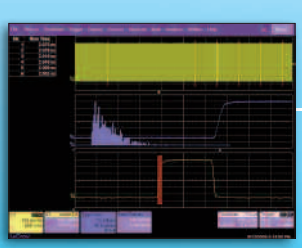
Sequence Mode allows you to partition your acquisition memory into segments and capture specific events over long periods of time. Then, view and analyze each segment individually.

1999

The first Waverunner oscilloscope introduced. Small, powerful, and an immediate front-runner in the mid-range category.

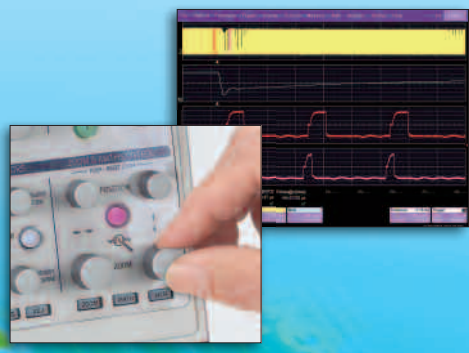
2001

Waverunner-2 raised the bar with higher sample rate, bandwidth, and memory.



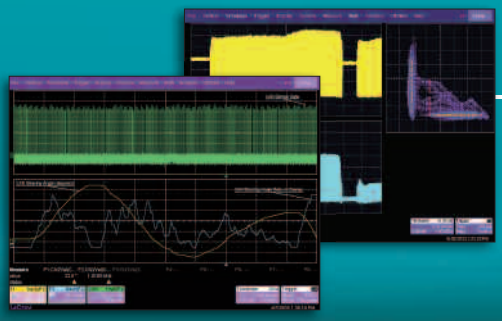
WaveScan™ Advanced Search and Analysis

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 using more than 20 different search/scan modes. Use ScanHisto or ScanOverlay to display intuitive scanned results.



Completely Customizable

Quickly create your own measurement parameters or math functions using Excel, MATLAB, Mathcad, or VBScripts (some capability optional).



Advanced Application Packages

Use a variety of application packages to provide detailed, fast solutions for specific problems.

2003

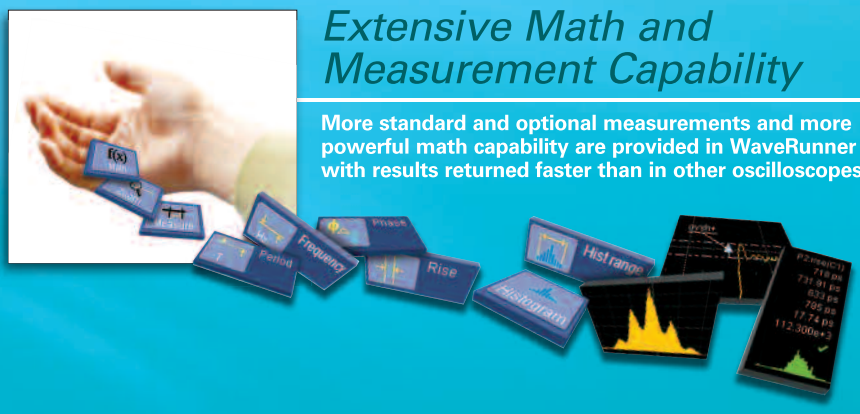
Performance boosted again with WaveRunner 6000—10:1 oversampling and 2 Mpt/Ch for 500 MHz oscilloscopes with versions up to 2 GHz.

2005

Engineers vote Big Display/Small Footprint form factor "Best in Test" in *Test & Measurement* magazine (for the WaveSurfer).

Fast Long Memory with Front Panel Zoom Controls

WaveRunner Xi's long memory is optimized for calculation of more information 10-100x faster than other oscilloscopes, while enabling easy access to simple zooming and positioning from the front panel.

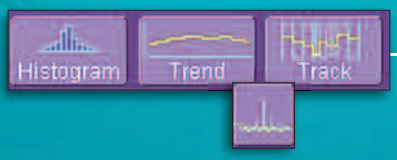


Extensive Math and Measurement Capability

More standard and optional measurements and more powerful math capability are provided in WaveRunner Xi, with results returned faster than in other oscilloscopes.

Integrated Tool Sets

LeCroy math, measure and analysis tools are tightly integrated with basic scope operations. It's easy to link capabilities and expand understanding. Free yourself from constraints!



Beyond Time Domain Analysis

Amplify your understanding with multidomain analysis of your signals. Convert signal information into Statistical domain (Histogram), Spectral domain (long memory FFTs), Jitter, Modulation, or other Measurement Parameter domains (Tracks of measurement parameters). (Some capability is optional.)

Complete Probing Solutions

A wide variety of active FET probes, current probes, differential probes, HV probes, etc. with complete tip and ground accessories make it easy to probe your signals.

Mixed Signal Oscilloscope Option

MS-32 adds 32 digital channels with 32 Mpts of memory (1 Mpt/Ch) to capture and analyze analog and digital events together (4 channel oscilloscopes only).

Power/Amplifier Measurements

Excellent overdrive recovery and signal integrity make WaveRunner Xi ideal for high-voltage switching loss, conduction loss, ripple, switching power supply, and other amplifier measurements. Use with LeCroy Differential Amplifiers for high performance 100,000:1 Common-Mode Rejection Ratio.

Timing Characterization

Extensive triggers allow fast event isolation. Measure timing statistically and view behavior graphically using histograms. Gain real understanding of root cause.

Slow/High-speed Signal Mix

Long memory, HFREJ trigger coupling, built-in noise filtering, etc. enable fast understanding of signal behavior in circuits with a mix of slow-speed (sensor, actuator, power supply, mechanical) and high-speed signals.

2006

WaveRunner Xi combines improved performance with the award-winning form factor of big display and small footprint.

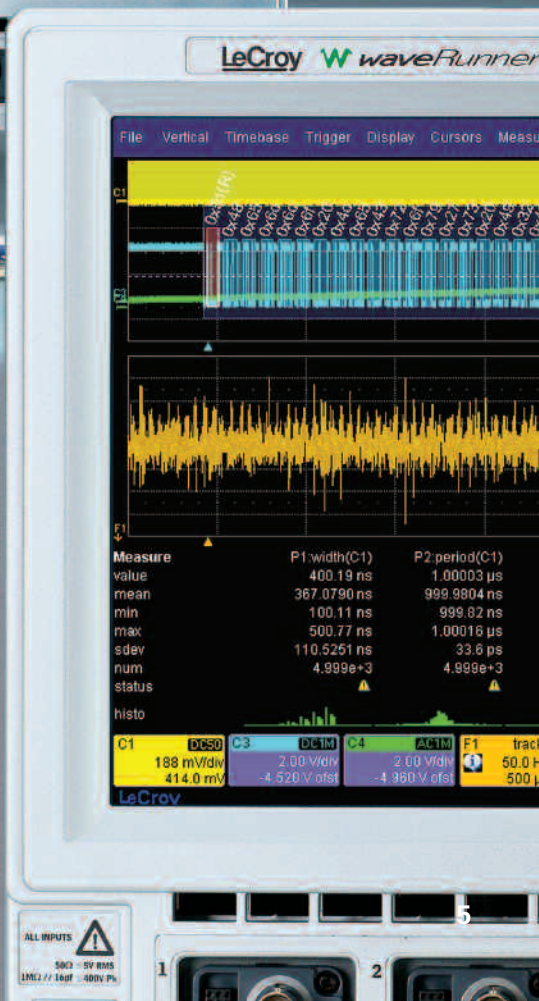
WaveRunner Xi is the most complete "problem solving" oscilloscope from 400 MHz to 2 GHz with great performance, an unbelievable big display/small footprint form factor, and a multitude of fast viewing, SMART/serial data triggering, scanning, and WaveShape Analysis capabilities for fast or slow signals. No matter what your need, you can put the precision, performance, and capability of WaveRunner Xi to work for you.

Great Performance

With 5 GS/s and 10 Mpts standard on every channel (up to 10 GS/s interleaved with 64Xi, 104Xi, and 204Xi), you can be assured of precise measurements of fast signals, and long captures of slow-speed events.

Big Display/Small Footprint

A big display is crucial to understanding circuit behaviors, especially when working with a combination of analog, digital, and serial data signals. That's why we use a big, bright 10.4" color display to allow room for everything, including time-correlated views of mixed-signal systems and non-time domain analysis. You'll love the impressive display viewing angle; and the very small instrument footprint makes it easy to work anywhere.



Powerful WaveShape Analysis Capability

WaveRunner Xi has the best problem-solving capability, whether you are gathering statistical data on thousands or millions of events, converting signal information into a statistical, modulation, or frequency domain for better understanding, or using WaveScan™ to find anomalous events. In addition, WaveRunner Xi's has numerous application packages to solve specific test and measurement challenges.

Outstanding Capabilities for Everyday Testing

LeCroy's "out-of-the-box" thinking about oscilloscopes provides a great form factor and no compromises. It's loaded with capability and features that will provide more insight and help you complete your testing faster.

1. Bright, 10.4" Display

You'll never use a small display oscilloscope again. A fantastic viewing angle makes it easy to view.

2. Only 15 cm (6") Deep

The most space-efficient oscilloscope for your bench from 400 MHz to 2 GHz.

3. Dedicated Cursor Knobs

Select type of cursor, position them on your signal, and read values without ever opening a menu.

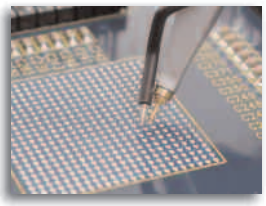
4. Zoom Control Knobs

Four dedicated knobs make it easy to navigate any zoom or math trace without opening menus.

5. Touch Screen with Built-in Stylus

The most time-efficient user interface is even easier to use with a built-in stylus.

6. High Impedance Active Probes



1 and 1.5 GHz active probes with 1 MΩ || 0.9 pF input impedance and an extensive probe tip and ground accessory selection.

7. LeCroy WaveStream™ Fast Viewing Mode

Provides a lively, analog-like feel similar to a phosphor trace. Adjust "trace" intensity with the front panel control, or toggle between LeCroy WaveStream and real-time modes.

8. LeCroy WaveScan™ Advanced Search & Analysis

Use more than 20 modes to capture and search, or "scan" for anomalous events over thousands or millions of acquisitions. Use ScanHisto or ScanOverlay to display intuitive scanned results.

9. Serial Triggering & Decoding

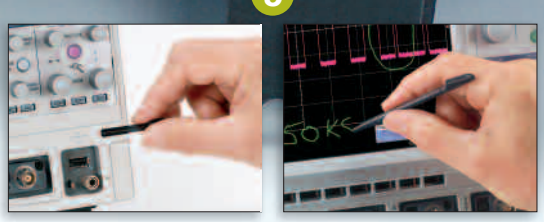
I²C and SPI and other serial triggers, now available for WaveRunner Xi.

10. "Push" Knobs

Trigger level, delay, and offset knobs all provide shortcuts to common actions when pushed.

11. Local Language User Interface

Select from 10 language preferences. Add a front panel overlay with your local language.

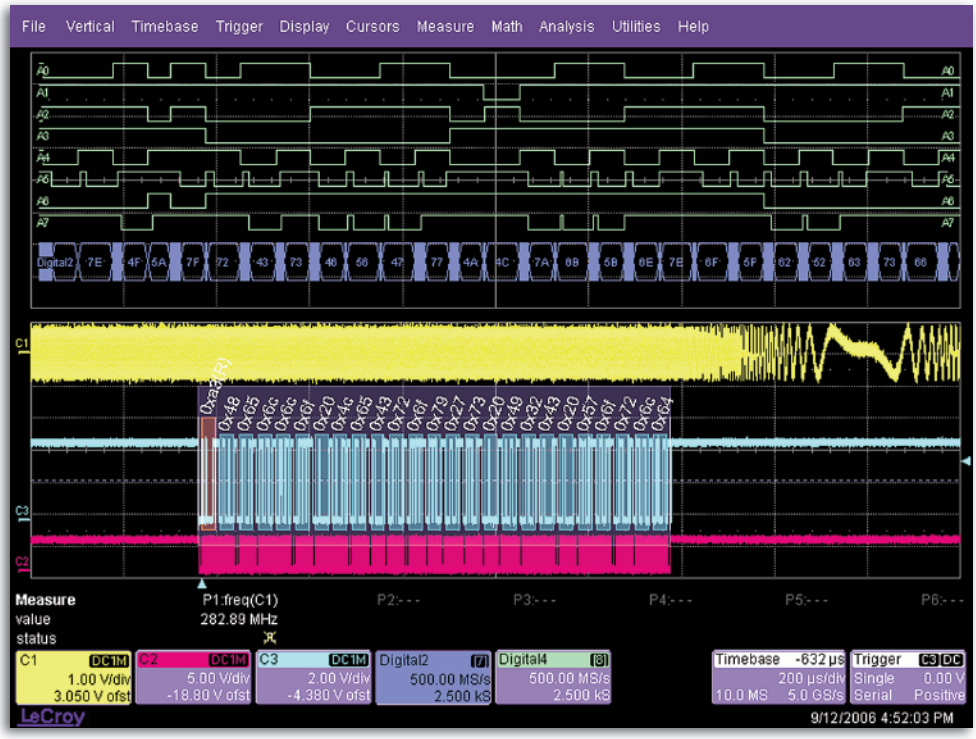


Embedded Controller Validation and Debug

LeCroy's powerful WaveRunner Xi oscilloscopes can be turned into mixed-signal oscilloscopes (MSOs) with the addition of the MS-32 mixed-signal oscilloscope option. In addition, I²C, SPI, and CAN, triggering and decoding options turn the WaveRunner Xi into an all-in-one analog, digital, and serial data trigger, acquisition, and analysis machine.

4 Analog + 32 Digital Channel Capability

The MS-32 is the first oscilloscope solution to combine 4 analog channels with 32 digital channels. This is ideal for the most efficient testing of 16-bit or 32-bit embedded controllers with analog signals (comparators, voltage sources, sensor/actuator signals, etc.), digital signals (ADDR, DATA, and Control lines), peripheral serial data signals (I²C, SPI), and embedded controller serial data signals (CAN) coincident at one time. Testing and debugging efficiency is greatly enhanced by eliminating the need to continuously disconnect/reconnect signals to observe different behaviors. Users can capture all of their signal information using oscilloscope or MS-32 long memory, or set up digital or analog trigger conditions to capture the event of interest.



32 Mpts of Digital Memory for Long Digital Capture Time

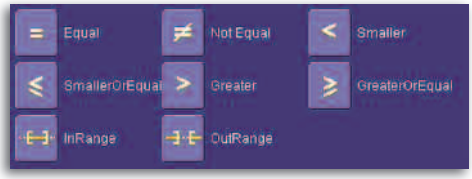
With 32 Mpts of memory on 32 channels (1 Mpts/Ch), the MS-32 ensures that users have enough memory to capture the area of interest, especially when combined with SMART Triggers, serial data triggers, and digital pattern triggers.

Quick Mixed-Signal Setup, Easy to Use

Unlike a traditional Logic Analyzer, the MS-32 is easy to use. A single module consolidates all of the MS-32/oscilloscope interconnections, so users can start viewing signals and begin debugging quickly. In addition, all standard oscilloscope tools are readily accessible. Signal debug is simple, using standard oscilloscope tools, such as cursors, measurement parameters, and zooming.

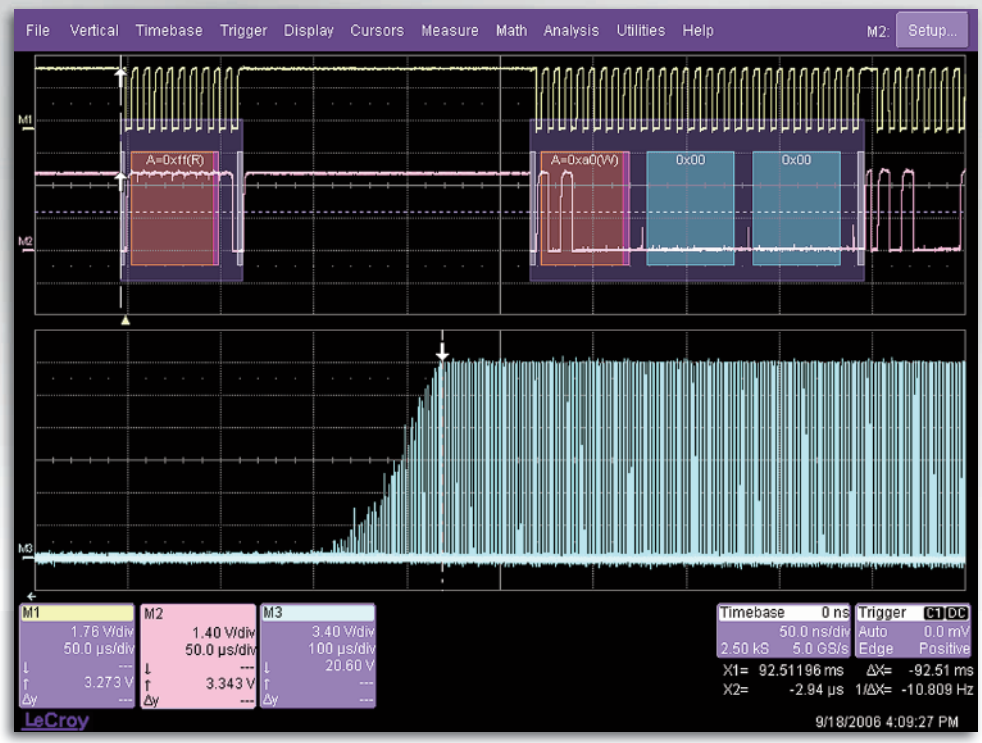
Complete I²C, SPI and CAN Serial Triggering

Quickly and easily isolate specific serial data events on your embedded controller for better understanding and faster debug. Set up trigger conditions in binary, hexadecimal (Symbolic for CAN) formats. Use the EXT input for the clock signal and keep an additional analog oscilloscope channel open for other uses. Trigger on DATA in specific locations of long I²C EEPROM reads. Get complete control of your debug process and finish faster.



Powerful Conditional I²C Data Triggering

Completely isolate specific SPI or I²C message events for better understanding and debug. Use a conditional I²C DATA trigger to select a range of DATA values to trigger on, not just a single DATA value. Oftentimes, I²C utilizes DATA bytes to specify sub-addresses for accessing memory locations in EEPROMs. Conditional DATA trigger



allows triggering on a range of DATA bytes that correspond to reads or writes to specific sub-address memory blocks in the EEPROM. It can also aid in monitoring DATA outputs from I²C-based sensors, such as analog-to-digital converters, and triggering when DATA is outside a safe operating range. In both cases, verifying proper operation becomes a simple task.

Intuitive, Color-Coded Decode Overlay

Advanced software algorithms deconstruct the waveform into binary, hex, or ASCII protocol information, then overlay the decoded data on the waveform. Various sections of the protocol are color-coded to make it easy to understand. The decode operation is fast—even with long acquisitions.

Table Summary and Search/Zoom

Turn your oscilloscope into a protocol analyzer with the Table display of protocol information. Customize the table, or export Table data to an Excel file. Touch a message in the table and automatically zoom for detail. Search for specific address or data values in the acquisition.

Idx	Time	Addr Length	Address	R/W	Length	Data
8	240.494 ms	7	0x21	1	2	0xff 00 00
9	360.555 ms	7	0x21	0	1	0x08
10	360.698 ms	7	0x21	1	2	0x49 00 00
11	481.865 ms	7	0x21	0	1	0x0a
12	482.007 ms	7	0x21	1	2	0x00 00 00
13	606.294 ms	7	0x20	0	3	0x01 36 00
14	721.335 ms	7	0x20	0	1	0x00
15	721.377 ms	7	0x20	1	2	0x12 36 00
16	841.266 ms	7	0x20	0	1	0x02

Excellence in Acquisition

WaveRunner Xi Fast Memory Architecture

LeCroy's proprietary method of data transfer and processing permits wave shapes to be captured and processed 10–100x faster than other oscilloscopes. The result is better capability to perform advanced Waveshape Analysis, and faster debug.

With WaveRunner Xi, you'll notice the difference when capturing long records and making measurements, calculating math or FFTs, or performing non-time domain analysis using statistically-based Histograms or parameter-based Tracks.

For instance, in a long 10 Mpt capture where it is desired to measure the periodicity of a signal, WaveRunner Xi will quickly capture and display thousands of signal periods, measure each period, calculate statistics, and display a Histogram of the measurement values. Other oscilloscopes struggle to calculate a single period value (instead of thousands) and cannot provide a Histogram view of the statistical data.

Similar speed is achieved during simple operations, such as subtracting two channels (when a differential probe isn't available), or computing FFTs with high-frequency resolution (and, hence, long memory).

SMART Triggers Isolate Events

The WaveRunner Xi oscilloscope provides a multitude of basic and advanced (SMART) triggers to meet any need. Advanced triggers isolate specific events of interest, and (when combined with long memory) provide a complete view of the signal activity around that event. WaveRunner Xi excels in this regard.

Trigger on what you expect (widths, glitches, video, logic patterns, etc.) and also trigger on unusual signals (dropouts, intervals, runts, slew rates). LeCroy's exclusion triggering can exclude normal signals and capture only the abnormal ones, speeding up the debug of your circuits and systems. Trigger on signals down to 1 ns in width (500 ps for width and glitch trigger), or use an "A" condition to qualify a "B" trigger.

Sequence Mode Extends Long Memory and SMART Triggering Capability

Use Sequence mode to store up to 10,000 triggered events as "segments" into oscilloscope memory. This can be ideal when capturing many fast pulses in quick succession (i.e., trigger re-arm time is most important) or when capturing few events separated by long time periods (i.e., longest capture time is most important).

Sequence mode can acquire 4 channels simultaneously, provide timestamps for each acquisition (to 1 ns resolution), minimize capture dead-time (to ≤ 800 ns), and allow various ways to view and analyze the captured segmented data.

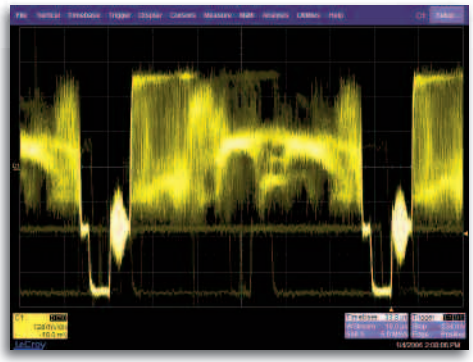
Combine sequence mode with an advanced trigger to isolate a rare event, capture all instances over hours or days, and view and analyze each event afterwards.

LeCroy WaveStream™ Fast Viewing Mode

WaveStream provides a vibrant, intensity graded (256 levels) display with a fast update to closely simulate the look and feel of an analog oscilloscope.

WaveStream is most helpful in viewing signals that have signal jitter or signal anomalies, or for applying a visual check before creating an advanced trigger or WaveScan setup to locate an unusual event.

Since the sample rate in WaveStream mode can be as high as 10 GS/s (up to 5x that of other oscilloscopes), it is an excellent runt or glitch finder. Timing jitter is often visually assessed to



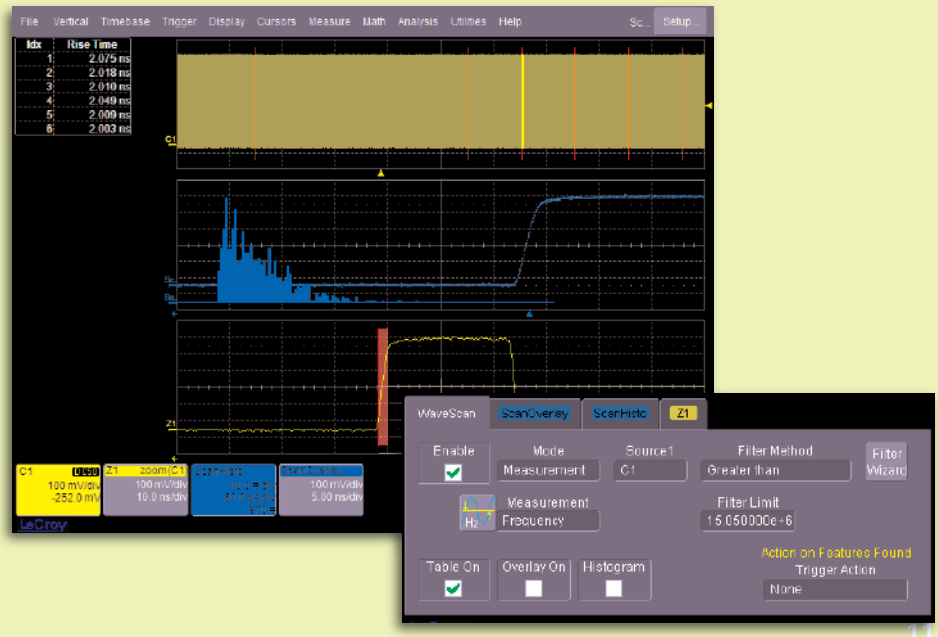
understand approximate behavior. WaveStream makes it easy to understand jitter on edges or in eye diagrams. WaveStream also excels in allowing you to relate composite (WaveStream) to single-event (real-time sampled) behaviors. Just capture in WaveStream mode, toggle to view or zoom a single trace, then toggle back to WaveStream mode.

WaveScan™ Advanced Search and Analysis Finds Problems that Triggers Won't Find.

The best trigger won't find all unusual events—a more powerful capability is sometimes needed. WaveScan provides the ability to locate unusual events in a single capture (i.e., capture and search), or "scan" for an event in many acquisitions over a long period of time. Select from more than 20 search modes (frequency, rise time, runt, duty cycle, etc.), apply a search condition and begin scanning. Since the scanning "modes" are not simply copies of the hardware triggers, the utility and capability is much higher. For instance, there is no "frequency" trigger in any oscilloscope, yet WaveScan allows "frequency" to be quickly "scanned" for. This allows the user to accumulate a data set of unusual events that are separated by hours or days, enabling faster debugging.

When used in multiple acquisitions, WaveScan builds on the traditional LeCroy strength of fast processing of data. A LeCroy X-Stream oscilloscope will quickly "scan" millions of events, looking for unusual occurrences, and do it much faster and more efficiently than other oscilloscopes can.

WaveScan in WaveRunner Xi also contains ScanHisto and ScanOverlay capability. Found events can be overlaid in a ScanOverlay view to provide a quick and simple comparison of events. In addition, measurement-based scanning modes (like the frequency example given above), permit ScanHistograms to show the statistical distribution of the found events. These analysis tools simplify understanding and enable faster debug.



Unmatched Measurement and Validation Capability

WaveRunner Xi provides the highest value for everyday characterization, validation, and debug, and the best capability for quickly debugging advanced problems. Whether you are debugging circuits with a mix of slow- and high-speed signals, performing signal integrity checks on high-speed clock and data signals, or doing advanced debugging of complex problems, WaveRunner Xi has the right toolset that is easily applied to the problem.

Oftentimes, only viewing signals does not provide the level of precision that is required for validating designs. At those times, the ability of WaveRunner Xi to quickly provide precise statistical data becomes vital. With WaveRunner Xi, you can quickly accumulate data on thousands of measurements in a single shot (WaveRunner Xi does not limit its measurements to a single value in an acquisition) or in multiple acquisitions.

Touch a button, and display statistical information. Touch another button to display a Histicon graphical view of the measurement distribution. Expand this view into a larger histogram of measurement data. Accumulate up to 2 billion measurement events, or create measurable persistence traces of signals with the optional WRXi-STAT.

All the essential tools needed for circuit validation

Advanced Math Characterization

Most oscilloscopes contain only a few simple math functions to subtract waveforms or to perform coarse resolution FFTs on short record length acquisitions. Or, they provide long memory, but limited ability to process the memory and perform WaveShape Analysis that leads to detailed understanding and faster debug.

WaveRunner Xi oscilloscopes contain dozens of standard math functions, and powerful capabilities, such as long memory FFTs, Trending, Tracking (optional), Sparsing, Interpolation selection, a variety of Persistence Views, user customized math and measurements (MATLAB, Mathcad, or Visual Basic formats), and numerous other specialized capabilities (optional Application Packages). The toolset is rich and deep, and sure to solve any complex problem.

LabNotebook™
A Unique Tool for Documentation and Report Generation

The LabNotebook feature of WaveRunner Xi provides a report generation tool to save and document all your work. Saving all displayed waveforms, relevant WaveRunner Xi settings, and screen images is all done through LabNotebook, eliminating the need to navigate multiple menus to save all these files independently.

The screen images saved can be annotated with freehand notes using the stylus and touch screen, and then included in your report.

One-touch Functionality

Easy report generation helps you share your findings and communicate important results.

LabNotebook adds a simple way to report your work and save all essential waveforms, settings, and screen images.

Quickly save all the necessary files with LabNotebook in a single button press.

Recall your settings from any report by using the Flashback capability.

The WaveRunner Xi touch screen and stylus allow for easy annotation of the screen. LabNotebook allows you to add freehand text and graphics in multiple colors along with printed text and arrows to help identify important parts of your waveforms and measurements.

Multidomain WaveShape Analysis Improves Understanding

The most difficult electrical circuit problems are rarely obvious in the time domain. Long memory with zooming, searching, and scanning is an important part of the solution. However, serious design professionals understand the importance of converting time-domain information into statistical, parameter, or frequency domains so as to get to the root of the problem quicker. WaveRunner Xi provides you with the tools necessary to understand complex circuit problems and solve them faster.

Trend Views Turn Your Oscilloscope Into a Strip Chart Recorder

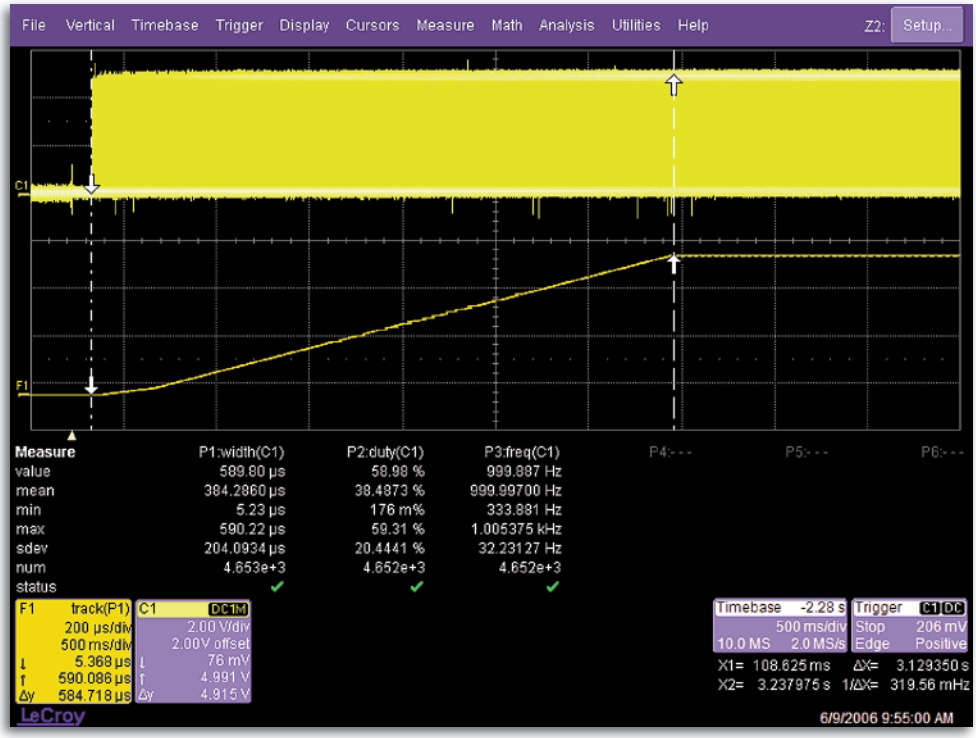
Slowly sample at 1000 seconds/div to capture hours of slow speed signal data. Using Trend Views, plot measurement values of high-speed signals with slower speed signals, such as transducer or voltage values.

Track Views Provide Graphical Display of Parameter Values vs. Time

Track in WaveRunner Xi (optional) uses every instance of a measurement in an acquisition to create a plot of measurement values on the Y-axis and time on the X-axis. The result is a graphical plot of a measurement change time-correlated to the original channel acquisition—perfect for intuitive understanding.

Some examples include:

- Measuring a signal's Frequency over a 100 ms interval, and understanding whether the correct frequency shifts are present at the right times.
- Measuring a pulse width modulated (PWM) signal's Width over a 1 second interval, and determining if the modulation circuit is correctly reacting to system changes.
- Measuring the cycle-cycle jitter values in a micro processor and understanding how cycle-cycle jitter peaks correlate to spikes in power supply lines.



The PWM signal for a power tool motor speed controller is monitored during start-up. The Width parameter is used. All instances of Width during the acquisition are measured. Then, Track was applied to determine when the speed plateaued (i.e., when the tool rotation reached steady-state).

Histograms Graphically Present Statistical Data

LeCroy oscilloscopes excel in capturing hundreds or thousands times more measurements per acquisition than other oscilloscopes do. With this much data, it is essential to provide more than just a list of mean, min, max, sdev, etc. Histograms provide an intuitive way to view the distribution of statistical data and gain real insight into underlying problems. For instance:

- Measure millions of jitter values in seconds, understand whether the measurement distribution is Gaussian or non-Gaussian, and correct timing problems to stay within a timing budget.
- Improve validation of timing budgets when measuring embedded controller response times. Measure hundreds of thousands of timing events instead of just hundreds, and easily view real-world worst-case timing situations.

A 200 MHz clock signal is acquired at 10 GS/s using 20 Mpts of acquisition data (400,000 cycles). Cycle-Cycle and Period Jitter are measured and analyzed with Tracks and Histograms. Cycle-Cycle jitter shows a distinctive modality. Other signals could now be acquired and time-correlated to understand the histogram modality.

Fast Fourier Transforms (FFTs) Provide Spectral Views for Advanced Troubleshooting

LeCroy's long memory (up to 25 Mpts) FFTs increase your ability to understand signal behaviors in the frequency domain. The long memory allows users to obtain 5–100x the frequency resolution possible with FFTs available in other oscilloscopes, which allows more precise troubleshooting. Built-in averaging of FFTs helps to eliminate random events from the calculations. In addition, LeCroy FFTs can be applied to any channel or math function, which greatly expands the ability to gather useful information.

Some examples include:

- Capture power supply, clock, and data signals with 1 kHz frequency resolution. Correlate power supply noise to signal integrity.
- Apply an FFT to a Track of Cycle-Cycle Jitter and gain insight into the frequency components and root cause of the jitter.
- Quickly capture hundreds of acquisitions and average the FFTs to increase frequency signal-noise ratio and to separate random from deterministic events.

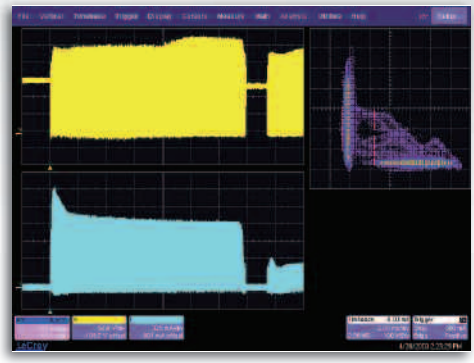
Specific Solutions for Tough Problems

In addition to the general purpose waveshape analysis tools that LeCroy offers with WaveRunner Xi, there are also specific tool sets that are packaged into a complete Application solution for Automotive, Embedded Design, or Switching Power Supply markets. These packages offer great value, and allow you to add to your oscilloscope over time as your needs change.

Mixed Signal Testing Oscilloscope Option (MS-32)*

Add 32 digital channels to a 4-channel WaveRunner Xi oscilloscope for 4 analog + 32 digital testing capability, with a simple oscilloscope setup and user interface. Each digital channel has 1 Mpts/Ch (32 Mpts total!) to capture all of your signal information for efficient debug and analysis. Thirty-two digital channels is ideal for the most efficient testing of 16-bit embedded controllers where all 16 ADDR and DATA lines can be viewed simultaneously.

*MS-32 is compatible with WRXi 4-channel model oscilloscopes only.

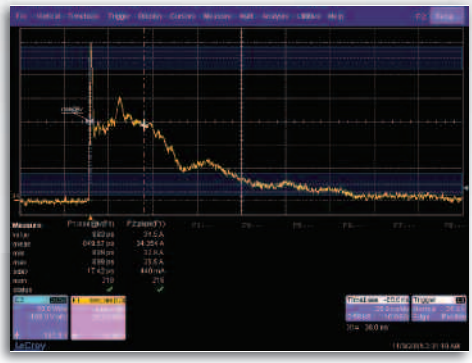


PowerMeasure Analysis Software Package (PMA2)

The PMA2 software package enhances your ability to analyze power conversion devices and circuits. Measure switching and conduction losses with high accuracy. Capture power supply start-up events using long memory, view changes in the PWM signals using Track, and correlate PWM changes to other circuit signals. Measure power frequency harmonics and apparent/real power and power factor. Optional accessories, such as differential amplifiers, differential probes, current probes, and deskew fixtures complete the solution.

CANbus Trigger, Decode, and Measure/Graph Testing Options (CANbus TDM, CANbus TD, Vehicle Bus Analyzers)

Flexibly trigger on CAN bus messages. Decode and display hexadecimal data values next to the CAN signal on the screen. Use CAN-specific parameters to automatically measure timing from sensor or actuator signals to specific CAN messages. Statistically analyze performance with histograms, and determine root cause of timing irregularities. Extract decimal data from a CAN message and graph it as if it were an analog signal. Easily correlate electrical problems to CAN bus messages or error frame data. In addition, Vehicle Bus Analyzers (VBAs) provide CAN symbolic level trigger and decode on up to four different CAN buses.



Electromagnetic Compatibility Software Package (EMC)

The EMC software package adds flexibility to the rise time, fall time, and width parameters necessary to accurately measure ESD pulses, EFT bursts, surges and transients common in EMC testing. In addition, the EMC package allows histogramming of up to 2 billion events, parameter math, and measurement filtering. Combine this with LeCroy's unbeatable standard statistics and measurement capability and you have a winning combination.

Jitter and Timing Analysis Software Package (JTA2)

Use specialized timing parameters to measure period, cycle-cycle, half period, width, etc. jitter on a variety of signals. Use the three views of jitter (statistical, time, and frequency) to understand root cause and to debug problems. Histograms (statistical view) provide understanding of statistical distributions. Tracks (time view) provide a means to show time-correlated peaks or modulations of jitter, and to compare it to other signals. FFTs (frequency view) provide the ability to debug root causes of high in-circuit jitter.

Digital Filter Software Package (DFP2)

DFP2 lets you implement Finite or Infinite Impulse Response filters to eliminate undesired spectral components, such as noise, and enhances your ability to examine important signal components. The DFP2 option allows you to choose from a standard set of FIR or IIR filters and also gives you the ability to design your own filters.

Probes

High performance probes are an essential tool for accurate signal capture. Consequently LeCroy offers an extensive range of probes to meet virtually every application need. Optimized for use with LeCroy oscilloscopes, these probes set new standards for responsiveness and signal detection.

ZS Series High Impedance Active Probes

Leading Features:

- 1 GHz (ZS1000) and 1.5 GHz (ZS1500) bandwidths
- High Impedance (1 MΩ || 0.9 pF)
- Extensive standard and available probe tip and ground connection accessories
- +/-12 Vdc offset (ZS1500)
- LeCroy ProBus system

ADP305, ADP300

Leading Features:

- 20 MHz and 100 MHz bandwidth
- 1,000 V_{rms} common mode voltage
- 1,400 V_{peak} differential voltage
- EN 61010 CAT III
- 80 dB CMRR at 50/60 Hz
- LeCroy ProBus system only

PPE1.2KV, PPE2KV, PPE4KV, PPE5KV, PPE6KV, PPE20KV

Leading Features:

- Suitable for safe, accurate high-voltage measurements
- 1.2 kV to 20 kV
- Works with any 1 MΩ input oscilloscope

CP030/31

Leading Features:

- 30 A_{rms} continuous current
- 50 or 100 MHz bandwidth
- Measure pulses up to 50 A_{peak}
- Small form factor accommodates large conductors with small jaw size
- LeCroy ProBus system

AP031

Leading Features:

- Lowest priced differential probe
- 15 MHz bandwidth
- 700 V maximum input voltage
- Works with any 1 MΩ input oscilloscope

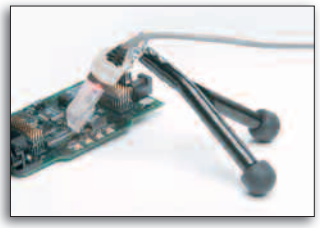
AP033/AP034

Leading Features:

- 500 MHz/1 GHz Bandwidth
- 10,000:1 CMRR
- Wide dynamic range, low noise
- LeCroy ProBus System

HFP 2500

Leading Features:



- 2.5 GHz bandwidth, 0.7 pF input capacitance
- Interchangeable tips for a variety of probing needs
- Hands-free probing with probe holder
- AutoColor ID matches probe color to channel
- LeCroy ProBus system

Specifications

Standard

Math Tools

Display up to four math function traces (F1–F4). The easy-to-use graphical interface simplifies setup of up to two operations on each function trace; and function traces can be chained together to perform math-on-math.

absolute value
average (summed)
average (continuous)
custom (MATLAB, Mathcad, VBScript) – limited points
derivative
deskew (resample)
difference (–)
enhanced resolution (to 11 bits vertical)
envelope
exp (base e)
exp (base 10)
fft (power spectrum, magnitude, phase, up to 50 kpts)
floor
histogram of 1000 events
integral
invert (negate)
log (base e)
log (base 10)
product (x)
ratio (/)
reciprocal
rescale (with units)
roof
(sinx)/x
square
square root
sum (+)
trend (datalog) of 1000 events
zoom (identity)

Measure Tools

Display any 6 parameters together with statistics, including their average, high, low, and standard deviations. Histicons provide a fast, dynamic view of parameters and wave-shape characteristics.

amplitude
area
base
cycles
custom (MATLAB, Mathcad, VBScript) - limited points
delay
∅delay
duration
duty cycle
falltime (90–10%, 80–20%, @ level)
first
frequency
last
level @ x
maximum
mean
median
minimum
number of points
+overshoot
–overshoot
peak-to-peak
period
phase
risetime (10–90%, 20–80%, @ level)
rms
std. deviation
time @ level
top
∅time @ level
∅time @ level from trigger
width (positive + negative)
x@ max.
x@ min.

Pass/Fail Testing

Simultaneously test multiple parameters against selectable parameter limits or pre-defined masks. Pass or fail conditions can initiate actions including document to local or networked files, e-mail the image of the failure, save waveforms, send a pulse out at the rear panel auxiliary BNC output, or (with the GPIB option) send a GPIB SRQ.

Software Options-*Advanced Math and WaveShape Analysis*

Statistics Package (WRXi-STAT)

This package provides additional capability to statistically display measurement information and to analyze results:

- Histograms expanded with 19 histogram parameters/up to 2 billion events.
- Persistence Histogram
- Persistence Trace (mean, range, sigma)

Master Analysis Software Package (WRXi-XMAP)

This package provides maximum capability and flexibility, and includes all the functionality present in XMATH, XDEV, and JTA2

Advanced Math Software Package (WRXi-XMATH)

This package provides a comprehensive set of WaveShape Analysis tools providing insight into the wave shape of complex signals. Includes:

- Parameter math – add, subtract, multiply, or divide two different parameters. Invert a parameter and rescale parameter values.
- Histograms expanded with 19 histogram parameters/up to 2 billion events.
- Trend (datalog) of up to 1 million events
- Track graphs of any measurement parameter.
- FFT capability includes: power averaging, power density, real and imaginary components, frequency domain parameters, and FFT on up to 24 Mpts.
- Narrow-band power measurements
- Auto-correlation function
- Sparse function
- Cubic interpolation function

Advanced Customization Software Package (WRXi-XDEV)

This package provides a set of tools to modify the scope and customize it to meet your unique needs. Additional capability provided by XDEV includes:

- Creation of your own measurement parameter or math function, using third-party software packages, and display of the result in the scope. Supported third-party software packages include:
  – VBScript – MATLAB – Excel – Mathcad
- CustomDSO – create your own user interface in a scope dialog box.
- Addition of macro keys to run VBScript files
- Support for plug-ins

Value Analysis Software Package (WRXi-XVAP)

Measurements:

- Jitter and Timing parameters (period@level,width@level, edge@level, duty@level, time interval error@level, frequency@level, half period, setup, skew, Δperiod@level, Δwidth@level).

Math:

- Persistence histogram • Persistence trace (mean, sigma, range)
- 1 Mpts FFTs with power spectrum density, power averaging, real, imaginary, and real+imaginary settings)

Statistical and Graphical Analysis

- 1 Mpts Trends and Histograms • 19 histogram parameters
- Track graphs of any measurement parameter

Intermediate Math Software Package (WRXi-XWAV)

Math:

- 1 Mpts FFTs with power spectrum density, power averaging, real, and imaginary components

Statistical and Graphical Analysis

- 1 Mpts Trends and Histograms
- 19 histogram parameters
- Track graphs of any measurement parameter

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			1 MΩ || 20 pF or 50Ω	
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)				
Offset Range	50 Ω: ±1 V @ 2-98 mV/div, ±10 V @ 100 mV/div - 1 V/div; 1 M Ω: ±1 V @ 2-98 mV/div, ±10 V @ 100 mV/div - 1 V/div, ±100 V @ 1.02 V/div - 10 V/div			50 Ω: ± 400 mv @ 2-4.95 mv/div, ± 1 V @ 5-99 mv/div, ± 10 V @ 100 mv – 1 V/div, ± 100V @ 1.02-10 V/div; 1 M Ω: ± 400 mv @ 2-4.95 mv/div, ± 1 V @ 5-99 mv/div, ± 10V @ 100 mv – 1 V/div, ± 100V @ 1.02-10 V/div	
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: 200 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 and <= 100 kS/s

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 200 ps/div to 10 ns/div			User selectable from 100 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)

Trigger System (continued)	44Xi	64Xi	62Xi	104Xi	204Xi
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	44Xi	64Xi	62Xi	104Xi	204Xi
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

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 (Accessory)	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

	44Xi	64Xi	62Xi	104Xi	204Xi
Signal Types	Selected from External Trigger or External Clock input on front panel				
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)	

Auxiliary Output

Signal Type	Trigger Enabled, Trigger Output. Pass/Fail, or Off
Output Level	TTL, ≈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} (±10%) at 400 Hz, Automatic AC Voltage Selection Installation Category: 300V CAT II; Max. Power Consumption: 340 VA/340 W; 290 VA/290 W for WaveRunner 62Xi

Environmental

Temperature: Operating	+5 °C to +40 °C
Temperature: Non-Operating	-20 °C to +60 °C
Humidity: Operating	Maximum relative humidity 80% for temperatures up to 31 °C decreasing linearly to 50% relative humidity at 40 °C
Humidity: Non-Operating	5% to 95% RH (non-condensing) as tested per MIL-PRF-28800F
Altitude: Operating	Up to 2,000 m
Altitude: Non-Operating	12,190 m

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	
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
1 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 104Xi
600 MHz, 4 Ch, 5 GS/s, 10 Mpts/Ch (20 Mpts/Ch in interleaved mode) with 10.4" Color Touch Screen Display	WaveRunner 64Xi
600 MHz, 2 Ch, 5 GS/s, 10 Mpts/Ch (20 Mpts/Ch in interleaved mode) with 10.4" Color Touch Screen Display	WaveRunner 62Xi
400 MHz, 4 Ch, 5 GS/s, 10 Mpts/Ch (20 Mpts/Ch in interleaved mode) with 10.4" Color Touch Screen Display	WaveRunner 44Xi

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) (for use with 2 Ch WaveRunner Xi)	WRXi-VL2
12.5 Mpts/Ch (25 Mpts/Ch Interleaved) (for use with 4 Ch WaveRunner Xi)	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	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
EMC Pulse Parameter Software Package	WRXi-EMC
Ethernet Test Software Package	WRXi-ENET
USB 2.0 Test Compliance Software Package (204Xi only)	WRXi-USB2
Electrical Telecom Mask Test Package	ET-PMT

Product Description	Product Code
Serial Data Options	
I^2C Trigger and Decode Option	WRXi-I2Cbus TD
SPI Trigger and Decode Option	WRXi-SPIbus TD
CANbus TD Trigger and Decode Option	CANbus TD
CANbus TDM Trigger, Decode, and Measure/Graph Option	CANbus TDM

A variety of Vehicle Bus Analyzers based on the WaveRunner Xi platform are available. These units are equipped with a Symbolic CAN trigger and decode

Mixed Signal Oscilloscope Options	
32 Digital Channel Oscilloscope Mixed Signal Option (for use with 4 Ch WRXi only)	MS-32

Probes and Amplifiers*	
Qty. 4 1.5 GHz, 1 MΩ || 0.9 pF High Impedance Active Probe	ZS1500-QUADPAK
Qty. 4 1 GHz, 1 MΩ || 0.9 pF High Impedance Active Probe	ZS1000-QUADPAK
2.5 GHz, 0.7 pF Active Probe	HFP2500
1 GHz Active Differential Probe (÷1, ÷10, ÷20)	AP034
500 MHz Active Differential Probe (x10, ÷1, ÷10, ÷100)	AP033
30 A; 100 MHz Current Probe – AC/DC; 30 A_{rms}; 50 A_{peak} Pulse	CP031
30 A; 50 MHz Current Probe – AC/DC; 30 A_{rms}; 50 A_{peak} Pulse	CP030
30 A; 50 MHz Current Probe – AC/DC; 30 A_{rms} Peak; 50 A Peak Pulse	AP015
150 A; 10 MHz Current Probe – AC/DC; 150 A_{rms}; 500 A_{peak} Pulse	CP150
500 A; 2 MHz Current Probe – AC/DC; 500 A_{rms}; 700 A_{peak} Pulse	CP500
1,400 V, 100 MHz High-Voltage Differential Probe	ADP305
1,400 V, 20 MHz High-Voltage Differential Probe	ADP300
1 Ch, 100 MHz Differential Amplifier	DA1855A

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

Hardware Accessories	
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

LeCroy

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

WRXiDSrevB_22Sep06
LG 7.5K