LeCroy

WaveRunner® 6000A Series

The New Benchmark for Everyday Oscilloscopes

The WaveRunner 6000A Series
The Everyday Bench Oscilloscope

The WaveRunner® 6000A Series is the best oscilloscope for everyday signal testing. Its remarkable functionality includes the following capabilities:
– acquisition technology that delivers measurements you can trust
– an efficient interface that feels just right to the busy engineer
– uncommon capabilities—right out of the box
– a platform for building on even more functionality

A Rich Feature Set is Standard

The WaveRunner 6000A Series is an everyday bench scope with true "lab instrument" capabilities. This series offers:

- Bandwidths from 350 MHz to 2 GHz
- Sample rates of 2.5 to 10 GS/s
- Standard memory of 4 Mpts/Ch
- All channels expandable to 12 Mpts
- Up to 24 Mpts when interleaved

Most importantly, these features are delivered at a price far below other oscilloscopes in this class.

Outstanding Signal Fidelity

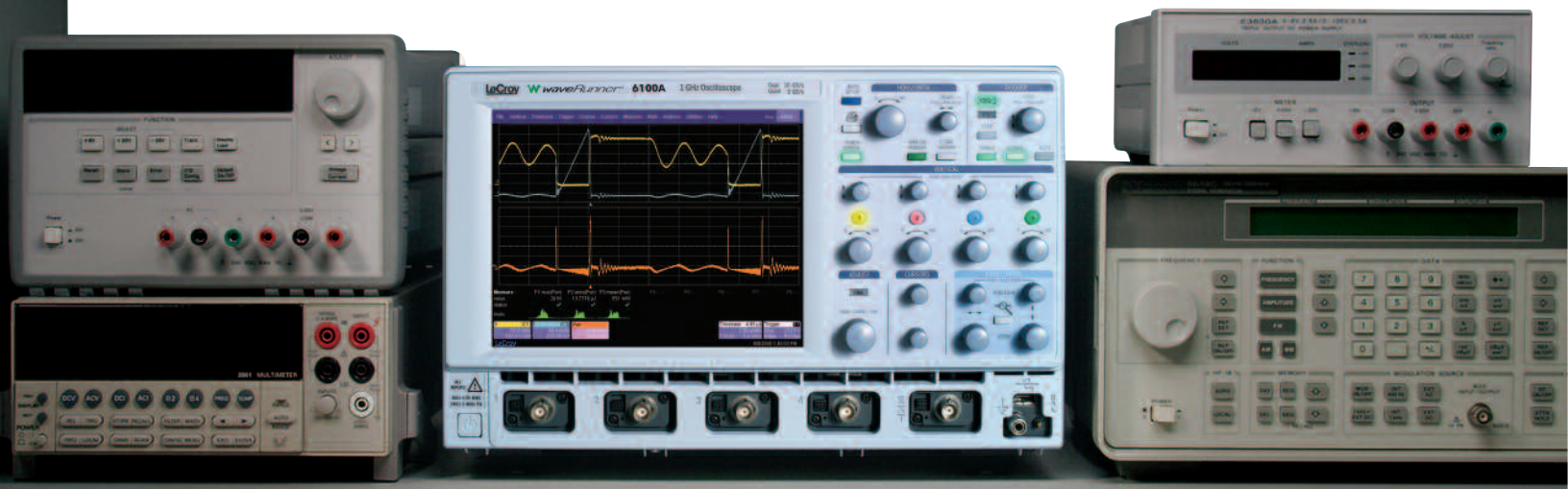
The WaveRunner 6000A Series is powered by the same SiGe chipset that is used in LeCroy's higher bandwidth WaveMaster oscilloscopes.

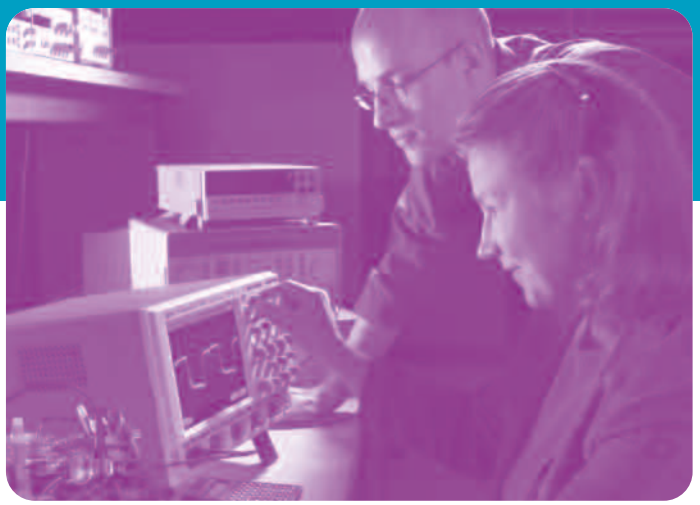
- High sample rate captures high frequency transients and sharp edges
- Very low residual jitter (2 ps typical)
- Includes ultra-stable clock (±5 ppm)

This outstanding performance gives you timing resolution that rivals oscilloscopes that cost twice as much.

Windows® XP Operating System

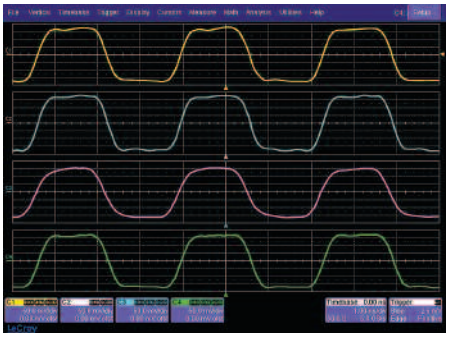
The open Windows XP operating system allows you to install Windows application software to analyze waveform data directly in the oscilloscope, eliminating the need for processing in another PC.



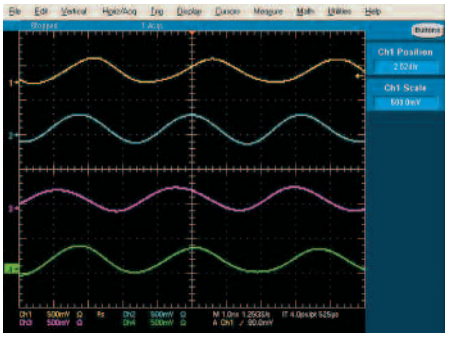


5 GS/s on Each Channel—See Details Others Miss

The WaveRunner 6000A is a true 4 channel instrument—you can sample at a full 5 GS/s on each channel. Other oscilloscopes can only use a single channel at 5 GS/s or 1/4 that rate when using all four channels. WaveRunner 6000A offers more than Nyquist sample rate on each channel.



With a true 5 GS/s on each channel, this 300 MHz square wave (checking a timing delay problem between multiple clock signals) is displayed accurately.

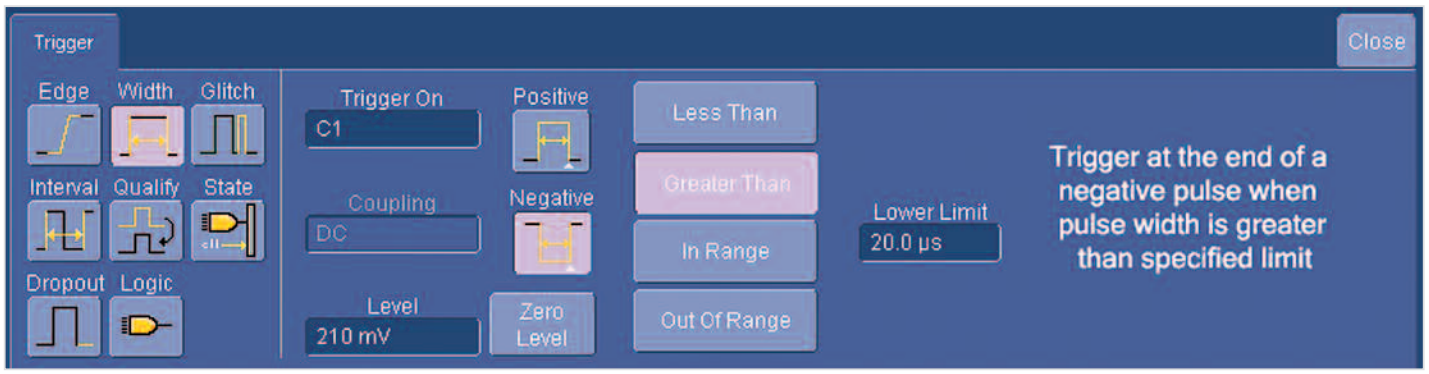


Other oscilloscopes are limited to 1.25 GS/s on each channel and display the same measurement as a less than informative sinusoidal signal.

SMART Trigger™ Makes the Most of Your Long Memory

The WaveRunner 6000A SMART Trigger provides the flexibility to quickly trigger and locate the specific signal characteristic or pattern you want. Trigger on abnormal signals at the touch of a button.

- Exclusion/inclusion feature triggers on signals outside, or within, a specific range of pulse widths.
- Selecting multiple threshold levels and pulse widths quickly catches the waveform for viewing and measuring.
- Memory retains thousands of acquired events for viewing at your leisure.
- Replay signal history, scan, and search from sweep to sweep.



The WaveRunner 6000A Series
An Outstanding Scope Experience

The WaveRunner 6000A oscilloscope is designed to be a custom fit to your working style. Hundreds of oscilloscope users helped us meet this goal by contributing their ideas to the uniquely efficient interface.

1. Bright Display

All WaveRunner 6000A Series oscilloscopes include a crisp and bright SVGA screen with 800 x 600 pixels for superior resolution. It's the best resolution available for this class of scope.

2. One-touch Efficiency

The descriptor labels show the oscilloscope settings and status. Touch the screen once to open a setup dialog and change settings.

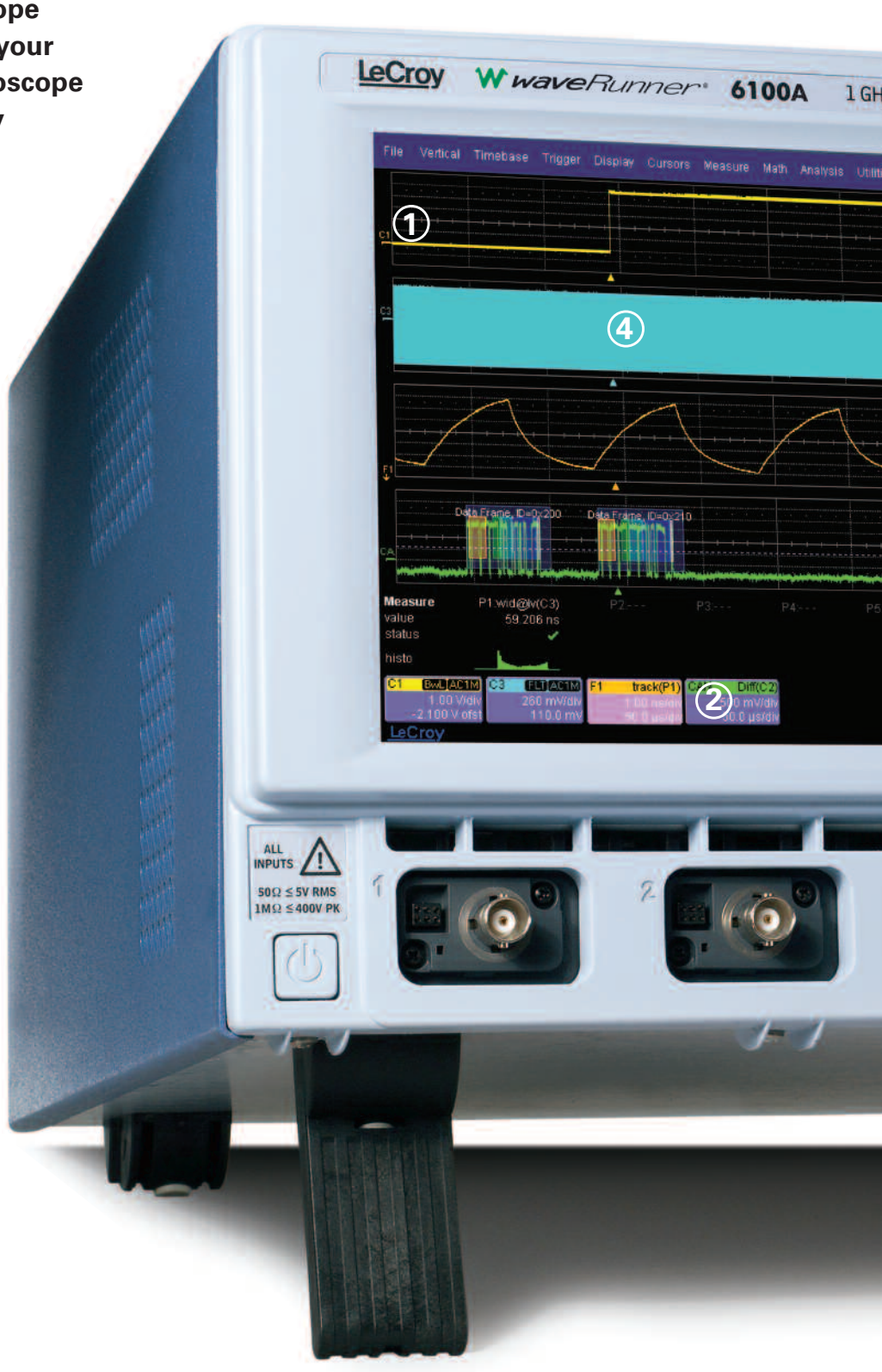
Quickly measure a signal's timing characteristics. Touch "Measure" and "Horizontal" to see multiple common timing parameters. Math, histograms, statistics, and other analysis tools are all within two touches.

3. Dedicated Vertical Controls

Each channel has its own volts per division (V/div) control knob. You can control any channel by turning the knob—eliminating the need to multiplex a single V/div control across all four channels.

4. Intensity Modulated Display

Display intensity can be adjusted from 0–100% to enable a better view of underlying glitches, runts, or signal modulation in long record captures. The perfect accompaniment to the WaveRunner 6000A oscilloscope's long memory.



PP007 Passive Probe

Only 2.5 mm in diameter with low circuit loading and a flat impulse response, this probe is the ideal fit for general-purpose applications.

5. Cursor Knobs

Need a quick measurement? Just turn the cursor knob to bring up a pair of vertical cursors to measure timing relationships and quickly characterize the waveform.

6. Zoom Control Knobs

Need a closer look at your signal? Push the QuickZoom button. Four dedicated knobs (zoom and offset in horizontal and vertical directions) make it easy to navigate any trace—from broad relationships to minute details.

7. "Push" Knobs

WaveRunner rotating knobs control functions, but pushing them invokes further functionality. Push the trigger level; the scope selects the correct setting for a stable display. Push the offset button; your scope instantly zeroes the offset, restoring the waveform clearly in the middle of the screen. Another push restores the offset.

8. Handy, Front Accessible USB Port

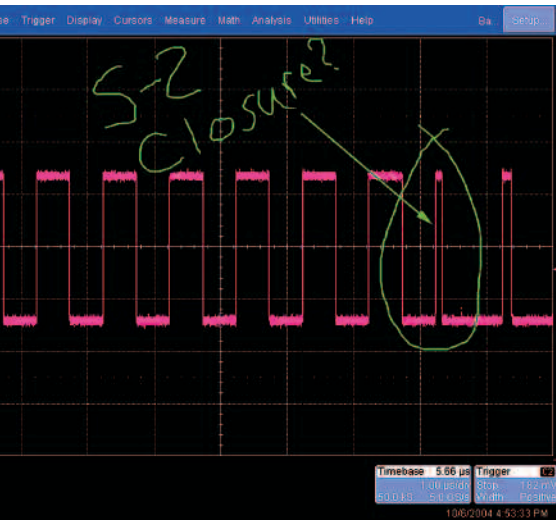
Use a memory stick to transfer your captured waveforms, or take your setup from scope to scope to automatically load your configuration. In addition, with one USB port on the front panel and four more on the back, you can connect a variety of plug-n-play peripheral and memory devices.

LabNotebook™
An In-Scope Solution for Documenting Results

WaveRunner lets you focus on understanding your signal rather than setting up your oscilloscope. The productivity improvement is dramatic and immediate. Here's a prime example of how thoroughly WaveRunner fits your everyday process.

LeCroy Introduces a Complete In-scope Solution—Standard on most LeCroy Oscilloscopes

Now you can efficiently create complete and detailed waveform reports directly in the oscilloscope. An all-in-one solution for annotating and sharing information, LabNotebook™ simplifies results recording and report generation by eliminating the multi-step processes that often involve several pieces of equipment.

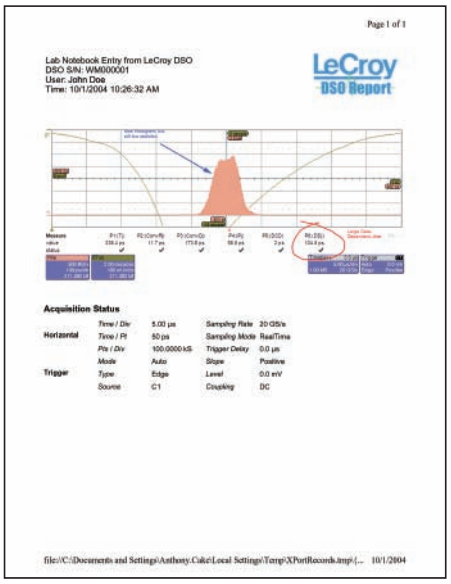


LabNotebook enables you to focus on results rather than the process, so you can now:

- Save all displayed waveforms
- Save the relevant setups with the saved waveform
- Add freehand notes with a stylus or as text
- Convert the complete report to pdf, rtf, or html
- Print or e-mail reports

Create Notes with the Screen Capture

By pressing Hard Copy, you can annotate waveforms as you capture them. Once the notes are finished, they can be readily saved as a report and e-mailed directly from the oscilloscope.



Flashback Function

You can employ the Flashback Function to recall the state of the oscilloscope, including saved waveforms and setup. Additional measurements are easily made using the keyword filter to find the correct notebook entry for recall.

From Everyday Testing to Robust Analysis

It's the perfect end-to-end solution: a bench top oscilloscope that can handle everyday signal measurements easily and efficiently, but can expand to perform more sophisticated WaveShape Analysis when needed. Yet it's priced far below other scopes that are not nearly as versatile and fully featured.

Expanded Analysis

The XMATH Advanced Math software package provides more than 30 math functions and 40 parameter measurements including:

- Parameter math
- Tracking measurements
- Expanded FFT (up to 24 Mpts)
- Expanded histogramming
- Trending of up to one million events

XMATH has a graphical interface that lets you connect input source, measurement, and display icons for surprisingly simple advanced analysis.

Custom Analysis

The XDEV Advanced Customization software package allows you to create your own scripts for measurement parameters or math functions, using third-party software packages such as Excel, MATLAB, and Mathcad.

XDEV seamlessly integrates your custom measurements directly into the oscilloscope's data path, eliminating the need to run separate programs. You can also use XDEV to customize the oscilloscope's interface. This package utilizes the power and efficiency of customization to enable faster analysis and solutions for your specific tasks.

Software Option Packages

General Purpose

Master Analysis Software Package (Includes JTA2, XMATH and XDEV)	WR6-XMAP
Advanced Math Software Package	WR6-XMATH
Customization Software Package	WR6-XDEV
Value Analysis Software Package (Includes XWAV and JTA2)	WR6-XVAP
Intermediate Math Software Package	WR6-XWAV
Processing Web Editor Software Package for Functions and Parameters	WR6-XWEB

Application Specific

Jitter and Timing Analysis Software Package	WR6-JTA2
PowerMeasure Analysis Software Package	WR6-PMA2
Digital Filter Software Package	WR6-DFP2
EMC Pulse Parameters Software Package	WR6-EMC*
Disk Drive Measurement Software Package	WR6-DDM2
Ethernet Test Software Package (WaveRunner 6200A Only)	WR6-ENET
USB 2.0 Compliance Test Software Package (WaveRunner 6200A Only)	WR6-USB2
Serial Data Mask Software Package	WR6-SDM†

Software and Hardware Option Packages

32 Digital Channel Oscilloscope Mixed Signal Option	MS-32‡
CANbus TDM Trigger, Decode and Measure/Graph Testing Option	CANbus TDM
CANbus TD Trigger and Decode Testing Option	CANbus TD

* WR6-EMC is compatible with all WaveRunner 6000A oscilloscopes except the WR6030A model.

† WR6200A oscilloscope required for full mask testing capability; lower bandwidth models will have reduced capabilities.

‡ MS-32 is compatible only with WR6000A 4-channel oscilloscopes.

Expandability Ensures an Excellent Return on Investment

Mixed Signal Testing Oscilloscope Option (MS-32)*

Add 32 digital channels to a 4-channel 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. 32 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 only with WR6000A 4-channel oscilloscopes.

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

Flexibly trigger on CAN bus messages. Decode and display hexadecimal data values next to the CAN signal on the screen. Measure and statistically analyze timing and other data. Graph system performance. Easily correlate electrical problems to CAN bus messages or error frame data.

Jitter and Timing Analysis Software Package (JTA2)

Find modulation effects and intermittent signal jitter to track timing changes, and to debug in the time, frequency, and statistical domains. Views like Jitter Track and Jitter Histogram let you see system variability in ways that you have never imagined.

Digital Filter Software Package (DFP2)

DFP2 lets you add any of a set of linear-phase Finite Impulse Response (FIR) filters. It enhances your ability to examine important signal components by filtering out undesired spectral components such as noise. Use the standard filters or create your own.

Electromagnetic Compatibility Software Package (EMC)*

The EMC software package adds flexibility to the rise time, fall time, and width parameters that are necessary to accurately measure ESD pulses, EFT bursts, surges and transients that are common in EMC testing. The WaveRunner 6000A provides easy access to parameter statistics and, with the EMC package, allows histogramming up to 2 billion events, parameter math, and measurement filtering.

*WR6-EMC is compatible with all WaveRunner 6000A oscilloscopes except the WR6030A model.

Disk Drive Measurement Software Package (DDM2)

The Disk Drive Measurement Package (DDM2) adds dozens of new disk drive measurements. DDM2, combined with WaveRunner 6000A's sequence triggering and SMART Triggers, offers the perfect solution for failure analysis when testing disk drives.

PowerMeasure Analysis Software Package (PMA2)

The PMA2 package automates and enhances your ability to analyze power conversion devices and circuits. Optional accessories, such as differential amplifiers, differential probes, current probes, and deskew fixtures complete the solution.

USB 2.0 Compliance Test Software Package (USB2)

(WaveRunner 6200A Only)

USB2 provides a complete acquisition and analysis system for USB 2.0 devices, hosts, and hubs, as specified in the USB-IF USB 2.0 Electrical Test Specification, version 1.0.

Ethernet Test Software Package (ENET)

(WaveRunner 6200A Only)

Conduct complete electrical testing for 1000Base-T, 100Base-T, and 10Base-T Ethernet standards. Jitter and pulse mask tests are performed with automatic waveform alignment, and all test results feature pass/fail indicators corresponding to the IEEE 802.3-2000 and ANSI X3.263 standards being tested.

Serial Data Mask Software Package (SDM)*

The SDM toolset harnesses the WaveRunner 6000A Series ocilloscope's long memory and low jitter to deliver outstanding serial bus characterization. Choose from a comprehensive list of standard eye pattern masks, or create a user-defined mask. Mask violations are clearly marked on the display, so you don't have to guess.

SDM also allows a software "GOLDEN" PLL reference to recover an eye diagram from a single long acquisition. The measurement is complete in seconds, and the already low trigger jitter is eliminated, giving you the most precise result possible.

*WR6200A oscilloscope required for full mask testing capability; lower bandwidth models will have reduced capabilities.

Application and Analysis Package 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
Δ 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
Δ time @ level
Δ 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

Master Analysis Software Package (XMAP)

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

Advanced Math Software Package (XMATH)

This package provides a comprehensive set of WaveShape Analysis tools providing insight into the wave shape of complex signals. Additional capability provided by XMATH includes:

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

Advanced Customization Software Package (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 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 (XVAP)

XVAP Adds the following capabilities:

Measurements:

- Jitter and Timing parameters (period@level,width@level, edge@level, duty@level, time interval error@level, frequencey@level, half period, setup, skew, Δ period@level, Δ width@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 (XWAV)

XWAV Adds the following capabilities:

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

Application and Analysis Package Specifications

Application Specific Test and Analysis Packages

Jitter and Timing Analysis Software Package (JTA2)

This package provides jitter timing and analysis using time, frequency, and statistical views for common timing parameters, and also includes other useful tools. JTA2 includes:

- Jitter and timing parameters, with "Track" graphs of
  - Cycle-Cycle Jitter
  - N-Cycle
  - N-Cycle with start selection
  - Frequency
  - Period
  - Half Period
  - Width
  - Time Interval Error
  - Setup
  - Hold
  - Skew
  - Duty Cycle
  - Duty Cycle Error
- Edge@lv parameter (counts edges)
- Histograms expanded with 19 histogram parameters and up to 2 billion events
- Trend (datalog) of up to 1 million events
- Track graphs of all parameters
- Persistence histogram, persistence trace (mean, range, sigma)

Digital Filter Software Package (DFP2)

LeCroy's Digital Filter Package (DFP2) implements a set of linear-phase Finite Impulse Response (FIR) filters and IIR filters. It enhances your ability to examine important signal components by filtering out undesired spectral components such as noise. With the custom design feature, corrupted signals can be reconstructed by applying matched (mirror) filters to compensate for known distortions.

The DFP2 option has a broad range of applications:

- System Identification
- Prediction
- Noise Cancellation
- Low-pass Filters
- Band-stop Filters
- Band-pass Filters
- High-pass Filters
- Raised Cosine, Raised Root Cosine, and Gaussian Filters

PowerMeasure Analysis Package (PMA2)

This package provides exceptional ability to measure and analyze the operating characteristics of power conversion devices and circuits.

- Automatic setup and display of relevant waveforms and parameters
- Waveforms scaled and displayed in volts, amps, watts, ohms, etc.
- Power device performance analyzed in-circuit
- Measure and view time domain response of the entire control loop
- Pre-compliance line harmonic testing to EN 61000-3-2
- Complete solutions available including probes and differential amplifiers

EMC Pulse Parameter Software Package (WR6-EMC)*

This package includes enhanced Rise@level, Fall@level and Width@level parameters. The new functionality in the WR6-EMC software package includes user definable thresholds for accurate pulse measurements.

*WR6-EMC is compatible with all WaveRunner 6000A oscilloscopes except the WR6030A.

Disk Drive Measurements Package (DDM2)

This package provides disk drive parameter measurements and related mathematical functions for performing disk drive WaveShape Analysis.

- Disk Drive Parameters are as follows:
  - amplitude assymetry
  - local base
  - local baseline separation
  - local maximum
  - local minimum
  - local number
  - local peak-peak
  - local time between events
  - local time between peaks
  - local time between troughs
  - local time at minimum
  - local time at maximum
  - local time peak-trough
  - local time over threshold
  - local time trough-peak
  - local time under threshold
  - narrow band phase
  - narrow band power
  - overwrite
  - pulse width 50
  - pulse width 50-
  - pulse width 50+
  - resolution
  - track average amplitude
  - track average amplitude-
  - track average amplitude+
  - auto-correlation s/n
  - non-linear transition shift
- Correlation function
- Trend (datalog) of up to 1 million events
- Histograms expanded with 18 histograms parameters and up to 2 billion events

CANbus TDM Trigger, Decode, and Measure/Graph Testing Option (CANbus TDM)

- Trigger Module with TC251-OPTO optically isolated Trigger Coupler installed (and room for one additional Trigger Coupler). Trigger Couplers are interchangeable.
- CANbus TD Series Oscilloscope Interface Module with 1.0 meter connection cable. Connects Trigger Module to LeCroy oscilloscope ProBus interface.
- Storage case with accessories (other accessories may be required)
- Software for
  - Trigger Setup
  - CAN Protocol Decode
  - CAN Measurement, (CAN-analog, CAN-CAN, and Time@CAN timing parameters, CAN bus load% and CAN-Value Data Extraction parameters)
  - Histogramming (up to 2 billion events)
  - Graphing (Track and Trend).

CANbus TD Trigger and Decode Testing Option (CANbus TD)

- Same hardware package as CANbus TDM
- Software for only
  - Trigger Setup
  - CAN Protocol Decode

Oscilloscope Mixed Signal Option (MS-32)*

32 Digital Channel Oscilloscope Mixed Signal Option.
Gripper probe accessories are recommended.

*MS-32 is compatible only with WR6000A 4-channel oscilloscopes.

Specifications

Vertical System	WaveRunner 6030A	WaveRunner 6050A	WaveRunner 6051A	WaveRunner 6100A	WaveRunner 6200A
Nominal Analog Bandwidth @ 50 Ω, 10 mV-1 V/div	350 MHz	500 MHz	500 MHz	1 GHz	2 GHz
Rise Time (Typical)	1 ns	750 ps	750 ps	300 ps	200 ps
Input Channels	4	4	2	4	4
Bandwidth Limiters	20 MHz; 200 MHz				
Input Impedance	1 MΩ || 20 pF (10 MΩ || 9.5 pF using PP007 probe)				
Input Coupling	50 Ω: DC, 1MΩ: AC, DC, GND				
Maximum Input Voltage	50 Ω: 5 V_{rms}, 1 MΩ: 250 V max. (Peak AC: ≤ 10 kHz + DC)				
Channel to Channel Isolation	> 40 dB @ < 100 MHz (> 30 dB @ full bandwidth)				
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: ±400 mV @ 2–4.95 mV/div ±1 V @ 5–100 mV/div ±10 V @ 102 mV/div–1 V/div 1 MΩ: ±400 mV @ 2–4.95 mV/div ±1 V @ 5–100 mV/div ±10 V @ 102 mV/div–1 V/div ±100 V @ 1.02 V/div–10 V/div				
Offset Accuracy	±(1.5% of offset value + 0.5% of full scale +1 mV) all fixed gain setting < 2 V/div ±(1.5% of offset value + 1.0% of full scale + 1 mV) for variable and V/div settings ≥ 2 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: to 20 ps/div, Roll mode: up to 1,000 s/div
Clock Accuracy	≤ 5 ppm @ 25 °C (≤ 10 ppm @ 5–40 °C)
Sample Rate and Delay Time Accuracy	Equal to Clock Accuracy
Trigger and Interpolator Jitter	≤ 3 ps rms (typical)
Time Interval Accuracy	Clock Accuracy + Jitter
Channel to Channel Deskew Range	±9 x time/div setting, 100 ms max., each channel
External Sample Clock	DC to 1 GHz; 50 Ω, (limited BW in 1 MΩ), BNC input, limited to 2 Ch operation (1 Ch in WR6051A), (minimum rise time and amplitude requirements apply at low frequencies)
Roll Mode	User selectable. Available at lower time/div settings

Acquisition System

Single-Shot Sample Rate/Ch	2.5 GS/s	5 GS/s	5 GS/s	5 GS/s	5 GS/s
Interleaved Sample Rate (2 Ch)	5 GS/s	N/A	N/A	10 GS/s	10 GS/s
Random Interleaved Sampling (RIS)	200 GS/s				
Trigger Rate	125,000 waveforms/second				
Sequence Time Stamp Resolution	1 ns				
Minimum Time Between Sequential Segments	8 µs				

Acquisition Memory Options	Max. Acquisition Points (4 Ch/2 Ch, 2 Ch/1 Ch in WR6051A)	Segments (Sequence Mode)
Standard	4M/8M	1,000
Option L	8M/16M	5,000
Option VL	12M/24M	10,000

Acquisition Processing	WR6030A	WR6050A	WR6051A	WR6100A	WR6200A
Time Resolution (min, Single-shot)	200 ps (5 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				

Specifications

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
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	2 ns to 20 s or 1 to 1,000,000,000 events
Internal Trigger Level Range	±4.1 div from center (typical)

	WR6030A	WR6050A	WR6051A	WR6100A	WR6200A
Trigger Sensitivity with Edge Trigger (Ch 1-4 + external)	2 div @ < 350 MHz, 1 div @ < 250 MHz	2 div @ < 500 MHz, 1 div @ < 350 MHz	2 div @ < 500 MHz, 1 div @ < 350 MHz	2 div @ < 1 GHz, 1 div @ < 750 MHz	2 div @ < 2 GHz, 1 div @ < 1.8 GHz
Max. Trigger Frequency with SMART Trigger® (Ch 1-4 + external)	350 MHz @ ≥ 10 mV	500 MHz @ ≥ 10 mV	500 MHz @ ≥ 10 mV	750 MHz @ ≥ 10 mV	750 MHz @ ≥ 10 mV

Trigger Level DC Accuracy	±4% full scale ±2 mV (typical)
External trigger range	EXT/10 ±4 V; EXT ±400 mV

Basic Triggers

Edge	Triggers when signal meets slope (positive or negative) 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 2 ns and 20 s.
Pattern	Logic combination (AND, NAND, OR, NOR) of 5 inputs (4 channels and external trigger input – 2 Ch+EXT on WR6051A). 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.

SMART Triggers w ith E xclusion Technology

Glitch and Pulse Width	Triggers on positive or negative glitches with widths selectable from 600 ps to 20 s or on intermittent faults (subject to bandwidth limit of oscilloscope).
Signal or Pattern Interval	Triggers on intervals selectable between 2 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 2 ns to 20 s, or 1 to 99,999,999 events.
Exclusion Triggering	Trigger on intermittent faults by specifying the normal width or period.

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 PP007-WR-1 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 8.4" flat-panel TFT-LCD with high resolution touch screen
Resolution	SVGA; 800 x 600 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

Analog Persistence Display

Analog and Color-Graded Persistence	Variable saturation levels; stores each trace's persistence data in memory.
Persistence Selections	Select analog, color, or three-dimensional.
Trace Selection	Activate persistence on all or any combination of traces.
Persistence	Aging time select from 500 ms to infinity.
Sweeps Displayed	All accumulated, or all accumulated with last trace highlighted.

Specifications

Zoom Expansion Traces

	Display up to 4 Zoom/Math traces

CPU

Processor	Intel® Celeron,® 2.0 GHz or better.
Processing Memory	256 MB on Std and M option; 512 MB with L and VL options
Operating System	Microsoft Windows® XP Professional

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	10/100Base-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 dual-monitor display mode.
Parallel Port	Standard DB-25
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 MΩ: AC, DC, GND
Maximum Input Voltage	50 Ω: 5 V_{rms}, 1 MΩ: 250 V max. (Peak AC: ≤ 10 kHz + DC)

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	100–240 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: 400 VA/400 W; 350 VA/350 W for WaveRunner 6051A

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 45% 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 at ≤ 25 °C
Altitude: Non-Operating	12,190 m (40,000 ft.)

Physical

Dimensions (HWD)	211 mm x 355 mm x 363 mm (excluding feet) 8.3" x 13.8" x 14.3"
Net Weight	10 kg. (22 lbs.), excluding printer
Shipping Weight	less than 13.6 kg. (30 lbs.)

Certifications

	CE Compliant, UL and cUL listed; Conforms to EN 61326-1, EN 61010-1, UL 3111-1, and CSA C22.2 No. 1010.1.

Warranty and Service

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

Ordering Information

WaveRunner 4-Channel/2-Channel Oscilloscopes	Product Code
2 GHz, 4 Ch, 5 GS/s, 4 Mpts/Ch (10 GS/s, 8 Mpts/2 Ch) Color with Windows® XP Pro	WaveRunner 6200A
1 GHz, 4 Ch, 5 GS/s, 4 Mpts/Ch (10 GS/s, 8 Mpts/2 Ch) Color with Windows XP Pro	WaveRunner 6100A
500 MHz, 4 Ch, 5 GS/s, 4 Mpts/Ch (8 Mpts/2 Ch) Color with Windows XP Pro	WaveRunner 6050A
500 MHz, 2 Ch, 5 GS/s, 4 Mpts/Ch (8 Mpts/1 Ch) Color with Windows XP Pro	WaveRunner 6051A
350 MHz, 4 Ch, 2.5 GS/s, 4 Mpts/Ch (5 GS/s, 8 Mpts/2 Ch) Color with Windows XP Pro	WaveRunner 6030A

Included with Standard Configuration	
÷10 HiZ 500 MHz Passive Probe (Total of 1 Per Channel)	PP007-WR-1
Getting Started Manual	
CD-ROM containing Operator's Manual, Remote Control Manual, and Automation Manual	
CD-ROMs containing Utility Software	
Optical 3-button Wheel Mouse – USB	
Standard Ports; 10/100Base-T Ethernet, USB 2.0 (5), Parallel, RS-232, SVGA Video out, Audio in/out	
Protective Front Cover	
Standard Commercial Calibration and Performance Certificate	
3-Year Warranty	

Memory Options	
24 Mpts max. when interleaved, 12 Mpts/Ch (for use with 4 Ch WaveRunner 6000A)	WR6-VL
24 Mpts max., 2 Ch 12 Mpts/Ch Memory Option	WR6-VL2
16 Mpts max. when interleaved, 8 Mpts/Ch (for use with 4 Ch WaveRunner 6000A)	WR6-L
16 Mpts max., 2 Ch 8 Mpts/Ch Memory Option	WR6-L2

Software Options	
Disk Drive Measurement Software Package	WR6-DDM2
Digital Filter Software Package	WR6-DFP2
Ethernet Test Software Package (WR6200A Only)	WR6-ENET
Jitter and Timing Analysis Software Package	WR6-JTA2
PowerMeasure Analysis Software Package	WR6-PMA2
EMC Pulse Parameter Software Package	WR6-EMC*
Serial Data Mask Software Package	WR6-SDM†
USB 2.0 Compliance Test Software Package (WR6200A Only)	WR6-USB2
Intermediate Math Software Package	WR6-XWAV
Advanced Math Software Package	WR6-XMATH
Advanced Customization Software Package	WR6-XDEV
Value Analysis Software Package (Includes XWAV and JTA2)	WR6-XVAP
Master Analysis Software Package (Includes JTA2, XMATH and XDEV)	WR6-XMAP
Processing Web Editor Software Package for Functions and Parameters	WR6-XWEB

*WR6-EMC is compatible with all WaveRunner 6000A oscilloscopes except the WR6030A.

†WR6200A oscilloscope required for full mask testing capability; lower bandwidth models will have reduced capabilities.

Hardware and Software Options	
32 Digital Channel Oscilloscope Mixed Signal Option	MS-32*
CANbus TDM Trigger, Decode and Measure/Graph Testing Option	CANbus TDM
CANbus TD Trigger and Decode Testing Option	CANbus TD

*MS-32 is compatible only with WR6000A 4-channel oscilloscopes.

Probes and Probe Accessories Options	Product Code
2.5 GHz, 0.7 pF Active Probe (÷10), Small Form Factor	HFP2500
1.5 GHz, 0.7 pF Active Probe (÷10), Small Form Factor	HFP1500
1 GHz, 0.7 pF Active Probe (÷10), Small Form Factor	HFP1000
WaveLink® 4 GHz Differential Probe with Adjustable Tip Module	D300A-AT*
WaveLink 4 GHz, 5 V Differential Probe with Small Tip Module	D350ST*
WaveLink ProBus Probe Body	WL300
1 GHz Active Differential Probe (÷1, ÷10, ÷20)	AP034
500 MHz Active Differential Probe (x10, ÷1, ÷10 or ÷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 Differential Probe	ADP305
1,400 V, 20 MHz Differential Probe	ADP300
Basic Adapter Kit for PP007-WR-1 and PP007-WS-1	PK701
Advanced Adapter Kit for PP007-WR-1 and PP007-WS-1	PK702
SMD Adapter Kit for PP007-WR-1 and PP007-WS-1	PK703
Microclip Kit for PP007-WR-1 and PP007-WS-1	PK704
1 Ch 100 MHz Differential Amplifier with Precision Voltage Source	DA1855A

*For a complete probe, order a WL300 Probe Body with the Probe Tip Module. Only applicable with the WR6200A oscilloscope.

Hardware Options and Accessories	
IEEE-488 GPIB Interface Upgrade	WR6-GPIB
Graphics Printer	WR6A-GP
Removable Hard Drive	WR6-RHD
CD-RW Upgrade	WR6-CDRW
Graphic Printer Retrofit	WR6A-RK-GP
USB Floppy Drive	WR6-FLPY
Hard Transit Case	WR6-HARD
Soft Carrying Case	WR6-SOFT
Rackmount, 6U High	WR6-RACK
Accessory Pouch	WR6-POUCH
Mini Keyboard, USB	WR6-KBD
USB Flash Memory	MEM-USB
Video Trigger Module	VT75
Oscilloscope Cart with Additional Shelf and Drawer	OC1024
Oscilloscope Cart	OC1021
Ethernet Compliance Fixture for 10Base-T	TF-10BT
Ethernet Compliance Fixture for 100Base-T/1000Base-T [Includes a Set of 2 Test Fixtures Signals on Twisted Pair Cables (UTP)]	TF-ENET
Telecom Adapter Kit 100 Ω Bal., 120 Ω Bal., 75 Ω Unbal.	TF-ET
USB 2.0 Testing Compliance Test Fixture	TF-USB

Customer Service

LeCroy oscilloscopes 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.

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

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