

# WaveRunner 6000 Series

**6030**  
**6050/6051**  
**6100**  
**6200**

## LEADING FEATURES

- **350 MHz, 500 MHz, 1 GHz and 2 GHz Bandwidths**
- **5 GS/s on All Channels (10 GS/s on 2 Ch for 6100 and 6200)**
- **1 Mpts on All Channels, Expandable to 12/24 Mpts**
- **Compact and Lightweight**
- **Easy User Interface**
- **New 2.5 mm Passive Probe**
- **Touch Screen Interface**
- **Vertical Controls for Each Channel**
- **USB 2.0 and 802.3xx LAN Ports**
- **Open Windows 2000**



## Excellent Performance, Great Price, Easy to Use

LeCroy's WaveRunner® 6000 Series is built to be the world's best everyday bench oscilloscope. It offers the best acquisition specifications, a user interface that makes it easy to perform the most common oscilloscope functions, industry-leading long term support and a "feel" that makes the oscilloscope a pleasure to drive.

For the first time, LeCroy has combined the type of high performance front amplifier, ADC, memory and triggering used in more expensive oscilloscopes and designed it all into a very affordable package. The WaveRunner 6000 Series also introduces a user interface that makes viewing and measuring signals simple and fast.

With the WaveRunner 6000 Series, all viewing controls and basic oscilloscope functions are easily at hand using front panel knobs. You get fast views and can zoom in to see details on the bright touch panel color screen. Or use the simple and intuitive controls to call up exactly the measurements you need.

The WaveRunner 6000 Series includes an industry-leading signal acquisition path, which provides a 5 GS/s ADC on every

channel and 1 Mbyte of standard memory. No need to worry about the undersampling or aliasing caused by slower ADCs or shorter memories on other oscilloscopes.

The WaveRunner 6000 Series comes standard with the new PP007 500 MHz passive probe (one per channel). This 2.5 mm high impedance probe offers excellent characteristics for probing everyday signals. LeCroy also offers a wide range of optional single-ended and differential active probes, current probes, optical to electrical (O/E) converters and differential amplifiers.

Lastly, we decided to architect the oscilloscope so that users could add just the functionality they want. There are options for testing power devices, serial data mask testing, jitter and timing analysis, and for a wide variety of probes, O/E converters and other application specific devices.

Altogether, the WaveRunner 6000 Series sets a new industry standard for high performance at low price in everyday bench oscilloscopes.

	WaveRunner 6030	WaveRunner 6050	WaveRunner 6051	WaveRunner 6100	WaveRunner 6200
<b>Vertical System</b>					
Analog Bandwidth @ 50 Ω, 10 mV–1 V/div, (-3 dB)	350 MHz	500 MHz	500 MHz	1 GHz	2 GHz
Rise Time (Typical)	1 ns	750 ps	750 ps	400 ps	225 ps
Input Channels	4	4	2	4	4
Bandwidth Limiters	20 MHz; 200 MHz				
Input Impedance	1MΩ    < 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 Vrms, 1 MΩ: 250 Vmax (Peak AC: ≤ 5 kHz + DC)				
Channel to Channel Isolation	> 40 dB @ < 100MHz (> 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 Gain Accuracy	±1.0% of full scale (typical), ±1.5% of full scale with V/Div ≥ 10 mV (warranted)				
Offset Range	50 Ω: ±400 mV @ 2–4.95 mV/div ±1 V @ 5–100 mV/div ±10 V @ 102 mV/div – 1V/div 1 MΩ: ±400 mV @ 2–4.95 mV/div ±1 V @ 5–100 mV/div ±10 V @ 102 mV/div – 1V/div ±100 V @ 1.02V/div – 10V/div				
Offset Accuracy	±(1.5% + 0.5% of offset value + 1 mV)				
Probing System	BNC or Probus®				
<b>Timebase System</b>					
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)				
Time Interval Accuracy	Clock Accuracy + Jitter Noise Floor				
Sample Rate and Delay Time Accuracy	Equal to Clock Accuracy				
Trigger and Interpolator Jitter	≤ 3 ps rms				
Channel to Channel Deskew Range	±9 X time/div setting, 100 ms max, each channel.				
External Sample Clock	DC to 1 GHz; 50 Ω or 1M Ω BNC input. Limited to 2 channel operation, (CH2 only in 6051). Minimum rise time and amplitude requirements apply at low frequencies.				
Roll Mode	User selectable. Available at lower time/div settings.				
<b>Acquisition System</b>					
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)	N/A	N/A	N/A	10 GS/s	10 GS/s
Max. Random Interleaved Sampling (RIS) Rate	200 GS/s				
Max. Trigger Rate	125,000 waveforms/second				
Sequence Time Stamp Resolution	1 ns				
Minimum Time between Sequential Segments	8 μs				
<b>ACQUISITION MEMORY</b>	<b>Max. Acquisition Points (4 Ch / 2 Ch; 2 Ch / 1 Ch in 6051)</b>		<b>Segments (Sequence Mode)</b>		
Standard	1M / 2M		500		
Option S	2M / 4M		500		
Option M	4M / 8M		1,000		
Option L	8M / 16M		5,000		
Option VL	12M / 24M		10,000		
<b>Acquisition Processing</b>	<b>6030</b>	<b>6050</b>	<b>6051</b>	<b>6100</b>	<b>6200</b>
Time Resolution (min. Single-shot)	200 ps (5 GS/s)			100 ps (10 GS/s)	
Averaged	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				
<b>Trigger System</b>					
Trigger Modes	Normal, Auto, Single, Stop				
Sources	Any input channel, External, Ext/10, or Line; slope and level unique to each source				
Trigger Coupling	DC				
Pre-trigger Delay	0–100% of memory size (adjustable in 1% increments, or 100 ns)				
Post-trigger Delay	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)				
	<b>6030</b>	<b>6050</b>	<b>6051</b>	<b>6100</b>	<b>6200</b>
Trigger Sensitivity w/ Edge Trigger (CH1-4+ 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 w/ SMART Trigger® (CH1-4+ external)	350 MHz Max. @ ≥ 10 mV	500 MHz Max. @ ≥ 10 mV	500 MHz Max. @ ≥ 10 mV	750 MHz Max. @ ≥ 10 mV	750 MHz Max. @ ≥ 10 mV
Trigger Level DC Accuracy	±4% full scale ±2 mV (typical)				
External Trigger Range	EXT/10 ±4V; EXT ±400mV				
<b>Basic Triggers</b>					
Edge/Slope/Line	Triggers when signal meets slope (positive or negative) and level condition				
<b>SMART Triggers®</b>					
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 6051). 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® with Exclusion 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 10 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 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; 800x600 pixels
Real Time Clock	Dates, hours, minutes, seconds displayed with waveform. Accurate to $\pm 50$ ppm. SNTP support to synchronize to precision internet clocks.
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

## Zoom Expansion Traces

	Display up to 4 Zoom/Math traces.
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## CPU

Processor	Intel Celeron 1.7 GHz or better
Processing Memory	256 MB on Std, S & M option; 512 MB with L and VL option
Operating System	Microsoft Windows 2000 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
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## Setup Storage

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

Remote Control	Via Windows Automation, or via LeCroy Remote Command Set
GPIO 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 RS232 port (not for remote oscilloscope control)

## Auxiliary Input

Signal Types	Selected from External Trigger or External Clock input on front panel
Coupling	50 $\Omega$ : DC, 1M $\Omega$ : AC, DC, GND
Maximum Input Voltage	50 $\Omega$ : 5 Vrms, 1M $\Omega$ : 250 Vmax (Peak AC: $\leq 10$ kHz + DC)

## General

Auto Calibration	Ensures specified DC and timing accuracy is maintained for 1-year minimum
Probe Calibrator	Output available on front panel provides a variety of DC and square wave signals for probe compensation adjustment
Power	100–240 Vrms at 50/60 Hz; 115 Vrms ( $\pm 10\%$ ) 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 6051

## Environmental

Temperature: Operating	+5 °C to 40 °C
Temperature: Nonoperating	-20 °C to +60 °C
Humidity: Operating	5% to 80% RH (noncondensing) up to 30 °C; upper limit derates linearly to 45% RH (noncondensing) at 40 °C
Humidity: Nonoperating	5% to 95% RH (noncondensing) as tested per MIL-PRF-28800F
Altitude: Operating	3,048 m (10,000 ft.) max at $\leq 25$ °C
Altitude: Nonoperating	12,190m (40,000 ft.)

## Physical

Dimensions (HWD)	211 mm x 355 mm x 363 mm (excluding handle and 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 Approved, UL and cUL listed; Conforms to EN 61326-1, EN 61010-1, UL 61010B-1, and CSA C22.2 No. 1010.1
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## Warranty and Service

	3-year warranty; calibration recommended annually. Optional service programs include extended warranty, upgrades, calibration, and customization services
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### WaveRunner 2- and 4-Channel Digital Oscilloscopes

2 GHz, 5 GS/s, 1 Mpts/4 Ch; 10 GS/s, 2 Mpts/2 Ch, 4 Ch Color	WaveRunner 6200
1 GHz, 5 GS/s, 1 Mpts/4 Ch; 10 GS/s, 2 Mpts/2 Ch, 4 Ch Color	WaveRunner 6100
500 MHz, 5 GS/s, 1 Mpts/4 Ch; 5 GS/s, 2 Mpts/2 Ch, 4 Ch Color	WaveRunner 6050
500 MHz, 5 GS/s, 1 Mpts/2 Ch; 5 GS/s, 2 Mpts/1 Ch, 2 Ch Color	WaveRunner 6051
350 MHz, 5 GS/s, 1 Mpts/4 Ch; 5 GS/s, 2 Mpts/2 Ch, 4 Ch Color	WaveRunner 6030

### Included with Standard Configuration

10:1 10 MΩ, 500 MHz BW Passive Probes – Qty 4 (2 with WaveRunner 6051)	PP007
Printed Getting Started Manual	WR6-GS-E
CD-ROM containing Operators Manual, Remote Command Manual, Utility Software, and Recovery Software	
Optical 3-button Wheel Mouse – USB	
Standard Ports; 10/100Base-T Ethernet, USB (5), Parallel, RS-232, SVGA Video out, Audio in/out	
Internal Hard Drive	
Protective Front Cover	
Standard Commercial Calibration and Performance Certificate	
3-Year Warranty	

### Memory Options

	6200	6100	6050	6030	6051
2 Mpts/Ch, 4 Mpts maximum using 2 Channel (1 Channel for 6051)			S		S2
4 Mpts/Ch, 8 Mpts maximum using 2 Channel (1 Channel for 6051)			M		M2
8 Mpts/Ch, 16 Mpts maximum using 2 Channel (1 Channel for 6051)			L		L2
12 Mpts/Ch, 24 Mpts maximum using 2 Channel (1 Channel for 6051)				VL	VL2

### Hardware Options

Removable HDD	WR6-RHD
CD-RW Upgrade	WR6-CDRW

### WaveShape Analysis Packages

CAN Bus Tigger and Decode Test Package	CANbus TD
Jitter and Timing Analysis	WR6-JTA2
PowerMeasure Analysis	WR6-PMA2
Disk Drive Measurement Package	WR6-DDM2
Digital Filter Package	WR6-DFP2
Serial Data Mask Package	WR6-SDM
Ethernet Test Package (WaveRunner 6100 and 6200 only1)	WR6-ENET
USB 2.0 Compliance Software (WaveRunner 6200 only2)	WR6-USB2
Advanced Math Package	WR6-XMATH
Intermediate Math Package	WR6-XWAV
Master Analysis Package (XMATH + XDEV + JTA2)	WR6-XMAP
Value Analysis Package (XWAV + JTA2)	WR6-XVAP
Developer's Customization Kit	WR6-XDEV
Norton Antivirus	WR6-AV

### Selected Accessories

Passive Probe, 500 MHz	PP007-1
2.5 GHz Active Voltage Probe	HFP2500
1.5 GHz Active Voltage Probe	HFP1500
1 GHz Active Voltage Probe	HFP1000
500 MHz Differential Probe	AP033
1 GHz Differential Probe	AP034
500A, 2 MHz Current Probe	CP500
150A, 10 MHz Current Probe	CP150
15A, 50 MHz Current Probe	CP015
30A, 50 MHz Current Probe	AP015
3 GHz Differential Probe and Adjustable Tips	D300 & D300AT
100 MHz Differential Amp	DA1855A
Floppy Drive (External USB)	WR6-FLPY
Rackmount, 6U Height	WR6-RACK
Mini Keyboard	WR6-KBD
Soft Carrying Case	WR6-SOFT
Hard Transit Case	WR6-HARD
Accessory Pouch	WR6-POUCH
GPIB	WR6-GPIB
256 MB USB Memory Key	MEM-USB
Scope Cart – Basic	OC1021
Scope Cart – With extra shelf & drawer	OC1024
Operator's Manual Printed Hardcopy	WR6-OM-E
5-Year NIST Calibration and Warranty	WR6-T5

<sup>1</sup> Package may be used with lower BW oscilloscope models, however, some measurements will not operate with signals at all data rates.

<sup>2</sup> Can be used with lower bandwidth models, however only USB 1.1 test functions will be available. WaveRunner 6200 required for USB 2.0 capability.

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