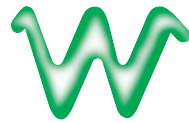


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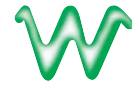
WaveRunner DIGITAL OSCILLOSCOPES

Announcing WaveRunner 6000 Series – The Dream Scope



LeCroy

LeCroy



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The New WaveRunner 6000 Series

The New Benchmark



WAVERUNNER 6000 SERIES

- Remarkably easy to use
- Sets a new standard for value
- Simple, affordable, and uncommonly capable

A BRAND NEW DAY FOR THE EVERYDAY BENCH SCOPE

The new WaveRunner 6000 Series is an engineer's dream come true: simple, affordable, and uncommonly capable. Until recently, you had to make a choice—shell out for a costly, complex, high-powered analytical oscilloscope for your everyday bench work. Or buy a cheap model and get stuck with an inferior, underpowered, low-end scope. The WaveRunner 6000 Series benchtop oscilloscopes eliminate this trade-off.

A simple scope for quick and easy measurements.

A high-powered analytical scope for more complex WaveShape Analysis.

What gives the WaveRunner 6000 Series this unprecedented versatility?

for Everyday Oscilloscopes

- An intuitive two-tiered user interface puts common tasks at your fingertips — and deeper analysis only two touches away.
- Uncompromising acquisition technology gives you confidence in the accuracy of your waveform measurements.
- Limitless analysis capability expands with your needs, eliminating equipment obsolescence.
- New passive probe with low impedance and a flat impulse response.
- The strongest warranty and longest support life available.

All at a remarkably affordable price.



The New WaveRunner 6000 Series

The New WaveRunner 6000 Series



1. Need to change settings? Touch the screen once.

In addition to the descriptor fields showing comprehensive information about scope settings and status, you can touch them to open up a setup dialog and change your settings.

2. Want to do some analysis? Two touches.

Want to quickly characterize a signal's timing characteristics? Touch 'Measure' and 'Horizontal' to see six 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. 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.

5. Zoom control knobs

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

6. Press a knob — presto!

Lost the waveform? Just press the offset button. Your scope instantly zeroes the offset, restoring the waveform to the middle of your screen where you can see it clearly. Press again to restore the offset. Similar press functions allow you to automatically set the trigger level, zero delay, and reset zooms.

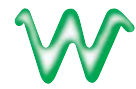
7. Handy USB Port

With one USB port on the front panel and four more on the back, you can connect an unlimited number of plug-n-play peripheral and memory devices.

Bonus feature: use a memory stick to take your setup from scope to scope and have them all automatically boot to your configuration. No more debates over settings with other users.

8. PP007 Passive Probe

This new probe is perfect for general-purpose applications — only 2.5 mm with low capacitance and a flat impulse response.



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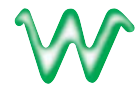
An Interface that's Easy to Use – Impossible to be Without

Hundreds of scope users like you have contributed to this uniquely simple and convenient user interface. With the WaveRunner 6000, everything you need to view and measure waveforms quickly and efficiently can be controlled from the front panel. Volts per division, offset, zoom, triggers, cursors, and documentation — all are at your fingertips with the turn of a knob or the press of a button.

Need to go beyond quick measurements and do some more sophisticated analysis? Just touch the display screen. Simple pop-up menus guide you, easily and intuitively, through virtually every measurement you might ever want to make.

We started from the proven code base of our acclaimed WaveMaster™ and WavePro® scopes. But it was hundreds of concept, alpha, and beta testers who helped us add the convenient little touches that make WaveRunner 6000 an outstanding everyday scope.





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The New WaveRunner 6000 Series

Acquisition Performance without Tradeoffs

Old-technology scopes force you to make trade-offs between sample rate and memory that compromise the accuracy of your measurements:

- You can have a fast sample rate, but you can't run at full speed for more than a few microseconds.

So you risk missing a detail that is separated from the trigger point. Or . . .

- You can run at full speed longer, but sample at a slower rate.

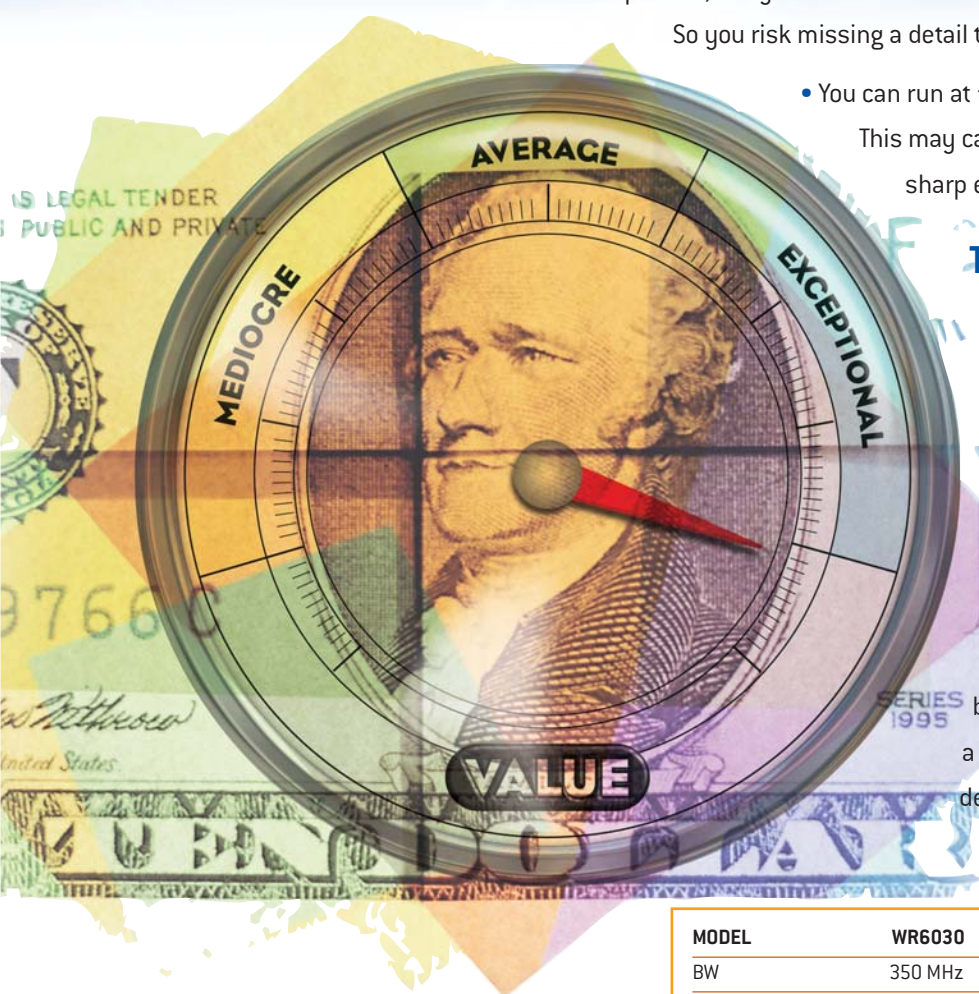
This may cause you to miss a high-frequency transient or a sharp edge.

The WaveRunner 6000 Series takes the trade-offs away.

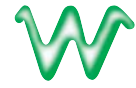
The WaveRunner 6000 Series of benchtop scopes backs up bandwidths from 350 MHz to 2 GHz, with sample rates of 2.5 to 10 GS/s.

Standard memory length is an impressive 1 Mpts, expandable to 12 Mpts on all channels, and up to 24 Mpts when interleaved.

This performance is delivered at a price far below old-technology oscilloscopes. So even on a tight budget, you can afford the confidence delivered by leading-edge technology.



MODEL	WR6030	WR6050	WR6051	WR6100	WR6200
BW	350 MHz	500 MHz	500 MHz	1 GHz	2 GHz
Channels	4	4	2	4	4
SR: All channels	2.5 GS/s	5 GS/s	5 GS/s	5 GS/s	5 GS/s
SR: Interleave	—	—	—	10 GS/s	10 GS/s
Memory: All Channels	1 Mpts [2 Mpts interleaved]				
Memory: Max Option	12 Mpts [24 Mpts interleaved]				
Complete specifications start on page 48					



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The New WaveRunner 6000 Series

UNRIVALED SIGNAL FIDELITY. BELIEVE IT.

The WaveRunner 6000 Series is powered by the same SiGe technology that is used in LeCroy's high-performance WaveMaster oscilloscopes. High sample rates combined with low jitter (3 ps typical) and an ultra-stable clock (± 5 ppm) give you timing resolution that rivals oscilloscopes that cost twice as much.

How much oversampling (Sample Rate/Bandwidth) is necessary? Opinions vary but LeCroy's analysis

shows that the

answer ranges from 3x to 10x, depending upon how you interpolate and view the data*.

Insufficient oversampling results in distorted waveforms.

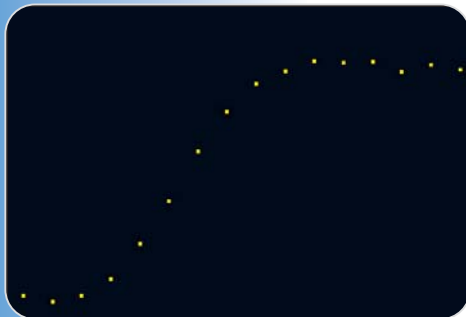
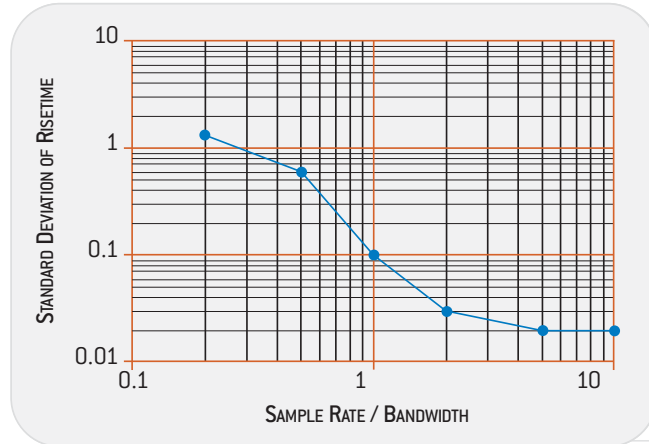
Figure 1 shows another example.

The consistency (low standard deviation) of a simple risetime

measurement improves as oversampling approaches 5x, with improvements diminishing significantly beyond 5x.

Regardless of your criteria, the WaveRunner 6000 Series gives you the acquisition headroom you need to be confident in the accuracy of your most critical measurements.

*Interpolation on your DSO, Pupalaiakis, 2003



Fast Edge

SAMPLE RATE	SR/BW	VARIANCE	
		Std. Dev.	%
200 MS/s	0.2	1.3 ns	110%
500 MS/s	0.5	0.6 ns	52%
1 GS/s	1.0	0.1 ns	8.7%
2 GS/s	2.0	0.03 ns	2.6%
5 GS/s	5.0	0.02 ns	1.7%
10 GS/s	10.0	0.02 ns	1.7%

Input: 1 ns rising edge

Figure 1

AN OUTSTANDING NEW PASSIVE PROBE

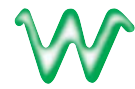
The new PP007 500 MHz passive probe comes standard with the WaveRunner 6000 Series.

Just 2.5 mm, the PP007 lets you take measurements in small spaces without touching another device. The low capacitance (<9.5 pF) and flat impulse response ensure your signal is perfectly transmitted to the high-fidelity WaveRunner front-end amplifier.

The probe is compatible with over 30 accessories, including clips, leads, hooks, tips, ground leads, and BNC adapters. This makes it practical in a variety of applications.

The PP007 is just one of over 25 LeCroy passive, active, current and differential probes that are compatible with the WaveRunner 6000 — one is sure to be perfect for your application.



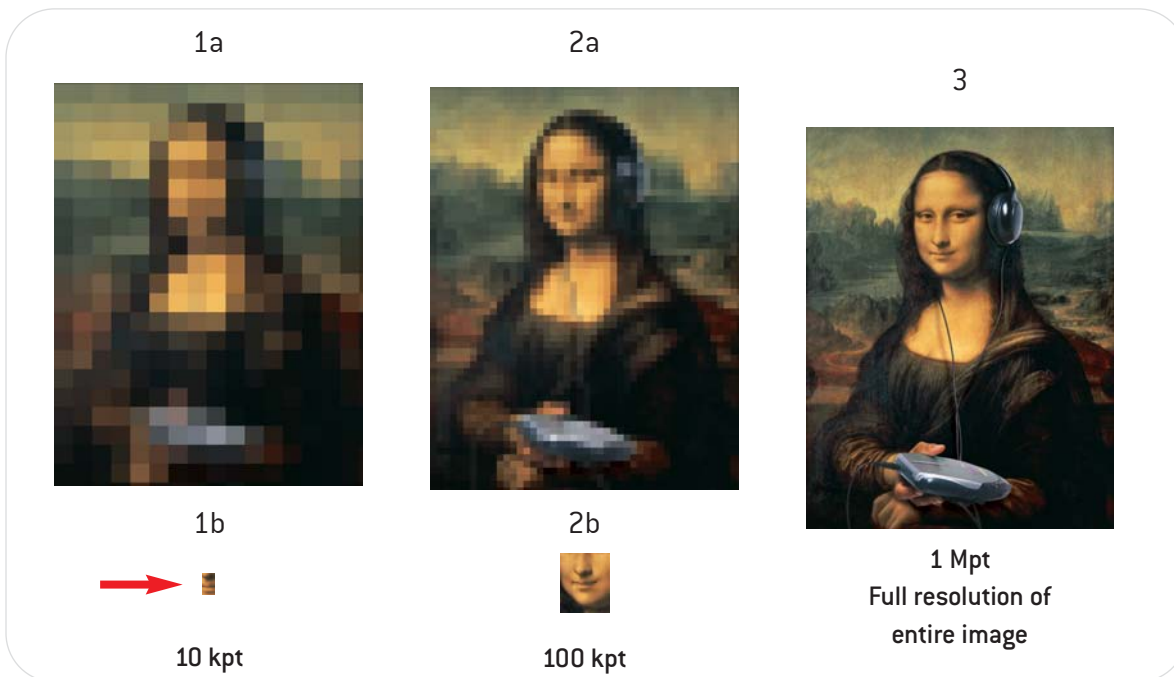


The New WaveRunner 6000 Series

Why is Long Memory Important?

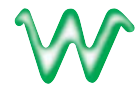
A fast sample rate is useless if you don't have enough memory to use it. Traditional oscilloscopes can run out of memory in microseconds if they are sampling at their fastest rate. If you need to see a longer period of time, you must reduce the sample rate and risk a loss of signal fidelity.

Here's an example. The most famous feature of the Mona Lisa is her smile. Yet, one of the great mysteries of the art world is why she is smiling. This parallels a typical debugging session. The smile represents the symptom that is triggering your scope (glitch, reset line going high, etc) and you must find the root cause. Figure 2 shows the dilemma facing the short-memory scope user: either be limited to looking at the smile (2b); or try to find the answer in a blurry picture (2a). Long memory in Figure 3 gives you enough information to see the entire picture at full resolution, and to realize that Mona Lisa is smiling, listening to Leo's new music player.



Other advantages of long sample records:

- Reliable capture of events that are unpredictable in time.
- Signal parameters can be tracked over time, which makes it easier to find effects that “drift” or “roll” as a function of time.
- Statistically significant histograms can be generated with a single acquisition.
- When looking for intermittent errors, capturing long records minimizes the “dead time” between data captures as well as jitter.
- Minimized or eliminated trigger jitter from multiple acquisitions.



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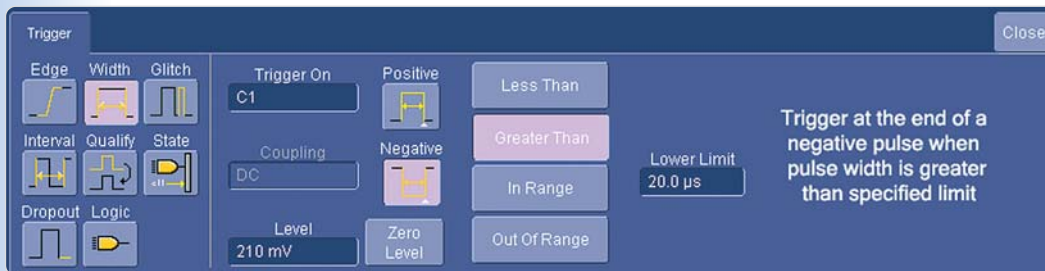
The New WaveRunner 6000 Series

SMART TRIGGER MAKES THE MOST OF YOUR LONG MEMORY

The WaveRunner 6000 SMART Trigger provides the flexibility needed to quickly trigger on the specific signal characteristic or pattern you are looking for. You can also trigger on abnormal signals at the touch of a button.

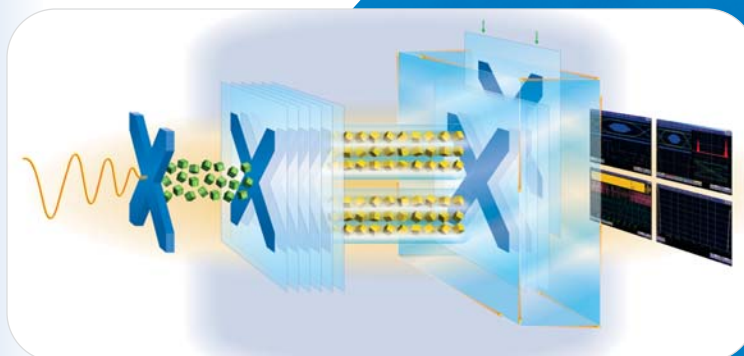
An exclusion/inclusion feature lets you trigger on signals that are either outside, or within, a specific range of pulse width. By selecting multiple threshold levels and the pulse width, you can quickly and easily catch the waveform you want to view and measure.

Your WaveRunner 6000 scope's memory retains thousands of events that can be acquired for viewing at your leisure. Replay the signal history, scan and search from sweep to sweep, and stop when you see something of interest.

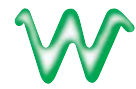


X-Stream™: Long memory without the wait

LeCroy's proprietary X-Stream Technology, built into all of our WaveRunner 6000 oscilloscopes, enables faster throughput and a highly responsive display.



Proprietary algorithms, CMOS memory, and SiGe amplifiers and ADCs, permit data transfer and processing 10 to 100 times faster than competitors' scopes.



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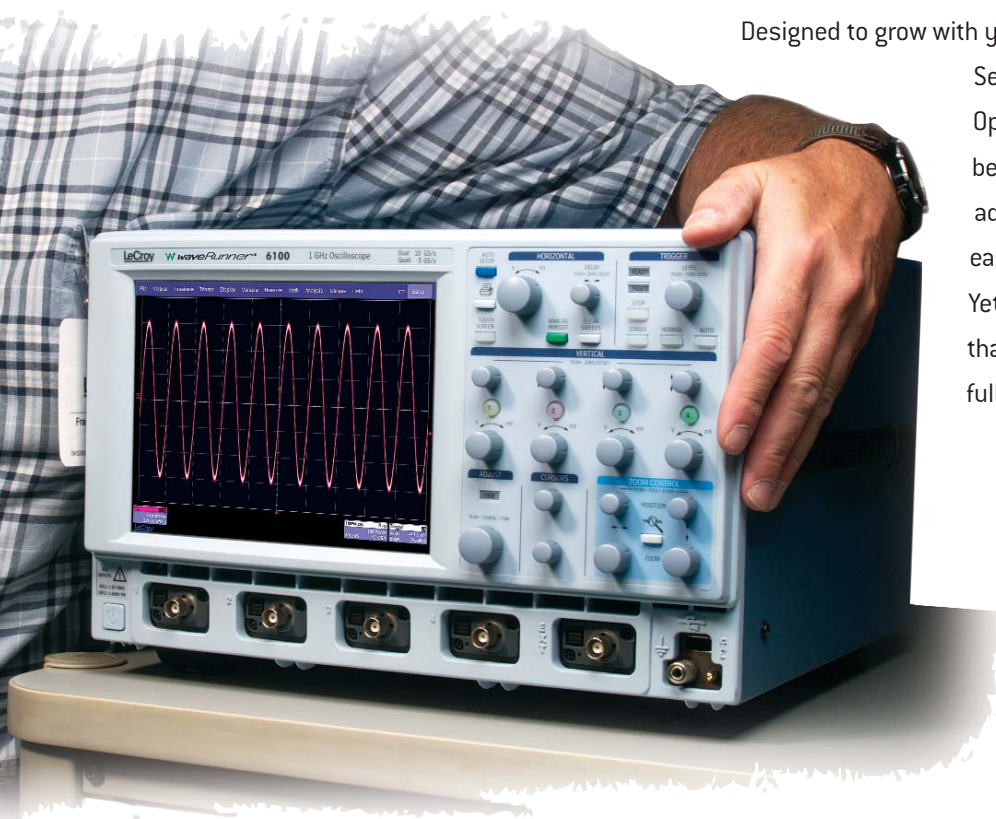
Unlimited Expandability Makes for a Lasting Relationship

It's an engineer's dream: a benchtop oscilloscope that can handle everyday signal measurements easily and efficiently, but can power up to perform more sophisticated WaveShape Analysis when needed.

Designed to grow with your needs, the WaveRunner 6000

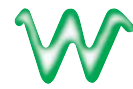
Series makes this dream come true.

Optional packages allow this versatile benchtop scope to handle your most advanced math and analysis tasks with ease, no matter what your application. Yet it's priced far below other scopes that are not nearly as versatile and fully featured.



WAVE SHAPE ANALYSIS PACKAGES

Advanced Math Package	WR6-XMATH
Developer's Customization Kit	WR6-XDEV
Master Analysis Package (XMATH + XDEV + JTA2)	WR6-XMAP
Digital Filter Package	WR6-DFP2
Disk Drive Measurements Package	WR6-DDM2
Ethernet Test Package (WaveRunner 6200 only)	WR6-ENET
Jitter and Timing Analysis	WR6-JTA2
PowerMeasure Analysis	WR6-PMA2
Serial Data Mask Package	WR6-SDM
USB 2.0 Compliance Software (WaveRunner 6200 only)	WR6-USB2



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EXPANDED ANALYSIS

Need more than the standard 30 math functions and 40 parameter measurements? The **XMATH** Advanced Math Package gives you a comprehensive set of tools for analyzing the wave shapes of complex signals.

XMATH includes parameter math, tracking measurements, expanded FFT (up to 24 Mpts), expanded histogramming, parameter math, and trending of up to one million events. You can even connect an unlimited number of functions together for maximum analysis power. To harness this power, XMATH also comes with a graphical interface that lets you connect input source, measurement, and display icons for surprisingly simple advanced analysis.

CUSTOM ANALYSIS

The **XDEV** Advanced Customization 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 lets you seamlessly integrate 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. Whether you need to create a template for a special task, or for a special audience (such as manufacturing technicians or students), or even if you simply like to tweak an interface to meet your specific tastes, you are in charge.

FLEXIBLE PROGRAMMABILITY

The WaveRunner 6000 Series offers many programming options. In addition to the legacy LeCroy remote command

language, you can use COM-based commands or IVI and LabView drivers.

OPEN WINDOWS OS

Your oscilloscope is an integral part of your tool chain. A modern scope needs to interact with design, simulation, documentation, and communication tools.

WaveRunner 6000's open Windows operating system allows you to install any Windows software you wish, integrate your scope with best-in-class tools and peripherals, connect to the Internet, even operate the scope remotely.

DIGITAL FILTER PACKAGE

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.

DISK DRIVE MEASUREMENT PACKAGE

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

ETHERNET TEST PACKAGE (WAVERUNNER 6200 ONLY)

This package (**ENET**) allows you to conduct complete electrical testing for 1000Base-T, 100Base-TX, 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.

JITTER AND TIMING ANALYSIS

Use the **JTA2** package to 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.

POWERMEASURE ANALYSIS

The industry-leading **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.

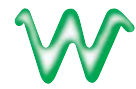
SERIAL DATA MASK PACKAGE

The **SDM** toolset harnesses the WaveRunner DSO's long memory and low jitter to deliver outstanding serial bus characterization. SDM lets you 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.

USB2.0 COMPLIANCE SOFTWARE (WAVERUNNER 6200 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.



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Every Scope Includes a Partnership

LeCroy has always thrived on a culture of fostering long-term relationships with customers. The importance of this is reflected throughout our product development, manufacturing, sales, and support processes. We are proud of the following company practices and encourage you to compare them with our competition.

Warranty — LeCroy scopes are designed, built, and tested to ensure high reliability. Naturally, we warrant our digital oscilloscopes for three years.

Your downtime and cost related to scope failures during warranty should be minimized. LeCroy ensures this by fully updating, calibrating, insuring, and return shipping your in-warranty units back to you quickly and at no charge.

Long-term Support — Quality capital purchases should be supported over time. LeCroy's policy is to support its instruments for seven years, at a minimum, after final production. This ensures that you will enjoy productive use of your LeCroy scopes for their entire operating life.

After-sale Option Add-ons and Upgrades —

We believe you should be able to add options later if you like, without pricing penalties. With LeCroy, you can.

Software Support — We also believe that you should be able to upgrade to the latest software you like, without charge. Once again, with LeCroy, you can.

Retrofit of New Features — You have a right to expect that, when technically feasible, new features will be available for previously purchased products. LeCroy makes it a point to protect you from product obsolescence.



WaveRunner Technical Specifications

	WAVERUNNER 6030	WAVERUNNER 6050	WAVERUNNER 6051	WAVERUNNER 6100	WAVERUNNER 6200
VERTICAL SYSTEM					
Nominal Analog Bandwidth @ 50 Ω [−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	25 MHz; 200 MHz				
Input Impedance	1MΩ // < 20pF (10 MΩ // 9.5pF using PP007 probe)				
Input Coupling	50 Ω: DC, 1MΩ: AC, DC, GND				
Maximum Input Voltage, 50 Ohm	50 Ω: 5 Vrms, 1 MΩ: 250 V max (Peak AC: ≤ 10 kHz + DC)				
Channel to Channel Isolation	> 40dB @ < 100MHz (> 30dB @ 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)				
Offset Range	50 Ω: ± 400 mV @ 2–4.99 mV/div ± 1 V @ 5–100 mV/div ± 10 V @ 102 mV/div – 1V/div 1 MΩ: ± 500 mV @ 2–4.99 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				

TIMEBASE SYSTEM

Timebases	Internal timebase common to all input channels; an external clock may be applied at the auxiliary input				
Time/Division Range	20 ps/div – 10 s/div				
Math and Zoom Traces	4 independent zoom and 4 math/zoom traces standard				
Clock Accuracy	≤ 5 ppm @ 25 °C (≤ 10ppm @ 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 (RMS)	≤ 3 ps rms (typical WaveRunner 6100)				
Channel to Channel Deskew Range	±4.5 ns				
External Sample Clock	30 MHz to 2 GHz; 50 Ω or 1M Ω BNC input				
Roll Mode	Switches Automatically at t/div > 0.5 s/div or sample rate < 20 KS/sec				

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]	N/A	N/A	N/A	10 GS/s	10 GS/s
Random Interleaved Sampling (RIS)	200 GS/s				
Trigger Rate	140,000 waveforms/second				
Sequence Time Stamp Resolution	1 ns				
Minimum Time between Sequential Segments	8 μs				

ACQUISITION MEMORY	Max. Acquisition Points (4 Ch / 2 Ch; 2 Ch / 1 Ch in 6051)	Segments (Sequence Mode)
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

ACQUISITION PROCESSING

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, and roof for up to 1 million sweeps
Interpolation	Linear, Sinx/x

WaveRunner Technical Specifications (continued)

TRIGGER SYSTEM

Trigger Modes	Normal, Auto, Single, Stop
Sources	Any input channel, External, Ext/10, or Line; slope and level unique to each source
Trigger Coupling	DC50 Ω , GND, DC1M Ω , AC1M Ω
Pre-trigger Delay	0–100% of memory size (adjustable in 1% increments, or 100 ns)
Post-trigger Delay	The smaller of 0 to 10,000 divisions or 86,400 seconds
Hold-off	2 ns to 20 s or 1 to 99,999,999 events
Internal Trigger Level Range	± 5 div from center (typical)
Max Trigger Frequency	2 divisions at > 750 MHz with Edge Trigger; 1 div at 750 MHz 750 MHz max with SMART Trigger @ ≥ 10 mV (subject to bandwidth limit of oscilloscope)
Trigger Level DC Accuracy	$\pm 4\%$ full scale ± 2 mV (typical)
External Trigger Range	EXT/10 ± 4 V; EXT ± 400 mV

BASIC TRIGGERS

Edge/Slope/Line	Triggers when signal meets slope (positive or negative) and level condition
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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 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 Width	Triggers on positive or negative pulse 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
Vertical Find Scale	Automatically sets the vertical sensitivity and offset for the selected channels to display

PROBES

Probes	One PPO07 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
Real Time Clock	Dates, hours, minutes, seconds displayed with waveform. Accurate to ± 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

WaveRunner Technical Specifications (continued)

ZOOM EXPANSION TRACES

Display up to 4 Zoom and 4 Math/Zoom traces

CPU

Processor	Intel Pentium 2 GHz or better
Processing Memory	256 MB on Std S & M option; 512 MB with L option & 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

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
GPIB Port (Optional)	Supports IEEE – 488.2
Ethernet Port	10/100Base-T Ethernet interface (RJ-45 connector)
USB Ports	5 USB 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
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GENERAL

Auto Calibration	Ensures specified DC and timing accuracy is maintained for 1 year minimum
Power	100–240 Vrms ($\pm 10\%$) at 50/60 Hz; 100–120 Vrms ($\pm 10\%$) at 400 Hz Automatic AC Voltage Selection Installation Category: 300V CAT II; Max. Power Consumption: 425 VA/425 W

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 50% 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 ≤ 25 °C
Altitude: Nonoperating	12,190m (40,000 ft.)
Random Vibration: Operating	5 Hz to 500 Hz, overall level: 0.31 grms, 15 min. duration in each of three orthogonal axes
Random Vibration: Nonoperating	5 Hz to 500 Hz, overall level: 2.4 grms, 15 min. duration in each of three orthogonal axes
Functional Shock	20 g peak, half sine, 11 ms pulse, 3 shocks (positive and negative) in each of three orthogonal axes, 18 shocks total

PHYSICAL

Dimensions (HWD)	211mm x 355mm x 363mm (excluding feet) 8.3" x 13.8" x 14.3"
Net Weight	10 kg (22 lb.), excluding printer
Shipping Weight	Less than 13.6 kg (30 lb.)
Certifications	CE Approved, 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

WaveRunner Ordering Information

WAVERUNNER 4-CHANNEL DIGITAL OSCILLOSCOPES

2 GHz 5/10 GS/s 1/2 Mpts Standard, 4-Channel Color	WaveRunner 6200
1 GHz 5/10 GS/s 1/2 Mpts Standard, 4-Channel Color	WaveRunner 6100
500 MHz 5 GS/s 1/2 Mpts Standard, 4-Channel Color	WaveRunner 6050
500 MHz 5 GS/s 1/2 Mpts Standard, 2-Channel Color	WaveRunner 6051
350 MHz 2.5 GS/s 1/2 Mpts Standard, 4-Channel Color	WaveRunner 6030

INCLUDED WITH STANDARD CONFIGURATION

10:1 10 MΩ, 500 MHz BW Passive Probes – Qty 4 (2 with WaveRunner 6051)	PP007
Operators Manual; Quick Reference Guide; CD-ROM with OM/RCM and Utility software and Recovery software	
Remote Control Manual	
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
4 Mpts/Ch, 8 Mpts maximum using 2 Channel (1 Channel for 6051)					M
8 Mpts/Ch, 16 Mpts maximum using 2 Channel (1 Channel for 6051)					L
12 Mpts/Ch, 24 Mpts maximum using 2 Channel (1 Channel for 6051)					VL

HARDWARE OPTIONS

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

WAVESHAPE ANALYSIS PACKAGES

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 6200 only)	WR6-ENET
USB 2.0 Compliance Software (WaveRunner 6200 only)	WR6-USB2
Advanced Math Package	WR6-XMATH
Intermediate Math Package	XWAV
Master Analysis Package (XMATH + XDEV + JTA2)	WR6-XMAP
Value Analysis Package (XWAV + JTA2)	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
1GHz Active FET Probe	AP020
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 Twin Tips	D300 & D300AT
100 MHz Differential Amp	DA1855A
Floppy Drive (External USB)	WR6-FLPY
Rackmount	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	OM-E
5-Year NIST Calibration and Warranty	WR6-T5

Waverunner LT Oscilloscopes Non-Windows Based DSOs



Waverunner LT oscilloscopes provide all you need to quickly capture, view, and analyze your signals — accurately and reliably:

- 1 GHz – 350 MHz bandwidth
- 1 – 4 GS/s max, single-shot sample rate
- 50 GS/s for repetitive signals
- Up to 8 million data points to view signals

From troubleshooting to timing analysis to production testing, the Waverunner LT scopes are uniquely qualified to meet your requirements — all at a great value!

SIMPLE, FAST ACCESS TO POWERFUL CAPABILITIES

Waverunner LT scopes are the second generation of the popular Waverunner series. They bring you the power of LeCroy signal acquisition, viewing, and analysis capabilities with simple one-button access. Using the new Wavepilot feature, it's easier than ever to capture, view and analyze long time duration, high-speed signals with high resolution for accurate, precise results.

EASY TO USE

Waverunner LT scopes are designed to get you up and running quickly. Their color-coded front panels and simple menu systems are easy to understand, so your focus is on the work and not on the tool. Common tasks are automatic. Navigation is streamlined and intuitive. You'll easily master their powerful operations.

THE RIGHT PRICE

Waverunner LT oscilloscopes raise the bar for capability and value — you get more for your money than with any other scope in this class. And because Waverunner LT scopes can be upgraded, you can extend their life to meet future needs.

INCREASE YOUR PRODUCTIVITY

The new Wavepilot and QuickZoom buttons make it simple to magnify; view; inspect or measure signal details; perform automatic measurements on signals; and to graph measurements in frequency spectra, histogram, or trend format. With TrackView, you can track problems to their source. Additional signal analysis capabilities let you datalog, chain math functions, and more. LeCroy's signal diagnostic and troubleshooting tools provide a complete solution for characterization, debug, and signal analysis.



FROM CIRCUIT TO SCOPE

A variety of accessories are offered for effectively connecting the Waverunner LT to your circuit. The LeCroy HFP small, lightweight probes assure you high-bandwidth, low-capacitance connections to your circuit. In addition, five interchangeable probe tips are available for probing surface mount devices, circuit vias, IC leads, and other difficult spots — making the HFP probes the best choice for probing high-frequency circuits. Current probes, differential probes, and amplifiers are also available.

WAVERUNNER LT COLOR DIGITAL OSCILLOSCOPES								
Model	Bandwidth	Channels Rate/Ch	Sample Sample Rate	Maximum per Ch/Max.	Acq. Memory	Option M per Ch/Max.	Option ML	Option L
LT584	1 GHz	Four	2 GS/s	4 GS/s	250 k/500 kpt	1/2 Mpts	—	4/8 Mpts
LT374	500 MHz	Four	2 GS/s	4 GS/s	250 k/500 kpt	1/2 Mpts	—	4/8 Mpts
LT372	500 MHz	Two	2 GS/s	4 GS/s	250 k/500 kpt	—	—	4/8 Mpts
LT354	500 MHz	Four	1 GS/s	1 GS/s	250k	1/1 Mpts	2/2 Mpts	—
LT264	350 MHz	Four	1 GS/s	1 GS/s	100k	1/1 Mpts	2/2 Mpts	—
LT262	350 MHz	Two	1 GS/s	1 GS/s	100k	—	2/2 Mpts	—



Waverunner LT Oscilloscopes Non-Windows Based DSOs

SIMPLIFIED OPERATION

Acquiring and displaying signals is easy. When you first see a Waverunner LT scope, you will notice that the front panel is clear, concise, and intuitive in operation. Getting signals on the screen is easy: follow the color channel coding and press Auto Setup. Adjust horizontal or vertical settings to view the way you want, and unleash the power of LeCroy SMART Memory with the press of QuickZoom. If you are concerned with intermittent runts or timing problems, just press the green ANALOG PERSIST button to see infrequent signal anomalies.



AUTO SETUP

Simply connect your signal, press AUTO SETUP, and view. Horizontal, Vertical, and Trigger settings are automatically set. LeCroy SMART Memory ensures the highest time resolution for the time window displayed.

MANY WAYS TO VIEW YOUR SIGNAL

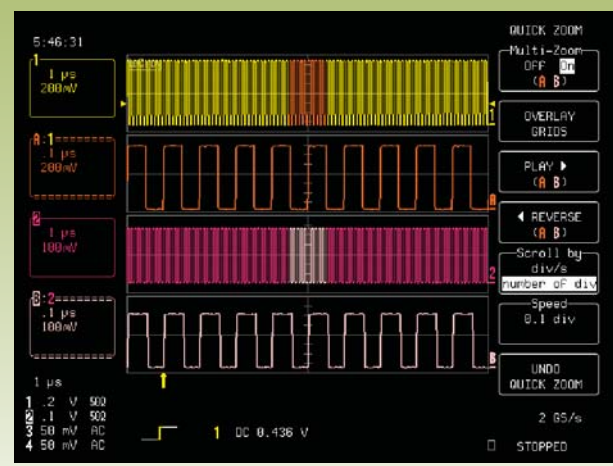
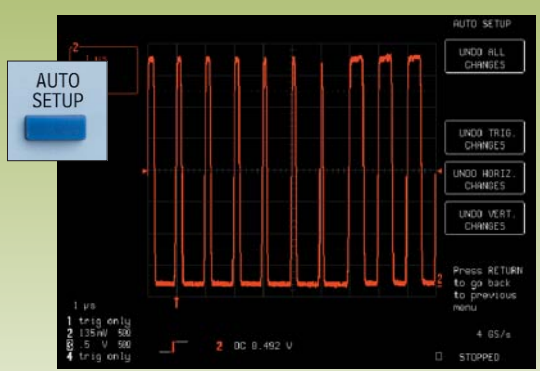
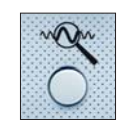
Capturing and viewing the signal is as easy as 1-2-3. ANALOG PERSISTENCE shows three dimensions of signal information. HISTORY gives you further



insight into the third dimension by recording snapshots of the signal in memory. Then analyzing signals in the sequence they were captured to find the problem.

QUICK ZOOM

Press the QUICK ZOOM button and view up to 4 zooms of up to 4 input signals. Magnify, inspect, search, and scan your signal to see details and understand problems.



QuickZoom automatically displays 10x magnified traces of all signals on multi-grids.

Wavepilot with Insight

From beginner to expert, it is now easier than ever to apply the power of the unique analysis tools available from LeCroy. The Wavepilot function provides simple access to powerful, easy-to-use signal analysis for real insight into problems.

CURSORS

Press Wavepilot and select cursors, then turn the knob for manual adjustment and measurement between sections of your signal.

MEASURE

Select MEASURE to simultaneously display up to 26 parameters on the signal of your choice and quickly switch from trace to trace. The Measure dashboard is context-sensitive, so when you display a histogram, you will see statistical parameters for it also.

GRAPH

Select GRAPH to automatically display an FFT, histogram (optional), or TrackView (optional). Setting up signal analysis is simple with the Wavepilot menus.

APPLICATION PACKAGES

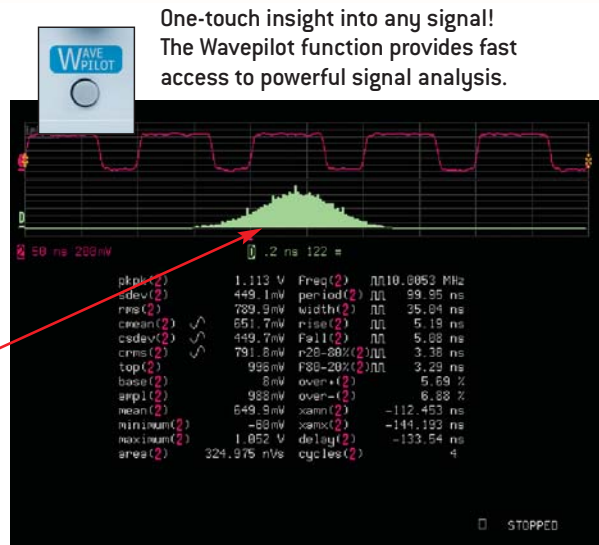
Select ACCESS to choose optional application-specific solution packages, including Telecommunications Mask Test, Jitter and Timing, Power Measurements, and Data Storage solutions.

GRAPH — HISTOGRAM

Histograms and Trends (optional) are popular tools used to summarize measurement results. LeCroy has made them easier than ever with Wavepilot. Parameter selection is simple, and graphs are automatically set up, scaled, and displayed.

avg(D)	1	35.008 ns
sigma(D)	1	131 ps
h rms(D)	1	35.008 ns
median(D)	1	35.011 ns
mode(D)	1	35.002 ns
maxp(D)	1	737 u
hbase(D)	>	34.482 ns
htop(D)	<	35.472 ns
hamp(D)	<	998 ps
Fwhm(D)	1	254 ps
low(D)	1	34.487 ns
high(D)	1	35.477 ns
range(D)	1	998 ps
pk(D)	1	1
totp(D)	1	20.000 ku

Select Trace A: the Histogram trace and Histogram parameters are displayed in place of signal parameters.



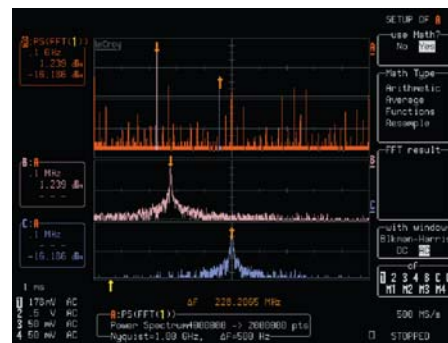
One-touch insight into any signal! The Wavepilot function provides fast access to powerful signal analysis.

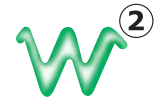
Histogram with Signal Measurements

MEASURE is simple to activate from the Wavepilot toolbar. The DASHBOARD View displays up to 26 standard signal parameters. You can also select a set of custom parameters.

FFT SPECTRUM ANALYSIS

When you need to understand the frequency content of your signal, spectrum analysis is easily accessed by pressing the Wavepilot button.





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Speed Up Debug and Analysis



SMART TRIGGER®

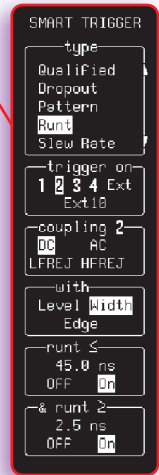
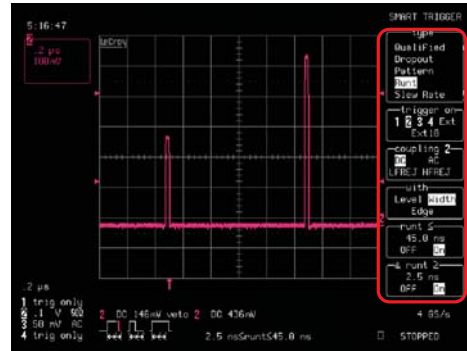
The Waverunner LT scope's trigger bar is simple to operate. Run the scope in normal or auto trigger modes, or capture one-time events into scope memory as large as 8 Mpts with a single-shot trigger. Triggering with Waverunner LT is direct, easy to read, and easy to understand.

SMART Trigger provides the flexibility needed to quickly trigger on the specific signal characteristic or pattern you are searching for. All Waverunner LT oscilloscopes include SMART Triggers. Trigger not only on what you expect but also on unusual signals. Exclusion triggers can exclude normal signals and capture only the abnormal ones, speeding up the debug of your circuits and systems. Trigger on signals down to 2 ns in width. The optional Advanced Trigger Package [ATP] extends Waverunner LT's SMART Trigger capability by adding runt and slew rate trigger for the capture of intermittent events.

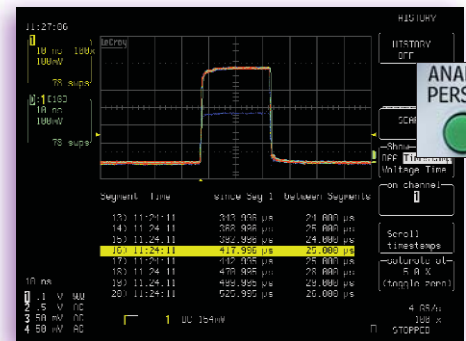
USE HISTORY VIEWS TO FIND INTERMITTENTS

Pressing the green ANALOG PERSIST button and selecting HISTORY converts the scope into a fast Analog Persistence fault-finder. The lifetime of your signal is written into the History memory and mapped on screen. You can measure each signal, see its trigger time, and identify rare events. Up to 4,000 events can be acquired for playback. This is great when you have intermittent problems and want to know if they occur at a rate related to other circuit or system timing events.

Press "play" to replay the signal history and automatically scan and search from sweep to sweep. Stop when you see something of interest. The display shows the Analog Persistence view of all acquired sweeps as well as the individual sweep under inspection. Since the time of each trigger event is displayed with a resolution of 1 ns, you can easily determine the rate of occurrence.



Runt triggering is great for capturing logic signals that exhibit inadequate levels or spurious signals interfering with circuit operation. With the exclusion/inclusion feature, the scope will only trigger on runt signals that are outside/within a specified range of pulse width.



HISTORY lets you see the intermittent, trigger on the problem, and find how often it's disrupting your design.

WAVERUNNER LT BASIC TRIGGERS

Name	Description
Edge	Select + or - slope and holdoff by time or events.
Window	Triggers when signal crosses window threshold in either direction.

WAVERUNNER LT SMART TRIGGERS

Name	Triggers Conditions
Glitch	From 2 ns – 20 s and when pulse is >, <, or in or out of a range
Interval	Between edges and ranges of 10 ns – 20 s
Qualified	By edge or state on a channel or if a pattern is present or absent
Dropout	If input drops out after a time from 25 ns – 20 s
Runt*	Pulse levels, edge, widths from 600 ps – 20 s
Slew Rate*	Slope, dV, dT from 1 ns – 20 ns
Pattern (logic)	Logical combination of up to 5 inputs (3 on two-channel models). Can also be used in combination with Qualified
TV	Triggers on line (up to 1500) and fields 1, 2, 4 or 8 (odd or even)

*Optional Advanced Trigger Package (ATP)

Probing Solutions

CONVENIENT, HANDS-FREE PROBING

To access the ever-increasing variety of test points, today's probing solutions need to be versatile, small, and lightweight. The new HFP series of probes meets these needs with high bandwidth, miniature size and a variety of tip styles, making probing easier than ever.

In combination with these innovative probe tips, the unique HFP FreeHand probe holder will hold the probe on test points to maintain signal fidelity. The end result of HFP "hands-free" probing is the enhanced ability to analyze waveforms instead of having to focus energy on keeping the probe itself in place.

AUTOCOLOR ID

When the probe is connected to a Waverunner LT scope, our new patent-pending AutoColor ID feature automatically senses and illuminates the probe head in that channel's trace color. You no longer need to worry about plastic rings or colored tape to identify which channel on the scope is connected to a particular test point.

CURRENT PROBES

CP150 and CP015 are high-performance current probes capable of measuring 150 amp and 15 amp current signals. They incorporate Hall effect and transformer technology to measure both DC and AC currents. LeCroy also offers the best differential amplifiers available on the market, the DA1800 series.

Other useful accessories for the Waverunner LT series are low-cost active differential probes, high voltage probes, an internal graphics printer, and a choice of two scope carts.

HFP1500

Leading Specifications

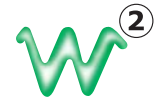
- 1.5 GHz Bandwidth
- 0.7 pF Input Capacitance at 1 GHz
- 100 kΩ VDC Input Resistance
- ±8 V Dynamic Range
- 5 Interchangeable Tips available for Probing a Variety of Test Points
- Replaceable Probe Tip Socket
- Hands-Free Probing with "Freehand" probe holder
- AutoColor ID Feature Matches the Probe Color to the Trace Color



Hands-free probing with FreeHand probe holder and HFP probe

The new current probes CP150 and CP015.





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Signal Measurements and Analysis

The new Wavepilot button and the Analysis Control Area provide quick access to a comprehensive, easy-to-use set of signal analysis tools that help you solve problems fast. Optional packages expand the Waverunner LT scope to a complete signal analyzer.

STANDARD IN ALL MODELS

Press Wavepilot to select the Parameter Dashboard and view up to 26 automatic measurements that update with your waveform — in real-time, on screen. Select Graph and view an FFT of a signal—up to 50 kpoints. Process signals with Math Tools including averaging to 1,000 sweeps to reduce noise or use enhanced resolution for up to 11 bits of vertical resolution. Chain up to 4 math functions and display the final waveform or any of the intermediate steps.

FILTERS INCLUDE:

Low Pass	Raised Cosine
High Pass	Raised Root Cosine
Band Pass	Gaussian
Band Stop	Custom
Up to 4 filters can be cascaded	

EXTENDED MATH AND MEASUREMENTS (EMM)

The EMM option provides basic graphical signal analysis tools including Histograms (200 events) and Trending of parameters (expanded to over 40). Additional Math Tools include signal integration and differentiation.

WAVEANALYZER SIGNAL ANALYSIS (WAVA)

Waveform averaging capability increases to one million acquisitions. The FFT spectrum analysis expands to process all acquired data up to 8 Mpts and provides additional spectral views. Histograms (up to 2 billion events) and Trends let you view and measure statistical variations of signal parameters.

JITTER AND TIMING ANALYSIS (JTA)

JTA has broad applications in measuring and analyzing digital electronics or mechanically related signals. Measure a wide variety of timing parameters: cycle-to-cycle, period, frequency, time interval, and width. Use JitterTrack to plot the parameter variation vs. time.

WAVEANALYZER WITH JTA (JTWA)

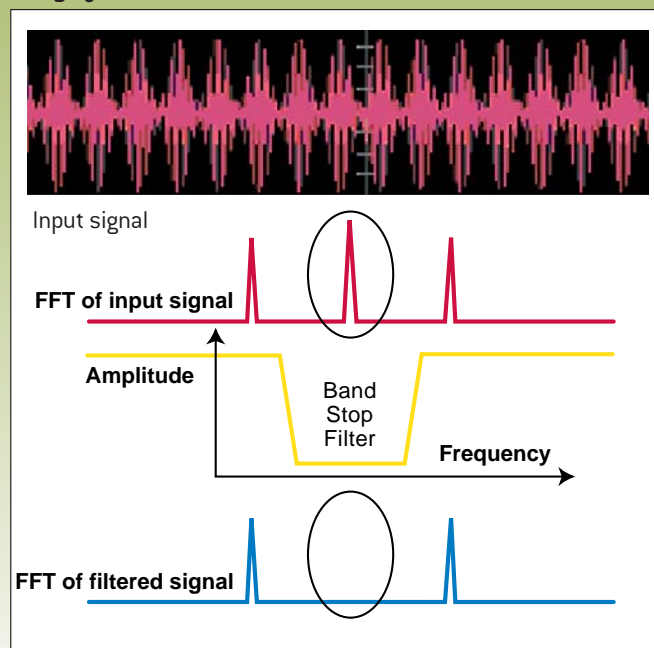
The WaveAnalyzer JTA option is the ultimate tool for characterization and troubleshooting in time, frequency, and statistical domains. It includes:

- WaveAnalyzer Signal Analysis (WAVA)
- Jitter and Timing Analysis (JTA)

DIGITAL FILTER PACKAGE (DFP)

The DFP option implements a set of linear-phase Finite Impulse Response (FIR) filters. The package enhances your ability to examine important signal components by filtering out undesired spectral components such as noise.

Design your own filters with DFP



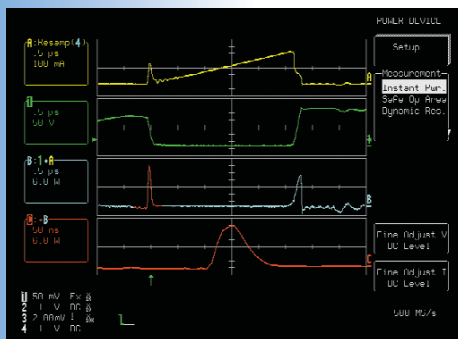
Powerful Applications

SOLUTION PACKAGES

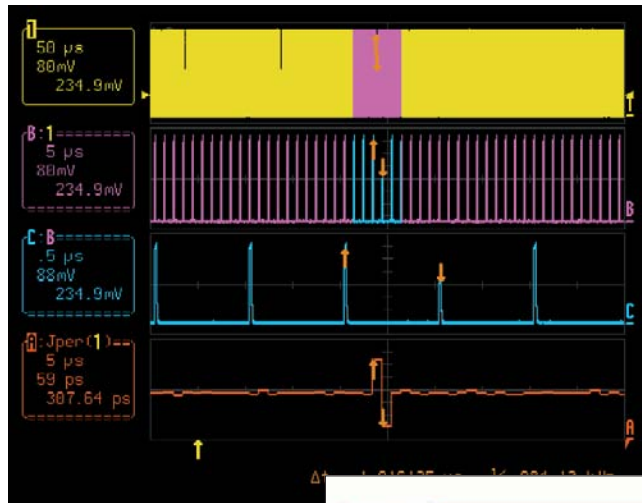
Here are solution packages from LeCroy targeted to your specific test applications. You'll find that these packages will bring precise measurements and fast analysis to your workflow.

WORLD CLASS POWER MEASUREMENT SOLUTIONS

With LeCroy PowerMeasure Systems, you can analyze power devices' performance while they are operating in circuit. The PowerMeasure System combines the required current and differential voltage measuring capability with unequalled DSO triggering, long record capture, and waveform math to make these difficult measurements as simple as the push of a few buttons.



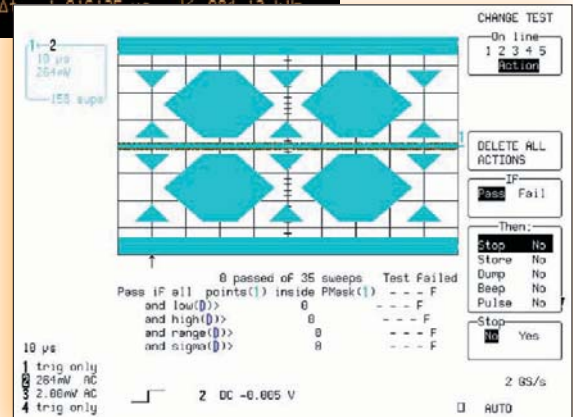
Current, voltage, instantaneous power, and energy dissipation measurements.



JitterTrack clearly shows timing variation as it tracks the signal cycle by cycle.

JITTER & TIMING ANALYSIS (JTA)

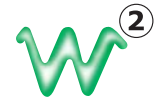
This analysis package provides a comprehensive set of precise timing measurements for clock, clock-to-data, and data-stream analysis. TrackView shows deviations directly synchronized to the signal — patterns you would never see without this view. Press the Wavepilot button for easy access, and zoom in on both the “where” and the “why” of the problem; you can see it and fix it! Quickly gain insight into the source of timing and signal integrity problems.



An Ethernet 100Base-T mask created with the MaskMaker utility.

POLYMASK

PolyMask is a powerful, general-purpose testing application that lets you view and test against complex masks. PolyMask locates and clearly depicts signal failures. In pass/fail testing, failures are highlighted with colored circles. Creating masks is greatly simplified with the MaskMaker utility, a simple program that runs on any PC with Windows. Masks can be used in either normal or X-Y display mode (useful for applications such as power measurement).



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Windows Connectivity



All it takes is a PC with Windows and a GPIB, RS-232-C, or the Ethernet option.

Connect your scope to Windows-based ScopeExplorer using the Ethernet (option), GPIB, or RS-232 interfaces. Click and drag files, or operate from the virtual front panel. Update your software via the web.

WINDOWS SOFTWARE TO ENHANCE YOUR PRODUCTIVITY

ScopeExplorer and ActiveDSO are Windows (95, 98, 2000, or NT) PC-based connectivity tools that make it easy to interface your Waverunner LT scope with a PC via Ethernet, RS-232-C, or GPIB. It's easy

to integrate scope data with Windows applications, as well as to control the Waverunner LT scope from your PC

SCOPEEXPLORER

Annotate and print screen shots, drag and drop files, save and load scope setup panels, and run CustomDSO applications. Click on the print icon to send the file to the printer of your choice. Access files on storage media, including PC-Cards, hard drives, and floppy diskettes.

ACTIVEDSO

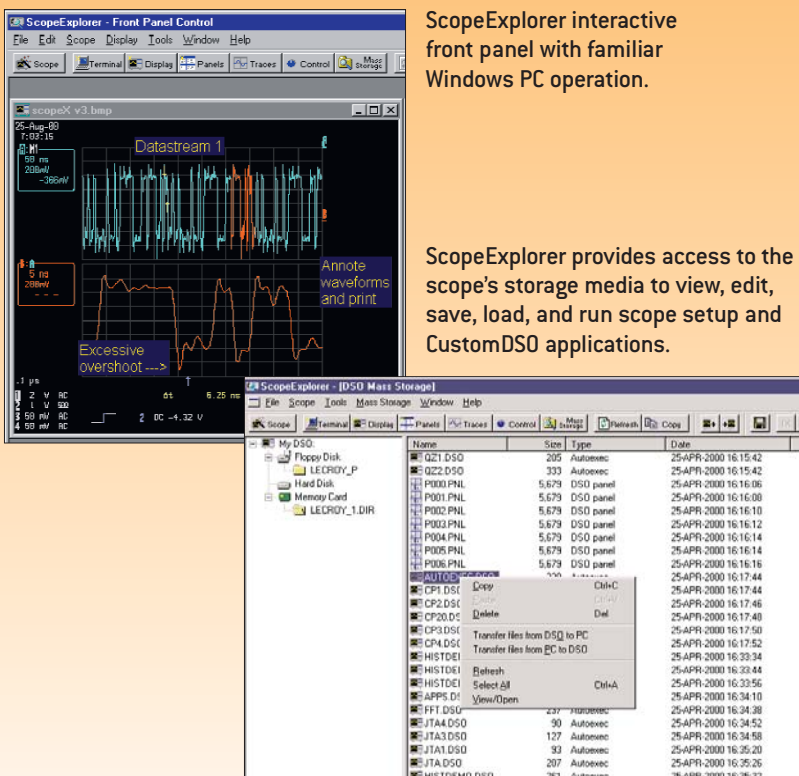
ActiveDSO is a LeCroy software utility for ActiveX control of LeCroy digital scopes.

Exchange Waverunner LT scope data with applications that support the ActiveX standard. Many applications (such as Excel, PowerPoint, Internet Explorer, Visual Basic, Visual C++ and Labview) allow users to incorporate ActiveX controls.

MASKMAKER AND DSO FILTER

These easy-to-use Windows-based graphic utilities let you create and edit test masks and digital filters for use on Waverunner LT scopes. Use MaskMaker with the PolyMask tolerance mask testing option. You can even create X-Y masks.

With the DSO Filter PC utility and DFP (Digital Filter Package), you can specify a set of filter coefficients in an Excel spreadsheet and load them directly into the oscilloscope.



Waverunner LT Technical Specifications

VERTICAL SYSTEM	LT584/M/L	LT374/M/L	LT372/L	LT354/M/ML	LT264/M/L	LT262/ML
Input Channels	4	4	2	4	4	2
Analog Bandwidth @ 50 Ω [-3 dB]	1 GHz	500 MHz	500 MHz	500 MHz	350 MHz	350 MHz
Hardware Bandwidth Limits	20 MHz or 200 MHz					
Input Impedance	50 Ω ±1%; 1 MΩ /12 pF typical (using PP006A probe)					
Input Coupling	1 MΩ: AC, DC, GND; 50 Ω: DC, GND					
Maximum Input	250 Vmax	50 Ω: 5 Vrms; 1 MΩ: 400 Vmax (peak AC ≤ 5 kHz + DC)				
Vertical Resolution	8 bits; up to 11 bits with enhanced resolution (ERES)					
Sensitivity [50 Ω or 1 MΩ]	2 mV – 5 V/div *	2 mV – 10 V/div fully variable				
DC Gain Accuracy	± [1.5% + 0.5% of full scale]					
Offset Accuracy [50 Ω or 1 MΩ]	± [1.5% + 0.5% of full scale + 1 mV]					
Offset Range	1 V – 5 V/div: ±100 V	2 mV – 99 mV/div: ±1 V 100 mV – 99 V/div: ±10 V 1 V – 10 V/div: ±100 V				
Isolation — Channel to Channel	> 250:1 at ≤ 500MHz; > 100:1 at 1 GHz					

TIMEBASE SYSTEM

Timebases	Main and up to four independent zoom traces simultaneously	
Ranges	← 500 ps/div – 1,000 s/div →	← 1 ns/div – 1,000 s/div →
Clock Accuracy	≤ 10 ppm	
Interpolator Resolution	5 ps	
External Clock Frequency	500 MHz maximum, 50 Ω, or 1 MΩ impedance	
Roll Mode – Operating Range	time/div 500 ms – 1,000 s/div or sample rate <100 kS/s max.	
External Timebase Clock	500 MHz maximum external sample clock input on front panel EXT BNC	

ACQUISITION SYSTEM

Single Shot Sample Rate						
1 Channel Max.	4 GS/s	4 GS/s	4 GS/s	1 GS/s	1 GS/s	1 GS/s
2 Channels Max.	4 GS/s	4 GS/s	2 GS/s	1 GS/s	1 GS/s	1 GS/s
3–4 Channels Max.	2 GS/s	2 GS/s	NA	1 GS/s	1 GS/s	NA
Maximum Acquisition Points/Ch						
1 Channel Max.	500k / 2M / 8M	500k / 2M / 8M	500k / 8M	250k / 1M / 2M	100k / 1 M / 2M	100k / 2M
2 Channels Max.	500k / 2M / 8M	500k / 2M / 8M	250k / 4M	250k / 1M / 2M	100k / 1 M / 2M	100k / 2M
3–4 Channels Max.	250k / 1M / 4M	250k / 1M / 4M	NA	250k / 1M / 2M	100k / 1 M / 2M	NA

ACQUISITION MODES

Random Interleaved Sampling (RIS)	50 GS/s for repetitive signals: 500 ps/div – 1 μs/div
Single Shot	For transient and repetitive signals: 1 ns/div – 1,000 s/div
Sequence	
LT262/264	2–400 segments
LT354/372/374	2–1,000 segments
LT584	2–1,000 segments
Memory Option M, ML, or L	2–4,000 segments
Intersegment Time	50 μs max.

ACQUISITION PROCESSING

Averaging	Summed averaging to 1,000 sweeps; continuous averaging with weighting range from 1:1 to 1:1023 (standard). Summed averaging up to 1 million sweeps (optional with WAVA)
Enhanced Resolution (ERES)	From 8.5 to 11 bits vertical resolution
Envelope (Extrema)	Envelope, floor, roof for up to 10 ⁶ sweep

*50 Ω: 2 mV – 1V/div; 1 MΩ: 2 mV – 5 V/div fully variable

Waverunner LT Technical Specifications (continued)

TRIGGERING SYSTEM

Modes	Normal, Auto, Single, and Stop
Sources	Any input channel, external, Ext/10 or line; slope, level, and coupling unique to each source (except line trigger). Inactive channels usable as trigger inputs.
Slope	Positive, Negative, Window
Coupling modes	DC, AC, HFREJ, LFREJ
AC Cutoff Frequency	7.5 Hz Typical
HFREJ, LFREJ	50 kHz typical
Pre-trigger delay	0–100% of horizontal time scale
Post-trigger delay	0–10,000 divisions
Holdoff by time or events	Up to 20 s or from 1 to 99,999,999 events
Internal trigger range	±5 div
Max. trigger frequency	1 GHz (LT584), 500 MHz (LT354, LT374, LT372), 350 MHz (LT264, LT262)
External trigger input range	±0.5 [±5 V with Ext/10 selected]
Maximum ext. input @ 50 Ω	±5 V DC or 5 Vrms
Maximum ext. input @ 1 MΩ	400 Vmax (DC + peak AC < 5 kHz) [250 Vmax on LT584]

AUTOMATIC SETUP

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

PROBES

Model PP006A	10:1, 10 MΩ with auto-detect (one per channel)
Probe System: ProBus	Automatically detects and supports a wide variety of differential amplifiers; active, high-voltage, current, and differential probes
Scale Factors	Up to 12 automatically or manually selected

COLOR WAVEFORM DISPLAY

Type	VGA color 8.4" flat-panel TFT-LCD
Resolution	VGA 640 x 480 pixels
Screen Saver	Display blanks after 10 minutes (when screen saver is "on")
Real Time Clock	Date, hours, minutes, and seconds displayed with waveform
Number of Traces	Display a maximum of eight traces. Simultaneously display channel, zoom, memory, and math traces.
Grid Styles	Single, Dual, Quad, Octal, XY, Single + XY, Dual + XY; Full Screen gives enlarged view of each style
Intensity Controls	Separate intensity control for grids and waveforms
Waveform Styles	Sample dots joined or dots only — regular or bold sample point highlighting
Trace Overlap Display	Select opaque or transparent mode with automatic waveform overlap management

ANALOG PERSISTENCE DISPLAY

Analog & Color-Graded Persistence	Variable saturation levels; stores each trace's persistence data in memory
Trace Selection	Activate Analog Persistence on a selected trace, top 2 traces, or all traces
Persistence Aging Time	Select from 500 ms to infinite
Trace Display	Opaque or transparent overlap
Sweeps Displayed	All accumulated or all accumulated with last trace highlighted

ZOOM EXPANSION TRACES

Display up to Four Zoom Traces	
Vertical Zoom	Up to 5X expansion, 50X with averaging
Horizontal Zoom	Expand to 2 pts/div, magnify to 50,000X
Auto Scroll	Automatically scan and display any zoom or math trace

RAPID SIGNAL PROCESSING

Processor	Power PC
Processing Memory	Up to 128 Mbytes
Real-time Clock	Dates, hours, minutes, seconds, and time stamp trigger time to 1 ns resolution

Waverunner LT Technical Specifications (continued)

INTERNAL WAVEFORM MEMORY

Waveform	M1, M2, M3, M4 (Store full-length waveforms with 16 bits/data point)
Zoom and Math	Four traces A, B, C, D with chained trace capability

SETUP STORAGE

Front Panel and Instrument Status	Four non-volatile memories and floppy drive are standard. Hard drive and memory card are optional.
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INTERFACE

Remote Control	Full control of all front panel controls and internal functions via RS-232-C, GPIB, or Ethernet (optional)
RS-232-C	Asynchronous transfer rate of up to 115.2 kbaud
GPIB Port	Full control via IEEE – 4888.2; configurable as talker/listener for computer control and data transfer
Ethernet (optional)	10Base-T Ethernet interface
Floppy Drive	Internal, DOS-format, 3.5" high-density
PC Card Slot (optional)	Supports memory and hard drive cards
External Monitor Port Standard	15-pin D-Type VGA-compatible
Centronics Port	Parallel printer interface
Internal Graphics Printer (optional)	Provides hard copy output in <10 seconds

OUTPUTS

Calibrator Signal	500 Hz – 1 MHz square wave or DC level; Select from –1.0 to +1.0 into 1 M Ω , output on front panel test point and ground lug.
Control Signals	Rear Panel, TTL level, BNC output; Choice of trigger ready, trigger out, pass/fail status (output resistance 300 Ω \pm 10%)

ENVIRONMENTAL AND SAFETY

Operating Conditions	
Temperature	5–40 °C rated accuracy 0–45 °C operating –20–60 °C nonoperating
Humidity	80% max. RH, noncondensing up to 35 °C; Derates to 50% max. RH, noncondensing at 45 °C
Altitude	4,500 m (15,000 ft.) max. up to 25 °C; Derates to 2,000 m (6,600 ft.) at 45 °C
CE Approved	
EMC	EMC Directive 89/336/EEC; EN 61326-1 Emissions and Immunity
Safety	Low Voltage Directive 73/23/EEC; EN 61010-1 Product Safety (Installation Category II, Pollution Degree 2, Protection Class 1)
UL and cUL Approved	
	UL Standard UL 3111-1 cUL Standard CSA C22.2 No. 1010-1

GENERAL

Auto Calibration	Ensures specified DC and timing accuracy is maintained for 1 year minimum
Auto Calibration Time	< 500 ms
Power Requirements	90–132 VAC at 45–440 Hz 180–250 VAC at 45–66 Hz Automatic AC voltage selection Power Consumption: 150–250 VA depending on model
Battery Backup	Front panel settings retained for two years minimum
Warranty and Calibration	Three years; calibration recommended yearly

PHYSICAL DIMENSIONS

Dimensions (HWD)	210 mm x 350 mm x 300 mm; 8.3" x 13.8" x 11.8" (height excludes feet)
Weight	18 lbs. (8 kg)
Shipping Weight	27 lbs. (12 kg)

Waverunner LT Technical Specifications (continued)

MATH TOOLS (STANDARD)

average (sum to 4,000 sweeps)	product
average (continuous weighted)	ratio
difference	reciprocal (invert)
enhanced resolution (to 11 bits)	resample (deskew)
envelope	rescale (with units)
FFT of 50 kpoint waveforms	roof
floor	sin x/x
identity	sum
negate	

Simultaneously perform up to four math (signal) processing functions; traces can be chained together to perform math on math.

amplitude	fall 90–10%	period
area	fall 80–20%	phase
base	frequency	rise 10–90%
cycle mean	maximum	rise 20–80%
cycle rms	mean	rms
cycles	minimum	sdev
delay	+overshoot	top
Δ delay	–overshoot	width
duty cycle	peak-to-peak	xamn
		xamx

MEASURE TOOLS (STANDARD)

Automated Measurements: Display any five parameters together with their average, high, low, and standard deviations.

PASS/FAIL

Test any five parameters against selectable thresholds. Limit testing is performed using masks created on the scope or PC. Set up a pass or fail condition to initiate actions such as hard copy output, saving waveform to memory, GPIB SRQ, or pulse out.

OPTIONS

Extended Math and Measurement: Adds math and advanced measurements for all general purpose applications. Includes all standard math and measurement tools, plus the following tools:

EXTENDED MATH TOOLS

absolute value	integrate
differentiate	square
exp (base e)	square root
exp (base 10)	trend (datalog)
log (base e)	Histogram (200 events)
log (base 10)	

CURSOR MEASUREMENTS

Type	Symbol	From	To
Relative time	↓ ↑	First point on waveform	Any other point on waveform
Relative voltage	--- ---	Select voltage level	Any other voltage level
Absolute time	⊥	Time and voltage relative	Ground and trigger
Absolute voltage	--- ---	Voltage	Ground

EXTENDED MEASURE TOOLS

cycle median	first point
cycle std. deviation	last point
Δ time @ level; % and volts	number of points
Δ time @ level from trigger	median
Δ time from clock to data volts	rise @ level; % and + (setup time)
Δ time from clock to data (hold time)	std. deviation
fall @ level; % and volts	duration

WAVEANALYZER

Includes the Extended Math and Measure Tools as well as expanded capabilities for performing FFTs, averaging, histograms, and histogram parameters.

WAVEANALYZER TOOLS

Histogram up to 2 billion events. Analyze with 18 histogram parameters. Summed averaging to 1 million sweeps. WaveAnalyzer FFT capability expands the basic FFT to include:

- FFT power averaging
- FFT power density, real, and imaginary
- FFT on all acquisition points

With WaveAnalyzer FFT you get maximum resolution at wide frequency spans.

OTHER APPLICATION SOLUTIONS

- Jitter and Timing Analysis (JTA)
- Digital Filter Package (DFP)
- PowerMeasure Analysis (PMA1)
- Polymask Mask Testing (PMSK)
- Advanced Optical Recording Measurements (AORM)
for LT37X, 35X and 58X scopes
- Disk Drive Measurements (DDM)
- PRML Analysis (PRML)

FREE SOFTWARE UTILITIES

- ScopeExplorer: Easy to use utility that provides a simple but powerful way to control your scope remotely over RS-232-C, GPIB, or Ethernet.
- ActiveDSO: ActiveX controls for flexible Windows applications programming with remote control.
- MaskMaker: Create a tolerance test mask offline with this graphic tool.
- DSO Filter: Specify a set of filter coefficients and load them into the scope.

Waverunner LT Technical Specifications (continued)

BASIC TRIGGERS

Edge/Slope/Window/Line	Triggers when signal meets slope and level condition
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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 25 ns and 20 s
Pattern	Logic combination of 5 inputs (3 on two-channel models); Each source can be high, low, or don't care. Triggers entering or exiting the pattern
TV-Video	Triggers selectable fields (1, 2, 4, or 8) for NTSC, PAL SECAM, or nonstandard video (up to 1,500 lines)

SMART TRIGGERS WITH EXCLUSION TECHNOLOGY

Signal or Pattern Width	Triggers on glitches or on pulse widths selectable from < 2.5 ns to 20 s or on intermittent faults
Signal or Pattern Interval	Triggers on intervals selectable between 10 ns and 20 s
Slew Rate*	Triggers on edge rates; select limits for dV, dt, and slope. Select edge limits between 2.5 ns and 20 s.
Runt*	Positive or negative runts defined by two voltage limits and two time limits. Select between 2.5 ns and 20 ns.

HARD COPY

	Print Screen is activated by a front-panel button or remote control. Store screen image files or print to external printers including network printers and directories. Network printing and file access requires the LAN10BT Ethernet option.
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SUPPORTED PRINTERS

B/W	LaserJet, DeskJet, Epson An optional, internal high-resolution graphics printer is also available for screen dumps; stripchart output formats capable of up to 200 cm/div
Color	DeskJet 550C, Epson Stylus, Canon 200/600/800 series, HP7470 and HP7550
Hard Copy Formats	TIFF b/w, TIFF color, BMP color, BMP compressed, and HPGL

WAVEFORM OUTPUT

	Store Waveforms on floppy disk or optional PC-Card Hard Drives and memory cards Save any trace you choose and select Auto-Store to automatically store the waveform after each trigger
Output Formats	The ASCII waveform output is compatible with spreadsheets, MATLAB, Mathcad, etc. Binary output is also available for reduced file size.

DOCUMENTATION

Included with Waverunner LT Oscilloscopes	Operator's Manual — hard copy Remote Programming Manual — hard copy CD-ROM — PDF formatted manuals plus software utilities including ScopeExplorer, ActiveDSO, MaskMaker, DSO-Filter, and DSONet Print Gateway
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*Optional Advanced Trigger Package

Waverunner LT Ordering Information

WAVERUNNER LT DIGITAL OSCILLOSCOPES	PRODUCT CODE
1 GHz, 2 GS/s, 250 kpts/Ch, 4 Channel Color	LT584
500 MHz, 2 GS/s, 250 kpts/Ch, 4 Channel Color	LT374
500 MHz, 2 GS/s, 250 kpts/Ch, 2 Channel Color	LT372
500 MHz, 1 GS/s, 250 kpts/Ch, 4 Channel Color	LT354
350 MHz, 1 GS/s, 100 kpts/Ch, 4 Channel Color	LT264
350 MHz, 1 GS/s, 100 kpts/Ch, 2 Channel Color	LT262

INCLUDED WITH STANDARD CONFIGURATION

10:1 10 M Ω Passive Probe (1 per channel)	PP006A
Operator's Manual, Quick Reference Guide, CD-ROM with OM/RCM PDF manuals, and utility software	WR2-OMCD-E
Operator's Manual	WR2-OM-E
Remote Control Manual	WR2-RCM-E
Floppy Disk Drive	
GPIO, RS-232-C, Centronics Parallel Port, VGA Video Output Port	
Protective Front Cover	
Performance Certificate	
3-Year Warranty	

MEMORY OPTIONS	4-Channel Scopes				2-Channel Scopes	
	LT264	LT354	LT374	LT584	LT262	LT372
M: 1 Mpts/Ch	•	•	•	•	N/A	N/A
ML: 2 Mpts/Ch	•	•	N/A	N/A	•	N/A
L: 4 Mpts/Ch	N/A	N/A	•	•	N/A	•

HARDWARE OPTIONS

Internal Graphics Printer	WR2-GP02
10Base-T Ethernet LAN Option	LAN10BT
PC Card Slot	PCSL0T
PC Card Slot including 1 hard drive card and 1 memory card	PCMEDIA

SOFTWARE OPTIONS

Wave Analyzer Analysis Package	WAVA
Jitter Analysis and Wave Analyzer	JTWA
Extended Math and Measurement Package	EMM
Jitter and Timing Analysis Package	JTA
Digital Filter Package	DFP
Surface Map Analysis Package	SMAP
Disk Drive Measurements	DDM
Supplementary Disk Drive Measurements	PRML
Advanced Optical Recording Measurements	AORM
Power Measure Analysis Software	PMA1
Advanced Trigger Package	ATP
PolyMask Mask Testing Software	PMSK

** Option only for LT37X, LT35X and LT58X series

SELECTED ACCESSORIES

1.5 GHz Active Probe	HFP1500
1 GHz Active Probe	HFP1000
Differential Probe	ADP300 series
Current Probe	CP and AP series
Differential Amplifiers	DA1800 series
50 Ω to 75 Ω Adapter	PP090
Oscilloscope Carts	OC1021, OC1024
Graphic Printer Paper/10 Rolls	GPR10

SERVICE AND EXTENDED WARRANTIES

US NIST Standard Calibration	CCNIST
US Military Standard Calibration	CCMIL
Swiss OFMET Standard Calibration	CCOFMET
5-Year Warranty at time of scope purchase	W5
5-Year Warranty and NIST Calibration at time of scope purchase	T5