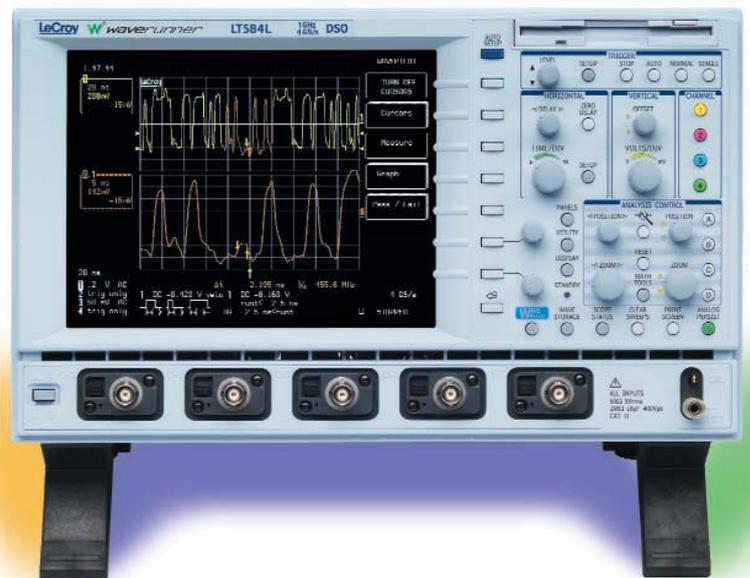


waverunner™

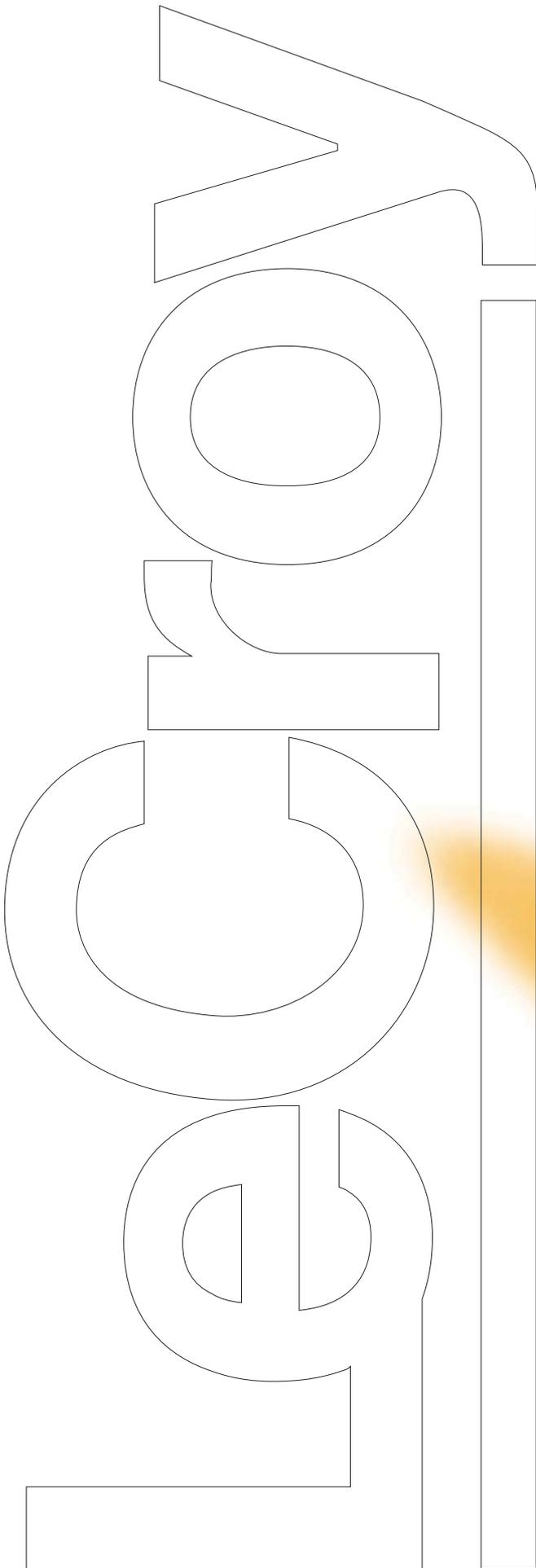
Powerful Capability.  
User Friendly.

**1 GHz**  
Great  
Value



WAVERUNNER-2 OSCILLOSCOPES

**1 GHz - 350 MHz Bandwidth**  
**4 GS/s - 1 GS/s Sample Rate**  
**8 Mpts - 100 kpts Record Length**



# Catch the New Wave

## Easy as 1-2-3

*Waverunner-2* 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-2* scopes are uniquely qualified to meet your requirements — all at a great value!

### Simple, Fast Access to Powerful Capabilities

*Waverunner-2* 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-2* 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 the tool. Common tasks are automatic. Navigation is streamlined and intuitive. You'll easily master their powerful operations.

### The Right Price

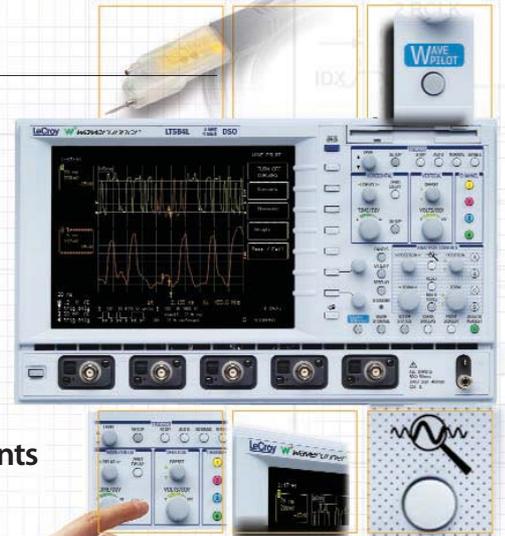
*Waverunner-2* oscilloscopes raise the bar for capability and value — you get more for your money than with any other scope in this class. And because *Waverunner-2* scopes can be upgraded, you can extend their life to meet future needs.

### Increase Your Productivity

The new *Wavepilot* and *QuickZoom* buttons make it simple to magnify, view, inspect or measure signal details, to perform automatic measurements on signals, and to graph measurements in frequency spectra, histogram, or trend format. With *TrackView*, you can track problems to the source. Additional signal analysis capabilities let you data-log, 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-2* 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-2 Color Digital Oscilloscopes							
Model	Bandwidth	Channels	Sample Rate/Ch	Maximum Sample Rate	Acq. Memory per Ch/Max	Option M per Ch/max	Option L per Ch/max
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	—	—
LT354	500 MHz	Four	1 GS/s	1 GS/s	250 k	1/1 Mpts	2/2 Mpts*
LT264	350 MHz	Four	1 GS/s	1 GS/s	100 k	1/1 Mpts	—
LT262	350 MHz	Two	1 GS/s	1 GS/s	100 k	—	—

\* Option ML



# Speed Up Debug and Analyze

## UNIQUE

### SMART Triggers®

The *Waverunner-2* 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-2* 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-2* 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-2*'s SMART Trigger capability by adding runt and slew rate trigger for the capture of intermittent events.

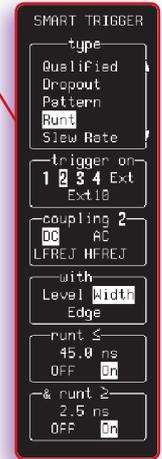
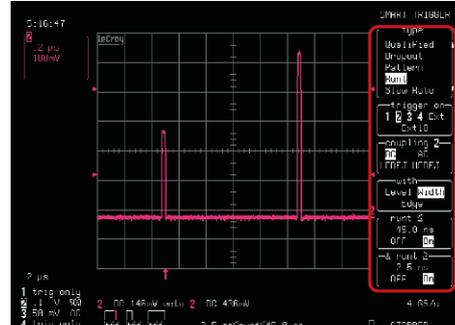
### Waverunner-2 Basic Triggers

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

### Waverunner-2 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
Qual First	A single pulse qualifies a sequence of triggers.
Dropout	If input drops out after a time from 25 ns - 20 s
Runt*	Pulse levels, edge, widths from 2 ns - 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.

\* Optional Advanced Trigger Package (ATP)

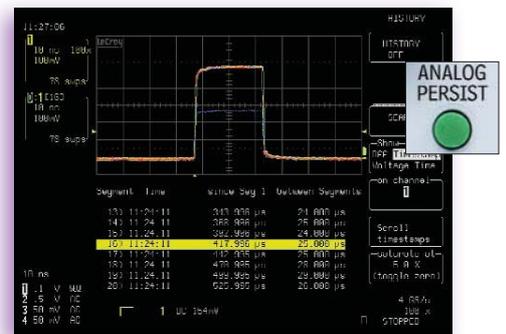


Runt triggering is great for capturing logic signals that exhibit inadequate levels or spurious signals that interfere with circuit operation. With the exclusion/inclusion feature, the scope will only trigger on runt signals that are outside/within a specified range of pulse width.

### 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.



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

# Probing Solutions

**NEW**

## Active Probes

### 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 before.

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-2* 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.

## HFP 1500

### Leading Specifications

- 1.5 GHz Bandwidth
- 0.7 pF Input Capacitance
- 100 k $\Omega$  V DC Input Resistance
- $\pm 8$  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.

## 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-2* series are low-cost active differential probes, high voltage probes, an internal graphics printer and a choice of two scope carts.

# 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-2* scope to a complete signal analyzer.

## Standard in all models

Press *Wavepilot* and 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.

## 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 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)

## 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.

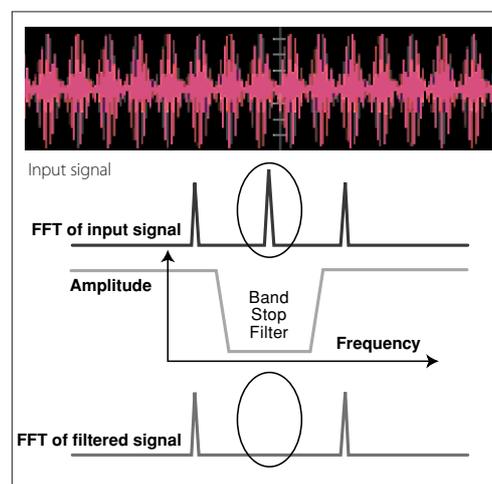
## Digital Filter Package (DFP)

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.

### Filters include:

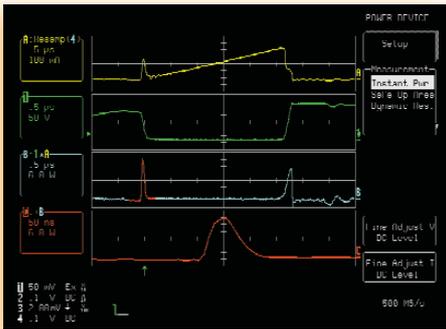
Low Pass	Raised Cosine
High Pass	Raised Root Cosine
Band Pass	Gaussian
Band Stop	Custom
Up to 4 filters can be cascaded	

## Design your own filters with DFP



# Powerful Applications

Here are four 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.

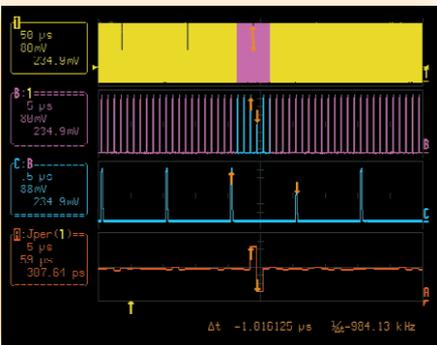


## World Class Power Measurement Solutions

With LeCroy PowerMeasure Systems, you can analyze power devices' performance while they are operating in circuit. The PowerMeasure System combines the

Current, voltage, instantaneous power and energy dissipation measurements.

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 very few buttons.



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 datastream 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.

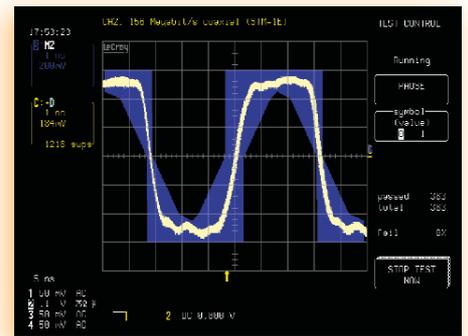
## Telecom Mask Test Packages

MT series Mask Testing options for electrical communications signals are available with *Waverunner-2* scopes. Mask Testing compares a trace against a mask template to check if it falls inside or outside the mask boundaries. Several actions may be initiated if the trace fails the test, including "stop", "output a pulse", and "datalog".

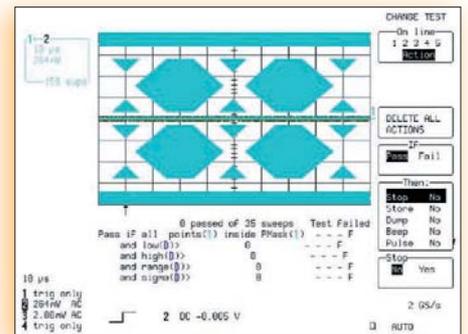
With the exclusive Finder Function, pulses, patterns or even random bit streams are easily isolated. MT packages take control of the *Waverunner* scope, displaying only relevant test menus.

## 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.)



Mask Testing and extinction ratio measurements of a 156 Megabit/s coaxial (STM1-E)



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

# Windows Connectivity

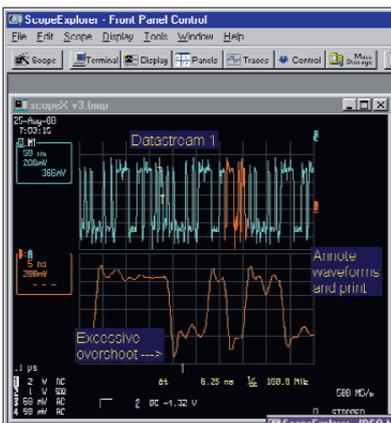
Connect your scope to Windows-based ScopeExplorer using the Ethernet (option), GPIB or RS-232 interfaces. Click and drag files, or operate from the virtual front panel. Update your software via the web.

## 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-2* 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-2* 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.



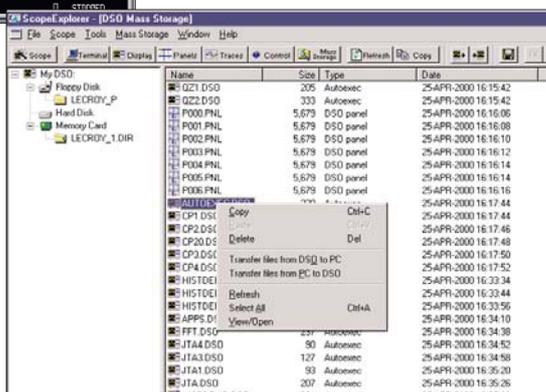
ScopeExplorer interactive front panel with familiar Windows PC operation.

ScopeExplorer provides access to the scope's storage media to view, edit, save, load, and run scope setup and CustomDSO applications.

Access files on storage media, including PC-Cards, hard drives, and diskettes inserted in a *Waverunner-2* scope.

## ActiveDSO™

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



Exchange *Waverunner-2* 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.

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

## 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-2* 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-2 Oscilloscopes

## Specifications

Vertical System	LT584/M/L	LT374 / M / L	LT372	LT354/M/ML	LT264/M	LT262
Input Channels	4	4	2	4	4	2
Analog Bandwidth @ 50 $\Omega$ (-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 $\Omega$ $\pm$ 1%; 1 M $\Omega$ / 12 pF typical (using PP006A probe)					
Input Coupling	1 M $\Omega$ : AC, DC, GND; 50 $\Omega$ : DC, GND					
Maximum Input	250 Vmax	50 $\Omega$ : 5 Vrms; 1 M $\Omega$ : 400 Vmax (peak AC $\leq$ 5 kHz + DC)				
Vertical Resolution	8 bits; up to 11 bits with enhanced resolution (ERES)					
Sensitivity (50 $\Omega$ or 1 M $\Omega$ )	2 mV - 5 V/div *	2 mV - 10 V/div fully variable				
DC Gain Accuracy	$\pm$ (1.5% + 0.5% of full scale)					
Offset Accuracy (50 $\Omega$ or 1 M $\Omega$ )	$\pm$ (1.5% + 0.5% of full scale + 1 mV)					
Offset Range	1 V - 5 V/div: $\pm$ 100 V	2 mV - 99 mV/div: $\pm$ 1 V 100 mV - 99 V/div: $\pm$ 10 V 1 V - 10 V/div: $\pm$ 100 V				
Isolation — Channel to Channel	>250:1 at $\leq$ 500MHz; >100:1 at 1 GHz					
<b>Timebase System</b>	Main and up to four independent zoom traces simultaneously					
Timebases	Main and up to four independent zoom traces simultaneously					
Ranges	500 ps/div - 1000 s/div   1 ns/div - 1000 s/div					
Clock Accuracy	$\leq$ 10 ppm					
Interpolator Resolution	5 ps					
External Clock Frequency	500 MHz maximum, 50 $\Omega$ , or 1 M $\Omega$ impedance					
Roll Mode - Operating Range	time/div 500 ms - 1000 s/div or sample rate <100 kS/s max					
External Timebase Clock	500 MHz maximum external sample clock input on front panel EXT BNC					
<b>Acquisition System</b>						
Single Shot Sample Rate						
1 Channel Max.	4 GS/s	4 GS/s	4 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
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	—	100k / 1 M	100k
2 Channels Max.	500k / 2M / 8M	500k / 2M / 8M	250k	—	100k / 1 M	100k
3 - 4 Channels Max.	250k / 1M / 4M	250k / 1M / 4M	NA	250k / 1M / 2M	100k / 1 M	NA
<b>Acquisition Modes</b>						
Random Interleaved Sampling (RIS)	50 GS/s for repetitive signals: 500 ps/div - 1 $\mu$ s/div					
Single Shot	For transient and repetitive signals: 1 ns/div - 1000 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 $\mu$ sec max.					
<b>Acquisition Processing</b>						
Averaging	Summed averaging to 10 <sup>3</sup> sweeps; continuous averaging with weighting range from 1:1 to 1:1023 (standard). Summed averaging up to 10 <sup>6</sup> sweeps (optional with WAVA)					
Enhanced Resolution (ERES)	From 8.5 to 11 bits vertical resolution					
Envelope (Extrema)	Envelope, floor, roof for up to 10 <sup>6</sup> sweep					

\* 50  $\Omega$ : 2 mV - 1V/div; 1 M $\Omega$ : 2 mV - 5 V/div fully variable

**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
Hold off by time or events	Up to 20s 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 $\Omega$	±5 V DC or 5 Vrms
Maximum ext. input @ 1 M $\Omega$	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 M $\Omega$ 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-2 Oscilloscopes

## 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)	10 Base-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 $\Omega$ , 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 $\Omega$ $\pm$ 10%)

### Environmental and Safety

Operating Conditions	
Temperature	5 - 40 °C rated accuracy 0 - 45 °C operating -20 - 60 °C non-operating
Humidity	80% max RH, non-condensing up to 35 °C; Derates to 50% max RH, non-condensing 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)

## 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 + (setup time)	rise @ level; % and volts
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 (Standard)

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)

Communications Mask Testing (MT01/MT02)

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-2 Oscilloscopes

## 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. Trigger entering or exiting the pattern
TV-Video	Triggers selectable fields ( 1, 2, 4, or 8 ) for NTSC, PAL SECAM, or nonstandard video ( up to 1500 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*	Trigger 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 to 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-2 Oscilloscopes:	Operators 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

# Ordering Information

<b>Waverunner-2 Digital Oscilloscopes</b>	<b>Product Code</b>			
<b>1 GHz, 2 GS/s, 250 kpts/ch, 4 Channel Color</b>	<b>LT584</b>			
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			
<b>Included with Standard Configuration</b>				
10:1 10 M $\Omega$ 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				
Three-Year Warranty				
<b>Memory Options</b>				
	<b>LT264</b>	<b>LT354</b>	<b>LT374</b>	<b>LT584</b>
M: 1 Mpts/ch	•	•	•	•
ML: 2 Mpts/ch	N/A	•	N/A	N/A
L: 4 Mpts/ch	N/A	N/A	•	•
<b>Hardware Options</b>				
Internal Graphics Printer	GP02			
10 Base-T Ethernet LAN option	LAN10BT			
PC Card Slot	PCSLOT			
PC Card Slot including 1 hard drive card and 1 memory card	PCMEDIA			
<b>Software Options</b>				
Wave Analyzer Analysis Package	WAVA			
Jitter Analysis and Wave Analyzer	JTWA			
Extended Math and Measurement Package	EMM			
ITU G.703 Fully Automated Mask Tester*	MT01			
ANSI T1.102 Fully Automated Mask Tester*	MT02			
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			
<b>Selected Accessories</b>				
1.5 GHz Active Probe	HFP 1500			
1 GHz Active Probe	HFP 1000			
Differential Probe	ADP300 series			
Current Probe	CP and AP series			
Differential Amplifiers	DA1800 series			
50 $\Omega$ to 75 $\Omega$ Adapter	PP090			
Oscilloscope Carts	OC1021, OC1024			
Graphic Printer Paper/10 Rolls	GPR10			
<b>Service and Extended Warranties</b>				
US NIST Standard Calibration	CCNIST			
US Military Standard Calibration	CCMIL			
Swiss OFMET Standard Calibration	CCOFMET			
Five-Year Warranty at time of scope purchase	W5			
Five-Year Warranty and NIST Calibration at time of scope purchase	T5			

\* Test Masks available are dependent upon oscilloscope bandwidth.

\*\* option only for LT37X, LT35X and LT58X series

## Sales and Service Throughout the World

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