

Digital Oscilloscopes



LT37X, LT26X

LEADING FEATURES

- 2 and 4 Channel Models
- 500 MHz and 350 MHz Bandwidths
- Up to 4 GS/s Single-Shot Sampling Rate
- 50 GS/s Repetitive Sample Rate
- Better than 10 ppm Timebase Accuracy with 5 ps resolution
- Up to 8 Mpt Waveforms
- 8.4" TFT LCD Color Display
- SMART Triggers include Slew Rate and Runt to 2.5ns (optional)
- Analog Persistence™ with History view
- QuickZoom automatically magnifies signal views
- Wavepilot™ provides Quick Access to Analysis Views of Measurements such as, FFTs, Histograms, and TrackViews
- Averaging and Enhanced Resolution up to 11 bits
- Deskew and Rescale
- GPIB, RS-232-C, VGA and Centronics Ports (Standard); Ethernet (Optional)
- Automatic Pass/Fail Testing
- PC Card Support for Hard Drives and Memory Cards
- Internal Graphics Printer Option



The LT37X and LT26X Waverunner-2 series scopes with Wavepilot and QuickZoom provide excellent data acquisition characteristics and easy signal analysis.

The new Waverunner-2 series of digital oscilloscopes from LeCroy provide the power you need to quickly view, measure, and evaluate your signals — accurately and reliably — all at a reasonable price. These oscilloscopes are designed to save engineers valuable time in troubleshooting and problem solving.

Each Waverunner-2 oscilloscope is an integrated and powerful system providing the capability to CAPTURE, VIEW, and ANALYZE (simple as well as complex) signals. The new *Wavepilot* button offers easy access to popular measurement and analysis functions.

Model LT374 provides 500 MHz of bandwidth at up to 4 GS/s into 8 Mpts of acquisition memory (when used with the "L" memory option). This allows single-shot capture of long/complex signals at high sampling rates.

The external trigger input is useful to trigger on an additional signal. Altogether, the Waverunner-2 series provides the bandwidth, sample rate, acquisition memory, and processing power needed to test signals with excellent fidelity, resolution, and precision.

The *Wavepilot* feature provides easy access to analysis capabilities which improve your productivity; you get one-touch operation of features that automatically sets up cursors, creates context-sensitive displays of up to 26 waveform parameters, histograms, and trends. *JitterTrack™* and *TrackView* help you track down timing and signal integrity problems right to the source.

Select the right configuration for your needs and budget. If you need to expand in the future, LeCroy provides reasonably priced upgrades for both hardware and software.

Signal Viewing

Display

The bright, clear 8.4" TFT LCD color display makes it easy to see signal details. Select *Full Screen*, and the entire screen is devoted to signal viewing to really see signal details.

QuickZoom automatically displays up to eight traces on multiple grids with maximum S/N ratio. With a press of the green *Analog Persistence* button, choose the intensity-graded or color-graded view and quickly visualize the signal's history.

Analog Persistence with "History"

Press *Analog Persistence* and select "History" to store and view up to 4,000 sequential acquisitions in Analog Persistence mode with display of trigger times down to 1 ns resolution. Scan forward and backward to search for signal errors, then analyze when and why the error occurred.

Quick Zoom

Press *QuickZoom* to explore signal relationships and inspect or magnify selected regions of a waveform. Use *AutoScroll* to scan and view details on signals of up to 8 Mpts.

Signal Analysis

Wavepilot

Wavepilot is the easy-to-access signal analysis feature on new Waverunner-2 oscilloscopes. *Wavepilot* gives you the most direct way to view measurement cursors, or a group of 26 measurement parameters and evaluate the signal with graphs including Histograms, TrackView, or the frequency spectrum (FFT) view.

Graph

Press *Wavepilot* and select "Graph" for quick and simple setup of measurements, FFT or TrackView trends. Select optional histograms or JitterTrack for accurate and precise results when evaluating critical timing parameters, crosstalk, and signal integrity problems in high-speed designs. All track views are synchronized to the signal so you can track problems to the source.

Cursors and Automatic Measurements

Press *Wavepilot* and select "Parameters" to view up to 26 of the 28 standard waveform parameters (over 40 are available with optional analysis packages). It's context-sensitive, so if you select FFT or TrackView, it shows the right parameters with the right units. Select the *Cursors* button for instant access to cursor measurements.

Signal Analysis Solutions

Optional software packages customize the Waverunner-2 scopes with powerful signal analysis solutions including power measure, disk drive and media development, wireless and network communications, and computer design. Press *Wavepilot* and select *Analysis Packages* for direct access.

Custom DSO

Get your work done fast by automating your analysis with your own customized setups and applications. Custom DSO applications can be created offline and stored on a floppy disk, or on the optional hard drive and memory cards for quick access.

Waverunner-2 Oscilloscope Configurations				
	LT374	LT372	LT264	LT262
Bandwidth	500 MHz	500 MHz	350 MHz	350 MHz
Input Channels	4	2	4	2
Single-Shot Sample Rate				
1 Channel max.	4 GS/s	4 GS/s	1 GS/s	1 GS/s
2 Channels max.	4 GS/s	2 GS/s	1 GS/s	1 GS/s
3-4 Channels max.	2 GS/s	NA	1 GS/s	NA
Random Interleaved Sampling (RIS)	50 GS/s for repetitive signals: 500 ps/div – 1 us/div			
Maximum Acquisition Points/Ch	(1 Ch) / (2 Ch) / (3 - 4 Ch)			
Standard	500 k / 500k / 250 k	500 k / 250 k / NA	100 k / 100 k / 100 k	100 k / 100 k / NA
M — memory option	2 M / 2 M / 1 M	NA	1 M / 1M / 1M	NA
L — memory option	8 M / 8 M / 4 M	NA	NA	NA

Specifications

Vertical System	LT374 / M / L	LT372	LT264/M	LT262
Input Channels	4	2	4	2
Analog Bandwidth @ 50 (-3 dB)	500 MHz	500 MHz	350 MHz	350 MHz
Hardware Bandwidth Limits	20 MHz or 200 MHz			
Input Impedance	50 \pm 1%; 10 M Ω / 12 pF typical (using PP006 probe)			
Input Coupling	1 M Ω : AC,DC,GND; 50 Ω : DC,GND			
Maximum Input	50 Ω : 5 Vrms; 1 M Ω : 400 Vmax (peak AC 5 kHz + DC)			
Vertical Resolution	8 bits; up to 11 bits with enhanced resolution (ERES)			
Sensitivity (50 Ω or 1 M Ω)	2 mV – 10 V/div fully variable			
DC Gain Accuracy	\pm (1.5% + 0.5% of full scale)			
Offset Accuracy (50 Ω or 1 M Ω)	\pm (1.5% + 0.5% of full scale + 1 mV)			
Offset Range	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 same V/div settings			
Timebase System	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	10 ppm			
Interpolator Resolution	5 ps			
External Clock Frequency	500 MHz maximum, 50 Ω , or 1 M Ω 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			
Acquisition System				
Single Shot Sample Rate				
1 Channel Max.	4 GS/s	4 GS/s	1 GS/s	1 GS/s
2 Channels Max.	4 GS/s	2 GS/s	1 GS/s	1 GS/s
3 – 4 Channels Max.	2 GS/s	NA	1 GS/s	NA
Maximum Acquisition Points/Ch				
1 Channel Max.	500k / 2M / 8M	500k	100k / 1 M	100k
2 Channels Max.	500k / 2M / 8M	250k	100k / 1 M	100k
3 – 4 Channels Max.	250k / 1M / 4M	NA	100k / 1 M	NA
Acquisition Modes				
Random Interleaved Sampling (RIS)	50 GS/s for repetitive signals: 500 ps/div – 1 μ s/div			
Single Shot	For transient and repetitive signals: 1 ns/div – 1000 s/div			
Sequence				
LT262/264	2 – 400 segments			
LT372/374	2 – 1 000 segments			
Memory Option M or L	2 - 4 000 segments			
Intersegment Time	50 μ sec max.			
Acquisition Processing				
Averaging	Summed averaging to 10 ³ sweeps; continuous averaging with weighting range from 1:1 to 1:1023 (standard). Summed averaging up to 10 ⁶ 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			

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
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	500 MHz (350MHz on LT264, LT262)
External trigger input range	±0.5 (±5 V with Ext/10 selected)
Maximum ext. input @ 50	±5 V DC or 5Vrms
Maximum ext. input @ 1 M	400 Vmax (DC + peak AC < 5 kHz)

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 PP006	10:1, 10 M 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
Realtime Clock	Dates, hours, minutes, seconds, and time stamp trigger time to 1 ns resolution

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.
-----------------------------------	--

Interface

Remote Control	Full control of all front panel controls and internal functions via RS232C, 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 ohm, 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 \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)
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 - 230 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)

Specifications

Continued

Math Tools

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

Standard Math Tools

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	

Measure Tools

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

Standard Measure Tools

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
delay	-overshoot	width
duty cycle	peak-to-peak	xamn
		xamx

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.

Extended Math and Measurement Option

Adds math and advanced measurements for all general purpose applications. Includes all standard math and measurement tools, plus:

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 to	Ground and trigger
Absolute voltage		Voltage	Ground

Extended Measure Tools

cycle median	first point
cycle std. deviation	last point
time @ level: % and volts	number of points
time @ level from trigger	median
time from clock to data + (setup time)	rise @ level: % and volts
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)
Communications Mask Testing (MT01/MT02)
Polymask Mask Testing (PSMK)
Advanced Optical Recording Measurements (AORM) for LT37X 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 RS232C, GPIB, or Ethernet.
ActiveDSO: Active X 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 in to the scope.

Specifications

Continued

Basic Triggers

Edge/Slope/Window/Line	Triggers when signal meets slope and level condition
------------------------	--

SMART Triggers

State or Edge Qualified	Triggers on any input source only if a defined state or edge occurred on another input source. Delay between sources is selectable by time or events.
Dropout	Trigger if signal drops out for longer than selected time between 25 ns and 20 s.
Pattern	Logic combination of 5 inputs (3 on 2 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 <25 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.
Run*	Positive or negative runts defined by two voltage limits and two time limits. Select between 2.5ns 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 net work printers and directories. Network printing and file access requires the LAN10BT Ethernet option.
--	---

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.
---	--

* optional Advanced Trigger Package

Ordering Information

Waverunner-2 Digital Oscilloscopes

	Product Code
500 MHz, 2 GS/s, 250 kpts/ch, 4 Channel Color	LT374
500 MHz, 2 GS/s, 250 kpts/ch, 2 Channel Color	LT372
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 Passive Probe (1 per channel)	PP006
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	WR-RCM-E
Floppy Disk Drive	
GPIB, RS-232-C, Centronics Parallel Port, VGA Video Output Port	
Protective Front Cover	
Performance Certificate	
Three-Year Warranty	

Memory Options

	LT264	LT374
M: 1 Mpts/ch	•	•
L: 4 Mpts/ch	-	•

Hardware Options

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

Software Options

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
Disk Drive Measurements	DDM
Supplementary Disk Drive Measurements	PRML
Advanced Optical Recording Measurements*	AORM
Power Measure Analysis Software	PMA1
Advanced Trigger Package	ATP

Selected Accessories

1 GHz Active probe	HFP 1000
Differential Probe	ADP300 series
Current Probe	CP and AP series
Differential Amplifiers	DA1800 series
50 to 75 adapter	PP090
Oscilloscope Cart	OC-RUNNER
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
Five-Year Warranty at time of scope purchase	W5
Five-Year Warranty and NIST Calibration at time of scope purchase	T5

* optional on LT37X series

Sales and Service Throughout the World

Corporate Headquarters

700 Chestnut Ridge Road
Chestnut Ridge, NY 10977
USA

<http://www.lecroy.com>

LeCroy Sales Offices:

Asia: Hong Kong
Phone (852) 2834 5630
Fax (852) 2834 9893

Austria: Markersdorf
Phone (43) 2749 30050
Fax (43) 2749 30051

Benelux: The Netherlands
Phone (31) 40 211 6998
Fax (31) 40 211 6999

France: Les Ulis
Phone (33) 1 69 18 83 20
Fax (33) 1 69 07 40 42

Germany: Heidelberg
Phone (49) 6221 827 00
Fax (49) 6221 834 655

Italy: Venice
Phone (39) 041 456 97 00
Fax (39) 041 456 95 42

Japan: Osaka
Phone (81) 6 6396 0961
Fax (81) 6 6396 0962

Japan: Tokyo
Phone (81) 3 3376 9400
Fax (81) 3 3376 9587

Japan: Tsukuba
Phone (81) 298 56 0961
Fax (81) 298 56 0962

Korea: Seoul
Phone (82) 2 3452 0400
Fax (82) 2 3452 0490

Spain: Madrid
Phone: (34) 91 640 11 34
Fax: (34) 91 640 06 40

Switzerland: Geneva
Phone (41) 22 719 2111
Fax (41) 22 719 2230

U.K.: Abingdon
Phone (44) 1 235 536 973
Fax (44) 1 235 528 796

USA: Chestnut Ridge
Phone (1) 845 578 6020
Fax (1) 845 578 5985



Copyright November 2000 ©

LeCroy and ProBus are registered trademarks of LeCroy Corporation. All rights reserved. Other product or brand names are trademarks or requested trademarks of their respective holders. Information in this publication supersedes all earlier versions. Specifications subject to change without notice.