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.

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

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

amplitude
area
base
cycle mean
cycle rms
cycles
delay
Δ delay
duty cycle
fall 90–10%
fall 80–20%
frequency
maximum
mean
minimum
+overshoot
–overshoot
peak-to-peak
period
phase
rise 10–90%
rise 20–80%
rms
sdev
top
width
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
differentiate
exp (base e)
exp (base 10)
log (base e)
log (base 10)
integrate
square
square root
trend (datalog)
Histogram (200 events)

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