WaveSurfer Specifications

Main Specifications

	424	422	434	432	454	452
Bandwidth (at probe tip)	200 MHz		350 MHz		500 MHz	
Rise Time (typical)	1.75 ns		1 ns		750 ps	
Input Channels	4	2	4	2	4	2
Display	10.4" Color flat-panel TFT-LCD, 800x600 SVGA, touch screen					
Sample Rate (single-shot)	2 GS/s max (interleaved mode), 1 GS/s (all channels)					
Sample Rate (RIS mode)	50 GS/s					
Standard Record Length	500 kpts/Ch (interleaved mode), 250 kpts/Ch (all channels)					
Maximum Record Length (Optional)	2 Mpts/Ch (interleaved mode), 1 Mpts/Ch (all channels)					
Standard Capture Time	up to 250 µs at full sample rate					
Maximum Capture Time (Optional)	up to 1 ms at full sample rate					
Vertical Resolution	8 bits					
Vertical Sensitivity	1 mV/div - 10 V/div (1 MΩ); 1 mV/div - 2 V/div (50 Ω)					
Vertical (DC Gain) Accuracy	±(1.5% of reading +0.5% of full scale)					
BW Limit	20 MHz		20 MHz, 200 MHz			
Maximum Input Voltage	±400 V_{pk} (CAT I), ±300 V_{pk} (CAT II)					
Input Coupling	AC, DC, GND (AC for 1 MΩ only)					
Input Impedance	1 MΩ//16 pF, or 50 Ω +/-1%,					
Probing System	BNC or ProBus®					
Probes	One PP007 per channel (standard)					
Time/div Range	1 ns - 1000 s/div		500 ps - 1000 s/div Roll mode from 200 ms/div - 1000 s/div		200 ps - 1000 s/div	
Timebase Accuracy	10 ppm					

Additional Specifications

Triggering System

Trigger Modes	Normal, Auto, Single, and Stop
Sources	Any input channel, External, Ext/10, or line; slope and level unique to each source (except for line trigger)
Trigger Coupling	AC, DC, HF, HFRej, LFRej
Pre-trigger Delay	0 – 100% of full scale
Post-trigger Delay	0 – 10,000 divisions
Hold-off	2 ns to 20 s or 1 to 99,999,999 events
Internal Trigger Level Range	±5 div from center
External Trigger Range	EXT/10 ±5 V; EXT ±500 mV
External Trigger Input Impedance	50 Ω, 1MΩ

Standard Triggers

Edge	Triggers when signal meets slope (positive, negative, or Window) and level condition
Glitch	Triggers on positive or negative glitches with widths selectable from 2 ns to 20 s or on intermittent faults. Includes exclusion mode (trigger on intermittent faults by specifying the normal width period).
Width	Triggers on positive or negative glitches with widths selectable from 2 ns to 20 s or on intermittent faults. Includes exclusion mode (trigger on intermittent faults by specifying the normal width period).
Logic (Pattern)	Logic combination (AND, NAND, OR, NOR) of 5 inputs (4 channels and external trigger input). Each source can be high, low, or don't care. The High and Low level can be selected independently.
TV-Composite Video	Triggers selectable fields (1, 2, 4, or 8), Positive or Negative slope, for NTSC, PAL, SECAM, or non-standard video (up to 1500 lines)

Optional SMART Triggers®

Runt	Trigger on positive or negative runts defined by two voltage limits and two time limits. Select between 2 ns and 20 ns. Includes exclusion mode (trigger on intermittent faults by specifying the normal width period).
Slew Rate	Trigger on edge rates. Select limits for dV, dt, and slope. Select edge limits between 2 ns and 20 ns. Includes exclusion mode (trigger on intermittent faults by specifying the normal width period).
Interval (Signal or Pattern)	Triggers on a source if a given state (or transition edge) has occurred on another source. Delay between sources is 2 ns to 20 s, or 1 to 99,999,999 events. Includes exclusion mode (trigger on intermittent faults by specifying the normal width period).
Dropout	Triggers if signal drops out for longer than selected time between 2 ns and 20 s. Includes exclusion mode (trigger on intermittent faults by specifying the normal width period).
Qualified (State or Edge)	Triggers on any input source only if a defined state or edge occurred on another input source. Delay between sources is 2 ns to 20 s, or 1 to 99,999,999 events. Includes exclusion mode (trigger on intermittent faults by specifying the normal width period).

Documentation and Connectivity

Printing	Connect to any WindowsXP-compatible printer. Load any standard WindowsXP printer driver onto the unit as future needs require.
Email	Configure the unit to send an email of a screen image in a variety of formats using MAPI (i.e. through a default email program) or SMTP (no additional program needed).

WaveSurfer Specifications

Waveform Memories	Save waveform data as a reference trace to be compared to channels, zooms, or math functions.
Waveform File Data	Save waveform data in the following formats: Binary, ASCII, Excel, Mathcad, MATLAB.
Screen Image	Save a screen image to the internal hard drive, a user-supplied USB memory stick, or any other peripheral connected to one of the three USB 2.0 ports. Image can be saved in a variety of formats, and with white or black background.
Waveform Labeling (Annotation)	Attach up to 10 labels to any combination of waveforms. Labels appear on screen images.
Hardcopy Front Panel Button	Configure the front panel Hardcopy button to send an email, save a screen image, save waveform file data, and save to the clipboard.
Networking	Standard 10/100Base-T Ethernet interface (RJ-45 connector). Connect to any network using DHCP with automatically assigned IP address.
Remote Control	Via LeCroy Remote Command Set (via Ethernet)
USB Ports	3 USB ports (one on front of instrument) support Windows compatible devices
External Monitor Port Standard	15-pin D-Type female SVGA-compatible connector for external color
Parallel Port	25-pin D-type female (Centronics)
Serial Port	9-pin D-type male (not for remote oscilloscope control)
Audio Port	Mic Input, Line Input, Line Output

Measure, Zoom, and Math Tools

Standard Parameter Measurement	Up to 6 of the following parameters can be calculated at one time on any waveform: Amplitude, Area, Base (Low), Delay, Duty, Fall Time (90%-10%), Fall Time (80%-20%), Frequency, Maximum, Mean, Minimum, Overshoot+, Overshoot-, Period, Peak-Peak, Rise Time (10%-90%), Rise Time (20%-80%), RMS, Skew, Standard Deviation, Top (High), Width. Measurements may be gated.
Zooming	Use front panel QuickZoom button, or use touch screen or mouse to draw a box around the zoom area.
Standard Math	Operators include Sum, Difference, Product, Ratio, and FFT (up to 25 kpts with power spectrum output and rectangular, VonHann, and FlatTop windows). 1 math function may be defined at a time.
Extended Math (MathSurfer Options)	Adds the following additional math functions: Absolute Value, Averaging (summed and continuous), Derivative, Envelope, Enhanced Resolution (to 11 bits), Floor, Integral, Invert, Reciprocal, Roof, Square, and Square Root. Also adds chaining of two math functions, and rescaling to different units.

Automatic Setup

Auto Setup	Automatically sets timebase, trigger, and sensitivity to display a wide range of repetitive signals. Vertical Find Scale automatically sets the vertical sensitivity and offset for the selected channel.
Analog Persistence	When ON, persistence applied to all waveforms. Select analog or color-graded. Variable saturation level, with aging time selectable from 500 ms to infinity.

Setup and Waveform Storage

Front Panel and Instrument Status	Save to the internal hard drive, over the network, or to a USB connected peripheral device.
Waveform Traces	Save to one of four internal memories with 16 bit resolution for recall/comparison.
Waveform Data	Save to the internal hard drive, over the network, or to a USB connected peripheral device.

Outputs

Calibrator	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 W ±10%)

Environmental and Safety

Temperature (Operating)	+5 °C to +40 °C
Temperature (Non-Operating)	–20 °C to +60 °C
Humidity (Operating)	5% to 80% relative humidity (non-condensing) at <= 30 °C. Upper limit derates to 55% relative humidity (non-condensing) at +40 °C.
Humidity (Non-Operating)	5% to 95% relative humidity (non-condensing) as tested per MIL–PRF–28800F.
Altitude (Operating)	up to 3048 m (10,000 ft) at up to 25 °C
Altitude (Non-Operating)	up to 12,190 m (40,000 ft)
Vibration (Operating)	Random vibration, 0.31 grms 5 Hz to 500 Hz, 15 minutes in each of three orthogonal axes
Vibration (Non-Operating)	Random vibration, 2.4 grms 5 Hz to 500 Hz, 15 minutes 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
Certification	CE Approved, UL (Std. UL 3111-1) and cUL (Std. CSA C22.2 No. 1010-1) listed. EMC Directive 89/336/EEC; EN61326-1:1997+A1:1998+A2:2001. Low Voltage Directive 73/23/EEC; EN 61010-1:2001 Product Safety (Installation Category II, Pollution Degree 2, Protection Class 1)

Physical Dimensions

Dimensions (HxWxD)	260 mm x 340 mm x 152mm (10.25" x 13.4" x 6"). Excluding accessories and projections.
Net Weight	6.8 kg (15 lbs). Excluding accessories.

General

Power (AC)	100–120 Vrms at 50/60/400 Hz; 200–240 Vrms at 50/60 Hz; Max. Power Consumption: 170 VA
Warranty and Calibration	Three year warranty. Calibration recommended yearly.

Ordering Information

	Product Code
WaveSurfer Four Channel Digital Oscilloscopes	
500 MHz, 1 GS/s, 250 kpts/Ch Color DSO with 10.4" Display 2 GS/s, 500 kpts/Ch in interleaved mode	WaveSurfer 454
350 MHz, 1 GS/s, 250 kpts/Ch Color DSO with 10.4" Display 2 GS/s, 500 kpts/Ch in interleaved mode	WaveSurfer 434
200 MHz, 1 GS/s, 250 kpts/Ch Color DSO with 10.4" Display 2 GS/s, 500 kpts/Ch in interleaved mode	WaveSurfer 424
WaveSurfer Two Channel Digital Oscilloscopes	
500 MHz, 1 GS/s, 250 kpts/Ch Color DSO with 10.4" Display 2 GS/s, 500 kpts/Ch in interleaved mode	WaveSurfer 452
350 MHz, 1 GS/s, 250 kpts/Ch Color DSO with 10.4" Display 2 GS/s, 500 kpts/Ch in interleaved mode	WaveSurfer 432
200 MHz, 1 GS/s, 250 kpts/Ch Color DSO with 10.4" Display 2 GS/s, 500 kpts/Ch in interleaved mode	WaveSurfer 422
Included with Standard Configuration	
10/100Base-T Ethernet Port, 3 USB2.0 Ports, SVGA Video Output Port, RS232-C Serial Port, Centronics Parallel Port, Protective Front Cover	
CD-ROM with Operator's Getting Started Manual, QRG, and Remote Control Manual	
Operator's Getting Started Manual, Quick Reference Guide	
PP007-WS 10:1 Passive Probe (1 per Channel)	
Standard Commercial Calibration and Performance Certificate	
3-Year Warranty	
Memory Options for Four Channel WaveSurfers	
2 Mpts/2 Ch, 1 Mpts/4 Ch	WS-L-4CH
Memory Options for Two Channel WaveSurfers	
2 Mpts/1 Ch, 1 Mpts/2 Ch	WS-L-2CH
Mounting/Ergonomic Accessories	
Mounting Brackets - 100 mm Square	WS-MB
Mounting Stand - Desktop Clamp Style (includes WS-MB Mounting Bracket)	WS-MS-CLAMP
Mounting Stand - Pedestal Style (includes WS-MB Mounting Bracket)	WS-MS-PED
Rackmount Ears for WaveSurfer	WS-RMA-25
Hardware and Software Accessories	
Advanced Trigger Package	WS-ADVTRIG
Electrical Telecom Mask Test Package	WS-ET-PMT
MathSurfer Extended Math and Graphical Setup Display	WS-MATHSURF
USB 2.0 to GP-IB Converter for WaveSurfer	WS-GPIB
METAS Traceable Calibration Certificate for WaveSurfer Series DSOs	WS-CCMETAS
MIL Std. Traceable Calibration Certificate for WaveSurfer Series DSOs	WS-CCMIL
NIST Traceable Calibration Certificate for WaveSurfer Series DSOs	WS-CCNIST
Warranty and Calibration	
5-Year Warranty on any WaveSurfer Series DSO	WS-W5
5-Year Warranty and NIST Calibration on any WaveSurfer Series DSO	WS-T5
5 Annual NIST Calibrations for WaveSurfer Series DSOs	WS-C5
1-Year Extended Warranty on any WaveSurfer Series DSO	WS-EW
2-Year Extended Warranty on any WaveSurfer Series DSO	WS-EW2

Sales and Service Throughout the World

Corporate Headquarters

700 Chestnut Ridge Road
Chestnut Ridge, NY 10977
USA
www.lecroy.com

LeCroy Sales Offices:

China: Beijing
Phone (86) 10 8526 1618
Fax (86) 10 8526 1619

France: Les Ulis
Phone (33) 1 6918 8320
Fax (33) 1 6907 4042

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

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

Italy: Venice
Phone (39) 041 599 7011
Fax (39) 041 456 9542

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

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

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

Singapore
Phone (65) 6442 4880
Fax (65) 6442 7811

Sweden: Stockholm
Phone (46) 8 580 143 45
Fax (46) 8 580 143 45

Switzerland: Geneva
Phone (41) 22 719 2228 (North)
Phone (41) 22 719 2175 (South)
Fax (41) 22 719 2230

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

U.S.A.: Chestnut Ridge
Phone (1) 845 578 6020
Fax (1) 845 578 5985

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