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Test & Measurement

- sales
- rentals
- calibration
- repair
- disposal

Complimentary Reference Material

This PDF has been made available as a complimentary service for you to assist in evaluating this model for your testing requirements.

TMG offers a wide range of test equipment solutions, from renting short to long term, buying refurbished and purchasing new. Financing options, such as Financial Rental, and Leasing are also available on application.

TMG will assist if you are unsure whether this model will suit your requirements.

Call TMG if you need to organise repair and/or calibrate your unit.

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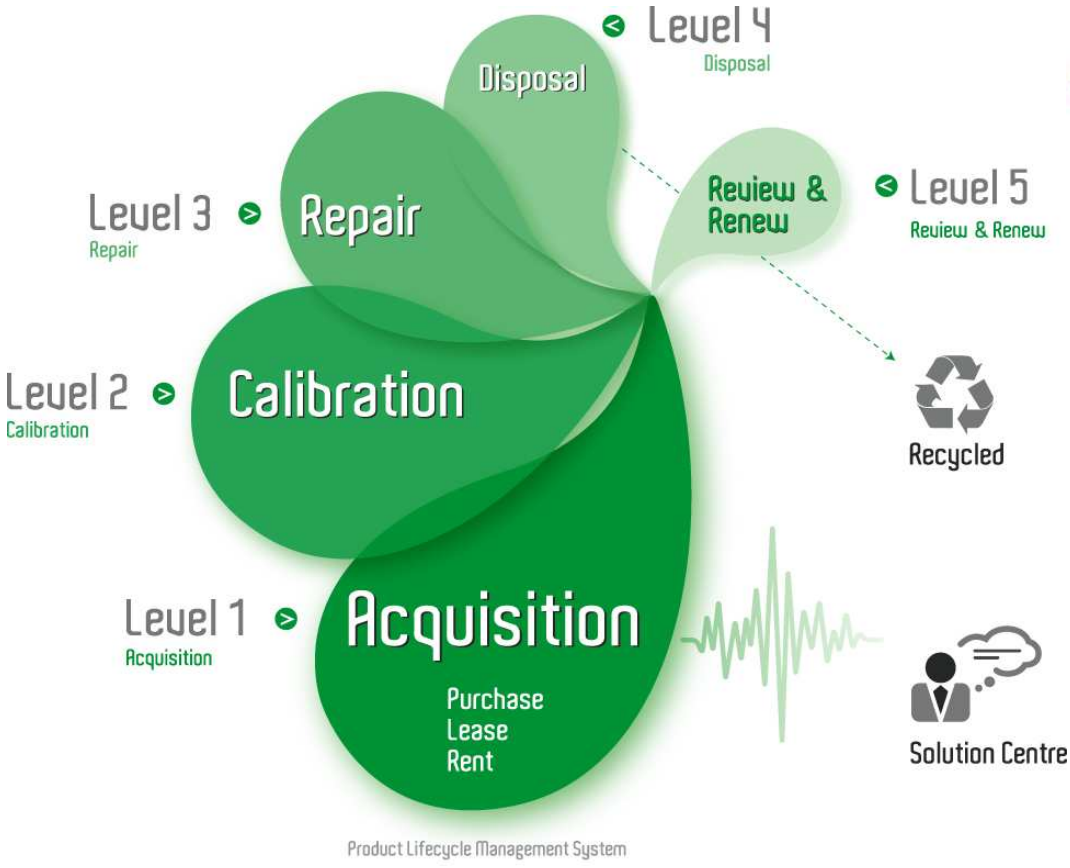
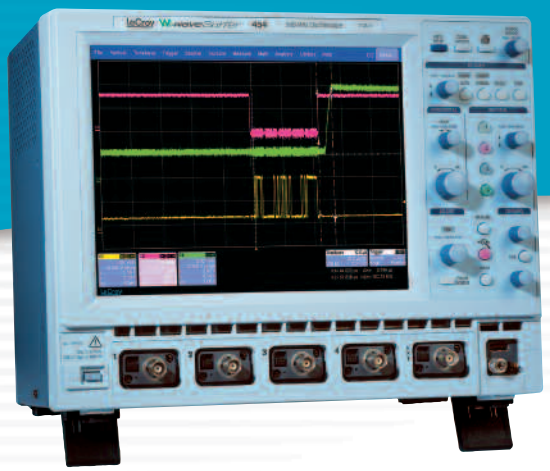


LeCroy

WaveSurfer® 400 Series Oscilloscope Specifications



	WaveSurfer 424	WaveSurfer 422	WaveSurfer 434	WaveSurfer 432	Wave Surfer 454	WaveSurfer 452
Bandwidth (@ 50 Ω)	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, 800 x 600 SVGA, touch screen					
Sample Rate (single-shot)	1 GS/s (all channels), 2 GS/s max (interleaved mode).					
Sample Rate (RIS mode)	50 GS/s					
Standard Record Length	1 Mpts/Ch (all channels), 2 Mpts/Ch (interleaved mode).					
Standard Capture Time	up to 1 ms at full sample rate					
Vertical Resolution	8 bits					
Vertical Sensitivity (V/div)	1 mV/div–10 V/div (1 MΩ); 1 mV/div–2 V/div (50 Ω)					
Vertical (DC Gain) Accuracy	±(1.5% + 0.5% of full scale)					
Vertical Offset Range	±1 V (1-20 mV/div), ±10 V (50-200 mV/div), ±100 V (500 mV–10 V/div)					
Bandwidth Limit	20 MHz		20 MHz, 200 MHz			
Maximum Input Voltage	CAT I: 400 Vmax (DC + Peak AC ≤ 5 kHz) with 1 MΩ input. 5 V_{rms} with 50 Ω input					
Input Coupling	AC, DC, GND (DC and GND for 50 Ω)					
Input Impedance	1 MΩ || 16 pF, or 50 Ω ±1%,					
Probing System	BNC or ProBus®					
Probes	One PP007 (2.5 mm) per channel standard					
Time Base Range	1 ns/div–1000 s/div		500 ps/div–1000 s/div		200 ps/div–1000 s/div	
Time Base Accuracy	10 ppm					
Trigger Modes	Normal, Auto, Single, and Stop					
Trigger Sources	Any input channel, External, Ext/10, or line; slope and level unique to each source (except for line trigger)					
Trigger Coupling	DC, AC, HF, HFRej, LFRej					
Pre-trigger Delay	0–100% of full scale					
Post-trigger Delay	0–10,000 divisions					
Trigger 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					

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 2.5 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 pulse widths selectable from 2.5 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).

WaveSurfer 400 Series Oscilloscope Specifications

Optional SMART Triggers™ (WS-ADVTRIG option)

Runt	Trigger on positive or negative runts defined by two voltage limits and two time limits. Select between 2 ns and 20s. Includes exclusion mode (trigger on intermittent faults by specifying the normal width or period).
Slew Rate	Trigger on edge rates. Select limits for dV, dt, and slope. Select edge limits between 2 ns and 20 s. Includes exclusion mode (trigger on intermittent faults by specifying the normal width or period).
Interval (Signal or Pattern)	Triggers on intervals selectable between 2 ns and 20 s.
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 or 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 or period).

Measure, Zoom, and Math Tools

Standard Parameter Measurements	Up to 6 of the following parameters can be calculated at one time on any waveform: Amplitude, Area, Base (Low), Cyclic Area, Cyclic Mean, Cyclic RMS, Cyclic Std. Deviation, Delay, Duty, Fall Time (90%-10%), Fall Time (80%-20%), Frequency, Maximum, Mean, Minimum, Overshoot+, Overshoot-, Period, Peak-Peak, Phase, Rise Time (10%-90%), Rise Time (20%-80%), RMS, Skew, Standard Deviation, Top (High), Width+, 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 (WS-MATHSURF Option)	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.

WaveStream™ Fast Viewing Mode

Intensity	Not Available
Number of Channels	Not Available
Max. Sampling Rate	Not Available
Waveforms/second (continuous)	Not Available
Operation	Not Available

Analog Persistence

Type	Analog or color-graded.
Saturation	Variable saturation level, adjustable from front panel.
Aging Time	Adjustable from 500 ms to infinity.
Operation	Front panel toggle between ON Analog, ON Color, or OFF (plus software user interface ON/OFF and type selectability). When ON, persistence applied to all waveforms.

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

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.

WaveSurfer 400 Series Oscilloscope Specifications

Documentation and Connectivity

Printing	Connect to any Windows® XP-compatible printer using the 25-pin D-type female (Centronics) printer port. Load any standard Windows® XP 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).
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 Windows automation, or via LeCroy Remote Command Set (via Ethernet or GPIB)
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 display
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
GPIB Port (Accessory)	Supports IEEE–488.2 (using NI USB-GPIB-B)

Outputs

Calibrator	1 kHz square wave, +1.0 V 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

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 g_{rms} 5 Hz to 500 Hz, 15 minutes in each of three orthogonal axes
Vibration (Non-Operating)	Random vibration, 2.4 g_{rms} 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	UL (Std. UL 61010-1 2nd Edition) & cUL (Std. CSA C22.2 No. 61010-1-04) Listed. CE Compliant. EMC Directive 89/336/EEC; EN 61326:1997/A3:2003. Low Voltage Directive 73/23/EEC; EN 61010-1:2001.

Physical Dimensions

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

General

Power (AC)	90-264 Vac, 47-63 Hz (90-132 Vac, 380-420 Hz); Max. Power Consumption: 200 VA
Power (DC)	DC Power and Battery Power Input 19-25 Vdc. DC Power IN = 1 IEC320 Port. Battery Power IN = 2 IEC320 Ports (no loss of power when changing batteries).
Warranty and Calibration	Three year warranty. Calibration recommended yearly.