LeCroy

WaveMaster® 8000A Series

The Ultimate Analysis Capability for Next-Generation Research

It's All About Performance

The LeCroy WaveMaster 8000A Series oscilloscope offers a unique combination of high bandwidth, fast sampling speeds, and long memory capture, ideal for digital and communications systems. Equipped with our patented X-Stream technology, its fast data transfer and processing system deliver unprecedented measurement capabilities, at speeds 10–100 times faster than conventional oscilloscopes. Providing true WaveShape Analysis, its high-performance capabilities are changing the way engineers think about design and testing.

Features:

- **High bandwidth from 3 GHz to 6 GHz**
- **Fast sampling speeds—to 20 GS/s on 4 channels**
- **Full sampling speed maintained over entire memory length**
- **Standard memory 2 Mpts/Ch**
- **High signal integrity with an SiGe amplifier, ADC, and trigger circuit**
- **Intuitive GUI for easier WaveShape Analysis**
- **10–100 times faster processing speeds**
- **A wide array of standard math tools**
- **Optional math and measurement packages**

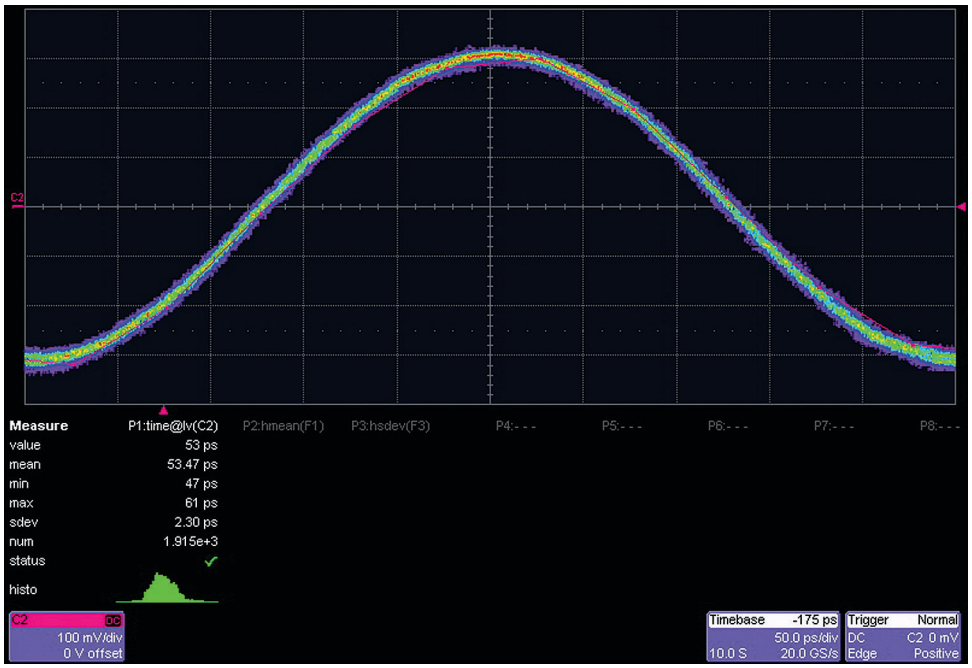
Measurement Accuracy

Superior timebase performance and very low jitter noise floor make WaveMaster a truly remarkable instrument. Delivering extremely stable and precise measurements, its high level of accuracy includes:

- 1 ps rms jitter noise floor
- Timebase stability of ±1 ppm clock accuracy
- Low trigger jitter < 2.5 ps
- Rise time as fast as 75 ps captures fast signal edges

Exceptional Trigger Performance

WaveMaster offers a comprehensive array of triggers for maximum performance. The SiGe trigger circuit offers a 5 GHz edge trigger bandwidth for capturing fast signals with superior sensitivity. The versatile SMART Trigger® captures a variety of signals, including glitches and pulse widths down to 600 ps. The logic trigger makes it easy to capture a pattern of up to 5 inputs, or to qualify on 4 signal inputs and trigger on the 5th.



A 2 GHz sine wave input with persistence "on" demonstrates the exceptionally low trigger jitter on WaveMaster oscilloscopes.

Deep Memory Calculations with Unprecedented Speed

LeCroy's proprietary X-Stream technology offers users the ability to see deep memory calculations updated quickly on the screen. With waveform processing at speeds 10–100 times faster than conventional oscilloscope technology, users can now easily:

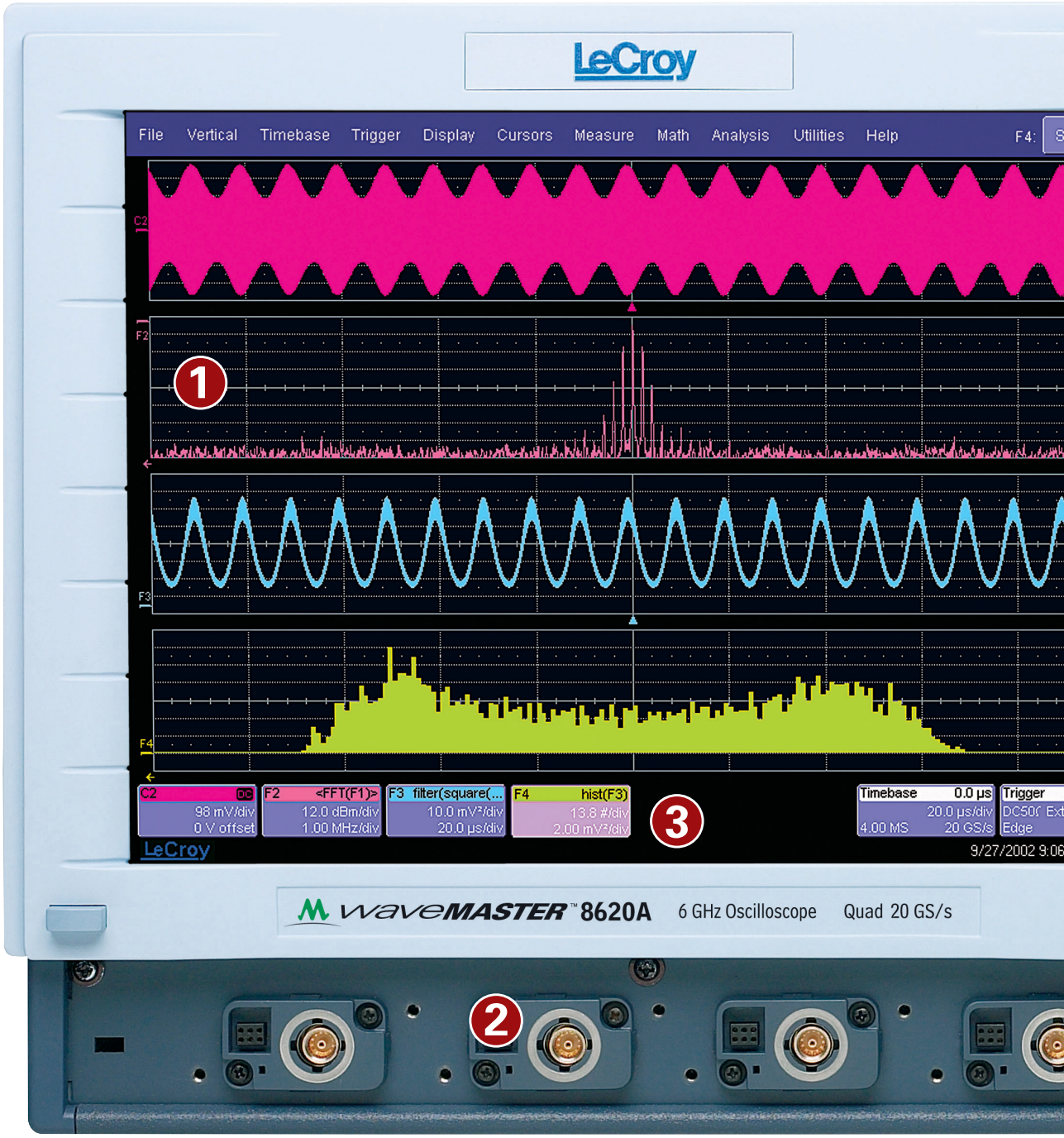
- Capture and analyze long records quickly
- Use advanced tools such as XMATH Advanced Math and XDEV Advanced Customization software packages with long records
- Display unique analysis views, such as 3-dimensional displays, and histicons

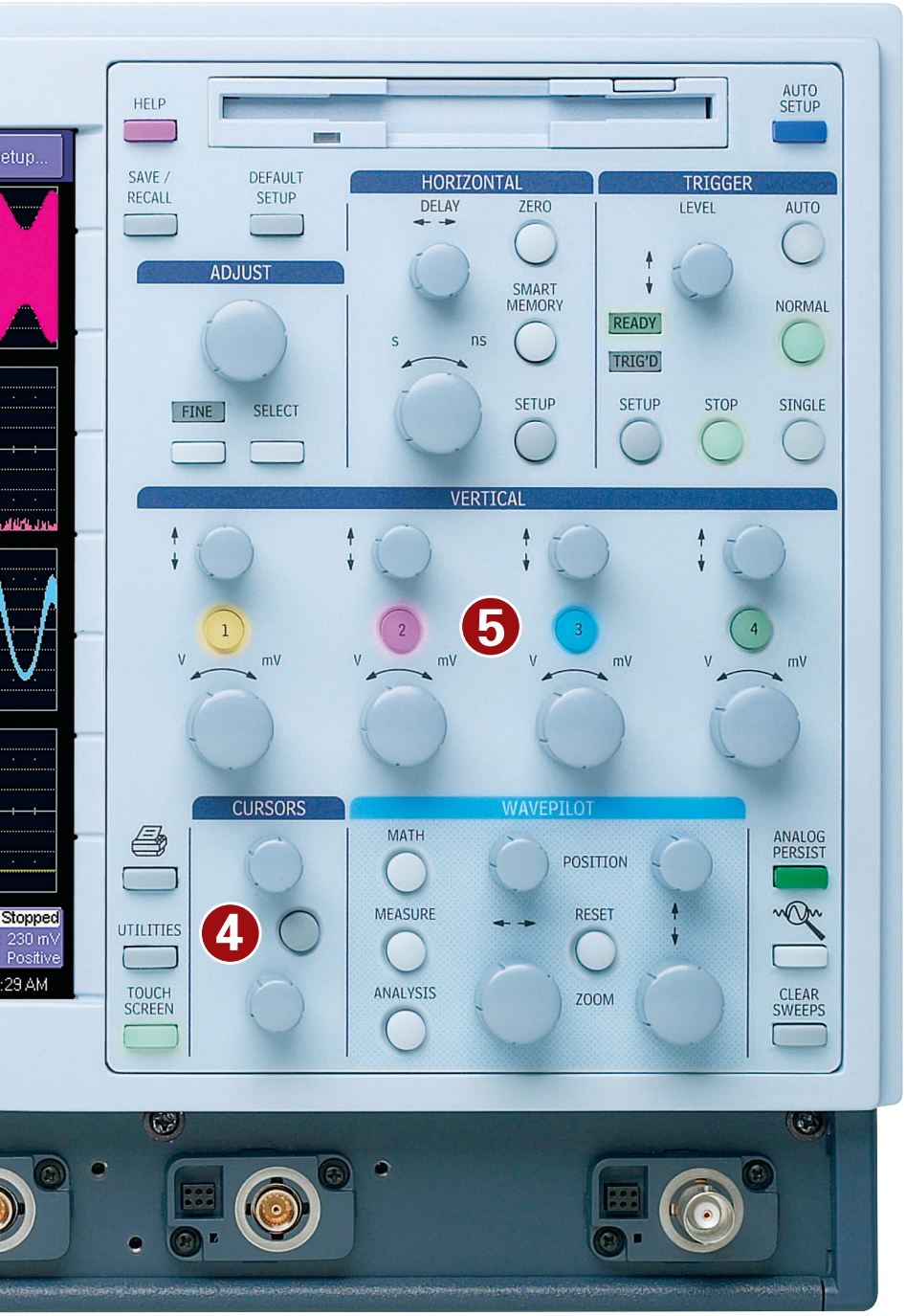
True Customization

LeCroy offers the ability to modify parameter measurements or math functions in the oscilloscope's interface for true customization. Users simply add proprietary functionality like MATLAB, Mathcad or Excel, just as in a LeCroy-installed function. The results are displayed on the screen. Since the resulting waveform is inserted back into the processing flow, the oscilloscope's cursors, measurements, and math can be performed on it. This feature adds a robust dimension to WaveMaster's capabilities, creating much more flexibility than a simple export of data to a third-party program.

Familiar Controls for Ease of Use

The WaveMaster 8000A Series oscilloscopes user interface is designed to be familiar, intuitive, and efficient. The easily recognizable oscilloscopes controls on the front panel combine with a natural, context-sensitive graphical user interface that react quickly to user commands. A flexible selection of cursors can be positioned by knobs dedicated to specific functions that can be accessed from the front panel or the touch screen. A high resolution (800 x 600 pixel) display with 20% larger viewing area keeps signal images crisp and clear.





1. 10.4" Touch Screen Display

800 x 600 SVGA resolution with large screen keeps pop-up control menus from covering the waveform.

2. ProLink Input Connections

High integrity, full bandwidth signal connector with probe power and control in one simple-to-connect interface.

3. One-touch User Interface

Need to quickly change a control parameter? Simply touch the parameter on the screen and the dialog pops up. No need to use several mouse clicks from a pull-down tree.

4. Dedicated Cursor Controls

No need to recall the cursor menu to change cursor position.

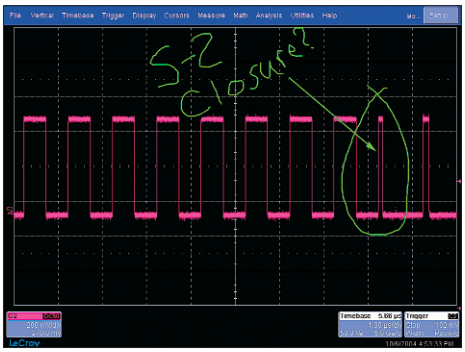
5. Dedicated Vertical Controls

Separate knobs set the vertical scale factor and offset for each active channel. The user can concentrate on the circuit—not on controlling the oscilloscope.

LabNotebook™
An In-Scope Solution for Documenting Results

LeCroy Introduces a Complete In-scope Solution—Standard on most LeCroy Oscilloscopes

Now you can efficiently create complete and detailed waveform reports directly in the oscilloscope. An all-in-one solution for annotating and sharing information, LabNotebook™ simplifies results recording and report generation by eliminating the multi-step processes that often involve several pieces of equipment.

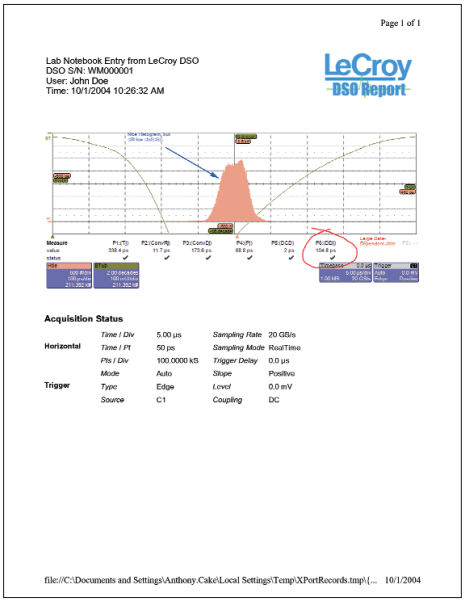


LabNotebook enables users to focus on results rather than the process, as they can now:

- Save all displayed waveforms
- Save the relevant setups with the saved waveform
- Add freehand notes with a stylus, or as text
- Convert the complete report to pdf, rtf, or html
- Print or e-mail reports

Create Notes with the Screen Capture

By pressing Hard Copy, you can annotate waveforms as you capture them. Once the notes are finished, they can be readily saved as a report and e-mailed directly from the oscilloscope.



Flashback Function

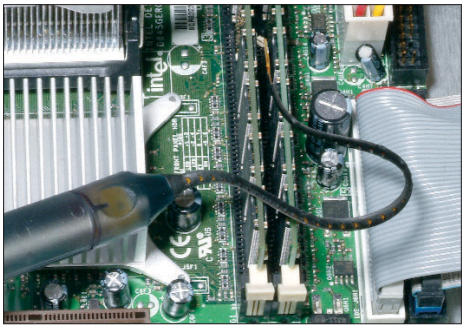
Users can employ the Flashback Function to recall the state of the oscilloscope, including saved waveforms and setup. Additional measurements are easily made, using the keyword filter to find the correct notebook entry for recall.

WaveLink Probes

WaveLink probes provide industry-leading performance for wideband signal connection to test instruments. The first differential probes to employ SiGe technology, they deliver full system bandwidth at the probe inputs when used with WaveMaster 6 GHz, 5 GHz, and 3 GHz oscilloscopes.

All WaveLink probes offer:

- Excellent low loading characteristics
- Superb flat frequency response
- Outstanding fidelity for high-speed signals



Enhanced Math Functions and Optional Packages

WaveMaster's robust capabilities include all standard math tools, as well as a pass/fail testing feature. Optional packages can boost these abilities even further, with advanced math, measure and timing tools, customization packages, jitter and timing analysis, and more. Please consult the LeCroy Web site for additional information.

Specifications

Vertical System*	WaveMaster 8620A	WaveMaster 8600A	WaveMaster 8500A	WaveMaster 8300A	WaveMaster 8100A XXL
Analog Bandwidth @ 50 Ω (-3 dB)	6 GHz	6 GHz	5 GHz	3 GHz	1 GHz
Rise Time (typical)	75 ps	75 ps	90 ps	150 ps	400 ps
Input Channels	4	4	4	4	4
Bandwidth Limiters	25 MHz; 250 MHz; 1 GHz; 3 GHz; 4 GHz			25 MHz; 250 MHz; 1 GHz	25 MHz; 250 MHz
Input Impedance	50 Ω ±2.0%				
Input Coupling	DC, GND				
Maximum Input Voltage	±4 Vpeak				
Channel-Channel Isolation	≥ 100:1 at 2 GHz; ≥ 40:1 at 3 GHz; ≥ 20:1 at 4 GHz				
Vertical Resolution	8 bits; up to 11 bits with enhanced resolution (ERES)				
Sensitivity	2 mV–1 V/div fully variable				
DC Gain Accuracy	±1.5% of full scale				
Offset Range	2 m–194 mV/div: ±750 mV; 195 mV–1 V/div: ±4 V				
Offset Accuracy	±(1.5% of full scale + 1.5% of offset value + 2 mV)				

Horizontal System

Time Base System	Internal timebase common to 4 input channels; an external clock may be applied at the auxiliary input
Time/Division Range	Real Time -200 ps–10 s/div to (1,000 s/div in Normal and Single mode); RIS mode: 20 ps -1 µs/div
Clock Accuracy	≤ 1 ppm @ 0–50 °C
Time Interval Accuracy	≤ 0.06 / SR + (1 ppm * Reading) (rms)
Sample Rate & Delay Time Accuracy	±1 ppm ≤ 10 s interval
Jitter Noise Floor	1 ps rms (typical)
Trigger and Interpolator Jitter	≤ 2.5 ps (typical)
Channel-Channel Deskew Range	±9 x time/div. setting, or 25.0 ns, whichever is larger
External Timebase Reference	100 MHz; 50 Ω impedance; applied at the rear input
External Clock	30 MHz–2 GHz; 50 Ω impedance; applied at the auxiliary input

Acquisition System

Single-Shot Sample Rate/Ch	20 GS/s	10 GS/s	10 GS/s	10 GS/s	10 GS/s
2 Channel Max.	N/A	20 GS/s	20 GS/s	20 GS/s	20 GS/s
Maximum Trigger Rate	150,000 waveforms/second (in Sequence Mode, up to 4 channels)				
Intersegment Time	≤ 6 µs				

	8620A	8600A / 8500A / 8300A	8100A XXL		
Maximum Acquisition Points/Ch	4 Ch	(2 Ch) / (4 Ch)	(2 Ch) / (4 Ch)	Duration @ 20 GS/s	Segments (Sequence Mode)
Standard	2M	4M/2M	N/A	0.1 ms	500 Segments
M – Memory Option	8M	8M/4M	N/A	0.4 ms	1,000 Segments
L – Memory Option	16M	16M/8M	N/A	0.8 ms	5,000 Segments
VL – Memory Option	32M	32M/16M	N/A	1.6 ms	10,000 Segments
XL – Memory Option	48M	48M/24M	N/A	2.4 ms	20,000 Segments
XXL – Memory Option	N/A	100M/48M	100M / 48M	5.0 ms	25,000 Segments

Color Waveform Display

Type	Color 10.4" flat-panel TFT-LCD with high resolution touch screen
Resolution	SVGA; 800x600 pixels
Number of Traces	Display a maximum of 8 traces. Simultaneously display channel, zoom, memory, and math traces.
Grid Styles	Auto, Single, Dual, Quad, Octal, XY, Single + XY, Dual + XY
Waveform Styles	Sample dots joined or dots only

Probes

Probes	A variety of optional active, optical, and passive probes is available. AP-1M required to support high impedance passive probes.
Probe System: ProLink with ProBus®	Automatically detects and supports a variety of compatible probes; supports ProLink-SMA and ProLink-BNC input adapters.
Scale Factors	Automatically or manually selected depending on probe used.

Zoom Expansion Traces

Display up to 4 Zoom and 4 Math/Zoom traces; 8 Math/Zoom traces available with XMAP (Master Analysis software package) or XMATH (Advanced Math software package).

Specifications

*8620A and 8600A bandwidth and rise time specifications are for sample speeds at 20 GS/s.

Triggering System

Modes	Normal, Auto, Single, and Stop
Sources	Any input channel, External, Ext X10, Ext/10, or line; slope and level unique to each source (except line trigger)
Coupling Mode	DC
Pre-trigger Delay	0–100% of horizontal time scale
Post-trigger Delay	0–10,000 divisions
Hold-off by Time or Events	Up to 20 s or from 1 to 1,000,000,000 events
Internal Trigger Range	±5 div from center

	8620A, 8600A, 8500A	8300A	8100A XXL
Trigger Sensitivity (edge, typical)	3 div < 5 GHz	2 div < 3 GHz	2 div < 1 GHz
(Ch 1 - 4 & Eternal)	2 div < 4 GHz	1.2 div < 1.8 GHz	1.2 div < 750 MHz
	1.2 div < 3 GHz		

Max, SMART Trigger Freq.	750 MHz
External Trigger Input Range	Aux (±0.4 V); Aux x10 (±0.04 V); Aux / 10 (±4 V)
Trigger Sensitivity (Edge)	3 Divisions @ 5 GHz, 2 Divisions @ 4 GHz, 1.2 Divisions @ 3 GHz (typical)

Basic Triggers

Edge	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	Triggers if signal drops out for longer than selected time between 2 ns and 20 s.
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. Triggers at start or end of the pattern.

Analog Persistence Display

Analog and Color-Graded Persistence	Variable saturation levels; stores each trace's persistence data in memory.
Persistence Selections	Select analog, color, or three-dimensional.
Trace Selection	Activate persistence on all or any combination of traces.
Persistence Aging Time	Select from 500 ms to infinity.
Sweeps Displayed	All accumulated, or all accumulated with last trace highlighted.

Internal Waveform Memory

	M1, M2, M3, M4 Internal Waveform Memory (store full-length waveforms with 16 bits/data point), or store to any number of files limited only by data storage media.

Setup Storage

Front Panel and Instrument Status	Store to the internal hard drive, floppy drive, or to a USB-connected peripheral device.

Acquisition Processing

Averaging	Summed or Continuous Averaging to 1 million sweeps
Enhanced Resolution (ERES)	From 8.5 to 11 bits vertical resolution
Envelope (Extrema)	Envelope, floor, or roof for up to 1 million sweeps
Interpolation	Linear or Sin x/x

SMART Triggers with Exclusion Technology

Glitch	Triggers on positive or negative glitches with widths selectable from 600 ps to 20 s or on intermittent faults.
Signal or Pattern Width	Triggers on positive or negative pulse widths selectable from 600 ps to 20 s or on intermittent faults.
Signal or Pattern Interval	Triggers on intervals selectable between 2 ns and 20 s.

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 channels to display a waveform with maximum dynamic range.
	3-year warranty; calibration recommended annually. Optional service programs include extended warranty, upgrades, and calibration services.

Specifications

CPU

Processor	Intel Pentium 4 @ 2.53 GHz or better
Processing Memory	Up to 2 Gbytes
Realtime Clock	Dates, hours, minutes, seconds displayed with waveform. SNTP support to synchronize to precision internet clocks.

Interface

Remote Control	Via Windows Automation or via LeCroy Remote Command Set
GPIB Port (Optional)	Supports IEEE – 488.2
Ethernet Port	10/100Base-T Ethernet interface
USB Ports	4 USB 2.0 ports support Windows-compatible devices
External Monitor Port Standard	15-pin D-Type SVGA compatible
Parallel Port	1 standard

Auxiliary Output

Signal Types	Select from calibrator, control signals, or Off.
Calibrator Signal	5 Hz–5 MHz square wave or DC Level; 0.0 to 0.5 V into 50 Ω (0–1 V into 1 MΩ), or TTL Volts (selectable).
Control Signals	Trigger enabled, trigger out, pass/fail status.

Auxiliary Input

Signal Types	Select from External Trigger or External Clock input on front panel.

General

Auto Calibration	Ensures specified DC and timing accuracy is maintained for 1 year minimum.
Power Requirements	100–240 V rms (±10%) at 50/60 Hz; 115 V rms (±10%) at 400 Hz, Automatic AC Voltage Selection Installation Category: 300V CAT II; Max. Power Consumption: 650 VA/650 W; 800 VA/800 W for WM8620A

Environmental

Temperature (Operating)	+5 ˚C to +40 ˚C including CD-ROM drive
Temperature (Non-Operating)	-20 ˚C to +60 ˚C
Humidity (Operating)	5% to 80% relative humidity (non-condensing) up to +30 ˚C. Upper limit derates to 25% 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 10,000 ft. (3048 m) at or below +25 ˚C
Altitude (Non-Operating)	Up to 40,000 ft. (12,192 m)
Random Vibration (Operating)	0.31 g rms 5 Hz to 500 Hz, 15 minutes in each of three orthogonal axes
Random Vibration (Non-Operating)	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

Physical Dimensions

Dimensions (HWD)	264 mm x 397 mm x 491 mm; 10.4" x 15.6" x 19.3" (height excludes feet)	
	8620A	**8100A XXL / 8300A / 8500A / 8600A**
Weight	23 kg; 49 lbs.	18 kg; 39 lbs.
Shipping Weight	29 kg; 63 lbs.	24 kg; 53 lbs.

Certifications

CE Compliant, UL and cUL listed;
Conforms to EN 61326-1; EN 61010-1; UL 3111-1; and CSA C22.2 No. 1010.1

Warranty and Service

3-year warranty; calibration recommended annually.
Optional service programs include extended warranty, upgrades, and calibration services.

Ordering Information

WaveMaster Digital Oscilloscopes	Product Code
4 Ch; 6 GHz; 20 GS/s; 2 Mpts/Ch	WaveMaster 8620A
4 Ch 6 GHz; 10 GS/s; 2 Mpts/Ch; 4 Mpts 20 GS/s using 2 or 1 Ch	WaveMaster 8600A
4 Ch 5 GHz; 10 GS/s; 2 Mpts/Ch; 4 Mpts 20 GS/s using 2 or 1 Ch	WaveMaster 8500A
4 Ch 3 GHz; 10 GS/s; 2 Mpts/Ch; 4 Mpts 20 GS/s using 2 or 1 Ch	WaveMaster 8300A

Memory Options	8620A		8600A / 8500A / 8300A	
WM-XL	48M	(4 Ch)	48M/24M	(2 Ch/4 Ch)
WM-VL	32M	(4 Ch)	32M/16M	(2 Ch/4 Ch)
WM-L	16M	(4 Ch)	16M/8M	(2 Ch/4 Ch)
WM-M	8M	(4 Ch)	8M/4M	(2 Ch/4 Ch)

Long Memory Models	
4 Ch; 6 GHz; 10 GS/s; 50 Mpts/Ch; 20 GS/s and 100 Mpts/Ch max. using 2 or 1 Ch	WaveMaster 8600A XXL
4 Ch; 5 GHz; 10 GS/s; 50 Mpts/Ch; 20 GS/s and 100 Mpts/Ch max. using 2 or 1 Ch	WaveMaster 8500A XXL
4 Ch; 3 GHz; 10 GS/s; 50 Mpts/Ch; 20 GS/s and 100 Mpts/Ch max. using 2 or 1 Ch	WaveMaster 8300A XXL
4 Ch; 1 GHz; 10 GS/s; 50 Mpts/Ch; 20 GS/s and 100 Mpts/Ch max. using 2 or 1 Ch	WaveMaster 8100A XXL

Included with Standard 8620A, 8600A, and 8500A Configurations
ProLink Adapter SMA; 4 each
ProLink Adapter BNC; 2 each
Optical 3-button Wheel Mouse-USB
Protective Front Cover
Printed Operator's Manual
Printed Getting Started Manual
Printed Remote Control Manual
Product Manual Set on CD-ROM
Software Option Manual on CD-ROM
Norton AntiVirus Software (1 year subscription)
Microsoft Windows License Agreement
Standard Commercial Calibration with Performance Certificate
Power cable for the destination country
3-Year Warranty

Included with Standard 8100A XXL and 8300A Configurations
ProLink Adapter BNC; 5 each
Optical 3-button Wheel Mouse-USB
Protective Front Cover
Printed Operator's Manual
Printed Getting Started Manual
Printed Remote Control Manual
Product Manual Set on CD-ROM
Software Option Manual on CD-ROM
Norton AntiVirus Software (1 year subscription)
Microsoft Windows License Agreement
Standard Commercial Calibration with Performance Certificate
Power cable for the destination country
3-Year Warranty

Software Options	
Advanced Math Software Package	XMATH
Master Analysis Package (Includes JTA2, XMATH, XDEV)	XMAP
Processing Web Editor Software Package for Functions and Parameters	XWEB
Digital Filter Software Package	DFP2
Advanced Customization Software Package	XDEV
PowerMeasure Analysis Software Package	PMA2

Software Options (continued)	Product Code
Jitter and Timing Analysis Software Package	JTA2
Advanced M1 Software Package for Jitter and Timing Measurements (1 seat)	LECROYM1/ADV-1
Advanced M1 Software Package for Jitter and Timing Measurements (4 seats)	LECROYM1/ADV-4
Basic M1 Software Package for Jitter and Timing Measurements (1 seat)	LECROYM1/BASIC
Serial Data Mask Software Package	SDM
Ethernet Test Software Package	ENET
USB 2.0 Compliance Test Software Package	USB2
Disk Drive Measurement Software Package	DDM2
Advanced Optical Recording Measurement Software Package	AORM

Probes Options and Accessories	
2.5 GHz, 0.7 pF Active Probe (÷10), Small Form Factor	HFP2500
WaveLink 7.5 GHz Differential Probe with Adjustable Tip Module	D600A-AT*
WaveLink 7 GHz Differential Probe with Small Tip Module	D600ST*
WaveLink 4 GHz, 5 V Differential Probe with Small Tip Module	D350ST*
WaveLink 6 GHz, Differential Positioner with Mounted Tip Module	D500PT*
WaveLink ProLink Probe Body	WL600
7.5 GHz Low Capacitance Passive Probe 500/1000 Ω	PP066
1 GHz Active Differential Probe (÷1, ÷10, ÷20)	AP034
Optical-to-Electrical Converter, 500–870 nm ProLink BMA Connector	OE525
Optical-to-Electrical Converter, 950–1630 nm ProLink BMA Connector	OE555
1 MΩ Adapter includes PP005A Passive Probe	AP-1M

*For a complete probe, order a WL600 Probe Body with the Probe Tip Module

Hardware Options and Accessories	
IEEE-488 GPIB Control Interface	GPIB-1
Dual Monitor Display	DMD-1
Keyboard, USB	KYBD-1
ProLink-to-BNC Adapter; 1 each	LPA-BNC
Kit of 4 ProLink BNC Adapters with Case	LPA-BNC-KIT
ProLink-to-SMA Adapter	LPA-SMA
Kit of 4 SMA ProLink Adapters with Case	LPA-SMA-KIT
Oscilloscope Cart with Additional Shelf and Drawer	OC1024
Oscilloscope Cart	OC1021
Rackmount Adapter with 25" (64 cm) Slides	RMA-25
Rackmount Adapter with 30" (76 cm) Slides	RMA-30
Video Trigger Module	VT75
Internal Graphics Printer	WM-GP02
Removable Hard Drive Package (includes USB, CD-ROM, Removable Hard Drive, and Spare Hard Drive)	WM-RHD
Additional Removable Hard Drive	WM-RHD-02
CD-ROM Read/Write Upgrade	WM-CDRW
Soft Carrying Case	WM-SCC
Hard Transit Case	WM-TC1
USB 2.0 Testing Compliance Test Fixture	TF-USB
Probe Deskew and Calibration Test Fixture	TF-DSQ

Customer Service

LeCroy oscilloscopes are designed, built, and tested to ensure high reliability. In the unlikely event you experience difficulties, our digital oscilloscopes are fully warranted for three years.

This warranty includes:
- No charge for return shipping
- Long-term 7-year support
- Upgrade to latest software at no charge

LeCroy

1-800-5-LeCroy www.lecroy.com

Local sales offices are located throughout the world.
To find the most convenient one visit www.lecroy.com

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