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 4 GHz to 6 GHz**
- **Fast sampling speeds—to 20 GS/s on 4 channels**
- **Full sampling speed maintained over entire memory length**
- **Standard memory 10 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 aging < 1 ppm/year 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.
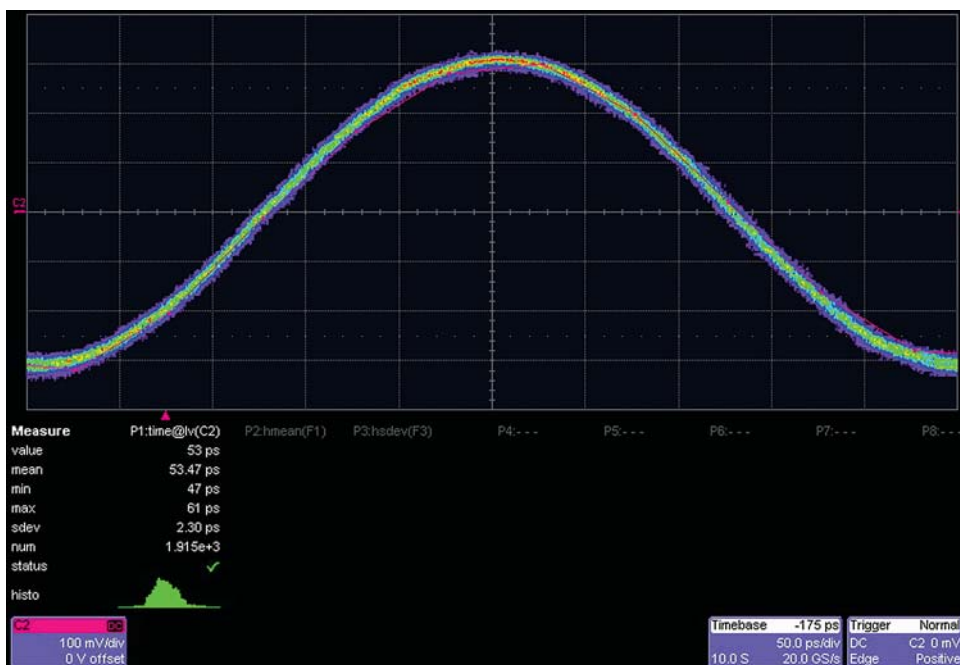
A 2 GHz sine wave input with persistence "on" demonstrates the exceptionally low trigger jitter on WaveMaster oscilloscopes.

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® 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.

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

WaveScan™ Advanced Search

WaveScan is a powerful tool that provides the ability to locate unusual events in a single capture, or scan for an event in many acquisitions over a long period of time using more than 20 different search/scan modes.

- Locate problems triggers won't find
- Use measurement-based scanning modes, like frequency, to show statistical distribution of events
- Overlay events for a quick and simple visual comparison

Familiar Controls for Ease of Use

The WaveMaster 8000A Series oscilloscope's 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.

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.
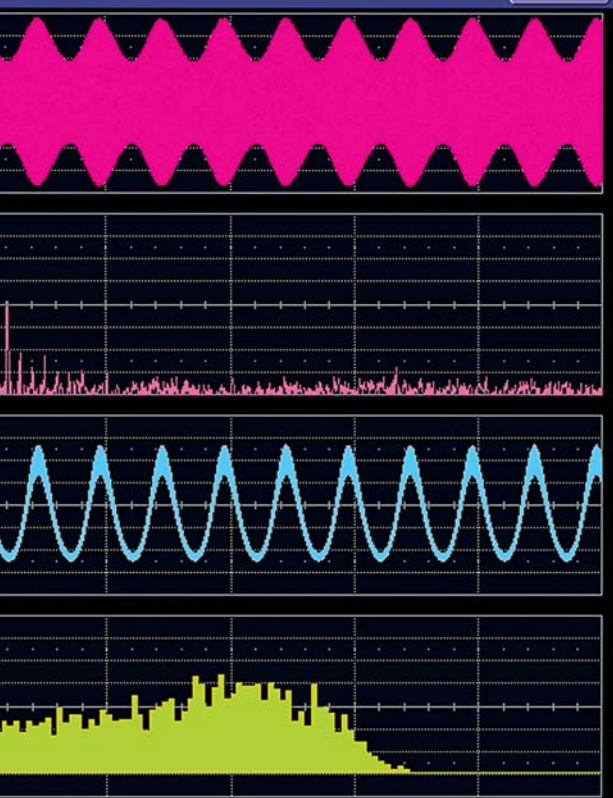
6. Front Access USB 2.0
Provides convenient access for transferring waveform or setup data to flash memory keys, without the need to reach behind the oscilloscope.
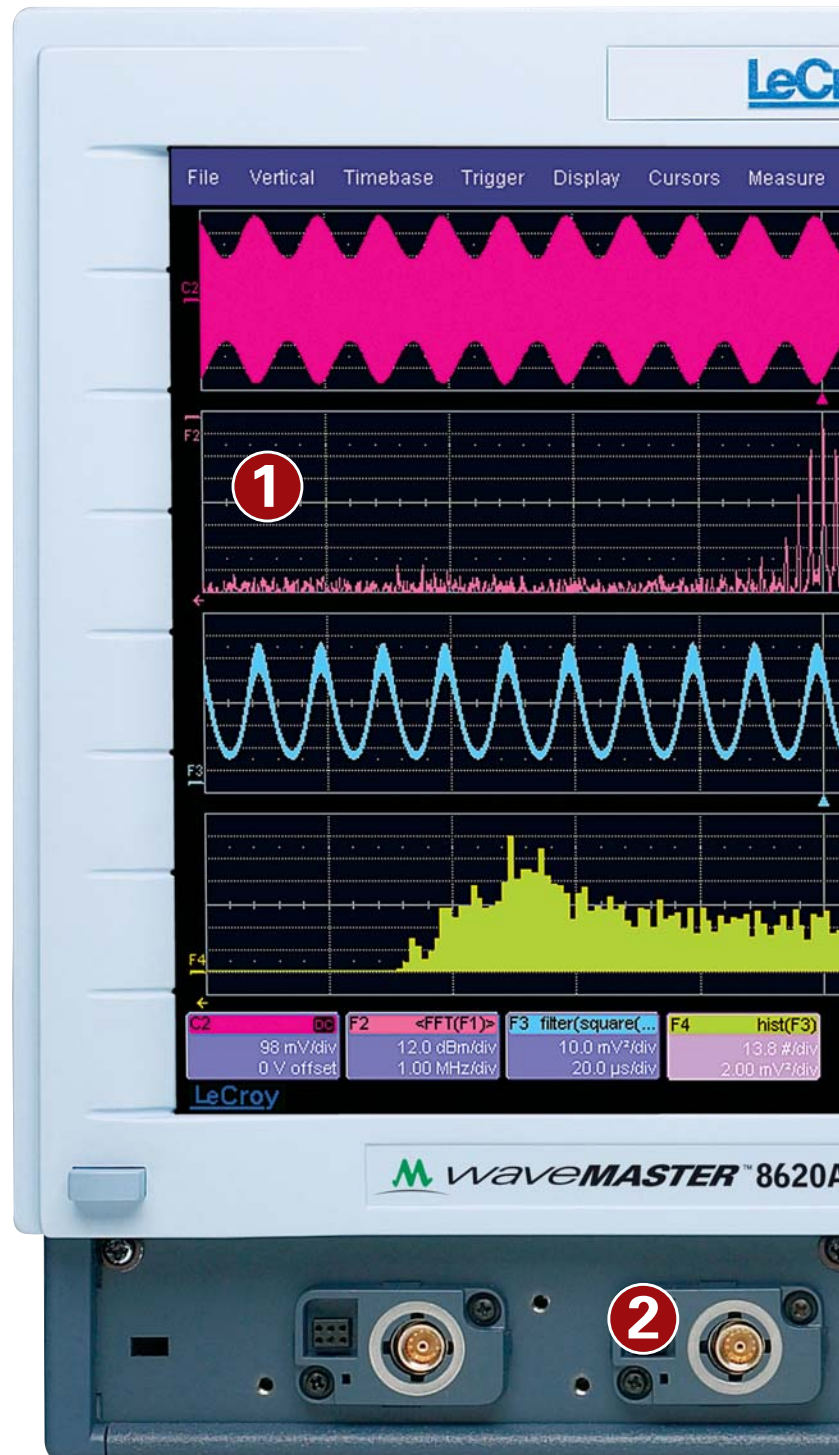
roy

Math   Analysis   Utilities   Help   F4:   Setup...

③

Timebase   0.0 µs   Trigger   Stopped
                20.0 µs/div   DC50Ω Ext 230 mV
4.00 MS   20 GS/s   Edge   Positive
   9/27/2002 9:06:29 AM

6 GHz Oscilloscope   Quad 20 GS/s

HELP

SAVE /
RECALL

DEFAULT
SETUP

ADJUST

FINE   SELECT

HORIZONTAL
DELAY   ZERO

s   ns

SMART
MEMORY

SETUP

⑥

AUTO
SETUP

TRIGGER
LEVEL   AUTO

READY   NORMAL

TRIG'D

SETUP   STOP   SINGLE

VERTICAL

1   2   ⑤   3   4

V   mV   V   mV   V   mV   V   mV

CURSORS   WAVEPILOT

UTILITIES

TOUCH
SCREEN

④

MATH

MEASURE

ANALYSIS

POSITION

RESET

ZOOM

ANALOG
PERSIST

CLEAR
SWEEPS

5

LabNotebook – A Comprehensive Report Documentation and Setup Archival Tool

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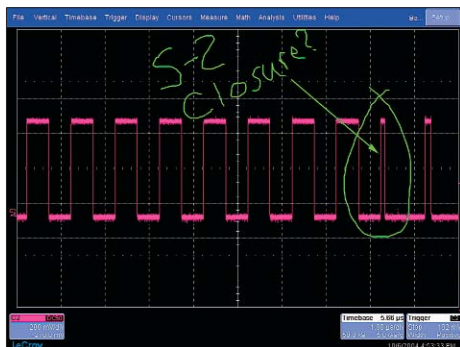
LabNotebook enables users to focus on results rather than the process, as they can now:

- 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.
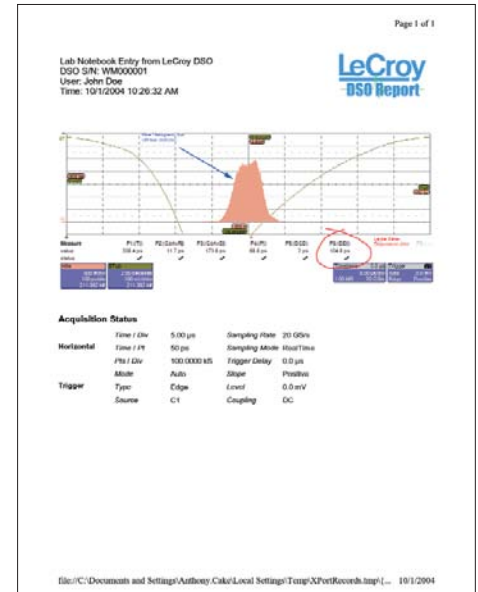
Flashback Function

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 and 4 GHz oscilloscopes.

All WaveLink probes offer:

- Excellent low loading characteristics
- Superb flat frequency response
- Outstanding fidelity for high-speed signals
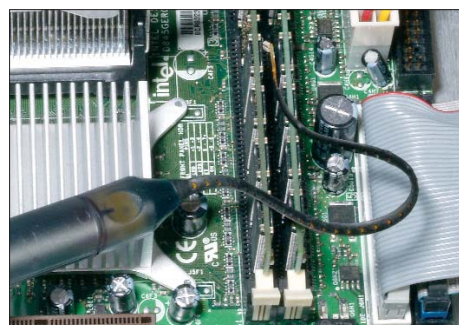
Enhanced Math Functions and Optional Packages

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 XXL	WaveMaster 8420A	WaveMaster 8400A XXL
Analog Bandwidth @ 50 Ω (-3 dB)	6 GHz	6 GHz	4 GHz	4 GHz
Rise Time (typical)	75 ps	75 ps	105 ps	105 ps
Input Channels	4			
Bandwidth Limiters	20 MHz, 200 MHz, 1 GHz, 3 GHz, 4 GHz		20 MHz, 200 MHz, 1 GHz, 3 GHz	
Input Impedance	50 Ω ±2.0%			
Input Coupling	DC, GND			
Maximum Input Voltage	±4 V$_{peak}$			
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, < 10 mV/div through zoom)			
DC Gain Accuracy	±1.5% of full scale			
Offset Range	±750 mV @ 2 mV–194 mV/div			
	±4 V @ 196 mV–1 V/div			
Offset Accuracy	±(1.5% of full scale +1.5% of offset value +2 mV)			

Horizontal System

Timebases	Internal timebase common to 4 input channels; an external clock may be applied at the auxiliary input
Time/Division Range	Real Time: 20 ps/div – 10 s/div
	Random Interleave Sampling: to 20 ps/div, Upper time/div limit function of sample rate and memory length settings
Sample Rate and Delay Time Accuracy	±1 ppm, aging < 1 ppm/year ≤ 10 sec interval
Time Interval Accuracy	≤ 0.06 / SR + (1 ppm, aging < 1 ppm/year * Reading) (rms)
Jitter Noise Floor	1 ps rms (typical)
Trigger and Interpolator Jitter	< 2 ps rms (typical)
Channel-Channel Deskew Range	±9 x time/div. setting, or 25 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

Acquistion System

	WaveMaster 8620A	WaveMaster 8600A XXL	WaveMaster 8420A	WaveMaster 8400A XXL
Single-Shot Sample Rate/Ch	20 GS/s on 4 Ch	20 GS/s on 2 Ch; 10 GS/s on 4 Ch	20 GS/s on 4 Ch	20 GS/s on 2 Ch; 10 GS/s on 4 Ch
Random Interleaved Sampling (RIS)	200 GS/s for repetitive signals, to 20 ps /div. Upper time/div limit function of sample rate and memory length settings			
Maximum Trigger Rate	150,000 waveforms/second			
Intersegment Time	6 µs			
Maximum Acquisition Memory Points/Ch	4 Ch	(2 Ch) / (4 Ch)	4 Ch	(2 Ch) / (4 Ch)
Standard Memory	10 M	96 M / 48 M	10 M	96 M / 48 M
VL – Memory Option	32 M	N/A	32 M	N/A
XL – Memory Option	48 M	N/A	48 M	N/A

Acquisition Processing

Averaging	Summed averaging to 1 million sweeps; 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

Triggering System

Modes	Normal, Auto, Single, and Stop
Sources	Any input channel, External, Ext X 10, Ext ÷10, or line; slope and level unique to each source (except line trigger)
Coupling Mode	DC
Pre-trigger Delay	0–100% of memory size (adjustable in 1% increments)
Post-trigger Delay	the smaller of 0–10,000 divisions or 86400 seconds
Hold-off by Time or Events	From 2 ns up to 20 s or from 1 to 99,999,999 events
Internal Trigger Range	±5 div from center

Specifications

Triggering System (cont.)	WaveMaster 8620A WaveMaster 8600A XXL	WaveMaster 8420A WaveMaster 8400A XXL
Trigger Sensitivity with Edge Trigger (Ch 1–4)	3 div @ ≤ 5 GHz 2 div @ < 4 GHz 1.2 div @ < 3 GHz (typical)	2 div @ ≤ 4 GHz 1.2 div @ < 3 GHz (typical)
External Trigger Sensitivity, (Edge Trigger)	300 mV @ ≤ 5 GHz, 200 mV < 4 GHz 120 mV < 3 GHz (typical)	200 mV @ < 4 GHz, 120 mV @ < 3 GHz
Max. Trigger Frequency, SMART Trigger	750 MHz @ ≥ 10 mV	
External Trigger Input Range	Aux (±0.4 V); Aux X10 (±0.04 V); Aux/10 (±4 V)	

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. 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.	

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.	

Color Waveform Display

Type	Color 10.4" flat panel TFT-LCD with high resolution touch screen	
Resolution	SVGA; 800 x 600 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, X-Y, Single+X-Y, Dual+X-Y	
Waveform Representation	Sample dots joined, or sample dots only	

Analog Persistence Display

Analog and Color-Graded Persistence	Variable saturation levels; stores each trace's persistence data in memory	
Persistence Types	Select analog, color graded, or three-dimensional	
Trace Selection	Select persistence on all or any combination of traces	
Persistence Aging Timing	Select from 500 ms to infinity	
Sweep Display Modes	All accumulated, or all accumulated with last trace highlighted	

Processor

Type	Intel® Pentium® 4, 2.54 GHz or better	
Processor Memory	Up to 2 GB	
Operating System	Microsoft Windows® XP Professional	
Oscilloscope Operating Software (X-Stream)	Entire instrument including any installed optional applications packages operates within a single Windows application	
Real Time Clock	Date and time displayed with waveform an in hardcopy files. SNTP support to synchronize to precision internal clocks.	

Internal Waveform Memory

	4 active waveform memory traces (M1-M4) store 16 bit/point full length waveforms. Waveforms can be stored to any number of files limited only by the data storage media capacity.	

Setup Storage

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

Specifications

Interface

Remote Control	Via Windows Automation, or via LeCroy Remote Command Set
GPIB Port (optional)	Supports IEEE – 488.2
Ethernet Port	Supports 10/100BaseT Ethernet interface
USB Ports	USB 2.0 ports on front and rear panels support Windows® XP compatible devices
External Monitor Port	15 pin D-Type SVGA compatible, duplicates instrument display. Optional dual monitor support for split Windows® applications
Parallel Port	1 standard

Auxiliary Input

Signal Types	Select External Trigger or External Clock Input on the front panel

Auxiliary Output

Signal Types	Select Calibrator, Trigger Enabled, Trigger Out, Pass/Fail, or Off
Calibrator Signal	5 Hz–5 MHz square wave or DC Level, 0–500 mV into 50 Ω, 0–1.0 V into 1 MΩ, or TTL logic voltages

General

Auto Setup	Automatically sets timebase, trigger, and sensitivity to display a wide range of repetitive signals
Find Vertical Scale	Automatically sets the vertical sensitivity and offset for the selected channel to display a waveform with the maximum dynamic range
Auto Calibration	Ensures specified DC and timing accuracy is maintained for 1 year minimum.

Power Requirements

Voltage	100–240 VAC ±10% at 50/60/400 Hz; 200–240 VAC ±10% at 50/60 Hz; Automatic AC Voltage Selection

	WaveMaster 8620A	WaveMaster 8600A XXL	WaveMaster 8420A	WaveMaster 8400A XXL
Max. Power Consumption	800 VA (800 W)	650 W/650 VA	800 VA (800 W)	650 W/650 VA

Environmental

Temperature (Operating)	+5 °C to +40 °C including CD-ROM drives
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)

Physical Dimensions

Dimensions (HWD)	264 mm x 397 mm x 491 mm; 10.4" x 15.6" x 19.3" (height excludes feet)			
Weight	23 kg; 50 lbs.	18 kg; 39 lbs.	23 kg; 50 lbs.	18 kg; 39 lbs.
Shipping Weight	29 kg; 63 lbs.	24 kg; 53 lbs.	29 kg; 63 lbs.	24 kg; 53 lbs.

Certifications

CE Compliant; UL and cUL listed; Conforms to EN 61326 (for EMC); EN 61010, UL 61010B-1 and CSA C22.2 No. 1010.1 (for safety)

Warranty and Service

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

Ordering Information

Product Description	Product Code
WaveMaster Digital Oscilloscopes	
4 Ch; 6 GHz; 20 GS/s; 10 Mpts/Ch	WaveMaster 8620A
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; 4 GHz; 20 GS/s; 10 Mpts/Ch	WaveMaster 8420A
4 Ch; 4 GHz; 10 GS/s; 50 Mpts/Ch; 20 GS/s and 100 Mpts/Ch max. using 2 or 1 Ch	WaveMaster 8400A XXL

Memory Options	8620A/8420A	
	32 M (4 Ch)	WM-VL
	48 M (4 Ch)	WM-XL

Included with Standard Configuration	
ProLink Adapter SMA; 4 each	LPA-SMA
ProLink Adapter BNC; 2 each	LPA-BNC
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

Application Specific Test and Analysis Software Options

Description	Product Code
Advanced Optical Recording Measurement Software Package	AORM
Disk Drive Measurement Software Package	DDM2
PowerMeasure Analysis Software Package	PMA2
8B/10B Decoding and Analysis Software Package	SDA-8B10B
EMC Pulse Parameter Software Package	WM-EMC

Advanced Math and WaveShape Analysis Software Options

Description	Product Code
Digital Filter Software Package	DFP2
Jitter and Timing Analysis Software Package	JTA2
Serial Data Mask Software Package	SDM
Advanced Customization Software Package	XDEV
Master Analysis Software Package (Includes JTA2, XMATH, XDEV)	XMAP
Advanced Math Software Package	XMATH
Processing Web Editor Software Package for Functions and Parameters	XWEB

Compliance Software Options

Description	Product Code
UWB Test Solution Software Package (For WaveMaster 8620A and 8600A XXL)	SDA-UWB
Ethernet Application Software Package	QPHY-ENET*
USB Application Software Package	QPHY-USB†

*TF-ENET-B required.   † TF-USB-B required.

Serial Data Options

Description	Product Code
UART and RS-232 Decode only Option	WM-UART-RS232bus D
I²C Decode only Option	WM-I2Cbus D
SPI Decode only Option	WM-SPIbus D
LIN Decode only Option	WM-LINbus D
FlexRay Trigger and Decode only Option	WM-FlexRaybus D

Product Description	Product Code
Hardware Options and Accessories	
2 x 36 inch SMA to SMA Cable	ENET-2CAB-SMA036
2 x 18 inch SMA to SMA Cable	ENET-2CAB-SMA018
2 x BNC to SMA Adapter	ENET-2ADA-BNCSMA
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
1 MΩ Adapter includes PP005A Passive Probe	AP-1M

Compliance Test Fixtures

Description	Product Code
10/100/1000Base-T Compliance Test Fixture	TF-ENET-B*
USB 2.0 Testing Compliance Test Fixture	TF-USB

*Includes ENET-2CAB-SMA018.

Probes and Probe Accessories

Description	Product Code
2.5 GHz, 0.7 pF Active Probe (÷10), Small Form Factor	HFP2500
Set of 4 ZS1500, 1.5 GHz, 0.9 pF, 1 MΩ High Impedance Active Probe	ZS1500-QUADPAK
Set of 4 ZS1000, 1 GHz, 0.9 pF, 1 MΩ High Impedance Active Probe	ZS1000-QUADPAK
WaveLink 7.5 GHz, Differential Probe Adjustable Tip Module	D600A-AT*
WaveLink 7 GHz, Differential Probe Small Tip Module	D600ST*
WaveLink 4 GHz, 5 V Differential Probe Small Tip Module	D350ST*
WaveLink 6 GHz, Differential Positioner Mounted Tip Module	D500PT*
WaveLink ProLink Probe Body	WL600
7.5 GHz Low Capacitance Passive Probe (÷10, 1 kΩ; ÷20, 500 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
Probe Deskew and Calibration Test Fixture	TF-DSQ

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

Customer Service

LeCroy oscilloscopes and probes 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 and our probes are warranted for one year.

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