



Expand
Your Universe
of Signal
Solutions

Sales and Service Throughout the World

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WaveMaster Oscilloscopes

POWERED BY X-STREAM

Model 8600A – 6 GHz Bandwidth
Model 8500A – 5 GHz Bandwidth
Model 8300A – 3 GHz Bandwidth



the BIG BANG of Signal Analysis

Everything starts with WaveMaster. It is the first “full performance” DSO. It will change your outlook. It will change the way you test. It will change the way you think. It will solve your problems faster.

WaveMaster 8000A Series



It's All About Performance

WaveMaster is the first full performance DSO providing high bandwidth, fast sampling speeds, and long memory capture. Revolutionary X-Stream Technology makes WaveShape Analysis fast and easy. XMATH Advanced Math and XDEV Advanced Customization packages add to the power and flexibility — enabling you to solve unique problems — faster than ever before.

Highest Speeds with Longest Memory

WaveMaster is the first DSO that can sample up to 20 GS/s on 2 channels (with up to 6 GHz bandwidth) into 48 Mpts of memory. Since high sample rates use lots of memory, even for short capture, WaveMaster comes standard with 1 Mpt/Ch.

SiGe Amplifier and ADC

LeCroy is the first DSO manufacturer to use SiGe for both the amplifier and ADC for the highest signal integrity.

SiGe Trigger Circuit

WaveMaster's trigger circuit provides the highest trigger bandwidth (up to 5 GHz) and superior trigger sensitivity — enabling stable triggering on high frequency, low amplitude signals.

X-Stream Technology

LeCroy's patented X-Stream Technology is a revolutionary advance in processing large amounts of data 10 – 100X faster than other oscilloscope technologies.

XMATH Advanced Math XDEV Advanced Customization

WaveMaster's WaveShape Analysis Engine provides capabilities not found in any other DSO. Set up your signal analysis with the graphical processing web editor. Create custom analysis functions with popular 3rd party analysis packages and insert them directly into the WaveShape Analysis Engine. Create a custom user interface. The solutions are simple to implement. The possibilities are endless.

Highly Intuitive User Interface

The WaveMaster is so simple to operate you'll be comfortable working with it in just a few minutes. Use the front panel controls or intuitive touch screen to set up and analyze your waveforms.

Discover WaveMaster Productivity

WaveShape Analysis

Wave shapes are evolving to be faster and more complex. Just being able to see a simple signal is no longer the complete answer. Real success depends on your ability to analyze and understand these complex wave shapes. In this context, you have to ask if your current signal analysis technology is enough to keep you competitive.

With this challenge in mind, we designed the new WaveMaster 8000A Series to provide the most advanced capture, view, and analysis available. At its core is our own X-Stream Technology — an extremely fast data transfer and processing system that delivers truly unprecedented measurement capabilities. Then we married it to SiGe technology to ensure accurate reproduction of your signals even at the highest frequencies.

And because every engineering group has its own needs, the WaveMaster 8000A Series offers an unrivaled level of customization. Now you can see the signal the way you want to see it. In essence the new WaveMaster DSO is a rare opportunity to make a quantum leap in your signal analysis capabilities.



X-Stream Technology™

The WaveShape Analysis Engine

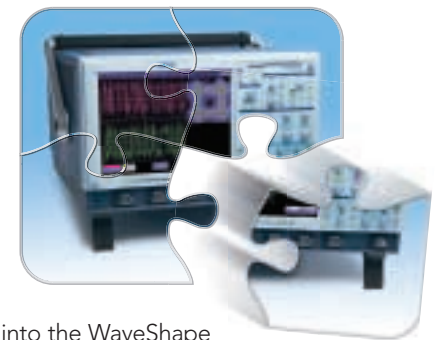
X-Stream Technology is unique to LeCroy and so powerful that we've applied for 14 patents. It is a proprietary method of data transfer and processing that permits calculations to be performed 10 – 100X faster than other scope technologies. It is necessary for extracting useful information from the large amount of data that fast sampling rates and complex wave shapes require. The result — the answer you need faster than you've ever seen before.



XDEV Advanced Customization

Ultimate Flexibility

WaveMaster's WaveShape Analysis Engine is totally unique — offering engineers unprecedented utility. Create your own custom functions and parameters in MATLAB®, Mathcad, Excel, or VBScript and insert them into the WaveShape Analysis Engine. Create your own user interfaces within the WaveMaster program, or program the DSO using ActiveX, Automation language, IV Drivers, embedded scripts, and other open Win2000/OS features to connect and network to the outside world.



XMATH Advanced Math

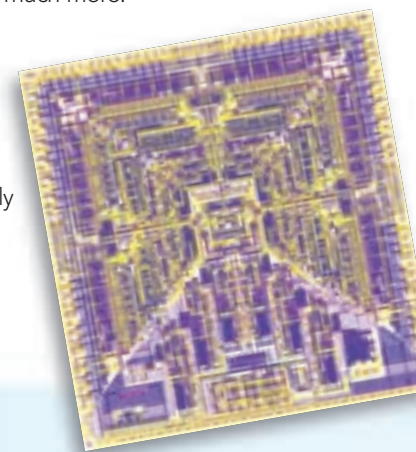
Expand Your Capabilities

XMATH adds a completely new and graphical method to map the flow of your signal through your WaveShape Analysis setup. Use the processing web editor to apply powerful WaveShape Analysis tools to your signal. In addition, you gain increased power and flexibility with additional math traces, a variety of graphing functions to enable you to understand parameter distributions and variations, expanded FFT capability, parameter math capability, and much more.

High Signal Integrity

All-SiGe Amplifier, ADC, and Trigger

LeCroy has set a new standard with the design of the WaveMaster. The LeCroy all-SiGe amplifier, ADC, and trigger circuitry are completely new, and designed to meet the needs of today's high frequency designers. They provide the signal integrity, timebase stability, and trigger performance you've been asking for. The result — faithful reproduction of your signal and accurate WaveShape Analysis.



The Performance is Up Front

High Bandwidth

6 GHz BANDWIDTH

The WaveMaster DSO is available in up to 6 GHz bandwidth with rise times as fast as 75 ps. A SiGe amplifier and SiGe ADC are each contained on a single chip for optimum matching of channel and gain response and deliver this performance into 24 Mpts/ch of memory.

High Sample Rate

The only scope in the world that allows you to capture two signals at 20 GS/s while using up to 48 Mpts of memory on each signal. Alternatively, capture four signals at 10 GS/s using up to 24 Mpts of memory on each channel.



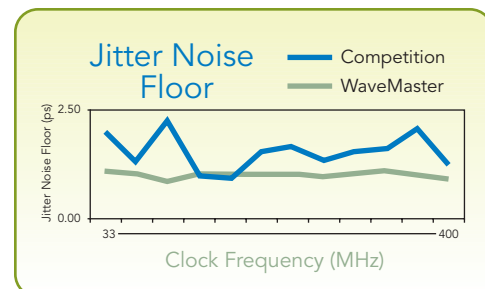
Long Memory

WaveMaster's standard memory of 1 Mpt/ch (with options up to 24 Mpt/ch) leads the industry in speed and ease of use. The WaveMaster DSO uses a LeCroy proprietary CMOS memory that is many times faster than conventional memory. LeCroy's SMART Memory enables better WaveShape Analysis by preventing the aliasing that can happen with short memory DSOs.

With the Highest Signal Integrity

Timebase Stability

The WaveMaster DSO's timebase design is unmatched with +/- 1 ppm clock accuracy, 1 ps jitter noise floor, and time interval accuracy < 0.06/SR +(1 ppm * reading).



Trigger Quality

The WaveMaster oscilloscope's SiGe trigger circuit provides 5 GHz guaranteed trigger bandwidth, sensitivity to trigger on low amplitude digital signals, and < 2.5 ps trigger jitter. Trigger on glitches and patterns with WaveMaster's flexible SMART Trigger.



X-Stream™ Technology

What is X-Stream?

X-Stream was invented by LeCroy. It enables data transfer and processing 10 — 100X faster than other scopes. It is the WaveShape Analysis Engine that is the foundation for user customization of functions and measurements. Only LeCroy has X-Stream Technology.

What Makes it Possible?

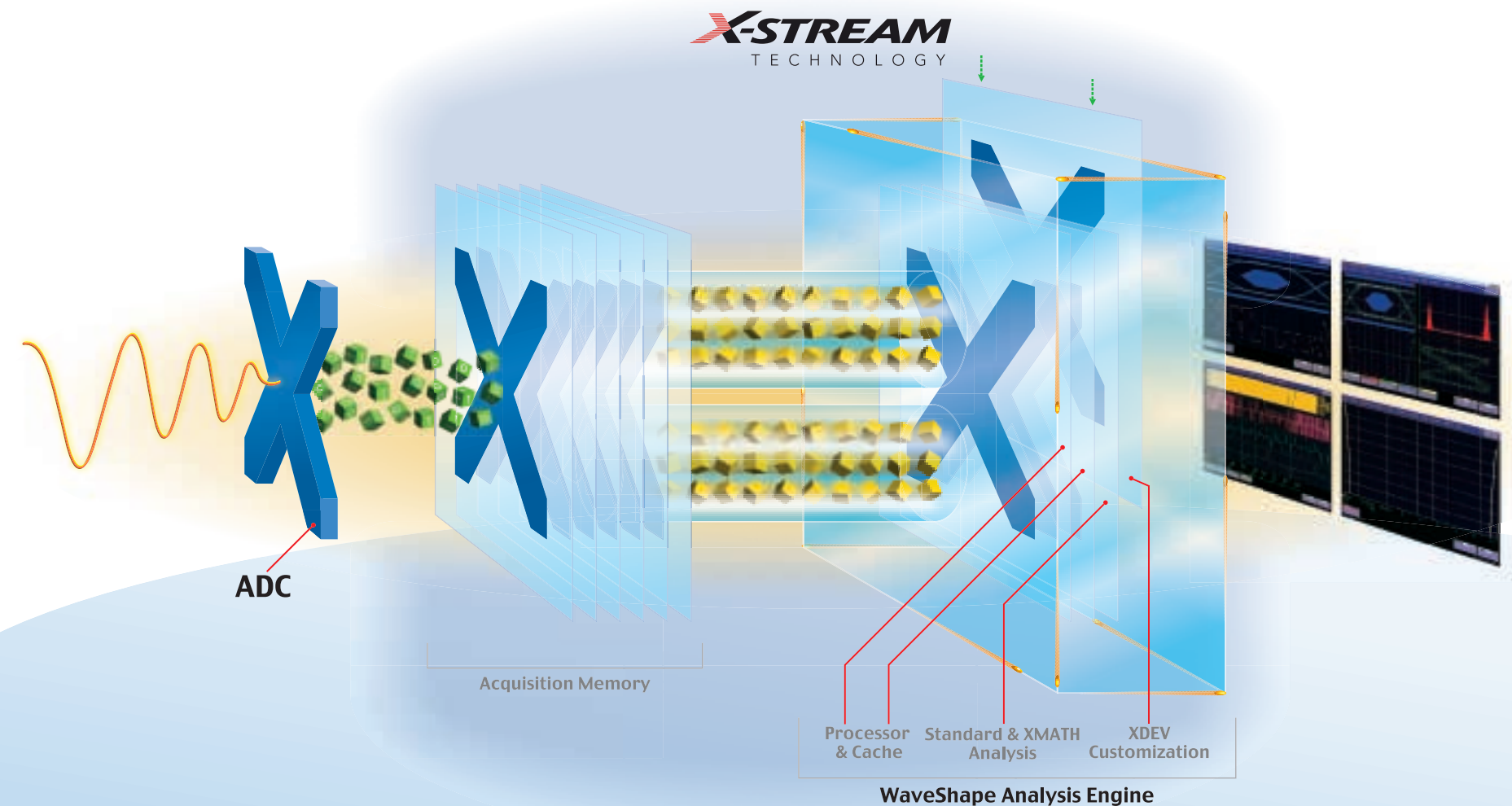
X-Stream is made possible by super-fast, super-long proprietary CMOS memory, dual high-speed gigabit ethernet links, and COM object software that optimizes performance and allows customized measurements.

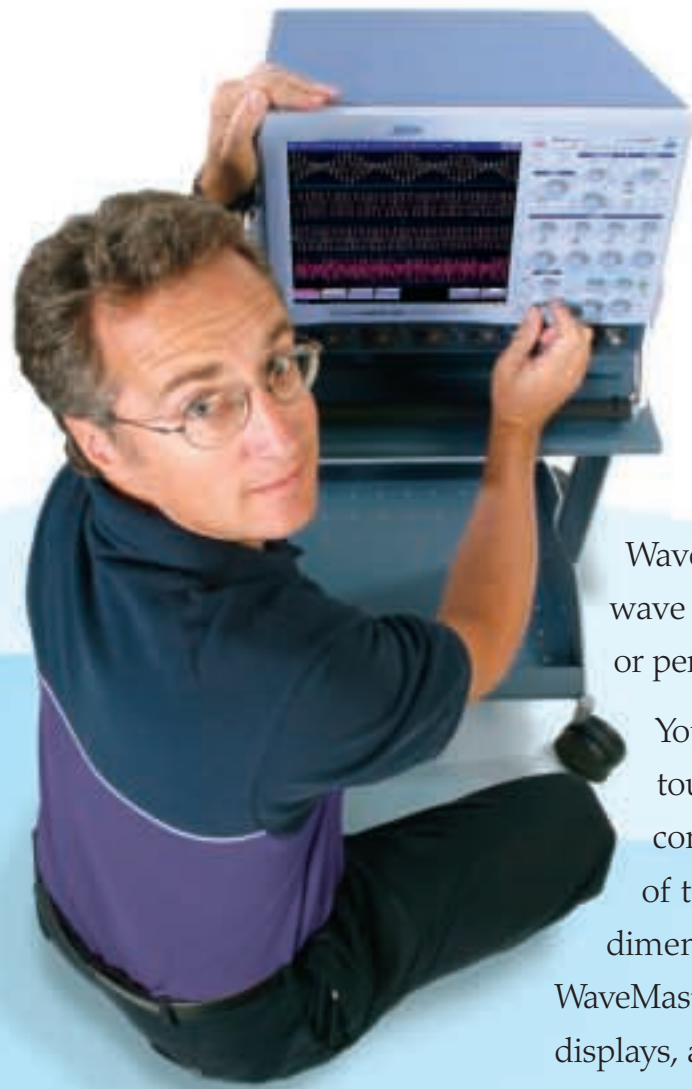
How is X-Stream Different from Other Technologies?

X-Stream "Streaming" Technology allows you to perform analysis faster by minimizing data transfer and calculation time. LeCroy's proprietary CMOS memory accepts 10 Gbytes of data in real-time from each SiGe ADC, packetizes it, and speeds the data through dual high-speed pipelines to the CPU. In the CPU, LeCroy's proprietary software algorithms "capture" each packet, and optimize the calculations through use of the CPU's cache memory. X-Stream minimizes calculation time by avoiding unnecessary "fetching" of data and math instructions from RAM. It also allows user-created functions and measurements to be inserted into the WaveShape Analysis Engine. You can use LeCroy's analysis or your own — all built into the oscilloscope.

What are the benefits of X-Stream?

- Capture and analyze long records quickly.
- Use advanced tools such as **XMATH Advanced Math** and **XDEV Advanced Customization** packages with long records.
- Display unique analysis views, such as XMATH's processing web, 3D displays, and histicons.

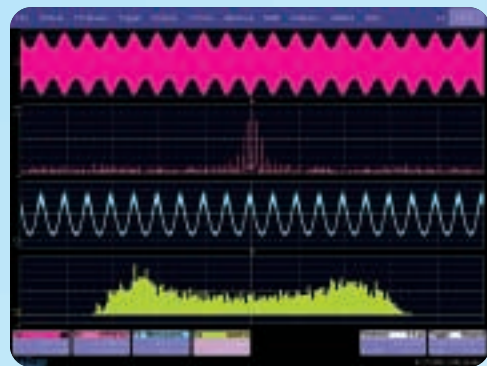




Perfect Vision Powerful Viewing

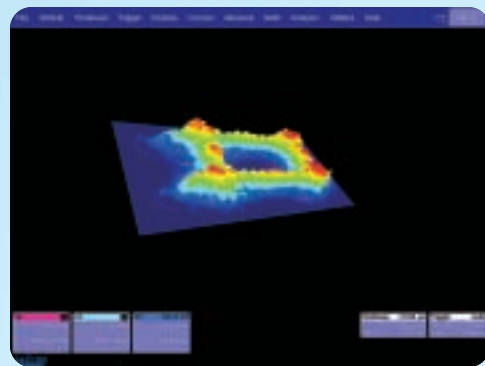
WaveMaster's display capabilities open a whole new world of wave shape exploration, whether you are simply viewing pulses or performing WaveShape Analysis.

You will appreciate the new technologies employed in the touch screen to ensure easy and simple selection of traces and controls, and you will marvel at the brightness and crispness of the traces. Persistence mode, including a unique three-dimensional persistence map, makes visual inspection easy. The WaveMaster's intuitive displays, such as X-Y, multiple grid, scaled grid displays, and sequence waterfall formats, make WaveShape Analysis second nature.



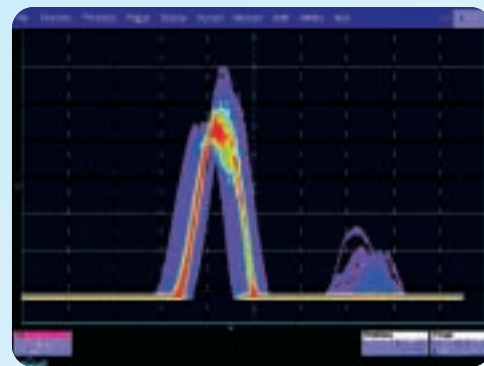
Multiple Grids

Display signal and WaveShape Analysis views in the most effective and intuitive way. Document your results in a clear and understandable format. Manually choose from seven different grid formats, or let AutoGrid determine it for you. The WaveMaster DSO always displays full vertical resolution on each grid to ensure maximum accuracy.



3-Dimensional Displays

Only WaveMaster is available with three dimensional views. The additional information in three dimensions greatly increases your ability to see the irregularities and find the root cause of signal problems.



Analog Persistence

Analog and Color-graded persistence are effective tools to intuitively view signal variations. Simply press the front panel button and capture waveforms with an analog view. In addition, LeCroy's XMATH Advanced Math package uniquely allows calculations and measurements to be made on persistence data.



Designed for Insight

The WaveMaster DSO has a 10.4" SVGA display with a grid area that is 20% larger than comparable oscilloscopes. In addition, the unique 800 x 600 SVGA screen provides remarkable clarity and high resolution. Menu sizes are optimized to provide the largest waveform viewing area while also providing a separate area for measurement data.

Made to Measure & Analyze

Unlimited Potential

Test approaches, techniques, and standards vary — so WaveMaster provides the most definitive, most powerful, and easiest-to-use set of measurement and math capability to enable you to:

- Quickly use cursors to confirm a reading
- Apply a number of parameters to a waveform and view statistics
- Analyze wave shapes in the time, statistical, or frequency domains
- Graphically display parameters, statistical distributions, and changes with time
- Create chained functions
- Visually set up and view complex functions and measurements
- Seamlessly integrate your own custom-designed math functions or measurement parameters into the oscilloscope (XDEV Advanced Customization)

No other instrument comes close to WaveMaster with this level of performance!

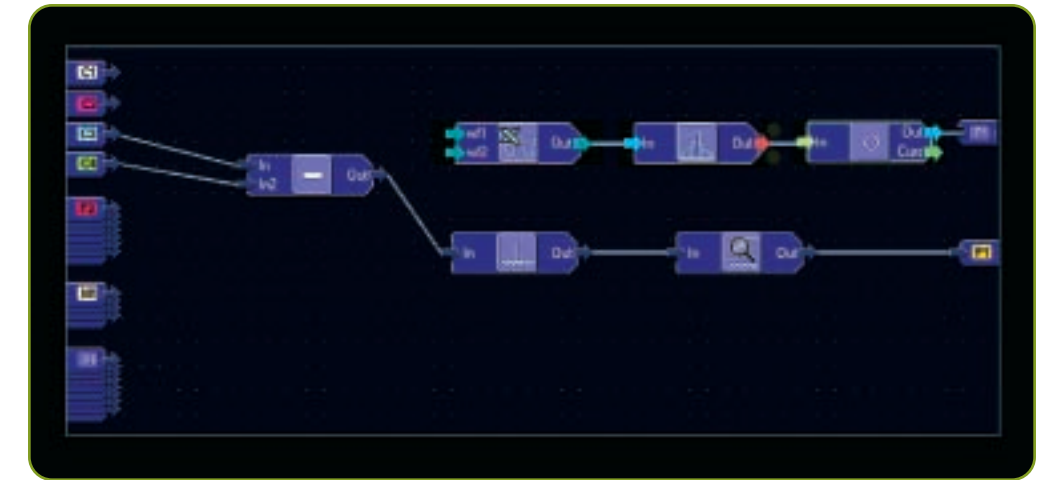


Zooming – Elegant, Simple, Powerful

Capturing up to 48M samples in a single trigger requires fast access to look at and analyze separate regions of the signal. WaveMaster's X-Stream Technology enables powerful zooming capability. Create up to 8 unique zooms, each one analyzing a different portion of the waveform. Perform calculations on zoomed areas. Multi-Zoom to view time-correlated events, or AutoScroll through your waveform.

Histicons

Parameter data can be powerfully analyzed with Histicons — small histogram views that give you a visual indication of parameter distributions. You can display up to 8 histicons at a time, with statistics, and have virtually no processing time penalty. Want a larger view? Simply touch the Histicon and a normal size histogram will appear.



Graphical Processing Web (XMATH Option)

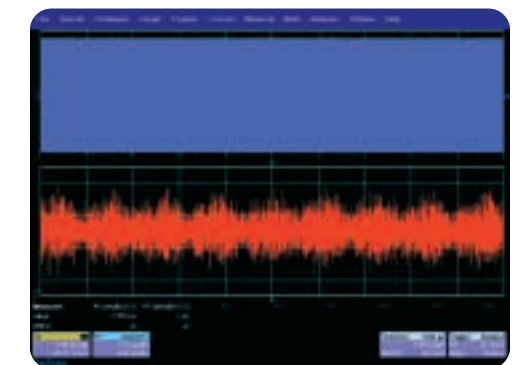
This offers a completely new and unique method to map the flow of your signal through your WaveShape Analysis setup. At each point, you can visually understand the processing being performed. Drag and drop functions and measurements. Chain an unlimited number of functions together for maximum analysis power.

Graphing of Parameters

Gain greater understanding and insight into underlying problems by using any of three parameter displays.

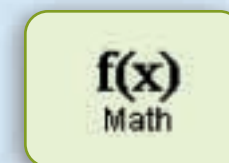
- "Track" shows the time evolution of a parameter correlated with the signal
- "Histogram" provides a view of the statistical distribution of a parameter
- "Trend" provides a graph of the history of parameter values in the order measured

Track is most powerful when analyzing long records. Here a track of the period parameter on a 1 Mpt record clearly shows the underlying signal modulation.

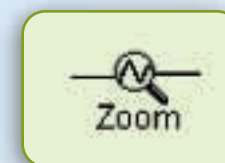


Integrated and Complete

All in one program – no need to open complicated accessories or application programs.



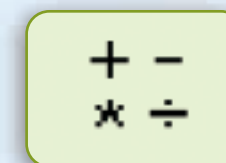
MATH
Easy access to math and measurements with a user-friendly display and setup window



ZOOMING
View signal detail with fast, intuitive zooming.



CURSORS
Dedicated cursor knobs make your job easy.



PARAMETER MATH
Derive and display a new measurement by calculating on two other parameter measurements.



GRAPH
With one button push, you can quickly analyze your measurements.



LABELS
Powerful waveform annotation capability

Customizable to Meet Your Needs

Answers Just the Way You Want Them

WaveMaster's XDEV customization is unique. To shorten your product time to market, you need more than basic connectivity or data export. You need an oscilloscope that can be made to do what you want, when you want it. WaveMaster with the XDEV Advanced Customization package opens a whole new world of possibilities.

Create your own measurements or math functions, or even your own user interface. Link to other programs and hardware using ActiveX, Automation Language, and VBScripts. Combine with the XMATH Advanced Math package for even more power. The possibilities are endless.



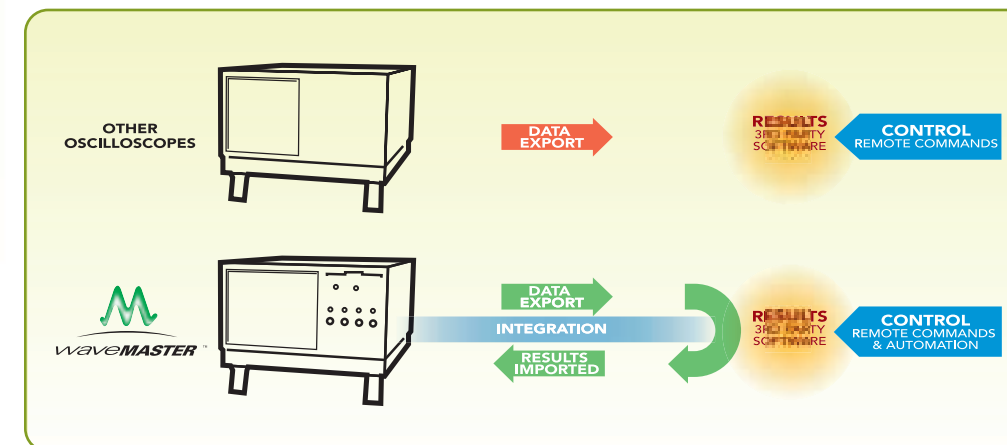
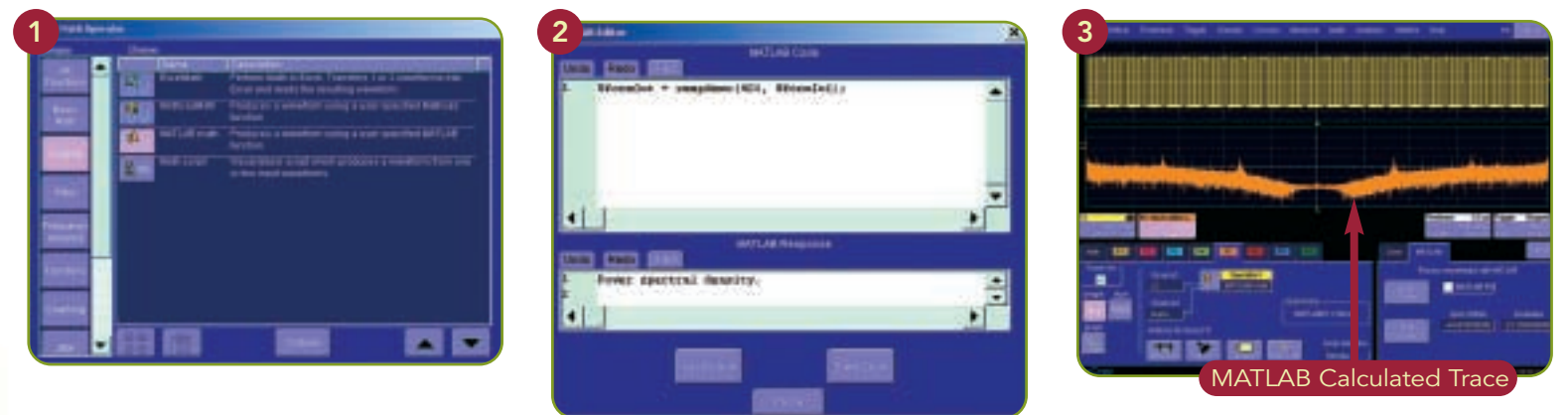
XDEV Advanced Customization

Only WaveMaster completely integrates third party programs into the oscilloscope's processing stream. This means that you can create and utilize a new measurement or math algorithm directly in the WaveShape Analysis Engine and display the result on the DSO in real-time! XDEV allows you to create your own script in your favorite programming

language, (Visual Basic, MATLAB, Mathcad, Excel), which can then be integrated seamlessly into the WaveShape Analysis Engine. For once there is no need to run a separate program, establish remote communication between the DSO and the other program, create a new reference waveform, or transfer large data files between the DSO and the other program. With the XDEV Advanced

Customization package, you extend the WaveMaster oscilloscope to include your most recent new technology algorithms the same day they are created.

An example of XDEV Advanced Customization is shown below. **1)** Select a customized algorithm. **2)** Load your algorithm. **3)** The calculated result is displayed on the WaveMaster DSO.



Customizability Comparison - WaveMaster offers the ultimate in flexibility. It is the only solution for customization that provides a "round trip" of the data back to your scope display. This chart shows how dramatically different LeCroy's solution is compared to other oscilloscopes.

CustomDSO

Perhaps you need to modify the WaveMaster UI to accommodate your test process? Starting with panel setups, you can quickly create a customized user interface tailored to your exact requirements. Microsoft plug-ins add another level of utility.

Custom Control

Interface WaveMaster with a 3rd party software program using LeCroy's standard remote command language, IV or LabView Drivers. Or use the Microsoft compliant Automation command language for complete, simple integration with other Automation-compatible programs (most Windows-based programs). Use the Microsoft Automation command language to quickly create customized user interfaces in Excel, Visual Basic, Visual C++, Word, Access, PowerPoint, Mathcad, MATLAB, etc. Connect to WaveMaster via the standard 10/100 Base-T network connection or via optional GPIB.

Using WaveShape Analysis

An Information Solution

Signals and speeds are becoming faster and more complex. Conventional measurement and viewing tools don't give you the complete picture anymore. You need new tools for today's problems. You need X-Stream Technology for fast processing of WaveShape Analysis, XMATH Advanced Math for power, and XDEV Advanced Customization to give you the flexibility you need to bring products to market quickly. Only WaveMaster has these technologies. Only WaveMaster can perform the WaveShape Analysis that you need.



Clock and Timing

Capture long or short acquisition with high signal integrity. Quickly and easily measure and view timing simultaneously on multiple signals. Quantify jitter. View jitter in the numerical, time, or statistical domains, and debug easily using the different views. Use XMATH and JTA2 to quickly debug power supply or other effects on digital signals.

Serial Datacom

Serial datacom signals are easily analyzed with WaveMaster. Acquire a single long acquisition, then use eye patterns (Serial Mask Package) to view jitter, create "Tracks" of timing parameters to understand signal errors, analyze statistical data, and zoom in on signal detail. Insert your own measurements of functions with XDEV customization. Use the OE425 and OE455 optical to electrical converters which offer up to 5 GHz optical bandwidth.

General Purpose Test

Excellent signal integrity, fast X-Stream measurements and unmatched ability to add user-defined custom measurements make WaveMaster the most powerful general purpose DSO available. Capture, view, measure, and analyze your signals using the most advanced amplifier, ADC, trigger, and measurement technology.



CONVENTIONAL ANALYSIS

Math & Measurement

Long Memory



LECROY WAVESHAPe ANALYSIS

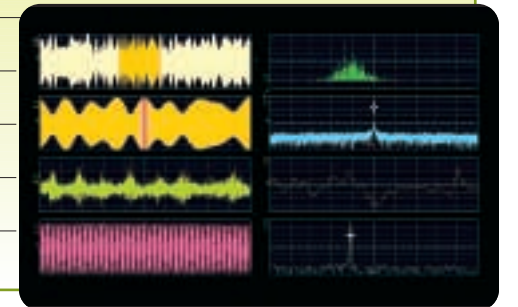
X-Stream Technology

XMATH Advanced Math

XDEV Advanced Customization

Math & Measurement

Long Memory



Serial Data Analyzer (SDA)

Easily perform mask tests, jitter measurements, signal parameter calculations, and bit error rate tests

on a wide variety of serial data protocols. SDA contains an advanced serial mask eye pattern test mode with violation locator — for rapid diagnosis of pattern dependent errors 10 — 100X faster than traditional eye pattern analysis. Measure and view estimated BER, Rj, Dj, and Dj breakdown. Perform BER testing with error map to isolate error sources. O/E Converters are also available.

Disk Drive Analyzer (DDA)

A unique combination of sophisticated measurement capability and simple interfaces makes the DDA-5005A the solution for disk drive analysis. View SAM histograms of head signal quality, rapidly locate PRML signal problems, create head signal quality line graphs, characterize media noise, and measure drive performance parameters.

Meet the LeCroy Wave Family

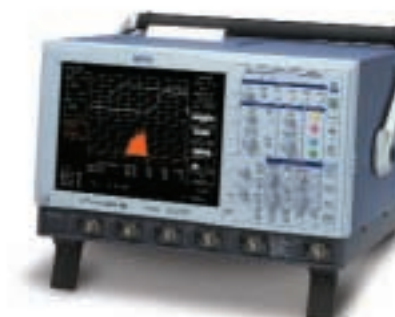
Each oscilloscope in LeCroy's Wave family is designed for fast and accurate measurements in WaveShape Analysis. From the affordable Waverunner to the measurement workhorse — WavePro — to the highest performance DSO — the WaveMaster — the Wave family integrates hardware, software, and user interfaces to provide a total measurement solution.



waveMASTER
OSCILLOSCOPES



waveMASTER
ANALYZERS



wavepro

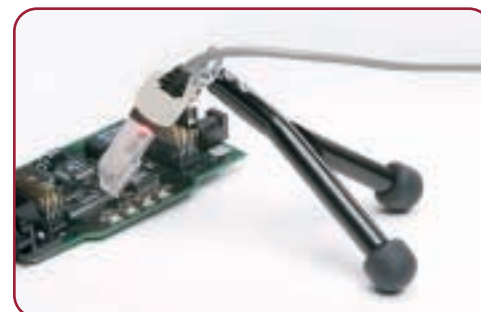


waverunner

Series	8600A Model	8500A Model	8300A Model	SDA Series	DDA 5005A Model	900 Series	LT500 , LT300, LT200 Models
Bandwidth	6 GHz	5 GHz	3 GHz	up to 6 GHz	5 GHz	500 MHz – 2 GHz	350 MHz – 1 GHz
Maximum Sample Rate	20 GS/s (2 channels)			20 GS/s (2 channels)		16 GS/s (1 channel)	4 GS/s
Maximum Memory (4 ch)	24 Mpts			48 Mpts	24 Mpts	16 Mpts	4 Mpts
Triggering	5 GHz Edge 750 MHz SMART Trigger			5 GHz Edge 750 MHz SMART Trigger		Up to 2 GHz Edge 750 MHz SMART Trigger	Up to 1 GHz Edge Up to 750 MHz SMART Trigger
Display	10.4"; 800 x 600 SVGA; TFT-LCD			10.4"; 800 x 600 SVGA; TFT-LCD		10.4"; 640 x 480 VGA; TFT	8.4"; 640 x 480 SVGA; TFT
Processing Platform	Pentium III or better; Windows 2000 OS			Pentium III or better; Windows 2000 OS		Power PC; Proprietary OS	Power PC; Proprietary OS
Dimensions	10.4" x 15.65" x 19.25" 39 lbs.			10.4" x 15.65" x 19.25" 39 lbs.		10.4" x 15.65" x 17.85" 31 lbs.	8.3" x 13.8" x 11.8" 18 lbs.

Probing Accessories for the WaveMaster Oscilloscope

Probing very high bandwidth signals requires special techniques and technologies. LeCroy offers a variety of solutions to match the demands of various applications. The easiest solution is for engineers whose test signals are available through a BNC or SMA cable. The front panel of the WaveMaster provides high-performance ProLink connectors whose core conductor is rated at 22 GHz bandwidth. ProLink adapters are available for SMA and BNC cables.



Troubleshooting components and PC sub-assemblies often requires probing of the device under test. Suppose you are designing a

high-speed transmission line. Then even the relatively low capacitance provided by an active probe may cause a problem with signal fidelity. High-speed design engineers have learned they cannot use a typical passive probe with 10 pF capacitance because the capacitive loading of this probe ($X_c = 1/2 \pi fC$) on the circuit is 159 ohms at 100 MHz. But they may not realize their active probe is causing the same problem at higher bandwidth. A 1 pF capacitive load provides 159 ohm loading at 1000 MHz (1 GHz). The solution to this

problem is an ultra low capacitance resistor divider probe.

The PP066 has 7.5 GHz bandwidth, less than 0.20 pF capacitance and a choice of 500 ohm or 1000 ohm impedance. Engineers designing circuits and needing to probe a wide variety of IC pins, circuit vias, and surface mount components will find the HFP series probes to be an ideal solution.

This modular series of active probes has a choice of bandwidths, a "FreeHand" probe holder and a wide variety of probe tips. The



HFP series offers high impedance (100 kohms) and low capacitance (less than 0.7 pF) at 1 GHz.

Another useful probing device is a low noise differential probe. The AP034 has 1 GHz bandwidth and offers excellent acquisition of differential signals.

If you need to capture optical signals, the OE425 and OE455 optical-to-electrical converters cover a wide range of wavelengths with up to 5 GHz optical bandwidth.

WaveMaster Specifications

Vertical System	WaveMaster 8600A	WaveMaster 8500A	WaveMaster 8300A
Analog Bandwidth @ 50 Ω (-3 dB)	6 GHz	5 GHz	3 GHz
Rise Time (Typical)	75 ps	90 ps	150 ps
Input Channels	4		
Bandwidth Limiters	25 MHz; 250 MHz; 1 GHz; 3 GHz; 4 GHz	25 MHz; 250 MHz; 1 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; Full bandwidth at ≥ 10 mV		
DC Gain Accuracy	±1.5% of Full Scale		
Offset Range	2 mV – 194 mV/div; ±750 mV; 195 mV – 1 V/div; ±4 V		
Offset Accuracy	±(1.5% of full scale + 1.5% of offset value + 2mV)		

Horizontal System

Timebases	Internal timebase common to 4 input channels; an external clock may be applied at the auxiliary input
Time/Division Range	20 ps/div – 1000 s/div
Math & Zoom Traces	4 independent zoom and 4 math/zoom traces standard; 8 math/zoom traces available with XMAP (Master Analysis package) or XMATH (Advanced Math package)
Clock Accuracy	≤ 1 ppm @ 0–40 degrees C
Time Internal Accuracy	≤ 0.06 / SR + (1 ppm * Reading) (RMS)
Sample Rate & Delay Time Accuracy	± 1ppm ≤ 10s interval
Jitter Noise Floor	1 ps RMS (Typical)
Trigger & Interpolator Jitter	≤ 2.5 ps (Typical)
Channel-Channel Deskew Range	±4.5 ns
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	10 GS/s		
2 Channel Max	20 GS/s		
Random Interleaved Sampling (RIS)	200 GS/s for repetitive signals: 20 ps/div – 1 μs/div		
Maximum Trigger Rate	150,000 waveforms/second (in Sequence Mode, up to 4 channels)		
Intersegment Time	≤ 6 μs		
Maximum Acquisition Points/Ch	(2 Ch) / (4 Ch)	Duration @ 20 GS/s	Segments (Sequence Mode)
Standard	2M / 1M	0.1 ms	500 Segments
M – Memory Option	8M / 4M	0.4 ms	1,000 Segments
L – Memory Option	16M / 8M	0.8 ms	5,000 Segments
VL – Memory Option	32M / 16M	1.6 ms	10,000 Segments
XL – Memory Option	48M / 24M	2.4 ms	20,000 Segments

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, roof for up to 1 million sweeps

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 99 999 999 events
Internal trigger range	±5 div from center
Max trigger frequency	5 GHz w/Edge Trigger; 750 MHz w/SMART Trigger (8300A = 3 GHz w/Edge Trigger, 750 MHz w/SMART Trigger)
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)

NOTE: 8600A Bandwidth and rise time specification is for sample rate ≥ 20 GS/s

Basic Triggers

Edge/Slope/Line	Triggers when signal meets slope and level condition.
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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.

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.

Probes

Probes	A variety of optional passive and active probes is available.
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

Color Waveform Display

Type	Color 10.4" flat-panel TFT-LCD with high resolution touch screen
Resolution	SVGA; 800 x 600 pixels
Realtime Clock	Dates, hours, minutes, seconds displayed with waveform. SNTP support to synchronize to precision internet clocks
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

Analog Persistence Display

Analog & 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

Zoom Expansion Traces

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

Processor	Intel Pentium III or better with MS Windows 2000 Platform
Processing Memory	Up to 512 MBytes

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.
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Setup Storage

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

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
Floppy Drive	Internal, DOS-format, 3.5" high-density
USB Ports	4 USB 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 or control signals output on front panel.
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.
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General

Auto Calibration	Ensures specified DC and timing accuracy is maintained for 1 year minimum.
Power Requirements	100–120 VAC at 50/60/400 Hz; 200–240 VAC at 50/60 Hz; Automatic AC Voltage selection. Power consumption: < 800 VA

Environmental

Temperature (Operating)	+5 °C to +40 °C including floppy disk and 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)
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)
Weight	18 kg; 39 lbs.
Shipping Weight	24 kg; 53 lbs.

Certifications

	CE Approved, 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.

Standard

Math Tools

Display up to four math function traces (F1 – F4). The easy to use graphical interface simplifies setup of up to two operations on each function trace, and function traces can be chained together to perform math-on-math.

absolute value	invert (negate)
average (summed)	log (base e)
average (continuous)	log (base 10)
derivative	product (x)
deskew (resample)	ratio (/)
difference (-)	reciprocal
enhanced resolution (to 11 bits vertical)	rescale (with units)
envelope	roof
exp (base e)	(sinx)/x
exp (base 10)	square
fft (power spectrum, magnitude, phase, up to 25 kpts)	square root
floor	sum (+)
histogram of 1000 events	trend (datalog) of 1000 events
integral	zoom (identity)

Pass/Fail Testing

Simultaneously test multiple parameters against selectable parameter limits or pre-defined masks. Pass or fail conditions can initiate actions including document to local or networked files, email the image of the failure, save waveforms, send a pulse out at the front panel auxiliary BNC output, or (with the GPIB option) send a GPIB SRQ.

Optional

Master Analysis Package (XMAP)

This package provides maximum capability and flexibility, and includes all the functionality present in XMATH, XDEV, and JTA2

Advanced Math Package (XMATH)

This package provides a comprehensive set of signal WaveShape Analysis Tools providing insight into the waveshape of complex signals. Additional capability provided by XMATH includes

- Intuitive, Graphical Math Setup (Processing Web) with unlimited chaining of functions
- 8 math traces total (4 additional)
- Parameter math – add, subtract, multiply, or divide two different parameters
- Histograms expanded with 19 histogram parameters and up to 2 billion events
- Trend (datalog) of up to 1 million events
- Track graphs of any measurement parameter
- FFT capability added to include: power averaging, power density, real and imaginary components, frequency domain parameters, and FFT on up to 25 Mpts.
- Narrow band power measurements
- Auto-correlation function
- Sparse function
- Cubic and Quadratic Interpolation function

Advanced Customization Package (XDEV)

This package provides a set of tools to modify the scope and customize it to meet your unique needs. Additional capability provided by XDEV includes

- Creation of your own measurement parameter or math function, using third party software packages, and display the result in the scope. Supported third party software packages include:
 - VBScript
 - MATLAB
 - Excel
 - Mathcad
- CustomDSO – create your own user interface in a scope dialog box.
- Add macro keys to run VBScript files
- Support of plug-ins

Measure Tools

Displays any 8 parameters together with statistics, including their average, high, low, and standard deviations. Histicons provide a fast, dynamic view of parameters and wave shape characteristics.

amplitude	maximum	width
area	mean	median
base	median	phase
cycles	minimum	time @ minimum (min.)
data	number of points	time @ maximum (max.)
delay	+overshoot	Δ time @ level
Δ delay	–overshoot	Δ time @ level from trigger
duty cycle	peak-to-peak	x @ max
duration	period	x @ min
falltime (90–10%, 80–20%, @ level)	phase	
frequency	risetime (10–90%, 20–80%, @ level)	
first	rms	
last	std. deviation	
level @ x	top	

Jitter and Timing Analysis Package (JTA2)

This package provides jitter timing and analysis using time, frequency, and statistical views for common timing parameters, and also includes other useful tools. JTA2 includes:

- Jitter and timing parameters, with “Track” graphs of
 - Cycle-Cycle Jitter
 - Period
 - Hold
 - N-Cycle
 - Half Period
 - Skew
 - N-Cycle with start selection
 - Width
 - Duty Cycle
 - Time Interval Error
 - Duty Cycle Error
 - Frequency
 - Setup
- Edge@lv parameter (counts edges)
- Histograms expanded with 19 histogram parameters and up to 2 billion events
- Trend (datalog) of up to 1 million events
- Track graphs of all parameters
- Persistence histogram, persistence trace (mean, range, sigma)

Disk Drive Measurements Package (DDM2)

This package provides disk drive parameter measurements and related mathematical functions for performing disk drive WaveShape Analysis.

- Disk Drive Parameters are as follows:

amplitude assymetry	local time trough-peak
local base	local time under threshold
local baseline separation	narrow band phase
local maximum	narrow band power
local minimum	overwrite
local number	pulse width 50
local peak-peak	pulse width 50–
local time between events	pulse width 50+ resolution
local time between peaks	track average amplitude
local time between troughs	track average amplitude–
local time at minimum	track average amplitude+
local time at maximum	
local time peak-trough	auto-correlation s/n
local time over threshold	non-linear transition shift
- Correlation function
- Trend (datalog) of up to 1 million events
- Histograms expanded with 18 histogram parameters and up to 2 billion events

Ordering Information

WaveMaster Four Channel Digital Oscilloscopes	Product Code
6 GHz, 20 GS/s (2 Ch); 10 GS/s (4 Ch) Color DSO 2 Mpts/2 Ch; 1 Mpt/Ch Standard	WAVEMASTER 8600A
5 GHz, 20 GS/s (2 Ch); 10 GS/s (4 Ch) Color DSO 2 Mpts/2 Ch; 1 Mpt/Ch Standard	WAVEMASTER 8500A
3 GHz, 20 GS/s (2 Ch); 10 GS/s (4 Ch) Color DSO 2 Mpts/2 Ch; 1 Mpt/Ch Standard	WAVEMASTER 8300A

Included with Standard 8600A and 8500A Configurations

ProLink Adapters; 4 each SMA; 2 each BNC
Operator's Manual; CD-ROM with OM/RCM, Utility software and Recovery software
Remote Control Manual
Floppy Disk Drive
CD ROM Drive
Optical 3 button Wheel Mouse-USB
Standard Ports; 10/100Base-T Ethernet, Parallel, SVGA Video Output, USB
Protective Front Cover
Standard Commercial Calibration and Performance Certificate
3-Year Warranty

Included with Standard 8300A Configuration

ProLink Adapter BNC; 5 each
Operator's Manual; CD-ROM with OM/RCM, Utility software and Recovery software
Remote Control Manual
Floppy Disk Drive
CD ROM Drive
Optical 3 button Wheel Mouse-USB
Standard Ports; 10/100Base-T Ethernet, Parallel, SVGA Video Output, USB
Protective Front Cover
Standard Commercial Calibration and Performance Certificate
3-Year Warranty

Memory Options

8 Mpts/2 Ch, 4 Mpts/ch	-M
16 Mpts/2 Ch, 8 Mpts/ch	-L
32 Mpts/2 Ch, 16 Mpts/ch	-VL
48 Mpts/2 Ch, 24 Mpts/ch	-XL

Hardware Options

IEEE-488 GPIB Remote Control Interface	GPIB-1
Internal Printer	WM-GP02
Removable Hard Drive Package (Includes USB CD-ROM)	WM-RHD
Additional Removable Hard Drive	WM-RHD-02

Software Options

Master Analysis Package; Includes XMATH, XDEV, JTA2	XMAP
Advanced Math Package	XMATH
Advanced Customization Package	XDEV
Jitter and Timing Analysis	JTA2
Disk Drive Measurement Package	DDM2
Digital Filter Package	DFP2
Serial Data Mask Package	SDM

Selected Accessories

ProLink Adapter SMA; 1 each	LPA-SMA
ProLink Adapter SMA kit of 4	LPA-SMA-Kit
ProLink Adapter BNC; 1 each	LPA-BNC
ProLink Adapter BNC kit of 4	LPA-BNC-Kit
Keyboard	KYBD-1
3.5 GHz Active Voltage Probe	HFP3500
7.5 GHz Low Capacitance Probe	PP066
1.0 GHz Differential Probe	AP034
O/E Converter, 700 – 870 nm wavelength	OE425
O/E Converter, 950 – 1630 nm wavelength	OE455
Norton Antivirus (Installed on WaveMaster)	WM-AV
Oscilloscope Cart	OC1021
Oscilloscope Cart (with additional shelf and drawer)	OC1024
Rackmount Kit - 25" Slide	RMA-25
Rackmount Kit - 30" Slide	RMA-30
WaveMaster Soft Carrying Case	WM-SCC
WaveMaster Hard Transit Case	WM-TC1

Warranty & Calibration

A variety of extended warranty, certification, and calibration services are available. Contact LeCroy Sales and Service for details.

Outstanding Customer Support

“Oscilloscope” is derived from the root meaning of “oscillate” (to change) and “scope” (to make visible). Bringing phenomena not directly observable to our senses into the visible realm to let you see, measure, analyze, and, ultimately, manipulate them is the art of instrument makers like LeCroy. This type of activity is founded on trust: if you can’t rely on what this instrument is presenting to you, you’re lost. Trust builds on, and from, long-term relationships. That kind of statement is easy to make; however, unlike with “banner specifications,” explaining and supporting the statement requires looking beneath the surface.

LeCroy has always thrived on a culture of fostering long-term relationships with customers. The importance of this is reflected throughout our product development, manufacturing, sales, and support processes. We are proud of the following company practices and encourage you to compare them with other vendors’ practices.

WARRANTY – LeCroy products are designed, built, and tested to ensure high reliability. Naturally, we warrant our digital oscilloscopes for three years. Your downtime and costs related to scope failures during warranty should be minimized. LeCroy ensures this by fully updating, calibrating, insuring, and return shipping your in-warranty units back to you quickly and at no charge.

LONG-TERM SUPPORT – Quality capital purchases should be supported over time. LeCroy supports its instruments for seven years after they leave production. This ensures that you will realize the full expected life of your investment in LeCroy instrumentation.

AFTER-SALE OPTION ADD-ONS AND UPGRADES – We believe you should be able to add options later if you like, without pricing penalties. With LeCroy, you can.

SOFTWARE SUPPORT – We also believe that you should be able to download the latest version of core software and updates to accessory software tools whenever you like, without charge. With LeCroy, you can.

RETROFIT OF NEW FEATURES – You have a right to expect that, when technically feasible, new features will be available for previously purchased products. LeCroy makes it a point to protect you from product obsolescence.



VIRUS PROTECTION ON WINDOWS SCOPES – A vendor that would sell a network-ready, Windows-based product without offering virus protection would be negligent. LeCroy has adopted appropriate safeguards for protecting our customers from viruses.

STABLE SALES AND APPLICATIONS ENGINEERING RELATIONSHIPS – In the test and measurement market, a stable, knowledgeable, and accessible Field Sales team can help you solve your measurement challenges. LeCroy’s hiring, training, retention, compensation, and territory coverage policies are all designed to provide you with the right solutions for the long term. The LeCroy team’s application and product knowledge is second-to-none.