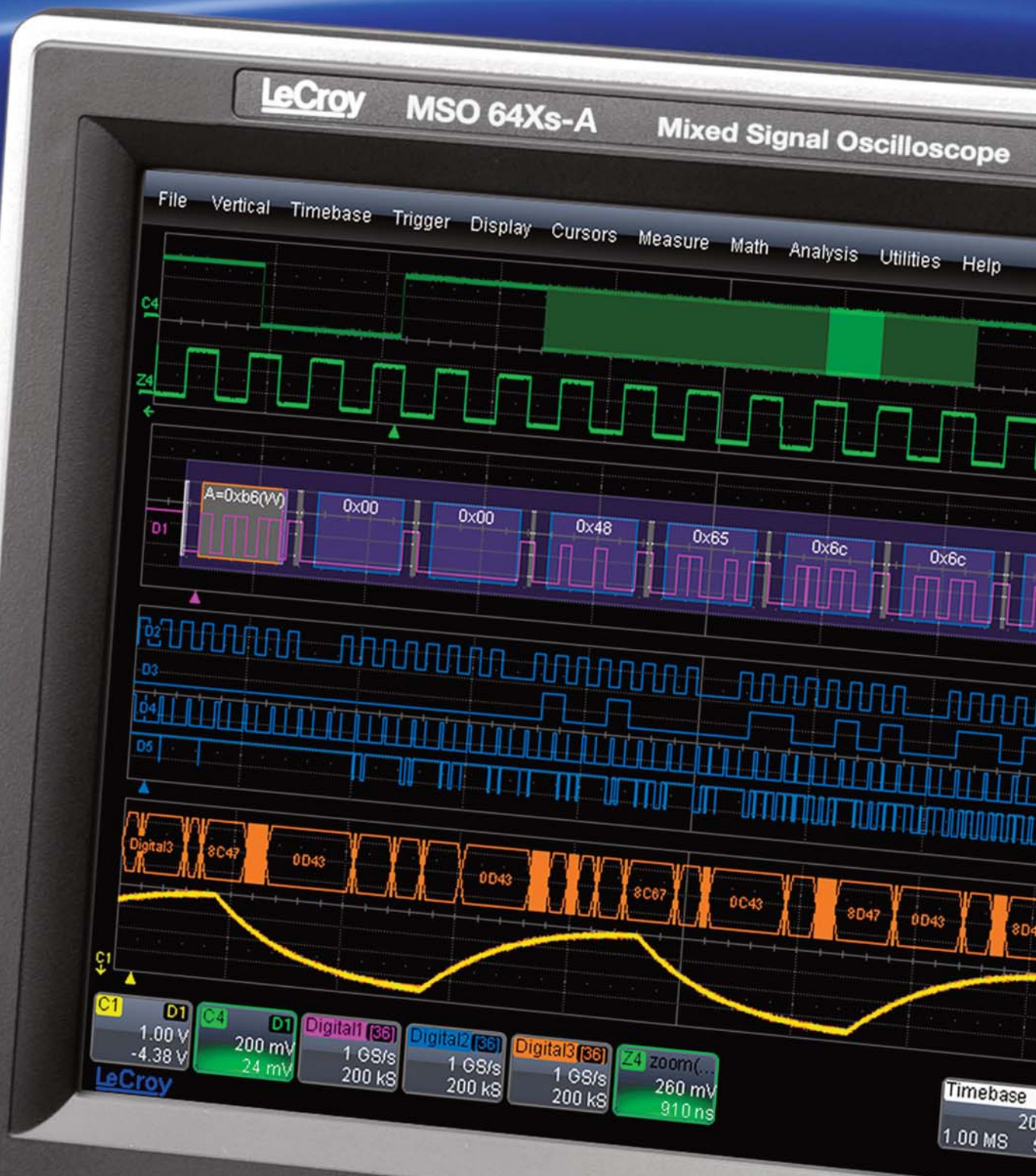




MSO Xs-A Mixed Signal Oscilloscopes

400 MHz–1 GHz

Engineered for Embedded
System Design and Debug



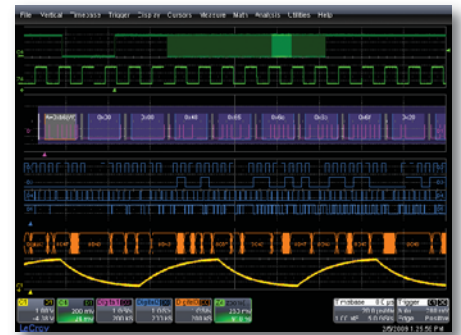
THE RIGHT TOOLS FOR EMBEDDED SYSTEM

Key Features

- 400 MHz, 600 MHz and 1 GHz bandwidths
- 4 analog and 18 digital channels
- 2.5 GS/s sample rates per channel, 5 GS/s with MSO 104Xs-A
- 10 Mpts/Ch memory on all channels, all the time
- Fast Processing of long memory and math
- Responsive User Interface
- WaveStream™ Fast Viewing Mode
- WaveScan™ – Advanced Search and Find
- Excellent triggering including HDTV Trigger
- 10.4" touch screen display
- LXI Compliant
- SMART® Trigger capabilities for combining parallel and serial triggering

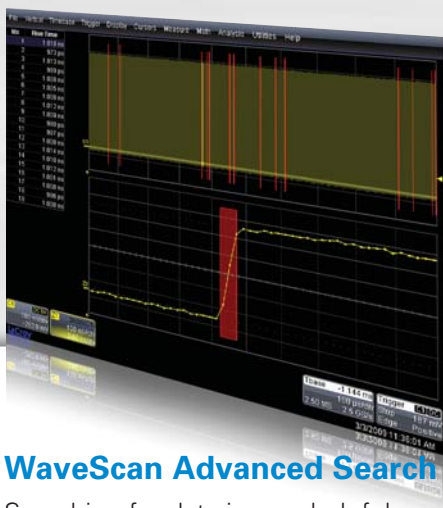
Successful design and debug of an embedded system requires monitoring a wide range of analog, digital and serial data signals. The MSO Xs-A with its long memory, fast processing, advanced measurements and touch screen is the right tool to view these signals and ensure proper bus traffic and timing between events.

Its small form factor pack a powerful processor that can handle the long 10 Mpts of memory on each of the 4 analog and 18 digital channels faster than any competing products and without any compromise of memory length or sample rate. The touch screen interface is the ultimate in ease of use and with features like WaveStream fast viewing mode and WaveScan Search and Find you can be confident that you will be able to quickly debug and solve every problem in your embedded system. Beyond the advanced measurement and triggering the MSO Xs-A offers a wide range of available serial data trigger and decode tools for I²C, SPI, UART, Serial Audio, CAN, and LIN. With analog bandwidths from 400 MHz to 1 GHz and max digital input frequencies up to 250 MHz the MSO Xs-A is the ideal mixed signal oscilloscope for everyday design and debug.



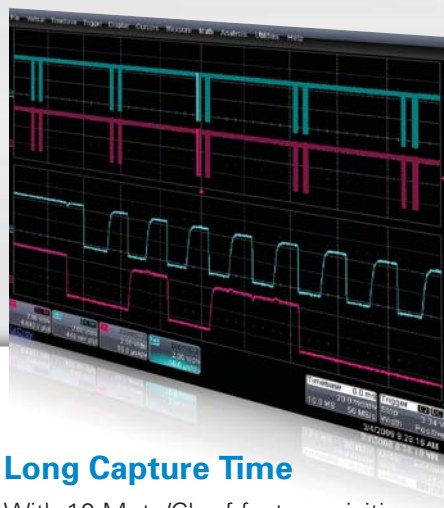
Speed and Responsiveness

The MSO Xs-A was designed to shorten debug time through faster hardware and more sophisticated software. The hardware allows for fast processing of long memory even when looking at all 22 inputs with math, measurements and serial decoders. The software is designed to respond immediately to the user's input even while processing data eliminating any lag or delay.



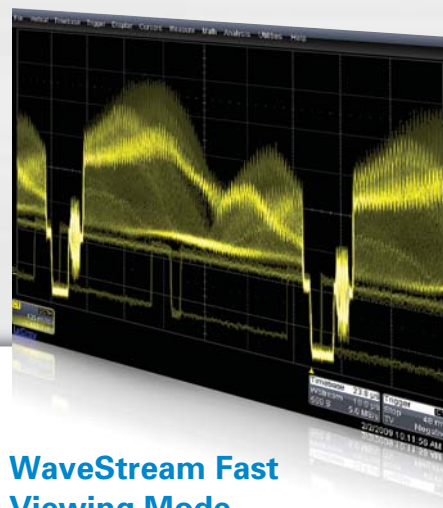
WaveScan Advanced Search

Searching for data is very helpful, but wouldn't it be better to Search for something you can't trigger on? WaveScan allows searching in a single acquisition using more than 20 different modes. Or, set up a Scan condition and scan for an event over hours or days, and perform some action when it is found.



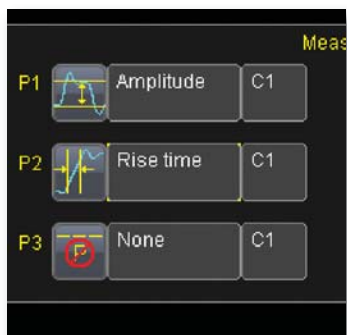
Long Capture Time

With 10 Mpts/Ch of fast acquisition memory standard the MSO Xs-A provides long capture time at full sample rate, and allows for very long captures at lower sample rates letting you capture long stretches of serial bus traffic. The MSO Xs-A long memory is also thoughtfully designed to respond quickly, even when measurements, math, or serial decoders are being used.



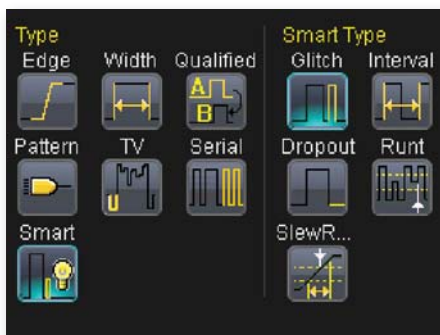
WaveStream Fast Viewing Mode

WaveStream provides a vibrant, intensity graded (256 levels) display with a fast update to closely simulate the look and feel of an analog oscilloscope. Turn WaveStream ON or OFF, and adjust intensity, using the front panel knob. Use it only when you want to.



Touch Screen Simplicity

Keep your testing efficient with a thoughtfully designed user interface that provides the busy engineer with a GUI that is smooth, transparent, and easy to use. Use the touch screen to quickly access all triggers, math functions and measurement parameters or to "draw a box" around the area of interest and zoom all channels to the desired area.



Advanced Mixed Signal Triggering

Powerful triggering allows for analog and digital cross-pattern triggering of up to 4 analog and 18 digital channels as well as Qualified AB event triggering to arm a trigger on a certain event and trigger on a parallel or serial pattern that follows.



Serial Data Trigger and Decode

Quickly and easily locate and isolate specific data on I²C, SPI, UART, CAN or LIN busses with the optional trigger and decode capabilities. Data is shown with a color-coded overlay directly on top of the physical layer waveform.

THE INTUITIVE, POWERFUL, FLEXIBLE MSO

The MSO Xs-A mixed signal oscilloscope makes everyday embedded system testing simpler and easier. The intuitive user interface and streamlined front panel make it easy to turn on and start making measurements. The interface is designed so that all triggering, decoding, measurements and functions are just one touch away

1. Digital Channel Capture

Capture 18 digital lines at 1 GS/s with 10 Mpts memory on each channel

2. Digital Waveform Views

View all lines individually or group them and view as a parallel bus

3. Analog Signal Capture

Capture and view analog channels with bandwidths up to 1 GHz, sample rate up to 5 GS/s and 10 Mpts on each channel

4. Serial Data Decode

View decoded bus information from I²C, SPI, UART, CAN, LIN or digital audio busses on analog or digital channels with serial data trigger and decode options

5. Local Language User Interface

Select from 10 languages. Add a front panel overlay with your local language





6. Bright 10.4" Touch Screen Display

Easily operate the MSO by accessing all functionality with a touch of the screen

7. Push Knobs

Trigger level, delay and offset knobs all provide shortcuts to common actions when pushed

8. WaveStream Fast Viewing Mode

Provides a lively, analog-like feel similar to a phosphor trace. Adjust "trace" intensity with the front panel control, or toggle between LeCroy WaveStream and real-time modes

9. Dedicated Cursor Knobs

Select type of cursor, position them on your signal, and read values without ever opening a menu.

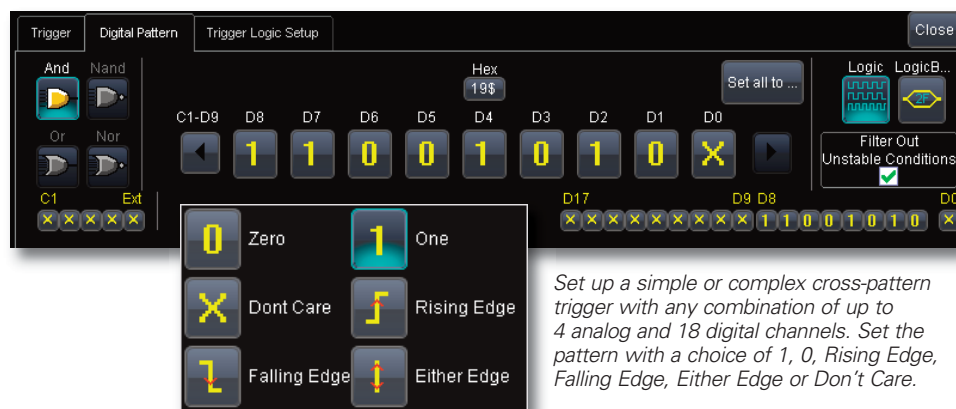
Document and Share:

- Save to on-board hard drive
- Save to network drive
- E-mail to team members
- Send to a printer
- Utilize front mounted USB port

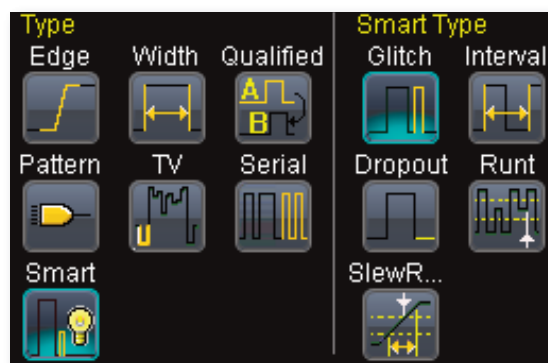
THE COMPLETE MIXED SIGNAL TOOLSET

Analog, Digital and Cross-pattern Triggering

The MSO Xs-A has an extensive set of triggering capabilities aimed at capturing a wide range of analog and digital signals. These triggers can be as simple as an edge trigger on an analog or digital channel or as complicated as a cross-pattern trigger which incorporates up to 4 analog and 18 digital channels. Powerful Qualified AB event triggering allows the trigger to be armed on one event and triggered on another.



Set up a simple or complex cross-pattern trigger with any combination of up to 4 analog and 18 digital channels. Set the pattern with a choice of 1, 0, Rising Edge, Falling Edge, Either Edge or Don't Care.



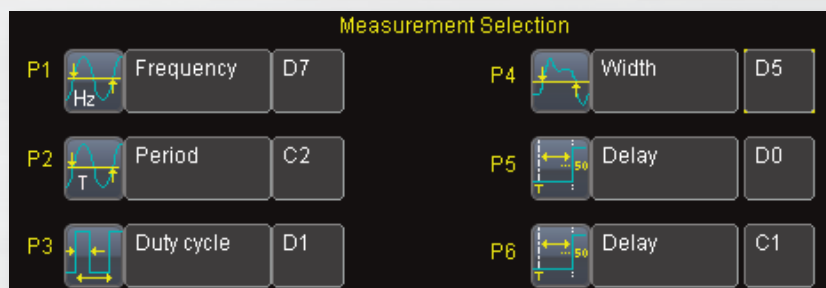
The advanced triggering of the MSO Xs-A goes well beyond the basic edge trigger and digital pattern trigger that many MSOs offer. Advanced triggers like runt and dropout and slew rate help find abnormal signals. The Qualified AB trigger can be used to connect multiple trigger events together.

Easy-to-use Measurement Tools

Cursor and measurement parameters are important for measuring and understanding both analog and digital waveforms. The MSO Xs-A cursors will read out hexadecimal bus values and analog channel voltages simultaneously. Automated measurement parameters will make measurements on both analog and digital channels with statistics to help you understand how they change over time.



Cursor measurements are displayed directly in the channel and group descriptor boxes which are always visible on screen.



Use up to 6 measurements simultaneously and make measurements on analog, digital or a combination of both. Measurements are quickly set up using the touch screen menus.

SERIAL DATA TRIGGER AND DECODE

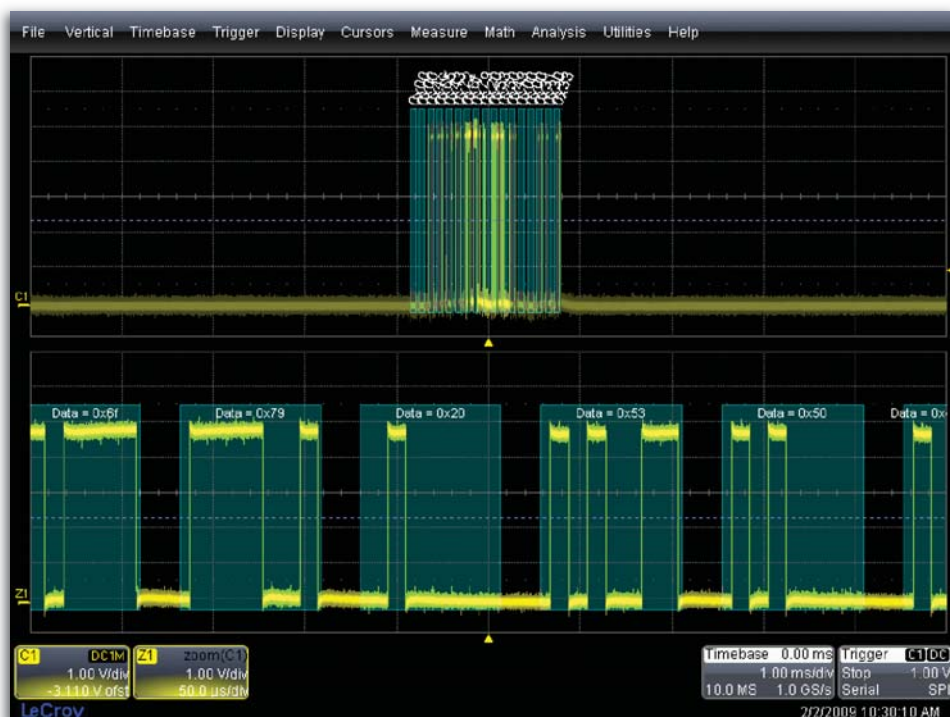
Complete I²C, SPI, UART, RS-232, LIN, CAN, and Digital Audio Serial Triggering

Quickly and easily isolate specific serial data events on your embedded controller for better understanding and faster debug. Set up trigger conditions in binary and hexadecimal formats. Use the digital channels to capture serial data busses keeping the analog oscilloscope channels open for other uses. Trigger on DATA in specific locations of long I²C EEPROM reads. Get complete control of your debug process and finish faster.



Powerful Conditional Data Triggering

Completely isolate specific message events for better understanding and debug. Use a conditional I²C, UART, RS-232, SPI, LIN or CAN DATA trigger to select a range of DATA values to trigger on, not just a single DATA value. Oftentimes, I²C utilizes DATA bytes to specify sub-addresses for accessing memory locations in EEPROMs. Conditional DATA trigger allows triggering on a range of DATA bytes that correspond to reads or



writes to specific sub-address memory blocks in the EEPROM. It can also aid in monitoring DATA outputs from sensors, such as analog-to-digital converters, and triggering when DATA is outside a safe operating range. In both cases, verifying proper operation becomes a simple task.

Intuitive, Color-Coded Decode Overlay

Advanced software algorithms deconstruct the waveform into binary, hex, or ASCII protocol information, then overlay the decoded data on the waveform.

Various sections of the protocol are color-coded to make it easy to understand. The decode operation is fast—even with long acquisitions.

Table Summary and Search/Zoom

Turn your oscilloscope into a protocol analyzer with the Table display of protocol information. Customize the table, or export Table data to an Excel file. Touch a message in the table and automatically zoom for detail. Search for specific address or data values in the acquisition.

Idx	Time	Addr Length	Address	R/W	Length	Data
8	240.484 ms	7	0x21	1	2	0x00 00 00
9	350.555 ms	7	0x21	0	1	0x08
10	390.698 ms	7	0x21	1	2	0x49 00 00
11	431.885 ms	7	0x21	0	1	0x0a
12	482.007 ms	7	0x21	1	2	0x00 00 00
13	606.294 ms	7	0x20	0	3	0x01 36 00
14	721.235 ms	7	0x20	0	1	0x00
15	721.377 ms	7	0x20	1	2	0x12 36 00
16	841.266 ms	7	0x20	0	1	0x02

LECROY WAVESCAN ADVANCED SEARCH

WaveScan provides powerful isolation capabilities that hardware triggers can't provide. WaveScan provides the ability to locate unusual events in a single capture (i.e., capture and search), or "scan" for an event in many acquisitions over a long period of time. Select from more than 20 search modes (frequency, rise time, runt, duty cycle, etc.), apply a search condition, and begin scanning.



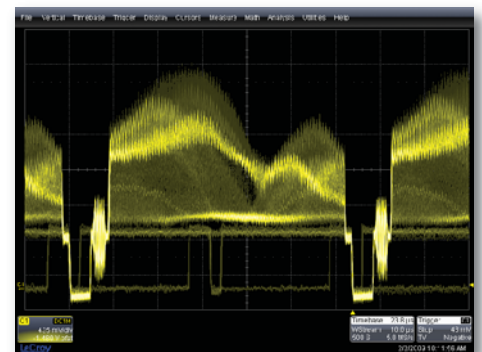
Since the scanning "modes" are not simply copies of the hardware triggers, the utility and capability is much higher.

For instance, there is no "frequency" trigger in any oscilloscope, yet WaveScan allows for "frequency" to be quickly "scanned." This allows the user to accumulate a data set of unusual events that are separated by hours or days, enabling faster debugging. When used in multiple

acquisitions, WaveScan builds on the traditional LeCroy strength of fast processing of data. A LeCroy X-Stream oscilloscope will quickly scan millions of events looking for unusual occurrences, and do it much faster and more efficiently than other oscilloscopes can.

WaveStream Fast Viewing Mode

WaveStream provides a vibrant, intensity graded (256 levels) display with a fast update rate to closely simulate the look and feel of an analog oscilloscope. WaveStream is most helpful in viewing signals that have signal jitter or signal anomalies, or for applying a visual check before creating an advanced trigger or WaveScan setup to locate an unusual event.



Since the sampling rate in WaveStream mode can be as high as 5 GS/s (up to 2.5x that of other oscilloscopes), it is an excellent runt or glitch finder. Timing jitter is often visually assessed to understand approximate behavior. WaveStream makes it easy to understand jitter on edges or in eye diagrams. WaveStream also excels in allowing you to relate composite (WaveStream) to single-event (real-time sampled) behaviors. Just capture in WaveStream mode, toggle to view or zoom a single trace, then toggle back to WaveStream mode.

PROBES, ACCESSORIES, AND OPTIONS

LeCroy offers an extensive range of probes, accessories, and options for the MSO Xs-A. Leverage your investment with these items.

ZS Series High Impedance Active Probes

Leading Features:

- 1 GHz (ZS1000) and 1.5 GHz (ZS1500) bandwidths
- High Impedance (0.9 pF, 1 M Ω)
- Extensive standard and available probe tip and ground connection accessories
- ± 12 Vdc offset (ZS1500)
- LeCroy ProBus system



ADP305, ADP300

Leading Features:

- 20 MHz and 100 MHz bandwidth
- 1,000 V_{rms} common mode voltage
- 1,400 V_{peak} differential voltage
- EN 61010 CAT III
- 80 dB CMRR at 50/60 Hz
- LeCroy ProBus system



PPE1.2KV, PPE2KV, PPE4KV, PPE5KV, PPE6KV, PPE20KV

Leading Features:

- Suitable for safe, accurate high-voltage measurements
- 1.2 kV to 20 kV
- Works with any 1 M Ω input oscilloscope



CP030, CP031

Leading Features:

- 30 A_{rms} continuous current (50 A_{peak})
- 50 or 100 MHz bandwidth
- Small form factor accommodates large conductors with small jaw size
- LeCroy ProBus system



AP031

Leading Features:

- Lowest priced differential probe
- 15 MHz bandwidth
- 700 V maximum input voltage
- Works with any 1 M Ω input oscilloscope



AP033, AP034

Leading Features:

- 500 MHz and 1 GHz bandwidth
- 10,000:1 CMRR
- Wide dynamic range, low noise
- LeCroy ProBus system



Advanced Trigger Option

Adds Runt, Slew Rate, Interval, Dropout, and Qualified/State triggers to the standard triggers.

Extended Math Option

Adds 12 additional math functions, chaining of two math functions, rescaling with unit selection, and 1 Mpts FFTs.

I²C, SPI, UART, RS-232, LIN, CAN and Digital Audio Trigger & Decode Options

Powerful serial triggering, including conditional data triggering, intuitive, color-coded decode overlay, search, and table display.



MSO Xs-A SPECIFICATIONS

Analog Channels

	MSO 44Xs-A	MSO 64Xs-A	MSO 104Xs-A
Bandwidth (@ 50 Ω)	400 MHz	600 MHz	1 GHz
Rise Time	875 ps	500 ps	300 ps
Input Channels	4		
Display	10.4" Color flat-panel TFT-LCD, 800 x 600 SVGA, touch screen		
Sample Rate (single-shot)	2.5 GS/s		5 GS/s
Sample Rate (RIS mode)	50 GS/s		
Standard Record Length	10 Mpts/Ch (all channels)		
Standard Capture Time	Up to 2 ms at full sample rate on all four channels		
Vertical Resolution	8-bits		
Vertical Sensitivity (V/div)	2 mV/div–10 V/div (1 M Ω); 2 mV/div–1 V/div (50 Ω)		
Vertical (DC Gain) Accuracy	$\pm 1.0\%$ of full scale (typical); $\pm 1.5\%$ of full scale ≥ 10 mV/div (warranted)		
BW Limit	20 MHz, 200 MHz		
Maximum Input Voltage	50 Ω : 5 V _{rms} , 1 M Ω : 400 V max. (DC + Peak AC ≤ 5 kHz)		50 Ω : 5 V _{rms} 1 M Ω : 250 V max. (DC + Peak AC ≤ 10 kHz)
Input Coupling	AC, DC, GND (DC and GND for 50 Ω)		
Input Impedance	1 M Ω 16 pF, or 50 Ω		1 M Ω 20 pF, or 50 Ω
Probing System	BNC or ProBus		
Probes	One PP009 (5 mm) per channel (standard)		One PP011 (5 mm) per channel (standard)

Digital Channels

Number of Channels	18
Maximum Input Frequency	250 MHz
Sample Rate (per Ch)	1 GS/s
Record Length (per Ch)	10 Mpts
Threshold Groupings	D0–D8, D9–D17
Threshold Levels	TTL, ECL, CMOS (2.5 V, 3.3 V, 5 V), PECL, LVDS or User Defined
Input Impedance	100 k Ω 5.0 pF
Maximum Input Voltage	± 30 V non-destruct

Horizontal and Trigger

Timebase Range	200 ps/div–1000 s/div (roll mode from 500 ms/div–1000 s/div)
Timebase Accuracy	≤ 5 ppm @ 25 °C (typical) (≤ 10 ppm @ 5–40 °C)
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, HFRej, LFRej
Pre-trigger Delay	0–100% of full scale
Post-trigger Delay	0–10,000 divisions
Trigger Hold-off	1 ns to 20 s or 1 to 1,000,000,000 events
Internal Trigger Level Range	± 4.1 div from center
External Trigger Range	EXT/10 ± 4 V; EXT ± 400 mV

MSO Xs-A SPECIFICATIONS

Trigger Types

	MSO 44Xs-A	MSO 64Xs-A	MSO 104Xs-A
Standard	Edge, Glitch, Width, Logic (Pattern), TV (NTSC, PAL, SECAM, HDTV – 720p, 1080i, 1080p), Runt, Slew Rate, Interval (Signal or Pattern), Dropout, Qualified (State or Edge)		

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), 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 can 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.

Physical (MS-250)

Dimensions (HWD)	1.5" x 4.25" x 8.375" (3.8 x 10.8 x 21.2 cm)
Weight	1.7 lbs. (.775 kg)
Leadset Length	16" (40.65 cm)

Physical (Base Oscilloscope)

Dimensions (HWD)	10.25" x 13.4" x 6" (26 cm x 34 cm x 15 cm) Excluding accessories and projections
Net Weight	16.0 lbs. (7.26 kg.)

Option

Extended Math (WSXs-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, and 1 Mpts FFTs.
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ORDERING INFORMATION

Product Description

Product Code

MSO Xs-A Mixed Signal Oscilloscopes

1 GHz, 5 GS/s, 4 + 18 Ch, 10 Mpts/Ch MSO with 10.4" Color Touch Screen Display	MSO 104Xs-A
600 MHz, 2.5 GS/s, 4 + 18 Ch, 10 Mpts/Ch MSO with 10.4" Color Touch Screen Display	MSO 64Xs-A
400 MHz, 2.5 GS/s, 4 + 18 Ch, 10 Mpts/Ch MSO with 10.4" Color Touch Screen Display	MSO 44Xs-A

Included with Standard Configuration

MS-250 Mixed Signal Oscilloscope Option
Advanced Triggering with LeCroy SMART Triggers
÷10, 500 MHz, 10 MΩ Passive Probe (Total of 1 Per Channel)
Getting Started Manual and Quick Reference Guide
Standard Ports: 10/100Base-T Ethernet, USB 2.0 (5), SVGA Video out, Audio in/out, RS-232
Protective Front Cover
Anti-virus Software (Trial Version)
Standard Commercial Calibration and Performance Certificate
3-year Warranty

General Accessories

Keyboard Accessory	WSXs-KYBD
Optical Mouse Accessory	WSXs-MOUSE
External GPIB Accessory	WS-GPIB
Hard Carrying Case	WSXs-HARDCASE
Soft Carrying Case	WSXs-SOFTCASE
Rack Mount Accessory	WSXs-RACK
Accessory Pouch	WSXs-POUCH

Mounting Accessory

Clamp Mounting Stand	WSXs-MS-CLAMP
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Local Language Overlays

German Front Panel Overlay	WSXs-A-FP-GERMAN
French Front Panel Overlay	WSXs-A-FP-FRENCH
Italian Front Panel Overlay	WSXs-A-FP-ITALIAN
Spanish Front Panel Overlay	WSXs-A-FP-SPANISH
Japanese Front Panel Overlay	WSXs-A-FP-JAPANESE
Korean Front Panel Overlay	WSXs-A-FP-KOREAN
Chinese (Tr) Front Panel Overlay	WSXs-A-FP-CHNSES-TR
Chinese (Simp) Front Panel Overlay	WSXs-A-FP-CHNSES-SI
Russian Front Panel Overlay	WSXs-A-FP-RUSSIAN

Product Description

Product Code

Software Options

Extended Math Software Package	WSXs-MATHSURF
Electrical Telecom Mask Test Software Package	WSXs-ET-PMT
Windows Lockout Software Option	WSXs-LOCKOUT

Serial Data Options

I ² C Trigger and Decode Option	WSXs-I2Cbus TD
UART and RS-232 Trigger and Decode Option	WSXs-UART-RS232bus TD
SPI Trigger and Decode Option	WSXs-SPIbus TD
LIN Trigger and Decode Option	WSXs-LINbus TD
CAN Trigger and Decode Option	WSXs-CANbus TD
Audio Bus Trigger and Decode Option	WSXs-AudioBus TD

Probes and Amplifiers*

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
1 GHz Active Differential Probe (÷1, ÷10, ÷20)	AP034
500 MHz Active Differential Probe (x10, ÷1, ÷10, ÷100)	AP033
30 A; 100 MHz Current Probe – AC/DC; 30 A _{rms} ; 50 A _{peak} Pulse	CP031
30 A; 50 MHz Current Probe – AC/DC; 30 A _{rms} ; 50 A _{peak} Pulse	CP030
30 A; 50 MHz Current Probe – AC/DC; 30 A _{rms} ; 50 A _{peak} Pulse	AP015
150 A; 10 MHz Current Probe – AC/DC; 150 A _{rms} ; 500 A _{peak} Pulse	CP150
500 A; 2 MHz Current Probe – AC/DC; 500 A _{rms} ; 700 A _{peak} Pulse	CP500
1,400 V, 100 MHz High-Voltage Differential Probe	ADP305
1,400 V, 20 MHz High-Voltage Differential Probe	ADP300
1 Ch, 100 MHz Differential Amplifier	DA1855A

*A wide variety of other passive, active, and differential probes are also available. Consult LeCroy for more information.

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



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

Local sales offices are located throughout the world.
Visit our website to find the most convenient location.