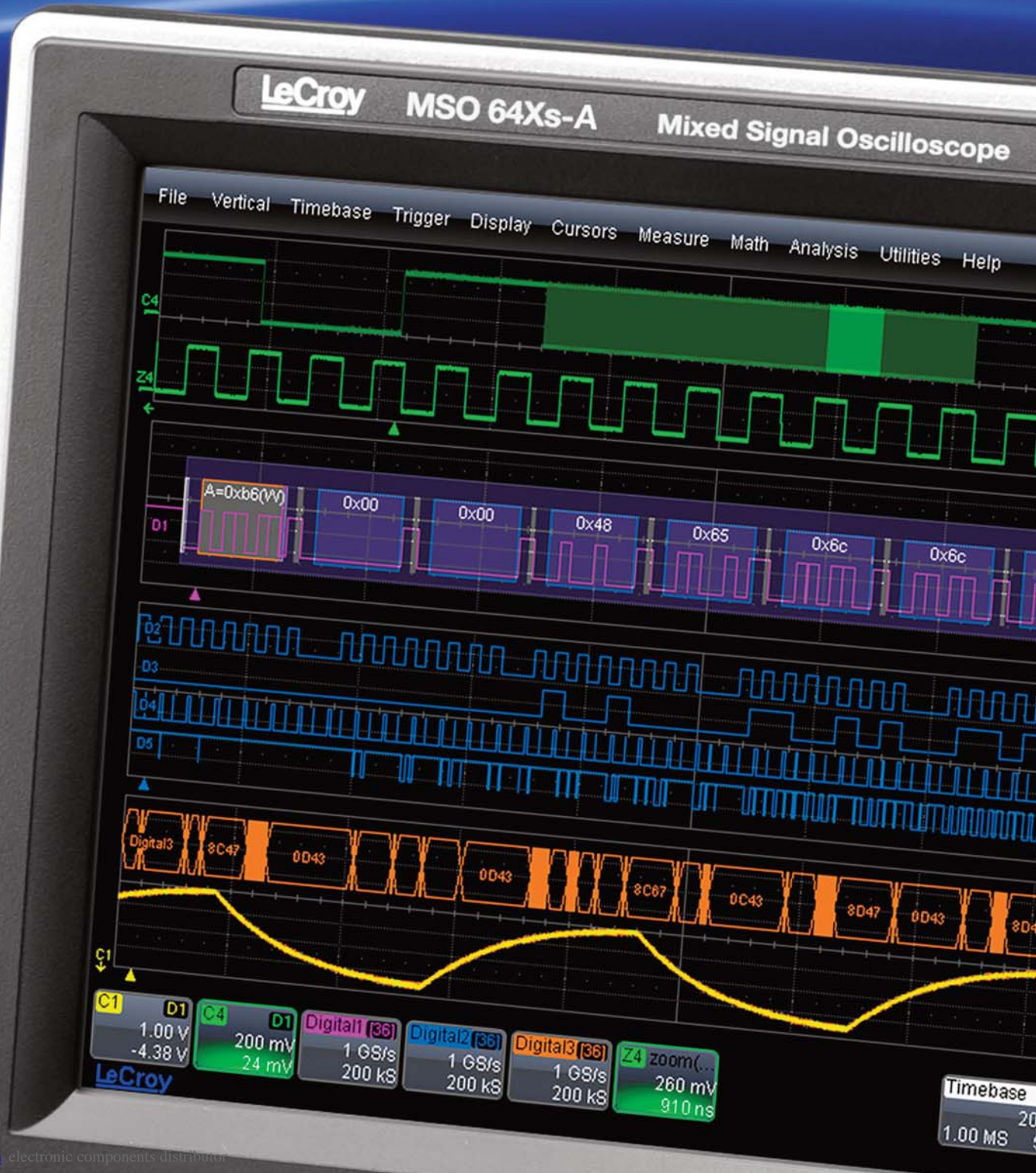




MSO Xs-A Mixed Signal Oscilloscopes

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

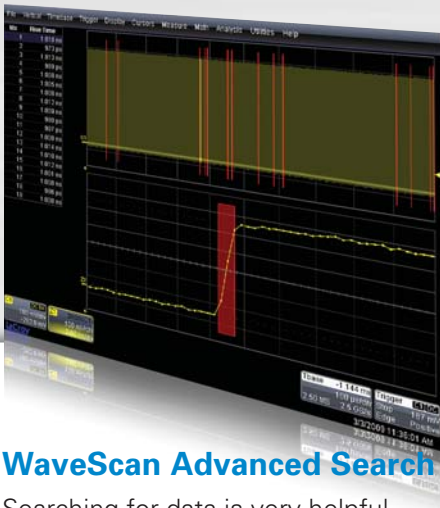
Successful design and debug of an embedded system requires monitoring a wide range of analog, digital and serial data signals. The MSO Xs-A with its long memory, fast processing, advanced measurements and touch screen is the right tool to view these signals and ensure proper bus traffic and timing between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



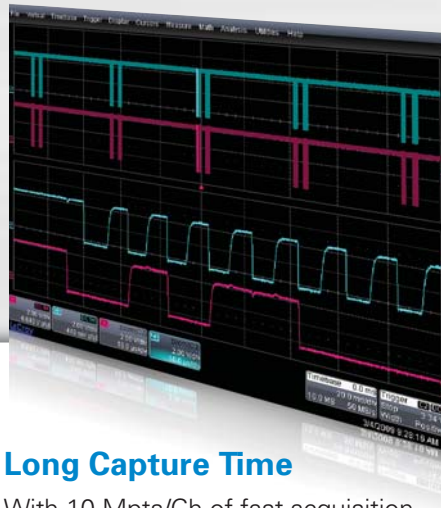
Speed and Responsiveness

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.



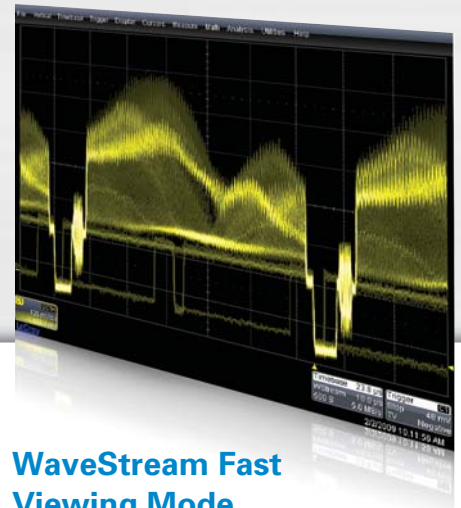
WaveScan Advanced Search

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.



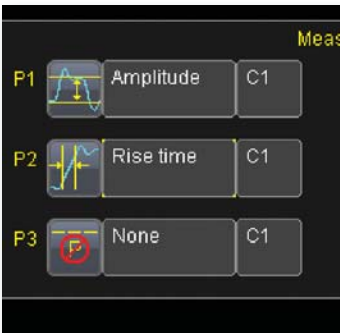
Long Capture Time

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.



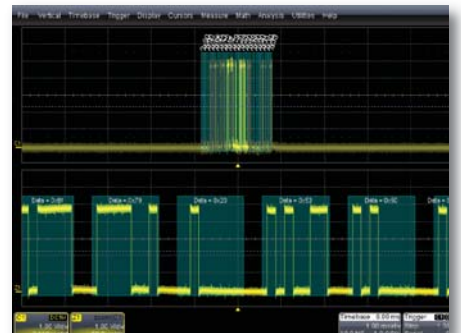
Touch Screen Simplicity

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:

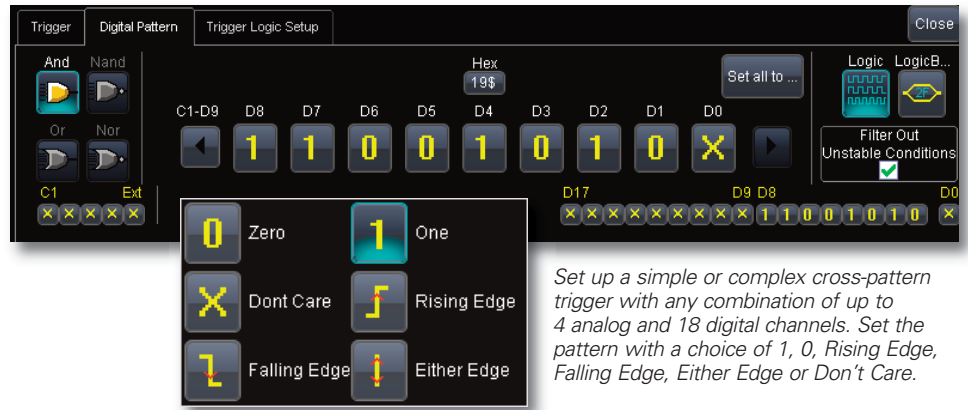
- Save to on-board hard drive
- Save to network drive
- E-mail to team members
- Send to a printer
- Utilize front mounted USB port



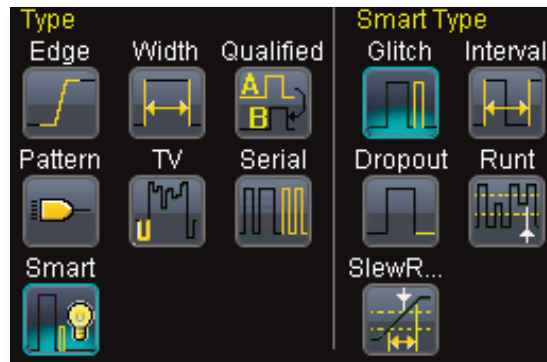
THE COMPLETE MIXED SIGNAL TOOLSET

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.



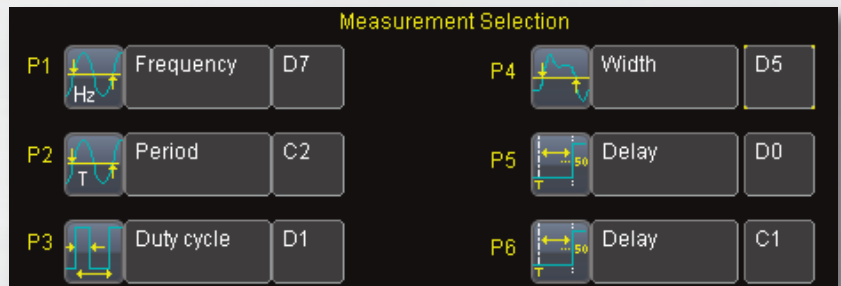
The advanced triggering of the MSO Xs-A goes well beyond the basic edge trigger and digital pattern trigger that many MSOs offer. Advanced triggers like runt and dropout and slew rate help find abnormal signals. The Qualified AB trigger can be used to connect multiple trigger events together.

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

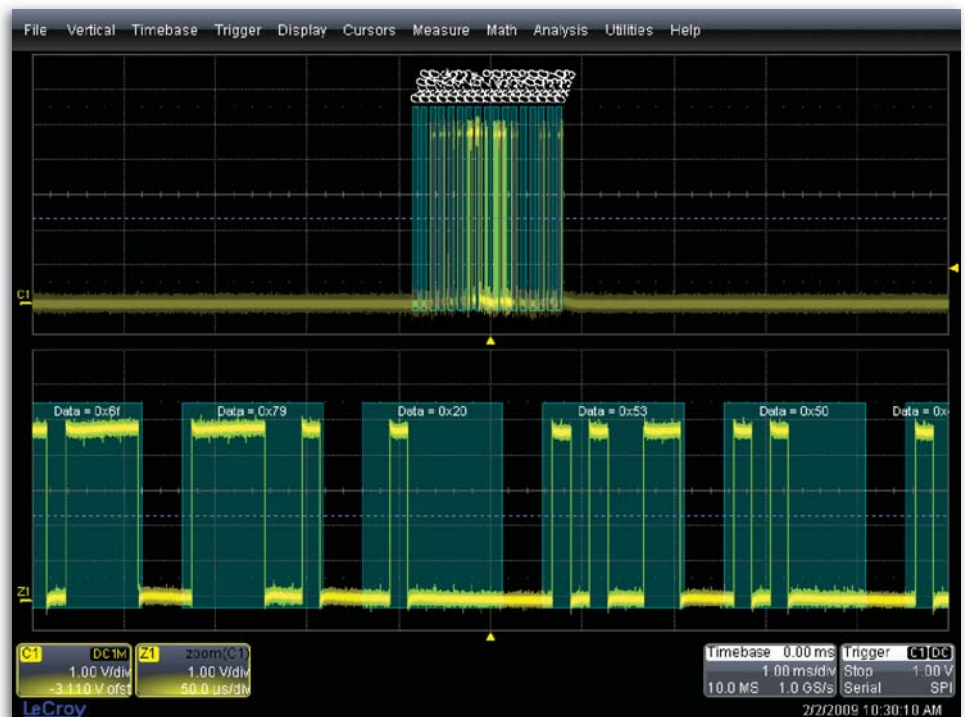
Complete I²C, SPI, UART, RS-232, LIN, CAN, and Digital Audio Serial Triggering

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.

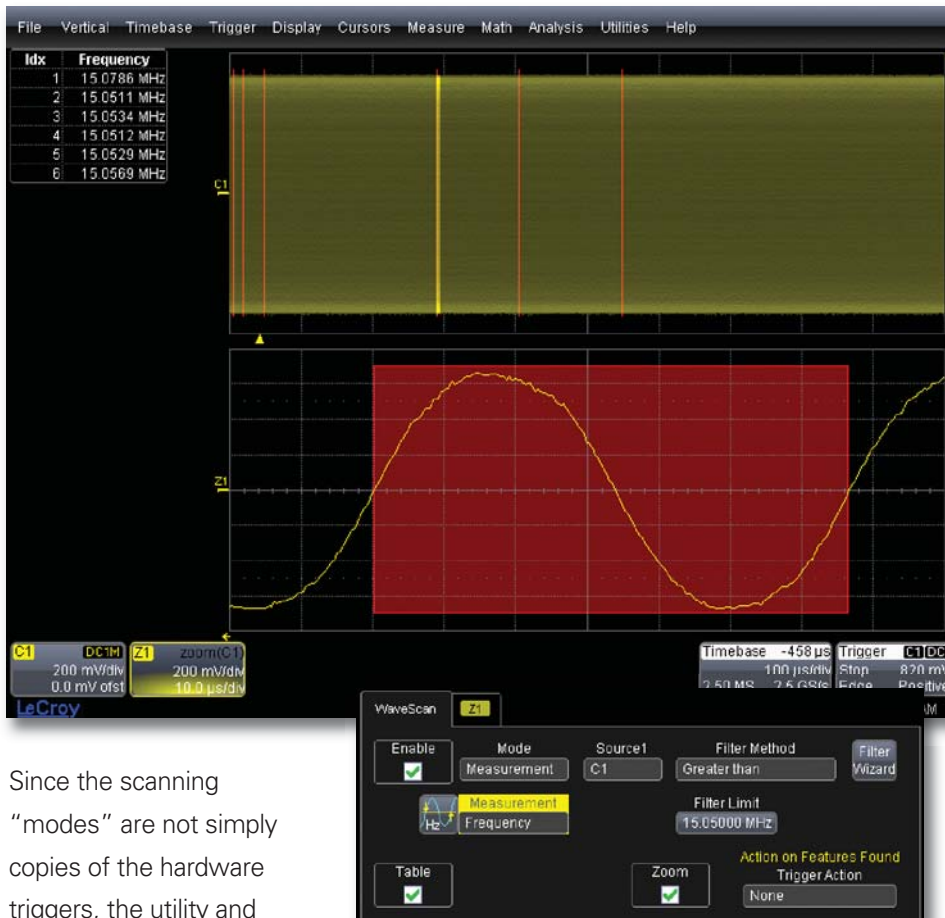
Table Summary and Search/Zoom

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 | 240.494 ms | 7 | 0x21 | 1 | 2 | 0x00 00 00 |
| 9 | 360.555 ms | 7 | 0x21 | 0 | 1 | 0x08 |
| 10 | 360.698 ms | 7 | 0x21 | 1 | 2 | 0x49 00 00 |
| 11 | 481.885 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.



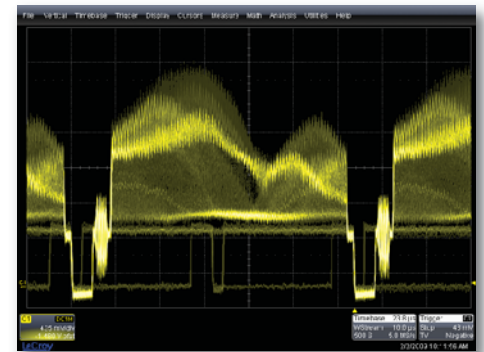
Since the scanning "modes" are not simply copies of the hardware triggers, the utility and capability is much higher.

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 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 $^{\circ}$ C (typical) (≤ 10 ppm @ 5–40 $^{\circ}$ 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. | | |
|--------------------------------------|---|--|--|

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 |
|----------------------|---------------|

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-CHNES-TR |
| Chinese (Simp) Front Panel Overlay | WSXs-A-FP-CHNES-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.