

MS-32

Oscilloscope Mixed
Signal Option

In order to get started quickly, take a few moments to read through this guide.

Information on basic oscilloscope operation can be found in the oscilloscope on-line Help.

When you have more time, read the MS-32 Operator's Manual. That contains more detailed information about the full capability of the MS-32 Option.

QUICK REFERENCE GUIDE

LeCroy

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

First Steps

MS-32 is a Digital Trigger and Timing Analysis tool that will greatly increase your ability to debug and analyze mixed signal systems. The names of the hardware components in the MS-32 Option are shown below.



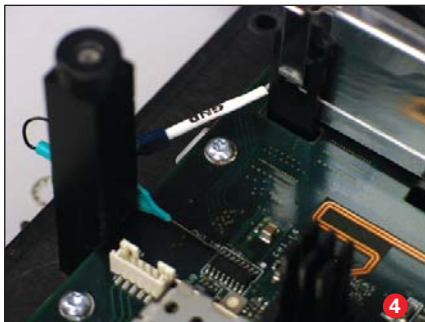
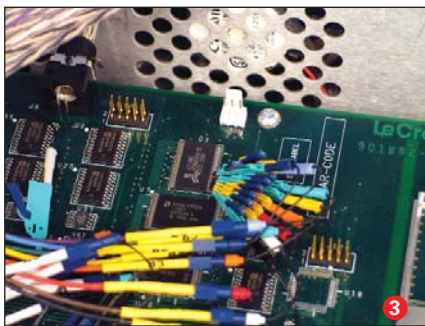
Connecting the MS-32 to the Oscilloscope



Connecting the MS-32 hardware to your LeCroy oscilloscope is easy. Follow these simple steps:

- 1** Connect the MS-32 Power Supply to the Digital Logic Pod and a power outlet. The "PWR" LED should be lit.
- 2** Connect the MS-32 Digital Lead Set to the Digital Logic Pod.
- 3** Connect the USB2.0 Cable to one of the oscilloscope's PC-USB2.0 ports.
- 4** Connect the other end of the USB2.0 Cable to the MS-32 Digital Logic Pod.
- 5** Connect the MS-32 Oscilloscope Interface Module (OIM) to the EXT input of the oscilloscope. Make sure that the top (OIM labeled side) is facing up.
- 6** Connect the SMB plug from the OIM to the Digital Logic Pod SMB jack that is labeled TRIG OUT.
- 7** Connect the BNC plug from the OIM to the Auxiliary Output on the back of the Oscilloscope.
- 8** Connect the SMB jack from the OIM to the SMB plug on the MS-32 Digital Lead Set.

Connecting to Digital Logic Lines



Standard Output Connection

The standard terminations on the digital lead sets can be pushed directly onto 25-mil pins. MicroGrippers may also be used to probe the test circuit's pins. These are available from LeCroy as accessories.

1 Group Colors

The 32 channels are divided into four physical groups of 8. Each group is bundled and colored. On the lead set, the plastic separator-blocks and terminators match the group color.

2 Line Colors

The wires in each color group use 8 repeating colors. The color sequence is the standard resistor color code sequence.

3 Digital Line Connection

Connect the Digital Leads to the digital lines you wish to observe (using accessory Microgrippers, as necessary or desired).

4 Ground Connection

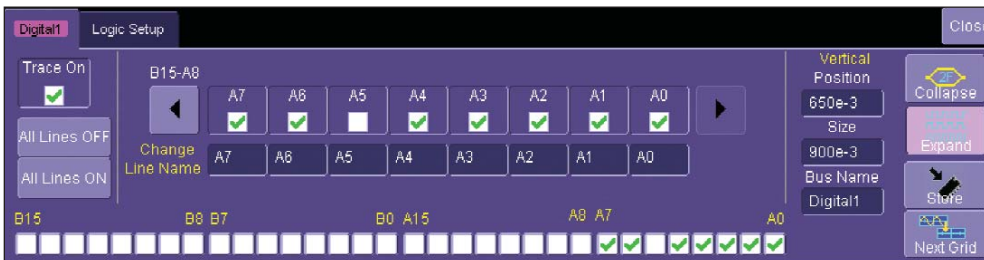
Connect the Digital Lead Set ground leads to the ground plane of your device under test. Use the following rules to ensure correct grounding:

- Use the shortest ground lead possible.
- Use the ground lead closest to the digital lines that ground relates to.
- If the ground plane is a pin on an IC, use the ground pin closest to the digital lines that ground relates to.

Connect at least one ground lead to the test circuit's ground. Connecting several ground leads is even better.

Using the MS-32

Digital Trigger Setup



Digital Trace Group Setup

Overview

MS-32 trigger and digital line display tools are easily accessible in a variety of ways. The MS-32 option adds additional dialogs (menus) to the existing oscilloscope. These dialogs include Analog/Digital Trigger Mode selection, Digital Trigger setup, Digital Trace Group setup, and Logic Threshold setup. Two of these dialogs are shown above.

When the MS-32 OIM and the Digital Logic Pod are connected to the oscilloscope, these dialogs are conveniently accessed with just one or two touches of the screen, making setup fast and easy.

Digital Trigger

MS-32 Digital Trigger and Timing Analysis Option has a very powerful and flexible Digital trigger, but it is also very easy to set up for basic triggering. To digitally trigger, connect the MS-32 digital logic pod as described on page 2. Then, select the Digital trigger mode in the Trigger tab. Digital triggers can be set up as a Logic, Logic Bus, or Interval conditions.

Digital Trace Groups

Digital trace groups are very similar to analog channels — they can be turned ON or OFF, they can be increased in size, and they can be positioned on the grid. You can also store them as waveform files. In software, they are accessed through the same Vertical menu as analog Channels. Cursors and some timing measurements work with Digital traces.

However, Digital trace groups have capability far beyond that of an analog channel. Each Digital trace group can consist of 1-32 digital lines. You can create up to 4 Digital trace groups, and each digital line can be used in as many or as few groups as desired. You can choose to display the group of digital lines as individual digital traces (one per line), or as a “collapsed” bus with bus data values calculated on screen within the bus trace.

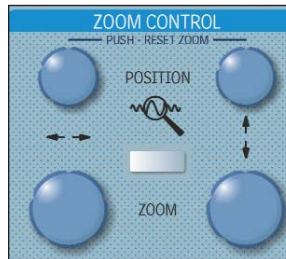
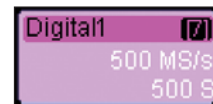
Useful Features

Digital Size and Position Controls



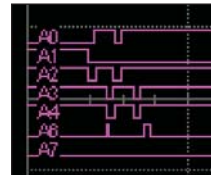
There are no dedicated front panel controls for Digital line position or size. However, you can touch the controls (shown at left) twice and enter in a unitless value for position and size using the pop-up keypad. Or you can touch them once, and use the front panel adjust knob to adjust the value.

Another way is to make the Digital trace group “active” by touching the descriptor box (shown at the right) once and then using the front panel vertical zoom controls (WaveRunner 6000) or channel controls (WaveSurfer) to adjust the position and size.



Displaying Digital Information in a Bus View

You can view a group of digital traces as individual lines (Expand mode), like this:



Or collapsed into a bus (Collapse mode), like this:



Just select the appropriate button in the Digital menu to get the view that you want.



Helpful Hints

Triggering & Signal Time Alignment



If your trigger condition occurs infrequently (approximately < 1 Hz), you may observe in AUTO trigger mode a non-triggered intermediate acquisition where digital and analog signals are not time-aligned. Switch to "NORMAL" or "SINGLE" to have only triggered (and thus time-aligned) acquisitions displayed.

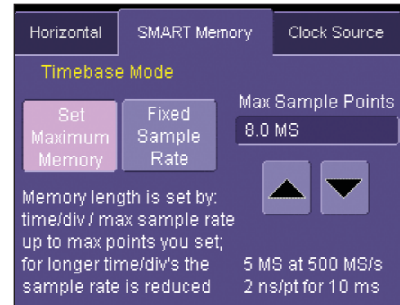
Setting Memory

The MS-32 option has 1 Mpts/Ch of digital memory. If you wish, all this memory can be 100% pre-trigger, 100% post-trigger, or something in between.

Optimize your Memory Length by accessing the Horizontal Dialog in your oscilloscope and selecting as follows:

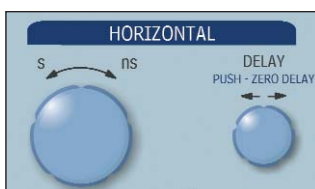
- WaveRunner — Set Max Memory mode or Fixed Sample Rate mode.
- WaveSurfer — choose a Max Number of Sample Points

Make sure to use enough memory to maintain the desired sample rate, or your analog and digital signals may not be acquired accurately.



WaveRunner Series SMART Memory Setup

Zooming Analog and Digital Data

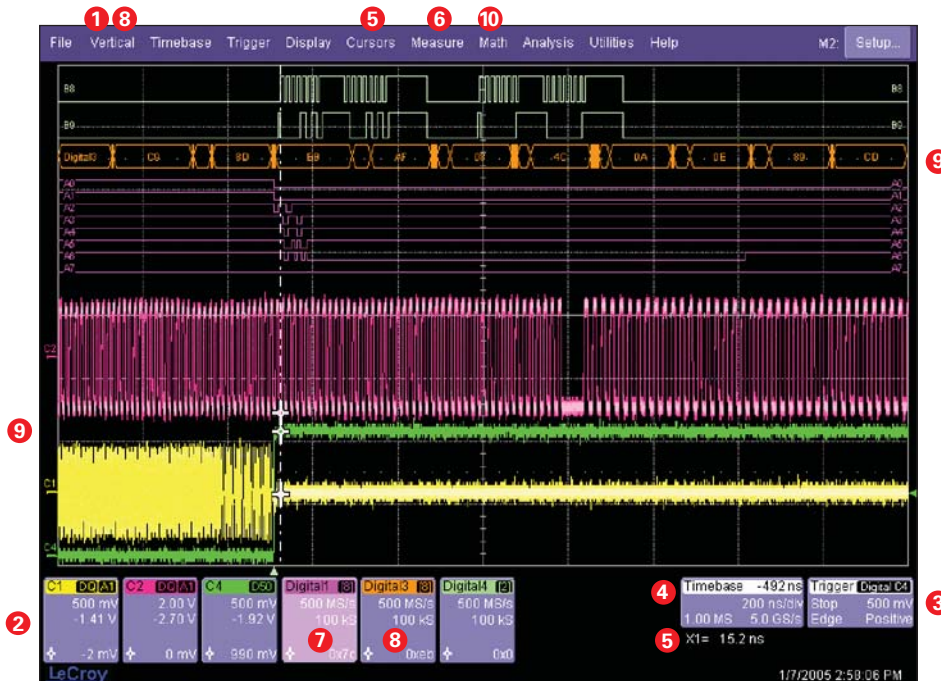


There are a number of ways to zoom a mix of analog and digital signals. The easiest method to zoom everything is to STOP the acquisition and then simply adjust the timebase Time/Div and Delay knobs on the front panel. Use the Time/Div knob to change the zoom ratio, and the Delay knob to change the position.

You can also zoom up to 4 analog channel or digital trace groups by drawing a box with a mouse pointer around the area you wish to zoom, then follow the on-screen instructions. Reference the MS-32 Operator's Manual for more detail on this method.



MS-32 Overview



- 1 Turn on and define a Digital trace from the Vertical menu.
- 2 Descriptor labels allow quick access to dialogs. Touch them to open the dialog specific to that descriptor label.
- 3 The Digital trigger can be set up from within the Trigger dialog. Touch the Trigger descriptor label, select Digital Trigger Mode to display the Digital Trigger tab, and then touch the Digital Trigger tab. You can also access the Trigger dialog from the menu bar.
- 4 The Timebase dialog can be used to adjust the memory for the oscilloscope. Touch the Timebase descriptor label to open the dialog. Use a sampling value at least 4x the clock frequency.
- 5 Add cursors to your display by touching this area and selecting the appropriate cursors. Adjust cursor position with the front panel knobs. Cursor data for digital and analog traces is in the descriptor boxes and the bottom right of the display.
- 6 Add measurement parameters by touching this area. Or, touch the MEASURE button in the toolbar of the Digital trace dialogs.
- 7 A descriptor label with a different color background indicates that this trace is "active." If it is a Digital trace, and is "active," the front panel zoom controls (on WaveRunner) will resize and position that particular digital trace. On WaveSurfer, the Vertical gain and position knobs will resize and position that particular digital trace.
- 8 Escape from the MS-32 dialogs at any time to add math, measurement parameters, or to make changes to your setup. Re-enter through the descriptor labels for Digital traces, or via the menu bar.
- 9 The digital information obtained by viewing parallel ADDR or DATA bus information can be defined as a bus. By collapsing multiple digital lines into one bus display, users can define a digital trigger for a particular bus value. Up to four different buses can be defined.
- 10 Reposition and resize Digital trace groups with the zoom vertical controls (WaveRunner) or the Vertical Gain and Offset controls (WaveSurfer); or, access the Zoom dialog by touching here.