TELEDYNE LECROY
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WaveMaster 8 Zi-B
Oscilloscopes
Getting Started Guide

TELEDYNE LECROY
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WaveMaster 8 Zi-B Oscilloscopes
Getting Started Guide

Welcome

Thank you for buying a Teledyne LeCroy product. We're certain you'll be pleased with the detailed features unique to our instruments. This guide is intended to help you set up a WaveMaster 8 Zi-B oscilloscope and learn some basic operating procedures, so you're quickly working with waveforms.

- See the *MAUI Oscilloscopes Remote Control and Automation Manual* for comprehensive information on remote control of WaveMaster 8 Zi-B.

- See the *WaveMaster 8 Zi-B Oscilloscopes Operator*'s Manual for detailed information on the operational features of the WaveMaster 8 Zi-B.

Both manuals can be downloaded from the Oscilloscope Manuals page on our website at: teledynelecroy.com/support/techlib

Introducing WaveMaster 8 Zi-B

The WaveMaster 8 Zi-B combines the performance, signal fidelity and feature set needed for today's high-speed measurements with the ease-of-use of a standard benchtop oscilloscope. Featuring the highest-speed serial data triggers, the only complete multi-lane serial data analysis and eye diagram solution, and the most comprehensive set of compliance packages, the WaveMaster 8 Zi-B simplifies the most complex testing.

MAUI® with OneTouch

MAUI with OneTouch introduces a new paradigm for oscilloscope user experience. Dramatically reduce set up time with revolutionary drag-and-drop actions, and use familiar touch screen gestures like pinch, swipe and flick to intuitively interact with the instrument.

Mixed Signal Option

The HDA125 High Speed Digital Analyzer and MS-250/MS-500 Mixed Signal Options enable up-to-36 integrated digital channels and a set of tools designed to simultaneously view, measure and analyze analog and digital signals for fast debugging of mixed signal designs. The industry's only true 14.1 Gb/s serial pattern hardware trigger combined with flexible analog and digital triggering across all channels provides the ability to quickly identify and isolate problems in an embedded system.

Multi-Lane Serial Data Analysis

SDAIII-CompleteLinQ simultaneously displays eye diagrams and breaks down jitter on four signals. Eye Doctor II and VirtualProbe options emulate real-world system behavior and analyze lane interactions using S-parameter files, while Crosstalk tools analyze amplitude noise. QualiPHY software simplifies and automates compliance testing and reporting for a wide range of serial data standards.

Key Specifications

Detailed specifications are on the product datasheet at **teledynelecroy.com**.

Bandwidth	4 GHz to 30 GHz
Analog Channels	4
Digital Channels (optional)	18 with HDA125 and MS-250 18 or 36 with MS-500
Vertical Resolution	8-bits standard up to 11-bits with ERES
Memory per Channel	256 Mpts/ch 4-channel operation 512 Mpts/ch 2-channel operation
Analog Sample Rate	40 GS/s 4-channel operation 80 GS/s 2-channel operation
Digital Sample Rate	1.25 GS/s with MS-250 or MS-500 12.5 GS/s with HDA125

Safety

Observe generally accepted safety practices in addition to the precautions specified here.

Symbols

⚠ **CAUTION** of potential damage to equipment, or **WARNING** of potential injury. Refer to the manual. Do not proceed until the information is fully understood and conditions are met.

⚡ **WARNING**. Risk of electric shock or burn.

⏚ Ground terminal

∿ Alternating current

⏻ Power On/Standby

○ AC Power Off

| AC Power On

Operating Environment

Temperature	5 °C to 40 °C
Humidity	Maximum RH 80% (non-condensing) up to 31 °C decreasing linearly to RH 50% at 40 °C
Altitude	Up to 10,000 ft (3,048 m) at or below 30 °C

Power

AC Power	100-240 VAC (±10%) at 50/60 Hz (±10%) or 100-120 VAC (±10%) at 400 Hz (±5%) Automatic AC Voltage Selection	
Consumption	4 to 20 GHz Models	25 to 30 GHz Models
Nominal	875 W / 875 VA	925 W / 925 VA
Maximum*	975 W / 975 VA	1025 W / 1025 VA
Standby	15 W	15 W

* All PC peripherals and active probes connected to four channels.

⚠ **WARNING.** Secure the power cord with the cable clamp at all times. Failure to do so creates a fire hazard. Ensure the rear panel power switch is in the Off position before connecting to AC mains.

Measuring Terminal Ratings

Ratings apply to inputs C1-C4 and Aux In.

ProBus Inputs	50 Ω coupling ≤ 3.5 Vrms
	1 MΩ coupling ≤ 400 Vpk max. (Peak AC ≤ 10 KHz + DC); derating at 17 dB/decade from 10 KHz to 1 MHz; 5 Vpk max. above 1 MHz
ProLink Inputs	50 Ω coupling ≤ 5 Vrms
2.92 mm Inputs	50 Ω coupling ≤ 5 Vrms

Measuring terminals have no rated measurement category (CAT) per IEC/EN 61010-1:2010. Measuring terminals are not intended to be connected directly to supply mains.

Precautions
Observe generally accepted safety procedures.

Use proper power cord. Use only the power cord shipped with this instrument and certified for country of use. Secure the cord at all times.

Maintain ground. The AC inlet ground is connected to the frame of the instrument. Connect line cords only to outlets with safety ground contacts.

⚠ **WARNING.** Interrupting the protective conductor inside or outside the oscilloscope, or disconnecting the safety ground terminal, creates a hazardous situation. Intentional interruption is prohibited.

Connect and disconnect properly. Do not connect/disconnect probes or test leads while they are connected to a live voltage source.

Observe all terminal ratings. Do not apply a voltage to any input that exceeds the maximum rating of that input. Refer to the markings next to the terminals for maximum allowed values.

Use only within operating environment listed here. Do not use in wet or explosive environments.

Use indoors only.

Keep product surfaces clean and dry.

Do not block the cooling vents. Leave a minimum six-inch (15 cm) gap between the instrument and the nearest object. Keep the underside clear of papers and other objects.

Exercise care when lifting and carrying. Unplug the instrument to move it.

Do not remove the covers or inside parts. Refer all maintenance to qualified service personnel.

Do not operate with suspected failures. Check body and cables regularly. If any part is damaged, cease operation immediately and sequester the instrument from inadvertent use.

Front of Oscilloscope

A. **Front Panel Release**

B. **Front Panel**

C. **Touch Screen Display**

D. **Cal Out Hook**

E. **USB 2.0 Ports** (3)

F. **Standby Power Button**

G. **Input Row Indicators**

H. **Input Channels C1-C4**

I. **Aux In and Aux Out**

J. **Ground Terminal**

K. **Fast Edge Output**

L. **Tilting Feet**

The **removable front panel** houses buttons and knobs that control acquisition settings. The **front panel release button** lets you detach the front panel and use it like a remote. Operate the instrument using front panel hard controls, display soft controls, or a mix of both that is convenient for you. See "Front Panel" on p.9.

The **touch screen display** is the principal viewing and control center of the oscilloscope. See p.10 for an overview of its components.

The **Cal Out** hook emits a signal that can be used to compensate passive probes. WaveMaster 8 Zi-B oscilloscopes are compatible with the included passive probes and all ProBus active probes that are rated for the oscilloscope's bandwidth. Probe specifications and documentation are at **teledynelecroy.com/probes**.

The **Standby Power button** controls the operational state of the oscilloscope. See "Powering On/Off".

C1-C4 are signal inputs. You may use either the "A" row of ProLink inputs or the "B" row of ProBus and 2.92 mm inputs for analog signal. A variety of adapters are available to accommodate different cable connectors. Your input selection is made visible by the **Input Row indicators**.

Aux Out can be configured to send a pulse to another device upon a trigger event or Pass/Fail outcome, or to generate a continuous signal. **Aux In** can be used to input an external trigger.

The **Ground Terminal** can be used to ground active probes or connected to a grounding wrist strap.

The **Fast Edge output** emits a square wave signal with ~30 ps rising edges that can be used to deskew channels.

Tilting feet allow you to adjust the angle of the display for easier bench top viewing.

Powering On/Off

Before connecting the power cord, flip the **AC Power Switch** on the back of the oscilloscope (p.6) to the Off position. Always support the power cord by running it through the **Power Cable Clamp**. Use a Philips screwdriver to remove the clamp, attach the power cord to the AC inlet, then secure the clamp over the cord as shown here.

After securing the cord to the oscilloscope, connect it to a grounded AC power outlet. Flip the AC power Switch On, then, press the **Standby Power Button** on the front of the instrument to turn on the instrument. The button will light to show the oscilloscope is operational.

⚠️ **CAUTION.** Do not power on or calibrate with a signal attached.

Press the Power button again or use or the **File > Shutdown** menu option to execute a proper shut down process and preserve settings.

⚠️ **CAUTION.** Do not press and hold the Power button. This will execute a hard shutdown, but may not preserve setups and data.

The Power button does not disconnect the oscilloscope from the AC power supply, but puts it into "Standby" mode. Some "housekeeping" circuitry continues to draw power. The only way to fully power down the instrument is to turn off the AC Power Switch on the back, or unplug the power cord from the outlet. We recommend unplugging the instrument if it will remain unused for a long period of time

⚠️ **CAUTION.** Do not change the Windows® Power setting to System Standby or System Hibernate. Doing so may cause failure.

Back of Oscilloscope

A. **Ethernet Ports** (2)

B. **USB 3.1 Ports** (4)

C. **DisplayPort Outputs** (3)

D. **Speaker**, **Mic**, and **Line-In** for external audio devices

E. **Expansion card slots** for optional hardware

F. **Removable hard drive**

G. **AC Power** switch and inlet

H. **Power Cable Clamp**

I. **10 MHz Ref In** and **Ref Out** connectors

J. **LBUS connector** for external mixed-signal devices

Connecting to External Devices/Systems

See the *WaveMaster 8 Zi-B Oscilloscopes Operator's Manual* for more instructions on connecting to external devices.

Audio/USB Peripherals
Connect the device to the appropriate port. These connections are "plug-and-play" and do not require further configuration. Use the Windows control panel to make adjustments. Choose **File > Minimize** to go to the Windows desktop.

External Monitor
The DisplayPort interfaces support Ultra HD monitors. Connect the monitor to any port on the back of the instrument. You can use an adapter if the cable has a different interface. Go to **Display > Display Setup > Open Monitor Control Panel** to configure display settings using the Windows control panel. Be sure to select the oscilloscope as the primary display.

To use the Extend Grids feature, configure the second monitor to extend, not duplicate, the oscilloscope display. If the external monitor is touch screen enabled, the MAUI user interface can be controlled through touch on the external monitor.

Note: The oscilloscope touch screen uses Fujitsu drivers. Because of potential conflicts, external monitors with Fujitsu drivers cannot be used as touch screens, only as displays.

LAN
WaveMaster 8 Zi-B is preset to accept a DHCP network address over a TCP/IP connection. Connect an ENET cable from either port to a network access device. Go to **Utilities > Utilities Setup > Remote** to find the IP address.

To assign the oscilloscope a static IP address, open **Net Connections** from the Remote dialog and use the Windows networking dialogs to configure the device address. Go to **File > File Sharing** to configure email.

Remote Control
You can control the instrument over a LAN using VICP (TCP/IP) or VXI-11 (LXI). Use a standard ENET cable to connect to a network access point, and be sure the instrument is on the same subnet as the controller. You can also connect directly using TCP/IP, but depending on the controller, you may need to use a cross-over cable.

Note: To connect the instrument to a remote PC running MAUI Studio, choose VICP (TCP/IP). To use LXI on Windows 10 oscilloscopes, switch to the Administrative User LCRYADMIN (p.41).

GPIB can also be used to make a remote connection if you have installed the optional GPIB card.

To change the remote control setting from the default VICP (TCP/IP), go to **Utilities > Utilities Setup > Remote**.

Printer
WaveMaster 8 Zi-B supports USB printers that are compatible with the Windows OS installed on the oscilloscope. Connect the printer to any USB port, then go to **File > Print Setup** > **Print** and select **Printer** to configure settings. Choose **Properties** to open the Windows print dialog.

Auxiliary Output
The oscilloscope can output a pulse upon a trigger event or Pass/Fail outcome, a direct current, or a square wave of custom amplitude and frequency. Connect a BNC cable from Aux Out on the front of the instrument to the other device. Go to **Utilities > Utilities Setup > Aux Output** to configure the output.

Reference Clock
To input or output a reference clock, connect a BNC cable from Ref In or Ref Out on the back of the instrument to the other instrument. Go to **Timebase > Horizontal Setup > Clock Source** to configure the clock.

Front Panel

Most of the front panel controls duplicate functionality available through the touch screen display. They are covered in more detail in the Basics section and in the *WaveMaster 8 Zi-B Oscilloscopes Operator's Manual*. Below are some special front panel controls.

A. **Help** opens WaveMaster Support, which contains extensive documentation of the standard oscilloscope functions as well as all options that run on the WaveMaster platform.

B. **Default Setup** returns all channels to the factory default settings.

C. **Auto Setup** turns on and configures all channels with a signal attached. The edge trigger level is set to the signal mean.

D. The **Print** button captures the screen and handles it according to your Print setting (file, LabNotebook, etc.).

E. The **Touch Screen** button enables or disables touch screen functionality.

F. **Clear Sweeps** resets math and measurement counters.

G. **Zoom** creates zooms of all open channel traces.
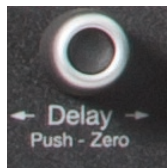
All the knobs on the front panel function one way if turned and another if pushed like a button. The first label describes the knob's principal "turn" action, while the second describes its "push" action.

Many front panel buttons light to indicate the function is active.

Saving and Sharing Data

Use the oscilloscope **File menu** options to save and recall data. See the *WaveMaster 8 Zi-B Oscilloscopes Operator's Manual* for more information on using these features.

LabNotebooks

LabNotebooks are composite files (.LNB) containing setups, waveform data and screen image as they were at the moment of capture. Creating a LabNotebook can be as simple as pressing the Print button as you work. Flashback LabNotebooks to restore the oscilloscope to the exact state it was in when the file was saved. Waveforms and tables are displayed as they were for new analyses to be performed.

LabNotebook files can be edited, annotated and exported into a preformatted HTML, .RTF or .PDF report. They can also be extracted into their component setup, waveform, and screen image files.

Setup, Waveform and Table Data

The current oscilloscope configuration can be saved to internal setup panels or setup (.LSS) files and later recalled.

Waveform data can be stored to trace (.TRC) files and later recalled into memories to restore the waveform display to the screen.

Table data can be saved to either ASCII (.TXT) or Excel (.CSV) files.

When multiple waveforms or tables are displayed, one command saves **All Displayed** to separate, autonamed files.

Screen Captures

The front panel **Print button** captures an image of the screen, which will then be handled according to your chosen Print method (sent to a printer, saved to an image file, etc.). Before printing or saving the capture, use the drawing tools to annotate the image, same as with LabNotebooks.

You can also use the touch screen **File > Save Screen Image.**

File Sharing

If the oscilloscope is networked, LabNotebooks, reports and other user data files can be emailed directly from the instrument or saved to accessible network devices.

Files can also be transferred to a USB drive through any of the host USB ports. Stored user data files are located on the D: drive.

Using the Touch Screen Display

The entire display is active. Use your finger to touch, drag-and-drop, swipe, pinch and flick. Many controls that display information also work as "buttons" to access other functions. If you have a mouse installed, you can click anywhere you can touch to activate a control; in fact, you can alternate between clicking and touching, whichever is convenient for you.
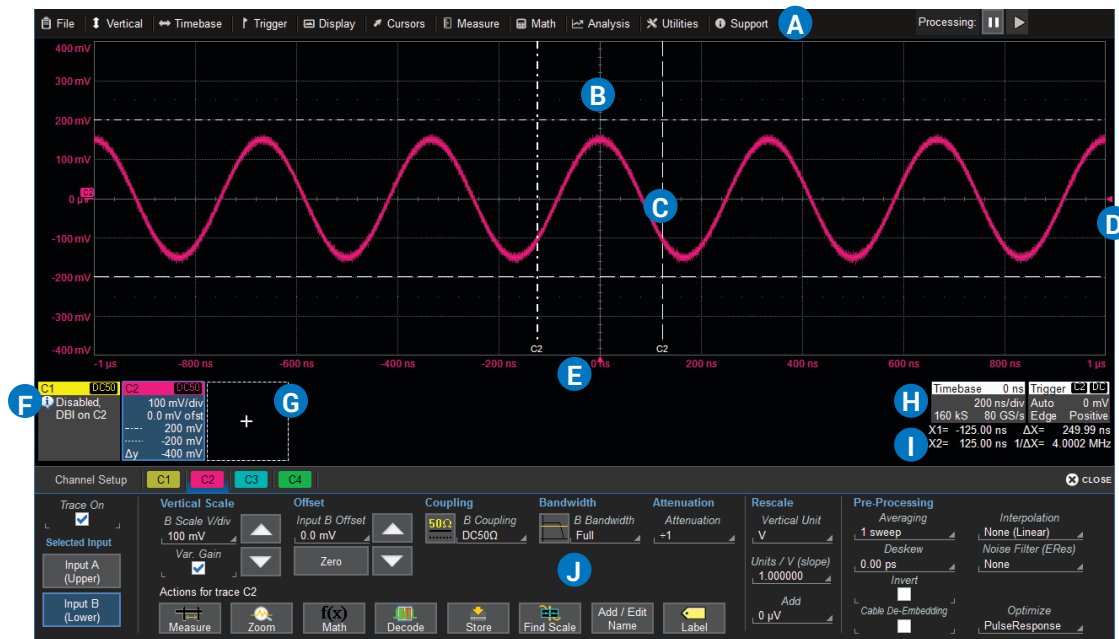
A. Menu Bar

B. Grid

C. Cursor

D. Trigger Level Indicator

E. Trigger Time Indicator

F. Trace Descriptor Box

G. Add New Box

H. Timebase and Trigger Descriptor Boxes

I. Horizontal Cursor Readout

J. Setup Dialogs

A drop-down **menu bar** lets you access set up dialogs and other functions. All functionality can be accessed through either the menu bar or other shortcuts.

If an action can be "undone" (such as recalling a setup), a small **Undo button** appears at the far right of the menu bar. Click this to return to the previous oscilloscope display.

The **grid** displays the waveform traces. It can be configured to show different grid modes.

Cursors show where measurement points have been set. Touch-and-drag cursor indicators to quickly reposition the measurement point. Horizontal cursor readouts appear below the Timebase and Trigger descriptors.

Trigger Level and **Trigger Time** indicators appear at the edge of the grid when a trigger is set, color-coded to match the trigger channel.

Trace Descriptor boxes appear along the bottom of the grid, one for each open trace. They adjust in size and detail as more are opened.

The **Add New box** sits next to the trace descriptor boxes. Use it to turn on new traces or the Measure table. See "MAUI with OneTouch" on p.15.

Timebase and Trigger descriptor boxes appear at the right of the display. Timebase and Trigger settings only apply to channel traces. Touch the descriptor box to open the corresponding set up dialog.

Dialogs appear at the bottom of the display for entering set up data. The top dialog will be the main entry point for the selected function. Related dialogs appear as a series of tabs behind the main dialog.
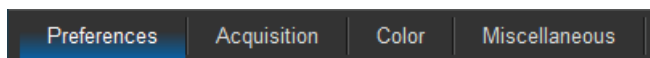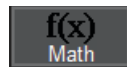
A **toolbar** along the bottom of the main Channel, Math, Memory and Digital dialogs initiates frequent actions without closing the underlying dialog. The actions always apply to the active (highlighted) trace.
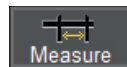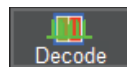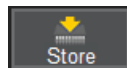
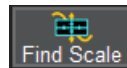Apply measurement parameters.

Display a zoom of the trace.

Apply a math function to the trace.

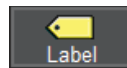Open the Serial Decode dialog (if decoder options installed; else disabled).

Copy the active trace to the corresponding internal memory (e.g., C2 to M2).
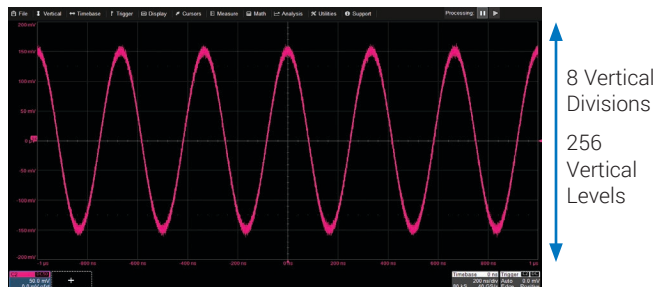
Scale the waveform to fit the grid.

Add a custom name to the trace.

Apply a custom label to the trace.

Changing the Display

The grid is 8 Vertical divisions representing 256 Vertical levels and 10 Horizontal time divisions. The value represented by each division depends on the scale settings of the traces that appear on it.

8 Vertical Divisions

256 Vertical Levels

Multi-Grid Display

The grid can be divided into multiple grids each representing the full number of Vertical levels. A variety of multi-grid modes are available.

256 Vertical Levels

256 Vertical Levels

By default, the oscilloscope has **Auto** Grid Mode enabled. Auto adds a grid for each new trace, up to 16 grids, until no more grids are available. Other grid modes create a fixed number and orientation of grids; the icon shows the result.

To modify the touch screen display, choose **Display > Display Setup** from the menu bar and make your selections from the Display dialog.

Extended Display

If you have a second monitor connected, , you can extend the display of traces across both the oscilloscope screen and the external monitor. Select **Extend Grids on 2nd Monitor** from the Display dialog, then choose a grid mode from the Extended Display pop-up menu. Both screens will share this grid mode. Drag-and-drop descriptor boxes to move traces between displays.

Oscilloscope with an extended display.

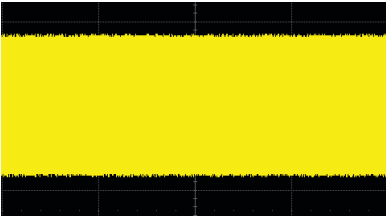## Line, Intensity, and Persistence

The trace style can be set to a series of separate sample **Points** or a continuous vector **Line**.

Grid Intensity makes the grid lines dimmer or brighter relative to the trace.

When more data is available than can actually be displayed, **Trace Intensity** helps to visualize significant events by applying an algorithm that dims less frequently occurring samples. Turn the front panel **Intensity knob** to control the trace Intensity (the level appears in the Message Bar).


Pressing the Intensity knob applies **Persistence** to the trace. You'll see the WaveStream indicator light to show Persistence is on. Continue pressing the knob to switch from Analog to Color or turn off Persistence. When Persistence is on, turning the Intensity knob adjusts the trace Intensity and Saturation levels.
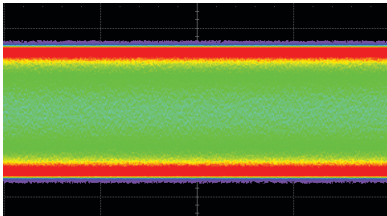

Intensity 100%
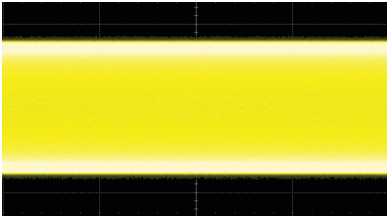
Intensity 15% with Analog Persistence
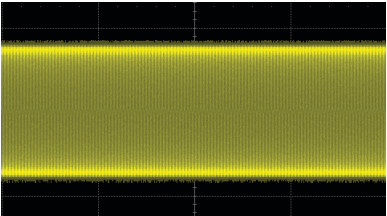
Intensity 15%

Intensity 15% with Color Persistence

Working With Traces

Trace Descriptor Boxes

Channel (C1-C4), Zoom (Z1-Z12), Math (F1-F12), Memory (M1-M12), and Digital (Digital1-Digital4) descriptor boxes appear along the bottom of the grid area when a trace is turned on. Descriptor boxes summarize, activate, arrange and configure the traces they represent.

Trace Context Menu

The trace context menu is a quick way to apply math, measurements or labels to traces. To open the context menu, right-click with your mouse or touch-and-hold on the trace descriptor box until a white circle appears, then release.

Active vs. Inactive Trace

Although several traces may be open and appear on the display, only one at a time is *active*. This is true for all traces, regardless of the type. All actions apply to the active trace until another is selected.

Touch a trace or its descriptor box to activate it and bring it to the *foreground*. When the descriptor box appears highlighted in blue, front panel controls and touch screen gestures apply to that trace.

Inactive. *Controls will not work for this trace.*

**Active.** *Controls will work for this trace.*

Adjusting Setups

On setup dialogs, many entries can be made by selecting from the pop-up menu that appears when you touch a control.

On some pop-up menus, you can choose to display options as a **list** or as **icons**.

When an entry field appears highlighted in blue after touching, it is *active* and the value can be modified by turning the front panel knobs. Fields that don't have a dedicated knob (as do Vertical Offset or Horizontal Delay) can be modified using the **Adjust knob**.
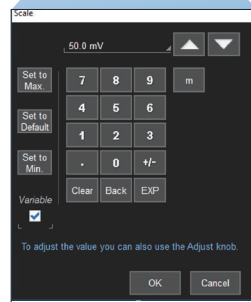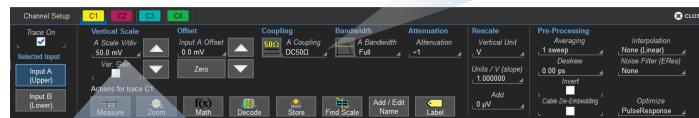
If you have a keyboard installed, you can type entries in an active (highlighted) data entry field. Or, you can touch again, then "type" the entry by touching keys on the **virtual keypad** or keyboard.

To use the virtual keypad, touch the soft keys exactly as you would a calculator. When you touch OK, the calculated value is entered in the field.

MAUI with OneTouch

Touch, drag, swipe, pinch and flick can be used to create and change setups with one touch. Just as you change the display by using the setup dialogs, you can change the setups by moving different display objects. Use the setup dialogs to refine OneTouch gestures to precise values.

As you drag and drop, valid targets are outlined with a white box. When you're moving over invalid targets, you'll see the "Null" symbol (Ø) under your finger tip or cursor.

Turn On

To turn on a new channel, math, memory, or zoom trace, drag any descriptor box of the same type to the **Add New ("+") box**. The next trace in the series will be added to the display at the default settings. It is now the active trace.
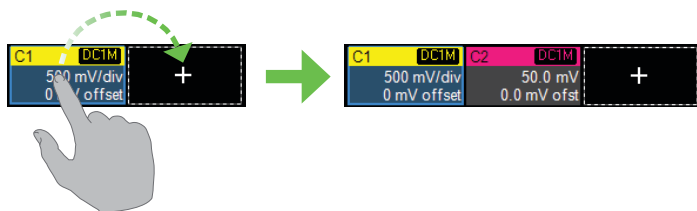
If there is no descriptor box of the desired type on the screen to drag, touch the Add New box and choose the trace type from the pop-up menu.

To turn on the Measure table when it is closed, touch the Add New box and choose Measurement.
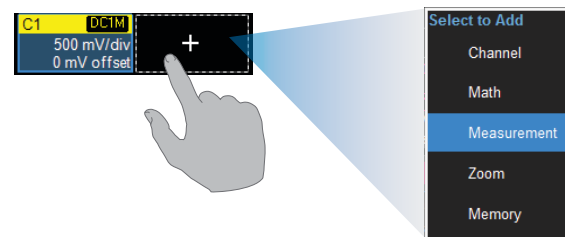
Copy Setups

To copy the setup of one trace to another of the same type (e.g., channel to channel, math to math), drag-and-drop the source descriptor box onto the target descriptor box.
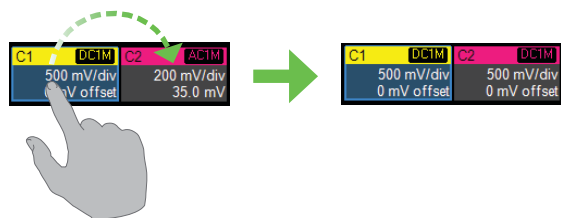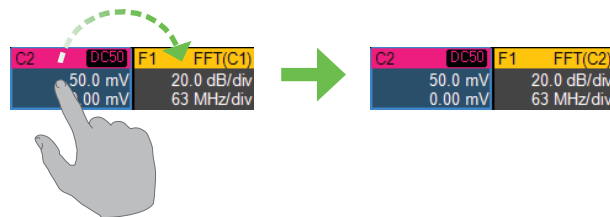

To copy the setup of a measurement (P*n*), drag-and-drop the source column onto the target column of the Measure table. You can do the same for a query (Q*n*) on the Pass/Fail readout table.
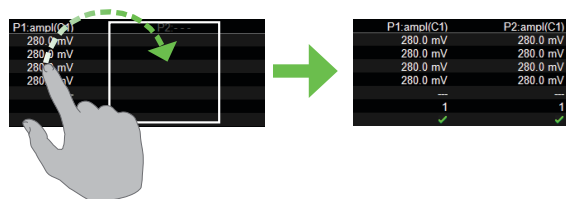

Change Source

To change the source of a trace, drag-and-drop the descriptor box of the desired source onto the target descriptor box. You can also drop it on the Source field of the target setup dialog.
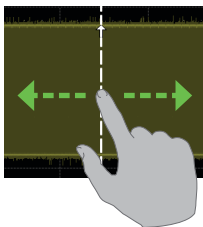

To change the source of a measurement, drag-and-drop the descriptor box of the desired source onto the parameter (P*n*) column of the Measure table. You can do the same to a query (Q*n*) on the Pass/Fail readout table.
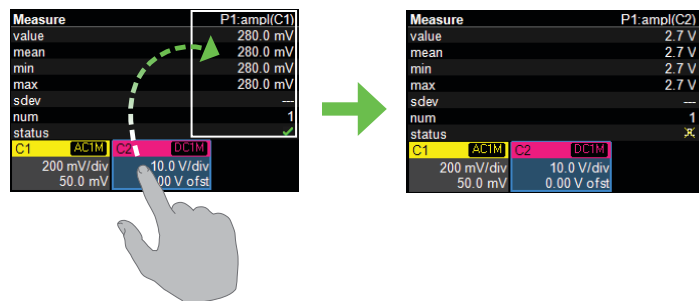
Position Cursors

To change cursor measurement time/level, drag cursor markers to new positions on the grid. The cursor readout will update immediately.


To place horizontal cursors on zooms or other calculated traces where the Horizontal Scale has forced cursors off the grid, drag the cursor readout from below the Timebase descriptor to the grid where you wish to place the cursors. The cursors are set at either the 5 (center) or 2.5 and 7.5 divisions of the grid. Cursors on the source traces adjust position accordingly.
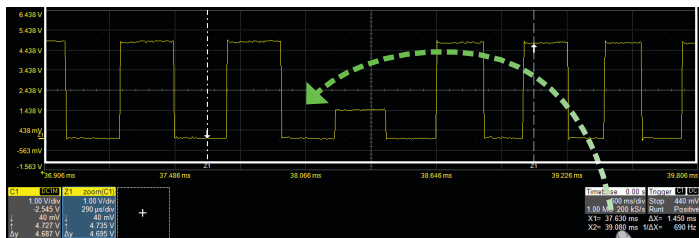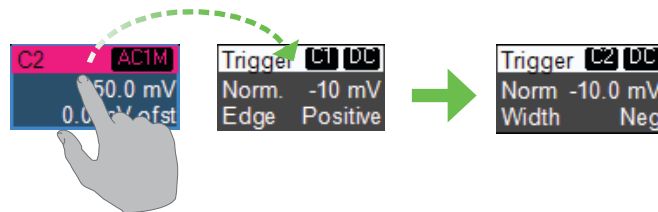

Change Trigger

To change the trigger level, drag the Trigger Level indicator to a new position on the Y axis. The Trigger descriptor box will show the new voltage Level.
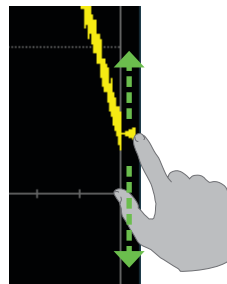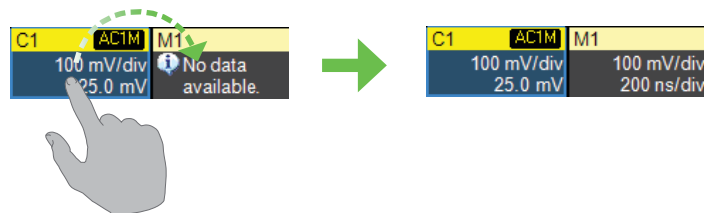

To change the trigger source channel, drag-and-drop the desired channel (C*n*) descriptor box onto the Trigger descriptor box. The trigger will revert to the last trigger set on that channel.

Store to Memory

To store a trace to internal memory, drag-and-drop its trace descriptor box onto the target memory (M*n*) descriptor box.

Move Trace

To move a trace to a different grid, drag-and-drop the trace descriptor box onto the target grid.
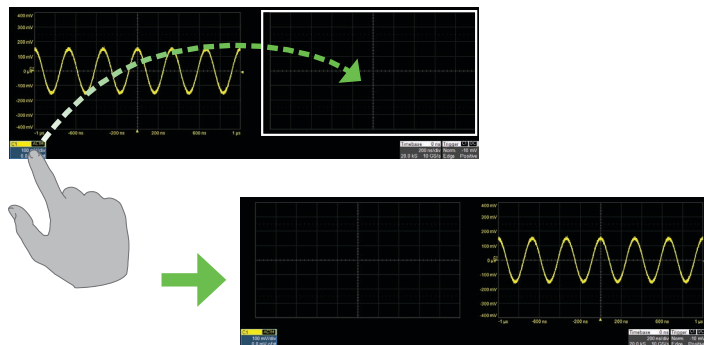
Scroll

To scroll long lists of values or readout tables, swipe the selection dialog or table in an up or down direction.
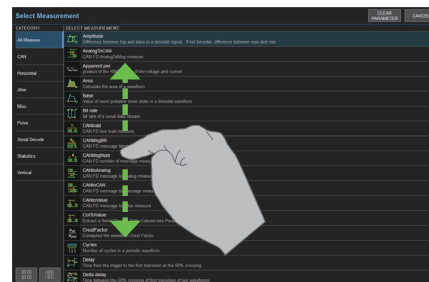
Pan

To pan a trace, activate it to bring it to the forefront, then drag the waveform trace right/left or up/down. If it is the source of any other trace, that trace will move, as well.

To pan at an accelerated rate, swipe the trace right/left or up/down.
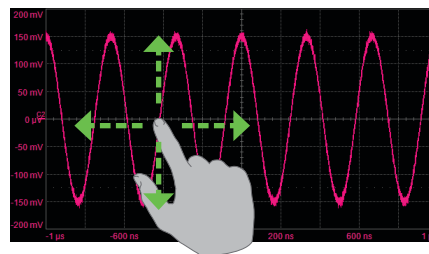
Zoom
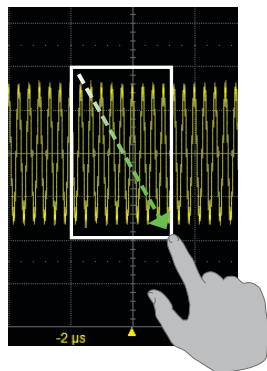
To create a new zoom trace, touch then drag diagonally to draw a selection box around the portion of the trace you want to zoom. Touch the Z*n* descriptor box to open the zoom factor controls and adjust the zoom exactly.
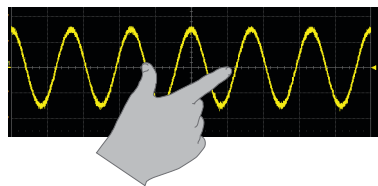
To "zoom in" on any trace, unpinch two fingers over the trace horizontally.
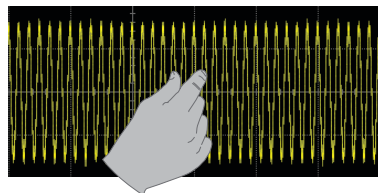
To "zoom out" on any trace, pinch two fingers over the trace horizontally.

Turn Off

To turn off a trace, flick the trace descriptor box toward the bottom of the screen.
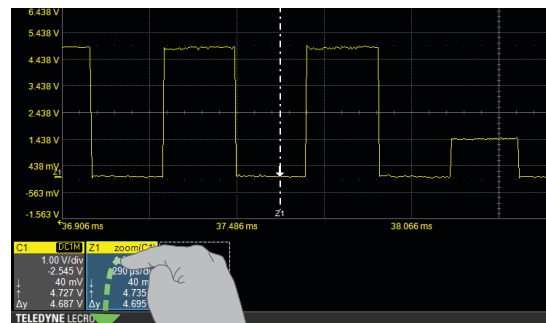
Vertical (Channel)

Vertical controls adjust traces along the Y axis. Traces represent eight Vertical divisions of the source signal at the selected number of units per division. The zero level is at the center grid line unless you add positive or negative Offset. The Volts knob also controls the Vertical Scale of zoom, math and memory traces.

From the Front Panel

Turn on/activate channel trace and open set up dialog.

Raise/lower **Offset** from zero. Push to return to zero Offset.

Raise/lower **Volts/div**. Push to toggle between coarse and fine scale adjustments.

Channel Descriptor Box

Pre-Processing Summary List

Coupling

Gain Setting

Offset Setting

Sweeps Averaged / Segment

Vertical Cursor Positions

C1   A E D1
50.0 mV
0 µV offset
288 #
–·–·–   38.0 mV
······   -37.0 mV
Δy   -75.0 mV

From the Touch Screen

Drop a channel descriptor on the **Add New box**, or touch the Add New box and choose **Channel**. Touch new **C*n* descriptor** to open the C*n* setup dialog.
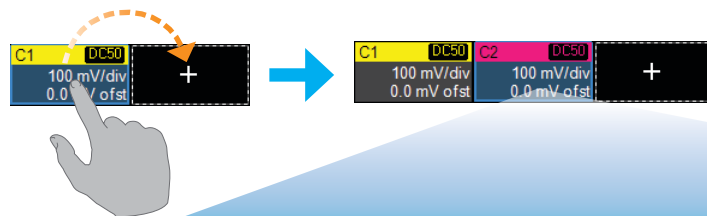
Enter **Attenuation** for passive and other vendors' probes.
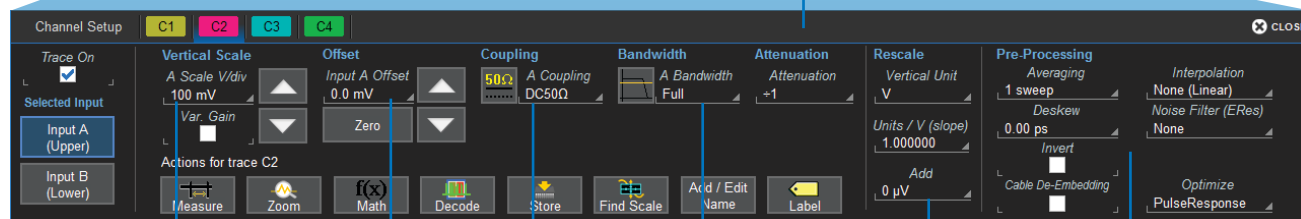
Enter **Volts/div** and **Offset**.

Enter **Coupling** for cables/probes.

Apply Optional **Bandwidth Filters**.

Rescale channel trace, or change **Vertical Unit** of grid.

Make any other **Pre-Processing** settings.

Digital

On instruments equipped with Mixed Signal Solutions HDA125, MS-250 or MS-500, digital selections are added to the Vertical menu, and the front panel Vertical knobs control active Digital line and bus traces.

From the Front Panel

Turn **Offset** to raise/lower group **Vertical Position**, the top of lowest bit relative to center.

Turn **Volts** to raise/lower **Group Height**, the total Vertical divisions occupied by group.

Digital Descriptor Box

Digital Lines in Group

Digital Sample Rate

Digital Memory

Digital Displays
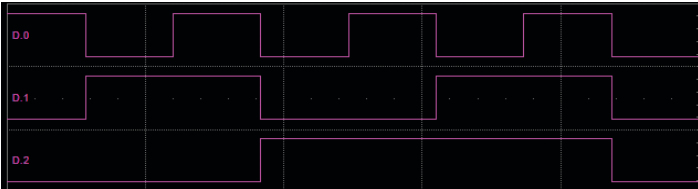
Line trace shows high, low and transition points for each line.

Bus trace collapses lines into hex values.

Activity indicators show when line is high, low, or transitioning.

From the Touch Screen

From the menu bar, choose **Vertical>Digital *n* Setup**. Touch **Digital*n* descriptor** to open Digital*n* setup dialog.
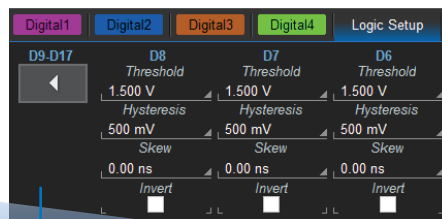
On the Logic Setup tab, choose a standard **Logic Family**, or enter a custom **Threshold** and **Hysteresis**. Separate controls allow you to set different values for each line.

Choose **Display Mode** of individual lines, bus trace, or both.

Optionally, choose a new **Label** for the lines. Select Custom to enter unique names.

Display buttons switch lead banks as you select lines.

Line Activity indicators show the state of each line: high, low, or transitioning.

Use checkboxes to select **lines in the group.**

Optionally, enter a custom **line name** in the field beneath.

Enter digital trace **Vertical Position** and **Group Height** in divisions.
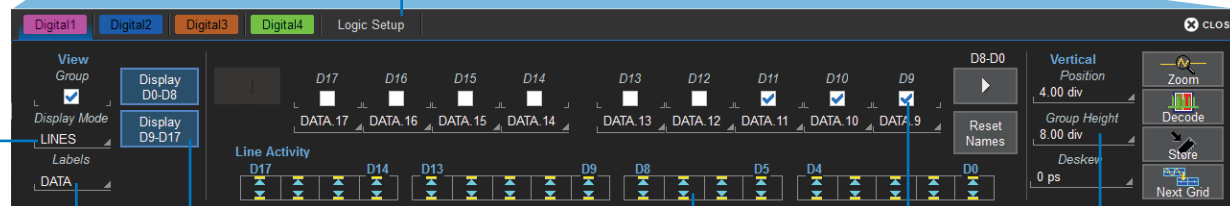
Horizontal (Timebase)

Horizontal controls adjust traces along the X axis. Analog traces usually represent one acquisition of the source signal for 10 divisions of the selected Time per division. The trigger event is shown at the center of the grid, unless you add positive or negative Delay time. The front panel Time knob also controls the Horizontal Scale of zoom, math and memory traces, allowing you to "zoom in" to see more detail or "zoom out" to see the bigger picture.

From the Front Panel

Raise/lower trigger **Delay**. Push to remove Delay.

Raise/lower **Time/div**. Push to toggle between coarse and fine scale adjustments.

Timebase Descriptor Box

Sampling Mode (blank in real-time)

Samples

Trigger Delay (Position)

Time/div

Sample Rate

From the Touch Screen

Touch the **Timebase descriptor** to open Timebase setup dialog.

Enter **Time/div**.

Select **Sampling Mode**.
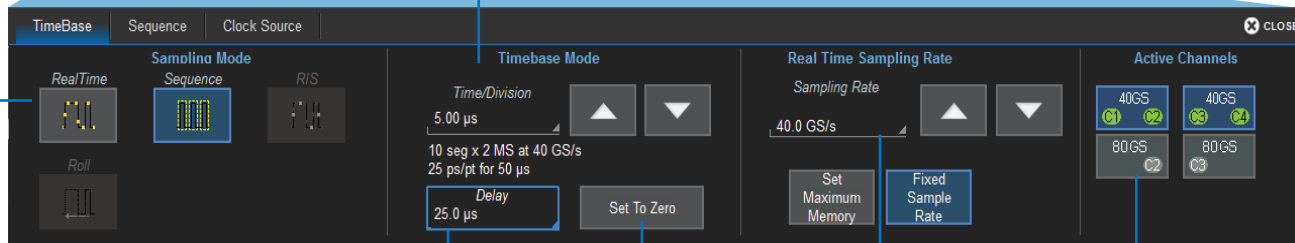
Optionally, enter **Delay**, (negative) time before trigger or (positive) time after trigger event to show.

Set To Zero removes Delay.

Enter fixed **Sample Rate** or **Maximum Points** of memory to use in acquisition.

Reduce number of **Active Channels** to increase per channel sample rate & memory.

Trigger

Triggers tell the oscilloscope when to perform an acquisition. The acquisition starts as soon as the trigger is armed *and* all trigger conditions are met, unless postponed by a Holdoff count of time or number of trigger events. Trigger types and modes are described at more length in the *WaveMaster 8 Zi-B Oscilloscopes Operator's Manual*.

From the Front Panel

Trigger armed.

Trigger fired.

Open Trigger setup dialog.

Raise/lower trigger Volt/Amp **Level**.

Push to **Find Level**.

Select **Trigger Mode**:
Auto — trigger after preset period if no valid trigger.
Normal — trigger repeatedly when all conditions met.
Single — trigger once when all conditions met.
Stop — stop acquisition.

Trigger Descriptor Box

Trigger Source

Trigger Coupling

Trigger Level

Trigger Slope

Trigger Mode

Trigger Type

Trigger Indicators

Level

Position

Pre/Post-Trigger — appears at corner of grid when trigger point is no-longer visible.
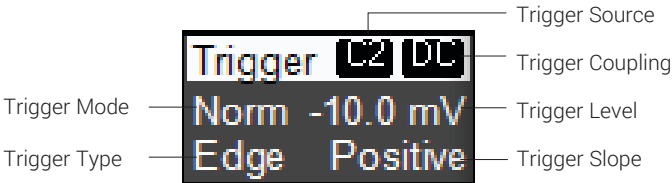
From the Touch Screen

Touch **Trigger descriptor** to open Trigger setup dialog.
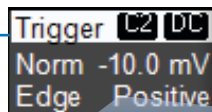
Choose trigger **Source** channel.

Choose trigger **Type**.
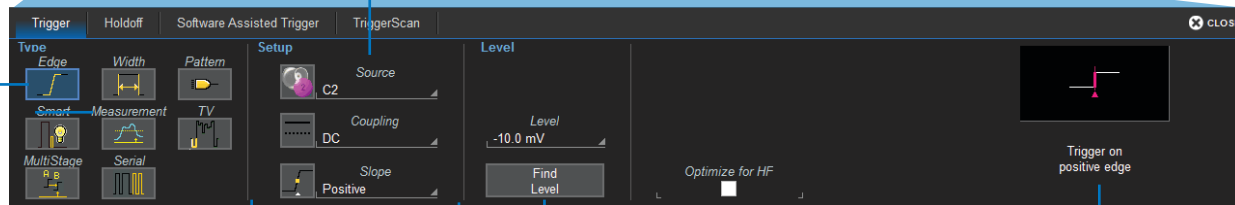
Set other **conditions**, such as **Slope** and **Coupling** (vary by trigger type).

Set trigger **Level**, or **Find Level** based on the input signal.

Icon summarizes the trigger selections.

Zoom

Zoom traces (Z*n*) display a magnified portion of another trace. Any trace can be zoomed, although Zoom is most useful for channel traces, as it allows you to see the source at the original Timebase at the same time as the Zoom "close up." The Zoom knobs also control the position and scale of Math function traces.

From the Front Panel

Create **Zoom** of all open traces.

Adjust Zoom **Horizontal Delay** (position).

Adjust Zoom **Horizontal Scale** (magnification).

Adjust Zoom **Vertical Offset** (position).

Adjust Zoom **Vertical Scale** (magnification).
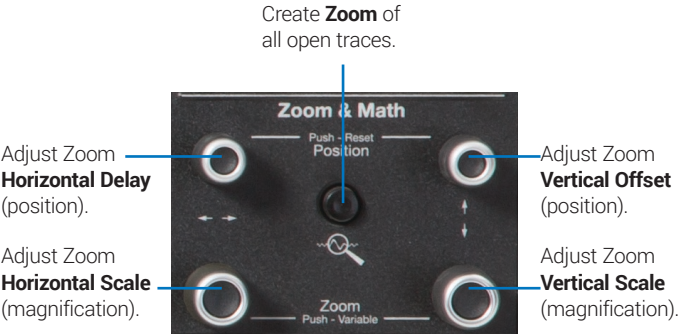
When you use the front panel Zoom button, a new Zoom trace is created for every open trace, showing a 10x magnification of the source trace.

The zoomed portion of the source trace is highlighted, so that the area corresponding to the zoom is more visible.
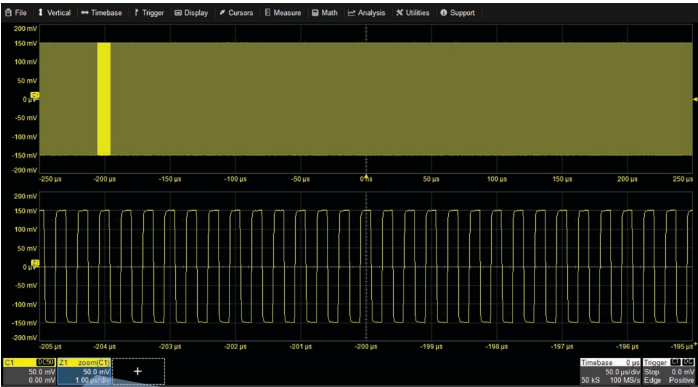
The **Zoom descriptor box** shows the **Zoom Source** and **Horizontal Scale**, which differs from the Timebase.

From the Touch Screen

OR
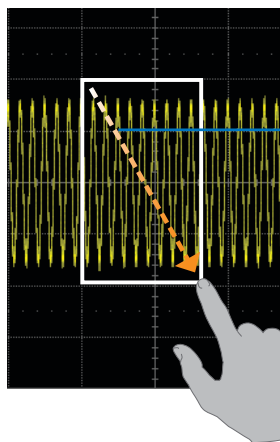
Draw a **Zoom box** over a portion of the source trace.

Repeat on another section to reposition the Zoom trace.
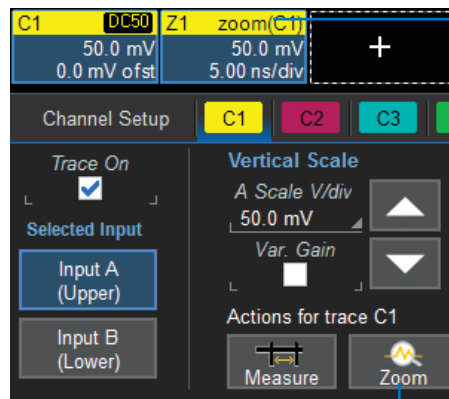
Zoom descriptor opens Zoom dialog to make other adjustments.

On the source trace setup dialog, touch **Action Toolbar Zoom button** to create a new zoom of just that source trace.

Cursors

Cursors set measurement points on the Vertical or Horizontal axis of a trace (or both). The five preset cursor types are described in more detail in the *WaveMaster 8 Zi-B Oscilloscopes Operator's Manual*. All show the absolute value where the cursor intersects the waveform and the delta of the two lines.

From the Front Panel

Turn to adjust **cursor position**. Push to select different lines.

Apply **cursor**. Continue pressing to cycle through **cursor types**.

Vertical Cursor readout on descriptors.

Choose **Cursor Type**.

From the Touch Screen

Cursors > Cursor Setup opens the Cursor dialog.

Touch-and-drag **cursor** to reposition.

Horizontal Cursor readout below Timebase.

Track moves both lines together.

Measurements and Statistics

Measurements are waveform parameters that can be expressed as numerical values, such as amplitude or frequency. You can measure up-to-twelve parameters on one or more traces and view the active readout in a table below the grid. Statistics can be added to the readout, along with histicons, a miniature histogram of the statistical distribution. You can also gate measurements to limit them to a specific portion of the trace, or plot a histogram, trend or track of the measurement over time.

Measure > Measure Setup opens the Measure dialog.

Touch **P***n* cell to re-open **P***n* dialog.

Touch **Measure** column to re-open Measure dialog if closed.

Measure dialog to add/remove **Statitics** & **Histicons**, turn on **Standard Measurements**, or **Clear Sweeps**.

P*n* **dialogs** to configure user-defined measurement set.

Action buttons quickly plot **Histogram**, **Trend** or **Track** of measurement.

Turn on **Help Markers** to show what is being measured on waveform.

Enter **Gates** (in div) to constrain span of measurement, or just drag gate markers from edge of grid.

Math

Math creates a new trace that displays the result of applying a mathematical function (e.g., Sum, Product, FFT) to one or more source traces. Operations can be chained by using one math function as a source for the other. The math trace always opens in a separate grid from the source and can be viewed along side it. One important distinction between math functions and measurement parameters is that the result of math is always another waveform, whereas the result of measurement is a number.

Math > Math Setup or front panel **Math button** opens Math dialog.

Units and scale on **F*n* descriptor**.

Math tab to turn on/off functions.

F*n* tab to set up/change function.

Make other settings on the **function subdialog** (varies by operation).

Choose **Source** trace(s) to operate on and math **Operator**.

Use **Zoom controls** to rescale math trace.

Memories (Reference Waveforms)

Memories are traces stored for reference that can be recalled to the display for comparison with other traces. A memory can be zoomed or measured for better analysis of historical data. You can store up-to-twelve internal memories (M1-M12). After that, new memories will overwrite previously stored data.

To store a new memory:
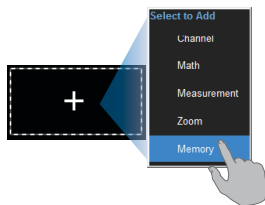
Touch the **Add New** box and choose **Memory** to turn on the next memory trace.
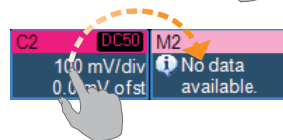
Then, drag the descriptor box of the trace you want stored onto the new M*n* descriptor box.

OR
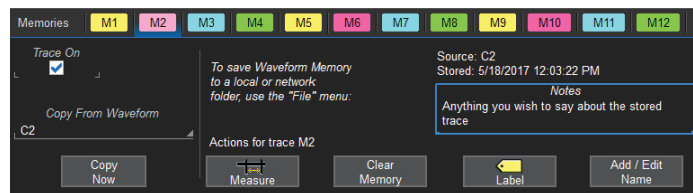
Choose **Math > Memory Setup**. On the M*n* tab, select the trace you want stored in **Copy From Waveform**, then touch **Copy Now**.

Optionally, add **Notes** or **Labels** to the stored memory.

To recall a stored memory:

Choose **Math > Memory Setup** to open the Memories dialog, then check On next to M1-M12.
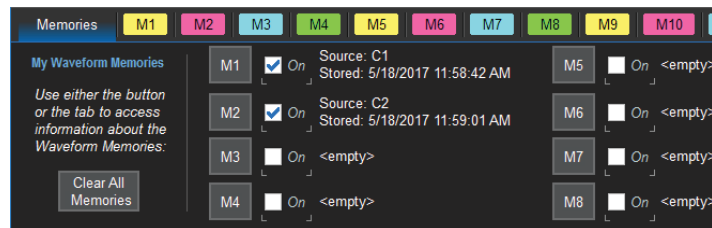
Internal memories persist only until the oscilloscope is rebooted. To store memories indefinitely, save them to a trace (.trc) file by choosing **File > Save Waveform**.

The trace file can later be recalled into one of the internal memories for viewing by choosing **File > Recall Waveform**. Only files saved with the .trc extension can be recalled.

Decode

If you have installed serial data -TD/TDME options, configuration dialogs are added to the Analysis menu. Decoders apply software algorithms to extract encoded information from physical layer waveforms measured on your oscilloscope. Waveforms are annotated to provide fast, intuitive understanding of the relationship between protocol and signal. Serial triggers fire upon finding complex, user-defined patterns and events in the data stream.

View decoding on the **colored overlays.**

Generate **eye diagrams** with TDME options.

When multiple decoders are running, touch the **Index cell** to drop-in the detailed decoding. Touch any cell *other than* Index and Protocol to zoom.

When there is more data than fits in a table cell, touch the **white triangle** to pop-up the full decoding.

Touch **data cells** to zoom that single record of data. The zoomed record is highlighted in the table and on the decode trace.

Touch drop-down arrow in **header** to filter column.

Select **Source** trace and **Protocol**.

Make required settings on the subdialogs.

WaveScan

Choose WaveScan from the Analysis menu, or press the front panel WaveScan Setup button. WaveScan Search and Find enables you to search for unusual events in a single capture, or to scan for a particular event in many acquisitions over a long period of time. A predefined set of scan modes (similar to trigger setups) enable a quick search for events of interest. The results are time stamped, tabulated, and can be selected for individual viewing.

Result table lists found events. Touch an event to zoom it.

Color overlays mark events on the source trace.

ScanHistogram view

Zoom view of selected event.

Choose scan **Mode** (event to find) and **Source** trace to scan.

Select different **views** of the scan: event table with/without time stamps, overlay, zoom.

Take **action** when an event is found, such as sounding a beep.

Cleaning

Clean the outside of the oscilloscope using a soft cloth moistened with water or isopropyl alcohol solution. Do not use harsh or abrasive cleansers. Dry thoroughly before using. Do not submerge the instrument or allow moisture to penetrate it.

⚠ **CAUTION.** Do not attempt to clean internal parts.

Adding Option Keys

Many software options are available to extend the capabilities of a WaveMaster oscilloscope. See the product page on our website for a list of compatible options.

To purchase an option, contact your Teledyne LeCroy sales representative. You will receive a license key via email that activates the optional features on the oscilloscope. To install the key on the oscilloscope:

1. From the menu bar, choose **Utilities > Utilities Setup > Options**.

2. Touch **Add Key**.

3. Enter the new **license key** and click **OK**.

4. Reboot the instrument.

Calibration

The oscilloscope is calibrated at the factory prior to shipment. Schedule an annual factory calibration as part of your routine maintenance.

WaveMaster 8 Zi-B incorporates automatic calibration routines so that it maintains specified performance. Always warm the oscilloscope at least 20 min. before taking measurements to reach a stable operating temperature and enable the automatic calibration to complete.

Go to **Utilities > Preference Setup** to select the automatic calibration routine used:

- **Maximum Accuracy** (default) performs an automatic calibration upon start-up and whenever conditions warrant it, such as a change to the acquisition settings that affects the ADCs.

- **Reduced Calibration** calibrates at each new combination of V/div, Time/div, and temperature and adds the calibration value to an internal calibration table. Only when the oscilloscope encounters an operating point outside of those previously recorded in the calibration table does it recalibrate and add it to the table.

⚠ **CAUTION.** Remove all inputs from the oscilloscope prior to manual calibration.

Firmware Updates

Free firmware updates are available periodically from the Teledyne LeCroy website at **teledynelecroy.com/support/softwaredownload.** Registered users will receive email notification when a new update is released.

⚠️ **CAUTION.** Do not install any XStreamDSO version prior to 8.6.1.0 on Windows 10 oscilloscopes. Doing so will disrupt the normal behavior of the software, unless you run the recovery procedure.

To download and install the update:

1. From the oscilloscope desktop (File > Exit) or a remote PC, launch the browser and visit the software download page at the URL above.

2. Click the link to **Oscilloscope Downloads > Firmware Upgrades**.

3. Enter the required model information and account login. If you don't yet have an account, create one now.

4. Follow the instructions to save the installer to a location on the oscilloscope D: drive or a USB storage device.

5. On the oscilloscope, use Windows Explorer to browse to the installer file and double-click it to launch the XStream Setup wizard.

6. If prompted, enter the password **SCOPEADMIN**, all uppercase.

7. Follow the wizard prompts.

8. When installation is complete, power cycle the instrument.

⚠️ **CAUTION.** The installation may take several minutes, depending on the length of time since your last update. Do not power down the oscilloscope at any point during the installation process.

Switching Windows Users

Windows 10 oscilloscopes are by default set to operate from the LeCroyUser account, but you must run the oscilloscope from the Administrative User, LCRYADMIN, in order to change Windows settings, run certain compliance packages or use LXI remote control.

Note: To install software or change Windows settings, it is sufficient to supply the administrative user password, SCOPEADMIN.

To switch to the LCRYADMIN account:

1. Exit the XStreamDSO application by choosing **File > Exit**.

2. Open the Windows **Start menu** ▦.

3. Hover over the **Teledyne LeCroy logo** and select user **LCRYADMIN**.

4. Enter the administrative password **SCOPEADMIN** (all uppercase).

5. Double-click the **StartDSO icon** on the oscilloscope desktop.

To return to the default user, repeat this procedure selecting **LeCroyUser** and entering the password **lecroyservice** (all lowercase).

You may create as many new users on the oscilloscope as you wish provided you are logged in as LCRYADMIN when doing so. Use the standard Windows tools to add users.

Note: As long as there are any Standard (non-administrative) users, the oscilloscope will reboot into the last active Standard user, regardless of whether you've switched to an administrative user. The only way to change this is to give LeCroyUser and all other users Administrator privileges.

Service

If the WaveMaster 8 Zi-B cannot be serviced on location, contact your service center for a **Return Material Authorization (RMA)** code and instructions where to ship the product. All products returned to the factory must have an RMA.

Return shipments must be prepaid. Teledyne LeCroy cannot accept COD or Collect shipments. We recommend air freighting. Insure the item you're returning for at least the replacement cost.

Follow these steps for a smooth product return.

1. Remove all accessories from the instrument.

2. Label the instrument with:
   • The RMA
   • Name and address of the owner
   • Description of failure or requisite service.

3. Pack the instrument in its original shipping box, or an equivalent carton with adequate padding to avoid damage in transit. Do not include the manual.

4. Mark the outside of the box with the shipping address. Be sure to add:
   • ATTN: *<RMA code assigned by Teledyne LeCroy>*
   • FRAGILE

5. **If returning a product to a different country:** contact Teledyne LeCroy Service for instructions on completing your import/export documents.

Service Plans

Extended warranty, calibration, and upgrade plans are available for purchase. Contact your Teledyne LeCroy sales representative or customersupport@teledynelecroy.com to purchase a service plan.

Service Centers

For a complete list of Teledyne LeCroy offices by country, including our sales and distribution partners, visit: **teledynelecroy.com/support/contact**
Teledyne LeCroy
700 Chestnut Ridge Road
Chestnut Ridge, NY, 10977, USA
teledynelecroy.com

Sales and Service:
Ph: 800-553-2769 / 845-425-2000
FAX: 845-578-5985
contact.corp@teledynelecroy.com

Support:
Ph: 800-553-2769
customersupport@teledynelecroy.com

Support

Online Documentation

Online Help is available by selecting **Support > Dynamic Help** from the oscilloscope display menu bar. You can also select **Support > OneTouch Help** for a demonstration of MAUI with OneTouch.

Teledyne LeCroy publishes a free Technical Library on its website at **teledynelecroy.com/support/techlib**. Manuals, tutorials, application notes, white papers, and videos are available to help you get the most out of your Teledyne LeCroy products.

The *WaveMaster 8 Zi-B Oscilloscopes Operator's Manual* can be downloaded from the Technical Library under **Manuals > Oscilloscopes.** This PDF contains more extensive operating procedures than are found here.

The Datasheet published on the product page contains the detailed product specifications.

Technical Support

Registered users can contact their local Teledyne LeCroy service center to make Technical Support requests by phone or email. For a complete list of offices, visit **teledynelecroy.com/support/contact**.

You can also submit Technical Support requests via the website at **teledynelecroy.com/support/techhelp**.

Warranty

NOTE: THE WARRANTY BELOW REPLACES ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS, OR ADEQUACY FOR ANY PARTICULAR PURPOSE OR USE. TELEDYNE LECROY SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER IN CONTRACT OR OTHERWISE. THE CUSTOMER IS RESPONSIBLE FOR THE TRANSPORTATION AND INSURANCE CHARGES FOR THE RETURN OF PRODUCTS TO THE SERVICE FACILITY. TELEDYNE LECROY WILL RETURN ALL PRODUCTS UNDER WARRANTY WITH TRANSPORT PREPAID.

The product is warranted for normal use and operation, within specifications, for a period of three years from shipment. Teledyne LeCroy will either repair or, at our option, replace any product returned to one of our authorized service centers within this period. However, in order to do this we must first examine the product and find that it is defective due to workmanship or materials and not due to misuse, neglect, accident, or abnormal conditions or operation.

Teledyne LeCroy shall not be responsible for any defect, damage, or failure caused by any of the following: a) attempted repairs or installations by personnel other than Teledyne LeCroy representatives; b) improper connection to incompatible equipment; or c) for any damage or malfunction caused by the use of non-Teledyne LeCroy supplies. Furthermore, Teledyne LeCroy shall not be obligated to service a product that has been modified or integrated where the modification or integration increases the task duration or difficulty of servicing the instrument. Spare and replacement parts, and repairs, all have a 90-day warranty.

The instrument's firmware has been thoroughly tested and is presumed to be functional. Nevertheless, it is supplied without warranty of any kind covering detailed performance. Products not made by Teledyne LeCroy are covered solely by the original manufacturer's warranty.

Certifications

Teledyne LeCroy certifies compliance to the following standards as of the time of publication. Please see the EC Declaration of Conformity document shipped with your product for current certifications.

EMC Compliance

EC DECLARATION OF CONFORMITY - EMC

The instrument meets intent of EC Directive 2014/30/EU for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications listed in the Official Journal of the European Communities:

EN 61326-1:2013, EN 61326-2-1:2013 EMC requirements for electrical equipment for measurement, control, and laboratory use. [1]

Electromagnetic Emissions:
EN 55011:2010, Radiated and Conducted Emissions Group 1, Class A [2][3]

EN 61000-3-2/A2:2009 Harmonic Current Emissions, Class A

EN 61000-3-3:2008 Voltage Fluctuations and Flickers, Pst = 1

Electromagnetic Immunity:
EN 61000-4-2:2009 Electrostatic Discharge, 4 kV contact, 8 kV air, 4 kV vertical/horizontal coupling planes [4]

EN 61000-4-3/A2:2010 RF Radiated Electromagnetic Field, 3 V/m, 80-1000 MHz; 3 V/m, 1400 MHz - 2 GHz; 1 V/m, 2 GHz - 2.7 GHz

EN 61000-4-4/A1:2010 Electrical Fast Transient/Burst, 1 kV on power supply lines, 0.5 kV on I/O signal data and control lines [4]

EN 61000-4-5:2006 Power Line Surge, 1 kV AC Mains, L-N, L-PE, N-PE [4]

EN 61000-4-6:2009 RF Conducted Electromagnetic Field, 3 Vrms, 0.15 MHz - 80 MHz

EN 61000-4-11:2004 Mains Dips and Interruptions, 0%/1 cycle, 70%/25 cycles, 0%/250 cycles [4][5]

[1] To ensure compliance with all applicable EMC standards, use high-quality shielded interface cables.

[2] Emissions which exceed the levels required by this standard may occur when the instrument is connected to a test object.

[3] This product is intended for use in nonresidential areas only. Use in residential areas may cause electromagnetic interference.

[4] Meets Performance Criteria "B" limits of the respective standard: during the disturbance, product undergoes a temporary degradation or loss of function or performance which is self-recoverable.

[5] Performance Criteria "C" applied for 70%/25 cycle voltage dips and for 0%/250 cycle voltage interruption test levels per EN61000-4-11.

European Contact:*
Teledyne GmbH, European Division
Im Breitspiel 11c
D-69126 Heidelberg
Germany
Tel: + 49 6221 82700

AUSTRALIA & NEW ZEALAND DECLARATION OF CONFORMITY – EMC
The instrument complies with the EMC provision of the Radio Communications Act per the following standards, in accordance with requirements imposed by Australian Communication and Media Authority (ACMA):

AS/NZS CISPR 11:2011 Radiated and Conducted Emissions, Group 1, Class A.

Australia / New Zealand Contacts:*

RS Components Pty Ltd.
Suite 326 The Parade West
Kent Town, South Australia 5067

RS Components Ltd.
Units 30 & 31 Warehouse World
761 Great South Road
Penrose, Auckland, New Zealand

* Visit teledynelecroy.com/support/contact for the latest contact information.

Safety Compliance
EC DECLARATION OF CONFORMITY – LOW VOLTAGE
The oscilloscope meets intent of EC Directive 2014/35/EU for Product Safety. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements

EN 61010-2:030:2010 Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-030: Particular requirements for testing and measuring circuits

The design of the instrument has been verified to conform to the following limits put forth by these standards:

- Mains Supply Connector: Overvoltage Category II, instrument intended to be supplied from the building wiring at utilization points (socket outlets and similar).
- Measuring Circuit Terminals: No rated measurement category. Terminals not intended to be connected directly to the mains supply.
- Unit: Pollution Degree 2, operating environment where normally only dry, non-conductive pollution occurs. Temporary conductivity caused by condensation should be expected.

U.S. NATIONALLY RECOGNIZED AGENCY CERTIFICATION
The oscilloscope has been certified by Underwriters Laboratories (UL) to conform to the following safety standard and bears the UL Listing Mark:

UL 61010-1 Third Edition – Safety standard for electrical measuring and test equipment.

CANADIAN CERTIFICATION
The oscilloscope has been certified by Underwriters Laboratories (UL) to conform to the following safety standard and bears the cUL Listing Mark:

CAN/CSA-C22.2 No. 61010-1-12. Safety requirements for electrical equipment for measurement, control and laboratory use.

Environmental Compliance
END-OF-LIFE HANDLING
The instrument is marked with this symbol to indicate that it complies with the applicable European Union requirements to Directives 2012/19/EU and 2013/56/EU on Waste Electrical and Electronic Equipment (WEEE) and Batteries.

The instrument is subject to disposal and recycling regulations that vary by country and region. Many countries prohibit the disposal of waste electronic equipment in standard waste receptacles. For more information about proper disposal and recycling of your Teledyne LeCroy product, please visit teledynelecroy.com/recycle.

RESTRICTION OF HAZARDOUS SUBSTANCES (RoHS)
Unless otherwise specified, all materials and processes are compliant with RoHS Directive 2011/65/EU in its entirety, inclusive of any further amendments or modifications of said Directive.

ISO Certification
Manufactured under an ISO 9000 Registered Quality Management System.

Intellectual Property
All patents pertaining to the WaveMaster 8 Zi-B are on our website at:

teledynelecroy.com/patents/

TELEDYNE LECROY
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