TELEDYNE LECROY
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WaveRunner® 8000HD
MDA 8000HD
Oscilloscopes
Getting Started Guide

TELEDYNE LECROY
Everywhereyoulook™

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MDA/WaveRunner 8000HD Oscilloscopes
Getting Started Guide

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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 WaveRunner/MDA 8000HD 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.
- See the *WaveRunner/MDA 8000HD Oscilloscopes Operator's Manual* for detailed information on the operational features.

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

Introducing MDA/WaveRunner 8000HD

Providing 12-bit resolution all the time, more channels than any other oscilloscope, and long memory without tradeoffs – WaveRunner 8000HD captures every detail.

The WaveRunner 8000HD uses HD4096 technology to provide superior and uncompromised measurement performance. HD4096 technology combines 12-bit ADCs with high sample rates, high signal-to-noise amplifiers and low noise system architecture (to 2 GHz) to deliver waveforms that are 16x closer to perfection.

WaveRunner 8000HD is the only oscilloscope to offer 8 analog channels and 16 digital channels that does not penalize you for using a digital channel. OscilloSYNC™ technology enables viewing and control of 16 analog channels on a single display for maximum flexibility.

With up to 5 Gpts of acquisition memory, WaveRunner 8000HD 12-bit oscilloscopes capture long periods of time, yet maintain high sample rate for visibility into the smallest details. Navigate long captures easily using timebase adjust or zoom traces.

The MDA 8000HD oscilloscopes built on the WaveRunner 8000HD platform are delivered standard with the Motor Drive Analysis software. Comparable 3-phase Electrical Power Analysis software may be added as an option on WaveRunner 8000HD oscilloscopes, see p.42.

	WaveRunner 8000HD / MDA 8000HD
Bandwidth	350 MHz to 2 GHz
Analog Channels	8
Vertical Resolution	12-bit
Sample Rate	up to 10 GS/s*
Std. Memory (8/4/2 Ch)	50 / 100 / 200 Mpts
Max. Memory (8/4/2 Ch)	1.25 / 2.5 / 5 Gpts
Digital Inputs (MSO only)	16
Digital Sample Rate	2.5 GS/s
Digital Memory	up to 500 Mpts

* With Enhanced Sample Rate. Detailed specifications are maintained on the product page at **teledynelecroy.com**.

Safety

Symbols

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

WARNING. Risk of electric shock or burn.

Frame or chassis terminal

Alternating current

Power On/Standby

Operating Environment

Temperature	5 °C to 40 °C
Humidity	5% to 90% RH (non-condensing) up to 31 °C decreasing linearly to 50% RH 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 Nominal	400 W / 400 VA
Maximum*	500 W / 500 VA
Standby	10 W

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

Measuring Terminal Ratings

Ratings apply to inputs C1-C8 and Ext In.

Maximum Input Voltage	50 Ω coupling ≤ 5 Vrms 1 MΩ coupling ≤ 400 Vpk max. (Peak AC ≤ 10 kHz + DC) derating at 18 dB/decade from 10 kHz to 1 MHz, 5 Vpk max. above 1 MHz

Measuring terminals have no rated measurement category (CAT) per EN IEC 61010-2-30:2021. Measuring terminals are not intended to be connected directly to supply mains.

Precautions

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

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 BNC terminals for maximum allowed values.

Use only within operational environment listed. 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 and use the built-in carrying handle to move the instrument.

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. **Touch Screen Display**

B. **Front Panel**

C. **Power Button**

D. **Channel Inputs**

E. **Calibration and Ground Terminals**

F. **Ext In Terminal**

G. **Mixed Signal Interface**

H. **USB 3.1 Ports** (2)

I. **Tilting Feet**

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

The **front panel** houses buttons and knobs that control different oscilloscope settings. Operate the instrument using front panel controls, touch screen controls, or a mix that is convenient for you.

Front mounted **host USB 3.1 ports** can be used for transferring data or connecting peripherals such as a mouse or keyboard.

The **mixed signal interface** connects the digital leadset to input up-to-16 digital lines (with the MSO option).

Calibration output terminal is used to compensate passive probes. The **Ground terminal** may be connected to a grounding wrist strap or the ground lead on probes.

Channels 1–8 are used to input analog signal. The connectors are compatible with ProBus probes. They can also accept a conventional BNC cable.

The **tilting feet** change the angle of display for easier viewing.

Powering On/Off

Plug the line cord only into a grounded AC power outlet. See Power in “Safety” for ratings. Press the **Power button** to turn on the oscilloscope. The LED on 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 unplug the AC line 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 and Side of Oscilloscope

A. Built-in Carrying Handle

B. Removable Solid State Drive

C. AC Power Inlet

D. Kensington Lock

E. Aux Out

F. Ref In and **Ref Out Connectors**

G. USBTMC port for remote control and data transfer

H. Speaker Out and **Mic In**

I. Ethernet Ports (2)

J. USB 3.1 Ports (4)

K. HDMI and **DisplayPort Out** to external monitors

Connecting to External Devices/Systems

After start up, configure external connections using the menu options listed below. See the *WaveRunner/MDA 8000HD Oscilloscopes Operator's Manual* for more detailed instructions.

Audio/USB Peripherals

Connect the device to the appropriate port. These connections are "plug-and-play" and do not require any further configuration. Use the Windows control panel to make adjustments. To go to the Windows desktop, choose **File > Minimize** or swipe from the far left of the screen.

External Monitor

The instrument supports 4K monitors (up to 4096x2304 resolution). Connect the monitor cable to the HDMI or DisplayPort output on the side panel (you can use a convertor if the cable has a different interface). Go to **Display > Display Setup > Open Monitor Control Panel** to configure display settings. Be sure to select the instrument 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.

LAN

The instrument is preset to accept DHCP network addressing over a TCP/IP connection. Just connect an ENET cable from a port on the side panel to a network access device. Go to **Utilities > Utilities Setup > Remote** to find the IP address.

To configure a Static IP address, touch **Net Connections** on the Remote dialog and enter the IP address.

Go to **Utilities > Preference Setup > Email** to configure email settings.

Printer

The instrument supports USB printers that are compatible with the Windows 10 OS installed. Connect the printer to any host USB port, then go to **File > Print Setup** and select **Printer** to configure printer settings. Touch **Properties** to open the Windows Print dialog.

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. To use LXI, switch to the Administrative User LCRYADMIN (p.40).

Note: You can also connect directly using TCP/IP, but depending on the controller, you may need to use a cross-over cable.

USBTMC and GPIB (with the optional GPIB card) can also be used to make a remote connection.

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

Trigger Out

To send a trigger pulse to another device, connect a BNC cable from Aux Out on the rear of the instrument to the other device. Go to **Utilities > Utilities Setup > Aux Output** and choose to output Trigger.

Reference Clock

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

Probes

WaveRunner/MDA 8000HD oscilloscopes are compatible with the included passive probes and most Teledyne LeCroy **ProBus** active probes that are rated for the oscilloscope's bandwidth. Probe specifications and documentation are available at **teledynelecroy.com/probes.**

Digital Leadset

Delivered with the purchase of the Mixed Signal Oscilloscope (MSO) option, the **digital leadset** enables input of up-to-16 lines of digital data. Lines can be organized into two logical groups representing different buses and renamed appropriately.

The digital leadset features two digital banks with separate threshold and hysteresis controls, making it possible to simultaneously view data from different logic families.

Each flying lead has a signal and a ground connection. A variety of ground extenders and flying ground leads are available for different probing needs. To achieve optimal signal integrity, connect the ground at the tip of the flying lead for each channel used in measurements. Use either the provided ground extenders or ground flying leads to make the ground connection.

To connect the leadset to the oscilloscope, push the connector into the mixed signal interface below the front panel until you hear a click.

To remove the leadset, press in and hold the buttons on each side of the connector, then pull out to release it.

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 ***WaveRunner/MDA 8000HD Oscilloscopes Operator's Manual***.

Shortcut buttons arranged across the top of the front panel give quick access to commonly used functions.

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

The **Save button** performs the last action you set on the Save dialog: save a setup file, waveform file, memory, screen image or LabNotebook.

The **User button** can be configured to perform your choice of functions: save LabNotebook, waveform or setup files; save setups or waveforms to internal memory; print the screen; find optimal Vertical Scale for a selected channel, etc. See the *Operator's Manual* for instructions.

When cursors are turned off, the Cursor knobs act as the **Adjust knobs**.They raise/lower the value when a data entry field is selected, or raise/lower trace intensity when a waveform is selected. Pushing the Adjust knobs returns settings to the default value.

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; the second label describes its "push" action.

Many front panel buttons light to indicate which functions and traces are active. The labels for Trigger, Horizontal, Vertical and Cursors/Adjust also light in the color of the trace that is currently associated with these knobs.

Touch Screen Display

The entire display is a capacitive touch screen. Use your finger or a capacitive stylus (not included) to touch, double-touch, touch-and-drag, or draw a selection box. 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.

A. **Menu Bar**

B. **Grid Area**

C. **Trigger Level Indicator**

D. **Trigger Time Indicator**

E. **Trace Descriptor Boxes**

F. **Add New Box**

G. **Cursor Markers**

H. **Timebase and Trigger Descriptor Boxes**

I. **Horizontal Cursor Readout**

J. **Setup Dialogs**

A **menu bar** of drop-down menus lets you access all functionality.

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 area** displays the waveform traces. You can adjust the brightness of the graticule, or change the number and style of grids.

Trigger level (vertical axis) and **trigger time** (horizontal axis) indicators appear on the grid when a trigger is set, color-coded to match the source.

Cursors show where measurement points have been set. Touch-and-drag cursor indicators to quickly reposition the measurement point. Vertical cursor readout appears on the Channel descriptor box; Horizontal cursor readout appears below the Timebase and Trigger descriptor boxes.

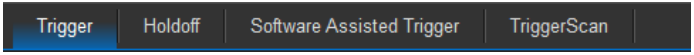
Trace descriptor boxes appear along the bottom of the grid area, one for each open trace. They adjust in size and detail as more are opened.

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.

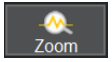
Dialogs appear at the bottom of the display for entering set up data. The top dialog will be the main entry point for the selected function.

For convenience, related dialogs appear as a series of tabs behind the main dialog. Touch the tab to open the dialog

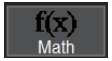


The **Action toolbar** on the main Channel, Math and Memory dialogs offers shortcuts to common actions so you don't have to leave the underlying dialog. Actions always apply to the active (highlighted) trace.

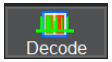
Apply measurement parameters



Display a zoom of the trace



Apply a math function to the trace



Open the Serial Decode dialog (if decoders are installed)

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

Scale the waveform to fit the grid

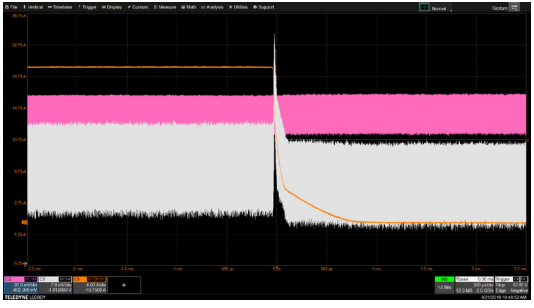
Add a custom name to the trace

Apply a custom label to the trace

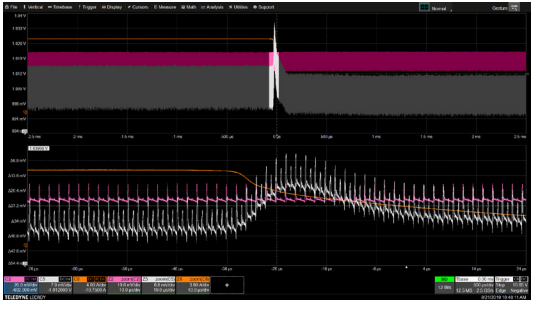
Changing the Display

Grid Mode

The grid is 8 Vertical divisions representing 4096 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.

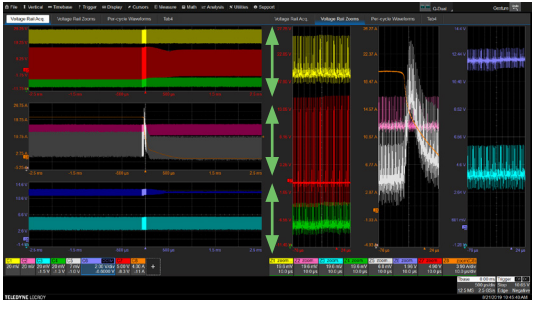


The grid area can contain multiple grids, each representing the full number of Vertical levels, so vertical precision is always maintained.



Q-Scape Multi-tab Display

In addition, the display area can be divided into multiple tabs. Each tab can show a single grid or a different multi-grid mode. Many of the same grid functions you can perform in Normal mode, such as moving traces to other grids, you can also perform in the Q-Scape modes.



Display Mode vs. Grid Mode

The Display Mode determines whether the touch screen has a single display or tabs each representing a separate display. The Grid Mode allows selection of a particular grid style in each display.

By default, the oscilloscope is in Normal Display Mode (a single display with no tabs) with the Auto Grid Mode enabled. Auto adds a grid for each new trace, up to 20 grids, until no more grids are available. Other grid modes create a fixed number and orientation of grids; the icon on the Display dialog 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, select **Extend Grids on 2nd Monitor** from the Display dialog, then choose a grid style from the Extended Display pop-up menu. Both displays will share this grid style. Drag-and-drop descriptor boxes to move traces between the displays.

Note: When a Q-Scape Display Mode is extended, only Tab 1 is moved to the second display.

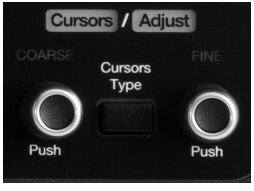
Oscilloscope with an extended display.

Line, Intensity, and Persistence

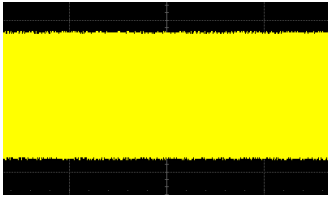
The trace can be displayed as a series of separate sample **Points** or a continuous vector **Line**.

Grid Intensity makes the graticule dimmer or brighter relative to the trace.

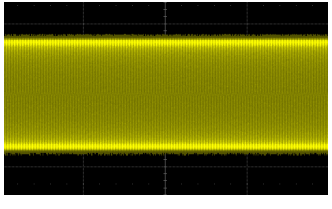
When more data is available than can actually be displayed, **Trace Intensity** helps to visualize significant events by applying an algorithm that dims less frequently occurring samples. With the trace selected (and cursors off), turn the front panel **Adjust knobs** to control the Trace Intensity.



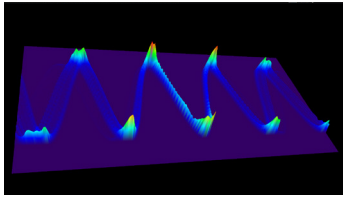
Various types of **Persistence** can be added to the display to visualize how waveforms change over time. Persistence displays can be colorized or modeled in 3D and rotated on three axes.



Intensity 100%



Intensity 15%

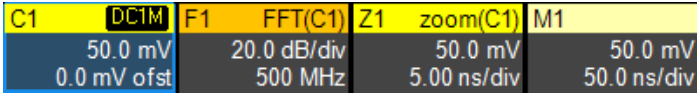


3D color persistence display, rotated

Working with Traces

Trace Descriptor Boxes

Channel (C1-C8), Zoom (Z1-Z*n*), Math (F1-F*n*), Memory (M1-M*n*), and Digital (Digital1-Digital4) descriptor boxes appear along the bottom of the grid area when a trace is turned on. Descriptor boxes are used to summarize, activate, arrange, and configure the traces they represent.



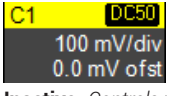
Trace Context Menu

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 box appears, then release.

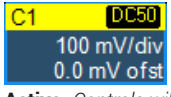
Active vs. Inactive Trace

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.*



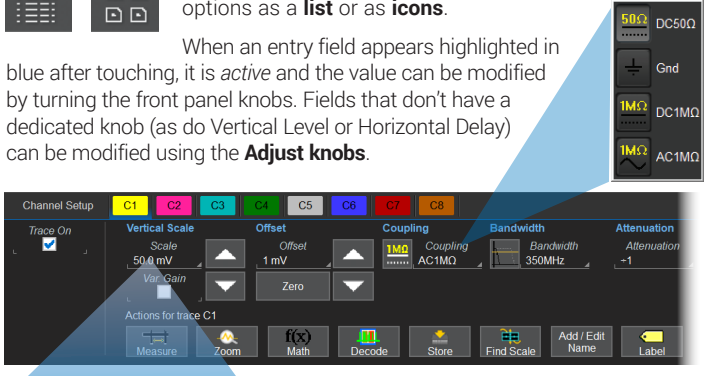
Active. *Controls will work for this trace.*

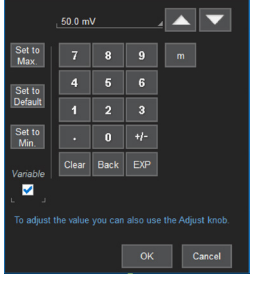
Adjusting

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 Level or Horizontal Delay) can be modified using the **Adjust knobs**.





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 using the **virtual keypad** or **virtual 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.

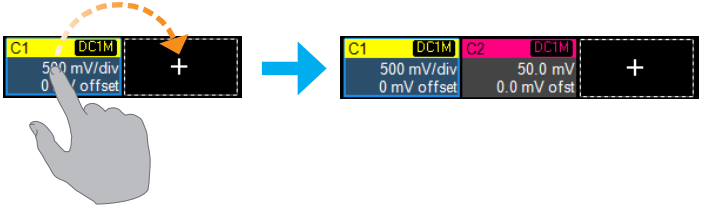
MAUI with OneTouch

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.

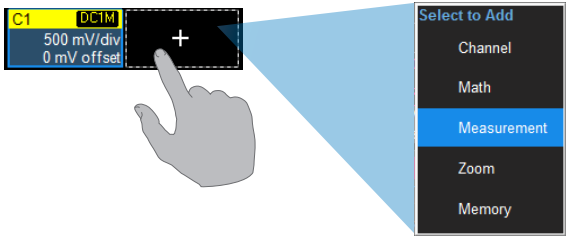
Turn On

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.



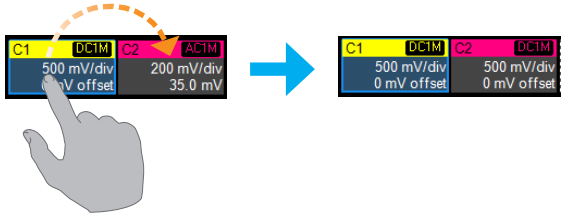
If there is no descriptor box of the desired type on the screen to drag, touch the Add New box and choose the trace type from the pop-up menu.

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

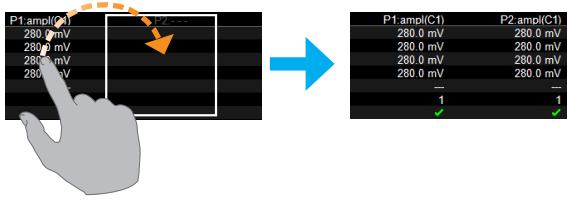


Copy Setups

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.

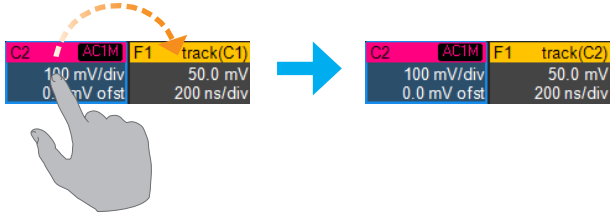


To copy the setup of a measurement (P*n*), drag-and-drop the source column onto the target column of the Measure table. You can do the same for a query (Q*n*) on the Pass/Fail readout table.

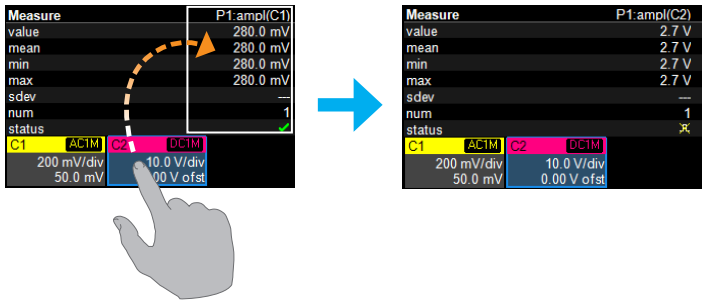


Change Source

To change the source of a math, zoom or memory 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.

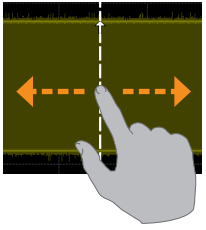


To change the source of a measurement, drag-and-drop the descriptor box of the desired source onto the parameter (P*n*) column of the Measure table. You can do the same to a query (Q*n*) on the Pass/Fail readout table.

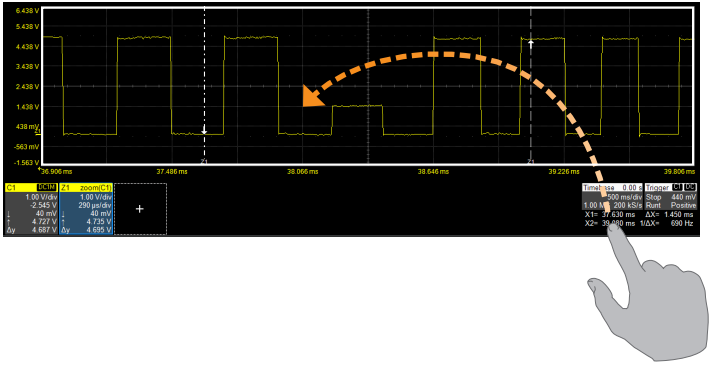


Position Cursors

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

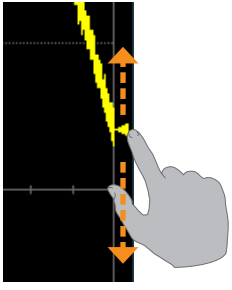


To place horizontal cursors on zooms or other calculated traces where the Horizontal Scale has forced cursors off the grid, drag the cursor readout from below the Timebase descriptor to the grid where you wish to place the cursors. The cursors are set at either the 5 (center) or 2.5 and 7.5 divisions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

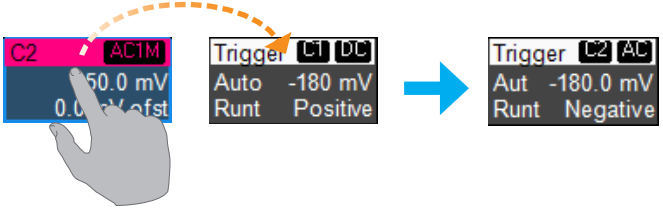


Change Trigger

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 Level.

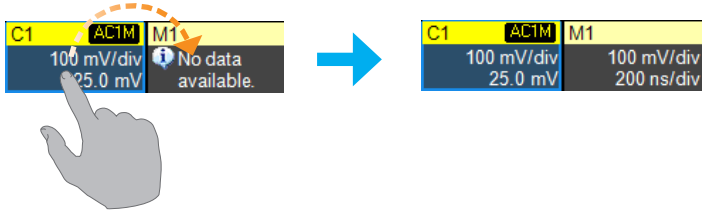


To change the trigger source channel, drag-and-drop the desired channel (C*n*) descriptor box onto the Trigger descriptor box. The trigger will revert to the last coupling and slope/polarity set on that channel.



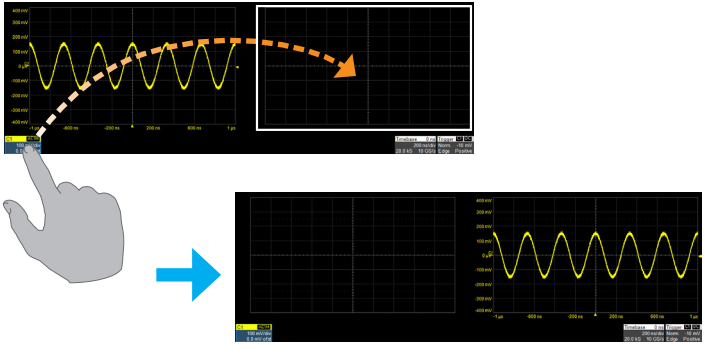
Store to Memory

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



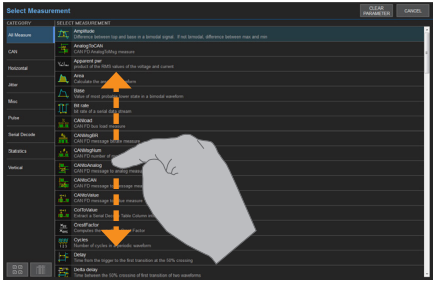
Move Trace

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.



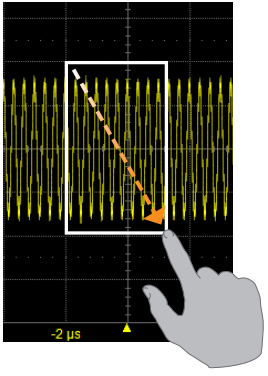
Pan

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.

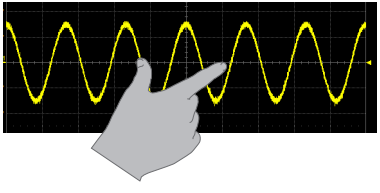
To pan at an accelerated rate, swipe the trace right/left or up/down.

Tip: Panning/swiping is an easy way to position a trace in the Analysis Zone.

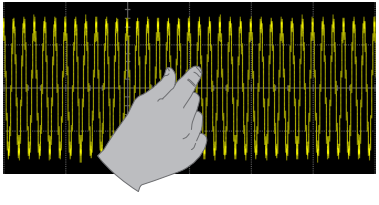
Zoom



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.



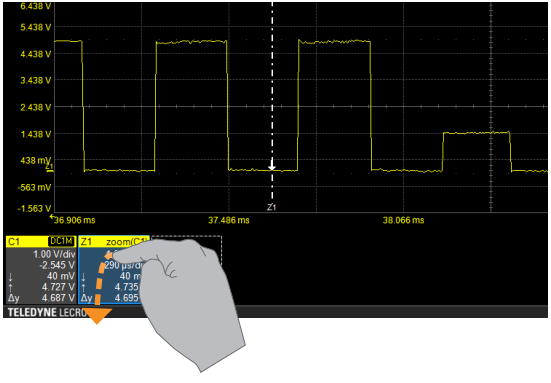
To "zoom in" on any trace, unpinch two fingers over the trace horizontally.



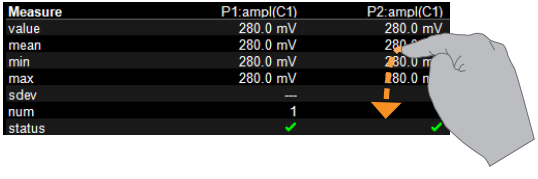
To "zoom out" on any trace, pinch two fingers over the trace horizontally.

Turn Off

To turn off a trace, flick the trace descriptor box toward the bottom of the screen.



To turn off a measure parameter or Pass/Fail query, flick the P*n* or Q*n* cell toward the bottom of the screen. If it's the last active cell of the table, the table will close.

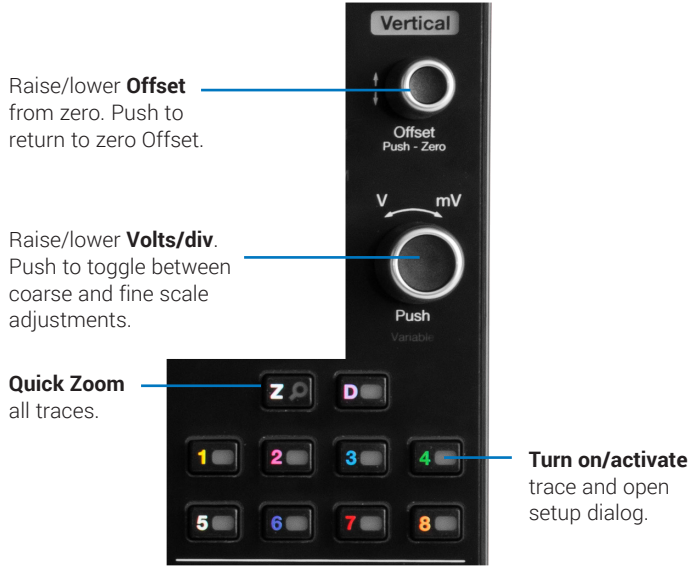


Measure	P1:ampl(C1)	P2:ampl(C1)
value	280.0 mV	280.0 mV
mean	280.0 mV	280.0
min	280.0 mV	280.0
max	280.0 mV	280.0
sdev	---	
num	1	
status	✔	✔

Vertical

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

From the Front Panel



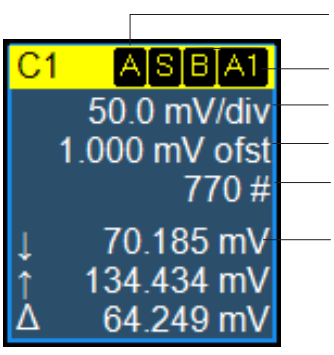
Raise/lower **Offset** from zero. Push to return to zero Offset.

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

Quick Zoom all traces.

Turn on/activate trace and open setup dialog.

Channel Descriptor Box



Pre-Processing Summary List (changes from default state)

Coupling

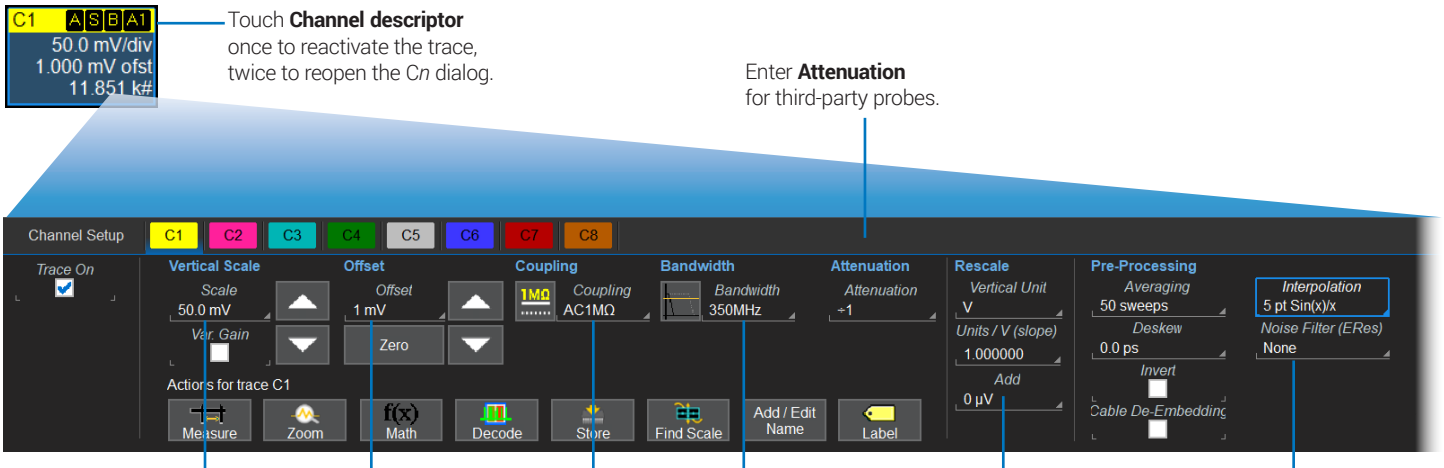
Volts/div (Gain)

Offset

Averages

Vertical Cursor Positions

From the Touch Screen



Digital

On Mixed Signal instruments, Digital selections are added to the Vertical menu, and the front panel Vertical knobs control active Digital line and bus traces.

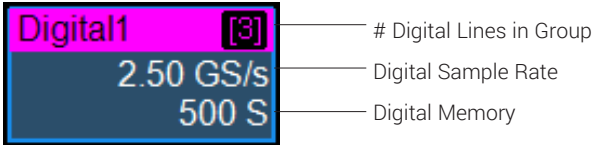
From the Front Panel

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

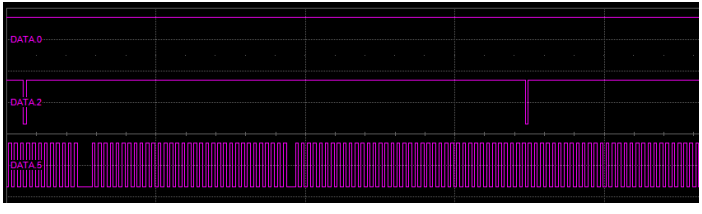
Turn **Volts** to raise/lower **Group Height**, the total Vertical divisions occupied by group.

Turn on/activate digital traces.

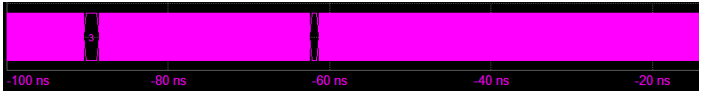
Digital Descriptor Box



Digital Display Modes



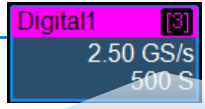
Line trace shows high, low and transition points for each line in group.

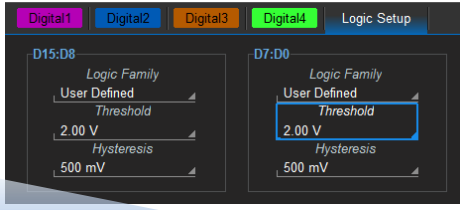


Bus trace collapses lines into hex values.

From the Touch Screen

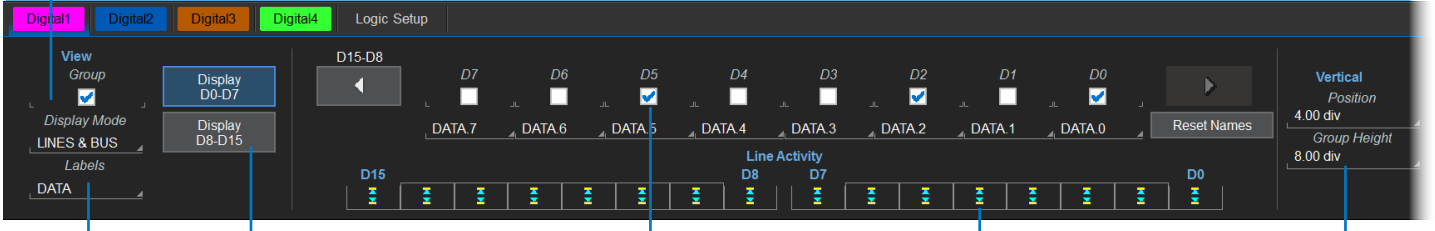
Touch **Digital descriptor** once to activate digital trace, twice to open Digital*n* dialog.





On the Logic Setup tab, choose a standard **Logic Family**, or enter a custom **Threshold** and **Hysteresis**. Each lead bank is controlled separately.

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



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

Use **Display buttons** to switch between lead banks as you select lines.

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

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

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

Enter **Vertical Position** and **Group Height** in divisions.

Horizontal (Timebase)

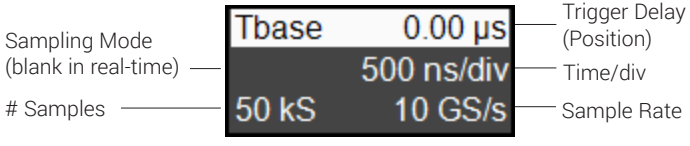
Horizontal controls adjust traces along the X axis. Analog traces usually represent one acquisition of the source signal for 10 divisions of the selected Time per division. The trigger event is shown at the center of the grid, unless you add positive or negative Delay time, which shifts the triger point left or right. The front panel Time/div 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.

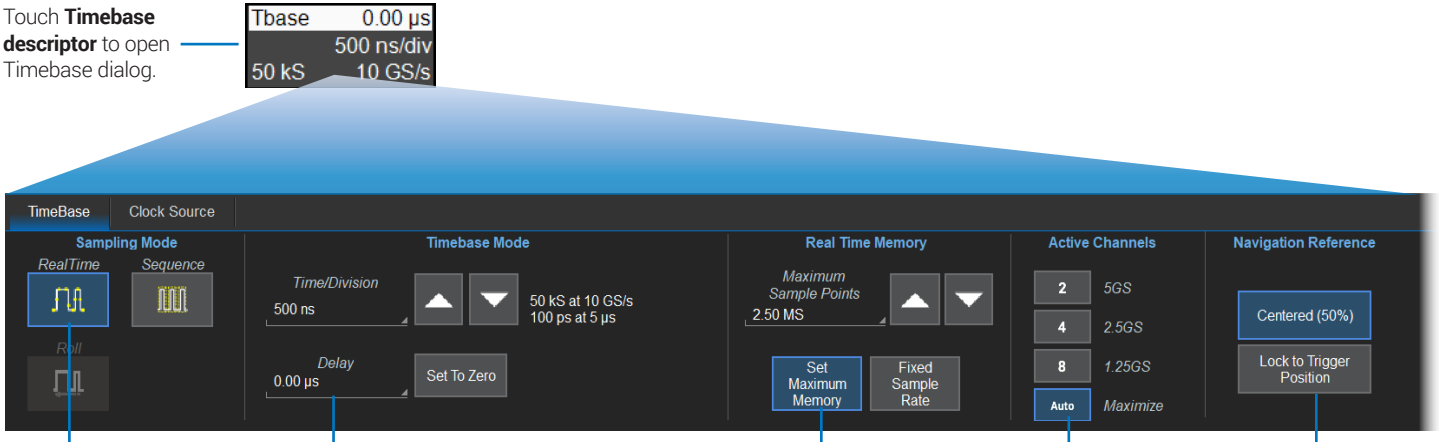
Raise/lower **Time/div**. Push to toggle between coarse and fine scale adjustments.

Timebase Descriptor Box



From the Touch Screen

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



Select **Sampling Mode**.

Refine **Time/div** and **Delay**.

Set To Zero removes Delay.

Set Maximum Memory possible at Time/div, or use a **Fixed Sample Rate**.

Use **2** or **4** channels for longer memory. **Auto** will automatically maximize based on which channels are in use.

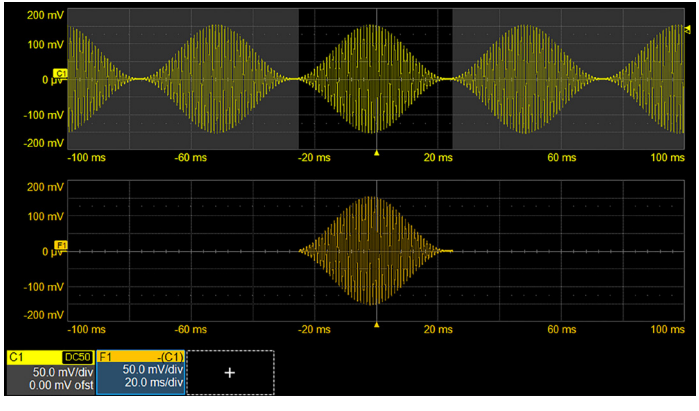
Change Time/div in reference to **Center (50%)** of display, or **Lock to Trigger** position (see pp.28-29).

Navigating Long Acquisitions

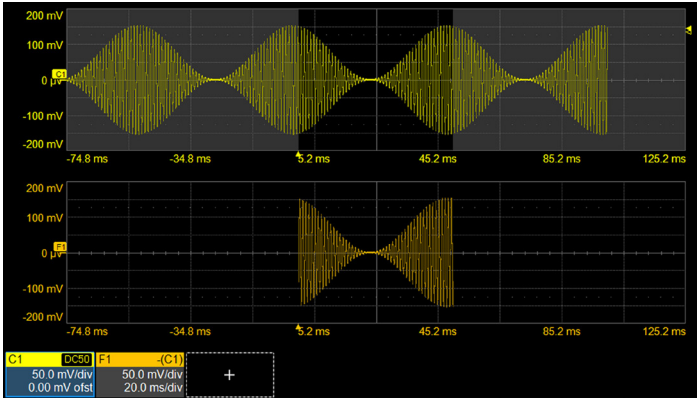
For signal acquisitions >2 Gpts, measurements and math calculations take place on only the center 2 Gpts—the "Analysis Zone". This area is marked on the source channel trace by grey shading applied outside of it (over the part not analyzed). You may need to reposition the trace so that the portion you wish to analyze falls within the Analysis Zone. Also, you may wish to shorten the time it takes to complete a complex analysis by analyzing only the most significant part of the acquisition. This can be easily done using Timebase controls and/or Zoom.

Navigating with Horizontal Delay

Stop acquisition, then pan/swipe or turn the Horizontal Delay knob until the part of the trace you wish to analyze is within the Analysis Zone.



Shading over source trace shows edges of Analysis Zone on long acquisition. Truncated math trace reveals extent of Analysis Zone.

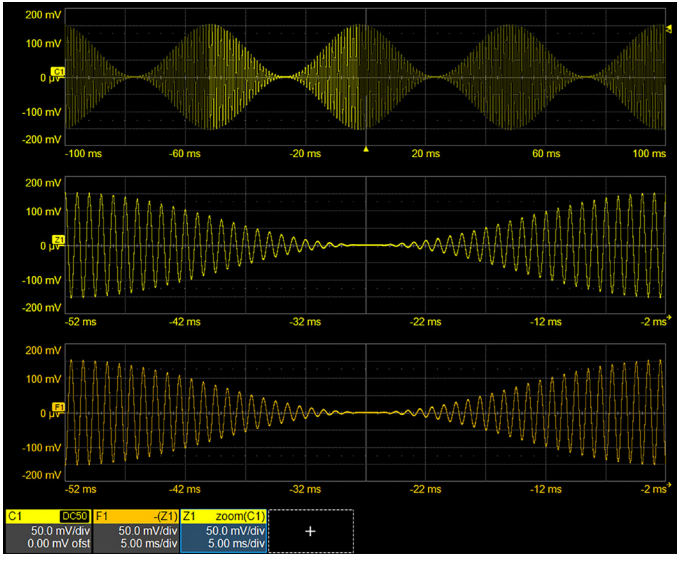


Math trace now shows how adding Delay shifts Analysis Zone.

Note: Your next acquisition will reflect any change to your Timebase settings. If you wish to preserve your initial acquisition settings, save the setup to internal memory before navigating, then recall it before you resume acquisition.

Navigating with Zoom

Stop acquisition, then create a zoom trace of the area you wish to analyze. Apply math and measurements to the zoom rather than the channel trace.

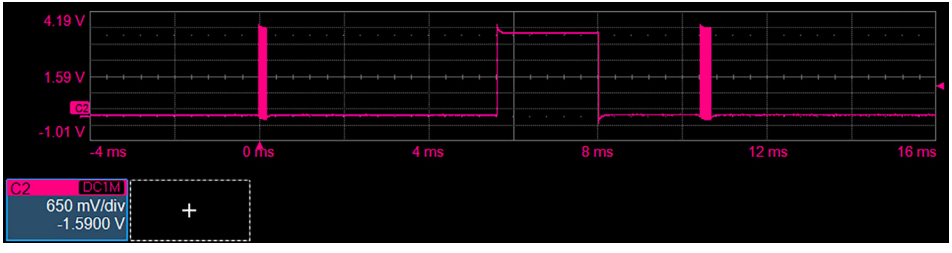


Math applied to a zoom is calculated on the entire trace (up to 2 Gpts). Highlighting on the source trace shows the zoomed area being analyzed.

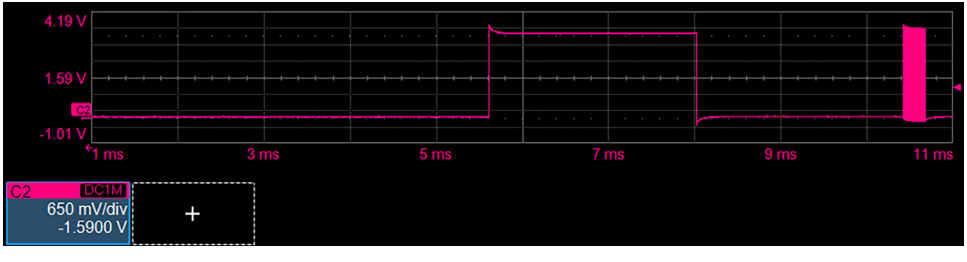
Navigation Reference

Changing the Navigation Reference setting can also help to reposition the acquired trace for analysis by selecting for different regions of the trace to remain centered as the Time/div changes:

Centered (50%) scales divisions equally so that whatever is at the center (50%) grid line remains at the center of the display. Other events move in reference to the center as Time/div changes. With this setting, the trigger point could potentially move off the grid as the scale changes.

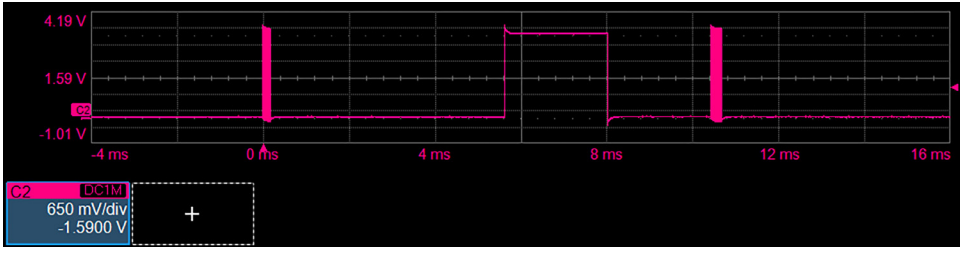


Timebase at 2 ms/div with -6.5 ms Delay shifting the trigger left of the center of the gird.

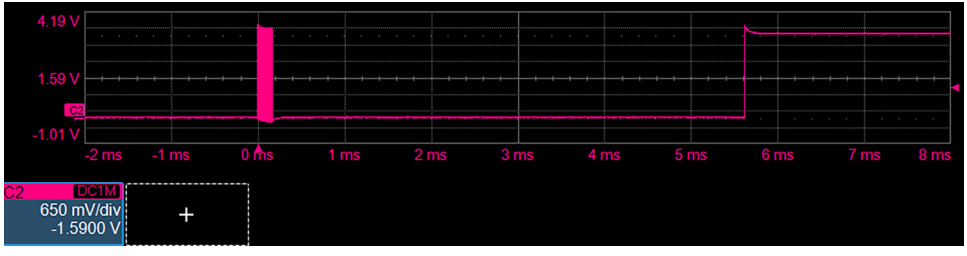


Timebase changed to 1 ms/div with Navigation Reference set to Centered (50%). Note how with this setting, the trigger event has shifted off the grid to the left as time "expands", but the center of trace remains in the same place.

A Navigation Reference of **Lock to Trigger** rescales divisions around the trigger point. The trigger event remains in place as Time/div changes, while other events move in reference to the trigger. If the trigger is currently placed at time zero, this will appear to behave the same as Centered, but the difference will be apparent if you have used Delay to shift the trigger position.



Same 2 ms/div Timebase with Timebase Reference set to Lock to Trigger starts the same as when Centered.

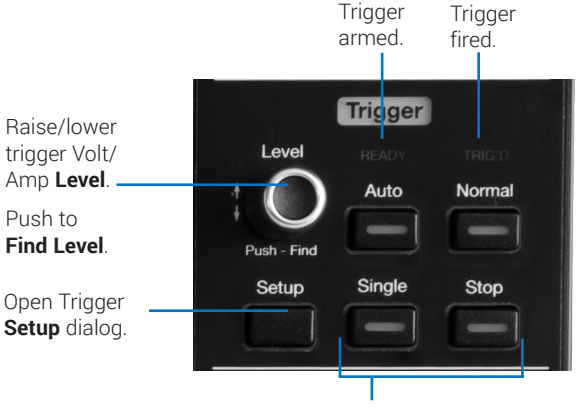


Now, when the Timebase is changed to 1 ms/div, the trigger event remains at its current position, but the rest of the trace shifts to the right as time "expands." The values associated with each horizontal grid division are different than when centered, although Time/div is still 1 ms/div.

Triggers

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 *WaveRunner/MDA 8000HD Oscilloscopes Operator's Manual.*

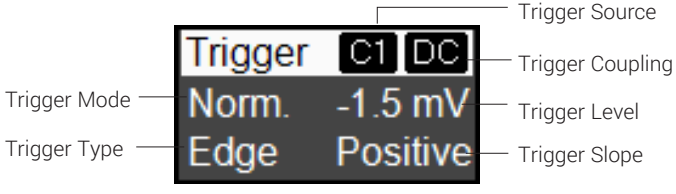
From the Front Panel



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.

Note: Auto and Normal Trigger Modes are disabled on >2 Gpts acquisitions.

Trigger Descriptor Box



Trigger Indicators

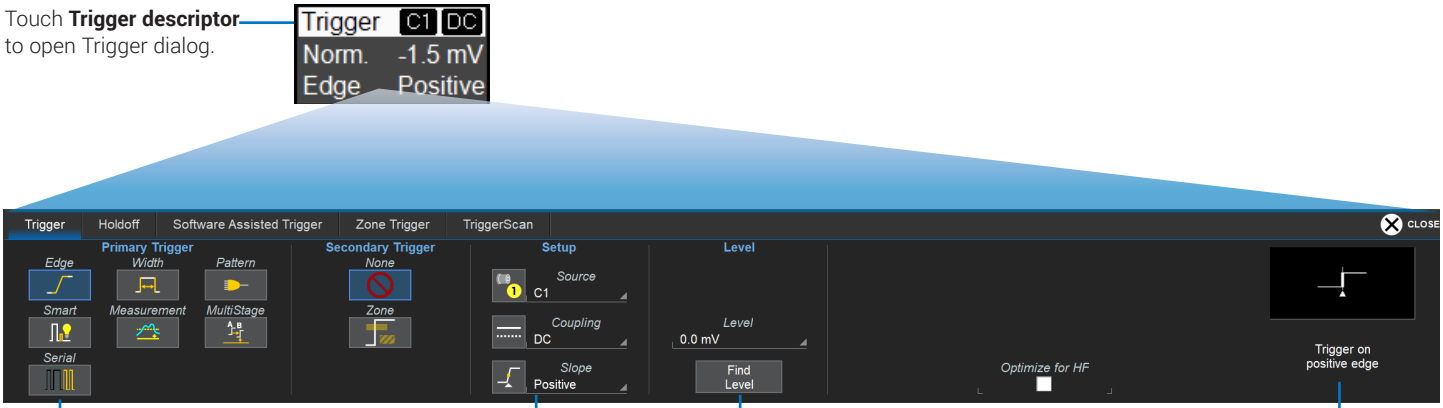
Level

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 dialog.



Choose trigger **Type**.

Choose trigger **Source** channel, then set other **conditions**, such as **Coupling** and **Slope** (varies by trigger type).

Set trigger **Levels**, or **Find Levels** based on the signal mean.

Icon summarizes the trigger selections.

Zoom

Zoom traces 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." Zoom is also useful for analyzing regions of >2 Gpts acquisitions that fall outside the center Analysis Zone. Use the Zoom trace as the source for measurements or math functions.

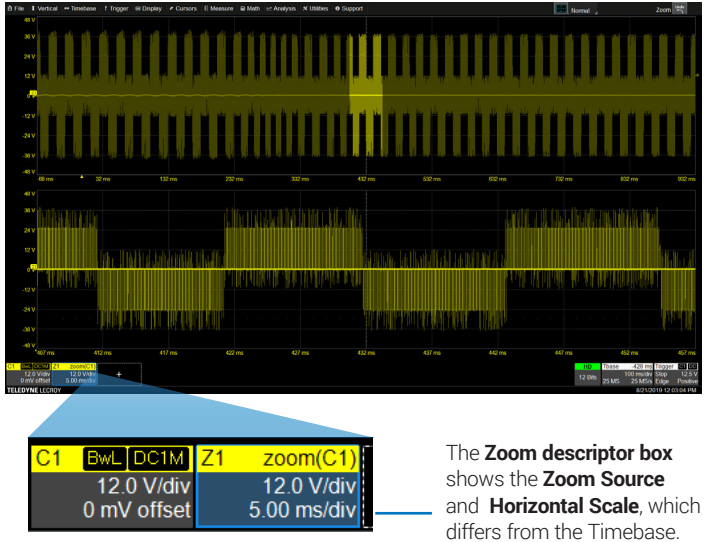
From the Front Panel

Adjust **Horizontal Scale** to change zoom magnification.

Create **Zoom** of all open traces.

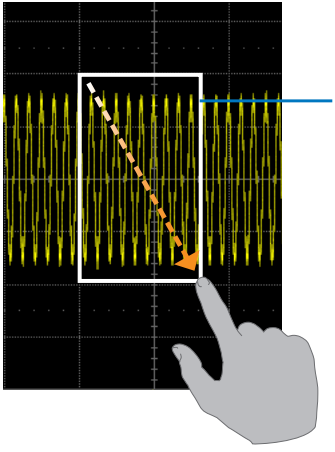
When you use the front panel Zoom button, a new Zoom trace is created for every open trace, showing a 10x magnification of the source trace.

The zoomed portion of the original 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.

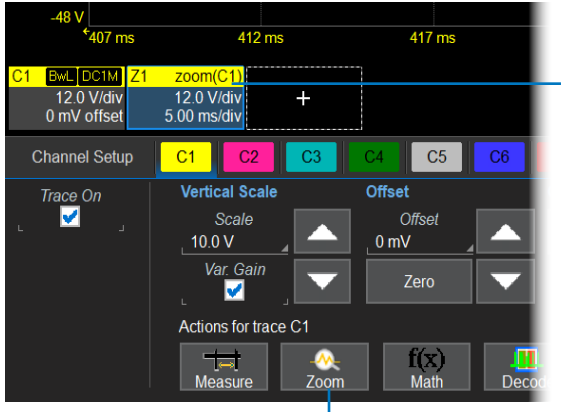
From the Touch Screen



Drag diagonally to draw a **rectangle** over the portion of the source trace you wish to zoom. The horizontal region is expanded to the width of the grid, while the vertical region is rescaled proportionally.

Repeat on another section to reposition the same Zoom trace or create another Zoom trace.

OR



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

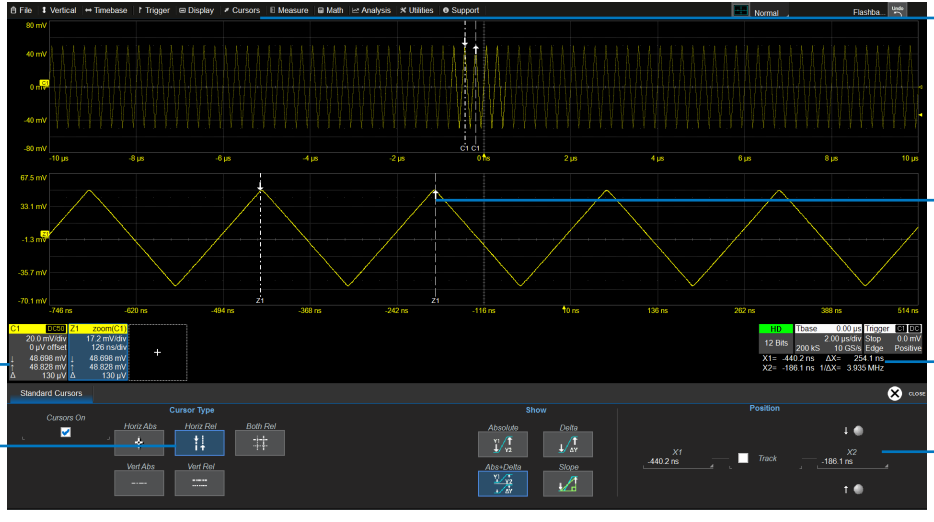
Cursors set measurement points on the Vertical or Horizontal axis of a trace (or both). The five preset cursor types are described in more detail in the *WaveRunner/MDA 8000HD Oscilloscopes Operator's Manual*.

From the Front Panel

Apply cursor.
Continue pressing to cycle through all **Cursor Types**.

Adjust **cursor position**.
Push to select different lines when using Both Rel cursors.

From the Touch Screen



Cursors > Cursor Setup opens the Cursor dialog.

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

Vertical Cursor readout on descriptor boxes.

Horizontal Cursor readout below Timebase.

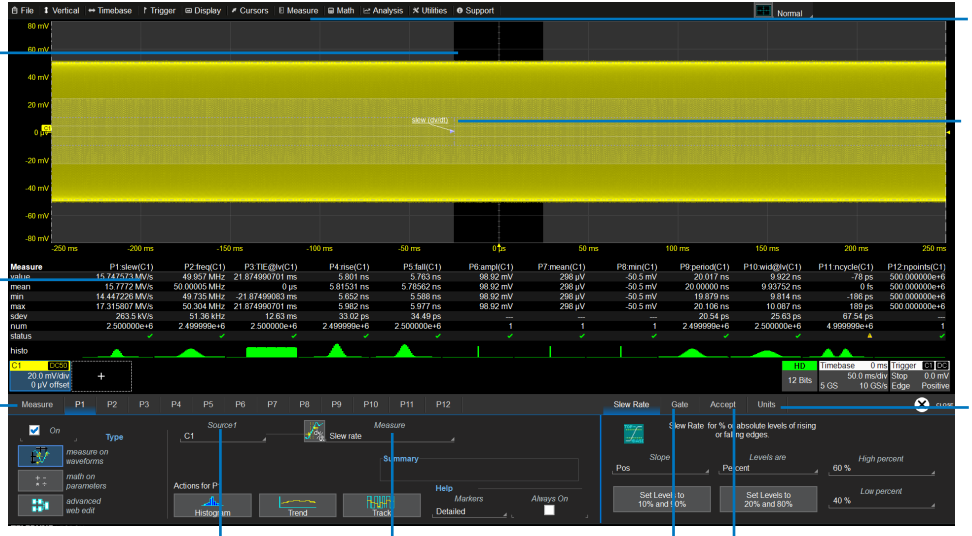
Choose **Cursor Type**.

Set exact **Position** using dialog. **Track** moves both lines together.

Measurements & Statistics

Measurements are waveform parameters that can be expressed as numerical values, such as amplitude or frequency. Measurement results are shown in a table below the grid. Statistics can be displayed, along with histicons, a miniature histogram of the statistical distribution. You can also gate measurements to limit them to a specific region of the trace.

Note: Measurements are constrained to the center 2 Gpts on >2 Gpts acquisitions. Shading shows the edges of this Analysis Zone.



Analysis Zone marks area measured on >2 Gpts acquisitions.

Touch table cells to re-open **Measure** or ***Pn*** dialogs.

Use Measure dialog to turn on **Statistics** and **Histicons**.

Measure > Measure Setup opens the Measure dialog.

Help Markers show what is being measured on waveform.

Select **Unit** in which result is displayed.

Choose **Source** trace to be measured and **Measurement**.

Enter Start & Stop **Gates** (in div) to limit the region measured, or just drag markers from edge of grid to gate positions.

Accept measurements based on range limits or the state of a second, qualifying waveform.

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. 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. The math trace always opens in a separate grid from the source and can be viewed along side it. Operations can be chained by using one math function as a source for the other, by creating Dual functions or by creating complex processing webs with Advanced Web Edit.

Note: Math calculations are constrained to the center 2 Gpts on >2 Gpts acquisitions.

Math > Math Setup opens the Math dialog.

Math trace units and scale on ***Fn* descriptor**

Math tab to turn on/off multiple math traces.

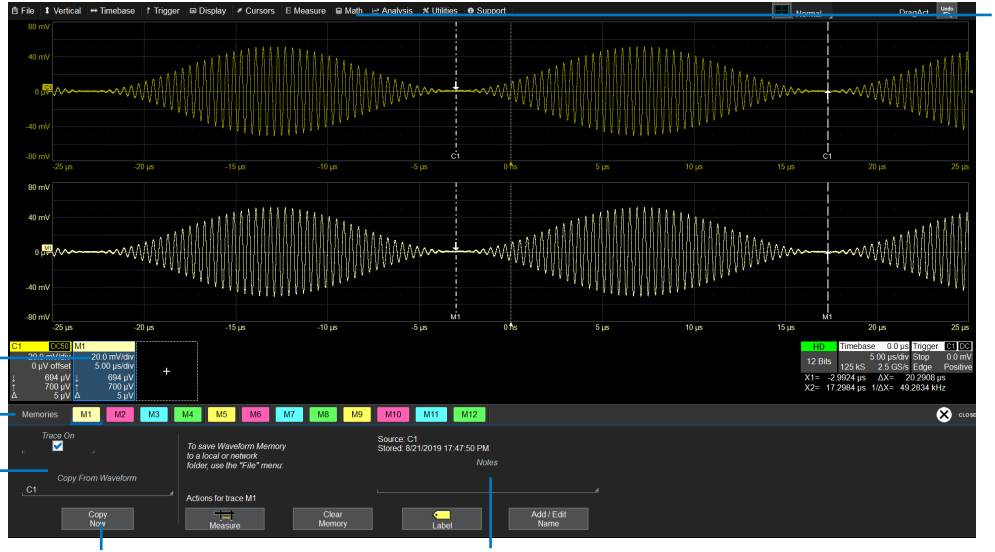
***Fn* tab** to set up/change single math function.

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

Use **Zoom controls** to change math trace Horizontal/Vertical Scale. Make other settings on the math **function subdialog** (vary by operation).

Memories (Reference Waveforms)

Memories are traces stored for reference. They can be recalled to the display for comparison with other traces. A memory can be zoomed or measured for better analysis of historical data. Internal memories persist only until the oscilloscope is rebooted. To store memories indefinitely, save them to an external file by choosing **File > Save Waveform**. The file can then be recalled into internal memories for viewing by choosing **File > Recall Waveform**. Only memory files saved with the .trc extension can be recalled.



Math > Memory Setup opens Memories dialog.

Memory trace units and scale on **M*n* descriptor box**.

Memories tab to turn on/off multiple memories. **M*n* tab** to save new memory.

Choose trace to save to memory (it must be visible on the grid). **Copy Now** to save it.

Optionally, add **Notes** describing memory before saving.

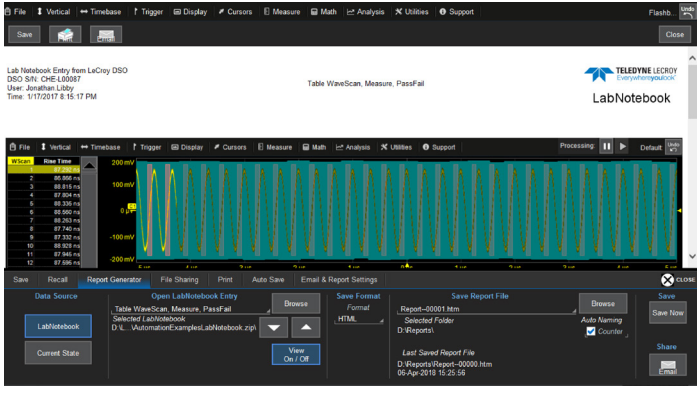
Saving and Sharing Data

Use the oscilloscope **File menu** options to save and recall data. See the *WaveRunner/MDA 8000HD Oscilloscopes Operator's Manual* for more information on using these features.

LabNotebooks

LabNotebooks store setups, waveform data, and screen image as they were at the moment of capture. Creating a LabNotebook can be as simple as pressing the Save or User button as you work. Recall 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. Use LabNotebooks to generate preformatted PDF/HTML reports.

Note: LabNotebook is disabled on >2 Gpts acquisitions.



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.

Screen Captures

The Save or User button can be configured to capture the screen and save the image to file using your Screen Image Preferences for file format, print area and color palette.

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. The oscilloscope can be added to a LAN via TCP/IP or directly connected to a PC via USBTMC to transfer data.

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.

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.

Activating Software Options

To purchase an option (p.42), 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 MDA/WaveRunner 8000HD is calibrated at the factory at 23 °C (± 2 °C) for all possible vertical and horizontal settings. This calibration is never deleted and is used if there is no more recent calibration.

So that it maintains specified performance, the oscilloscope employs an automatic Temperature Dependent Calibration using a combination of cached and dynamic calibrations. Warm the oscilloscope for at least 20 min. after power on to reach a stable operating temperature. You will see a warning message on the Calibration dialog when the oscilloscope is still in the warm-up phase. Specifications are not guaranteed during warm up.

When Automatic Calibration (the default) is enabled on the Preferences dialog, the oscilloscope checks the current temperature on acquisition. If the temperature has changed ± 5 °C from the last temperature calibrated for the acquisition settings in use, it will load the most recent calibration file that is within ± 5 °C of the current temperature. If there is no file within threshold, it will load the closest temperature and you will receive a message on the Calibration dialog to manually recalibrate. You will also receive a message to manually recalibrate if it has been over six months since the last calibration.

If you turn off Automatic Calibration, there is no temperature check, and the last set of calibration files remains until you manually recalibrate.

To manually recalibrate, from the menu bar, choose **Utilities > Calibration**. There are two calibration routines for selection:

Calibrate All calibrates all possible combinations of vertical and horizontal settings at the current temperature. This calibration is valid for all possible settings at the current temperature ± 5 °C and may take over an hour to complete. Calibrate All will remove any calibration over six month old, except for the original, factory calibration.

Calibrate Current Setting calibrates the current vertical and horizontal settings at the current temperature. This calibration is valid for *only the current acquisition settings* at the current temperature ± 5° C and takes about 10 seconds to complete.

⚠ **CAUTION**. Remove all inputs before calibrating the oscilloscope.

The Calibration dialog will inform you when calibration is valid.

Schedule factory calibration once per year. Contact your local Teledyne LeCroy office for service.

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.

Consult your IT department/lab manager for the current LCRYADMIN user password, which is required for firmware installation and other Windows OS changes. User passwords at time of shipment are on a sticker on the body of the oscilloscope.

⚠ **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.

To download and install an 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 setup wizard.
6. When prompted, enter the LCRYADMIN password.
7. Follow the wizard prompts.
8. When installation is complete, power cycle the instrument.

Switching Windows Users

Windows 10 oscilloscopes are by default set to operate from the LeCroyUser account, but you may need to switch to the Administrative User, LCRYADMIN, to run certain compliance packages or use LXI remote control.

Note: To install software or change Windows settings, it is sufficient to supply the LCRYADMIN password. Consult your IT department/lab manager for the current passwords.

To switch to the LCRYADMIN account:

1. Exit the MAUI 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 oscilloscope **LCRYADMIN password.**
5. Double-click the **StartDSO icon** on the oscilloscope desktop.

To return to the Standard user, repeat this procedure selecting user **LeCroyUser** and entering the LeCroyUser password.

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 manually switched to an Administrative user. The only way to change this is to give LeCroyUser and all other users Administrator privileges.

Service

If the WaveRunner/MDA 8000HD 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
   - Admin. and User passwords if other than shown on label.
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

Software Options

These are just some of the software options available to enhance the operation of a WaveRunner/MDA 8000HD oscilloscope. After activating the license key (p.39), options are added to the oscilloscope's menu bar.

Advanced Customization Package (WR8KHD-XDEV) lets you insert custom measurement parameters and math functions into the oscilloscope's real-time processing stream. Scripts can be written right on the oscilloscope or called from external applications, such as MATLAB. Language support for VBScript, MATLAB Script, MathCad Script, Excel VBA, and C/C++.

Digital Filter Package (WR8KHD-DFP2) implements a set of linear-phase FIR and IIR filters to remove undesired spectral components such as noise.

JITKIT (WR8KHD-JITKIT) makes it easy to understand the basic system jitter performance of clock signals and clock-data activities through a wide variety of common jitter measurements.

Eye Doctor II (WR8KHD-EYEDRII) provides channel emulation and de-embedding tools. It seamlessly integrates into SDA III software for eye diagram and jitter analysis.

Virtual Probe (WR8KHD-VIRTUALPROBE) helps to understand the characteristics of signals where a physical probe cannot be placed. Can be used to remove or add effects of fixtures for which only an S-parameter model exists.

SDA Expert (WR8KHD-SDAX-* options) delivers jitter and timing analysis for NRZ and PAM data signals. The SDAX-Complete option delivers multi-lane capabilities fully integrated with Eye Doctor II and Virtual Probe software for a complete signal integrity toolkit.

Clock Expert (WR8KHD-CLKX and WR8KHD-CLKX-PRO options) provides basic and separated jitter measurements geared toward clock signals in circuit, plus Phase Noise, SSC and Acummulated Jitter measurements with Clock Expert Pro.

Spectrum Analyzer (WR8KHD-SPECTRUM) creates an RF Spectrum Analyzer-like environment for analyzing frequency-dependent effects. Use FFT with little or no concern about the details of setting up an FFT.

DDR Debug Toolkit (WR8KHD-DDR*-TOOLKIT) provides test, debug and analysis tools for the entire DDR design cycle. The unique DDR analysis capabilities provide automatic Read and Write burst separation, bursted data jitter analysis, and DDR-specific measurement parameters.

Power Analysis Software (HDO6K-PWR) lets you measure and analyze the operating characteristics of power conversion devices and circuits.

Digital Power Management Analysis (WR8KHD-DIGPWRMGMT) software translates complicated multi-phase PMIC, VRM, POL, LDO and other DC rail behaviors into per-cycle measurements and Waveforms (plots) for complete and fast understanding of DC-DC converter power system behaviors.

3-Phase Power Analysis software (WR8KHD-THREEPHASEPOWER) provides complete static and dynamic 3-phase electrical power analysis, with options for harmonics measurements, dq0 transforms and vector display. **Motor Drive Analysis** software delivered standard on MDA 8000HD oscilloscopes features the same capabilites with additional mechanical speed & torque measurements designed specifically for testing motor drives.

Power Device (WR8KHD-PWRDEV) simplifies setup of power measurements for double-pulse testing.

Many **Serial Trigger & Decode Options** provide added insight when debugging serial data protocols. Options are offered as trigger and decode (D/TD); plus serial data measure/graph and eye diagram tests (DME/TDME); plus Symbolic decoding (DME/TDME Symbolic). Physical layer test packages (TDMP) are also available for some protocols.

QualiPHY ensures physical layer compliance for a large number of serial data protocols. For the most up to date list of decoder and QualiPHY options, go to teledynelecroy.com/serialdata.

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 *WaveRunner/MDA 8000HD Oscilloscopes Operator's Manual* can be downloaded from the Technical Library under **Manuals > Oscilloscopes**. This PDF document 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.

European Council

CE The instrument bears this mark to indicate it conforms to all applicable European Council standards. Please see the EC Declaration of Conformity document shipped with your product for current certifications.

EMC DIRECTIVE

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

EN IEC 61326-1:2021 EMC requirements for electrical equipment for measurement, control and laboratory use

EN IEC 61326-2-1:2021 Particular requirements for sensitive test and measurement equipment for EMC unprotected applications [1, 2, 3]

[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.

LOW VOLTAGE DIRECTIVE

The instrument 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+A1:2019 Safety requirements for electrical equipment for measurement, control and laboratory use–Part 1: General requirements

EN 61010-2:030:2021 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:

- 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.

END-OF-LIFE HANDLING / WEEE

The instrument bears this mark 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 of your Teledyne LeCroy product, 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.

European Contact:*
Teledyne GmbH, European Division
Im Breitspiel 11c
D-69126 Heidelberg
Germany
Tel: + 49 6221 8270

United Kingdom

The instrument bears this mark to indicate conformity with health, safety, and environmental protection standards for products sold within Great Britain (England, Wales and Scotland).The design of the product has been verified to conform to the applicable harmonized standards and technical specifications, and with the relevant Union harmonization legislation.

Australia and New Zealand

The instrument bears this mark to indicate it complies with the EMC provision of the Australian Communication and Media Authority (ACMA) Radio Communications Act:

AS/NZS CISPR 11:2015, 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 information.

United States and Canada

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

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

UL 61010-2-030 Ed. 2-2018 – Particular requirements for equipment having testing or measuring circuits.

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

CAN/CSA-C22.2 No. 61010-2-030:18 – Particular requirements for equipment having testing or measuring circuits.

China

Unless otherwise specified, all materials and processes are compliant with the latest requirements of China RoHS 2.

ISO Certification

Manufactured under an ISO 9000 Registered Quality Management System.

Intellectual Property

All patents pertaining to the WaveMaster 8000HD are on our website at:

teledynelecroy.com/patents/

936958-00 Rev A,
October, 2024

TELEDYNE LECROY
Everywhereyoulook™