



TELEDYNE LECROY
Everywhereyoulook™

HDO8000 8-Channel High Definition Oscilloscopes Getting Started Guide

HD
4096





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HDO8000

8-Channel High Definition 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 so unique to our instruments. This Getting Started Guide is designed to cover important safety and installation information for your oscilloscope, along with some basic operating procedures so you're quickly working with waveforms.

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INTRODUCTION



HDO8000
8-Channel High Definition Oscilloscopes

About the HDO8000 Oscilloscopes

HDO8000 High Definition Oscilloscopes have more channels, more resolution, more bandwidth and more memory than any other midrange oscilloscope. They are ideal for debugging and troubleshooting high power or three-phase power electronics, automotive electronics, and embedded/mechatronic designs with high resolution sensor signals. Comprehensive digital logic (MSO), low-speed serial data trigger, decode and analysis toolsets, and the widest variety of probes and application packages complete the solution. Get the most intuitive long-memory analysis using the unique Q-Scape™ multi-tab display architecture.

HD4096 Technology

HD4096 high-definition technology consists of high sample rate 12-bit ADCs, high signal-to-noise input amplifiers, and a low-noise system architecture. This technology enables HDO™ oscilloscopes to capture and display signals up to 1 GHz with a high sample rate and 16 times more resolution than other oscilloscopes. Waveforms captured and displayed on the HDO6000 with HD4096 technology are cleaner and crisper. Signal details often lost in the noise are clearly visible and easy to distinguish, and measurements can be performed with unmatched precision for improved debug and analysis.

Mixed Signal Option

With embedded systems growing increasingly more complex, powerful mixed signal debug capabilities are an essential part of modern oscilloscopes. The 16 integrated digital channels and set of tools designed to view, measure and analyze analog and digital signals enable fast debugging of mixed signal designs. Flexible analog and digital cross-pattern triggering across all 24 channels provides the ability to quickly identify and isolate problems in an embedded system.

Long Memory

Capture large amounts of data with more precision using the 250 Mpts of acquisition memory. Zoom in for detail, use Roll Mode for extremely long time periods, or 2.5 GS/s for capturing fast transients and slow events together over longer periods than ever before possible.

Q-Scape Multi-Tab Display Architecture

Unique Q-Scape multi-tab display architecture speeds your understanding of your design by providing four times the display area. Quickly move waveforms to different tabs through drag-and-drop. Extended desktop supports UHD 3840 x 2160 pixel displays.

Comprehensive Analysis Tools

HDO8000 has the most comprehensive trigger, decode, math, measurement, and application toolsets available. Use tracks, trends and histograms to enhance understanding of complex behaviors. Navigate waveforms in the frequency domain using spectrum analyzer type controls. WaveScan® Search and Find allows you to search a single acquisition using more than 20 different criteria. LabNotebook concisely documents and stores your results.

Specifications

Detailed specifications are maintained in the Datasheet on the product page at teledynelecroy.com.

Key Specifications	
Bandwidth	350 MHz–1 GHz
Resolution	12-bit, up to 15-bit enhanced
Analog Channels	8
Sample Rate (all channels)	2.5 GS/s
Memory (per channel)	50 Mpts/ch
Optional Memory (per channel)	250 Mpts/ch
Digital Channels	16
Digital Sample Rate	1.25 GS/s
Minimum Detectable Pulse Width	2 ns
Maximum Input Frequency	250 MHz

Materials List

Check that you have all the parts listed here. Contact Teledyne LeCroy immediately if any part is missing.

- 1 oscilloscope
- 4 passive probes
- 1 AC power cord (rated for country)
- 1 protective front cover
- 1 Getting Started Guide
- 1 Oscilloscope Security Certificate
- 1 Oscilloscope Registration Card
- 1 Calibration Document

HD08k-MSO option includes:

- 1 digital leadset
- 5 flying ground leads
- 20 ground extenders
- 22 XL microgrippers
- enabling keycode (installed on HD08000 oscilloscope)

General Safety Information

This section contains instructions that must be observed to keep the instrument operating in a correct and safe condition. You are required to follow generally accepted safety procedures in addition to the precautions specified in this section. **The overall safety of any system incorporating this instrument is the responsibility of the assembler of the system.**

Symbols

These symbols appear on the instrument's front or rear panels and in its documentation to alert you to important safety considerations.

 **CAUTION** of damage to instrument, or **WARNING** of hazard to health. Attend to the accompanying information to protect against personal injury or damage. Do not proceed until conditions are fully understood and met.

 **WARNING.** Risk of electric shock.

 Measurement ground connection.

 Alternating Current.

 On/Standby power.

Precautions

- **Use proper power cord.** Use only the power cord shipped with this instrument and certified for the country of use.
- **Maintain ground.** This product is grounded through the power cord grounding conductor. To avoid electric shock, connect only to a grounded mating outlet.
- **Connect and disconnect properly.** Do not connect/disconnect probes or test leads while they are connected to a voltage source.
- **Observe all terminal ratings.** Do not apply a voltage to any input (C1-C8, EXT or Dig) that exceeds the maximum rating of that input. Refer to the front of the oscilloscope for maximum input ratings.
- **Use only within operational environment listed.** Do not use in wet or explosive atmospheres.
- **Use indoors only.**
- **Keep product surfaces clean and dry.**
- **Do not block the cooling vents.** Leave a minimum six-inch gap between the instrument and the nearest object. Keep the underside clear of papers and other objects.
- **Do not remove the covers or inside parts.** Refer all maintenance to qualified service personnel.
- **Do not operate with suspected failures.** Inspect all parts regularly and do not use the product if any part is damaged. Cease operation immediately and sequester the instrument from inadvertent use.

Operational Environment

Temperature: 5° to 40° C

Humidity: Maximum relative humidity 90% for temperatures up to

31° C decreasing linearly to 50% relative humidity at 40° C

Altitudes: up to 3,000 m (at < 30° C)

Power and Ground Connections

The instrument operates from a single-phase, 100 to 240 Vrms ($\pm 10\%$) AC power source at 50/60 Hz ($\pm 5\%$) or a 100 to 120 Vrms ($\pm 10\%$) AC power source at 400 Hz ($\pm 5\%$). The instrument automatically adapts to the line voltage. Manual voltage selection is not required.

The AC inlet ground is connected directly to the frame of the instrument. For adequate protection against electric shock, connect to a mating outlet with a safety ground contact.

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

Maximum power consumption with all accessories installed (e.g., active probes, USB peripherals, digital leadsets) is 550 W (550 VA). Power consumption in standby mode is 10 W.

Cleaning

Clean only the exterior of the oscilloscope using a damp, soft cloth. Do not use harsh chemicals or abrasive elements. Under no circumstances submerge the instrument or allow moisture to penetrate it. Avoid electric shock by unplugging the power cord from the AC outlet before cleaning.

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

Support

Online Documentation

Online Help is available by selecting Support > Help from the oscilloscope display menu bar.

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

The *HDO8000 Oscilloscopes Operator's Manual* can be downloaded from teledynelecroy.com/support/techlib. This .PDF document contains more extensive procedures for operating your oscilloscope than are found here. You can also download Oscilloscope System Recovery Tools and Procedures, which contains instructions for using Acronis® True Image® Home included with the oscilloscope.

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

Technical Support

Registered users can contact their local Teledyne LeCroy service center at the number listed in this guide to make Technical Support requests by phone or email. You can also submit Technical Support requests via the website at teledynelecroy.com/support/techhelp.

SET UP



HDO8000
8-Channel High Definition Oscilloscopes

SET UP

The Front of Your Oscilloscope



- A** Touch Screen Display
- B** Front Panel
- C** Shortcut Buttons
- D** Built-in Stylus Holder
- E** Power Button
- F** Channel Inputs
- G** Mixed Signal Interface
- H** Ground and Calibration Output Terminals
- I** USB Ports
- J** Tilting Feet

The **touch screen display** is the principal viewing and control center of the oscilloscope. See "Touch Screen Display" for an overview of its components.

The **front panel** houses buttons and knobs that control different oscilloscope settings. Operate the instrument using front panel hard controls, display soft controls, or a mix of both that is convenient for you.



All front panel knobs have multiple modes of operation: pressing them invokes one action and turning them another. The labels below the knob tell you what happens when you "Push" instead of turn.

Immediately beneath the touch screen is a row of **shortcut buttons** that launch various oscilloscope functions, such as LabNotebook, Spectrum Analyzer, or serial data trigger and decode software.



The **built-in stylus holder** stores a stylus that can be used with the touch screen display.



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

The **Power button** turns on the oscilloscope. See "Powering On/Off" for more information.

Channels 1–8 are signal inputs to the oscilloscope; **Ext** is for connecting an external trigger device.

The **mixed signal interface** connects the digital leadset to input up-to-16 digital lines (with the HDO8k-MSO option only).

Ground and calibration output terminals are used to compensate passive probes.

The **tilting feet** enable easier benchtop viewing.

Signal Inputs

Digital Leadset

Supplied with the purchase of the Mixed Signal option, the digital leadset enables input of up-to-16 lines of digital data. Lines can be organized into four logical groups and can be named 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.

Probes

HDO8000 Oscilloscopes are compatible with the included passive probes and all Teledyne LeCroy ProBus active probes that are rated for the oscilloscope's bandwidth. Probe specifications and documentation are available at teledynelecroy.com/probes.

The Side of Your Oscilloscope



The side of the HDO8000 houses a **removable hard drive**.

To remove the drive:

1. Loosen the two knobs that secure the cover and remove it. You may use a screwdriver to loosen the knobs.
2. Grab the drive by the attached tab and pull out.

To replace the drive:

1. Insert the drive with the label facing away from you. Do not force the drive into place. Strong resistance may mean the drive is flipped the wrong way.
2. Replace the cover.



Power down the oscilloscope before removing or replacing the drive. Failure to do so may damage the instrument. Secure the cover at all times when the drive is in place.

The Back of Your Oscilloscope



- A** Built-in Carrying Handle
- B** Ref In/Out connector to input/output an external Reference Clock
- C** Aux Out connector to send device trigger enabled, trigger out, or pass/fail output to another device
- D** USBTMC Port for remote control
- E** Ethernet Ports (2) for LAN connection
- F** Host USB 3.0 Ports (4)
- G** Display Port for external monitor
- H** Audio In/Out: Speaker, Mic, and Line-In for external audio devices
- I** AC Power Inlet for the AC line cord
- J** Kensington Lock

Carrying

The oscilloscope's case contains a **built-in carrying handle**. Always unplug the instrument from the power source before lifting and carrying it.

Powering On/Off

Connect the line cord rated for your country to the AC power inlet on the back of the instrument, then plug it into a grounded AC power outlet. (see Power and Ground Connections in "General Safety Information").

Press the **Power button** to switch on the instrument. The LED on the button lights to show the oscilloscope is on.



CAUTION. Do not change the instrument's Windows® Power Options from the default Never to System Standby or System Hibernate modes.



CAUTION. Do not power on or calibrate the oscilloscope with a signal attached.

Use the **File > Shutdown** menu bar option to switch "off". Pressing the Power button again will execute a shutdown, but we do not recommend doing this as it does not allow the Windows operating system to shut down properly, and memories and setup panels will not be saved.

The Power button does not disconnect the oscilloscope from the AC power supply; 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.



CAUTION. Do not place the instrument so that it is difficult to reach the power cord in case you need to disconnect from power.

We recommend unplugging the instrument if it will remain unused for a long period of time.

Connecting

After start up, configure the oscilloscope as necessary and described below. See the *HDO8000 Oscilloscopes Operator's Manual* for more detailed instructions.

USB Peripherals

Connect the device to a USB port on the front or back of the instrument.

Printer

HDO8000 supports printers that operate with the provided USB host ports and are compatible with the Windows OS installed on the oscilloscope. Simply connect the printer to any host USB port, then go to **Utilities > Utilities Setup > Hardcopy** to configure printer settings.

External Controller

Connect an Ethernet cable from a LAN port on the back of the instrument to the controller. Go to **Utilities > Preference Setup > Remote** to configure remote control using TCPIP or LXII.

Other Oscilloscope (for Reference Clock)

Connect a BNC cable from Ref In/Out on the back of the instrument to the other instrument. Go to **Timebase > Horizontal Setup > Reference Clock** to configure the clock.

Other Auxiliary Device

Connect a BNC cable from Aux Out on the back of the instrument to the other device. Go to **Utilities > Utilities Setup > Aux Output** to configure the connection.

SET UP

LAN

HDO8000 accepts DHCP network addressing. Connect a cable from either Ethernet port on the back panel to a network access device. Go to **Utilities > Utilities Setup > Remote** and select TCPIP to obtain a network connection and 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 **Utilities > Preference Setup > Email** to configure email settings.

External Monitor

HDO8000 supports up to UHD monitors with 3840x2160 resolution. Connect the monitor cable to the Display Port output on the back of the instrument (you can use a convertor if the cable has a different interface). Configure display settings using the Windows control panel dialogs. Be sure to configure the oscilloscope as the first monitor. 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 software user interface can be controlled through touch on the external monitor.

Note: External monitors with Fujitsu drivers cannot be used as touch screens, only as displays.

Language Selection

To change the language that appears on the display, go to **Utilities > Preference Setup > Preferences** and make your **Language** selection. The oscilloscope software must be restarted after the language is selected.

If you wish to also change the language of the Windows operating system:

1. Choose File > Minimize to hide the oscilloscope display and show the Windows Desktop.
2. From the Windows task bar, choose Start > Control Panel > Clock, Language and Region.
3. Under Region and Language select Change Display Language.
4. Click the Install/Uninstall Languages button.
5. Select Install Language and Browse Computer or Network.
6. Click the Browse button, navigate to D:\Lang Packs\ and select the language you want to install. Follow the installer prompts.
7. After exiting the Control Panel, click the oscilloscope icon in the lower-right corner of the desktop to maximize the oscilloscope display.

Note: The available languages are: German, Spanish, French, Italian, and Japanese. Other language packs are available from Microsoft's website

Software Activation

The oscilloscope operating software (firmware and standard applications) is active upon delivery.

Purchasing Software Options

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

1. Go to Utilities > Utilities Setup > Options.
2. Touch Add Key.
3. Enter the new license key and click OK.
4. Reboot the oscilloscope.

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. 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 (xstreamdsoinstaller_x.x.x.x.exe) and double-click it to launch the XStream Setup wizard.
6. Follow the wizard prompts.
7. When installation is complete, power cycle the instrument.



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

USER INTERFACE



HDO8000
8-Channel High Definition Oscilloscopes

USER INTERFACE

Touch Screen Display

The entire display is a touch screen. Use your finger or the stylus to touch, double-touch, touch-and-drag, touch-and-hold (right click) and 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 for you.



- A** Menu Bar
- B** Display Tabs when in Q-Scape Multi-tab Display Mode
- C** Grid Area
- D** Trigger Level Indicator
- E** Channel Descriptor Box
- F** Trigger Position Indicator
- G** Timebase and Trigger Descriptor Boxes
- H** Dialog Tabs

A **menu bar** of drop-down menus 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 area** displays the waveform traces. You can adjust many grid settings on the Display Setup dialog. In Q-Scape mode, **display tabs** appear along the top of each grid area. Each tab can be configured for a different grid display.

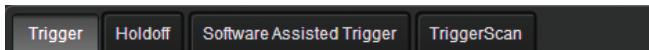
Trigger level and **trigger position** indicators appear on the grid when a trigger is set, color-coded to match the input.

Trace Descriptor boxes appear along the bottom of the grid area, one for each open trace.

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.

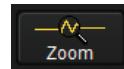
For convenience, related dialogs appear as a series of tabs behind the main dialog. Touch the tab to open the dialog.



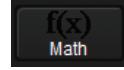
A **toolbar** along the bottom of the main Channel, Math, Memory and Digital dialogs applies common actions so that you don't have to leave the underlying dialog. They always apply to the active (highlighted) trace.



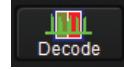
Apply up-to-12 measurement parameters.



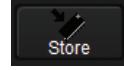
Display a zoom of the trace.



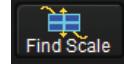
Apply a math function to the trace.



Open the Serial Decode dialog.



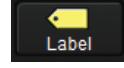
Copy the active trace to the corresponding internal memory (e.g., C2 to M2).



Scale the waveform to fit the grid.



Move the active trace to the next grid.



Apply a custom label to the trace.

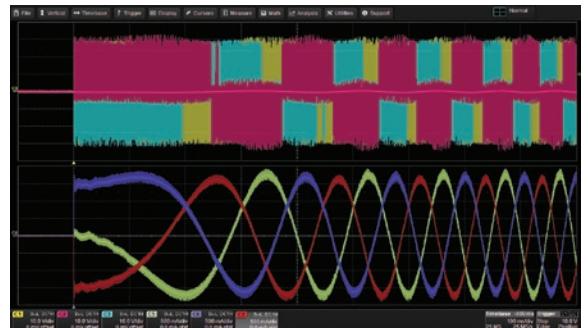
Display Grid

Every grid is 8 Vertical divisions representing 4096 Vertical levels and 10 Horizontal divisions. The value represented by each division depends on the Vertical and Horizontal scale settings of the traces that appear on it.



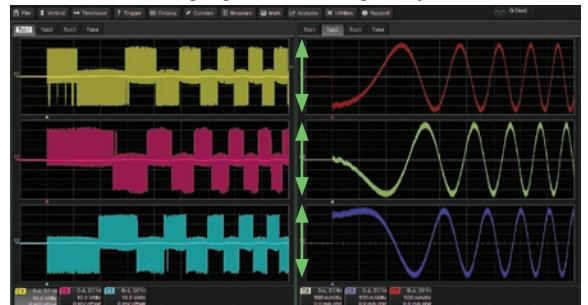
Multi-Grid Display

The grid area can contain multiple grids. Each grid still represents 4096 Vertical levels. Therefore, absolute Vertical measurement precision is maintained. A variety of multi-grid styles are available.



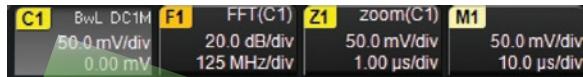
Q-Scape Multi-Tab Display

In addition, the grid area can be divided into multiple tabs. Each tab can show a single grid or a multi-grid style.



Trace Descriptor Boxes

Channel (C1-C8), Zoom (Z1-Z12), Math (F1-F12), Memory (M1-M12), and Digital (Digital1-Digital4, with MSO) **descriptor boxes** appear along the bottom of the grid area when a trace is turned on. They have three main functions:



Inform—trace descriptors summarize current settings for that trace. Units and scale shown are appropriate to the type of trace.

Navigate— when you touch the descriptor box, the corresponding setup dialog opens.



Arrange—if you drag-and-drop the descriptor box onto another grid, the trace moves to that grid.

USER INTERFACE

Entering>Selecting Data

Touch & Type



Touching once activates a control. In some cases, you'll immediately see a pop-up menu of options. Touch one to select it.



In other cases, data entry fields appear highlighted on the display. When a data entry field is highlighted (as shown above), it is active and can be modified by using the front panel Adjust knob.

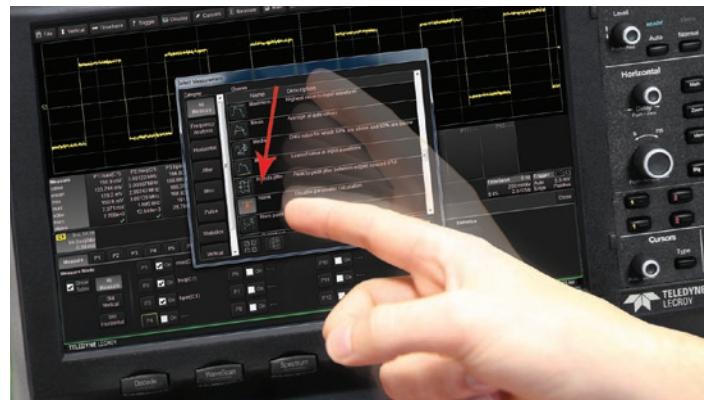


If you have a keyboard installed, you can type your entry in the active field. Or, you can touch again, then select your entry from the pop-up menu or keypad.

You'll see a pop-up keypad when you double-touch a numerical data entry field. Touch the soft keys to use it exactly as you would a calculator. When you touch OK, the calculated value is entered in the field.

Touch & Swipe

Touch-and-swipe the screen in an up or down direction to scroll long lists of values. You can also use scroll bars or Up/Down arrow keys to scroll lists until you've selected the desired value.



Touch & Drag

Touch-and-drag traces, labels, cursors and trigger indicators to reposition them on the grid. This is the same as setting the values on the dialog.

To quickly zoom areas of the grid, touch-and-drag to draw a selection box around a portion of the trace.



Use the stylus when you need a more precise selection tool than your finger. It is especially helpful for zooming exact areas of the grid or selecting values that lie close together on pop-up menus.

Working With Traces

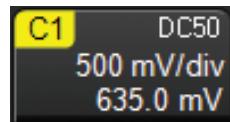
The easiest way to turn on a trace is to use the front panel **C1-C8**, **Dig(ital)**, **Math**, **Zoom**, and **Mem(ory)** buttons. A waveform appears on the grid, a new descriptor box opens at the bottom of the grid area, and the corresponding setup dialog opens. This is now the “active” trace.

To turn off a trace, press the front panel button again.

Active vs. Inactive Trace

A highlighted descriptor box indicates the active trace, and all display and front panel actions will apply to that trace until another is selected. This is true for all traces, regardless of the type. Although several traces may be open and appear on the display, only one at a time is active.

Also, the front panel buttons will light to indicate the active trace.



Inactive. Controls will not work for this trace.



Active. Controls will work for this trace.

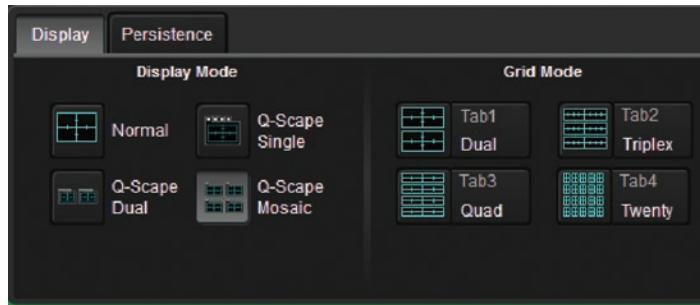
Moving Traces

To move traces from grid to grid, drag-and-drop the trace descriptor box onto the desired grid, or activate the trace and use the **Next Grid** toolbar button. This enables you to rearrange traces on the grids in any way you like.

You can also drag the trace right or left to view pre- or post-trigger time, or up and down to change the Vertical offset.

Changing the Display

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**, 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 in Q-Scape Display Mode with an extended display.

Display Mode vs. Grid Mode

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

By default, the oscilloscope is in **Normal** Display Mode (a single grid area and no tabs) with the **Auto** grid style enabled. **Auto** adds a grid for each new trace, up to 16 grids, until no more grids are available. Other grid styles create a fixed number and orientation of grids; the icon shows the result.

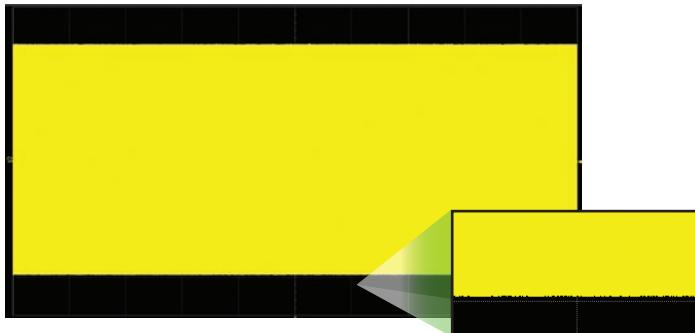
The various **Q-Scape** Display Modes divide the screen into tabbed displays. Each tab can be configured with different grid styles. Many of the same grid functions you can perform in **Normal** mode, such as moving traces to other grids, you can also perform in the **Q-Scape** Display Modes.

Line and Intensity

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.

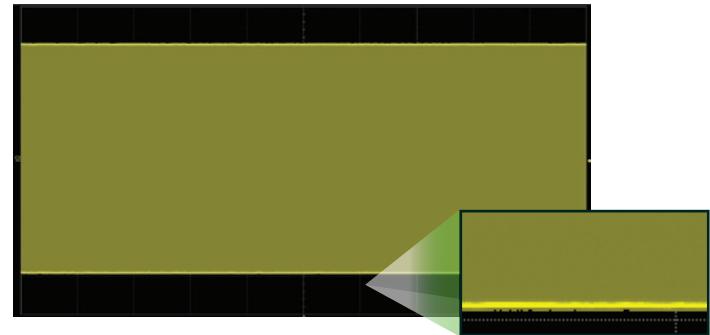
When more data is available than can actually be displayed, **Trace Intensity** helps to visualize significant events by applying an algorithm that dims less frequently occurring samples.



With Intensity 100%



The front panel **Intensity button** sets the Adjust knob to control the trace intensity setting.



With Intensity 40%

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 *HDO8000 Oscilloscopes Operator's Manual*. Below are a few useful front panel controls.

- A** **Auto Setup** turns on and configures all channels with a signal attached. The edge trigger level is set to the signal mean.
 - B** **Default Setup**, on the other hand, returns all channels to the factory default settings.
 - C** The **Print** button captures the entire screen and handles it according to your Hardcopy setting (print to file on USB drive, create LabNotebook entry, etc.).
 - D** The **Touch Screen** button enables or disables touch screen functionality.
 - E** **Clear Sweeps** resets math and measurement counters.
 - F** The front panel **Adjust** knob changes the value in any highlighted data entry field when turned. Pushing the Adjust knob toggles between coarse (large increment) or fine (small increment) adjustments when the knob is turned.
- All the knobs on the front panel function one way if turned and another if pushed like a button. The top label describes the knob's principal "turn" action, while the bottom label describes its "push" action.
- Many front panel buttons light to indicate the function is active.



BASICS



HDO8000
8-Channel High Definition Oscilloscopes

Vertical

These controls adjust the channel trace along the Y axis.

From the Front Panel



A Press Channel (number) button to turn on analog trace or Dig button to turn on digital trace (HDO8k-MSO option only).

B Turn to raise or lower Vertical Offset (analog) or Vertical Position (digital).

C Turn to raise or lower Vertical Scale (analog) or Group Height (digital).



Analog Traces From the Display

Choose Vertical > Channel Setup.



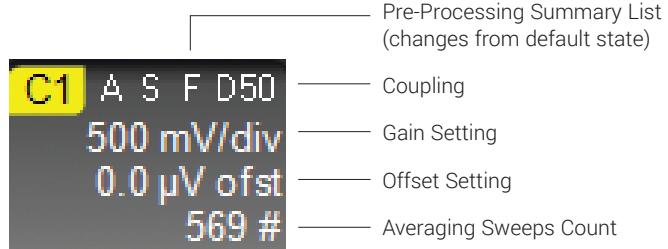
A Check boxes to turn on traces.

B Touch any Vertical setting to change the value.

C Go to Cx tab to rescale or make pre-processing settings.

D Copy selected channel setup to any other channels.

Channel Descriptor Box

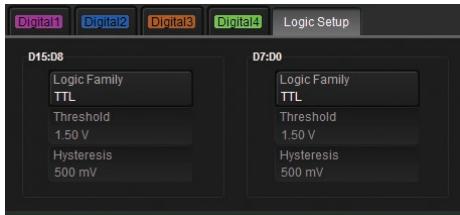


Digital Traces From the Display

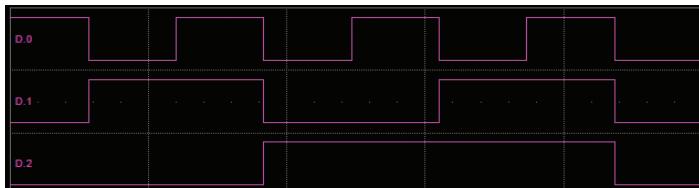
Choose Vertical > Digital Setup.



- A Touch Digital tab to choose group (1-4).
- B Choose Display Mode of digital lines, bus trace or both.
- C Touch arrows to switch between banks 0-7 and 8-15.
- D Touch checkboxes to select the lines in the group.
- E Enter Vertical Position (top of lowest bit relative to center) and Group Height (vertical space occupied by group) in divisions.
- F Open Logic Setup tab and set Threshold.
- G Watch Line Activity Indicators instead of line traces to quickly see the state of each digital line.



Choose a standard Logic Family, or enter custom values for Threshold and Hysteresis. Separate controls allow you to set different values for each bank.



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



Bus trace collapses lines into hex values.

Digital Descriptor Box



- # Digital Lines in Group
- Digital Sample Rate
- Digital Memory

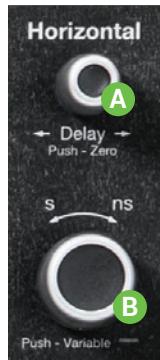
Line Activity Indicators



Horizontal (Timebase)

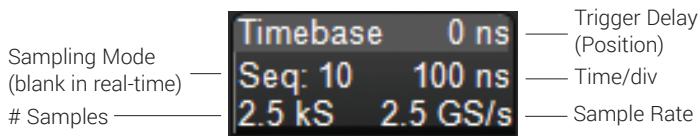
These controls adjust the trace along the X axis.

From the Front Panel



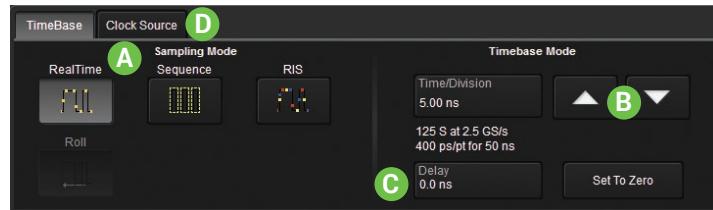
- A** Turn to raise or lower trigger Delay. Push to return Delay to zero.
- B** Turn to raise or lower Horizontal Scale (Time/div). Push to adjust scale with more precision on math, memory, or zoom traces.

Timebase Descriptor Box



From the Display

Touch the Timebase descriptor box to open the Timebase dialog.



- A** Touch button to select a Sampling Mode.
- B** Use the Up/Down buttons to change Time/Division.
- C** Enter a Delay time or use the button to Set To Zero.
- D** Use Clock Source dialog to change reference clock.

Triggers

Triggers tell the oscilloscope when to perform an acquisition. Available trigger types are described at more length in the *HDO8000 Oscilloscopes Operator's Manual*.

From the Front Panel



- A** Opens the Trigger dialog.
- B** Stops the oscilloscope from acquiring data.
- C** Triggers once (single-shot acquisition) when all conditions are met.
- D** Triggers repeatedly whenever all conditions are met.
- E** Same as Normal when there is a valid trigger; triggers after a preset period when there is no valid trigger.
- F** Turn to raise or lower Trigger Level (V). Push to automatically find the level.
- G** Lights up when a trigger is armed.
- H** Lights up when a trigger has fired.

From the Display

Touch Trigger descriptor box to open the Trigger dialog.



A Touch to choose trigger Type.

B Touch to set Trigger Level (V).

C Touch to let the software automatically set trigger level based on the input signal.

Trigger Descriptor Box

Trigger Status	Trigger Source
Trigger Type	Trigger Coupling
Trigger Type	Trigger Level
Trigger Type	Trigger Slope

Trigger Indicators



Level
Indicator



Position
Indicator



Pre/Post-Trigger Indicator appears at the corner of the grid when a trigger point is no longer visible.

Cursors

Cursors set measurement points on a trace. There are five preset cursor types, each with a unique appearance on the display: Horizontal (Time), Horizontal + Vertical, Vertical (Amplitude), Horizontal (Frequency), and Horizontal (Event). These are described in more detail in the *HD08000 Oscilloscopes Operator's Manual*.

From the Front Panel



- A** Press to apply cursor. Continue pressing to cycle through all cursor types.
- B** Turn to adjust cursor position. Push to select different cursor lines to adjust.

From the Display



- A** Choose Cursor > Cursor Setup to open the Cursor dialog.
- B** Touch to choose Cursor Type.
- C** Touch-and-drag cursor line to reposition cursor.
- D** Vertical Cursor readout appears on descriptor boxes.
- E** Horizontal Cursor readout appears below Timebase.

Measurements & Statistics

Measurements are waveform parameters that can be expressed as numerical values, such as amplitude or frequency. You can set up to 12 simultaneous measurements on one or more traces and view the active readout in a table. Statistical measurements 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.



- A Choose Measure > Measure Setup to open the Measure dialog.
- B Use Measure dialog to turn on/off measurements, statistics, histicons, and help markers.
- C Readout of parameter values. Touch any cell to re-open Measure dialog if closed.
- D Use Px dialog to create/change custom measurement.
- E Choose source channel.
- F Choose parameter.
- G Use Gate tab to set measurement gates, or drag gate markers from edge of grid.
- H Touch button to plot Histogram, Trend, or Track of measurement.

Math

Math traces display the result of applying a mathematical function (e.g., FFT) to one or more traces. One important distinction between math functions and measurement parameters is that the result of math is always another waveform trace, whereas the result of measurement is a number.



- A Choose Math > Math Setup or press front panel Math button to open Math dialog.
- B Select an existing function to turn it on. Math trace (F1-F12) opens in separate grid.
- C Touch Fx tab or button to set up or change a function.
- D Math descriptor box shows math scaling. Touch to re-open function tab and adjust trace.

Zoom

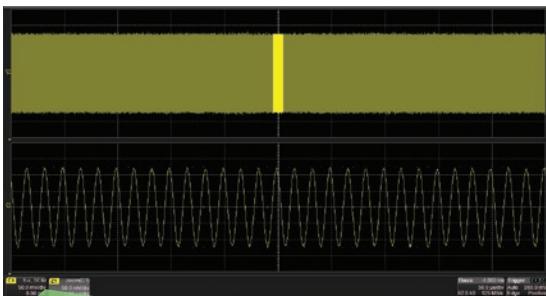
Zooms display a magnification of another trace. You can create up to 12 zooms (Z1-Z12) from any other type of trace.

From the Front Panel



Press the Zoom button.

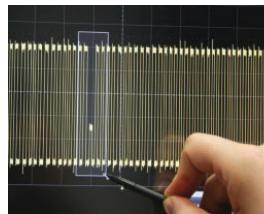
Zoom trace opens for every open channel trace. The zoomed portion of the original trace is highlighted.



Use Vertical knobs to adjust V/div.

Use Horizontal knobs to adjust Time/div.

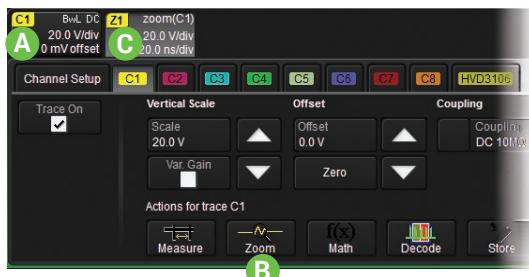
From the Display



Draw a zoom box on a portion of a trace, then choose a zoom location (Zx).

Repeat on another section to open a new zoom trace.

OR



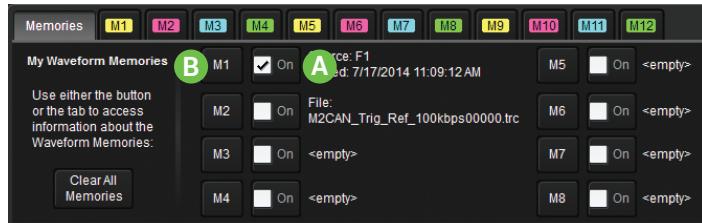
- A** Touch Channel descriptor box to activate the trace.
- B** Touch the Zoom toolbar button.
- C** Touch Zoom descriptor to open the Zoom dialog and rescale the zoom.

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. You can store up to 12 internal memories (M1-M12). After that, new memories will overwrite previously stored data.

Internal memories only persist 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 one of the four internal memories for viewing by choosing File > Recall Waveform. Only memory files saved with the extension .trc can be recalled.

Press the front panel Mem(ory) button to open the Memory dialog.



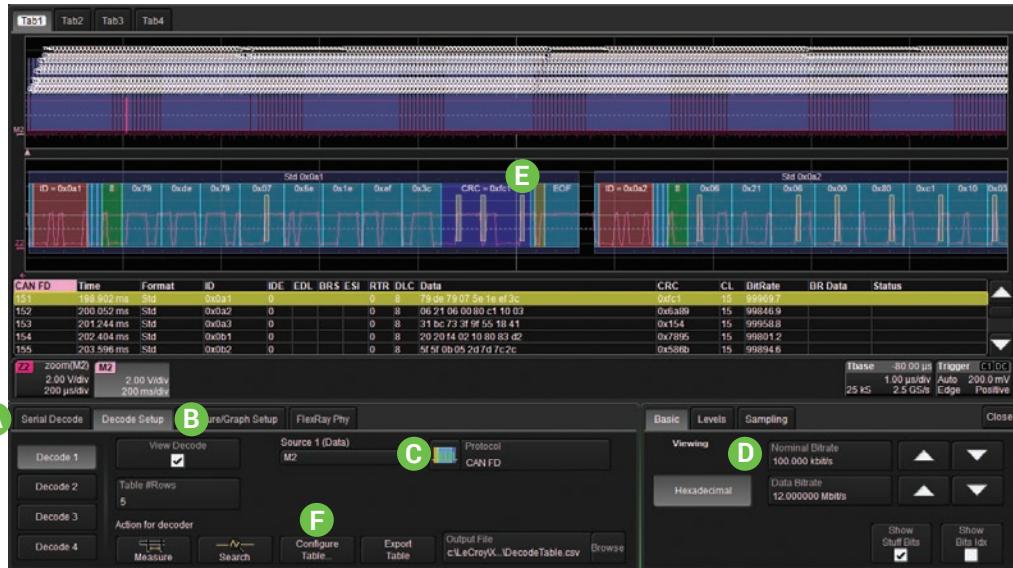
- A** To turn on a stored memory, check On next to M1-M12.
- B** To store a new memory, touch M1-M12 button or tab.



- C** Select source trace in Copy From Waveform.
- D** Touch to copy to internal memory.
- E** Add notes or labels to stored waveform.

Decode

The **Decode** shortcut button is activated when serial trigger and decode software options are installed. Press it to open the serial decode dialogs. Decoders apply software algorithms to extract encoded serial data information from physical layer waveforms measured on your oscilloscope. The extracted information is displayed over the waveforms, color-coded to provide fast, intuitive understanding of the relationship between message frames and time synchronous events. Serial triggers fire upon finding decoded data that match complex, user-defined filters. Measure and Graph options allow you to apply special measurements designed for serial data debugging and plot the measurements. See Software Options on p. 44.



- A** Turn on/off preset decoders from Serial Decode dialog, or link the decoder to a serial trigger (where supported).
- B** Open Decode Setup dialog to set up or change a decoder.
- C** Choose input Source(s) and Protocol.
- D** Make other required settings on the right-hand dialogs.
- E** View decoding on the trace overlays and in the result table.
- F** Customize the result table or search for specific events in the decoded waveform.

WaveScan

Press the **WaveScan** shortcut button to open the WaveScan dialogs. 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), easily customized, enable a quick search for events of interest. The results are time stamped, tabulated, and can be selected for individual viewing.



- Choose scan Mode (event to find) and Source waveform to search.
- Refine scan settings.
- Select different views of the results: event table with/without time stamps, scan overlay, zoom trace, or all.
- Take action when an event is found, such as sending a pulse or sounding an alarm.
- Color overlays mark the found events on the trace.
- Result table lists found events. Touch an event to zoom it on the grid.

Spectrum Analyzer

The **Spectrum** shortcut button opens the Spectrum Analyzer tool. Spectrum Analyzer lets you quickly and easily use the Fast Fourier Transform (FFT) for frequency analysis. The controls are the same as you would find on an RF spectrum analyzer. You set the inputs and desired frequency span, and the oscilloscope automatically generates output in units relevant to the frequency domain. A spectrogram generator displays 2D or 3D renderings of historical data.



- A** Use Enable to open/close FFT trace.
- B** Choose type and source of input.
- C** Specify frequency span of interest.
- D** Automatically mark and tabulate peaks, or set measurement markers on frequencies.
- E** 2D or 3D spectrogram shows history of spectra; 2D can be shifted on two axes; 3D can be rotated around three axes.
- F** Tabular readout of marker measurements.
- G** Undo to exit Spectrum Analyzer.

LabNotebook

Press the **LabNotebook** shortcut button to open LabNotebook. The integrated LabNotebook tool lets you build reports containing waveform images and custom annotations right on the oscilloscope. You create individual Notebook Entries as you work, which are saved to a Notebook in a resident database. When you choose File > LabNotebook, the LabNotebook dialog opens showing all your Notebooks and Notebook Entries, where they can be further annotated and exported into different report formats.



- A** Select Notebook.
- B** Create Notebook Entry from dialog or menu bar.
- C** Notebook Entries appear in list. Select from the list to edit or export. Open tab of same name to add description and annotations to an entry.
- D** View screen capture associated with selected entry.
- E** Export selected entries to a report.
- F** Use Flashback to restore all setups to same state as when selected entry was created.
- G** Undo to exit Flashback and return to previous setups.

History Mode

The **History** shortcut button puts the instrument into History Mode. History Mode allows you to review any acquisition saved in the oscilloscope's history buffer, which automatically stores all acquisition records until full. Not only can individual acquisitions be restored to the grid, you can "scroll" backward and forward through the history at varying speeds to capture details and changes in the waveforms over time. Each record is indexed and time-stamped, and you can choose to view the absolute time of acquisition or the time relative to where you are in the history.



- A** Select different display modes: Table with/without Relative Time stamps.
- B** Display a single acquisition in the history by selecting it from the table of acquisitions.
- C** Use the Navigation buttons and the slider bar at the bottom of the dialog to "scroll" the history.

Q-Scape Multi-Tab Display Mode

The **Q-Scape** shortcut button puts the oscilloscope into tabbed display mode. Press the button again to return to Normal display mode (no tabs).



- A** Also use the Q-Scape soft button on the menu bar to change the display mode.
- B** Touch-and-hold (right-click) on tab marker to rename it.
- C** Use the Display dialog to assign a grid mode to each tab.
- D** Drag-and-drop trace descriptor boxes to move traces to different grids. Descriptor boxes remain in tab where trace resides.
- E** Timebase and Trigger descriptors remain outside tabs when in Q-Scape display modes.

Sharing Data

Print/Screen Capture

HDO8000 oscilloscopes offer several ways to preserve and share data, any of which can be associated with the front panel **Print button**.



Pressing Print captures an image of the display, which will then be handled according to your chosen Print method (sent to a printer, saved to a file, etc.). Go to Utilities > Utilities Setup > Hardcopy to configure how the oscilloscope handles the Print command.

Note: To make Print create a new Notebook Entry, go to File > LabNotebook > Preferences and select Create Entry when Hardcopy Pressed.

Sending Data

If the oscilloscope is networked, LabNotebook reports, waveform files, setups, and other user data can be emailed directly from the instrument.

Files can also be transferred to a USB drive through any of the host USB ports. Exit to the desktop (File > Exit) and use the Windows Explorer to transfer files from oscilloscope folders to USB drives. Stored user data files are located on the D: drive.

Temperature Dependent Calibration

The HDO8000 is calibrated at the factory prior to being shipped. This calibration is run at 23° C ($\pm 2^{\circ}$ C) and is valid for temperatures $\pm 5^{\circ}$ C of the original calibration temperature. Within this temperature range the HDO8000 will meet all of the specifications. When the oscilloscope is used outside of this temperature range a temperature dependent calibration is recommended. There are two options for this calibration: Calibrate All or Calibrate Current Setting.

Calibrate All - All possible combinations of vertical and horizontal settings are calibrated at the current temperature. This calibration is valid for the current temperature $\pm 5^{\circ}$ C. This calibration takes about 150 minutes.

Calibrate Current Setting - The oscilloscope is calibrated at the current vertical and horizontal setting. This calibration is valid for this setting for the current temperature $\pm 5^{\circ}$ C. This calibration takes under 60 seconds.

It is recommended that the HDO8000 be calibrated when the temperature range is outside of the $\pm 5^{\circ}$ C of the original calibration temperature or when it has been more than 1 month since the previous calibration.

It is recommended that the HDO8000 be warmed up for at least 20 minutes prior to use. During the HDO8000 warm-up period, the oscilloscope will automatically initiate calibrations to ensure that the HDO8000 is always calibrated.

It is required that all inputs be removed from the oscilloscope prior to performing calibration.

Software Options

Optional software packages are available to enhance the capabilities of an HDO8000 oscilloscope.

Advanced Customization Package (HDO8K-XDEV) supports creation of user-defined measurement parameters and math functions. Algorithms can be created in your favorite programming language, such as MATLAB.

Digital Filter Package (HDO8K-DFP2) implements a set of linear-phase Finite Impulse Response (FIR) and IIR filters to remove undesired spectral components such as noise.

Electromagnetic Compliance Package (HDO8K-EMC) offers specialized measurements to test a design's susceptibility to EM discharge.

JITKIT (HDO8K-JITKIT) makes it easy to understand the basic system jitter performance of clock signals and clock-data activities, including period, half period, cycle-cycle, skew, amplitude, differential voltage crossing, slew rate, and a wide variety of common jitter measurements.

Power Analysis Option (HDO8K-PWR) provides exceptional ability to measure and analyze the operating characteristics of power conversion devices and circuits. Measure critical device power switching, analyze control loop modulation, and measure line power harmonics.

Serial Data Mask Package (HDO8K-SDM) adds eye pattern mask testing capability to the instrument.

Many **Serial Trigger/Decoder Options** (see table) are available to provide added insight when debugging particular serial data standards. For the most up to date list, go to teledynelecroy.com/serialdata.

Part Number	Description
HDO8K-1553 TD	MIL-STD-1553 Trigger and Decoder
HDO8K-ARINC429bus Dsymbolic	ARINC-429 Symbolic Decoder
HDO8K-Audiobus TD/TDG	Audiobus Trigger and Decoder for I ^S , LJ, RJ and TDM (optional Graph)
HDO8K-AUTO	CAN, LIN, and FlexRay Trigger and Decoder
HDO8K-CANbus TD/TDM	CAN Trigger and Decoder (optional Measure and Symbolic)
HDO8K-CAN FDbus TD/TDM	CAN FD Trigger and Decoder (optional Measure and Symbolic)
HDO8K-DigRF3Gbus D	MIPI DigRF 3G Decoder
HDO8K-DigRFv4bus D	MIPI DigRF v4 Decoder
HDO8K-DPHYbus D	MIPI D-PHY Decoder
HDO8K-EMB	I ^C , SPI, UART/RS-232 Trigger and Decoder
HDO8K-ENETbus D	10M and 100M ENET Decoder
HDO8K-FlexRaybus TD/TDP	FlexRay Trigger and Decoder (optional Physical Layer Tests)
HDO8K-I2Cbus TD	I ^C Trigger and Decoder
HDO8K-LINbus TD	LIN Trigger and Decoder
HDO8K-Manchester D	Manchester Decoder
HDO8K-NRZ D	NRZ Decoder
HDO8K-PROTObus MAG	Measure and Graph for serial decoders
HDO8K-SENTbus D	SENT Decoder
HDO8K-SpaceWirebus D	SpaceWire Decoder
HDO8K-SPIbus TD	SPI Trigger and Decoder
HDO8K-UART-RS232bus TD	UART and RS232 Trigger and Decoder
HDO8K-USB2bus D	USB 2.0 Decoder
HDO8K-USB2-HSICbus D	USB-HSIC Decoder

REFERENCE



HDO8000
8-Channel High Definition Oscilloscopes

Service

Contact your local Teledyne LeCroy service center for calibration or other service.

Returning a Product

If the product cannot be serviced on location, the service center will give you a **Return Material Authorization (RMA)** code and instruct you 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 device. Do not include the manual.
2. Pack the product in its case, surrounded by the original packing material (or equivalent).
3. Label the case with a tag containing:
 - The RMA
 - Name and address of the owner
 - Product model and serial number
 - Description of failure or requisite service
4. Pack the product case in a cardboard shipping box with adequate padding to avoid damage in transit.
5. Mark the outside of the box with the shipping address given to you by Teledyne LeCroy; be sure to add the following:
 - ATTN: <RMA code assigned by Teledyne LeCroy>
 - FRAGILE

6. If returning a product to a different country:

- Mark the shipment as a **Return of US manufactured goods for warranty repair/recalibration.**
- If there is a cost for the service, list the cost in the Value column and the original purchase price **For insurance purposes only.**
- Be very specific about the reason for shipment. Duties may have to be paid on the value of the service.

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.

Teledyne LeCroy Service Centers

For a complete list of Teledyne LeCroy offices by country, including our sales and distribution partners, visit: teledynelecroy.com/support/contact

<p>World Wide Corporate Office Teledyne LeCroy 700 Chestnut Ridge Road Chestnut Ridge, NY, 10977, USA teledynelecroy.com</p> <p>Sales and Service: Ph: 800-553-2769 / 845-425-2000 FAX: 845-578-5985 contact.corp@teledynelecroy.com</p> <p>Support: Ph: 800-553-2769 support@teledynelecroy.com</p>	<p>US Protocol Solutions Group Teledyne LeCroy 3385 Scott Boulevard Santa Clara, CA, 95054, USA teledynelecroy.com</p> <p>Sales and Service: Ph: 800-909-7211 / 408-727-6600 FAX: 408-727-0800 protocolsales@teledynelecroy.com</p> <p>Support: Ph: 800-909-7112 / 408-653-1260 psgsupport@teledynelecroy.com</p>	<p>Europe Teledyne LeCroy SA 4, Rue Moïse Marcinhes Case postale 341 1217 Meyrin 1 Geneva, Switzerland teledynelecroy.com/europe</p> <p>Sales and Service: Ph: + 41 22 719 2228 / 2323 / 2277 FAX: + 41 22 719 2233 contact.sa@teledynelecroy.com</p> <p>Support: applications.indirect@teledynelecroy.com</p>
<p>China LeCroy Corporation Beijing Rm. 2001, Unit A, Horizon Plaza No. 6 Zhichun Rd., Haidian Dist. Beijing 100088, China www.lecroy.com.cn</p> <p>Sales: Ph: 86-10-82800318 / 0319 / 0320 FAX: 86-10-82800316 Marketing.China@teledynelecroy.com</p> <p>Service: Rm. 2002 Ph: 86-10-82800245 Service.China@teledynelecroy.com</p>	<p>Korea Teledyne LeCroy Korea 10th fl. 333 Yeongdong-daero Gangnam-gu Seoul 135-280, Korea teledynelecroy.com/korea</p> <p>Ph: ++ 82 2 3452 0400 FAX: ++ 82 2 3452 0490</p>	<p>Japan Teledyne LeCroy Japan 3F, Houbunshafuchi Bldg. 3-11-5, Midori-cho, Fuchu-Shi Tokyo, 183-0006 Japan teledynelecroy.com/japan</p> <p>Ph: + 81-42-402-9400 FAX: + 81-42-402-9586</p>

Certifications

EMC Compliance

EC DECLARATION OF CONFORMITY - EMC

The MDA meets intent of EC Directive 2004/108/EC 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 planes⁴

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 lines⁴

EN 61000-4-5:2006 Power Line Surge, 1 kV AC Mains, L-N, L-PE, N-PE⁴

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:^{*}

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D-69126 Heidelberg

Germany

Tel: + 49 6221 82700

AUSTRALIA & NEW ZEALAND DECLARATION OF CONFORMITY – EMC

The MDA 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 2006/95/EC 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 MDA 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 2002/96/EC and 2006/66/EC 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)

This instrument and its accessories conform to the 2011/65/EU RoHS2 Directive.

ISO Certification

Manufactured under an ISO 9000 Registered Quality Management System.

Warranty

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 oscilloscope 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 or 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 oscilloscope. Spare and replacement parts, and repairs, all have a 90-day warranty.

The oscilloscope'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 warranty of the original equipment manufacturer.

Windows License Agreement

The HDO8000 Series Oscilloscope software runs on the Windows operating system. Teledyne LeCroy's agreement with Microsoft prohibits users from installing third-party software on HDO8000 Oscilloscopes that is not relevant to measuring, analyzing, or documenting waveforms.

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