



WaveSurfer 3000 Getting Started Guide





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WaveSurfer 3000

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 *Getting Started Guide* is designed to cover important oscilloscope safety and installation information along with some basic operating procedures so you're quickly working with waveforms.

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INTRODUCTION

WaveSurfer 3000

About the WaveSurfer 3000 Oscilloscopes

WaveSurfer 3000 oscilloscopes feature the MAUI advanced user interface with touch screen simplicity to shorten debug time. Quickly identify and isolate anomalies with WaveScan, Fast Display, and History mode for faster troubleshooting; LabNotebook enables easy documentation and convenient collaboration. The advanced probeinterface, upgradable bandwidth and multi-instrument capabilities provide maximum versatility and investment protection.

MAUI - A New Wave of Thinking

MAUI is the most advanced oscilloscope user interface. MAUI is designed for touch; all important oscilloscope controls are accessed through the intuitive touch screen. MAUI is made for simplicity; time saving shortcuts and intuitive dialogs simplify setup. MAUI is built to solve; deep set of debug and analysis tools help identify problems and find solutions quickly.

Advanced Anomaly Detection

Combining a fast waveform update rate of 130,000 waveforms/second with History mode waveform playback and WaveScan search and find, the WaveSurfer 3000 is an outstanding tool for waveform anomaly detection.

Capture, Debug, Analyze, Document

The advanced active probe interface gives tremendous flexibility for capturing all types of signals. Debug, analyze and document problems through the use of powerful math and measurement capabilities, Pass/Fail mask testing, sequence mode segmented memory, and LabNotebook report generator.

Multi-Instrument Capabilities

Beyond traditional oscilloscope functionality the WaveSurfer 3000 has a variety of multi-instrument capabilities including waveform generation through a built-in function generator with arbitrary waveform capabilities, protocol analysis with serial data trigger and decode, a digital voltmeter, and logic analysis with an available 16-channel mixed signal option.

Specifications

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

Key Specifications	
Bandwidth	200 MHz – 750 MHz
Channels	2 or 4
Sample Rate (all channels)	2 GS/s
Memory (per channel)	10 Mpts/ch
Digital Channels	16
Digital Sample Rate	500 MS/s
Minimum Detectable Pulse Width	4 ns
Maximum Input Frequency	125 MHz

Materials List

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

- 1 oscilloscope
- 2 or 4 passive probes (one for each channel)
- 1 Micro SD Card (installed)
- 1 AC power cord (rated for country)
- 1 protective front cover
- 1 Getting Started Guide
- 1 Oscilloscope Registration Card
- 1 Calibration Document
- 1 CE Certificate

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, C2, C3, C4, 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.
- **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: 0° to 50° C

Humidity: Maximum relative humidity 90% for temperatures up to 31° C decreasing linearly to 50% relative humidity at 50° C

Altitudes: up to 3,048 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 150 W (150 VA) for four-channel models and 100 W (100 VA) for two-channel models. Power consumption in standby mode is 4 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.

Fuse Replacement

Disconnect the power cord before inspecting or replacing the fuse. Open the fuse holder (located at the rear of the instrument below the AC power inlet) using a small, flat-bladed screwdriver. Replace the old fuse with a new 5 x 20 mm T-rated 3.15 A/250 V fuse. Close the fuse holder before powering on.



WARNING. For continued fire protection at all line voltages, replace the fuse with one of the specified type and rating only. Always disconnect the power cord before replacing the fuse.

Support

Online Documentation

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 *WaveSurfer 3000 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.

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

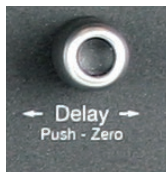
The Front of Your Oscilloscope



- A** Touch Screen Display
- B** Front Panel
- C** WaveSource Waveform Generator Button
- D** Ground and Calibration Terminals
- E** USB Ports
- F** Mixed Signal Interface
- G** Channel Inputs
- H** Power Button
- I** Rotating / 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 second label describes what happens when you “push” instead of turn.



Front mounted host USB 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 MSO option).

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

Channel inputs 1–4 (or 1–2 depending on model) are signal inputs to the oscilloscope.

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

The **rotating, tilting feet** enable four different viewing positions.



The Back of Your Oscilloscope



- A** Built-in Carrying Handle
- B** WaveSource Waveform Generator output connector
- C** Kensington Lock
- D** Micro SD Card Slot
- E** EXT TRIG connector to input an external trigger signal
- F** AUX OUT connector to send device trigger enabled or trigger out signal to another device
- G** VGA Video Output for connecting to external monitors
- H** Ethernet Port for connecting to networks
- I** USBTMC Port for remote control
- J** USB Ports (2) for connecting external USB devices
- K** AC Power Inlet for the AC line cord
- L** Fuse Holder

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").

The **Power button** controls the operational state of the oscilloscope. Press the button to switch on the instrument; the LED on the button lights to show the oscilloscope is on. Press it again to switch "off" (Standby power).



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

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

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 connection on the oscilloscope using the menu options listed below. See the *WaveSurfer 3000 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. Go to **Utilities > Utilities Setup > Hardcopy** to configure printer settings.

External Controller

Connect a USB-A/B cable from the USBTMC port on the back of the instrument to the controller. Go to **Utilities > Preference Setup > Remote** to configure remote control.

WaveSource Waveform Generator (to other device)

Connect a BNC cable from the WaveSource connector on the back of the instrument to the other device. Go to **Utilities > WaveSource** or touch the front panel WaveSource button to configure the output signal.

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.

LAN

WaveSurfer 3000 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 configure a Static IP address, touch **Net Connections** on the Remote dialog and enter the address.

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

External Monitor

WaveSurfer 3000 supports external monitors with 1028 x 600 resolution. Connect the monitor cable to the VGA video output on the back of the instrument. The connection is "plug-and-play" and does not require any further configuration on the oscilloscope. If necessary, configure the monitor to receive output.

Printer

WaveSurfer 3000 supports PictBridge-compliant printers. Connect the printer to any host USB port. The connection is "plug-and-play."

Micro SD Card

The Micro SD Card acts as the oscilloscope's removable hard drive. Use it to store and easily share setup files, waveform trace files, LabNotebook notebooks, and related data.

When using the oscilloscope Disk Utilities, the Micro SD Card appears as Storage Card, while a connected USB drive appears as USB Disk.

Probes

WaveSurfer 3000 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.

Digital Leadset

Available with the purchase of an MS probe, the digital leadset enables input of up-to-16 lines of digital data. Lines can be organized into two logical groups and can be named appropriately.

The digital leadset features two digital banks with separate threshold 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.

Software Activation

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

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 a remote PC, visit our download page and click the link to Oscilloscope Downloads > Firmware Upgrades.
2. Select your oscilloscope series and model number.
3. Enter your registration login information, or create a new account.
4. Click the download link, and choose to Save the installer to a USB storage device.
5. Insert the USB device into one of the ports on the front of the oscilloscope.
6. Go to Utilities > Utilities Setup.
7. On the Utilities dialog, choose Update Firmware.
8. Browse to the installer file in the USB Disk folder, then select Upgrade.
9. When installation is complete, power cycle the instrument.



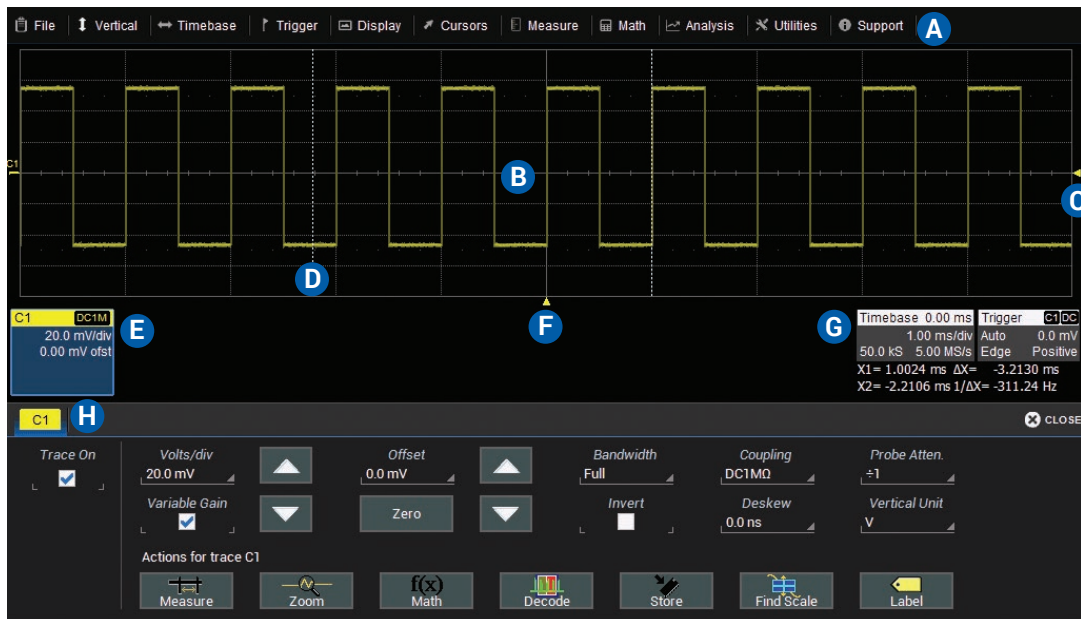
CAUTION. The installation may take several minutes, depending on the length of time since your last upgrade. Do not power down the oscilloscope at any point during the installation process.

USER INTERFACE

WaveSurfer 3000

Touch Screen Display

The entire display is a touch screen. Use your finger 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** Cursor
- 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.

The **grid area** displays the waveform traces. You can adjust the brightness of the grid lines to make other objects more visible.

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

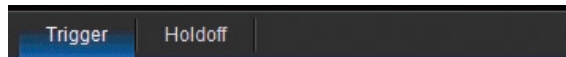
Cursors show where measurement points have been set. Touch-and-drag cursor indicators to quickly reposition the measurement point.

Channel (C1-C4), Zoom (Z1-Z4), Math (F1-F2), Memory (M1-M2), and Digital (Digital1-Digital2, with MSO option) **descriptor boxes** appear immediately below the grid and summarize current settings for each open trace. Touch the descriptor box to open the corresponding set up dialog.

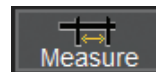
Timebase and Trigger descriptor boxes appear at the right of the display. Timebase and Trigger settings only apply to channel traces. Touch the descriptor box to open the corresponding set up dialog.

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.

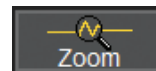
For convenience, related dialogs appear as a series of tabs behind the main dialog. Touch the tab to open the dialog



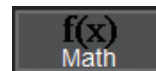
A **toolbar** on the main Channel, Math, and Memory dialogs offers shortcuts to common actions so you don't have to leave the underlying dialog. Actions always apply to the active (highlighted) trace.



Apply measurement parameters to the trace



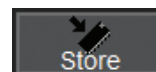
Display a zoom of the trace



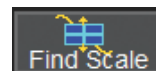
Apply math functions to the trace



Open serial data decoder dialogs (if options installed; else disabled)



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



Scale the trace to fit the grid



Apply a custom label to the trace

Changing the Display

Grid Mode

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

By default, the oscilloscope has **Auto Grid** enabled. Auto Grid adds a grid for each new trace type (channels/memories, math, and zooms) as they open and removes the grid when no longer needed. There are options to display all traces on a single grid, an XY trace, or a single grid with an XY trace.

You can also apply **Axis Labels** to show the value currently represented by the extreme Vertical and Horizontal margins of the grid. **Grid Intensity** makes the grid lines dimmer or brighter relative to the trace.

Language Selection

To change the language that appears on the display, go to **Utilities > Preference Setup > Preferences** and make your **Language** selection. Restart the oscilloscope software after changing the language selection.

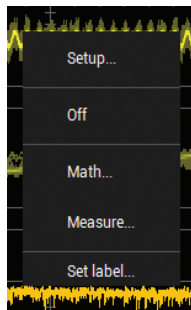
Working With Traces

The easiest way to turn on a trace is to use the front panel **C1-C4**, **Math**, and **Zoom** 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 the trace, press the front panel button again.

Traces can also be turned on/off by using the **Trace On** checkbox on the Channel, Math, Zoom, and Memory setup dialogs.

Trace Context Menu



Touching a trace opens a context menu of actions that can be applied to that trace, such as create math function, apply measurements or label.

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.



Active. Controls will work for this trace.



Inactive. Controls will not work for this trace.

Intensity

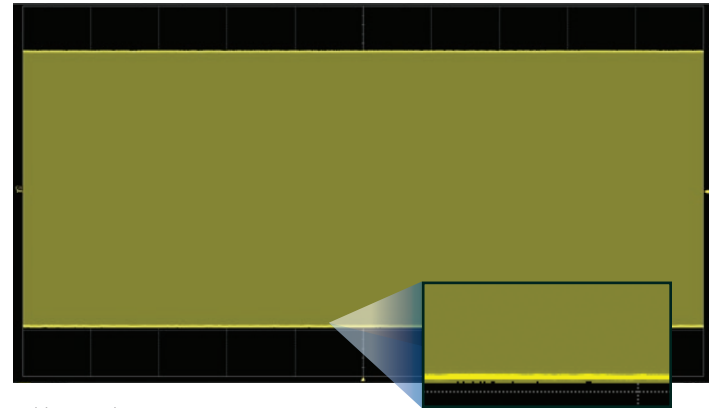
When more data is available than can actually be displayed, **Trace Intensity** helps to visualize significant events by applying an algorithm that dims less frequently occurring samples.



Press the front panel **Intensity button**, then turn the **Adjust knob** to control the Trace Intensity.



With Intensity 100%



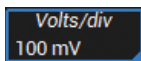
With Intensity 40%

Entering/Selecting Data

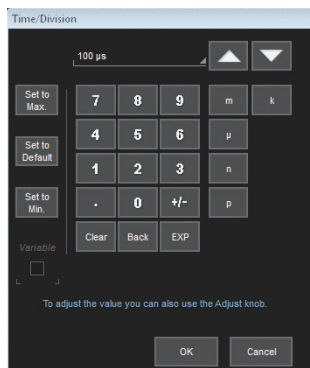
Touch & Type



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 here), 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, 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 value is entered in the field.



On some pop-up menus, options can be displayed as a **list** or as **icons**. Touch the respective button to change the appearance.

Touch & Drag

Touch-and-drag waveforms, cursors and trigger indicators to reposition them on the grid; this is the same as setting the values on the dialog. Quickly zoom areas of the grid by touching and dragging to draw a selection box around a portion of the trace.



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 *WaveSurfer 3000 Oscilloscopes Operator's Manual*. Below are a few useful front panel controls.

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

The **Print button** captures the entire screen and handles it according to your Hardcopy settings (e.g., print, email, or save to file), or creates a Notebook Entry in LabNotebook if configured for it.

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

The **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. Adjust is also used to control the trace intensity value when the **Intensity button** is turned on.

Other shortcut buttons arranged across the bottom (Decode, WaveScan, etc.) open special applications.

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.

Front panel buttons light to indicate which functions and traces are active.



BASICS

WaveSurfer 3000

Vertical

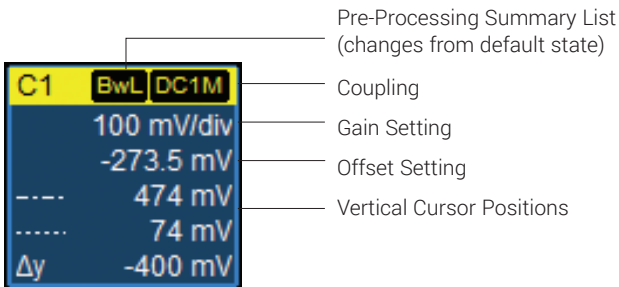
These controls adjust the channel trace along the Y axis.

From the Front Panel

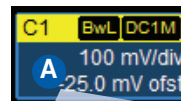


- A** Press to turn on/activate analog trace.
- B** Turn to raise or lower Offset (analog) or Vertical Position (digital). Push to return to zero.
- C** Turn to raise or lower Vertical Scale (analog) or Group Height (digital). Push to adjust with more precision.
- D** Press to activate digital trace (MSO option only).

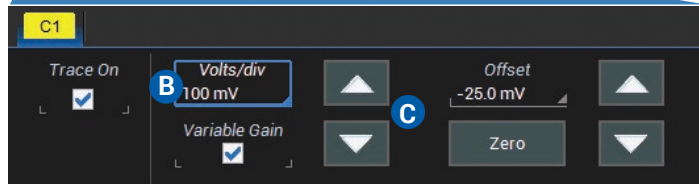
Channel Descriptor Box



Analog Traces From the Display

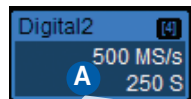


- A** Touch Channel descriptor once to activate the trace and again to open the Channel setup dialog.



- B** Touch any control activate it and change the value.
- C** Use the Up/Down buttons to raise/lower Vertical Scale or Offset.

Digital Traces From the Display

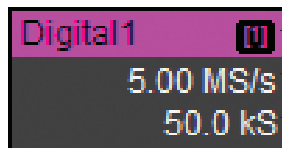


A Touch Digital descriptor once to activate the digital trace and again to open the Digital setup dialog.

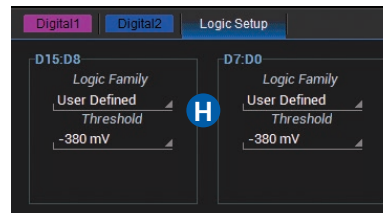


- B** Touch tab to choose digital group (1-2).
- C** Choose to display individual digital lines, bus trace or both.
- D** Touch arrows to switch between banks 0-7 and 8-15.
- E** Touch checkboxes to select the lines in the group.
- F** Enter Vertical Position (top of lowest bit relative to center) and Group Height (vertical space occupied by group) in divisions.
- G** Touch to open Logic Setup dialog.

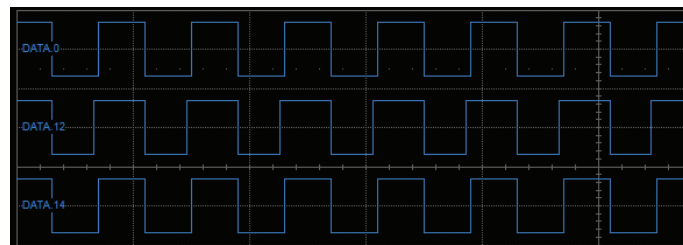
Digital Descriptor Box



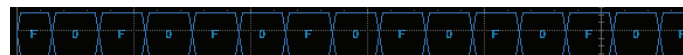
- # Digital Lines in Group
- Digital Sample Rate
- Digital Memory



H Choose a standard Logic Family, or enter custom values for Threshold. 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.

Line Activity Indicators



High



Low



Transitioning

Watch Line Activity Indicators instead of line traces to quickly see the state of each digital line.

Horizontal (Timebase)

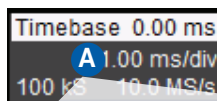
These controls adjust the trace along the X axis.

From the Front Panel

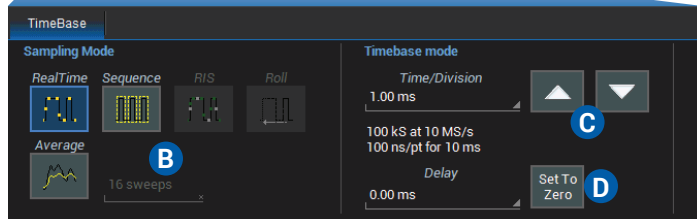


- A** Turn to raise or lower trigger Delay. Push to return Delay to zero.
- B** Turn to raise or lower Horizontal Scale (Time/div). Push to adjust scale with more precision on math, memory, or zoom traces.

From the Display

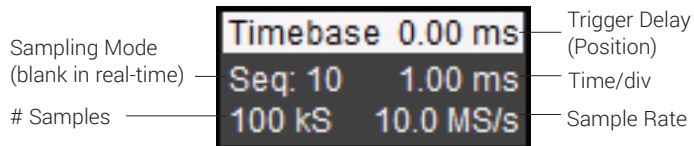


- A** Touch Timebase descriptor to open the Timebase setup dialog.



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

Timebase Descriptor Box



Triggers

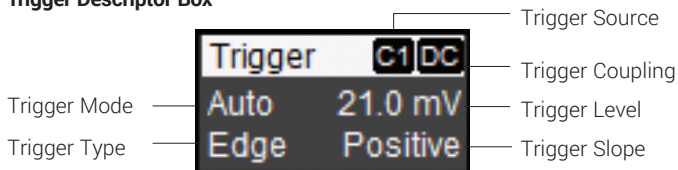
Triggers tell the oscilloscope when to perform an acquisition. Trigger types and modes are described at more length in the *WaveSurfer 3000 Oscilloscopes Operator's Manual*.

From the Front Panel

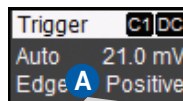


- A** Press to open the Trigger setup dialog.
- B** Press to control acquisition processing:
 Auto – trigger after a preset period if there is no valid trigger.
 Normal – trigger repeatedly whenever all conditions are met.
 Single – trigger once when all conditions are met.
 Stop – stop acquisition.
- C** Turn to raise or lower trigger voltage Level. Push to find a level.
- D** READY lights when trigger armed; TRIG'D lights when trigger fired.

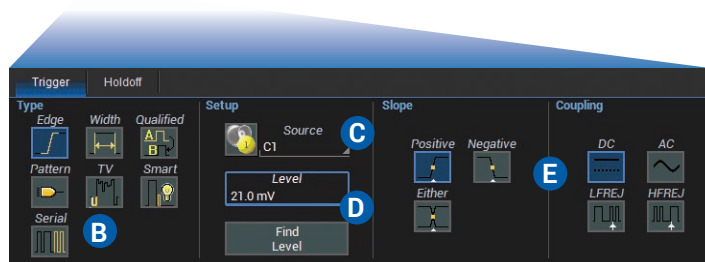
Trigger Descriptor Box



From the Display



- A** Touch Trigger descriptor to open the Trigger setup dialog.



- B** Touch to choose trigger Type.
- C** Choose trigger Source channel.
- D** Set Trigger Level (V), or let the software automatically Find Level based on the input signal.
- E** Choose trigger Coupling and enter other conditions.

Trigger Indicators



Level



Position

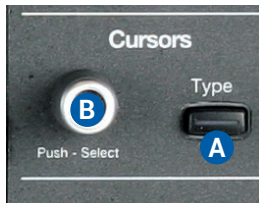


Pre/Post-Trigger – appears at corner of grid when trigger point is no-longer visible.

Cursors

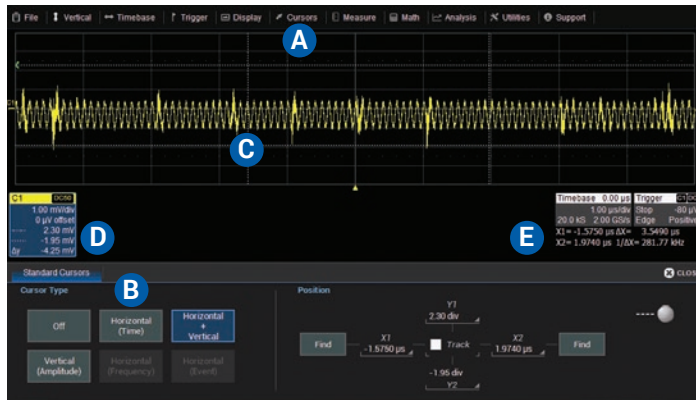
Cursors set measurement points on a trace. There are five preset cursor types, each with a unique appearance on the display. These are described in more detail in the *WaveSurfer 3000 Oscilloscopes Operator's Manual*.

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.

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.

Zoom

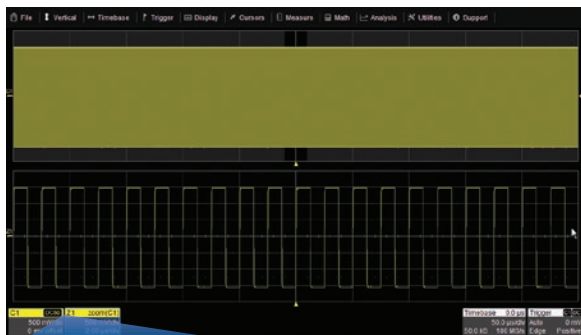
Zoom traces display a magnified portion of another trace.

From the Front Panel



Press the Zoom button.

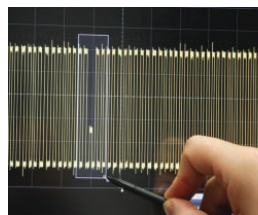
Zoom trace opens for every channel trace. The un-zoomed portion of the original trace is shaded (grey), so that the zoomed portion is more visible.



C1	DC50	Z1	zoom(C1)
	500 mV/div		500 mV/div
	0 mV offset		2.00 μ s/div

Use Horizontal knobs to adjust scale.

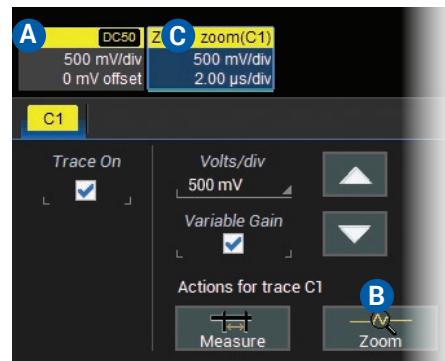
From the Display



Draw a zoom box on a portion of a Channel trace.

Repeat on another section to reposition the zoom trace.

OR



- A** Touch Channel descriptor box to activate the trace.
- B** Touch the Zoom shortcut button.
- C** Touch Zoom descriptor to open the Zoom dialog and adjust scale.

Measurements & Statistics

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



- A** Choose Measure > Measure Setup to open the Measure dialog.
- B** Touch Measure cell to re-open Measure dialog if closed.
- C** Measurement readout table
- D** Select to show measurement table; clear to hide.
- E** Touch to choose parameter.
- F** Touch to choose source trace.
- G** Touch to set measurement gates.
- H** Select to display histograms.
- I** Select to add statistics to the table.

Math

Math traces display the result of applying a mathematical function (e.g., FFT) to one or more channel 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.



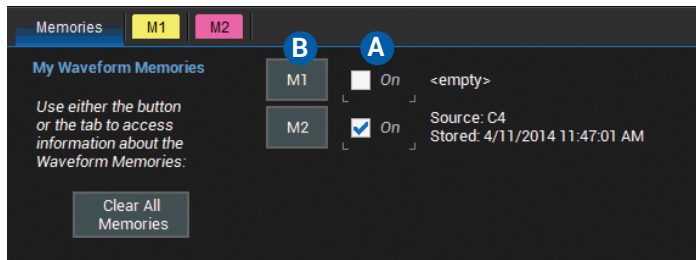
- A** Choose Math > Math Setup or press front panel Math button to open Math dialog.
- B** Select an existing function (F1-F2) to turn it on. Math trace opens in separate grid.
- C** Touch F<#> tab to set up or change a function. (Deselect Trace On to close trace.)
- D** Choose Source channel and math Operator (function).
- E** Math descriptor box shows math scaling. Touch to re-open F<#> tab if closed.

Memories (Reference Waveforms)

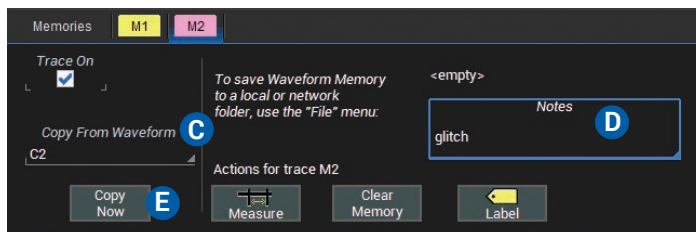
Memories are traces stored for reference. They can be recalled to the display for comparison with other traces. A memory can be zoomed or measured for better analysis of historical data. You can store up-to-two internal memories (M1-M2). After that, new memories will overwrite previously stored data.

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 two 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 stored memory, check On next to M1-M2.
- B** To store new memory, touch M1-M2 button or tab.



- C** Select source trace in Copy From Waveform.
- D** Add notes describing contents of memory.
- E** Touch to copy to internal memory.

WaveSource

The optional WaveSource Waveform Generator allows you to output sine, square, triangle, pulse, DC, Noise, and Arbitrary waveforms from the WaveSurfer 3000.

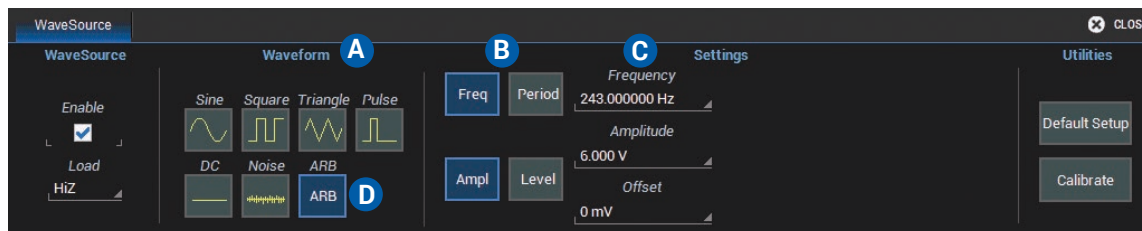
Connect a BNC cable from the WaveSource output on the back of the oscilloscope to the input device.

From the Front Panel

Press the WaveSource button.

From the Display

Choose Utilities > WaveSource.



- A** Select a waveform type.
- B** Choose setup group (e.g., Frequency or Period, Amplitude or Level).
- C** To adjust a parameter, select it and turn the Front Panel Adjust knob or type a new value.
- D** To setup Arbitrary waveforms, select ARB waveform type, then go to the Arbitrary dialog that appears.

Documenting

Print/Screen Capture

Pressing the Print button captures an image of the display, which is then handled according to your chosen Hardcopy method. Go to Utilities > Utilities Setup > Hardcopy to configure how the oscilloscope handles the capture. To make the Print button create a new Notebook Entry when pressed twice, go to File > LabNotebook > Preferences and select Create Entry when Hardcopy Pressed.

Sharing Data

The oscilloscope can be added to a LAN via TCP/IP or directly connected to a PC via USBTMC. Saved files can be emailed directly from the instrument or transferred to a USB drive through any of the host USB ports on the instrument.

LabNotebook

The integrated LabNotebook tool lets you record waveform images and waveform files right on the oscilloscope. You create individual Notebook Entries as you work, which are saved to Micro SD Card. When you choose File > LabNotebook, the LabNotebook dialog opens showing all your Notebook entries. You can also use the LabNotebook Flashback feature to put the oscilloscope back to the exact state it was in when the Notebook Entry was saved. See the *WaveSurfer 3000 Oscilloscopes Operator's Manual* for more information on using LabNotebook.

Temperature Dependent Calibration

The WaveSurfer 3000 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 WaveSurfer 3000 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 45 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 30 seconds.

It is recommended that the WaveSurfer 3000 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 WaveSurfer 3000 be warmed up for at least 20 minutes prior to use. During the WaveSurfer 3000 warm-up period, the specifications are not guaranteed.

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

Software Options

Software options are available to enhance the operation of a WaveSurfer 3000 oscilloscope. After activating your license key (see p.14), these functions are added to the oscilloscope's menu bar.

Multi-Instrument Options

The **Mixed Signal** option (WS3K-MSO) enables mixed analog and digital input and triggering. The digital leadset is delivered with the purchase of this option. See p.13 and p.25.

The **WaveSource Waveform Generator** option (WS3K-FG) provides stimulus output of Sine, Square, Ramp, Pulse, DC, Noise, and Arbitrary waveforms. See p.33.

The **Digital Voltmeter** option (WS3K-DVM) activates an integrated 4-digit digital voltmeter and 5-digit frequency counter that operates through the same probes already attached to the oscilloscope channels. View real-time and statistical (Min, Max, Avg, Range) measurements through a dedicated user interface display that continues even when your triggering system is stopped. The WS3K-DVM license key can be downloaded from teledynelecroy.com/redeem/dvm at no charge.

Serial Trigger and Decode Options

Serial trigger and decode options provide added insight when debugging serial data standards (see table below). For the most up-to-date list, go to: teledynelecroy.com/serialdata.

To access serial trigger and decode functions, press the front panel Decode button or choose Analysis > Serial Decode from the menu bar.

Serial trigger and decoder setup differs depending on the protocol. For detailed instructions, see the *Trigger and Decode Instruction Manual* linked to each serial data standard on our website.

Part Number	Description
WS3K-AUTO TD	CAN Std. and LIN Trigger and Decoder
WS3K-EMB TD	I ² C, SPI, UART/RS-232 Trigger and Decoder
WS3K-CAN FDbus TD	CAN Std. and CAN FD Trigger and Decoder
WS3K-FlexRaybus TD	FlexRay Trigger and Decoder

REFERENCE

WaveSurfer 3000

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 your regional service center 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 Ph: ++ 82 2 3452 0400 FAX: ++ 82 2 3452 0490</p>	<p>Japan Teledyne LeCroy Japan 3F, Houbunshafuchu Bldg. 3-11-5, Midori-cho, Fuchu-Shi Tokyo, 183-0006 Japan teledynelecroy.com/japan Ph: + 81-42-402-9400 FAX: + 81-42-402-9586</p>

Certifications

EMC Compliance

EC DECLARATION OF CONFORMITY - EMC

The oscilloscope 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 planes ⁴

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

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

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

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

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

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

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

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

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

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

European Contact:*

Teledyne LeCroy Europe GmbH
Im Breitspiel 11c
D-69126 Heidelberg
Germany
Tel: + 49 6221 82700

AUSTRALIA & NEW ZEALAND DECLARATION OF CONFORMITY – EMC

Oscilloscope 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 teledyneleeroy.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 oscilloscope has been certified by Underwriters Laboratories (UL) to conform to the following safety standard and bears the cUL Listing Mark:

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

Environmental Compliance

END-OF-LIFE HANDLING



The instrument is marked with this symbol to indicate that it complies with the applicable European Union requirements to Directives 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 WaveSurfer 3000 series oscilloscope software runs on the Windows operating system. Teledyne LeCroy's agreement with Microsoft prohibits users from installing third-party software on WaveSurfer 3000s that is not relevant to measuring, analyzing, or documenting waveforms

