



TELEDYNE LECROY
Everywhere you look™

WaveSurfer 3000z Oscilloscopes Getting Started Guide





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Everywhere you look™

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WaveSurfer 3000z Oscilloscopes

Getting Started Guide

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Welcome

Thank you for buying a Teledyne LeCroy product. We're certain you'll be pleased with the detailed features unique to our instruments. This guide is intended to help you set up a WaveSurfer 3000z oscilloscope and learn some basic operating procedures, so you're quickly working with waveforms.

- See the *MAUI Oscilloscopes Remote Control and Automation Manual* for comprehensive information on remote control of WaveSurfer 3000z.
- See the *WaveSurfer 3000z Oscilloscopes Operator's Manual* for detailed information on the operational features of the WaveSurfer 3000z.

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

Introduction

Introducing WaveSurfer 3000z Oscilloscopes	2	Math	28
Key Specifications	2	Memories (Reference Waveforms)	29
Materials List	2	WaveSource	30
Safety	4	Saving and Sharing Data	31

Overview

Front of Oscilloscope	4	Maintenance	
Powering On/Off	5	Cleaning	32
Back of Oscilloscope	6	Fuse Replacement	32
Connecting to External Devices/Systems	7	Calibration	32
Front Panel	9	Firmware Updates	33
Touch Screen Display	10	Language Selection	33
		Activating Software Options	33
		Service	34

Basics

Changing the Display	12	Reference	
Working With Traces	14	Software Options	35
Vertical	16	Warranty	35
Digital	18	Certifications	36
Horizontal (Timebase)	20		
Triggers	22		
Zoom	24		
Cursors	26		
Measurements & Statistics	27		

Introducing WaveSurfer 3000z

The WaveSurfer 3000z accentuates the Most Advanced User Interface (MAUI) through a 10.1" capacitive touch screen. It promotes true versatility with 20 Mpts of memory, multi-instrument capabilities, a powerful, deep toolbox, and 100 MHz - 1 GHz of bandwidth.

Superior User Experience

MAUI is designed for touch, built for simplicity, and made to solve. Operate the oscilloscope just like a phone or tablet with the most unique touch screen features on any oscilloscope. Time saving shortcuts and intuitive dialogs simplify setup and shorten debug time. A deep set of integrated debug and analysis tools help identify problems and find solutions quickly.

Advanced Anomaly Detection

A fast waveform update rate used in conjunction with history mode, WaveScan, sequence sampling mode, and mask testing facilitates outstanding waveform anomaly detection.

Biggest Touch Screen Display

A large capacitive touch screen enables accessible and responsive touch operation. The 10.1" display is 30% larger than competitive offerings, providing more waveform viewing area.

Powerful, Deep Toolbox

The standard collection of math, measurement, debug, and documentation tools provides unsurpassed analysis capabilities.

Key Specifications

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

Bandwidth	100 MHz		200 MHz - 1 GHz	
Analog Channels	4 standard	2 interleaved	4 standard	2 interleaved
Memory (per channel)	10 Mpts/ch	20 Mpts/ch	10 Mpts/ch	20 Mpts/ch
Sample Rate (all channels)	1 GS/s	2 GS/s	2 GS/s	4 GS/s
Vertical Resolution	8-bit		8-bit	
Digital Channels (optional)	16		16	
Digital Sample Rate	500 MS/s		500 MS/s	
Min. Digital Pulse Width	4 ns		4 ns	
Max. Digital Input Frequency	125 MHz		125 MHz	

Materials List

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

- 1 oscilloscope
- 1 AC power cord rated for the region
- 1 Micro SD card (installed)
- 1 protective front cover
- 4 passive probes
- 1 Getting Started Guide
- 1 Oscilloscope Registration Card
- 1 Calibration Certificate
- 1 Declaration of Conformity (CE Certificate)

Safety

Observe generally accepted safety procedures in addition to the precautions listed here.

Operating Environment

Temperature	0 °C to 50 °C
Humidity	Maximum RH 90% (non-condensing) up to 31 °C decreasing linearly to RH 50% at 50 °C
Altitude	Up to 10,000 ft (3,048 m) at or below 30 °C

Power

AC Power	100-240 VAC (±10%) at 50/60 Hz (±10%) or 100-120 VAC (±10%) at 400 Hz (±5%) Automatic AC Voltage Selection
Consumption Nominal	80 W / 80 VA
Maximum*	150 W / 150 VA
Standby	4 W

* All active probes and peripherals installed.

Symbols



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



WARNING. Risk of electric shock or burn.



Measurement ground connection.



Alternating current



Power On/Standby (Off).

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 live voltage source.

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

Use only within operational environment listed. Do not use in wet or explosive environment.

Exercise care when lifting and carrying. Unplug and use the built-in carrying handle to move the instrument.

Use indoors only.

Keep product surfaces clean and dry.

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

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

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

Front of Oscilloscope



- A. Touch Screen Display
- B. Front Panel
- C. Ground and Calibration Terminals
- D. USB 2.0 Ports
- E. Mixed Signal Interface
- F. Channel Inputs
- G. Rotating / Tilting Feet
- H. Power On/Off Button

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

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

Front mounted **host USB 2.0 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 a Mixed Signal probe).

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

Channels 1–4 are used to input analog signal.




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

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 in "Safety").

The **Power button** controls the operational state of the oscilloscope. Press Power to switch on the instrument and load the oscilloscope software. 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.

Back of Oscilloscope



- A. Built-in Carrying Handle
- B. WaveSource Output
- C. Kensington Lock
- D. Micro SD Card (removable drive)
- E. EXT Trigger Input
- F. AUX Output
- G. VGA Video Output to external monitors
- H. Ethernet Port
- I. USBTMC Port for remote control
- J. USB 2.0 Ports
- K. AC Power Inlet
- L. Fuse Holder

Connecting to External Devices/Systems

After start up, configure external connections using the menu options listed below. See the *WaveSurfer 3000z Oscilloscopes Operator's Manual* for more detailed instructions.

USB Peripherals

Connect the device to one of the host **USB 2.0 ports** on the front or back of the instrument. Most USB connections are "plug-and-play".

Printer

WaveSurfer 3000z supports PictBridge-compliant printers. Connect to any **USB 2.0 port**. Go to **Utilities > Utilities Setup > Hardcopy** to configure printer settings.

External Monitor

WaveSurfer 3000z supports external monitors with 1024 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.

WaveSource Waveform Generator

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

Note: WaveSource is optional and requires an activated license key.

Trigger Out

To send a trigger pulse to another device, connect a BNC cable from the **AUX output** on the back of the instrument to the other device.

LAN

WaveSurfer 3000z is preset to accept DHCP network addressing over a TCP/IP connection. Just connect a cable from the **Ethernet port** on the back panel to a network access device. Go to **Utilities > Utilities Setup > Remote** to find the IP address.

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

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

Remote Control

You can control the instrument using the IP address. Be sure the instrument is on the same subnet as the controller.

To switch to USBTMC control, connect a USB-A/B cable from the USBTMC port on the back of the instrument to the controller. Go to **Utilities > Utilities Setup > Remote** to change the remote control setting to USBTMC.

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, LabNotebooks, and other data.

To remove the card, push in and release. The card should partially pop out, at which point it can be pulled out fully.

To replace the card, push it into the slot until you hear it click.

Note: When using the oscilloscope Disk Utilities, the Micro SD Card is labeled Storage Card, while a connected USB drive is labeled USB Disk.

Probes

WaveSurfer 3000z oscilloscopes are compatible with the included passive probes and most Teledyne LeCroy **ProBus** active probes that are rated for the oscilloscope's bandwidth. Probe specifications and documentation are available at teledynelecroy.com/probes.

Digital Leadset

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

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



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

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

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



Front Panel

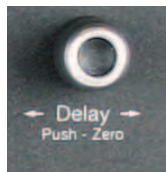
Most of the front panel controls duplicate functionality available through the touch screen display. They are covered in more detail in the Basics section and in the *WaveSurfer 3000z Oscilloscopes Operator's Manual*.

Shortcut buttons arranged across the top of the front panel give quick access to commonly used functions. Other shortcut buttons arranged across the bottom (Decode, WaveScan, etc.) open special applications.

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 (lit).



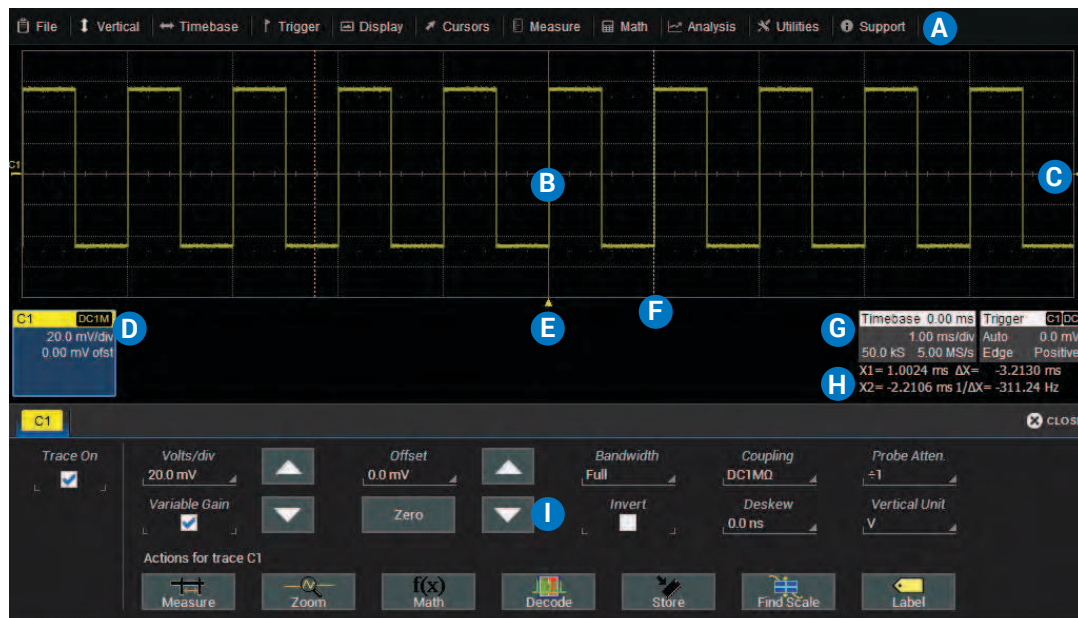
All the knobs on the front panel function one way if turned and another if pushed like a button. The first label describes the knob's principal "turn" action; the second label describes its "push" action.

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



Touch Screen Display

The entire display is a capacitive touch screen. Use your finger or a capacitive stylus (not included) to touch, double-touch, touch-and-drag, or draw a selection box. Many controls that display information also work as “buttons” to access other functions. If you have a mouse installed, you can click anywhere you can touch to activate a control; in fact, you can alternate between clicking and touching, whichever is convenient.



A. Menu Bar

B. Grid Area

C. Trigger Level Indicator

D. Channel Descriptor Box

E. Trigger Time Indicator

F. Cursor

G. Timebase and Trigger Descriptor Boxes

H. Cursor Readout

I. Setup Dialogs

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

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

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

Channel (C1-C4), Zoom (Z1-Z4), Math (F1-F2), Memory (M1-M2), and Digital (Digital1-Digital2, with MSO option) **trace 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.

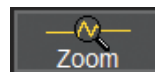
For convenience, related dialogs appear as a series of tabs behind the main dialog. Touch the tab to open the dialog



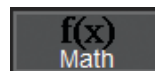
The **Action toolbar** on the main Channel, Math, and Memory dialogs offers shortcuts to common actions so you don't have to leave the underlying dialog. Actions always apply to the active (highlighted) trace.



Apply measurement parameters to the trace



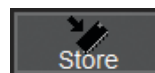
Display a zoom of the trace



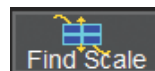
Apply math functions to the trace



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

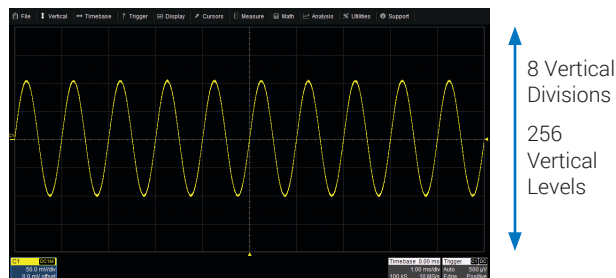


Apply a custom label to the trace

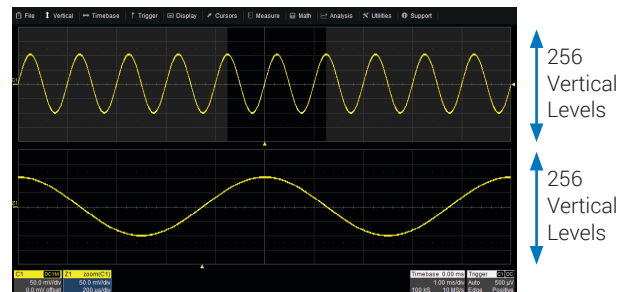
Changing the Display

Grid Mode

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



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



By default, the oscilloscope has the **Auto** grid mode enabled. Auto adds a new grid for each new type of trace—(analog) channel, zoom, or math function—and closes the grid when no longer needed. All traces of the same type appear on the same grid.

You can also choose to display all traces on a **Single** grid, or one of the **XY** grid modes that combine a frequency-time trace with the level-time traces.

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

Line and Intensity

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

You can also apply **Axis Labels** to show the value currently represented by the extreme Vertical and Horizontal margins of the grid.

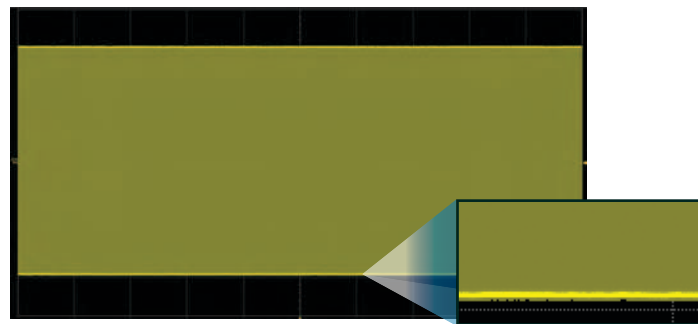
When more data is available than can actually be displayed, **Trace Intensity** helps to visualize significant events by applying an algorithm that dims less frequently occurring samples.



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



With Intensity 100%



With Intensity 40%

Working with Traces

The easiest way to turn on a trace is to press the front panel **C1-C4**, **Math**, and **Zoom** buttons. Provided there is a signal, 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 Descriptor Boxes

Channel (C1-C4), Zoom (Z1-Z4), Math (F1-F2), Memory (M1-M4), and Digital (Digital1-Digital2) descriptor boxes appear along the bottom of the grid area when a trace is turned on. Descriptor boxes summarize and activate the traces they represent.

C1	DC1M	F1	FFT(C1)	Z1	zoom(C1)	M1	
50.0 mV		20.0 dB/div		50.0 mV		50.0 mV	
0.0 mV ofst		500 MHz		5.00 ns/div		50.0 ns/div	

Active vs. Inactive Trace

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

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

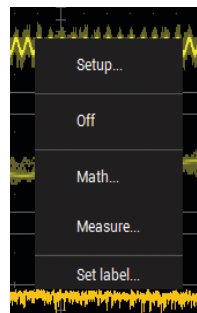


Active. Controls will work for this trace.



Inactive. Controls will not work for this trace.

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.

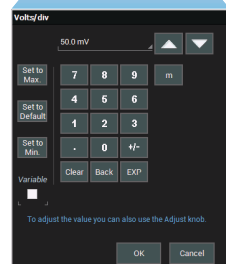
Adjusting Setups

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



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

When an entry field appears highlighted in blue after touching, it is *active* and the value can be modified by turning the front panel knobs. Fields that don't have a dedicated knob (as do Vertical Level or Horizontal Delay) can be modified using the **Adjust knob**.



If you have a keyboard installed, you can type entries in an active data entry field. Or, you can touch again, then “type” the entry by touching keys on the virtual keypad or keyboard.

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

Touch & Drag

Just as you change the display by using the setup dialogs, you can change the setups by moving different display objects.

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 create new zoom traces by touching and dragging to draw a selection box around a portion of the original trace.


Vertical

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

From the Front Panel

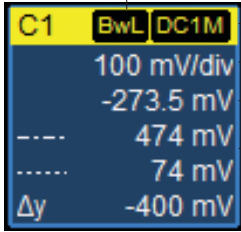
Raise/lower **Offset** from zero. Push to return to zero Offset.

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



The image shows the vertical control section of an oscilloscope front panel. It includes two large rotary knobs. The top knob is labeled 'Vertical' and 'Offset Push - Zero'. The bottom knob is labeled 'V' and 'mV' with a curved arrow, and 'Push - Variable'. To the right of the knobs are five buttons labeled 1, 2, 3, 4, and Dig. A blue line points from the text 'Turn on/activate trace and open setup dialog.' to the button labeled '1'.

Channel Descriptor Box



The Channel Descriptor Box is a digital display showing channel settings. It includes a yellow header bar with 'C1', 'BwL', and 'DC1M'. Below this, it shows '100 mV/div', '-273.5 mV', '---- 474 mV', '----- 74 mV', and 'Δy -400 mV'. Lines point from the text labels on the right to the corresponding elements in the box.

Pre-Processing Summary List (changes from default state)

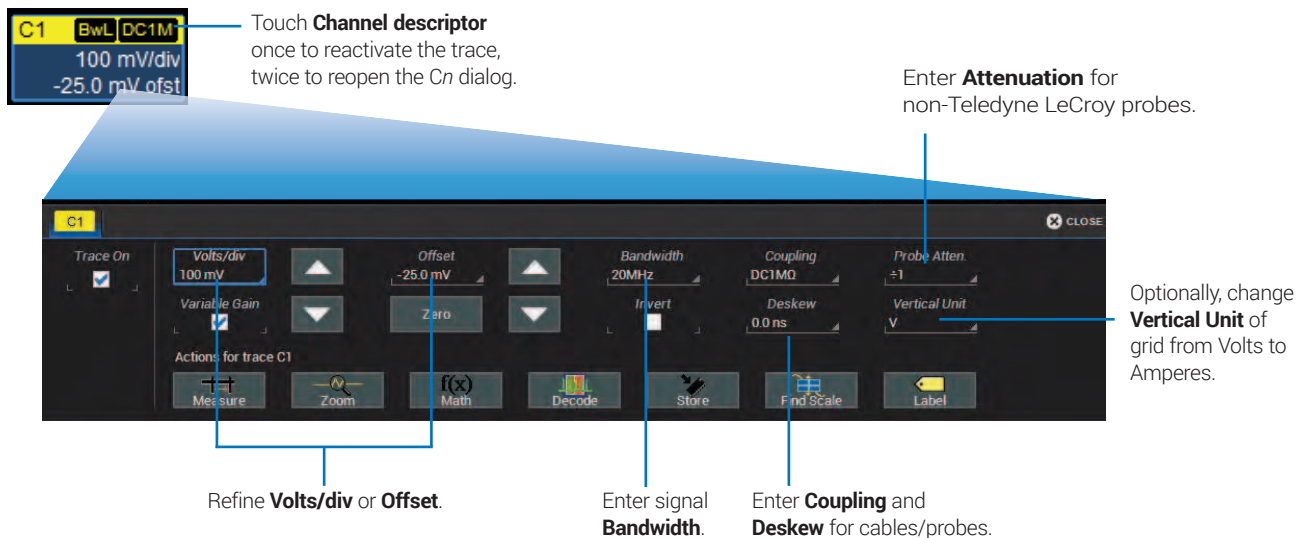
Coupling

Volts/div (Gain)

Offset

Vertical Cursor Positions

From the Touch Screen



Digital

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

From the Front Panel

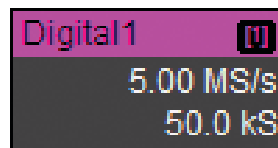
Turn **Offset** to raise/lower group **Vertical Position**, the top of lowest bit relative to center.

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



Turn on/activate digital traces.

Digital Descriptor Box

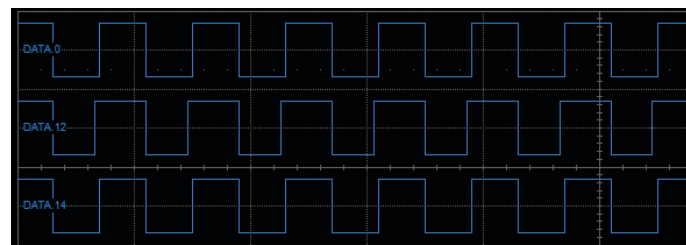


Digital Lines in Group

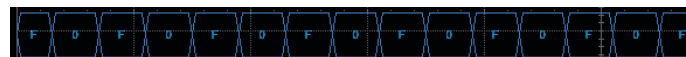
Digital Sample Rate

Digital Memory

Digital Display Modes



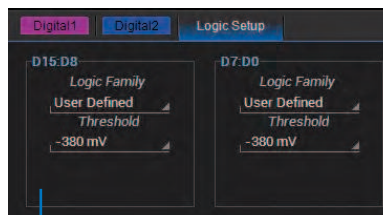
Line trace shows high, low and transition points for each line.



Bus trace collapses lines into hex values.

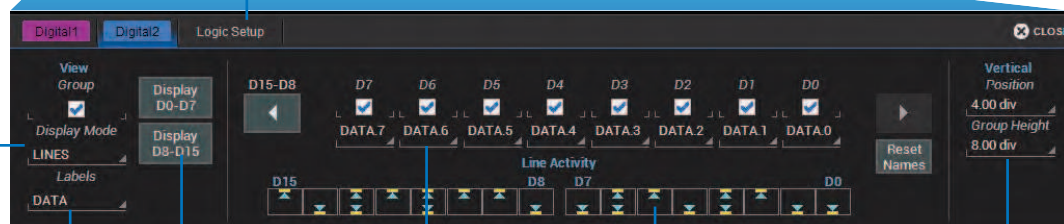
From the Touch Screen

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



On the Logic Setup tab, choose a standard **Logic Family**, or enter a custom **Threshold**. Separate controls allow you to set different values for each lead bank.

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



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

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

Use checkboxes to select the **lines in the group**.
Optionally, enter a unique **line name** in the field beneath.

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

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

Horizontal (Timebase)

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

From the Front Panel



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

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

Timebase Descriptor Box

Sampling Mode (blank in real-time)	Timebase 0.00 ms	Trigger Delay (Position)
# Samples	Seq: 10 1.00 ms	Time/div
	100 kS 10.0 MS/s	Sample Rate

From the Touch Screen

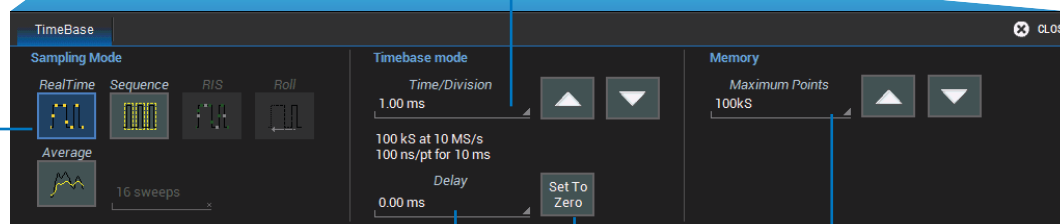
Touch the **Timebase descriptor** to open Timebase setup dialog.

Timebase 0.00 ms
1.00 ms/div
100 kS 10.0 MS/s

Refine **Time/div.**

Select **Sampling Mode**.

When Average, also enter the number of **Sweeps**.



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

Set To Zero removes Delay.

Enter **Maximum Points** of memory to use in acquisition. Default is the maximum available.

Triggers

Triggers tell the oscilloscope when to perform an acquisition. The acquisition starts as soon as the trigger is armed *and* all trigger conditions are met, unless postponed by a Holdoff count of time or number of trigger events. Trigger types and modes are described at more length in the *WaveSurfer 3000z Oscilloscopes Operator's Manual*.

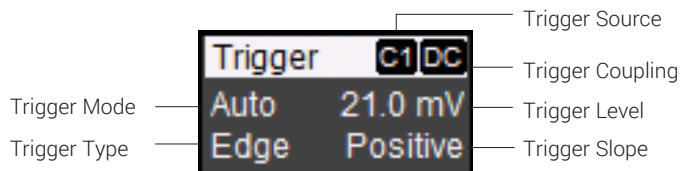
From the Front Panel



Select **Trigger Mode**:

- Auto – trigger after preset period if no valid trigger.
- Normal – trigger repeatedly when all conditions met.
- Single – trigger once when all conditions met.
- Stop – stop acquisition.

Trigger Descriptor Box



Trigger Indicators



Level



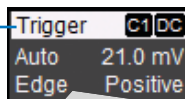
Position



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

From the Touch Screen

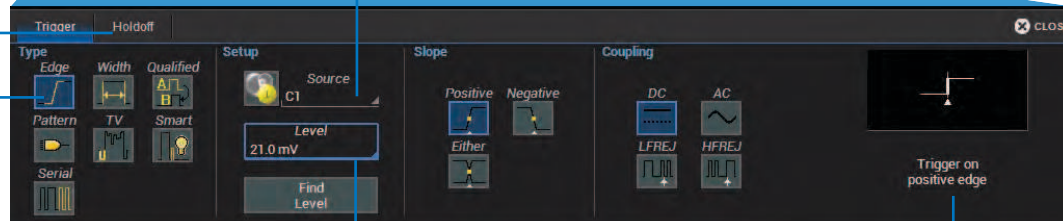
Touch **Trigger descriptor** to open Trigger setup dialog.



Choose trigger **Source** channel.

Open tab to set trigger **Holdoff**.

Choose trigger **Type**.



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


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

Icon summarizes the trigger selections.

Zoom

Zoom traces display a magnified portion of another trace. Any trace can be zoomed, although Zoom is most useful for channel traces, as it allows you to see the source at the original Timebase at the same time as the Zoom "close up."

From the Front Panel

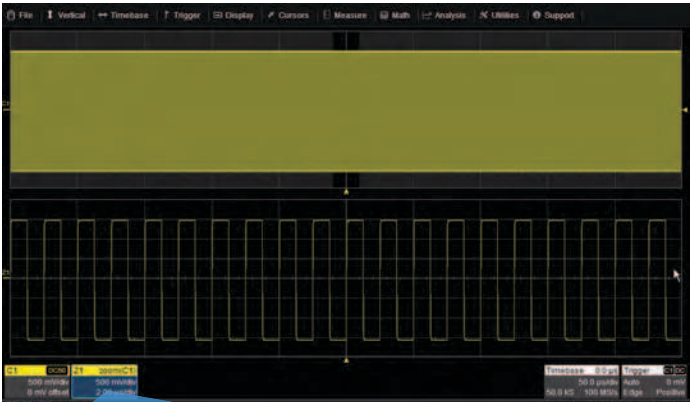


Adjust **Horizontal Scale** to change zoom magnification.

Create **Zoom** of all open traces.

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

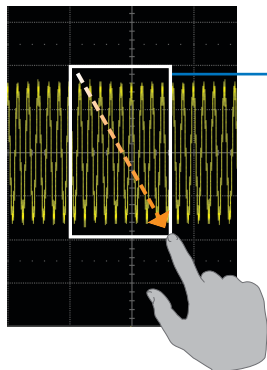
The un-zoomed portion of the original trace is shaded (grey), so that the zoomed portion is more visible.



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

The **Zoom descriptor box** shows the **Zoom Source** and **Horizontal Scale**, which differs from the Timebase.

From the Touch Screen



Draw a **Zoom box** over a portion of the source trace. Repeat on another section to reposition the Zoom trace.

OR



Zoom descriptor opens Zoom dialog to make other adjustments.

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

Cursors

Cursors set measurement points on the Vertical or Horizontal axis of a trace (or both). The five preset cursor types are described in more detail in the *WaveSurfer 3000z Oscilloscopes Operator's Manual*. All show the absolute value where the cursor intersects the waveform and the delta of the two lines.

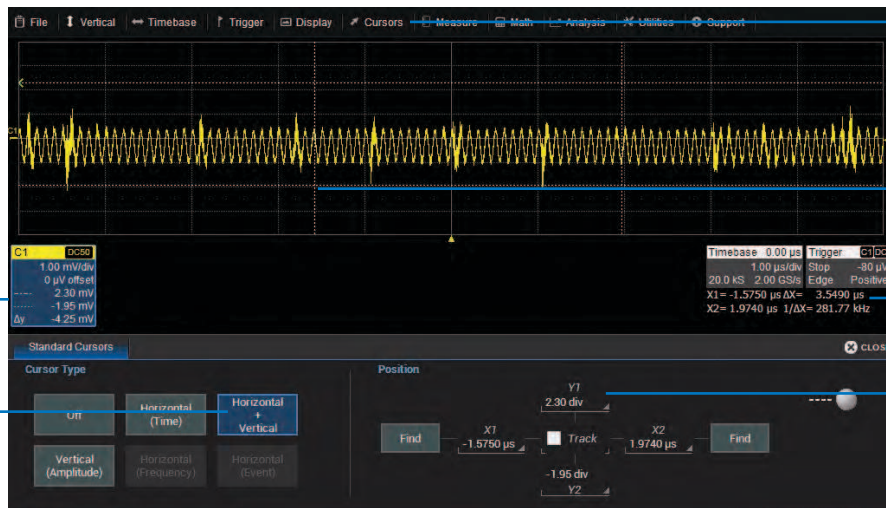
From the Front Panel

Adjust **cursor position**.
Push to select different lines.



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

From the Touch Screen



Vertical Cursor readout
on descriptor boxes.

Choose **Cursor Type**.

Cursors > Cursor Setup
opens the Cursor dialog.

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

Horizontal Cursor readout
below Timebase.

Set exact **Cursor Position**
using dialog.

Track moves both lines
together.

Measurements & Statistics

Measurements are waveform parameters that can be expressed as numerical values, such as amplitude or frequency. You can set up to six simultaneous measurements on one or more traces and view the active readout in a table below the grid. Statistics can be added to the readout along with 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.

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



Measure > Measure Setup opens the Measure dialog.

Add/remove **Statistics** and **Histograms**.

Clear Sweeps to restart measurements..

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

Enter measurement **Gates** in divisions, or just drag gate markers from edge of grid to set gates.

Math

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

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

Math trace units and scale on **F_n descriptor box**.

Math tab to turn on/off function trace.

F_n tab to set up/change function.

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

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

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

Memories (Reference Waveforms)

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

Internal memories persist only until the oscilloscope is rebooted. To store memories indefinitely, save them to an external file by choosing **File > Save Waveform**. The file can then be recalled into one of the two internal memories for viewing by choosing **File > Recall Waveform**. Only memory files saved with the .trc extension can be recalled.



Math > Memory Setup or **front panel Mem button** opens the Memories dialog.

Memory trace units and scale on **Mn descriptor box**.

Memories tab to turn on/off memory.

Mn tab to save new memory.

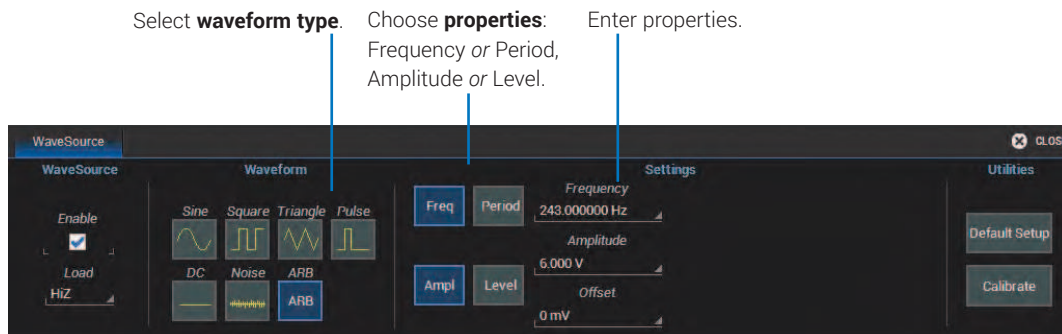
Choose trace saved in **Copy From Waveform**. It must be visible on the grid to save to memory.

Copy Now to save.

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

WaveSource

The optional WaveSource Waveform Generator allows you to output multiple types of waveform signals, including arbitrary waveforms, from the WaveSurfer 3000z. To use it, just connect a BNC cable from the WaveSource output on the back of the oscilloscope to the input device and set up the waveform on the WaveSource dialog. To access WaveSource, press the **front panel WaveSource button**, or choose **Utilities > WaveSource**.



Saving and Sharing Data

Use the oscilloscope **File menu** options to save and recall data. See the *WaveSurfer 3000z Oscilloscopes Operator's Manual* for more information on using these features.

LabNotebooks

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



Setup, Waveform and Table Data

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

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

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

Screen Captures



The front panel Print button captures an image of the screen, which will then be handled according to your chosen Hardcopy (Print) method (send to a printer, save to an image file, etc.).

File Sharing

If the oscilloscope is networked, LabNotebooks, reports, and other user data files can be emailed directly from the instrument or saved to accessible network devices. The oscilloscope can be added to a LAN via TCP/IP or directly connected to a PC via USBTMC.

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

Cleaning

Clean the outside of the WaveSurfer 3000z using a soft cloth moistened with water or isopropyl alcohol solution. Do not use harsh or abrasive cleansers. Dry thoroughly before using. Do not submerge the instrument or allow moisture to penetrate it.

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.

Calibration

The WaveSurfer 3000z is calibrated at the factory prior to being shipped. The calibration is run at 23 °C (± 2 °C) and is valid for temperatures ± 5 °C of the original calibration temperature. Within this temperature range, the WaveSurfer 3000z will meet all specifications once warmed up.

Warm up the WaveSurfer 3000z for at least 20 minutes prior to each use so it can reach a stable operating temperature. Specifications are not guaranteed during the warm up period.

Whenever the oscilloscope is used in an environment ± 5 °C from the original calibration temperature, or when it has been more than one month since the previous calibration, manual calibration is recommended. There are two calibration routines for selection:

Calibrate All calibrates all possible combinations of vertical and horizontal settings at the current temperature. This calibration is valid for the current temperature ± 5 °C and takes about 45 minutes.

Calibrate Current Setting calibrates at the current vertical and horizontal setting. This calibration is valid at this setting only for the current temperature ± 5 °C and takes under 30 seconds.

From the menu bar, choose **Utilities > Preference Setup > Calibration** to run the calibration.



CAUTION. Remove all inputs from the oscilloscope prior to performing calibration.

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

Firmware Updates

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



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

Language Selection

To change the language that appears on the oscilloscope touch screen, from the menu bar, choose **Utilities > Preference Setup > Preferences** and make your **Language** selection.

You can also make this selection at power on by touching the Talk icon when it appears at the upper-right of the touch screen.

Reboot the oscilloscope after changing language.

Activating Software Options

To purchase an option (p.35), contact your Teledyne LeCroy sales representative. You will receive a license key via email that activates the optional features on the oscilloscope. To install the key on the oscilloscope:

1. From the menu bar, choose **Utilities > Utilities Setup > Options**.
2. Touch **Add Key**.
3. Enter the new **license key** and click **OK**.
4. Reboot the instrument.

Service

If the WaveSurfer 3000z cannot be serviced on location, contact your service center for a **Return Material Authorization (RMA)** code and instructions where to ship the product. All products returned to the factory must have an RMA.

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

Follow these steps for a smooth product return:

1. Remove all accessories from the instrument.
2. Label the unit with:
 - The RMA
 - Name and address of the owner
 - Description of failure or requisite service.
3. Pack the instrument in its original shipping box, if available, or an equivalent carton with adequate padding to avoid damage in transit. Do not include the manual.
4. Mark the outside of the box with the shipping address. Add:
 - ATTN: <RMA code assigned by Teledyne LeCroy>
 - FRAGILE
5. **If returning a product to a different country:** contact Teledyne LeCroy Service for instructions on completing your import/export documents.

Service Plans

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

Service Centers

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

Teledyne LeCroy
700 Chestnut Ridge Road
Chestnut Ridge, NY, 10977, USA
teledynelecroy.com

Sales and Service:

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

Support:

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

Software Options

Software options are available to enhance the operation of a WaveSurfer 3000z 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.8 and p.18.

The **WaveSource Waveform Generator** option (WS3K-FG) provides stimulus output of Sine, Square, Ramp, Pulse, DC, Noise, and Arbitrary waveforms. See p.30.

The **Digital Voltmeter** option (WS3K-DVM) activates an integrated 4-digit digital voltmeter and 5-digit frequency counter that operates through the probes already attached to the oscilloscope channels. View real-time and statistical (Min., Max., Avg., Range) measurements through a dedicated display that continues even when your triggering system is stopped.

The free WS3K-DVM license key can be downloaded from

teledynelecroy.com/redeem/dvm.

Serial Trigger and Decode Options

Serial trigger and decode options provide added insight when debugging serial data standards. For the most up-to-date list, go to:

teledynelecroy.com/serialdata.

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

Warranty

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

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

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

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

Certifications

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

EMC Compliance

EC DECLARATION OF CONFORMITY - EMC

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

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

Electromagnetic Emissions:

EN 55011:2010, Radiated and Conducted Emissions Group 1, Class A^{2 3}

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

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

Electromagnetic Immunity:

EN 61000-4-2:2009 Electrostatic Discharge, 4 kV contact, 8 kV air, 4 kV vertical/horizontal coupling 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:*

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

AUSTRALIA & NEW ZEALAND DECLARATION OF CONFORMITY – EMC

The instrument complies with the EMC provision of the Radio Communications Act per the following standards, in accordance with requirements imposed by Australian Communication and Media Authority (ACMA):

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

Australia / New Zealand Contacts:*

RS Components Pty Ltd.	RS Components Ltd.
Suite 326 The Parade West	Units 30 & 31 Warehouse World
Kent Town, South Australia 5067	761 Great South Road
	Penrose, Auckland, New Zealand

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

Safety Compliance

EC DECLARATION OF CONFORMITY – LOW VOLTAGE

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

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

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

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

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

U.S. NATIONALLY RECOGNIZED AGENCY CERTIFICATION

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

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

CANADIAN CERTIFICATION

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

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

Environmental Compliance

END-OF-LIFE HANDLING



The instrument is marked with this symbol to indicate that it complies with the applicable European Union requirements of Directives 2012/19/EU 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, inclusive of any further amendments or modifications of said Directive.

Intellectual Property

All patents pertaining to the WaveSurfer 3000z can be found on our website at:

teledynelecroy.com/patents/

