TELEDYNE LECROY
Everywhereyoulook™

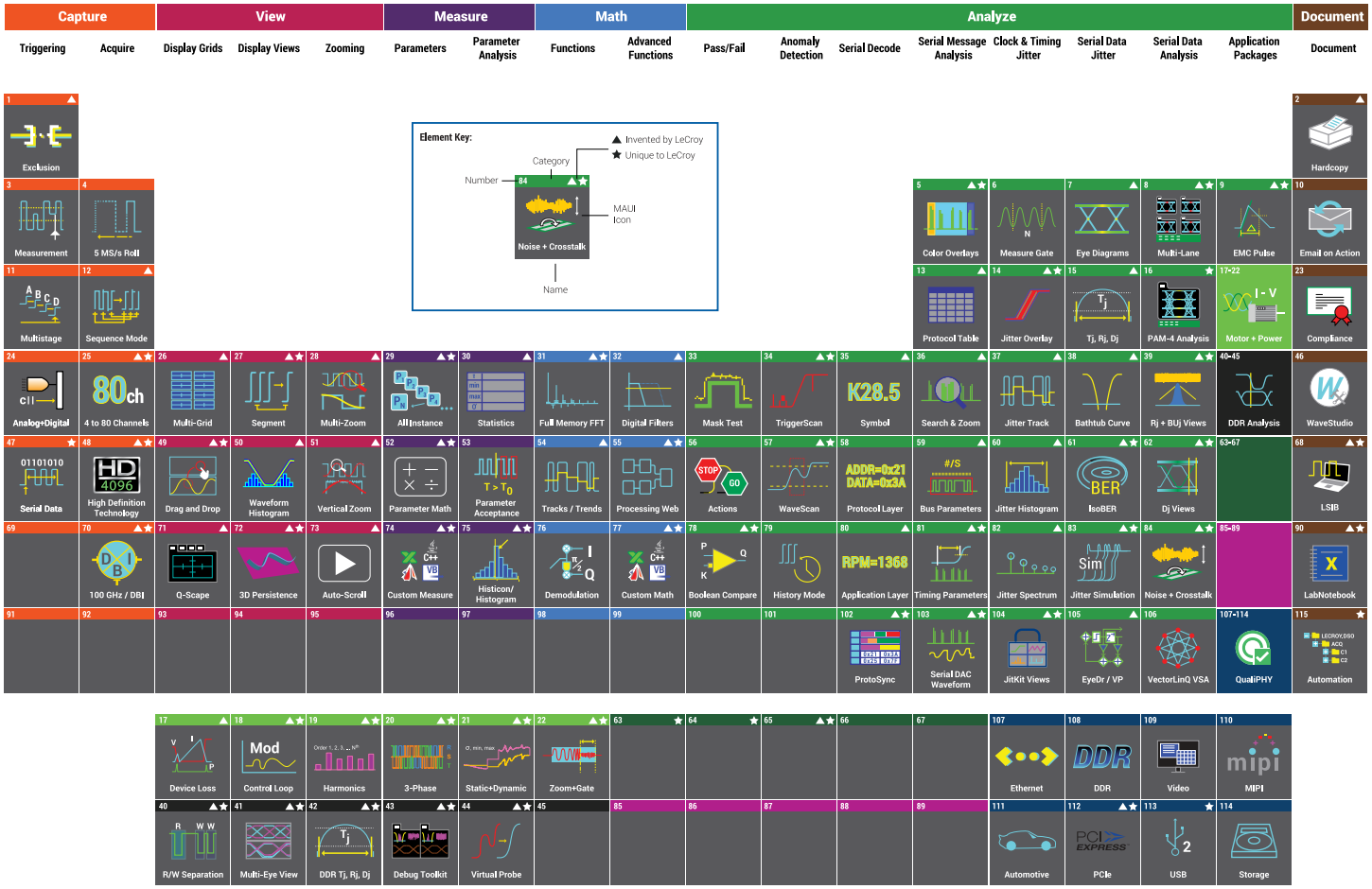
Oscilloscope Features, Options, and Accessories

WaveSurfer 3000z
WaveSurfer 4000HD
HDO4000A

POWERFUL, DEEP TOOLBOX

Our “powerful, deep toolbox” starts with all the standard tools listed on the following pages. These standard tools provide exceptional capabilities for Measure & Math, Statistical Analysis, Anomaly Detection, basic Jitter Analysis, Spectrum Analysis—nearly any type of waveform analysis you can name.

Software options integrate seamlessly with the standard tools to extend your capabilities into a wide variety of applications. Our MAUI® with OneTouch user interface and deep toolbox is consistently applied across product lines ranging in bandwidth from 100 MHz to 65 GHz, providing a unified user-experience and set of debug, validation and analysis capabilities that is unique in the industry.



Our heritage

Teledyne LeCroy’s 50+ year heritage is in processing long records to extract meaningful insight. We invented the digital oscilloscope and many of the additional waveshape analysis tools.

Our obsession

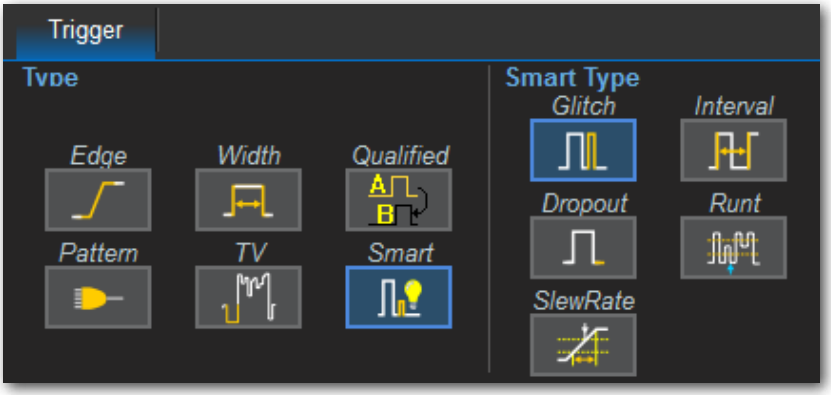
Our tools and operating philosophy are standardized across much of our product line. This deep toolbox inspires insight; and your moment of insight is our reward.

Our invitation

Our Periodic Table of Oscilloscope Tools explains the toolsets that Teledyne LeCroy has deployed in our oscilloscopes. Visit our interactive website to learn more about them. **teledynelecroy.com/tools**

Our Probe Catalog showcases even more accessories for use with your Teledyne LeCroy oscilloscope. Go to **teledynelecroy.com/probes** to download a copy.

WAVEFORM CAPTURE



Advanced Triggering

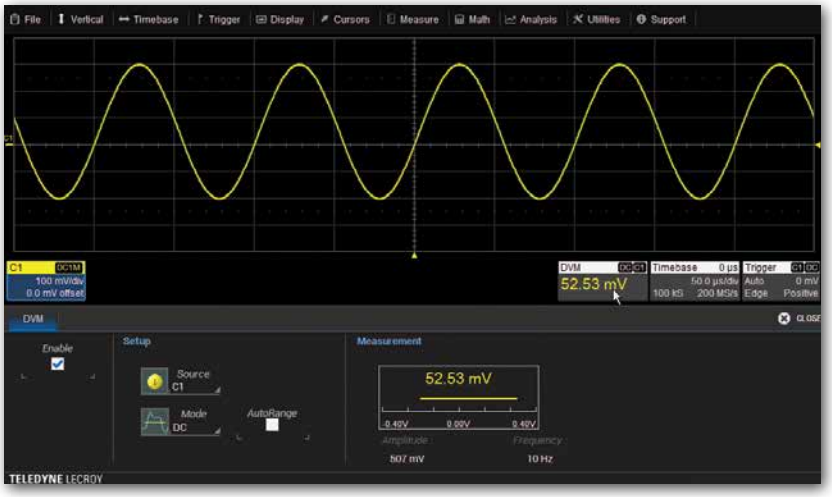
- Multi-stage triggers permit complex qualification of multiple waveform events.
- Smart Triggers find anomalies such as runts, glitches and dropouts, or incorrect time intervals, slew rates and windows.
- Pattern Triggers permit AND, NAND, OR, or NOR qualification of parallel patterns across analog channels and digital lines.
- Measurement triggers utilize included oscilloscope measurements.
- Serial Trigger & Decode software options add protocol-specific triggers to the standard set.

Flexible Sampling Modes

- Sequence Mode provides efficient use of acquisition memory to capture hundreds or thousands of acquisition segments without “dead-time” between.
- Roll Mode displays acquired sample points “rolling” continuously from right to left at sample rates up to 5 MS/s.
- Random Interleaved Sampling (RIS) Mode allows effective sampling rates higher than the maximum single-shot sampling rate.
- Fast Update of up to 170,000 waveforms per second easily displays random or infrequent events (on WaveSurfer 4000HD and Wavesurfer 3000z models).

Mixed-Signal Solutions
(-MS Models, MSO Option)

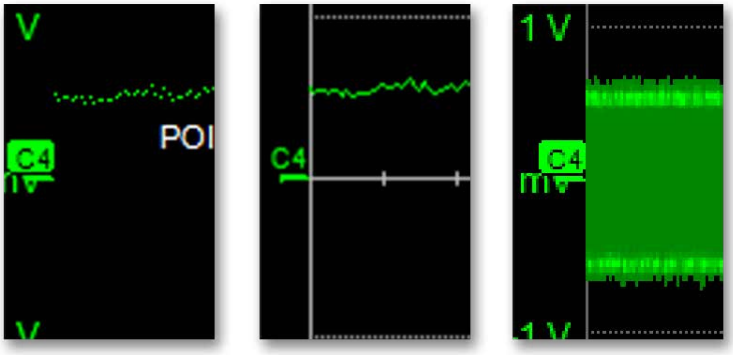
- Integrated Mixed Signal interface enables 16 lines of digital input at 500 MS/s.
- Flexible analog and digital cross-pattern triggering across all analog or digital channels.
- Utilize digital inputs for low-speed serial triggering or capture/decode.
- Provides advanced digital debug tools such as parallel pattern search, measurements and simulation.



Multi-Instrument Solutions
(WaveSurfer 4000HD and WaveSurfer 3000z)

- WaveSource Automatic Waveform Generator (FG software option) allows you to output custom sine, square, triangle, pulse, DC, noise, and arbitrary waveforms from the oscilloscope.
- Free Digital Voltmeter (DVM software option) adds integrated 4-digit digital voltmeter and 5-digit frequency counter that operates through the same probes already attached to the oscilloscope channels..

COMPREHENSIVE WAVEFORM VIEWING

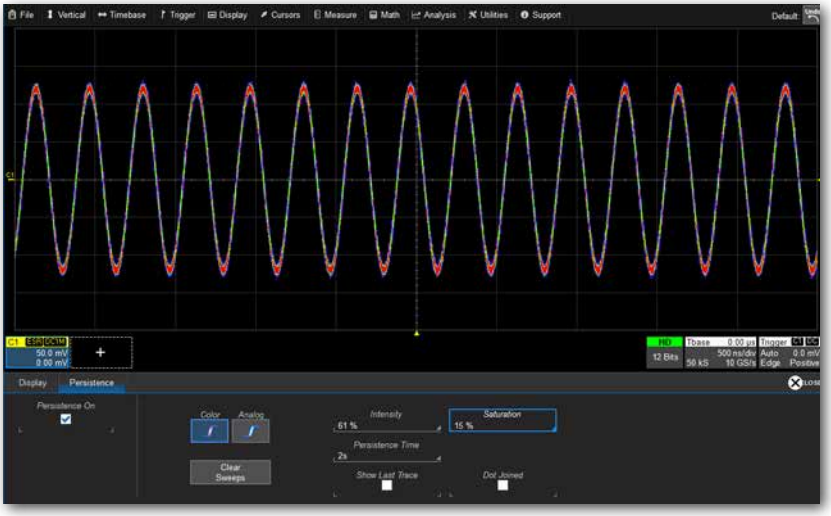


Configurable Displays

- Show/hide axis labels next to grid divisions.
- Add custom trace labels to mark points of interest on waveform.
- Adjust trace intensity to highlight rare or more frequent events in captured waveforms.
- Change intensity of grid lines relative to waveform traces.
- Choose style of traces (on supported models): series of dots or joined lines.
- Several grid selections, including XY and side-by-side (VT plus XY).

Full Vertical Display

- Full number of vertical levels shown on every open grid.
- Maintains full vertical resolution when acquired waveforms are minimized in height.
- Set vertical scale independently for each math, memory or zoom trace (not available on WaveSurfer 3000z).



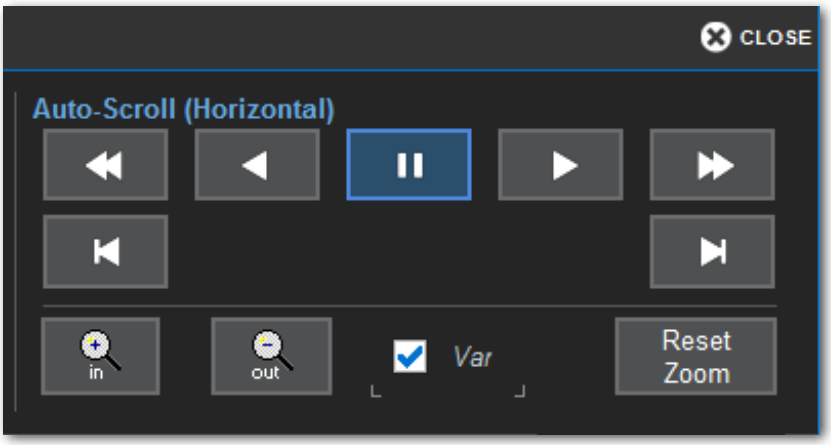
Display Persistence

- Build persistence maps from multiple acquisitions to understand how waveforms change over time.
- Select single-color analog or full-color displays.

COMPREHENSIVE WAVEFORM VIEWING

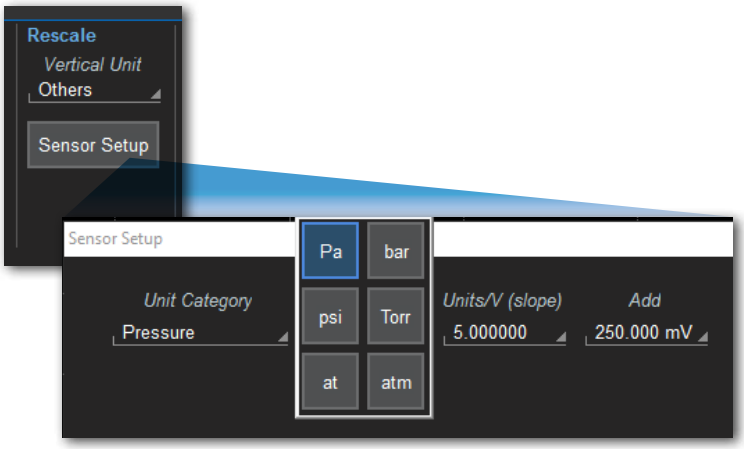
Comprehensive Zooming Capabilities

- Quick Zoom all waveforms with a single button press, or touch-and-drag over a trace to create individual zooms.
- Zoom both vertically and horizontally (on supported models).
- Touch result tables (Serial Decode, History, WaveScan, etc.) to zoom that part of the source waveform.



Auto Scroll

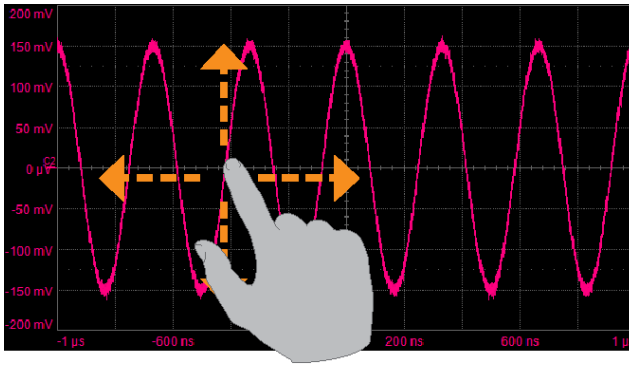
- Auto Scroll applies zoom to navigating History, WaveScan and Decode Search results.
- Automatically scroll through acquisition memory without manual knob turning.
- Forward or reverse direction at fast or slow speeds, single-stepped or continuous motion.



Channel Rescaling and Unit Conversion (HDO4000A)

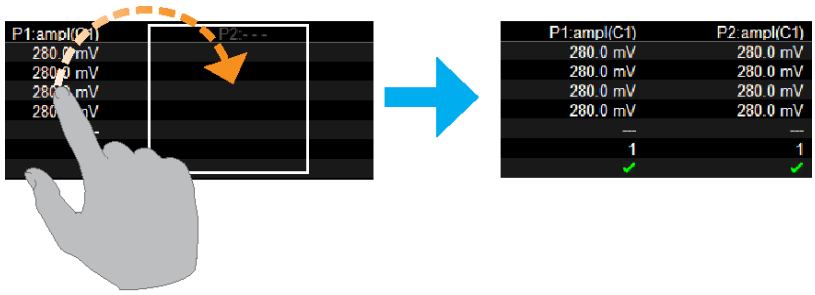
- Change the displayed Vertical Scale of any channel trace using a custom multiplier and/or additive constant.
- Display acquired waveforms in over 65 SI and English units. Conversion is conveniently done on channel setup dialog.
- Math trace units intelligently converted based on input trace units and math operation.

COMPREHENSIVE WAVEFORM VIEWING



MAUI

- Most Advanced User Interface—designed for touch, built for simplicity, and made to solve.
- All important controls always one touch away.
- Drag to change Level, Offset or Delay, reposition cursors, or gate measurements.
- Swipe to pan lists.



MAUI with OneTouch
(WaveSurfer 4000HD and HDO4000A)

- Use gestures to change setups, often with just one touch.
- Drag to add new trace, copy measurement, or change source.
- Drag to move trace to new grid (on HDO4000A).
- Flick to remove traces and measurements (on HDO4000A).
- Pinch/unpinch traces to “zoom” in and out (on HDO4000A).

ADVANCED MEASURE & MATH

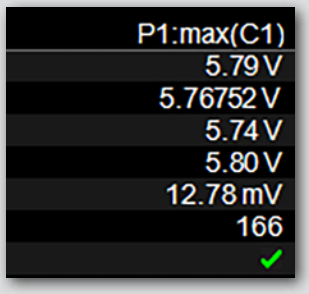
Advanced Measure

Choose your own set of parameters using the industry's most extensive set of standard measurements.

1. All-instance measurements for each acquisition
2. Full statistics (up-to-2 billion events)
3. Histicons provide snapshot of statistical distribution
4. User-defined measurement gate
5. Cyclic calculation of vertical parameters
6. At-level measurements for select parameters*

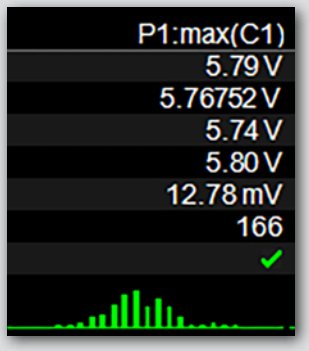
* On HDO4000A and WaveSurfer 4000HD.

Measurement Statistics



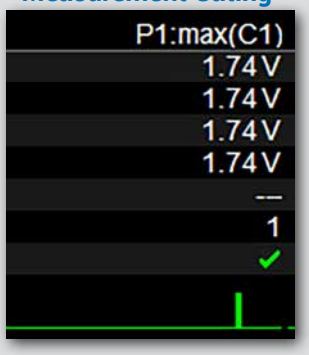
Statistics automatically calculated for all instance measurements, simply opt to display them or not.

Measurement Histicons



Turn on measurement histicons (miniature histograms) for quick visualization of statistical distribution.

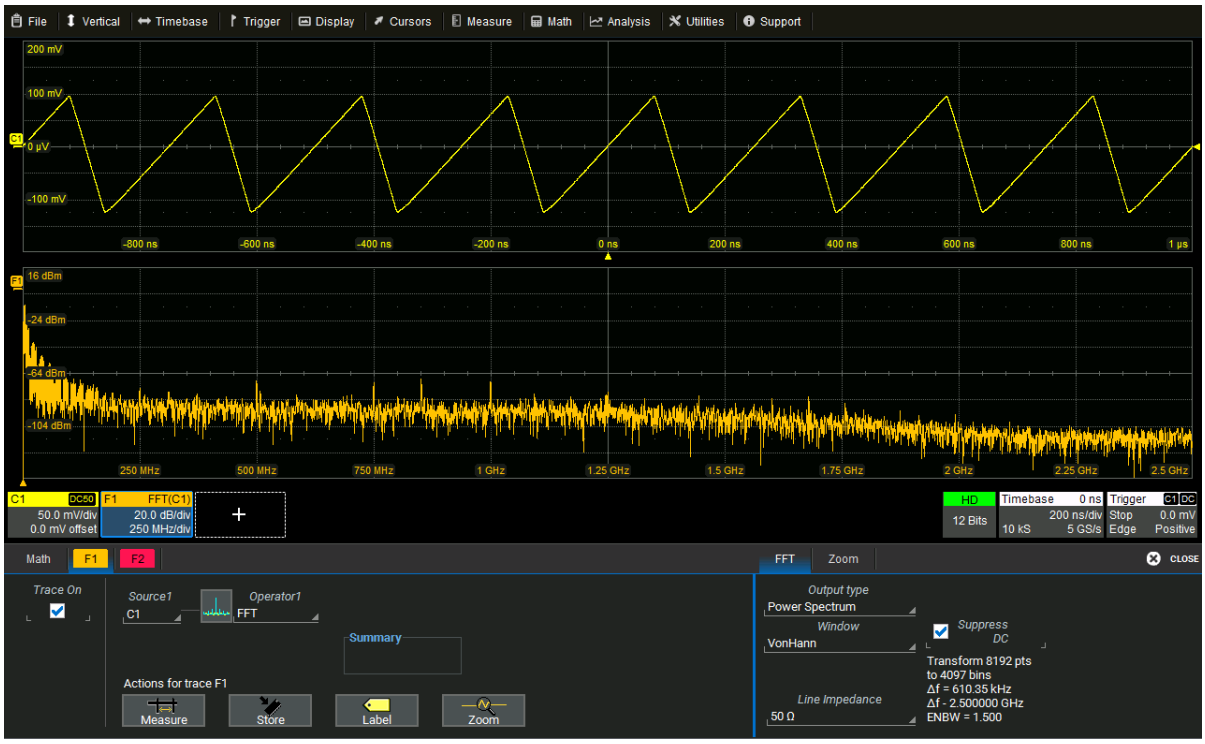
Measurement Gating



Restrict measurements to region of trace within gates. Drag gate indicators to set gates.

Advanced Math

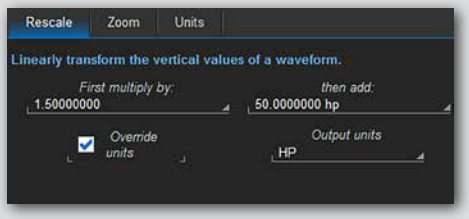
Configure two concurrent math functions using the industry's most extensive set of standard math operators.



1. Vertically zoom math waveforms independently
2. Math waveform units intelligently rescaled and converted based on input trace units and operation
3. Graph trend of a measurement
4. Dual operator functions chain two operations*
5. Override unit in which math trace is displayed*

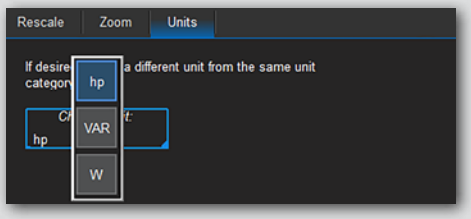
* On HDO4000A.

Rescale Math Function



Use Rescale function to add custom multiplier and/or additive constant to another trace. Rescale can be applied to any channel, math, memory or zoom trace.

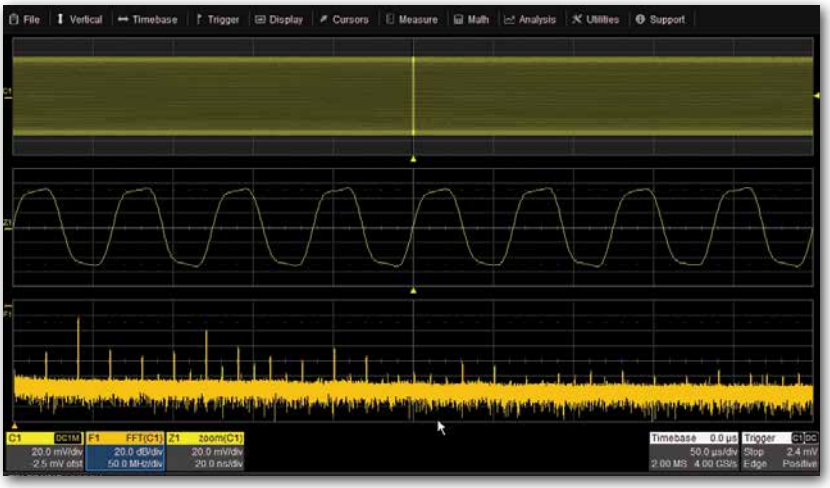
Unit Override



Change unit in which math trace is displayed to another within the same dimensional group (on HDO4000A).

Trend Graphing

Use trends for chart recorder-like capabilities on the oscilloscope.



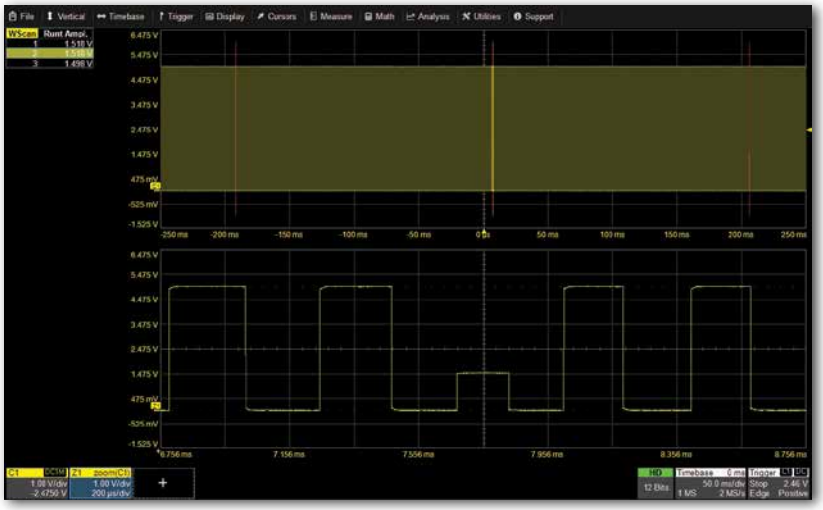
FFT Frequency Analysis

- Select for Magnitude or Power Spectrum.
- Five different Window selections.
- Provides highest SNR when used with 12-bit HD4096 oscilloscopes, such as WaveSurfer 4000HD and HDO4000A.

ADVANCED ANOMALY DETECTION

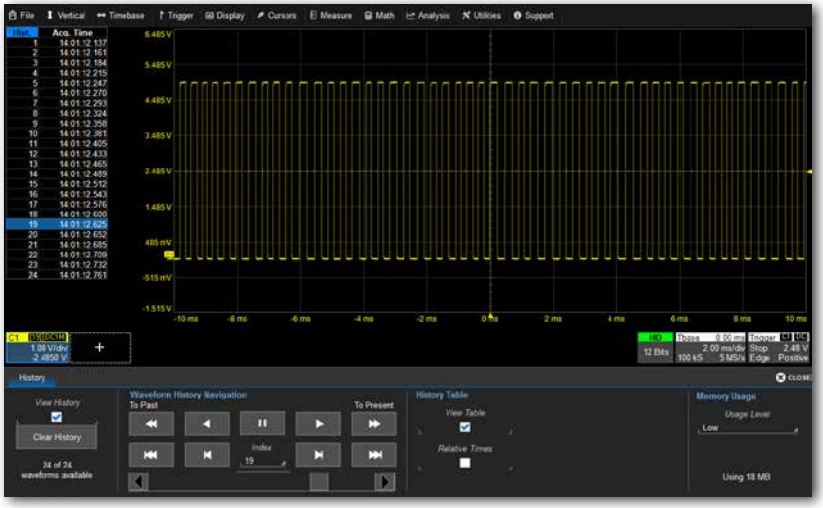
PASS/FAIL Mask Testing

- Test waveforms against industry-standard or custom masks.
- Easily create new masks from “golden” waveforms.
- Mask violations clearly marked on waveform.
- Start/stop testing after defined number of sweeps, or run indefinitely. PASS/FAIL results over number of sweeps clearly displayed.
- Choose actions to take when a test is passed or failed: save waveform data, save a screen image, save a LabNotebook, sound an alarm signal, send a pulse or stop acquisition..



WaveScan® Advanced Search

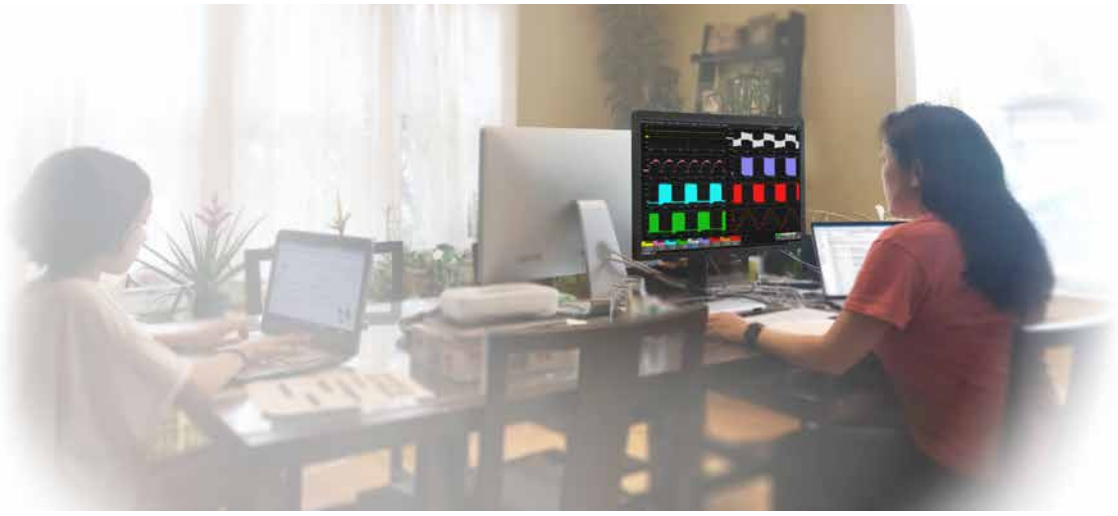
- Search analog, digital or parallel bus signals using more than 20 different criteria, isolating events hardware triggers alone can’t find, like frequencies.
- Set up a condition and scan single or multiple acquisitions over hours or days.
- Touch timestamped WaveScan table to zoom to that event.



History Mode Waveform Playback

- Never miss a waveform: History Mode stores a buffer of acquisitions for later viewing and analysis.
- Always enabled and easily accessible.
- Touch timestamped History table to display a specific acquisition.
- Cursor readouts and Measure table reflect the visible acquisition.

REMOTE CONTROL & CONNECTIVITY



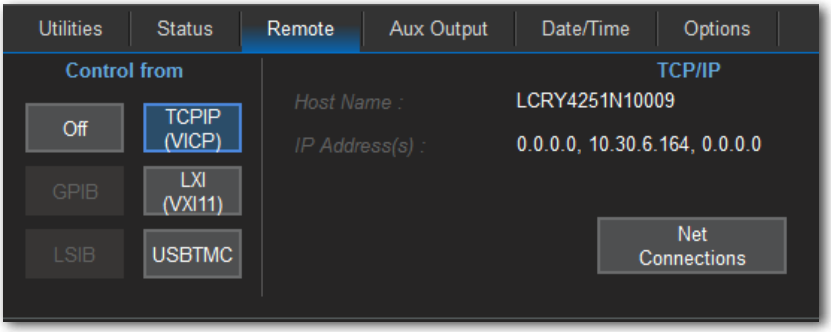
MAUI Studio puts the Teledyne LeCroy MAUI oscilloscope software on your desktop for offline analysis of waveforms and remote control of Teledyne LeCroy oscilloscopes. Work from home or while travelling. Supports Ethernet (TCP/IP) connection only.

MAUI Studio (HDO4000A)

- Simulates interface of HDO4000A oscilloscopes.
- Import LabNotebooks, trace files *and* other vendors' waveform files (Tek, Keysight, Rohde & Schwarz, Yokogawa) and analyze anywhere.

MAUI Studio Pro (HDO4000A optional)

- Simulates oscilloscope interface of your choice.
- Import LabNotebooks, trace files *and* other vendors' waveform files (Tek, Keysight, Rohde & Schwarz, Yokogawa) and analyze anywhere.
- Enhanced LabNotebook replicates source oscilloscope model type and software options with no additional purchase.
- Remote control Teledyne LeCroy oscilloscopes over Ethernet using all the connected oscilloscope's software options.
- Arbitrary Function Generator lets you simulate waveforms with custom noise/jitter characteristics.
- Offered with free, 30-day trial.



PC Requirements

- x64 Windows 10 Pro operating system
- Intel® CoreTM i7 Processor or better, 2.4 GHz or higher
- 4 GB RAM or better
- 2 GB or more available free space for the installed application
- Minimum 1280x780 pixel display, 1920x1080 recommended

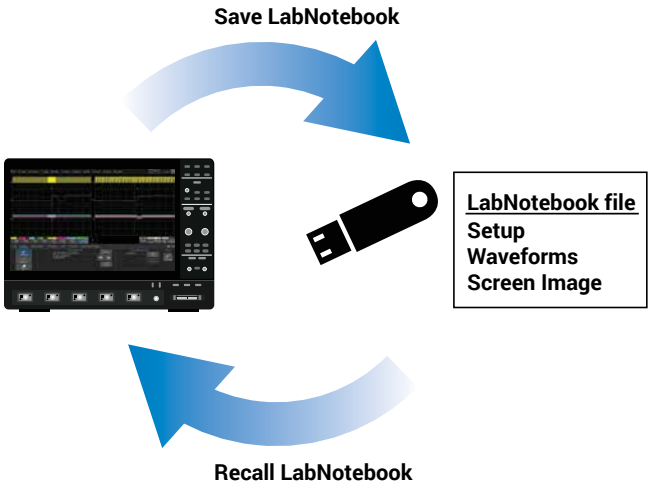
Note: The host PC must have an active internet connection to download and register MAUI Studio software.

Download at teledynelecroy.com/mauistudio

Microsoft COM Automation and IEEE 488.2 Remote Control

- Connect to oscilloscope via TCP/IP, LXI, USBTMC or GPIB (with optional adapter).
- Remote interface via DCOM, ActiveDSO (proprietary ActiveX control) or NI-VISA.
- Proprietary set of IEEE 488.2 remote commands supported on all oscilloscopes.
- COM Automation commands supported within IEEE 488.2 remote control programs.

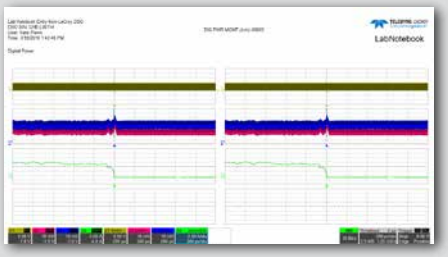
DOCUMENTATION & DATA SHARING



LabNotebook

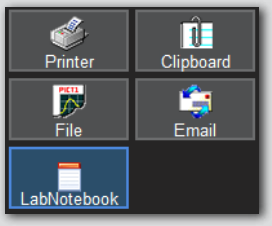
- Store all setups, waveforms and screen image in a single LabNotebook file.
- Add descriptive notes to LabNotebooks, or mark up screen images.
- Recall ("Flashback") LabNotebooks to restore oscilloscope to past state—including all setups, waveforms and table data.
- Extract component files from .LNB format files, or append other files to .LNB (on supported models).

Generate Reports



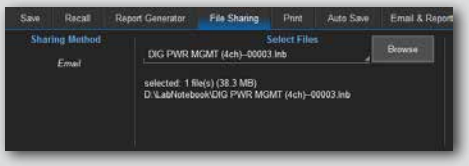
Generate preformatted .PDF, .RTF or .HTML reports from saved LabNotebooks or the oscilloscope current state (on HDO4000A). Reports can show your company logo or use Print color palette to save ink/toner.

Print

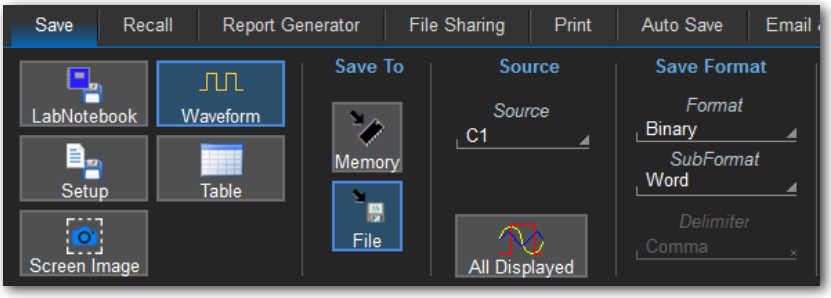


Configure Print or Save/User front panel button to create a LabNotebook or screen capture file with just one press.

Email



Email LabNotebooks and other files from the oscilloscope. Preset the recipient address to save time.



Save/Recall

- Save all setups/waveforms to file or internal memory; recall to quickly set up oscilloscope or analyze waveforms further.
- Capture screen image and save to .JPG, .PNG, .TIF or .BMP file.
- Save table data to Excel or text file for storage and sharing.
- Auto Save waveform and table data to file with each trigger.
- Save/recall files from any network folder accessible to the oscilloscope.

STANDARD TOOLBOX AVAILABILITY

● = standard, o = available as an option

	WaveSurfer 3000z	WaveSurfer 4000HD	HDO4000A
Waveform Acquisition			
Advanced Triggers	●	●	●
Sequence Sampling Mode	●	●	●
Roll Sampling Mode (5 MS/s)	●	●	●
RIS Sampling Mode	●		●
Fast Update	●	●	
Acquisition System Hardware Modules, Options and Upgrades			
Integrated 16-line Digital Input w/Digital Leadset (-MS model or MSO option)	o[1]	o[1]	o[1]
Memory options or upgrade (Mpts/ch)			o
Bandwidth Upgrade	o[2]	o[2]	
Comprehensive Waveform Viewing			
Axis and Trace Labels	●	●	●
Trace and Grid Intensity Adjustment	●	●	●
Dot or Joined Trace Style Selection		●	●
Multi-Grid Display	●	●	●
XY Displays	●	●	●
Display Persistence	●	●	●
Segment Waveform Displays	●	●	●
Horizontal Zooming	●	●	●
Independent Vertical Zooming		●	●
Auto Scroll	●	●	●
Channel Rescaling and Unit Conversion			●
Most Advanced User Interface (MAUI)	●	●	●
MAUI with OneTouch		●	●
Advanced Measure & Math			
Comprehensive Standard Measurement Parameters	●	●	●
All Instance Measurements	●	●	●
Full Statistics (mean, min, max, sdev, number)	●	●	●
Histicon Display	●	●	●
Measurement Gate	●	●	●
Cyclic Calculation of Vertical Measurement Parameters	●	●	●
Comprehensive Standard Math Functions	●	●	●
Single or Dual Operator Math Functions			●
Horizontal or Vertical Zoom Math Function	●	●	●
Automatic Math Rescaling and Unit Conversion	●	●	●
Manual Math Unit Override			●
Trend Graph of Measurement Parameters	●	●	●

STANDARD TOOLBOX AVAILABILITY

● = standard, o = available as an option

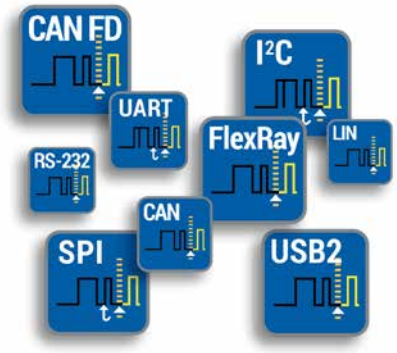
	WaveSurfer 3000z	WaveSurfer 4000HD	HDO4000A
FFT & Spectral Analysis			
FFT Frequency Analysis	●	●	●
Advanced Anomaly Detection			
PASS/FAIL Mask Testing	●	●	●
WaveScan Advanced Search	●	●	●
History Mode Waveform Playback	●	●	●
Remote Control & Connectivity			
MAUI Studio			●
MAUI Studio Pro			o
COM Automation	●	●	●
IEEE 488.2 Remote Control	●	●	●
10/100BaseT or 10/100/1000BaseT Ethernet	●	●	●
USBTMC	●	●	
External USB-to-GPIB Adapter	o	o	o
Documentation & Data Sharing			
LabNotebook	●	●	●
Extractable .LNB Files		●	●
Report Generator			●
Screen Capture	●	●	●
Network File Sharing	●	●	●
Email	●	●	●
Configurable User or Print Button	●	●	●
Use Print Colors	●	●	●
Configurable Print Color Palette			●
Save/Recall Setups, Waveforms, Table Data	●	●	●
Auto Save	●	●	●

1 Integrated digital input capabilities must be selected at time of initial purchase.
2 Contact Teledyne LeCroy Service. Upgrade may require return to service center.

SERIAL MESSAGE ANALYSIS OPTIONS

Serial Trigger & Decode (Software Options, see Table of Options for details on availability)

Serial Trigger and Decode software options offer complete serial message debug and validation for over 20 supported protocols. Extend your knowledge of cause-effect behaviors and physical layer problems.



Trigger

- Trigger on protocol elements or specific DATA patterns. Includes powerful conditional DATA triggering.
- Highly adaptable ERROR Frame triggering to isolate protocol errors.
- Combine UART/SPI bytes into single “message frame” to trigger on proprietary protocols.
- Trigger on application level values with Symbolic options.

Decode

- Decode and display up-to-two or four protocols of any type simultaneously.
- Transparent, color-coded overlay marks protocol elements (ID, DATA, CRC, complete frame, etc.) on waveform. Decoded data listed on overlay.
- Interactive table displays interleaved records from all protocol decoders; touch a record to zoom to the waveform location. Export table data to file. Customize table display.
- User-defined decode Search zooms to the next match it finds.

SERIAL MESSAGE ANALYSIS OPTIONS

Serial Message Analysis Options Availability

D = Decode only, TD = Trigger & Decode

	WaveSurfer 3000z	WaveSurfer 4000HD	HDO4000A
100Base-T1 TD			o
ARINC 429 Symbolic D			o
AudioBus (I2S) TD	o	o	o
AUTO Bundle: CAN and LIN TD	o		
AUTO Bundle: CAN, CAN FD, LIN and FlexRay TD		o	
AUTO Bundle: CAN, LIN and FlexRay TD			o
CAN TD			o
CAN FD TD (incl. Standard CAN)	o		o
DP-AUX D			o
EMBEDDED Bundle: I2C, SPI, UART and RS-232 TD	o	o	
ENET D			o
FlexRay TD	o		o
I2C TD			o
I3C TD			o
LIN TD			o
Manchester D			o
MDIO D			o
MIL-STD-1553 TD			o
MIPI DigRF 3G D			o
MIPI DigRF V4 D			o
MIPI D-PHY D			o
(Packetized) NRZ D			o
PMBus TD			o
SENT TD			o
SMBus TD			o
SpaceWire D			o
SPI TD			o
SPMI TD			o
UART and RS-232 TD			o
USB 2.0 TD			o
USB 2.0 HSIC D			o
USB-PD TD			o

Note: Oscilloscope bandwidth must be ≥ serial data bit rate, and sample rate must be ≥ four times the bit rate for decoders to function.

POWER ANALYSIS OPTIONS

Device and Switch-Mode Power Supply Power Analysis (PWR Software Option)

- Control loop and time domain response analysis.
- Automatically identifies device measurement zones with color-coded overlays.
- Line power and harmonics tests to IEC 61000-3-2. Total harmonic distortion table shows frequency contribution.
- Measurement parameters provide details of single cycle or average device power losses.
- B-H Curve shows magnetic device saturation.

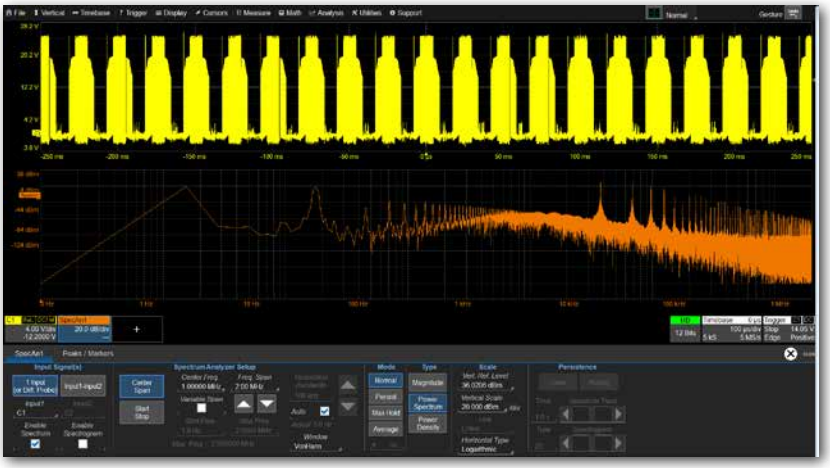
Power-Device Analysis (PWRDEVICE Software Option)

- Automatically calculates various device losses as defined by JEDEC®.
- Results shown in convenient Numerics table.
- Easily generate measurement per-cycle Waveforms for all or selected cycles.
- Zoom+Gate mode permits fast understanding of complex, dynamic events.
- Ideally used with DL-ISO High Voltage Fiber Optically Isolated Probes.

Power Analysis Options Availability

	WaveSurfer 3000z	WaveSurfer 4000HD	HDO4000A
Device and Switch-Mode Power Supply Power Analysis Software	o	o	o
Power-Device Analysis Software			o

SPECTRAL ANALYSIS OPTIONS



Spectrum Analyzer
(SPECTRUM-1 Software Option)

- One Magnitude, Power or Density spectrum integrated with other MAUI displays.
- Logarithmic horizontal and vertical scales.
- Non-linear "sniffer" probe correction factors.
- Peaks and markers tables.
- Persistence and averaging.
- 2D or 3D color spectrograms.

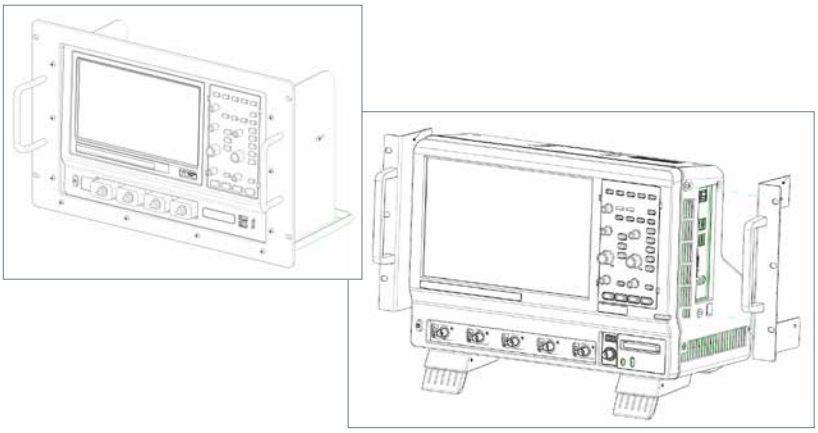
Spectral Analysis Options Availability

	WaveSurfer 3000z	WaveSurfer 4000HD	HDO4000A
Spectrum Analyzer (SPECTRUM-1) Software	o	o	o

OSCILLOSCOPE ACCESSORIES

Cases
(SOFTCASE Accessory)

- SOFTCASE has foam-reinforced walls for long-term storage and protection in transit, with less weight than a hard case.



Rackmounts
(RACK, RACKMOUNT Accessories)

- Support the oscilloscope for 19″ rack installation.
- Uniquely designed for each model.
- Rackmount ears (shown right) attach to sides of oscilloscope to permit direct mounting into rack.
- Rackmount shelf (shown left) supports oscilloscope on shelf that mounts to rack.
- Consult Customer Service for details on which Rackmount is provided for each oscilloscope.

Oscilloscope Accessories Availability

	WaveSurfer 3000z	WaveSurfer 4000HD	HDO4000A
Soft Case	o	o	o
Rackmount	o	o	o

MAINTENANCE AGREEMENTS

5-Year Annual Traceable Calibration (C5)

- C5 provides Annual NIST Traceable Calibration.
- C5/MIL provides Annual Z540 Traceable Calibration (before and after data included).
- C5/17025 provides Annual ISO17025 Accredited Calibration with Uncertainties (before and after data included).

5-Year Extended Warranty (W5)

- W5 extends total warranty coverage to 5 years (including oscilloscope standard 3-year warranty).

5-Year Extended Warranty with Annual Traceable Calibration (T5)

- T5 extends total warranty coverage to 5 years (including oscilloscope standard 3-year warranty) and also includes an annual NIST Traceable Calibration.
- T5/MIL extends total warranty coverage to 5 years (including oscilloscope standard 3-year warranty) and also includes an annual Z540 Traceable Calibration (before and after data included).

5-Year Worry Free (WF5)

- WF5 extends total warranty coverage to 5 years (including oscilloscope standard 3-year warranty) and also includes coverage for EOS/ESD events or minor mechanical damage.

Maintenance Agreements Availability

	WaveSurfer 3000z	WaveSurfer 4000HD	HDO4000A
5-Year Annual Traceable Calibration	o	o	o
5-Year Extended Warranty	o	o	o
5-Year Extended Warranty with Annual Traceable Calibration	o	o	o
5-Year Worry Free Warranty	o	o	o

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