

SEE THE WHOLE LINK

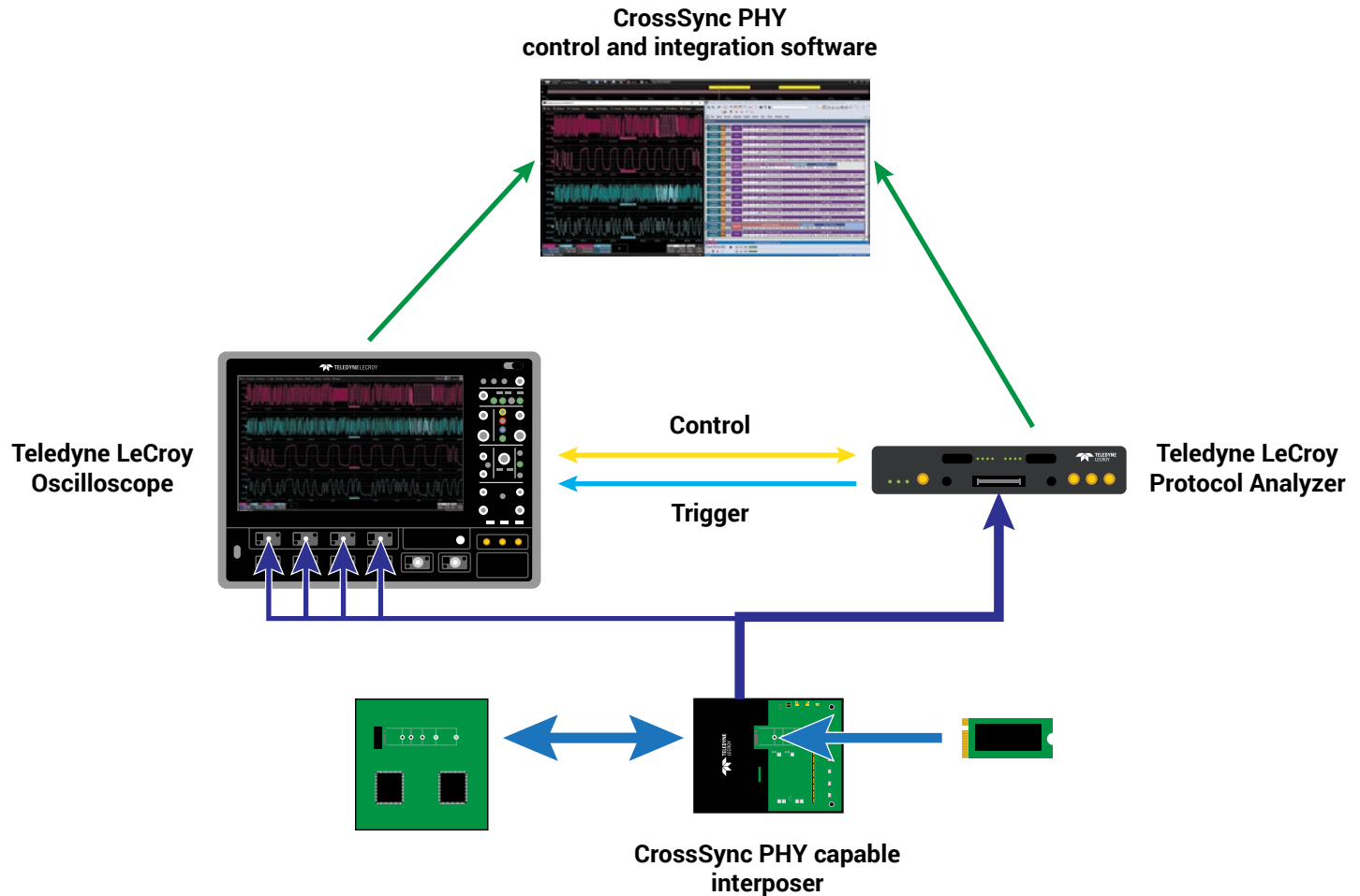


Debug and validate
active link behavior
across electrical and
protocol layers.

CrossSync™ PHY
Cross-layer Analysis for PCI Express®

THE CrossSync™ PHY CONCEPT

Interoperability issues can lead to finger-pointing exercises that cost money and time-to-market. Teledyne LeCroy CrossSync PHY software and interposers merge the functions of your Teledyne LeCroy protocol analyzer and oscilloscope - giving insight into link behavior that no other instrument can provide.



Validate and debug active link operation

- CrossSync PHY capable interposers enable observation of both electrical and protocol behavior without disturbing the link
- Sideband signals, reference clock, and power rails are all easily accessible to oscilloscope probes
- Optional high-bandwidth oscilloscope probing points for PCI Express data lanes

Quickly resolve interoperability issues by capturing the entire protocol stack

- Trigger protocol analyzer and oscilloscope captures on the same high-level event
- Easily measure timing relationships between protocol and electrical domains
- Faster root-cause analysis means fewer costly finger-pointing exercises

Analyze link training with integrated physical and protocol views

- Observe electrical-level results of protocol-level commands
- Combined navigation means always knowing which protocol and electrical behaviors happen at the same time
- No single instrument can deliver this level of cross-layer insight into link training behavior

MORE VISIBILITY INTO...



Correlated electrical and protocol views of a link speed change from 8 to 16 GT/s.

Dynamic Link Behavior

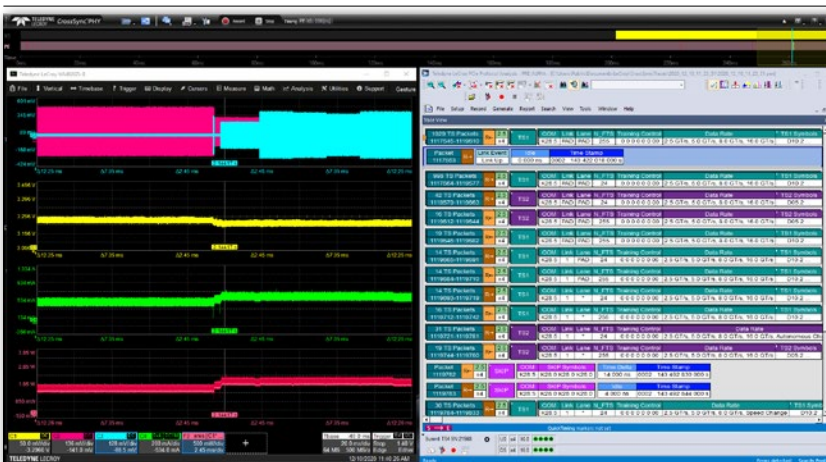
- Characterize entire boot sequence with visibility into sideband signals, reference clock, data lanes, and power rails.
- Observe speed changes in both electrical and protocol domains.
- Trigger on problematic link training behaviors and analyze their consequences through the entire protocol stack.
- Save, recall, and re-analyze linked oscilloscope and protocol analyzer traces.



Analyzing exit from L1.2 including reference clock and CLKREQ# behavior.

Power Management Transitions

- Quick and easy triggering and capture of both protocol and electrical behavior as a device enters or exits low-power states.
- Precise timing measurements between protocol commands and electrical behaviors of reference clock and high-speed data lines.
- Dynamic power analysis through Power Management transitions including L1 substates.



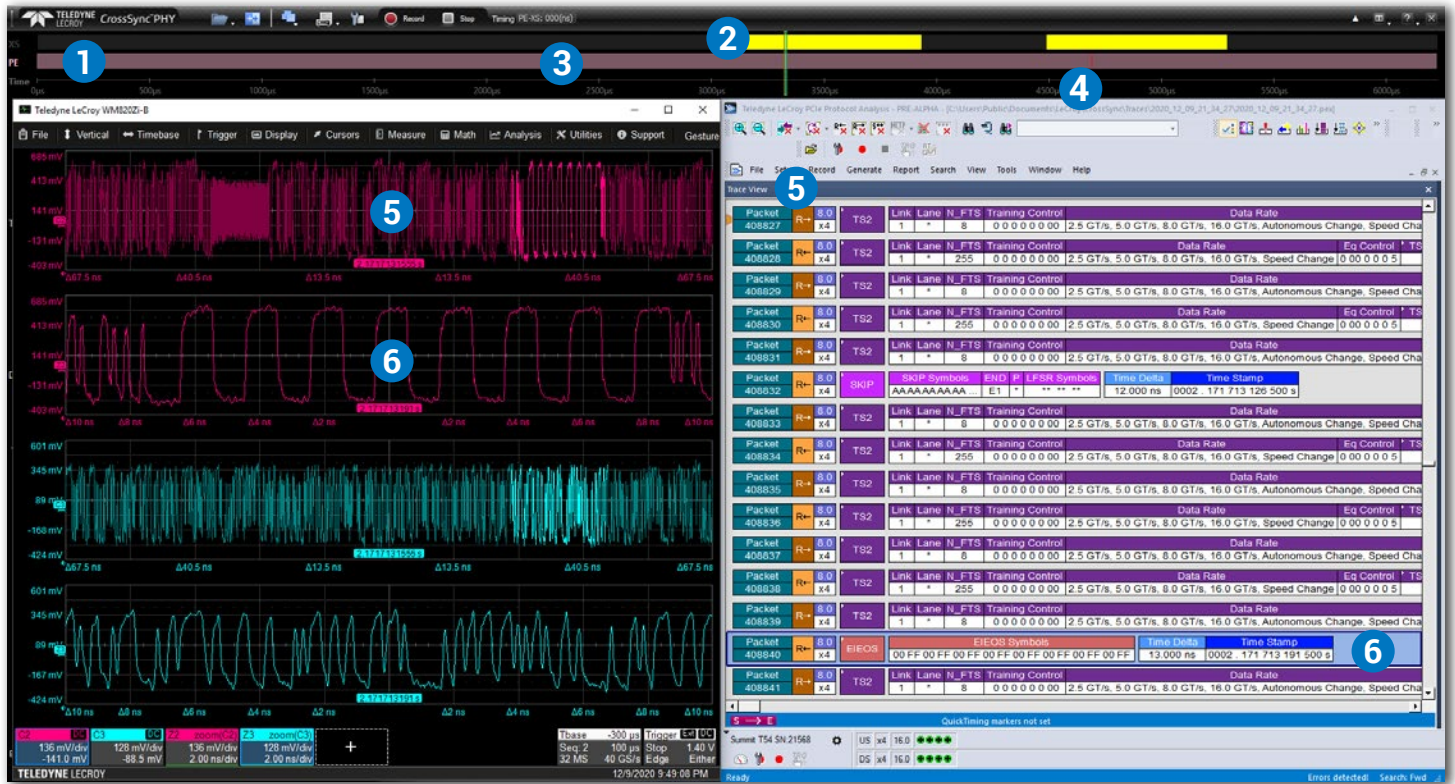
Dynamic rail voltage, current and power measurements as lane changes speed to 16 GT/s.

Dynamic Power Characterization

- CrossSync PHY interposers have built-in rail voltage and current measurement points.
- Voltage and current waveforms are synchronized and time-correlated to protocol analyzer trace.
- Oscilloscope tools enable measurement of dynamic power consumption and power integrity metrics.
- Compatible with RP4030 Active Voltage Rail probe for low-noise measurement of voltage rails with high bandwidth and low loading.

CrossSync™ PHY INTEGRATED ANALYSIS SOFTWARE

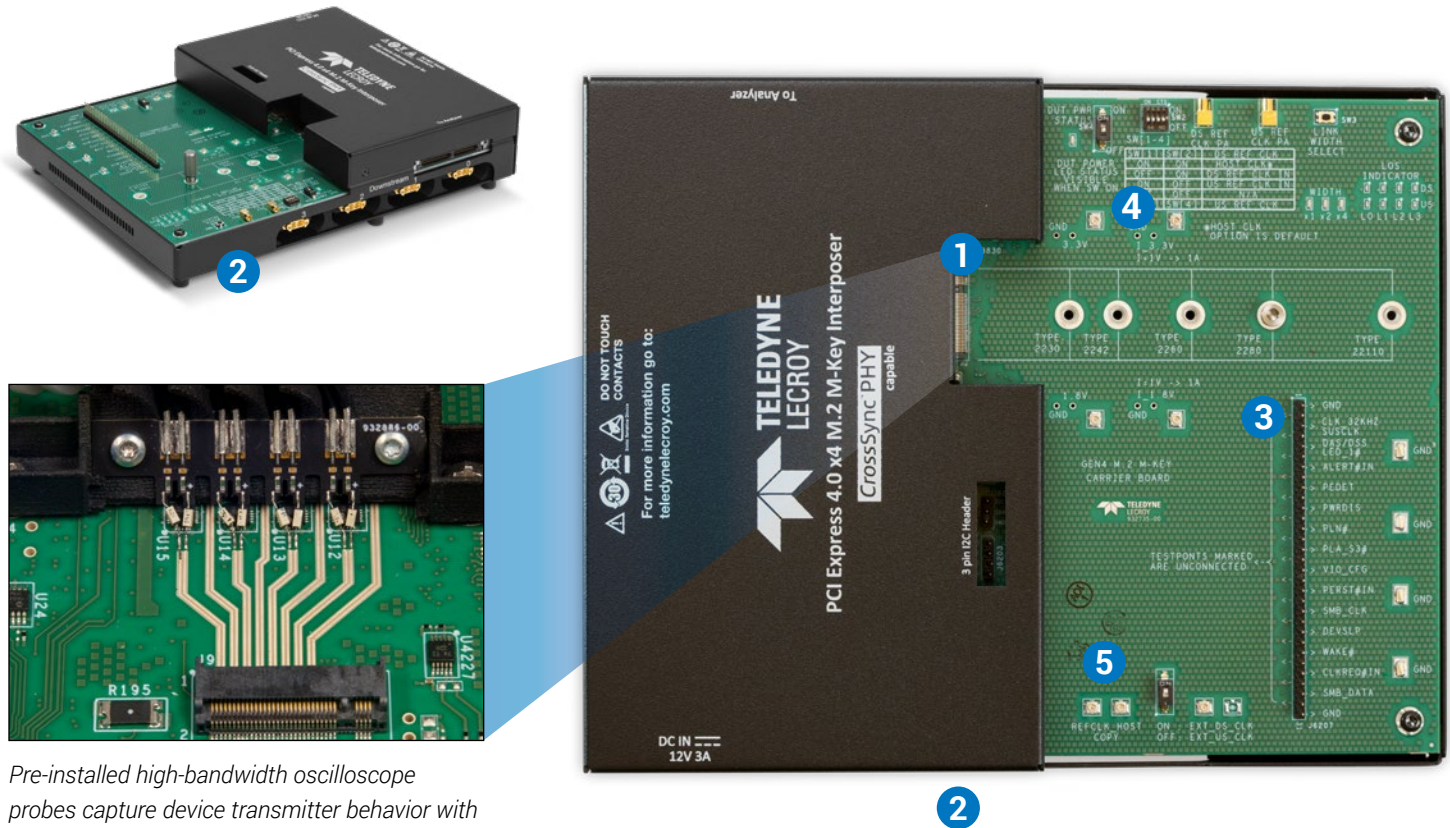
The CrossSync PHY software option for your Teledyne LeCroy oscilloscope enables precise, intuitive navigation between time-correlated protocol analyzer and oscilloscope traces.



1. CrossSync PHY navigation bar makes clear the timing relationship between linked protocol analyzer and oscilloscope captures
2. One or many oscilloscope acquisition segments are represented in the navigation bar
3. Protocol analyzer trace represented in the navigation bar
4. Common trigger point ensures precise timing alignment between protocol trace, oscilloscope acquisitions, and navigation bar view
5. Oscilloscope timebase and protocol analyzer acquisition window remain synchronized while navigating through the combined acquisition, for total confidence in timing behavior
6. Selecting a packet on the protocol trace enables zoom traces on the oscilloscope to the same time window, enabling sub-packet-level measurement precision

CrossSync™ PHY CAPABLE PCI EXPRESS INTERPOSERS

CrossSync PHY capability enhances Teledyne LeCroy's industry-leading set of protocol analysis interposers by adding high-fidelity oscilloscope probing points with simple and convenient signal access.



Pre-installed high-bandwidth oscilloscope probes capture device transmitter behavior with minimal loading.

1. Transparent signal path between host and endpoint, with convenient connections to both protocol analyzer and oscilloscope
2. Simple, low-loading direct connection to high-speed lanes for Teledyne LeCroy DH series oscilloscope probes up to 30 GHz bandwidth – no soldering required
3. Easy access to all sideband signals
4. High-bandwidth voltage and current connections for monitoring dynamic power rail behavior
5. High-fidelity buffered reference clock connection for observing clock behavior during power-up and low-power states

COMPATIBLE PROTOCOL ANALYSIS PRODUCTS

Summit T54 Protocol Analyzer



- Protocol Analyzer for PCI Express 5.0 and CXL (Compute Express Link)
- Supports x1, x2 and x4 Links at data rates of 2.5GT/s, 5GT/s, 8GT/s, 16GT/s and 32GT/s
- Trace buffer up to 64GB
- Can be cascaded to support x8 Link Widths with up to 128GB of trace buffer
- Support for Storage Protocol Decodes for NVMe, NVMe-MI, SATA Express and SCSI Express (SOP-PQI)
- Support for sideband signals SMBus, CLKREQ#, WAKE#, PERST#
- Uses CATC Trace software including Spreadsheet view, LTSSM State View and BitTracer

PCI Express 4.0 x4 M.2 M-Key Interposer



- Supports PCI Express M.2 M-Key connectors up to x4 Link Width
 - Supports Data Rates up to 16GT/s
 - CrossSync PHY capable allowing direct connection of High Speed and Sideband signals to Oscilloscope
 - Power rail probe points allowing Voltage and Current measurements on Oscilloscope
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COMPATIBLE OSCILLOSCOPE PRODUCTS



LabMaster 10 Zi-A

- Up to 65 GHz real-time bandwidth
- Supports PCI Express measurements to PCIe 5.0 and beyond
- Powerful server-class PC with 20 processor cores and up to 192 GB system RAM for fast processing of long waveforms



WaveMaster 8 Zi-B

- Up to 33 GHz real-time bandwidth
- Supports PCI Express measurements to PCIe 4.0
- Flexible inputs support 1 M Ω passive and current probes with no adapters necessary



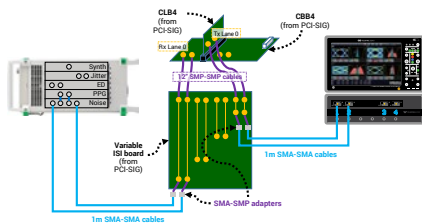
DH Series high-bandwidth differential probes

- Connect directly to CrossSync PHY interposers with no soldering required
- Up to 30 GHz bandwidth, low noise, low loading
- Other tips available: solder-in (standard and high-sensitivity), high-temperature solder-in, handheld browser, QuickLink adapter



RP4030 Active Voltage Rail Probe

- Connects directly to CrossSync PHY interposers with no soldering required
- 4 GHz bandwidth with $\pm 30V$ Offset Capability
- Low attenuation for very low noise
- 50 k Ω DC Input Impedance for low loading



QualiPHY PCIE test automation software

- Automates LabMaster and WaveMaster oscilloscopes to perform PCI Express compliance and characterization testing
- Compatible with Anritsu MP1900A Signal Quality Analyzer for complete receiver test calibration and execution
- Available for PCI Express 3.0, 4.0, and 5.0



PCI Express decode

- Decode PCI Express signals up to data link layer directly in the oscilloscope user interface
- Intuitive, Color-Coded Overlays
- Interactive Table Summarizes Results

ORDERING INFORMATION

Product Description

Product Code

Oscilloscope Software Options (enables CrossSync PHY functionality on installed CrossSync software)

CrossSync PHY protocol analyzer synchronization for LabMaster 10 Zi	LM10Zi-CrossSyncPHY
CrossSync PHY protocol analyzer synchronization for WaveMaster 8 Zi	WM8Zi-CrossSyncPHY

CrossSync PHY capable PCI Express Interposers

PCIe 4.0 M.2 M-Key Interposer - CrossSync PHY capable (no high-speed oscilloscope probes installed)	PE210UIA-X
PCIe 4.0 M.2 M-Key Interposer with oscilloscope probe Lane 0	PE210UIA-1PHY
PCIe 4.0 M.2 M-Key Interposer with oscilloscope probe Lane 0, 1	PE210UIA-2PHY
PCIe 4.0 M.2 M-Key Interposer with oscilloscope probe Lane 0, 1, 2, 3	PE210UIA-4PHY

Compatible Protocol Analyzers

Summit T54 (licensed as a Gen4 x4 analyzer, no probes or cables)	PE190AAA-X
G4 x1, x4 Straight Cable for Summit T416, Summit T48, Summit T54 (Gen 4 PHY)	PE020UCA-X
G4 x1, x4 Straight Cable for Summit T516, Summit T54 (Gen 5 PHY)	PE034UCA-X

Recommended Oscilloscopes

CrossSync PHY is compatible with all LabMaster 10 Zi and WaveMaster 8 Zi series oscilloscopes.

Below are some recommendations for example test configurations.

PCI Express 4.0 - CrossSync PHY and Compliance Test capable

25 GHz (or higher), 80 GS/s, 4 Ch, 32 Mpts/Ch LabMaster 10 Zi Acquisition Module	LabMaster 10-25Zi-A
LabMaster Master Control Module	LabMaster MCM-Zi-A

PCI Express 3.0 - CrossSync PHY and Compliance Test capable

13 GHz (or higher), 40 GS/s, 4ch, 64 Mpts/Ch Serial Data Analyzer with 6.5 Gb/s Serial Trigger, 8b/10b and 64b/66b decode.	SDA 813Zi-B
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Recommended Oscilloscope Probes

8 GHz differential probe with ProLink interface	DH08-PL
13 GHz differential probe with ProLink interface	DH13-PL
16 GHz differential probe with ProLink interface	DH16-PL
20 GHz differential probe with ProLink interface	DH20-PL
25 GHz differential probe with 2.92 mm interface	DH25-2.92MM
30 GHz differential probe with 2.92 mm interface	DH30-2.92MM
Power/Voltage Rail Probe. 4 GHz bandwidth, 1.2x attenuation, $\pm 30V$ offset, $\pm 800mV$	RP4030

Recommended Oscilloscope Software Options

QualiPHY PCIe 5.0 Tx/Rx/LEQ Compliance Software Option (incl QPHY-PCIE4-Tx-RX and QPHY-PCIE3-Tx-RX) <i>Requires LabMaster 10 Zi with 50 GHz bandwidth or higher</i>	QPHY-PCIE5-TX-RX
QualiPHY PCIe 4.0 Tx/Rx/LEQ Compliance Software Option (incl QPHY-PCIE3-Tx-RX) <i>Requires LabMaster 10 Zi with 25 GHz bandwidth or higher</i>	QPHY-PCIE4-TX-RX
QualiPHY PCIe 3.0 Tx/Rx/LEQ Compliance Software Option <i>Requires any LabMaster 10 Zi, or WaveMaster/SDA 8Zi with 13 GHz bandwidth or higher</i>	QPHY-PCIE3-TX-RX

Related Oscilloscope Decoder Options

These options operate only on the acquired oscilloscope trace and do not sync with protocol analyzer hardware.

PCI Express Protocol Link Layer Decode Annotation for WaveMaster/SDA/DDA 8Zi	WM8Zi-PCIEBUS D
Decode Annotation and Protocol Analyzer Software Synchronization Option for WaveMaster/SDA/DDA 8Zi	WM8Zi-PROTOSYNC
Decode Annotation and Protocol Analyzer+Bit Tracer SW Synchronization Option for WaveMaster/SDA/DDA 8Zi	WM8Zi-PROTOSYNC-BT
PCI Express Protocol Link Layer Decode Annotation - LabMaster 10 Zi Series	LM10Zi-PCIEBUS D
Decode Annotation and Protocol Analyzer Software Synchronization Option for LabMaster 10 Zi Series	LM10Zi-PROTOSYNC
Decode Annotation & Protocol Analyzer+Bit Tracer SW Synchronization Option for LabMaster 10Zi Series	LM10Zi-PROTOSYNC-BT

Customer Service

Teledyne LeCroy oscilloscopes and probes are designed, built, and tested to ensure high reliability. In the unlikely event you experience difficulties, our digital oscilloscopes are fully warranted for three years and our probes are warranted for one year.

This warranty includes:

- No charge for return shipping
- Long-term 7-year support
- Upgrade to latest software at no charge



1-800-5-LeCroy
teledynelecroy.com

Local sales offices are located throughout the world.
Visit our website to find the most convenient location.