

Product Line Card





**LabMaster 10 Zi-A
(SDA Models)**

**WaveMaster 8 Zi-B
(SDA/DDA 8 Zi-B)**

Bandwidth	20 GHz to 65 GHz	4 GHz to 30 GHz
Resolution	8-bit resolution, 11-bit with enhanced resolution	8-bit resolution, 11-bit with enhanced resolution
Rise Time	6.5 ps to 19.3 ps	15.5 ps to 95 ps
Channels (Analog+Digital+Sensor)	Up to 80, 80 + 18	4, 4 + 18
Display	15.3" WXGA Touch Screen	15.3" WXGA Touch Screen
Standard Memory	32 Mpts/Ch (64 Mpts/Ch)	32 Mpts/Ch (64 Mpts/Ch)
Maximum Memory†	Up to 1024 Mpts	Up to 512 Mpts
Sample Rate	Up to 160 GS/s	Up to 80 GS/s
MSO Characteristics† (Digital Channels)	3 GHz, 12.5 GS/s, 18 Ch	3 GHz, 12.5 GS/s, 18 Ch
Trigger Types	Edge, Width, Glitch, Pattern, Runt, Slew Rate, Interval (Period), Dropout, Qualified, Cascade (Sequence) Trigger, High-speed Serial Trigger†	Edge, Width, Glitch, Pattern, Video, HDTV, Runt, Slew Rate, Interval (Period), Dropout, Qualified, Cascade (Sequence) Trigger, High-speed Serial Trigger†
Serial Data† Trigger (T) Decode (D) Measure / Graph (M) Eye Diagram (E) Graph only (G) Physical Layer (P)	TD: 80-bit NRZ, 8b/10b, 64b/66b D: 64b66b, 8b/10b, ARINC 429, Audio, CAN, CAN FD, CAN FD Symbolic, DigRF 3G, DigRF v4, ENET, ENET 10G, Fibre Channel, I ² C, LIN, Manchester, MDIO, MIL-STD-1553, NRZ, PCIe, RS-232, SAS, SATA, SENT, SpaceWire, SPI, UART, UniPro, USB 1.0/1.1/2.0, USB 3.0 DP: D-PHY, Fibre Channel, FlexRay, M-PHY DG: Audio	TD: 80-bit NRZ, 8b/10b, 64b/66b, RS-232, UART TD or TDME: CAN, CAN FD, CAN FD Symbolic, I ² C, LIN, MIL-STD-1553, SPI, TD or TDxx: Audio (TDG), FlexRay (TDMP) D: DigRF 3G, DigRF v4, ENET, ENET 10G, Fibre Channel, Manchester, MDIO, NRZ, PCIe, SAS, SATA, SENT, SpaceWire, SPMI, UniPro, USB 2.0-HSIC, USB 3.0, 64b / 66b, 8b/10b DP: D-PHY, M-PHY DME: ARINC 429, USB 1.0/1.1/2.0
Serial Data Analysis	Eye Jitter and Noise Analysis (SDAIII-CompleteLINQ), Virtual Probe, Eye Doctor II, PAM4 Signal Analysis, Serial Data Mask, Cable De-Embedding	
Serial Data Compliance	DDR 3/4/5, LPDDR 3/4/5, DisplayPort 1.4, eDP, Ethernet 10GBase-T, 10GBase-KR, HDMI 1.4/2.0, MIPI M-PHY, PAM4-56G, PCI Express 1.0/2.0/3.0/4.0/5.0, SAS 2/3, SATA, SFI, USB 3.0/3.1/3.2, USB4	DDR 2/3/4, LPDDR 2/3/4, DisplayPort 1.4, eDP, Ethernet 10/100/1000Base-T, Ethernet 10GBase-T, 10GBase-KR, HDMI 1.4/2.0, MIPI D-PHY, MIPI M-PHY, MOST 50/150, PAM4-56G, PCI Express 1.0/2.0/3.0, SAS 2/3, SATA, SFI, USB 1.1/2.0, USB 3.0/3.1/3.2, USB4
Applications Software Options	Spectrum Analyzer (Dual+Reference), Clock and Clock-Data Jitter Analysis, DDR Debug Toolkit, Switch-mode Power Supply and Device Analysis, Advanced Customization (Standard with LabMaster 10 Zi-A), EMC Pulse Parameters, Digital Filter Package, Protocol Analyzer Synch (ProtoSync), Advanced Vector Signal Analysis, Vector Signal Analysis, Advanced Optical Recording, Disk Drive Analysis, Disk Drive Measurements, Coherent Optical Analysis, Electrical Telecom Pulse Mask Test	
Connectivity and Storage	USB Host for Storage, LAN for PC, LXI for PC, GPIB for PC†	
Math	+, -, x, /, FFT, Absolute Value, Average, Copy, Correlation, Derivative, Deskew, Envelope, Enhanced Resolution, Exponent, Floor, Histogram, Integral, Invert, Log, Phistogram, Ptrace Mean, Ptrace Range, Ptrace Sigma, Reciprocal, Rescale, Roof, Segment, Sparse, Square, Square Root, Track, Trend, Zoom	
Dimensions (HWD)	MCM-Zi-A: 277 x 462 x 396 mm (10.9" x 18.2" x 15.6") LabMaster 10-xxZi Acq. Module: 202 x 462 x 660 mm (8.0" x 18.2" x 26")	355 x 467 x 406 mm (14" x 18.4" x 16")
Weight	MCM-Zi-A: 47 lbs. (21.4 kg) LabMaster 10-xxZi-A Acq. Module - 58 lbs. (24 kg)	58 lbs. (26.4 kg)
Warranty	3 yr	3 yr
Starting Price	\$226,809	\$79,425

† Optional



	WavePro HD	WaveRunner 8000HD/MDA 8000HD	WaveRunner 9000/9000-MS/ WaveRunner 8000-R
Bandwidth	2.5 GHz to 8 GHz	350 MHz to 2 GHz	500 MHz to 4 GHz
Resolution	12-bit resolution, 15-bit with enhanced resolution	12-bit resolution, 15-bit with enhanced resolution	8-bit resolution, 11-bit with enhanced resolution
Rise Time	57.5 ps to 166 ps	1 ns to 235 ps	700 ps to 100 ps
Channels (Analog+Digital+Sensor)	4, 4 + 16	8, 8 + 16	4, 4 + 16
Display	15.6" Widescreen Capacitive Touch Screen	15.6" Widescreen Capacitive Touch Screen	15.4" WXGA Multi-Touch Screen
Standard Memory	50 Mpts/Ch 100 Mpts Interleaved	50 Mpts/Ch 100 / 200 Mpts Interleaved	16 Mpts/Ch; M Models: 64 Mpts/Ch 32 Mpts Interleaved; M Models: 128 Mpts
Maximum Memory[†]	Up to 5 Gpts	Up to 5 Gpts	Up to 128 Mpts
Sample Rate	Up to 20 GS/s	Up to 10 GS/s	Up to 20 GS/s; M Models: Up to 40 GS/s
MSO Characteristics[†] (Digital Channels)	250 MHz, 1.25 GS/s 16 Ch	500 MHz, 2.5 GS/s 16 Ch	250 MHz, 1.25 GS/s, 16 Ch
Trigger Types	Edge, Width, Glitch, Pattern, Runt, Slew Rate, Interval (Period), Dropout, Qualified,	Edge, Width, Glitch, Pattern, Runt, Slew Rate, Interval (Period), Dropout, Qualified, Measurement, Window	Edge, Width, Glitch, Pattern, Video, HDTV, Runt, Timeout, Slew Rate, Interval (Period), Dropout, Qualified, Measurement, Window, Cascade
Serial Data[†] Trigger (T) Decode (D) Measure / Graph (M) Eye Diagram (E) Graph only (G) Physical Layer (P)	TD or TDME: 100Base-T1, CAN, CAN FD, CAN FD Symbolic, SPMI, I ² C, I ² C, LIN, MIL- STD-1553, RS-232, SENT, SMBus, SPI, UART, USB 1.0/1.1/2.0 TD or TDxx: Audio (TDG), FlexRay (TDMP) D: DigRF 3G, DigRF v4, ENET, Fibre Channel, Manchester, MDIO, NRZ, PCIe, SATA, SAS, SpaceWire, UniPro, USB 2.0-HSIC, USB 3.0, 8b/10b DP: D-PHY, M-PHY DME: ARINC 429	TD or TDME: 100Base-T1, CAN, CAN FD, CAN FD Symbolic, SPMI, I ² C, I ² C, LIN, MIL-STD-1553, RS-232, SENT, SMBus, SPI, UART, USB 1.0/1.1/2.0 TD or TDxx: Audio (TDG), FlexRay (TDMP) D: DigRF 3G, DigRF v4, D-PHY, ENET, Manchester, MDIO, NRZ, SpaceWire, USB 2.0-HSIC, 8b/10b DME: ARINC 429	TD: SATA, 8b/10b TD or TDME: 100Base-T1, CAN, CAN FD, CAN FD Symbolic, SPMI, I ² C, I ² C, LIN, MIL- STD-1553, RS-232, SENT, SMBus, SPI, UART, USB 1.0/1.1/2.0 TD or TDxx: Audio (TDG), FlexRay (TDMP) D: DigRF 3G, DigRF v4, ENET, Fibre Channel, Manchester, MDIO, NRZ, PCIe, SAS, SpaceWire, UniPro, USB 2.0-HSIC DP: D-PHY, M-PHY DME: ARINC 429
Serial Data Analysis	Eye Jitter and Noise Analysis (SDAIII- CompleteLINQ), Virtual Probe, Eye Doctor II, Serial Data Mask, Cable De-Embedding	Eye and Jitter Analysis (SDAIII), Virtual Probe, Eye Doctor II, Serial Data Mask, Cable De-Embedding	Eye Jitter, Virtual Probe, Eye Doctor II, Serial Data Mask, Cable De-Embedding
Serial Data Compliance	DDR 2/3, LPDDR 2/3, Automotive Ethernet 1000Base-T1, BroadR-Reach, Ethernet 10/100/1000Base-T, MIPI D-PHY, MOST 50/150, PCI Express 1.0, USB 1.1/2.0	Automotive Ethernet 1000Base-T1, BroadRReach, Ethernet 10/100/1000Base-T, MOST 50/150, USB 1.1/2.0	DDR 2/3, LPDDR 2/3, Automotive Ethernet 1000Base-T1, BroadR-Reach, Ethernet 10/100/1000Base-T, MIPI D-PHY, MOST 50/150, USB 1.1/2.0
Applications Software Options	Spectrum Analyzer (Dual+Reference), Clock and Clock-Data Jitter Analysis, DDR Debug Toolkit, Switch-mode Power Supply and Device Analysis, Three-phase Electrical Power, Harmonic, and Vector Analysis, Digital Power Management, Advanced Customization, EMC Pulse Parameters, Digital Filter Package, Protocol Analyzer Synch (ProtoSync), Vector Signal Analysis, Advanced Optical Recording, Disk Drive Analysis, Disk Drive Measurements, Electrical Telecom Pulse Mask Test	Spectrum Analyzer (Dual+Reference), Clock and Clock-Data Jitter Analysis, Switch-mode Power Supply and Device Analysis, Three- phase Electrical Power, Harmonic, and Vector Analysis, Digital Power Management, Advanced Customization, EMC Pulse Parameters, Digital Filter Package, Vector Signal Analysis, Three-phase Electrical and Mechanical Power Analysis (included with MDA Models)	Spectrum Analyzer (Dual+Reference), Clock and Clock-Data Jitter Analysis, DDR Debug Toolkit, Switch-mode Power Supply and Device Analysis, Advanced Customization, EMC Pulse Parameters, Digital Filter Package, Protocol Analyzer Synch (ProtoSync), Vector Signal Analysis, Advanced Optical Recording, Disk Drive Analysis, Disk Drive Measurements, Electrical Telecom Pulse Mask Test
Connectivity and Storage	USB Host for Storage, USB Device for PC, LAN for PC, GPIB for PC†		
Math	+, -, x, /, FFT, Absolute Value, Average, Copy, Correlation, Derivative, Deskew, Envelope, Enhanced Resolution, Exponent, Floor, Histogram, Integral, Invert, Log, Phistogram, Ptrace Mean, Ptrace Range, Ptrace Sigma, Reciprocal, Rescale, Roof, Segment, Sparse, Square, Square Root, Track, Trend, Zoom		+, -, x, /, FFT, Absolute Value, Average, Copy, Correlation, Derivative, Deskew, Envelope, Enhanced Resolution, Exponent, Floor, Histogram, Integral, Invert, Log, Phistogram, Ptrace Mean, Ptrace Range, Ptrace Sigma, Reciprocal, Rescale, Roof, Segment, Sparse, Square, Square Root, Track, Trend, Zoom
Dimensions (HWD)	345 x 445 x 196 mm (13.6" H x 17.5" W x 7.7" D)	345 x 445 x 196 mm (13.6" H x 17.5" W x 7.7" D)	358 x 445 x 242 mm (14.1" x 17.5" x 9.5") WaveRunner 8000-R: 316 x 417 x 238 mm (12.44" x 16.42" x 9.37")
Weight	24.4 lbs (11.1kg)	24.4 lbs (11.1kg)	25.8 lbs. (11.7 kg)
Warranty	3 yr	3 yr	3 yr
Starting Price	\$32,569	\$28,830	\$16,764



**HDO6000A/
HDO6000A-MS**

**HDO4000A/
HDO4000A-MS**

WaveSurfer 4000HD

Bandwidth	350 MHz to 1 GHz	200 MHz to 1 GHz	200 MHz to 1 GHz
Resolution	12-bit resolution, 15-bit with enhanced resolution	12-bit resolution, 15-bit with enhanced resolution	12-bit resolution, 15-bit with enhanced resolution
Rise Time	1 ns to 450 ps	1.75 ns to 450 ps	1.75 ns to 450 ps
Channels (Analog+Digital+Sensor)	4, 4 + 16, 4 + 16 + 24	4, 4 + 16, 4 + 16 + 24	4, 4 + 16, 4 + 16 + 24
Display	12.1" WXGA Multi-Touch Screen	12.1" WXGA Multi-Touch Screen	12.1" Widescreen Capacitive Touch Screen
Standard Memory	50 Mpts/Ch	12.5 Mpts/Ch 25 Mpts Interleaved	12.5 Mpts/Ch 25 Mpts Interleaved
Maximum Memory†	Up to 250 Mpts	Up to 50 Mpts	Up to 25 Mpts
Sample Rate	Up to 10 GS/s	Up to 10 GS/s	Up to 5 GS/s
MSO Characteristics† (Digital Channels)	250 MHz, 1.25 GS/s 16 Ch	250 MHz, 1.25 GS/s 16 Ch	125 MHz, 500 MS/s 16 Ch
Trigger Types	Edge, Width, Glitch, Pattern, Video, HDTV, Runt, Timeout, Slew Rate, Interval (Period), Dropout, Qualified, Measurement, Window, Cascade	Edge, Width, Glitch, Pattern, Video, HDTV, Runt, Slew Rate, Interval (Period), Dropout, Qualified, Window	Edge, Width, Pattern, Video, HDTV, Runt, Slew Rate, Interval (Period), Dropout, Qualified
Serial Data† Trigger (T) Decode (D) Measure / Graph (M) Eye Diagram (E) Graph only (G) Physical Layer (P)	TD or TDME: 100Base-T1, CAN, CAN FD, CAN FD Symbolic, SPMI, I ² C, I ² C, LIN, MIL-STD-1553, RS-232, SENT, SMBus, SPI, UART TD or TDxx: Audio (TDG), FlexRay (TDMP) D: DigRF 3G, DigRF v4, D-PHY, ENET, Manchester, MDIO, NRZ, SpaceWire, USB 1.0/1.1/2.0, USB 2.0-HSIC DME: ARINC 429	TD: 100Base-T1, Audio, CAN, CAN FD, FlexRay, SPMI, I ² C, I ² C, LIN, MIL-STD-1553, RS-232, SENT, SMBus, SPI, UART D: ARINC 429, DigRF 3G, DigRF v4, D-PHY, ENET, Manchester, MDIO, NRZ, SpaceWire, USB 1.0/1.1/2.0, USB 2.0-HSIC	TD: Audio, CAN, CAN FD, LIN, FlexRay, I2C, SPI, UART, RS232
Serial Data Analysis	Serial Data Mask	–	–
Serial Data Compliance	–	–	–
Applications Software Options	Spectrum Analyzer (Dual+Reference), Clock and Clock-Data Jitter Analysis, Switch-mode Power Supply and Device Analysis, Three-phase Electrical Power, Harmonic, and Vector Analysis, Digital Power Management, Advanced Customization, EMC Pulse Parameters, Digital Filter Package, Vector Signal Analysis, Electrical Telecom Pulse Mask Test	Spectrum Analyzer (Single), Switch-mode Power Supply and Device Analysis, Electrical Telecom Pulse Mask Test	Spectrum Analyzer (Single), Switch-mode Power Supply and Device Analysis, Arbitrary Waveform Generator, Digital Voltmeter (Included standard with registration)
Connectivity and Storage		USB Host for Storage, USB Device for PC LAN for PC, GPIB for PC†	
Math	+, -, x, /, FFT, Absolute Value, Average, Copy, Correlation, Derivative, Deskew, Envelope, Enhanced Resolution, Exponent, Floor, Histogram, Integral, Invert, Log, Phistogram, Ptrace Mean, Ptrace Range, Ptrace Sigma, Reciprocal, Rescale, Roof, Segment, Sparse, Square, Square Root, Track, Trend, Zoom	+, -, x, /, FFT, Absolute Value, Average, Derivative, Deskew, Envelope, Enhanced Resolution, Floor, Integral, Invert, Reciprocal, Rescale, Roof, Square, Square Root, Trend, Zoom	+, -, x, /, FFT, Absolute Value, Average, Derivative, Deskew, Envelope, Enhanced Resolution, Floor, Integral, Invert, Reciprocal, Rescale, Roof, Square, Square Root, Trend, Zoom
Dimensions (HWD)	291.7 x 399.4 x 131.31 mm (11.48" x 15.72" x 5.17")	291.7 x 399.4 x 131.31 mm (11.48" x 15.72" x 5.17")	273 x 380 x 160 mm (10.7" x 14.9" x 6.3")
Weight	12.6 lbs (5.71 kg)	12.6 lbs (5.71 kg)	11.7 lbs (5.3 kg)
Warranty	3 yr	3 yr	3 yr
Starting Price	\$16,284	\$11,141	\$7,640



	WaveSurfer 510	WaveSurfer 3000z	T3DSO2000/ T3DSO2000A	T3DSO1000 / T3DSO1000A
Bandwidth	1 GHz	100 MHz to 1 GHz	100 MHz to to 500 MHz	100 MHz to 350 MHz
Resolution	8-bit resolution, 11-bit with enhanced resolution	8-bit resolution, 11-bit with enhanced resolution	8-bit resolution, 11-bit with enhanced resolution	8-bit resolution, 11-bit with enhanced resolution
Rise Time	350 ps	3.5 ns to 430 ps	3.5 ns to 800 ps	3.5 ns to 1 ns
Channels (Analog+Digital+Sensor)	4, 4 + 18	4, 4+16	2 or 4, 2 or 4 + 16	2 or 4, 2 or 4 + 16
Display	12.1" WXGA Multi-Touch Screen	10.1" Capacitive Touch Screen	T3DSO2000: 8" 800 x 480 T3DSO2000A: 10.1" Capacitive Touch Screen 1024 x 600	7" 800 x 480
Standard Memory	16 Mpts/Ch, 32 Mpts interleaved	10 Mpts/Ch, 20 Mpts Interleaved	T3DSO2000: 70 Mpts/Ch, 140 Mpts interleaved T3DSO2000A: 100 Mpts/Ch, 200 Mpts interleaved	T3DSO1000: 7 Mpts/Ch, 14 Mpts interleaved, T3DSO1000A: 14 Mpts/Ch, 28 Mpts interleaved
Maximum Memory[†]	Up to 32 Mpts	Up to 20 Mpts	Up to 140 Mpts / 200 Mpts	Up to 28 Mpts
Sample Rate	10 GS/s	Up to 4 GS/s 100 MHz models: Up to 2 GS/s	Up to 2 GS/s	T3DSO1000: Up to 1 GS/s T3DSO1000A: Up to 2 GS/s
MSO Characteristics[†] (Digital Channels)	250 MHz, 1 GS/s	125 MHz, 500 MS/s	125 MHz, 500 MS/s / 500 MS/s, 3.3 ns min detectable pulse width	250 MHz, 1 GS/s
Trigger Types	Edge, Width, Glitch, Pattern, Video, HDTV, Runt, Slew Rate, Interval (Period), Dropout, Qualified	Edge, Width, Pattern, TV, Runt, Slew Rate, Interval (Period), Dropout, Qualified	Edge,Pulse, Pattern, Video, Runt, Slope, Interval, Dropout, Window / Zone	Edge,Pulse, Pattern, Video, Runt, Slope, Interval, Dropout, Window
Serial Data[†] Trigger (T) Decode (D) Measure / Graph (M) Eye Diagram (E) Graph only (G) Physical Layer (P)	TD: 100Base-T1, Audio, CAN, CAN FD, FlexRay, SPMI, I ² C, I ² C, LIN, MIL-STD-1553, RS-232, SENT, SMBus, SPI, UART D: ARINC 429, DigRF 3G, DigRF v4, D-PHY, ENET, Manchester, MDIO, NRZ, SpaceWire, USB 1.0/1.1/2.0, USB 2.0-HSIC	TD: Audio, CAN, CAN FD, FlexRay, I ² C, LIN, RS-232, SPI, UART	T3DSO2000: TD: I ² C, SPI, UART-RS-232, CAN, LIN T3DSO2000A: TD: I ² C, SPI, UART-RS232, CAN, LIN D: CAN FD, FlexRay, I ² S, MILSTD-1553B	TD: I ² C, SPI, UART-RS232, CAN, LIN
Serial Data Analysis	–	–	–	–
Serial Data Compliance	–	–	–	–
Additional Software Options	Spectrum Analyzer (Single), Switch-mode Power Supply and Device Analysis	Switch-mode Power Supply and Device Analysis, Function Generator, Digital Voltmeter (Included standard with registration)	T3DSO2000: Arbitrary Waveform Generator T3DSO2000A: Arbitrary Waveform Generator, Switchmode Power Supply and Device Analysis, Bode Plot, 10-bit mode, Mask Test	Arbitrary Waveform Generator, WiFi, Bode Plot
Connectivity and Storage	USB Host for Storage, LAN for PC, GPIB for PC [†]	USB Host, USB Device, LAN, GPIB, and LXI Compatible	USB Host, USB Device, LAN	USB Host, USB Device, LAN
Math	+, -, x, /, FFT, Derivative, Deskew, Integral, Rescale, Roof, Square, Square Root, Zoom, Absolute Value, Average, Envelope, Enhanced Resolution, Exp (base e), Exp (base 10) Floor, Invert, Log (base e), Log (base 10), Reciprocal, Roof and Trend	+, -, x, /, FFT, Absolute Value, Average, Derivative, Envelope, Floor, Integral, Invert, Reciprocal, Rescale, Roof, SinX/x, Square, Square Root, Trend, Zoom	+, -, x, /, FFT, Derivative, Integral, Square Root / Formula Editor	+, -, x, /, FFT, Derivative, Integral, Square Root
Dimensions (HWD)	316 x 417 x 238 mm (12.44" x 16.42" x 9.37")	270 x 380 x 125 mm (10.63" x 14.96" x 4.92")	224 x 352 x 128 mm (8.81" x 13.86" x 5.04")/ /224 x 352 x 111 mm (8.81" x 13.86" x 4.37")	150 x 312 x 133 mm (5.91" x 12.28" x 5.94")
Weight	22.8 lbs. (10.3 kg)	10.6 lbs (4.81 kg)	7.92 lbs. (3.6 kg)/ 8.6 lbs. (3.9 kg)	5.72 lbs. (2.6 kg)
Warranty	3 yr	3 yr	3 yr	3 yr
Starting Price	\$13,553 <i>Limited Availability</i>	\$2,990	\$1,444	\$724

TEST & MEASUREMENT INSTRUMENTS

MDA 8000HD Motor Drive Analyzer



3-phase Electrical and Mechanical Power Analysis

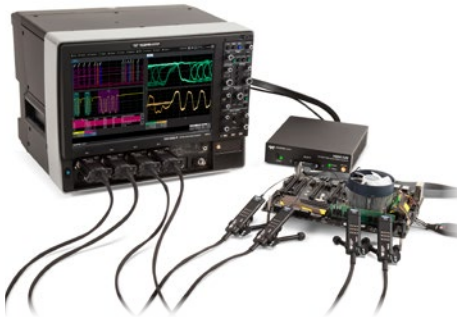
Motor drive engineers need to understand every part of drive system operation. They need to view control, sensor, device and power waveforms, they need to understand dynamic events, and they need flexibility to debug anything. The Motor Drive Analyzer does it all.

Key Features:

- Up to 2 GHz, 10 GS/s, 5 Gpts with 12-bit resolution
- Dynamic power analysis, from startup to overload
- Per-cycle time-correlated power Waveforms
- Comprehensive motor interface (Torque, Speed, Angle, Power)
- Unique Zoom+Gate mode
- Two- and three-wattmeter methods supported
- Harmonics calculations, displays and filtering (optional)
- Vector displays (optional)
- Up to 6000 Vrms isolation with HVD Series differential probes
- Easily interface many different current measurement devices

teledynelecroy.com/motor-drive-analyzer | teledynelecroy.com/static-dynamic-complete

HDA125 High-speed Digital Analyzer



The Most Flexible Mixed-Signal Test Solution

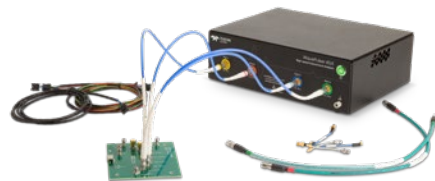
The HDA125 transforms your Teledyne LeCroy oscilloscope into the highest-performance, most flexible mixed-signal solution for high-speed digital debug and evaluation. With 12.5 GS/s digital sampling rate on 18 input channels, and the revolutionary QuickLink probing solution allowing seamless transitions from digital to high-bandwidth analog acquisitions, validation of challenging interfaces such as DDR4 has never been simpler or more comprehensive.

Key Features:

- 12.5 GS/s sampling rate for 80ps timing accuracy
- 3 GHz leadset for capturing digital signals up to 6 Gb/s
- Add high-speed mixed-signal capability to your Teledyne LeCroy high-bandwidth oscilloscope
- LBUS connection for precise timing synchronization
- USB 3.1 for fast data transfer
- Unique QuickLink probing system
- Differential solder-in tips with 9-inch lead simplify access to difficult test points
- Ultra low loading for superior performance
- 8 GHz bandwidth tips are compatible with both HDA digital leadset and Teledyne LeCroy WaveLink differential analog probes for unmatched acquisition flexibility

teledynelecroy.com/logicanalyzers

WavePulser 40iX High-speed Interconnect Analyzer



Impedance Profile (TDR), S-parameters, and Deep Toolbox

WavePulser 40iX is the ideal single measurement tool for high-speed hardware designers and test engineers. The combination of S-parameters (frequency domain) and Impedance Profiles (time domain) in a single acquisition with a deep toolbox provides unmatched characterization insight of high-speed interconnects.

Key Features:

- S-parameters DC to 40 GHz, single-ended and mixed-mode
- Impedance Profile with <1 mm resolution, differential and common-mode
- Internal, automatic OSLT calibration
- USB-connected, small, lightweight
- Flexible display of the measurements
- Remove effects from fixtures, connectors and cables
- Emulate eye diagrams with CTLE, DFE and FFE equalization
- Advanced jitter analysis

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TEST & MEASUREMENT INSTRUMENTS

Teledyne Test Tools

Learn More: teledynelecroy.com/testtools

Teledyne Test Tools is a comprehensive range of test equipment solutions to complement Teledyne LeCroy's family of oscilloscopes and analyzers. These tools provide a one-stop-shop for test engineers, developers and teaching establishments looking to satisfy ongoing testing, education and electronics validation needs efficiently, reliably and within budget.

The Teledyne Test Tools portfolio was created in collaboration with leading OEM technology partners to support new product design needs across a range of industries such as mobile, automotive, communications, defense and manufacturing.



T3SP Time Domain Reflectometers

Teledyne Test Tools T3SP10D and T3SP15D stimulate the DUT with true differential signals. The TDRs offer fast rise times of 50 ps (T3SP10D) and 35 ps (T3SP15D) for fault resolution (in FR4) of 4.2 mm and 3 mm, respectively, at DUT lengths of up to 40 meters and TDR repetition rates of up to 10 MHz and uses the same open short load thru (OSL for T3SP10D and OSLT for T3SP15D) calibration standards as vector network analyzers. Thanks to their small form factors, light weight, and optional internal batteries, the instruments go anywhere in test labs or in the field at a cost-effective price point.



T3AWG2K Series - 16-bit Dual Channel Function / Arbitrary Waveform Generators

The T3AWG2K series consists of two affordable dual-channel arbitrary waveform generators, 16-bit vertical resolution, 6 Vpp output voltage (500 to 500), 128 Mpts/ch memory, a maximum sampling rate of 600 MS/s and a maximum sine wave frequency of 150 MHz. The T3AWG2152-D mainframe adds 8 synchronized digital channels to the analog outputs, ideal for debugging and digital design validation.



T3AWG3K-series 2, 4 and 8 Channel Arbitrary Waveform Generators

T3AWG3K Series consists of six high definition high performance Arbitrary Waveform Generators (HD AWG) consisting of 2, 4 and 8 channels, 16 bit vertical resolution, 12 Vpp max output voltage (50Ω into 50Ω), 128 Mpts/ch memory (optional 1 Gpts/ch), a maximum sampling rate of 1.2 GS/s and a max sinewave frequency of 250 MHz and 350 MHz respectively. The baseline HW voltage offset capability provide the unmatched ability to generate ±24 V or 48V output voltage window (50Ω into High Impedance).



T3AFG Function/Arbitrary Waveform Generators

Teledyne Test Tools T3AFG series of function / arbitrary waveform generators use advanced Digital Frequency Synthesis (DDS) technology to produce high quality standard function and arbitrary waveform signals. They also provide a wide range of analog and digital modulation functions. The T3AFG series of Arbitrary Waveform Generators includes models with up to 500 MHz bandwidth, 2.4 GSa/s sample rate, 16-bit vertical resolution and 20 Mpts of data. Common analog and digital modulations, sweep and burst are provided to support complex signal generation. The T3AFG series also provides true dual channels with internal waveform combination, flexible phase/channel control and copy/coupling/tracking between channels. These features enable Teledyne Test Tools Arbitrary Waveform Generators to provide a variety of high fidelity and low jitter signals, meeting the growing requirements of complex and intensive applications. The T3AFG200, 350 and 500 models also have the added feature of IQ modulation to support complex applications.



T3DMM Series - Digital Multimeters

Teledyne Test Tools new T3DMM series are dual display digital desktop multimeters that provide a rich and powerful feature set. The design is easy-to-use from the front-panel and computer-based control via USB or LAN. Each model is equipped with a 4.3 inch TFT-LCD true color screen with 480 * 272 resolution for easy viewing. The T3DMM series also features numerical data display, histograms, trend charts, bar charts and statistics, in addition to the built-in arithmetic functions including Measurement statistics.



T3DSO1000/1000A Series Oscilloscopes

Teledyne Test Tools new T3DSO1000/1000A Oscilloscopes feature two channel and four channel models. The two channel model is available in 100 MHz, 200 MHz or 350 MHz bandwidths, a single ADC with up to 2 GSa/s maximum sample rate, and up to 28 Mpts of sample memory. The four channel scope is available in 100 and 200 MHz models and incorporates two 1 GSa/s ADCs and two 14 Mpts memory modules. When all channels are enabled, each channel has sample rate of 500 MSa/s and a standard record length of 7 Mpts. When only a single channel per ADC is active, the maximum sample rate is 1 GSa/s and the maximum record length is 14 Mpts. For ease-of-use, the most commonly used functions can be accessed with its user-friendly front panel design.



T3DSO2000



T3DSO2000A

T3DSO2000/2000A Series Oscilloscopes

Teledyne Test Tools new T3DSO2000A Oscilloscopes feature two channel and four channel models with analog bandwidth options from 100 MHz to 500 MHz. Each model offers a maximum sample rate of 2 GSa/s, and a maximum memory depth of 140 Mpts / 200 Mpts in half channel mode. All models incorporates two 2 GSa/s ADCs and two 140 Mpts or 200 Mpts memory modules. When all channels are enabled, each channel has sample rate of 1 GSa/s and a standard record length of 70 Mpts or 100 Mpts depending on model. When only a single channel per ADC is active, the maximum sample rate is 2 GSa/s and the maximum record length is 140 Mpts / 200 Mpts depending on model. For ease-of-use, the most commonly used functions can be accessed with its user-friendly front panel design. The T3DSO2000 comes with an 8" 800 x 480 display whereas the T3DSO2000A series has the larger 10.1 inch capacitive touch screen TFT-LCD display with 1024 x 600 resolution.

Teledyne Test Tools – continued



T3VNA Vector Network Analyzers

Teledyne Test Tools T3VNA family of Vector Network Analyzers consists of models with various Vector Network Analysis frequency ranges from as low as 100 kHz up to 3.2 GHz and Spectrum Analysis frequency range from 9 kHz up to 3.2 GHz depending on model. The small footprint and easy user interface is augmented by a high performance specification with many advanced measurement functions and capabilities.



T3SA Series - Spectrum Analyzers

Teledyne Test Tools new T3SA3000 family of Spectrum Analyzers offers a frequency range of 9 KHz to either 2.1/3.2 GHz alongside many impressive features. With their light weight, small form factor, and user friendly interface, these Spectrum Analyzers take powerful and reliable automatic measurements that are presented on a large, bright, easy to read touch screen display. Typical uses for the T3SA3000 series are research and development, education, production, maintenance, and pre-compliance testing..



T3PS Series - Power Supplies

The Teledyne Test Tools range of DC Bench Power Supplies comes in non-programmable and programmable versions with one, two, three and four output configurations. Key features within the Teledyne Test Tool Power Supply range include programmability via USB or LAN, a graphical display of power waveforms, as well as high resolution numeric display of voltage and current. Typical customer applications for DC Bench Power Supplies include those in industries such as mobile, automotive, communications, defense, and manufacturing as well as those within teaching, education and research institutions.



T3EL Series Bench Electronic Loads

The T3EL series is a family of single channel, 300 Watt Electronic Loads that are ideal for R&D, product validation and Q&A in a bench or automated environment for low to medium power applications starting from 60mA, such as electronic components, batteries, portable chargers and power products. Electronic Loads are typically used to provide a load to the outputs of a power supply, usually capable of dynamic loading, and are fully programmable. Electronic Loads help designers to test electronic power products and ensure quality, reliability, and performance.

PROBES

Learn More: <https://teledynelecroy.com/tdr-and-s-parameters>

TDR Probes

TDR Differential Probe 18 GHz, variable pitch

T3SP-DPROBE



High precision differential TDR Probe provides an 18 GHz, high performance solution for TDR circuit board impedance characterization and high-speed electrical signal analysis applications. The ergonomic and robust case design providing best ratio of thickness and width. The robust measuring tips guarantee a long life and high repeatability of the measurements. Adjustable pitch 0.1-5.0 mm.

TDR Differential Probe 5 GHz, fixed pitch

T3SP-DPROBE-F



Economic differential TDR Probe provides an ideal solution for TDR circuit board impedance characterization on a very attractive price. It is the ideal probe for fast and accurate PCB impedance measurements up to 5 GHz. Fixed 2.54 mm pitch.

TDR Single-ended Probe 5 GHz, fixed pitch

T3SP-SEPROBE-F



Single-ended TDR probe provides an ideal solution for TDR circuit board impedance characterization at a very attractive price. It is the ideal single-ended probe for fast, accurate and repeatable accurate PCB impedance measurements up to 5 GHz. Fixed 2.54 mm pitch.

TDR Single-ended Probe 10 GHz, variable pitch

T3SP-SEP



High precision Single-ended TDR probe provides a 10 GHz, high performance and repeatable solution for TDR circuit board impedance characterization for all the high-speed single-ended electrical signal analysis applications. The variable pitch combined with the compact dimension make this probe an ideal solution for high repeatable TDR single-ended measurements. 1.0,1.27,1.65, 2.0 and 2.5 mm variable pitch.

Teledyne LeCroy offers an extensive range of probes to meet virtually every probing need.

Differential Probes (4 to 25 GHz)

Various
(see teledynelecroy.com/probes for more information)



General purpose high-bandwidth probes with high dynamic range and offset. Wide variety of tips and leads available, including solder-in, QuickLink solder-in, HiTemp solder-in, browser tip, square-pin, and SMA/SMP lead (tip availability depends on probe model).

Differential Probes (200 MHz – 1.5 GHz)

ZD1500, ZD1000,
ZD500, ZD200
AP033, T3DP7000



High bandwidth, excellent common-mode rejection ratio (CMRR) and low noise make these active differential probes ideal for applications such as automotive electronics and data communications. AP033 provides 10x gain for high-sensitivity measurement of series/shunt resistor voltages.

Active Voltage/Power Rail Probe

RP4030



Specifically designed to probe a low impedance power/voltage rail. The RP4030 has 30 V built-in offset adjust, low attenuation (noise), and high DC input impedance with 4 GHz of bandwidth. Featuring a wide assortment of tips and leads, including solder-in and U.FL receptacle connections.

ZS Series High Impedance Active Probes

ZS4000, ZS2500,
ZS1500, ZS1000



High input impedance (1 M Ω), low 0.9 pF input capacitance and an extensive set of probe tips and ground accessories make these low-cost, single-ended probes ideal for a wide range of applications. The ZS Series is available up to 4 GHz bandwidth.

High Voltage Fiber Optically-isolated Probes

HVFO108,



The HVFO is a compact, simple, affordable probe for measurement of small signals (gate-drives, sensors, etc.) floating on an HV bus in power electronics designs, or for EMC, EFT, ESD, and RF immunity testing sensor monitoring. Suitable for up to 35kV common-mode. 140 dB CMRR.

High Voltage Differential Probes

HVD3102A, HVD3106A-6M,
HVD3106A, HVD3206A,
HVD3206A-6M, HVD3605A, AP031



Available with 1, 2 or 6 kV common-mode ratings. Excellent CMRR (65 dB @ 1 MHz) at high frequencies is combined with low inherent noise, wide differential voltage range, high offset voltage capabilities, and 1% gain accuracy. The ideal probe for power conversion system test.

Current Probes

CP030, CP030-3M, CP030A
CP031, CP031A, CP150,
CP150-6M, CP500, DCS025, T3CP50



Available in bandwidths up to 100 MHz with peak currents of 700 A and sensitivities to 1 mA/div. Extra-long cables (3 or 6 meters) available on some models. Ideal for component or power conversion system input/output measurements.

T3RC Series Rogowski Coil Current Probes

T3RC0300-UM, T3RC0600-HF,
T3RC3000-HF, T3RC3000-LF,
T3RC6000-LF



Teledyne Test Tools Rogowski Current probes offer a broad range of products covering a wide frequency span and current measurement ranges for maximum application coverage whilst being easy to use in difficult to reach parts of the circuit.

High Voltage Passive Probes

HVP120, PPE4KV,
PPE5KV, PPE6KV, T3HVP100



High voltage single-ended passive probes are suitable for a wide range of applications where ground-referenced high-voltage measurements must be made safely and accurately. There are several fixed-attenuation probes covering a range from 1 kV to 6 kV and varying transient overvoltage ratings. All of these high voltage probes feature a spring loaded probe tip and a variety of standard accessories to make probing high voltages safe and easy. Additionally, all of the high voltage probe have a probe sense pin to automatically configure the oscilloscope for use with the probe.

Passive Probes

PP006C, PP016, PP018, PP019,
PP020, PP021, PP022, PP023, PP024,
PP025, PP026



Typical passive probes provide a /10 attenuation and feature a high input resistance of 10 M Ω . This high input resistance means that passive probes are the ideal tool for low frequency signals since circuit loading at these frequencies is minimized. Passive probes are designed to handle voltages of at least 400 V, some as high as 600 V. Teledyne LeCroy passive probes feature an attenuation sense pin for automatic probe detection and voltage scaling.

Probe and Current Sensor Adapters

TPA10, CA10, CA10-QUADPAK



TPA10 adapts supported Tektronix TekProbe-compatible probes to Teledyne LeCroy ProBus interface. CA10 is a programmable adapter for third-party current sensors that have voltage or current outputs proportional to measured current.

Optical to Electrical Converters

OE6250G-M, OE695G,
OE425, OE455



Teledyne LeCroy's wide-band multi-mode optical-to-electrical converters are designed for measuring optical communications signals. Their broad wavelength range and multi-mode input optics make these devices ideal for applications including Ethernet, Fibre Channel, and ITU telecom standards. Available to support optical data rates up to 11.3 Gb/s with reference receivers, or slightly higher without reference receivers.

PCI Express®



Summit™ T54 Analyzer

2.5 GT/s ✓ 5 GT/s ✓ 8 GT/s ✓ 16 GT/s ✓ 32 GT/s ✓

The Summit T54 is Teledyne LeCroy's highest performance portable protocol analyzer that fully supports up to PCI Express 5.0 AND CXL protocol analysis. The Summit T54 can capture up to a x4 link and is configurable up to 64 GB trace depth with a single unit. Larger trace depths and link-widths can be achieved by cascading a second unit, providing up to 128 GB of trace memory and up to x8 link-width. The product is ideal for high-performance protocol development for storage SSDs, servers and workstations, and for customers currently working on PCIe 3.0 or 4.0 who may upgrade to PCIe 5.0.



Summit M5x Analyzer /Jammer

2.5 GT/s ✓ 5 GT/s ✓ 8 GT/s ✓ 16 GT/s ✓ 32 GT/s ✓

The Summit M5x Protocol Analyzer /Jammer is the computer industry's first platform to not only support today's PCIe 4.0 specification but is designed to also support the next generation PCIe 5.0 (32GT/s) specification, CXL, and the Gen-Z Specification. The Summit M5x introduces new error injection (jamming) capabilities for PCIe and Gen-Z testing in addition to high speed recording and analyzing. The Summit M5x protocol analyzer/jammer features the PCIe industry's first PCIe 4.0 "RAS" Error and Gen-Z jamming test capability.



Summit Z516 Protocol Exerciser

2.5 GT/s ✓ 5 GT/s ✓ 8 GT/s ✓ 16 GT/s ✓ 32 GT/s ✓

The Summit Z516 Exerciser is Teledyne LeCroy's highest performance PCI Express and CXL protocol exerciser, and supports PCI Express 5.0; data rates of 2.5GT/s, 5GT/s, 8GT/s, 16GT/s and 32 GT/s; supports bidirectional lane widths of x1, x2, x4, x8 and x16.



Summit Z58 Protocol Exerciser Analyzer

2.5 GT/s ✓ 5 GT/s ✓ 8 GT/s ✓ 16 GT/s ✓ 32 GT/s ✓

The Summit Z58 Exerciser supports PCI Express 5.0; data rates of 2.5GT/s, 5GT/s, 8GT/s, 16GT/s and 32 GT/s; full data capture on bidirectional lane widths of x1, x2, x4, and x8; and a full 8 GB of trace memory. The system offers advanced features such as performance monitoring, LTSSM, equalization decodes and much more.



Summit T416 Analyzer

2.5 GT/s ✓ 5 GT/s ✓ 8 GT/s ✓ 16 GT/s ✓

The Summit T416 is a PCI Express protocol analyzer, and offers advanced features such as: support for PCI Express Spec 4.0; data rates of 2.5 GT/s, 5.0 GT/s, 8.0 GT/s, and 16.0 GT/s; full data capture on bidirectional link widths of x1, x2, x4, x8 and x16; and up to 128GB of trace memory. The product is ideal for high-performance protocol development for add-in boards, servers and workstations, and for customers currently working on PCIe 3.0 or who wish to support PCIe 4.0.



Summit T48 Protocol Analyzer

2.5 GT/s ✓ 5 GT/s ✓ 8 GT/s ✓ 16 GT/s ✓

The Summit T48 offers advanced features such as: support for PCI Express 4.0 Specification; data rates of 2.5 GT/s, 5.0 GT/s, 8.0 GT/s, and 16.0 GT/s; full data capture on bidirectional link widths of x1, x2, x4, and x8; and up to 64GB of trace memory. The product is ideal for high-performance protocol development for add-in boards, servers and workstations, and for customers currently working on PCIe® 3.0 or who wish to support PCIe 4.0



Summit Z416 Protocol Exerciser

2.5 GT/s ✓ 5 GT/s ✓ 8 GT/s ✓ 16 GT/s ✓

The Summit Z416 Exerciser is a PCI Express protocol exerciser analyzer, and supports PCI Express 4.0; data rates of 2.5GT/s, 5GT/s and 8GT/s; full data capture on bidirectional lane widths of x1, x2, x4, x8 and x16; and a full 8 GB of trace memory. The system offers advanced features such as performance monitoring, LTSSM, equalization decodes and much more. It is approved by the PCI-SIG as a protocol compliance tool for PCIe 4.0.



Summit T3-16 Analyzer

2.5 GT/s ✓ 5 GT/s ✓ 8 GT/s ✓

The Summit T3-16 Protocol Analyzer is a high-end analyzer that offers new features for Gen3 application development. While sharing application compatibility with the previous analyzer platforms, the Summit can record traces on SSC supported lanes at speeds of 2.5, 5 and 8 GT/s. Users acquainted with Teledyne LeCroy's multiple probing accessories will find the right probing required to do the job.



Summit T3-8 Analyzer

2.5 GT/s ✓ 5 GT/s ✓ 8 GT/s ✓

The Summit T3-8 supports PCI Express 3.0 in a smaller package designed for lane widths up to x8. Features include data rates of 2.5 GT/s, 5 GT/s and 8 GT/s; full data capture on bidirectional lane widths of x1, x2, x4 and x8 (x16 is available using two units); and 4 GB of trace memory. The system offers performance monitoring, LTSSM, equalization decodes and much more.

PCI Express - continued



Summit T34 Analyzer

2.5 GT/s ✓ 5 GT/s ✓ 8 GT/s ✓

The Summit T34 provides a low-cost and extremely portable analyzer that fully supports PCI Express 3.0 protocol analysis. It can capture up to 4 lanes of traffic and is configurable up to 32 GB trace depth with a single unit. Larger trace depths can be achieved by cascading a second unit, providing up to 64 GB of trace memory.



Summit Z3-16 Exerciser

2.5 GT/s ✓ 5 GT/s ✓ 8 GT/s ✓

The Summit Z3-16 is Teledyne LeCroy's fourth generation protocol exerciser, with support for PCI Express at the Gen3 data rates of up to 8 GT/s. The Summit T3-16 Analyzer and Summit Z3-16 Exerciser provide a complete test and development system for engineers working on PCI Express 3.0 designs. It is approved by the PCI-SIG as a protocol verification tool for PCIe 3.0.



Summit T28 Analyzer

2.5 GT/s ✓ 5 GT/s ✓

The Summit T28 supports PCI Express 2.0 designs in a compact and economical package. Features include data rates of 2.5 GT/s and 5 GT/s; full data capture on bidirectional lane widths of x1, x2, x4 and x8; and 4 GB of trace memory. The system offers performance monitoring, LTSSM, equalization decodes and much more.



Summit T24 Analyzer

2.5 GT/s ✓ 5 GT/s ✓

With advanced features such as support for PCI Express Spec 2.0, data rates of both 2.5 and 5 GT/s, lane widths from x1 to x4, and a full 2 GB of trace memory, the Summit T24 provides unmatched capability and flexibility for developers and users of advanced PCI Express products. The Summit T24 is the most cost effective PCI Express Analyzer available in the market today.



ProtoSync® PE Oscilloscope Decode

2.5 GT/s ✓ 5 GT/s ✓ 8 GT/s ✓ 16 GT/s ✓

Provided as an option to Teledyne LeCroy's LabMaster, WaveMaster, and WavePro Series of oscilloscopes, ProtoSync PE goes beyond simple decode annotation and provides the intuitive CATC Trace and BitTracer views of the captured waveform, with a time and zoom correlation of physical layer signals, protocol packets, and logic analyzer byte views on a single instrument.

Adapters, Interposers, and Probes for PCI Express

Teledyne LeCroy offers the industry's widest range of PCI Express adapters, interposers and probes, including a wide variety of specialty probes designed to make it simple and easy to probe sophisticated high-speed serial designs.



Gen4
OCuLink Host
Adapter



OCuLink Cable
Interposer



90 Degree Server
Interposer



AMC Interposer



VPX Interposer



Gen 3
M.2 Interposer



External Cable
Interposer



SFF-8639 Interposer



Passive Slot
Interposer



Mini Card Interposer



XMC Interposer



ExpressModule
Interposer



M.2 Interposer



Active Slot Interposer



Multi-lead Probe
(solder down)



Mid-bus Probe



HP Blade Server
Interposer



Compact PCI Serial
Interposer



G4x16 90 Degree
Left Server Interposer

G4x16 90 Degree Right
Server Interposer



PCIe 4.0 x16 OCP
NIC 3.0 Interposer



PCIe 4.0 x4 EDSFF
Interposer



G4x8
OCuLink
Cable
Interposer



PCI Express Gen4 U.2 /U.3
Standard 12 Inch Interposer



Serial Attached SCSI (SAS) and Serial ATA (SATA)



Sierra T244 Protocol Verification System

3G ✓ 6G ✓ 12G ✓ 24G ✓

The industry's first SAS 4.0 protocol analyzer provides accurate and reliable capture of up to four SAS 24 Gb/s physical links for efficient test and debug of next generation storage systems. Featuring the industry's highest-fidelity TAP4™ probe design, the Sierra T244 seamlessly locks on 24G signaling without distorting the dynamic link training sequence for fast debug of link bring up issues.



Sierra M244 Protocol Verification System

3G ✓ 6G ✓ 12G ✓ 24G ✓

The Teledyne LeCroy Sierra M244 is the industry's first SAS 4.0 protocol analyzer / jammer / exerciser system for testing next generation storage systems, devices and software. The Sierra M244 operating as an analyzer can record "4-wide" links. When licensed with the Infusion™ Jammer option, the M244 provides a "real-time" jammer capability to modify or corrupt traffic on 1, 2, or 4 ports simultaneously. The exerciser option supports initiator and target traffic generation allowing users to meticulously test low-level functionality at full 24G line rate.



Sierra M124A Protocol Verification System

1.5G ✓ 3G ✓ 6G ✓ 12G ✓

The Sierra M124 is the next generation platform in the industry-leading Sierra family of SAS and SATA protocol test systems from Teledyne LeCroy. As the first SAS 3.0 protocol test platform to implement linear probing technology and a non-retimed pass-through signal, the Sierra M124 provides transparent simultaneous protocol analysis of up to four 12 Gb/s SAS ports.



Sierra M122A Protocol Verification System

1.5G ✓ 3G ✓ 6G ✓ 12G ✓

The Sierra M122 is the two-port version of the industry-leading Sierra M124 SAS and SATA protocol test system. Featuring Teledyne LeCroy's most advanced linear probing technology, the Sierra M122 provides unmatched accuracy while simultaneously analyzing up to two 12 Gb/s SAS ports.

SAN – Ethernet and Fibre Channel



SierraNet™ M648

10G ✓ 25G ✓ 40G ✓ 50G ✓ 100G ✓ 200GbE ✓ 16GFC ✓ 32GFC ✓ 64GFC ✓

The SierraNet M648 platform provides best in class traffic capture and manipulation for testing application or link characteristics. SierraNet M648 is the latest in the line of industry leading test and measurement tools from Teledyne LeCroy, designed for today's high-speed storage and communications fabrics. SierraNet M648 supports examination of Ethernet and Fibre Channel links utilizing both Pulse Amplitude Modulation 4 (PAM4) and legacy Non-Return to Zero (NRZ) technologies.



SierraNet T328

25G ✓ 50G ✓ 100G ✓ 32GFC ✓

The SierraNet T328 system provides 10/25/40/50/100Gbp/s Ethernet and legacy (1,2,4,8G) and current (16/32G) Fibre Channel data capture and protocol verification for developers & protocol test engineers in LAN, SAN, NAS and other Ethernet and Fibre Channel applications. Available with eight SFP28 FlexPorts™ for maximum configuration and utility, the SierraNet T328 offers world-class protocol analysis capabilities with an easy to use, customizable hardware & software interface, large capture buffers, and the most advanced T.A.P3 capture, triggering and filtering capabilities in the industry.



SierraNet M328

25G ✓ 50G ✓ 100G ✓ 32GFC ✓

The SierraNet M328 system provides users with traffic capture, data analysis, protocol verification and introduces error injection capabilities for 25/50/100Gbp/s Ethernet and legacy (1, 2, 4, 8G) and current (16/32G) Fibre Channel LAN, SAN, NAS and other high-speed fabric applications. Available with eight SFP28 FlexPorts™ for maximum configuration and utility, the SierraNet M328 offers world-class protocol analysis capabilities with an easy to use, customizable hardware & software interface, large capture buffers, and the most advanced triggering and filtering capabilities in the industry.



SierraNet M328-Q

25G ✓ 50G ✓ 100G ✓ 32GFC ✓

The SierraNet M328-Q system provides users with traffic capture, data analysis, protocol verification and introduces error injection capabilities for 25/50/100Gbp/s Ethernet and legacy (1, 2, 4, 8G) and current (16/32G) Fibre Channel LAN, SAN, NAS and other high-speed fabric applications. Available with two QSFP28 FlexPorts™ for maximum configuration and utility, the SierraNet M328-Q offers world-class protocol analysis capabilities with an easy to use, customizable hardware & software interface, large capture buffers, and the most advanced triggering and filtering capabilities in the industry.



SierraNet M168

10G ✓ 16GFC ✓

The SierraNet M168 system provides 10Gbps Ethernet and 16G Fibre Channel data capture and protocol verification for developers & protocol test engineers in LAN, SAN, other Ethernet and Fibre Channel applications. Available with eight SFP+ FlexPorts™ for 10Gbps Ethernet and 16G Fibre Channel, the SierraNet offers world-class protocol analysis capabilities with an easy to use, customizable hardware & software interface, large capture buffers, and the most advanced triggering and filtering capabilities in the industry.

Universal Serial Bus (USB)



Voyager™ M4x Protocol Verification System

1.5M ✓ 12M ✓ 480M ✓ 5G ✓ 10G ✓ 20G ✓ 40G ✓

The industry's most accurate and trusted USB analyzer platform now supports USB4, USB 3.2, Thunderbolt™ 4, and Thunderbolt™ 3 testing and verification. The legendary Voyager family combines best-in-class probe technology with industry-leading analysis software allowing designers and validation teams to debug problems and verify interoperability for next-generation USB systems.



Voyager M310P Protocol Verification System

1.5M ✓ 12M ✓ 480M ✓ 5G ✓ 10G ✓

The Voyager M310P is Teledyne LeCroy's comprehensive protocol verification system designed for USB 2.0, USB 3.1, Type-C and Power Delivery. The non-intrusive probing and a range of turnkey Compliance packages make the Voyager M310P the intelligent choice for USB 3.1 protocol analysis.



Voyager M3x Protocol Verification System

1.5M ✓ 12M ✓ 480M ✓ 5G ✓

The Voyager M3x is Teledyne LeCroy's 7th generation USB protocol verification system designed for the next evolution of universal serial bus known as SuperSpeed USB. Leveraging Teledyne LeCroy's extensive expertise in high-speed serial data analysis, the Voyager provides traffic generation and recording of both USB 2.0 and 3.0 at data rates up to 5 Gb/s.



USB Advisor™ T3 Analyzer

1.5M ✓ 12M ✓ 480M ✓ 5G ✓

The USB Advisor T3 protocol analyzer is an inexpensive, small form-factor, but full featured analysis system for those testing USB 3.0 and USB 2.0 devices. It captures, displays, and analyzes bus traffic using the CATC Trace™ display software. It automatically highlights protocol errors while displaying a chronological list of packets with full decoding of USB device classes.



Mercury™ T2P/Mercury T2C

1.5M ✓ 12M ✓ 480M ✓

The pocket-sized Mercury T2C & T2P capture and decode the widest range of USB 2.0 device classes plus Type-C link states and Power Delivery 3.0 messages. Both the Mercury T2C and T2P utilize the industry leading CATC Trace™ analysis software for verifying and debugging USB and PD protocol issues. Now there are two base models to choose from; the original Mercury T2C and the new Mercury T2P, which adds the Power Tracker™ graphical view of VBUS and CC voltages. The Mercury T2C / T2P analyzers include adapters allowing developers to utilize the type-C connection with their existing legacy devices and hosts, creating an analyzer which is both backward-compatible and future-safe.



Mercury T2

1.5M ✓ 12M ✓ 480M ✓

The original Mercury T2 is the small and affordable USB 2.0 protocol analyzer that combines the de facto standard CATC Trace display with the very latest USB class decoding. This low-cost solution is bus powered and includes real time hardware triggering allowing the Mercury T2 to tackle sophisticated analysis tasks in a surprisingly small package. It features legacy Type A & B connectors for USB developers that do not require Type-C analysis capabilities.

MIPI® Protocol Analyzers



Eclipse™ T42 UniPro/UFS Analyzer

GEAR1 ✓ GEAR2 ✓ GEAR3 ✓ GEAR4 ✓

The Eclipse T42 is an entry level analyzer to address next tier implementations in the UFS ecosystem. The Eclipse T42 Analyzer supports MIPI M-PHY v4.1 HS-G4B, UniPro v1.8 and UFS3.0, and M-PHY v3.1 HS-G3, UniPro v1.61, and UFS2.1. Supporting HS-G4, the unit includes x2 solder down probes. The Eclipse T42 Protocol Analyzer can be upgraded to the advanced feature set of the Eclipse M42x Protocol Analyzer.



Eclipse M42x UniPro/UFS Analyzer/Exciser

GEAR1 ✓ GEAR2 ✓ GEAR3 ✓ GEAR4 ✓

The Eclipse M42 updates the Teledyne LeCroy family of UniPro/UFS protocol analyzers and exercisers. Supporting MIPI M-PHYTM Gear4 at speeds up to 11.8Gbps, the Eclipse M42 stands as the markets most complete analyzer/exciser. The Eclipse M42 analyzes bi-directional UniPro and UFS traffic, performing protocol sequence and timing analysis and packet header and payload inspection, to provide complete protocol debug and analysis of UFS and UniPro devices.



Envision X84 CSI & DSI Protocol Generator

GEAR1 ✓ GEAR2 ✓ GEAR3 ✓ GEAR4 ✓

With comprehensive support for MIPI CSI-2v2 and DSI-2 specifications, Teledyne LeCroy's Envision X84 generator platform provides the industry's most accurate and reliable generation of MIPI camera and display protocols for fast debug, analysis and problem solving. The Envision X84 exerciser is loaded with innovative features that help uncover elusive protocol errors and is the intelligent choice for any camera and display validation needs. Using the same hardware platform as the Envision X84 C/D-PHY protocol analyzer, the Envision X84 offers the most flexible solution for MIPI Camera and Display validation and debug.

Bluetooth®

The Frontline® family of Bluetooth protocol analyzers and tools support every profile and protocol in the entire Bluetooth specification. From Bluetooth “classic” (BR/EDR) to Bluetooth low energy (LE) technology, Frontline protocol analyzers make it easier to get products to market faster by helping troubleshoot, debug, and decode these complex communication streams.



X240 Wireless Wideband Analyzer

2.0 ✓ 2.1 ✓ 3.0 ✓ 4.0 ✓ 4.1 ✓ 4.2 ✓ 5 ✓ 5.1 ✓ 5.2 ✓

Teledyne LeCroy's Frontline X240 Wireless Wideband Analyzer, featuring flexible technology-based licensing and exceptional portability, brings 2.4GHz ISM band analysis to every lab and every environment efficiently and affordably. Coupled with Teledyne LeCroy's Wireless Protocol Suite software's streamlined UI and superior decoding engine, the X240 is equipped to decode Bluetooth BR/EDR and Low Energy, 802.11, and 802.15.4 traffic for more rapid, robust, and cost-effective wireless development, testing and troubleshooting.



Sodera® Wideband Bluetooth Protocol Analyzer

2.0 ✓ 2.1 ✓ 3.0 ✓ 4.0 ✓ 4.1 ✓ 4.2 ✓ 5 ✓ 5.1 ✓ 5.2 ✓

The Frontline Sodera is a highly portable, wideband Bluetooth protocol analyzer that captures ALL Bluetooth traffic. The Sodera concurrently captures all Bluetooth packets (BR/EDR/LE) across all channels, including paging, inquiry, secure connections, secure simple pairing, and data exchange packets. Its compact size and quick-change battery allow easy, on-the-go testing in automobiles and other power-sparse environments. Supports the latest Bluetooth specification to debug all classic and low energy Bluetooth connections in the 2.4 GHz band.



Sodera LE Wideband Bluetooth Protocol Analyzer

4.0 ✓ 4.1 ✓ 4.2 ✓ 5 ✓

The Frontline Sodera LE is a wideband Bluetooth protocol analyzer capable of sniffing all Bluetooth low energy channels simultaneously and passing detected packets on to the Frontline software for analysis and review. The Bluetooth low energy specification is rapidly being updated with modification that enable the “Internet of Things” (IoT) and our connected world. Sodera LE uses a software defined radio, which gives flexibility to keeping up with these specification changes. Supports the latest Bluetooth specification to debug low energy Bluetooth connections in the 2.4 GHz band.



BPA® 600 Dual Mode Bluetooth Protocol Analyzer

2.0 ✓ 2.1 ✓ 3.0 ✓ 4.0 ✓ 4.1 ✓ 4.2* ✓

The Frontline BPA 600 Dual Mode Bluetooth Protocol Analyzer is a USB powered tool designed to capture, decode, analyze and debug classic BR/EDR Bluetooth and low energy communications with minimal setup. Decodes all Bluetooth classic and low energy traffic including advertising packets, data packets and LL control packets, and providing visibility into all three advertising channels concurrently, even before the connection is established. Supports all Bluetooth specifications through 4.2.



BPA low energy Bluetooth Protocol Analyzer

4.0 ✓ 4.1 ✓ 4.2* ✓

The Frontline BPA low energy Protocol Analyzer is a USB powered tool designed to capture, decode, analyze and debug Bluetooth low energy communications with minimal setup. Decodes all Bluetooth low energy traffic including advertising packets, data packets and LL control packets, and providing visibility into all three advertising channels concurrently, even before the connection is established. Supports all Bluetooth low energy specifications through 4.2.

* Except optional extended packet length.

Conformance, Radio Frequency Physical Layer (RF PHY), and Expert System Modules for Bluetooth



Harmony Low Energy Tester

4.0 ✓ 4.1 ✓ 4.2 ✓ 5 ✓ 5.1 ✓ 5.2 ✓

The Frontline Harmony Low Energy Tester, an integrated software/hardware test platform for Bluetooth protocol qualification testing that provides Test Manager, Upper Tester and Lower Tester in one product. The Harmony Low Energy Tester performs complete Bluetooth LE controller qualification testing for LE Link Layer and HCI test cases providing coverage for all Bluetooth LE released specifications. The Frontline Harmony tester is listed as a Validated Test Platform by the Bluetooth SIG.



TLF3000 RF PHY Tester

4.0 ✓ 4.1 ✓ 4.2 ✓ 5 ✓ 5.1 ✓ 5.2 ✓

TLF3000 RF PHY tester is a wideband, ultra-high dynamic range 2.4 GHz software-defined receiver, signal analyzer and signal generator. It captures and analyses the entire 2402-2480 MHz band simultaneously providing RF PHY testing, signal generation, signal analysis in one powerful package. The TLF3000 is a flexible scalable solution that offers 3 technology licenses (Bluetooth Low Energy, BR/EDR and 802.15.4) and 2 key market use cases (Developer and Production). The Developer configuration is a fully featured solution for lab use and the Production configuration is a stripped back solution designed for repetitive testing in a production line environment.

Conformance, Radio Frequency Physical Layer (RF PHY), and Expert System Modules for Bluetooth (cont'd)



Bluetooth Protocol Expert System

2.0 ✓ 2.1 ✓ 3.0 ✓ 4.0 ✓ 4.1 ✓ 4.2 ✓ 5 ✓ 5.1 ✓ 5.2 ✓

The Bluetooth Protocol Expert System is a powerful software module addition to the core Frontline software that identifies and displays errors, warnings, protocol violations, connection status, and more in the Bluetooth trace and then provides Bluetooth specification reference and solutions – a huge time saver. Helps to makes the Bluetooth novice and expert, and the expert's job easier! Using the Bluetooth Protocol Expert System streamlines root cause analysis and simplifies the troubleshooting of complex interoperability and protocol issues.



Bluetooth Audio Expert System

2.0 ✓ 2.1 ✓ 3.0 ✓ 4.0 ✓ 4.1 ✓ 4.2 ✓ 5 ✓ 5.1 ✓ 5.2 ✓

The Bluetooth Audio Expert System is an audio quality software module focused on resolving audio issues related to the Bluetooth protocol. It works in combination with Frontline's powerful software and allows Bluetooth engineers the ability to see audio and codecs events synchronized precisely with Bluetooth protocol events. The Audio Expert System provides information they need to efficiently develop and troubleshoot their Bluetooth enabled audio devices and improve overall audio quality for their customers.

Wi-Fi (802.11)



802.11 a/b/g/n Protocol Analyzer

The Frontline 802.11 a/b/g/n protocol analyzer provides passive capture of 802.11 a/b/g/n data communications, utilizing a 250GB on-board buffer, and can be linked to BPA 600 or Sodera to view Bluetooth and Wi-Fi packets synchronized on the same timeline. Debug conflicts and collisions occurring as a result of Bluetooth and 802.11 data being transmitted in the same 2.4GHz range.

Communication Probes, Taps, and Analyzers for RS-232, RS 422/485, Ethernet, DH+, and CC-Link



The **RS-232 ComProbe II** passively monitors and actively tests asynchronous equipment, circuits and software applications on serial data communications networks. It plugs into a PC's USB port to tap into RS-232 circuit. The RS-232 ComProbe II is compatible with **NetDecoder** and **Serialtest** software protocol analyzers and is also sold in bundles with other industrial hardware components.



The **RS-422/485 ComProbe II** monitors and captures Asynchronous RS-422/584 communications. It plugs into a PC's USB port and has screw terminal connectors to tap into the RS-422/485 circuit. The RS-422/485 ComProbe II is compatible with **NetDecoder** and **Serialtest** software protocol analyzers and is also sold in bundles with other industrial hardware components.



The **Ethernet ComProbe** is a non-intrusive, passive network tap that captures bi-directional Ethernet data. The Ethernet ComProbe is compatible with **NetDecoder** and **Ethertest** software protocol analyzers and is also sold in bundles with other industrial hardware components. It is compatible with the **Wireshark** protocol analyzer.



Frontline's **CC-Link ComProbe** is a CLPA certified CC-Link network monitor. It is a complete solution for testing and troubleshooting CC-Link and CC-Link IE products and networks. The CC-Link ComProbe is compatible with the **NetDecoder** software protocol analyzer and is also sold in bundles with other industrial hardware components.



The **NetDecoder - DH+ Analyzer** is a comprehensive data capture, debugging, network monitoring and analysis tool for troubleshooting DH+ networks. The DH+ Analyzer works with Rockwell Automation's **1784-U2DHP** to capture DH+ data. Uses the **NetDecoder** software protocol analyzer.



The **NetDecoder - ControlNet Analyzer** provides a comprehensive troubleshooting and diagnostics solution for solving communication problems on ControlNet networks. The ControlNet analyzer supports two of Rockwell Automation's interface cards: **1784-PCC** card for PCMCIA interfaces and **1784-U2CN** for USB interfaces. Uses the **NetDecoder** software protocol analyzer.



The **NetDecoder - DeviceNet Analyzer** provides a comprehensive troubleshooting and diagnostics solution for solving communication problems on DeviceNet networks. The DeviceNet analyzer supports Rockwell Automations **1784-U2DN** **USB** interface and Molex-SST's PCI and PCMCIA interface cards. Uses the **NetDecoder** software protocol analyzer.

NetDecoder Software

Frontline's NetDecoder™ is award winning software designed to diagnose and troubleshoot communication problems in industrial networks. Frontline's NetDecoder analyzer has the ability to monitor and provide detailed timing, data and messaging information for serial, fieldbus, and Ethernet networks.

The NetDecoder protocol analyzer is used in many industries including Oil & Gas, Food and beverage, Electric power transmission, Water or sewer management, and Factory automation.

The NetDecoder analyzer supports these technologies:

Serial Protocols
Modbus RTU
Modbus ASCII
DNP3 over serial
DF1/PCCC
IEC 60870-5-101
IEC 60870-5-103
BSAP Bristol Babcock
ABB COMLI
Emerson ROC
BACNet
IEC-60870-5-102
Saia-Burgess S-Bus
CC-Link

Ethernet Protocols
Modbus/TCP
EtherNet/IP (CIP and PCCC)
Allen-Bradley's CSP/PCCC
DNP3 over Ethernet
IEC 60870-5-104
PROFINET
CC-Link IE

Industrial Bus Protocols
Allen-Bradley's Data Highway Plus (DH+)
DeviceNet
ControlNet
Allen-Bradley DH-485
CAN 2.0 A

Serialtest Software

Serialtest Async is software used to passively monitor and actively test serial asynchronous (async) communication circuits and networked equipment, at speeds up to 921.6 Kbps. The product offers an economical solution for debugging, testing, and troubleshooting equipment, circuits and software applications on serial data communication networks. Typical test application areas include utility meter reading, railroad signal and switch monitoring, PC-based control, lottery and gaming, credit authorization, and the Internet.

Ethertest Software

Ethertest is a general purpose Ethernet communications monitor and protocol analyzer for 10Mbps, 100Mbps and 1Gbps Ethernet local area networks. Performs full 7 layer decodes on TCP/IP, SMB, NetBIOS, Novell NetWare, and more. Interfaces with the LAN through a PC's standard network Interface Card (NIC). In applications ranging from financial institutions to manufacturing facilities, network engineers will find Ethertest easy to work with but loaded with features.

quantumdata M4 Series

The Teledyne LeCroy quantumdata M4 series test instruments are versatile test instruments that offer entry level functional testing that can be upgraded to support sophisticated analysis, diagnostics and full compliance testing. The M4 series instruments are compact in size and can be controlled either through a robust and efficient API for remote or automated testing applications, or locally using an external monitor, keyboard and mouse. They can be stacked on a benchtop or rack mounted. The test functions supported provide development engineers in R&D with quick Time-to-Insight to help them identify and resolve problems early in the product development cycle.



M41h 48G Video Analyzer/Generator for HDMI Testing

The M41h 48G Video Analyzer/Generator for HDMI Testing supports protocol analysis of incoming HDMI 2.1 Fixed Rate Link (FRL) (or TMDS) video streams at data rates up to 48 Gb/s from sources outputting the higher video resolutions. The instrument's analyzer feature provides visibility into the underlying protocol elements and structures necessary for transporting HDMI video streams at the new 48 Gb/s rate. The M41h's FRL video generation function enables users to select 8K, 4K, 1080p and lower resolution formats with varying bit depths and frame rates for transmission. The Aux Channel Analyzer (ACA) utility enables monitoring of the DDC channel to provide a transaction log of the EDID exchange, SCDC register reads/writes, HDCP authentication transactions and FRL link training. A complete set of Fixed Rate Link (FRL) and TMDS protocol compliance tests are supported as well for both FRL and TMDS sources and sinks. The M41h also supports functional testing and compliance testing for HDMI products and devices that support enhanced Audio Return Channel (eARC)—both eARC Tx and eARC Rx.



M42d 80G Video Analyzer/Generator for DisplayPort 2.0 Testing

The M42d 80G Video Analyzer/Generator for DisplayPort 2.0 Testing provides an unprecedented combination of functional and compliance testing for video, audio and protocol of DisplayPort 2.0 and DisplayPort 1.4. The M42d supports legacy DisplayPort lane rates of 1.62, 2.7, 5.4, 8.1 Gb/s and the new DP 2.0 higher speed lane rates and new line coding—128b/132b—for 10.0, 13.5, & 20.0Gb/s data rates up to 4 lanes. The protocol analyzer provides a snapshot status view and deep analysis using captures of incoming DisplayPort 2.0 (and DP 1.4) streams from source devices including DSC/FEC compressed streams. The M42d's video generator can be used for testing displays, USB-C adapters, extenders, etc. The video generator offers a large library of standard video timings and test patterns necessary for testing next generation high resolution displays. The M42d supports a full suite of DP 1.4 link layer, forward error correction (FEC) and display stream compression (DSC) compliance tests for both sources and sinks. (Compliance tests for DP 2.0 are planned for the future.) The Passive Probe feature will enable full monitoring of the DisplayPort Main Link and the Aux Channel between two DisplayPort devices up to 20 Gb/s lane rates. Support for testing advanced features such as Panel Replay and LTTTPR will be supported in future releases.

quantumdata 980 Series

The Teledyne LeCroy quantumdata 980B Advanced Test Platform is a module based system that can accommodate multiple 980 series modules. The 980B system modules support test solutions for HDMI and DisplayPort. Both video generation (transmitter) functions for testing sink devices (displays) and video and protocol analysis (receiver) functions for testing source devices are supported. The 980 modules offer a rich set of test features, including functional testing, deep analysis, interoperability testing and compliance testing. These test functions provide development engineers in R&D with fast Time-to-Insight to help them identify and resolve problems early in the product development cycle. The 980B system has an embedded touch screen display to control the instrument.



980 48G Protocol Analyzer/Generator module for HDMI Testing

The 980 48G Protocol Analyzer/Generator module for HDMI Testing supports protocol analysis of incoming HDMI 2.1 Fixed Rate Link (FRL) video streams at data rates up to 48 Gb/s from sources outputting the higher video resolutions. The module's analyzer feature provides visibility into the underlying protocol elements and structures necessary for transporting HDMI video streams at the new 48 Gb/s rate. The module's FRL video generation function supports up to 8K formats at 48 Gb/s. Users can select 8K, 4K, 1080p or lower resolution formats with varying bit depths and frame rates for transmission. The Aux Channel Analyzer (ACA) utility enables monitoring of the DDC channel to provide a transaction log of the EDID exchange, SCDC register reads/writes, HDCP authentication transactions and FRL link training. A complete set of Fixed Rate Link (FRL) protocol compliance tests are supported as well for both FRL and TMDS sources and sinks. The module also supports functional testing and compliance testing for HDMI products and devices that support enhanced Audio Return Channel (eARC)—both eARC Tx and eARC Rx.



980 DisplayPort 1.4 USB-C/eDP Video Generator / Analyzer module

The 980 DisplayPort 1.4 USB-C/eDP Video Generator/Analyzer module supports video, audio and protocol functional testing of high-end DisplayPort displays and sources at HBR3 lane data rates up to 8.10 Gb/s on 1, 2 & 4 lanes including tests for multi-stream transport (MST). All the DisplayPort features and functions available in the module are provided through both standard DP ports and USB-C ports which support DisplayPort USB-C DP Alt Mode. The capture and store analysis function provides deep visibility into the DisplayPort protocol elements, including Display Stream Compression (DSC), to help identify complex protocol related problems early in the development cycle. The module also supports DP 1.4 Link Layer, Display Stream Compression (DSC), Forward Error Correction (FEC) compliance testing for sources, sinks and repeaters. The Aux Channel Analyzer utility (ACA) enables monitoring of the DisplayPort Aux Channel and USB-C Configuration Channel (CC) to provide a transaction log of the EDID exchange, link training, HDCP authentication and PD negotiations into and exit out of DP Alt Mode. The module is eDP hardware ready which will enable eDP test features to be introduced.

quantumdata 780 Series

The Teledyne LeCroy quantumdata 780 series handheld test instruments are portable, feature rich, video/audio generators and protocol analyzers that support quick verification testing and troubleshooting of digital video systems and analog video displays on-site or in the R&D lab. The 780 instruments are equipped with both digital video transmitter (output) ports and receiver (input) ports to support testing of audio, video and protocols of various digital video source and sink (display) devices as well as cables and distribution equipment.



780C Video Generator / Analyzer - for HDMI, HDBaseT and 3G-SDI Testing

The 780C Multi-Interface Interoperability Tester is a portable, handheld multi-interface video/audio generator and protocol analyzer. The 780C is equipped with HDMI and 3G-SDI ports while also offering HDBaseT ports. The HDMI and HDBaseT ports operate at pixel rates up to 300MHz. The instrument is equipped with both output and input ports for testing video, audio and protocols on source and sink devices as well as cables and distribution equipment. The instrument is operated through the convenient 7 inch touch screen. A status bar on the bottom of the display provides at-a-glance status of the output and input ports



780E Video Generator / Analyzer - for HDMI, DisplayPort and HDBaseT Testing

The 780E Multi-Protocol Analyzer / Generator for HDMI, DisplayPort and HDBaseT, is a handheld digital video/audio generator and protocol analyzer. The 780E is the only portable test instrument equipped with HDMI and DisplayPort ports while also offering HDBaseT ports. The 780E supports testing video, audio and protocols—including HDCP 2.2 on HDMI and DisplayPort—on source and sink devices as well as cables and distribution equipment up to 600MHz for HDMI and up to 5.4Gb/s link rates on DisplayPort. The instrument is operated through the convenient 7 inch touch screen. A status bar on the bottom of the display provides at-a-glance status of the output and input ports.

quantumdata 280 Test Set

The Teledyne LeCroy quantumdata 280 HDMI/HDBaseT Video Generator (Tx) and Analyzer (Rx) is small compact, battery powered test set ideally suited for professional A/V integrators and home theatre installers. This convenient test set enables integrators and installers to conduct basic verification and diagnostic tests on HDMI/HDBaseT cables, video distribution networks and individual A/V components.



280G Video Generator

The 280G Video Generator is equipped with an HDMI output port for testing up to 18 Gbps data rate (600 MHz pixel rate) and the HDBaseT output port for testing up to 300 MHz pixel rate. The HDMI and HDBaseT outputs enable selection of video formats, bit depth, frame rate, chroma subsampling, high dynamic range and test patterns. Hot plug, EDID, HDCP, infoframes can be verified and high dynamic range can be tested as well.



280A Video Analyzer

The 280A Video Analyzer is equipped with an HDMI input port for testing up to 18 Gbps data rate (600 MHz pixel rate) and the HDBaseT input port for testing up to 300 MHz pixel rate. The HDMI and HDBaseT inputs enable verification of incoming video formats, bit depth, frame rate, chroma subsampling and video content including high dynamic range. The +5V, EDID, HDCP, can be verified as well.

quantumdata 804 Series

The Teledyne LeCroy rack mountable 804, 804A and 804B series Video Generators are optimized for testing modern HDMI flat panel TVs. The 804 series instruments feature four (4) HDMI outputs—all active simultaneously—for testing HDTVs with multiple HDMI inputs. This eliminates the need for splitters often required for testing each HDMI input on an HDTV. The 804 series instruments can output component analog and composite analog video as well as HDMI. The 804 instruments are equipped with all the standard video timings, test patterns and audio formats necessary for testing HDTVs including tests for HDMI protocols such as HDCP, EDID and CEC.



804A 300MHz HDMI Video Generator

The 804A Video Test Generator supports testing of HD and UHD TVs and displays at pixel rates up to 300 MHz on its HDMI outputs. This enables testing of high end 4K resolutions at 50/60Hz with HDMI 2.0 4:2:0 pixel encoding. The instrument also supports testing of 21:9 format resolutions at or below 300 MHz pixel rate. The 804A instrument supports functional protocol tests such as HDCP and EDID including new data elements related to HDMI 2.0.



804B 600MHz HDMI Video Generator

The 804B Video Test Generator supports testing of HD and UHD TVs and displays at pixel rates up to 600 MHz on its HDMI outputs. This enables testing of high end 4K resolutions at 50/60Hz with HDMI 2.0 4:4:4 pixel encoding. The instrument also supports testing of 21:9 format resolutions at or below 600 MHz pixel rate. The 804B instrument supports functional protocol tests such as HDCP (versions 1.4 & 2.2) and EDID including new data elements related to HDMI 2.0.

Appliances

The OakGate Appliances for PCIe Gen4 are versatile test systems designed to support all popular storage interfaces and protocols, such as PCIe, SAS, and SATA. They can be used to validate and debug U.2, U.3, and EDSFF 1U Short SSDs for PCIe Gen4. The desktop appliances are designed for environments inside or outside the lab, where the appliances rest on a bench or a desk. The rackmount appliance is designed for versatility and scalability and fits in a standard 19-inch rack at a 3U height. The expandable desktop and rackmount appliance can be connected to a variety of external enclosures, such as the OakGate 12-bay enclosures, which provide high-density scaling and power management. The OakGate Enduro controller application and Storage Validation Framework Pro (SVF Pro) software, supplied with the appliance, can exercise each SSD individually, as well as provide built-in power cycling and power measurement capabilities. Additionally, each appliance includes one year of hardware and software support.



Compact Desktop Appliance for PCIe Gen4 (OGT-DC100-G4)

The OakGate DC100 appliance provides a compact solution for testing a few devices in areas where space is limited, such as a developer's testing environment. It includes two motherboard PCIe Gen4 slots (one x16 and one x4) for testing add-in cards (AICs). Its small footprint and quiet operation make the compact desktop appliance an ideal system for working in a small office, cubicle, or lab environment. This appliance provides the same full set of Enduro/SVF Pro functionality as the other OakGate appliances. The compact desktop appliance is powered by the AMD Ryzen™ 7 3700X, eight-core, 3.6GHz desktop processor and has 16GB DDR4 system memory (up to 64GB available). Its chassis dimension is approximately 10.63" W x 15.47" D x 8.35" H.



Expandable Desktop Appliance for PCIe Gen4 (OGT-DE200-G4)

The OakGate DE200 appliance provides maximum expansion possibilities in a desktop form factor. It includes four motherboard PCIe Gen4 x16 slots for testing AICs or connecting to a variety of external enclosures, such as the OakGate 12-bay enclosures. Depending on the type of optional 4-bay plug-in module installed, it can test up to four U.2, U.3, or EDSFF 1U short devices. This appliance includes an adjustable fan speed knob, which can be used to reduce fan noise when the appliance is not fully loaded. The expandable desktop appliance is powered by the AMD EPYC™ 7302P, 16-core, single-socket, 3.0 GHz processor and has 32GB DDR4 ECC system memory. Its chassis dimension is approximately 17.3" W x 20.47" D x 7.01" H (4U).



3U Rackmount Appliance for PCIe Gen4 (OGT-R300-G4)

The OakGate R300 appliance is designed to meet the demands for high-density scaling and versatility. It provides seven motherboard PCIe slots (four Gen4 x16, one Gen4 x8, and two shared Gen3 (two at x8 and x8 or two at x16 and x0)). These slots can be used for testing SSDs in three ways 1) as expansion slots to connect to a variety of external enclosures, such as the OakGate 12-bay enclosures that test U.2, U.3, or EDSFF 1U SSDs 2) for "in-appliance" testing, such as testing NVMe add-in cards, and 3) connecting to the optional OakGate 4-bay plug-in modules to test U.2, U.3, or EDSFF 1U short SSDs. The rackmount appliance is powered by the AMD EPYC™ 7402P, 24-core processor, single-socket, 2.8 GHz processor and has 64GB DDR4 ECC system memory (up to 512GB available). Its chassis dimension is approximately 19" W x 26" L x 5.5" H (3U).

4-Bay Modules

The M-Series 4-Bay Modules provide a simple, flexible way to test U.2, U.3, or EDSFF 1U Short SSDs within an OakGate expandable desktop appliance or 3U rackmount appliance. The module resides in the front compartment of the appliance and allows testing of up to four SSDs. The OakGate SVF Pro, supplied with the appliance, can exercise each SSD individually, as well as provide built-in power cycling and power measurement capabilities.



U.2 Plug-In Module for PCIe Gen4 (OGT-MU401x-G4, OGT-MU402x-G4, OGT-MU403x-G4)

When installed in an OakGate DE200 appliance or R300 appliance, the 4-Bay U.2 Plug-In Module for PCIe Gen4 provides a simple, flexible way to test and debug up to four mixed-protocol SSD that use a U.2 (SFF-8639) connector. Supported protocols include NVMe, NVMe-MI (standard and basic), SAS, SATA, and AHCI. Front-side LEDs indicate power (green) and activity (amber); and inside LEDs indicate CPU heartbeat and dual-port PCIe. The module includes four SSD carriers.



U.3 Plug-In Module for PCIe Gen4 (OGT-MU3-401x-G4, OGT-MU3-402x-G4)

When installed in an OakGate DE200 appliance or R300 appliance, the 4-Bay U.3 Plug-In Module for PCIe Gen4 provides a simple, flexible way to test and debug up to four NVMe SSDs that use a U.3 (SFF-TA-1001) connector. Supported protocols include NVMe and NVMe-MI (standard and basic). Front-side LEDs indicate power (green) and activity (amber); and inside LEDs indicate CPU heartbeat and dual-port PCIe. The module includes four SSD carriers.

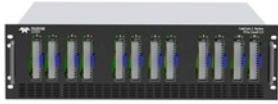


EDSFF 1U Short Plug-In Module for PCIe Gen4 (OGT-MES401x-G4, OGT-MES402x-G4)

When installed in an OakGate DE200 appliance or R300 appliance, the 4-Bay EDSFF 1U Short Plug-In Module for PCIe Gen4 provides a simple way to test and debug up to four EDSFF 1U short NVMe SSDs that use a x4 (1C) SFF TA-1002 connector. It supports EDSFF 1U short form factors as defined in the SFF-TA-1006 specification (some of the narrow form factors may be required to use the included EDSFF short carriers). Depending on the module type, single-port and/or dual-port NVMe EDSFF 1U short SSDs can be tested. Front-side LEDs indicate power (green) and activity (amber); and inside LEDs indicate CPU heartbeat and dual-port PCIe. The module includes four SSD carriers.

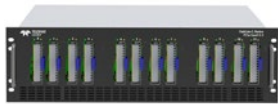
12-Bay Enclosures

The OakGate E-Series enclosures provide a simple, flexible way to test up to twelve U.2, U.3, or EDSFF 1U SSDs when connected to an OakGate expandable desktop or 3U rackmount appliance. The SSDs are easily accessible from the front side of the enclosure and no tools are needed to insert or remove them. The Enduro/SVF Pro software, supplied with the appliance, can exercise each SSD individually, as well as provide built-in power cycling and power measurement capabilities.



U.2 Enclosure for PCIe Gen4 (OGT-EU12P-01-G4, OGT-EU12P-02-G4, OGT-EU12S-01-G4)

When connected to an OakGate DE200 appliance or R300 appliance, the 12-Bay U.2 Enclosure for PCIe Gen4 allows testing for up to twelve SSDs that use a U.2/SFF-8639 connector. It supports single/dual-port NVMe, single/dual-port 12G SAS, and single-port 6G SATA SSDs. Supported protocols include NVMe, NVMe-MI (standard and basic), SAS, SATA, and AHCI. Front-side LEDs indicate power (green) and activity (amber). The enclosure's power supply is 760W and the maximum drive power is 40W per drive. Its chassis dimension is approximately 17.5" W x 20" D x 5.25" H (3U). The enclosure includes twelve SSD carriers.



U.3 Enclosure for PCIe Gen4 (OGT-EU3-12P-01-G4, OGT-EU3-12P-02-G4)

When connected to an OakGate DE200 appliance or R300 appliance, the 12-Bay U.3 Enclosure for PCIe Gen4 allows testing for up to twelve single/dual-port NVMe SSDs that use a U.3 (SFF-TA-1001) connector. Supported protocols include NVMe and NVMe-MI (standard and basic). Front-side LEDs indicate power (green) and activity (amber). The enclosure's power supply is 850W and the maximum drive power is 40W per drive. Its chassis dimension is approximately 17.5" W x 20" D x 5.25" H (3U). The enclosure includes twelve SSD carriers.



EDSFF Enclosure for PCIe Gen4 (OGT-EDL12P-01-G4, OGT-EDL12P-02-G4, OGT-EDS12P-01-G4, OGT-EDS12P-02-G4)

When connected to an OakGate DE200 appliance or R300 appliance, the 12-Bay EDSFF Enclosure for PCIe Gen4 allows testing for up to twelve Enterprise and Datacenter SSD Form Factor (EDSFF) 1U NVMe SSDs that use a x4 (1C) SFF-TA-1002 connector. Front-side LEDs indicate power (green) and activity (amber). The enclosure's power supply is 850W and the maximum drive power is 40W per drive. The chassis dimension for the long 1U SSDs is approximately 17.5" W x 28.25" D x 5.25" H (3U); and for the short 1U SSDs, it is approximately 17.5" W x 20.00" D x 5.25" H (3U). The enclosure includes twelve SSD carriers.

Depending on the enclosure type, various EDSFF 1U NVMe SSDs can be tested:

- PCIe Gen4 12-Bay Enclosure for EDSFF 1U Long NVMe SSDs:
 - OGT-EDL12P-01-G4: single-port
 - OGT-EDL12P-02-G4: dual-port
- PCIe Gen4 12-Bay Enclosure for EDSFF 1U Short NVMe SSDs:
 - OGT-EDS12P-01-G4: single-port
 - OGT-EDS12P-02-G4: dual-port



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