

Oscilloscope, Protocol, and Digitizer Products Line Card





WaveMaster 8000HD
(SDA models)



LabMaster 10 Zi-A
(SDA Models)

Bandwidth	6 GHz to 65 GHz	20 GHz to 65 GHz
Resolution	12-bit resolution	8-bit resolution, 11-bit with enhanced resolution
Rise Time	6.5 ps to 77 ps	6.5 ps to 19.3 ps
Channels (Analog+Digital)	4, 4 + 16 (internal MSO), 4 + 18 (external MSO)	Up to 80, 80 + 18
Display	15.6" Widescreen Capacitive Touch Screen	15.3" WXGA Touch Screen
Standard Memory	200 Mpts/ch (400 Mpts/ch)	32 Mpts/Ch (64 Mpts/Ch)
Maximum Memory†	Up to 8 Gpts	Up to 1024 Mpts
Sample Rate	Up to 320 GS/s	Up to 160 GS/s
MSO Characteristics† (Digital Channels)	Internal MSO: 500 MHz, 2.5 GS/s External MSO: 3 GHz, 12.5GS/s	3 GHz, 12.5 GS/s, 18 Ch
Trigger Types	Edge, Width, Glitch, Window, Pattern, Runt, Slew Rate, Interval, Dropout, Measurement, Multi-stage: Qualified, Multi-stage: Qualified First, High-speed serial trigger†	Edge, Width, Glitch, Pattern, Runt, Slew Rate, Interval (Period), Dropout, Qualified, Cascade (Sequence) Trigger, High-speed Serial Trigger†
Serial Data†	TD: 80-bit NRZ, 8b/10b, 64b/66b - 8/16Gbps, QSPI TD or TDME: 10BASE-T1S, MIL-STD-1553, CAN FD, CAN XL, EMB, I2C, I3C, LIN, PMBus, SENT, SMBus, SPI, SPMI, UART RS-232, USB 2.0 TD or TDxx: 1000BASE-T1 (TD/TDMP), 100BASE-T, AUDIO (TDG), FlexRay (TD/TDMP), USB4 Sideband (TD/TDMP), USBPD (TD/TDMP) D: ARINC 429, C-PHY, DigRF3G, DigRF v4, DP-AUX, D-PHY, ENET, ENET 10G, Fibre Channel, Manchester, MDIO, M-PHY, PCIe, SAS, SATA, SpaceWire, UniPro, USB 2.0-HSIC, USB 3.2 (Gen1, Gen2, Gen2x2), 64b/66b, 8b/10b DP: D-PHY, M-PHY DME: ARINC 429, I3C, USB2, USB4 DMP: C-PHY, DP-AUX	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 3.2 (Gen1, Gen2, Gen2x2) DP: D-PHY, Fibre Channel, FlexRay, M-PHY DG: Audio, DME: USB4 DMP: USB-PD, DP-AUX, USB4-SB
Serial Data Analysis	SDA Expert eye, jitter and noise analysis for NRZ and PAM, SDA Expert technology analysis options for PCIe NRZ, PCIe 6.0, USB 3.2, USB4, DisplayPort, Virtual Probe, EyeDrill, Serial Data Mask, Cable De-embedding	
Serial Data Compliance	DDR 2/3/4/5, LPDDR 2/3/4/4X, DisplayPort 2.0/1.4, eDP, 10Base-T1L, 10Base-T1S, 100Base-T1, 1000Base-T1, MultiGBase-T1, NBASE-T, Ethernet 10/100/1000Base-T, Ethernet 10GBase-T, 10GBase-KR, HDMI 2.1/2.0/1.4b, MIPI C-PHY, MIPI D-PHY, MIPI M-PHY, PCI Express 1.0/2.0/3.0/4.0/5.0/6.0, SAS 3, SATA, SFI, USB 1.1/2.0, USB 3.2 (Gen1, Gen2, Gen2x2), USB4/TBT4	DDR 3/4/5, LPDDR 3/4/4X, DisplayPort 2.0/1.4, eDP, Automotive Ethernet 100Base-T1, 1000Base-T1, MultiGBase-T1, Ethernet 10GBase-T, 10GBase-KR, HDMI 2.1/2.0/1.4b, MIPI M-PHY, PAM4-56G, PCI Express 1.0/2.0/3.0/4.0/5.0/6.0, SAS 2/3, SATA, SFI, USB 3.2 (Gen1, Gen2, Gen2x2), USB4/TBT4
Applications Software Options	Spectrum Analyzer (Single, Dual+Reference), Basic Clock Jitter Analysis, Advanced Clock Jitter and Phase Noise Analysis, Automotive Ethernet Debug, PCI Express Analysis, CrossSync PHY, DDR Debug Toolkit, Switch mode Power Supply, Advanced Customization, EMC Pulse Parameters, Digital Filter Package, Power-Device, ProtoSync, Advanced Vector Signal Analysis, Vector Signal Analysis	Spectrum Analyzer (Single, Dual+Reference), Basic Clock Jitter Analysis, Advanced Clock Jitter and Phase Noise Analysis, Automotive Ethernet Debug, PCI Express Analysis, CrossSync PHY, DDR Debug Toolkit, Switch mode Power Supply, 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	USBTMC over USB 3.1 Gen1 port, USB Host for Storage, LAN for PC, LXI for PC, GPIB for PC†	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)	With handles and protective cover: 15" H x 20.75" W x 16.2" D (381 x 527 x 410 mm) Without handles and protective cover: 15" H x 17.5" W x 15.8" D (381 x 445 x 400 mm)	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")
Weight	48 lbs (21.8 kg)	MCM-Zi-A: 47 lbs. (21.4 kg) LabMaster 10-xxZi-A Acq. Module - 58 lbs. (24 kg)



WaveMaster 8 Zi-B
(SDA 8 Zi-B)



WavePro HD



WaveRunner 8000HD/MDA 8000HD

Bandwidth	4 GHz to 16 GHz	2.5 GHz to 8 GHz	350 MHz to 2 GHz
Resolution	8-bit resolution, 11-bit with enhanced resolution	12-bit resolution, 15-bit with enhanced resolution	12-bit resolution, 15-bit with enhanced resolution
Rise Time	28.5 ps to 95 ps	57.5 ps to 166 ps	1 ns to 235 ps
Channels (Analog+Digital)	4, 4 + 18	4, 4 + 16	8, 8 + 16
Display	15.3" WXGA Touch Screen	15.6" Widescreen Capacitive Touch Screen	15.6" Widescreen Capacitive Touch Screen
Standard Memory	32 Mpts/Ch (64 Mpts/Ch)	50 Mpts/Ch 100 Mpts Interleaved	50 Mpts/Ch 100 / 200 Mpts Interleaved
Maximum Memory†	Up to 512 Mpts	Up to 5 Gpts	Up to 5 Gpts
Sample Rate	Up to 80 GS/s	Up to 20 GS/s	Up to 10 GS/s
MSO Characteristics† (Digital Channels)	3 GHz, 12.5 GS/s, 18 Ch	250 MHz, 1.25 GS/s 16 Ch	500 MHz, 2.5 GS/s 16 Ch
Trigger Types	Edge, Width, Glitch, Pattern, Video, HDTV, Runt, Slew Rate, Interval (Period), Dropout, Qualified, Cascade (Sequence) Trigger, High-speed Serial Trigger†	Edge, Width, Glitch, Pattern, Runt, Slew Rate, Interval (Period), Dropout, Qualified,	Edge, Width, Glitch, Pattern, Runt, Slew Rate, Interval (Period), Dropout, Qualified, Measurement, Window
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, RS-232, UART TD or TDME: 10Base-T1S, CAN, CAN FD, CAN FD Symbolic, I ² C, LIN, MIL-STD-1553, SPI TD or TDxx: 1000BASE-T1 (TD/TDMP), 100BASE-T, Audio (TDG), FlexRay (TDMP), USB-PD (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 3.2 (Gen1, Gen2, Gen2x2), 64b / 66b, 8b/10b DP: D-PHY, M-PHY DME: ARINC 429, USB 1.0/1.1/2.0, USB4 DMP: DP-AUX, USB4-SB	TD: QSPI TD or TDME: 10Base-T1S, CAN, CAN FD, CAN XL, CAN XL Symbolic, SPMI, I ² C, I ² C, LIN, MIL-STD-1553, RS-232, SENT, PMBus, SMBus, SPI, UART, USB 1.0/1.1/2.0, USB-PD TD or TDxx: 1000BASE-T1 (TD/TDMP), 100BASE-T, Audio (TDG), FlexRay (TDMP), USB-PD (TDMP), USB4-SB (TDMP) D: DigRF 3G, DigRF v4, ENET, Fibre Channel, Manchester, MDIO, NRZ, PCIe, SATA, SAS, SpaceWire, UniPro, USB 2.0-HSIC, USB 3.2 (Gen1), 8b/10b DP: D-PHY, M-PHY DME: ARINC 429 DMP: DP-AUX	TD: QSPI TD or TDME: 10Base-T1S, CAN, CAN FD, CAN XL, CAN XL Symbolic, SPMI, I ² C, I ² C, LIN, MIL-STD-1553, RS-232, SENT, PMBus, SMBus, SPI, UART, USB 1.0/1.1/2.0, USB-PD TD or TDxx: 1000BASE-T1 (TD/TDMP), 100BASE-T, Audio (TDG), FlexRay (TDMP), USB-PD (TDMP), USB4-SB (TDMP) D: DigRF 3G, DigRF v4, D-PHY, ENET, Manchester, MDIO, NRZ, SpaceWire, USB 2.0-HSIC, 8b/10b DME: ARINC 429 DMP: DP-AUX
Serial Data Analysis	SDA Expert eye, jitter and noise analysis for NRZ and PAM, SDA Expert technology analysis options for PCIe NRZ, USB 3.2, USB4, DisplayPort, Virtual Probe, EyeDrII, Serial Data Mask, Cable De-embedding	SDA Expert eye, jitter and noise analysis for NRZ and PAM, Virtual Probe, EyeDrII, Serial Data Mask, Cable De-embedding	SDA Expert eye, jitter and noise analysis for NRZ and PAM, Virtual Probe, EyeDrII, Serial Data Mask, Cable De-embedding
Serial Data Compliance	DDR 2/3/4/5, LPDDR 2/3/4/4X, DisplayPort 2.0/1.4, eDP, 10Base-T1L, 10Base-T1S, 100Base-T1, 1000Base-T1, MultiGBase-T1, Ethernet 10/100/1000Base-T, Ethernet 10GBase-T, 10GBase-KR, HDMI 2.1/2.0/1.4b, 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 3.2 (Gen1, Gen2, Gen2x2), USB4/TBT4	DDR 2/3, LPDDR 2/3 4/4X, 10Base-T1L, 10Base-T1S, 100Base-T1, 1000Base-T1, MultiGBase-T1, Ethernet 10/100/1000Base-T, MIPI D-PHY, MOST 50/150, PCI Express 1.0, USB 1.1/2.0	10Base-T1L, 10Base-T1S, 100Base-T1, 1000Base-T1, Ethernet 10/100/1000Base-T, MOST 50/150, USB 1.1/2.0
Applications Software Options	Spectrum Analyzer (Single, Dual+Reference), Basic Clock Jitter Analysis, Advanced Clock Jitter and Phase Noise Analysis, Automotive Ethernet Debug, PCI Express Analysis, CrossSync PHY, DDR Debug Toolkit, Power-Device, Switch mode Power Supply, 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	Spectrum Analyzer (Single, Dual+Reference), Basic Clock Jitter Analysis, Advanced Clock Jitter and Phase Noise Analysis, DDR Debug Toolkit, Power-Device, Switch mode Power Supply, Three-phase Electrical Power, Harmonic, and Vector Analysis, dq0 transformations, 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 (Single, Dual+Reference), Basic Clock Jitter Analysis, Advanced Clock Jitter and Phase Noise Analysis, Automotive Ethernet Debug, Power-Device, Switch mode Power Supply, Three-phase Electrical Power, Harmonic, and Vector Analysis, dq0 transformations, 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)
Connectivity and Storage	USB Host for Storage, LAN for PC, LXI for PC, GPIB for PC†	USB Host for Storage, USB Device for PC, LAN for PC, GPIB for PC†	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		
Dimensions (HWD)	355 x 467 x 406 mm (14" x 18.4" x 16")	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)
Weight	58 lbs. (26.4 kg)	24.4 lbs (11.1kg)	24.4 lbs (11.1kg)
Warranty	3 yr	3 yr	3 yr † Optional 3



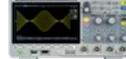
	WaveRunner 9000/9000-MS	HDO6000B/HDO6000B-MS	HDO4000A/HDO4000A-MS
Bandwidth	500 MHz to 4 GHz	350 MHz to 1 GHz	200 MHz to 1 GHz
Resolution	8-bit resolution, 11-bit with enhanced resolution	12-bit resolution, 15-bit with enhanced resolution	12-bit resolution, 15-bit with enhanced resolution
Rise Time	700 ps to 100 ps	1 ns to 450 ps	1.75 ns to 450 ps
Channels (Analog+Digital)	4, 4 + 16	4, 4 + 16	4, 4 + 16
Display	15.4" WXGA Multi-Touch Screen	15.6" Widescreen Capacitive Touch Screen	12.1" WXGA Multi-Touch Screen
Standard Memory	16 Mpts/Ch; M Models: 64 Mpts/Ch 32 Mpts Interleaved; M Models: 128 Mpts	50 Mpts/Ch	12.5 Mpts/Ch 25 Mpts Interleaved
Maximum Memory[†]	Up to 128 Mpts	Up to 250 Mpts	Up to 50 Mpts
Sample Rate	Up to 20 GS/s; M Models: Up to 40 GS/s	Up to 10 GS/s	Up to 10 GS/s
MSO Characteristics[†] (Digital Channels)	250 MHz, 1.25 GS/s, 16 Ch	250 MHz, 1.25 GS/s 16 Ch	250 MHz, 1.25 GS/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, Timeout, Slew Rate, Interval (Period), Dropout, Qualified, Measurement, Window, Cascade	Edge, Width, Glitch, Pattern, Video, HDTV, Runt, Slew Rate, Interval (Period), Dropout, Qualified, Window
Serial Data[†] Trigger (T) Decode (D) Measure / Graph (M) Eye Diagram (E) Graph only (G) Physical Layer (P)	TD: SATA, 8b/10b, QSPI TD or TDME: 10Base-T1S, CAN, CAN FD, CAN XL, CAN XL Symbolic, SPMI, I ³ C, I ² C, LIN, MIL-STD-1553, RS-232, SENT, PMBus, SMBus, SPI, UART, USB 1.0/1.1/2.0, USB-PD TD or TDxx: 1000BASE-T1 (TD/TDMP), 100BASE-T, Audio (TDG), FlexRay (TDMP), USB-PD (TDMP), USB4-SB (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 DMP: DP-AUX	TD: QSPI TD or TDME: 10Base-T1S, CAN, CAN FD, CAN XL, CAN XL Symbolic, SPMI, I ³ C, I ² C, LIN, MIL-STD-1553, RS-232, SENT, PMBus, SMBus, SPI, UART, USB-PD TD or TDxx: 1000BASE-T1 (TD/TDMP), 100BASE-T, Audio (TDG), FlexRay (TDMP), USB-PD (TDMP), USB4-SB (TDMP) D: DigRF 3G, DigRF v4, D-PHY, ENET, Manchester, MDIO, NRZ, SpaceWire, USB 1.0/1.1/2.0, USB-PD, USB 2.0-HSIC DME: ARINC 429 DMP: DP-AUX	TD: 10Base-T1S, 100Base-T1, Audio, CAN, CAN FD, CAN XL, FlexRay, SPMI, I ³ C, I ² C, LIN, MIL-STD-1553, RS-232, SENT, PMBus, SMBus, SPI, UART, USB-PD, USB4-SB D: ARINC 429, DigRF 3G, DigRF v4, D-PHY, ENET, Manchester, MDIO, NRZ, SpaceWire, USB 1.0/1.1/2.0, USB-PD, USB 2.0-HSIC, DP-AUX
Serial Data Analysis	SDA Expert eye, jitter and noise analysis for NRZ and PAM, Virtual Probe, EyeDrill, Serial Data Mask, Cable De-embedding	SDA Expert eye, jitter and noise analysis for NRZ and PAM, Serial Data Mask	—
Serial Data Compliance	DDR 2/3, LPDDR 2/3, 10Base-T1L, 10Base-T1S, 100Base-T1, 1000Base-T1, MultiGBase-T1, Ethernet 10/100/1000Base-T, MIPI D-PHY, MOST 50/150, USB 1.1/2.0	10Base-T1L, 10Base-T1S, 100Base-T1, 1000Base-T1, Ethernet 10/100/1000Base-T, MOST 50/150	—
Applications Software Options	Spectrum Analyzer (Single, Dual+Reference), Basic Clock Jitter Analysis, Advanced Clock Jitter and Phase Noise Analysis, DDR Debug Toolkit, Power-Device, Switch mode Power Supply, 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 (Single, Dual+Reference), Basic Clock Jitter Analysis, Advanced Clock Jitter and Phase Noise Analysis, Power-Device, Switch mode Power Supply, Three-phase Electrical Power, Harmonic, and Vector Analysis, dq0 transformations, Digital Power Management, Advanced Customization, EMC Pulse Parameters, Digital Filter Package, Vector Signal Analysis, Electrical Telecom Pulse Mask Test	Spectrum Analyzer (Single), Power-Device, Switch mode Power Supply, 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, Derivative, Deskew, Envelope, Enhanced Resolution, Floor, Integral, Invert, Reciprocal, Rescale, Roof, Square, Square Root, Trend, Zoom
Dimensions (HWD)	358 x 445 x 242 mm (14.1" x 17.5" x 9.5")	352 mm x 445 mm x 170 mm (13.8" x 17.5" x 6.7")	291.7 x 399.4 x 131.31 mm (11.48" x 15.72" x 5.17")
Weight	25.8 lbs. (11.7 kg)	21 lbs (9.8 kg)	12.6 lbs (5.71 kg)
Warranty	3 yr	3 yr	3 yr



	WaveSurfer 4000HD	WaveSurfer 3000z	T3DSO4000L-HD	T3DSO3000HD
Bandwidth	200 MHz to 1 GHz	200 MHz to 1 GHz	500 MHz – 2 GHz	200 MHz - 1 GHz
Resolution	12-bit resolution, 15-bit with enhanced resolution	8-bit resolution, 11-bit with enhanced resolution	12-bit resolution	12-bit resolution
Rise Time	1.75 ns to 450 ps	3.5 ns to 430 ps	230 ps to 550 ps	450 ps to 1.7 ns
Channels (Analog+Digital)	4, 4 + 16	4, 4+16	4 or 8 + EXT, 4 or 8 + EXT +16	4, 4+16
Display	12.1" Widescreen Capacitive Touch Screen	10.1" Capacitive Touch Screen	Dot, Vector	10.1" TFT-LCD Capacitive Touch Screen 1024 x 600
Standard Memory	12.5 Mpts/Ch 25 Mpts Interleaved	10 Mpts/Ch, 20 Mpts Interleaved	125 Mpts/ch	100 Mpts/ch
Maximum Memory†	Up to 25 Mpts	Up to 20 Mpts	Up to 500 Mpts	400 Mpts
Sample Rate	Up to 5 GS/s	Up to 4 GS/s 100 MHz models: Up to 2 GS/s	10 GS/s per channel	Up to 4 GS/s
MSO Characteristics† (Digital Channels)	125 MHz, 500 MS/s 16 Ch	125 MHz, 500 MS/s	Up to 1 GS/s; Record length up to 50 Mpts	Max sample rate up to 1 GS/s; Record length up to 100 Mpts
Trigger Types	Edge, Width, Pattern, Video, HDTV, Runt, Slew Rate, Interval (Period), Dropout, Qualified	Edge, Width, Pattern, TV, Runt, Slew Rate, Interval (Period), Dropout, Qualified	Edge, Slope, Pulse width, Window, Runt, Interval, Dropout, Pattern, Video, Qualified, Nth edge, Setup/hold, Delay, Serial	Edge, Slope, Pulse width, Window, Runt, Interval, Dropout, Pattern, Video, Qualified, Nth edge, Setup/hold, Delay, Serial
Serial Data† Trigger (T) Decode (D) Measure / Graph (M) Eye Diagram (E) Graph only (G) Physical Layer (P)	TD: Audio, CAN, CAN FD, LIN, FlexRay, I2C, SPI, UART, RS232	TD: Audio, CAN, CAN FD, FlexRay, I2C, LIN, RS-232, SPI, UART	TD: I2C, SPI, UART, CAN, LIN, CAN FD, FlexRay, I2S, MIL-STD-1553B, SENT D: Manchester	(TD) I2C, SPI, UART, CAN, LIN, CAN FD, FlexRay, I2S, MIL-STD-1553B, SENT, ARINC429. (D) Manchester
Serial Data Analysis	–	–	–	–
Serial Data Compliance	–	–	–	–
Additional Software Options	Spectrum Analyzer (Single), Switch-mode Power Supply and Device Analysis, Arbitrary Waveform Generator, Digital Voltmeter (Included standard with registration)	Switch-mode Power Supply and Device Analysis, Function Generator, Digital Voltmeter (Included standard with registration)	Waveform generator, Search, Navigate, Mask Test, DVM, Bode Plot, Power Analysis, Histogram, Counter, Eye Diagram, Jitter Analysis	Search, Navigate, History, Mask Test, Digital Voltmeter, Counter, Waveform Histogram, Bode plot, and Power Analysis
Connectivity and Storage	USB Host for Storage, USB Device for PC, 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, 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, Envelope, Floor, Integral, Invert, Reciprocal, Rescale, Roof, SinX/x, Square, Square Root, Trend, Zoom	4 traces 8 Mpts FFT, +, -, x, ÷, ∫dt, d/dt, √, Identity, Negation, Absolute, Sign, ex, 10x, In, Ig, Interpolation, MaxHold, MinHold, ERES, Average. Supports formula editor.	4 traces 4 Mpts FFT, +, -, x, ÷, ∫dt, d/dt, √, Identity, Negation, Absolute, Sign, ex, 10x, In, Ig, Interpolation, MaxHold, MinHold, ERES, Average, Filter. Supports formula editor
Dimensions (HWD)	273 x 380 x 160 mm (10.7" x 14.9" x 6.3")	270 x 380 x 125 mm (10.63" x 14.96" x 4.92")	4 ch: 391 mm x 43 mm x 421 mm (15.39" x 1.69" x 17") 8 ch: 391 mm x 86 mm x 421 mm (15.39" x 3.39" x 17")	317.2 x 236 x 149 mm (12.4": x 9.29" x 5.87")
Weight	11.7 lbs (5.3 kg)	10.6 lbs (4.81 kg)	4 ch 13.7 lbs (6.1 kg) 8 ch: 20.1 lbs (9.1 kg)	8.82 lbs. (5.6 kg)
Warranty	3 yr	3 yr	3 yr	3 yr



	T3DSO3000	T3DSO2000HD	T3DSO2000A
Bandwidth	200 MHz to to 1 GHz	100 MHz – 350 MHz	100 MHz to to 500 MHz
Resolution	8-bit resolution, 11-bit with enhanced resolution	12-bit resolution	8-bit resolution, 11-bit with enhanced resolution
Rise Time	0.4 ns to 1.7 ns	1 ns to 3.5 ns	3.5 ns to 800 ps
Channels (Analog+Digital)	2 or 4, 2 or 4 + 16	4 + EXT	2 or 4, 2 or 4 + 16
Display	10.1" Capacitive Touch Screen 1024 x 600	10.1" TFT-LCD Capacitive Touch Screen 1024 x 600	10.1" Capacitive Touch Screen 1024 x 600
Standard Memory	125 Mpts/Ch, 250 Mpts Interleaved	100 Mpts/Ch, 200 Mpts Interleaved	100 Mpts/Ch, 200 Mpts Interleaved
Maximum Memory†	Up to 250 Mpts	Up to 200 Mpts	Up to 200 Mpts
Sample Rate	Up to 5 GS/s	2 GS/s (interleaving mode), 1 GS/s (non-interleaving mode)	Up to 2 GS/s
MSO Characteristics† (Digital Channels)	1.25 GS/s, 3.3 ns min detectable pulse width	Up to 500 MS/s; record length up to 50 Mpts	500 MS/s, 3.3 ns min detectable pulse width
Trigger Types	Edge, Pulse, Pattern, Video, Runt, Slope, Interval, Dropout, Window / Zone	Edge, Slope, Pulse width, Window, Runt, Interval, Dropout, Pattern, Video, Qualified, Nth edge, Setup/hold, Delay, Serial	Edge, Pulse, Pattern, Video, Runt, Slope, Interval, Dropout, Window / Zone
Serial Data† Trigger (T) Decode (D) Measure / Graph (M) Eye Diagram (E) Graph only (G) Physical Layer (P)	TD: I ² C, SPI, UART, CAN, LIN, CAN FD, I ² S, MIL-STD-1553B, FlexRay, SENT, Manchester	TD: I ² C, SPI, UART, CAN, LIN CAN FD, FlexRay, I ² S, MIL-STD-1553B, SENT, D: Manchester	TD: I ² C, SPI, UART, CAN, LIN
Serial Data Analysis	–	–	–
Serial Data Compliance	–	–	–
Additional Software Options	Arbitrary Waveform Generator, Switchmode Power Supply and Device Analysis, Bode Plot, 10-bit mode, Mask Test	Waveform generator, Search, Navigate, Mask Test, DVM, Bode Plot, Power Analysis, Histogram, Counter	Arbitrary Waveform Generator, Switchmode Power Supply and Device Analysis, Bode Plot, 10-bit mode, Mask Test
Connectivity and Storage	USB Host, USB Device, LAN	USB Host, USB Device, LAN	USB Host, USB Device, LAN
Math	+, -, x, /, FFT, Derivative, Integral, Square Root / Formula Editor	2 traces 2 Mpts FFT, +, -, x, ÷, ∫dt, d/dt, √, Identity, Negation, Absolute, Sign, e ^x , 10 ^x , ln, lg, Interpolation, MaxHold, MinHold, ERES, Average. Supports formula editor.	+, -, x, /, FFT, Derivative, Integral, Square Root / Formula Editor
Dimensions (HWD)	370 x 144 x 231 mm (14.6" x 5.67" x 9.09")	317.2 x 236 x 149 mm (12.4" x 9.29" x 5.87")	224 x 352 x 111 mm (8.81" x 13.86" x 4.37")
Weight	8.82 lbs. (4.0 kg)	8.82 lbs. (5.6 kg)	8.6 lbs. (3.9 kg)
Warranty	3 yr	3 yr	3 yr



	T3DSO1000HD	T3DSO1000 / T3DSO1000A	T3DSOH1000/T3DSOH1000-ISO
Bandwidth	100 MHz & 200 MHz	100 MHz to 350 MHz	100 MHz & 200 MHz
Resolution	12-bit resolution	8-bit resolution, 11-bit with enhanced resolution	8-bit resolution
Rise Time	Typical 3.5 ns (T3DSO1104HD) Typical 1.8 ns (T3DSO1204HD)	3.5 ns to 1 ns	3.5 ns to 1.7 ns
Channels (Analog+Digital)	4, 4+16	2 or 4, 2 or 4 + 16	2
Display	10.1" TFT-LCD Capacitive Touch Screen 1024 x 600	7" 800 x 480	5.6-inch TFT -LCD display
Standard Memory	25 Mpts/Ch,	T3DSO1000: 7 Mpts/Ch, 14 Mpts Interleaved, T3DSO1000A: 14 Mpts/Ch, 28 Mpts Interleaved	6 Mpts/Ch (two channels)
Maximum Memory[†]	100 Mpts	Up to 28 Mpts	Max 12 Mpts/Ch (single channel)
Sample Rate	Up to 2 GS/s	T3DSO1000: Up to 1 GS/s T3DSO1000A: Up to 2 GS/s	1 GSa/s (single channel) 500 MSa/s (two channels)
MSO Characteristics[†] (Digital Channels)	Maximum sample rate up to 1 GS/s; record length up to 10 Mpts	250 MHz, 1 GS/s	–
Trigger Types	Edge, Slope, Pulse width, Window, Runt, Interval, Dropout, Pattern, Video, Qualified, Nth edge, Delay, Setup/Hold time, Serial	Edge,Pulse, Pattern, Video, Runt, Slope, Interval, Dropout, Window	Edge, Slope, Pulse Width, Window, Runt, Interval, Time out (dropout), Pattern
Serial Data[†] Trigger (T) Decode (D) Measure / Graph (M) Eye Diagram (E) Graph only (G) Physical Layer (P)	TD: I ² C, SPI, UART, CAN, LIN. D: CAN-FD, FlexRay	TD: I ² C, SPI, UART-RS232, CAN, LIN	TD: I ² C, SPI, UART-RS232, CAN, LIN
Serial Data Analysis	–	–	–
Serial Data Compliance	–	–	–
Additional Software Options	Search, Navigate, History, Mask Test, Counter, Bode plot, and Power Analysis	Arbitrary Waveform Generator, WiFi, Bode Plot	–
Connectivity and Storage	USB Host, USB Device, LAN	USB Host, USB Device, LAN	Isolated USB Host, USB Device (MicroUSB – TMC)
Math	4 traces 2 Mpts FFT, +, -, x, ÷, fdt, d/dt, √, Identity, Negation, Absolute, Sign, ex, 10x, ln, lg, Interpolation, MaxHold, MinHold, ERES, Average. Supports formula editor.	+, -, x, /, FFT, Derivative, Integral, Square Root	+, -, x, /, FFT, Derivative, Integral, Square Root
Dimensions (HWD)	"317.2 × 236 × 149 mm (12.4" × 9.29" × 5.87")"	150 x 312 x 133 mm (5.91" x 12.28" x 5.94")	276 x 168 x 68 mm (10.87" x 6.6" x 2.7")
Weight	8.82 lbs. (5.6 kg)	5.72 lbs. (2.6 kg)	3.14 lbs. (1.75kg)
Warranty	3 yr	3 yr	3 yr

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 and 3-phase dq0 transforms (optional)
- Up to 6000 Vrms isolation with HVD Series differential probes
- 1 GHz High Voltage Optically Isolated Probes for wide bandgap device (GaN & SiC) analysis and testing
- Automatic JEDEC switching device measurements
- Easily interface many different current measurement devices

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

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 with a high-speed logic analyzer. With 12.5 GS/s sampling rate on up to 18 input channels, the QuickLink probe tips allow a seamless transition when testing either the digital or analog domains. The HDA125 is often used in DDR testing, giving engineers the highest accuracy for DDR Read and Write burst separation, a key requirement for JEDEC testing.

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
- QuickLink tips also work with analog differential probes
- 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 and DH series differential analog probes for unmatched acquisition flexibility

teledynelecroy.com/logicanalyzers

WavePulser 40iX High-speed Interconnect Analyzer



Impedance Profile (TDR), S-parameters, De-embedding and Eye Diagram

WavePulser 40iX is the ideal single measurement tool for high-speed hardware designers and test engineers. The combination of S-parameters and impedance profile measurements in a single acquisition with de-embedding in both frequency and time domain 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
- De-embedding of cables, connectors and test fixtures
- Emulate eye diagrams with CTLE, DFE and FFE equalization
- Advanced jitter analysis

teledynelecroy.com/wavepulser

TEST & MEASUREMENT INSTRUMENTS

CrossSync™ PHY – Cross-layer Analysis for PCI Express®, USB4® and Thunderbolt™



Debug and validate active link behavior across electrical and protocol layers

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 enables observation of both electrical and protocol behavior without disturbing the link
- Sideband signals and power rails are all easily accessible to oscilloscope probes
- Interposers and test coupon fixtures provide oscilloscope and protocol analyzer signal access to USB-C and common PCI Express connector form factors

Quickly resolve interoperability issues by capturing the entire protocol stack

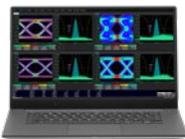
- Trigger protocol analyzer and oscilloscope captures on the same high-level event
- Easily measure timing relationships between protocol and electrical domains
- Faster root-cause analysis means fewer costly finger-pointing exercises

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 behaviors

teledynelestroy.com/cross-sync-phy

MAUI Studio



Works Where You Are

Unleash the power of a Teledyne LeCroy oscilloscope anywhere using a PC with MAUI Studio Pro. Use MAUI Studio Pro to exactly replicate your oscilloscope setup and provide remote connection. Collaborate better and be more productive.

Download and register [here](#) for a free 30-day trial of MAUI Studio Pro.

teledynelestroy.com/maustudio

QPHY2-PC



Off-line Compliance Test Software

QPHY2-PC products permit you to capture waveforms in your lab and take your test session off-line, freeing the oscilloscope for other testing in the lab. It is compatible with any QualiPHY 2 software option.

teledynelestroy.com/qualiphy-compliance#qphy2-pc

RapidWave4000 Production Cable Tester

Production Configuration



Failure Analysis
and Signal Integrity Testing



Production Testing of USB Type-C® and HDMI® 2.1 Cables

The RapidWave4000 is a high-speed advanced production cable tester that meets the demanding test requirements of USB Type-C, HDMI 2.1 and other cables with transfer rates up to 48 Gb/s.

- Performs comprehensive and fast production cable testing
- Reduces test costs while improving cable quality
- Improves cable failure analysis - solve failure issues faster

Key Features:

- Comprehensive Electrical Testing (Continuity, DCR, Quiescent current, IL)
- E-market read test for USB cables
- Advanced Signal Integrity Testing (Eye Diagram, Crosstalk, Impedance profile, Skew)
- Single Instrument for Production, QA and Engineering
- Detailed Pass/Fail Reporting
- Pay-per-test purchase option
- Test Cost Tracking with Teledyne Manufacturing Cloud (TMC)
- Low-cost replaceable cable adapters

teledynelestroy.com/advanced-cable-tester

Teledyne Test Tools

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 T3SP15D stimulates the DUT with true differential signals. The TDR offers fast rise times of 35 ps for fault resolution (in FR4) of 3 mm, 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 (OSLT) 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.



T3AWG6K Series – 2, 4 and 8 Arbitrary Waveform Generators

The T3AWG6K series consists of three high-performance arbitrary waveform generators with 2, 4 and 8 analog channels, 16-bit vertical resolution, sampling rate up to 12.32 GS/s with RF mode, waveform memory depth of 4 Gpts, with outstanding signal fidelity and easy generation of complex signals. In addition, up to 32 digital channels in sync with analog signals for advanced electronic testing.



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.



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.



T3PM Series - Power Meters

Teledyne Test Tools range of digital power meters are for single-phase (1P/2W) AC power measurements with a test Bandwidth ranging from DC, 0.1 Hz to 100 kHz. The T3PM1006 model features a 4" TFT LCD screen with a five-digit measurement display. It offers 19 power measurement parameters to choose from, integration measurement function, front/rear panel input terminals, and various communication interfaces to help users to make convenient and accurate power measurement. The T3PM1100 model offers DC, 0.1 Hz - 100 kHz test bandwidth, 16 bits ADC, and 300 kHz sampling rate. It features a 5" TFT LCD screen with a five-digit measurement display. It also has options to display waveform (voltage/current/power), the integration measurement function, harmonic measurement and analysis of each order (meeting the IEC 61000-4-7 harmonics measurement requirements at 50/60 Hz), external sensor input terminals, and various communication interfaces to help users to make convenient and accurate power measurements.



T3MIL Series - Milli Ohm Meters

Teledyne Test Tools series of D.C. Milli-Ohm meters offer two models T3MIL50 and T3MIL50X, which features a 3.5-inch TFT display with a measurement accuracy of 0.05 %, maximum 50,000 count measurement display and sampling rate of 60 readings per second. The T3MIL series also provides four wire measurement as well as temperature measurement and temperature compensation functions to meet the requirements of low resistance measurement applications.

Teledyne Test Tools – continued



T3VNA3200 Vector Network Analyzer

Teledyne Test Tools T3VNA3200 Vector Network Analyzer has a frequency range from 100 kHz up to 3.2 GHz and Spectrum Analysis frequency range from 9 kHz up to 3.2 GHz. 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 & Rack Mount 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 and Rack Mount 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, 200 and 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 <10mA, 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.



LCR Meters

Teledyne Test Tools range of high precision LCR meters offers three models with maximum test frequency ranging from 2 kHz to 300 kHz and basic accuracy of 0.05%. The T3LCR series provides a wide range of measurements while maintaining a compact size. The entire series adopts 3.5-inch color LCD and features clearly displayed parameters. The T3LCR meters are well suited for the needs of R&D, production environment, MLCC testing as well as performing a full range of automated measurements.



Data Acquisition Unit

The Teledyne Test Tools T3DAQ1-16 is a 16 channel Data Acquisition System incorporating the latest 4.3" (10.92 cm) dual-display technology which can be configured to show Data Histograms, Data fluctuation Trends, Bar Graph, Statistics or the traditional Number mode, all in an easy-to-use interface. The T3DAQ features 12 multi-purpose + 4 current channels and supports various measurement functions. It provides a convenient and versatile solution for test applications that require multiple measurement points or signals and is an ideal tool for R&D burn-in and production testing.

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.

Oscilloscope Probes Differential Probes (200 MHz – 1.5 GHz)



Wide dynamic range, low loading and excellent noise performance. From 200 MHz to 1.5 GHz. Specialty AP033 provides 10x gain and high CMRR.

Differential Probes (4 – 6 GHz)



5 Vp-p dynamic range with ± 3 V offset and low noise and loading. Solder-in, browser, QuickLink, Quick Connect, square pin and HiTemp leads/tips.

Differential Probes (8 – 30 GHz)



For serial data, DDR, or other high-speed signals. Standard and high-sensitivity solder-in, HiTemp, and QuickLink for mixed-signal probing.

High Voltage Passive Probes



1 kV to 6 kV ratings. Provide ground-referenced high voltage measurements in a wide range of applications.

Active Voltage Probes



1 to 4 GHz models. High signal fidelity and low circuit loading (< 1 pF tip capacitance). ± 8 V dynamic range, ± 12 V offset.

Active Voltage/ Power Rail Probe



2 to 4 GHz bandwidth, ± 60 V offset, ± 800 mV dynamic range. High DC input impedance and low noise/attenuation for power rail probing.

Passive Probes



10x attenuating with 10 M Ω input resistance. Ideal for low frequency signals.

High Voltage Optically Isolated Probes



Up to 1 GHz. Ideal for GaN and SiC devices. Highest accuracy, most bandwidth, wide range of voltages, optical isolation.

60 V Common Mode Differential Probes



The ideal probes for lower voltage GaN power conversion measurement with the highest accuracy, best CMRR, and lowest noise. Up to 1 GHz.

High Voltage Differential Probes



1 kV, 2 kV and 6 kV CAT safety rated models. Widest differential voltage ranges, exceptional CMRR, low noise, 1% gain accuracy.

Current Probes



For AC, DC, and impulse current measurements. Utilizes combination of Hall effect and transformer technology. Up to 500A, up to 100 MHz.

Probe and Current Sensor Adapters



Change between the different Teledyne LeCroy Oscilloscope input types or provide simple interface to 3rd-party probes.

Rogowski Coil Probes



Wide frequency range and small sense coils for maximum flexibility. From 60 to 6000 Amps, as low as 0.1 Hz to as high as 30 MHz.

Transmission Line Probes



High bandwidth passive probe for use with 50 Ω inputs. DC to 7.5 GHz with 0.25 pF input capacitance. 10x or 20x attenuation.

PCI Express®, NVMe®, CXL



Summit™ M616 Analyzer/Exerciser

2.5 GT/s ✓ 5 GT/s ✓ 8 GT/s ✓ 16 GT/s ✓ 32 GT/s ✓ 64 GT/s ✓

Teledyne LeCroy's highest performance protocol analyzer/exerciser that fully supports up to PCI Express 6.0 and CXL protocol analysis and traffic generation. Captures up to a x16 link and is configurable up to 64 GB trace depth with a single unit. The product is ideal for high-performance protocol development for storage SSDs, servers and workstations, and for customers currently working on PCIe 5.0 who may upgrade to PCIe 6.0 and CXL protocol analysis/traffic generation.



Summit T516 Analyzer

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

Teledyne LeCroy's protocol analyzer that fully supports up to PCI Express 5.0 and CXL protocol analysis. Captures up to a x16 link and is configurable up to 256 GB trace depth with a single unit. The product is ideal for high-performance protocol development for storage SSDs, servers and workstations, and for customers currently working on PCIe 4.0 who may upgrade to PCIe 5.0 and CXL protocol analysis.



Summit T54 Analyzer

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

Teledyne LeCroy's portable protocol analyzer that fully supports up to PCI Express 5.0 and CXL protocol analysis. Captures 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.



Summit M5x Analyzer / Jammer

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

Unparallel combination of error injection (jamming) for PCIe 4.0 and Gen-Z testing and full protocol analysis for PCIe 5.0 (32GT/s) specification, CXL, and the Gen-Z Specification. The Summit M5x protocol analyzer/jammer features PCIe 4.0 "RAS" Error and Gen-Z jamming test capability.



Summit Z516 Exerciser

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

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



Summit Z58 Exerciser Analyzer

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

PCI Express 5.0 full exerciser and analyzer for bidirectional lane widths of x1, x2, x4, and x8; includes 8 GB of trace memory for data rates of 2.5GT/s, 5GT/s, 8GT/s, 16GT/s and 32 GT/s. 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 ✓

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 at up to 16 lanes.



Summit T48 Analyzer

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

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 at up to 8 lanes.



Summit Z416 Exerciser

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

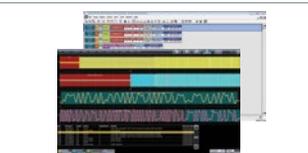
PCI Express protocol exerciser and analyzer with full support for PCI Express 4.0; data rates of 2.5GT/s, 5GT/s and 8GT/s; full data capture on bidirectional lane widths of x1, x2, x4, x8 and x16; and a full 8 GB of trace memory. The system offers advanced features such as performance monitoring, LTSSM,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



Summit T34 Analyzer

2.5 GT/s ✓ 5 GT/s ✓ 8 GT/s ✓

Extremely portable and cost-effective 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.



ProtoSync® PE Oscilloscope Decode

2.5 GT/s ✓ 5 GT/s ✓ 8 GT/s ✓ 16 GT/s ✓ 32 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, NVMe and CXL

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.



PCIe 5.0 U.2/U.3 Interposer



PCIe 5.0 U.2/U.3 Adapters



PCIe 6.0 CEM Interposer



PCIe 6.0 EDSFF Interposer



PCIe 5.0 EDSFF Adapter



PCIe 6.0 M.2 Interposer



PCIe 6.0 CEM Interposer with CrossSync PHY



G5 MCIO Cable Interposer



PCIe 5.0 M.2 Adapter



PCIe 6.0 x16 OCP NIC 3.0 Interposer



VPX Interposer



PCIe 4.0 Midbus Probe



PCIe 4.0 Multi-Lead Probe



PCIe 6.0 CEM x4 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 ✓



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 ✓



Industry-leading SAS 3.0 protocol test system for SAS and SATA protocol validation. The four port analyzer, exerciser and error injection system provides the most accurate and reliable capture of SAS 12 Gb/s protocol for fast debug, analysis and problem solving. The Sierra M124 is the first platform to implement linear probing technology and a non-retimed pass-through signal.

Sierra M122A Protocol Verification System

1.5G ✓ 3G ✓ 6G ✓ 12G ✓



A two-port version of the industry-leading Sierra M124 SAS 3.0 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.

Ethernet and Fibre Channel



SierraNet M1288 Protocol Verification System

Ethernet 25/50/100Gb (NRZ) ✓ Ethernet 50/100/200/400Gb/800Gb (PAM4) ✓ Fibre Channel 32/64/128Gb ✓

The industry's first protocol verification system for 802.3ck PAM4 Ethernet and 128Gb Fibre Channel. The test platform provides best in class analysis, jamming and generation for traffic capture and manipulation for testing application and link characteristics. SierraNet M1288 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. Optional probe available for QSFP-dd and OSFP connectivity.



SierraNet™ M648 Protocol Verification System

Ethernet 10/25/40/50/100Gb (NRZ) ✓ Ethernet 50/100/200/400Gb (PAM4) ✓ Fibre Channel 16/32/64Gb ✓

The industry's first protocol verification system for PAM4 Ethernet and Fibre Channel from Teledyne LeCroy, provides best in class traffic capture, analysis, generation, and manipulation for testing Ethernet and Fibre Channel. The test platform 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 Protocol Verification System

Ethernet 1/2.5/5/10/25/40/50/100Gb ✓ Fibre Channel 8/16/32Gb ✓

Provides 10/25/40/50/100Gbps Ethernet and 8/16/32Gb 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 Protocol Verification System

Ethernet 1/2.5/5/10/25/40/50/100Gb ✓ Fibre Channel 8/16/32Gb ✓

The SierraNet M328 system provides users with traffic capture, data analysis, protocol verification and introduces error injection capabilities for 10/25/40/50/100Gb Ethernet and 8/16/32G 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 M328Q Protocol Verification System

Ethernet 25G/50G/100G ✓ Fibre Channel 32Gb ✓

The SierraNet M328-Q system provides users with traffic capture, data analysis, protocol verification and introduces error injection capabilities for 10/25/40/50/100Gb Ethernet and 8/16/32G 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.



Xena Z800 Freya Ethernet Traffic Generators

Ethernet 50Gb/100Gb/200Gb/400Gb/800Gb PAM4 using 56Gbps/112Gbps SerDes Ethernet ✓

Z800 Freya modules can generate and analyze traffic at Ethernet PAM4 speeds from 50Gb up to 800Gb using both 56Gbps and 112Gbps SerDes. The award-winning Z800 Freya modules feature a proprietary PHY for testing all Layer 1 functions. This provides unmatched flexibility for rapidly testing new features and standards and achieving superior signal integrity over electrical cables. Z800 Freya can also be licensed for dedicated ANLT testing, enabling test engineers to debug and optimize Physical Layer Auto-Negotiation and Link Training issues. Available in both fixed desktop and scalable rack-mountable chassis.



Xena Z400 Thor Ethernet Traffic Generator

Ethernet 10Gb/25Gb/40Gb/50Gb/100Gb (NRZ) ✓ Ethernet 50Gb/100Gb/200Gb/400Gb (PAM4) ✓

The Z400 Thor can generate and analyze traffic at all Ethernet speeds from 10Gb up to 400Gb using both NRZ and PAM4 modulation. Used extensively for testing Auto-Negotiation and Link Training, Z400 Thor is available in both fixed desktop and scalable rack-mountable chassis.



Xena Z100 Loki Ethernet Traffic Generator

Ethernet 10Gb/25Gb/40Gb/50Gb/100Gb (NRZ) ✓

The Z100 Loki can generate and analyze traffic at five Ethernet speeds from 10Gb up to 100Gb (NRZ). Loki offers 2 x QSFP28 ports and is available in both fixed desktop and scalable rack-mountable chassis.



Xena Z10 Odin Ethernet Traffic Generators

Ethernet 10Mbps/100Mbps/1Gb/10Gb (NRZ) ✓

Z10 Odin can generate and analyze traffic at all Ethernet speeds up to 10Gb (NRZ). There are seven versions supporting different interfaces (SFP & SFP+) as well as RJ45 and Base-T1 copper for Automotive Ethernet testing, and all are available in both fixed desktop and scalable rack-mountable chassis.

Ethernet and Fibre Channel – continued



Xena E100 Chimera Network Emulator

Ethernet 10Gb/25Gb/40Gb/50Gb/100Gb NRZ Ethernet ✓

E100 Chimera makes it easy to emulate a wide range of impairments to Ethernet traffic at wire speed up to 100Gb. When installed together with Xena Ethernet traffic generators, this can be done seamlessly using the free XenaManager software. E100 Chimera is widely used for fronthaul testing of 5G networks. Available for both fixed desktop and scalable rack-mountable chassis.



Xena B2400 and Compact

Chassis support for Ethernet modules

The Xena B2400 and Compact chassis' allow for complete flexibility for installation of Ethernet test modules. The modular design allows for a single module in a smaller compact chassis or multiple modules that allow for supporting multiple test modules in the same chassis.

Universal Serial Bus (USB®)



Voyager™ M4x Analyzer Exerciser System

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

The industry's most accurate and trusted USB analyzer platform 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 M310e Analyzer Exerciser System

1.5M ✓ 12M ✓ 480M ✓ 5G ✓ 10G ✓

Most comprehensive protocol verification system for USB 2.0, USB 3.1, Gen2x1, Type-C, and Power Delivery 3.1 including EPR testing. The non-intrusive probing and a range of turnkey Compliance packages make the Voyager M310e the intelligent choice for USB protocol analysis.



Advisor™ T3 Analyzer

1.5M ✓ 12M ✓ 480M ✓ 5G ✓

Cost-effective, small form-factor and still full featured protocol analyzer 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™ T2C / Mercury T2P Analyzer

1.5M ✓ 12M ✓ 480M ✓

The pocket-sized analyzer that 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. The Mercury T2P adds to the Mercury T2C rich functionality, also 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 Analyzer

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 M52 UniPro/UFS Analyzer/Exerciser

GEAR1 ✓ GEAR2 ✓ GEAR3 ✓ GEAR4 ✓ GEAR5 ✓

Implementing a new high speed front end, supporting MIPI M-PHY™ HS-Gear5 at speeds up to 23Gbps, the Eclipse M52 stands as the markets most complete analyzer/exerciser. The Eclipse M52 is the right tool for engineers and developers who need to ensure the correct and efficient operation of technologies employing the high data transfer speeds of the UniPro/UFS specifications.



Envision X14 CSI & DSI Protocol Analyzer/Generator

C-PHY@6Gs/s ✓ D-PHY@9Gb/s ✓ CSI ✓ DSI ✓ Analyzer ✓ Generator ✓

With comprehensive support for MIPI CSI-2v2 and DSI-2 specifications, Teledyne LeCroy's Envision X14 analyzer and signal generator platform provides the industry's most accurate and reliable analysis of MIPI camera and display protocols for fast debug, trouble isolation and problem resolution. The Envision X14 test instrument's innovative features help uncover elusive protocol errors and is the intelligent choice for any camera and display validation needs. A set of solder down probes enable passive monitoring between and application processor and a MIPI image/camera or display device. The Envision X14 system unites C-PHY & D-PHY, CSI & DSI and video analysis & signal generation into a single box with a flexible ala carte licensing of options to tailor the instrument's feature set to each specific application.

Wireless: Bluetooth®, 802.11, 802.15.4

The Frontline® family of Wireless protocol analyzers and tools support a wide variety of protocol standards, including the Bluetooth, 802.11 and 802.15.4. 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.

Frontline X500e Wireless Protocol Analyzer

Bluetooth BR/EDR & LE 6.x ✓ 802.11 a/b/g/n ✓ 802.11 ac ✓ 802.11 ax (Wi-Fi 6/6E) ✓ 802.11 be (Wi-Fi 7) ✓ 802.15.4 ✓

Teledyne LeCroy's Frontline X500e Wireless Protocol Analyzer is the most versatile wireless analysis tool in the industry, boasting support for concurrent time-correlated captures of all the adopted and developing (updated via software) Bluetooth BR/EDR and Low Energy, the latest Wi-Fi technologies including Wi-Fi 5, 6/6E, 7 on two concurrent channels, and 802.15.4-Zigbee/Matter/Thread. Add to that wired logic (24 Ch.), UART/SPI/Audio I2S, USB, RF spectrum, mesh, and antenna diversity, the X500e is truly the right tool for every wireless developer.



Frontline X240 Wireless Wideband Analyzer

Bluetooth BR/EDR & LE 6.0 ✓ 802.11 a/b/g/n ✓ 802.11 ac ✓ 802.15.4 ✓

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 economically. Coupled with Teledyne LeCroy's Wireless Protocol Suite software's streamlined UI with Automation support, the X240 can analyze Bluetooth BR/EDR and Low Energy, or Wi-Fi 5, or 802.15.4-Zigbee/Thread/Matter making it a robust, and cost-effective test tool for everyone. Connect multiple X240s via Sync cable to capture multiple technologies concurrently.



Frontline BPA low energy Bluetooth Protocol Analyzer

Bluetooth Low-Energy 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

testHarmony LE Tester

Bluetooth Low-Energy 4.0 ✓ 4.1 ✓ 4.2 ✓ 5 ✓ 5.1 ✓ 5.2 ✓ 5.3 ✓ 5.4 ✓

The testHarmony LE Exerciser is a highly flexible test solution designed to provide pre-compliance, debugging, regression and robustness testing for chipset vendors and product manufacturers during the development cycle and post release. The tester supports test case package licenses based on Bluetooth feature group functionality and are available either individually or as a complete package. testHarmony supports a subset of test cases that enable the user to change specific test case parameters to test above and beyond the Bluetooth SIG LE specification. With the purchase of testHarmony and at least one test case package the user will also get access to a set of custom test cases that are not part of the specification.



TLF3000 RF PHY Tester

Bluetooth BR/EDR & LE 5.4 ✓ 802.15.4 ✓

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 covers 3 technologies (Bluetooth Low Energy, BR/EDR and 802.15.4) via licensing. The TLF3000 is fully featured solution for lab use with embedded test scripts to execute all of the test cases in the Bluetooth SIG RF Test Specifications.



FRVS Bluetooth RF Test System

Bluetooth BR/EDR & LE 5.4 ✓

FRVS is recognized by the Bluetooth SIG as a validated test system for qualification testing of products to Bluetooth BR/EDR and low energy RF test specifications. At the core of the system is the Teledyne LeCroy TLF3000 RF Tester. The FRVS system is a highly portable and flexible qualification testing solution that, due to its unique parallel architecture, can execute testing much faster than traditional RF test systems. This compact yet powerful system is significantly smaller than comparable solutions, and can easily be accommodated on the test bench.



Communication Probes, Taps, and Analyzers for RS-232 and RS 422/485



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** software protocol analyzers.



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** software protocol analyzers.

NetDecoder Software

The NetDecoder product is 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

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.

HDMI® 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 an 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.

quantumdata M41h 48G Video Analyzer/Generator for HDMI Testing

Video Analyzer/Generator for 8K 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 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.



quantumdata M42de 80G Video Analyzer/Generator for DisplayPort 2.1 Testing

The M42de Video Analyzer/Generator for DisplayPort 2.1 Testing provides an unprecedented combination of functional and compliance testing for video, audio and protocol of DisplayPort 2.1 and DisplayPort 1.4. The M42de is the successor to the M42d with additional features such as support for the new Enhanced DP80 connectors to support the full 80G video generation and video analysis on the full sized DP ports. The M42de supports legacy DisplayPort lane rates of 1.62, 2.7, 5.4, 8.1 Gb/s and the new DP 2.1 higher speed lane rates and new Ultra High Bit Rate (UHBR) line coding— 128b/132b—for 10.0, 13.5, & 20.0Gb/s data rates up to 4 lanes. The M42de's protocol analyzer provides a snapshot status view and deep analysis using captures of incoming DisplayPort 2.1 (and DP 1.4) streams from source devices including DSC/ FEC compressed streams. The instrument's video generator can be used for testing displays, USB-C adapters, docks, hubs, etc. The video generator offers a large library of standard video timings and test patterns necessary for testing next generation high resolution displays. The M42de supports a full suite of DP 1.4 compliance tests for link layer, forward error correction (FEC) and display stream compression for both sources and sinks. Compliance tests for DP 2.1 including link layer, adaptive sync and LTPPR are now available as well with new tests and updates being rolled out in subsequent release. The Passive Probe is a unique and powerful feature that enables passive monitoring of the DisplayPort Main Link and the Aux Channel between two DisplayPort devices up to 20 Gb/s lane rates. Support for functional testing of advanced features such as Panel Replay, Adaptive Sync and LTPPR are also supported.



quantumdata M21

The Teledyne LeCroy quantumdata M21 handheld test instrument is a portable, feature rich, HDMI video analyzer / generator and a DisplayPort video analyzer that supports quick verification testing and troubleshooting of digital video systems in the R&D lab.

quantumdata M21 Video Analyzer/Generator - for HDMI & DisplayPort Testing

The Teledyne LeCroy quantumdata M21 Video Analyzer for HDMI 2.1 and DisplayPort 2.0 testing offers a wide array of benefits to design engineers in R&D as well as professional A/V installers in the field for testing HDMI and DisplayPort devices. The M21 instrument is equipped with both an HDMI Rx port and an HDMI Tx port for testing HDMI source, sink and repeater devices up to 48Gb/s using the new 8K Fixed Rate Link (FRL) protocol. The instrument is also equipped with a DisplayPort Rx port for analyzing source devices up to 54Gb/s (13.5Gb/s per lane). The portable size, battery operated and large user-friendly touch screen interface provides convenience to complement the rich feature set. The user interface design and test functions greatly reduce Time-to-Insight whether running tests on distinct devices or entire digital video distribution networks.



quantumdata 804 Series

The Teledyne LeCroy rack mountable 804 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.



quantumdata 804 225MHz HDMI Video Generator

Video Test Generator for testing of HD and UHD TVs and displays at pixel rates up to 225 MHz on its HDMI outputs. This enables testing of high end 1080p resolutions at 50/60Hz with HDMI 1.4 4:4:4 pixel encoding and deep color. The instrument's four (4) HDMI outputs and attractive price make it ideal for testing TVs in manufacturing production line facilities. The 804 instrument supports functional protocol tests such as HDCP and EDID including new data elements related to HDMI 1.4. The 804 also supports video generation capabilities for analog including composite, component and VGA video formats.



quantumdata 804B 600MHz HDMI Video Generator

Video Test Generator for 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 instrument's four (4) HDMI outputs and attractive price make it ideal for testing TVs in manufacturing production line facilities. 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. The 804B also supports video generation capabilities for analog including composite, component and VGA video formats.

SSD Test Appliances

The OakGate SSD Test solutions are the storage industry's most advanced. OakGate's highly capable and flexible platforms support all popular storage protocols and are based on advanced, proprietary SVF Pro/Enduro software, and industry standard hardware. The OakGate test solutions have been deployed by top tier components suppliers, drive manufacturers, and storage system OEMs worldwide. The OakGate SSD Test Software includes a broad range of capabilities including deep protocol inspection and analysis, high-performance traffic generation, full-performance characterization, complex error injection, advanced test automation and power cycling for PCIe, SAS, SATA and Fibre Channel. In addition, the open API allows easy integration into the customer's existing test infrastructure. The OakGate SSD Test Solutions are available for PCIe 5.0 and PCIe 4.0.

Oakgate R350 PowerPlus Rackmount Appliance for PCIe 5.0



The R350-G5-PowerPlus Appliance is ideal for medium to large test teams who need maximum performance and comprehensive power and sideband signal management feature support. The R350-G5-PowerPlus Appliance includes a seamlessly integrated Power Management Card (PMC) that adds full voltage margining and glitching support. Customers no longer need to purchase 3rd-party power interposers which significantly reduces their overall total cost of ownership. The R350-G5-PowerPlus Appliance can connect up to one (1) optional OakGate 8-bay plug-in module to test U.2, M.2, U.3, CEM, EDSFF E1.S or EDSFF E3.S/L SSDs. The 3U Rackmount Appliance is powered by the OakGate Storage Validation Framework (SVF) engine, the industry's most advanced storage-testing software. The robust SVF software, now in its fifth generation, offers a comprehensive set of testing features and capabilities.

Oakgate R300 Rackmount Basic Appliance for PCIe 5.0



The R300-G5-Basic Appliance is ideal for small or medium test teams who need to test PCIe Gen5 SSDs, but do not require scalability. The R300-G5-Basic Appliance can connect up to two (2) optional OakGate 8-bay plug-in modules to test U.2, M.2, U.3, CEM, EDSFF E1.S or EDSFF E3.S/L SSDs. The 3U Rackmount Appliance is powered by the OakGate Storage Validation Framework (SVF) engine, the industry's most advanced storage-testing software. The robust SVF software, now in its fifth generation, offers a comprehensive set of testing features and capabilities.

Oakgate R300 Rackmount Pro Appliance for PCIe 5.0



The R300-G5-Pro Appliance is ideal for medium to large test teams who need maximum performance and scalability. The R300-G5-Pro Appliance can connect up to two (2) optional OakGate 8-bay plug-in modules to test U.2, M.2, U.3, CEM, EDSFF E1.S or EDSFF E3.S/L SSDs AND up to two (2) optional OakGate 16-Bay Enclosures to test U.2, M.2, U.3, EDSFF E1.S/L or EDSFF E3.S/L SSDs. The Pro 3U Rackmount Appliance is powered by the OakGate Storage Validation Framework (SVF) engine, the industry's most advanced storage-testing software.

Oakgate DE200 Desktop Basic Appliance for PCIe 5.0



The DE200-G5-Basic Appliance is ideal for small or medium test teams who need to test PCIe Gen5 SSDs, but do not require scalability. The DE200-G5-Basic Appliance can connect to one optional OakGate 8-bay plug-in module to test U.2, M.2, U.3, CEM, EDSFF E1.S or EDSFF E3.S/L SSDs. The OakGate 8-Bay plug-in modules are interchangeable so you can modify the appliance to match the required SSD format. The Desktop Appliance is powered by the OakGate Storage Validation Framework (SVF) engine, the industry's most advanced storage-testing software. The robust SVF software, now in its fifth generation, offers a comprehensive set of testing features and capabilities.

SSD Test Appliances – continued



Oakgate DE200 Desktop Pro Appliance for PCIe 5.0

The DE200-G5-Pro Appliance is ideal for medium to large test teams who need maximum performance and scalability. The DE200-G5-Pro Appliance can connect one optional OakGate 8-bay plug-in module to test U.2, M.2, U.3, CEM, EDSFF E1.S or EDSFF E3.S/L SSDs AND one optional OakGate 16-Bay Enclosure to test U.2, M.2, U.3, EDSFF E1.S/L or EDSFF E3.S/L SSDs. The Oakgate 8-Bay plug-in modules are interchangeable so you can modify the appliance to match the required SSD format. The Pro Desktop Appliance is powered by the OakGate Storage Validation Framework (SVF) engine, the industry's most advanced storage-testing software. The robust SVF software, now in its fifth generation, offers a comprehensive set of testing features and capabilities.



Oakgate DL100 Entry-level Desktop Appliance for PCIe 5.0

The DL100-G5 Entry-Level Appliance is ideal for small, budget-conscious test teams who need to test PCIe 5.0 SSDs, but do not require complex enterprise level testing and scalability. The DL100-G5 Entry-Level Appliance comes standard with one customer designated OakGate 8-bay plug-in module. Module interface choices include U.2, M.2, U.3, EDSFF E1.S or EDSFF E3.S/L. The Entry-Level Desktop Appliance is powered by a "lite" version of OakGate Storage Validation Framework Pro (SVF) engine, the industry's most advanced storage-testing software comprehensive set of testing features and capabilities.

DL100 Desktop Versions

OGT-DL100-E1S-G5	DL100 Desktop Appliance with support of up to eight E1.S Single/Dual-port NVMe drives
OGT-DL100-E3-G5	DL100 Desktop Appliance with support of up to eight E3.S Single/Dual-port NVMe drives
OGT-DL100-M2-G5	DL100 Desktop Appliance with support of up to eight M.2 NVMe drives
OGT-DL100-U2-G5	DL100 Desktop Appliance with support of up to eight U.2 Single/Dual-port NVMe drives
OGT-DL100-U3S-G5	DL100 Desktop Appliance with support of up to eight U.3 Single-port NVMe drives
OGT-DL100-U3D-G5	DL100 Desktop Appliance with support of up to eight U.3 Dual-port NVMe drives



OakGate DE200 Expandable Desktop Appliance for PCIe 4.0

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 × 20.47" D × 7.01" H (4U).



OakGate R300 3U Rackmount Appliance for PCIe 4.0

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 × 26" L × 5.5" H (3U).

16-Bay Enclosures

The E-Series 16-Bay Expansion Enclosures provide a simple, flexible way to test all the popular SSD form factors and connector types when attached to an OakGate R300-G5- PRO Rackmount Appliance or DE200-G5-PRO Desktop Appliance. The Expansion Enclosure allows testing of up to sixteen SSDs and provides a flexible way to increase a customer's test capabilities. This allows much larger configurations to be tested with single appliance which can help reduce test time.



Gen5 Enclosures

OGT-ED3-16P-G5	OakGate Gen5 16-Bay Enclosure for EDSFF E3 Short/Long Drives (Single/Dual-Port Mode)
OGT-EDL-16P-G5	OakGate Gen5 16-Bay Enclosure for EDSFF E1 LONG Drives (Single/Dual-Port Mode)
OGT-EDS-16P-G5	OakGate Gen5 16-Bay Enclosure for EDSFF E1 SHORT Drives (Single/Dual-Port Mode)
OGT-EM2-16P-G5	OakGate Gen5 16-Bay Enclosure for M.2 PCIe/NVMe Drives
OGT-EU2-16P-G5	OakGate Gen5 16-Bay Enclosure for U.2 PCIe/NVMe Drives (Single/Dual-Port Mode)
OGT-EU3-16P-01-G5	OakGate Gen5 16-Bay U.3 Single-port Enclosure PCIe/NVMe Drives
OGT-EU3-16P-02-G5	OakGate Gen5 16-Bay U.3 Dual-port Enclosure PCIe/NVMe Drives
OGT-EDS25-8P-G5	OakGate Gen5 16-Bay Enclosure for EDSFF E1 SHORT 25mm Drives (Single/Dual-Port Mode)

SSD Test Appliances – continued

8-Bay Modules



The M-Series 8-Bay Plug-In Modules provide a simple, flexible way to test all the popular SSD form factors and connector types within an OakGate R300 Rackmount Appliance and/or DE200 Desktop Appliance. The module resides in the front compartment of the OakGate appliance and allows testing of up to eight SSDs.

Gen5 Modules

OGT-MCEM-800-G5	Oakgate Gen5 CEM Module - Supports up to eight Add In Card (AIC) NVMe drives
OGT-ME3S-800-G5	Supports up to eight single or dual-port E3 S/L Short or Long NVMe drives/Single/Dual-Port Mode
OGT-MES25-400-G5	Supports up to four single or dual-port 25mm E1 Short NVMe drives/Single/Dual-Port Mode
OGT-MES-800-G5	Supports up to eight single or dual-port E1 Short NVMe drives/Single/Dual-Port Mode <ul style="list-style-type: none"> Requires customer to Choose 1 of the following Carrier types <ul style="list-style-type: none"> OGT-AES89-G5 -E1.S 8mm/9mm or OGT-AES15-G5 E1.S 15mm at no charge
OGT-MM2-800-G5	Oakgate M.2 Gen 5 Module
OGT-MU2-800-G5	Supports up to eight U.2 single or dual port 2.5-inch NVMe drives/Single/Dual-Port Mode
OGT-MU3-801-G5	Supports up to eight, U.3 single-port, 2.5-inch NVMe drives
OGT-MU3-802-G5	Supports up to eight, U.3 dual-port, 2.5-inch NVMe drives

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

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).

U.3 Enclosure for PCIe Gen4

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).

EDSFF Enclosure for PCIe Gen4

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



SSD Test Appliances – continued 4-Bay Modules

The M-Series 4-Bay Modules provide a simple, flexible way to test and debug U.2, U.3, or EDSFF 1U Short SSDs within an OakGate expandable desktop appliance or 3U rackmount appliance. When installed in an OakGate DE200 appliance or OakGate R300 appliance the module 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

The module includes four SSD carriers for hosting 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.



U.3 Plug-In Module for PCIe Gen4

The module includes four SSD carriers for hosting 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.



EDSFF 1U Short Plug-In Module for PCIe Gen4

The module includes four SSD carriers for hosting up to four EDSFF 1U short NVMe SSDs that use a x4 (10) 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.



CXL Memory Device Validation

The highly-capable PCIe 5.0 OakGate CXL Validation Platforms support the CXL 1.1 protocol and are based on advanced, proprietary software, industry standard hardware. OakGate's CXL Validation Software called Endeavor is the industry's first with an unprecedented level of functionality, performance, and ease of use for testing CXL memory devices. The software has been developed with significant inputs from CXL device manufacturing partners. OakGate's products have been deployed by top tier components suppliers, drive manufacturers, and storage system OEMs worldwide. Future support for CXL 2.0 and 3.0 planned.

CD240-G5 CXL Validation Desktop Appliance

The OakGate CD240 Compute Express Link (CXL) Validation Desktop Appliance is the industry's first validation system designed to test and debug PCI Express® 5.0 CXL Memory Expansion Devices. The CD240-G5 CXL Validation Appliance is ideal for test teams who need to validate CXL device functionality and performance in a Intel host-based test system. The CXL Validation Appliance can connect up to four (4) CEM (for add-in-cards) or four (4) EDSFF E.3 CXL memory expansion devices. The CXL Validation Desktop Appliance is powered by the OakGate Endeavor software, the industry's first CXL-based validation testing software. The robust Endeavor software offers a broad set of testing features and capabilities. Endeavor supports a range of capabilities including traffic generation, register editing, security flows utilizing SPDM over DOE, SMBus and PCIe VDM, power control, sideband control and an interface to send passthrough commands. The CXL validation platforms also includes a python application programming interface (API).



CM-Series 4-Bay CXL Modules for PCI Express 5.0 CXL Appliances

Oakgate 4-Bay Modules for the PCIe 5.0 CD240-G5 CXL Validation Appliance are a robust, versatile way to test and debug solid-state CXL memory devices. Available for Type 3 CEM and E.3 CXL Memory Expansion Devices. The 4-Bay Modules can be easily swapped in/out.



Teledyne LeCroy's Austin Labs offers expert engineering services including third-party **Testing**, in-depth **Protocol Training** and advanced **Automation** to help our customer solve problems on time and under budget. Its worldwide locations allow for in country support and localization for all testing and training requirements. Austin Labs is a trusted partner for services throughout the industry supporting startup businesses to large OEM's, bringing expertise, high performance test equipment, and fully automated testing solutions.

TESTING

Austin Labs is the industry leading third-party testing facility. We help our customers overcome testing challenges in their products including Data Integrity, Performance Analysis, Protocol Analysis and compliance, Error Injection, Signal Integrity, Electrical Compliance, Interoperability, Technical Consulting, Design and Feasibility.

With state-of-the-art test facilities located around the world and industry expertise Austin Labs takes advantage of the wide array of Teledyne LeCroy tools for validation testing of products from server/storage to client systems with expertise in **PCIe, NVMe, CXL, Ethernet, Fibre Channel, SAS, SATA, USB, Thunderbolt, Bluetooth, WiFi, HDMI, DisplayPort, MiPi C/D-Phy, MiPi M-Phy**, and others.

Austin Labs provide customized testing services for many markets including:

- Server/Client/Compute
- Chipset Solutions
- Storage/Networking
- Automotive/Infotainment/Connected Car/Apple CarPlay/Android Auto
- Medical/Bluetooth Connectivity
- IOT (Internet of Things)/Smart Home Technologies

TECHNICAL TRAINING

World class protocol training courses designed for intermediate and advanced students looking to build their expertise in technologies including **PCI Express, NVMe, CXL, USB, Ethernet, Fibre Channel, FCoE, iSCSI, SAS, Bluetooth, NVMe over Fabrics** and more. All classes are instructor led and guide students through the protocol specifications. The protocol specifications are reinforced with **hands-on labs** that help the student see how protocols are implemented and designed for real-world use cases.

AUTOMATION

Take advantage of Teledyne LeCroy's tools along with advanced automation solutions provided by Austin Labs. Austin Labs applies its expertise to guide and develop customized automated testing capabilities using Teledyne LeCroy products along with external test platforms. This synergy brings the best of testing and the automation together to test smarter and faster. Austin Labs creates fully automated solutions that include:

- LeCroy API – automation for analyzer, exerciser, jammer, oscilloscope
- Verification Scripting Engine (VSE) – post processing of analyzer captures
- LinkExpert – Graphical user interface that can be used for pass/fail test requirements
- Directed Tests – automated solutions for the Oakgate test platform

Austin Labs own **SmartTest** automation testing system, a fully robotic solution, allows for complete automated testing including replication of human interaction, augmented by computer vision and artificial intelligence to precisely control test environments with 100% repeatability for data analysis.

Teledyne SP Devices designs and manufactures world-leading modular data acquisition and signal generation instruments. Our products utilize patented calibration logic, the latest data converters, and state-of-the-art FPGA technology resulting in an unrivaled combination of high sampling rate and resolution. Products are available with a rich set of application-specific features and embedded real-time signal processing.

Our extensive product portfolio enables cost-optimized system-level solutions and the modular approach allows for compact yet scalable systems that can easily be tailored for specific needs. The modules offer flexible operation by supporting AC- or DC-coupling, adjustable DC offset, programmable input voltage range, advanced triggering, and choice of single-ended or differential outputs. This helps simplify integration through good matching with most sensors.

For a full list of products and more please visit our website at spdevices.com.

ADQ7DC – 14-bit, 10 GSPS Digitizer



Key Features

- 1 or 2 input channels, software-selectable
- 10 or 5 GSPS sampling rate per channel with 14 bits resolution
- Open FPGA for custom real-time signal processing
- Available in PXIe, PCIe, MTCA.4, USB 3.0, and 10 GbE form factors
- Multi-channel synchronization capabilities
- 7 Gbyte/s peer-to-peer streaming to GPU and SSD storage
- Application-specific firmware helps shorten design time

Example Applications

- Time-of-flight mass spectrometry
- Imaging flow cytometry
- LiDAR

ADQ14 – 14-bit, 2 GSPS Digitizer



Key Features

- 1, 2, or 4 input channels
- 0.5, 1, or 2 GSPS sampling rate with 14 bits resolution
- AC- or DC-coupled and variable gain option (for DC-coupling)
- Open FPGA for custom real-time signal processing
- Available in PXIe, PCIe, USB 3.0, and 10 GbE form factors
- Multi-channel synchronization capabilities
- Application-specific firmware helps shorten design time

Example Applications

- Swept-Source Optical Coherence Tomography (SS-OCT)
- Thomson scattering
- Distributed optical fiber sensing

SDR14TX – 14-bit, 2 GSPS AWG



Key Features

- Dual-channel arbitrary waveform generator (AWG) with 2 GSPS sample rate and 14 bits resolution
- Open FPGA for custom real-time signal processing
- Available in PXIe and PCIe form factors
- Multi-channel synchronization capabilities
- 1st and 2nd Nyquist operation up to 1.8 GHz
- Programmable waveform sequencing and markers

Example Applications

- Radar
- Quantum technology
- Wireless communication

ADQ30 12-bit, 1 GSPS Digitizer



Key Features

- 1 input channel
- 1 GSPS sampling rate per channel with 12 bits resolution
- Open FPGA for custom real-time signal processing
- Available in PCIe form factor
- General Purpose Input/Output (GPIO)
- 7 Gbyte/s peer-to-peer streaming to CPU and GPU

Example Applications

- Time-of-flight mass spectrometry
- Distributed Fiber Optical Sensing
- LiDAR

ADQ32 - 12-bit, 5 GSPS Digitizer



Key Features

- 1 or 2 input channels, software-selectable
- 5 or 2.5 GSPS sampling rate per channel with 12 bits resolution
- Open FPGA for custom real-time signal processing
- Available in PCIe form factor
- General Purpose Input/Output (GPIO)
- 7 Gbyte/s peer-to-peer streaming to GPU

Example Applications

- Swept-Source Optical Coherence Tomography (SS-OCT)
- Time-of-flight mass spectrometry
- LiDAR

Digitizers – continued

ADQ32-PDRX – 12-bit, 2.5 GSPS Digitizer Optimized for Pulse Detection



Key Features

- 1 analog input channel
- 2.5 GSPS sampling rate
- Open FPGA for custom real-time signal processing
- DC-coupled input with 1 GHz input bandwidth
- 12-bit vertical resolution
- 3 bits dynamic range extension through built-in dual gain channel combination

Example Applications

- Time-of-Flight Mass Spectrometry
- LiDAR
- High energy physics

ADQ33 12-bit, 1 GSPS Digitizer Digitizer



Key Features

- 2 input channels
- 1 GSPS sampling rate per channel with 12 bits resolution
- Open FPGA for custom real-time signal processing
- Available in PCIe form factor
- General Purpose Input/Output (GPIO)
- 7 Gbyte/s peer-to-peer streaming to CPU and GPU

Example Applications

- Swept-Source Optical Coherence Tomography (SS-OCT)
- Time-of-flight mass spectrometry
- Distributed Fiber Optical Sensing
- Scanning acoustic microscopy
- LiDAR

ADQ33-PDRX – 12-bit, 1 GSPS Digitizer Optimized for Pulse Detection



Key Features

- 1 input channels
- 1 GSPS sampling rate per channel with 12 bits resolution
- Open FPGA for custom real-time signal processing
- Available in PCIe form factor
- General Purpose Input/Output (GPIO)
- 7 Gbyte/s peer-to-peer streaming to CPU and GPU
- 3 bits dynamic range extension through built-in dual gain channel combination

Example Applications

- Swept-Source Optical Coherence Tomography (SS-OCT)
- Time-of-flight mass spectrometry
- Distributed Fiber Optical Sensing
- Scanning acoustic microscopy
- LiDAR

ADQ35 12-bit, 10 GSPS Digitizer



Key Features

- 1 or 2 input channels
- 10 or 5 GSPS sampling rate per channel with 12 bits resolution
- Open FPGA for custom real-time signal processing
- Available in PCIe form factor
- General Purpose Input/Output (GPIO)
- 14 Gbyte/s peer-to-peer streaming to CPU and GPU

Example Applications

- Swept-Source Optical Coherence Tomography (SS-OCT)
- Time-of-flight mass spectrometry
- Distributed Fiber Optical Sensing
- Scanning acoustic microscopy
- LiDAR

ADQ35-PDRX – 12-bit, 5 GSPS Digitizer Optimized for Pulse Detection



Key Features

- 1 input channel
- 5 GSPS sampling rate per channel with 12 bits resolution
- Open FPGA for custom real-time signal processing
- Available in PCIe form factor
- General Purpose Input/Output (GPIO)
- 14 Gbyte/s peer-to-peer streaming to CPU and GPU
- 3 bits dynamic range extension through built-in dual gain channel combination

Example Applications

- Time-of-flight mass spectrometry
- Pulse data systems
- LiDAR

ADQ36 - 12-bit, 5 GSPS Digitizer



Key Features

- 2 or 4 input channels, software-selectable
- 5 or 2.5 GSPS sampling rate per channel with 12 bits resolution
- Large open FPGA for custom real-time signal processing
- Available in PXIe form factor
- 7 Gbyte/s peer-to-peer streaming to GPU

Example Applications

- High energy physics
- Beam position monitor
- LiDAR

Digitizers – continued

ADQ7WB - RF Digitizer

Key Features

- 2 input channels
- 5 GSPS sampling rate per channel with 12 bits resolution
- AC-coupled with 6.5 GHz analog input bandwidth
- Open FPGA for custom real-time signal processing
- Available in PCIe and PXle form factors
- General Purpose Input/Output (GPIO)
- 7 Gbyte/s peer-to-peer streaming to GPU

Example Applications

- RF monitoring and recording
- Channel sounding
- Satellite monitoring



ADQ8-8C - 10-bit, 1 GSPS Digitizer

Key Features

- 8 input channels
- 1 GSPS sampling rate per channel with 10 bits resolution
- DC-coupled with 500 MHz analog bandwidth
- Multi-channel synchronization capabilities
- 2.6 Gbyte/s data streaming
- Digital filter for bandwidth control
- Available in PXle and MTCA.4 form factors

Example Applications

- Thomson scattering
- Automated test equipment
- Hydrodynamic FXR



ADQ8-4X - 10-bit, 4 GSPS Digitizer

Key Features

- 2 or 4 input channels, software-selectable
- 4 or 2 GSPS sampling rate per channel with 10 bits resolution
- DC-coupled with 1 GHz analog bandwidth
- Programmable DC-offset
- 2.6 Gbyte/s data streaming
- High-precision clock/trigger with multiple modes and sources
- Available in PXle form factor

Example Applications

- Time-of-flight applications
- Scientific instruments
- Quantum technology



ADQ214-DCLN 14-bit, 400 MSPS Digitizer

Key Features

- 2 input channels
- 400 MSPS sampling rate per channel with 14 bits resolution
- Open FPGA for custom real-time signal processing
- Available in PXle, USB2.0 form factors
- General Purpose Input/Output (GPIO)

Example Applications

- Phase noise measurement
- Signal analysis
- Wireless communication
- Automated test





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