

Voyager™ M4x

USB Protocol Analyzer and Exerciser System



Key Features

- **Capture / Analyze USB 3.2 / USB4 / Thunderbolt™ 3 including PD & SBU traffic** - See end-to-end host, hub, and device operation
- **Integrated analyzer / exerciser** - Multifunction system with options allowing USB 3.2 / USB4 traffic generation
- **USB Type-C & PD analyzer** - Capture Type-C and Power Delivery protocol messages and state changes
- **CATC Trace Analysis Software** - Expand / Collapse transport layer for faster interpretation of USB traffic
- **T.A.P.4™ probing** - Proven analog front-end architecture to provide the truest picture of power-on link training
- **Up to 32GB Recording Memory** - Capture long recording sessions for analysis and problem solving
- **Hide / Show Traffic by HopID** - HopID Filtering makes it easy to focus the analysis on specific paths/functions
- **Detects numerous USB4 Link & Protocol errors** - Critical link and timing errors are detected and labeled
- **External Trigger In / Out** - Use the Voyager to identify any packet and toggle a scope or logic analyzer (via SMA connectors)
- **Cascade Multiple Analyzers** - Synchronize recordings across multiple analyzers including legacy USB 3.x Voyager systems
- **Gbe or USB 3.0 Upload** - Sustained transfer rates of 600Mbps over Gbe provide instant access to captured data

Teledyne LeCroy's legendary Voyager analyzer platform provides the industry's most accurate and reliable capture of USB 3.2, USB4 and Thunderbolt™ 3 protocol for fast debug, analysis and problem solving. The new platform leverages Teledyne LeCroy's cutting-edge T.A.P.4™ probe technology and industry-leading analysis software to create the ultimate, all-in-one test solution for USB.

Unmatched Accuracy

The Voyager M4x features the industry's highest fidelity probe design and provides unmatched reliability when testing devices at the full USB4 Gen3x2 (40Gb/s aggregate) speed or USB 3.2 Gen2x2 (20Gb/s aggregate) speed. Designed to sit inline between host and hub, the M4x will non-intrusively record all USB Type-C signaling including USB 3.2 / USB4 / TBT3 data, side-band and CC (PD) messages. Hot plug any combination of USB4 host and hub and the Voyager system will record the speed negotiation handshake and lock at the specified rate. The Voyager is fully compatible with both active and passive cable environments. The built-in triggering provides unprecedented flexibility with every header field configurable as a trigger event. The 32GB buffer allows extended recording sessions.

Analysis Software

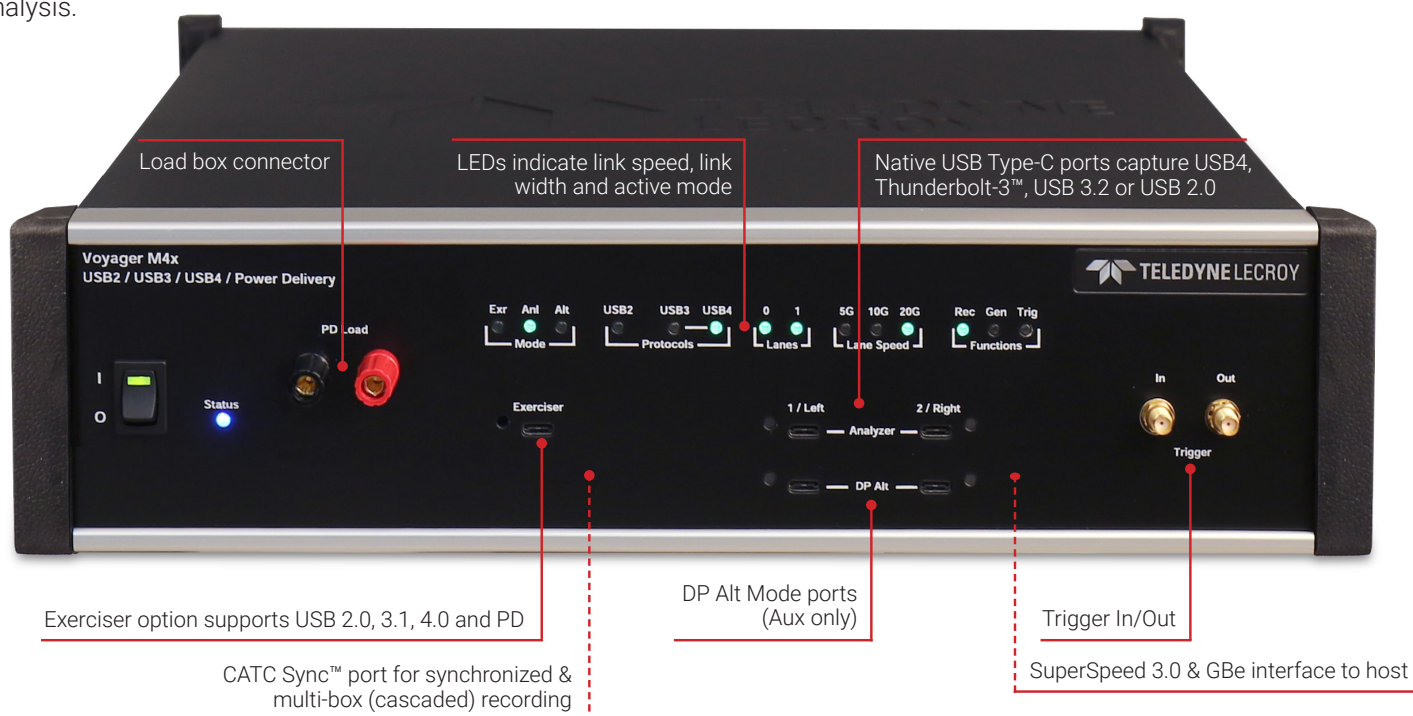
The Voyager utilizes the legendary CATC Trace - the industry's de facto standard display and shows all packets labeled and interleaved in a single view. Traffic from the logical USB 3.2 / USB4 and side-band channels can be individually filtered, searched or exported from the trace. The Transfer level can be expanded and collapsed to show the logical layer including all ordered sets and control packets. While in line, the analyzer will record and display all register reads and writes to provide an unambiguous picture of the router and path configuration space. The HopID window allows precise hiding of traffic based on Hopid and Protocol Defined Function (PDF). Isolating traffic on specific paths provides a coherent picture of the full configuration sequence for each PCIe, USB or DP adapter within the network.

Triggering and Filtering

The Voyager provides hardware triggering to pinpoint protocol events of interest. Trigger events can be specified at the lowest levels including bus states, ordered sets, VBUS & CC voltages, PD messages, protocol errors or header fields including address or packet types. For USB4 Tunneled traffic, trigger on any data pattern within the first 5 DWORDS of a frame.

Flexible Hardware

The front-end of the Voyager analyzer features USB4 rated connectors that support the full 40Gb/s data rate for loss-less capture of traffic from all active links simultaneously. The Voyager M4x platform is available with up to 32GB of recording memory plus USB 3.0 and Gigabit Ethernet links for uploading recorded traffic to the host PC. Field upgradeable firmware ensures future support for new features or changes to the USB specification. Economical USB 3.2 configurations are available today that support bonded USB traffic (20 Gb/s aggregate) over Type-C while allowing future upgrade to USB4 analysis.



Exerciser Option

The exerciser option adds a flexible traffic generation capability for USB4, Thunderbolt 3, and USB 3.2 to the Voyager M4x platform. It allows users to transmit custom packets over standard USB Type-C cables with low-level control of headers, payloads, timing, and link states. Seamlessly integrated with the protocol analyzer, the M4x system can emulate host or device router operations while recording the real response from the DUT. Leveraging the same proven architecture developed for SuperSpeed USB, the M4x exerciser adds Gen3x2 and Gen2x2 support allowing users to perform initial power-on, functional and compliance testing for next generation USB4 & USB 3.2 chipsets.

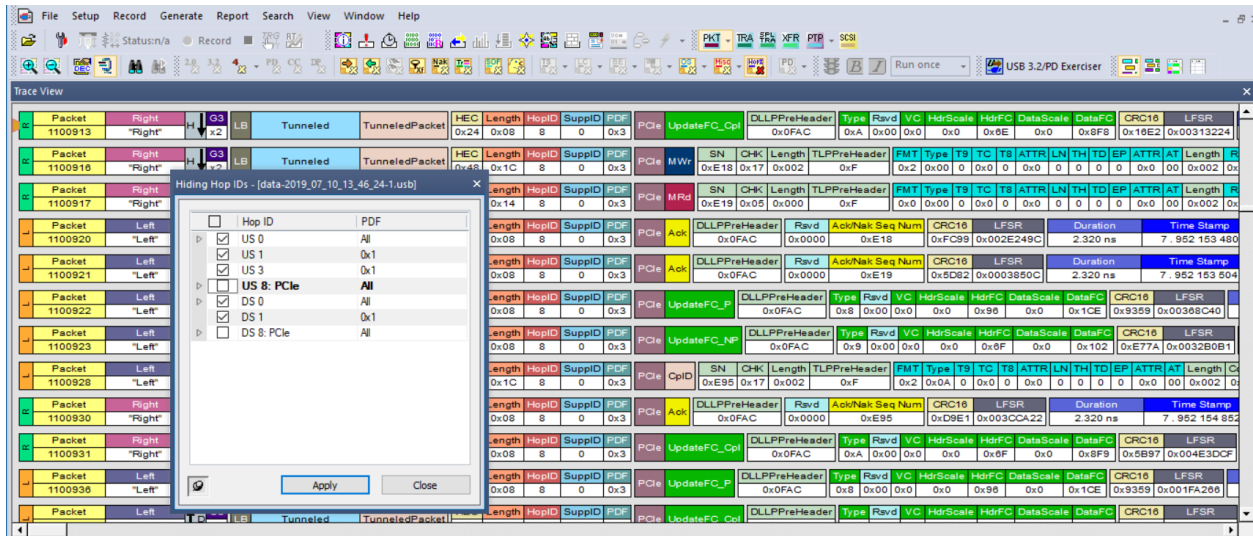
The screenshot shows the Voyager M4x software interface. The top section displays a list of packets with columns for Packet, Left, Right, Control, InterDomainRequest, Error, Length, HopID, SupplID, and RouteString. Below this, a detailed traffic summary report is shown, including a tree view of the report and a table of metrics.

Type	Left	Right	Total
SCR content error	0	0	0
HEC Error	0	0	0
CRC Error	0	0	0
ECC Error	0	0	0
Data Size is either less 0 dw or greater 60 dw	0	0	0
Adapter Num is invalid	0	0	0
Interdomain CM is invalid	2	0	2
Invalid gap between HS packets	0	0	0
Length and size values don't match	0	0	0
Payload length is invalid	0	0	0
USB4 Transfer: Response without request	0	0	0
USB4 Transfer: Response to request with bad CRC	0	0	0
USB4 Transfer: Incomplete	0	0	0
USB4 Transfer: Notification to request with bad CRC	0	0	0

Traffic summary reports show protocol metrics which are hyperlinked to the actual bus events

Error Detection

The Voyager M4x can detect and flag real USB 3.2, USB4 and PD protocol errors. At the lower layers, training sequences, SCR content and CRC errors are automatically verified and flagged. Configuration Packet Timing is checked along with many of the USB4 logical layer timing requirements. Dozens of checks are reported for PD and USB 3.2 protocol including occupying reserved fields, invalid frame size, and correctable bit-errors.



HopID Filtering makes it easy to focus the analysis on specific paths/functions

Protocol Decoding

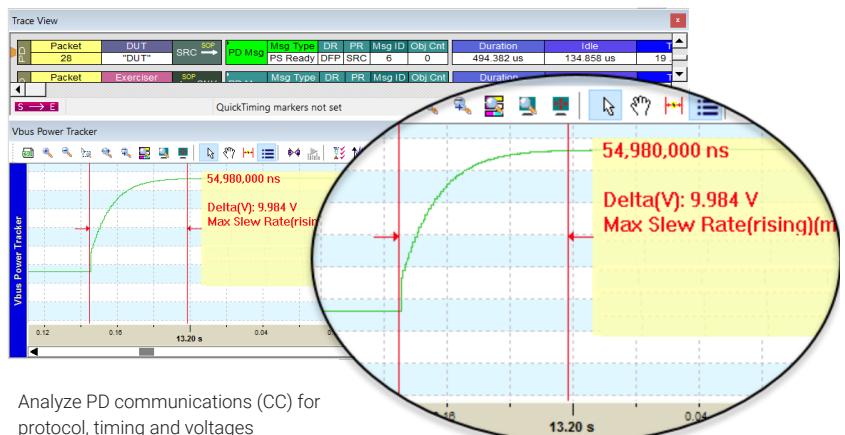
All the logical link sub-states are recorded and displayed including SLOS1/SLOS2, TS1, TS2, and deskew ordered sets. Sideband registers are parsed to automatically assign protocols to HopIDs. Register Read Request / Response transactions are fully decoded. The configuration space viewer populates router, adapter and path entries dynamically to provide an easy to read (32-bit table) view of the adapter configuration process. For DP alt-mode testing, DP Aux commands are captured and decoded. More extensive decoding is available by exporting the tunneled traffic to Teledyne LeCroy PCI Express or DisplayPort analyzer applications.

Find the Issues Fast

The Voyager software provides many mechanisms to measure and report on USB and PD protocol. With the Traffic Summary display, users can evaluate statistical reports at a glance or navigate to individual events. Users may select packets or link commands then jump to each occurrence with a single keystroke. Higher-level events are also tracked and reported at the logical USB4 transport layer.

Measure and Verify VBUS and CC Voltages with Power Tracker

The Voyager M4x Power Tracker option monitors and displays vBus power and current graphically in a time-line format. The voltages are synchronized to trace events allowing users to verify power state transitions at the protocol and electrical layers. Separate power graphs are provided for CC and VCONN making it easy to debug logical Type-C state transitions.



Analyze PD communications (CC) for protocol, timing and voltages

The Voyager system features countless innovations in data analysis to help reduce time-to-market for USB systems and devices. Combined with future enhancements bringing exerciser and compliance testing, the Voyager platform is well suited for low-level USB4 silicon validation as well as system and software level verification.

Specifications	
Protocols Supported	USB4, Thunderbolt 3, USB 3.2, Side-Band signals & CC (PD) messages
Host Hardware Requirements	Intel Pentium 4 or AMD Duron with USB 2.0 interface, 1GB RAM (8GB RAM recommended)
System Requirements	64-bit versions of Microsoft Windows® 11, Windows 10, Windows Server 2016, and Windows Server 2019; 2 GB of RAM; Storage with at least 2 GB of free space for the installation of the software and additional space for recorded data; display with resolution of at least 1024x768 with at least 16-bit color depth; USB 2.0 port and/or 100/1000baseT Ethernet. For optimal performance, please refer to our recommended configuration in the product documentation.
Memory Size	16GB/32GB
Signal Rate Supported	1.2Mb/s – 20Gb/s
Data Bus Interface	Full duplex differential (USB 3.2 / USB4) Side-band channel CC (PD) messages
Front Panel Connectors	Analyzer – one (1) USB 3.2 / USB4 recording channel with left/right Type-C Connectors Exerciser – one (1) USB 3.2 / USB4 generation channel with Type-C Connectors DP Alt-Mode – one (1) DisplayPort over Type-C Auxiliary (Aux) channel & CC messages only
Front Panel Indicators	Platform LEDs: Power, Status Function LEDs : Rec, Gen, Trig Analyzer LEDs: 2.0, 3.0, 4.0 Active Mode LEDs : Exerciser, Analyzer, Alt-mode Lane LEDs : 1 or 2 Lane Speed LEDs : 5G, 10G, 20G
Dimensions (W x H x D)	(W x H x D) 418 x 98 x 375 mm (16.5" x 3.8" x 14.75")
Weight	5.1 Kg (12 lbs.)
Environmental	Operating Temperature: 0°C to 55°C (32°F to 131°F) Non-Operating Temperature: -20°C to 80°C (-4°F to 176°F) Humidity: Operating 10% to 90% RH (non-condensing)
External Trigger IN/OUT	SMA connectors
Warranty	12 Month Hardware Warranty

Ordering Information

Product Description

Voyager M4x USB 4.0 (40Gb/s) Analyzer Exerciser System
 Voyager M4x USB 4.0 (40Gb/s) Analyzer System
 Voyager M4x USB 3.2 (20Gb/s) Analyzer Exerciser System
 Voyager M4x USB 3.2 (20Gb/s) Analyzer System
 Voyager M4x 32GB Memory option (Software License allows 32GB memory upgrade for M4x platform only)
 Voyager M4x Power Tracker option
 Voyager USB4 Gen-3 (40Gb/s) Compliance License
 Medium Zero Carrying Case (for use with Summit T3-8 & Voyager M4x)

Product Code

USB-TZP4-V08-X
 USB-T0P4-V08-X
 USB-TZP3-V08-X
 USB-T0P3-V08-X
 USB-MEM32-V08-A
 USB-AC04-V01-A
 USB-AC40-V06-A
 AC007XXA-X



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