

Voyager M4x™ Protocol Analyzer/Exerciser Quick Start

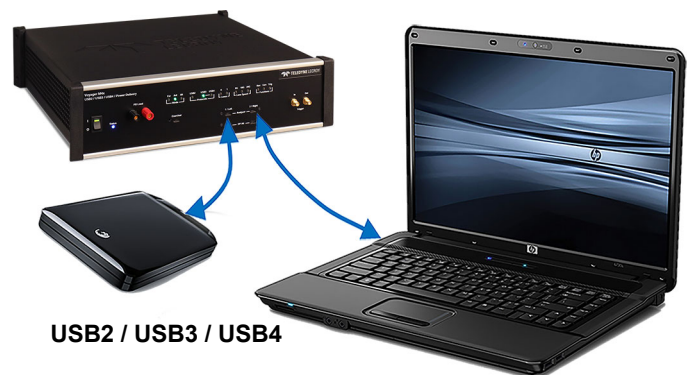


Before Starting

Use this document for quick installation and setup. If you experience problems or need more information, see the **USB Protocol Suite User Manual** at the Teledyne LeCroy website <https://teledynelecroy.com/sw/usb/>

1 Introduction

The Teledyne LeCroy Voyager M4x™ Protocol Analyzer/Exerciser is a multifunction verification system for USB development and testing. It supports USB4 (40Gbps), Thunderbolt™ 3 (40Gbps), as well as USB 2.0, Power Delivery (PD) 2.0 and 3.0 and USB Type-C™ event data over the "C" connector cables. The Power Delivery can capture Provider, Consumer, SOP, SOP' and SOP" traffic. The Voyager M4x is designed to record USB traffic and graphically present the logical transactions and events. The Voyager M4x is connected to a laptop or desktop host machine via its Super Speed USB or Gigabit Ethernet port. The system can monitor traffic between USB 2.0 links using standard high-speed compliant cables.



You must install the software before connecting the analyzer to the host machine for the first time.

2 Components

The basic components included with the Voyager M4x are:

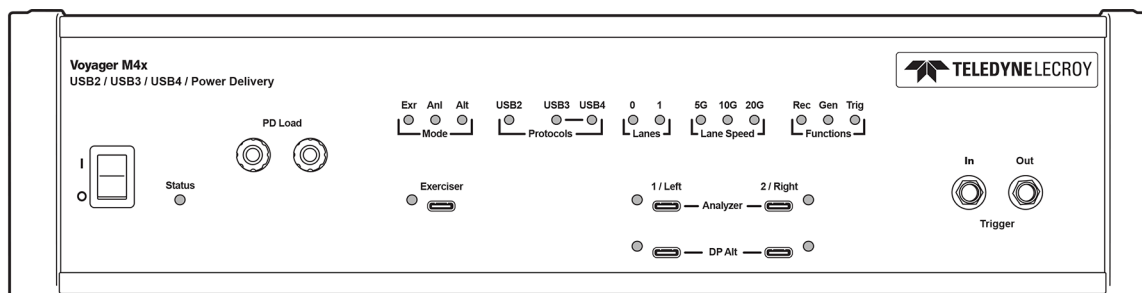
- Voyager M4x Protocol Analyzer/Exerciser System
- AC power cord
- USB cables:
 - **USB4/USB 3.2:** C-C unmarked 40Gbps, C-C eMarked 40Gbps, C-C V_{CONN}-thru 40Gbps

- **USB 3.2:** C-B, C-A, C-A receptacle, A-B
- **USB 2.0:** C-B, C-uB

- Quick Start Guide

Refer to the *USB Protocol Suite User Manual* at the Teledyne LeCroy website <https://teledynelecroy.com/sw/usb/> for component specifications.

3 Description



The indicators and connectors on the front of the analyzer:

Power Switch

(Green if plugged in and on)

Status LEDs

Mode

Exr - Exerciser or Trainer

Anl - Analyzer - USB4, USB 3.x, USB 2, PD, TBT3

Alt - DP Alt - USB 2, PD, Display Port Aux Channel

Protocols

USB2 - Yellow: Low/Full Speed; Green: Hi Speed

USB3 - USB 3.x Capture is enabled

USB4 - USB4/TBT3 Capture is enabled

Lanes - Green if Lane is Active

Lane Speed - Data Speed on Rx/Tx

Functions

Rec - Recording

(Green: Enabled)

Gen - Generator Status

(Green: Enabled)

Trig - Triggered

(Yellow: Triggered)

Exerciser Connector

Connect here if using M4x in Exerciser, Trainer, or Compliance mode (not yet supported)

Analyzer Connectors 1/Left and 2/Right

Use these UNLESS capturing DP Alt Mode traffic

DP Alt Connectors 1/Left and 2/Right

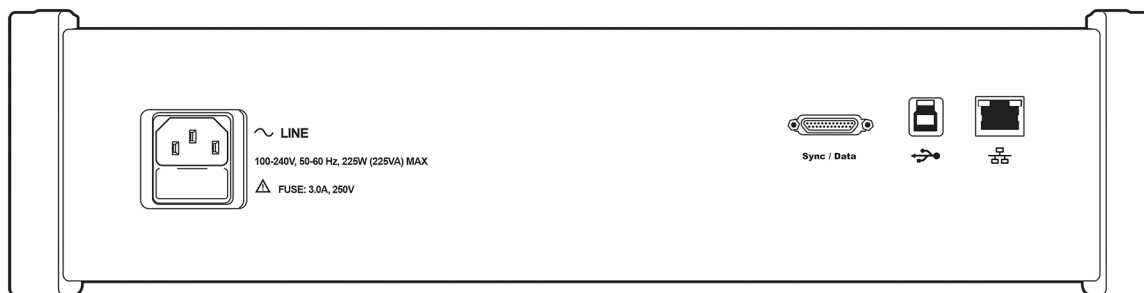
Use these if capturing DP Alt Mode Traffic

Connector LEDs

Red: Plug orientation is incorrect

Green: Plug orientation is correct

Warning: Do not open the Voyager M4x enclosure. No operator serviceable parts are inside. Refer servicing to Teledyne LeCroy customer care.



The analyzer has the following connectors in the rear:

Sync / Data - Used for daisy-chaining and Cross Sync with cable (P/N AC031XXA-X), as well as 8-bit data capture and external Trig In/Out (P/N AC050XXA-X)

ETHERNET - Gigabit Ethernet for connection to host

USB - USB 3.1 Super Speed Standard B Connector to host

AC IN - 100-240V AC power cord

4 Installing the Software

You must install the software before connecting the analyzer to the host machine for the first time.

To install the software, follow these steps:

1. Download the latest software from the website <https://teledynelecroy.com/sw/usb/>.
2. Follow the on-screen instructions.

Note: If you see an error message during installation, consult your system administrator.

Refer to *System Requirements* in the readme file for a list of supported Windows operating systems.

5 Setting Up the Analyzer

To set up the analyzer:

1. Connect the analyzer to a 100-volt to 240-volt, 50-Hz to 60-Hz, power outlet (225W minimum).
2. Connect the USB port on the rear of the Voyager M4x

to a USB port on the host machine using the 1m USB 3.1 cable USB A-B cable.

3. Turn on the power switch. The Voyager M4x initializes itself and performs self-diagnostics. The Status LED turns blue when the M4x is ready to use.

6 Starting the Application

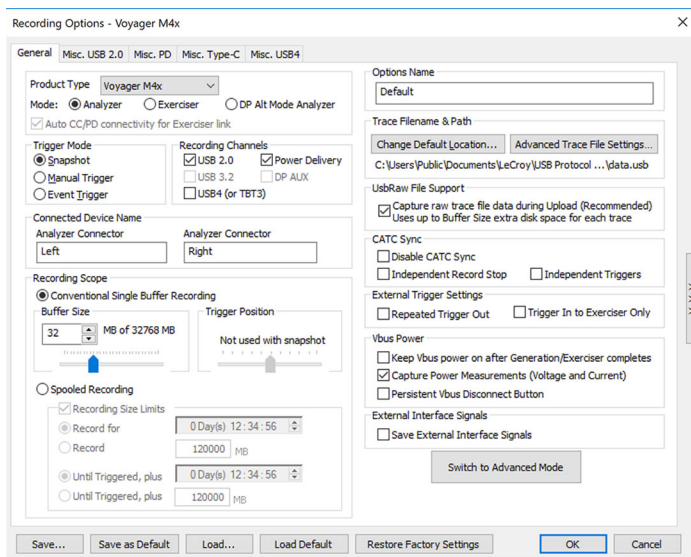
To start the application, launch the Teledyne LeCroy USB Protocol Suite program from the Start Menu.

You can use the software with or without the system connected to the host machine. Without the analyzer, the

7 First USB Recording

After installing and launching the software, you can test the system by performing the following steps:

1. Connect a USB Device Under Test with its cable to Connector 1 (on the left), and a USB Host Under Test with its cable to Connector 2 (on the right). Use the top 2 connectors in all situations except when Display Port Alt Mode is being investigated.
2. Select **Setup > Recording Options**.
3. Select the **General** tab to display the following dialog box showing factory default settings such as Snapshot and 16 MB buffer size. For the first recording, you can leave these settings unchanged.



4. Click **OK** to activate the selected recording options.
5. Turn on the USB devices to be tested and ensure that they are in a mode which generates USB traffic.

6. Click **Record** on the Toolbar.

The system starts to record the USB traffic immediately. After 16 MB of traffic are recorded, the analyzer uploads the data and displays the packets in the trace window.

7. To terminate recording before the snapshot

automatically completes, click  on the Toolbar. When the recording session is finished, the traffic is uploaded from the analyzer to the hard drive on your host machine as a file named **data.usb** or the name

program functions as a trace viewer to view, analyze, and print trace files.

The first time you open the USB Protocol Suite application, confirm proper installation by selecting **About** from the Help menu to view the Software Version, Firmware Version, BusEngine™ Version, and Unit Serial Number.

you assigned as the default filename. While the file is being uploaded, you should see a brown progress bar at the bottom of the screen. When the bar disappears, it indicates that the data has been uploaded to disk.

8. To save a current recording for future reference, select **File > Save As** from the Menu Bar OR

Click  on the Toolbar.

Give the recording a unique name and save it to the appropriate directory.

Trace View Features

After a moment, recording terminates and results display.

- The packet view display makes extensive use of color and graphics to fully document the captured traffic.
- Packets are shown on separate rows, with their individual fields both labeled and color coded.
- Packets are numbered (sequentially, as recorded), time-stamped (with a resolution of 1 ns on USB4 signaling), and highlighted to show the transmitted speed (low-speed, full-speed, high-speed, or superspeed).
- Display formats can be named and saved for later use.
- Data fields can be collapsed to occupy minimal space in the display.

The display software can operate independently of the hardware and functions as a standalone trace viewer that may be freely distributed.

Each row numerates, labels, and color-codes a USB packet

Before Trigger

Packet	Dir	F	Sync	SOF	Frame #	CRC5	EOP	Idle	Time Stamp	
2734	→	S	00000001	0xA5	721	0xD0	250 ns	996.883 μs	00010.2143 3631	
Packet	Dir	F	Sync	SOF	Frame #	CRC5	EOP	Idle	Time Stamp	
2735	→	S	00000001	0xA5	722	0xD0	233 ns	996.900 μs	00010.2151 3619	
Packet	Dir	F	Sync	SOF	Frame #	CRC5	EOP	Idle	Time Stamp	
2736	→	S	00000001	0xA5	723	0xD0	233 ns	350 ns	00010.2159 3607	
Packet	Dir	F	Sync	SETUP	ADDR	ENDP	CRC5	EOP	Idle	Time Stamp
2737	→	S	00000001	0xB4	0	0	0x08	233 ns	183 ns	00010.2159 3802
Packet	Dir	F	Sync	DATA0	8 bytes	0xBB29	233 ns	483 ns	00010.2159 3987	
2738	→	S	00000001	0xC3	3	0	0x08	233 ns	483 ns	00010.2159 3987
Packet	Dir	F	Sync	ACK	EOP	Idle	Time Stamp			
2739	←	S	00000001	0xB4	233 ns	983.200 μs	00010.2159 4510			
Packet	Dir	F	Sync	SOF	Frame #	CRC5	EOP	Idle	Time Stamp	
2743	→	S	00000001	0xA5	724	0xD0	250 ns	333 ns	00010.2167 3596	
Packet	Dir	F	Sync	IN	ADDR	ENDP	CRC5	EOP	Idle	Time Stamp

After Trigger

Time-stamp appended to each packet
Filtered Traffic is displayed as a gray line
Specifies speed packet transmitted
Indicates a marked comment is set

8 Recording Traffic Generation with the Analyzer

Traffic Generation

Systems configured with the Voyager exerciser option can generate USB4/PD traffic and record the real response from the DUT.

Traffic Generation can also transmit known bad packets, providing an opportunity for engineers to observe how a device handles specific adverse conditions. To use this feature, refer to *Traffic Generation* in the USB Protocol Suite User Manual.

To start traffic generation, select Exerciser mode: Mode: ☐ Analyzer ☒ Exerciser

For creating USB4/PD traffic, clear **Auto CC/PD connectivity for exerciser link** in recording options.

☐ Auto CC/PD connectivity for Exerciser link

Start Recording

Click the Record button  Record on the Toolbar or select the **Record > Start** command. You can also select the

USB/PD Exerciser icon  USB/PD Exerciser from the Toolbar to open a generation script file for USB 4 or PD scenarios.

Click the **Run** button **Run** on the Exerciser script editor Toolbar or select **Generation > Run Scenario**.

Save the Trace

After the upload finishes, the software saves the recorded traffic data in the **LeCroyUSB Protocol Suite** directory in a file named **data.usb**. You can change the default directory and file name by clicking the **Change Default Location** button in the Trace Filename & Path section of the General tab.

Power Delivery Trace

A typical power delivery trace is shown below:

PD	Packet 212	SRC	SOP →	PD Msg	Msg Type	Rsvd 1	Spec Rev	PR	Msg ID	Obj Cnt	Rsvd 2	Fixed	Max Cur	Voltage	Dual Role
		Source Cap		0x0	Rev. 1	SRC	0	4	0x0		1.50 A	5.00 V	0		
				Fixed	Max Cur	Voltage	Dual Role	Fixed	Max Cur	Voltage	Dual Role	CRC32			
				3.00 A	5.00 V	0	Fixed	3.00 A	12.00 V	0	Fixed	3.00 A	18.00 V	0	0xCB6672D8

Teledyne LeCroy Customer Support

Online Download

Periodically check the Teledyne LeCroy Protocol Solutions Group web site for software updates and other support related to this product. Software updates are available to users with a current Maintenance Agreement.

Web: teledynelecroy.com/protocolanalyzer/usb

E-mail: psgsupport@teledyne.com

Support: teledynelecroy.com/support/contact

Trademarks and Servicemarks

Teledyne LeCroy, Voyager, USB Protocol Suite, CATC Trace, and BusEngine are trademarks of Teledyne LeCroy Inc.
Microsoft and Windows are registered trademarks of Microsoft Inc.
All other trademarks are property of their respective companies.

Changes

Product specifications are subject to change without notice.

Teledyne LeCroy reserves the right to revise the information in this document without notice or penalty.