

Summit™ M5x Protocol Analyzer / Jammer for PCI Express® 5.0



Key Features

Find errors fast

- One button error check
- Fast upload speed
- Large trace memory
- Powerful triggering/filtering

See and understand the traffic

- Get useful information
- More choices of data views
- More ways to analyze data
- Custom decoding and reports

Data capture

- 100% data capture at 32.0 GT/s

Deep memory buffer

- Up to 128 GB depth

PCIe storage protocols supported

- NVM Express
- NVMe-MI
- SATA Express (ATA/AHCI-PCIe)
- SCSI Express (SOP-PQI)

Virtualization protocols

- SRIOV
- MRIOV
- ATS

Sideband signaling

- SMBus
- CLKREQ#
- WAKE#
- PERST#

Supports CXL

Jammer (Real-Time Error Injector)

BitTracer™

The Summit M5x is Teledyne LeCroy's highest performance PCI Express analyzer, offering both inline probing and direct tapping approaches to protocol capture - the best in overall diversity in probing methods.

Inline operation provides advanced features such as: real-time error injection (jammer) for PCI Express 4.0 specification; support for 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 for up to 16 GT/s; and up to 128GB of trace memory.

Direct tapping operation supports PCIe® 5.0 protocol analysis with speeds up to 32GT/s at up to x8 link widths. The Summit M5x is ideal for high-performance protocol development of add-in boards, switches, servers and workstations, and for customers currently working on PCIe.

Flexible Hardware

The Summit M5x PCIe 5.0 Protocol Analyzer is a high-end analyzer that offers important analysis features for new application development.

While sharing application compatibility with the previous protocol analyzer platforms, the Summit M5x can record traces at speeds of 2.5, 5.0, 8.0, 16.0 and 32.0 GT/s.

The Summit M5x also supports PCIe 4.0 at up to x16 link widths and its memory buffer can be configured up to 128GB, which is advantageous for users requiring long protocol recordings.

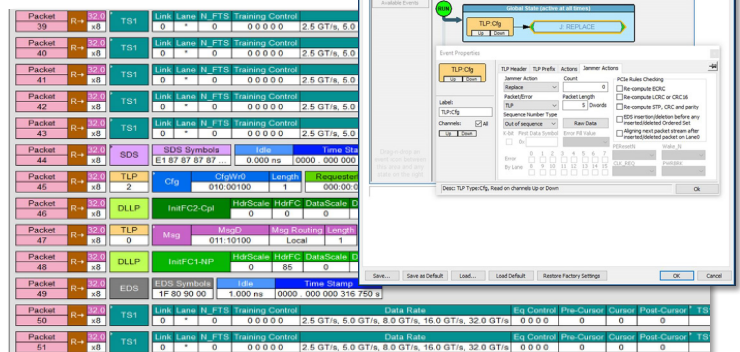
The protocol analyzer can be controlled through USB or remotely through 1000baseT Ethernet. The Summit M5x protocol analyzer can also be synchronized with other highspeed protocol analyzers from Teledyne LeCroy using CrossSync, functionality that enables time

aligned packet traffic as well as cross triggering from multiple high-speed serial busses as may be needed to design, debug and validate across bridges.

The Summit M5x is a fully featured Protocol

Analyzer for CXL (Compute Express Link) Links. Support is provided for CXL.io, CXL.mem and CXL.cache with full decoding from the FLIT layer to the CXL Message layers. The Summit M5x supports triggering, filtering and decoding of links up to 8 lanes and speeds up to 32GT/s.

The Summit M5x platform supports direct tapping capture analysis at speeds up to 32 GT/s and up to x8 link width. PCIe 5.0 CEM Interposers support standard capture and recording method of signal acquisition. These interposers provide monitoring between the Device under Test (DUT) and the host system and are connected through cables from the protocol analyzer to provide high level protocol analysis.



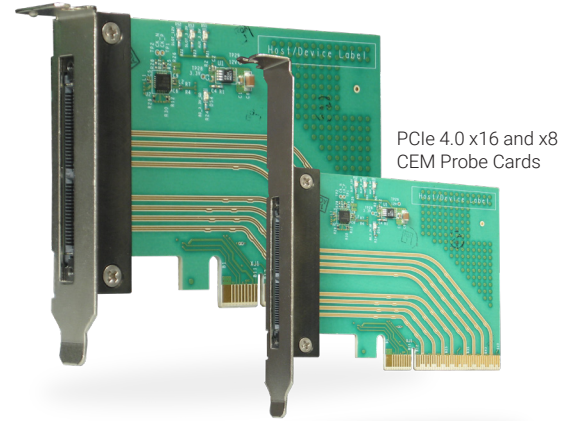
Intuitive software controls for ease-of-use, are available including a hierarchical display, protocol traffic summaries, detailed error reports, timing calculators, bus utilization graphs, and the ability to create user defined test reports allowing developers to troubleshoot intricate problems and finish their projects on time. PCIe storage decodes such as NVMe/ NVMe-MI, SATA Express (AHCI and ATA), SCSI Express (PQI and SOP), Trusted Computing Group (TCG), Precision Time Management (PTM) and virtualization decode such as Single and Multi-Root I/O Virtualization (SRIOV and MRIOV) as well as Address Translation Services (ATS) are available to broaden its capabilities to many different industry segments.

Jammer

The Summit M5x protocol analyzer features the PCIe industry's first PCIe 4.0 jamming test capability. The Summit M5x sits between a root complex and endpoint and can accurately change traffic between the two ends in order to test a variety of traffic scenarios for behavioral results. Unlike previous PCIe jammers, jamming the transmission between the root complex and endpoint is done within normal operation of the PCIe specification instead of breaking the spec with undue latencies and retransmissions. This feature supports jamming NVMe and NVMe-MI protocol as well. The analyzer and jammer combination make this a powerful testing tool for any lab.

Summit M5x introduces a new probing methodology that eliminates the need of a traditional "interposer" type probe to interface with systems under test. This is ideal for server based systems that utilize horizontal insertion. The Summit M5x supports PCIe 4.0 at up to x16 link widths and its memory buffer can be configured up to 128GB, which is advantageous for users requiring long protocol recordings. The protocol analyzer can be controlled through USB or remotely through 1000baseT Ethernet. The Summit M5x protocol analyzer can also be synchronized with other highspeed protocol analyzers from Teledyne LeCroy using CrossSync, functionality that enables time aligned packet traffic as well as cross triggering from multiple high-speed serial busses as may be needed to design, debug and validate across bridges.

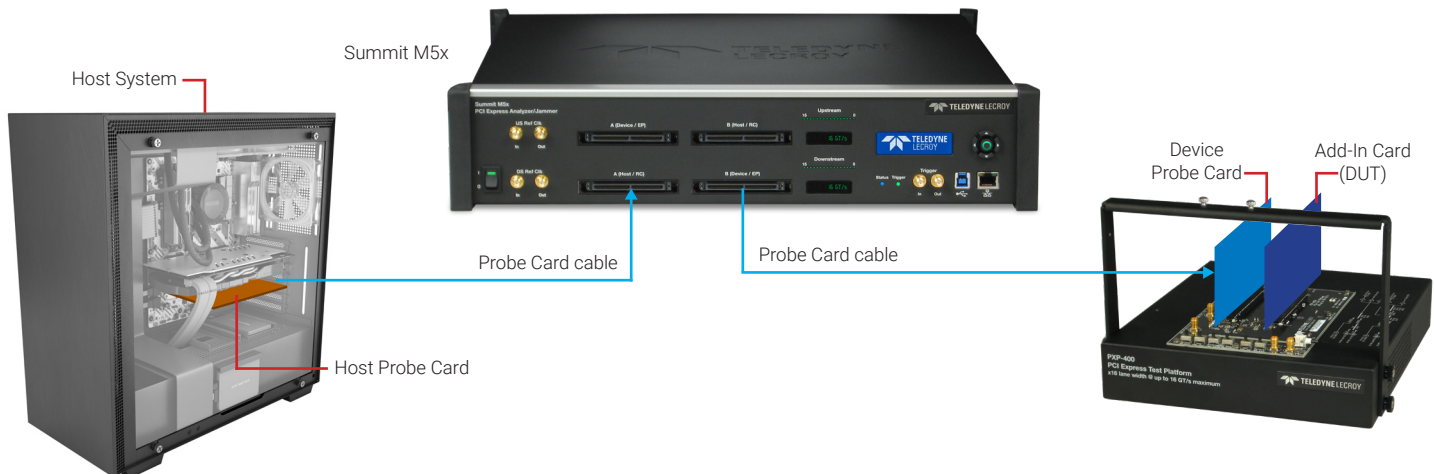
Jamming is easily achieved by using the software interface to create various jamming scenarios such as modify, replace, insert or delete real-time traffic between a PCIe root complex and endpoint. The value of the jammer is a variety of errors can be generated that will help identify potential problems that may corrupt data during transmissions between host and device. In addition, various packages such as RAS Testing are available as software options that can help guide testing through a more standardized way.



PCIe 4.0 x16 and x8 CEM Probe Cards

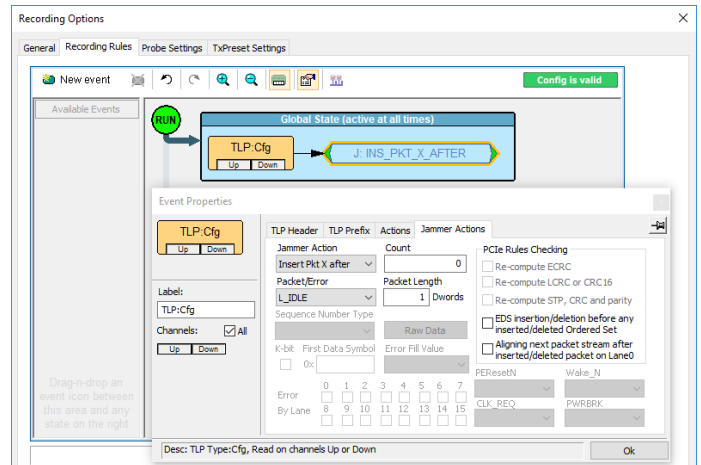
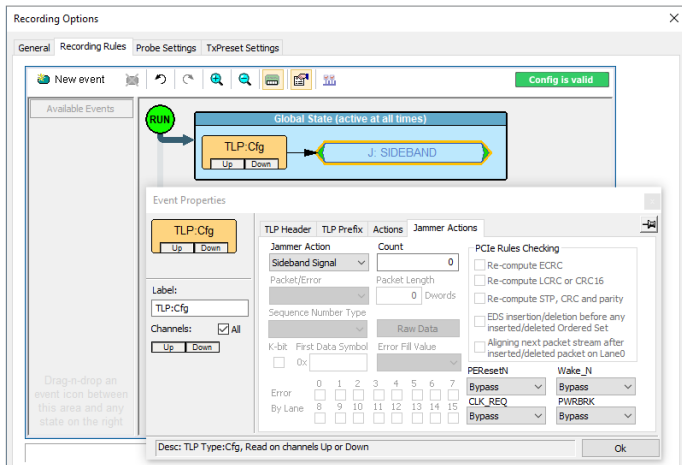


PCIe 4.0 U.2 Host Probe Card



Features of the Summit M5x Jamming Capability

- Delete, replace, modify and insert packets
- Insert Bus errors (modify first Data Symbol; Insert Disparity, symbol and Sync Errors; and change or corrupt sequence numbers, STP, SDP, EDB, End, LCRC and ECRCs)
- Assert or De-assert PERST, CLK_REQ, WAKE and PWRBRK on the PCIe Sideband bus



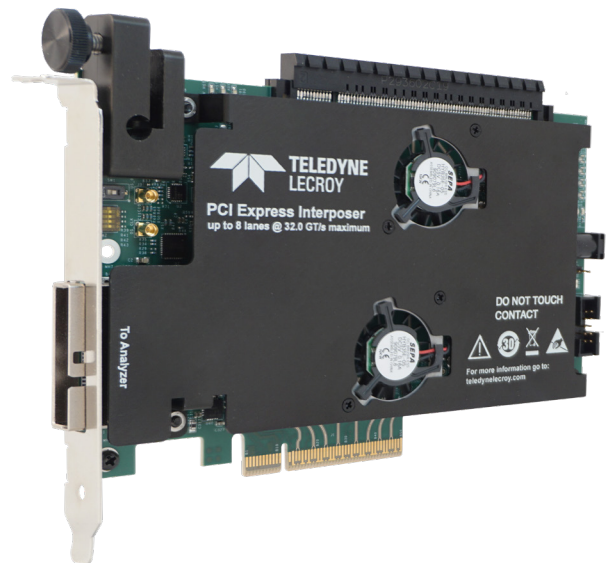
Summit M5x Jammer Actions

PCIe 4.0 "RAS" Error Injection Testing

With its PCIe 4.0 compliant jamming capability, the Summit M5x delivers test functionality sought after by engineers trying to ensure improved system robustness. Moreover, the Summit M5x quickly and easily injects PCIe RAS (Reliability, Accessibility and Serviceability) errors including Correctable, Uncorrectable and Fatal errors between a standard Root Complex and Endpoint in adherence to design specifications to identify potential error handling problems. The RAS testing functionality supports PCIe links up to 16 lanes at 16GT/s and is run using the LinkExpert software to fully automate the testing and validation of system level error handling and reporting mechanisms.

Probing via Direct Tapping

The Summit M5x PCIe 5.0 Protocol Analyzer is a high-end analyzer that offers important analysis features for new application development. While sharing application compatibility with the previous protocol analyzer platforms, the Summit M5x can record traces at speeds of 2.5, 5.0, 8.0, 16.0 and 32.0 GT/s. Capturing is performed by inserting the PCIe 5.0 Interposer into the host system. The Device Under Test (DUT) is then inserted into top of the PCIe 5.0 Interposer. The Interposer taps all PCIe signals transmitted between host and DUT. This probing solution provides accurate data through reliable and complete decodes of Transaction Layer Packets (TLPs), Data Link Layer Packets (DLLPs), and all primitives. Setting up and taking a trace is simple to do without the worry of extra plugin platforms or complex networking issues.



Expert Features

The Summit M5x provides decoding for the high performance NVM Express™ storage protocol. DataCenter monitoring technology such as NVMe™-MI and out-of-band SMBus signaling (decoded and synchronized with PCI Express®) can be analyzed for protocol traffic issues. Want to get down to the byte level and see traffic just before lane alignment? BitTracer™ software option records the bytes exactly as they come across the link, allowing debugging of PHY layer problems and combining the features of a logic analyzer format with a decoded protocol analyzer format. Software options like RAS Testing can speed and standardize testing and troubleshooting.

The Summit M5x utilizes the CATC Trace™, Spreadsheet View, LTSSM State View, Bit Tracer View and other focused views to assist users in analyzing how PCI Express protocol components work together in diagnosing

problems. These various interfaces help find errors fast by using the powerful triggering, filtering and error reporting.

These diverse data views combined with meaningful reports about performance and protocol behavior in real time and post-captured traffic create a powerful and intuitive expert software system, featuring:

- integrated detailed knowledge of the protocol hierarchy and intricacies as defined in the spec
- graphical displays optimized for fast and easy navigation
- alerts to violations detected at all levels of the protocol layers
- easy drill down to areas of interest or collapse and hide fields that are not relevant
- data can be viewed in several ways from logical to chronological, and by events unique to PCI Express

Specifications	
Host Machine Minimum Requirements	64-bit (x64) versions of Windows® 11, Windows 10, Windows Server 2016, and Windows Server 2019. o The latest Service Pack available for the Windows OS in use is required. 4 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 2.0/3.0/3.1 port and/ or 100/1000 Mbps Ethernet network interface. For optimal performance, please refer to our recommended configuration in the product documentation.
Recording Memory Size	Summit M5x Protocol Analyzer: Up to 128 GB
Data Rates Supported	2.5 GT/s, 5.0 GT/s, 8.0 GT/s and 16.0 GT/s; also support 32.0GT/s when using an interposer in PCIe 5.0 mode.
Ports	Summit M5x Protocol Analyzer: Downstream and Upstream reference clock inputs, USB 3.0 Type B connector, Trigger in and out, 1 GB/s ethernet port, Sync in/out port
Display Panel	Summit M5x Protocol Analyzer: 122x32 Pixel Graphic displays plus two 8 character SPEED indication Displays for (2.5 GT/s, 5.0 GT/s, 8.0 GT/s, 16.0 GT/s)
LEDs	Power LED, Status LED, Trigger LED, 32 Activity LEDs (2 per lane for 16 lanes)
Dimensions and Weight	Summit M5x Protocol Analyzer: 432 x 88 x 365 mm (16.99 " x 3.45" x14.35"), 5.4 Kg (12 lb) M5x Slot Probes: 100 x 198 x 170 mm (3.9" x 7.8" x 6.7"), 1.4 Kg (3 lb)
Power Requirements	90 - 264 VAC, 47 - 63 Hz, 650W
Environmental	Temperature (operating): 5° to 40°C (41° to 104°F) Temperature (non-operating): -20° to 60°C (-4° to 140° F) Humidity (operating): 5% to 80% RH (non-condensing) at <=30°C, 50% max RH (non-condensing) at 40°C Humidity (non-operating): 5% to 95% max RH (non-condensing)

Additional Features

- ✓ Protocol Hierarchical Display
- ✓ SMBus
- ✓ Config Spec Viewer
- ✓ Expert Graphical Bus Utilization View
- ✓ Spreadsheet View
- ✓ CXL Decoding
- ✓ TLP Packet Script Decoding
- ✓ Verification Script Engine
- ✓ Queue Utilization
- ✓ PCIe/NVMe Jammer
- ✓ Timing Calculator
- ✓ 1 GB/s Ethernet & USB 3.0
- ✓ NVMe
- ✓ ZeroTime™ Search
- ✓ Trigger/Filter Control
- ✓ Gen-Z Analysis
- ✓ SATA Express
- ✓ Dword View
- ✓ Performance Metrics
- ✓ NVMe-MI
- ✓ LTSSM View
- ✓ Expert Triggering
- ✓ RAS Testing
- ✓ Header Field Viewer
- ✓ Trace Expert

Ordering Information

Product Description

Summit M5x System (licensed as a Gen4 x4, 8GB memory)
G4x4 Summit M5x U.2 Host Probe Card
G4 Device Probe Card (Supports G4x1/x4/x8/x16)
G4x1 Host Probe Card
G4x4 Host Probe Card
G4x8 Host Probe Card
G4x16 Host Probe Card
G5x8 CEM Interposer

Product Code

PE184AAA-X
PE203UIA-X
PE173UIA-X
PE174UIA-X
PE175UIA-X
PE176UIA-X
PE177UIA-X
PE202UIA-X



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