TELEDYNE LECROY
Everywhereyoulook™

Sierra™ T244 & M244
SAS 4.0 Protocol Verification Systems

Key Features

- T.A.P.4™ Linear signal probing technology (T244)
- Auto-speed detection
- Intelligent triggering
- Hardware filtering
- Error detection (including FEC)
- SAS & SATA decoding
- Logical and chronological displays for both DWORD and SPL Packet modes
- Statistical reporting
- External Triggering
- Cascading up to 32 ports
- USB 3.0 and Gigabit Ethernet host interfaces
- Optical, active, and passive copper cable supported
- Dynamic memory allocation
- InFusion (Jammer) Option (M244)
- Host PC Disconnect / Reconnect while still Capturing
- 5V/12V DC power port

The Teledyne LeCroy Sierra T244 & M244 systems provide unmatched analysis and debug capabilities for developers working on next generation storage systems, devices and software.

Designed to address the next evolution of Serial Attached SCSI 4.0, the Sierra T244 is a dedicated protocol analyzer that boasts the highest fidelity probing technology to seamlessly capture 24Gb/s, 12Gb/s, 6Gb/s and 3Gb/s SAS and SATA traffic. The Sierra M244 combines all the analysis features with the InFusion™ option, the industry's most flexible "jammer" for testing performance and error recovery. From the leaders in high-speed serial data analysis, the Sierra platforms leverage years of innovation in protocol test to help developers reduce time-to-market for enterprise storage systems.

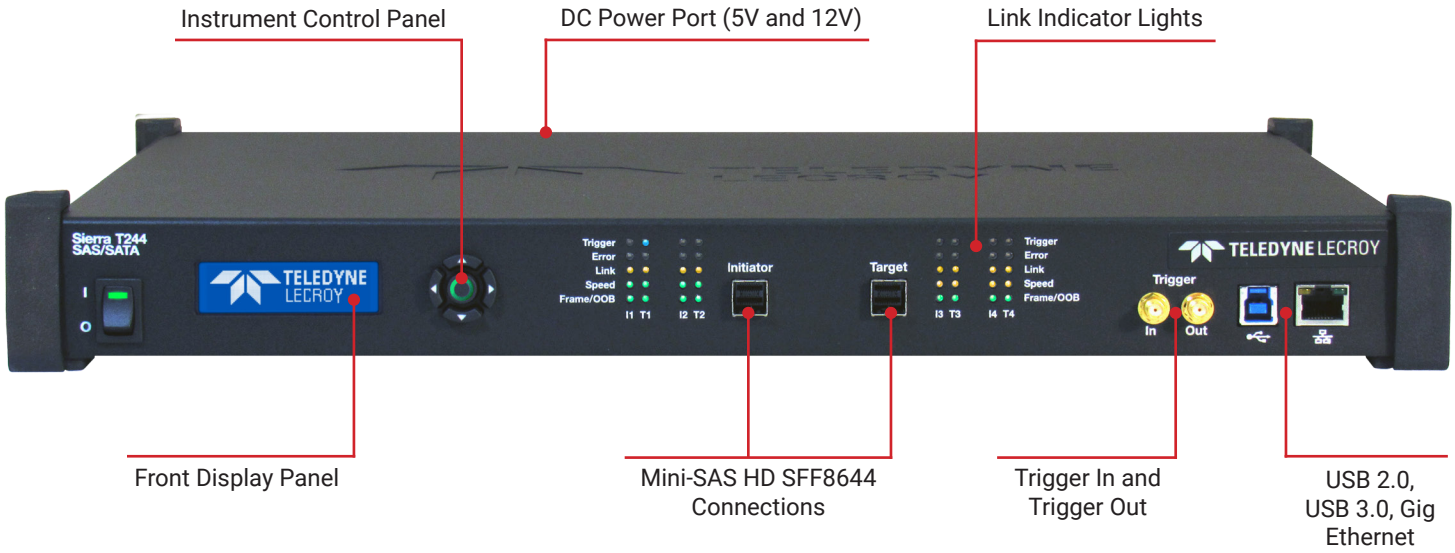
The industry's first protocol analyzers for testing SAS 4.0, the Sierra T244 and M244 are the ideal solutions for early-adopters that require state-of-the-art 24Gb/s capture along with comprehensive support for legacy SAS devices. Mini-SAS HD ports allow easy connection to SAS 12 GB/s as well as future SAS 24Gb/s devices. Flexible capture options support single- and wide-port links. The industry's deepest memory buffer (up to 128GB) is shared across all active ports. Capture up to 32 physical links by simply cascading multiple Sierra units together. The Sierra platforms feature a fully re-programmable protocol processing engine that can adapt to changes in the specification. Both Sierra platforms can be licensed to support SAS 4.0 or, alternatively, licensed with SAS 3.0 which is field-upgradeable to support 24Gb/s when needed. Flexible analysis software can be customized to show lower-level details or higher-level events based on user needs. With roots in the earliest incarnation of SCSI technology, the Sierra platforms are continually evolving to provide unmatched accuracy and scalability for today's storage developer.

SERIAL ATA EXPRESS

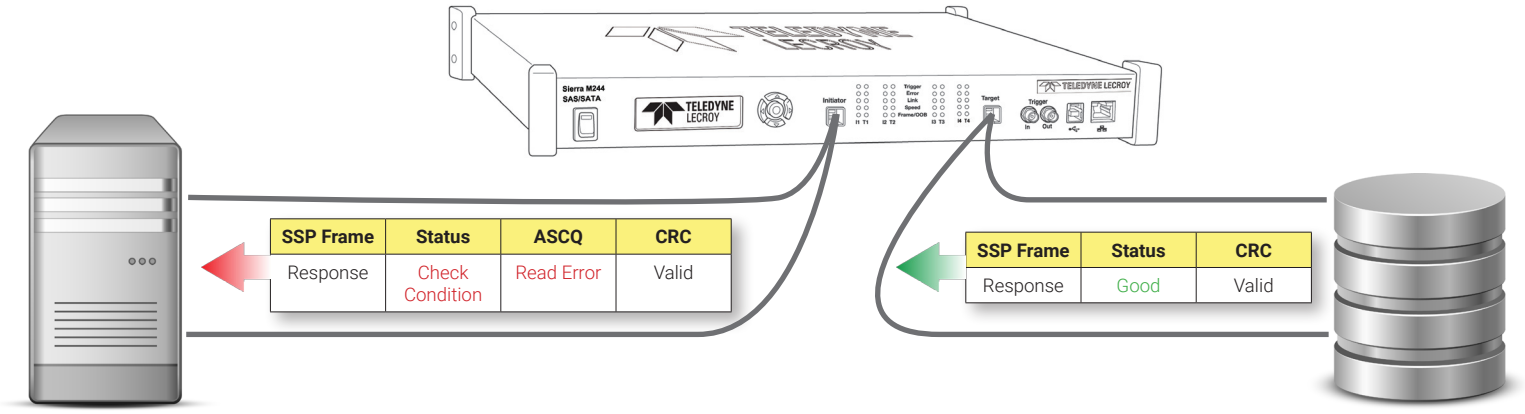
Serial Attached SCSI

Flexible Hardware

The Sierra chassis supports a convenient means for stacking and/or racking multiple units and still provide access to all data bus ports, controls and connectors on the front panel. Host connectivity to the Sierra includes support for both SuperSpeed USB 3.0 and Gigabit Ethernet. Suitable for both bench-top or storage rack environments, a built-in LCD reports which user is currently connected to the Sierra system, the system IP address and status. Channel LEDs provide information on negotiated link speed, protocol error detection, link detection, and whether OOB or data frames are currently on the link. Thoughtfully, the analysis software mimics the key LEDs allowing remote users to see the link status over the network.



Disconnect / Reconnect allows the T244/M244 to be armed then disconnected from the host laptop. The analyzer will transparently wait for the trigger condition and preserve the trace in memory until the user reconnects. The T244/M244 boast the largest memory buffers in the industry (from 32GB to 128GB) to allow long recording times. A built-in port provides DC power for target devices to supply SSDs or HDDs with 12v or 5v power. The rear chassis also provides a sync-port capable of synchronizing trace captures from multiple analyzer units, as well as from other protocols, using CrossSync technology.



Use the Jammer to verify proper error handling by inserting additional DWORDs into a response frame to force a "Check Condition" including additional sense code qualifiers

Sierra T244 Analyzer

The Sierra T244 is a dedicated SAS 4.0 protocol analyzer designed to non-intrusively capture up to four 24 Gb/s SAS logical links providing unmatched visibility to the lowest layers of SAS 4.0 bus traffic. It uses custom probe technology known as T.A.P.4™ (Transparent Acquisition Probing), which has been field-proven in Teledyne LeCroy's 32Gbps Fibre Channel and PCIe 4.0 analyzer platforms. Leveraging this cutting-edge analog front-end, the T244 provides a robust analysis platform well suited for both test chip bring-up, as well as multi-vendor interoperability debug environments. The T.A.P.4 probe design sets the standard for recording accuracy by seamlessly capturing and analyzing power-on handshaking and speed negotiation, including 24 Gbps link training coefficients without distorting the dynamic equalization process.

Sierra M244 Analyzer / Jammer system

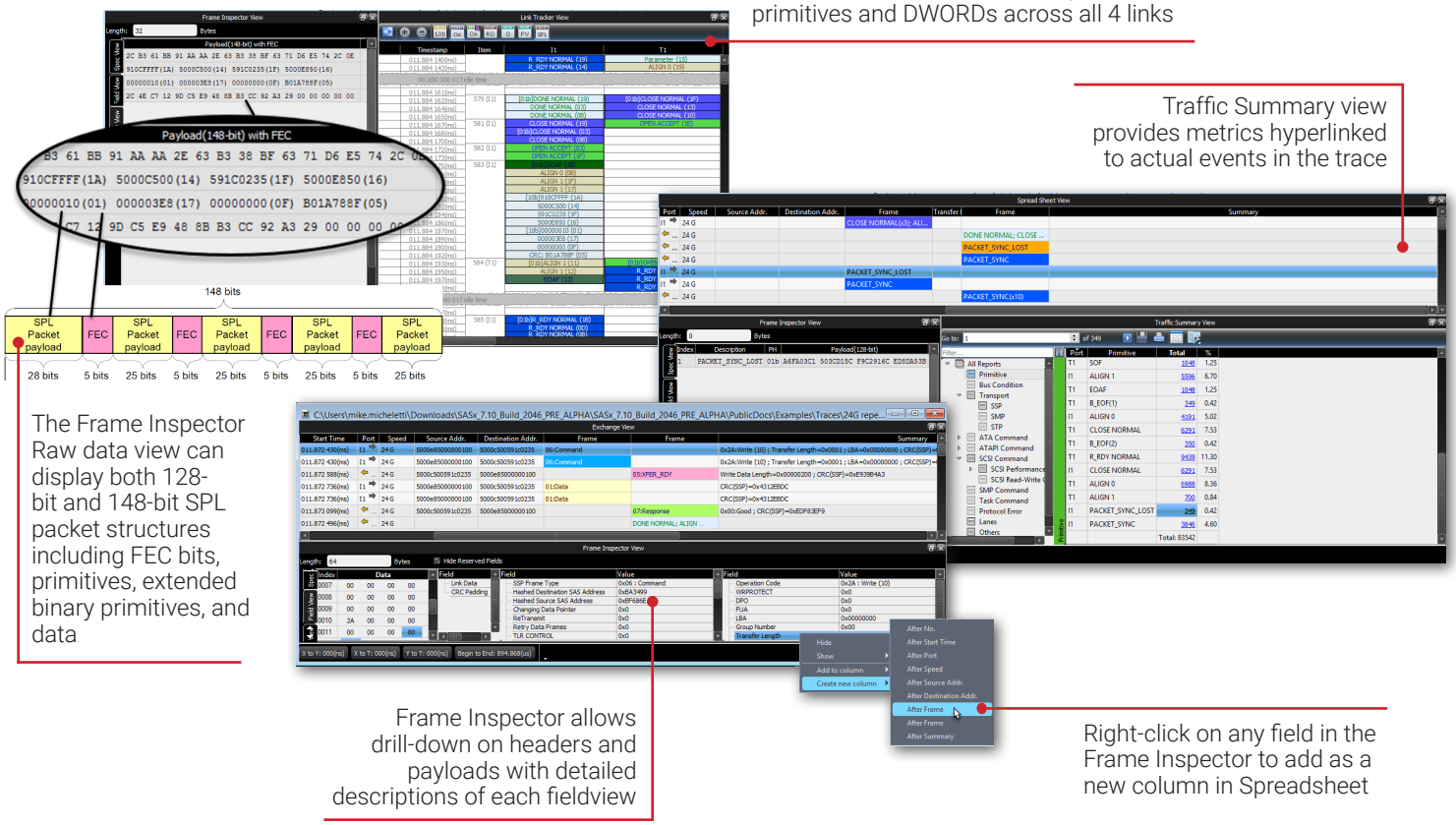
The Sierra M244 offers a full-function analyzer with an integrated jammer option (InFusion) allowing on-the-fly error injection for 24Gb/s SAS, as well as legacy speeds and SATA. The analyzer supports four-wide SAS analysis and provides the same data analysis displays, triggering and search tools as the T244 system. The M244 uses an active repeater front-end allowing it to programmatically alter or corrupt traffic for both SAS 24G and legacy speeds. InFusion is designed to create faulty link conditions while the analyzer records the real response from the system-under-test. The InFusion system goes far beyond simple CRC error injection by making it easy to modify bus states, primitives or specific frames to force PHY, Link or protocol level errors. Essential for firmware and software development, InFusion lets users perform real-world stress testing for enterprise storage applications.

Feature Comparison

	T244	M244
Recording Channels	4 ports	4 ports
Maximum Memory	128GB	128GB
Speeds Supported	3G/6G/12/24G	3G/6G/12/24G
Cascade Analyzers	8	8
Integrated DC Power	•	•
Disconnect / Resume Capture	•	•
12G Model Upgradeable to 24G	•	•
SATA Support	•	•
T.A.P.4™ Front End	•	
Active Front End		•
Jammer Option		•
Optical Cable Support	•	•
Managed Cable Support	•	•

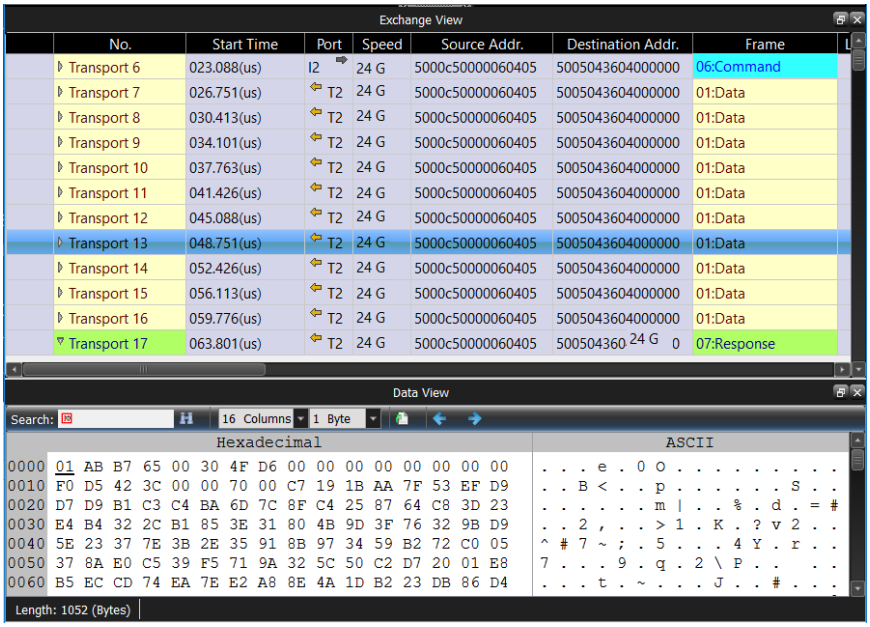
Expert Analysis Software

Seamlessly integrated with Teledyne LeCroy's expert analysis software, the Sierra platform overcomes the struggles of legacy debug tools with a revamped graphical interface featuring easy to understand displays of protocol traffic. For viewing commands and frames in sequential order, the Spreadsheet View provides a traditional table format that can be customized to add any field in a separate column. The Exchange level assembles frames and primitives into the logical SCSI commands, data and status transactions. This is critical for wide-port traces where large gaps can occur between command and status.



Multiple trace views provide superior visibility for troubleshooting low-level problems or higher level application issues. For byte level detail, the Link Tracker shows every SPL Packet across all four physical links in separate columns. Packet mode structures can be shown in scrambled and unscrambled format; with and without FEC patterns. For 8b10b encoded packets, DWORDs can be viewed in 10-bit, 8-bit and scrambled formats. The Frame Inspector can also drill-down on 150-bit SPL packet structures including primitives, extended binary primitives, headers, and payloads.

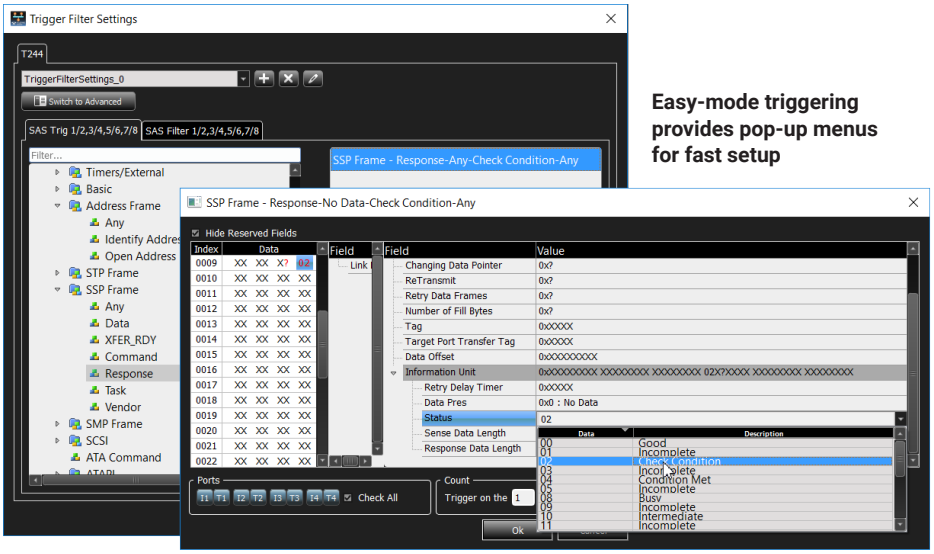
Use the Exchange view to see SCSI and SAS Management transactions fully decoded including Discovery request/ responses, SCSI sense data and ASCQ fields. All of the analysis views can be used simultaneously and are automatically synchronized and displayed within one application. Any combination of display and filtering options can be configured as the default view making it faster to interpret captured traffic. Navigate traces at the logical command level, then easily drill-down to the chronological packet level.



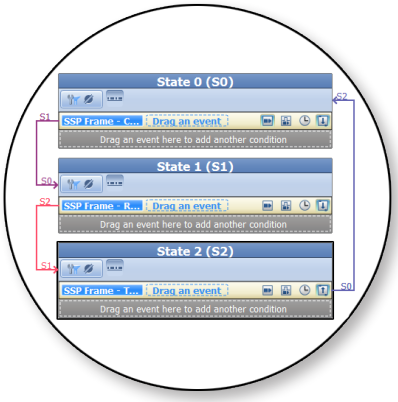
The Exchange view logically assembles transactions and primitives into the logical SCSI commands, data and status transactions

Pinpoint Triggering

The Sierra provides hardware triggering to pinpoint protocol events of interest. Trigger events can be specified at the lowest levels including error conditions, bus states, primitives (SOF, OPEN-REJECT, TRAIN-DONE, etc..), header fields (Tag, LBA, etc…) or payload patterns (CDB, Sense Data, etc…). Users can define sophisticated sequential event trigger scenarios including complex sequences such as timing intervals between events or errors at specific LBAs. The Advanced mode offers 24 sequential states, 4 independent timers, multiple counters, the ability to pre-filter at each state, and the ability to assign individual triggers to each port pair. From speed changes to protocol errors, virtually any logical SAS or SATA event can be defined as the trigger event.



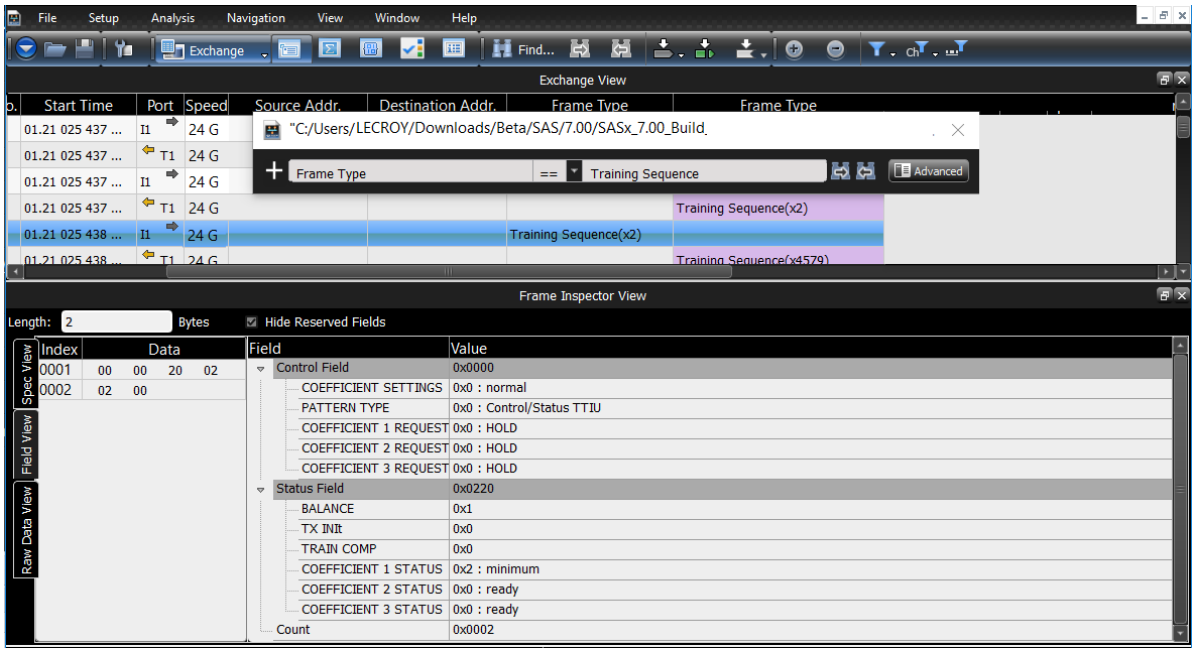
Easy-mode triggering provides pop-up menus for fast setup



Advanced-mode triggering tracks multi-level sequential states with independent filter and trigger events in each state

Fast Search Tools

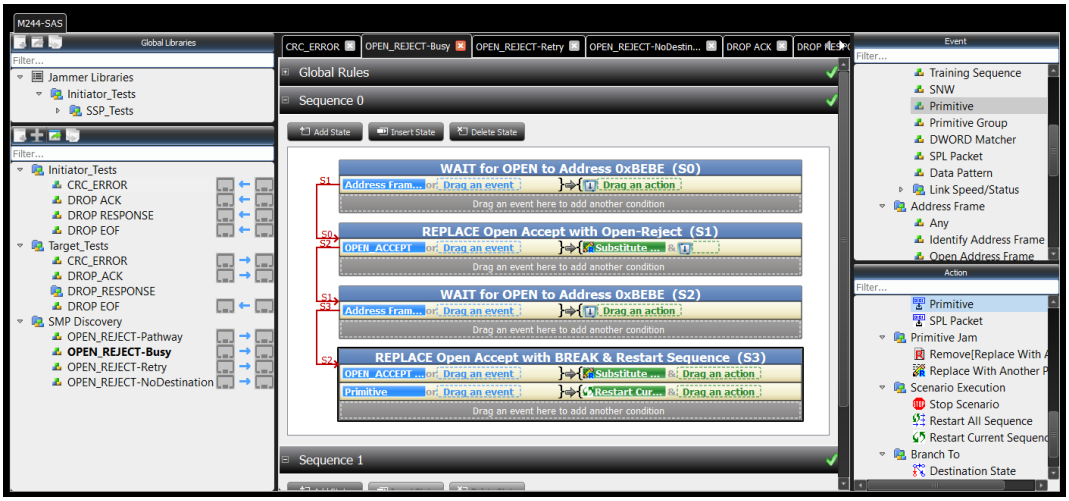
The Sierra SAS verification system provides extensive traffic metrics and statistics to help locate and identify protocol issues. Statistical reports provide hyperlinks to events in trace. Navigation in the spreadsheet view is easy with Quick-Search. Click on any field and navigate forward or backward to the next occurrence. Add Boolean operators to find lower or higher values. Easily search by command, address, tag or status. The Quick Filter uses the same easy mechanism to hide selected fields. Markers can be added, searched and displayed as tooltips.



Quick-Find allows easy search of Training, Link and Transport level fields

Integrated Jammer (InFusion)

Building on the capabilities of the industry's first SAS/SATA error injection system, the InFusion™ option for Sierra M244 can programmatically alter or corrupt traffic for both SAS and SATA protocols. Fully integrated within the SAS4 Protocol Suite, InFusion is designed to create faulty link conditions while the analyzer records the real response from the system under test. The InFusion for SAS 4.0 is the ideal tool for stress testing systems while running real traffic and actual workloads.



InFusion option for M244 provides easy drag-and-drop setup for error injection scenarios

Impair and Analyze up to 4-wide Links Simultaneously

The Sierra InFusion 24G system on the M244 platform can operate on up to four SAS or SATA links simultaneously. The Sierra analyzer can simultaneously monitor traffic in both directions over the same physical links. By default, the analyzer will use two channels to monitor "before" and "after" the error injection.

Powerful Error Injection and Traffic Modification Features

Once the Sierra InFusion system has been added to a SAS or SATA link, it automatically passes the boot up sequence and preserves protocol handshaking between devices. It silently monitors the line while transmitting a faithful copy of the original data stream. The system will wait for a specific time interval or for an event designated by the user before it begins modifying frames or injecting errors. Sierra InFusion can be configured to send a single error, multiple errors, or random errors.

When changing fields within a frame, the Sierra InFusion traffic modifier will preserve the outbound frame structure, including recalculating the FEC and/or CRC if needed. The response transmitted from the device-under-test will pass through the Sierra system, without modification. This allows true end-to-end system testing. The Sierra InFusion software will maintain a log that contains a summary of the exchange.

Versatile and Easy to Use

In just minutes, InFusion's drag-and-drop interface makes it easy to create test scenarios. Any primitive or data pattern can be intercepted and changed to a user defined pattern. From dropping entire packets - to changing any field within a frame, the InFusion system can create data integrity or simple handshaking errors. This allows for unprecedented corner case and protocol level stress testing for enterprise storage applications.

Supported Error Conditions and Actions

Drop Frame	Drop Primitive	Capture DWORD
Drop Link	Replace Primitive	FEC Correctable error
Insert DWORDs	Change DWORDs	FEC Uncorrectable error
Truncate frame	Insert CRC-Error	Alter Speed Negotiation
Insert Running Disparity Error	Insert Symbol Error	Replace Data pattern
Insert Idle	Insert Primitive	Reject Connection
Corrupt Framing	Corrupt Flow Control	Loop scenario
Corrupt SSP, SMP, STP frame contents	Insert Marker	Jump to any state
Force Check Condition	Count Event	Trigger

A Comprehensive Solution for SAS and SATA

Teledyne LeCroy's SAS and SATA solutions provide you with advanced features necessary to ease the development and deployment of SAS and SATA storage systems. With best-in-class features including pooled recording memory, GbE and SuperSpeed USB data upload ports, the Sierra systems make no compromises on advanced capabilities. By combining the functionality and power of the Sierra SAS/SATA Analysis and InFusion Jammer system, users have a complete solution for end-to-end validation of storage subsystems.

Specifications	
Host Machine Minimum Requirements	Microsoft Windows® 10, Windows 8.1 (x86 and x64), Windows Server 2012 (x64), Windows 7 (x86 and x64), Windows Server 2008R2 (x64); 2 GB of RAM; Storage with at least 600 MB 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.
Recording Memory Size	32 GB, 64 GB or 128 GB
No. of Recording Channels	T244/M244 - Up to 4 ports
Data Rates Supported	24 Gb/s, 12 Gb/s 6 Gb/s, 3 Gb/s
Cascadable	Up to 32 ports
Host Interface	USB 2.0, USB 3.0, 10/100/1000baseT Ethernet
Data Bus Connectors	Mini-SAS HD ports
Front Panel Connectors	Mini-SAS HD Initiator (up to 4 ports), Mini-SAS HD Target (up to 4 ports), External Trigger IN/OUT, USB 3.0 & 10/100/1000 Ethernet Host Interface
Front Panel Indicators	5 LEDs (Trigger, Error, Link, Speed, Frame/OOB) for each of 4 Initiators and Targets; Status LCD; Power
Rear Panel Connectors	AC Power in, DC Power out, SYNC Port
Dimensions	Metal Chassis: 392 x 89 x 372 mm; With Bumpers 418 x 98 x 375 mm (16.5” x 14.75” x 3.8”)
Weight	3.6 Kg (8.5 lbs)
Power Requirements	90-254 VAC, 47-63 Hz universal input, 200W maximum

Ordering Information

Product Description	Product Code
Sierra T244/M244 SAS 4.0 (24G) Analysis Systems	
Sierra T244 SAS 4.0 Protocol Analysis Platform, 128GB Memory, 4-Port Bundle	SAS-T024-1284-B
Sierra T244 SAS 4.0 Protocol Analysis Platform, 64GB Memory, 4-Port Bundle	SAS-T024-644-B
Sierra T244 SAS 4.0 Protocol Analysis Platform, 32GB Memory, 4-Port Bundle	SAS-T024-324-B
Sierra M244 SAS 4.0 (24G) Protocol Analysis Platform, 128GB Memory, 4-Port Bundle	SAS-M024-1284-B
Sierra M244 SAS 4.0 (24G) Protocol Analysis Platform, 64GB Memory, 4-Port Bundle	SAS-M024-644-B
Sierra M244 SAS 4.0 (24G) Protocol Analysis Platform, 32GB Memory, 4-Port Bundle	SAS-M024-324-B
Sierra T244/M244 SAS 3.0 (12G) Analysis Systems	
Sierra T244 SAS 3.0 (12G) Protocol Analysis, 128GB Memory, 4-Port Bundle	SAS-T2412-1284-B
Sierra T244 SAS 3.0 (12G) Protocol Analysis, 64GB Memory, 4-Port Bundle	SAS-T2412-644-B
Sierra T244 SAS 3.0 (12G) Protocol Analysis, 32GB Memory, 4-Port Bundle	SAS-T2412-324-B
Sierra M244 SAS 3.0 (12G) Protocol Analysis, 128GB Memory, 4-Port Bundle	SAS-M2412-1284-B
Sierra M244 SAS 3.0 (12G) Protocol Analysis, 64GB Memory, 4-Port Bundle	SAS-M2412-644-B
Sierra M244 SAS 3.0 (12G) Protocol Analysis, 32GB Memory, 4-Port Bundle	SAS-M2412-324-B
Sierra M244 SAS 4.0 (24G) Jammer Options	
Sierra M244 or Sierra M242 SAS InFusion (Jammer option for 6G, 12G & 24G) - License for 1 port	SAS-J024-001-A
Sierra M244 or Sierra M242 SAS InFusion (Jammer option for 6G, 12G & 24G) - License for 2 ports	SAS-J024-002-A
Sierra M244 SAS InFusion (Jammer option for 6G, 12G & 24G)- License for 4 ports	SAS-J024-004-A
Sierra M244 SAS 3.0 (12G) Jammer Options	
Sierra M122 / M124 and M242 / M244 Sierra SAS InFusion (Jammer option for 6G/12G) - License for 1 port	SAS-J012-001-A
Sierra M122 / M124 and M242 / M244 Sierra SAS InFusion (Jammer option for 6G/12G) - License for 2 ports	SAS-J012-002-A
Sierra M124 and M244 Sierra SAS InFusion (Jammer option for 6G/12G) - License for 4 ports	SAS-J012-004-A
Sierra M244/T244 SAS 4.0 Upgrade Option	
Upgrade from 12G to 24G for Sierra T244/M244 Protocol Analyzer; (Upgrade 12G to also operate at 24G)	SAS-UPT1224-X

Local sales offices are located throughout the world.
Visit our website to find the most convenient location.

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