

Sierra™ SAS/SATA 6G/12G Protocol Test Systems



**Complete Protocol Test
in a Single Package!**

CAPTURE, DISPLAY AND ANALYSIS OF BOTH SAS AND SATA

Key Features

- SAS & SATA Analysis at Data Rates to 12G
- Fully-integrated, Multifunctional System
 - ✓ Analyzer
 - ✓ Traffic Generator
 - ✓ Jammer
 - ✓ Compliance Test
- Fast Lock Time
- Intelligent Triggering
- Hardware Filtering
- Raw Bit Recording
- Error Detection
- Transparent Post-Processing
- Memory Segmentation
- SAS & SATA Decoding
- Logical and Chronological Traffic Displays
- Statistical Reporting
- Power Monitoring Option
- Cascade up to 32 Ports
- External Triggering
- Trace Memory up to 64 GB
- Real-Time Performance Monitoring
- GbE/USB 3.0 Host Interface

The Sierra Protocol Test Systems are the 7th generation of SAS/SATA test platforms from Teledyne LeCroy, the leading manufacturer of protocol test systems for high speed serial interfaces. Designed for the latest generation SAS (12G) and SATA (6G), the Sierra product family sets new standards for performance while incorporating a complete range of features in a standalone multi-function system. Leveraging Teledyne LeCroy's extensive expertise in high-speed interface testing, the Sierra provides the most accurate capture, display and analysis of both SAS and SATA traffic at data rates up to 12 Gb/s. The Sierra M124A product family supports protocol analysis, traffic generation and jammer, all within one system. The M6-2 product family adds 6Gb/s host and/or device emulation. The compact M6-1 is the ultra-portable SAS/SATA 6Gb/s analyzer for tackling single channel traffic analysis tasks. Together the Sierra product family provides comprehensive, end-to-end coverage with features to match every test requirement and budget.

The Industry's Highest Fidelity Probe Technology

The Sierra M124A is the flagship protocol analyzer platform featuring the industry's first linear probe design. Supporting analysis of up to four 12 Gb/s SAS ports, this custom probe technology known as T.A.P.3™ (Transparent Acquisition Probing) has been field proven in Teledyne LeCroy's market-leading Summit PCIe 3.0 analyzer platform. Designed to non-intrusively record SAS 12 Gb/s signaling, T.A.P.3 technology utilizes a custom linear amplifier and line conditioner that passes through signals that are very close in physical behavior to those on the probe's receiver. Transparent to the system under test, this approach provides the most unambiguous view of the dynamic equalization that is part of SAS 12G link training.

The Sierra M6 platforms all utilize native PHYs in their probe design to provide the fastest lock time for

6Gb/s links. The key benefits compared to alternate active probe designs include better capture performance during speed negotiation and power management state changes, plus better fidelity in marginal link environments. With hundreds of installations world-wide the Sierra M124 and M6 product families have shown seamless interoperability and zero functional impact on the system-under-test.

Detailed Protocol Specific Support

The Sierra provides extensive protocol decoding, expert error analysis and context sensitive tool tips when viewing the decoded traffic. This extensive protocol support, combined with multiple traffic views, advanced triggering, and data filtering allows engineers to quickly ramp up their SAS and SATA expertise. Every engineer becomes a protocol wizard with the support of Sierra's detailed expert analysis.



Flexible and Reliable 12G Test Systems

The Sierra M124A platform is designed for accuracy and flexibility. The M124A system supports four recording channels while the M122 offers two recording channels at a lower entry price. Both systems are available in the full SAS 3.0 configuration (3G / 6G / 12G) or with SAS 2.0 capabilities (3G / 6G only) allowing users to upgrade to 12G support in the future. Featuring Teledyne LeCroy's T.A.P.3 probe design, the Sierra 12G platforms provides unmatched accuracy for SAS and SATA protocol analysis. The Sierra enclosure is easily positioned on the bench top or integrated into a 19" rack. Combining best-in-class hardware capabilities with comprehensive analysis features, the Sierra M124A is the smart choice for SAS/SATA protocol test.

Sierra's intuitive trace displays include both graphical and tabular formats

Source SAS Address	Destination SAS Address	Protocol Type	OpCode / Command	Tag	LBA	Sector Count	Xfer Length	Payload size	Status	Completion Time
All	All	All	All	---	All	All	All	All	All	All
500605B000014024	5000C50000513A31	SSP	Read 10	0xA1	0x1118377		0x8	8192	Good	89.360 000 61 us
500605B000014024	5000C50000513A31	SSP	Write 10	0x1F5	0xc94a47		0x8	8192	Good	3.293 920 04 ms
500605B000014024	5000C50000513A31	SSP	Write 10	0xB3	0x4337aca		0x8	8192	Good	7.123 186 59 ms
500605B000014024	5000C50000513A31	SSP	Read 10	0x1C0	0x2e13895		0x8	8192	Good	7.713 200 12 ms
500605B000014024	5000C50000513A31	SSP	Write 10	0x1C2	0x109d599		0x8	8192	Good	5.996 493 34 ms
500605B000014024	5000C50000513A31	SSP	Write 10	0xB5	0x109d5a1		0x8	8192	Good	4.027 906 89 ms
500605B000014024	50001C107154A216	STP	Write FPDMA Queued	0x0	0x15624933	0x8		4096	Normal Output	78.115 974 43 ms
		STP	Write FPDMA Queued	0x0	0x15624933	0x8		4096	Normal Output	78.115 882 87 ms
500605B000014024	50001C107154A215	STP	Write FPDMA Queued	0x0	0x21384ee1	0x8		4096	Normal Output	7.786 386 97 ms
		STP	Write FPDMA Queued	0x0	0x21384ee1	0x8		4096	Normal Output	7.786 320 21 ms
500605B000014024	50001C107154A215	STP	Write FPDMA Queued	0x0	0x5fe10e2	0x8		4096	Normal Output	20.132 267 00 ms
		STP	Write FPDMA Queued	0x0	0x5fe10e2	0x8		4096	Normal Output	20.132 200 24 ms

Affordable and Portable 6G Test Systems

Available in two different form-factors, the Sierra M6 product family provides a flexible, extensible test platform for 6Gb/s SAS and SATA applications. The M6-2 is a compact two channel test platform that utilizes native PHYs in the analog front end to deliver the industry's fastest lock time. It supports the full range of test and analysis capabilities, including comprehensive protocol analysis, traffic generator, jammer plus host and device emulation, and compliance test for SAS and SATA 6Gb/s devices. The Sierra M6-1 is the world's smallest SAS/SATA bus analyzer offering one 6Gb/s recording channel which can also operate as a standalone jammer. The M6 remains the most widely used, cost-effective system for testing 6Gb/s SAS and SATA protocols.

DEVELOP, TEST, DEBUG AND VALIDATE

Flexible Hardware

The Sierra chassis supports a convenient means for stacking or racking multiple units and still provide access to all data bus ports, controls and connectors on the front panel. Suitable for both bench-top or storage rack environments, the Sierra LCD reports which user is currently connected to the Sierra system, the system IP address and status. LEDs provide information on negotiated link speed, protocol error detection, link detection, and whether OOB or data frames are currently on the link.

Host connectivity to the Sierra includes support for both USB and Gigabit Ethernet. Memory configurations--from 2GB to 64GB--can address long recording times. The convenient expansion port allows the Sierra system to adapt to a user's current and future needs. Using plug-in cards, (located on the rear panel) the expansion slot can add capabilities, such as synchronizing trace files from multiple units. The Power Expansion option provides DC power for target devices. It also offers special support for initiating SATA DevSleep (for DUTs that support it) while graphically tracking power consumption by the device.

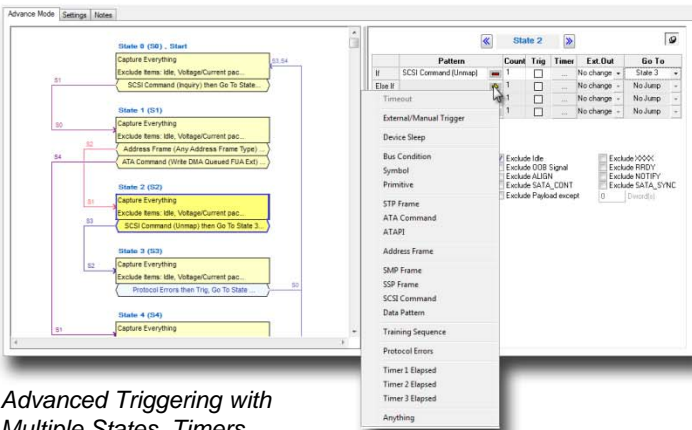
Expert Analysis Software

From the link layer to the application layer, the Sierra analysis suite offers a wide range of traffic views and tools to enable engineers to easily zero-in on areas of interest. For applications at the link layer, the Column view shows the handshaking of primitives and frame composition from SOF to EOF. DWORDS can be viewed in 8b, 10b, and scrambled formats. When working at the frame level, the Text View shows exchanges of frames and accompanying primitives. 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 command level assembles frames and primitives into the logical SCSI operations, data and status transactions. This is critical for wide-port traces where large gaps can occur between command and status. The Frame Inspector decodes both header and payload including the full CDB. All of the views for expert analysis can be used simultaneously and are automatically synchronized and displayed within one application allowing users to view traffic in the most convenient format.

FEATURE COMPARISON	M6-1	M6-2	M122	M124A
ANALYZER	✓	✓	✓	✓
TRAFFIC GENERATOR (Trainer)		✓	✓	✓
JAMMER (InFusion™)	✓	✓	✓	✓
HOST & DEVICE EMULATION		✓		
MAXIMUM MEMORY	8 GB	16 GB	32 GB	64 GB
SPEEDS SUPPORTED	1.5/3/6G	1.5/3/6G	1.5/3/6/12G	1.5/3/6/12G
RECORDING CHANNELS	1	2	2	4
SATA 6G COMPLIANCE OPTION		✓		
SAS 12G VERIFICATION OPTION			✓	✓
CASCADE ANALYZERS	8	8	8	8
EXPANSION PORT		✓	✓	✓
POWER TRACKER OPTION		✓	✓	✓
OPTICAL & MANAGED CABLE SUPPORT				✓

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 (NAK, HOLD, RIP, etc..) and header fields (packet type, LBA, etc...). Users can define sophisticated sequential event trigger scenarios including more complex events such as timing violations between state changes. 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, it's easy to trigger on virtually any logical SAS or SATA event.



Advanced Triggering with Multiple States, Timers & Counters

Automatic Post-Processing

The Sierra analyzer software automatically post-processes captured traffic to identify important events. State changes, primitives, SSP and SMP packets, the statistical reports make it easy to determine what was captured at a glance. Protocol errors are automatically identified and labeled. Performance metrics, including throughput, latency and queue depth are appended to each command. ZeroTime™ search boosts productivity by immediately identifying whether searched items actually occurred in the trace.

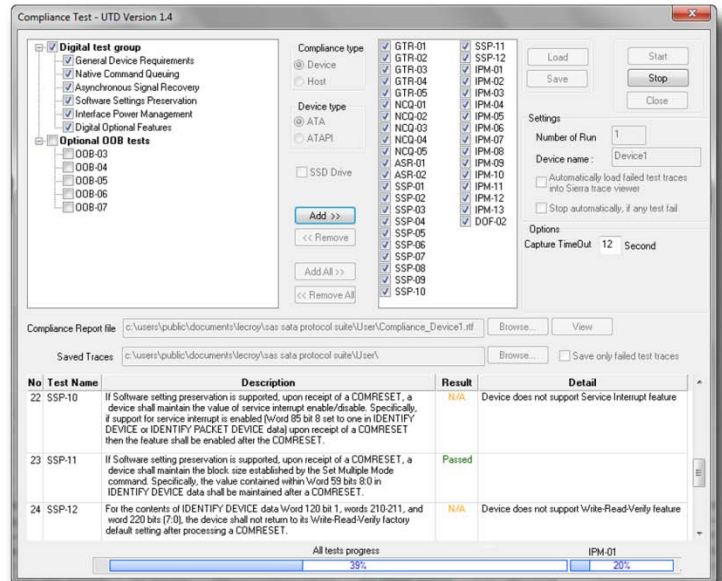
In normal analyzer mode, the Sierra statistical reports generate a wealth of metrics and traffic information. The system also offers a special Performance Analyzer mode,

which displays event metrics over extended periods.

Graphically charting throughput, bus utilization command and frame counts in real-time helps developers identify bottlenecks and latency in the system.

Compliance Test to Ensure Interoperability

The Sierra system is available with a fully automated compliance option for SAS and SATA standards to help ensure interoperability between host and device. The SATA Compliance Suite is offered on the M6 platform and is approved by the SATA-IO for verifying reset, NCQ, power management and other features on SATA devices. For SAS 12G HDD and SSD developers, a complete SAS Verification Test Suite is offered on the M124A platform which was developed in conjunction with the UNH-IOL (University of New Hampshire Interoperability Lab). The M6 and M124A platforms both use scripts to generate specific traffic conditions. Fully automated, the systems capture and analyze actual responses, then generate detailed reports with PASS/FAIL results.



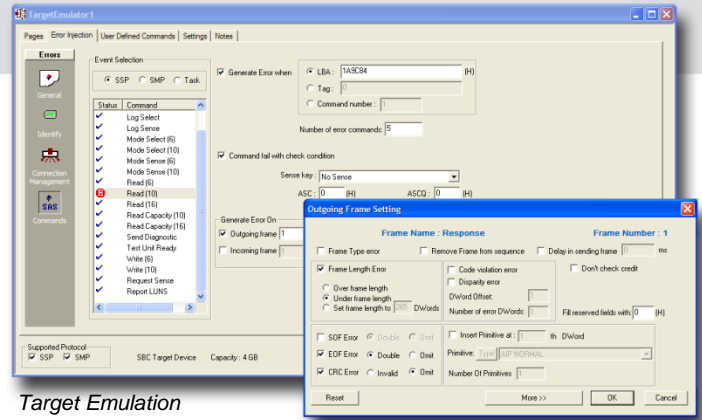
Automated Compliance Test Suite



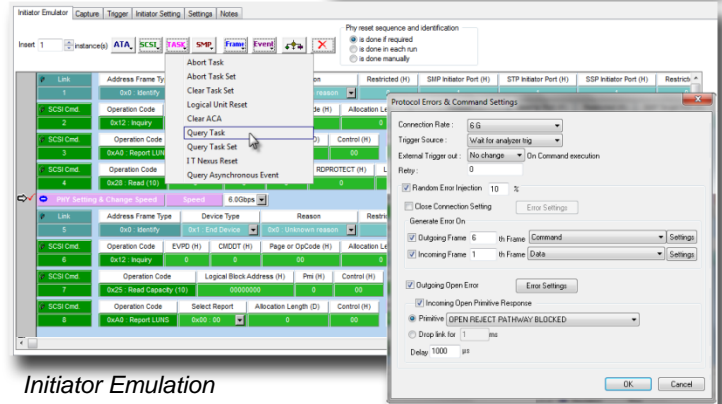
MULTIPLE WAYS TO VIEW YOUR DATA

Host and Device Emulation (M6-2 only)

The host and device emulators mimic real device behaviors which can be customized with menu driven command and response settings. The emulators automatically handle all SAS and SATA link training, flow control and transaction handling to make development of test scenarios fast and easy. Engineers can systematically verify proper command and error-handling for both hosts and devices. The target emulator can import mode page settings from real devices which can be edited to create custom device behaviors. A variety of error conditions can be inserted periodically or intermittently including dropping the link, adding CRC, RD, Delimiter, and frame length errors.



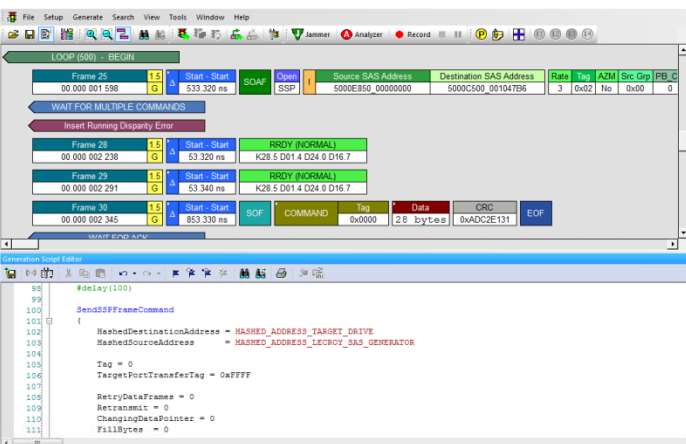
Target Emulation



Initiator Emulation

Flexible Traffic Generation

The Sierra Trainer is a script-based traffic generator that gives engineers the ability to control what is being sent down to the bit level, including flexibility for altering the OOB sequence, SNW timing windows, SMP discovery and virtually any ATA or SCSI command. Using previously recorded SAS or SATA traffic files, it's possible to export either host or device side transmissions to the generator allowing users to programmatically re-create error conditions with the Trainer system. Global settings make script development easy by allowing the Sierra to

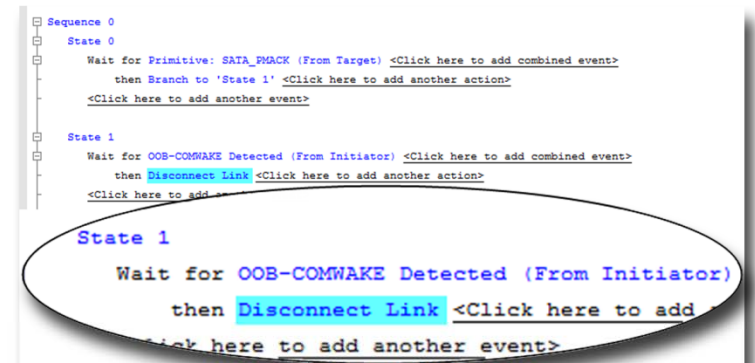


Easily Generate Invalid or Marginal Traffic Conditions with Trainer

automatically handle out-of-band, speed negotiation, SSP open requests, and acknowledgement frames.

Powerful "Jammer" Error Injection

InFusion is the "jammer" option for the Sierra platform which can programmatically alter or corrupt traffic for both SAS and SATA protocols. Fully integrated within the analyzer platform, InFusion is the ideal tool for stress testing systems while running real traffic and actual workloads. 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 hundreds of protocol errors "on-the-fly" to test fault recovery.



Use InFusion to Insert, Drop or Modify Packets on-the-fly

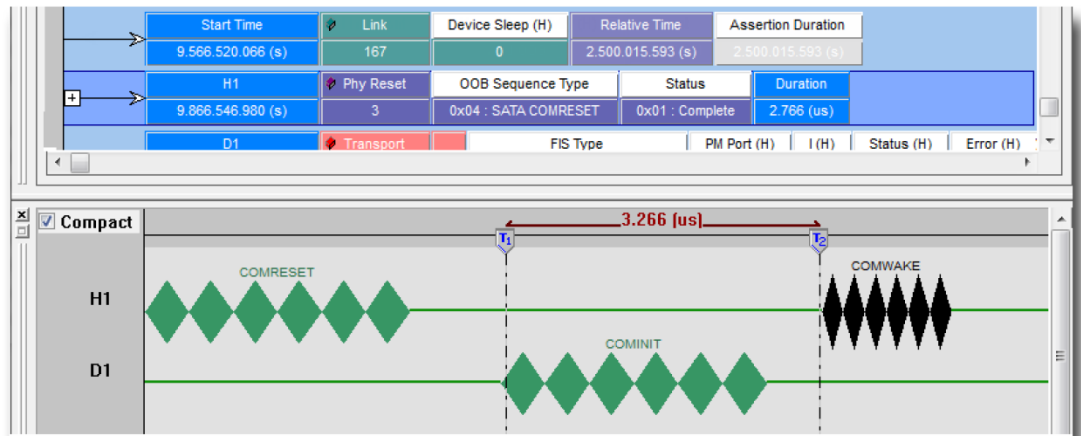
Intelligent Software for Fast Problem Resolution

The Sierra SAS / SATA verification system provides extensive traffic display and analysis capabilities to help locate and identify protocol issues. 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 ability to add capabilities like compliance testing and error injection ensures engineers have all the tools they need to identify problems and complete end-to-end validation testing.

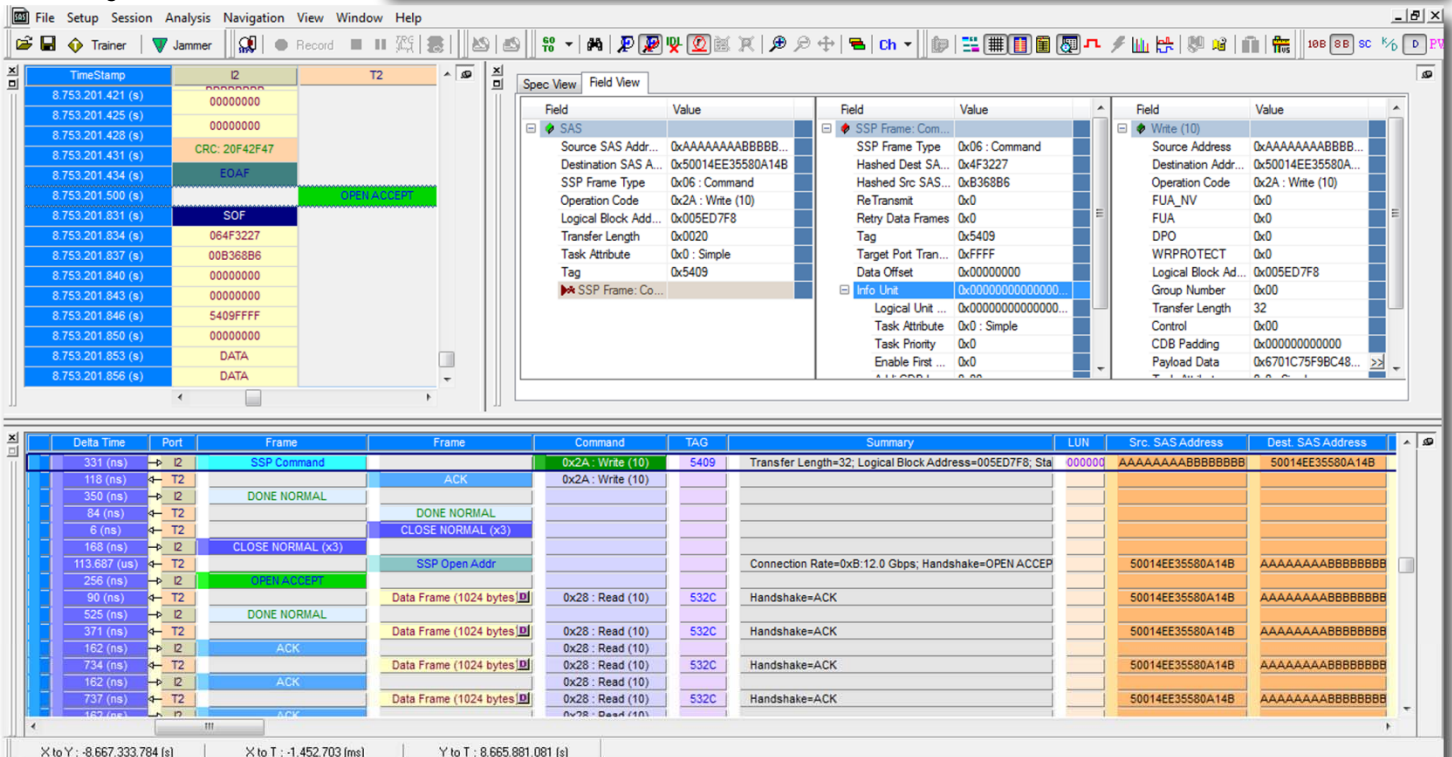


Analyze Dev-Sleep Power Efficiency with Power Tracker

Measure OOB Interval Timing with Waveform View



Simultaneously View Higher and Lower Layers by Combining Views



Specifications

	Sierra M6-1	Sierra M6-2	Sierra M122/M124A
Host Machine Minimum Requirements	Microsoft Windows® 8, Windows Server 2012, Windows 7, Windows Server 2008R2, Windows XP; 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	2 GB, 4 GB or 8 GB	2 GB, 4 GB, 8 GB or 16 GB	8 GB, 16 GB or 32GB (64GB on M124A)
No. of Ports Supported	1 port	2 ports	M122 – 2 ports M124A – 4 ports
Data Rates Supported	6 Gb/s, 3 Gb/s and 1.5 Gb/s	6 Gb/s, 3 Gb/s and 1.5 Gb/s	12 Gb/s, 6 Gb/s, 3 Gb/s and 1.5 Gb/s
Cascadable	Up to 8 ports	Up to 16 ports	M122 – Up to 16 ports M124A – Up to 32 ports
Host Interface	USB 2.0 or 10/100/1000baseT Ethernet	USB 2.0, 10/100/1000baseT Ethernet	USB 2.0, USB 3.0, 10/100/1000baseT Ethernet
Data Bus Interface	Internal SATA ports	Internal SATA ports	Mini-SAS HD ports
Front Panel Connectors	Internal SATA bus connectors (up to one port), External Trigger IN/OUT and Sync ports, USB 2.0 & 10/100/1000 Ethernet Host Interface	Internal SATA bus connectors (up to two ports, each with Host and Device), External Trigger IN/OUT, External Signals Connector, USB 2.0 & 10/100/1000 Ethernet Host Interface	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 1 Host and Device; Status LCD	5 LEDs (Trigger, Error, Link, Speed, Frame/OOB) for each of 2 Hosts and 2 Devices; Status LCD	5 LEDs (Trigger, Error, Link, Speed, Frame/OOB) for each of 4 Initiators and 4 Targets; Status LCD; Power
Rear Panel Connectors	DC Power, Sync Port	AC Power, Expansion Port (Expansion cards are optional)	AC Power, Expansion Port (Expansion cards are optional)
Dimensions	Chassis: 159 x 35 x 229 mm (6.25" x 1.38" x 9.0")	Chassis: 298 x 51 x 305 mm (11.75" x 2.0" x 12.0") With Bumpers: 324 x 62 x 308 mm (12.75" x 2.5" x 12.1")	Chassis: 392 x 89 x 372 mm (15.4" x 3.5" x 14.65") With Bumpers: 418 x 98 x 375 mm (16.5" x 3.8" x 14.75")
Weight	0.77 Kg (1.7 lbs)	2.45 Kg (5.4 lbs)	3.6 Kg (8.5 lbs)
Power Requirements	12V DC (90-254 VAC, 47-63 Hz for supplied AC adapter)	90–254 VAC, 47–63 Hz (universal input), 150 W	90-254 VAC, 47-63 Hz (universal input), 400W max

Ordering Information

Product Description

Sierra Hardware Platforms

Sierra M124A SAS/SATA Platform 64 GB Memory
Sierra M124A SAS/SATA Platform 32 GB Memory
Sierra M124A SAS/SATA Platform 16 GB Memory
Sierra M122 SAS/SATA Platform 32 GB Memory
Sierra M122 SAS/SATA Platform 16 GB Memory
Sierra M6-2 SAS/SATA Platform 16 GB Memory
Sierra M6-2 SAS/SATA Platform 8 GB Memory
Sierra M6-2 SAS/SATA Platform 4 GB Memory
Sierra M6-2 SAS/SATA Platform 2 GB Memory
Sierra M6-1 SAS/SATA Platform 8 GB Memory
Sierra M6-1 SAS/SATA Platform 4 GB Memory
Sierra M6-1 SAS/SATA Platform 2 GB Memory

SAS/SATA Analyzer Software

12G (M122/124) Protocol Analysis Software – 4 ports
12G (M122/124) Protocol Analysis Software – 2 ports
6G (M122/124) Protocol Analysis Software – 4 ports
6G (M122/124) Protocol Analysis Software – 2 ports
6G (M6-2) Protocol Analysis Software – 4 ports
6G (M6-2) Protocol Analysis Software – 2 ports
6G (M6-2) Protocol Analysis Software – 1 port
6G (M6-1) Protocol Analysis Software – 1 port

Product Code

SAS-M012A-644-X
SAS-M012A-324-X
SAS-M012A-164-X
SAS-M012-322-X
SAS-M012-162-X
SAS-M006-162-X
SAS-M006-802-X
SAS-M006-402-X
SAS-M006-002-X
SA1-M006-801-X
SA1-M006-401-X
SA1-M006-201-X

SAS-T012-004-A
SAS-T012-002-A
SAS-T612-004-A
SAS-T612-002-A
SAS-T006-004-A
SAS-T006-002-A
SAS-T006-001-A
SA1-M006-001-A

Product Description

SAS/SATA Trainer Software

12G Trainer Software -- 4 ports
12G Trainer Software -- 2 ports
12G Trainer Software -- 1 port
6G Trainer Software -- 1 port

SAS/SATA Jammer Software

12G InFusion Software – 4 ports
12G InFusion Software – 2 ports
12G InFusion Software – 1 port
6G InFusion Software – 4 ports
6G InFusion Software – 2 ports
6G InFusion Software – 1 port
6G (M6-1) InFusion Software – 1 port

SAS/SATA Emulator Software (6G only)

6G Initiator Emulator Software – 4 ports
6G Initiator Emulator Software – 2 ports
6G Initiator Emulator Software – 1 port
6G Target Emulator Software – 4 ports
6G Target Emulator Software – 2 ports
6G Target Emulator Software – 1 port

Product Code

SAS-ZG12-004-A
SAS-ZG12-002-A
SAS-ZG12-001-A
SAS-ZG06-001-A

SAS-J012-004-A
SAS-J012-002-A
SAS-J012-001-A
SAS-J006-004-A
SAS-J006-002-A
SAS-J006-001-A
SA1-MJ06-001-A

SAS-ZI06-004-A
SAS-ZI06-002-A
SAS-ZI06-001-A
SAS-ZT06-004-A
SAS-ZT06-002-A
SAS-ZT06-001-A



1-800-909-7211
teledynelecroy.com



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