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Keysight
SAS (Serial Attached SCSI) and SATA (Serial ATA) Protocol Analyzers

Data Sheet



U3055A/U3056A Pro II 12G SAS analyzer



U3052C/U3057C Pro SAS/SATA analyzer



U3051C SAS/SATA analyzer



U3053C SAS/SATA jammer

KEYSIGHT TECHNOLOGIES

For today's SAS and SATA developers and integrators, getting to the root of a problem can be especially difficult when there isn't an obvious trigger condition. Troubleshooting is further complicated by increasing storage capacities, data rates, and protocol complexity. Integrators and developers need faster and deeper analyzers to keep up. Traditionally, those needing to capture large amounts of traffic have been faced with limited trace buffers, long waits to view the data, slow searches, and slow saving. SerialTek has overcome the old limitations with the BusXpert Series of SAS/SATA Analyzers. The BusXpert uses advanced technologies such as the industry's first PCI Express x4 uplink to the host (550 MB/s), up to 72 GB of buffer (Pro II), Hardware Accelerated Gigabit Ethernet, pre-indexed and compressed trace data, multiple analysis processors, and instant display of the captured data.

The BusXpert also features easy to use triggering, pre/post-filtering, textual search and sequence search, and many different displays of the captured traffic. It is available in a variety of configurations to fit specific needs for buffer size, port-count, protocols, and budget. The BusXpert breaks free of past analyzer limitations and lets users spend more time on development and debug efforts.

Hardware Innovations

The BusXpert also features a Native PHY, fast data Re-Lock, 2-ns timestamp resolution, Eye-opener front-end, and tunable RX/TX signaling. The Native PHY, along with SerialTek's proprietary re-lock implementation, allows the BusXpert to achieve the industry's fastest PLL lock-time, resulting in extremely accurate capture during speed negotiation, power management, and SSC transmissions. A 2-ns timestamp resolution allows for extra detailed timing information. This is especially useful with SAS wide links and is also helpful in determining if timing violations occurred during capture. This 2-ns timestamp resolution is three times more accurate than found in other competing solutions. The tunable RX/TX and eye-opener front-end allow the BusXpert's signal characteristics to be adjusted on the fly.

Pre-indexing enables fast displaying of, searching for, and hiding of the captured bus activity. Trace-processing works with pre-indexing to allow for quicker display of transactions, decreasing the time needed for searching and allowing saved traces to perform just as fast as traces stored on the BusXpert. Trace formatting enables efficient use of the host system's disk space, allowing more traces to be saved without the extra data found in other trace formats. Compression is used to cut down on the space needed for repetitive SAS and SATA link layer traffic and also to utilize the pipe connection to the host system more effectively.

BusXpert's hardware was designed to deliver trace data at speeds of up to 550 MB/s, capturing up to 72 GB of bus activity and ensuring the data captured is represented as accurately as it appears on the bus. To take advantage of the performance offered by the hardware, BusXpert's software was designed from the ground up to fully utilize the fast pipes and large buffers. Existing methods of dealing with the upload and display of trace data were not efficient enough and led to some key innovations found only in the BusXpert software: Pre-indexing, trace-processing, trace-formatting, and compression.

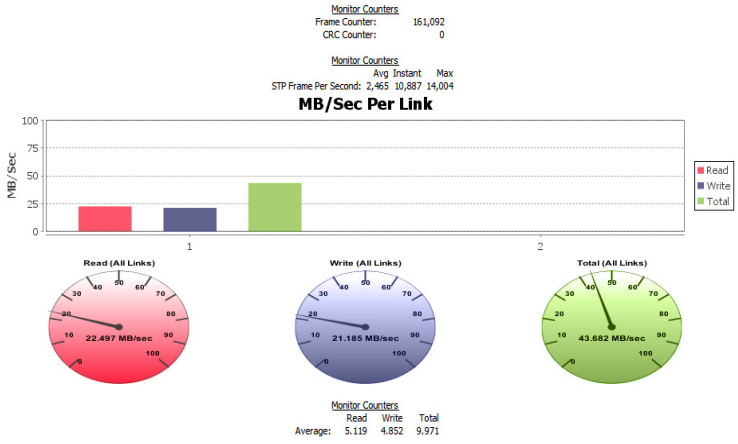
The BusXpert PRO is the only SAS analyzer and SATA analyzer to offer hardware accelerated gigabit ethernet and PCI Express x4 for the host interface. This enables fast uploads of even the largest capture files—it can be configured for up to 72 GB of data capture.

Inventive Software

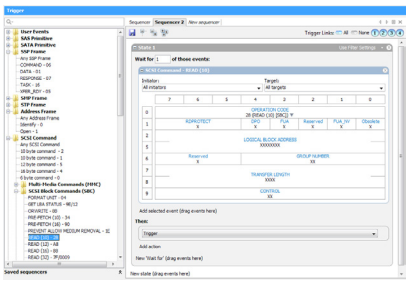
BusXpert has a new and revolutionary Java-based, portable user interface with multiple docking views and easy-to-use portable API for automation. InstaView and PreIndexing innovations allow viewing of any size trace and lets designers truly use the analyzer in under five seconds!

Outstanding features that make SAS/SATA analysis a snap include

- Multiple capture recording:
  Allows the analyzer to re-arm itself after a trigger condition has been met and start a new recording for up to 256 consecutive segments.
- ATAPI support:
  Software fully decodes ATAPI commands.
- Live counters and monitors:
  Allow the user to independently count user-specified events, such as frame errors, and take a trace simultaneously.
- InstaSearch technology:
  Uses the latest in MicroBlaze microprocessor technology to search through large trace buffers in seconds.
- Strong compression:
  Allows the user to maximize buffer space by compressing primitives even when an ALIGN or IDLE are between each occurrence.
- Triggering improvements:
  Users can now specify more than one trigger action in each "Wait for" state.
- Additional command decoding:
  Deeper decodes of popular commands such as Identify Device and Inquiry.
- Overlapped command display:
  In response to customer enhancement requests, users can now monitor the number of commands and responses while a single command is outstanding.
- Live performance monitoring:
  Measure IOPS per second, Read/Write/Total MB/s per each link for comparison.



Inventive Software (continued)

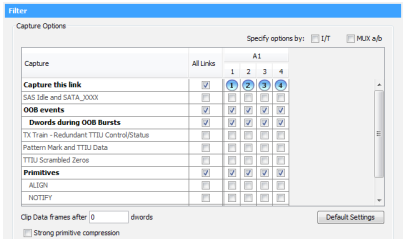


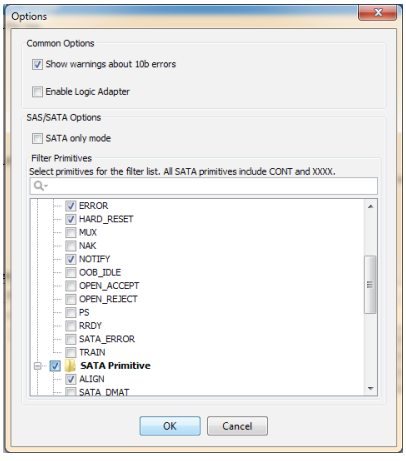
Triggering

BusXpert's triggering interface allows for quick definition of events with frame layouts matching the SAS2 and SATA specifications. Simple and complex triggers can be built with ease. BusXpert's triggering includes:

- Up to 8 sequencers
- Up to 16 states per sequencer
- Up to 32 counters and timers
- Multi-level branching
- User-defined events
- External trigger in/out

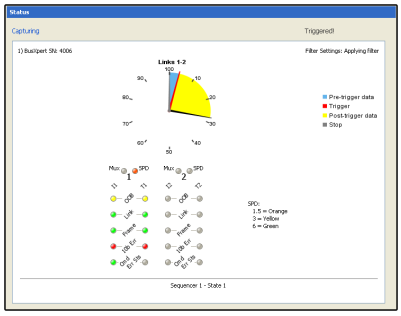
Also featured is the ability to copy and paste frames and primitives from an open trace, saving additional time on defining events. Any of the events created can be saved to the User Events folder for future use.





Pre-filtering

Filtering out specific primitives, frames, data, and addresses is easy. Simply specify which patterns to filter out during a capture to maximize buffer space, resulting in more meaningful data.

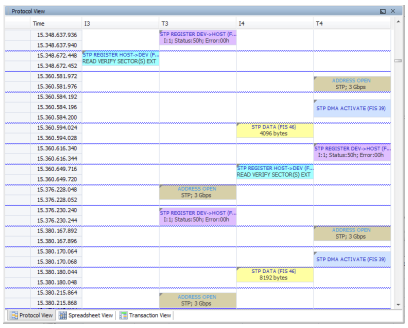


Line status

The Status menu shows a visual representation of what is currently occurring on the bus and also a status of the capture.

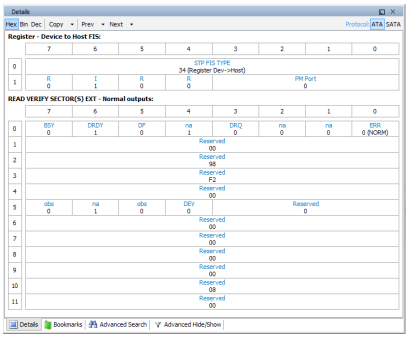
The MUX/Spd/OOB/Link/Frame/10b Err/Cmd/ and Err Sts LEDs match the activity on the front of the BusXpert. Status lights such as Frame, Cmd, Link, and OOB are useful in determining what is happening on the bus at any given time, while the error lights, such as 10b Err and Err Sts, let the user know that signal errors and command errors are occurring.

Inventive Software (continued)



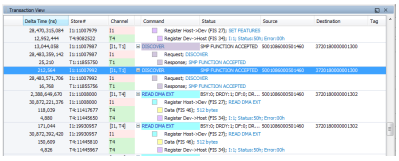
Protocol view

Shows the precise timing relationship of each DWORD in the trace. This is useful for tracking the handshaking between products under test.



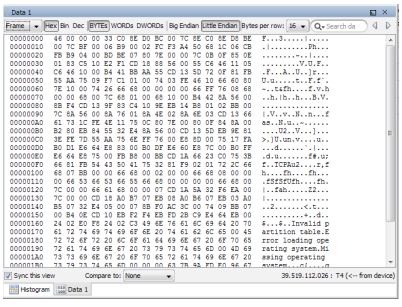
Frame details

Shows each frame in the format used by the SAS or SATA specification. This is useful for checking frame contents and correlating against expected values.



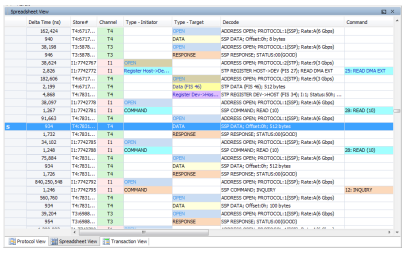
Transaction view

Shows each command in the order it was initiated. Commands may be expanded to show the frames associated with them or collapsed so that only a summary of the command is shown.



Data view

Shows the payload of a selected SAS or SATA Data Frame in several different formats.



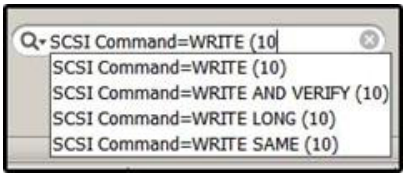
Spreadsheet view

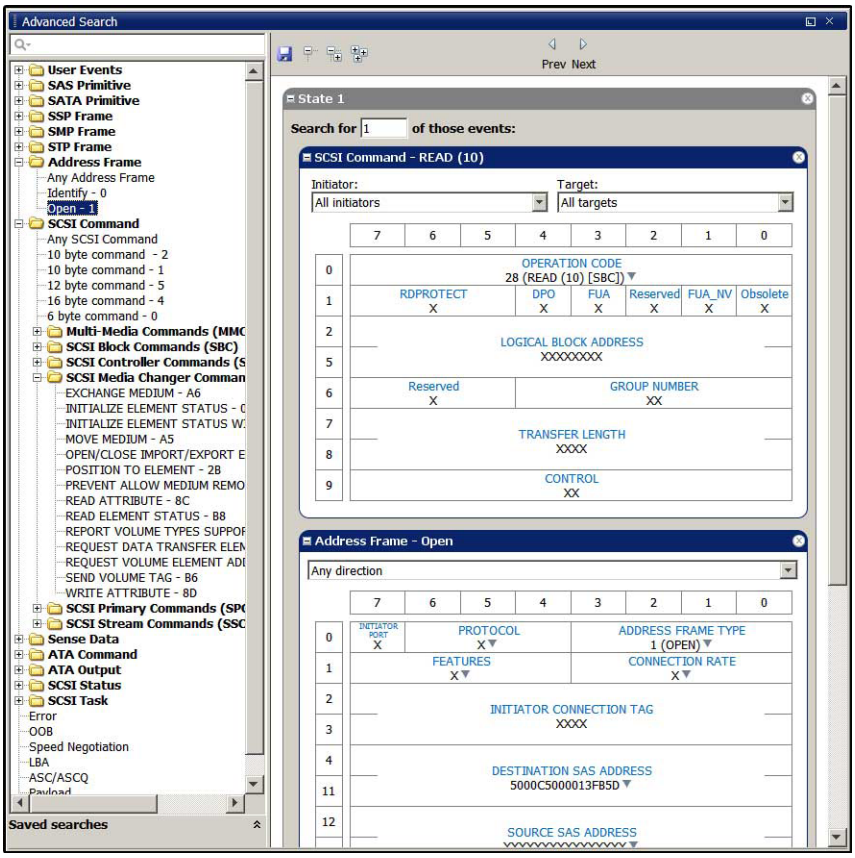
Provides extensive decoding of the frames, primitives, and Out-of-Band (OOB) events and sorts them to show the order in which they occurred. The displayed columns are chosen from an extensive list of fields and events.

Inventive Software (continued)

Searching for data

Easily search for specific frames, primitives, addresses or other events with the Quick Search and Advanced Search functions. Quick Search is a text search that fills in the rest of the search term as the user starts typing. Advanced Search provides a way to search for sequences of events, either within a frame, or across multiple frames or events. It is identical to the Trigger Sequencer in appearance.





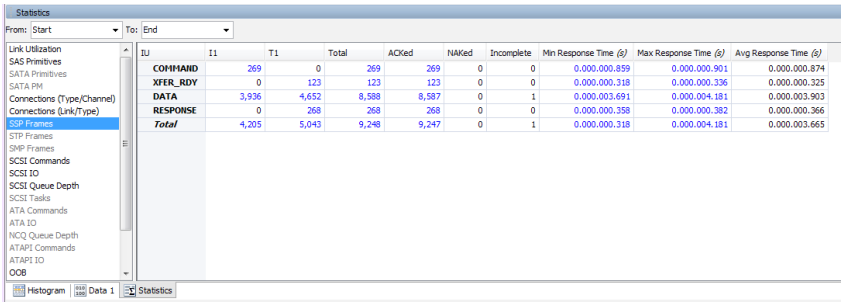
The 'Protocol view,' 'Transaction View,' and 'Spreadsheet view' show different levels of the same data and can be synchronized by double-clicking in any of the views. All of the views can be easily configured to display anywhere in the workspace. Hide, dock, pin, and resize to the desired configuration and the software will retain the last known settings. Each view can be exported to CSV and XML formats, and the Frame 'Details' view will also export to HTML. All command decodes are XML-based and can easily be edited or created for unique or vendor-specific commands.

The intuitive interface used for Triggering is also used with the Searching and Filtering functions allow for simplicity and ease of use. Any created and saved events are available to use in each of the interfaces.

BusXpert's software is up-to-date with the latest specifications for SAS2 and SATA Revision 3.0. It is also constantly updated with new features driven by market demands and customer requests.

Statistical Analysis: Get an Overall View of the Types of Traffic Captured

- Navigate into areas of interest
- Look for max/min performance areas



There are several reports that are generated by the statistics view and many of them can be used to find interesting areas in the trace. For example, with the graphic above, click on the 'Max Response Time' number in blue to jump to that command in the trace, and then set a bookmark to identify it for future use. Click on the arrow button next to the result for a drop-down of the 15 max/min values. Then click on the values within that drop-down to be taken to that location in the trace.

Statistics categories

SAS/SATA	SATA only
Link utilization	Link utilization
SAS primitives	
SATA primitives	Primitives
SATA PM	PM
Connections (Type/Channel)	
Connections (Link/Type)	
SSP frames	
STP frames	Frames
SMP frames	
SCSI commands	
SCSI IO	
SCSI queue depth	
SCSI tasks	
ATA commands	ATA commands
ATA IO	ATA IO
NCQ queue depth	NCQ queue depth
ATAPI commands	ATAPI commands
ATAPI IO	ATAPI IO
OOB	OOB
Speed negotiation	Speed negotiation
Errors	Errors

U3055A/U3056A – BusXpert Pro II 12 Gb SAS/6 Gb SATA Analyzer



The SerialTek BusXpert Pro II is our flagship SAS and SATA analyzer. It features the HD Mini-SAS connectors for 4-port connections, the industry's largest buffer up to 72 GB and is small enough to easily transport around the lab or in the field. Multiple units can be cascaded together for recording multiple ports simultaneously and viewed in the same GUI.

Key features:

- Enhanced gigabit ethernet > 70 MB/s
- 500 picosecond timestamp resolution
- Eye-opener front end
- Tunable RX/TX signaling
- Cascadeable up to 4 BusXpert Pro platforms
- Supports 1.5/3.0/6.0/12.0 (SAS Only) Gbps
- Deep triggering and filtering
- Trace buffer up to 72 GB

Hardware specifications:

- Measures 10" x 14" x 3.5"
- Weighs 10 lbs
- Status LEDs per port pair for
  - Auto speed detection
  - OOB present
  - Link up/down
  - Frames present
  - 10b error detection
  - Commands present
  - Command errors

In addition to the features above, the BusXpert Pro II also supports:

- External trigger in/out
- Manual trigger button
- (3) 7 Segment display for unit # and IP address
- 12 Gb SAS analyzer with support for 6 Gb/3 Gb SATA/STP
- Windows and Linux compatibility for both the GUI and API

U3052C/U3057A – BusXpert PRO Series SAS/SATA Analyzer



The SerialTek BusXpert Pro is the workhorse for 4 port analysis of SAS and SATA. It features the optional Mini-SAS connectors for 4-port connections, the industry's largest buffer up to 36 GB and is small enough to easily transport around the lab or in the field. Multiple units can be cascaded together for recording multiple ports simultaneously and viewed in the same GUI.

Key features:

- PCI express > 550 MB/s
- Enhanced gigabit ethernet > 70 MB/s
- Native PHY
- Fast data re-lock
- 2 ns timestamp resolution
- Eye-opener front end
- Tunable RX/TX signaling
- Cascadeable up to 4 BusXpert Pro platforms
- Available with either mini-SAS or SATA 7-pin connectors
- Supports 1.5/3.0/6.0 Gbps
- Deep trigger and filter
- Trace buffer up to 36 GB

Hardware specifications:

- Measures 8.5" x 14" x 3.5"
- Weighs 10 lbs
- Status LEDs per port pair for
  - Auto-MUX detection
  - Auto speed detection
  - OOB present
  - Link up/down
  - Frames present
  - 10b error detection
  - Commands present
  - Command errors

In addition to the features above, the BusXpert Pro also supports:

- External trigger in/out
- Manual trigger button
- SATA-only option for SATA analyzer
- SAS analyzer with support for SATA/STP
- Windows and Linux compatibility for both the GUI and API

U3051C – BusXpert Micro Series SAS/SATA Analyzer



The BusXpert Micro Series SAS and SATA analyzer has a very portable form-factor, making it a preferred choice for those developers needing a compact platform with minimal noise and size. Its small dimensions also make it easy to take along in the field and to move it from bench to bench in the lab.

The analyzer comes with several status LEDs for a quick visual reference of what is occurring on the bus. It also supports trigger in/out for those needing to trigger a scope or logic analyzer. The BusXpert Micro Series is our most capable SAS/SATA analyzer for complete SAS and SATA protocol analysis. It features the industry's largest buffer, offering options from 2 GB up to 9 GB. It also has the industry's most in-depth triggering, with up to three simultaneous sequencers. Each sequencer can contain up to 16 states with timers, counters, and the ability to jump anywhere within the sequence. The BusXpert GUI also makes it easier for developers to create triggers and understand what is happening on the bus, and it displays the data in a meaningful format.

Key features:

- PCI express > 550 MB/s
- Enhanced gigabit ethernet > 70 MB/s
- Native PHY
- Fast data re-lock
- 2 ns timestamp resolution
- Eye-opener front end
- Tunable RX/TX signaling
- Cascade-able up to 2 BusXpert Micro Systems
- SATA 7-pin connectors
- 1-port or 2-port (full duplex links)
- 5 V/12 V controllable external power connector
- License for SAS/SATA or SATA-only
- Software configurable for 3.0/6.0 Gbps
- Deep trigger and filter
- Trace buffer up to 9 GB

U3051C – BusXpert Micro Series SAS/SATA Analyzer (continued)

Hardware specifications:

- Measures 6” x 9” x 1.75”
- Weighs less than 3 lbs
- Status LEDs per port pair for
  - Auto speed detection
  - OOB present
  - Link Up/Down
  - Frames present
  - 10b error detection
  - Commands present
  - Command errors

In addition, the BusXpert Micro also supports:

- External trigger in/out
- Manual trigger button
- SATA-only option for SATA analyzer
- SAS analyzer with support for SATA/STP
- Cascade with BusXpert Micro and MicroLite USB analyzer for simultaneous record and display of SAS/SATA and USB traffic
- Windows and Linux compatibility for both the GUI and API

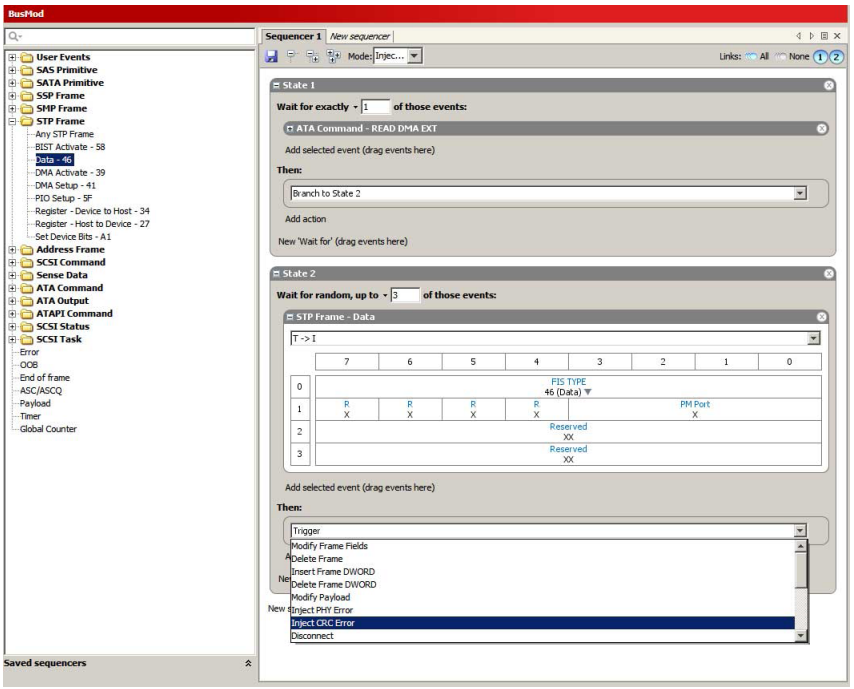
U3053C – BusMod Error Injector + BusGen BIST Generator



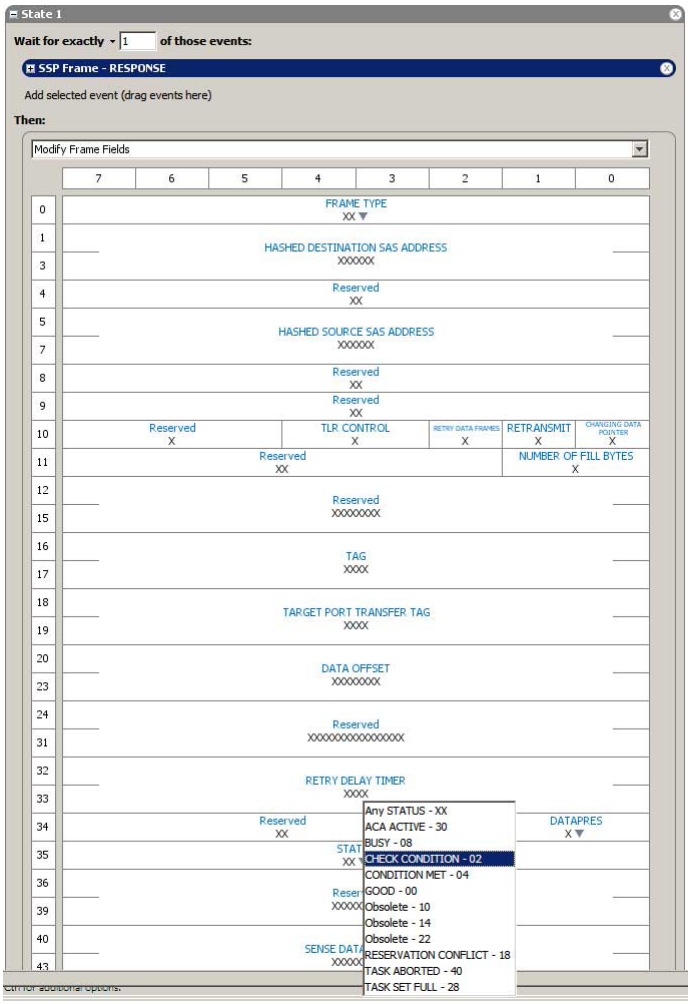
Validating design robustness with reliable tools

For today's SAS and SATA developers and integrators, verifying design robustness and error recovery can be a challenging task, especially when it is difficult to duplicate test cases and customer issues. Troubleshooting is further complicated by ever-climbing storage capacities, network architectures, data rates, and protocol complexity. The BusMod Error Injector gives designers the ability to insert a variety of errors into a live data stream to test real-time error handling, system recovery, and duplication of issues seen in the field. Used in conjunction with the BusXpert SAS/SATA analyzers, users can easily verify correct and incorrect responses to issues caused by the error injector. BusMod's error injection provides the ability to create random and defined line errors such as CRC or 8b10b encoding errors, modify or replace frames, frame data and primitives. BusMod also has the capability of generating the SATA Built-In-Self-Test (BIST) frame for testing physical compliance of both hosts and devices. Used with the Frame Error Rate Counter (FERC) capability of the BusXpert analyzers, the BusMod Micro and Pro systems become versatile SATA compliance test tools.

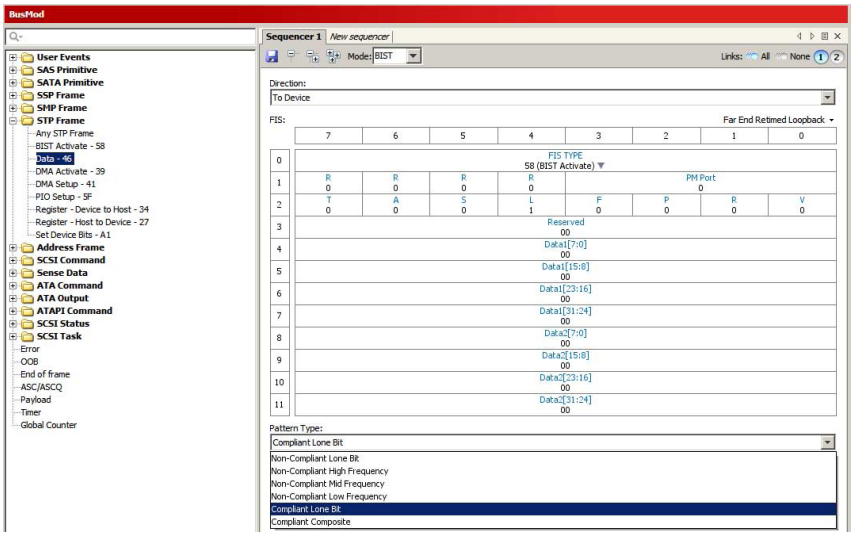
Creating test scripts is easy using the SerialTek GUI. The interface is very similar to the BusXpert software to maintain ease and simplicity of use. Below are some examples of the U3052C GUI and capabilities.



U3053C – BusMod Error Injector + BusGen BIST Generator (continued)

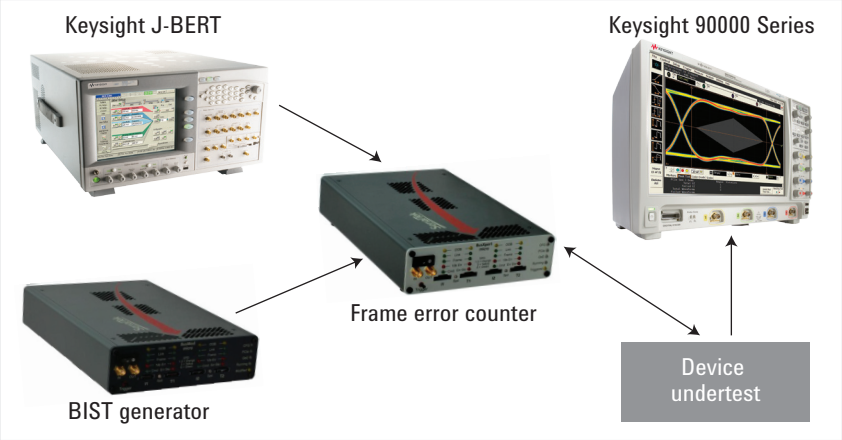


For SATA physical layer compliance testing, users can instead send out the BIST frame and specify the different types of BIST commands, patterns, and so on.



U3053C – BusMod Error Injector + BusGen BIST Generator (continued)

The diagram below shows how a combination of the right tools could be a very powerful test setup for SAS and SATA physical compliance testing:



In the diagram above, the BusGen sends a SATA BIST frame to put the device under test into a special loop-back test mode. The J-BERT is then used to send compliance patterns with varying levels of jitter. The device sends the pattern back, and the BusXpert, using its Frame Error Counter capability, counts if there are any CRC errors in the frames from the device. The scope is used to verify the eye pattern of the device under test.

System Requirements

To get the best performance out of your BusXpert Analyzer, we recommend the following systems:

Minimum configuration:

1.5 GHz Celeron or AMD equivalent processor, 1 GB of memory, Gigabit Ethernet and/or USB, Graphics capable of supporting 1024 x 768.

Recommended Configuration:

2.8 GHz or greater processor, 3 GB or greater of 1.3 GHz FSB memory, PCIe™ x4 or ExpressCard slot, Graphics capable of supporting 1920 x 1200 or greater BusXpert software is compatible with Windows XP and Windows Vista and Windows 7; 32 and 64-bit platforms. BusXpert requires 100 MB for installation. Additional disk space is recommended for storing traces.

The following information applies to all SAS/SATA analyzers:

Model	Description
Analyzer control	Analyzer operation is controlled from PC based software operating through Ethernet connection or PCIe.
Operating system	Microsoft Windows 32 or 64 bit OS.
Trigger in	SMA connector to the FPGA sequencer logic though the buffer powered by 3.3 V with 1 K pull-down resistor.
Trigger out	SMA connector with LVCMOS25 driver, 6 ma drive strength, external trigger modes are: Pulse high, Pulse low, and Toggle.
Environment and safety	This instrument is intended for indoor use in an installation category II, pollution degree 2 environment.
Temperature	Operating: 20 to 30 °C
	Non-operating: –40 to +70 °C
Humidity (non-condensing)	Operating: 50% to 80% at 30 °C
	Non-operating: 90% for 12 hours at 65 °C
Safety	Safety IEC 61010-1:2001 / EN 61010-1:2001 Canada: CAN/CSA C22.2. No 61010-1-04 USA: ANSI/UL 61010-1:2004
	Pollution degree: 2
	Environmental rating: Standard

Ordering Information

Physical specifications

SerialTek Series	Model	Cable type	Port count	Protocol support	Protocol speeds	Buffer options	Trigger	PC control interface			Power 100 to 240 VAC 50 to 60 Hz	Size	Weight
								USB 3.0	GbE	PCIe			
Pro II	U3056A	HD MiniSAS	4	SAS/SATA	1.5/3/6/12 Gbps	72 GB	8 seq/ 16 state	Y	Y	x4	200 W internal	10"x14"x3.5"	12 lbs
Pro II	U3055A	HD MiniSAS	4	SAS/SATA	1.5/3/6/12 Gbps	6, 18, 36 GB	8 seq/ 16 state	Y	Y	x4	200 W internal	10"x14"x3.5"	12 lbs
Pro Series	U3057C	MiniSAS	4	SAS/SATA	1.5 /3/6 Gbps	36 GB	8 seq/ 16 state	N	Y	x4	150 W internal	8.5"x14"x3.5"	10 lbs
Pro Series	U3052C	MiniSAS	4	SAS/SATA	1.5 /3/6 Gbps	4, 9, 18 GB	8 seq/ 16 state	N	Y	x4	150 W internal	8.5"x14"x3.5"	10 lbs
Micro Series	U3051C	SATA (x2)	1, 2	SAS/SATA SATA only	1.5 /3/6 Gbps	2, 4, 9 GB	4 seq/ 16 state	N	Y	x4	90 W external	6"x9"x1.75"	3 lbs
Micro Series jammer	U3053C	SATA (x2)	1, 2	SAS/SATA SATA only	1.5 /3/6 Gbps	NA	1 seq/ 16 state	N	Y	x4	90 W external	6"x9"x1.75"	3 lbs

U3051C Micro – 2 Port 6 Gbps SAS/SATA Protocol Analyzer



U3051C	When ordering the U3051C, you must also order one of the available 6 configuration options.	
U3051C-001	3 G, SATA, 1 port, 2 GB memory	Enables SATA I and SATA II (1.5 Gbps and 3.0 Gbps) operation, enables a 2 GB capture buffer for one port only. This "Lite" configuration support a single trigger sequence of a single state and a single buffer segment.
U3051C-002	6 G, SATA, 1 port, 2 GB memory	Enables SATA I, II, III (1.5 Gbps, 3.0 Gbps, and 6 Gbps) operation, enables a 2 GB capture buffer for one port only. Full support for multi-state triggering, with multiple sequences and buffer segments.
U3051C-003	6 G, SATA, 1 port, 4 GB memory	Enables SATA I, II, III (1.5 Gbps, 3.0 Gbps, and 6 Gbps) operation, enables a 4 GB capture buffer for one port only. Full support for multi-state triggering, with multiple sequences and buffer segments.
U3051C-004	6 G, SATA, 2 port, 4 GB memory	Enables SATA I, II, III (1.5 Gbps, 3.0 Gbps, and 6 Gbps) operation, enables a 4 GB capture buffer for two ports. Full support for multi-state triggering, with multiple sequences and buffer segments.
U3051C-005	6 G, SAS & SATA, 2 port, 4 GB memory	Enables SAS and SATA I, II, III (1.5 Gbps, 3.0 Gbps, and 6 Gbps) operation, enables a 4 GB capture buffer for two ports. Full support for multi-state triggering, with multiple sequences and buffer segments.
U3051C-006	6 G, SAS & SATA, 2 port, 9 GB memory	Enables SAS and SATA I, II, III (1.5 Gbps, 3.0 Gbps, and 6 Gbps) operation, enables a 9 GB capture buffer for two ports. Full support for multi-state triggering, with multiple sequences and buffer segments.

U3052C and U3057C PRO – 4 Port 6 Gbps SAS/SATA Protocol Analyzer



U3052C	**When ordering the U3052C, you must also order one of the available two configuration options.**	
U3052C-001	Pro analyzer, 4 port, 6 Gbps link speed, SAS and SATA, 9 GB capture memory	Enables SAS and SATA I, II, III (1.5 Gbps, 3.0 Gbps, and 6 Gbps) operation, enables a 9 GB capture buffer for four ports. Full support for multi-state triggering, with multiple sequences and buffer segments.
U3052C-002	Pro analyzer, 4 port, 6 Gbps link speed, SAS and SATA, 18 GB capture memory	Enables SAS and SATA I, II, III (1.5 Gbps, 3.0 Gbps, and 6 Gbps) operation, enables a 18 GB capture buffer for four ports. Full support for multi-state triggering, with multiple sequences and buffer segments.
U3057C	**When ordering the U3057C, there are no available options.**	
	Pro analyzer, 4 port, 6 Gbps link speed, SAS and SATA, 36 GB capture memory	Enables SAS and SATA I, II, III (1.5 Gbps, 3.0 Gbps, and 6 Gbps) operation, enables a 36 GB capture buffer for four ports. Full support for multi-state triggering, with multiple sequences and buffer segments.

U3055A and U3056A PRO II – 4 Port 12 Gbps SAS/SATA Protocol Analyzer



U3055A	**When ordering the U3055A, you must also order one of the available three configuration options.**	
U3055A-001	Pro II analyzer, 4 port, 12 Gbps link speed, SAS, 9 GB capture memory	Enables SAS at 12 Gbps and SAS and SATA I, II, III (1.5 Gbps, 3.0 Gbps, and 6 Gbps) operation, enables a 9 GB capture buffer for four ports. Full support for multi-state triggering, with multiple sequences and buffer segments.
U3055A-002	Pro II analyzer, 4 port, 12 Gbps link speed, SAS, 18 GB capture memory	Enables SAS at 12 Gbps and SAS and SATA I, II, III (1.5 Gbps, 3.0 Gbps, and 6 Gbps) operation, enables a 18 GB capture buffer for four ports. Full support for multi-state triggering, with multiple sequences and buffer segments.
U3055A-003	Pro II analyzer, 4 port, 12 Gbps link speed, SAS, 36 GB capture memory	Enables SAS at 12 Gbps and SAS and SATA I, II, III (1.5 Gbps, 3.0 Gbps, and 6 Gbps) operation, enables a 36 GB capture buffer for four ports. Full support for multi-state triggering, with multiple sequences and buffer segments.
U3056A	**When ordering the U3056A, there are no available options.**	
	Pro analyzer, 4 port, 6 Gbps link speed, SAS and SATA, 72 GB capture memory	Enables SAS at 12 Gbps and SAS and SATA I, II, III (1.5 Gbps, 3.0 Gbps, and 6 Gbps) operation, enables a 72 GB capture buffer for four ports. Full support for multi-state triggering, with multiple sequences and buffer segments.
	Pro II analyzer, 4 port 12 Gbps link speed, SAS, 72 GB capture buffer	

U3053C – 2 Port 6 Gbps SAS/SATA and SATA Error Insertion (Jammer) and BIST



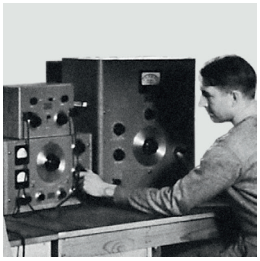
U3053C	When ordering the U3053C, you must also order one of the available three configuration options.	
U3053C-001	BIST generator, 1 port, 6 Gbps, SATA only	Enables SATA I, II, III (1.5 Gbps, 3.0 Gbps, and 6 Gbps), SATA BIST operation on one port only.
U3053C-002	Micro BusMod error injector, 1 port and BIST generator, 1 port, 6 Gbps link speed, SATA only	Enables SATA I, II, III (1.5 Gbps, 3.0 Gbps, and 6 Gbps) SATA BIST operation on one port and error injection on one port.
U3053C-003	Micro BusMod error injector, 2 port and BIST generator, 1 port, 6 Gbps link speed, SATA only	Enables SATA I, II, III (1.5 Gbps, 3.0 Gbps, and 6 Gbps) SATA BIST operation on one port and error injection on two ports.
U3053C-004	Micro BusMod error injector, 2 port and BIST generator, 1 port, 6 Gbps link speed, SAS and SATA	Enables SAS and SATA I, II, III (1.5 Gbps, 3.0 Gbps, and 6 Gbps) SATA BIST operation on one port and error injection on two ports.

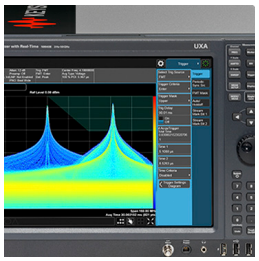
Optional Accessories When Preferred Connection Is PCIe

U3052C-OC-ACCS	Accessories
U4601A	PCIe XpressCard adapter for laptop connections
U4602A	PCIe x4 card (slot adapter) for desktop connections
U4603A	PCIe x4 cable, 2 meters long
U4604A	PCIe x4 cable, 3 meters long

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