

# Analysis Without The Limitations

## BusXpert Micro Series SAS/SATA Analyzers

### UNPARALLELED PERFORMANCE

Upload and display traces using

- PCI Express > 550MB/s
- Gigabit Ethernet > 70MB/s
- Pre-Indexed Trace for faster searching and display

### ACCURATE CAPTURE

- Native PHY
- Fast Data Re-Lock
- 2ns Timestamp Resolution
- Eye-Opener front end
- Tunable RX/TX signalling

### CONVENIENT DESIGN

- 5V / 12V SW controllable external power connector
- Available as Micro and MicroLite
- Configurable SAS/SATA or SATA protocol support
- 1 or 2 port licensing options
- Up to 18GB of trace buffer
- Lightweight (< 3lbs) and Compact (6"x9"x1.75")
- Cascade up to 2 Micro platforms for capture of 4 ports simultaneously
- 7 unique Status LEDs per port



- Record, upload and display SAS and SATA traffic in seconds with either Gigabit Ethernet or PCI Express
- Native PHY with fast Data Re-Lock, Eye-Opener front-end, Tunable RX/TX signalling, and 2ns timestamp resolution for industry's most accurate capture
- Lightweight and compact design for ultra-portability
- Available in 1-port or 2-ports with up to 18GB of trace buffer

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 ever-climbing 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 18GB of buffer, 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's 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. SerialTek delivers on it's promise of "Analysis Without the Limitations".

# Traffic Display

The BusXpert provides a variety of traffic displays, with some optimized for different protocol layers, some optimized for time relationships, some correlate directly with the SAS/SATA specification, and some provide just the user data. All of the views are exportable via CSV and XML. Additionally, some can be exported to HTML. Bookmarks make it easy to label and discuss specific events in the trace.

Time	Delta time	Channel	Type	Initiator	Type - Target	Decode	Command
0.002.346.706	5,642	I4	OPEN			ADDRESS OPEN; PROTOCOL:2(STP); Rate:8(1,5 Gbps)	
0.002.346.632	4,926	I4	OPEN		DMA Setup (FIS 41)	STP DMA SETUP (FIS 41); D;0; I;0; A;0; Offset:0h; 512 bytes	
0.002.373.930	24,298	T4				ADDRESS OPEN; PROTOCOL:2(STP); Rate:8(1,5 Gbps)	
0.002.377.588	3,668	T4			DMA Activate (FIS 39)	STP DMA ACTIVATE (FIS 39)	
0.002.387.166	9,568	I4			Data (FIS 46)	STP DATA (FIS 46); 512 bytes	
0.002.397.592	10,426	I4	OPEN		Register Host->Dev (FIS 27)	ADDRESS OPEN; PROTOCOL:2(STP); Rate:8(1,5 Gbps)	
0.002.401.798	4,206	I4	OPEN		Register Host->Dev (FIS 27)	STP REGISTER HOST->DEV (FIS 27); WRITE FPDMA QUEUED	61: WRITE FPDMA QUEUED
0.002.450.036	48,238	T4				ADDRESS OPEN; PROTOCOL:2(STP); Rate:8(1,5 Gbps)	
0.002.453.810	3,774	T4			Register Dev->Host (FIS 34)	STP REGISTER DEV->HOST (FIS 34); I;0; Status:40h; Error:00h	
0.002.459.050	5,240	T4				ADDRESS OPEN; PROTOCOL:2(STP); Rate:8(1,5 Gbps)	
0.002.459.220	5,880	I4	OPEN		Register Dev->Host (FIS 34)	ADDRESS OPEN; PROTOCOL:2(STP); Rate:8(1,5 Gbps)	
0.002.462.130	2,810	T4			Set Device Bits (FIS A1)	STP SET DEVICE BITS (FIS A1); Tags: 1 9 10; I;1; A;0; Status:...	
0.002.468.922	6,792	I4	Register Host->Dev (FIS 27)			STP REGISTER HOST->DEV (FIS 27); READ FPDMA QUEUED	60: READ FPDMA QUEUED
0.002.491.528	22,606	T4				ADDRESS OPEN; PROTOCOL:2(STP); Rate:8(1,5 Gbps)	
0.002.495.222	3,694	T4			Register Dev->Host (FIS 34)	STP REGISTER DEV->HOST (FIS 34); I;0; Status:40h; Error:00h	
0.002.500.802	5,580	I4	OPEN		Register Dev->Host (FIS 34)	ADDRESS OPEN; PROTOCOL:2(STP); Rate:8(1,5 Gbps)	
0.002.504.950	4,148	I4	OPEN		Register Host->Dev (FIS 27)	STP REGISTER HOST->DEV (FIS 27); READ FPDMA QUEUED	60: READ FPDMA QUEUED
0.002.538.514	33,564	T4				ADDRESS OPEN; PROTOCOL:2(STP); Rate:8(1,5 Gbps)	
0.002.542.234	3,720	T4			Register Dev->Host (FIS 34)	STP REGISTER DEV->HOST (FIS 34); I;0; Status:40h; Error:00h	
0.002.547.758	5,524	I4	OPEN		Register Dev->Host (FIS 34)	ADDRESS OPEN; PROTOCOL:2(STP); Rate:8(1,5 Gbps)	
0.002.551.970	4,212	I4	Register Host->Dev (FIS 27)			STP REGISTER HOST->DEV (FIS 27); READ FPDMA QUEUED	60: READ FPDMA QUEUED
0.002.555.016	3,046	I2	OPEN			ADDRESS OPEN; PROTOCOL:1(SSP); Rate:A(6 Gbps)	
0.002.556.274	1,258	I2	COMMAND			SSP COMMAND; WRITE (10)	2a: WRITE (10)
0.002.569.980	13,706	T4				ADDRESS OPEN; PROTOCOL:2(STP); Rate:8(1,5 Gbps)	
0.002.573.648	3,648	T4			Register Dev->Host (FIS 34)	STP REGISTER DEV->HOST (FIS 34); I;0; Status:40h; Error:00h	
0.002.578.758	5,110	T3				ADDRESS OPEN; PROTOCOL:2(STP); Rate:8(1,5 Gbps)	
0.002.579.310	552	I4	OPEN			ADDRESS OPEN; PROTOCOL:2(STP); Rate:8(1,5 Gbps)	
0.002.582.420	3,110	T4			DMA Setup (FIS 41)	STP DMA SETUP (FIS 41); D;1; I;0; A;0; Offset:0h; 512 bytes	
0.002.601.740	19,320	T4				ADDRESS OPEN; PROTOCOL:2(STP); Rate:8(1,5 Gbps)	
0.002.605.486	3,746	I4			Data (FIS 46)	STP DATA (FIS 46); 512 bytes	
0.002.616.094	10,608	I4	Register Host->Dev (FIS 27)			STP REGISTER HOST->DEV (FIS 27); WRITE FPDMA QUEUED	61: WRITE FPDMA QUEUED
0.002.728.964	112,870	T4				ADDRESS OPEN; PROTOCOL:2(STP); Rate:8(1,5 Gbps)	
0.002.732.658	3,694	T4			Register Dev->Host (FIS 34)	STP REGISTER DEV->HOST (FIS 34); I;0; Status:40h; Error:00h	
0.002.738.228	5,570	I4	OPEN		Register Dev->Host (FIS 34)	ADDRESS OPEN; PROTOCOL:2(STP); Rate:8(1,5 Gbps)	
0.002.742.374	4,146	I4	Register Host->Dev (FIS 27)			STP REGISTER HOST->DEV (FIS 27); WRITE FPDMA QUEUED	61: WRITE FPDMA QUEUED
0.002.745.514	3,140	T3				ADDRESS OPEN; PROTOCOL:1(SSP); Rate:A(6 Gbps)	

Spreadsheet View provides extensive decoding of frames, primitives, and Out-of-Band events, and sorts them to show the order they occurred in. The displayed columns are chosen from an extensive list of fields and events.

Time	Channel	Command	Status	Source	Destination	Tag	LBA/Sector	Transfer Size	Duration
0.002.556.274	I2, T2, T4	WRITE (10) GOOD		102030405060708	5000CCA08019861	d336	0000000009984	512	0.039.272.675
0.002.556.274	I2	COMMAND; WRITE (10)							
0.038.133.392	T2	XFER_RDY; 512 bytes							
0.038.139.358	I2	DATA; Offset:0h; 512 bytes							
0.041.828.848	T4	RESPONSE; STATUS:0(GOOD)							
0.002.616.094	I3, T3, H...	WRITE FP; Error:00h; Status:40h	102030405060708	500E004AAAAAAA...	0008	0000000002527		512	0.002.311.655
0.002.616.094	I4	Register Host->Dev (FIS 27); WRITE FPDMA QUEUED							
0.002.732.658	T4	Register Dev->Host (FIS 34); I;0; Status:40h; Error:00h							
0.004.238.794	T4	DMA Setup (FIS 41); D;0; I;0; A;0; Offset:0h; 512 bytes							
0.004.259.510	T3	DMA Activate (FIS 39)							
0.004.259.666	I3	Data (FIS 46); 512 bytes							
0.004.927.316	T4	Set Device Bits (FIS A1); Tags: 1 8 9 14 15; I;1; N;0; Status:0; StatusH:4h; Error:00h							
0.002.742.374	I2, T2, H...	WRITE FP; Error:00h; Status:40h	102030405060708	500E004AAAAAAA...	000e	0000000002528		512	0.002.185.375
0.002.742.374	I4	Register Host->Dev (FIS 27); WRITE FPDMA QUEUED							

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.

7	6	5	4	3	2	1	0
FRAME TYPE 01 (DATA)							
HASHED DESTINATION SAS ADDRESS 22E67C (Seagate Technology 6959A99)							
Reserved 00							
HASHED SOURCE SAS ADDRESS 1190C7							
Reserved 00							
TLR CONTROL 0							
RETRY DATA FRAMES 0							
RETRANSMIT 0							
CHANGING DATA POINTER 0							
NUMBER OF FILL BYTES 0							
Reserved 00000000							
TAG 0037							
TARGET PORT TRANSFER TAG 5FC							
DATA OFFSET 00000000							

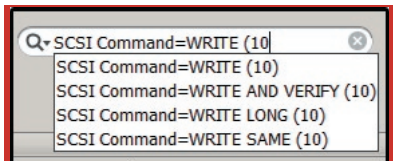
Frame Details shows each frame in the format used by the SAS or SATA specification.

Time	I2	T2	I4	T4
0.002.547.760				STP; 1,5 Gbps
0.002.551.968				STP REGISTER HOST->DEV (FIS 27); READ FPDMA QUEUED
0.002.551.972				ADDRESS OPEN
0.002.555.016				SSP; 6 Gbps
0.002.555.020				SSP COMMAND
0.002.556.272				WRITE (10)
0.002.556.276				ADDRESS OPEN
0.002.569.980				STP; 1,5 Gbps
0.002.573.648				STP REGISTER DEV->HOST (FIS 34); I;0; Status:40h; Error:00h
0.002.573.652				ADDRESS OPEN
0.002.579.308				STP; 1,5 Gbps
0.002.579.312				STP REGISTER HOST->DEV (FIS 27); WRITE FPDMA QUEUED
0.002.582.420				STP DMA SETUP (FIS 41); D;1; I;0; A;0; Offset:0h...
0.002.582.424				ADDRESS OPEN
0.002.601.740				STP; 1,5 Gbps
0.002.601.744				STP DATA (FIS 46); 512 bytes
0.002.605.484				ADDRESS OPEN
0.002.605.488				STP REGISTER HOST->DEV (FIS 27); WRITE FPDMA QUEUED
0.002.616.092				ADDRESS OPEN
0.002.616.096				STP; 1,5 Gbps
0.002.728.964				ADDRESS OPEN
0.002.728.968				STP REGISTER DEV->HOST (FIS 34); I;0; Status:40h; Error:00h
0.002.732.656				ADDRESS OPEN
0.002.732.660				STP; 1,5 Gbps
0.002.738.228				ADDRESS OPEN
0.002.742.372				STP REGISTER HOST->DEV (FIS 27); WRITE FPDMA QUEUED
0.002.742.376				ADDRESS OPEN
0.002.745.512				SSP; 6 Gbps
0.002.745.516				SSP COMMAND
0.002.746.772				

Protocol View shows the precise timing relationship of each D-Word in the trace. Useful for tracking the handshaking between products under test.

## Searching for Data

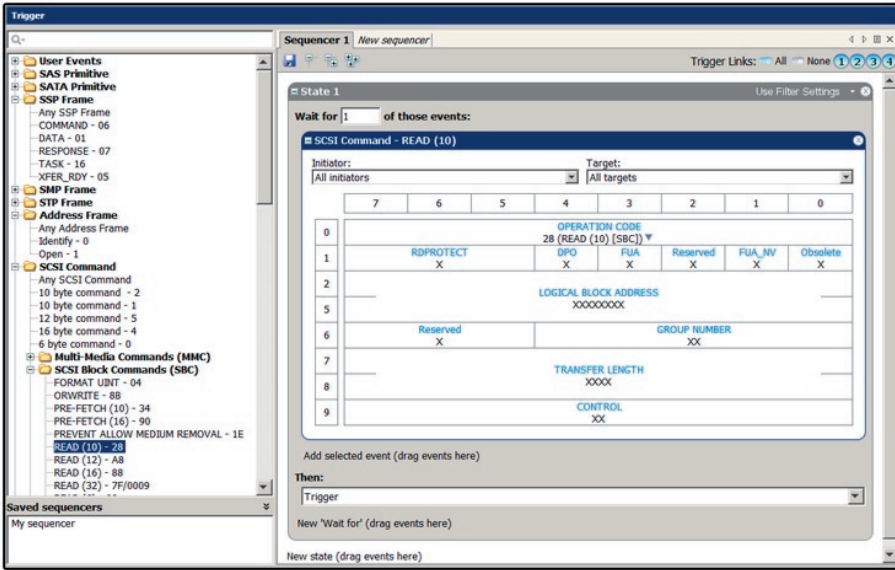
Easily search for specific frames, primitives, addresses or other events with the Quick Search and Advanced Search functions.



Quick Search is a text search that fills in the rest of the search term as the user starts typing.

Advanced Search interface showing search criteria and results for a SCSI Command - READ (10).

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.



## 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 Micro's advanced triggering includes:

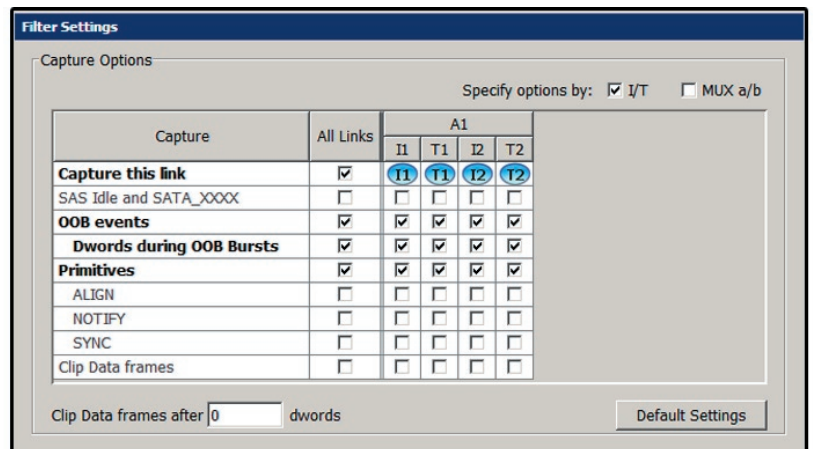
- Up to 8 sequencers
- Up to 16 states per sequencer
- Up to 32 counters and timers
- Multi-level branching
- User defined events
- External Trigger In/Out

BusXpert MicroLite can trigger on single events only.

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 off to the User Events folder for future use.

## Pre-Filtering

Filtering out specific primitives, frames, data, and addresses is a snap. Easily 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 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.



#### ADDITIONAL FEATURES

- XML based decoding
- Easy definition of custom decodes
- Primitive Compression
- Status LEDs for
  - SPD
  - OOB
  - Link
  - Frame
  - 10b Err
  - Command
  - Err Sts
- Java-based application
- Post Filtering / Hiding
- Trace Export to CSV, HTML, XML
- Live SAS Address Table
- API

## Sample Configurations and Part Numbering

The BusXpert Micro Series are available in several different configurations. Below is a sampling of configurations with part numbers:

Part #	Description
MA-1x3ST-18GB	BusXpert Micro Analyzer, 1-port, 1.5Gb/s-3.0Gb/s SATA only, 18GB Buffer, Advanced Triggering and Segmented Buffer
MLA-2x6SA-4GB	BusXpert MicroLite Analyzer, 2-port, 6Gb/s SAS/SATA, 4.5GB Buffer, Single trigger term, Single buffer segment
MA-2x6SA-9GB	BusXpert Micro Analyzer, 2-port, 6Gb/s SAS/SATA, 9GB Buffer, Advanced Triggering and Segmented Buffer

## System Requirements

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

- Minimum configuration: 1.5Ghz Celeron or AMD equivalent processor, 1GB of Memory, Gigabit Ethernet and/or USB, Graphics capable of supporting 1024x768
- Recommended Configuration: 2.8Ghz or greater processor, 3GB or greater of 1.3Ghz FSB memory, PCIe x4 or ExpressCard slot, Graphics capable of supporting 1920x1200 or greater

BusXpert software is compatible with Windows XP and Windows Vista 32 and 64-bit platforms.

BusXpert is also compatible with Linux: Ubuntu 9.10, Fedora 12, and RedHat/CentOS 5.4 or later.

BusXpert requires 100MB for installation. Additional disk space is recommended for storing traces.

## About SerialTek

SerialTek's experienced team shares a common goal: Design and build the ultimate analyzer platform to eliminate the bottlenecks that keep developers waiting. With the BusXpert, they celebrate their first victory. SerialTek is committed to raising customer expectations with each successive year of innovation.

For additional information or questions regarding SerialTek products, including quotes, product demonstrations, software and technical assistance please contact us at:

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