

# Analysis Without The Limitations

## BusXpert PRO Series SAS/SATA Analyzer

### Agilent U3052A



#### UNPARALLELED PERFORMANCE

Upload and display traces using

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

#### ACCURATE CAPTURE

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

#### CONVENIENT DESIGN

- 3 Different Configurable Platforms (Mini SAS, SATAx2 or SATAx4)
- Up to 36GB of trace buffer
- Lightweight (10lbs) and Compact (8.5"x14"x3.5")
- Cascade up to 4 platforms for high port count analysis
- 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 2-ports or 4-ports with up to 36GB 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. Faster and deeper analyzers are needed 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 36GB 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 its 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
0.002.344.706	5,642	I4	OPEN		ADDRESS OPEN; PROTOCOL2(STP); Rate:8(1,5 Gbps)	
0.002.349.632	4,926	T4	OPEN	DMA Setup (FIS 41)	STP DMA SETUP (FIS 41); D1: 1; A:0; Offset:0; 512 bytes	
0.002.373.930	24,298	T4	OPEN		ADDRESS OPEN; PROTOCOL2(STP); Rate:8(1,5 Gbps)	
0.002.377.598	3,668	T4	OPEN	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	10,458	I4	OPEN		ADDRESS OPEN; PROTOCOL2(STP); Rate:8(1,5 Gbps)	
0.002.401.798	4,206	I4	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	OPEN		ADDRESS OPEN; PROTOCOL2(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	
0.002.456.050	5,240	T4	OPEN		ADDRESS OPEN; PROTOCOL2(STP); Rate:8(1,5 Gbps)	
0.002.459.220	3,580	I4	OPEN		ADDRESS OPEN; PROTOCOL2(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; N: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	OPEN		ADDRESS OPEN; PROTOCOL2(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		ADDRESS OPEN; PROTOCOL2(STP); Rate:8(1,5 Gbps)	
0.002.504.950	4,148	I4	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	OPEN		ADDRESS OPEN; PROTOCOL2(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		ADDRESS OPEN; PROTOCOL2(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; PROTOCOL1(SSP); Rate:A(6 Gbps)	
0.002.556.274	1,258	I2	COMMAND		SSP COMMAND; WRITE (10)	2a: WRITE (10)
0.002.569.980	13,708	T4	OPEN		ADDRESS OPEN; PROTOCOL2(STP); Rate:8(1,5 Gbps)	
0.002.573.448	3,668	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	OPEN		ADDRESS OPEN; PROTOCOL2(STP); Rate:8(1,5 Gbps)	
0.002.579.310	552	I4	OPEN		ADDRESS OPEN; PROTOCOL2(STP); Rate:8(1,5 Gbps)	
0.002.582.420	3,110	T4	DMA Setup (FIS 41)		STP DMA SETUP (FIS 41); D1: 1; I:0; A:0; Offset:0; 512 bytes	
0.002.601.740	19,328	T4	OPEN		ADDRESS OPEN; PROTOCOL2(STP); Rate:8(1,5 Gbps)	
0.002.605.486	3,746	T4	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	OPEN		ADDRESS OPEN; PROTOCOL2(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		ADDRESS OPEN; PROTOCOL2(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	3,146	I4	OPEN		ADDRESS OPEN; PROTOCOL2(STP); Rate:8(1,5 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	5000CA08019861	0336	000000000984	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:00(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); D1:0; I:0; A:0; Offset:0h; 512 bytes							
0.004.250.510	T3	DMA Activate (FIS 39)							
0.004.259.636	I4	Data (FIS 46); 512 bytes							
0.004.927.636	T3	Set Device Bits (FIS A1); Tags: 1 8 9 14 15; I:1; N:0; Status:0:0h; StatusHI: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							
Reserved 00							
TLR CONTROL 0							
RETRY DATA FRAMES 0							
RETRANSMIT 0							
NUMBER OF FILL BYTES 0							
Reserved 00000000							
TAG 0037							
TARGET PORT TRANSFER TAG 5FEC							
DATA OFFSET 00000000							

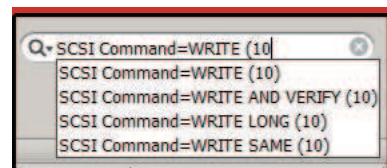
Frame Details shows each frame in the format used by the SAS or SATA specification.

Time	I2	T2	I4	T4
0.002.547.760				STP; 1,5 Gbps
0.002.551.968				STP REGISTER HOST->DEV (FIS 27); WRITE FPDMA QUEUED
0.002.551.972				READ FPDMA QUEUED
0.002.555.016				ADDRESS OPEN SSP; 6 Gbps
0.002.555.020				
0.002.556.272				SSP COMMAND WRITE (10)
0.002.556.276				ADDRESS OPEN
0.002.569.980				STP; 1,5 Gbps
0.002.569.984				STP REGISTER HOST->DEV (FIS 27); WRITE FPDMA QUEUED
0.002.573.648				STP REGISTER DEV->HOST (FIS 34); I:0; Status:40h; Error:00h
0.002.573.652				
0.002.579.308				ADDRESS OPEN STP; 1,5 Gbps
0.002.579.312				
0.002.582.420				STP DMA SETUP (FIS 41); D1:1; I:0; A:0; Offset:0h; 512 bytes
0.002.582.424				
0.002.601.740				ADDRESS OPEN STP; 1,5 Gbps
0.002.601.744				
0.002.605.484				STP DATA (FIS 46); 512 bytes
0.002.605.488				
0.002.616.092				STP REGISTER HOST->DEV (FIS 27); WRITE FPDMA QUEUED
0.002.616.096				
0.002.728.964				ADDRESS OPEN STP; 1,5 Gbps
0.002.728.968				
0.002.732.656				STP REGISTER DEV->HOST (FIS 34); I:0; Status:40h; Error:00h
0.002.732.660				
0.002.738.228				ADDRESS OPEN STP; 1,5 Gbps
0.002.738.232				
0.002.742.372				STP REGISTER HOST->DEV (FIS 27); WRITE FPDMA QUEUED
0.002.742.376				
0.002.745.512				ADDRESS OPEN SSP; 6 Gbps
0.002.745.516				
0.002.746.772				SSP COMMAND

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

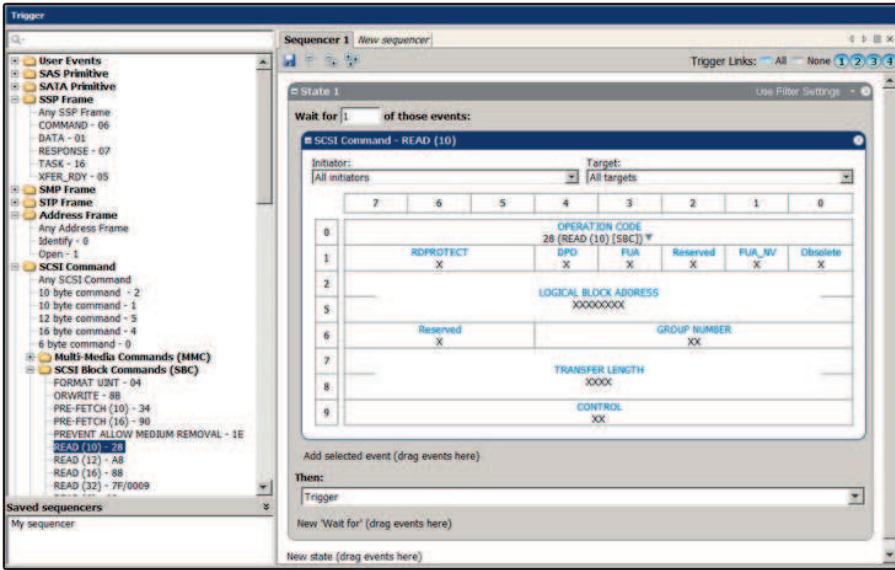
## Searching for Data

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



7	6	5	4	3	2	1	0	
OPERATION CODE 28 (READ) (SBC) *								
0	RDPROTECT	X	DFI	X	Reserved	FUA	INJ	Obsolete
1								
LOGICAL BLOCK ADDRESS XXXXXXXX								
5								
6	Reserved	X			GROUP NUMBER	XX		
7								
TRANSFER LENGTH XXXX								
8								
CONTROL XX								
9								

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

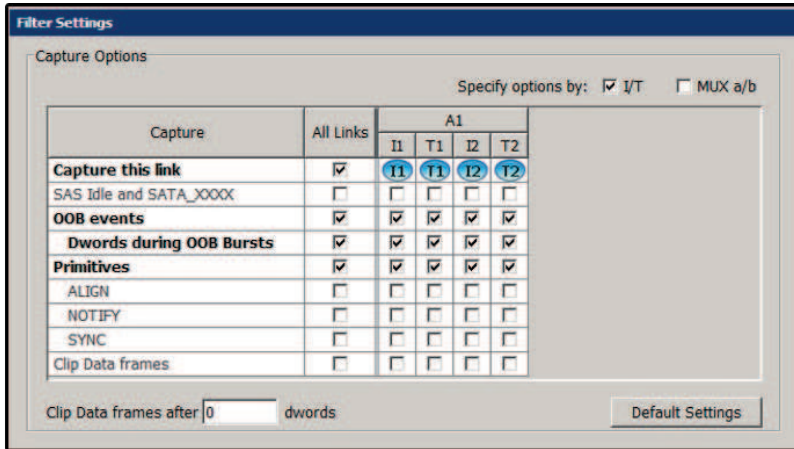
BusXpert's triggering interface allows for quick definition of events with frame layouts matching the SAS2 and SATA specifications. Simple and complex triggers can be built with ease. BusXpert's triggering includes:

- Up to 3 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 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.

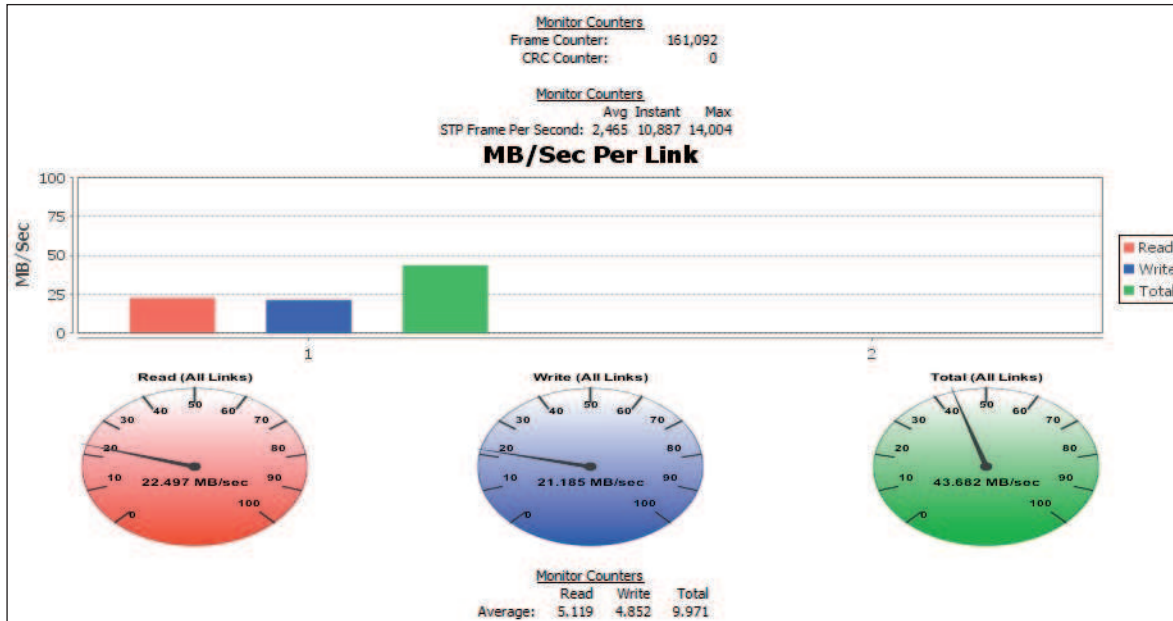


## Line Status

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

## Real-Time Statistics

Simultaneously measure individual read and write, and IOPs performance statistics while the analyzer is recording bus traffic. Compare performance across all of the links to see performance differences. Use live counters to keep track user-definable events such as frame error rate counting, and average IOPs.



## Post-Capture Statistics

After capturing a trace, the BusXpert provides a variety of statistical measurements. View statistics such as command performance (latency, throughput, etc), link utilization (frame turn-around rate, etc), SMP and connection management, and many more. Click on data within each report to go to the event in the trace. All of the reports are exportable to HTML, XML, and XLS formats for external data-mining and reports.

Command	Total	Failed	Incomplete	Min Latency (s)	Max Latency (s)	Avg Latency (s)	Min Transfer (B)	Max Transfer (B)	Avg Transfer (B)	Min Throughput (MB/s)	Max Throughput (MB/s)	Avg Throughput (MB/s)	Min Response Time (s)	Max Response Time (s)	Avg Response Time (s)
XEROX 100: XEROX FF00	32	0	4	0.000.008.526	0.033.192.682	0.008.139.603	32,768	32,768	32,768	0.936	436.941	57.840	0.000.071.520	0.033.382.208	0.008.252.404
READ (10)	12	0	1	0.004.952.308	0.033.192.682	0.014.831.014	32,768	32,768	32,768	0.936	6.113	3.057	0.005.111.990	0.033.382.208	0.015.020.854
WRITE (10)	20	0	3	0.000.008.526	0.029.794.238	0.003.809.866	32,768	32,768	32,768	1.047	436.941	93.287	0.000.071.520	0.029.857.242	0.003.872.819
XEROX 100: XEROX FF01	32	0	5	0.000.008.540	0.028.417.472	0.007.679.634	32,768	32,768	32,768	1.097	438.375	58.914	0.000.071.286	0.028.486.355	0.007.791.053
READ (10)	12	0	2	0.000.317.746	0.025.921.387	0.012.581.667	32,768	32,768	32,768	1.193	60.788	13.959	0.000.513.995	0.026.205.422	0.012.775.598
WRITE (10)	20	0	3	0.000.008.540	0.028.417.472	0.004.796.085	32,768	32,768	32,768	1.097	438.375	65.358	0.000.071.286	0.028.480.553	0.004.658.967
XEROX 100: XEROX FF02	45	0	19	0.000.240.780	0.115.242.789	0.032.904.689	32,768	32,768	32,768	0.253	6.605	1.916	0.004.731.559	0.123.475.839	0.035.693.577
READ (10)	20	0	8	0.004.508.523	0.113.660.983	0.029.196.232	32,768	32,768	32,768	0.275	6.605	2.523	0.004.731.559	0.113.626.717	0.029.381.356
WRITE (10)	25	0	11	0.000.240.780	0.115.242.789	0.036.083.368	32,768	32,768	32,768	0.253	3.905	1.395	0.008.003.058	0.123.475.839	0.041.104.053
XEROX 100: XEROX FF03	17	0	5	0.005.740.056	0.055.189.546	0.023.206.887	32,768	32,768	32,768	0.565	5.361	2.059	0.005.829.524	0.055.287.656	0.023.299.637
READ (10)	12	0	5	0.013.864.270	0.055.189.546	0.031.745.272	32,768	32,768	32,768	0.565	2.239	1.262	0.013.937.139	0.055.287.656	0.031.839.599
WRITE (10)	5	0	0	0.005.740.056	0.016.370.078	0.011.253.147	32,768	32,768	32,768	1.898	5.361	3.174	0.005.829.524	0.016.461.854	0.011.343.691
XEROX 100: XEROX FF04	1	0	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
XEROX 100: XEROX FF05	33	0	17	0.004.605.234	0.088.533.867	0.040.339.471	32,768	32,768	32,768	0.353	3.195	1.198	0.009.781.840	0.088.591.730	0.043.362.043
Total	160	0	51	0.000.008.340	0.115.242.789	0.020.318.304	32,768	32,768	32,768	0.253	438.375	30.311	0.000.071.286	0.123.475.839	0.021.494.010

Type/Channel	Total	Accepted	Rejected	Closed	Broken	Incomplete	Min PBC	Max PBC	Avg PBC	Min AWT (s)	Max AWT (s)	Avg AWT (s)	Min Response time (s)	Max Response time (s)	Avg Response time (s)	Min AIP count	Max AIP count	Avg AIP count
SSP	569	567	1	567	0	2	0	0	0.000	0.000.000.000	0.000.038.000	0.000.000.328	0.000.000.322	0.000.001.508	0.000.000.668	0	3	0.895
T2	192	191	0	191	0	1	0	0	0.000	0.000.000.000	0.000.022.000	0.000.000.250	0.000.000.848	0.000.001.172	0.000.000.946	2	3	2.036
T3	7	7	0	7	0	0	0	0	0.000	0.000.000.000	0.000.000.000	0.000.000.322	0.000.000.322	0.000.000.322	0	0	0.000	
T4	52	52	0	52	0	0	0	0	0.000	0.000.000.000	0.000.038.000	0.000.001.807	0.000.000.730	0.000.001.508	0.000.000.983	2	2	2.000
T3	31	30	1	30	0	1	0	0	0.000	0.000.000.000	0.000.001.000	0.000.000.096	0.000.000.444	0.000.000.462	0.000.000.460	0	0	0.000
T4	285	285	0	285	0	0	0	0	0.000	0.000.000.000	0.000.001.000	0.000.000.143	0.000.000.438	0.000.000.470	0.000.000.447	0	0	0.000
T2	1	1	0	1	0	0	0	0	0.000	0.000.000.000	0.000.003.000	0.000.000.324	0.000.000.324	0.000.002.344	0.000.000.584	0	10	0.757
T3	43	43	0	43	0	0	0	0	0.000	0.000.000.000	0.000.003.000	0.000.000.488	0.000.000.598	0.000.002.286	0.000.000.997	1	9	2.860
T4	1	1	0	1	0	0	0	0	0.000	0.000.000.000	0.000.000.000	0.000.000.000	0.000.000.324	0.000.000.324	0.000.000.324	0	0	0.000
T3	3	3	0	3	0	0	0	0	0.000	0.000.000.000	0.000.001.000	0.000.000.666	0.000.000.466	0.000.001.294	0.000.000.744	1	5	2.333
T4	40	37	3	37	0	3	0	0	0.000	0.000.000.000	0.000.001.000	0.000.000.250	0.000.000.424	0.000.000.464	0.000.000.443	0	0	0.000
T3	21	21	0	21	0	0	0	0	0.000	0.000.000.000	0.000.002.000	0.000.000.809	0.000.000.466	0.000.002.344	0.000.000.921	1	10	3.143
T4	151	141	10	141	0	10	0	0	0.000	0.000.000.000	0.000.001.000	0.000.000.225	0.000.000.418	0.000.000.466	0.000.000.466	0	0	0.000

# Sample Configurations and Part Numbering

The BusXpert PRO is available in several different configurations. Below is a sampling configuration with part numbers:

Part #	Description
U3052A	BusXpert Pro Analyzer Base Model
U3052A-4PT	BusXpert Pro Analyzer 4 Port License
U3052A-006	BusXpert Pro Analyzer 6.0Gbps Link Speed License
U3052A-SAS	BusXpert Pro Analyzer SAS/SATA Recording License
U3052A-36GB	BusXpert Pro Analyzer 36GB Memory Option

For a formal quote with pricing, please contact [sales@serialtek.com](mailto:sales@serialtek.com)

## 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 requires 60MB for installation. Additional disk space is recommended for storing traces.

BusXpert is also compatible with Linux: Ubuntu 9.10, RedHat/CentOs 5.4, Fedora 12, OpenSUSE 11.2, and SUSE Enterprise Server 11.

## 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:

[www.agilent.com/find/BusXpert](http://www.agilent.com/find/BusXpert)

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06/10

### ADDITIONAL FEATURES

- XML based decoding
- Easy definition of custom decodes
- Primitive Compression
- Status LEDs for
  - MUX
  - 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

### SPECIFICATIONS

- 100-240VAC 50-60Hz
- 200W Max Power
- 40 Deg C Max Ambient Temperature
- 8.5" x 14" x 3.5"
- CE/FCC Approved