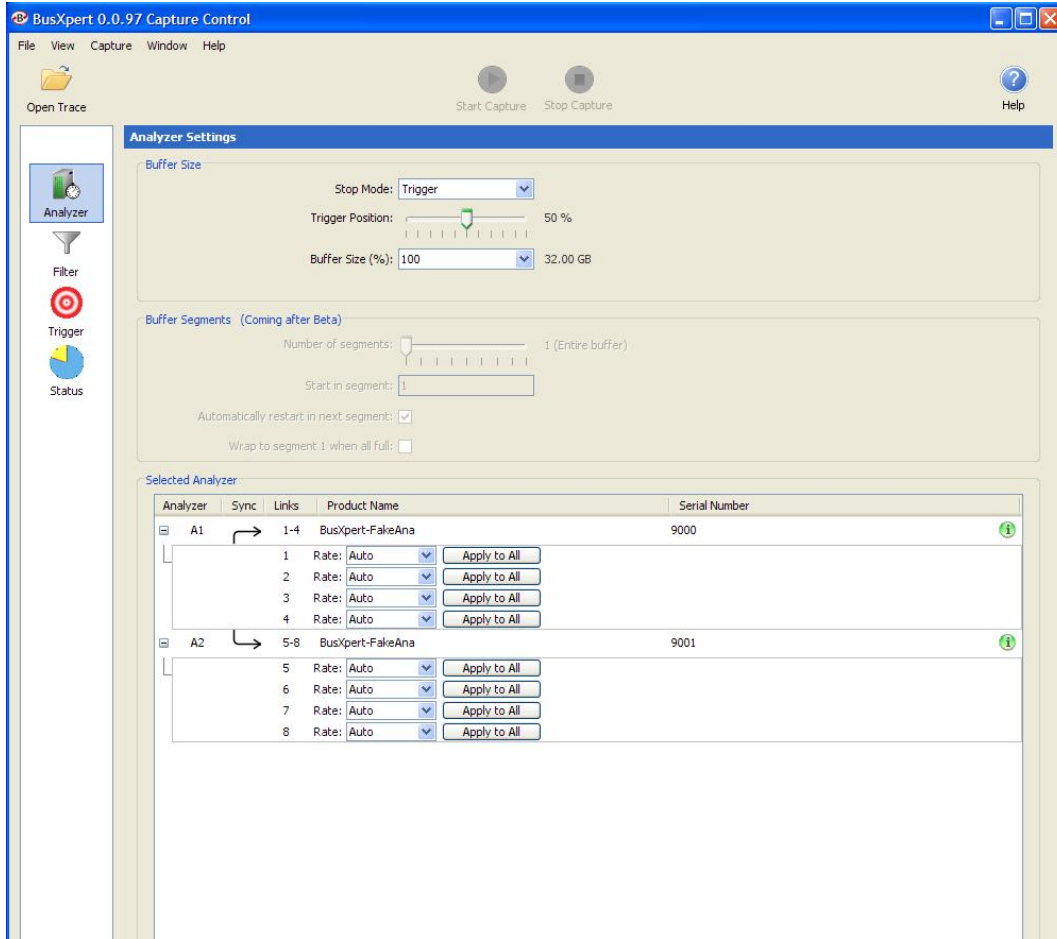


The Capture Control is the nerve center of 'setting' up the BusXpert for use. It's where you setup the buffer size, buffer type, segmentation, pre-filters and triggers.



Pre-filters are for 'excluding' items from the trace file. Soon, there will be pre-filtering by SAS addresses too.

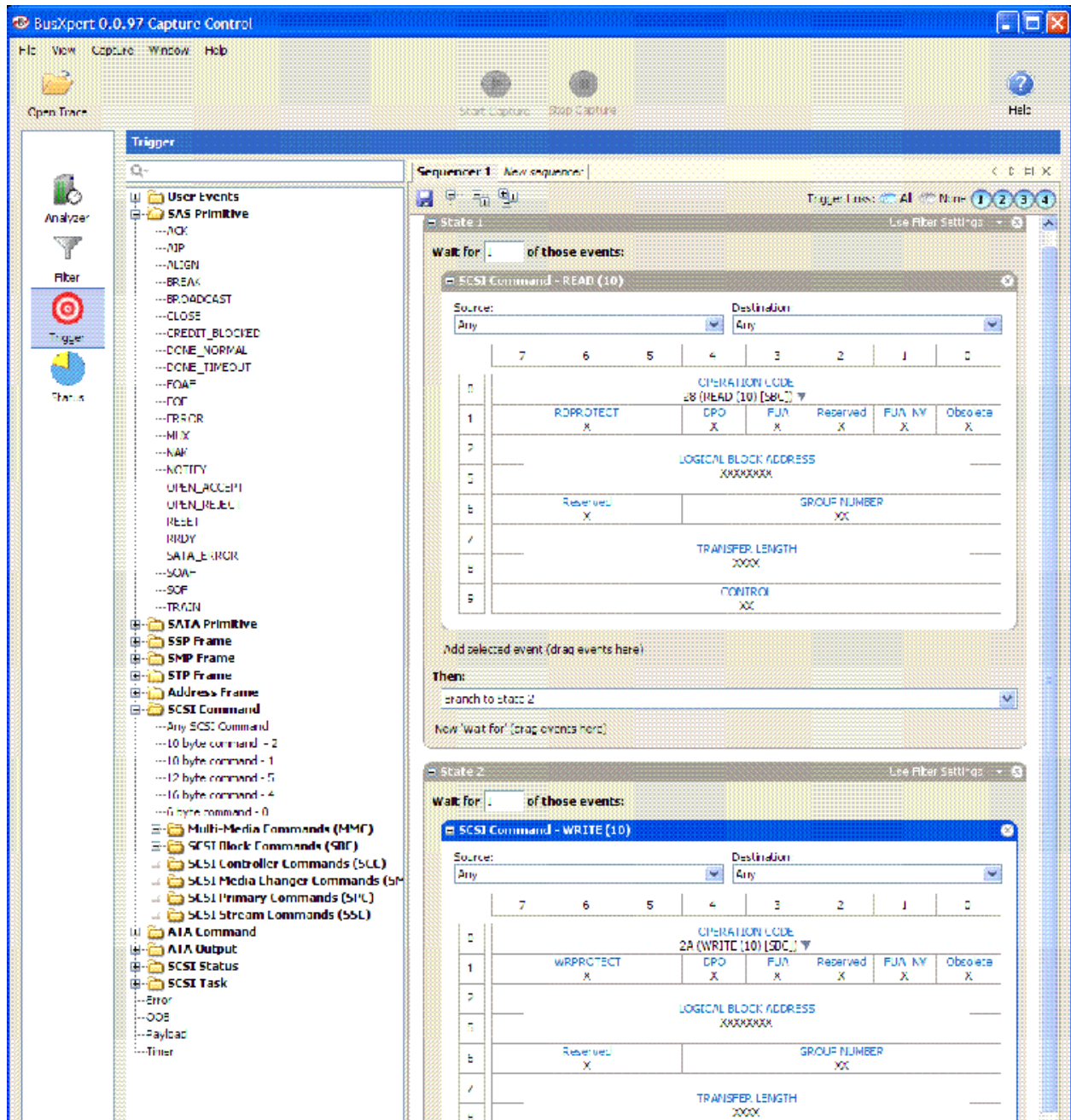
The screenshot shows the 'Filter Settings' window in BusXpert 0.0.97. The window has a menu bar (File, View, Capture, Window, Help) and buttons for 'Open Trace', 'Start Capture', 'Stop Capture', and 'Help'. A sidebar on the left contains 'Analyzer', 'Filter', 'Trigger', and 'Status' icons. The main area is titled 'Filter Settings' and contains 'Capture Options'.

Under 'Capture Options', there are checkboxes for 'I/T' and 'MUX a/b'. Below this is a table with columns for 'All Links' and 'A1' (I1a, T1a, I1b, T1b, I2a, T2a, I2b, T2b, I3a, T3a, I3b, T3b, I4a, T4a, I4b, T4b). The rows represent different filter categories.

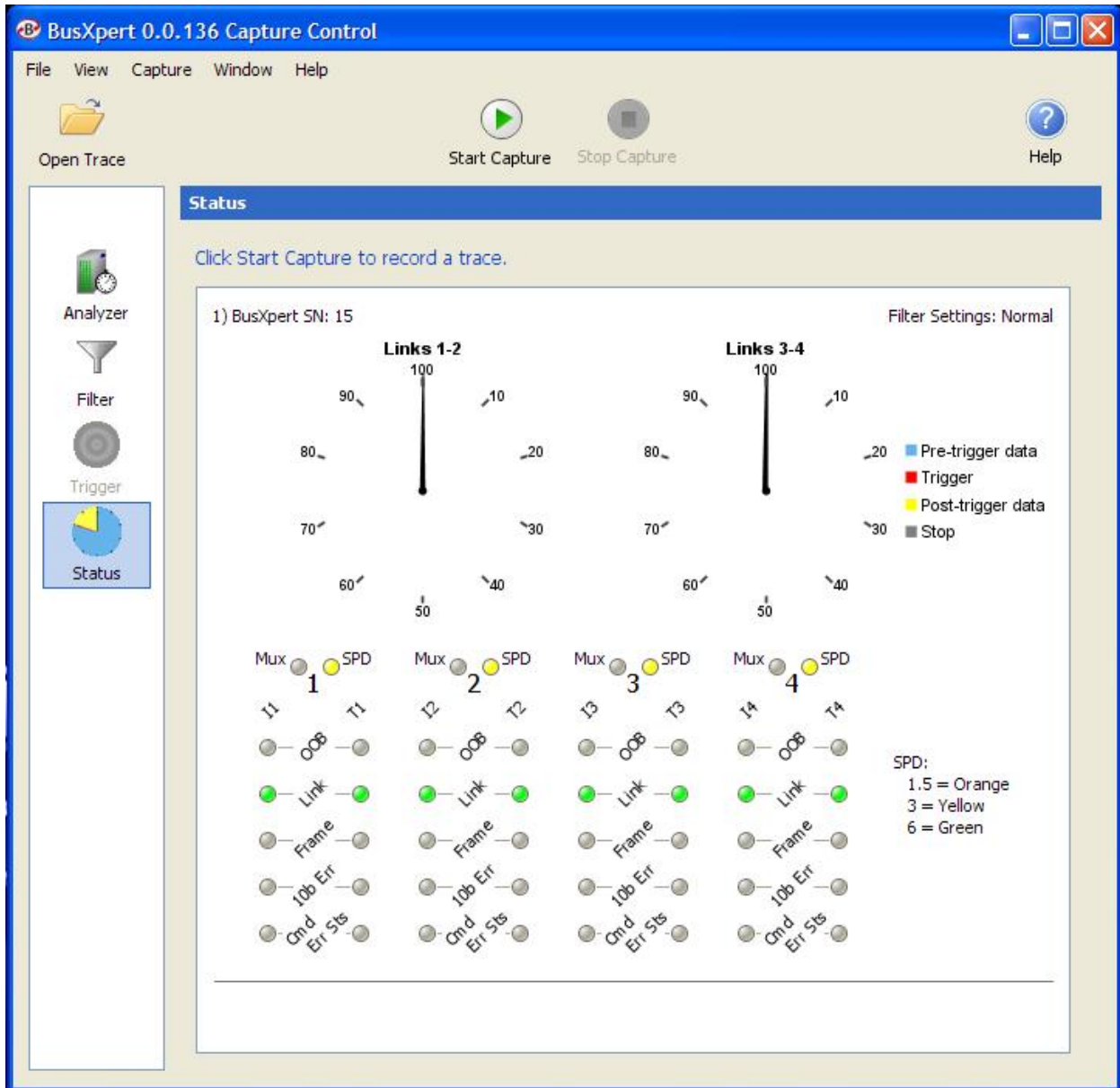
Capture	All Links	A1															
		I1a	T1a	I1b	T1b	I2a	T2a	I2b	T2b	I3a	T3a	I3b	T3b	I4a	T4a	I4b	T4b
<b>Capture this link</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SAS Idle and SATA_XXXX	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>OOB events</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Dwords during OOB Bursts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Primitives</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ALIGN	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
NOTIFY	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SYNC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

At the bottom right of the table area is a 'Default Settings' button.

Triggering is one of the most important features on any analyzer. The BusXpert has made it both easy and powerful in this feature rich drag 'n drop environment. You can have upto 32 or conditions in any 'state' and up to 16 'and' conditions within any single sequencer. There are 8 timers and individual counters for each event as well as full branching and looping within the sequencers. There are upto 4 sequencers per/4 ports (8 sequencers for muxed traffic) making the BusXpert the most innovative triggering analyzer in the marketplace. Individual items can be edited and saved (dragged into) the User Terms area for reuse and full trigger sequencers can be saved for sharing and reuse.



The Status displays any time the analyzer is 'armed' and running. It not only shows the circular buffer usage, it shows the LED lights from the front of the analyzer in 'real-time' and will show where the triggering logic is within the triggering sequencer.



The BusXpert Viewer Software: Where the innovation just keeps on getting better! This is the protocol view and the 'lowest' level of data view for the BusXpert. Any frame with multiple dwords in it will be automatically 'rolled up' so that it doesn't take up many lines/pages of view space, but simply put the mouse over that event and you can easily expand the entire frame into separate dwords and be able to go previous or next with a simple click. Simple side-by-side I/T display complete with X and O markers, unlimited long bookmarks and time stamp manipulation.

Time	I1	T1
0.017.207.384		
0.017.207.388	ACK BC818181	
0.017.304.752	SSP COMMAND WRITE (10)	
0.017.304.756		
0.017.305.292		ACK BC818181
0.017.305.296		
0.017.327.840	SOF (SSP COMMAND) BC18E467	
0.017.327.844	COMMAND_Dest:BF686E 06BF686E	
0.017.327.848	Source:DB182F 00DB182F	
0.017.327.852		
0.017.327.856		
0.017.327.860	TLP Ctrl:0,Retry:0,Re-tr:0,CDP:0 00000000	
0.017.327.864	Reserved 00000000	
0.017.327.868		
0.017.327.872	Tag:0001,Tgt Port Tx Tag:FFFF 0001FFFF	
0.017.327.876		
0.017.327.880	Data Offset:00000000 00000000	
0.017.327.884	LUN[63:32] 00000000	
0.017.327.888		
0.017.327.892	LUN[31:0] 00000000	
0.017.327.896		
0.017.327.900	ENABLE FIRST BURST:0,TASK ... 00000000	
0.017.327.904		
0.017.327.908	READ (10),RDPROTECT:0,DPO: ... 28000000	
0.017.327.912		
0.017.327.916	LBA:0000000E,GROUP NUMBER ... 000E0000	
0.017.327.920	TRANSFER LENGTH:0002,CON ... 02000000	
0.017.327.924		
0.017.327.928	Reserved 00000000	
0.017.327.932		
0.017.327.936	CRC BAADBABE	
0.017.327.940	EOF BC18F09B	
0.017.327.944		
0.017.328.380		ACK BC818181
0.017.328.384		
0.017.428.344		SSP XFER_RDY 1024 bytes
0.017.428.348		
0.017.428.844		
0.017.428.848	ACK BC818181	
0.017.467.752	SSP DATA Offset:0h; 1024 bytes	
0.017.467.756		
0.017.469.952		ACK BC818181
0.017.469.956		
0.017.512.440		RRDY (NORMAL) BC8118F0
0.017.512.444		
0.017.512.492		RRDY (NORMAL) BC8118F0
0.017.512.496		

The Spreadsheet view is a line-by-line interleaved display for easily seeing flow between any initiator(s) or target(s) including expander traffic and primitive flow. All columns are re-sizeable, hide-able, move-able and user name-able. These views are completely 'synchronize-able' in time order by a simple 'double-click'.

Time	DeRa...	Store#	Cha...	Type - Initiator	Type - Target	Command	Decode	Tag	Source	Destination	LBAJ...
0.018.538.526	1,025,...		T1:112	T1		RESPONSE	SSP RESPONSE; STATUS:00(GOOD)	0	5000e85000000001	5000e85000000...	
0.018.539.046	520		I1:110	II	ACK		ACK				
0.018.556.560	17,514		I1:111	II	RRDY (NORMAL)		RRDY (NORMAL)				
0.018.556.613	53		I1:112	II	RRDY (NORMAL)		RRDY (NORMAL)				
0.018.556.666	53		I1:113	II	RRDY (NORMAL)		RRDY (NORMAL)				
0.019.582.946	1,026,...		T1:114	T1		DATA	SSP DATA; Offset:0h; 1024 bytes	1	5000e85000000001	5000e85000000...	
0.019.585.132	2,186		I1:114	II	ACK		ACK				
0.019.638.586	53,454		T1:116	T1		RESPONSE	SSP RESPONSE; STATUS:00(GOOD)	1	5000e85000000001	5000e85000000...	
0.019.639.106	520		I1:115	II	ACK		ACK				
0.019.732.960	93,874		I1:116	II	COMMAND	2a: WRITE (10)	SSP COMMAND; WRITE (10)	0	5000e85000000100	5000e85000000...	10
0.019.733.520	540		T1:118	T1		ACK	ACK				
0.019.755.992	22,472		I1:118	II	COMMAND	28: READ (10)	SSP COMMAND; READ (10)	1	5000e85000000100	5000e85000000...	10
0.019.756.532	540		T1:119	T1		ACK	ACK				
0.019.860.132	103,600		T1:120	T1		XFER_RDY	SSP XFER_RDY; 1024 bytes	0	5000e85000000001	5000e85000000...	
0.019.860.632	500		I1:120	II	ACK		ACK				
0.019.879.946	19,314		I1:121	II	RRDY (NORMAL)		RRDY (NORMAL)				
0.019.879.999	53		I1:122	II	RRDY (NORMAL)		RRDY (NORMAL)				
0.019.880.052	53		I1:123	II	RRDY (NORMAL)		RRDY (NORMAL)				
0.019.896.360	16,308		I1:124	II	DATA		SSP DATA; Offset:0h; 1024 bytes	0	5000e85000000100	5000e85000000...	
0.019.897.207	847		I1:125	II	ALIGN (2)		ALIGN (2)				
0.019.898.566	1,359		T1:122	T1		ACK	ACK				
0.019.929.932	31,366		T1:123	T1		RRDY (NORMAL)	RRDY (NORMAL)				
0.019.929.985	53		T1:124	T1		RRDY (NORMAL)	RRDY (NORMAL)				
0.019.930.038	53		T1:125	T1		RRDY (NORMAL)	RRDY (NORMAL)				
0.020.955.492	1,025,...		T1:126	T1		RESPONSE	SSP RESPONSE; STATUS:00(GOOD)	0	5000e85000000001	5000e85000000...	
0.020.956.012	520		I1:127	II	ACK		ACK				
0.021.998.632	1,042,...		T1:128	T1		DATA	SSP DATA; Offset:0h; 1024 bytes	1	5000e85000000001	5000e85000000...	
0.022.000.820	2,188		I1:128	II	ACK		ACK				
0.022.054.280	53,460		T1:130	T1		RESPONSE	SSP RESPONSE; STATUS:00(GOOD)	1	5000e85000000001	5000e85000000...	
0.022.054.800	520		I1:129	II	ACK		ACK				
0.022.072.592	17,792		I1:130	II	RRDY (NORMAL)		RRDY (NORMAL)				
0.022.072.645	53		I1:131	II	RRDY (NORMAL)		RRDY (NORMAL)				
0.022.072.698	53		I1:132	II	RRDY (NORMAL)		RRDY (NORMAL)				
0.022.150.786	78,088		I1:133	II	COMMAND	2a: WRITE (10)	SSP COMMAND; WRITE (10)	0	5000e85000000100	5000e85000000...	12
0.022.151.332	546		T1:132	T1		ACK	ACK				
0.022.173.872	22,540		I1:135	II	COMMAND	28: READ (10)	SSP COMMAND; READ (10)	1	5000e85000000100	5000e85000000...	12
0.022.174.420	548		T1:133	T1		ACK	ACK				
0.022.275.832	101,412		T1:134	T1		XFER_RDY	SSP XFER_RDY; 1024 bytes	0	5000e85000000001	5000e85000000...	
0.022.276.332	500		I1:137	II	ACK		ACK				
0.022.313.786	37,454		I1:138	II	DATA		SSP DATA; Offset:0h; 1024 bytes	0	5000e85000000100	5000e85000000...	
0.022.316.000	2,214		T1:136	T1		ACK	ACK				
0.022.345.046	29,046		T1:137	T1		RRDY (NORMAL)	RRDY (NORMAL)				
0.022.345.099	53		T1:138	T1		RRDY (NORMAL)	RRDY (NORMAL)				
0.022.345.152	53		T1:139	T1		RRDY (NORMAL)	RRDY (NORMAL)				

The Transaction view was done in order to simply and efficiently show the different transaction levels of all commands found throughout the trace and their individual duration/completion times. The top level event is in 'time order' but then anything in the 'tree control' that's 'grouped' together can be out of order due to command tag queuing. However, this view makes it very simple to see incomplete and 'bad' commands. All columns are change-able, re-sizeable and hide-able too.

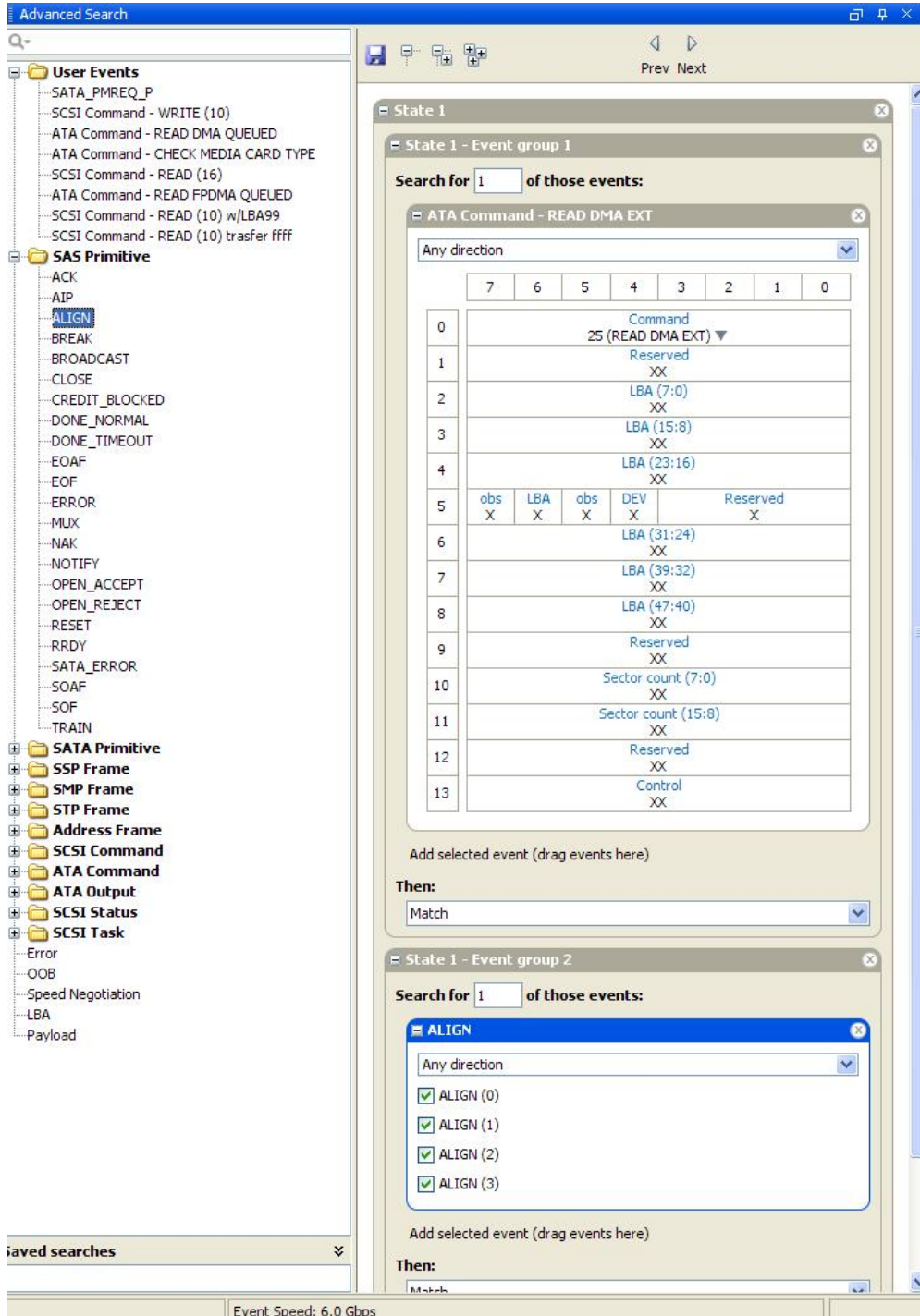
Transaction View										
Time	Store.#	Channel	Command	Tag	LBA	Status	Transfer Size	Duration		
0.007.667.100	I1:49	[I1, T1]	⊕ READ (10)	0001	0000000000006	GOOD	1,024	0.002.295.306		
0.010.052.452	I1:60	[I1, T1]	⊕ WRITE (10)	0000	0000000000008	GOOD	1,024	0.001.219.186		
0.010.075.466	I1:62	[I1, T1]	⊕ READ (10)	0001	0000000000008	GOOD	1,024	0.002.293.892		
0.012.468.646	I1:73	[I1, T1]	⊕ WRITE (10)	0000	000000000000A	GOOD	1,024	0.001.223.280		
0.012.491.732	I1:75	[I1, T1]	⊕ READ (10)	0001	000000000000A	GOOD	1,024	0.002.298.540		
0.014.888.552	I1:90	[I1, T1]	⊕ WRITE (10)	0000	000000000000C	GOOD	1,024	0.001.219.826		
0.014.911.566	I1:92	[I1, T1]	⊖ READ (10)	0001	000000000000C	GOOD	1,024	0.002.295.826		
0.014.911.566	I1:92	I1	COMMAND; READ (10)							
0.017.151.226	T1:100	T1	DATA; Offset:0h; 1024 bytes							
0.017.206.866	T1:102	T1	RESPONSE; STATUS:00(GOOD)							
0.017.304.752	I1:103	[I1, T1]	⊕ WRITE (10)	0000	000000000000E	GOOD	1,024	0.001.234.300		
0.017.327.840	I1:105	[I1, T1]	⊕ READ (10)	0001	000000000000E	GOOD	1,024	0.002.311.272		
0.019.732.980	I1:116	[I1, T1]	⊖ WRITE (10)	0000	0000000000010	GOOD	1,024	0.001.223.038		
0.019.732.980	I1:116	I1	COMMAND; WRITE (10)							
0.019.860.132	T1:120	T1	XFER_RDY; 1024 bytes							
0.019.896.360	I1:124	I1	DATA; Offset:0h; 1024 bytes							
0.020.955.492	T1:126	T1	RESPONSE; STATUS:00(GOOD)							
0.019.755.992	I1:118	[I1, T1]	⊕ READ (10)	0001	0000000000010	GOOD	1,024	0.002.298.814		
0.022.150.786	I1:133	[I1, T1]	⊕ WRITE (10)	0000	0000000000012	GOOD	1,024	0.001.220.212		
0.022.173.872	I1:135	[I1, T1]	⊕ READ (10)	0001	0000000000012	GOOD	1,024	0.002.295.540		
0.024.569.086	I1:146	[I1, T1]	⊕ WRITE (10)	0000	0000000000014	GOOD	1,024	0.001.223.120		
0.024.592.100	I1:148	[I1, T1]	⊕ READ (10)	0001	0000000000014	GOOD	1,024	0.002.298.852		
0.026.985.280	I1:159	[I1, T1]	⊕ WRITE (10)	0000	0000000000016	GOOD	1,024	0.001.221.932		
0.027.008.366	I1:161	[I1, T1]	⊕ READ (10)	0001	0000000000016	GOOD	1,024	0.002.297.620		
0.029.405.186	I1:175	[I1, T1]	⊕ WRITE (10)	0000	0000000000018	GOOD	1,024	0.001.223.366		
0.029.428.200	I1:177	[I1, T1]	⊕ READ (10)	0001	0000000000018	GOOD	1,024	0.002.298.692		
0.031.821.386	I1:188	[I1, T1]	⊕ WRITE (10)	0000	000000000001A	GOOD	1,024	0.001.220.986		
0.031.844.472	I1:190	[I1, T1]	⊕ READ (10)	0001	000000000001A	GOOD	1,024	0.002.296.666		
0.034.240.466	I1:201	[I1, T1]	⊕ WRITE (10)	0000	000000000001C	GOOD	1,024	0.001.223.646		
0.034.263.486	I1:203	[I1, T1]	⊕ READ (10)	0001	000000000001C	GOOD	1,024	0.002.299.646		
0.036.659.786	I1:217	[I1, T1]	⊕ WRITE (10)	0000	000000000001E	GOOD	1,024	0.001.219.900		
0.036.682.880	I1:219	[I1, T1]	⊕ READ (10)	0001	000000000001E	GOOD	1,024	0.002.296.866		
0.039.069.720	I1:230	[I1, T1]	⊕ WRITE (10)	0000	0000000000020	GOOD	1,024	0.001.220.272		
0.039.092.740	I1:232	[I1, T1]	⊕ READ (10)	0001	0000000000020	GOOD	1,024	0.002.296.032		
0.041.487.426	I1:243	[I1, T1]	⊕ WRITE (10)	0000	0000000000022	GOOD	1,024	0.001.232.646		
0.041.510.520	I1:245	[I1, T1]	⊕ READ (10)	0001	0000000000022	GOOD	1,024	0.002.307.966		
0.043.918.772	I1:259	[I1, T1]	⊕ WRITE (10)	0000	0000000000024	GOOD	1,024	0.001.222.500		
0.043.941.792	I1:261	[I1, T1]	⊕ READ (10)	0001	0000000000024	GOOD	1,024	0.002.297.746		
0.046.336.486	I1:272	[I1, T1]	⊕ WRITE (10)	0000	0000000000026	GOOD	1,024	0.001.234.406		
0.046.359.580	I1:274	[I1, T1]	⊕ READ (10)	0001	0000000000026	GOOD	1,024	0.002.309.458		
0.048.766.220	I1:285	[I1, T1]	⊕ WRITE (10)	0000	0000000000028	GOOD	1,024	0.001.233.818		
0.048.789.240	I1:287	[I1, T1]	⊕ READ (10)	0001	0000000000028	GOOD	1,024	0.002.308.518		



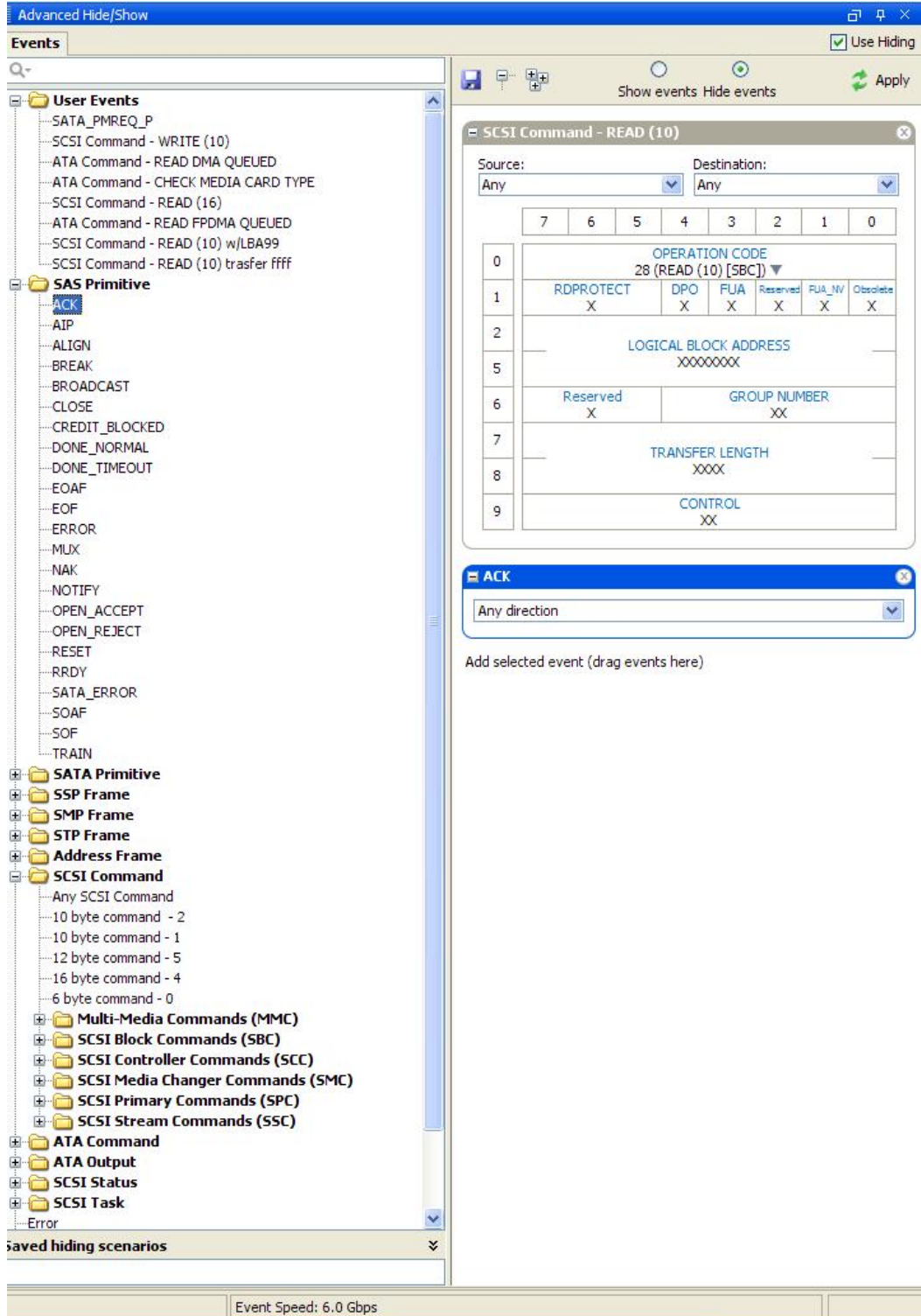
Then there's the Frame Details View. This view has won the hearts and minds of all engineers that see/use it. It simply decodes/displays all frame data identically as the specification shows it. No more having to refer to the specification document in order to remember which bits and bytes mean what within any frame or command. This view is dynamically updated as you pass over these items in any of the different views of the BusXpert's interface.

	7	6	5	4	3	2	1	0
0	FRAME TYPE 06 (COMMAND)							
1	HASHED DESTINATION SAS ADDRESS BF686E							
3	Reserved 00							
4	Reserved 00							
5	HASHED SOURCE SAS ADDRESS DB182F							
7	Reserved 00							
8	Reserved 00							
9	Reserved 00							
10	Reserved 0	TLR CONTROL 0			RETRY DATA FRAMES 0	RETRANSMIT 0	CHANGING DATA POINTER 0	
11	Reserved 00					NUMBER OF FILL BYTES 0		
12	Reserved 00000000							
15	Reserved 00000000							
16	TAG 0000							
17	TAG 0000							
18	TARGET PORT TRANSFER TAG FFFF							
19	TARGET PORT TRANSFER TAG FFFF							
20	DATA OFFSET 00000000							
23	DATA OFFSET 00000000							
24	LOGICAL UNIT NUMBER 0000000000000000							
31	LOGICAL UNIT NUMBER 0000000000000000							
32	Reserved 00							
33	ENABLE FIRST BURST 0	TASK PRIORITY 0			TASK ATTRIBUTE 0			
34	Reserved 00							
35	ADDITIONAL CDB LENGTH 00					Reserved 0		
36	OPERATION CODE 2A (WRITE (10) [SBC])							
37	WRPROTECT 0	DPO 0	FUA 0	Reserved 0	FUA_NV 0	Obsolete 0		
38	LOGICAL BLOCK ADDRESS 00000010							
41	LOGICAL BLOCK ADDRESS 00000010							
42	Reserved 0	GROUP NUMBER 00						
43	TRANSFER LENGTH 0002							
44	TRANSFER LENGTH 0002							
45	CONTROL 00							
46	Reserved 00							

Searching can be as simple as typing in a single event, command or primitive that you want to look for and saying 'find', however, it can be as complex as the most diverse triggering setup in order to find exactly what you are looking for. Thus, the BusXpert's Advanced Search was implemented. Easy-to-use drag 'n drop technology for building up complex levels of searching.



Lastly, but certainly not least, is the Advanced Filtering. While there are several 'fast' filters for the everyday/trace filtering there are those times when you really need to do multiple commands, event and primitives to filter these large traces down into meaningful data. That's where the BusXpert's Advanced Filter (show/hide) shines.



All views can be placed on the screen anywhere the user wishes in nearly any configuration possible. Simply grab the window you want and drag it to where you want it displayed. The software is smart enough to remember your last settings and keep the view that 'you' have chosen.

The screenshot displays the BusExpert 0.0.136 Trace Viewer interface, which is divided into several panes for analyzing data. The main window title is "BusExpert 0.0.136 Trace Viewer - sample\_6f\_writes\_reads\_ccs.as".

- Transaction View:** A table listing individual transactions with columns for Time, Store#, Channel, Command, Tag, LBA, Status, Transfer Size, and Duration. It shows a sequence of read and write operations.
- Spreadsheet View:** A detailed view of a transaction, showing fields like Time, Data, Store#, Channel, Type, Initiator, Type - Target, Command, Decode, Tag, Source, and Destination. It highlights specific data points and their interpretations.
- Protocol View:** A vertical pane on the right showing a hierarchical protocol tree. It details the structure of the data, including fields like "SOP (SOP DATA)", "SOP COMMAND", "SOP\_READ (10)", and "SOP\_XFER\_RDY".
- Data:** A hex dump at the bottom showing the raw data bytes in hexadecimal and ASCII, with a search bar and various filters.

The interface includes a menu bar (File, Edit, View, Go to, Capture, Window, Help), a toolbar with icons for file operations and capture control, and a search bar at the top. The bottom status bar shows the current time, trigger settings, and event statistics.