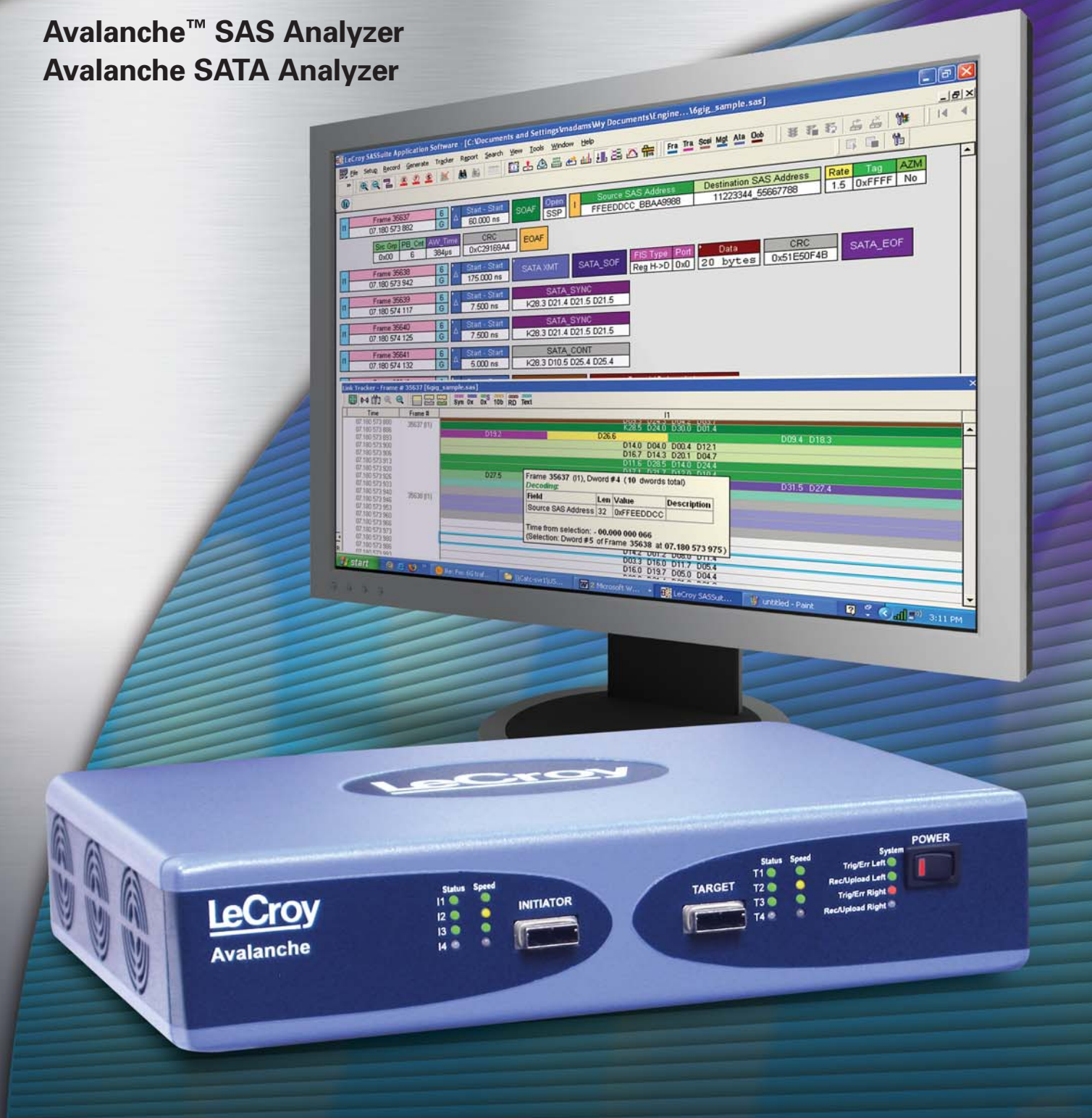
LeCroy

6Gb/s SAS and SATA Protocol Analysis Solutions

Avalanche™ SAS Analyzer
Avalanche SATA Analyzer



LeCroy, a worldwide leader in serial data test solutions, creates advanced instruments that drive product innovation by quickly measuring, analyzing, and verifying complex electronic signals. The Avalanche SAS and SATA Protocol Analyzers are LeCroy's newest systems that decode data rates up to 6Gb/s Serial Attached SCSI (SAS) and 6Gb/s Serial ATA (SATA) traffic.

Avalanche runs the SAS*Suite*™ and SATA*Suite*™ applications. Powerful post-processing reporting and search tools allow users to find errors and their causes very quickly. This system is capable of connecting to four hosts and targets simultaneously. Raw bit recording allows for analysis down to the lowest possible level and the 4GB buffer can record very deep traces. Avalanche also supports the SAS specification for zoning and multiplexing, which are used in complex storage networking environments. Avalanche comes in a compact package that is highly portable.

The SAS and SATA Solution

The Avalanche SAS analyzer system does more than just record traffic moving across 4-wide SAS links. Using the SAS*Suite* application, it provides a time-synchronized view, both at the DWORD and the Frame level, for all four links. In addition, it logically groups all frames that are part of a common operation, even if they are spread across multiple physical pathways. This eliminates the need to decode SAS transactions manually and helps find problems faster. It also includes full SATA analysis for testing in Serial ATA environments (6, 3, or 1.5Gb/s), and full decoding of STP traffic when SATA devices are used in SAS expander environments.

The SATA Only Solution

Avalanche also comes in a SATA-only version that runs the SATA*Suite* application. The Avalanche SATA Protocol Analyzer is capable of recording on four channels at 6, 3, or 1.5Gb/s data rates.

Powerful Display Views Allow for Easy Analysis of Protocol Traffic

LeCroy's SAS*Suite* or SATA*Suite* analysis software gives you a variety of powerful tools for analyzing and displaying bus traffic. The SAS*Suite* or SATA*Suite* software makes it easy for you to view all elements of a command, even if they are spread over several different physical links, helping you understand traffic flow and ensure devices are behaving correctly at the protocol level.

The Avalanche Analyzer records all the data on the link. Unfiltered SAS traffic contains tens of thousands of frames and primitives, which can make it extremely difficult for you to analyze and discover errors within the data. Within the trace display, you can preserve the detail, but also have an easy way to view the traffic hierarchically.

For instance, you can:

- Isolate the view to just the transport layer by clicking on the TRANS icon. This narrows down the display to the transport layer of the protocol, where each bi-directional exchange of information is represented as a discrete transaction making it easier for you to see the exchange of information between the initiator and target.
- Decode up to the application layer by selecting the SCSI icon. This decodes the SCSI command layer, and shows the addresses of the devices involved, the tag, the LUN, the type of command plus performance metrics that the software calculates.

Although the trace display is ideal for showing traffic at the logical level, it is often necessary to drill down to the byte level and see traffic across multiple lanes on a common timescale. The Link Tracker™ software display provides this view, and allows you to see the low level primitives and 32-bit data structures in hex, scrambled hex, or decoded with the field names displayed.

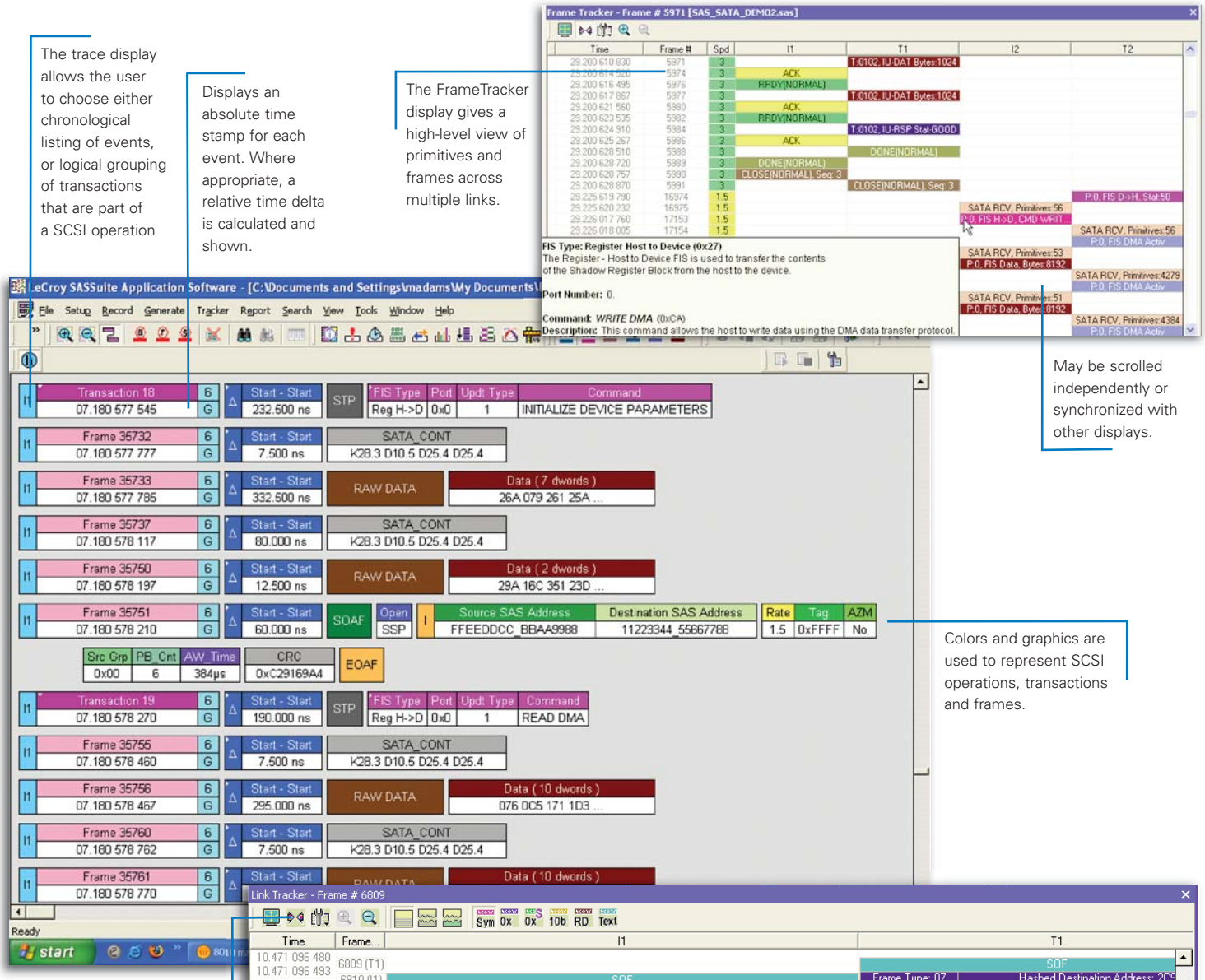
For more advanced analysis, another view available to you is the FrameTracker™ software display. This view shows each exchange of information in a separate cell while preserving the spatial relationship of traffic that is moving across multiple links.

Within each of these displays, Tooltips pop up to provide you with detailed descriptions of the field, including information about the SAS or SATA specification. At the higher layers, valuable performance metrics are calculated for each operation such as the number of frames in a sequence or the throughput and latency of a command. This helps you identify possible problems at the lower levels.

The trace display allows the user to choose either chronological listing of events, or logical grouping of transactions that are part of a SCSI operation

Displays an absolute time stamp for each event. Where appropriate, a relative time delta is calculated and shown.

The FrameTracker display gives a high-level view of primitives and frames across multiple links.



The Register - Host to Device FIS is used to transfer the contents of the Shadow Register Block from the host to the device.

Port Number: 0.

Command: *WRITE DMA* (0xCA)

Description: This command allows the host to write data using the DMA data transfer protocol.

May be scrolled independently or synchronized with other displays.

Colors and graphics are used to represent SCSI operations, transactions and frames.

May be scrolled independently or synchronized with other displays.

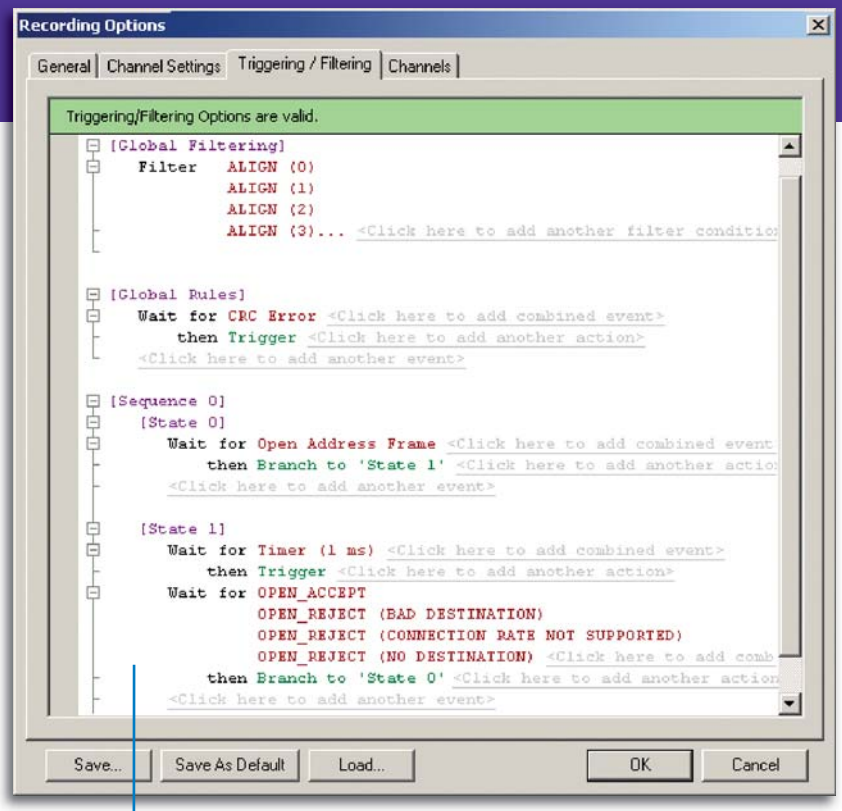
The Link Tracker display shows all DWORDs on all channels synchronized to a common clock.

Tooltips decode SCSI-specific payload information.

Simplify analysis of state transitions by viewing traffic across multiple links.

Powerful Triggering and Filtering

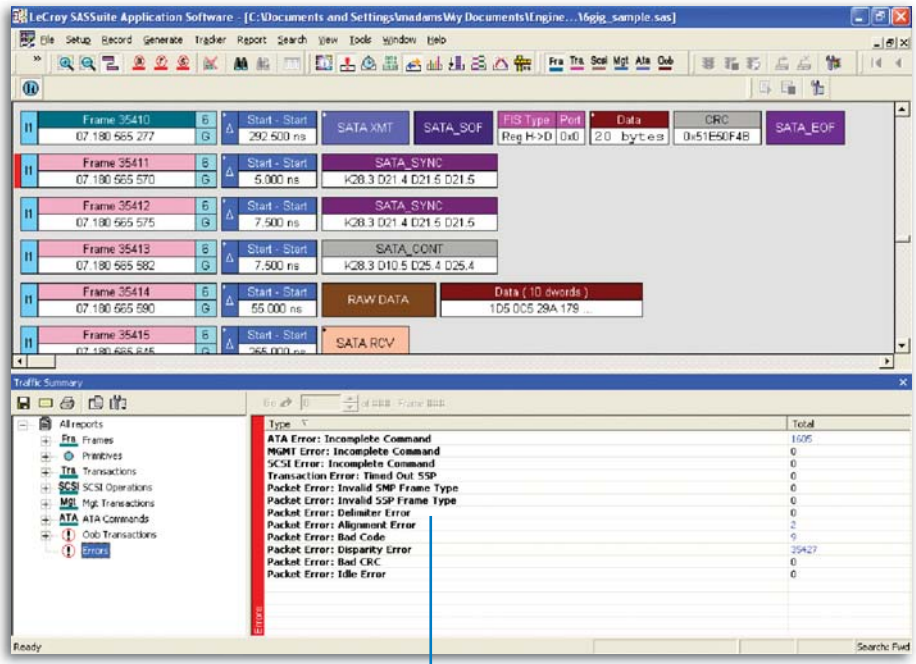
As the protocol evolves and moves from prototypes to system level testing, triggering becomes more important since problems from linking devices is more intermittent. The Avalanche software provides the ability to select simple triggers on typical events, like out of band signals, SCSI operations, primitives, hashed addresses or SCSI status. Triggers can be set up on almost any sequence of events possible; it supports up to 256 levels or sequential states, with six events per level. Multiple IF/THEN/ELSE/GOTO conditions can be programmed to isolate the important part of the traffic stream, and when you open the trace, it jumps right to that portion of the trace.



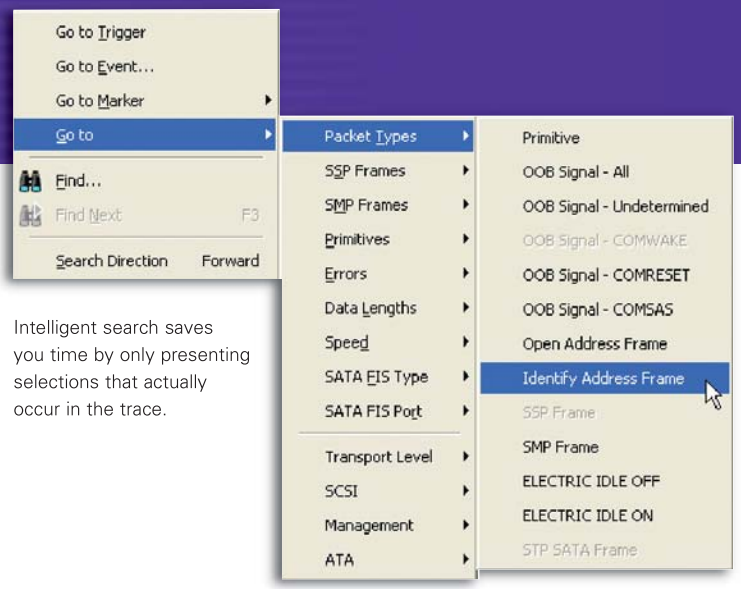
In this example, Avalanche filters out all ALIGN and NOTIFY primitives; If OPEN_ADDRESS is transmitted and OPEN ACCEPT or OPEN REJECT is not received within 1.00ms, then the analyzer (Open Time-out violation) triggers.

Comprehensive Traffic Reports and Summaries

Our SAS and SATA solutions are more than just data recorders. The real value is in the analysis of the data. The Avalanche software generates detailed reports that provide statistics on the occurrence of errors, primitives, frames, commands and other protocol events within the trace. You can evaluate these metrics at a glance or use them to navigate through the recording. The traffic summary can be printed or saved to text with a single keystroke.



Click on any error to automatically jump through each occurrence within the trace



Intelligent search saves you time by only presenting selections that actually occur in the trace.

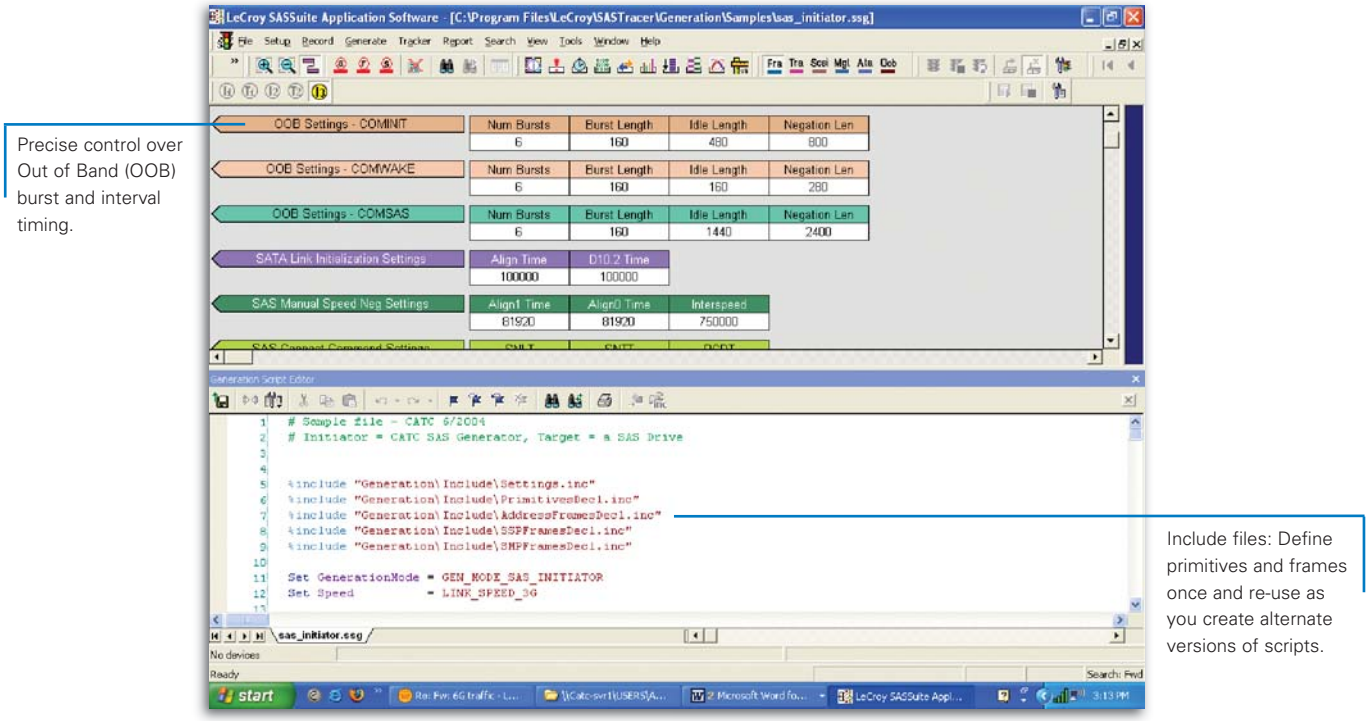
Search Results Quickly

The advanced search features in the SAS*Suite* and SATA*Suite* software help you quickly find what you want. By using the Quick Search, you can select fields right from the drop down menu, such as Go To Trigger or Event, or directly to a specific marker or time stamp in the trace. The Go To feature provides a simple way to search for SAS or SATA specific items within the trace, such as SSP frames or specific primitives.

The advanced Find lets you search on specific SCSI parameters like the Initiator Address or Tag Value of a SCSI operation. Using the Find dialog, you can chose your selection criteria and create a new trace file that represents only the data you seek.

OOB (Out of Band) Decoding Level

An OOB icon allows the trace view to show combined OOB scenarios (establishing link, speed negotiation, etc.) in one simplified and integrated view. These scenarios typically occur at power on and after hardware resets as devices initialize and initiate communications.



Precise control over Out of Band (OOB) burst and interval timing.

Include files: Define primitives and frames once and re-use as you create alternate versions of scripts.

A Comprehensive Solution

LeCroy's SAS and SATA solutions provide you with the advanced features necessary to speed the development and deployment of SAS and SATA devices. LeCroy's comprehensive product line, including Avalanche analyzers, SAS *Tracer/Trainer* analyzers and exercisers, InFusion error injectors, and high-speed Serial Data oscilloscopes, provides the tools to help engineers quickly identify and solve complex technical problems.

Let LeCroy's Serial Data Solutions peel back the layers of SAS and SATA to solve your test and verification challenges.

Key Features and Benefits

Features	Benefits
Complete Recording and Analysis At All Defined Data Rates	Avalanche system is designed to be plug-and-play compatible with both SAS and SATA (SAS version) or with SATA only (SATA version) at data rates of 6, 3, and 1.5Gb/s
Four Analysis Ports	Simultaneously monitor, trigger and record up to 4 independent links, each with independent data rates
State Machine Triggering	Isolate areas of interest with real-time hardware triggering
Hardware Filtering	Extend capture window by removing non-essential primitives from the recording
Raw Bit Recording	Analyze traffic at the lowest possible level
SAS Zoning and Multiplexing Capable	Capture, record, and analyze traffic in complex storage network environments
Link Tracker Display	Chronologically display all DWORDs on all channels, synchronized to a common clock
FrameTracker Display	Summary view shows transport level events in a time-synchronized table format
Cascade Multiple Analyzers	By cascading up to 8 analyzers, time-correlated traces for up to 32 channels can be recorded
Traffic Summaries	Statistical reports provide high-level abstraction of events, operations, errors, and OOB transactions
Collapsible / Expandable Headers	Easy "drill-down" on field structures for individual Frames, Commands, and Tasks
Automatic Multilevel Decoding	View high-level protocol events at OOB View, Frame and Transport (or FIS) layers; including SCSI STP, SMP or ATA transactions
Field Upgradeable BusEngine™	Easily upgrade firmware to support new features
Dynamically Allocated Memory	A total of 4GB of trace memory is divided into two dynamically-allocated 2GB buffers(1) to capture long recording sessions for analysis and problem solving
3 Year Hardware Warranty	Protect your investment with our industry-leading warranty

(1) Channels 1 and 2 share one 2GB buffer; Channels 3 and 4 share the second buffer.

Specification and Ordering Information

Specifications

LeCroy Avalanche SAS and SATA Protocol Analyzer

Host Requirements	Windows 2000, or greater; Intel Pentium II processor or greater; USB port
Recording Memory Size	4GB for trace capture, timing, and control information
Power Requirements	100–250 VAC, 50–60 Hz (universal input), 180W maximum
Connectors	AC power connection, External trigger connection (TRIG IN/OUT, SMA), USB type "B" host computer connection, Breakout Board Data Output Connection (RS232)
Power (PWR)	Lights when power is on
Status (STATUS)	Lights during power up of platform; Blinks if self-test fails
Manual Trigger Switch	Forces a trigger event when pressed
Basic Trigger Events	Primitives, Bus Conditions, FISs, Errors, ATA Commands, SATA Commands, External Signals, Vendor FIS, Data Pattern SCSI Operations, SCSI Status, SSP IUs, SMP Request/Response
Traffic Summary Reports	Errors, Primitives, FIS, Frames, Transactions, SCSI Operations, ATA Commands
Bus Utilization Reports	Pending SCSI IOs, Pending ATA IOs, Response Time, Latency Time, Throughput, Frame Length, Link Utilization, Data Throughput, Frames Count

Connectors

Two (2) 4-port MiniSAS	One MiniSAS connector supports up to four initiators, the second connector supports up to four targets

Indicators (LEDs)

Initiator Status (I1, I2, I3, I4)	Green when receiving a frame, Red on error, and mixed Green/Red during OOB
Initiator Speed (I1, I2, I3, I4)	Green for 6Gb/s, mixed Green/Yellow for 3Gb/s, and Yellow for 1.5Gb/s
Target Status (T1, T2, T3, T4)	Green when receiving a frame, Red on error, and mixed Green/Red during OOB
Target Speed (T1, T2, T3, T4)	Green for 6Gb/s, mixed Green/Yellow for 3Gb/s, and Yellow for 1.5Gb/s
Trig/Err Right	Green when Channel 1 or 2 are triggered, Red on error
Rec/Upload Right	Red when Link 1 or 2 are recording, Green when uploading
Trig/Err Left	Green when Channel 3 or 4 are triggered, Red on error
Rec/Upload Left	Red when Channel 3 or 4 are recording, Green when uploading

Physical and Environmental

Dimensions (W x H x D)	29.4 x 6.7 x 23.7 cm (11.6 x 2.6 x 9.3 inches)
Net Weight (Chassis)	3.4 Kg (7.5 lbs.)
Net Weight (Chassis + Power Supply)	4.3 Kg (9.5 lbs.)
Temperature: Operating	0 °C to 55 °C (32 °F to 131 °F)
Temperature: Non-Operating	-20 °C to 80 °C (-4 °F to 176 °F)
Humidity: Operating	10% to 90% RH (non-condensing)

Ordering Information

Product Description	Product Code
Avalanche SAS and SATA Systems (units)	
Avalanche 4-port System	SS022UAA-X
Avalanche SAS and SATA Applications	
SAS*Suite* 6G 1-port Software License (SAS & SATA)	SS031SAA-X
SAS*Suite* 6G 2-port Software License (SAS & SATA)	SS032SAA-X
SAS*Suite* 6G 4-port Software License (SAS & SATA)	SS033SAA-X

Product Description	Product Code
Avalanche SAS and SATA Applications (continued)	
SAS*Suite* 6G 1-port Software License (SATA only)	SA031SAA-X
SAS*Suite* 6G 2-port Software License (SATA only)	SA032SAA-X
SATA*Suite* 6G 4-port Software License (SATA only)	SA033SAA-X

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