PROTOCOL SOLUTIONS GROUP
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Sierra M6-4
SAS/SATA Protocol Analyzer
User Manual
Version 1.1

October 2008

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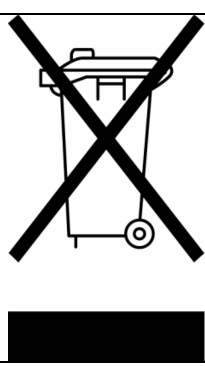
WEEE Program



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Contents

Introduction

This manual describes installation and operation of the LeCroy Sierra M6-4™ Protocol Analyzer and includes examples of typical applications.

Figure 1 LeCroy Sierra M6-4 Protocol Analyzer

Analyzer Overview

The Sierra M6-4 SAS/SATA Protocol Analyzer is a serial bus analyzer, supports host and device emulation, and provides error injection functionality. The SAS analyzer software performs serial bus analysis for Serial Attached SCSI (SAS) data transfers, as well as Serial ATA (SATA) data transfers through STP data transfers. The SATA analyzer software performs serial bus analysis for Serial ATA (SATA) data transfers.

The Sierra M6-4 Analyzer helps Hardware, Firmware, Design, and Application Engineers troubleshoot and diagnose SAS and SATA problems within their product. The analyzer supports the following:

- Capture, triggering, and filtering of Serial Attached SCSI packets or Serial ATA packets
- Generation of bus traffic as a SAS Initiator Emulator or a SATA Host Emulator, while monitoring and analyzing results
- SAS target emulation and SATA device emulation
- Running a Pattern Generator
- TX Vout on transmitters for test and characterization

The analyzer provides for bi-directional trigger and capture of commands, primitives, patterns and all bus conditions. You can capture all frames and/or exclude traffic.

The Sierra M6-4 Analyzer has a USB port and an Ethernet port to connect to a computer. You can cascade analyzer units for higher port counts. You can trigger manually or trigger on a specific event.

The Sierra M6-4 Analyzer provides a full range of views and statistical reports.

Receiving Your Analyzer

The analyzer package includes the following components:

- 1 Sierra M6-4 Analyzer identified in the packing list
- 1 MiniSAS to 4-x1 SATA straight cable, 1 meter
- 1 MiniSAS to 4-x1 SATA crossover cable, 1 meter
- 2 mSAS to mSAS cables, 1 meter
- 2 mSAS to SAS x4 cables, 1 meter
- 1 USB A-B 2.0 cable, 1.8 meter
- 1 Ethernet cable, 10 feet
- 1 10-position ribbon cable, 6 inches
- 1 SMB RA to SMB RA cable, 6 inches
- 1 Three-Prong AC power cord
- 1 Installation CD ROM with software and documentation
- 1 Sierra M6-4 Getting Started manual

Unpacking the Analyzer

Inspect the received shipping container for any damage. Unpack the container and account for each of the system components listed on the accompanying packing list. Visually inspect each component for absence of damage. In the event of damage, notify the shipper and LeCroy Corporation. Retain all shipping materials for shipper's inspection.

Analyzer Features

The Analyzer has the following features:

- Power Switch
- Frame, Speed, Link, Error, and Trigger LEDs
- External Trigger Input and Output
- Initiator and Target mini-SAS connectors (4)
- Expansion In/Out data ports and Clock In/Out connectors
- Status and Configuration LCD Display
- USB port for host connectivity
- Ethernet port for network connectivity
- Power In (on back)

Figure 2 Front Panel

LEDs

LEDs support each port link, with the following functionality:

FRAME/OOB Green Before the link is established, illuminates during the OOB sequence. After the link is established, indicates traffic on the bus.

SPEED Orange Illuminates as follows:

Speed	**Initiator**	**Target**
1.5G	Off	Off
3.0G	On	Off
6.0G	On	On

LINK Yellow Illuminates when a link is established.

ERROR Red Illuminates when an error occurs.

TRIGGER Blue Illuminates when a trigger occurs.

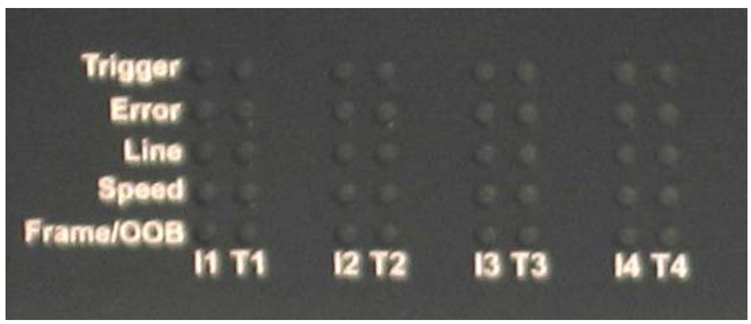


Figure 3 LEDs

Status and Configuration Display

The Analyzer front LCD display indicates the configuration and status of operations. For example, during initialization, the LCD panel displays boot status messages.

Installing Your Analyzer

Software Installation

The software works on systems using the Windows® XP operating system.

Do not connect! Do not connect Sierra M6-4 to your host system until software installation is complete.

1. Insert the Installation CD ROM into the CD drive on the host machine.
2. The installation automatically starts setup, unless Auto Run is off. In that case, select the CD ROM from “My Computer” and click **Setup**.
3. After the warning to close all other programs and before starting the installation, the Install component selection opens.
4. Select components for installation.
5. Click **Next** to complete the installation.

System restart

You must restart your computer before you can use your Analyzer software.

Error Message

If you get an error message during installation of the drivers for Window, consult your system administrator. Your system may allow only administrator-level users to copy such driver files.

Hardware Setup

Separate Systems

When using the analyzer, it is recommended to use a system to generate bus traffic and a second system to run the software, to avoid characterization of analyzer traffic.

Connecting in General

Note: You must install the software before connecting the analyzer to the host machine for the first time.

To set up the analyzer:

1. Connect the analyzer to a 100V–240V, 50Hz–60Hz, power outlet and turn on the Power switch.
   At power on, the analyzer will go through initialization as shown on the LCD display.
2. Connect the USB cable between the Sierra M6-4 USB port and a USB port on the Host PC. The host PC operating system detects the analyzer and driver files.
3. Connect the analyzer as shown in Figure 4:

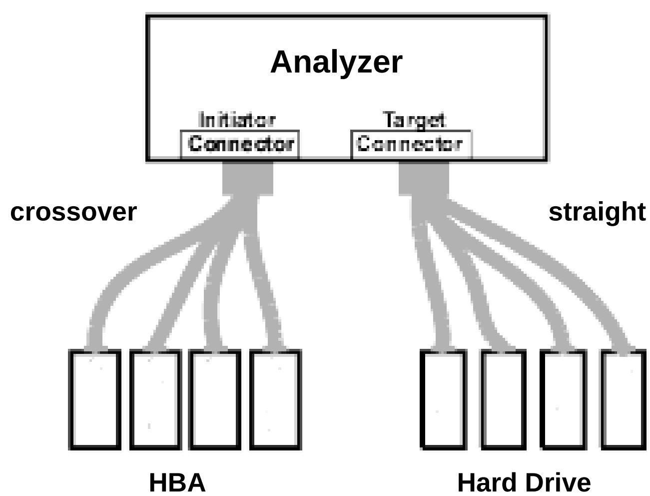


Figure 4 Analyzer Connections

Cables to Use

When using Sierra as a Host Emulator, connect from Target to hard drives using an iPass to SATA octopus Straight cable.

When using Sierra as a Device Emulator, connect from Initiator to HBAs using an iPass to SATA octopus Crossover cable.

When connecting between a HBA and a disk drive, use a crossover MiniSAS (iPASS) from the initiator port on the Sierra to MiniSAS or SAS4X cable depending on the HBA connector, and a MiniSAS from the target port to SATAx4, connecting the SATA connector to the disk drive.

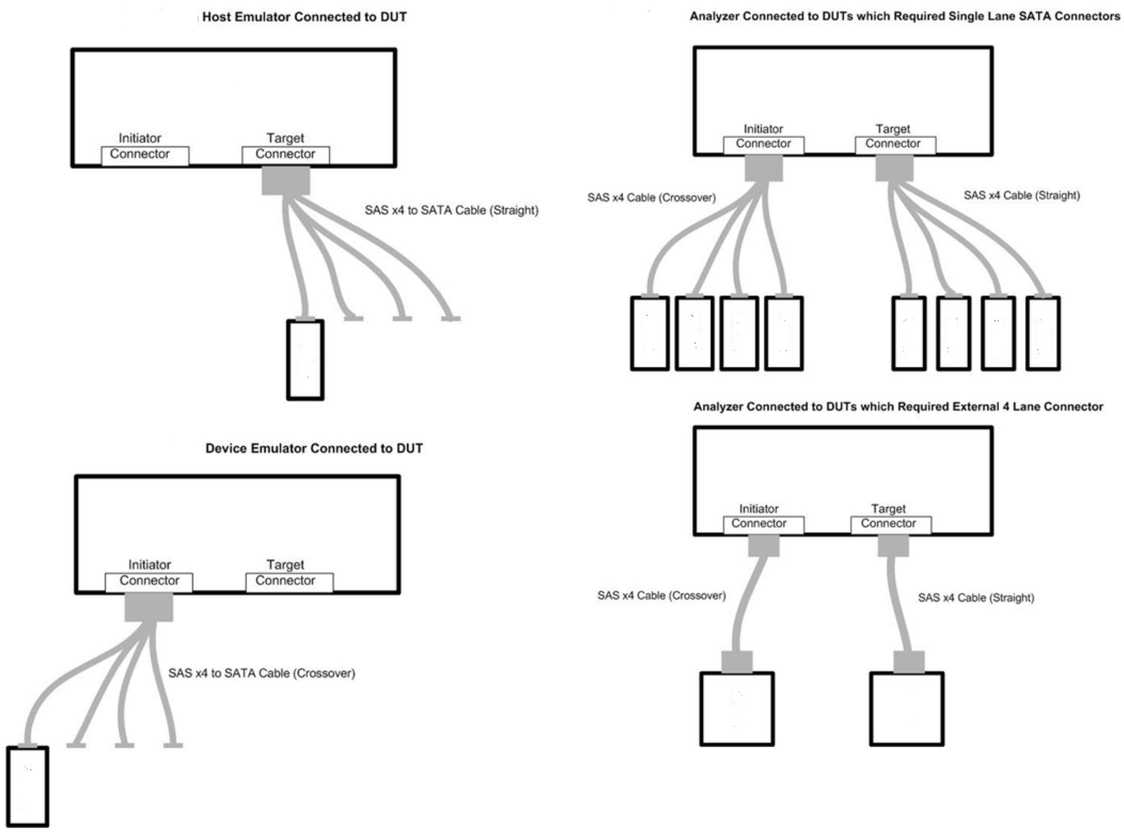


Figure 5 Sierra M6-4 Connected as an Analyzer

Expandability

You can use cascading of analyzer units for higher port count, by daisy chaining the units through the provided Expansion and Clock In/Out interfaces on the analyzer front. Connect “Out” connectors to “In” connectors of the next unit in the chain, for both Signal and Clock interfaces. You must provide external hubs for connecting the host PC to these units using USB or Ethernet. You can cascade up to eight units.

Cascading

To set up the units in a cascade:

1. Connect all units to the Host PC using either USB or Ethernet cables. You can use hubs.
2. Locate the Expansion and Clock ports on the front of each unit.

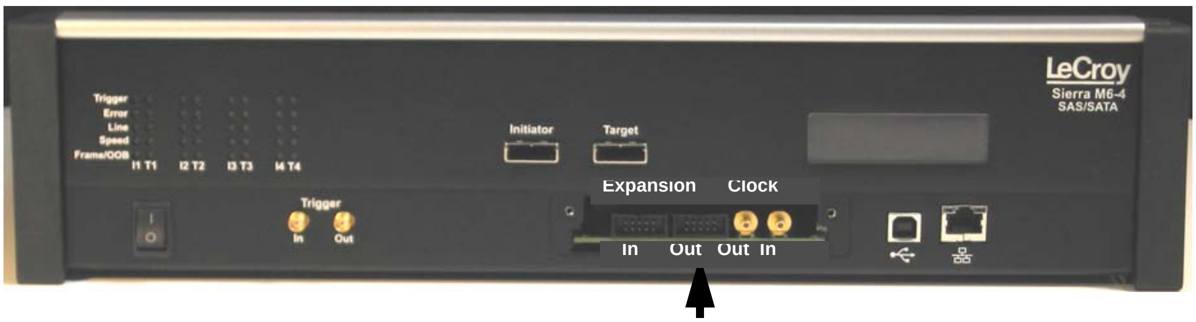


Figure 6 Expansion and Clock Ports on Front Panel

3. Connect the OUT Clock connector of Unit 1 to the IN Clock connector of Unit 2 using the supplied stacking cables. Similarly connect any additional units.

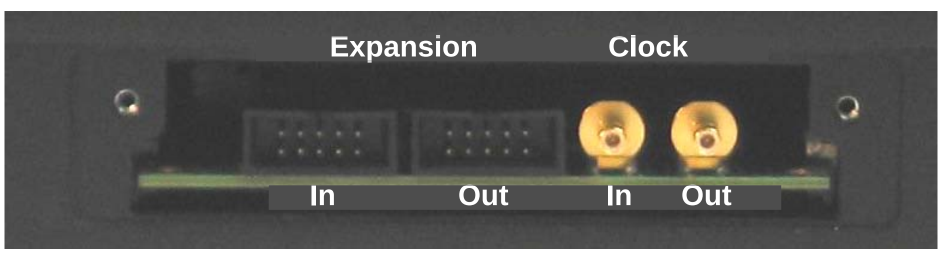


Figure 7 Expansion and CLOCK Ports

4. Connect the OUT 10-pin connector of Unit 1 to the IN 10-pin connector of Unit 2 using the supplied stacking cables. Similarly connect any additional units.

Note: Unit 1 must be the unit that has the first out connection.

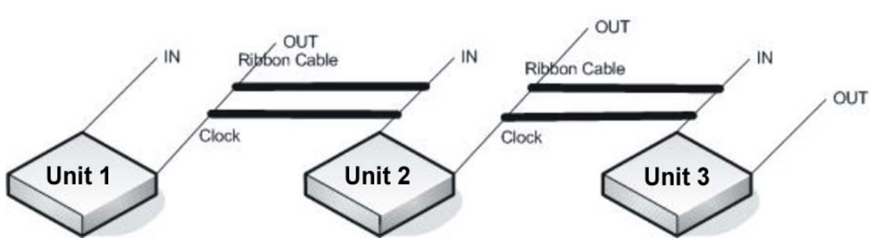


Figure 8 Cascading

5. Make a note of the last four digits of the MAC address of the unit designated as Unit 1 and the last four digits of the other units, in order of connection.

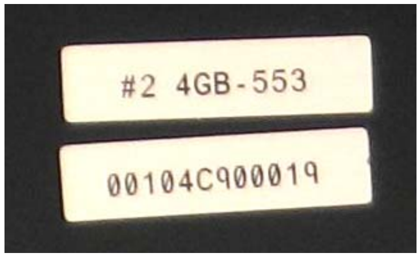


Figure 9 Address Digits

Important! Power up all units before starting the software.

After you start the software, the software searches for and displays all connected units in the Select Device dialog.

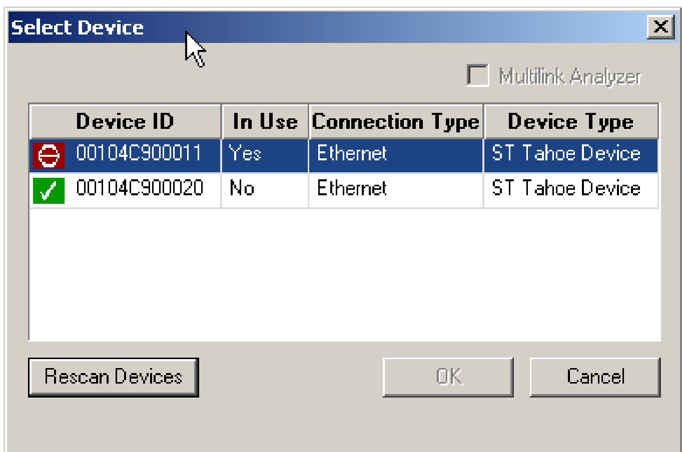


Figure 10 Select Device Dialog

If you have multiple devices, you can check the **Multilink Analyzer** check box.

You must compare the addresses in the Device ID field to the addresses you noted in step 5 above.

To match your unit sequence to the address for each unit in the Select Device dialog, click the pull down tab under the **Order** heading (not shown, but on the right side) and select unit numbers: 1 for Unit 1, 2 for Unit 2, and so on.

Then click **OK** and let the software initialize.

Important! Power up all units before starting the software.

Connecting via Ethernet

The Ethernet connection can have any of these configurations:

1. Analyzer connected to a network using a hub, switch, Gigabit Ethernet interface, or similar device.
2. Analyzer connected to the host computer (machine running the application software), using a hub, switch, Gigabit Ethernet interface, or similar device.
3. Analyzer connected directly to the host computer using a crossover cable.

Connecting to a Network

When connected to a network, the analyzer can communicate with the DHCP server to establish a connection. The DHCP server continually sends the next available IP address to the analyzer until the software starts.

Connecting using a Hub, Switch, or Similar Device

When connected to the host machine using a hub, switch, Gigabit Ethernet interface, or similar device, the Analyzer must communicate with the host computer to establish a connection. The host computer continually broadcasts the next available IP address to the Analyzer, until the software starts.

IP Address

When you start the software, the Device Selection dialog appears.

Figure 11 Device Selection Dialog

To look for local devices on the Ethernet, select the **Ethernet** check box.

The Internet Protocol (TCP/IP) Properties dialog may prompt you to automatically use the offered IP address or to assign a specific IP address. (The assigned IP address must be on the same network segment as the host computer.)

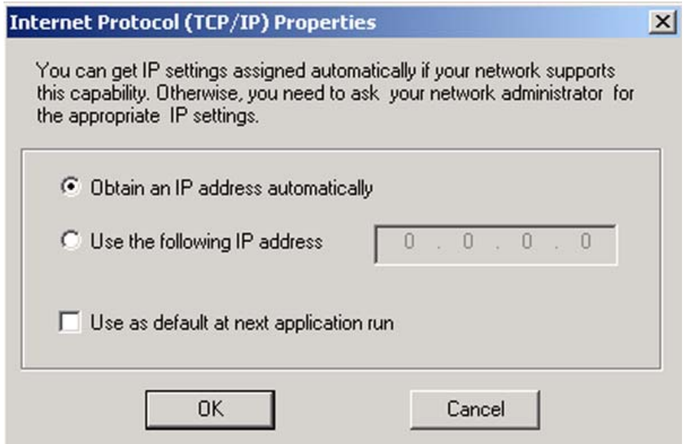


Figure 12 Internet Protocol (TCP/IP) Properties

The menu also allows you to save the selected option (automatic or specific address).

If the assigned IP address is not available, the OS notifies you of an IP address conflict.

After you click **OK**, the software searches for all analyzers connected to the network and displays a list of available units in the Select Device dialog.

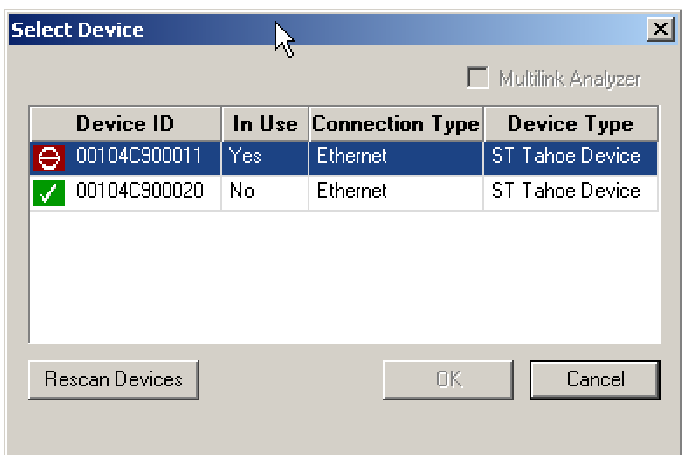


Figure 13 Select Device Dialog

After you select a unit, the software assigns the IP address to the selected unit, completing the connection, then launches the software.

Connecting over Different Subnets

If the Host PC (with the Sierra software) and Sierra M6-4 are on the same subnet, they will see each other's broadcasts, and the Sierra M6-4 application will automatically appear in the Select Device dialog, from which you can select a device (as described in the previous section).

If the Host PC and Sierra M6-4 do not reside on the same subnet, they will not see each other automatically. You must add the Sierra M6-4 IP address manually. When you start the software, the Device Selection dialog appears.

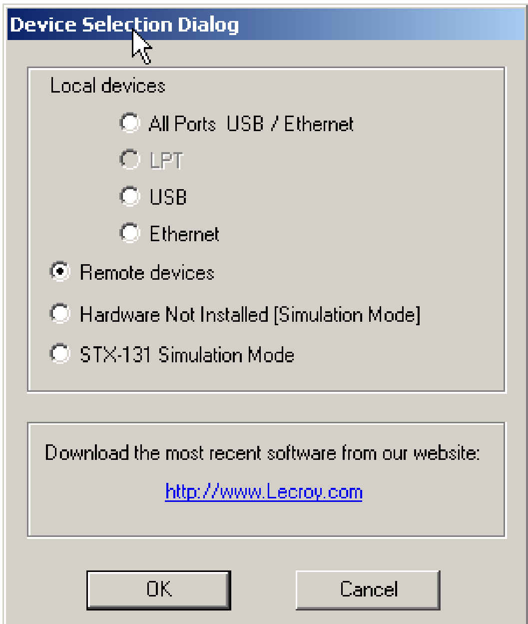


Figure 14 Select Device Dialog

In the Device Selection dialog, select **Remote Devices** and click **OK** to open the Remote Connection Settings dialog.

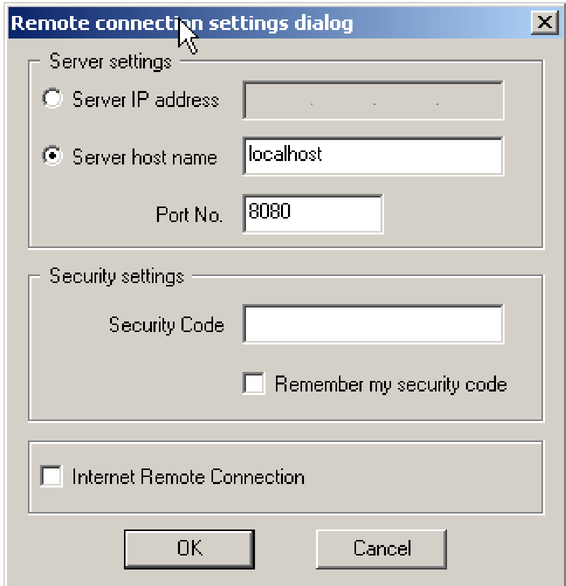


Figure 15 Select Device Dialog

To set the remote connection settings:

1. Enter the **Server IP Address** or **Server Host Name**.
2. Enter the **Port Number** or use the default.
3. (optional) Select the **Internet Remote Connection** check box if the connection uses the Internet.
4. (optional) Enter a **Security Code**.
5. Click **OK**.

The Sierra application on the Host PC will send a connection request to that IP address.

Launching Your Analyzer

To launch the software, double-click the **SAS** or **SATA** Icon in the Program Manager Window.

Establish Interface

The first time you run your software, the software displays the Device Selection dialog.

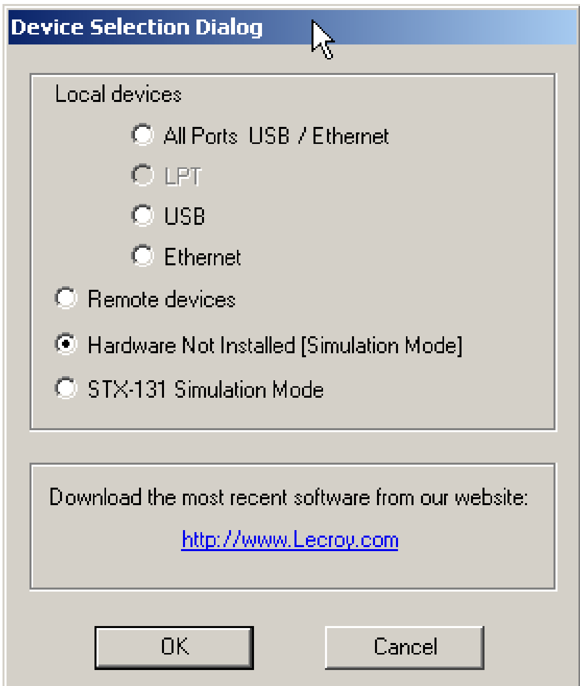


Figure 16 Device Selection Dialog

Select an interface:

- **Local devices**: Connected by USB and/or Ethernet (see “Connecting via Ethernet” on page 10)
- **Remote devices**: Available in the Remote Connection Settings dialog (see “Connecting over Different Subnets” on page 12)
- **Simulation Modes**: Hardware Not Installed or STX-131 (see “Operating in Simulation Mode” on page 15)

Click **OK** to display the software.

Operating in Simulation Mode

The system operates in Simulation Mode by default if the software detects no hardware. However, you can operate in Simulation Mode directly, without installing the Analyzer hardware. To operate without hardware, select **Hardware Not Installed (Simulation Mode)** in the Device Selection dialog box and click **OK.**

The Analyzer software launches and displays the appropriate tool bar, but with the limitation that the Analyzer operates only on static, previously captured, bus data.

Limitations Simulation Mode lets you try all of the available functions, but the system is not capturing any real data and is displaying only pre-captured results.

Using the Software

The Sierra M6-4 application has the LeCroy SAS Protocol Suite and the LeCroy SATA Protocol Suite.

The LeCroy SAS Protocol Suite can be a:

- **Protocol Analyzer:** Captures data, triggers on events, and saves. **Easy Mode** allows standard Trigger and Data capture. **Advanced Mode** allows you to program custom triggering in and out, capturing, state jumps, and timers (see “Protocol Analysis” on page 19).
- **Protocol Analyzer Initiator Emulator:** Generates bus traffic for capture. It also has Easy Mode and Advanced Mode (see “Exercise and Capture” on page 78).
- **Target Emulator**: Acts as target (see “Target and Device Emulation” on page 121).

The LeCroy SATA Protocol Suite can be a:

- **Protocol Analyzer:** Captures data, triggers on events, and saves. **Easy Mode** allows standard Trigger and Data capture. **Advanced Mode** allows you to program custom triggering in and out, capturing, state jumps, and timers (see “Protocol Analysis” on page 19).
- **Protocol Analyzer Host Emulator:** Generates bus traffic for capture. It also has Easy Mode and Advanced Mode (see “Exercise and Capture” on page 78).
- **Device Emulator**: Acts as device (see “Target and Device Emulation” on page 121).

Protocol Analyzer

To use the software for protocol analysis, first select **File > New > Protocol Analyzer** for a new project or **File > Open** an existing protocol analysis file: .**sac** for a SAS file or .**stc** for a SATA file (see “Protocol Analysis” on page 19). You can also open a **.scs** SAS Sample file or **.sts** SATA Sample file. Example files are in the Examples folder. You can also use **Project Setup > Last Protocol Analyzer.**

In Easy Mode, on the Capture tab, select to capture **Everything** or **Pattern**. For Pattern, select a Pattern. You can exclude patterns and frames. You can use different patterns for pre-trigger and post-trigger.

In Easy Mode, on the Trigger tab, select the trigger type. For Pattern, select the pattern.

In Easy Mode, on the Settings tab, select trigger position and memory use.

Change the Analyzer settings if necessary. Change the port Speed if necessary.

Use Advanced Mode only after you become familiar with the hardware and software and have special needs.

Protocol Analyzer Initiator Emulator or Host Emulator

To use the software for protocol analysis to generate host traffic, first select **File > New > Protocol Analyzer Initiator Emulation** or **Protocol Analyzer Host Emulation** for a new project or **File > Open** an existing Pattern Generator file: **.spg** for a single-role file (see “Exercise and Capture” on page 78).

In Easy Mode, on the Initiator Emulator or Host Emulator tab, insert instances of ATA, SCSI, TASK, SMP, Frame, or Event. Select the type of each from the drop-down lists. You can also loop, go to, wait, delay, if...then, and stop.

In Easy Mode, on the Capture tab, select to capture **Everything** or **Pattern**. For Pattern, select a Pattern. You can exclude patterns and frames. You can use different patterns for pre-trigger and post-trigger.

In Easy Mode, on the Trigger tab, select the trigger type. For Pattern, select the pattern.

In Easy Mode, on the Initiator Setting or Host Setting tab, select the port and speed. Select to run the Pattern Generator or Initiator Emulator or Host Emulator.

In Easy Mode, on the Settings tab, select trigger position and memory use. Also change the Analyzer settings if necessary. Specify addresses, stops, times, and sizes, if necessary.

Use Advanced Mode only after you become familiar with the hardware and software and have special needs.

Target Emulator or Device Emulator

To use the software as a target or device emulator, first select **File > New > Target Emulator** or **Device Emulator** for a new project or **File > Open** an existing Emulator file: **.std** Target Emulator file or **.sde** Device Emulator file (see “Target and Device Emulation” on page 121). You can also use **Project Setup > Last Target Emulator** or **Last Device Emulator.**

In the Pages tab, change settings for the supported pages if necessary.

In the Error Injection tab, select General periodic errors, Identify frames, Connection Management open and close connection errors, SAS Commands and events errors, ATA Commands errors, or SATA Signature content.

Use the User-defined Commands tab only after you have become familiar with operations.

In the Settings tab, select addresses, sizes, times, and ports, if necessary.

You can capture traffic when using an Analyzer project (but not a Target Emulator project). With a Protocol Analyzer open, open a **Target Emulator.** After checking the settings, click the **Activate/Deactivate** (Active) device button. or select **Project Setup > Active Device.** If you change Target Emulator settings, **Deactivate** and then **Activate Device**.

Viewing Captured Data

After data capture, the captured data is in the Viewer (see “Display Manipulation” on page 149). You can display the same data in:

- **Packet View**: Shows packets.
- **Text View**: Shows transaction frames, grouped in columns by port.
- **Column View**: Shows DWORDS in columns by port.
- **Spreadsheet View**: Shows Packet View fields by time.
- **Histogram View**: Shows frame-type transfers.
- **Waveform Display**: Shows waveform display for all active ports, on which you can perform timing measurements.
- **Data View**: Displays data payloads.

You can show or hide fields and ports, change port names, and change data format.

You can show the layers and channels using their toolbars.

You can decode using the Decode toolbar.

You can Search and Filter.

Configuration

For special work, you can use the Configuration menu to configure Data Blocks, Software Settings, and TxVout & Pre-emphasis (see “Display Configuration” on page 192).

Port Status

You can display an overview of the active ports by clicking the buttons at the bottom right of the main window (see “Port Status” on page 164).

Statistical Reports

You can generate statistics for all transports, commands, primitives, bus conditions, addresses, lanes, and errors (see “Statistical Report” on page 208).

Data Report

The data report displays all the data sent from the host to the device and from the device to the host (see “Data Report” on page 229).

Infusion

The LeCroy Infusion™ Error Injector and Traffic Modifier is an error injector and traffic modification tool that allows you to verify real-world fault handling for Serial Attached SCSI (SAS) and Serial ATA (SATA) systems (see “Infusion Overview” on page 243).

Next Chapter

To start working with the protocol analyzer and software, go to “Protocol Analysis” on page 19.

Protocol Analysis

The system performs Protocol Analysis by defining and running an analysis project. An analysis project definition defines what to capture, what the analyzer triggers on, and the memory settings. You can save defined projects as project ***.sac** files for later use.

Easy Mode (Pre-Defined Setups)

After you install the Analyzer software (see “Software Installation” on page 5) and set up the Analyzer (see “Hardware Setup” on page 6), launch the Analyzer software (see “Launching Your Analyzer” on page 14) to display the default Protocol Analyzer in Easy Mode at the Capture tab.

This mode allows you to operate the analyzer with minimum setup. In this mode, you can perform only a Trigger and Data capture, or you can program the SAS Initiator Emulator or SATA Host/Device Emulator to generate bus traffic for triggering and data capture.

Main Window

Use Easy Mode to get a comprehensive overview of your analyzer’s capabilities:

SAS: On the Analyzer Menu Bar, click **File > New > Protocol Analyzer** to open a SAS Protocol Analyzer dialog.

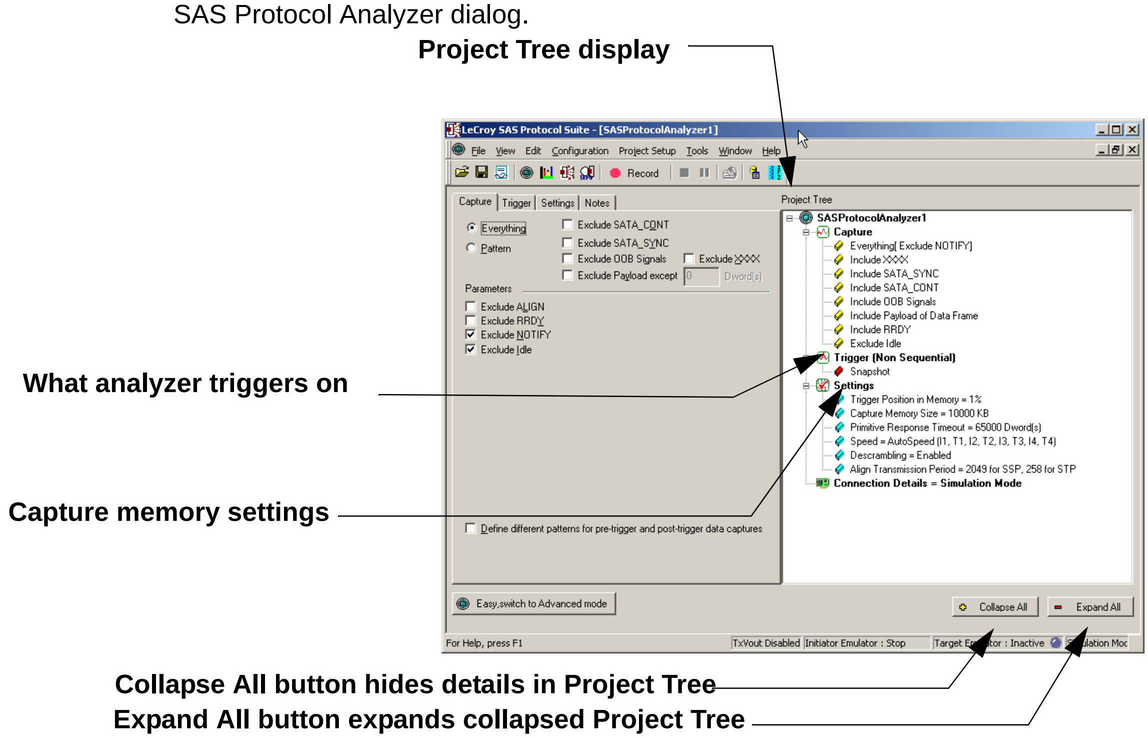


Figure 17. SAS: New Analysis Project Dialog

The New Project dialog opens with default settings to capture Everything on the bus and to Trigger On on Snapshot. (The analyzer captures everything immediately without triggering on anything in particular.)

SATA: On the Analyzer Menu Bar, click **File > New > Protocol Analyzer** to open a SATA Protocol Analyzer dialog.

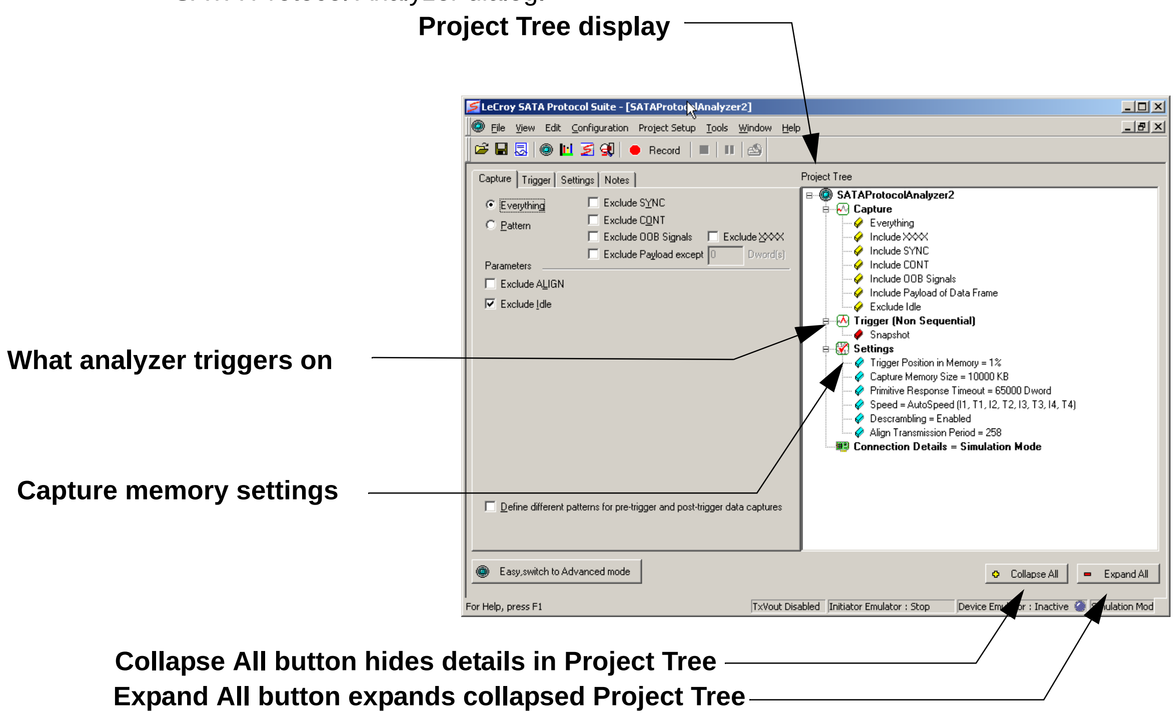


Figure 18. SATA: New Analysis Project Dialog

SAS vs. SATA: SATA Dialog does not show “Exclude RRDY” or “Exclude NOTIFY”. SATA Dialog replaces “Exclude SATA_CONT” with “Exclude CONT” and “Exclude SATA_SYNC” with “Exclude SYNC”.

Project Tree

The Project Tree on the right side of the main window displays a comprehensive tree structured overview of the project. The project tree shows what to capture, on what the analyzer triggers, and the capture memory settings.

Capture Tab Fields

The Capture tab has the following fields:

Exclude SATA_CONT (SAS) or Exclude CONT (SATA)
Check this to exclude SATA_CONT primitives from the data capture.

Exclude SATA_SYNC (SAS) or Exclude SYNC (SATA)
Check this to exclude SATA_SYNC primitives from the data capture.

Exclude OOB Signals
Check this to exclude OOB signals from the data capture.

Exclude XXXX
Check this to exclude XXXX patterns from the data capture.

Exclude Payload except
Check this to exclude Payload of Data Frames from the data capture. You can except a number of Dword(s).

Exclude ALIGN
Check this to exclude ALIGN primitives from the data capture.

Exclude RRDY (SAS only)
Check this to exclude RRDY primitives from the data capture.

Exclude NOTIFY (SAS only)
Check this to exclude NOTIFY primitives from the data capture.

Exclude Idle
Check this to exclude Idles from the data capture.

Define different patterns for pre-trigger and post-trigger data captures
Replaces the Capture tab with a Pre-Trigger Capture tab and a Post-Trigger Capture tab.

SAS Software Menus and Toolbar

The SAS software has the following menus and main toolbar.

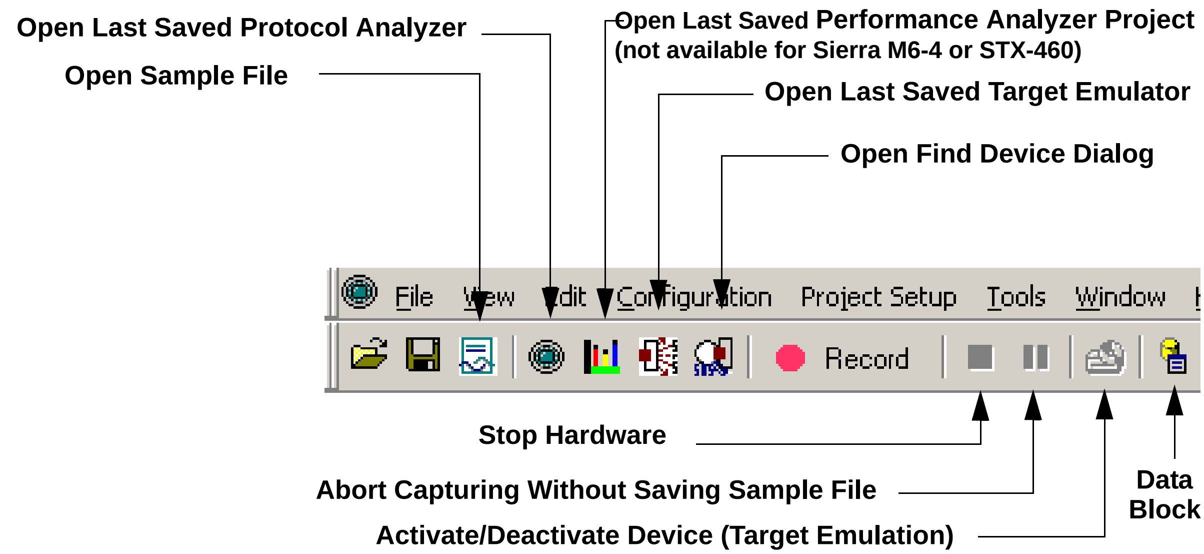
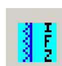


Figure 19. SAS: Software Menus and Toolbar

Infusion: The toolbar adds the  Infusion button, which displays the Infusion error injection window.

SATA Software Menus and Toolbar

The SATA software has the following menus and main toolbar.

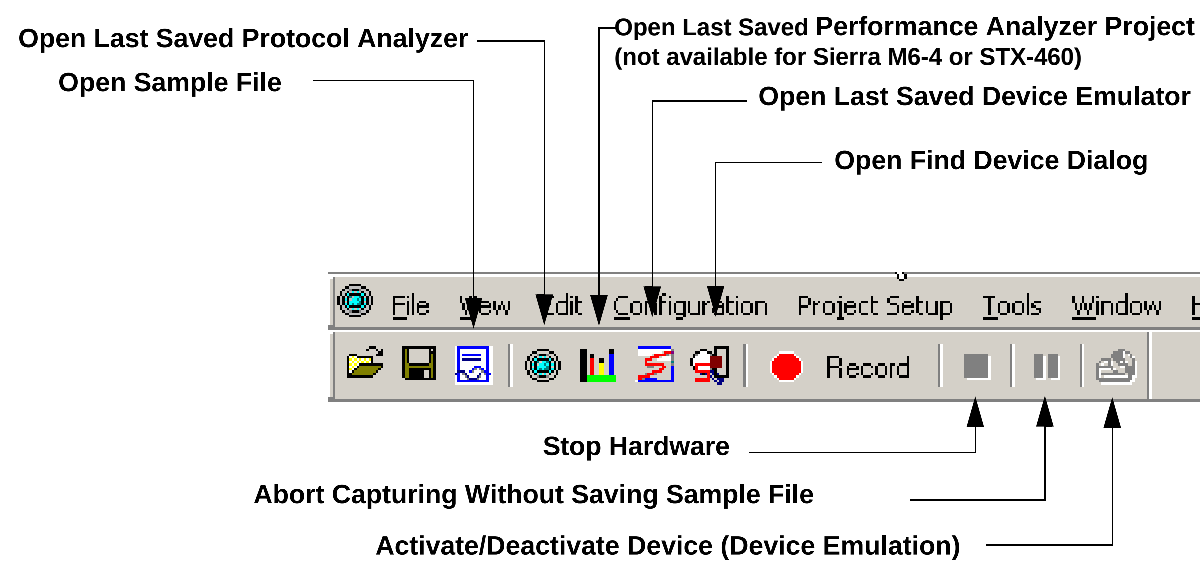


Figure 20. SATA: Software Menus and Toolbar

Run Hardware

To get an immediate overview of the bus traffic to and from your Analyzer:

1. Click the  **Record** button.
2. The analyzer begins filling the defined memory buffer with traffic on the bus. After the traffic fills the memory buffer, the traffic is uploaded to the viewer and the Packet View display opens. Packet View is the default display. However, you can view results in any of the different views by selecting **View** on the menu bar and choosing the desired View.

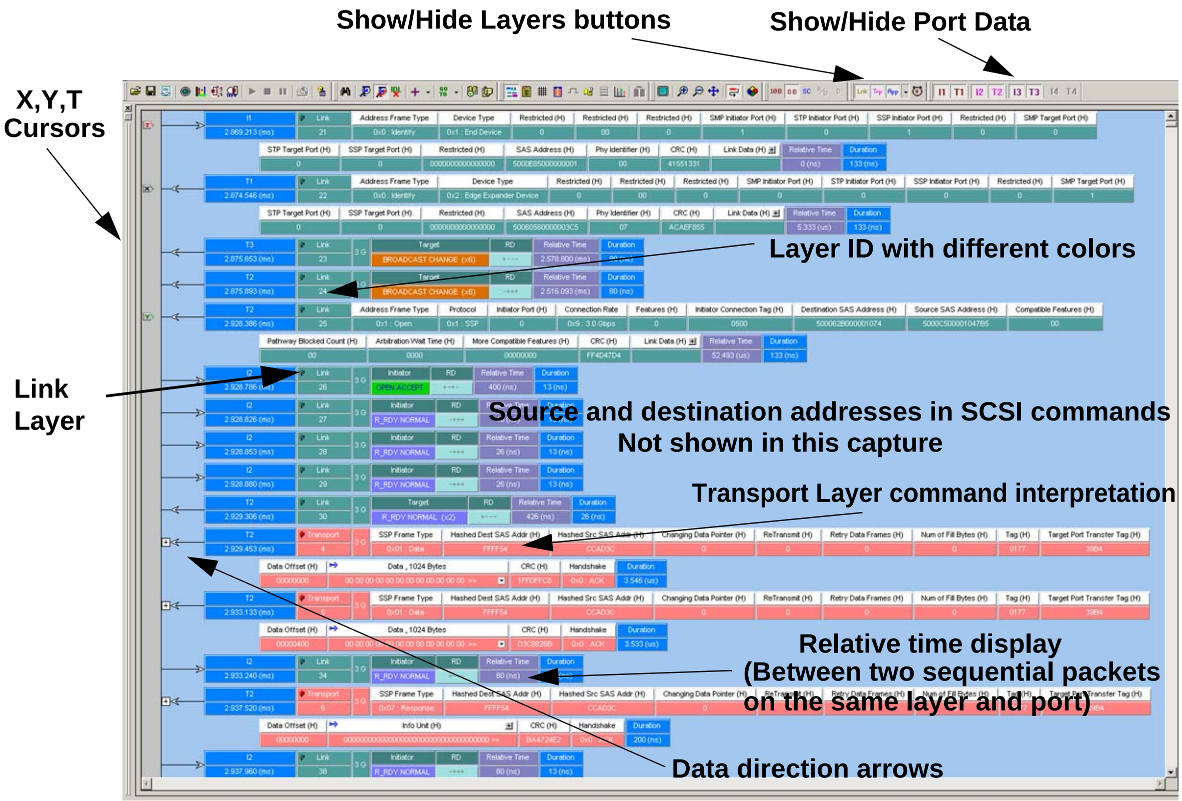


Figure 21. SAS: Typical Packet View Results Display

SAS: In case of an STP interface, the expander displays STP addresses provided to the SATA drive and the SAS software integrates the STP addresses in the ATA command.

The results display shows each transaction for every layer identified in a different color and the data direction identified with data direction arrows. Upstream traffic has an arrow from right to left: ⇐. Downstream traffic has an arrow left to right: ⇒.

You can hide any layer by clicking the corresponding **Show/Hide** button on the menu bar. The system retains all captured data, but the display has only some data layers for simpler viewing.

You can configure the viewer display for test and viewing preferences (see “Viewer Display” on page 149 for details about configuring the viewer display).

The Analysis Project dialog offers you a comprehensive set of choices to create a trigger and capture project satisfying some specific need. You can set the Analyzer to:

- Capture specific patterns (see section "Patterns and Data Capture Setup").
- Capture different patterns pre- and post-trigger.
- Exclude parameters from capture.
- Trigger on a pattern or sequence of patterns (see section "Trigger Setup").
- Configure trace capture memory (Settings tab).
- Select file to save trace capture in memory (Settings tab).
- Include a project note (Notes tab).

Saving a Trace Capture

You can save a Trace Capture for review at a later time using the **Save As** dialog.

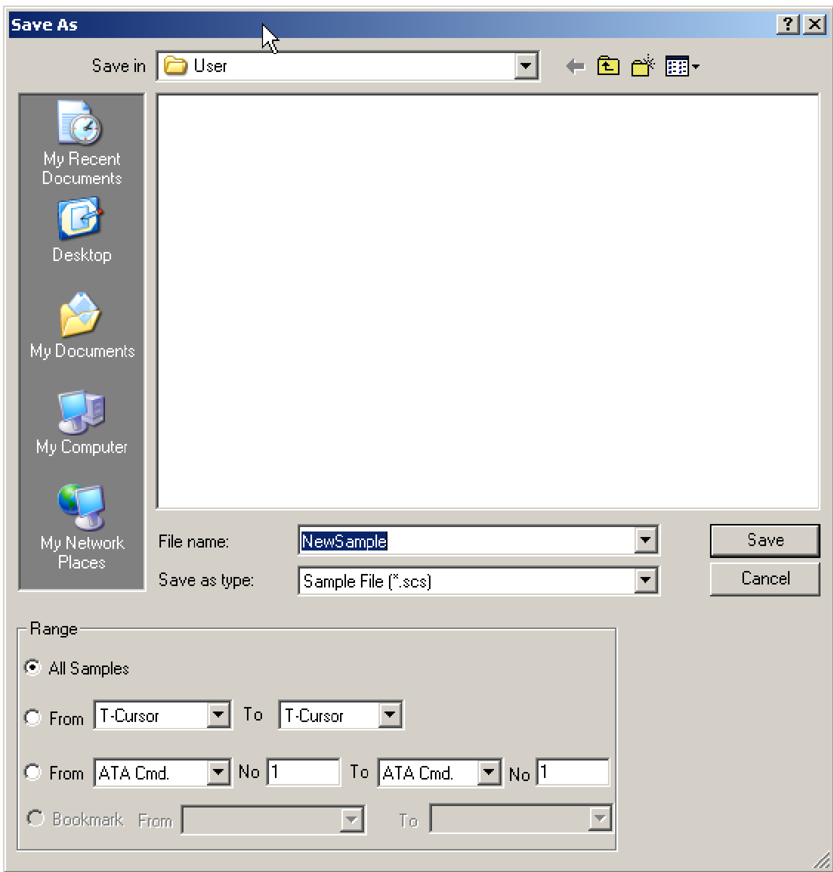


Figure 22. Save As Dialog

You can limit the range of the saved file. You can save:

- All Samples
- a range between selected cursors
- a range between selected Idle, link, commands

Projects

You can define a new project, starting with the default project definition, or modify the settings for the last project run.

New Default Project

To start a **New** project, select **File > New** on the main menu bar and choose **Protocol Analyzer** to open a new project with default settings that you can modify (see “Main Window” on page 19).

Last Project

Clicking the **Green** button  opens the last project run, so you can modify it.

Project File Types

Projects have the following file types:

*.asl	Decoding script file (in the Examples folder “User Define Decoding Script” subfolder)
*.cfg	Display Configuration file (in the System folder “Config” subfolder)
*.dat	DataBlock file (in the System folder “DataBlock” subfolder)
*.sac	SAS Protocol Analyzer/Capture Project/Viewer file (in the Examples folder “EasyCaptr”, “AdvanceCaptr”, or “Exerciser” subfolders)
*.saf	Device Identifier file
*.scs	SAS Sample file (in the SAS Examples folder “Sample” subfolder)
*.sde	Device Emulator file (in the System folder “Compliance” subfolder)
*.sfl	Filter configuration file
*.spg	Single-role Pattern Generator file (in the Examples folder SAS “PatternGenerator\Single role (spg files)” subfolder and SATA “PatternGenerator\Single Role” subfolder). Single role means the file is for a Device or Host.
*.ssh	SAS Search configuration File
*.stc	SATA Protocol Analyzer/Capture Project/Viewer file (in the Examples folder “EasyCaptr”, “AdvanceCaptr”, or “Exerciser” subfolders)
*.std	Target Emulator file (in the Examples folder “Target Emulator” subfolder)
*.sts	SATA Sample file (in the SATA Examples folder “Sample” subfolder)
*.tsh	SATA Search configuration file
*.wss	SAS Workspace file (in the SAS System folder “Predefined\Workspace” subfolder)
*.wst	SATA Workspace file (in the SATA System folder “PreDefined\Workspace” subfolder)

Example Projects

The Analyzer includes example projects that you can use to perform an immediate analysis without any setup.

The Analyzer system software has a pre-defined folder (directory) structure for storing all files. All example files are in the Examples folder under the Sierra M6-4 folder.

It is strongly recommended that you open some example files to see types of projects that you can create.

Run an Example Analysis Project

To run an example project:

1. Select **File > Open.**
2. Locate example analysis projects by looking in the Examples folder. Examples are available for AdvanceCaptr, EasyCaptr, Exerciser, PatternGenerator, Samples, Target Emulator, and User Define Decoding Script.
3. In the EasyCaptr folder, choose an example ***.sac** file and click **Open** to display the example project dialog.

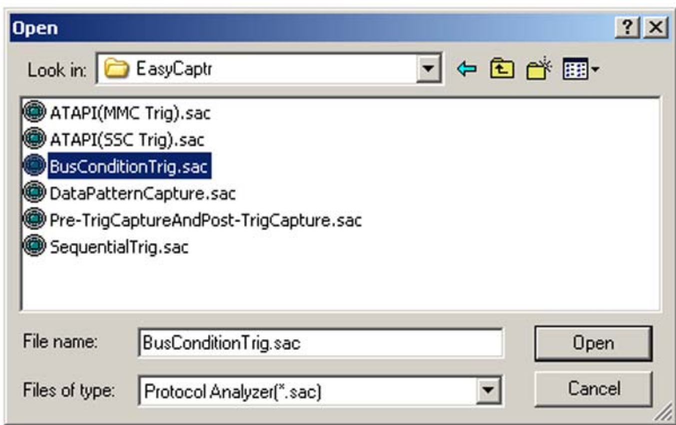


Figure 23. File Open Dialog

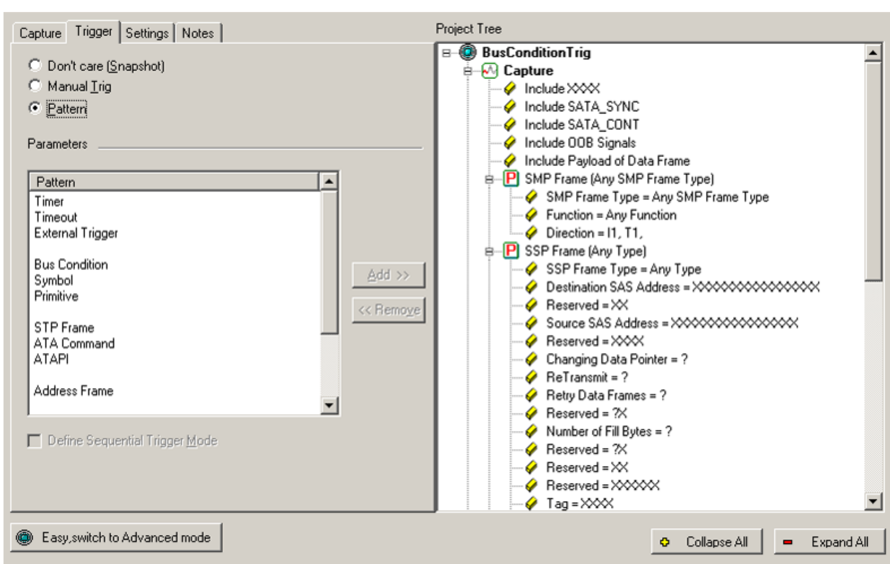


Figure 24. SAS: Sample Protocol Analysis Project

SAS vs. SATA: For Pattern Parameters, SATA Dialog adds FIS, FIS Pattern, and ATA Command Pattern and does not have STP Frame, SSP Frame, SMP Frame, and Address Frame.

4. Click the **Record** button to execute the pre-defined example.
5. After the project runs, you see an analyzer trace capture display similar to the one shown in Figure 25.

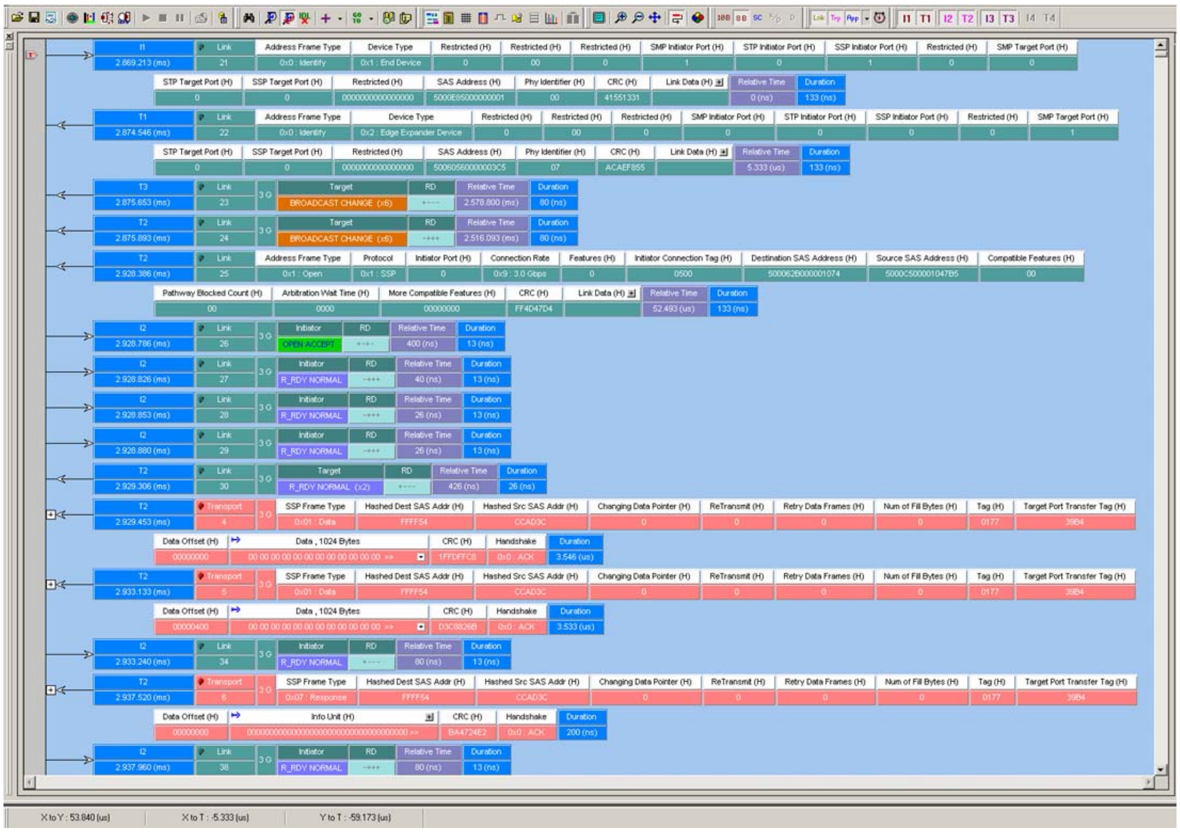


Figure 25. SAS: Analyzer Trace Capture Display

For details about the results display, see “Display Manipulation” on page 149 and see “Display Configuration” on page 192.

Patterns and Data Capture Setup

You can refine data capture by choosing **Pattern** and then selecting specific patterns for capture. Additionally, you can define a different set of patterns to capture after trigger.

To define specific patterns for capture, click the **Pattern** button to display the Capture tab for Pattern.

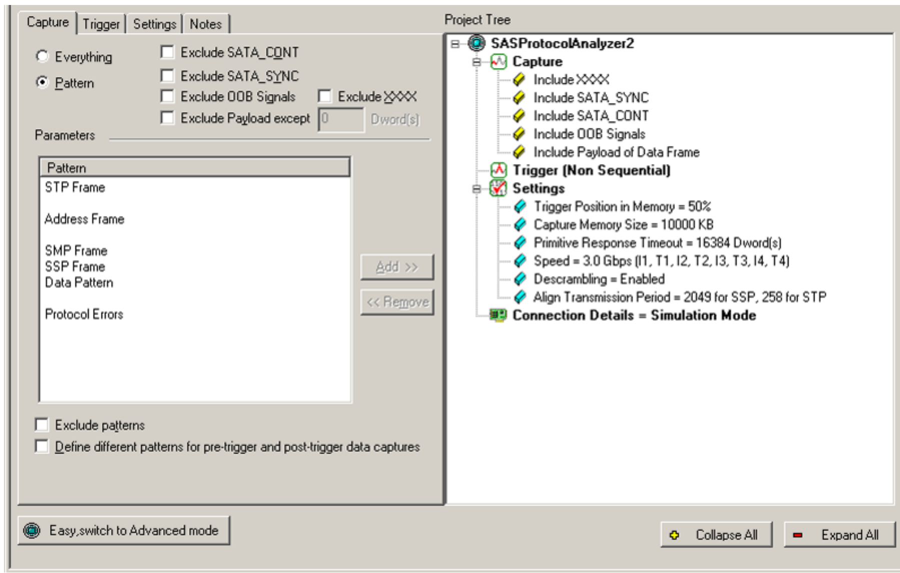


Figure 26. SAS: Choosing Capture Patterns

SAS vs. SATA: SATA Dialog replaces “Exclude SATA_CONT” with “Exclude CONT” and “Exclude SATA_SYNC” with “Exclude SYNC”.

SAS: The SAS Parameters window displays the following pattern capture categories:

- STP Frame
- Address Frame
- SMP Frame
- SSP Frame
- Data Pattern
- Protocol Errors

SATA: The SATA Parameters window displays the following pattern capture categories:

- FIS
- FIS Pattern
- Data Pattern
- Protocol Errors

Choose a Parameter

To choose a parameter for capture from any of these categories, highlight the category in the parameter window and click the **Add>>** button. This opens selection dialogs for each of the categories displaying all of the parameters for that category. All patterns added appear in the Project Tree.

Exclude Patterns

Check this box to allow for the capture of everything except the patterns that have been added to the Project Tree.

When you check this box, the Primitive category appears in the Parameter window, and the window enables the Exclude Idle checkbox.

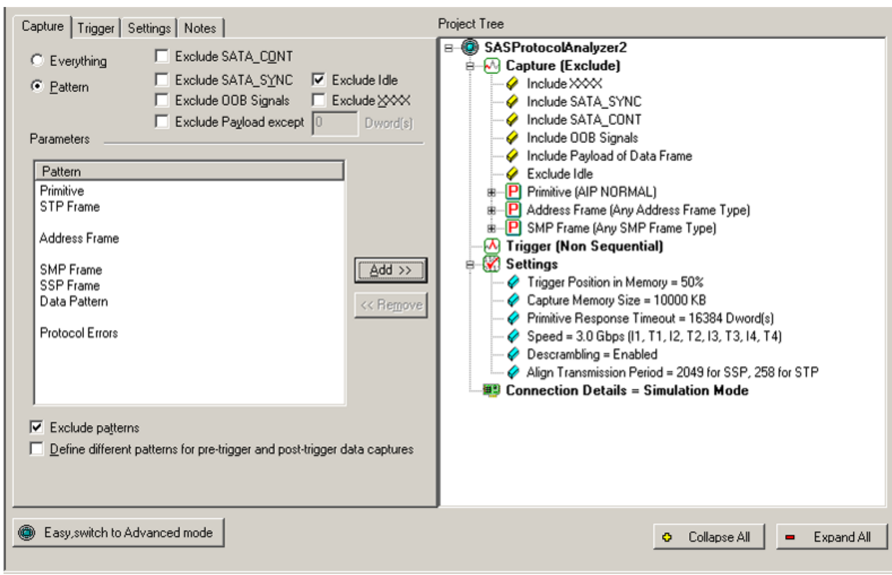


Figure 27. SAS: Exclude Patterns Checked

SAS vs. SATA: SATA Dialog replaces "Exclude SATA_CONT" with "Exclude CONT" and "Exclude SATA_SYNC" with "Exclude SYNC". SATA Dialog has different Pattern Parameters (see "Patterns and Data Capture Setup" on page 28).

To remove an item from capture, highlight it in the Project tree and click the **<<Remove** button.

Pre and Post Trigger Data Capture

You can define one set of patterns for capture prior to the occurrence of a trigger and another set of patterns for capture after the occurrence of a trigger. The selection and setup procedure is the same for both Pre-Trigger capture and Post-Trigger capture.

Check **Define different patterns for pre-trigger and post-trigger data capture** to enable the Pre-Trigger Capture and Post-Trigger Capture tabs (instead of only the Capture tab).

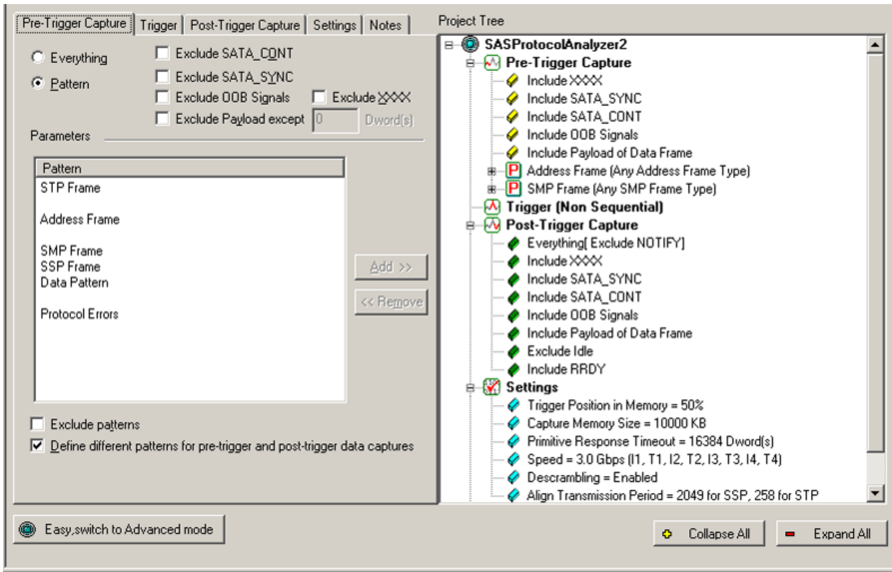


Figure 28. SAS: Post-trigger Capture Dialog Enabled

SAS vs. SATA: SATA Dialog replaces “Exclude SATA_CONT” with “Exclude CONT” and “Exclude SATA_SYNC” with “Exclude SYNC”. SATA Dialog has different Pattern Parameters (see “Patterns and Data Capture Setup” on page 28).

Defining Patterns

To select an item for capture, either highlight the category and click the **Add>>** button, or double-click the category, to open a corresponding definition dialog. You can define patterns for specific ports by checking or unchecking the Port ID.

Primitive

Double-click **Primitive** (available only if you check Exclude Patterns) to open the Primitive selection dialog.

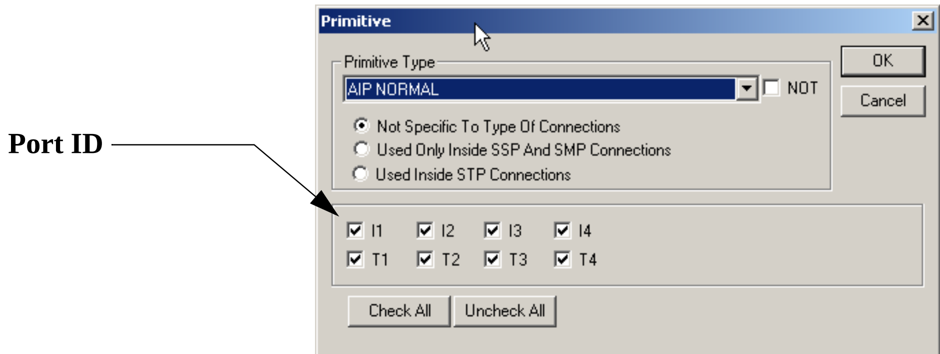


Figure 29. SAS: Primitive Dialog

SAS vs. SATA: SATA Dialog has no radio buttons and has different drop-down options.

Click the down arrow next to the Primitive drop-down list box, choose a Primitive to exclude, and click **OK**. Repeat for additional Primitives.

Data Pattern

Double-click **Data Pattern** to open the Data Pattern definition dialog

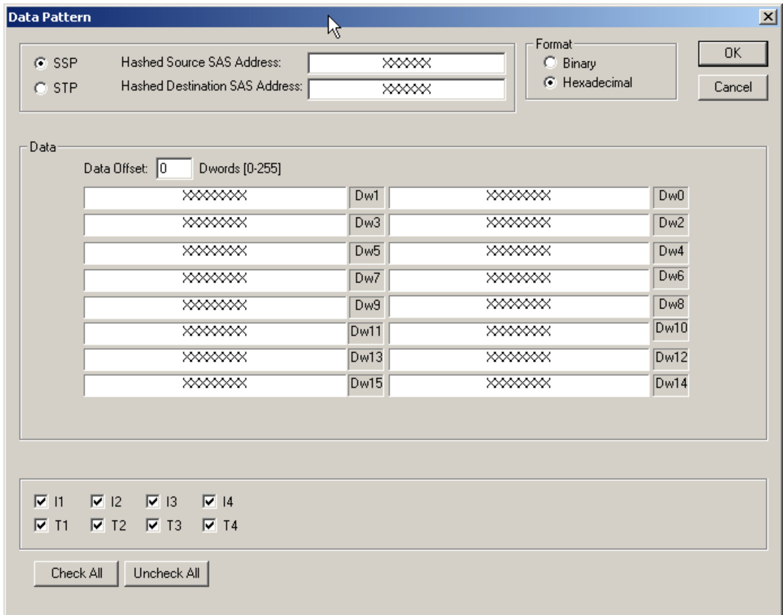


Figure 30. SAS: Data Pattern Dialog

SAS vs. SATA: SATA Dialog shows Port at the top and does not show SSP or STP.

Define the data pattern for capture or exclusion from capture and click **OK**.

Note: When entering the data pattern in the “Data” section of this screen, if you are reading the data pattern from a recorded trace, you must reverse the order of the bytes listed for each dword entered. For example, if you want to capture (or exclude) “00 01 02 03” (as displayed in the trace), you must enter this pattern as “03 02 01 00”.

Protocol Errors

Double-click **Protocol Errors** to open the Protocol Errors selection dialog.

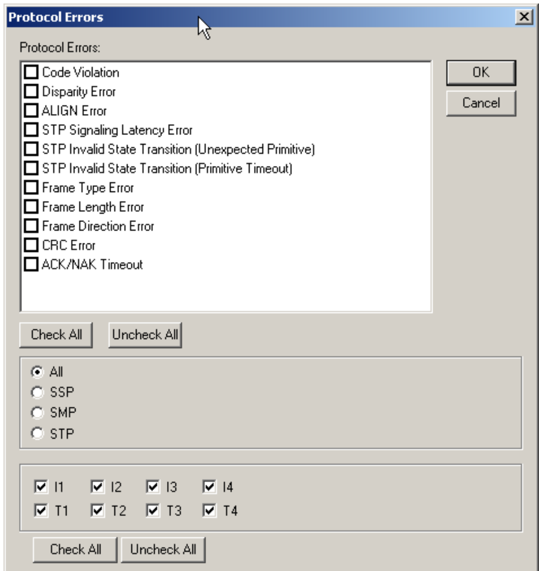


Figure 31. SAS: Protocol Errors Dialog

SAS vs. SATA: SATA Dialog shows Port and does not show SSP, SMP, or STP radio buttons.

Check protocol error(s) to omit or not capture, then click **OK**.

STP Frame (SAS only)

Double-click **STP Frame** to open the FIS Patterns dialog.

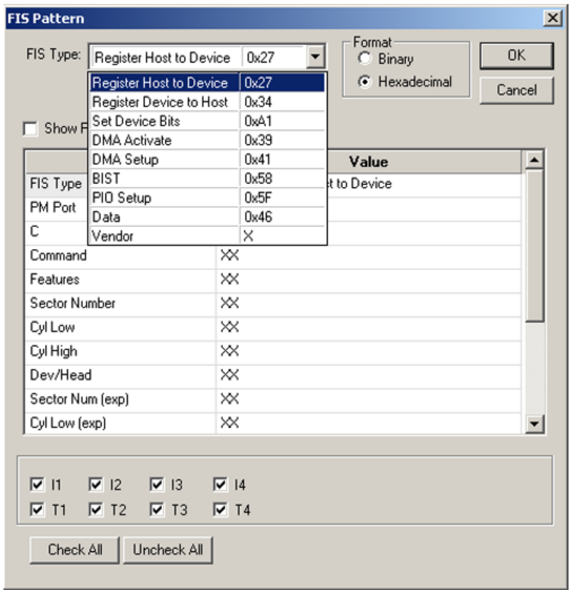


Figure 32. SAS: FIS Patterns Dialog

SAS vs. SATA: Not available in SATA.

Click the down arrow next to the Type drop-down list box, choose an FIS type to capture or exclude, and click **OK**. Repeat for additional types.

Available FIS Types

- Register Host to Device
- Register Device to Host
- Set Device Bits
- DMA Activate
- DMA Setup
- BIST
- PIO Setup
- Data
- Vendor

Address Frame (SAS only)

Double-click **Address Frame** to open the Address Frame Type Pattern dialog.

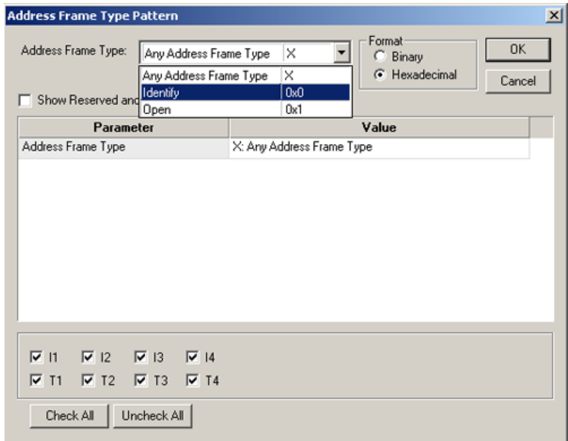


Figure 33. SAS: Address Frame Type Pattern Dialog

SAS vs. SATA: Not available in SATA.

Click the down arrow next to the Address Frame Types list box and choose an address frame type.

SMP Frame (SAS only)

Double-click **SMP Frame** to open the SMP Frame Pattern dialog.

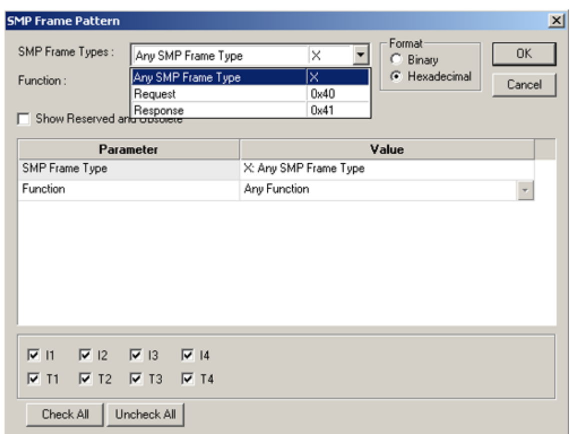


Figure 34. SAS: SMP Frame Pattern Dialog

SAS vs. SATA: Not available in SATA.

Click the down arrow next to the SMP Frame Type list box and choose a frame type. Assign a specific function to the frame by clicking the down arrow next to the Function list box and choose a function.

SSP Frame (SAS only)

Double-click **SSP Frame** to open the SSP Frame Pattern dialog.

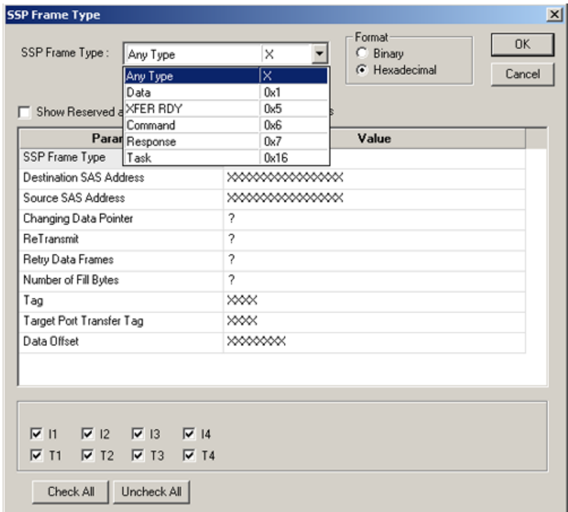


Figure 35. SAS: SSP Frame Type Dialog

SAS vs. SATA: Not available in SATA.

Click the down arrow next to the SSP Frame Type list box and choose an SSP Frame type.

FIS (Frame Information Structure) (SATA only)

Double-click **FIS** to open the FIS Type selection dialog.

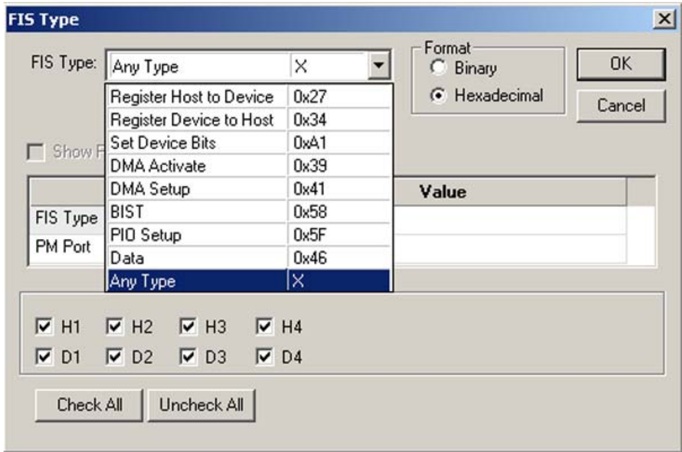


Figure 36. SATA: FIS Types Dialog

SAS vs. SATA: Not available in SAS.

Click the down arrow next to the Type drop-down list box, choose a **FIS** type to capture, and click **OK**. Repeat for additional types.

Available FIS Types

- Register Host to Device
- Register Device to Host
- Set Device Bit
- DMA Activate
- DMA Setup
- BIST
- PIO Setup
- Data
- Any Type

FIS Pattern (SATA only)

Double-click **FIS Pattern** to open the FIS Pattern selection dialog.

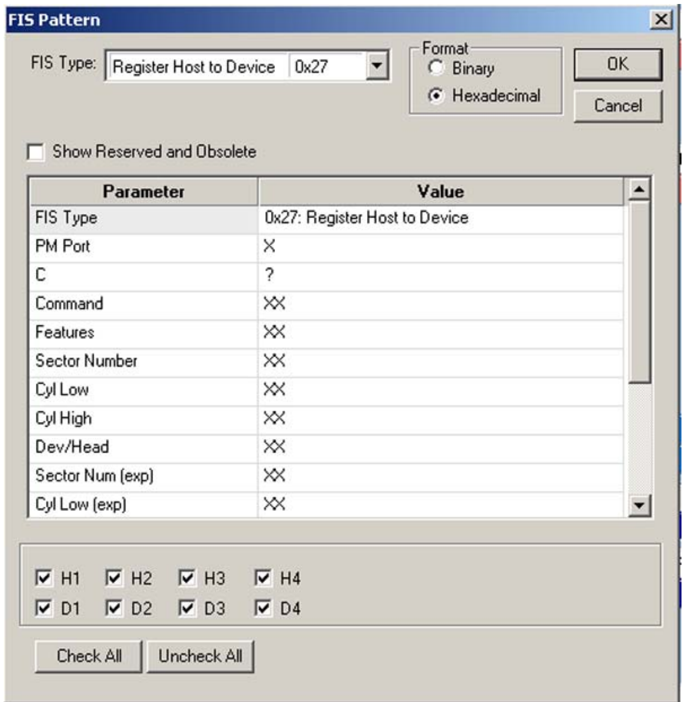


Figure 37. SATA: FIS Pattern Dialog

SAS vs. SATA: Not available in SAS.

The FIS Pattern dialog opens with the default FIS Type as **Register Host to device.** To choose another available FIS Type, click the down arrow next to the FIS Type list box.

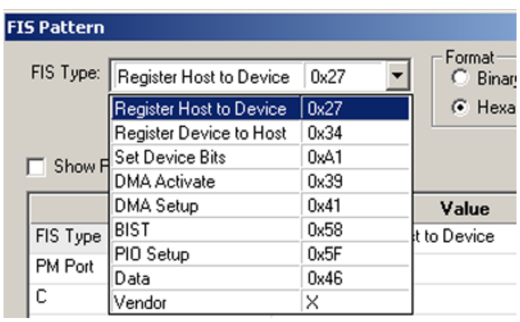


Figure 38. SATA: FIS Pattern Dialog Dropdown

SAS vs. SATA: Not available in SAS.

Choose FIS Type and complete the corresponding dialog.

FIS Types (SAS and SATA)

If you select STP Frame (SAS) or FIS Pattern (SATA) for the Pattern, the FIS Pattern window opens. You can select the FIS Type in this window from among the following types.

Register Host to Device

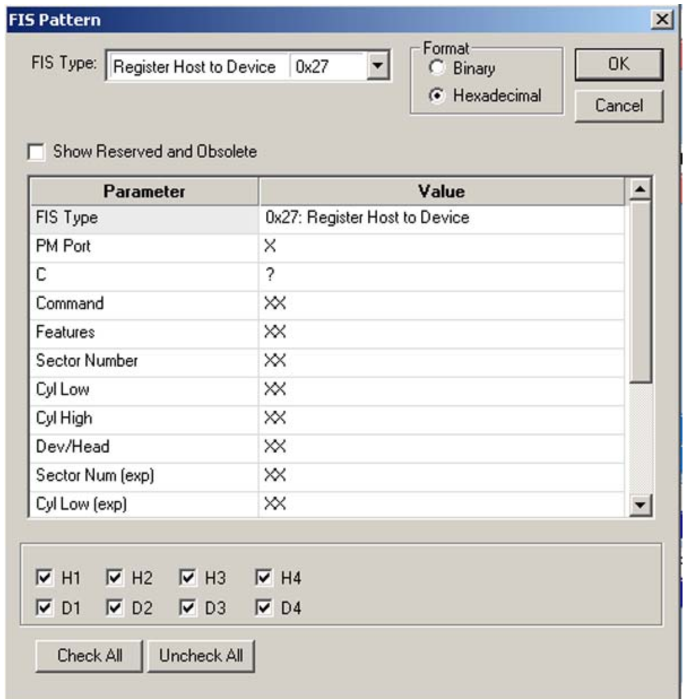


Figure 39. Register Host to Device

Register Device to Host

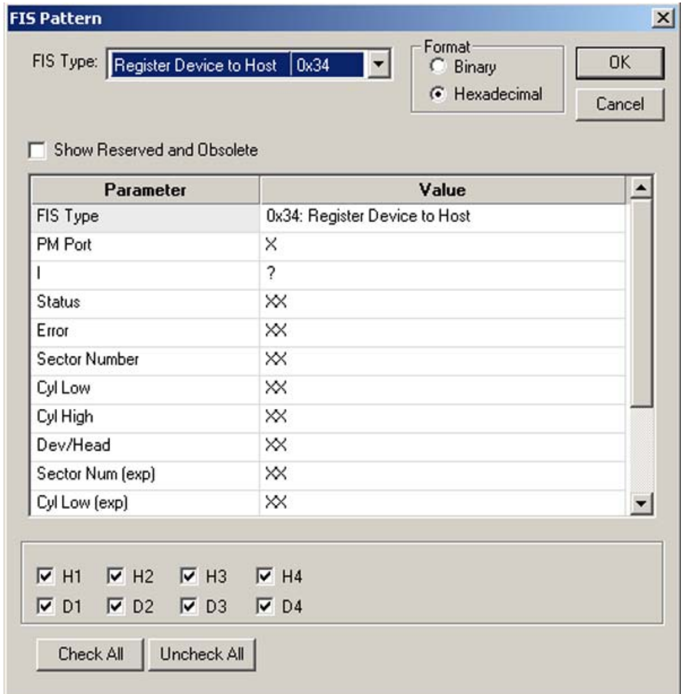


Figure 40. Register Device to Host

Set Device Bits

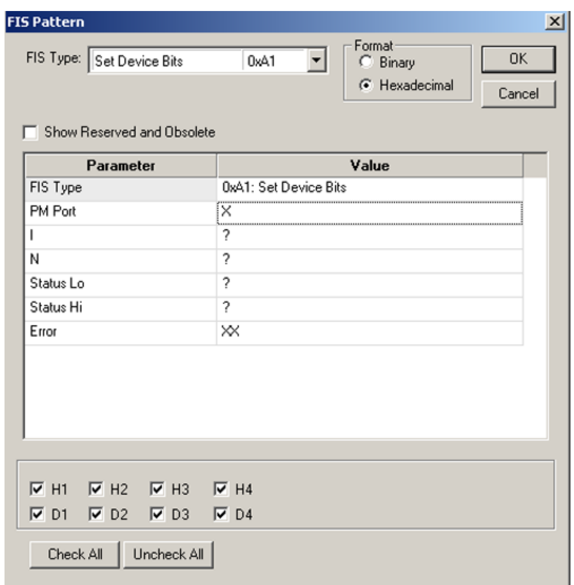


Figure 41. Set Device Bits

DMA Activate

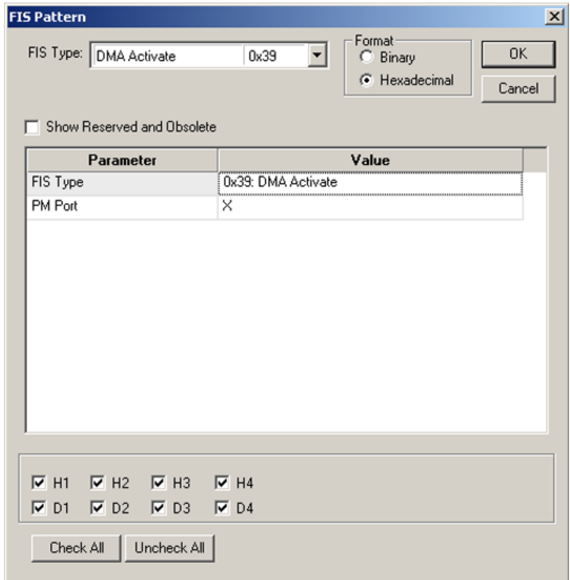


Figure 42. DMA Activate

DMA Setup

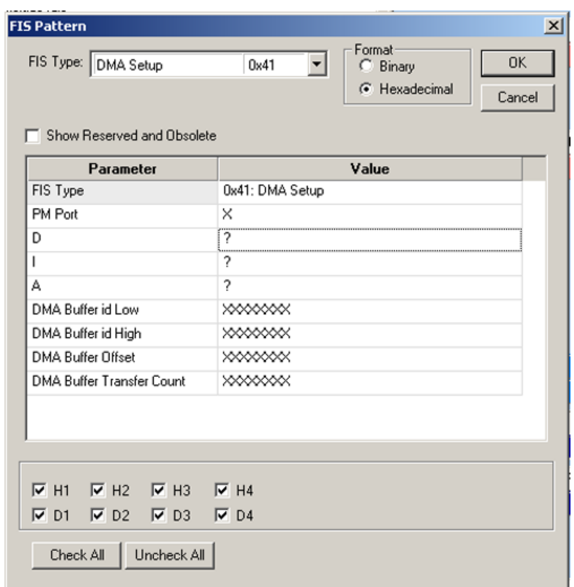


Figure 43. DMA Setup

BIST

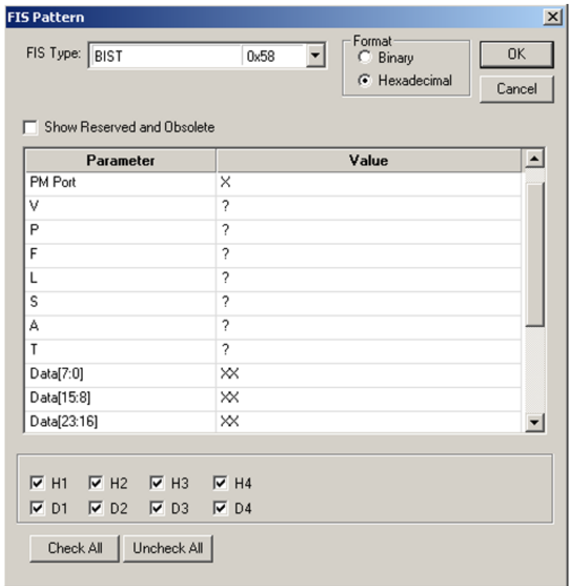


Figure 44. BIST

PIO Setup

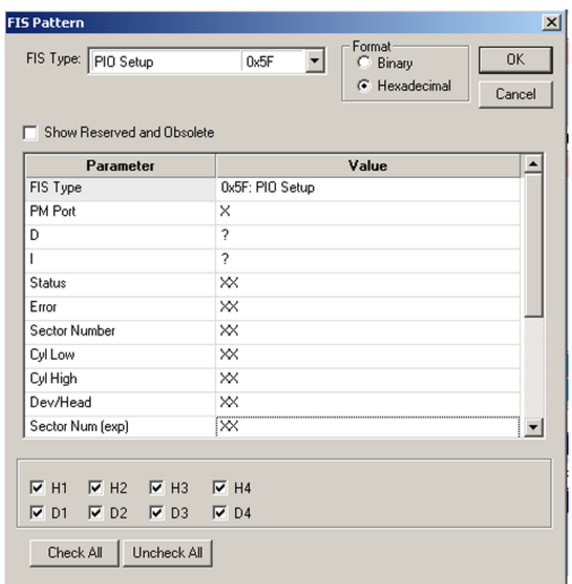


Figure 45. PIO Setup

Data

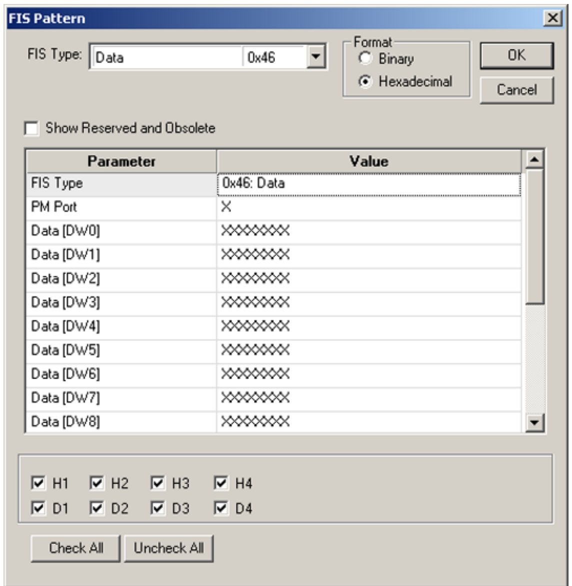


Figure 46. Data

Vendor

Vendor is for FIS Pattern.

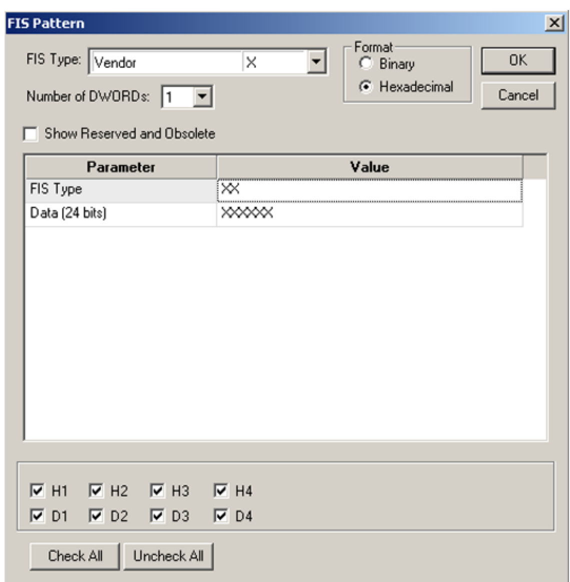


Figure 47. Vendor

Trigger Setup

The **Trigger** tab in the analysis project dialog allows you to specify when the analyzer completes a data capture. Three trigger modes are available: The default **Don't care (Snapshot), Manual Trig,** and **Pattern.**

When data capture starts with **Don't care (Snapshot)** selected, the analyzer triggers on the first data pattern on the bus.

Starting a data capture with **Pattern** selected triggers when specific pattern(s) are detected in the captured data stream. The following three ways can trigger the analyzer with **Pattern** selected.

- Trigger on any pattern (Any Trigger Mode)
- External Trigger
- Trigger on a sequence of patterns (Sequential Trigger Mode)

Snapshot Mode

To trigger immediately on any pattern, check the **Don't care (Snapshot)** button.

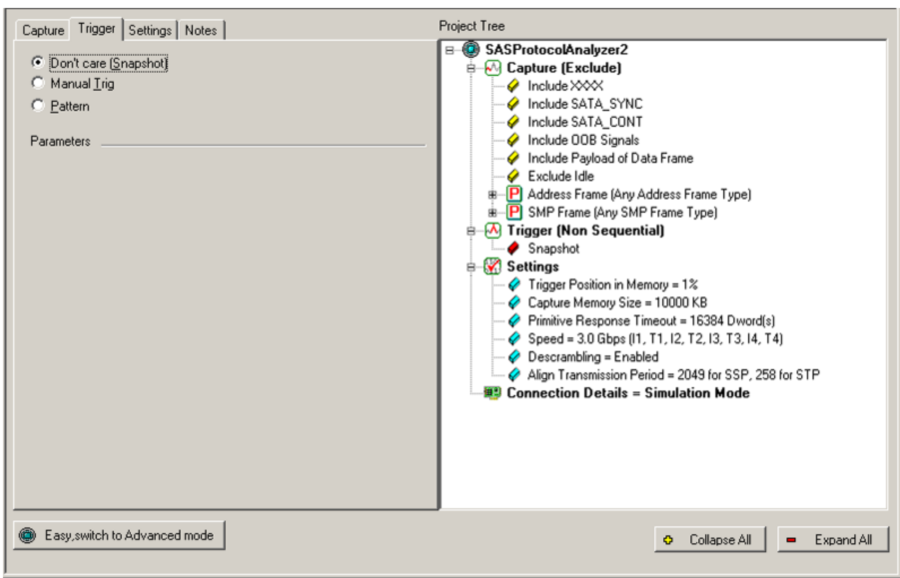


Figure 48. Default Trigger Selected

Manual Trigger Mode

In the **Manual Trigger** mode, the analyzer captures bus traffic continually from when you use the Manual Trigger until you click the **Stop Hardware** button (on the analyzer toolbar), which triggers the analyzer. To perform a manual trigger, check the **Manual Trig** button.

Any Trigger Mode

In **Any Trigger** mode, the Analyzer triggers whenever any of the patterns selected for triggering occurs (an OR condition). The procedure for selecting trigger parameters is identical to that for selecting capture parameters. All items selected for triggering appear in the Project Tree.

To define patterns for triggering, check the **Pattern** button in the Trigger dialog.

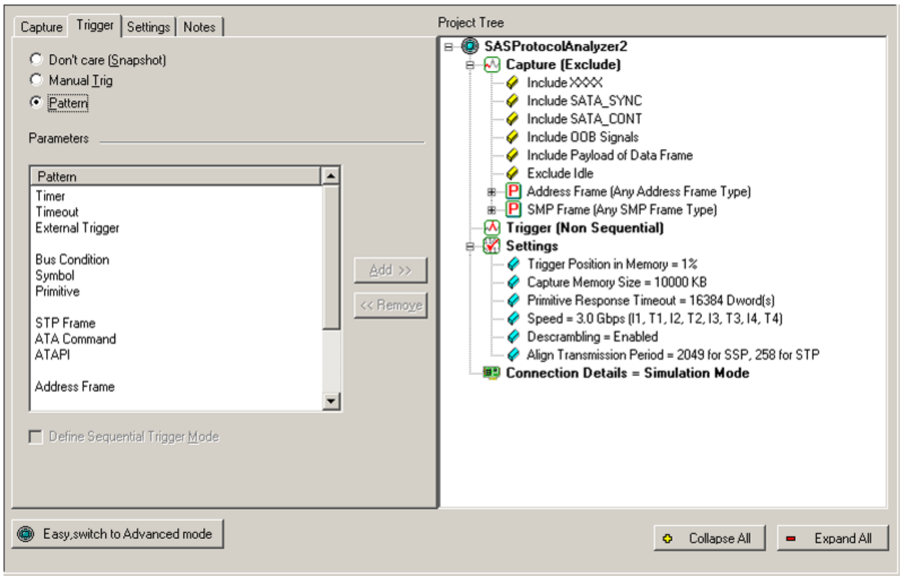


Figure 49. SAS: Select Patterns for Trigger

The SAS **Parameters** window displays the following trigger pattern categories:

- Timer
- Timeout
- External Trigger
- Bus Condition
- Symbol
- Primitive
- STP Frame
- ATA Command
- ATAPI
- Address Frame
- SMP Frame
- SSP Frame
- SCSI Command
- Data Pattern
- Protocol Errors

The SATA **Parameters** window displays the following trigger pattern categories:

- Timer
- Timeout
- External Trigger
- Bus Condition
- Symbol
- Primitive
- FIS
- FIS Pattern
- ATA Command
- ATA Command Pattern
- ATAPI
- Soft Reset
- Data Pattern
- Protocol Errors

Choosing a Parameter

Either highlight the category and click the **Add>>** button, or double-click the category, to open a corresponding definition dialog.

To remove an item, highlight it in the Project Tree, then click the **<<Remove** button.

Triggering on a Timer

Selecting a timer for a trigger in the **Any Trigger Mode** limits the time that the analyzer looks for selected triggering conditions before triggering. The timer activates when the Project runs. If none of the selected triggering conditions occurs during the timer's active time, the Analyzer triggers at the end of the time set for the timer.

You can set a timer independently of any other trigger selection, to cause an unconditional trigger after a set time.

To set the timer value, double-click **Timer** in the Pattern window of the Capture Project dialog to open the Timer dialog.

Figure 50. Timer Dialog

Check a Time Unit, enter the Timer Value, and click **OK.**

Timeout

Selecting **Timeout** for the pattern opens the Timeout Pattern dialog.

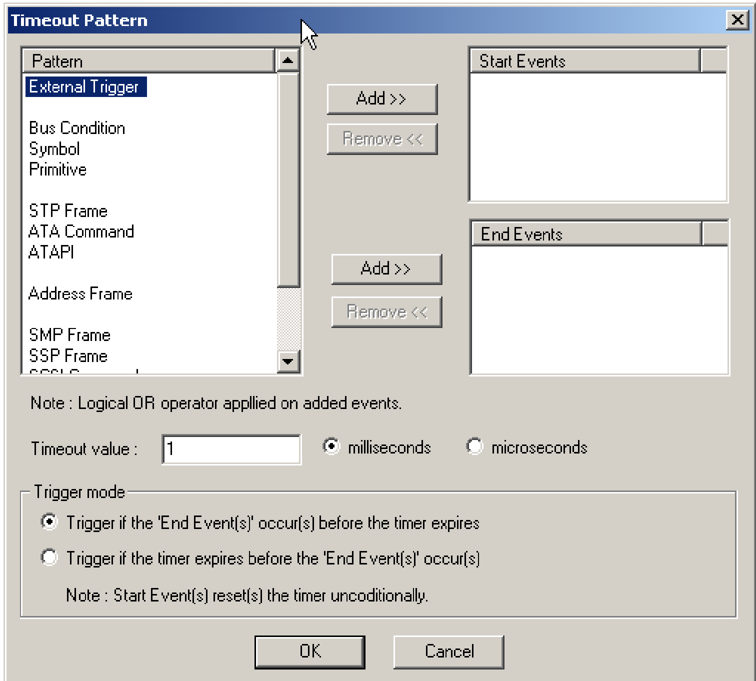


Figure 51. Timeout Dialog

Select a pattern for Start Events or End Events, enter a Timeout value, then select Trigger Mode:

- If End Events occur before timer expires
- If timer expires before End Events

Note: You cannot select a Timeout pattern if you select any other pattern as the trigger condition.

External Trigger

You can trigger on an external trigger. To set up the trigger, click the **External Trigger** category.

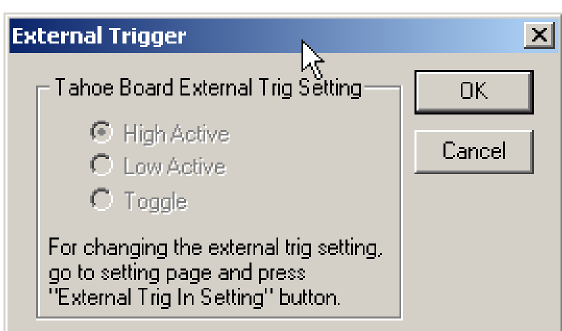


Figure 52. External Trigger Dialog

You cannot select an External Trigger Setting, so click **OK**.

Bus Condition

Double-click **Bus Condition** in the Pattern window of the Capture Project dialog to open the Bus Conditions dialog.

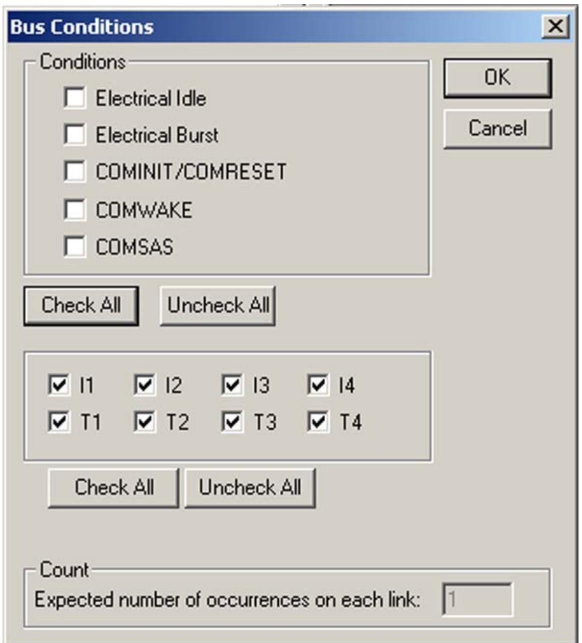


Figure 53. SAS: Bus Conditions Dialog

SAS vs. SATA: SATA Dialog separates the COMINIT and COMRESET check boxes and replaces COMWAKE with Host COMWAKE and COMSAS with Device COMWAKE.

Check Conditions on which to trigger, then click **OK**.

Note: You can define triggering for specific ports by checking or unchecking Port IDs.

Symbol

Double-click **Symbol** in the Pattern window of the Capture Project dialog to open the Symbol dialog.

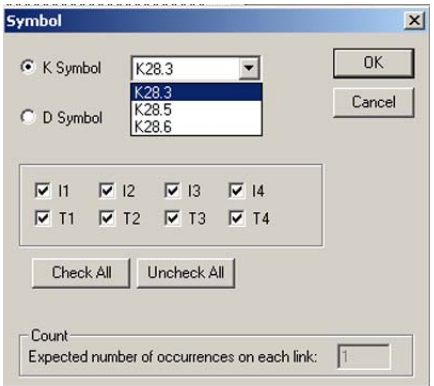


Figure 54. Symbol Dialog

Choose a symbol type by checking either the K Symbol or D Symbol option, then click the down arrow in the Symbol dropdown list, choose a symbol to trigger on, and click **OK**. Note that the D Symbol choice does not have a down arrow.

Primitive

Double-click **Primitive** in the Pattern window of the Capture Project dialog to open the Primitive dialog.

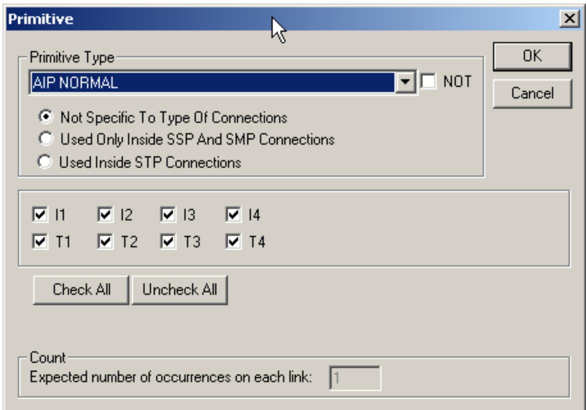


Figure 55. SAS: Primitive Dialog

SAS vs. SATA: SATA Dialog has no radio buttons and has different drop-down options.

Click the down arrow next to the Primitive dropdown list, scroll the list to choose a primitive on which to trigger, and click **OK**. **Note:** Check the box to the right of the Primitive Type to use the logical NOT.

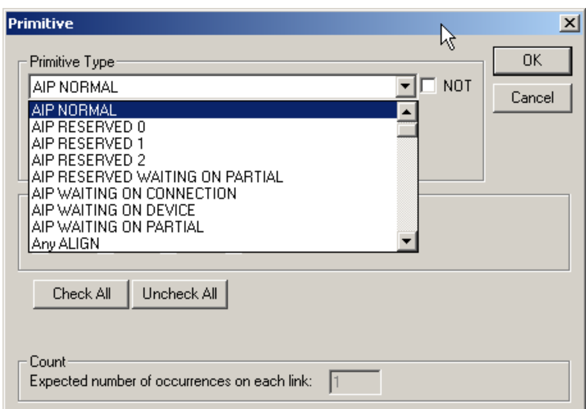


Figure 56. SAS: Primitive Selection Choices

SAS vs. SATA: SATA Dialog has different choices.

ATA Command

Double-click **ATA Command** in the Pattern window of the Capture Project dialog to open the ATA Command Pattern dialog.

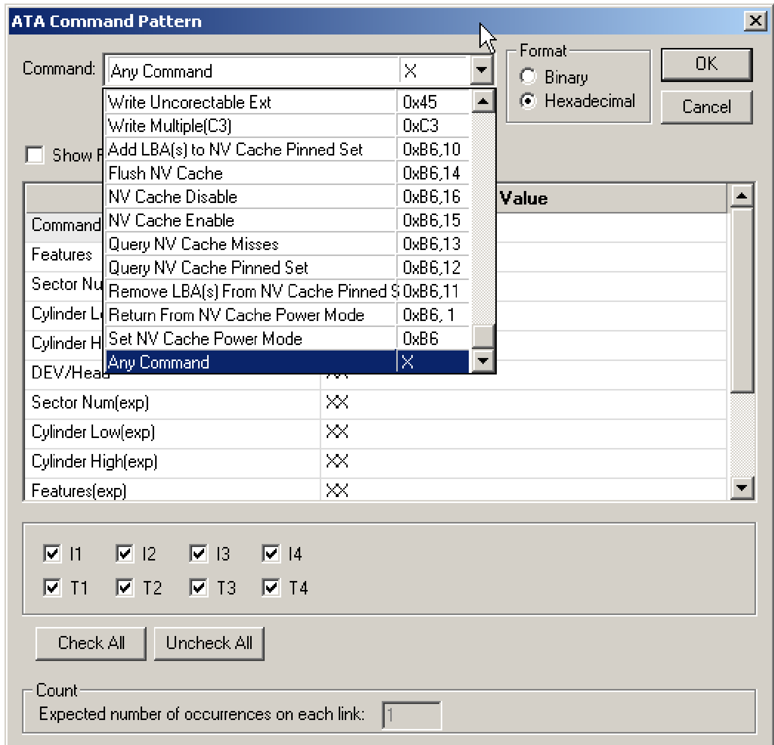


Figure 57. SAS: FIS Pattern Dialog

SAS vs. SATA: SATA Dialog has different dropdown options.

Click the down arrow next to the Command dropdown list, scroll the list to choose a command to trigger on, and click OK.

A powerful triggering choice is **Any Command**, which causes the analyzer to trigger on any ATA command.

ATAPI

Double-click **ATAPI** in the Pattern window of the Capture Project dialog to open the ATAPI Pattern dialog.

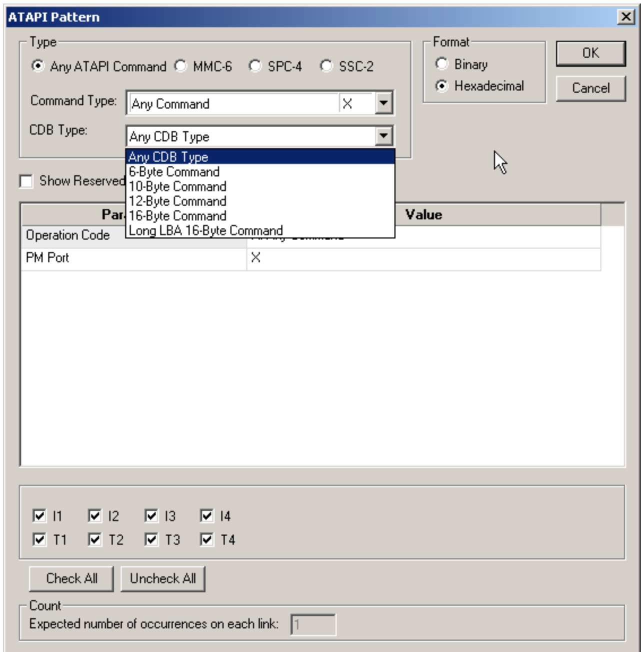


__Figure 58. SAS: ATAPI Pattern Dialog__

SAS vs. SATA: SATA Dialog has different dropdown options.

Click the down arrow next to the CDB dropdown list, scroll the list to choose a CDB Type, and click **OK**.

Data Pattern

Double-click **Data Pattern** in the Pattern window of the Capture Project dialog to open the Data Pattern dialog.

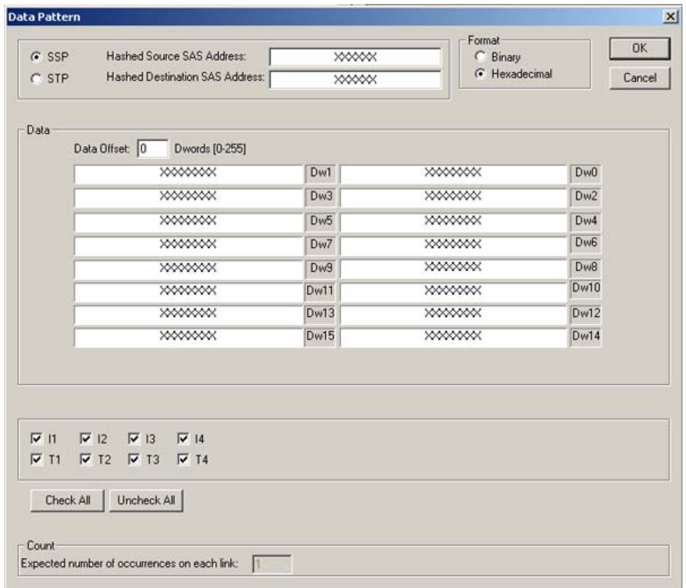


Figure 59. SAS: Data Pattern Dialog

SAS vs. SATA: SATA Dialog shows Port at the top and does not show SSP or STP.

Define the data pattern for triggering and click **OK**.

Note: When entering the data pattern in the “Data” section of this screen, if you are reading the data pattern from a recorded trace, you must reverse the order of the bytes listed for each dword entered. For example, if you want to trigger on “00 01 02 03” (as displayed in the trace), you must enter this dword pattern as “03 02 01 00”.

Protocol Errors

Double-click **Protocol Errors** in the Pattern window of the Capture Project dialog to open the Protocol Errors dialog.

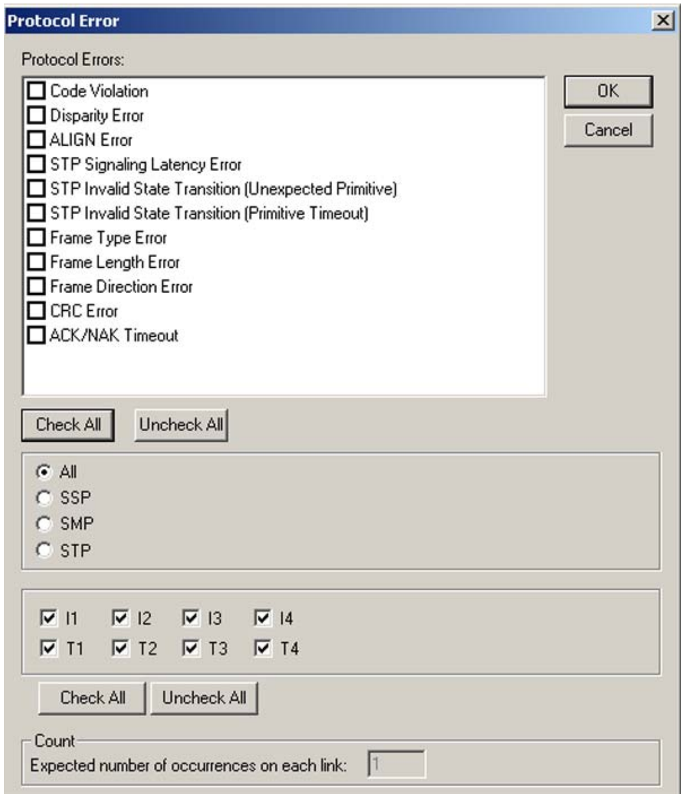


Figure 60. SAS: Protocol Errors Dialog

SAS vs. SATA: SATA Dialog shows Port and does not show SSP, SMP, or STP radio buttons.

Check the protocol error(s) to trigger on and click **OK**.

STP Frame (SAS only)

Double-click **STP Frame** in the Pattern window of the Capture Project dialog to open the FIS Pattern dialog.

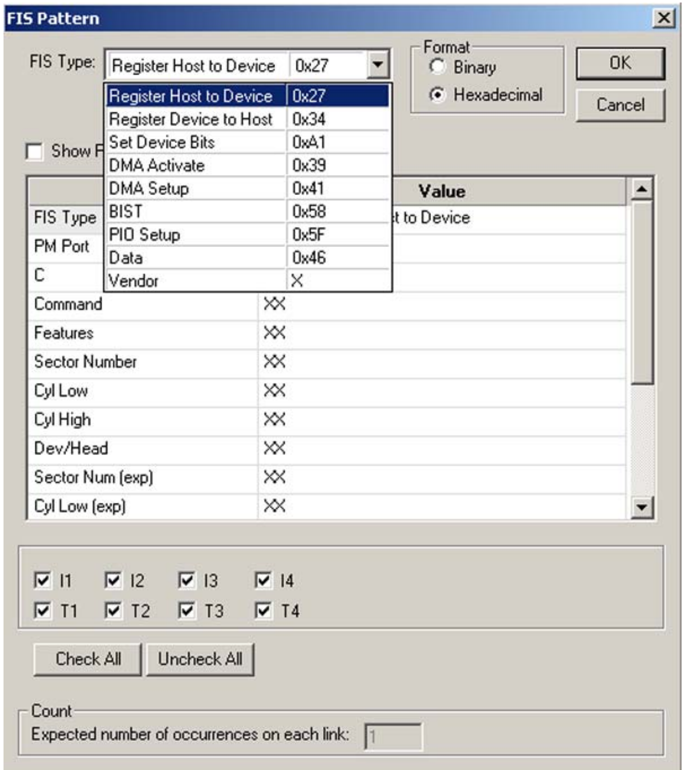


Figure 61. SAS: FIS Pattern Dialog

SAS vs. SATA: Not available in SATA.

Click the down arrow next to the FIS type dropdown list, scroll the list to choose an FIS type on which to trigger, and click **OK**.

Address Frame (SAS only)

Double-click **Address Frame** in the Pattern window of the Capture Project dialog to open the Address Frame Type Pattern dialog.

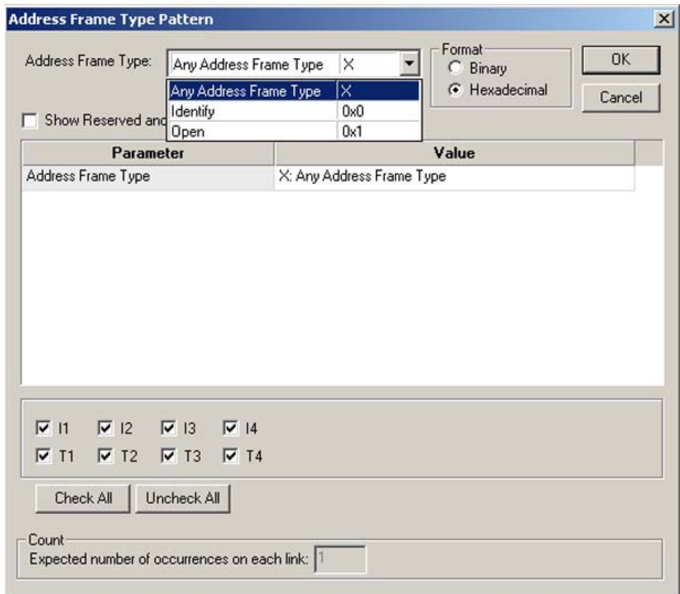


Figure 62. SAS: Address Frame Type Pattern Dialog

SAS vs. SATA: Not available in SATA.

Click the down arrow next to the Address Frame Type dropdown list, scroll the list to choose an address frame type on which to trigger, and click **OK**.

SMP Frame (SAS only)

Double-click **SMP Frame** in the Pattern window of the Capture Project dialog to open the SMP Frame Pattern dialog.

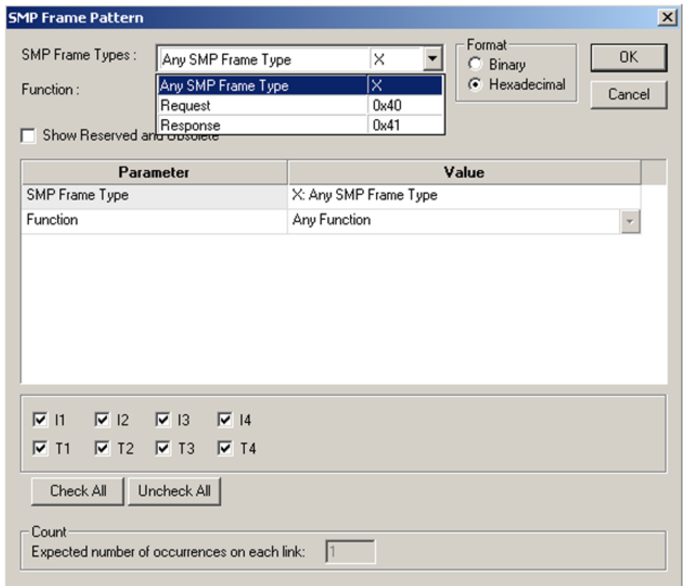


Figure 63. SAS: SMP Frame Pattern Dialog

SAS vs. SATA: Not available in SATA.

Click the down arrow next to the SMP Frame Types dropdown list, then scroll the list to choose an SMP frame type on which to trigger.

Then click the down arrow next to the Function dropdown list, choose a function, and click **OK**.

SSP Frame (SAS only)

Double-click **SSP Frame** in the Pattern window of the Capture Project dialog to open the SSP Frame Type dialog.

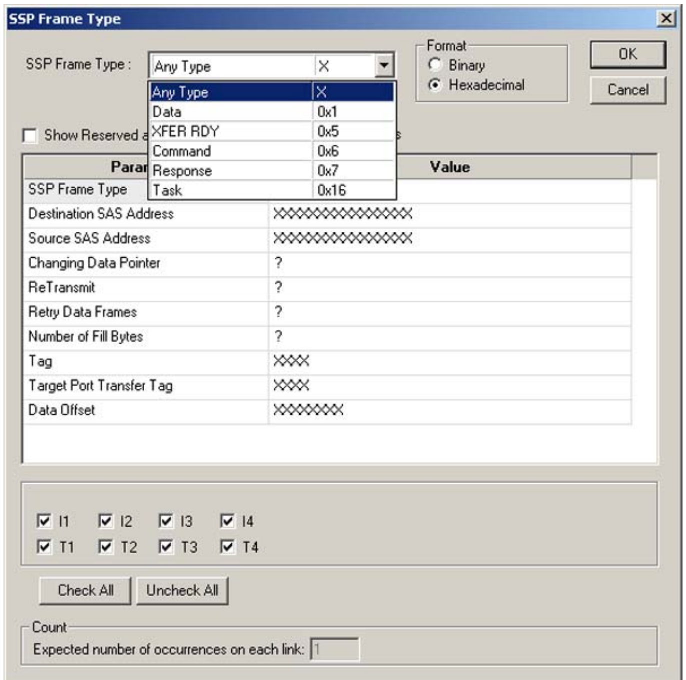


Figure 64. SAS: SMP Frame Type Dialog

SAS vs. SATA: Not available in SATA.

Click the down arrow next to the SSP Frame Type dropdown list, scroll the list to choose an SSP frame type on which to trigger, and click **OK**.

SCSI Command (SAS only)

Double-click **SCSI Command** in the Pattern window of the Capture Project dialog to open the SCSI Command Pattern dialog.

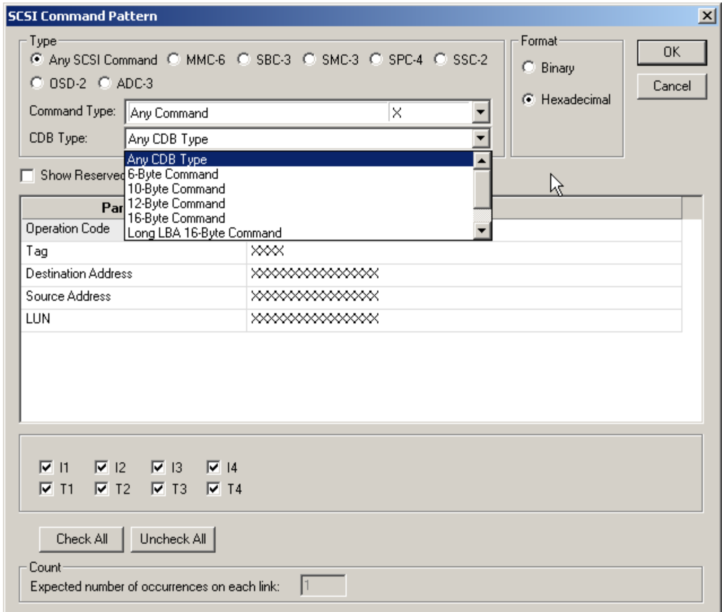


Figure 65. SAS: SCSI Command Pattern Dialog

SAS vs. SATA: Not available in SATA.

Click the down arrow next to the CDB dropdown list, scroll the list to choose a CDB Type, and click **OK**.

FIS (Frame Information Structure) (SATA only)

Double-click **FIS** to open the FIS Type selection dialog.

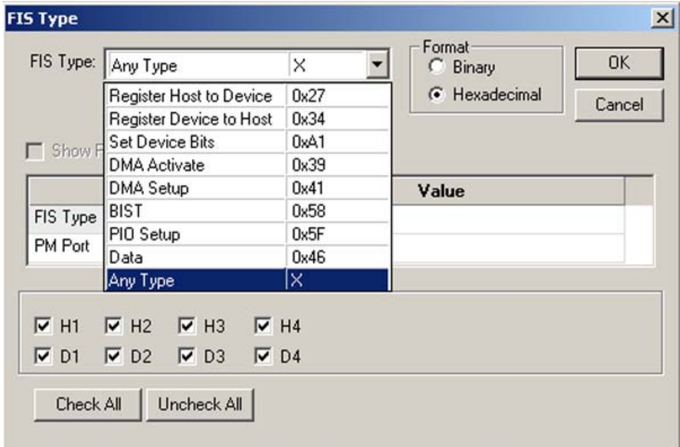


Figure 66. SATA: FIS Type Dialog

SAS vs. SATA: Not available in SAS.

Click the down arrow next to the Type drop-down list box, choose a **FIS** type on which to trigger, and click **OK.** Repeat for additional types.

Available FIS Types:

- Register Host to Device
- Register Device to Host
- Set Device Bit
- DMA Activate
- Any Type
- DMA Setup
- BIST
- PIO Setup
- Data

Note: You cannot trigger on a Vendor FIS.

FIS Pattern (SATA only)

Double-click **FIS Pattern** to open the FIS Pattern selection dialog.

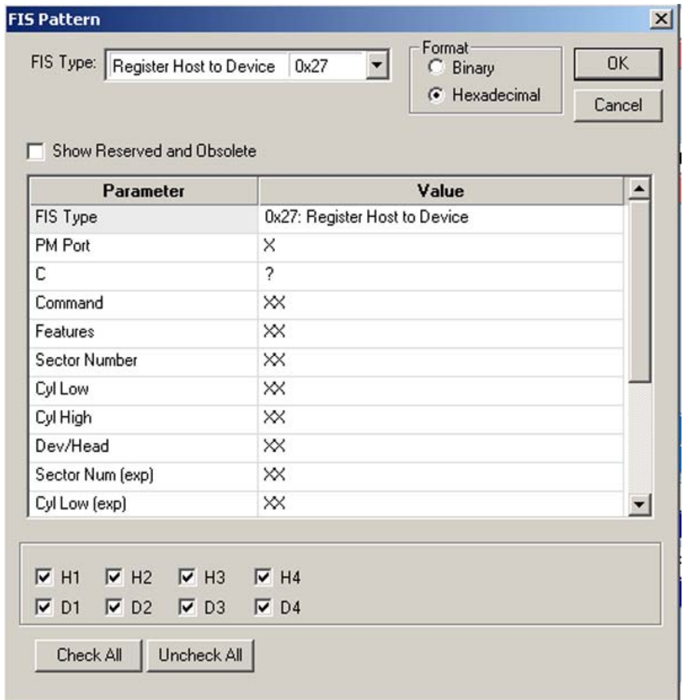


Figure 67. SATA: FIS Pattern Dialog

SAS vs. SATA: Not available in SAS.

The FIS Pattern dialog opens with the default FIS Type **Register Host to device.** To choose another available FIS Type, click the down arrow next to the FIS Type list box.

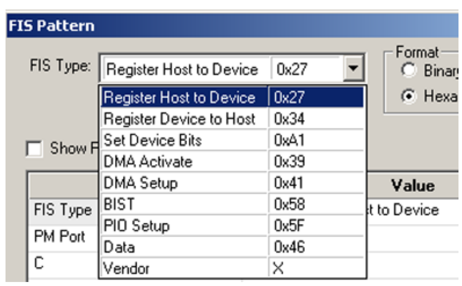


Figure 68. SATA: FIS Pattern Dialog Choices

SAS vs. SATA: Not available in SAS.

Choose an FIS Type and complete the corresponding dialog.

ATA Command Pattern (SATA only)

Double-click **ATA Command** Pattern to open the ATA Command Pattern selection dialog.

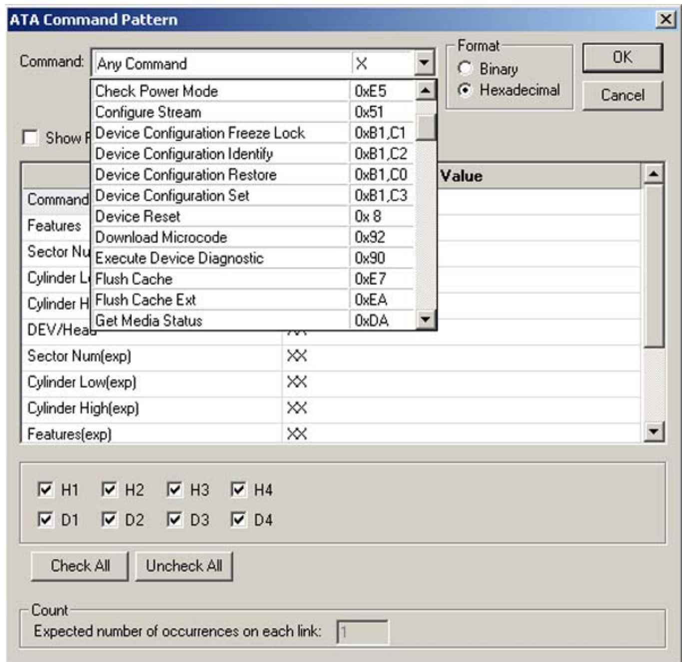


Figure 69. SATA: ATA Command Pattern Dialog

SAS vs. SATA: Not available in SAS.

Click the down arrow next to the Command list box, choose an ATA command, and click **OK**.

Soft Reset (SATA only)

Double-click **Soft Reset** to open the Soft Reset dialog.

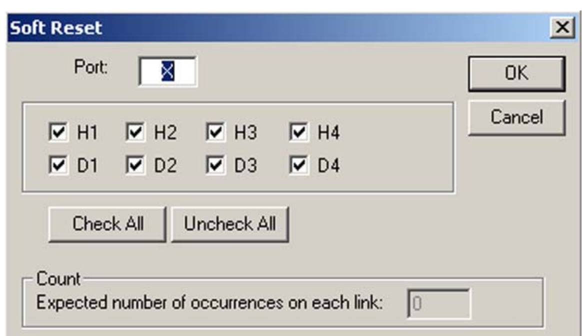


Figure 70. SATA: Soft Reset Dialog

SAS vs. SATA: Not available in SAS.

Sequential Trigger Mode

In Sequential Trigger mode, triggering occurs whenever the system detects a specific sequence of patterns. Defining the triggering patterns sets the sequence order. You must define at least two patterns to enable selection of Sequential Trigger mode.

Note: Patterns, such as Primitives and Symbols or Frames, occurring very close together on different ports, cause an error in triggering.

To define a triggering sequence, select more than one pattern, then check the **Define Sequential Trigger Mode** check box.

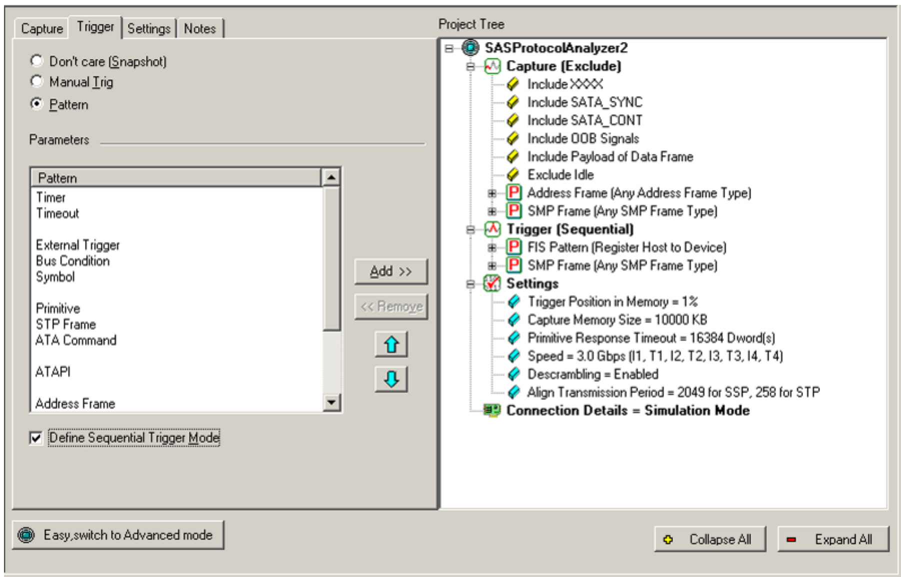


Figure 71. SAS: Select Sequential Trigger Mode

SAS vs. SATA: SATA Dialog has different patterns.

Timer

The sequential triggering mode offers the option of triggering on a timer or inserting a timer in the triggering sequence to delay detection of the next pattern in the sequence. To insert a timer in the trigger list, double-click **Timer** to open the Timer dialog.

Figure 72. Timer Dialog

Enter a **Timer Value**, choose the Time Unit, and click **OK**.

Defining Patterns

The definition of patterns for the sequential trigger mode is identical to the Any Trigger mode, with the following exception:

In sequential triggering mode, the definition dialogs for the triggering patterns enable the setting to count the number of occurrences. This allows you to specify the number of times that the pattern must occur before triggering or proceeding in the trigger sequence.

Figure 73. Number of Occurrences

Note: The events on each link are counted independently, causing a trigger whenever the number of occurrences on any link equals the specified value.

Triggering Order

As triggering patterns are defined and added, they are displayed in the Project Tree sequentially in the order that they were entered under the Trigger category. When the project runs, the analyzer detects the occurrence of each pattern in order and triggers on the last one.

You can re-order the sequence of triggering patterns. To change the sequence order, highlight a trigger pattern and use the **Up** or **Down** arrow to move it to a new position.

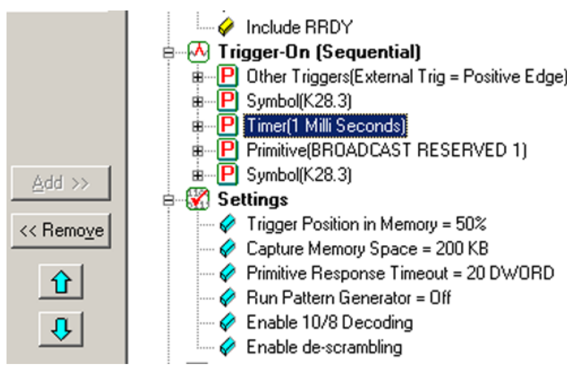


Figure 74. Triggering Order

Pre-Trigger

You can set the amount of data to capture before and after the trigger, as a percentage of pre-trigger, between 1% and 99%. Position the pre-trigger slider to a percentage. This feature allows the evaluation of bus activity leading up to and after the triggering event. Figure 75. illustrates the operation of pre-trigger in data memory.

Pre-trigger data is capture of the specified percentage of data prior to the triggering event. It cannot be guaranteed and may be 0. This can occur when the triggering event occurs before storing the required amount of pre-trigger event data. In such a case, the data display shows fewer than the specified data points prior to the triggering event.

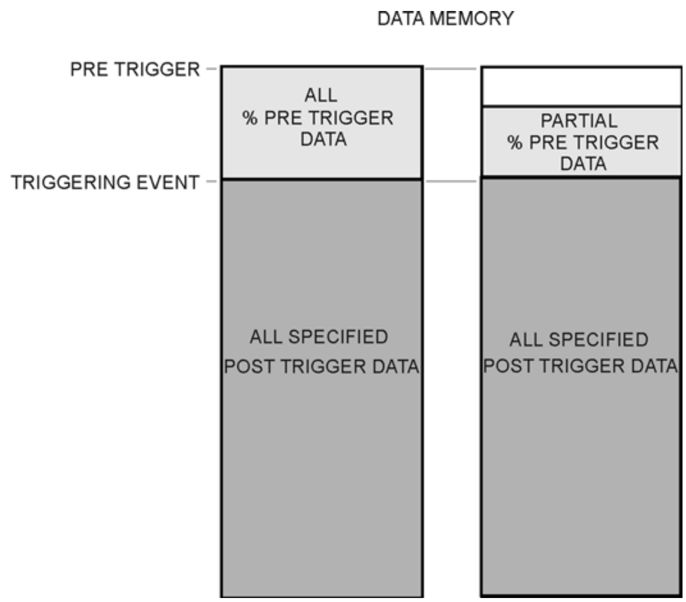


Figure 75. Pre-Trigger Example, 20% Pre-Trigger

Project Settings

To set project options, click the **Settings** tab.

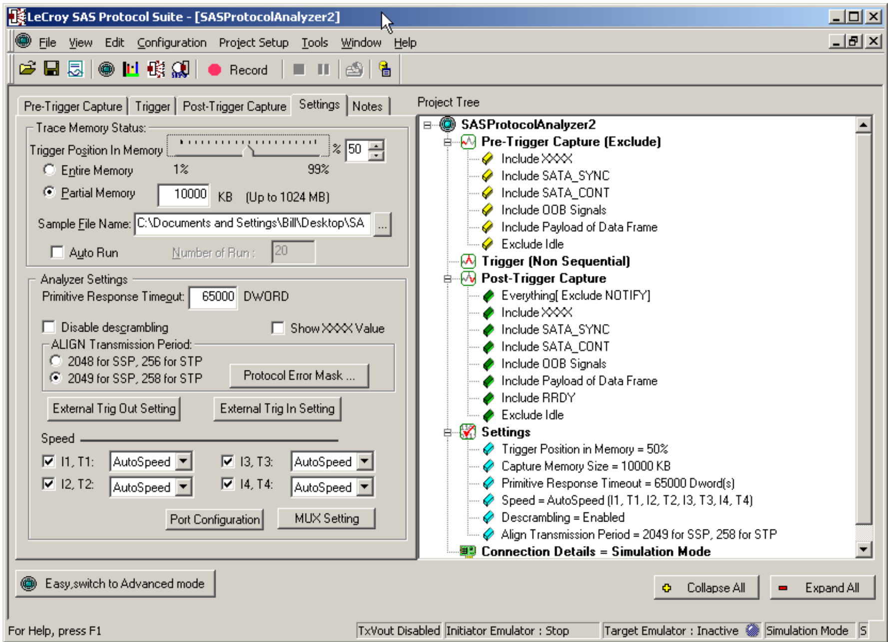


Figure 76. SAS: Setting Project Options

SAS vs. SATA: For the ALIGN Transmission Period section, SATA Dialog shows options 256 and 258, and does not show 2048 or 2049.
For Speed, SATA Dialog shows H1, D1 to H4, D4 and does not show I1, T1 to I4, T4.
SATA Dialog does not show MUX Setting button.

Memory Settings

The Trace Memory Status section has the following fields.

Trigger Position

Pre-Trigger defaults to 50%, which defines the percentage of data to capture before and after the triggering event. You can change this percentage by dragging the slider.

Capture of the specified percentage of the data prior to the triggering event cannot be guaranteed and may be 0. This can occur if the triggering event occurs before storing the required amount of pre-trigger event data. In such a case, the data display shows fewer than the specified data points prior to the triggering event. For more detail, see “Pre-Trigger” on page 65.

Memory Size

To reduce the capture memory size, check **Partial Memory** and enter a buffer size, or check **Entire Memory** to allow capture for the entire memory, if you want to capture the maximum amount of trace data. (Minimum size of memory is 2 GB. Maximum size of entire memory is 8 GB.)

Note: In cases where the size of a data packet exceeds the set buffer memory allocation, the project runs, but no capture results. In such cases, you must increase the buffer memory size to a value greater than the packet size.

Sample File Name

Click the **ellipses** next to the Sample File Name text box and choose a file name and location for the results of your current project.

Auto Run

To repeat the current capture and trigger setup automatically, check the **Auto Run** checkbox and enter the number of times in the **Number of Run** text box. The capture and trigger repeat automatically for the specified number of times, and the results are saved in consecutively numbered **Sample.scs** files.

Analyzer Settings

The Analyzer Settings section has the following fields.

Primitive Response Timeout

Primitive Response Timeout specifies the number of DWORDs after a Primitive Response.

Disable Scrambling

If checked, causes the Analyzer to assume that no traffic is scrambled. By default, the Analyzer assumes the scrambling state of the devices under test

Show XXXX value

Check this option to display XXXX values.

ALIGN Transmission Period (differs for SAS and SATA)

Choose the ALIGN Transmission Period for SSP and STP by clicking the corresponding option button, then open the Protocol Error Mask dialog.

Protocol Error Mask

Click the **Protocol Error Mask** button to open the Protocol Error Mask dialog.

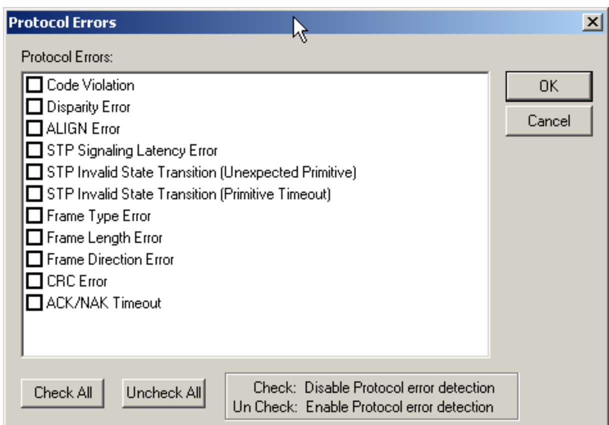


Figure 77. Protocol Errors Dialog

Check the Protocol Errors not to display in the sample view.

External Trig Out Setting

The Analyzer can send a Low or High external signal anytime a trigger occurs. Select the External Trig Out Setting: High Active, Low Active, or Toggle from High to Low or Low to High once (3.3 V output).

Enter the External TrigOut pulse width.

External Trig In Setting

An external Low or High input signal can cause triggering. Select the External Trig In Setting: High Active, Low Active, or Toggle from High to Low or Low to High once (3.3 V output).

Choose Port Speed

The default speed is **Autospeed**. You can also select the port speed from the drop-down list: 1.5 Gbps, 3.0 Gbps, or 6.0 Gbps. It is recommended to specify the speed, to reduce the hunt for lock speed.

Note: If a Port ID check box has no check, the analyzer does not capture any patterns for that port. The system allocates trace memory for that port to its adjacent port, for example: I1, T1 <-> I2, T2 or I3, T3 <-> I4, T4.

Port Configuration

Port configuration depends on the application you run. To act as analyzer, select the **Analyzer** port configuration. To activate a Device emulator on a port, select the **TargetEmulator/DeviceEmulator** port configuration. To activate the device emulator on a port and run the Analyzer on the same port, select **Analyzer/Emulator**.

MUX Setting (SAS only)

Enable Muxing on port combinations.

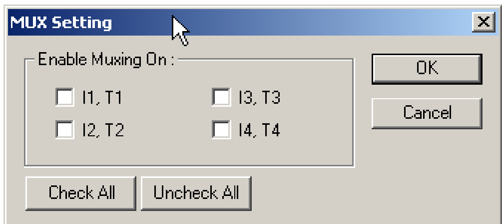


Figure 78. MUX Setting Dialog Box

If you enable this option on two ports, the data of both ports transfers on one physical link, whose speed is twice the speed of each link, and the data of two links multiplexes on one physical link. For example, two 3 G ports together make one 6 G port. Note the following:

- The muxing check boxes are usable only if two or more emulator channels are selected.
- The initiator emulator check box is greyed out if only one emulator channel is selected.

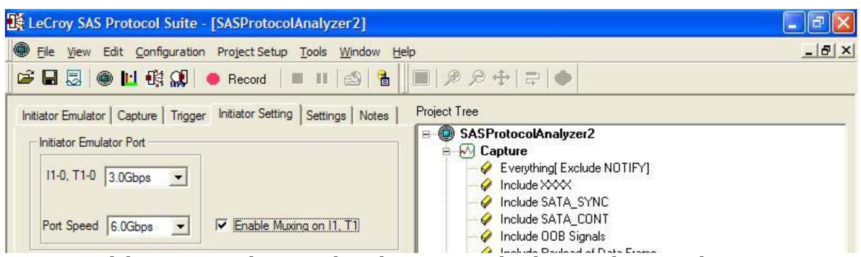


Figure 79. Initiator Emulator Check Box and Channel Speeds

- The target emulator check box is not displayed at all until two or more emulator channels are selected.

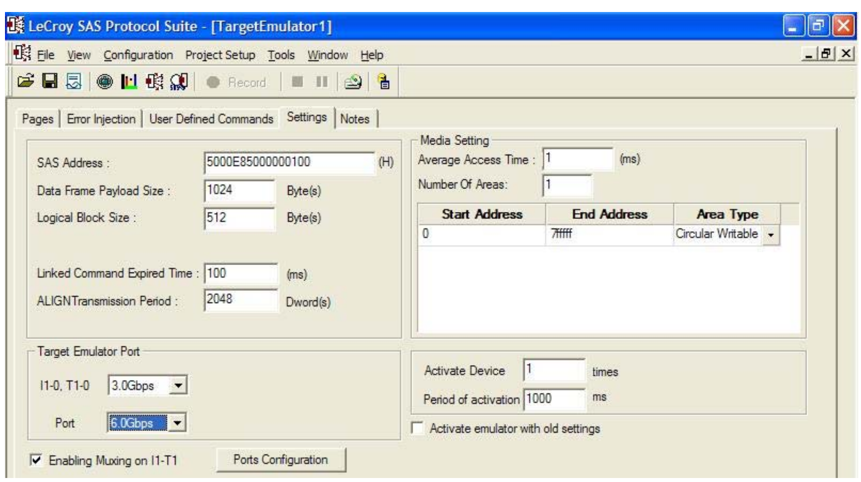


Figure 80. Target Emulator Check Box and Channel Speeds

Add a Project Note

To enter and save information about the current project, click the **Notes** tab and enter the data about the project.

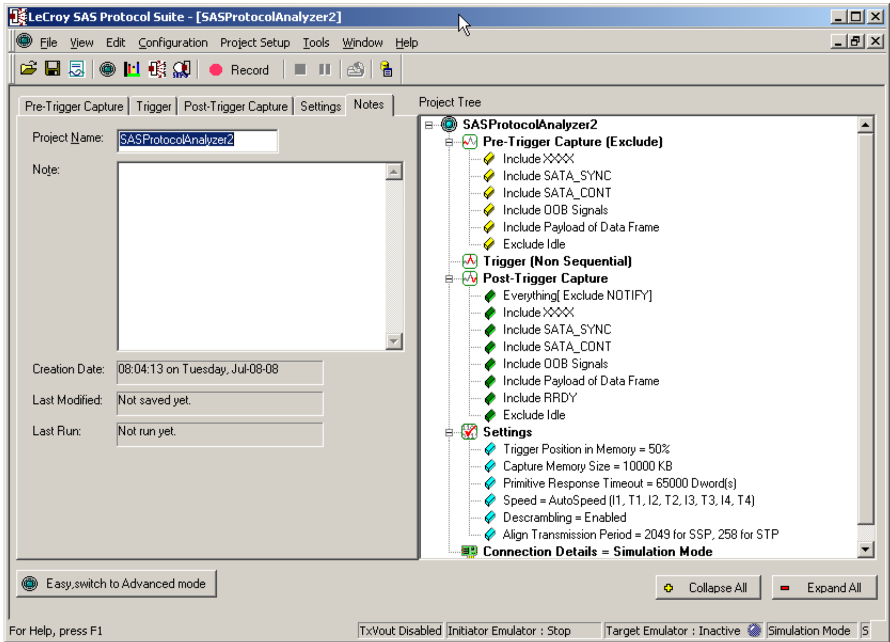


Figure 81. Project Notes Tab

Advanced Mode (User-Defined)

Advanced Mode expands Analysis capability by allowing you to program complex triggering and data capture projects.

The Advanced Mode is a state machine with up to 23 different states. You can program each state individually to:

- Trigger on a different event or trigger unconditionally.
- Capture Everything, Nothing, or a user-defined pattern.
- Include up to three ELSE IF statements, allowing a jump to any other state based on a user definition.
- Use up to three timers, which you can set to a maximum value of 42949 ms. You can set a timer in the state or continue the timer set in the previous state.
- Output an external trigger High or Low.

Working in Advanced Mode

To start working in the Advanced Mode, click the **Easy, Switch to Advanced Mode** button in an open Analyzer window.

You can:

- Display the state definition
- Set Output Trigger level
- Select up to three timers
- Define the If condition and up to three Else If conditions
- Set number of occurrences before trigger
- Set captured data
- Set excluded data
- Go to next state
- Add state
- Choose link for Sequencer setup

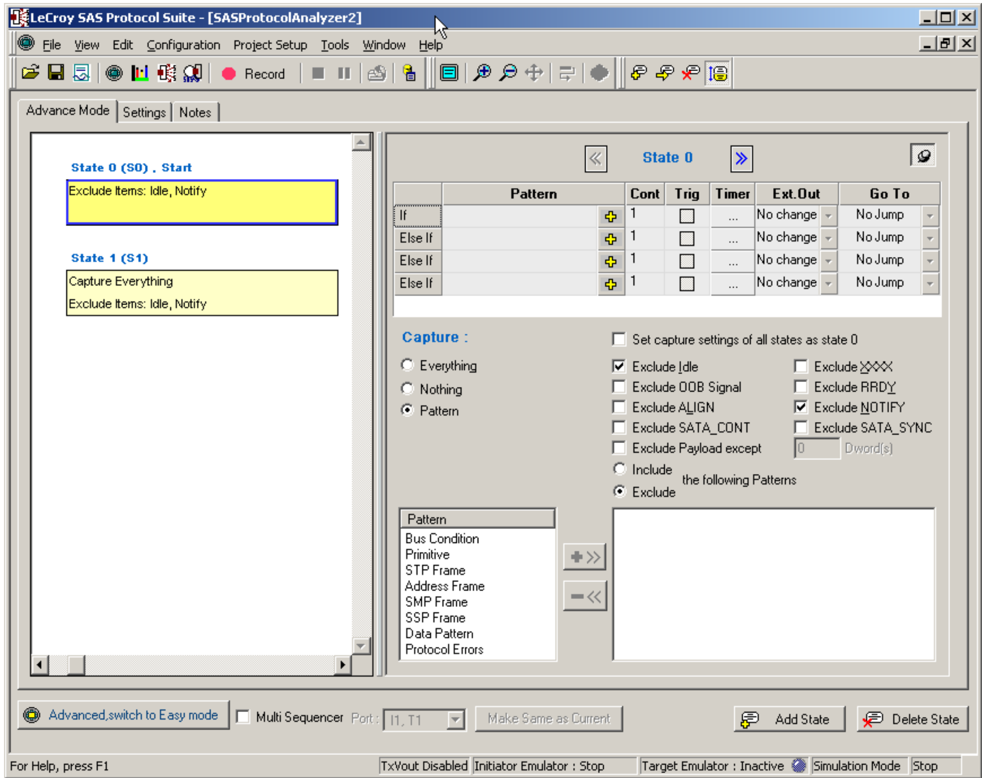


Figure 82. SAS: State Programming Dialog

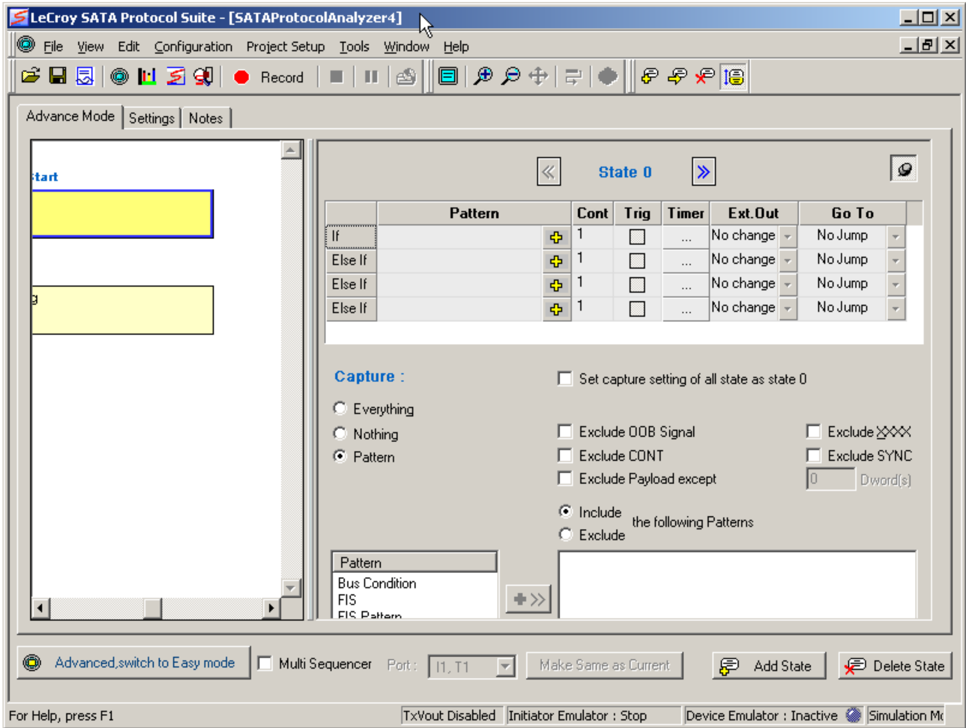


Figure 83. SATA: State Programming Dialog

SAS vs. SATA: SATA Dialog removes Exclude Idle, Exclude ALIGN, Exclude RRDY, and Exclude NOTIFY.
SATA Dialog replaces Exclude SATA_CONT with Exclude CONT and Exclude SATA_SYNC with Exclude SYNC.
SATA Dialog has Patterns Bus Condition, FIS, FIS Pattern, Data Pattern, and Protocol Errors and does not have STP Frame, SMP Frame, STP Frame, or Address Frame.

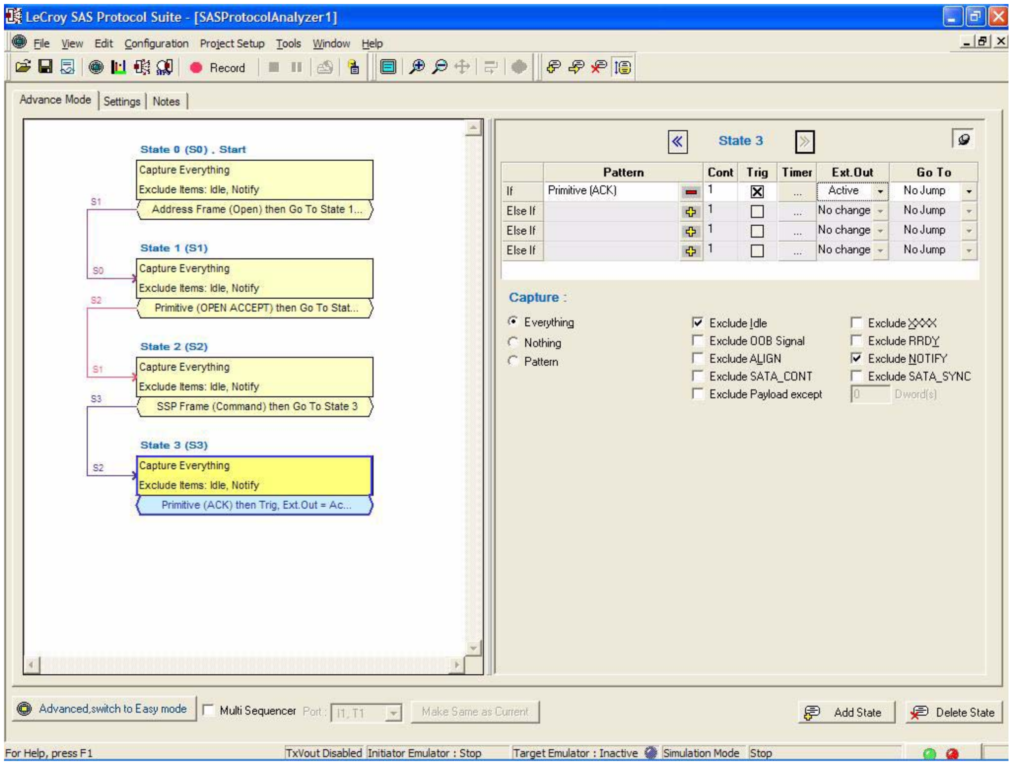


Figure 84. SAS: Advanced Trigger with multiple branches

Setting Trigger Conditions

To set the If and Else If trigger condition:

1. Click the **Add Pattern** button  for a Pattern field and choose a trigger condition from the drop-down list.

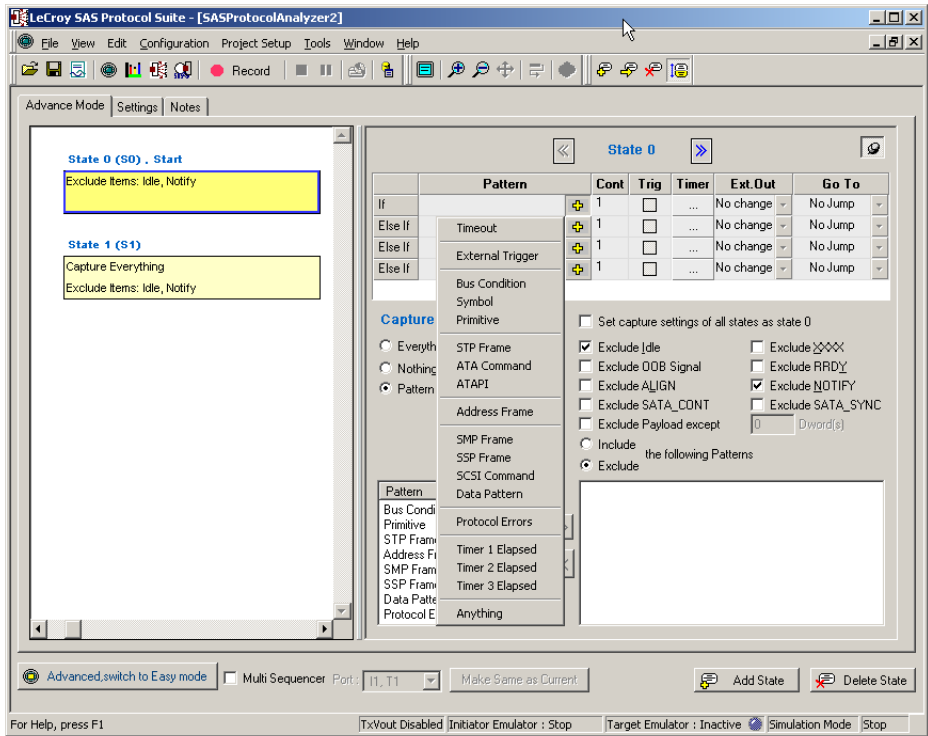


Figure 85. SAS: Choosing a Trigger Condition

2. Define each selected pattern in the same way as in Easy Mode, as described starting on page 31. To use a timer, define it first.

Note: You can set a timer for any If or Else If condition.

3. Enter a value for the number of occurrences before trigger in the **Cont** field, up to a maximum of 65535 occurrences.
4. Choose a capture option: **Everything, Nothing,** or **Pattern**.
5. If you choose Pattern, you can select patterns for inclusion or exclusion. Clicking the **Pattern** option enables a pattern definition dialog.

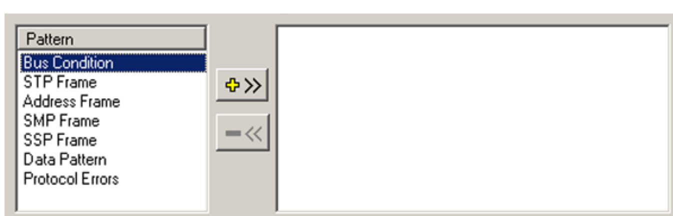


Figure 86. SAS: Choosing a Pattern

6. Choose pattern(s) and click the **+>>** button to add them for capture or exclusion. You define each pattern the same way as in Easy mode (see "Defining Patterns" on page 31).
7. For an output trigger, click the down arrow in the **Ext. Out** field and choose an output trigger level.
8. To go to another state, click the down arrow in the **Go To** field and select a state. If no other state has been defined, choose **New State** to add a state.

Multi-Link Triggering

You can set different triggering for each link. To set different trigger conditions for a link, check the **Multi Sequencer** check box and select the link for setup from the Port drop-down list.

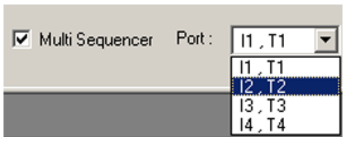


Figure 87. Multi-Link Triggering Setup

Set Timers

You can set and use up to three timers for triggering. You can set each timer for each state or continue from a timer set in the previous state. The timer defined for a particular state starts when entering that state. To set timers, click the **ellipses** in the **Timer** field in each state and define each of the timers in the Set Timers dialog.

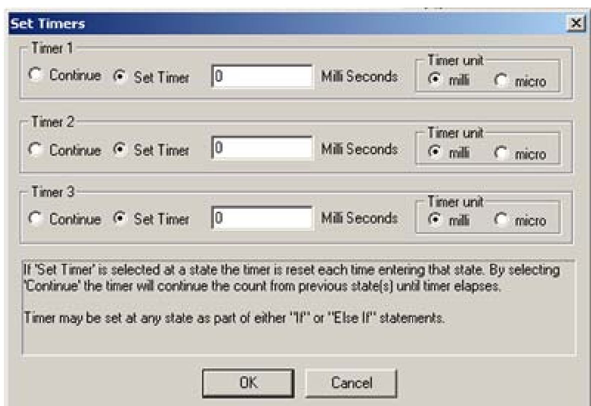


Figure 88. Set Timers Dialog

Useful Key Sequences

The following key sequences are active to assist you in navigating a defined state machine:

Ctrl+a	Add State
Insert	Insert State
Del	Delete State
Ctrl+c/Ctrl+Ins	Copy
Ctrl+v/Shift+Ins	Paste
Up/Down arrow keys	Moves selection between states
Page Up/Page Down	Page Up and Page Down states
Home	Go to first page
End	Go to end page

Project Settings

Prior to running the Advanced mode project, click the **Settings** tab. The options in the Settings dialog are the same as for the Easy Mode, described starting on page 66.

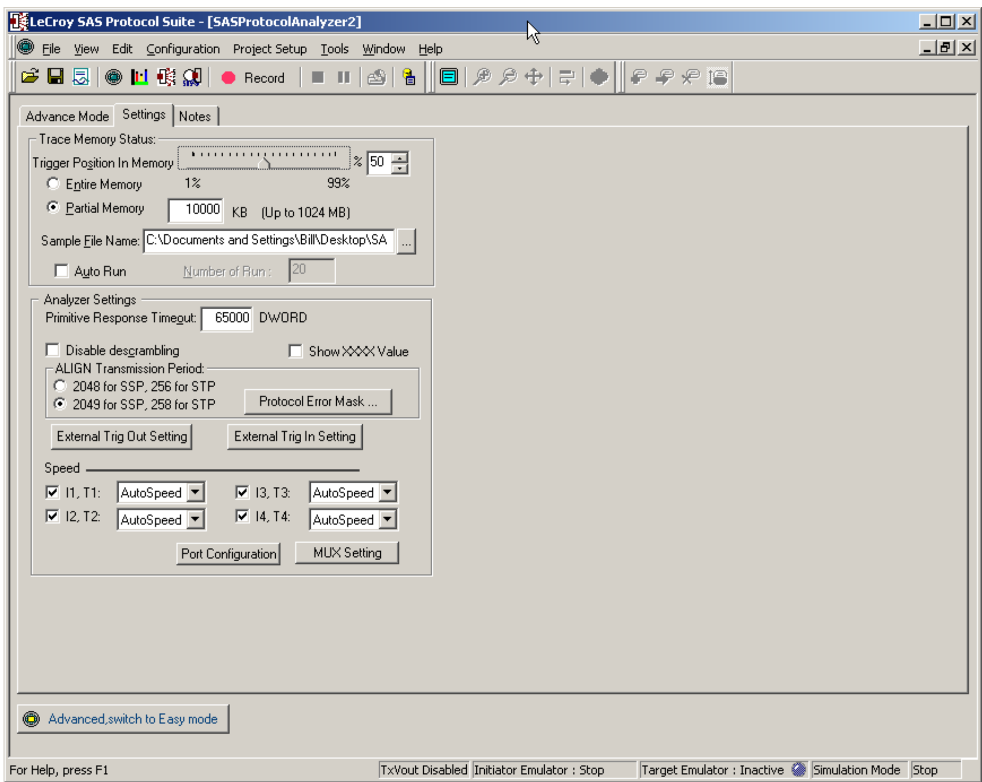


Figure 89. SAS: Project Settings Page

SAS vs. SATA: For the ALIGN Transmission Period section, SATA Dialog shows options 256 and 258, and does not show 2048 or 2049.
For Speed, SATA Dialog shows H1, D1 to H4, D4 and does not show I1, T1 to I4, T4.
SATA Dialog does not show MUX Setting button.

Notes

To include some descriptive information about the project, click the **Notes** tab and enter a brief descriptive note (see “Add a Project Note” on page 70).

Exercise and Capture

SAS: To perform a capture with SAS Initiator Emulator generated bus traffic, click **File > New > Protocol Analyzer (Initiator Emulator)**.

SATA: To perform a capture with SATA Host Emulator generated bus traffic, click **File > New > Protocol Analyzer (Host Emulator)**.

Program the Initiator Emulator or Host Emulator, then set up a capture, as described in "Protocol Analysis" on page 19.

Programming the Initiator or Host Emulator

SAS: Click the **Initiator Emulator** tab:.

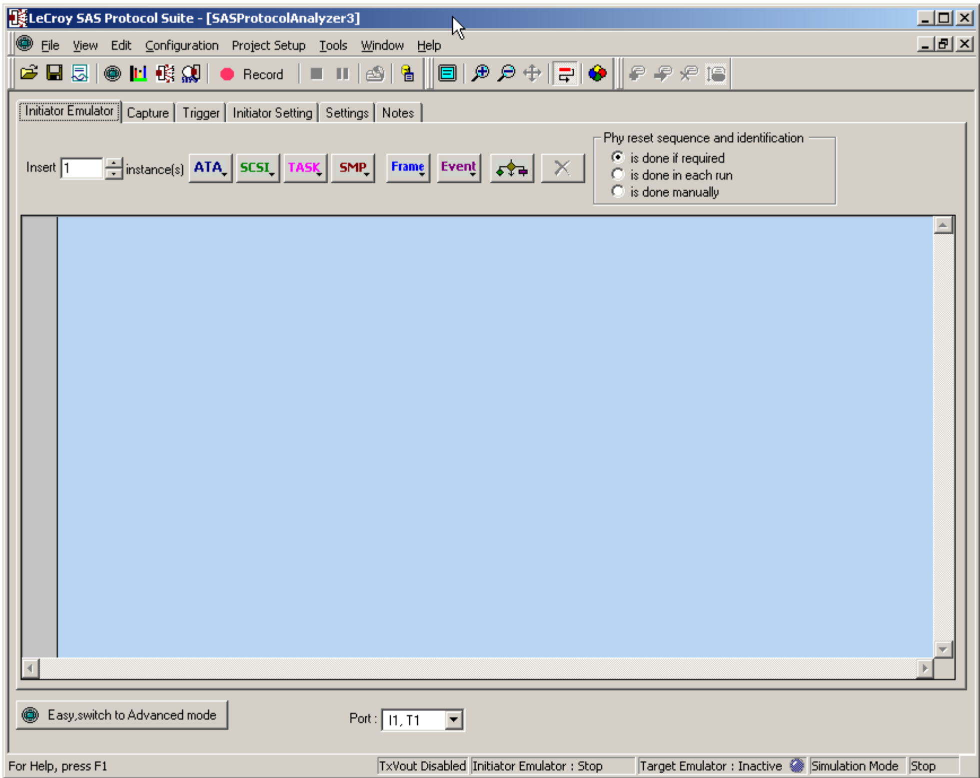


Figure 90. SAS: Initiator Emulator Program Dialog

SATA: Click the **Host Emulator** tab:

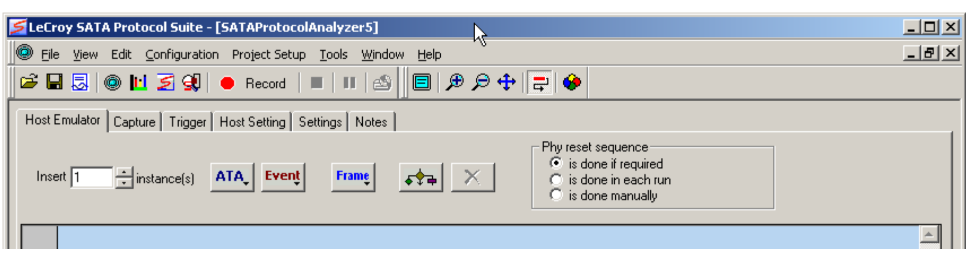


Figure 91. SATA: Host Emulator Program Dialog

SAS vs. SATA: SATA Dialog removes the SCSI, Task, and SMP buttons and replaces the Initiator Setting tab with the Host Setting tab.

SAS: You can create an Initiator program using ATA, SCSI, Task, and SMP commands; Frames; and/or Events. These commands can execute in a program loop or be subject to user-specified conditions.

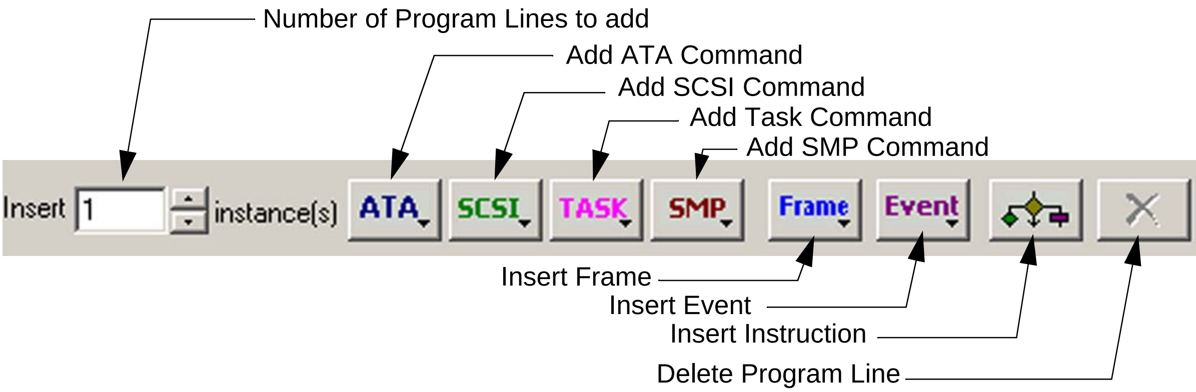


Figure 92. SAS: Host Emulator Program Dialog

SATA: You can create an Host program using ATA, Frames, and/or Events.

Add Program Lines

To add program lines, enter the number of lines to add in the Insert field, then click a command button: ATA, SCSI, TASK, SMP, Frame, or Event.

Adding Initiator or Host Emulator Commands

Adding an ATA Command

Click the **Insert ATA Command** button, click one of the command categories, and choose a command.

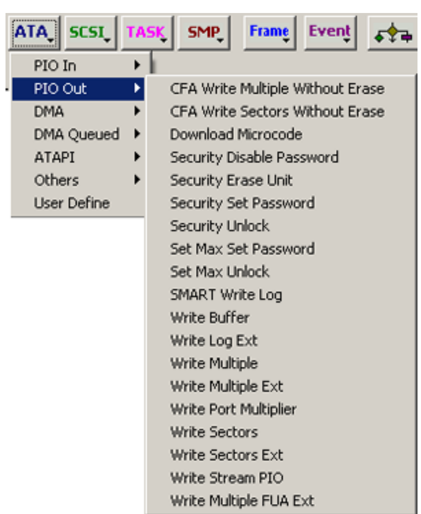


Figure 93. ATA Dropdown List

Adding a User-Defined ATA Command

Click the **Insert ATA Command** button and choose User Defined. This enters an ATA command line with editable fields to define your own custom command.

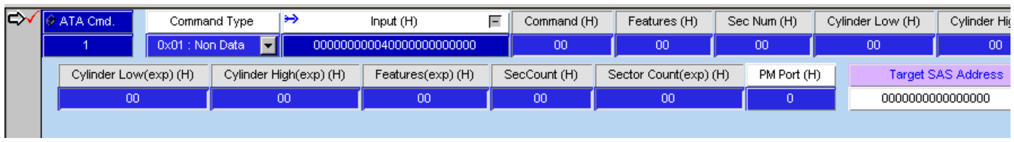


Figure 94. Insert ATA Command

Adding a SCSI Command (SAS only)

Click the **Insert SCSI Command** button, click one of the command categories, and choose a command.

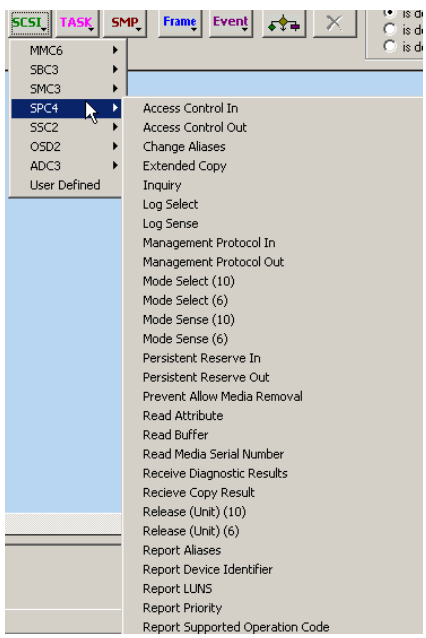


Figure 95. SAS: SCSI Dropdown List

Adding a User-Defined SCSI Command (SAS only)

Click the **Insert SCSI Command** button and choose User Defined. This enters an SCSI command line with editable fields to define your own custom command.

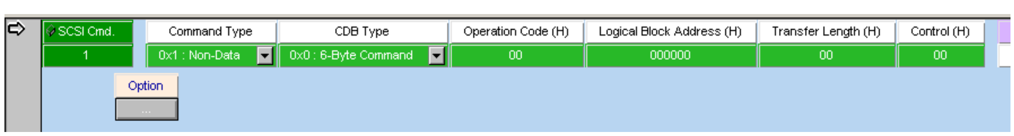


Figure 96. Insert SCSI Command

Adding a TASK Command (SAS only)

Click the **Insert Task Command** button and choose the command to insert.

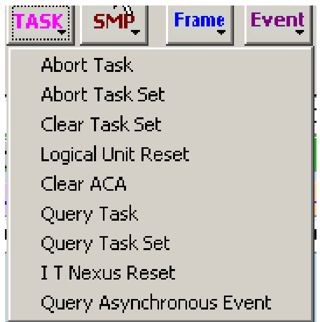


Figure 97. SAS: TASK Dropdown List

Adding an SMP Command (SAS only)

Click the **Insert SMP Command** button and choose the command to insert.

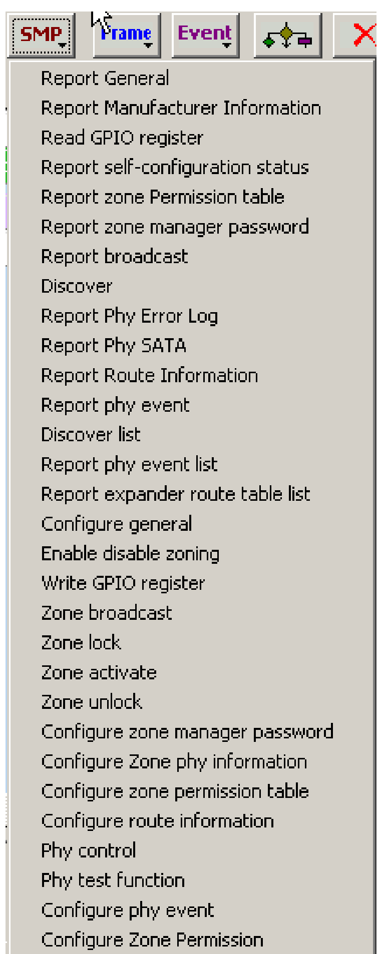


Figure 98. SAS: SMP Dropdown List

Adding a Frame

SAS: Click the **Insert Frame** button and choose the frame type to insert.

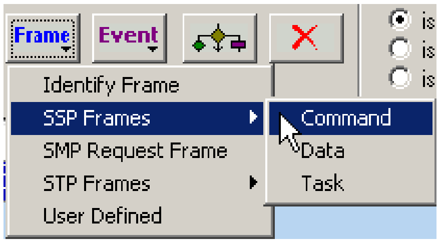


Figure 99. SAS: Frame Dropdown List

Note that SSP and STP frames offer additional options.

SATA: Click the **Insert Frame** button and choose the frame type to insert.

Figure 100. SATA: Frame Dropdown List

Adding an Event

Click the **Insert Event** button and choose the event to insert.

Figure 101. SAS: Event Dropdown List

Figure 102. SATA: Event Dropdown List

Inserting Instructions

Instructions are logical program elements that allow the definition of how the Initiator Emulator program executes. Using instructions, you can define program loops, make conditional jumps, and insert delays and stops.

To insert an instruction, click a command in the Initiator Emulator program where you want the instruction inserted, then click the **Insert Instruction** button, then choose the instruction to insert.

Figure 103. Insert Instructions Dropdown List

Start Loop

Click the command at which to start the loop, and then insert the **Loop Start** instruction.

Figure 104. Start Loop

Loop Count

Enter the number of times to run the loop in the number text box, or click the down arrow on the Count Drop-down combo box and choose **Infinite**.

End Loop

Click the command at which to stop the loop, and then insert the **Loop End** instruction.

Figure 105. End Loop

Add a Goto

To insert an unconditional jump to a previously labeled command, insert a **Goto** instruction. Then click the down arrow on the Drop-down combo box and choose the label to designate the destination command.

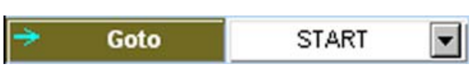


Figure 106. Goto

Add an If

To insert a conditional jump to a previously labeled command, insert an **If** instruction. Choose a specialized condition for the If from the If flyout.

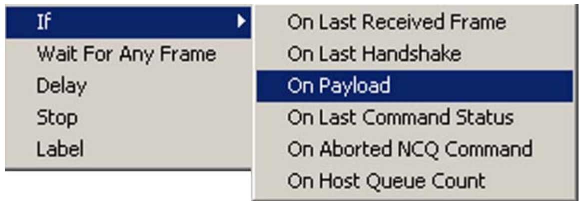


Figure 107. If

Then click the down arrow on the If Drop-down combo box, choose the condition for the jump and then the down arrow on the Goto Drop-down combo box, and choose the label to designate the destination of the jump.

Figure 108. If on Payload

For commands with incoming payloads, you can specify patterns for a condition by clicking the options button on a payload instruction and defining pattern(s).

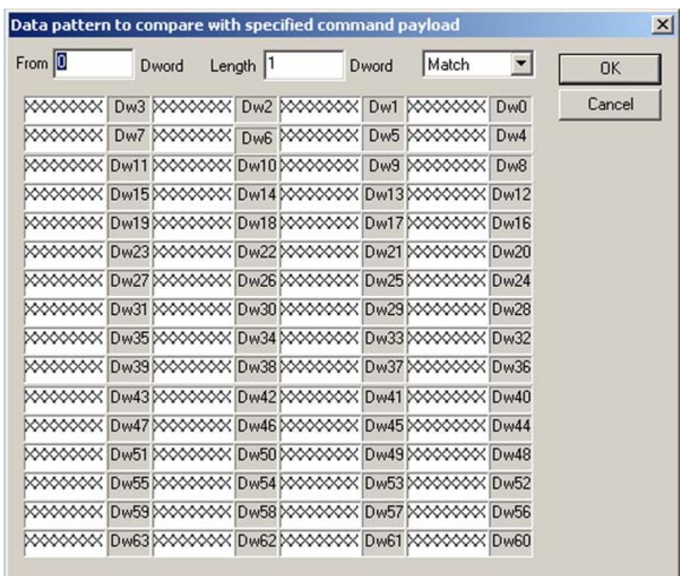


Figure 109. Specify Patterns

Add Wait for Any Frame

Insert this instruction and set an expiration time and a label for the Goto. This instruction causes the Initiator program to go to the specified label if any frame occurs prior to the expiration time. If the expiration time occurs first, the Initiator program goes to the next step.

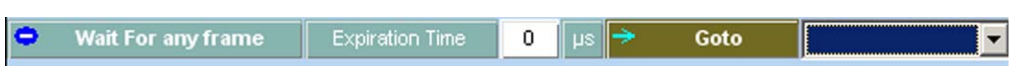


Figure 110. Wait

Insert Delay

To delay program execution, insert a **Delay** instruction. Enter the delay value (in microseconds) in the number text box to define a delay.

Figure 111. Delay

Add Stop

To define the end of the Initiator Emulator program, insert the Stop Initiator Exerciser instruction.

Figure 112. Stop

Add a Label

Add a label to any command, to use for conditional and unconditional jumps. Click the command to label, and insert the Label instruction. You can also insert a label by right-clicking a command and choosing **Add Label**.

Figure 113. Label

Labels are automatically labeled as Label# sequentially as they are added. However, you can assign them meaningful names such as STOP and START.

Instruction insert

You can set the instruction to insert before or after a command by setting the insertion mode. To set the insertion mode, right-click in the initiator page and choose I**nsert before current position** or **Insert after current position**.

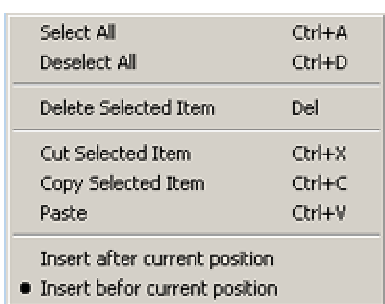


Figure 114. Instruction Insert

Phy Reset Sequence and Identification

The system performs this when required, by default, but you can perform it manually or on each run.

Sample Host Emulator Program (SATA only)

Figure 115. shows a simple completed SATA Host Emulator program.

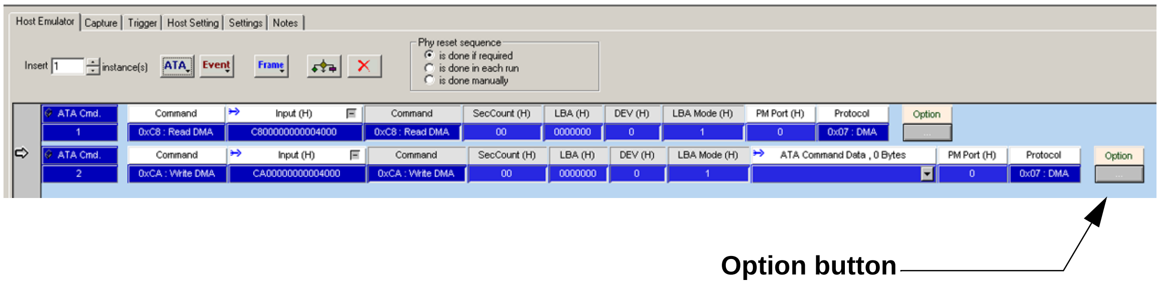


Figure 115. SATA: Sample Host Emulator Program

Sample Initiator Emulator Program (SAS only)

Figure 116. shows a simple completed SAS Initiator Emulator program.

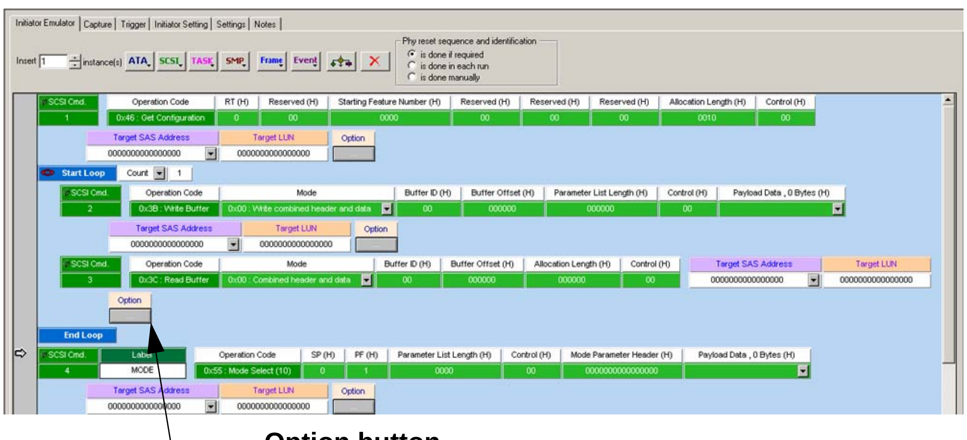


Figure 116. SAS: Sample Initiator Emulator Program

Data Blocks

For commands requiring data blocks, click the down arrow of the **Payload Data** drop-down combo box and choose from a set of pre-defined data blocks. If you need a new data block, select **Configuration > Data Block** or click the  **Data Block** icon on the tool bar to open a data block definition dialog (see "Creating a Data Block" on page 114 for instructions on creating data blocks).

Exercising Specific Addresses

Since more than one device can be active at any given time, you can specify specific commands to send to an address. To assign commands to an address:

1. Click the down arrow on a **Target SAS Address** block in a completed Initiator Emulator program, then choose **Find New Device**.

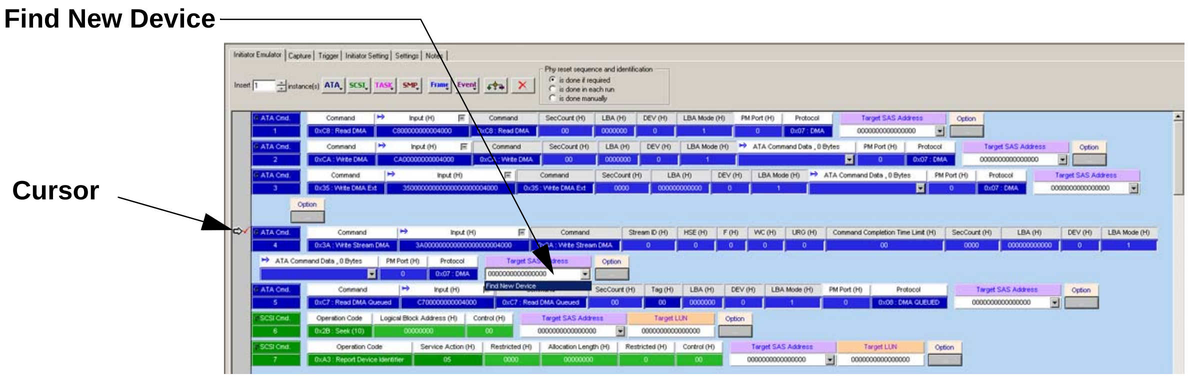


Figure 117. SAS: Find SAS Devices Select

Choosing **Find New Device** opens the Device Identifier dialog. (The default Find option is SAS address)

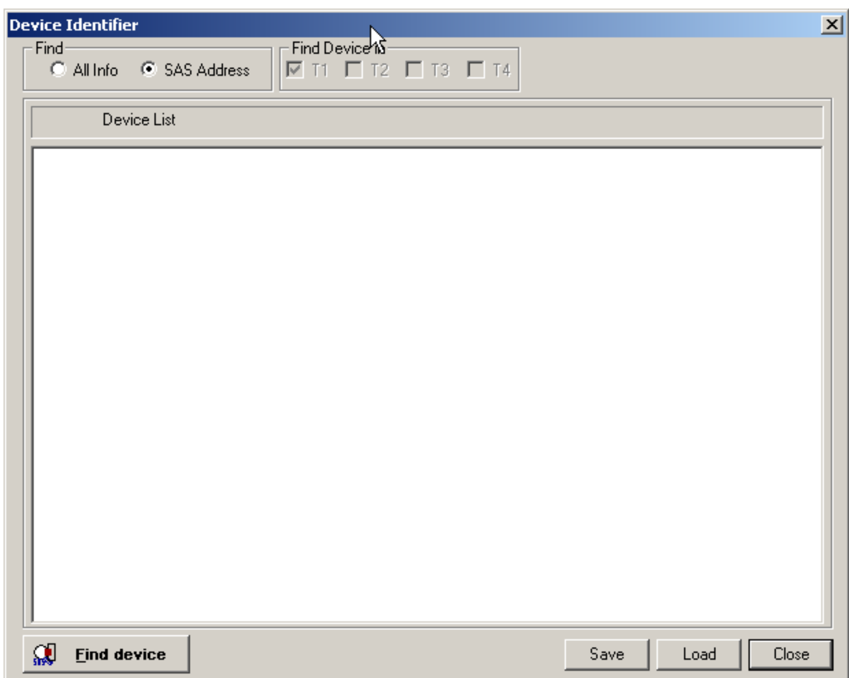


Figure 118. SAS: Device Identifier Dialog

SAS vs. SATA: SATA Dialog does not show Find section (All Info and SAS Address). SATA Dialog has devices D1 to D4 and does not show T1 to T4.
SATA Dialog does not show Supported Pages and Subpages.

2. Click the **Find device** button to display all active addresses.

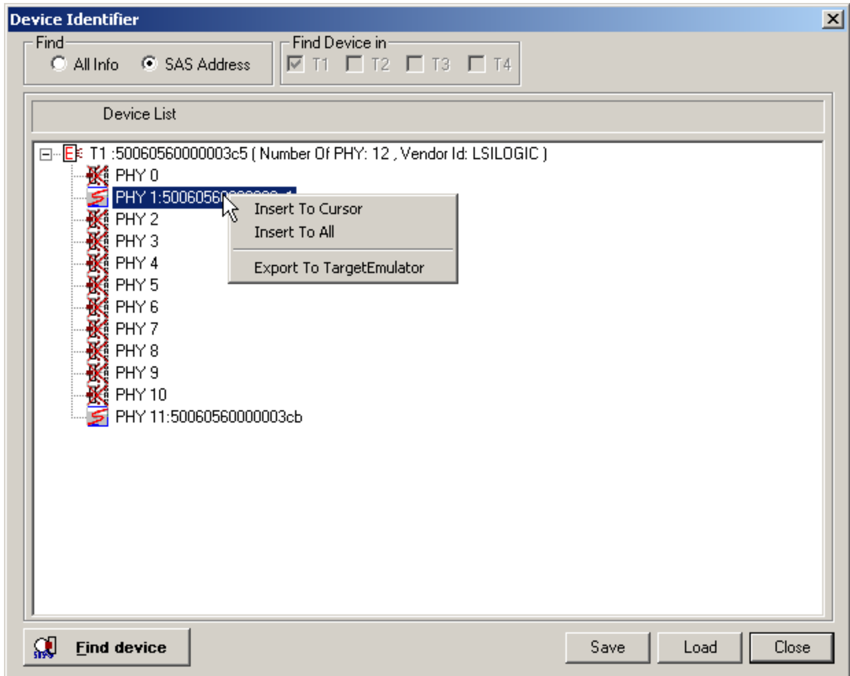


Figure 119. SAS: Active SAS Addresses

3. To assign commands to an active address, right-click an address and choose: **Insert To Cursor** assigns all commands up to the cursor to the chosen address. **Insert: To All** assigns all commands to the chosen address.

Record and Play

This feature allows the selection of a range of commands in a trace and exports them to a previously saved ***.sac** file for execution by the SAS Initiator Emulator or ***.stc** file for execution by the SATA Host Emulator. You can export commands from all available samples, between X and Y cursors, or between designated commands.

To perform this action:

1. Run a capture project or open a previously run and saved a captured trace file.
2. Set X and Y cursors to export between cursors.

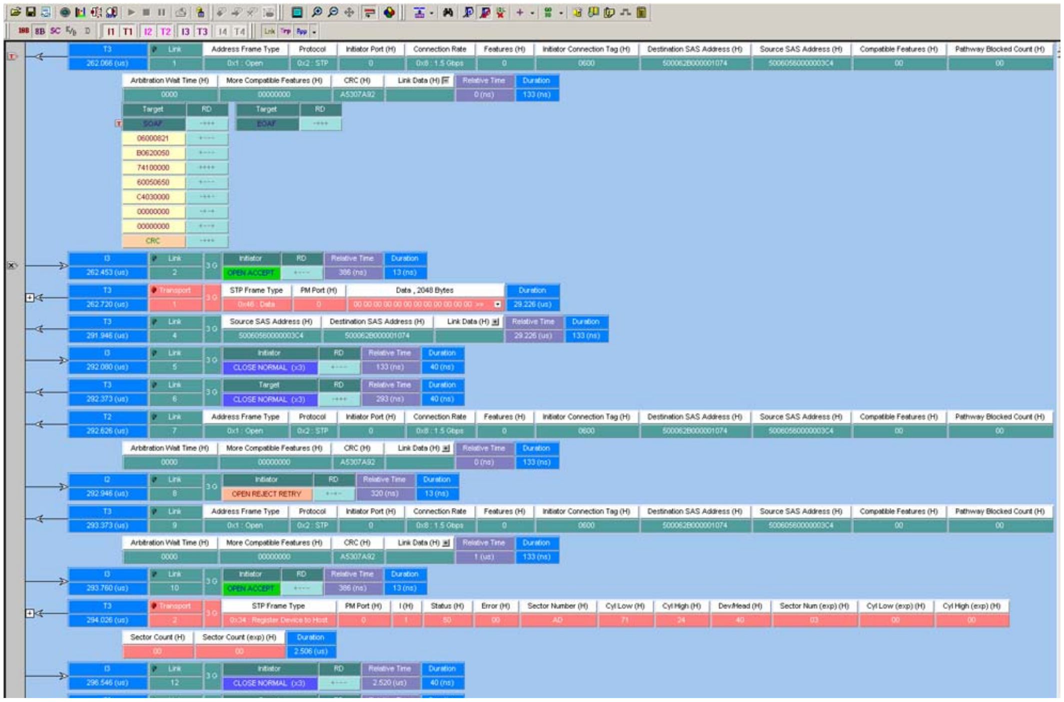


Figure 120. SAS: Captured Trace Display With Cursors Set

3. Click **File** and then choose **Export to Initiator Emulator** or **Export to Host Emulator.**

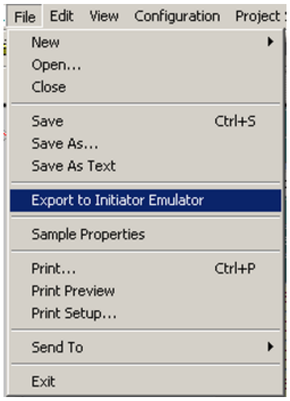


Figure 121. SAS: Export to Initiator Emulator

This displays the Extract Sample File dialog.

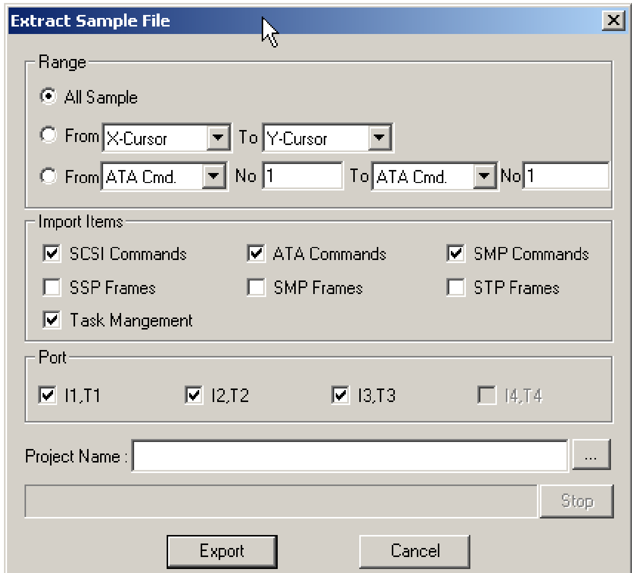


Figure 122. Extract Sample File Dialog

4. Click the ellipses next to the Project Name address bar and select an existing ***.sac** or ***.stc** file.
5. Choose an export range and item, Command, or FIS, then click **Export.**
6. After the export action completes, open the exported ***.sac** or ***.stc** file.

Figure 123. SATA: Host Emulator Program With the Exported Commands

You can run this set of commands immediately, or you can modify it by inserting instructions and/or additional commands.

Error and Command Settings

Each command type allows you to set a variety of command settings and to introduce errors. Click the **Option** button on a command line to display the corresponding Protocol Error and Command Settings dialog.

ATA Error and Command Settings

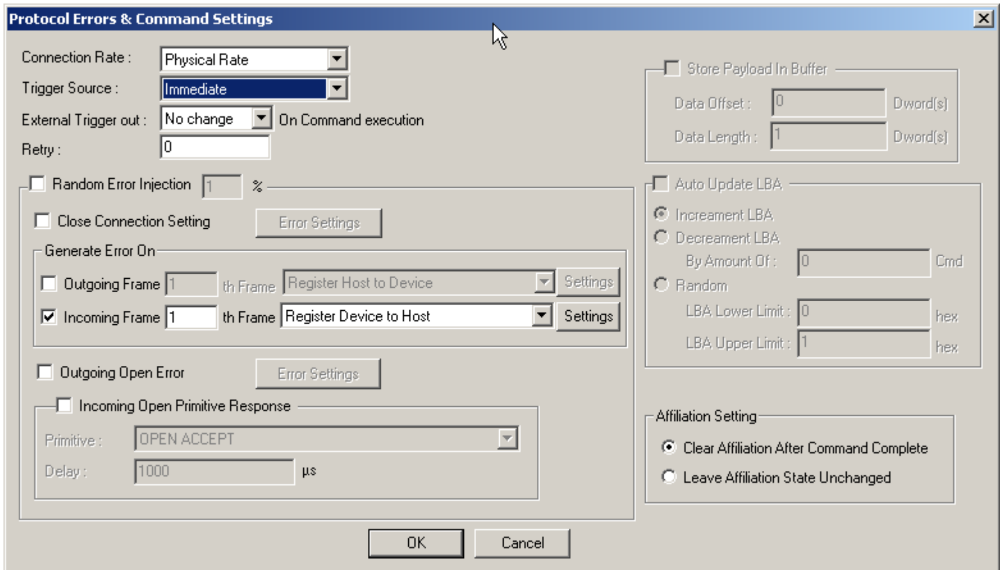


Figure 124. SAS: Protocol Error and Command Settings for ATA Dialog

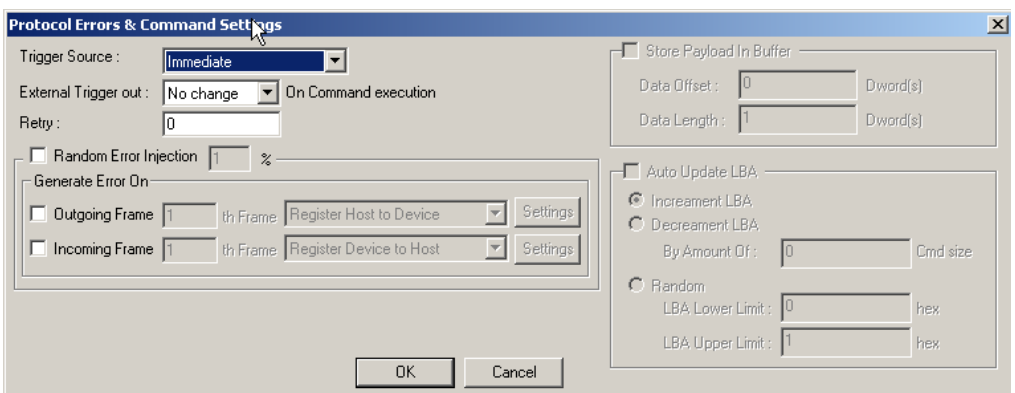


Figure 125. SATA: Protocol Error and Command Settings for ATA Dialog

Connection Rate

Select the Connection Rate to allow a higher speed port to communicate with a lower speed port: Physical Rate, 1.5 G, 3, or 6.

Trigger Source

Click the down arrow on the **Trigger Source** combo box to choose trigger type: Immediate, Wait for external trig, or Wait for Analyzer trig.

External Trigger Out

Click the down arrow on the **External Trigger out** combo box to choose the external trigger level: High, Low, or No change on command execution.

Retry

Enter a value for the number of command retries when a command failed in the **Retry** text box.

Store Payload in Buffer

Check the **Store Payload in Buffer** check box and enter values for Data Offset and Data Length.

Auto Update LBA

Check the **Auto Update LBA** check box and check an auto update option button.

Random Error Injection

Random Error Injection specifies the probability of Error Injection on the command. The probability percentage that you select applies to all Error Injection items.

Close Connection Setting

Checking **Close Connection Setting** enables the Error Settings button. Click this button to display the Close Connection Setting dialog,

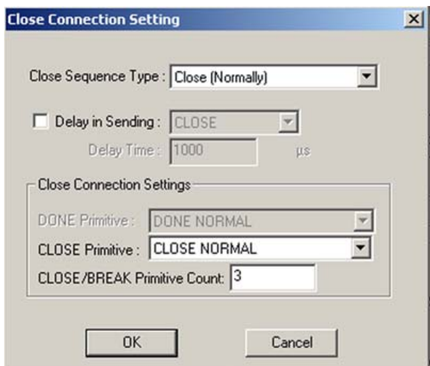


Figure 126. Close Connection Dialog

Select the **Close Sequence Type** from the drop-down list. Selecting **Delay in sending** allows you to specify the delay in sending Done, Close, or Break.

Select the **Close Connection Settings** from the drop-down lists.

Outgoing Open Error

Check **Outgoing Open Error** and then the enabled Error Settings button to display the Open Frame Setting dialog.

Figure 127. Open Frame Setting Dialog

Check errors to introduce.

Scroll through the available choices in the Destroy Field of Frame list box and check the field to destroy.

Incoming Open Primitive Response

Check this box, then click the down arrow next to the **Primitive** list box and choose a response type. Enter a **Delay** value**.**

Figure 128. Incoming Open Primitive Response Dialog

Affiliation Setting

Check **Clear Affiliation After Command Complete** to release device to commands from other sources, or check **Leave Affiliation State Unchanged** to retain control of device.

Enable First Burst

Check **Enable First Burst** to allow first burst.

Task Attribute

Choose **Simple, Head of Queue, Ordered**, or **ACA**.

Outgoing ATA Frame Settings

Before selecting Outgoing Frame Settings, select the Types Of Frames and the Frame Number on which to inject an error. Then check **Outgoing Frame** in the **Generate Error On** area and then the enabled **Settings** button to display the Outgoing Frame Settings dialog.

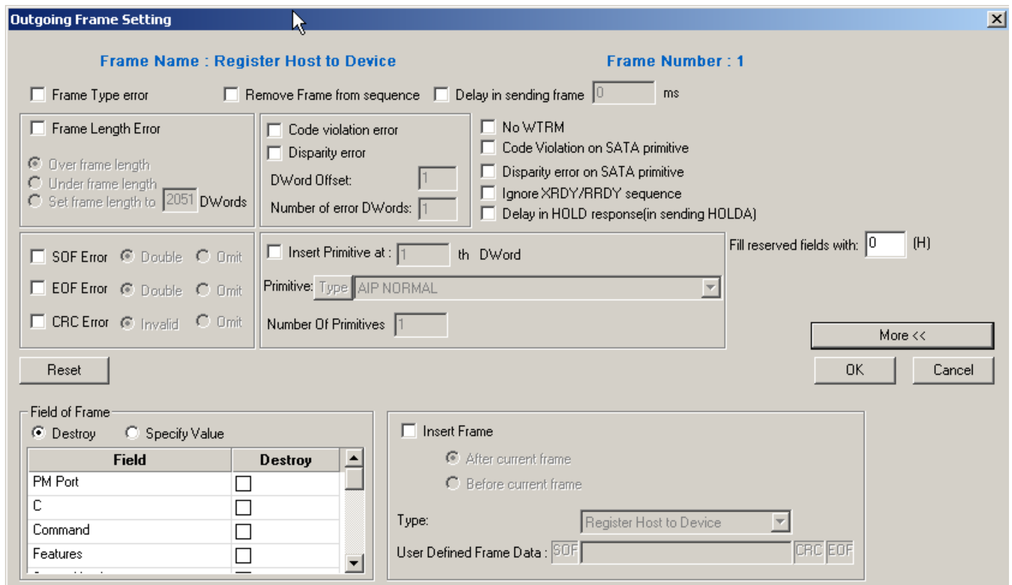


Figure 129. Outgoing Frame Settings

Frame Type Error

Check this to introduce a frame type error.

Remove Frame from sequence

Check this to remove frame from sequence.

Delay in sending frame

Check this to delay sending frame and enter a value for the delay.

Frame Length Error

Check **Frame Length Error** and choose the type of error to introduce**.**

Code violation and Disparity error

Check these and specify DWord offset and number of error DWords.

Additionally check:

No WTRM
Code Violation on SATA primitive
Disparity error on SATA primitive
Ignore XRDY/RRDY sequence
Delay in HOLD response (in sending HOLDA)

SOF, EOF and CRC errors

Check these and specify Double or Omit by checking the corresponding option button.

Insert Primitive

Check **Insert Primitive** and then click the **Type** button to open the Primitive Type dialog and select the primitive type.

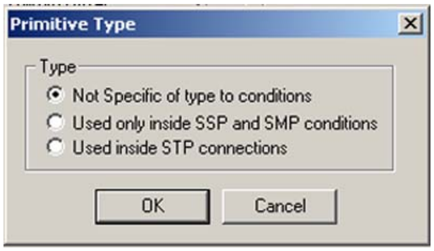


Figure 130. Primitive Type Dialog

Click the down arrow on the **Primitive** combo box, choose a primitive, then click **OK.**

Fill reserved fields with

Enter a value for which reserved fields to change, if other than 0.

Field of Frame

Select **Destroy**, scroll through the available choices in the Field of Frame list box, and choose a field to destroy. Alternatively, select **Specify Value** to fill the chosen field with a pre-defined value.

Insert Frame

Check **Insert Frame**, click the down arrow on the **Type** combo box, and choose the frame type.Then choose to insert it before or after an outgoing frame command. Make sure that you have clicked **More**.

Note: In addition to the pre-defined frame types, you can scroll down the list to **User Defined** and enter your own frame data between SOF and EOF.

Incoming ATA Frame Settings

Before selecting Incoming Frame Settings, select the Types Of Frames and the Frame Number on which to inject an error. Then check **Incoming Frame** in the Generate Error On area and then the enabled **Settings** button to display the Incoming Frame Settings dialog.

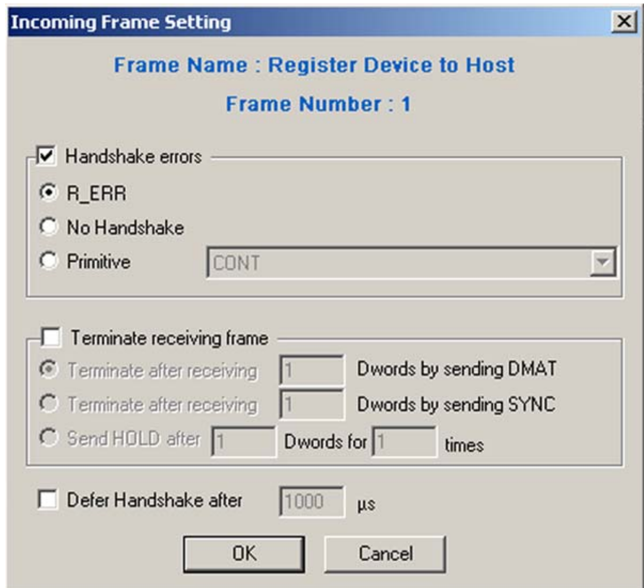


Figure 131. Incoming Frame Setting Dialog ATA

Handshake Error

Check **Handshake Errors** to enable selection of errors and primitives. Check **R_ERR** or select **Primitive** to send as an incoming frame response. Check **No Handshake** to send no response.

Terminate Receiving Frame

Check **Terminate Receiving Frame**, then choose the termination type.

Defer Handshake

Check the **Defer Handshake after** check box and enter a value for the time to defer the handshake.

SCSI Error and Command Settings (SAS only)

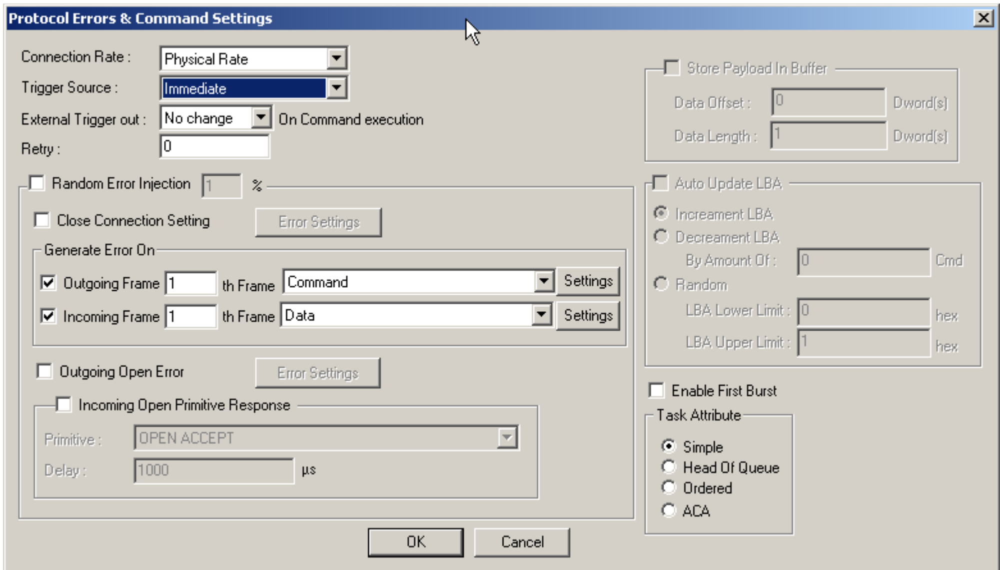


Figure 132. SAS: Protocol Error and Command Settings for SCSI Dialog

Connection Rate

Select the **Connection Rate** to allow a higher speed port to communicate with a lower speed port: Physical Rate, 1.5 G, 3, or 6.

Trigger Source

Click the down arrow on the Trigger Source combo box, and choose trigger type: Immediate, Wait for external trig, or Wait for Analyzer trig.

External Trigger Out

Click the down arrow on the External Trigger out combo box to choose the external trigger level: High, Low, or No change on command execution.

Retry

Enter a value for the number of command retries for failed commands in the Retry text box.

Random Error Injection

Random Error Injection specifies the probability of Error Injection on the command. The probability percentage that you select applies to all Error Injection items.

Close Connection Setting

Checking **Close Connection Settings** enables the Error Settings button. Click this button to display the Close Connection Setting dialog.

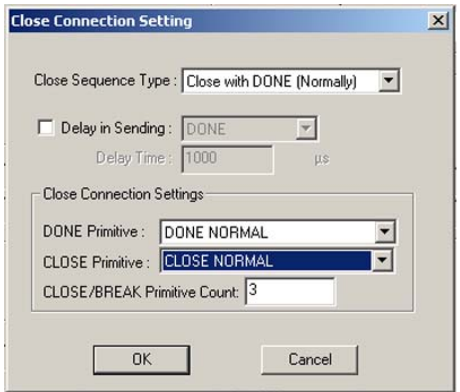


__Figure 133. SAS: Close Connection Settings__

Select a **Close Sequence Type** from the drop-down list.

Check **Delay in Sending** to specify the delay in sending Done, Close, or Break.

Select **Close Connection Settings** from the drop-down lists.

Store Payload in Buffer

This option is available for read type commands. Choose and specify **Data Offset** and **Data Length**.

Auto Update LBA

Check to enable Auto Update of LBA, then specify the update by checking the option.

Outgoing Open Error

Check **Outgoing Open Error** and then the enabled Error Settings button to display the Open Frame Setting dialog.

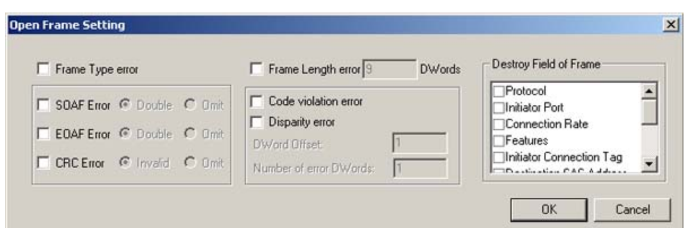


__Figure 134. SAS: Open Frame Settings__

Check the errors to introduce.

Scroll through the available choices in the **Destroy Field of Frame** list box and check the destroy field.

Incoming Open Primitive Response

To set a response to an incoming Open frame, check **Incoming Open Frame Response**, select a Primitive, and enter a value for Delay.

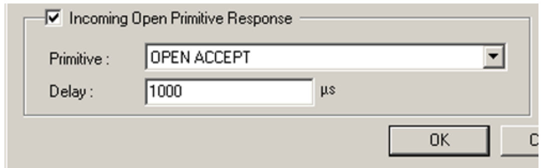


Figure 135. SAS: Open Primitive Response

Enable First Burst

Check the **Enable First Burst** box to specify to transfer the first burst data as defined by the First Burst Size field in the Advanced Initiator Setting dialog. See Figure 142. on page 106.

Task Attribute

Choose a task attribute of Simple, Head of Queue, Ordered, or ACA by checking the corresponding option button.

Outgoing SCSI Frame Settings

Before selecting Outgoing Frame Settings, select the Types Of Frames and the Frame Number on which to inject an error. Then check **Outgoing Frame** in the Generate Error On area and then the **Settings** button to display the Outgoing Frame Setting dialog.

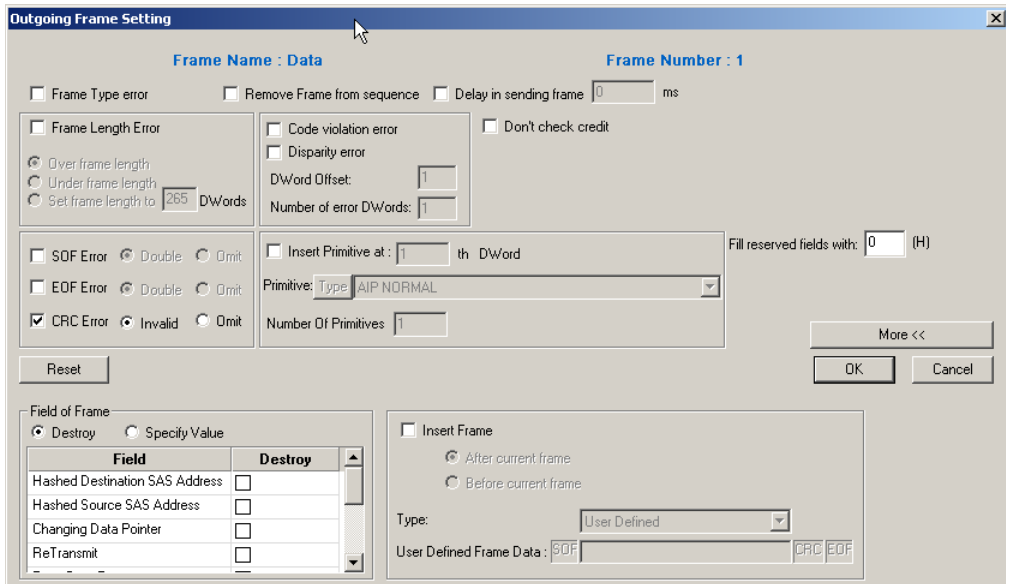


Figure 136. SAS: Outgoing Frame Setting Dialog SCSI

Frame Type Error

Check this to introduce a frame type error.

Remove Frame from sequence

Check this to remove frame from sequence.

Delay in sending frame

Check this to delay sending frame and enter a value for the delay.

Frame Length Error

Check **Frame Length Error,** then choose the type of error to introduce.

Code violation and Disparity error

Check these and specify DWord offset and the number of error DWords.

Don't check credit

Check this to disable credit checking.

SOF, EOF and CRC errors

Check these and specify Double or Omit by checking the corresponding option button.

Insert Primitive

Check **Insert Primitive**, click the **Type** button to open the Primitive Type dialog, then select the primitive type.

Field of Frame

Select **Destroy**, scroll through the available choices in the Field of Frame list box, and choose a field to destroy. Alternatively, you can select **Specify Value** to fill the chosen field with a pre-defined value.

Insert Frame

You can insert a frame before or after the current frame. To insert a frame, check **Insert Frame**, check the option button at which to insert the frame, and choose a Frame Type.

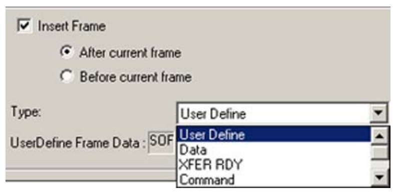


Figure 137. SAS: Insert Frame

Incoming SCSI Frame Settings

Before selecting Incoming Frame Settings, select the Types Of Frames and the Frame Number on which to inject an error. Then check **Incoming Frame in the Generate Error On** area and then the enabled **Settings** button to display the Incoming Frame Setting dialog.

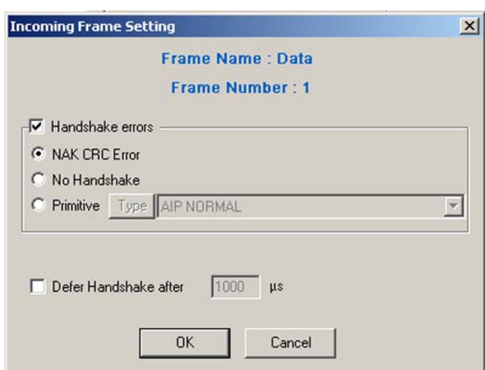


Figure 138. SAS: Incoming Frame Setting Dialog (SCSI)

Handshake Error

Check **Handshake Error** and select **NAK CRC Error, No Handshake**, or **Primitive** and a Primitive Type.

Defer Handshake

Check the **Defer Handshake after** check box and enter a value for the time to defer the handshake.

Initiator Setting Tab (SAS only)

The Initiator Setting tab allows you to select the Port(s) for generating SAS traffic and to specify SAS Address, Data Frame Payload size, Frame Receive Timeout, Logical Block size, and ATA Command Execution Time out.

You can run a Pattern Generator. To run the Pattern generator, check the **Run Pattern Generator** option button and select a **Pattern Generator File.** You can create Pattern Generator Files (see “Appendix A” on page 291).

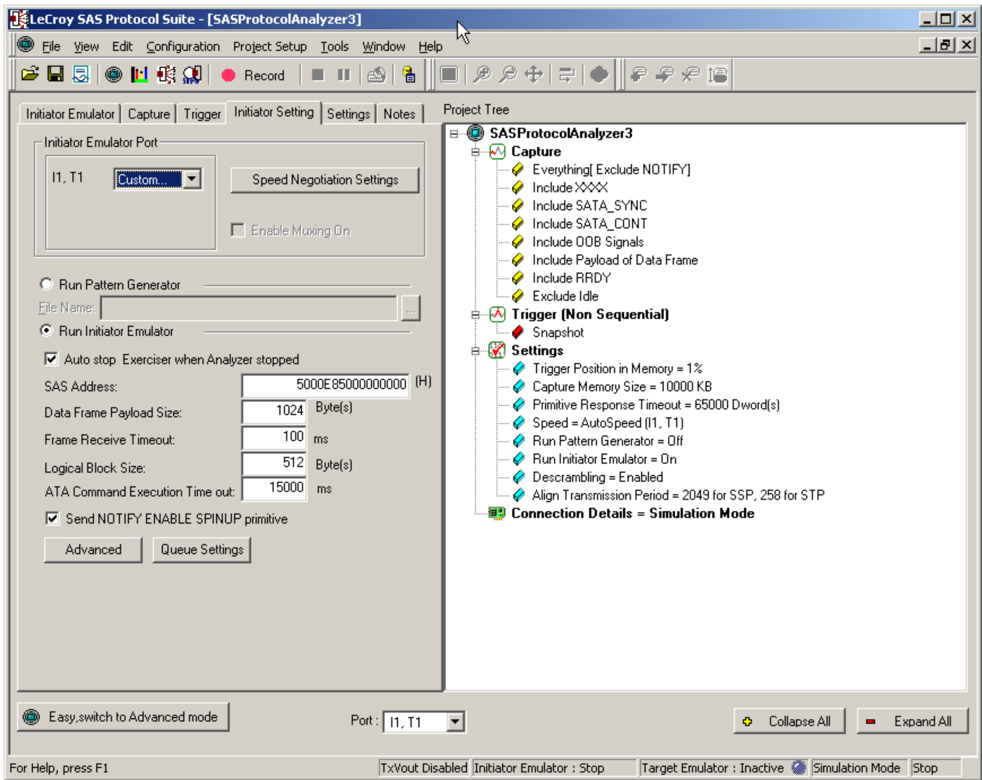


Figure 139. SAS: Initiator Setting Tab

Choose Initiator Emulator Port

For each port, select a speed, then click the **Speed Negotiation Setting** button.

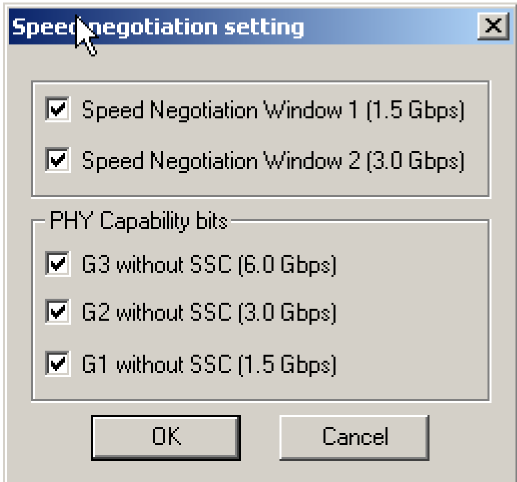


Figure 140. SAS: Speed Negotiation Setting Dialog

Select the port speed settings, all by default.

After you click **OK**, you can **Enable Muxing On**.

Pattern Generator

You can select a Pattern Generation file.

Initiator Emulator

You can run an Initiator Emulator while setting:

- Auto stop exerciser when Analyzer stops
- SAS Address
- Data Frame Payload Size
- Frame Receive Timeout
- Logical Block Size
- ATA Command Execution Timeout
- Send NOTIFY ENABLE SPINUP primitive

Check **Autostop exerciser when Analyzer Stopped** to halt the Initiator Emulator when the Analyzer stops. If unchecked, the Exerciser continues to run even after the Analyzer stops.

Queue Settings

Click the **Queue Settings** button to display the Queue Settings dialog and specify:

- Queue Depth
- NCQ Error Recovery
- Queued/Non-Queued Items Status
- NCQ/Queue Command Timeout.

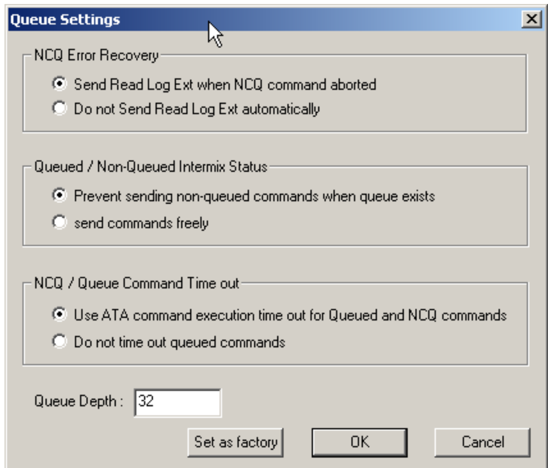


Figure 141. Queue Setting Dialog

Advanced Initiator Settings

Click the **Advanced** button to display additional settable options:
- Align Transmission Period
- STP Initiator ALIGN Transmission Period
- Bus Inactivity Time Limit
- Maximum Connect Time Limit
- First Burst Size
- I_T nexus loss time
- Max Credits in each Connection
- Delay between getting HOLD and Sending HOLDA.

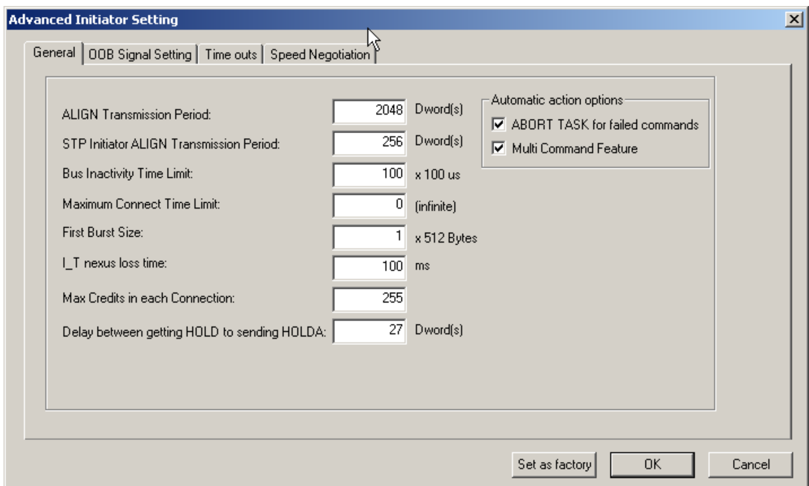


Figure 142. Advanced Initiator Settings Dialog General Tab

In the Advanced Initiator Setting dialog, choose **Automatic action** options from
- ABORT TASK for Failed Commands
- Multi Command feature.

OOB Signal Setting Tab

Click the **OOB Signal Setting** tab in the Advanced Host Setting dialog to specify OOB parameters in the enabled editable fields**:**

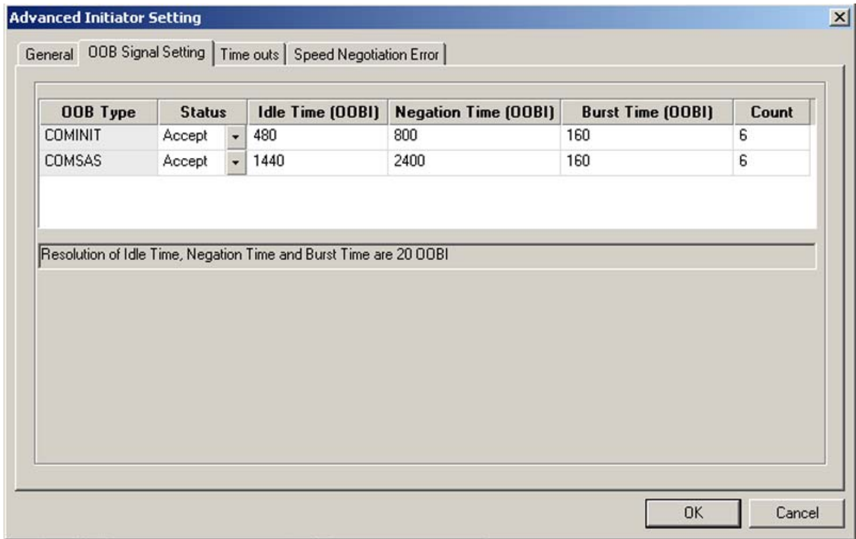


Figure 143. OOB Signal Setting Tab

Timeouts Tab

Click the **Timeouts** tab in the Advanced Host Setting dialog to specify timeouts for connection, CREDIT, ACK/NAK, ATA Command, OOB Signal and Identify frame.You can also edit the speed negotiation parameters.

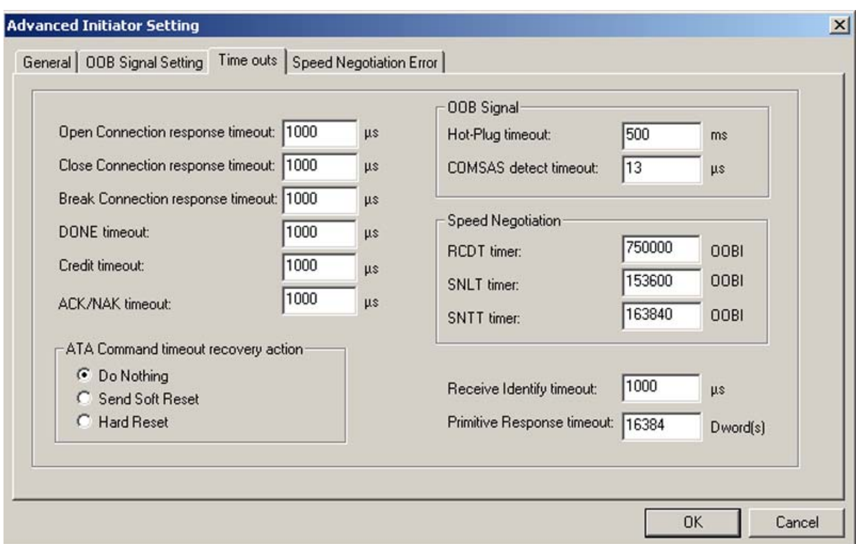


Figure 144. Timeouts Tab

Speed Negotiation Tab

Use the Speed Negotiation tab to inject errors during speed negotiation.

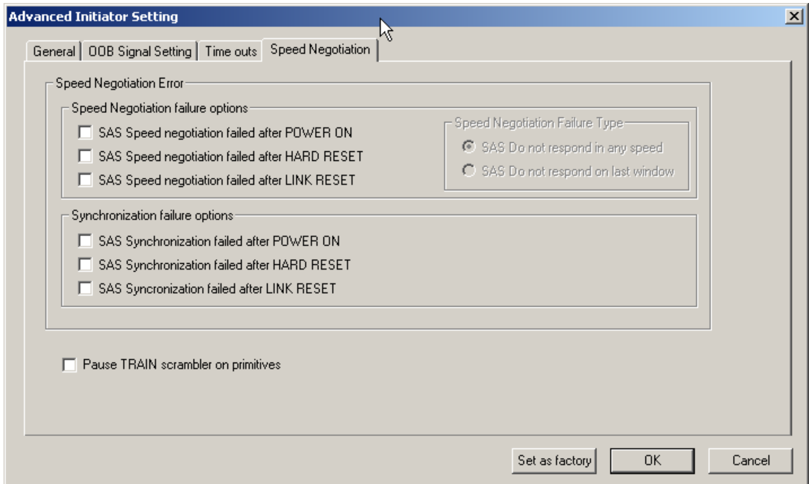


Figure 145. Speed Negotiation Tab

Host Setting Tab (SATA)

The Host Emulator Setting dialog allows you to select the Port(s) for exercising, choose to use the Host Emulator or Pattern generator and specify Host Emulator characteristics.

Click the **Host Setting** tab:

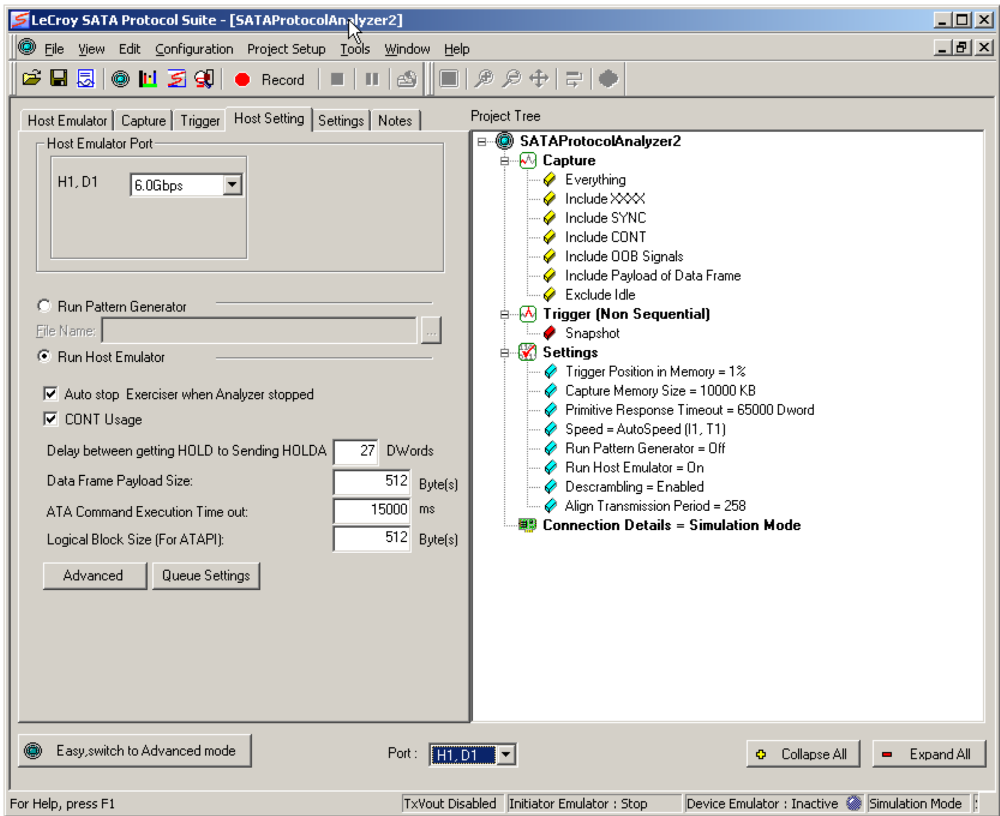


Figure 146. SATA: Host Setting Tab

Choose Host Emulator Port

For each port, select a speed.

Pattern Generator

You can select a Pattern Generation file. To perform a capture with a Pattern Generator, enter a path to a pattern generator ***.spg** file in the File Name dialog. See Appendix A for instructions how to create a Pattern Generator file.

Host Emulator

You can run an Host Emulator while setting:

- Auto stop exerciser when Analyzer stops
- CONT usage
- Delay between getting HOLD to Sending HOLDA
- Data Frame Payload Size
- ATA Command Execution Timeout
- Logical Block Size (for ATAPI)

Check **Autostop exerciser when Analyzer Stopped** to halt the Host Emulator when the Analyzer stops.

Check **CONT Usage** to enable the specification of **Delay between getting HOLD to sending HOLDA**, **Data Frame Payload Size,** and **ATA Command Execution Timeout**.

Queue Settings

Click the **Queue Settings** button to display the Queue Settings dialog and specify:

- Queue Depth
- NCQ Error Recovery
- Queued/Non-Queued Items Status
- NCQ/Queue Command Timeout

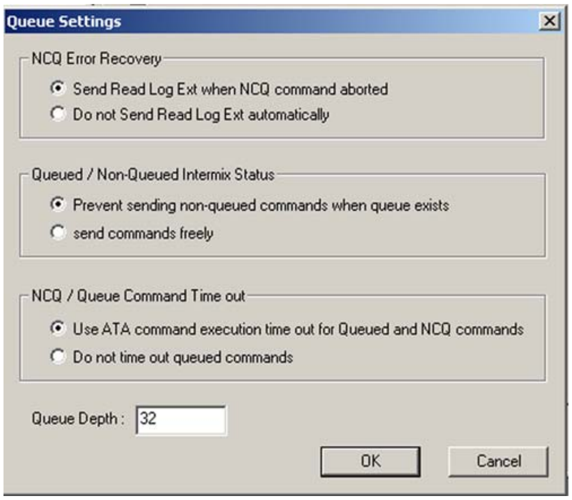


Figure 147. SATA: Queue Settings Dialog

Advanced Host Setting Dialog

Click the **Advanced** button to display all settable options.

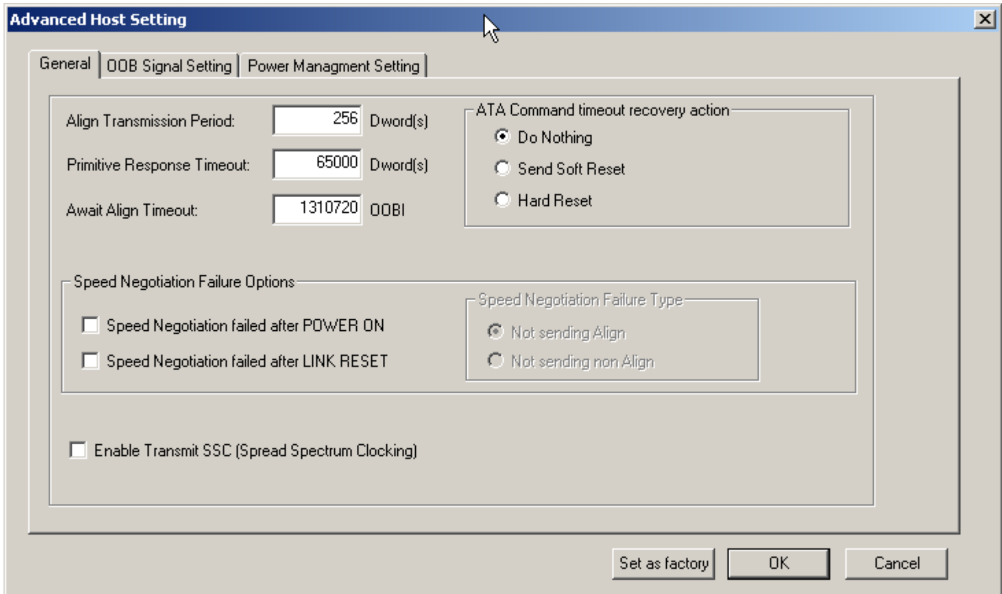


Figure 148. SATA: Advanced Host Setting Dialog General Tab

Settable options are:

- Set **Align Transmission Period**, **Primitive Response Timeout** and **Await Align Timeout**.
- Choose **ATA Command timeout recovery action** by checking the corresponding option button.
- Specify **Speed Negotiating Failure Option(s)** and a **Speed Negotiation Failure Type**.

OOB Signal Setting Tab

Click the **OOB Signal Setting** tab in the Advanced Host Setting dialog to specify OOB parameters in the enabled editable fields.

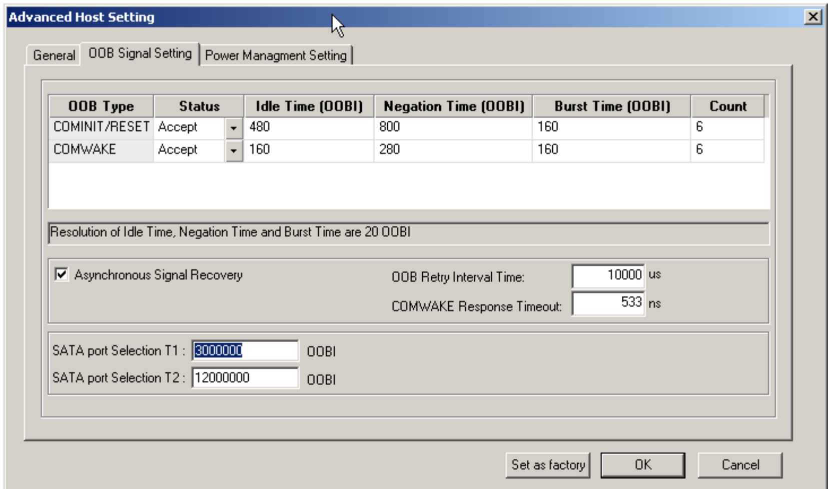


Figure 149. SATA: OOB Signal Setting Tab

Asynchronous signal recovery
Set the OOB Retry Interval Time, check the Asynchronous signal recovery option check box and enter a value for the time.

Inter-reset Delay Settings
Enter a value for **SATA port Selection T1** to specify the inter-reset- assertion delay for the first event of the selection sequence and **SATA port Selection T2** to specify the inter-reset- assertion delay for the second event of the selection sequence.

Power Management Settings

Click the **Power Management Setting** tab in the Advanced Host Setting dialog to specify the settings in the editable fields.

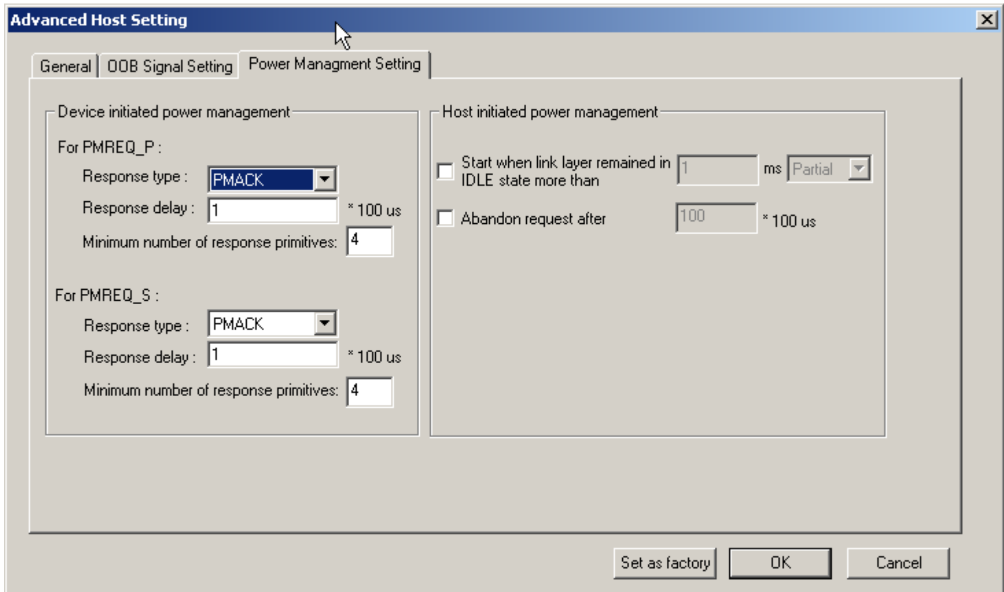


Figure 150. SATA: Power Management Settings

Set parameters for Host and/or Device initiated power management.

Project Settings

Set project settings in the Project Settings tab (see “Project Settings” on page 66).

Note: When using the Exerciser, channel 2 is not available and is grey.

Creating a Data Block

You can create the following types of data blocks, for use with data fields:

- Random data pattern
- Custom data pattern specifically for your application
- Counter data pattern
- Walking bit pattern

To create a data block, click the  **Default Data Block** button on the Main toolbar, or select **Configuration > Data Block** to open the Data Block dialog box as shown in Figure 151.

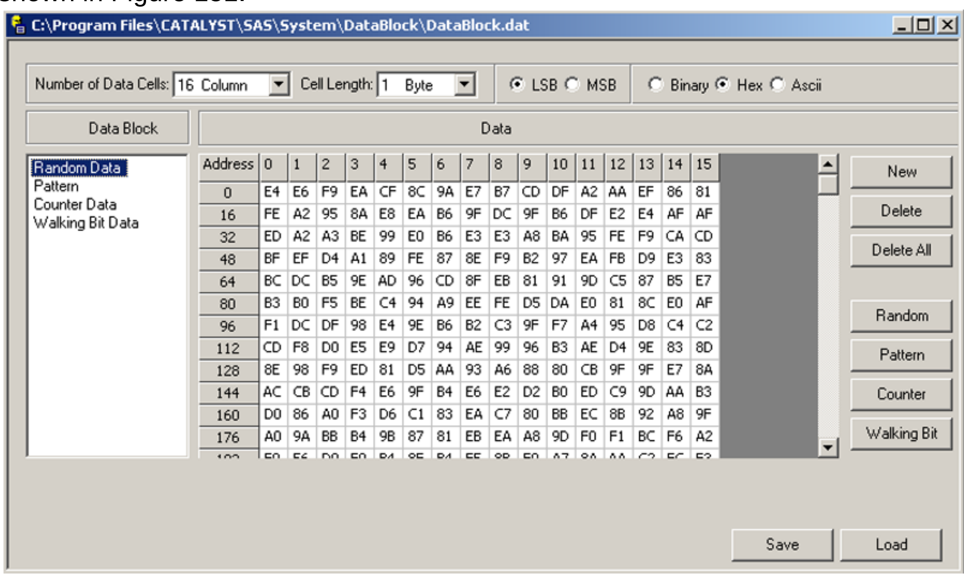


Figure 151. Default Data Block Dialog Box

To add another data block:

1. Click the **New** button in the Data Block dialog box.

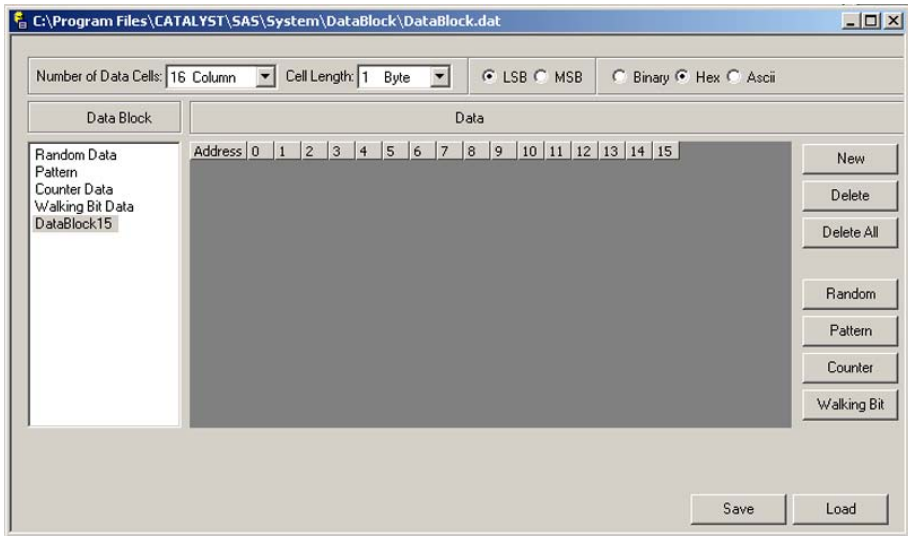


Figure 152. New Data Block Dialog Box

2. Choose the number of data columns (up to 16 data cells/row) and the cell length (up to 16 bytes/cell). This is a display function only.
3. Click either the **Bin, Hex**, or **Ascii** option button to choose a number format.
4. Click either the **LSB** or **MSB** option button to choose a bit order.

Naming a Data Block

Each new data block automatically receives a sequential data block number. To assign a unique descriptive name to a data block, right-click the data block name to open the Data Block Edit menu.

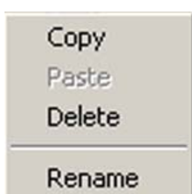


Figure 153. Data Block Edit

Choose **Rename.**

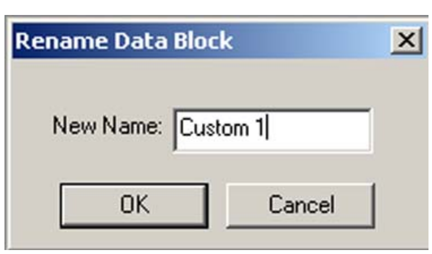


Figure 154. Rename Data Block

Enter a descriptive name in the New Name edit box and click **OK.**

Editing a Data Block

You can enter data in the defined cell structure by these methods:

- Define your own pattern
- Set a counter
- Choose a Random Pattern
- Choose a Walking Bit Pattern

Define Your Own Pattern

To define a pattern:

1. Click **Pattern** to open the Define Pattern dialog box as shown in Figure 155.
2. Enter a data pattern in the Data Pattern edit box.
3. Choose the number of times to repeat that pattern, and click **OK.**

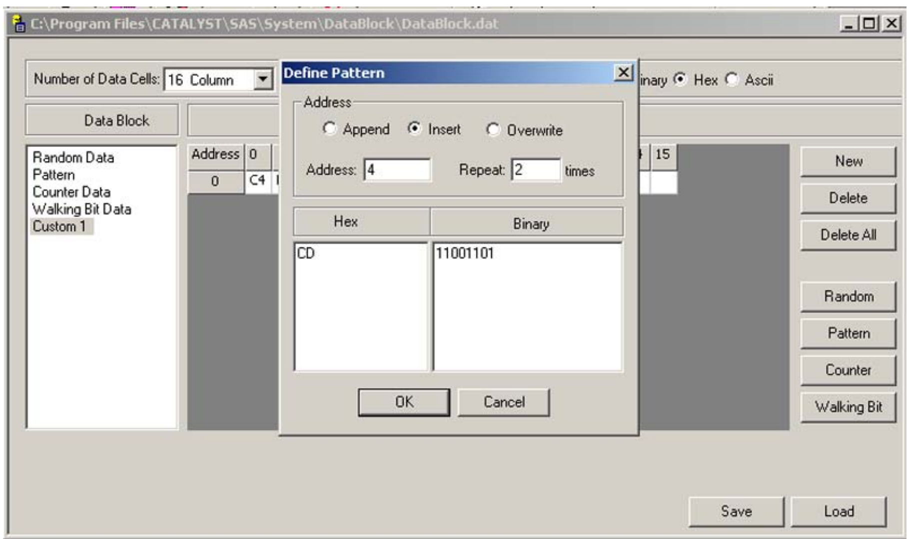


Figure 155. Define Your Own Data Pattern

Address

The cell address starts at 0 for the first data entry and automatically increments to the next available address. You can set it to a previously defined address to modify its content or insert additional data.

Insert/Overwrite Data

To define whether to overwrite data in a previously defined cell or insert new data after that cell, toggle the **Insert/Overwrite** button.

Save

When you have completed a data block definition, click the **Save** button to save the newly created data block.

Counter

To use a counter as data, click the **Counter** button, enter a Starting Number for the counter and the data address to count to, and click **OK**.

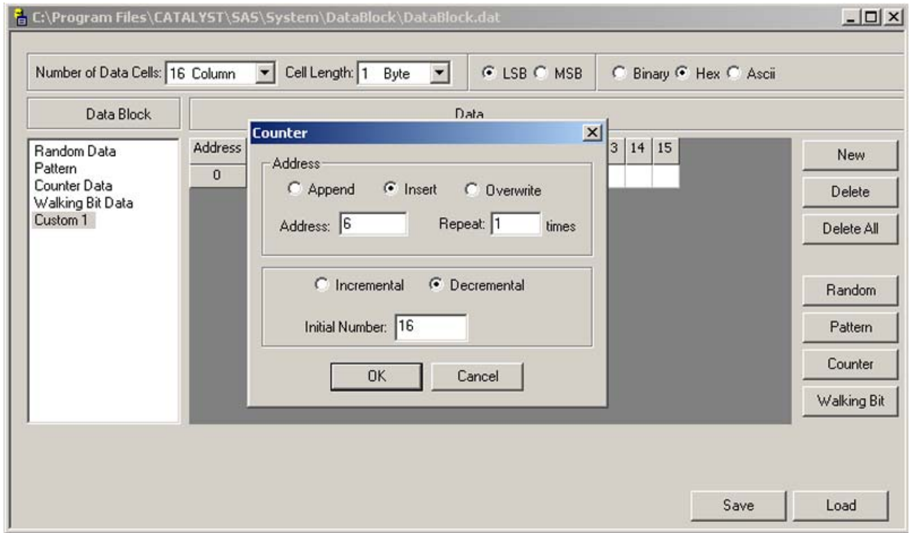


Figure 156. Set Counter as Data

Random Data Pattern

To use a random data pattern, click the **Random** button, enter the number of times to repeat the pattern, and click **OK.**

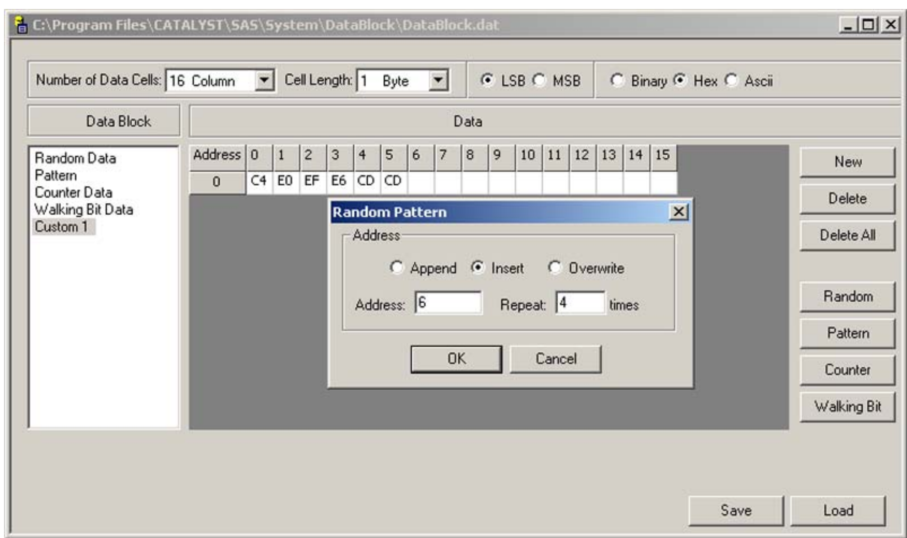


Figure 157. Choose a Random Pattern

Walking Bit Pattern

To use a walking bit pattern, click the **Walking Bit** button, then choose either a walking bit of “0” or “1”, the walk direction, the start position, and the number of times to repeat the pattern.

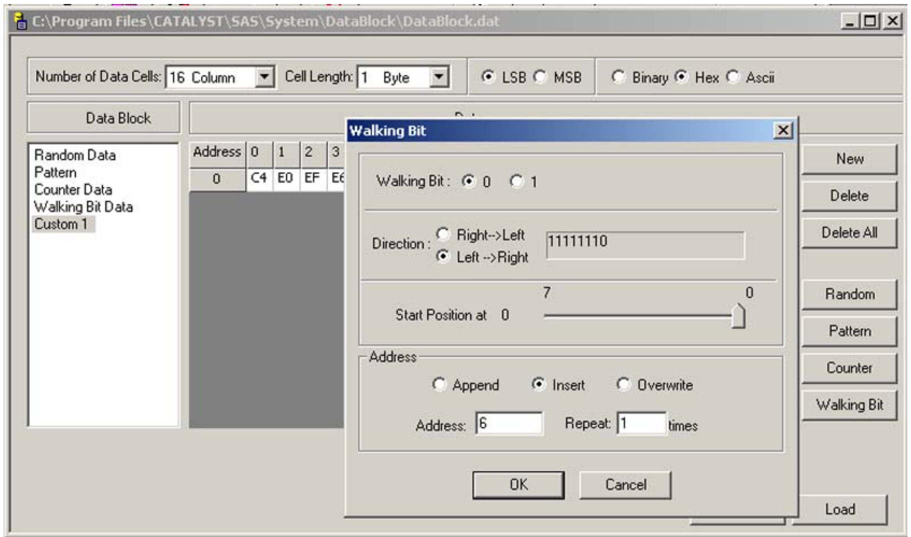


Figure 158. Define a Walking Bit Pattern

Creating and Editing Data Blocks as Text

You can create and edit data blocks using a text editor such as Windows® Notepad. To create a data block in Notepad, launch Notepad. Enter a header consisting of [Item1, Item2, Item3, Item4, Item5] where:

Item1 is the name of the Data Block.

Item2 is the size of the Data Block or the number of bytes in the format.

Item3 is the format of the data (HEX, BIN, ASCII).

Item4 is the group of bytes defined (1, 2, 4, 8 or 16).

Item5 is the direction (LSB or MSB).

Then enter the data in space delimited Hex format and save as a *.txt text file.

Load Data

To import Text Editor created data, click the **Load** button in the data block definition dialog to open the Load dialog. Choose a file and click **Load.** Modify existing data.

Save As

To create a new data block from an existing data block using a text editor, select the data block to edit from the **Data Block Name** list, then click **Save As** to open the Save As dialog.

Assign a name to the new data block text file and click **Save**.

You can now edit the newly created text file using Notepad or any other text editor, then import it into the data block definition, as described above.

Performance Analysis

Performance analysis is not currently available for Sierra M6-4.

Target and Device Emulation

You can run the analyzer while device emulation is active to monitor bus traffic.

Pages Tab

SAS: To set up SAS Target Emulation, click **File > New > Target Emulator** to display the target emulator with the Pages tab selected.

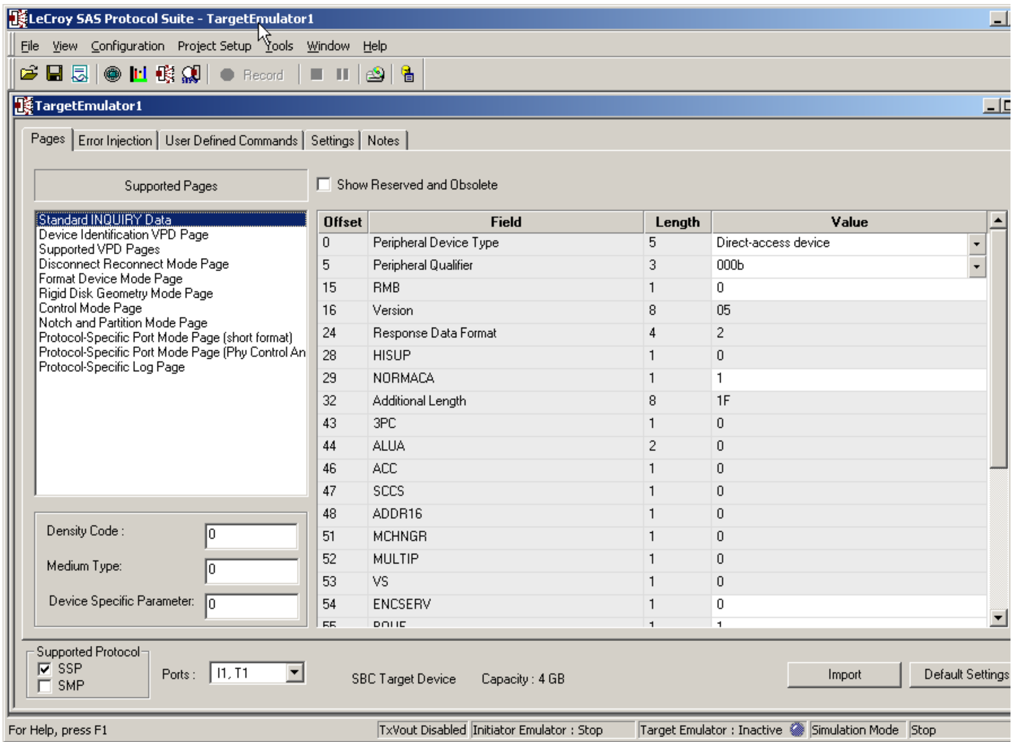


Figure 159. SAS: Target Emulation Project Pages Tab

The Target Emulator pages open with default settings for each page. To change settings for your application:

1. Select a page in the Supported Pages box and set values for each of the enabled (white) Value fields.
2. Enter values for Density Code, Medium Type, and Device Specific Parameter for the target emulator.
3. Check **SSP** or **SMP** to specify the protocol to support.
4. To reset the pages to the default settings, click the **Default Settings** button.
5. To use a previously defined Target, click the **Import** button and choose a previously defined Device Identifier *.saf file.

Note Clicking the **Import** button on any of the Target Emulation dialogs sets all the parameters for the current emulation, including User-Defined Commands.

SATA: To set up a Device Emulation, click **File > New > Device Emulator**. The Device Emulation project opens with the Pages tab selected.

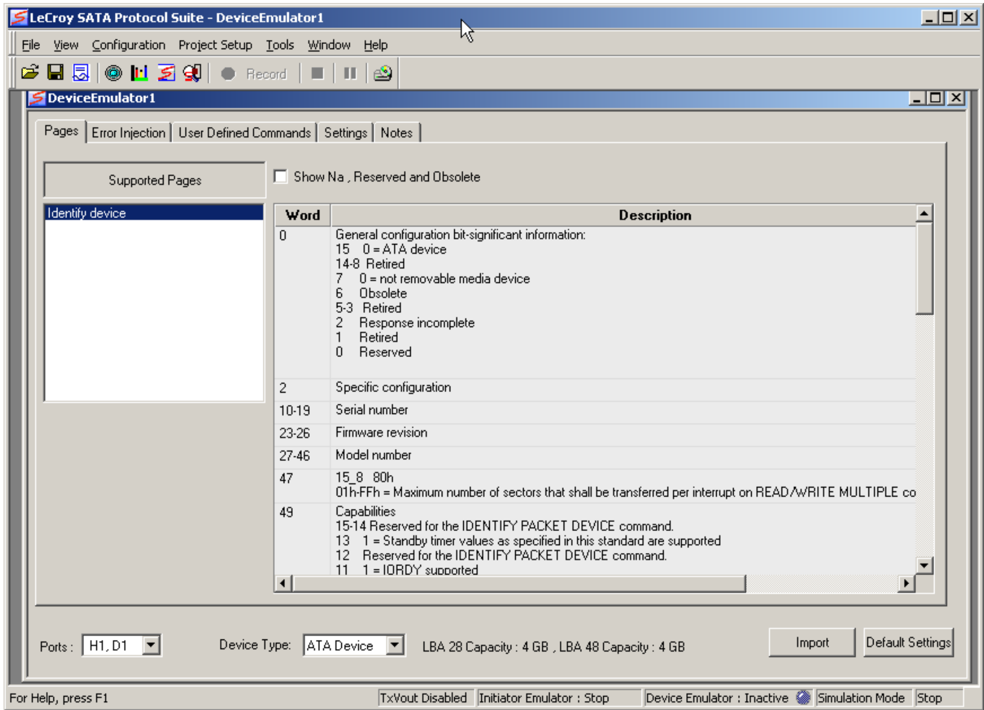


Figure 160. SATA: Device Emulation Project Pages Tab

The Device Emulator pages open with default settings for each page. To change settings for your application:

1. Set the Device Type of either ATA or ATAPI
2. Set values for each of the enabled (White) Value fields on the Identify page.
3. To reset the pages to the default settings, click the **Default Settings** button.
4. To use a previously defined emulation, click the **Import** button and select an emulation.

Error Injection Tab

Clicking the **Error Injection** tab opens the General Errors dialog.

SAS: In addition to specifying general errors, you can also set errors for Identify, Connection Management, and SAS Commands by clicking the corresponding icon in the Errors window.

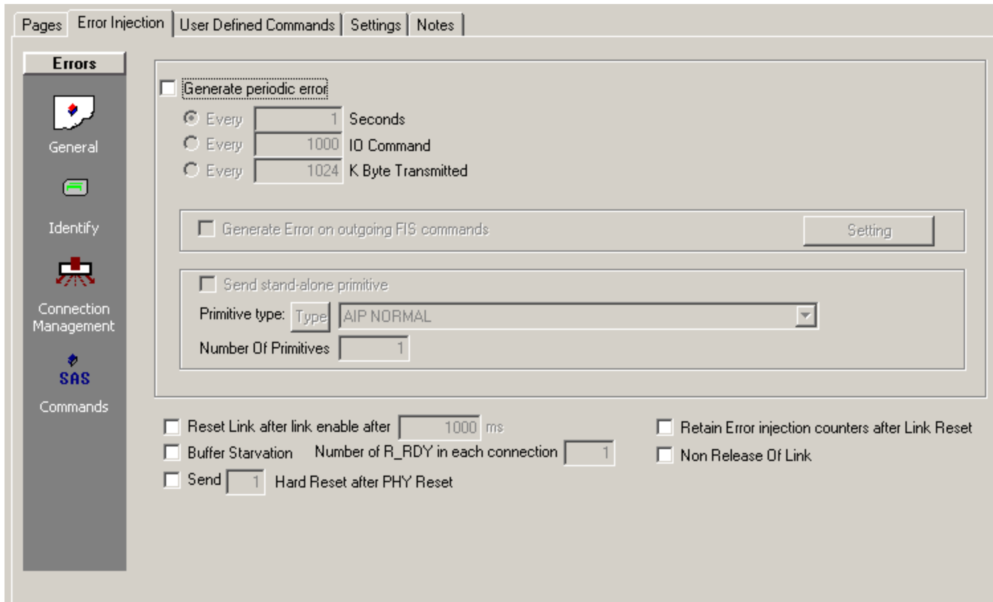


Figure 161. SAS: Setting General Errors

SATA: In addition to specifying general errors, you can also set errors for ATA Commands and SATA Signature by clicking the corresponding icon in the Errors window

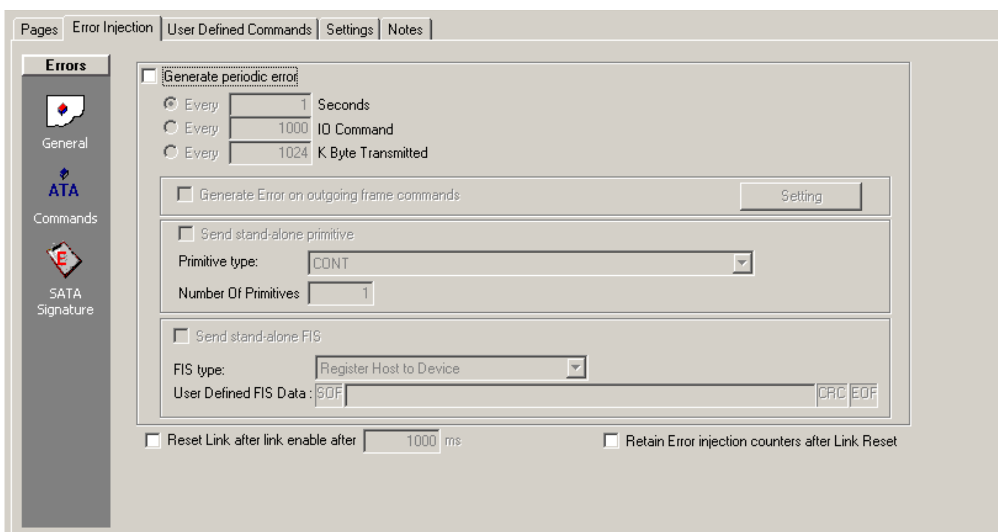


Figure 162. SATA: Setting General Errors

Setting General Errors

Generate Periodic Error

Generate Periodic Error allows you to inject periodic error on Command frame, FIS frame, stand alone primitive, and stand alone FIS. Check **Generate Periodic Error** and select the period unit of time, number of IO commands, or number of kilobytes transferred, by checking the corresponding option button.

Outgoing FIS Command Error or Outgoing Frame Command Error

SAS: Check **Generate Error on outgoing FIS commands**, then click the **Setting** button to open the error setting dialog.

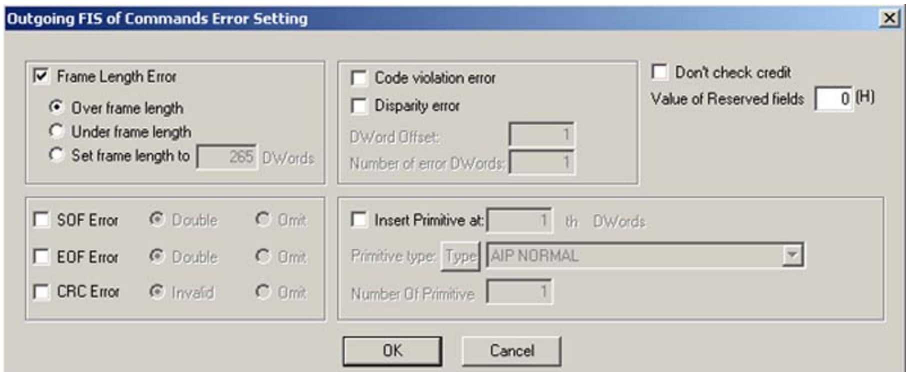


Figure 163. SAS: Outgoing FIS of Command Error Setting

SATA: Check **Generate Error on outgoing frame commands**, then click the **Setting** button to open the error setting dialog

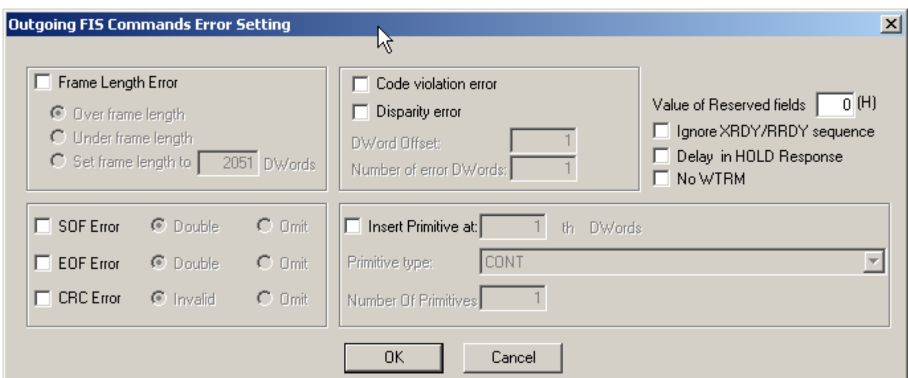


Figure 164. SATA: Outgoing FIS of Command Error Setting

Frame Length Error

Check **Frame Length Error** and choose the type of error to introduce.

Code violation and Disparity errors

Check these and specify the DWord offset and the number of error DWords.

Don't check credit (SAS only)

Check this to disable credit checking.

Value of Reserved Fields

Enter a value.

Ignore XRDY/RRDY sequence (SATA only)
Check or not.

Delay in HOLD Response (SATA only)
Check or not.

No WTRM (SATA only)
Check or not.

SOF, EOF & CRC Errors
Check any or all and choose the criteria for introduction.

Insert Primitive
Check **Insert Primitive,** click the **Type** button to open the **Primitive Type** dialog, then select the primitive type.

Send Primitive

Check **Send stand-alone primitive**, click the Type button to open the Primitive Type dialog, select the primitive type, and click **OK**.

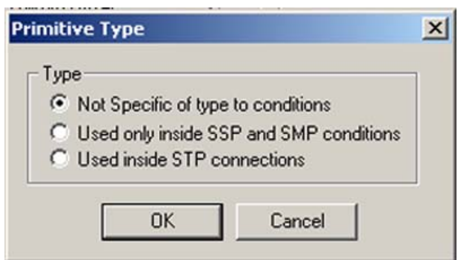


Figure 165. Primitive Type

Click the down arrow on the Primitive list box, choose a primitive, enter a value for the number of primitives to send, and click **OK**.

Reset Link

Check **Reset Link after link enable after** and enter time value after which to reset the link.

Retain Error Injection Counters after Link Reset

If unchecked, after every Link Reset, the Emulator resets its internal Command Number/Counters and re-initializes the Error injection core. If checked, the Emulator keeps the state.

Generate Link Errors (SAS only)

To introduce link errors, check **Non release of link** to prevent release of the link even if exceeding link connection time, and/or check **Buffer starvation** and enter a value in **Number of R_RDY** for each connection text box to simulate a busy link.

Send Hard Reset (SAS only)

Check **Send [#of] Hard Reset after PHY Reset** and specify number of resets to send.

Send FIS (SATA only)

Check **Send stand-alone FIS**, select the FIS Type button, and optionally enter User Defined FIS Data.

Identify Errors (SAS only)

Click the **Identify** icon in the Errors window to display the Identify Error Setting dialog.

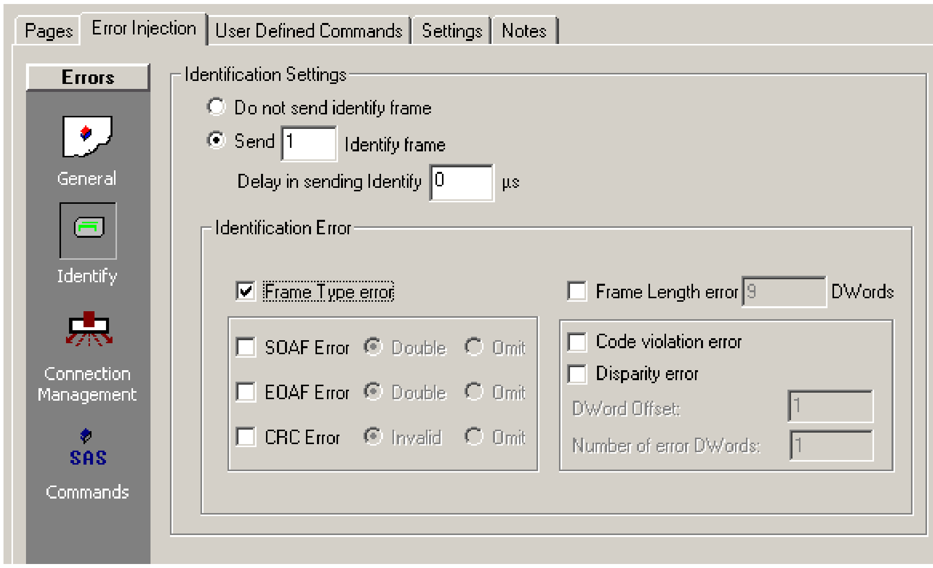


Figure 166. SAS: Identify Error Setting Dialog

Sending Identify Frame

Check the **Send** option button, then specify the number of Identify frames to send (and a delay, if needed).
Not to send Identify frames, check the **Do not send identify frames** option button.

Frame Type Error

Check this to send a Frame Type error.

Frame Length Error

Check **Frame Length error** and enter the number of DWords in the corresponding text box.

SOAF, EOAF and CRC

Check any or all and check the criteria for introduction.

Code violation and Disparity

Check either or both and specify DWord offset and Number of DWords in the corresponding text boxes.

Connection Management (SAS only)

Click the **Connection Management** icon in the Errors window to display the Connection Management Setting dialog.

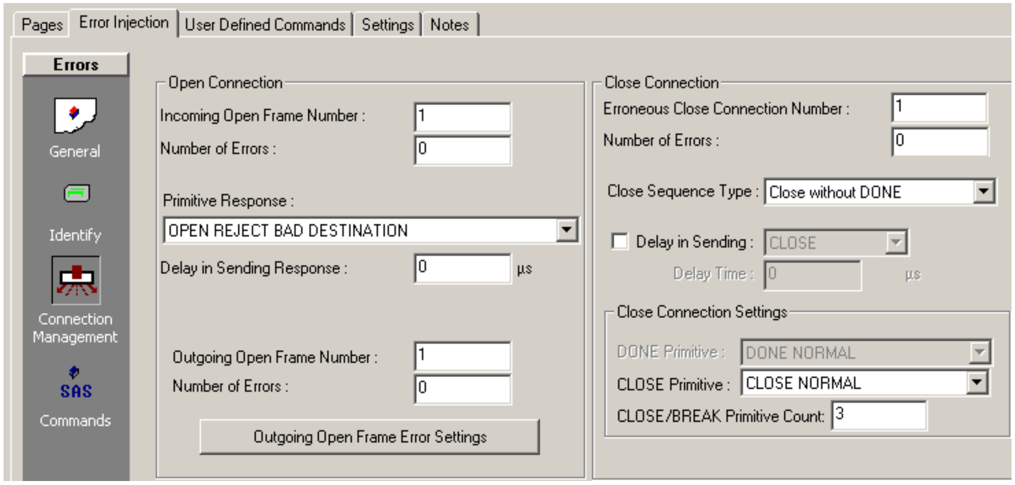


Figure 167. SAS: Connection Management Setting Dialog

Open Connection Definition

Incoming Frame Settings

1. In the **Open Connection** dialog, enter a value for the **Incoming Open Frame Number** and the **Number of Errors** in the corresponding text box**.**
2. Click the down arrow next to the **Primitive Response:** drop down list box, choose a primitive response, and enter a value for the **Delay in Sending Response** text box.
3. Enter a value for **Outgoing Open Frame Number** and **Number of Errors** in the corresponding text box.

Outgoing Frame Settings

Click **Outgoing Open Frame Error Settings** to display the **Open Frame Setting** dialog. Check the errors to introduce and click **OK.**

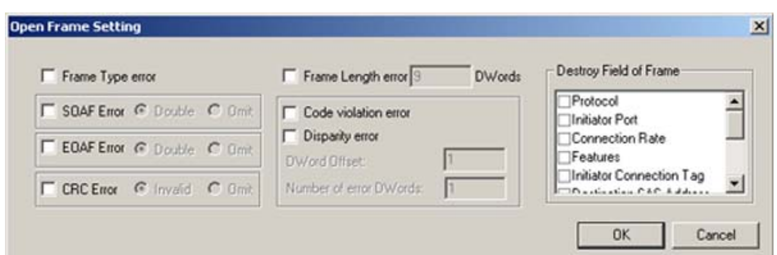


Figure 168. SAS: Open Frame Setting

Close Connection Definition

1. In the **Close Connection** dialog, enter a value for the **Erroneous Close Connection Number** and the **Number of Errors** in the corresponding text box.
2. Click the down arrow next to the **Close Sequence Type** drop down list box, then choose a closing sequence.
3. For a delay in sending, click the **Delay in Sending** check box, click the down arrow on the associated drop down list box, choose what to delay, and enter a value for the **Delay Time**.

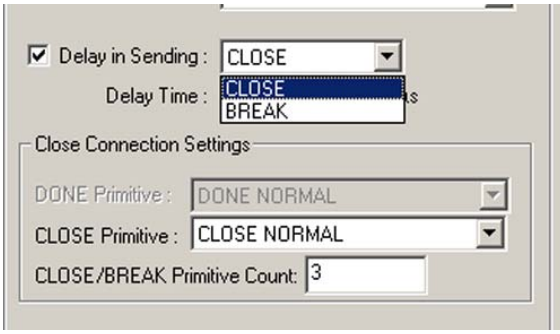


Figure 169. SAS: Delay in Sending

4. Click the down arrow on the **ClOSE Primitive** or **DONE Primitive** dropdown list box in the **Close Connection Settings** dialog, then choose a Close or Done Primitive.
5. Enter a value in the **CLOSE/BREAK Primitive Count** text box.

SAS Commands Errors (SAS only)

Click the **SAS Commands** icon in the Errors window to display the Commands Error Setting dialog

Status Indication

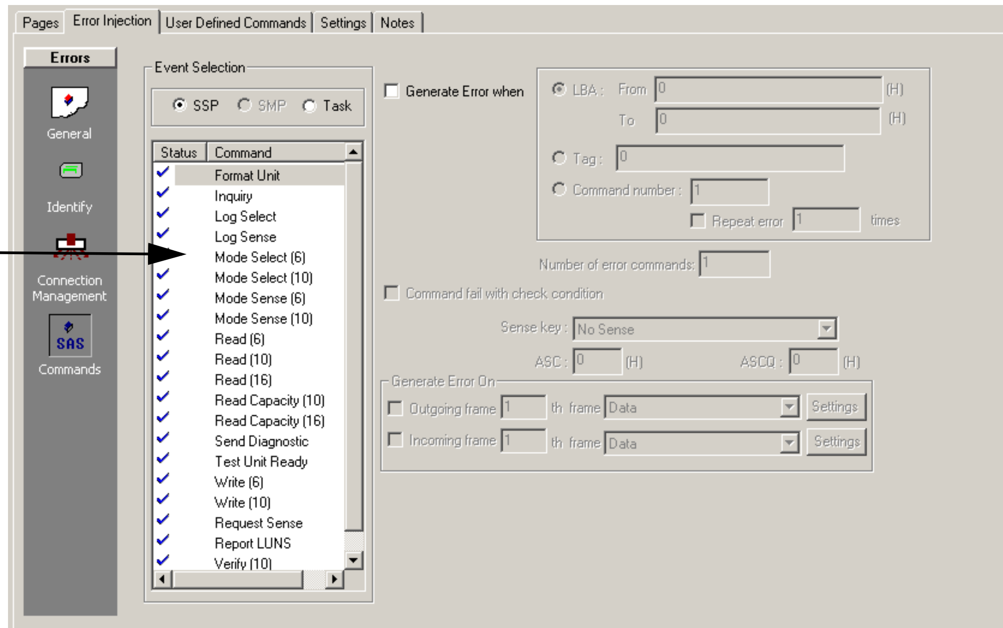


Figure 170. SAS: SAS Commands Error Setting Dialog

1. Click the **SSP, SMP** or **Task** option button to display the commands available for each of these categories in the Event Selection window.
2. Click a command for which to set an error, check the **Generate Error when:** check box, then enter values for **LBA, TAG**, or **Command number** in the corresponding text box.

   When using Command Number as the Error Injection filter, you can repeat the erring-command sets by checking **Repeat error**.
3. Click the **Command fail with check condition** check box, click the down arrow on the **Sense Key** drop down list box, choose an error type, and then enter values for **ASC** and **ASCQ** in the corresponding text boxes.
4. Set up Outgoing and Incoming frame errors.

Note: Once you check the **Generate Error On:** check box for a command, a red status indication appears next to the command, indicating an error condition.

Outgoing Frame Settings

Before selecting Outgoing Frame Settings, select the Types Of Frames and the Frame Number on which to inject an error. Then check **Outgoing Frame** in the Generate Error On area and then the enabled **Settings** button to display the Outgoing Frame Setting dialog.

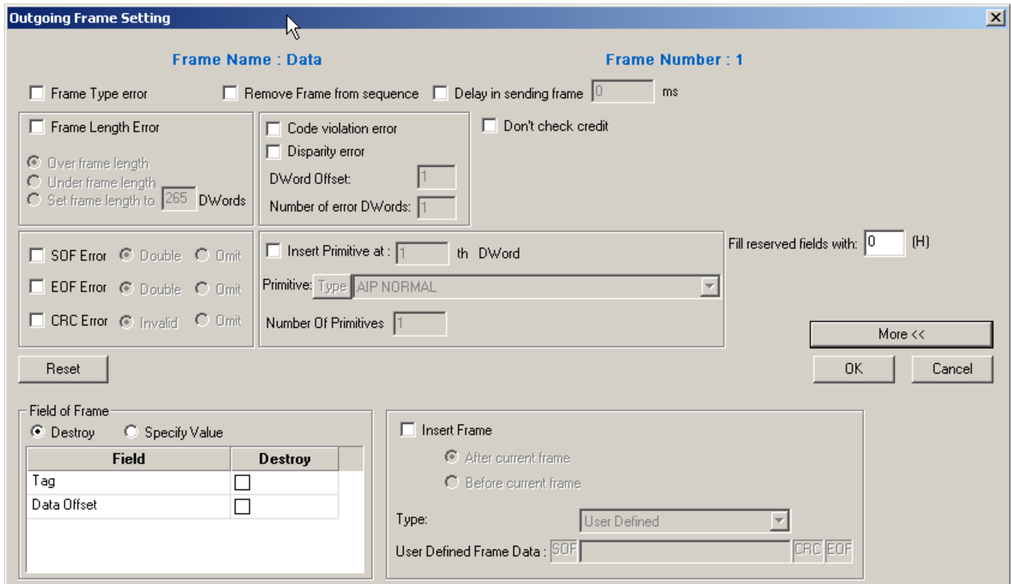


Figure 171. Outgoing Frame Setting Dialog

Frame Type Error

Check this to introduce a frame type error.

Remove Frame from sequence

Check this to remove frame from sequence.

Delay in sending frame

Check this to delay sending frame and enter a value for the delay.

Frame Length Error

Check **Frame Length Error** and choose the type of error to introduce**.**

Code Violation and Disparity error

Check these and specify DWord offset and the number of error DWords.

Don’t check credit

Check this to disable credit checking.

SOF, EOF, and CRC errors

Check these and specify Double or Omit by checking the corresponding option button.

Insert Primitive

Check **Insert Primitive**, click the **Type** button to open the Primitive Type dialog, select the primitive type, and click **OK.**

Destroy Field of Frame

Make sure to click the **More** button and then check the field to destroy.

Insert Frame

Check **Insert Frame,** click the down arrow on the **Type** combo box, and choose the frame type. Make sure that you have clicked **More.**

Incoming Frame Settings

Before selecting Incoming Frame Settings, select the **Types Of Frames** and the **Frame Number** on which to inject an error. Then check **Incoming Frame** in the Generate Error On area and then the enabled **Settings** button to display the Incoming Frame Settings dialog.

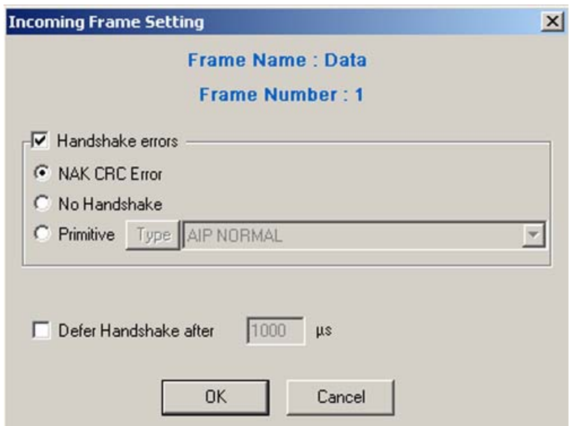


Figure 172. Incoming Frame Setting Dialog

Handshake Error

Check **Handshake Errors** to enable selection of error on handshake. Check **NAK**, **CRC,** or any other **Primitive** to send as an incoming frame response. Check **No Handshake** to send no response.

Defer Handshake Errors

Check **Defer Handshake** and enter a value for the time to defer the handshake.

ATA Commands Errors (SATA only)

Click the **ATA Commands** icon in the Errors window to display the ATA Commands Error Setting dialog.

Status Indication

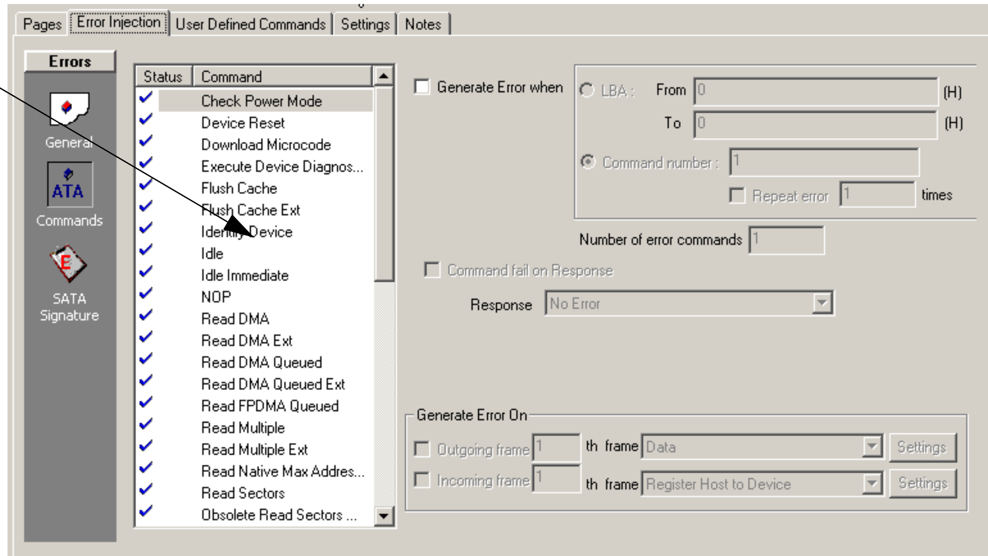


Figure 173. SATA: SAS Commands Error Setting Dialog

To set errors for ATA commands:

1. Click a command for which to set an error and then check the **Generate Error when** check box and chose **LBA or Command number** with a value in the corresponding text box.
2. When you choose Command Number, you can use **Repeat error** for periodic series of errors in commands. Set the number of times to repeat the error, by entering a value in the **Number of Error Commands** text box.

Note: Once you check the **Generate Error when:** check box for a command, a red status indication appears next to the command selected indicating an error condition.

3. To force the system to send a defined response frame to the host, check the **Command fail on Response** check box and then choose a pre-defined response.
4. Repeat for every command for which to set an error.

Outgoing Frame Settings

Before selecting Outgoing Frame Settings, select the Types Of Frames and the Frame Number on which to inject an error. Then check **Outgoing Frame** in the **Generate Error On** area and then the enabled **Settings** button to display the Outgoing Frame Setting dialog.

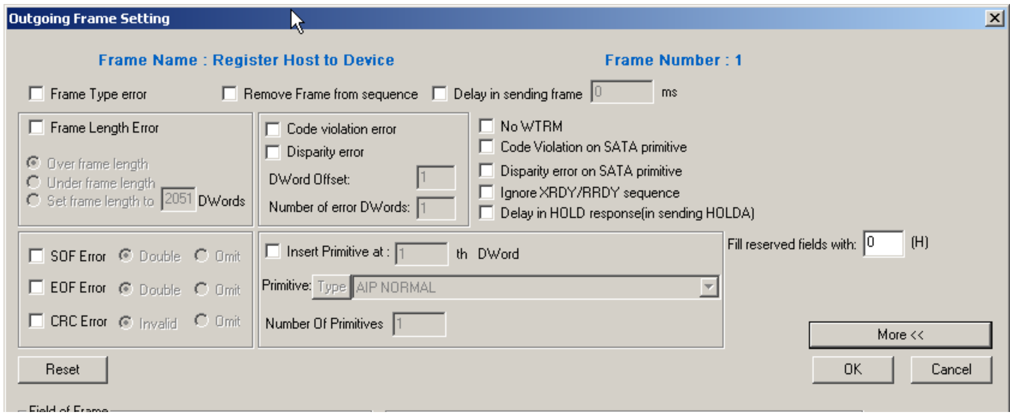


Figure 174. Outgoing Frame Setting Dialog

Frame Type Error

Check this to introduce a frame type error.

Remove Frame from sequence

Check this to remove frame from sequence.

Delay in sending frame

Check this to delay sending frame and enter a value for the delay.

Additionally check:

- No WTRM
- Code Violation on SATA primitive
- Disparity error on SATA primitive
- Ignore XRDY/RRDY sequence
- Delay in HOLD response (in sending HOLDA)

Frame Length Error

Check **Frame Length Error,** choose the type of error to introduce and click **OK**.

Code violation and Disparity error

Check these and specify DWord offset and the number of error DWords.

SOF, EOF and CRC errors

Check these and specify **Double** or **Omit** by checking the corresponding option button.

Insert Primitive

Check **Insert Primitive** to enable the Primitive Type dialog, select the primitive type and number of primitives, and click **OK**.

Destroy Field of Frame

Click the **More** button to display the Field of Frame area, check **Destroy,** and check the fields to destroy. Alternatively, check **Specify Value** to choose from a predefined list of values.

Set Value of Field

Check **Fill Out** in the **Field of Frame** area and enter values for fields.

Insert Frame

Check **Insert Frame** and then click the down arrow on the **Type** combo box and choose the frame type. Make sure that you have clicked **More.**

Note: In addition to the pre-defined frame types, you can scroll down the list to **User Defined** and then enter your own frame data between SOF and EOF.

Incoming Frame Settings

Before selecting Incoming Frame Settings, select the Types Of Frames and the Frame Number on which to inject an error. Then check **Incoming Frame** in the **Generate Error On** area and then the enabled **Settings** button to display the Incoming Frame Settings dialog.

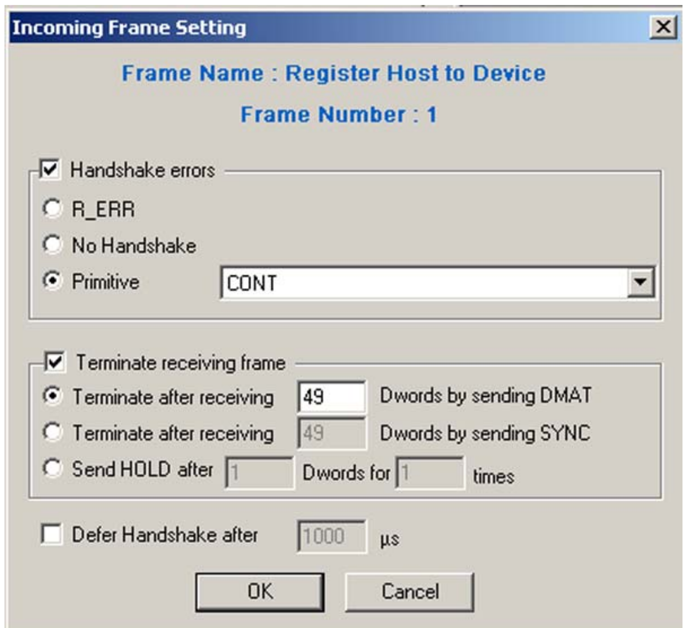


Figure 175. Incoming Frame Setting Dialog

Handshake Errors

Check **Handshake Errors** to enable selection of error on handshake. Check NAK, CRC, or any other **Primitive** to send as an incoming frame response. Check **No Handshake** to send no response.

Defer Handshake Errors

Check **Defer Handshake** and enter a value for the time to defer the handshake.

Primitive

Check **Insert Primitive** then click the down arrow on the **Primitive** drop down combo box and choose a primitive.

Terminate receiving frame

Check **Terminate receiving frame** and choose the termination condition.

SATA Signature (SATA only)

Click the **SATA Signature** icon in the Errors window to display the SATA Signature dialog.

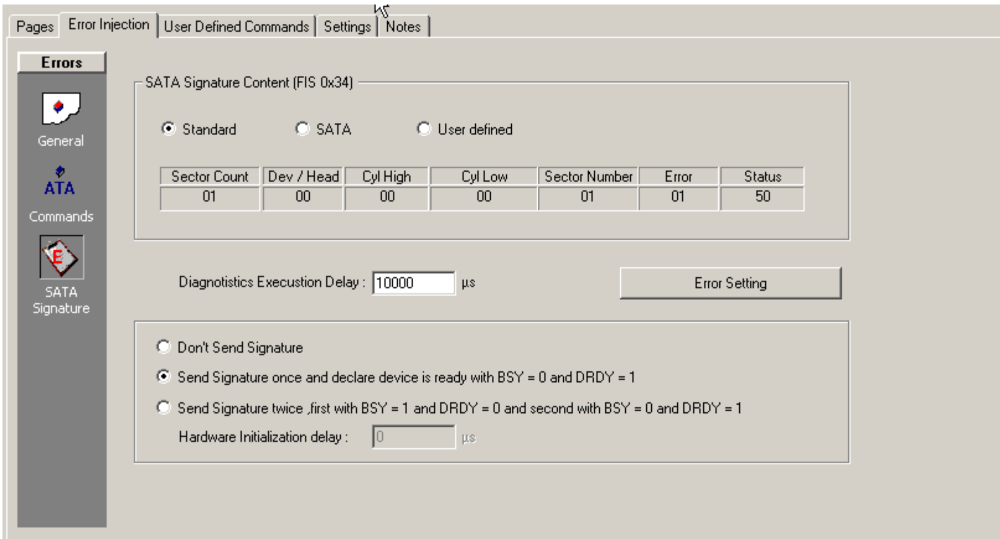


Figure 176. SATA: SATA Signature Dialog

Choose SATA Signature Content

Choose either the pre-defined **Standard** or **SATA**. Alternatively, you can define your own signature by checking the **User Defined** option button and then entering values in the enabled fields.

Specify when to send Signature

You can choose from **Don't Send Signature, Send Signature once** and declare device is ready with BSY=0 and DRDY=1, or **Send Signature twice**, first with BSY=1 and DRDY=0 and second with BSY=0 and DRDY=1, by checking the corresponding option button.

Note If you choose **Send Signature twice**, first with BSY=1 and DRDY=0 and second with BSY=0 and DRDY=1, the system enables the Hardware initialization delay text box, allowing you to set the hardware initialization delay.

SATA Signature Errors

You can define errors to introduce when sending a SATA Signature. To define the errors, click the **Error Setting** button to open the SATA Signature Error Setting dialog.

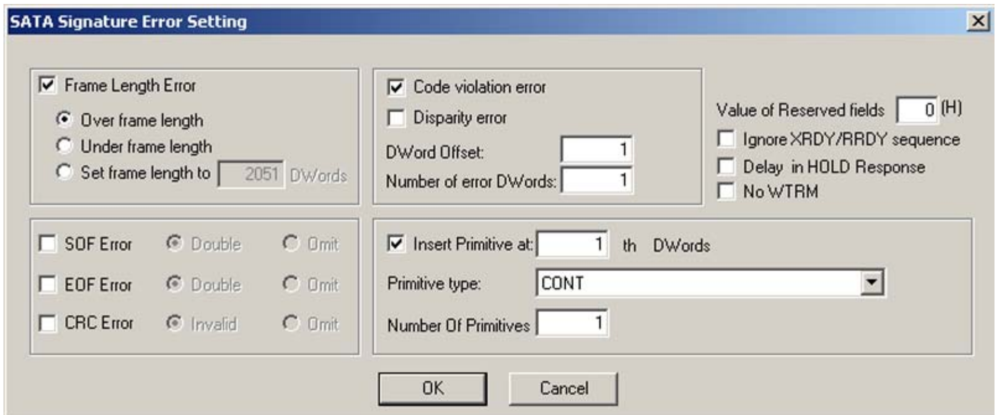


Figure 177. SATA: SATA Signature Error Setting

Frame Length Error

Choose the Frame Length Error type to introduce.

SOF, EOF and CRC Errors

Check any or all and check the criteria for introduction.

Code Violation and Disparity errors

Check and specify DWord offset and Number of DWord errors for Disparity error.

Additional Settings

Set and check:

- Value for Reserved fields
- Ignore XRDY/RRDY Sequence
- Delay in HOLD Response
- No WTRM

Insert Primitive

Check **Insert Primitive**, click the down arrow on the **Primitive** list box, choose a primitive type and enter a value for the Number of Primitive.

User-Defined Commands Tab

To create command(s) specifically for your application, click the **User Defined Commands** tab to display the command definition dialog.

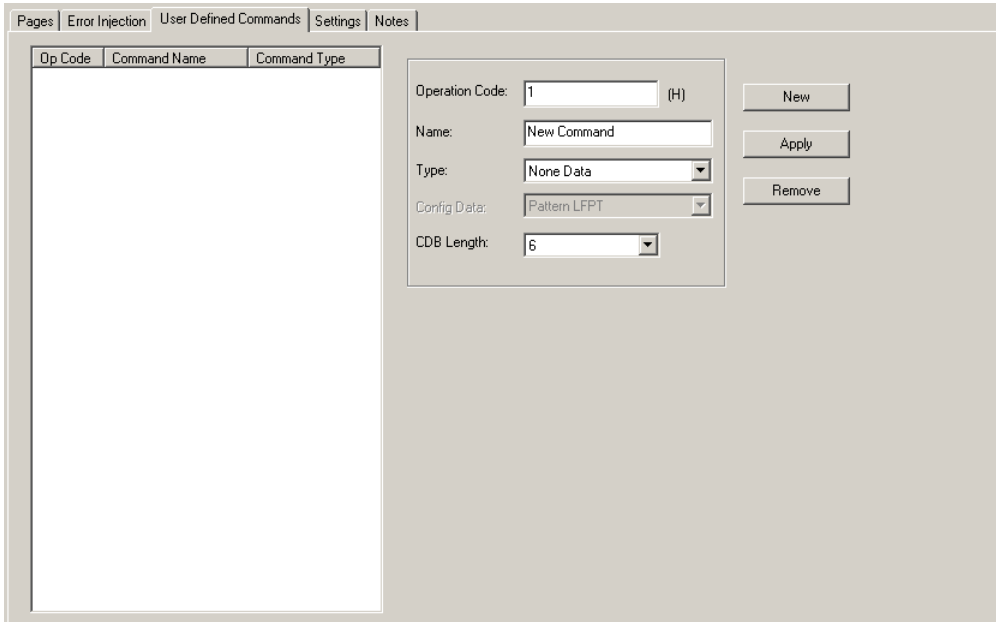


Figure 178. SAS: Command Definition Dialog

To define a command:

1. Enter an **Operation Code** and a **Name** in the corresponding text boxes.
2. Click the down arrow on the **Type** combo box and choose a command type.
3. For command types requiring configuration data, click the down arrow on the enabled **Config data:** combo box and choose appropriate configuration data.
4. Enter the **CDB length**: 6, 10, 12, or 16.
5. When done, click the **New** button.
6. The defined command appears in the command name window.
7. To make changes to a previously defined command, highlight the command, make the changes, and click **Apply.**

Note: After creation, the User-Defined commands appear in the Event Selection dialog.

Target Emulator Settings (SAS)

Click the **Settings** tab to display the Target Emulator Settings dialog.

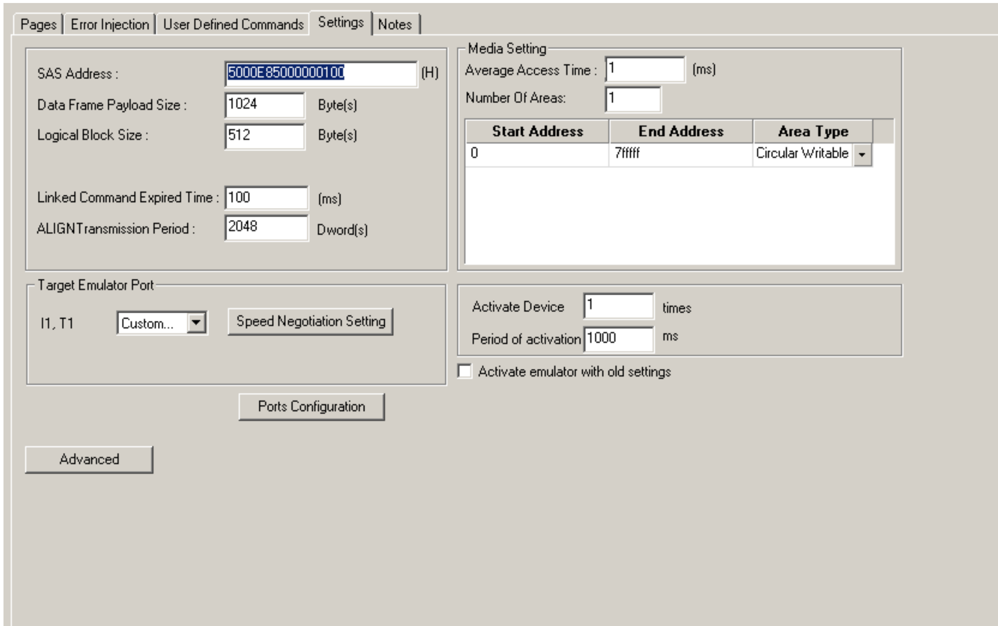


Figure 179. SAS: Target Emulator Settings Dialog

The Settings page opens with a default set of values, which you can modify. To return to these values, click the **Default Settings** button.

Define the Target

Enter a **SAS Address, Data Frame Payload Size, Logical Block Size, Linked Command Expired Time**, and **ALIGN Transmission Period** in the corresponding text box.

Media Settings

Enter a value for Average Access Time to simulate Seek/Access time delay of a real device.

Enter a Number of Writable Areas. **Define a Start** and an **End Address,** click the down arrow under the **Area Type**, and choose **Normal Writable, Circular Writable**, or **Non-Writable**.

Choose Target Emulator Port

Click a port option button, then click the **Speed Negotiation Setting** button (see “Speed Negotiation Tab” on page 108). Select the port speed settings, all by default.

Ports Configuration

Click the **Ports Configuration** button to display the Ports Configuration dialog.

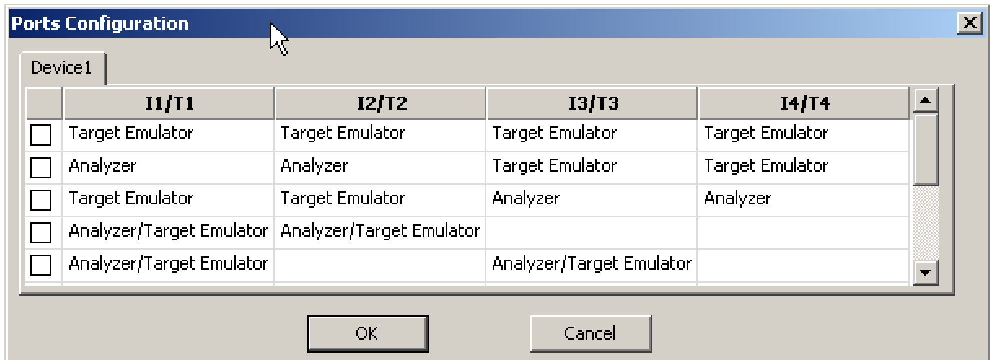


Figure 180. SAS: Ports Configuration Dialog

Device Activation

Enter a number of times in the **Activate Device** field. Enter a **Period of Activation**.

You can **Activate emulator with old settings**.

Advanced Settings

Click the **Advanced Button** to display additional setting options. The dialog opens displaying the OOB Signal Setting tab.

OOB Signal Setting

Edit the default values displayed in the white editable fields.

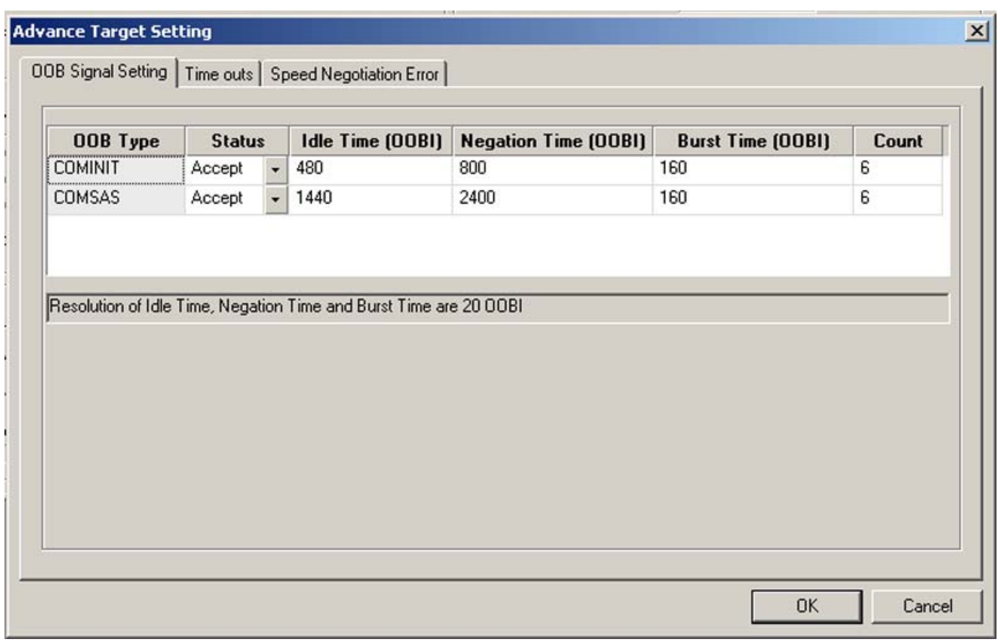


Figure 181. OOB Signal Setting Dialog

Set Timeouts

Click the **Timeouts** tab to display the Timeouts setting dialog.

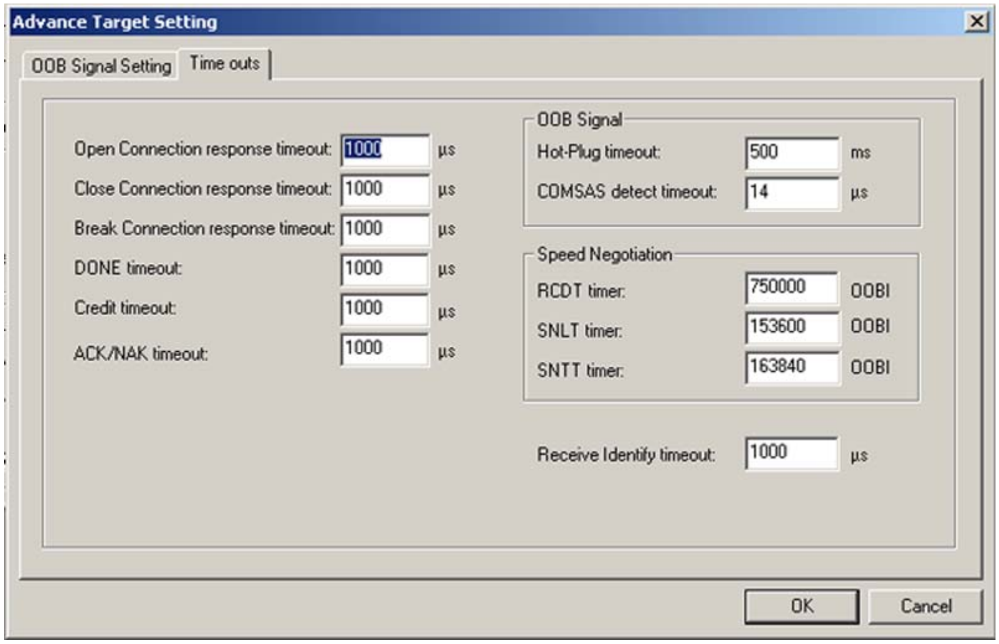


Figure 182. Timeout Setting Dialog

Edit the default values displayed in the white editable fields and click **OK**.

Set Speed Negotiating error

Click the **Speed Negotiation** tab to display the Speed Negotiation dialog.

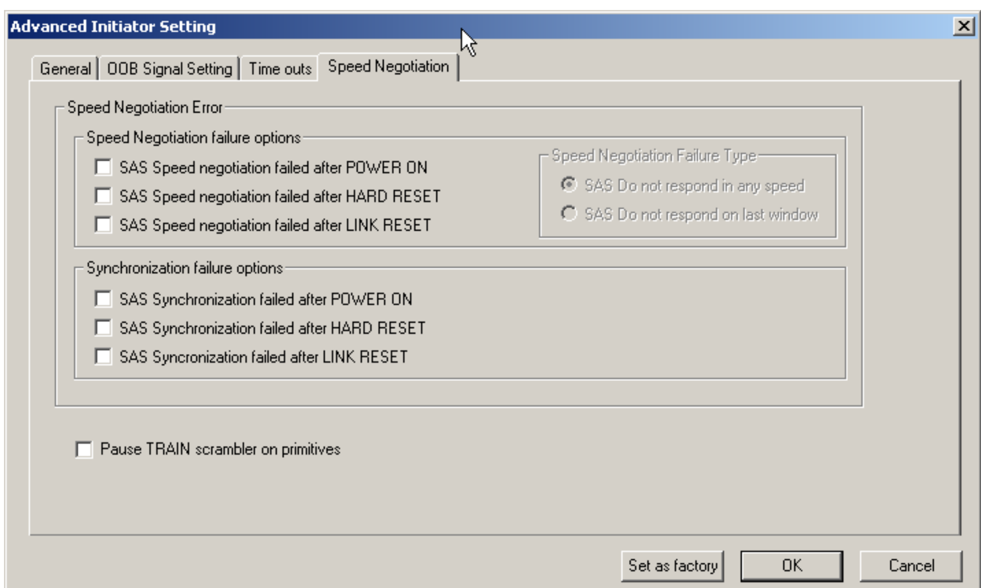


Figure 183. Speed Negotiating Error Setting Dialog

Check a **Speed Negotiation Error** check box and choose a failure type by checking a corresponding option button. Additionally, you can choose the **Synchronization failure** option.

Notes Tab

Click the **Notes** tab and enter a Project Name and a brief description of the Target Emulation project (see “Add a Project Note” on page 70).

Run Target Emulation

Click the  **Activate Device** button or select **Project Setup > Active Device** to start emulation.

Note: You can run the analyzer while device emulation is active to monitor bus traffic.

Device Emulator Settings (SATA only)

Click the **Settings** tab to display the Device Emulator Settings dialog.

The Settings tab opens with a default set of values, which you can modify. To return to these values, click the **Default Settings** button.

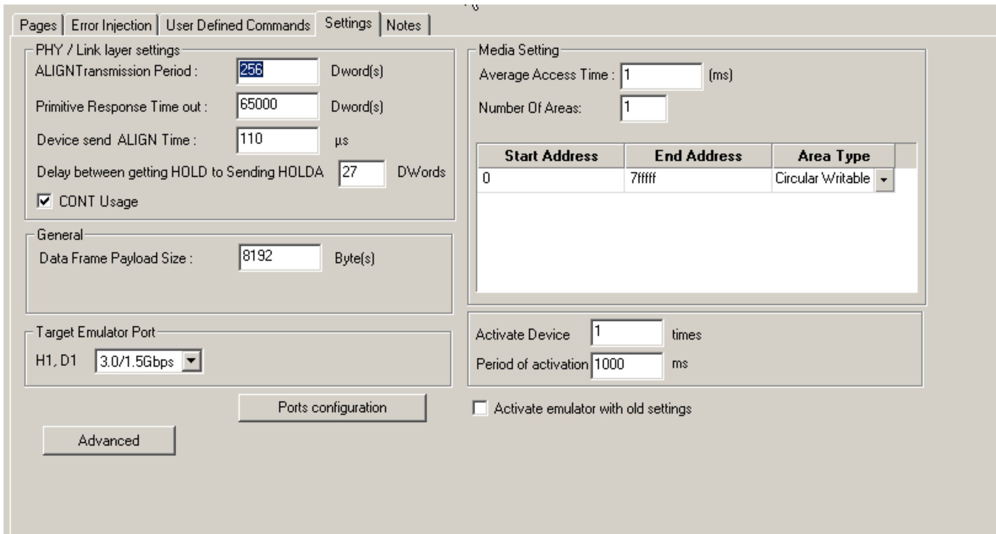


Figure 184. SATA: Device Emulator Settings

PHY/Link layer settings

Enter values for **Align Transmission Period**, **Primitive Response Timeout**, and **Standby Timeout**, **Device send Align Time** and **Delay between getting HOLD to Sending HOLDA** and specify a delay. Check **CONT usage**.

Media Settings

Enter a value for **Average Access time** to simulate Seek/Access time delay of a real device.

Enter a **Number of Areas.** Define a **Start** and an **End Address**, click the down arrow under the **Area Type** and choose **Normal Writable**, **Circular Writable,** or **Non Writable.**

Payload Size

Enter a value for **Data Frame Payload Size** in the General area.

Choose Target Emulator Port

Click a port option button and click the down arrow next to the **Speed** list box and choose a port speed. Use the **Speed Negotiation Setting** button to open the dialog (see “Speed Negotiation Tab” on page 108).

Note: If you have made some changes to a defined emulation and want to return to the original definition, check the **Activate the emulator with old settings**.

Ports Configuration

Click the **Ports Configuration** button to display the Ports Configuration dialog (see “Ports Configuration” on page 140).

Activation

Enter **number of times** and **period of activation**.

Advanced Options

Click the **Advanced** button to display the OOB Signal Setting, Power Management setting, Speed Negotiation, NCQ Command setting and Miscellaneous additional setting dialogs.

OOB Signal Setting

Edit the default values displayed in the white editable fields.

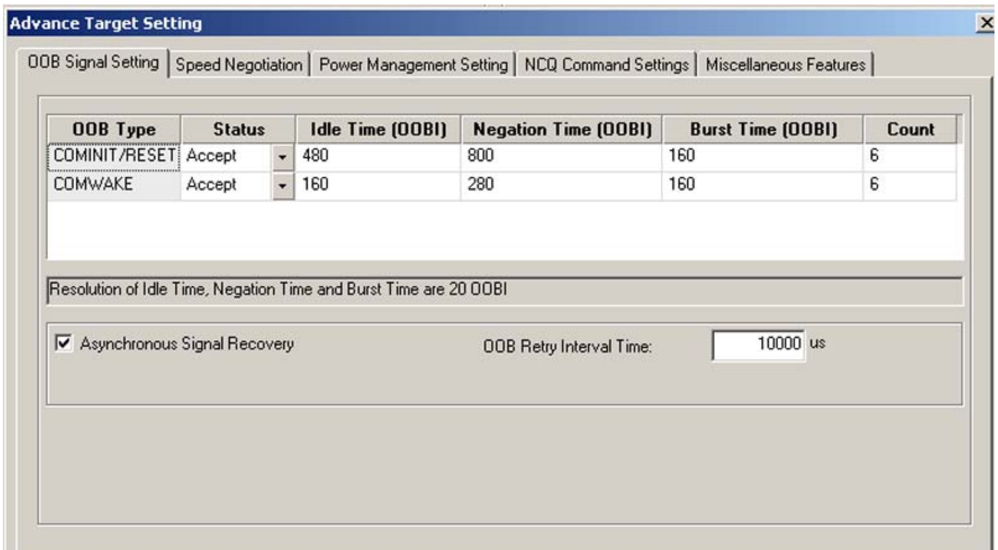


Figure 185. OOB Signal Setting Dialog

Speed Negotiation

Click the **Speed Negotiation** tab to display the Speed Negotiation dialog. Specify **Speed Negotiating Failure Option(s)** and a **Speed Negotiation Failure Type**

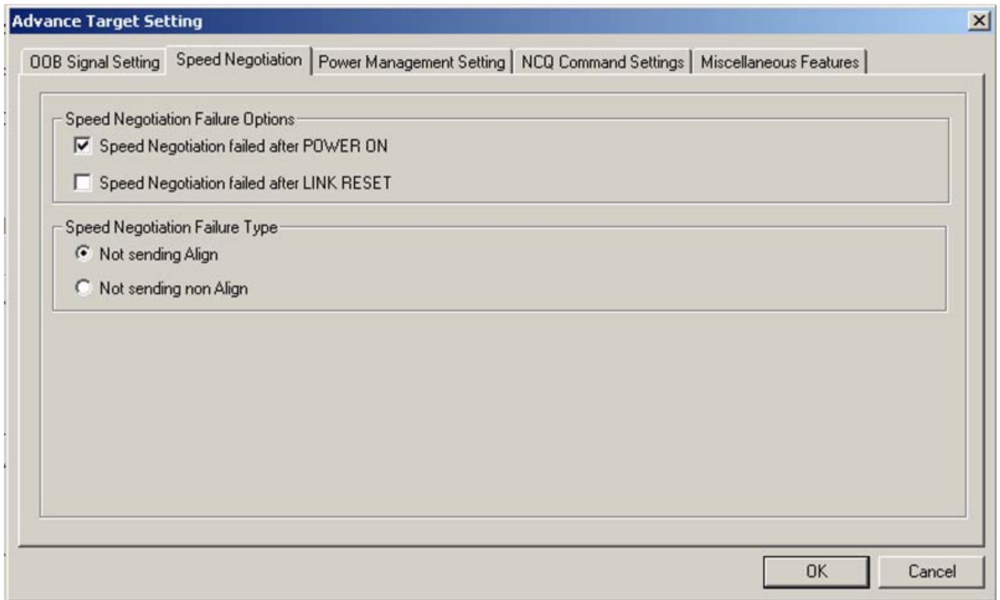


Figure 186. Speed Negotiation Dialog

Power Management Settings Tab

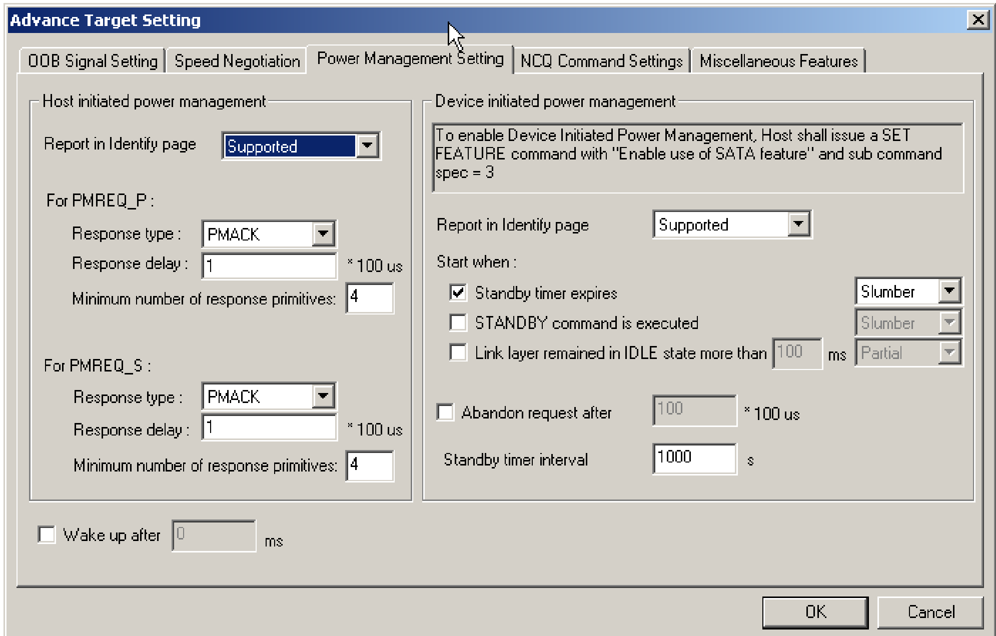


Figure 187. Power Management

1. In the **Host Initialized Power Management** area, choose whether to support the report in the Identify page.
2. Specify the response type for PMREQ_P and PMREQ_S, the delay, and **Minimum Number of Response Primitives**.
3. In the **Device Initiated Power Management** area choose whether to support the report in the Identify page.
4. Define start event by choosing **Standby timer expires, STANDBY command executes**, or **Link layer remains in IDLE state** more than [XXX] ms.
5. Specify time for **Abandon request** and **Wake up after** and enter the **Standby timer interval**.

NCQ Command Settings Tab

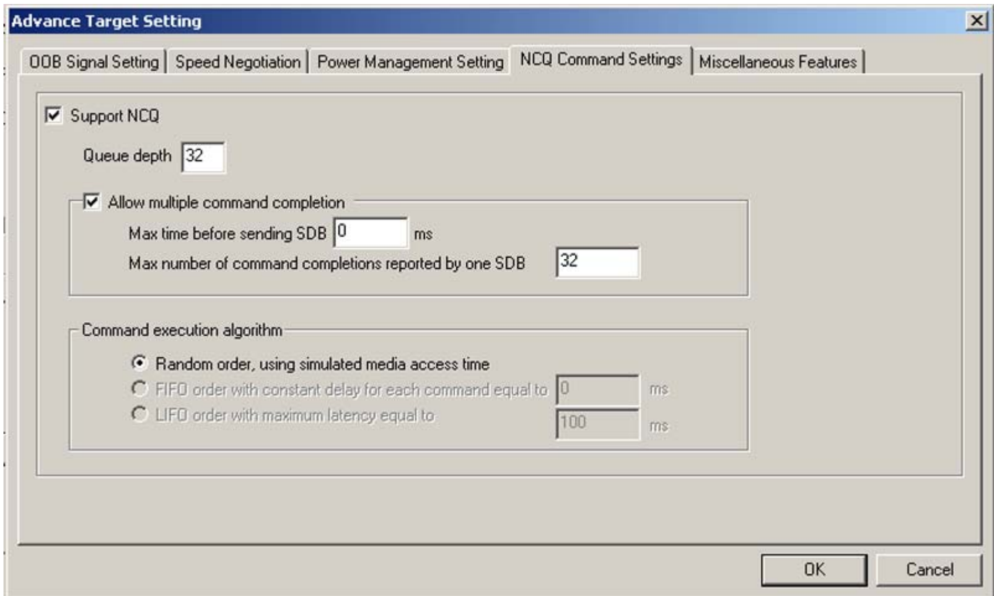


Figure 188. NCQ Commands

1. To enable **NCQ** commands, check **Support NCQ** and specify **Queue depth**.
2. Optionally check **Allow multiple command completion** and enter values for **Max time before sending SDP** and **Max number of command completions reported by one SDB**.

Miscellaneous Features Tab

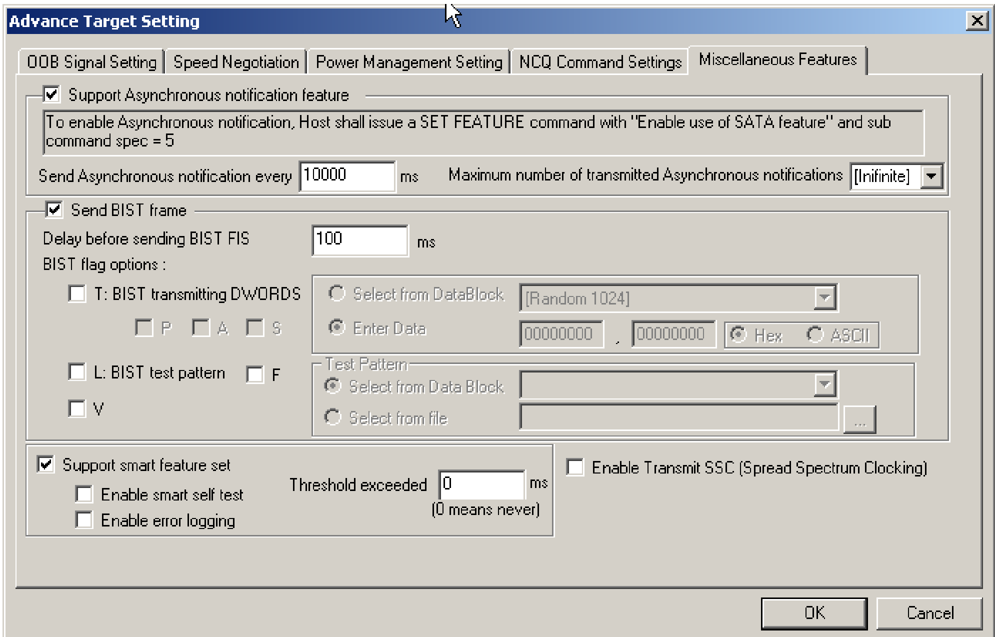


Figure 189. Miscellaneous Features

1. To enable Asynchronous notification, check the **Support Asynchronous notification feature** and specify the Asynchronous notification interval and the Maximum number of transmitted Asynchronous notifications.
2. To send a BIST frame, check **Send BIST frame** and enter a value for the **Delay before sending BIST FIS**.
3. Choose **BIST flag options**.

Project Note

Click the **Notes** tab and enter a **Project Name** and a brief description of the Device Emulation project (see "Add a Project Note" on page 70).

Run Device Emulation

Click the  **Activate Device** button to start emulation.

Note: You can run the analyzer while device emulation is active to monitor bus traffic.

Display Manipulation

Viewer Display

After data is captured (Recorded), the Viewer displays a sample file (**.scs** for SAS and **.sts** for SATA) in Packet View:

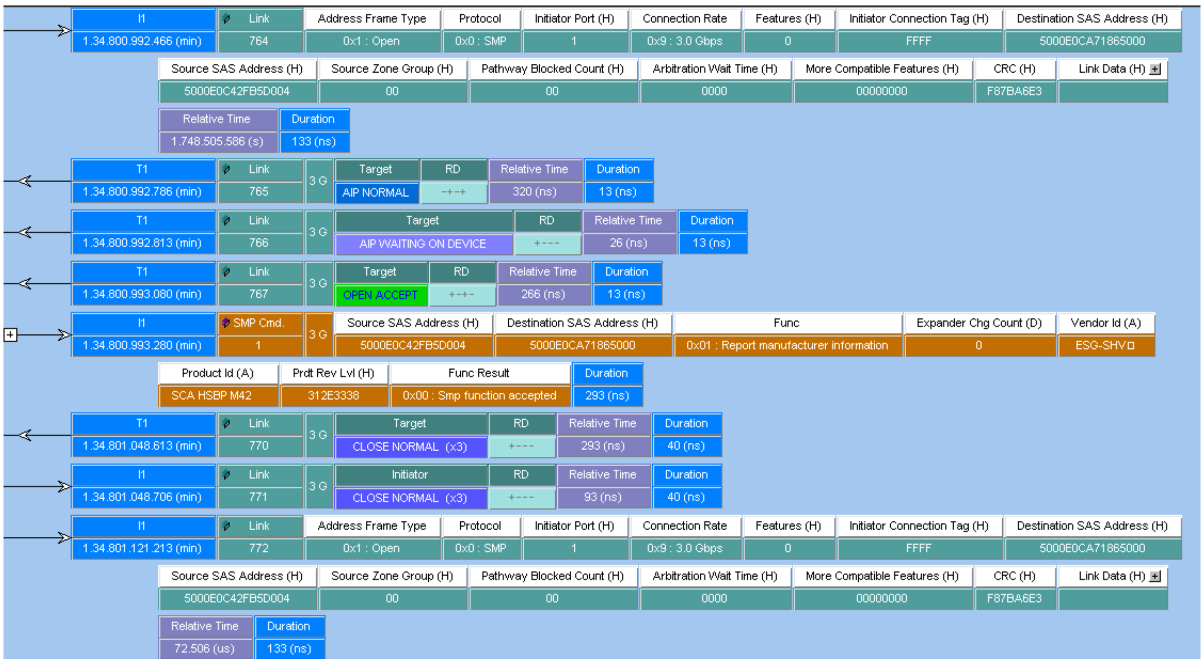


Figure 190 SAS: Packet View of .scs Sample File

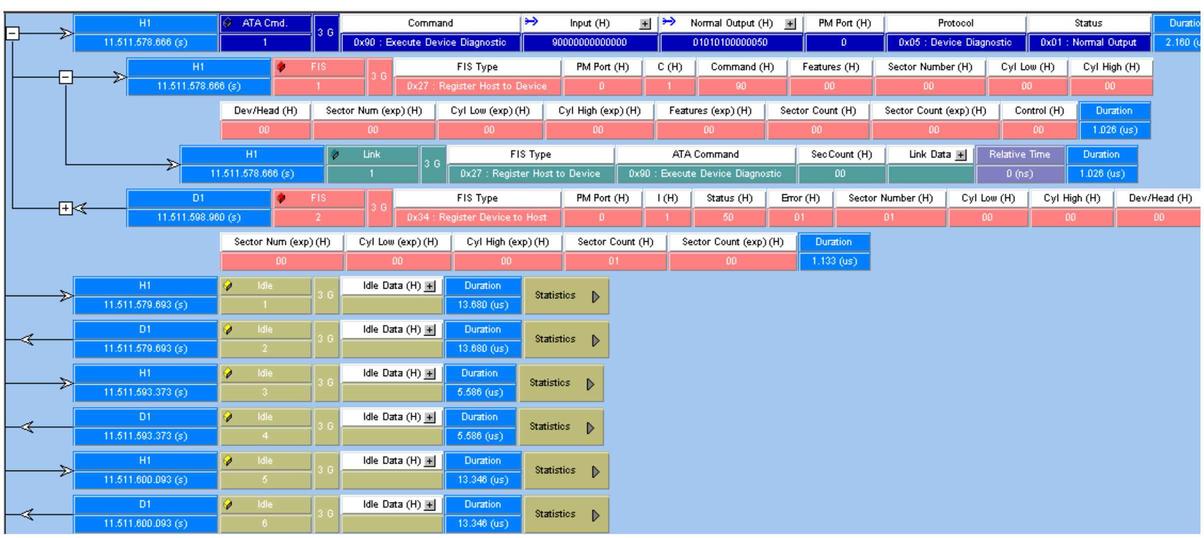


Figure 191 SATA: Packet View of .sts Sample File

You can configure the data viewer display. Toolbars are available for quick access to data viewer display features.

You can display the same data in:

- Column view, with transactions grouped for each active port
- Text view, with transactions grouped for each active port
- Spreadsheet view
- Histogram view

Note: You can change the view type when opening a sample by changing the default workspace or by saving options in the Software Setting dialog.

Switching Views

To display the capture in any other available view, select from the View menu or from the View Type toolbar.

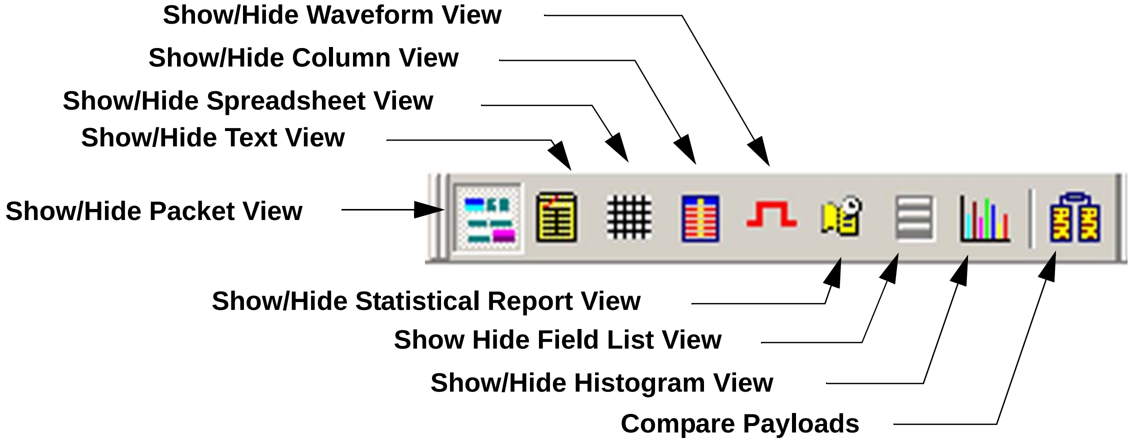


Figure 192. View Type Toolbar

After you select a view, it appears in a separate window. To increase the new window display size, select **View > Packet View** or click the  **Show/Hide Packet View** button to hide the Packet View.

When scrolling through a window display using the scroll bar, the displays in the other windows also scroll.

To rearrange the tiling, select the **Window** menu and choose **Cascade, Tile Vertical,** or **Tile Horizontal**.

Text View

Text View displays the captured data interpreted as transaction frames, grouped in columns by port.

To display Text View, select **View > Text View** or click the  button on the View Type toolbar.

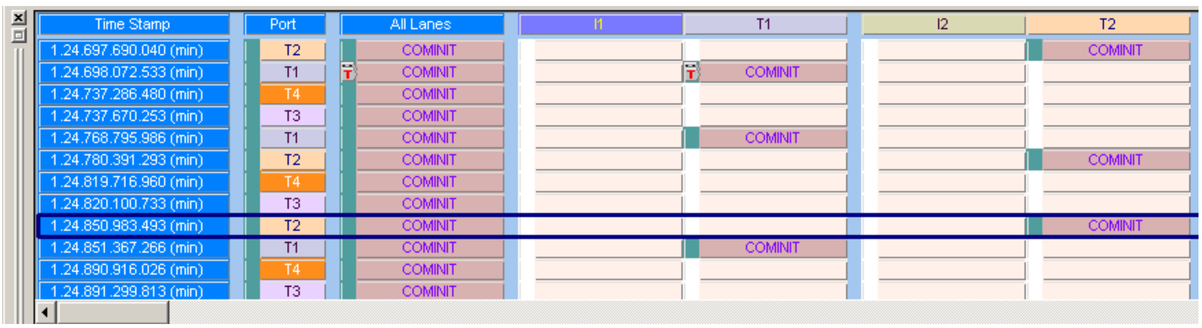


Figure 193. SAS: Text View

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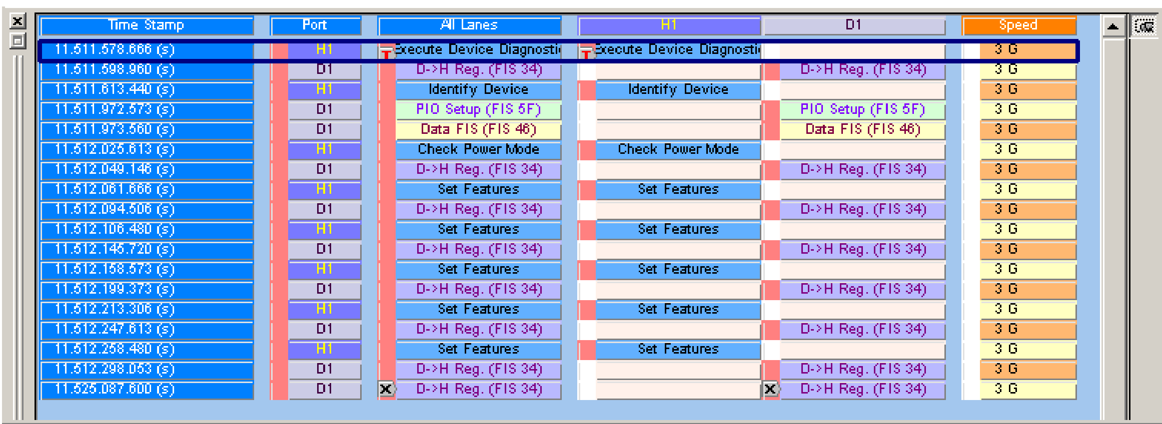

Figure 194. SATA: Text View

Column View

Column View displays the captured data grouped in columns by port. Each row shows captured DWORDs on different ports related to the timestamp. It also shows different speed (1.5G, 3G, 6G) DWORDs. Different DWORD cell height shows the duration of the DWORD.

To display Column View of the current capture, click **View > Column View** or click the  button on the View Type toolbar.

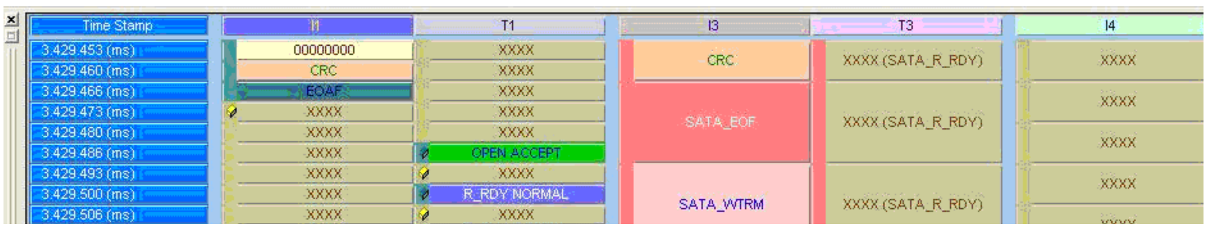

Figure 195. SAS: Column View

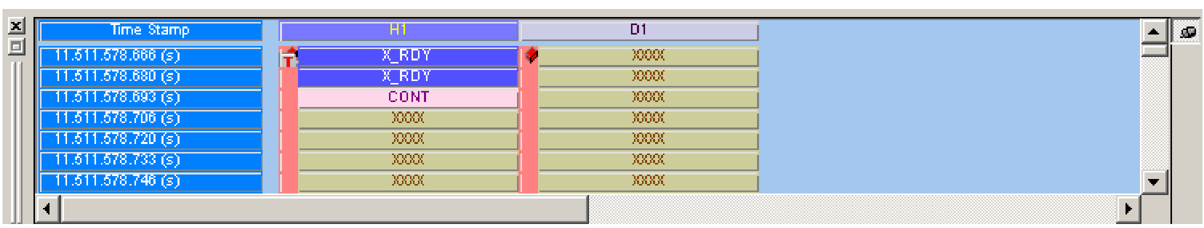

Figure 196. SATA: Column View

Resize Columns

You can resize the columns in Column View by clicking in the column boundary and dragging the boundary to a new position.

Rearrange Columns

You can rearrange columns by left-clicking in the column title and then dragging the drag-and-drop icon  to a new position.

Customize Display

Rename Port

You can rename each port for easy identification. To rename a port, right-click the **port ID** in Text View or Column View.

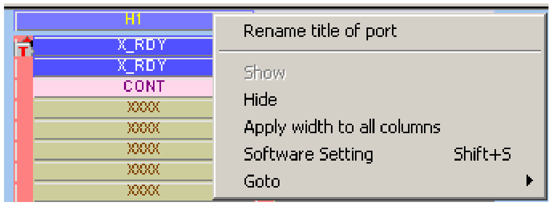

Figure 197. Rename Port

Choose **Rename title of port** to open the Rename Title of Port dialog

Figure 198. Rename Title of Port

Show/Hide Port

You can simplify the viewer display by hiding the captures of ports. All active ports are highlighted on the Show/Hide Ports toolbar. Click a port button to hide the capture for that port.

Figure 199 SAS: Show/Hide Ports Toolbar

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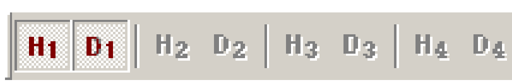


Figure 200 SATA: Show/Hide Ports Toolbar

You can also show or hide a port by right-clicking a **Port ID** in Text View or Column View and choosing **Show** or **Hide** (see Figure 197.)

Show/Hide Field

You can simplify the Viewer display by hiding some fields. You can hide the **Duration**, **Relative Time**, **External Signals,** and **Packet number** fields by right-clicking the corresponding field title and choosing **Hide Field**.

Figure 201 Hide Field

To restore a field to the display, right-click a **Port ID** field and choose the hidden field to restore.

Figure 202 Show Field

Note: Only the fields previously hidden appear in the restore list.

Related Frames

Right-click a **Command frame** for an SSP frame, or **Register Device to Host** for an STP frame, to open a short-cut menu, then choose **Goto Response** to jump to the corresponding Response frame in the viewer.

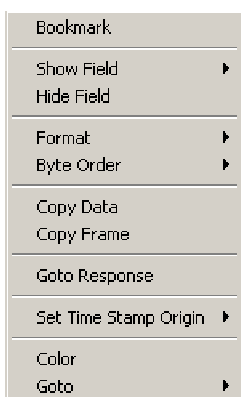


Figure 203 Goto Response

Similarly, right-click a **Response frame** for an SSP Frame, or **Register Device to Host** for an STP frame, to open a short-cut menu, then choose **Goto Command** to jump to the corresponding Command frame in the viewer.

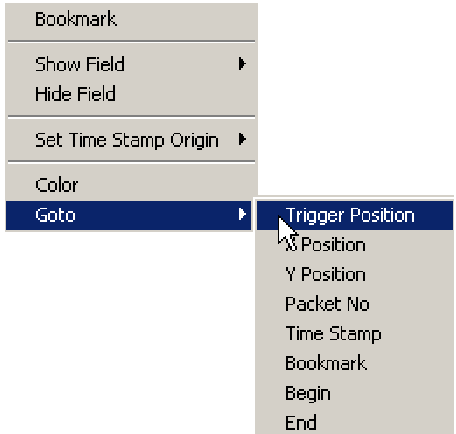


Figure 204 Goto Command

Byte Order

You can change the byte order in fields marked by an arrow and other fields.

Right-click in the field, select **Byte Order,** and choose the ordering.

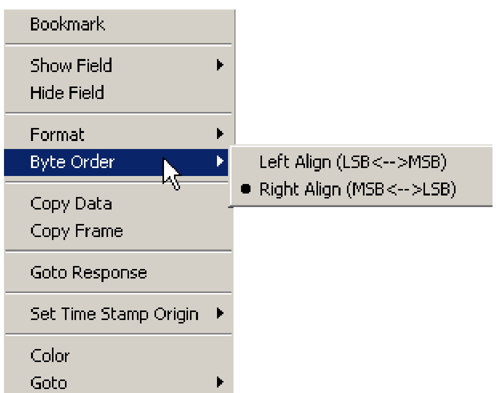


Figure 205 Byte Order

Note: A blue arrow in the byte order field indicates that it has been changed.

Choose Data Format

You can display data values either in hexadecimal (default) or binary. To choose data format, right-click the mouse over a data field, and choose **Format** and the format.

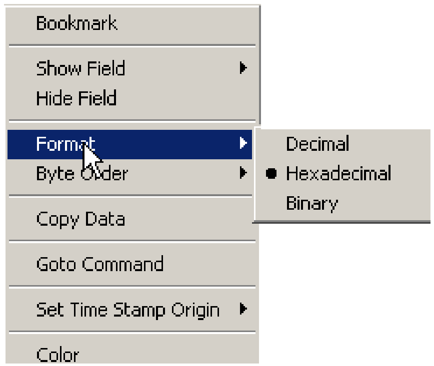


Figure 206 Format

Show All Data

To display all captured data, click the **data expand** toggle arrow in a data field, to examine the data in detail.

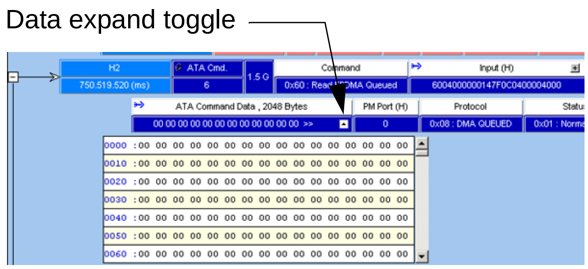


Figure 207 Show All Data

You can expand or collapse all data fields globally. To expand all data fields, right-click the mouse in a data field and choose **Expand All.**

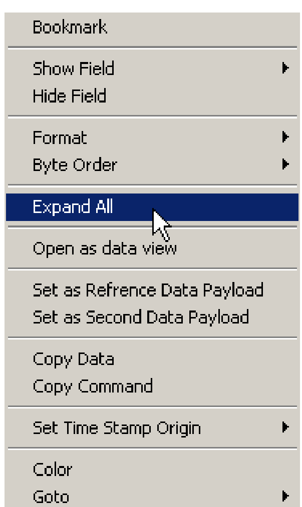


Figure 208 Expand All

To collapse all fields, right-click the mouse in a data field and choose **Collapse All.**

Field List View

Whenever an additional view (such as Text View) displays, you can display a Field List View, which displays field information in a list format.

To open a Field List View of the current capture, select **View > Field List View** or click the  button on the View Type toolbar.

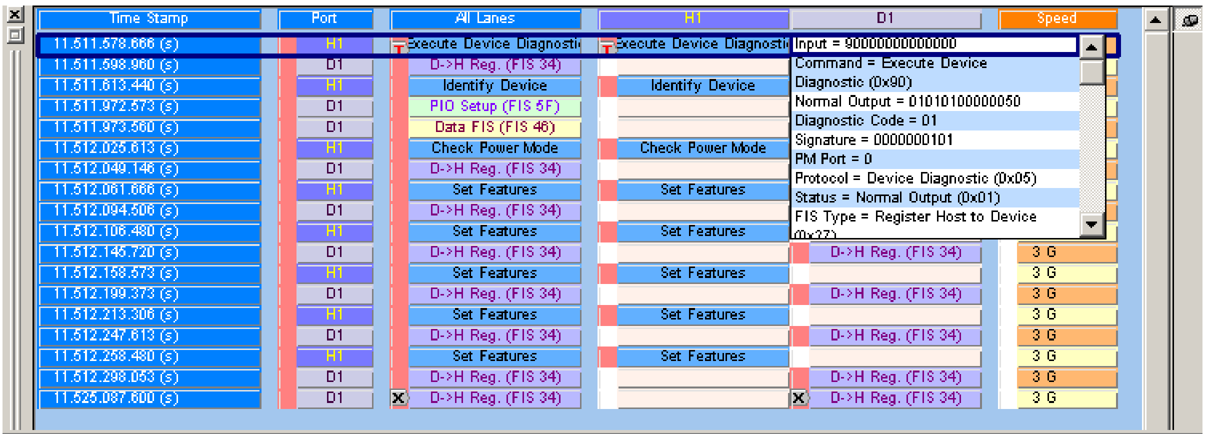
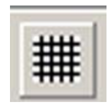


Figure 209 Field List View

Spreadsheet View

Spreadsheet View displays all of the Packet View fields in a time sequential spreadsheet format.

To display the Spreadsheet View of the current capture, click

View > Spreadsheet View or click the  button on the View Type toolbar.

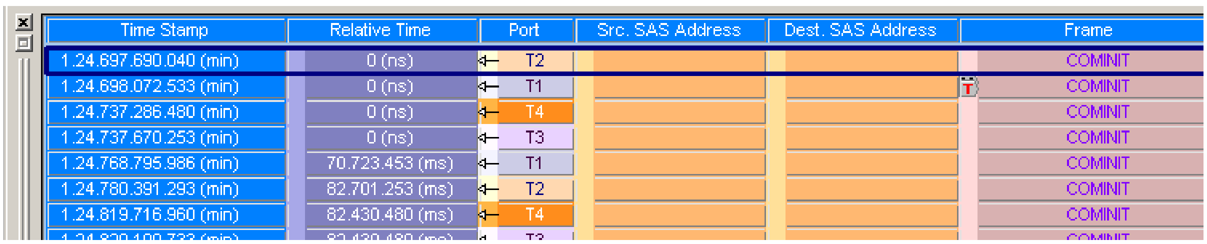


Figure 210. SAS: Spreadsheet View

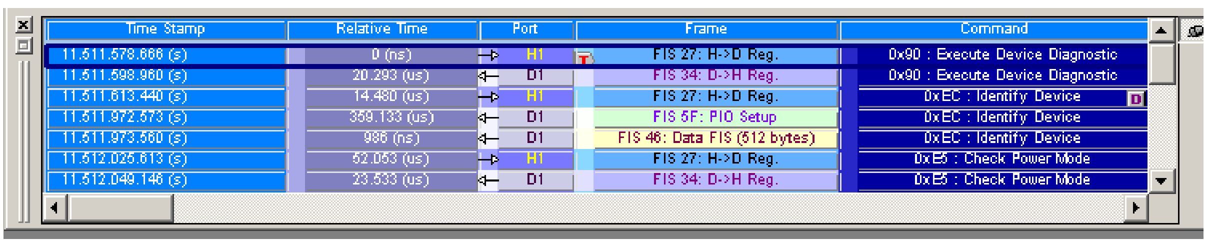
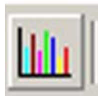


Figure 211. SATA: Spreadsheet View

Histogram View

The Histogram View displays a histogram of frame-type transfers.

To display the Histogram View of the current capture, click **View > Histogram View** or

click the  button on the View Type toolbar.

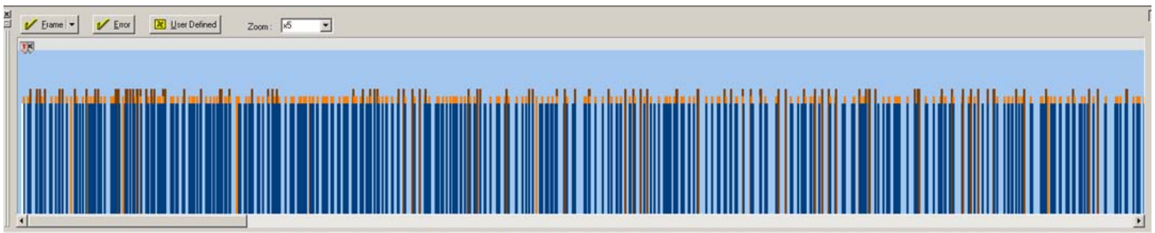


Figure 212. Histogram View

Hide Frames

You can customize the histogram by including only frame types that you want.

To choose frame types to include in the display, click the down arrow on the **Frame** button on the Histogram toolbar and check frame types:

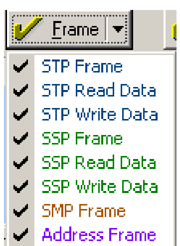


Figure 213. SAS: Histogram Frames

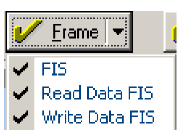
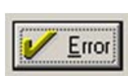


Figure 214. SAS: Histogram Frames

Hide Error Frames

Frames with errors are displayed in red. To hide error frames from the histogram, click

the 

button.

User Defined

You can define additional items for inclusion in the Histogram by clicking the

button to open the User Defined dialog.

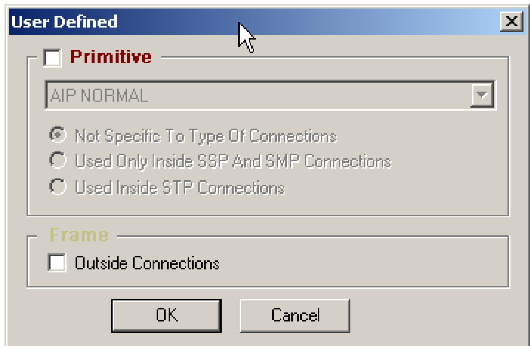


Figure 215. SAS: Histogram User Defined Dialog

You can include Primitive and/or Outside Connections frames.

Primitives

To include Primitives, check the **Primitive** check box, click the down arrow on the Primitive list box, and choose a Primitive.

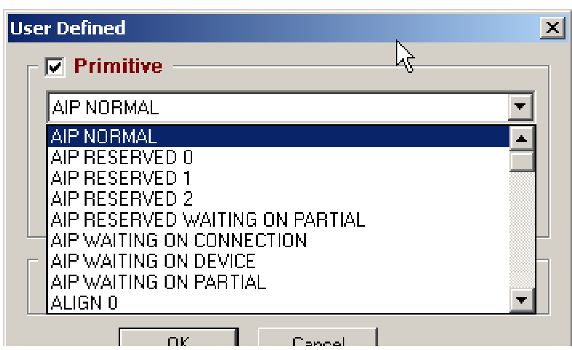


Figure 216. SAS: Choosing a Primitive

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Figure 217. SATA: Choosing a Primitive

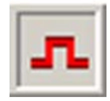
Check a Connection Type option radio button, if available, and click **OK**.

Zoom

You can Zoom from x1 to x256.

Waveform Display

You can enable a waveform display for all active ports, and perform timing measurements, by positioning timing cursors within the waveform display.

Select **View > Wave Form View** or click the  **Show/Hide Waveform** button on the View Type toolbar to enable the waveform display.

The Compact View shows the OOB Sequence with speed negotiation.

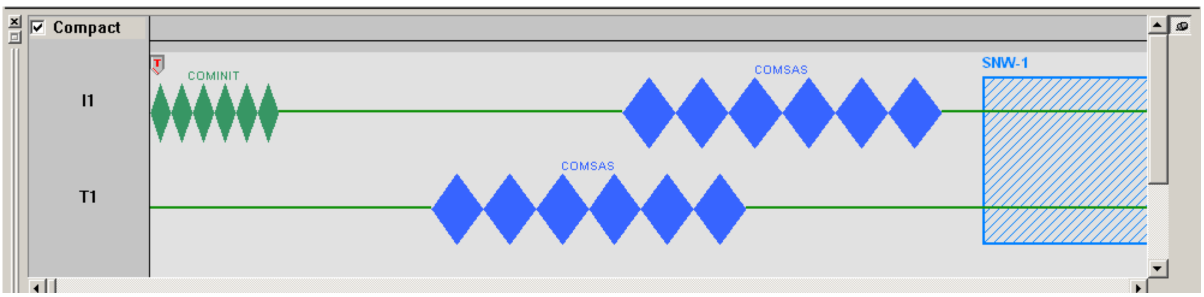


Figure 218 SAS: Waveform View

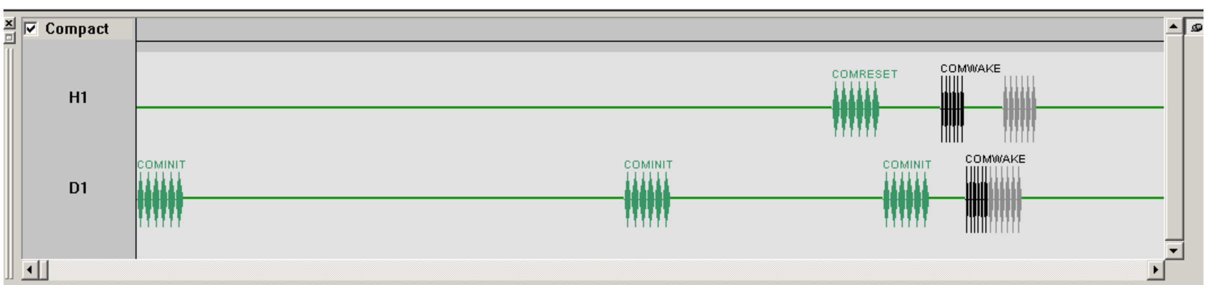


Figure 219 SATA: Waveform View

Making a timing Measurement

Timing measurements are made with two timing cursors T1 and T2. Click the left mouse button in the gray bar on the top of the waveform display at a point for the T1 cursor, and the right mouse button at a point for the T2 cursor. The time difference between the cursors is on a line connecting the two cursors.

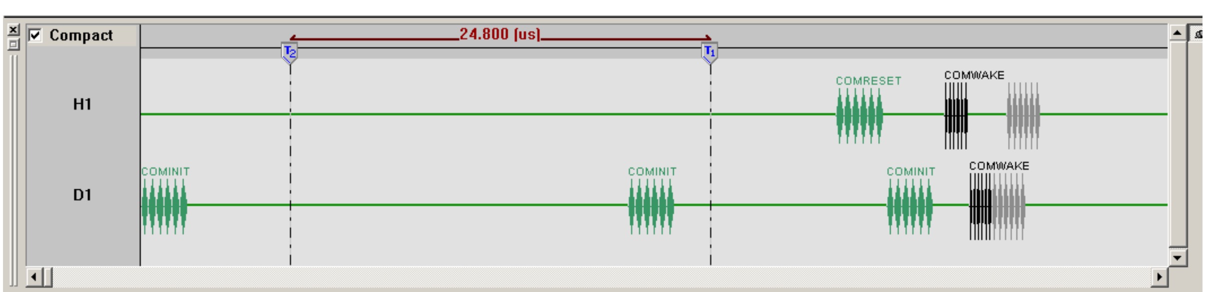


Figure 220 SATA: Timing Cursors Enabled

Expanded Waveform View

To see a 10x time scale expansion of the waveform, uncheck the **Compact View** checkbox in the Waveform View window. The OOB Sequence has speed negotiation (Hardware version 4 or later).

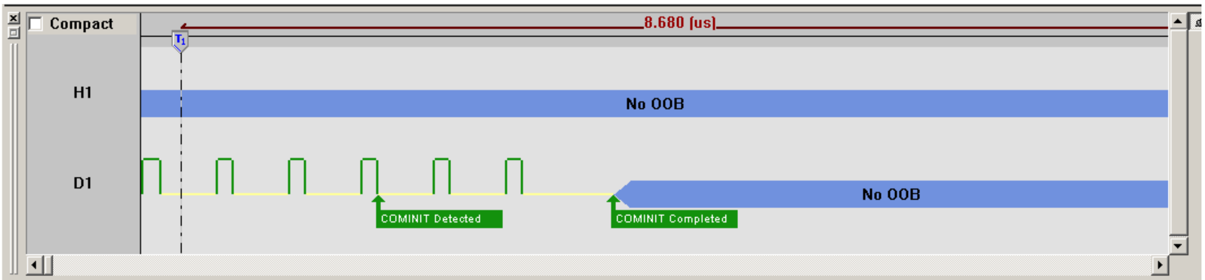


Figure 221 SATA: Expanded Waveform View

Data View

To display data payloads, select **View > Data View** or click the  **Show/Hide Compare 2 Data Payloads** button on the View Type toolbar.

Compare Two Data Payloads

To compare two data payloads, select two different payload packets, one as reference. Right-click a payload field in Packet View or a related frame in Text View or Spreadsheet View to display a menu, then select **Set As Reference Data Payload**.

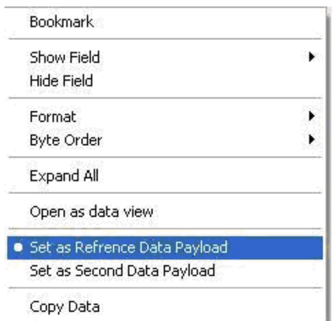


Figure 222 Set As Reference Data Payload

Select a second data payload and select **Set As Second Data Payload.**

Then select **View > Compare payload views** or click the  **Show/Hide Compare 2 Data Payloads** button on the View Type toolbar.

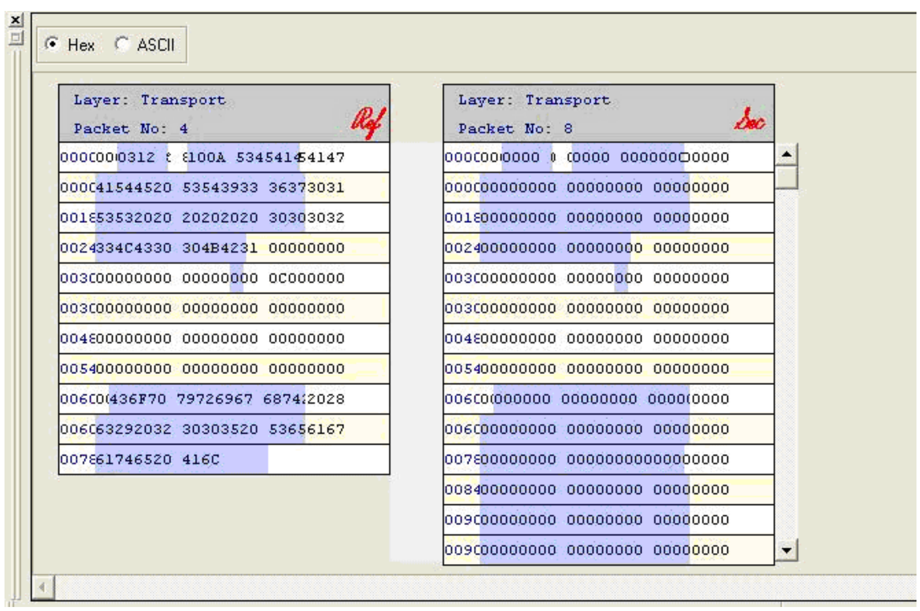


Figure 223 Compare Data Payloads

Note: If you select reference and second data payloads, the Compare Payloads view is active.

Port Status

You can get an overview of the active ports by clicking the **Port Status** button at the bottom right of the application window.

The Port Status displays the Port, Speed, and Analyzer.

In addition to displaying OOB, Link, Frame, and Error, a display showing the % buffer full opens when a trigger occurs.

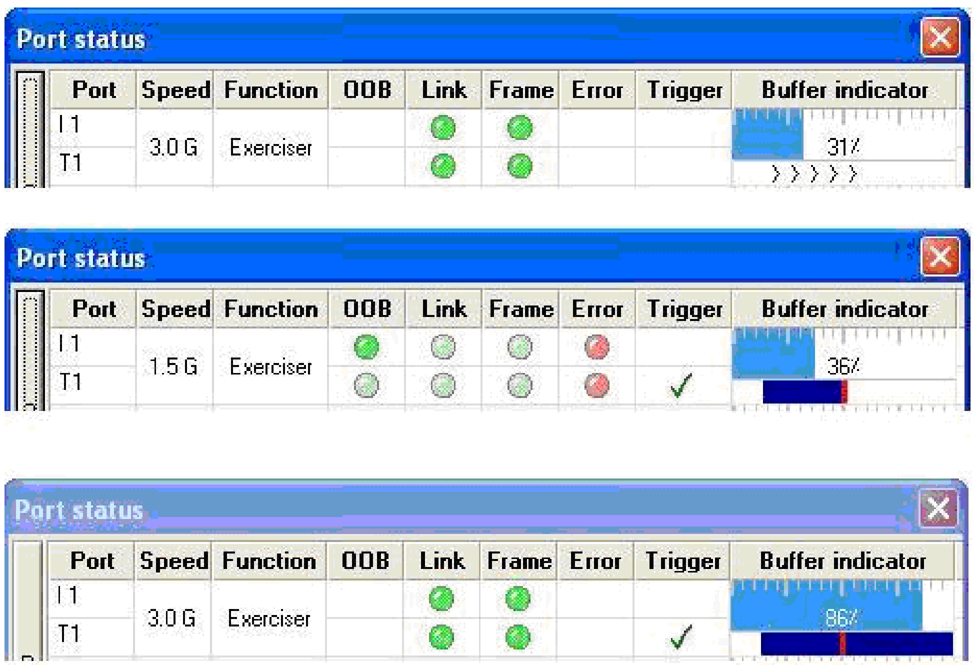


Figure 224 Port Status Window and Capturing Time

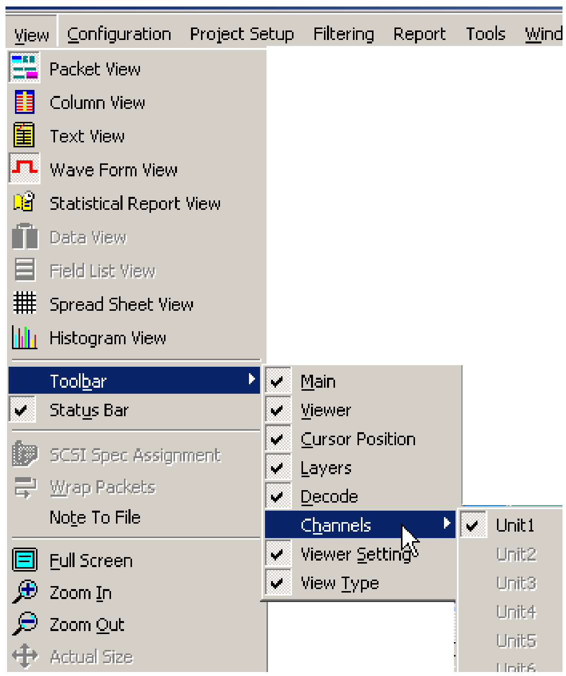
1. Pre-trig capturing (trig is 50%)
2. Trig point (shown by red bar; 36% pre trig was captured)
3. Post-trig capturing (50% post-trig was captured and capturing has stopped)

Note: If sample capture occurs with more than one unit active, additional Port Status windows display.

Toolbars

Enabling Tool Bars

To customize the Viewer Display workspace, you can enable and reposition the available toolbars. To display or hide toolbars, select **View > Toolbar**, then check or uncheck toolbars**.**



Toolbars are:

- Main
- Viewer
- Cursor Position
- Layers
- Decode
- Channels (Unit 1, Unit2, and so on)
- Viewer Setting
- View Type

Once enabled, the toolbars can dock at the Viewer Display window or float on the windows desktop.

Main Toolbar

See “SAS Software Menus and Toolbar” on page 22.

View Type Toolbar

See “Switching Views” on page 150.

Viewer Toolbar

The Viewer toolbar allows searching, filtering, collapsing/expanding, and data reporting.

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The **Search** button opens the search dialog (see “Search” on page 187).

The **Filtering Setup** button opens the Filter dialog (see “Filtering” on page 172) and allows you to specify the criteria for filtering the result.

The **Enable Disable Filtering** button toggles the result between a filtered and unfiltered view (see “Filtering” on page 172).

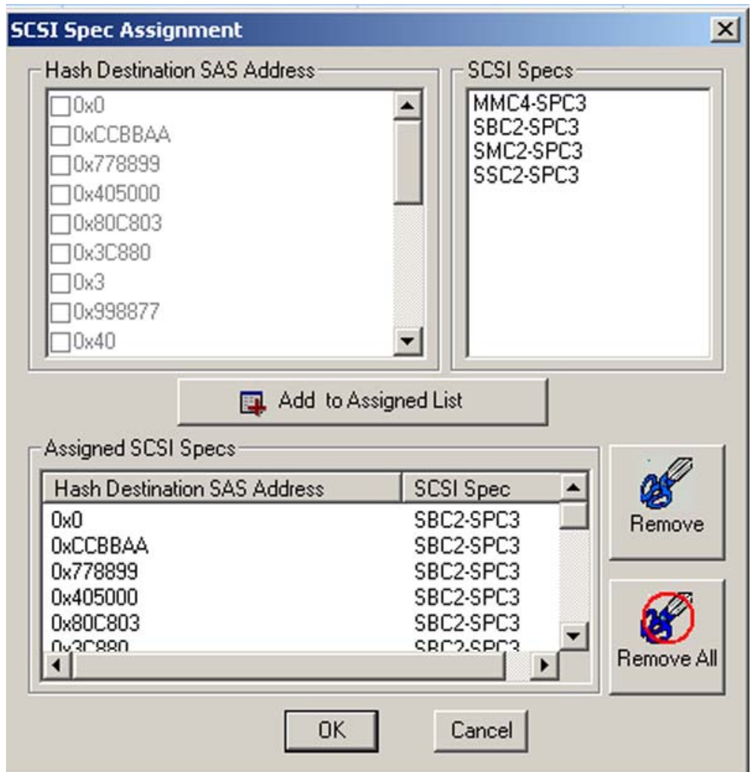
The **Filter Idle** button toggles the display to show/hide idle packets (see “Filtering” on page 172).

The **Expand/Collapse all Layers** button expands or collapses Transport and Application layers to simplify results display.

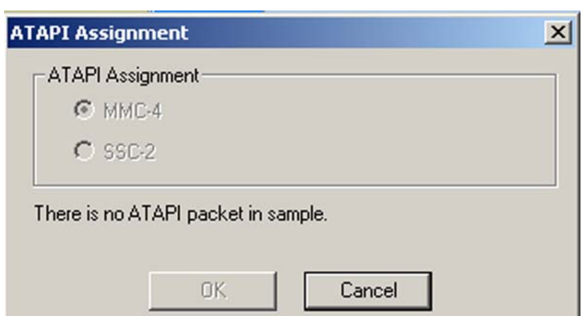
The down arrow on the **Go To** button allows location of cursors or specific packets: Trigger Position, X Position, Y Position, Packet Number, Timestamp, Bookmark, Begin, and End.

The **Data Report** button displays the data report.

The **SCSI Spec Assignment** button displays the SCSI Spec Assignment dialog for SAS

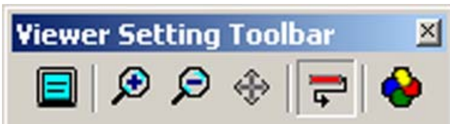


It displays the ATAPI Assignment dialog for SATA.



Viewer Setting Toolbar

The Viewer Setting toolbar allows wrapping, zooming, and configuration



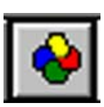
The **Full Screen** button on the Viewer Setting Toolbar increases the data display area to the full screen.

The **Zoom In** button on the Viewer Setting Toolbar magnifies the data display area on the screen. Clicking this button in Column or Text View increases column width only.

The **Zoom Out** button on the Viewer Setting Toolbar scales the data display area to display more data lines on the screen. Clicking this button in Column or Text View decreases column width only.

The **Normal Zoom** button on the Viewer Setting Toolbar resets the zoom to default normal on the screen. Clicking this button in Column or Text View resets column width only.

The **Wrap Packets** button on the Viewer Toolbar wraps the packet data in the display to eliminate the need for horizontal scrolling.



The **View Setting** button on the Viewer Setting Toolbar opens the Sample Viewer Configuration dialog (see “Display Configuration” on page 192).

Cursor Position Status Bar

To display the cursor position status bar, select **Toolbar > Cursor Position**.

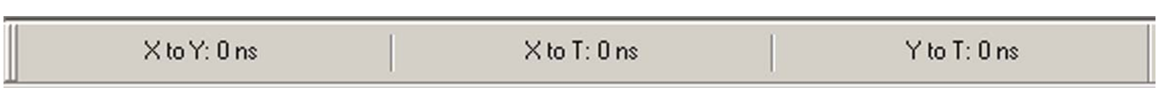


Figure 225. Cursor Position Toolbar

See “Using the Cursors and Bookmarks” on page 183.

Layers Toolbar (SAS)

The Layers toolbar shows or hides packet types.

The **Show/Hide Link Packet** button displays/hides the Link layer.

The **Show/Hide Transport Packet** button on the Layers Toolbar displays/hides the Transport layer and below.

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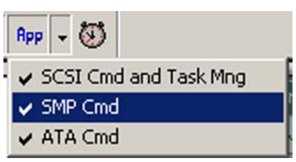
The **Show/Hide All Commands Packet** button shows/hides the Command layer and all layers below: SCSI Cmd and Task Mng, SMP Cmd, and ATA Cmd.



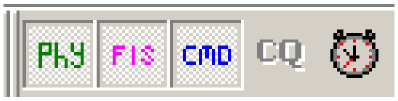
Click the down arrow on the **Show/Hide All Commands Packet** button to choose command types to show/hide.

The **Order/Reorder** button toggles the time order of packets.

The **Pack/Unpack Repeated Primitives** toggles packing repeated primitives in one port.

Layers Toolbar (SATA)

The Layers toolbar shows or hides packet types.



The **Show/Hide Physical Packet** button toggles the display of physical layer packets.

The **Show/Hide FIS packet** button toggles the display of FIS layer packets. When “OFF”, the FIS layer and its links are hidden.

The **Show/Hide CMD packet** button toggles the display of the CMD packets. When “ON”, only the command layer displays.

The **Show/Hide Command Queue** button displays queued commands.

The **Order/Reorder** toggles the time order of packets.

Decode Toolbar

The **Decode Toolbar** controls encoding and scrambling features.

The **10B** button displays the payload data as 10-bit encoded data.

The **8B** button displays the payload as 8-bit scrambled or unscrambled data, depending on the Scrambled setting.

The **SC** button selects scramble/unscramble for the 8-bit payload data.

To view corresponding Unscrambled and Scrambled payload data values instantaneously, position the mouse pointer over a data field.

Running Disparity indication

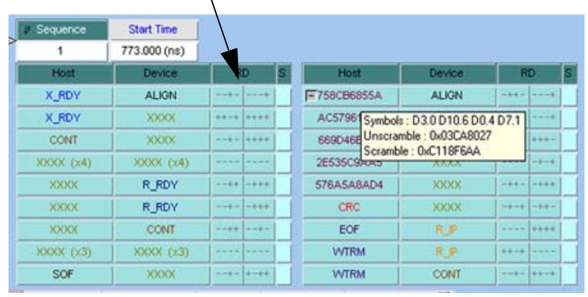


Figure 226 Payload Data Display

The **Symbol Notation** button decodes the 8-bit or 10-bit encoded data in Column View.

The **Show Data** button displays the payload data values in Column View.

Filtering

The Filtering menu and options allow you to modify data in the sample viewer display to exclude packets with a set of user-defined patterns and show the results in all views.

To set up filtering, you must have a viewer display open.

The Filtering menu has the options:

- Enable Filtering (see “Enable Filter” on page 182)
- Filtering (see “Filter Setup” on page 172)
- Link Layer (SAS)
- Transport Layer (SAS)
- Application Layer (SAS)
- Physical Layer (SATA)
- FIS Layer (SATA)
- Command Layer (SATA)
- Filter Idles (see “Filter Idle” on page 182)

Filter Setup

To display the Filter setup dialog, click the  **Filter** button on the Viewer toolbar or select **Filtering > Filtering**.

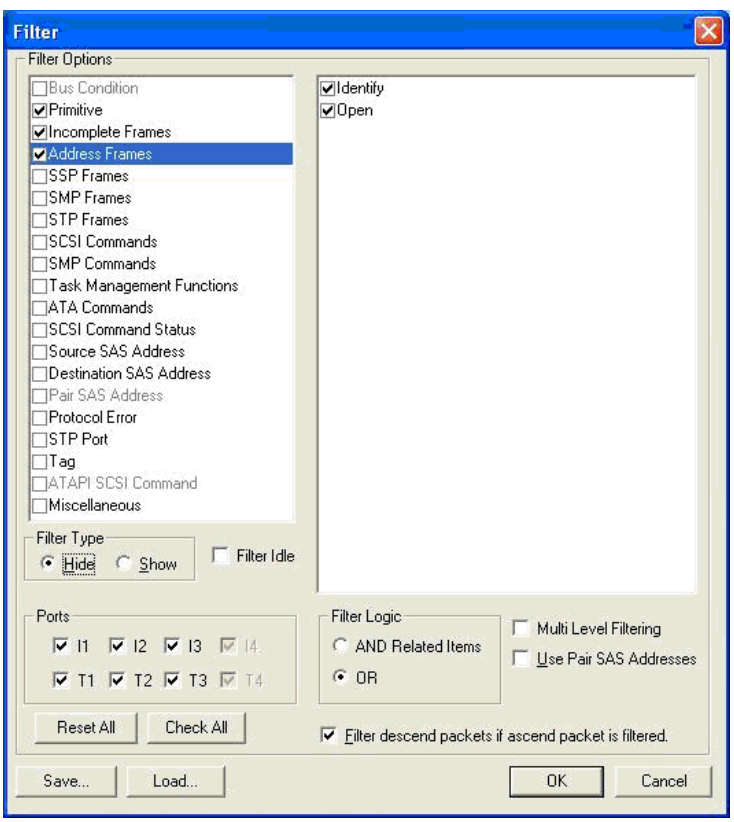


Figure 227 SAS: Filter Setup Dialog

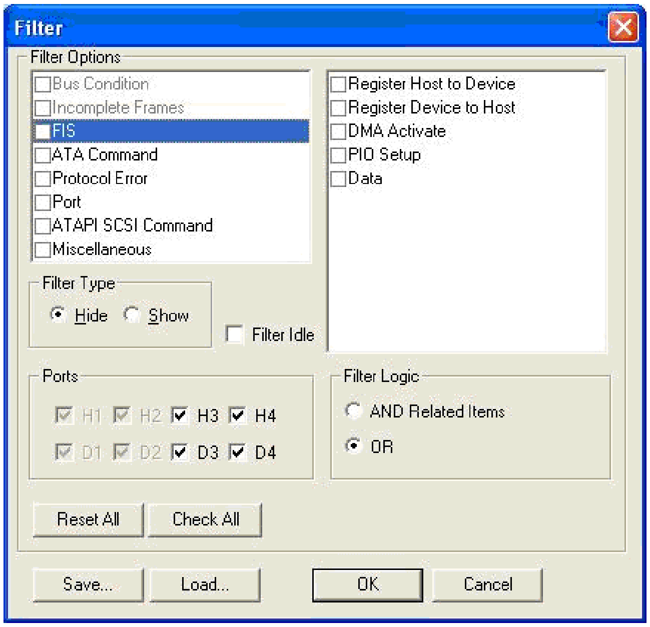


Figure 228 SATA: Filter Setup Dialog

You can select or deselect each of the items shown in the Filter Options window for filtering, by checking or unchecking a corresponding check box. Items not in the current sample are in shade.

Note 1 If you select a group, that also selects all child items.

Note 2 Only packets captured at run time are available for selection for filtering.

Filter Type

You can choose to show or hide the Filter Type items by checking the **Show** or **Hide** option button.

Filtering Direction

You can select items for filtering in a single direction or both directions by checking the corresponding Port. By default, all ports are enabled. Uncheck the port check boxes for ports not to include in the filter.

Filter Idle

Depending on the Filter Type (Hide/Show), Idle packets in the Sample Viewer are shown or hidden.

Save Filter Setup

After you have set up a Filter configuration, you can save it as an SAS Filter file (***sfl**) or SATA Filter file (***.tfl**) by clicking **Save**. You can then use it on a different capture by clicking **Load** in the Filter dialog.

Filter Logic

After you have set up Filter options, you can set filter logic to **And Related Items** to apply “AND” logic on related selected options (for example, SCSI commands and SAS Addresses) or **OR** to apply “OR” logic on all selected options.

Multilevel Filtering in SAS

You can set up a filter in a sequential steps by **Multi level filtering**. In each level, you can select specific items to “AND” to the previous level. The results of all levels show in views.

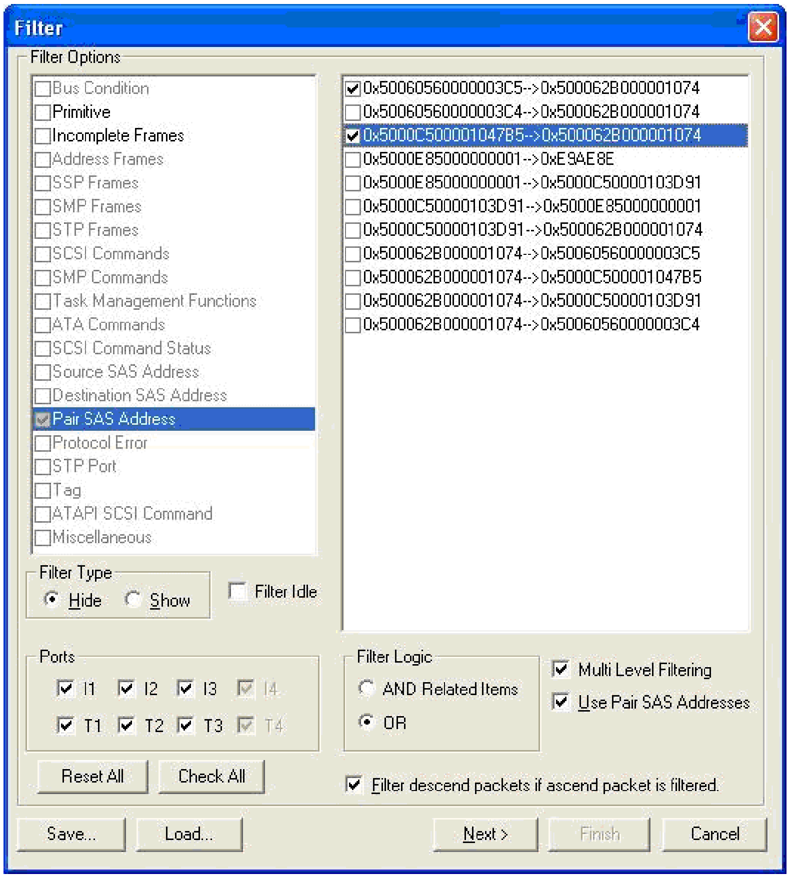


Figure 229 First Level of Multilevel Filtering

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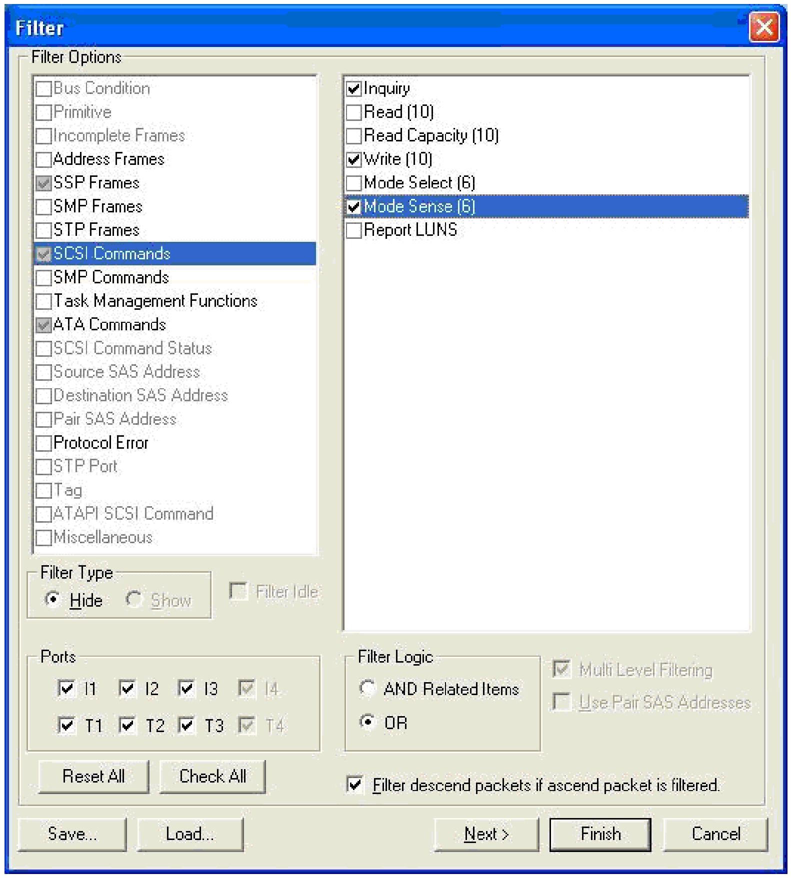

Figure 230 Second Level of Multilevel Filtering

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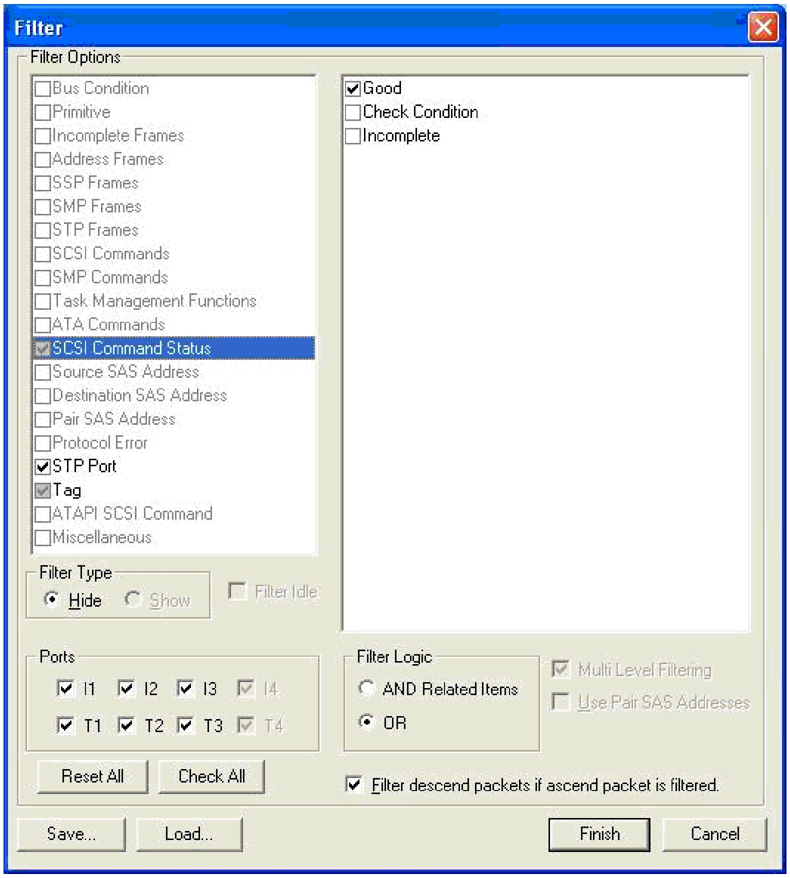


Figure 231 Third Level of Multilevel Filtering

Filter descend packets by ascend packet

You can apply a filter on a descend packet if you check the **Filter descend packet if ascend packet is filtered** option. If you uncheck this option, the software only filters the filtered packet. For example, if this option is checked and any SCSI command is selected, all transport and link packets of this command are filtered,. If you unchecked this option, only selected SCSI commands are filtered.

Selectable Filter Options for SAS

The SAS Filter Options are:

- Bus Condition
- Primitive
- Incomplete Frames
- Address Frames
- SSP Frames
- SMP Frames
- STP Frames
- SCSI Commands
- Task Management Functions
- ATA Commands
- SCSI Command Status (see “Filter Check Condition” below)
- Source SAS Address
- Destination SAS Address
- Pair SAS Address
- Protocol Error
- STP Port
- Tag (see “Filter by Tag Number” below)
- ATAPI SCSI Command
- Miscellaneous (see “Miscellaneous” below)

Bus Condition

When selected, depending on the Filter Type, the Hide/Show selection shows or hides captured Bus Conditions in the Sample Viewer.

Incomplete Frames

When selected, depending on the Filter Type, the Hide/Show selection shows or hides Incomplete Frames in the Sample Viewer.

ATA Command

When selected, depending on the Filter Type, the Hide/Show selection shows or hides captured ATA commands in the Sample Viewer.

Protocol Error

When selected, depending on the Filter Type, the Hide/Show selection shows or hides captured packets with the specified Protocol Errors in the Sample Viewer.

ATAPI SCSI Command

When selected, depending on the Filter Type, the Show/Hide selection shows or hides ATAPI SCSI commands.

Filter Check Condition

Checking the **SCSI Command Status** check box enables Check Condition for filtering.

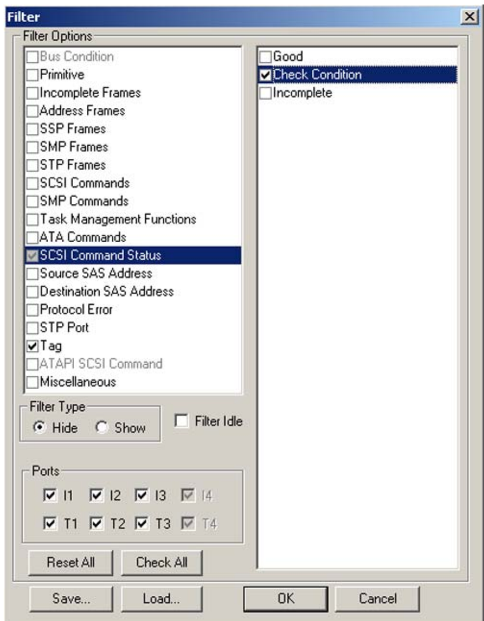


Figure 232. SAS: Filter Check Condition

Filter by Tag Number

Checking the **Tag** check box displays tags available for filtering. Check the corresponding check boxes for tags to filter.

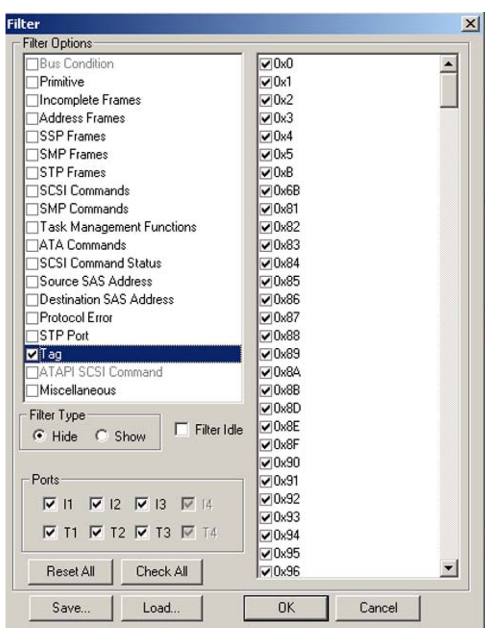


Figure 233. SAS: Filter by Tag Number

Filter Miscellaneous

When you choose **Miscellaneous**, an additional dialog displays, allowing you to specify the filtering of State Range and/or External Signal In

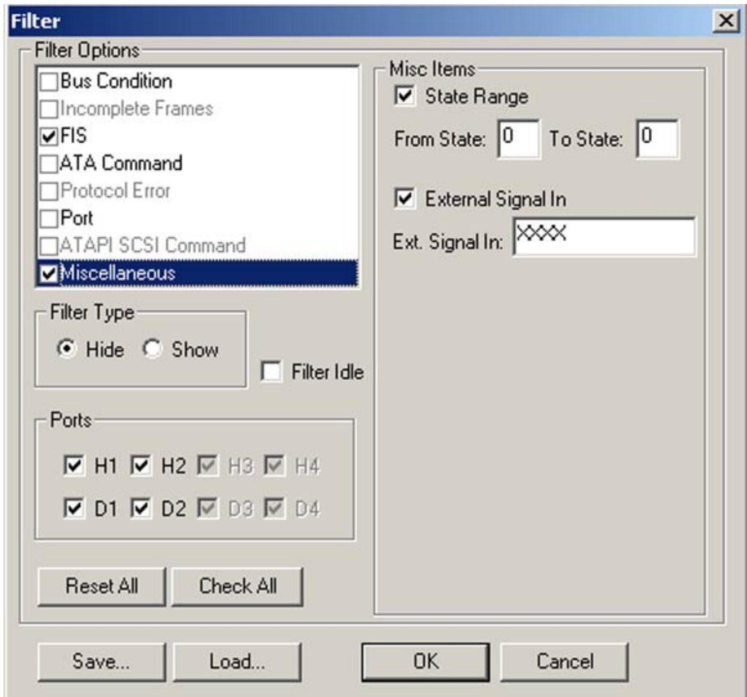


Figure 234. Filter State and/or External Signals

Use Pair SAS Addresses

You can use all available pair SAS addresses (Source -> Destination) instead of using SAS source and destination addresses. To enable the pair SAS address filter option, check **Use Pair SAS Addresses** check box in the Filter dialog.

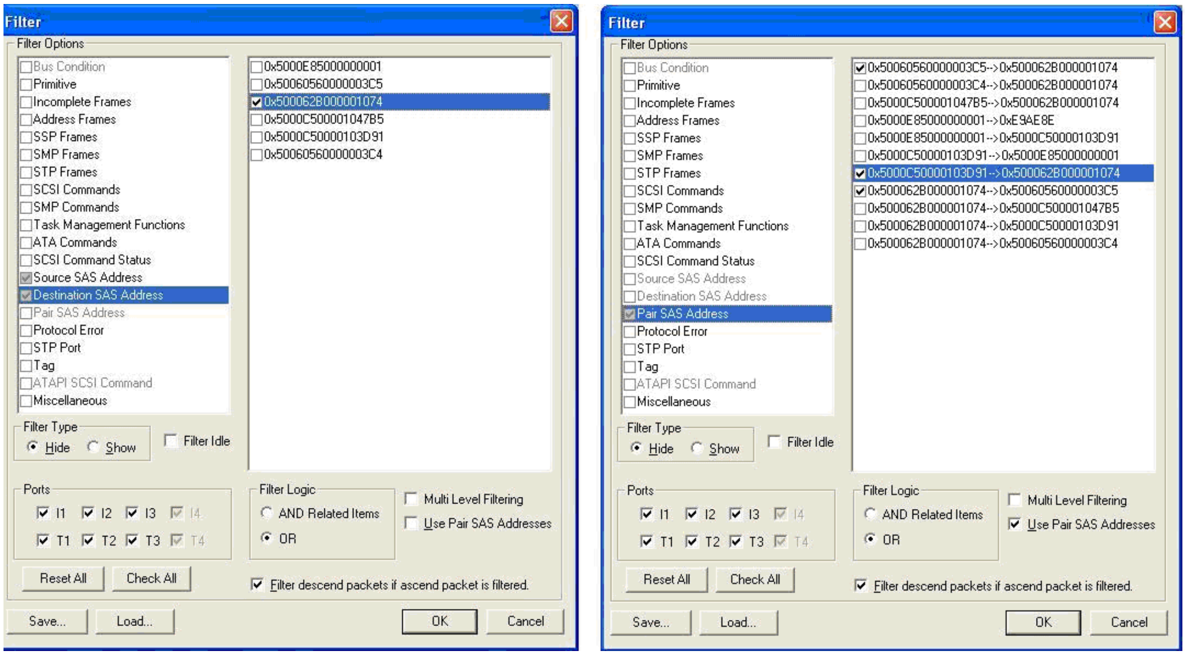


Figure 235 SAS: SAS Address Filtering before and after Using Pair SAS Addresses

Note: If you enable pair SAS addresses, the source/destination SAS addresses options are disabled and filtering on them is ignored at filtering time. If you disable pair SAS addresses, the pair SAS address option is disabled and filtering on it is ignored at filtering time.

Selectable Filter Options for SATA

The SATA filter options are:

- Bus Condition
- Incomplete Frames
- FIS
- ATA Command
- Protocol Error
- Port
- ATAPI SCSI Command
- Miscellaneous
- Filter Idle

Bus Condition

When selected, depending on the Filter Type, the Hide/Show selection shows or hides captured Bus Conditions in the Sample Viewer.

Incomplete Frames

When selected, depending on the Filter Type, the Hide/Show selection shows or hides Incomplete Frames in the Sample Viewer.

FIS

When selected, depending on the Filter Type, the Hide/Show selection shows or hides captured FIS items in the Sample Viewer.

ATA Command

When selected, depending on the Filter Type, the Hide/Show selection shows or hides captured ATA commands in the Sample Viewer.

Protocol Error

When selected, depending on the Filter Type, the Hide/Show selection shows or hides captured packets with the specified Protocol Errors in the Sample Viewer.

Port

When selected, depending on the Filter Type, the Show/Hide selection shows or hides packet traffic for the selected port.

ATAPI SCSI Command

When selected, depending on the Filter Type, the Show/Hide selection shows or hides ATAPI SCSI commands.

Miscellaneous

When you choose Miscellaneous, an additional dialog displays, allowing you to specify the filtering of State Range and/or External Signal In (see “Filter Miscellaneous” on page 179).

Enable Filter

Select **Filtering > Enable Filtering** or click the  **Filter Enable** button on the display menu bar to toggle between Filtered and Unfiltered display.

Filter Idle

Depending on the Filter Type (Hide/Show), Idle packets in the Sample Viewer are shown or hidden.

You can quickly filter idles by clicking the 

Filter Idle button. This button toggles between Show and Hide items.

Using the Cursors and Bookmarks

Cursors

The data viewer display incorporates three cursors labeled **X, Y,** and **T.** All cursors are initially overlaid and positioned at location 0, which is the trigger position of the display. The Trigger, or **T**, cursor is the measurement reference and is always at location 0 in the display.

Positioning the X Cursor

To position the X-Cursor within the viewer data display, click the left mouse button in the gray bar on the left side of the sample viewer next to the line in which to place the cursor.

Positioning the Y Cursor

To position the Y-cursor within the viewer data display, click the right mouse button in the gray bar on the left side of the sample viewer next to the line in which to place the cursor.

Note: You can also left-click to set the X-cursor and right-click to set the Y cursor in the Frame and Column View by clicking in the narrow strip on the very left side of a cell. Similarly, you can set the cursors in the Waveform View by left and right clicking at the beginning of a waveform.

Time

Time differences between the cursors are displayed in the Cursor Position toolbar. To display the cursor position toolbar, select **Toolbar** from the view menu and choose Cursor Position.

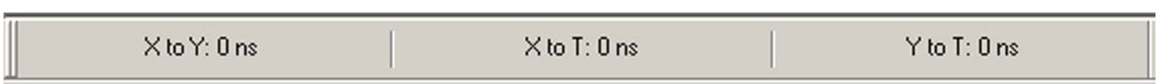


Figure 236. Cursor Position Toolbar

Locate Cursors

To quickly locate any cursor within the data viewer display, click the **Go To** button and choose the cursor to locate. You can also locate a cursor by selecting **Go To** from the Edit menu and choosing the cursor to locate.

Figure 237. Locate Cursor

Go to Time Stamp

To locate a timestamp, click the **Go To** button and choose **Timestamp**.

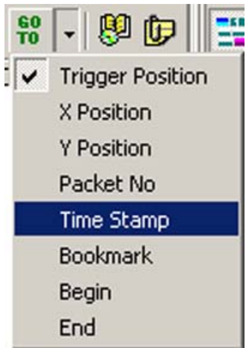


Figure 238. Time Stamp

Enter a time stamp value in the Go To Timestamp dialog and click **OK**.

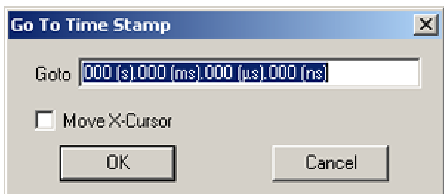


Figure 239. Go to Time Stamp

Bookmarks

Bookmarks are a convenient way to mark a point in the data viewer display by name, so that you can rapidly return to that point. To create a bookmark, right-click the mouse in the data viewer area on a packet in which to place the bookmark.

Figure 240. Bookmark

Click **Bookmark** from the fly out menu to open the Bookmark Comment Dialog.

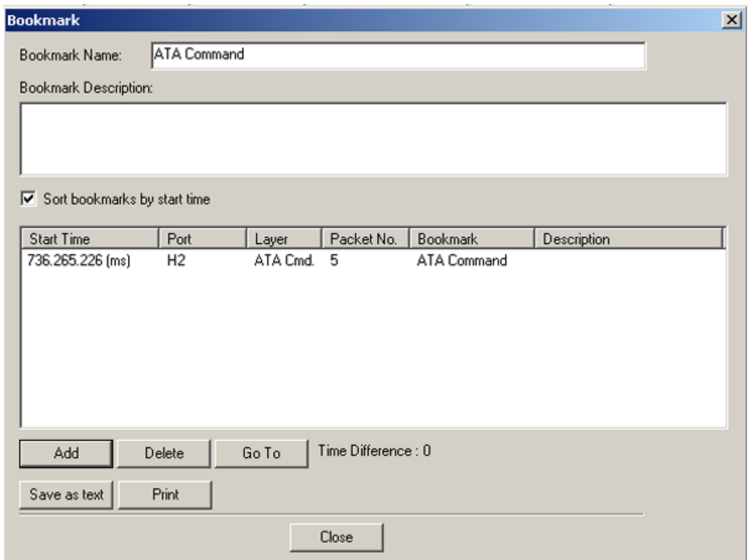


Figure 241. Bookmark Dialog

Enter a description for the bookmark and click the **Add** button. Repeat for additional **bookmarks.**

Note: Column View has a different bookmark mechanism than other views, and you can set a bookmark on each DWORD in the view.

Finding a Bookmark

To find a bookmark in the data viewer display, right-click the mouse in the sample viewer and select **Bookmark.**

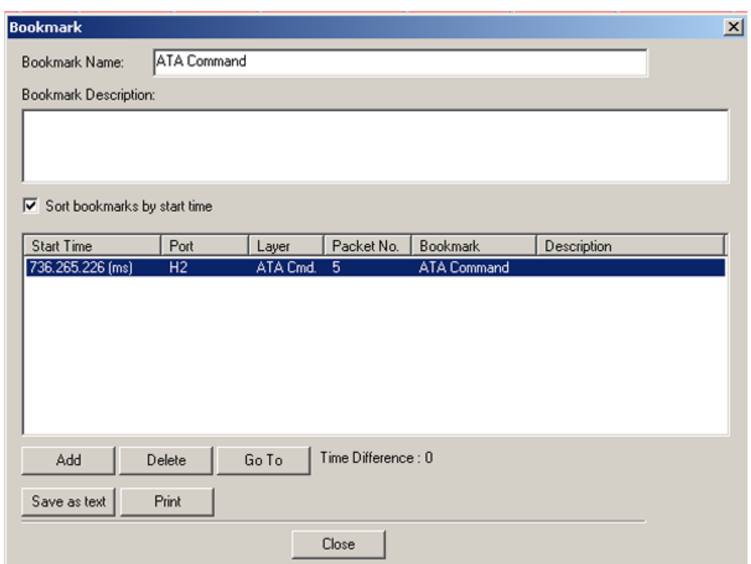


Figure 242 Go To Bookmark Dialog Box

Highlight the bookmark to which to go, then click the **Go To** button, or double-click the selection**.**

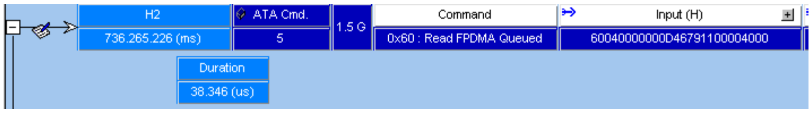


Figure 243 Bookmark Found Example in Data Viewer Display

Bookmark Description

To get a quick description of a displayed bookmark, position the tool tip over a bookmark. The name and description of the bookmark display.

Set Time Stamp Origin

Right-click in the sample viewer to open the fly out menu:

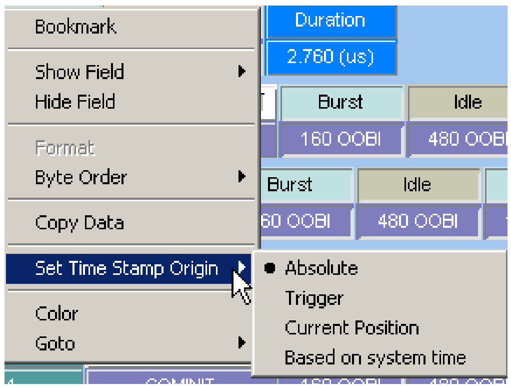


Figure 244 Bookmark Found Example in Data Viewer Display

Highlight **Set Time Stamp Origin** and choose either Absolute, Trigger, Current Position, or Based on system time.

Search

The Search menu and toolbar options permit you to examine any data capture file to quickly locate the packet or data pattern.

To perform an initial search, select **Edit > Search** or click the  **Search** button to open the Search setup dialog (Figure 245).

Note: Only items captured in the sample file are enabled for search.

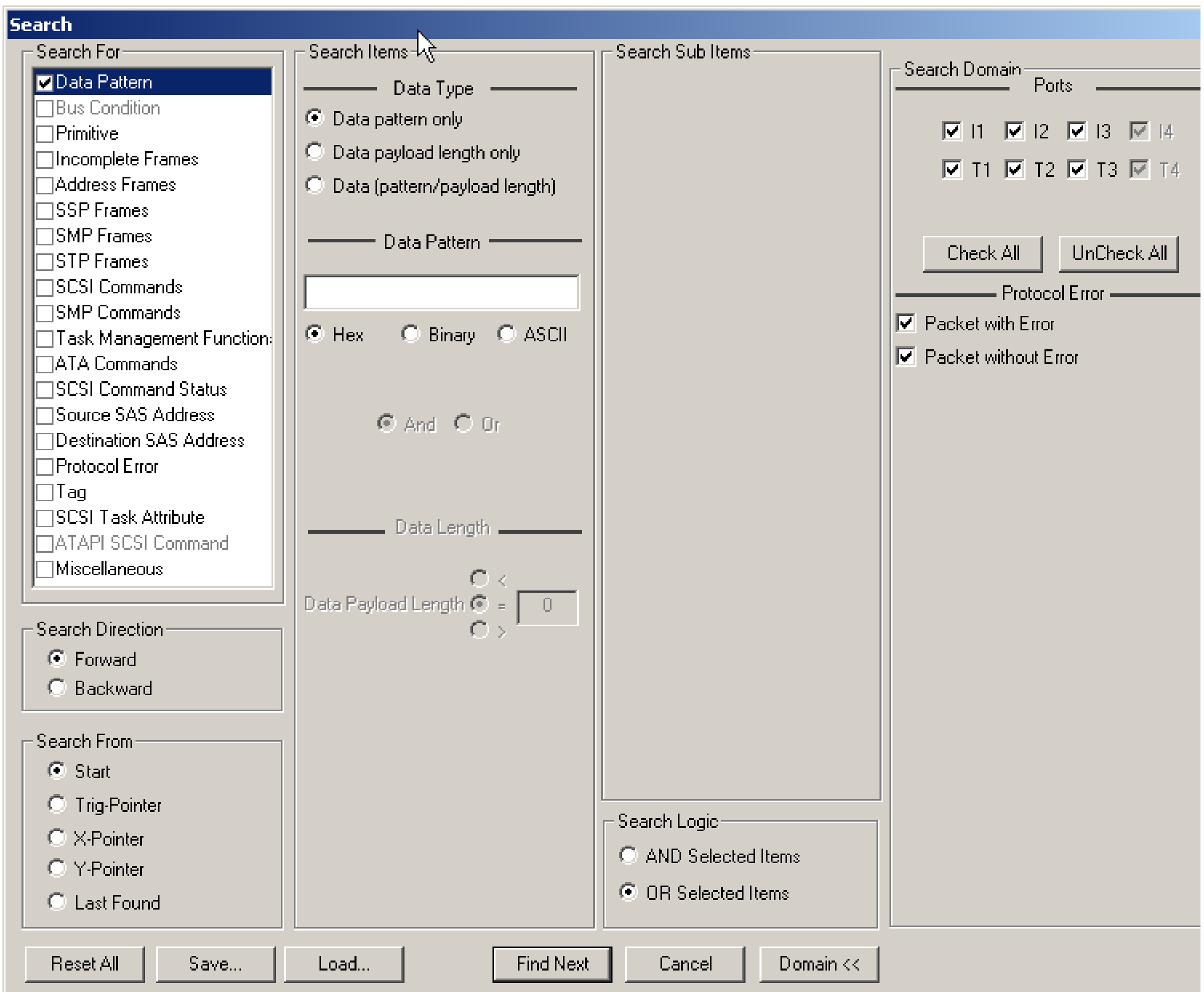


Figure 245 SAS: Search Data Pattern

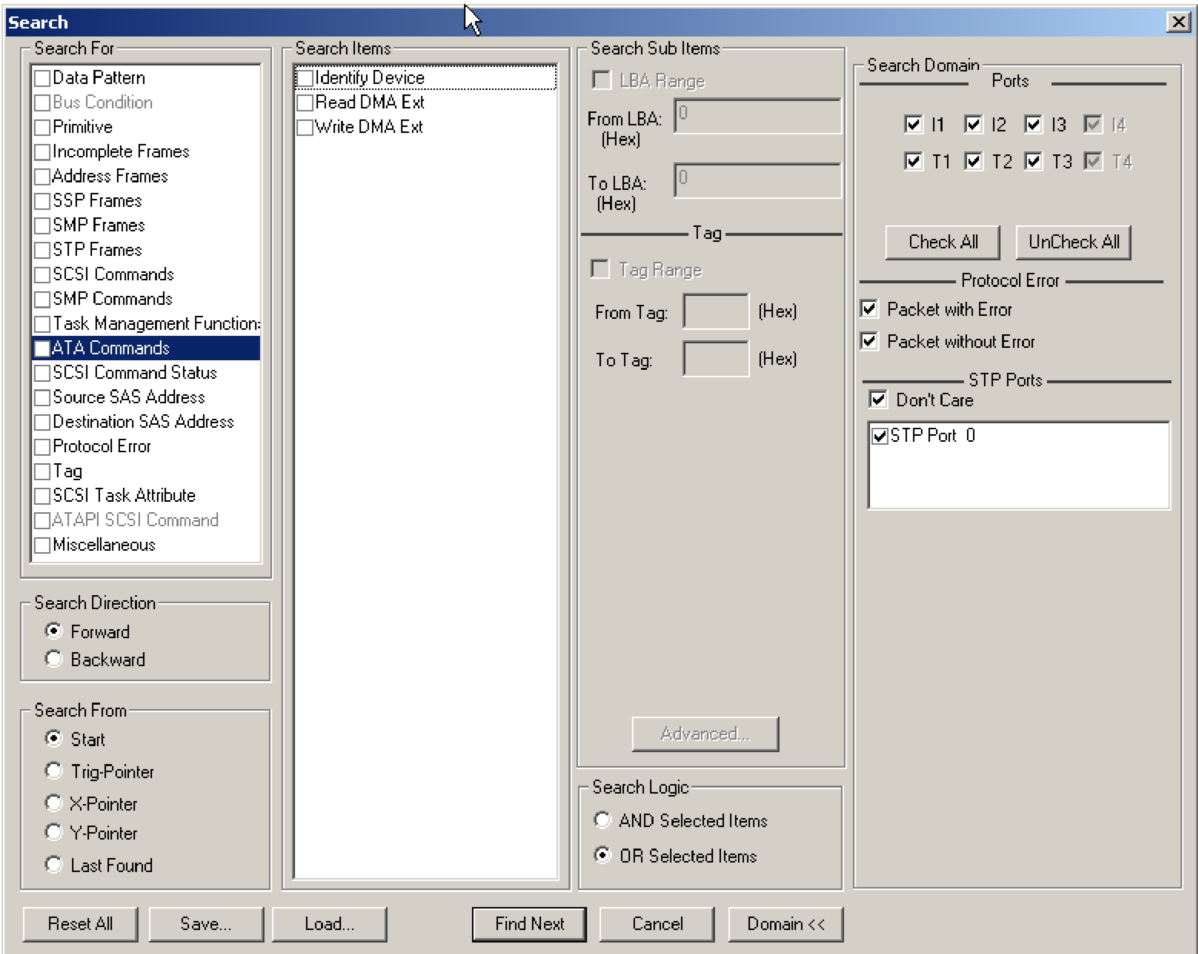


Figure 246 Search Parameter Definition Dialog

You can continue to search the output file using **Next Search (F3)** or **Previous Search (F4)** for the same pattern, until you redefine the data capture search parameters.

Save Search Setup

After you have set up a Search configuration, you can save it as a SAS Search configuration file (***.ssh**) or a SATA Search configuration file (***.tsh**) by clicking **Save**. You can then use it on a different capture by clicking **Load** in the Search dialog.

Search Direction

Choose either **Forward** or **Backward** direction in which to perform the search.

Search From

Choose a starting point to begin or continue a search: Start of the sample file, Trigger Pointer, X Pointer, Y Pointer, or Last Found.

Search Logic

The default setting is **Or Selected Items**. With this setting, clicking **Find Next** locates all selected items in turn. If you choose **And Selected Items,** you can set a logical AND combination of items to find. Both options allow setting Advanced search features.

Search For

Choose a category to search in the **Search For** window. Each of the search categories offers additional choices in the **Search Items window** to refine the search. Check items for the selected category.

Data Pattern

Search for Data Pattern allows you to search for a specific Data Type, Pattern, and Length (see Figure 245).

- Data Pattern Only
- Data Payload Length Only
- Data Pattern and Data Payload Length

Advanced options

Some of the Search For categories offer advanced options for search. To set these options, highlight the search item in a category and click the **Advanced** button to open the Advanced options dialog.

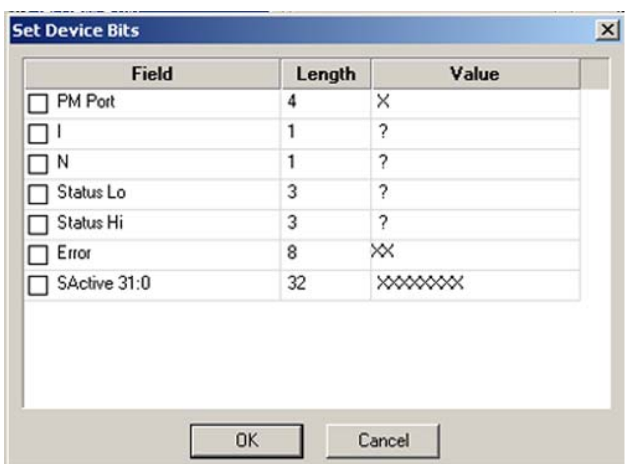


Figure 247 Advanced Options Dialog Example: Set Device Bits

Set the options and click **OK.**

Search Domain

Click the **Domain** button and choose a search domain from all ports or a specific port.

Protocol Error

You can refine the search to locate packets with an error or without an error.

Note: When searching for Protocol Errors in Column View, you cannot search for a specific Protocol Error type. Search returns any protocol error.

Search Sub Items

When searching SCSI Command Status, you can refine the search by selecting from a list of Sub Items.

Note: Some of the search categories allow you to refine the search by specifying specific SAS addresses and STP ports to search.

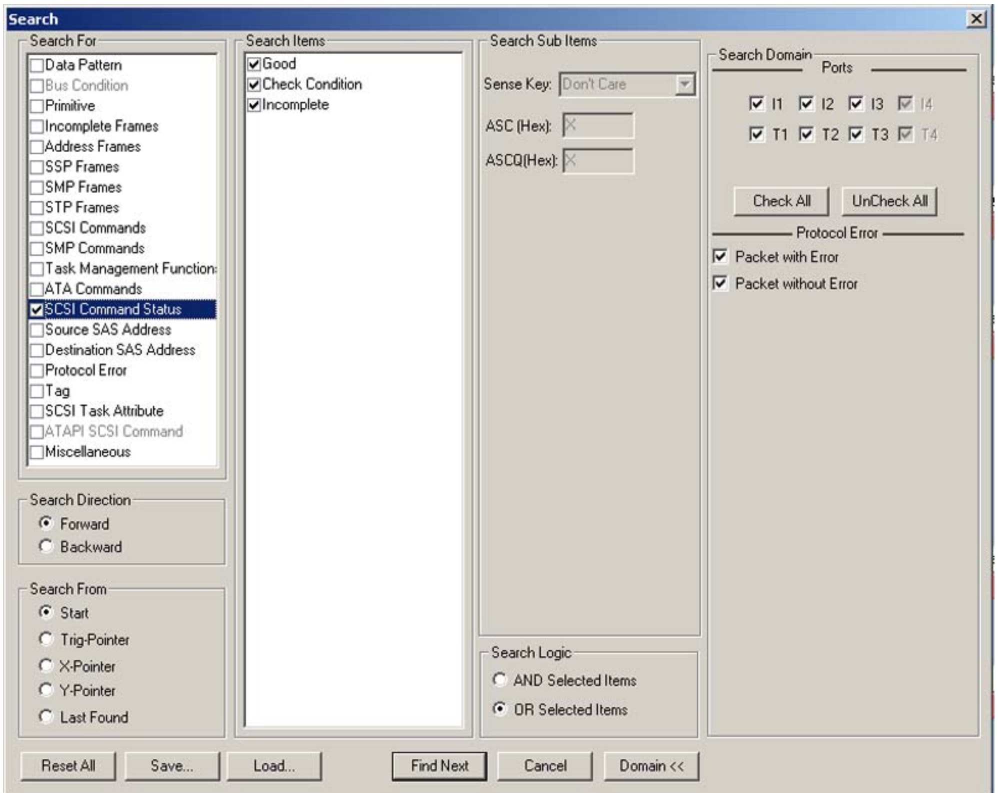


Figure 248. Search Sub Items

When you check the **SCSI Command Status,** the **Check Condition** item appears in the Search Items Window, if a check condition has occurred. Clicking this enables **Search Sub Items,** allowing you to refine the search by specifying **Sense Key, ASC,** and **ASCQ.**

Search by Tag Number

To search by Tag Number, check the **Tags** box in the Search For window and then check the Tag(s) for which to search in the Search Items window.

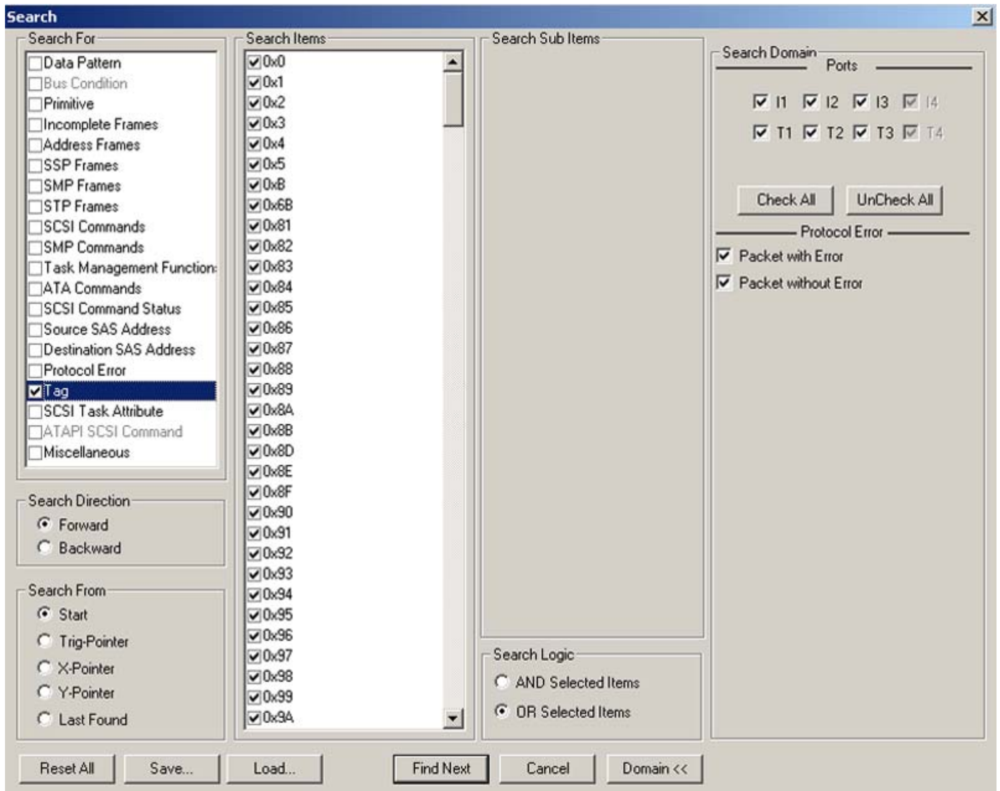


Figure 249. Search by Tag Number

Display Configuration

The Analyzer ships with a default display configuration of field and viewer settings. You can define your own field and viewer settings for a particular testing scenario.

Sample Viewer Configuration

The Sample Viewer Configuration dialog allows you to change the following display settings:

- Field settings
  - Data format
  - Field header text color
  - Hide/Show field
- Viewer Settings
  - Change fonts
  - Wrap packets
  - Time Stamp Origin
  - Enable/Disable tool tip
- Save Display Configurations in a file
- Load Display Configuration settings from a file
- Factory Setting (Restores Default Settings)

Display Configuration

To customize the display, click the  **Configuration** button on the Viewer toolbar, or select **Configuration > Sample Viewer Configuration**, to open the Sample Viewer Configuration dialog.

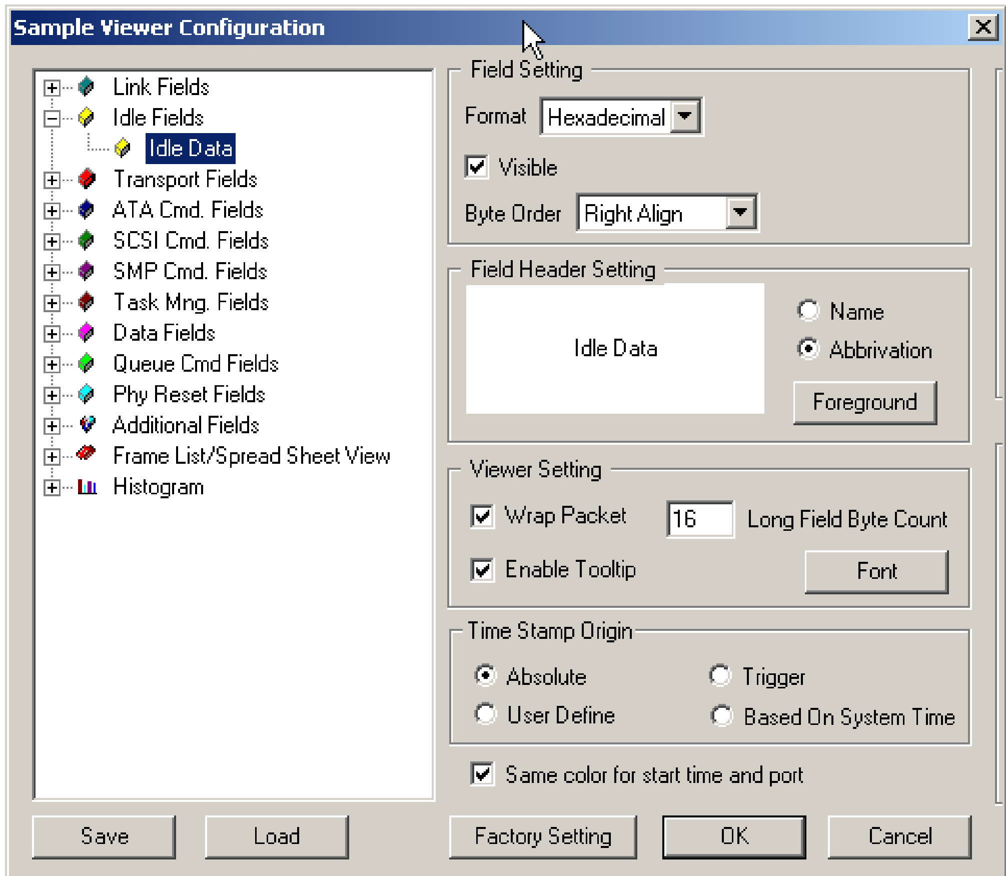


Figure 250 Sample Viewer Configuration

Field Settings

To view a packet field, select a field from the packet field tree and check the **Visible** box. Uncheck it to hide the field. To change the data format of a packet field, select the field and choose a data format from the Format drop-down list.

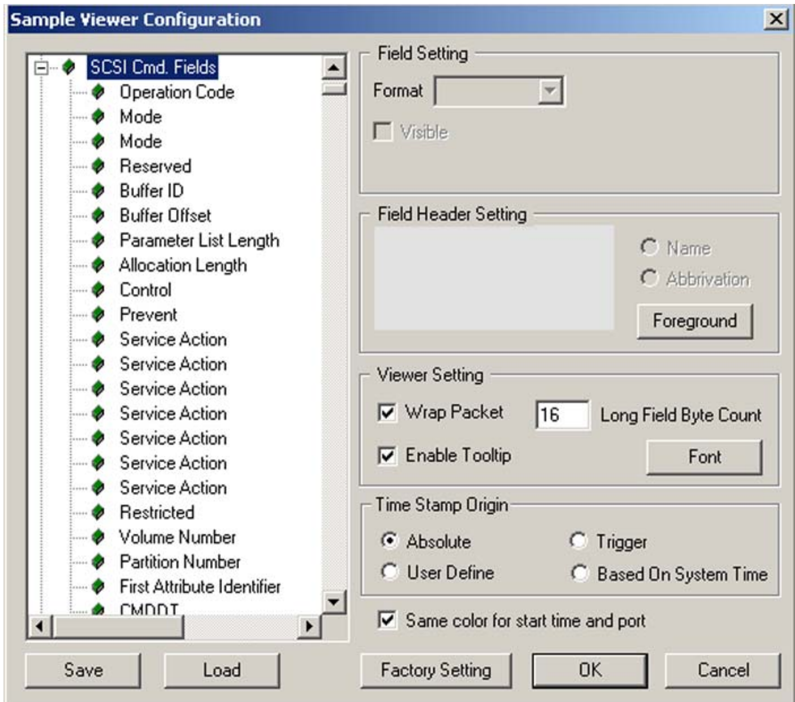


Figure 251 SCSI Command Fields

Color

To change the color of the text in a packet field header, select a field from the packet field tree and click the **Foreground** button.

Figure 252 Color

Choose an appropriate color and click **OK.**

Font

To change display fonts, click the **Font** button to open the Font dialog box.

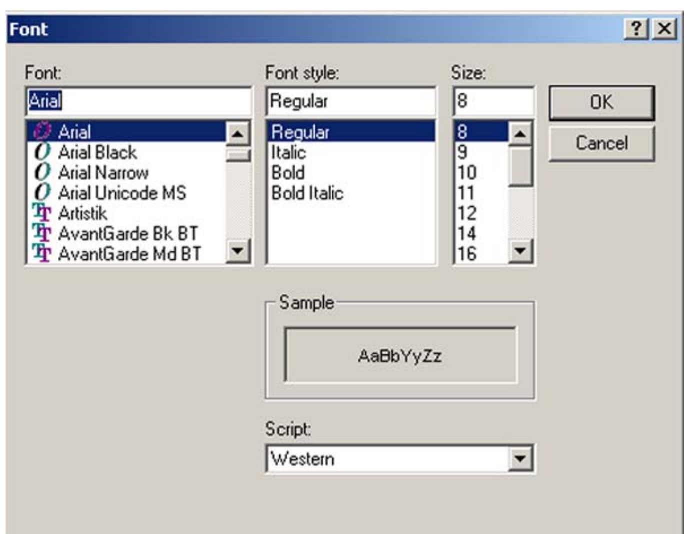


Figure 253 Font

Choose the font, font style, and size, and click **OK.**

Viewer Settings

Check the **Wrap Packet** box to enable the wrapping of packets in the display.

Check the **Enable Tooltip** box to enable tool tips for packet fields.

To change the length of long byte fields displayed, enter a number of bytes to display in the Long Field Byte Count size box.

Check **Absolute Trig** to display trigger in real time. If left unchecked, the trigger position is t=0 with samples before trigger shown as a (-) number and after trigger as a (+) number.

When finished, click **OK** to save changes and close the Display Configuration dialog.

Save/Load Settings

You can save the customized configuration settings in a ***.cfg** file by clicking the **Save** button and completing the Save As procedure. To load a previously saved configuration file, click **Load** and choose an appropriate file.

Set Port Alias

Port Alias allows you to assign a meaningful name to each port to assist in interpreting the results displayed in the sample view.

To assign port names in an open sample view, select **Configuration > Set Port Alias**.

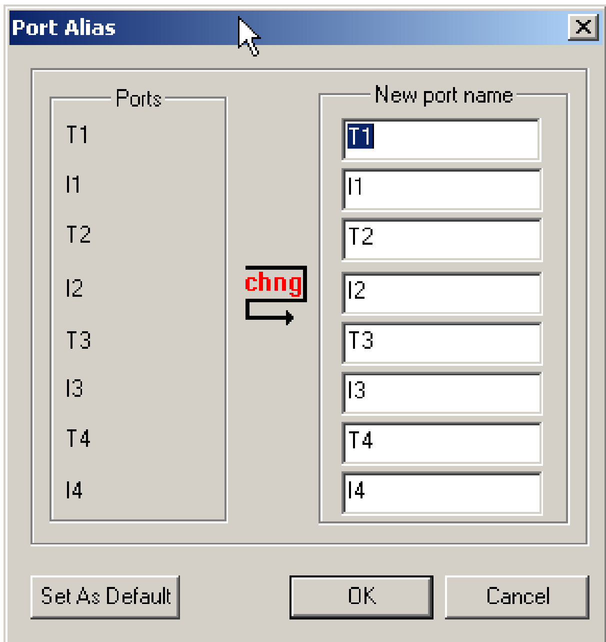


Figure 254 SAS: Assign Port Alias

Assign a meaningful name to each port in use and click **OK**. The assigned names replace the port numbers in the sample view.

If you elect to save the capture sample file, the assigned port names are saved together with the result, so that when you open the sample file later, the assigned names are retained.

Set As Default

If you want to set these port aliases for sample files that will be captured later, you can set them as default, and new samples will be opened by these default port aliases.

SAS Address Alias

SAS Address Alias allows you to assign a meaningful name to each SAS address to assist in interpreting the results displayed in the sample view. To assign SAS address names in an open sample view, select **Configuration > Set SAS Address Alias.**

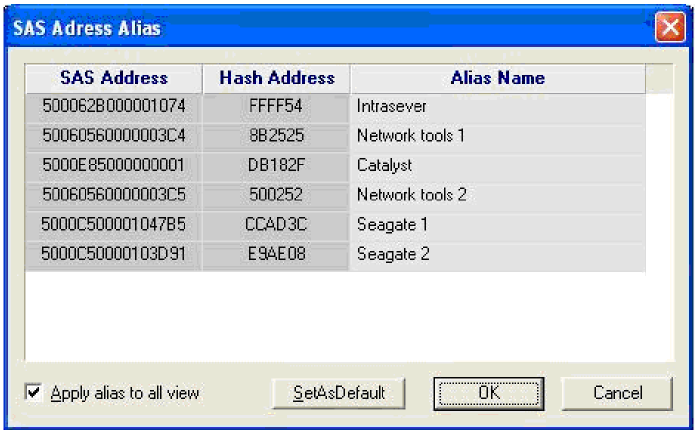


Figure 255 SAS: Assign SAS Address Alias

Assign a meaningful name to each SAS address in use and click **OK**. The assigned names replace the SAS address in the sample view, Search, filter,. and Statistical report.

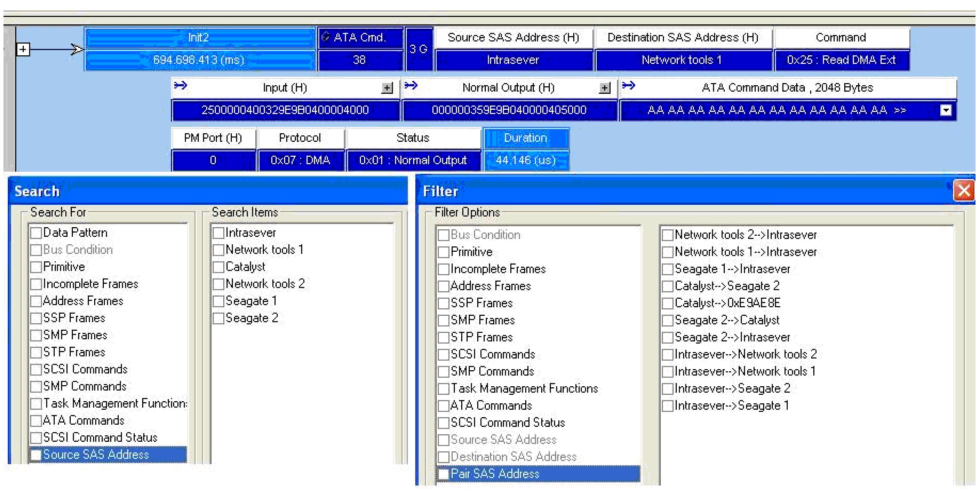


Figure 256 SAS: SAS Address Alias

If you elect to save the captured sample file, the assigned SAS address names are saved together with the result, so that when you open the sample file later, the assigned names are retained.

Set As Default

If you want to set these SAS address aliases for sample files that will be captured later, you can set them as default, and new samples will be opened by these default SAS address aliases.

Tx Vout

The analyzer incorporates the ability to select TX Vout for the transmitter on each port. Selecting TX Vout increases the output voltage swing above the nominal value, for test and characterization purposes. This feature is also useful to compensate for line loss when driving long cables.

To select TX Vout, select **Configuration > Tx Vout & Preemphasis** to display the Rx/Tx Settings dialog:

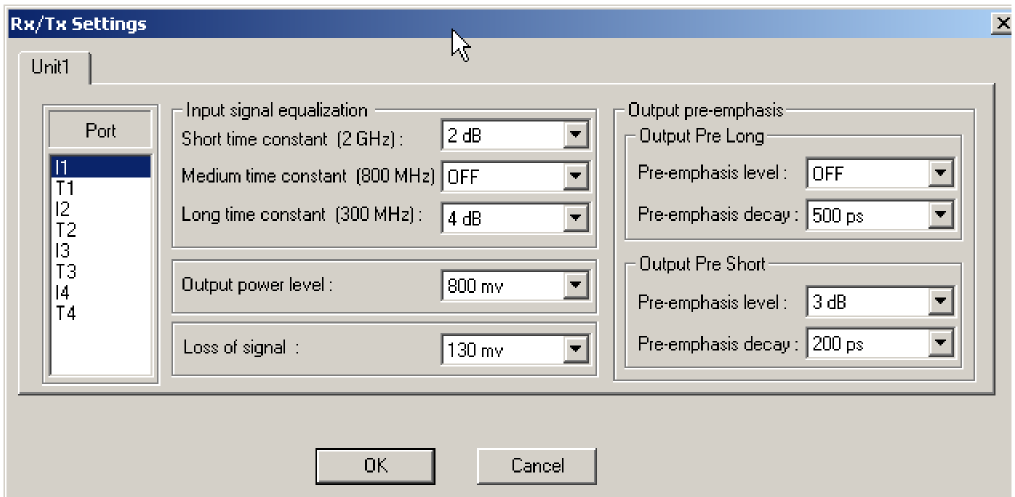


Figure 257 Choose Port for TX Vout

Software Settings

Software Settings allow you to define template files for new Analyzer projects, to specify how sample files appear when opened, and to set ATAPI Spec Assignment.

To perform software settings in an open sample view, select **Configuration > Software Settings**.

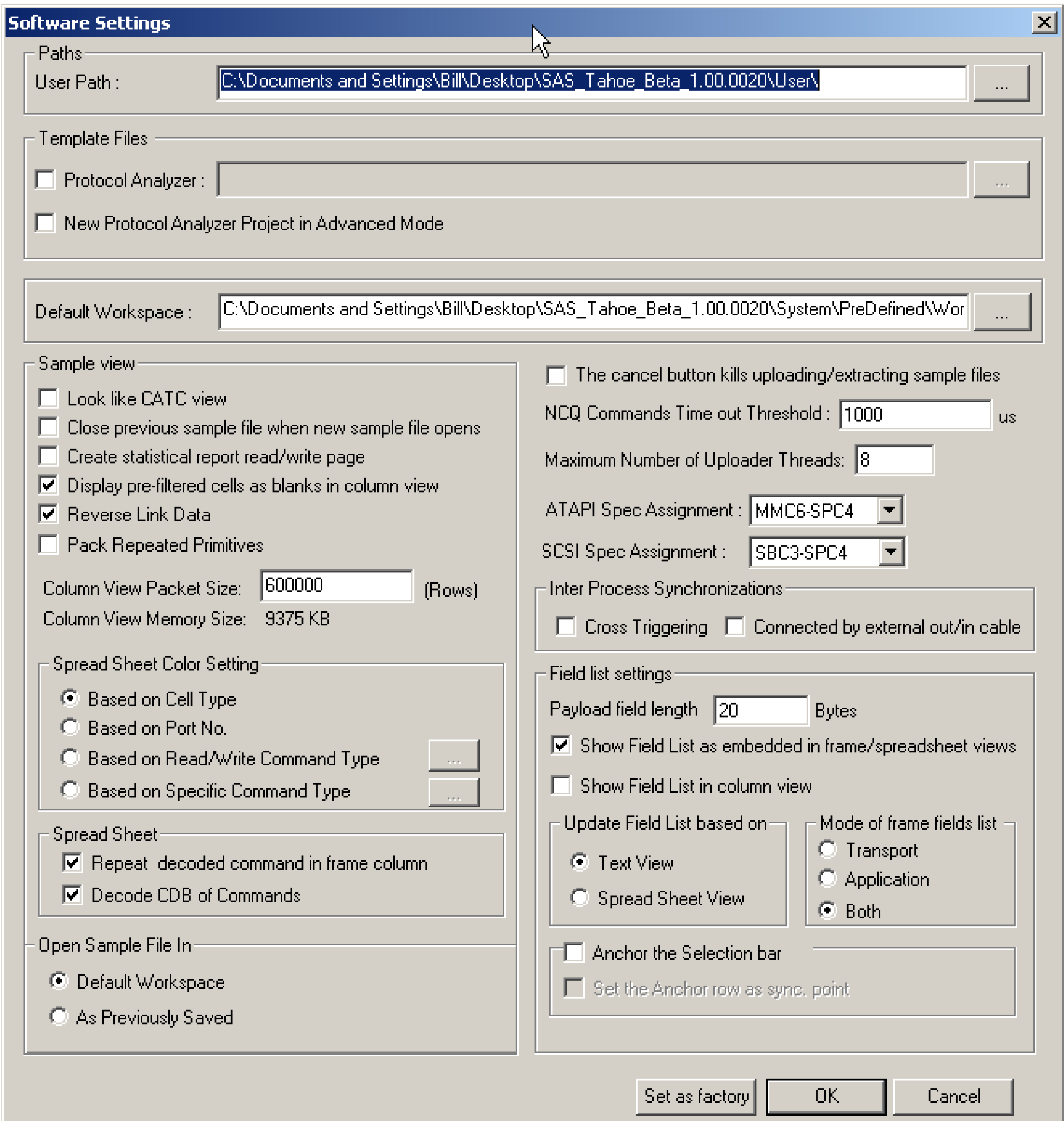


Figure 258. SAS: Software Settings Dialog

Display Configuration

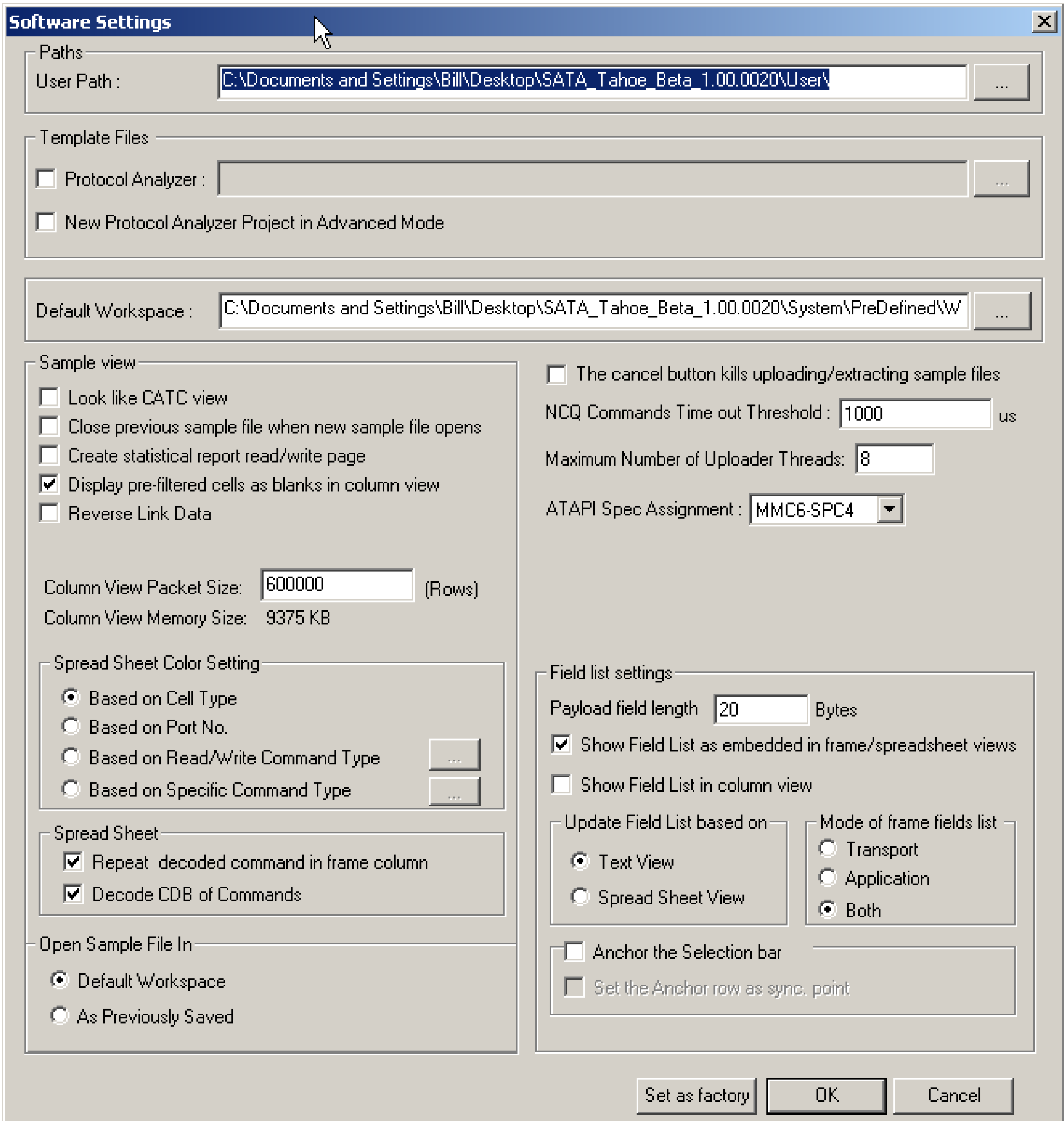
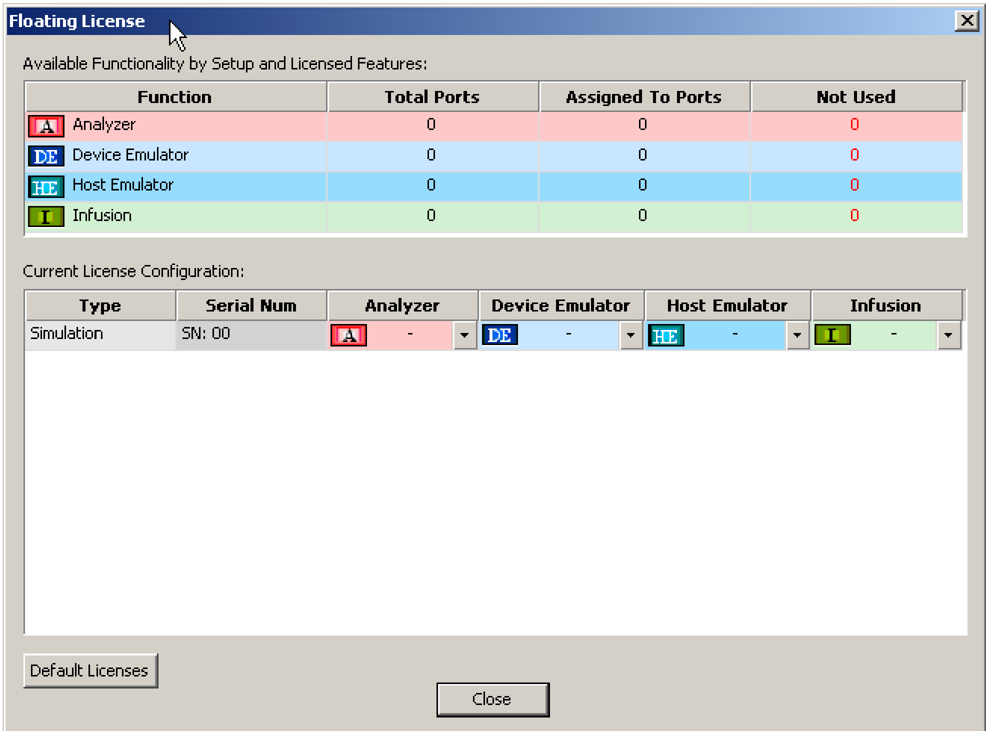


Figure 259. SATA: Software Settings Dialog

Set the options and click **OK**.

Floating License

The Floating License dialog displays the available functionality by Function, Total Ports, Assigned To ports, and Not Used. It also displays the Current License Configuration by License Type, Serial Number, Analyzer, Device Emulator, Host Emulator, and Infusion.



External Trig Setting

The External Trig Setting dialog displays the External Trig Out Setting and External Trig In Setting as High Active, Low Active, or Toggle.

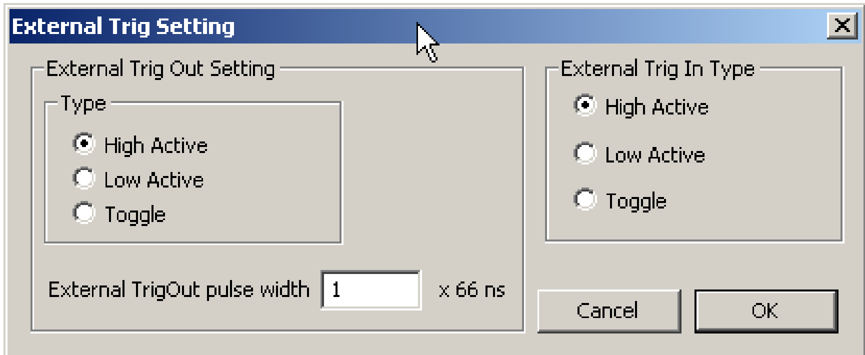


Figure 260. External Trigger Setting Dialog

To display the External Trig Setting dialog, select **Configuration > External Trig Setting**.

External Trig Out Setting

The Analyzer can send a Low or High external signal anytime a trigger occurs. Select the External Trig Out Setting: High Active, Low Active, or Toggle from High to Low or Low to High once (3.3 V output).

Enter the External TrigOut pulse width.

External Trig In Setting

An external Low or High input signal can cause triggering. Select the External Trig In Setting: High Active, Low Active, or Toggle from High to Low or Low to High once (3.3 V output).

Update STX Board Interface

The Update STX Board Interface dialog allows you to update the STX Board Interface.

Update Sierra Device

The Update Sierra Device dialog allows you to update the Sierra M6-4 Analyzer.

USB IP Setup

If you are connected to a device using USB, you can use IP_SETUP to change the IP settings:

- **DHCP** automatically assigns an IP address. DHCP is the default.
- **Static IP** prompts you to enter a specific IP address.

To change from DHCP to Static IP while connected to a device using USB:

1. Select **Configuration > Setup IP** from the menu bar.

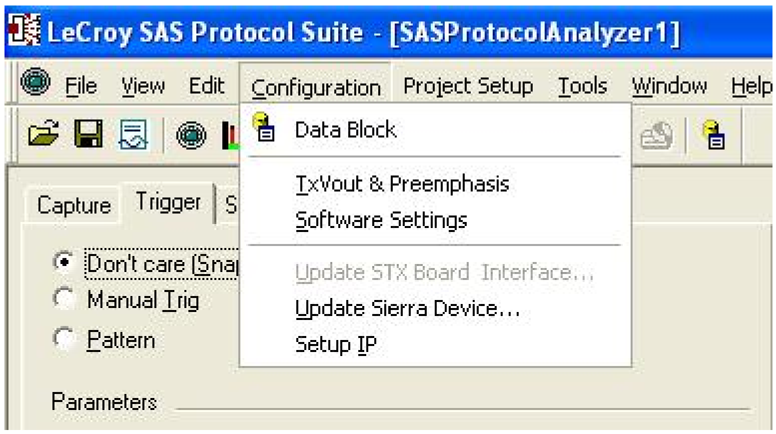


Figure 261 Configuration Menu with Setup IP Command

Note: If you are not connected to the device using USB, the Configuration menu does not have the Setup IP command.

The IP Setup dialog appears. For IP Mode, two radio buttons are available: Static IP and DHCP. DHCP is the default.

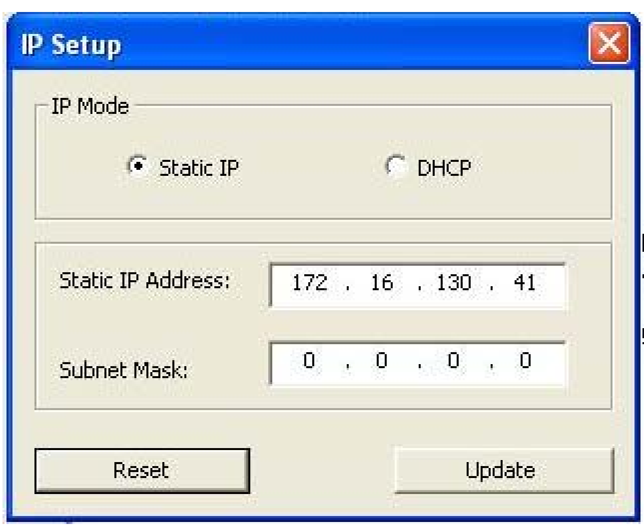


Figure 262 IP Setup Dialog

2. To change to Static IP, click the **Static IP** radio button.
   Enter the **Static IP Address**.
   Enter the **Subnet Mask**.
   Click **Update**.
   The system displays a warning message.

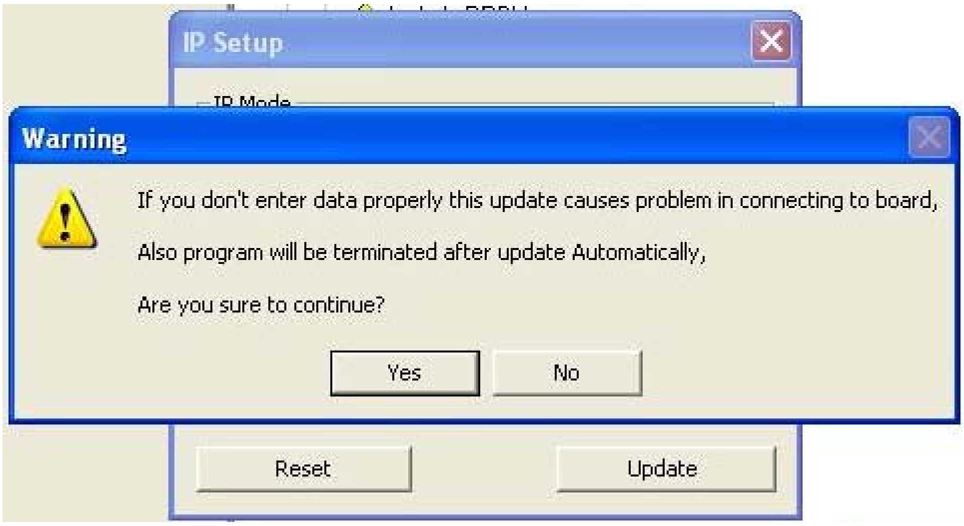


Figure 263 Warning Message

Click **Yes** to get a success message.

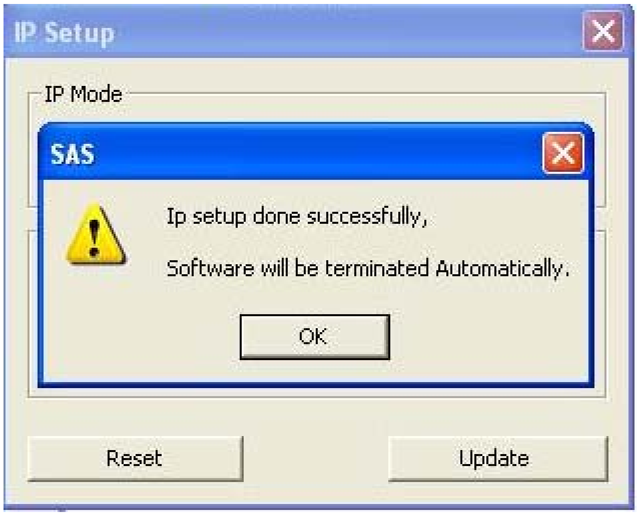


Figure 264 SAS IP Setup Success Message

Click **OK**. The message closes and the device resets.

3. To change back to DHCP, in the IP setup dialog, click the **DHCP** radio button, then click **Update**.

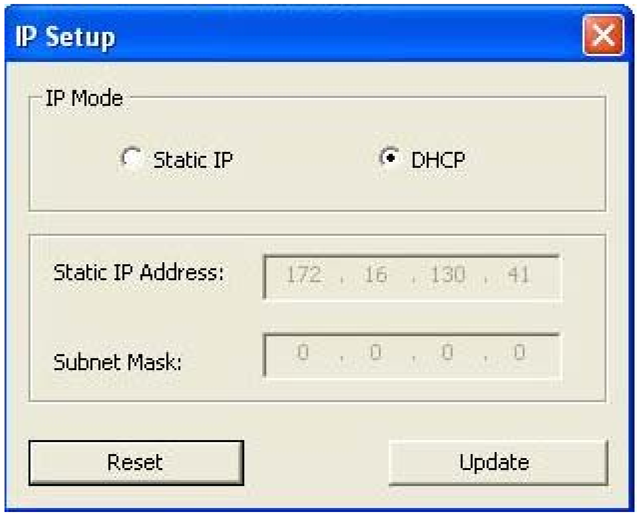


Figure 265 SAS IP Setup Success Message

After you see the Warning Message, click **Yes**

After you see the Success Message, click **OK**.

Note: You can also click **Reset**.

User-Defined Decoding

User-defined decoding allows you to create a definition file to interpret commands and frames that are not in the standard set recognized by the software.

Select **Configuration > User Defined Decoding** to open the User Defined Decoding dialog.

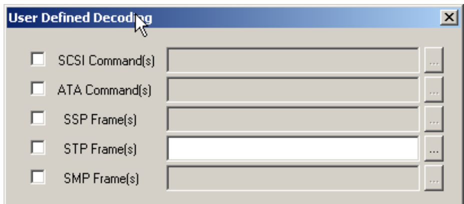


Figure 266. SAS: User Defined Decoding

SAS vs. SATA: SAS adds SCSI Commands, SSP Frames, and SMP Frames.

Check **ATA Commands** and/or **STP frames.** Click the ellipses next to a command type text box to display the **Open** dialog. Choose an appropriate script file and click **Open**.

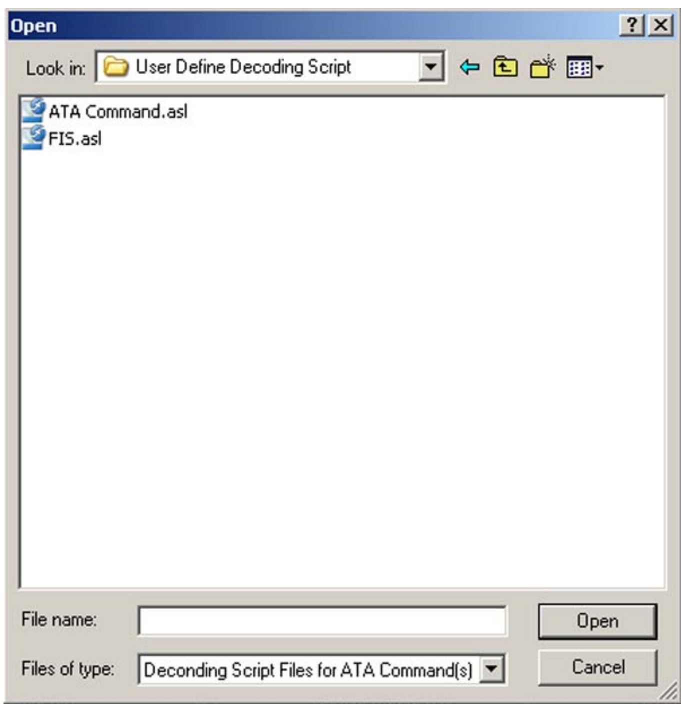


Figure 267 Choosing a Script File

Statistical Report

Whenever a captured sample is in the Sample Viewer, a **Statistical Report** selection in the **Report** menu and a **Statistical Report Button** on the viewer toolbar are enabled. You can create a Statistical Report for the entire capture or select a portion of it.

To display a Statistical Report, click the  **Statistical Report** button on the viewer toolbar or select **Report > Statistical Report** to display the Select Statistical Report Range dialog.

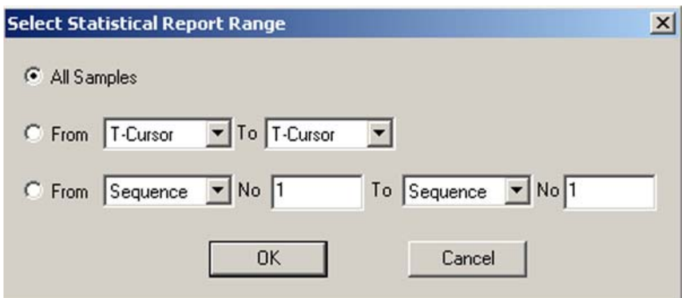


Figure 268 Statistical Report Range Dialog

The default statistical report has All Samples. You can set a specific Statistical report range between defined cursor positions or events.

Report between Cursors

Click the option button next to the **From** cursor selection drop down list. Then click the **From** down arrow and choose the 1st cursor, click the **To** down arrow to choose the 2nd cursor, and click **OK.** The resulting report has only the capture between the cursors.

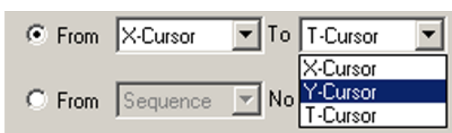


Figure 269 Report between Cursors

Report between Events

Click the option button next to the **From** the event selection dropdown list, click the **From** down arrow to choose the 1st event, then enter the number of its occurrence. Next click the **To** down arrow to choose the 2nd event, then enter the number of its occurrence.

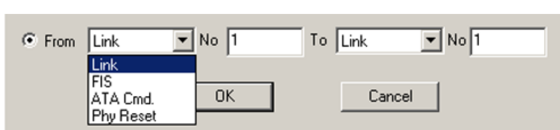


Figure 270 SATA: Report between Events

Click **OK.** The resulting report are limited to the capture between the defined events.

SAS vs. SATA: SAS adds Transport, SCSI Cmd, SMP Cmd, and Task Mng to the drop-down list and deletes FIS and Phy Reset.

Statistical Report Content

SAS: A complete SAS statistical report consists of the following reports, accessed by clicking the corresponding tab in the dialog:

- General
- Bus Condition
- Primitive
- SSP Transport
- SMP Transport
- STP Transport
- ATA Command
- SCSI Command
- SMP Command
- Task Command
- SAS Address
- Read/Write Command
- Protocol Error
- Performance
- Lanes
- Others

SATA: A complete SATA statistical report consists of the following reports, accessed by clicking the corresponding tab in the dialog:

- General
- Bus Condition
- Primitive
- FIS
- ATA Command
- ATAPI Command
- Read/Write Command
- Protocol Error
- Performance
- Others
- PM Statistic
- PM Performance

Note: Results are displayed only for items that have been captured in the sample.

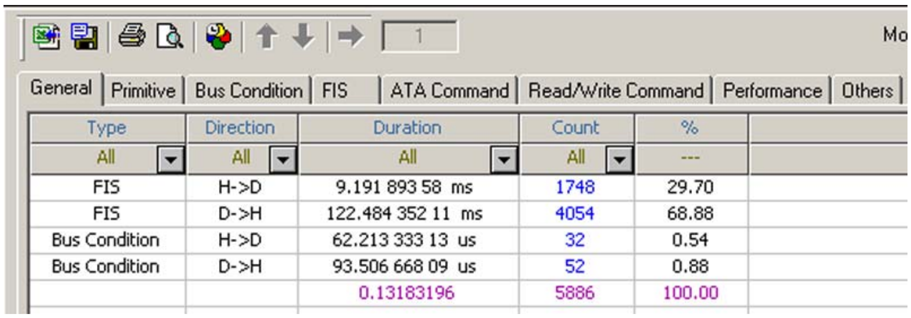
Report Options

Some report categories offer options to display only specific items.These report categories incorporate drop-down list boxes offering pre-defined and custom options. For details see “Formatting the Statistical Report View” on page 226.

General Report

To display the General Report, click the **General** tab. The General Report displays the report data in columns with the following information:

- Type
- Direction
- Duration
- Count (number of occurrences)
- % of total count



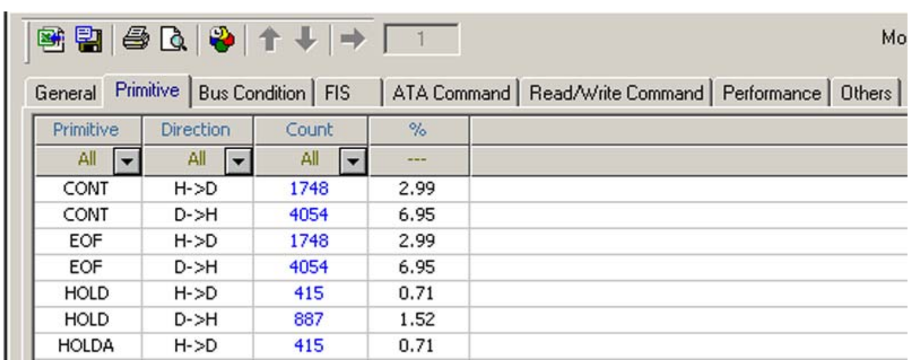
Type	Direction	Duration	Count	%
All	All	All	All	---
FIS	H->D	9.191 893 58 ms	1748	29.70
FIS	D->H	122.484 352 11 ms	4054	68.88
Bus Condition	H->D	62.213 333 13 us	32	0.54
Bus Condition	D->H	93.506 668 09 us	52	0.88
		0.13183196	5886	100.00

Figure 271 General Statistical Report

Primitive Report

To display the Primitive Report, click the **Primitive** tab. The Primitive Report displays information in the following columns:

- Primitive
- Direction
- Count (number of occurrences)
- % of total count



Primitive	Direction	Count	%
All	All	All	---
CONT	H->D	1748	2.99
CONT	D->H	4054	6.95
EOF	H->D	1748	2.99
EOF	D->H	4054	6.95
HOLD	H->D	415	0.71
HOLD	D->H	887	1.52
HOLDA	H->D	415	0.71

Figure 272 Primitive Report

Bus Condition Report

To display the Bus Condition Report, click the **Bus Condition** tab. The Bus Condition Report displays information in the following columns.

- Bus Condition
- Direction
- Count (number of occurrences)
- % of total count

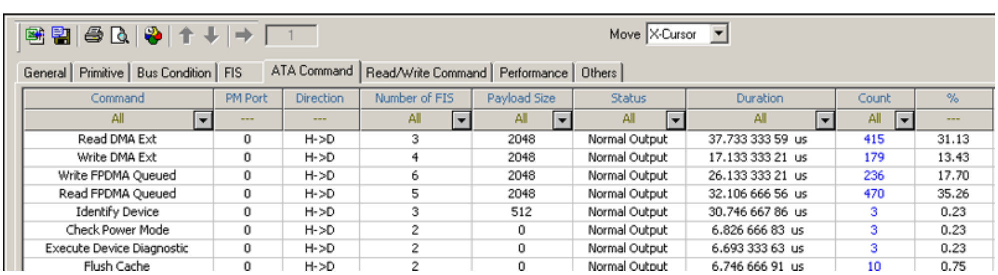
Bus Condition	Direction	Count	%
All	All	All	---
Keep Alive Activity	H->D	1	1.19
Activity On	H->D	12	14.29
Activity On	D->H	12	14.29
COMINIT/COMRESET	H->D	1	1.19
COMINIT/COMRESET	D->H	28	33.33
COMWAKE	H->D	12	14.29
COMWAKE	D->H	12	14.29
COMSAS	H->D	6	7.14
		84	100.00

Figure 273 Bus Condition Report

ATA Command Report View

To display the ATA Command Report, click the **ATA Command** tab. The ATA Command Report displays information in the following columns:

- Command
- PM Port
- Direction
- Number of FIS
- Payload Size (Dwords)
- Status
- Timeout
- Duration
- Count (number of occurrences)
- % of total count



Command	PM Port	Direction	Number of FIS	Payload Size	Status	Duration	Count	%
All	---	---	All	All	All	All	All	---
Read DMA Ext	0	H->D	3	2048	Normal Output	37.733 333 59 us	415	31.13
Write DMA Ext	0	H->D	4	2048	Normal Output	17.133 333 21 us	179	13.43
Write FPDMA Queued	0	H->D	6	2048	Normal Output	26.133 333 21 us	236	17.70
Read FPDMA Queued	0	H->D	5	2048	Normal Output	32.106 666 56 us	470	35.26
Identify Device	0	H->D	3	512	Normal Output	30.746 667 86 us	3	0.23
Check Power Mode	0	H->D	2	0	Normal Output	6.826 666 83 us	3	0.23
Execute Device Diagnostic	0	H->D	2	0	Normal Output	6.693 333 63 us	3	0.23
Flush Cache	0	H->D	2	0	Normal Output	6.746 666 91 us	10	0.75

Figure 274 SATA: ATA Command Report

Protocol Error Report

To display the Protocol Error Report, click the **Protocol Error** tab.The Protocol Error Report displays the report data in columns with the following information:

- Protocol Error
- Direction
- Count
- % of count

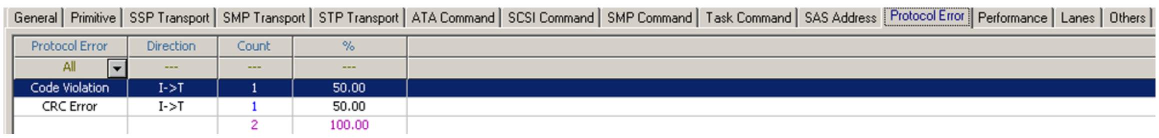


Figure 275 SAS: Protocol Error Report

Others Report View

To display the Others Report view, click the **Others** tab. The Others Report view displays information in the following columns:

- Items
    - Idle No
    - Payload Size
    - Sample Time
    - Idle (Initiator)
    - Idle (Target)
    - SSP Bus Utilization
    - SMP Bus Utilization
    - STP Bus Utilization
- Report
    - Count/Time

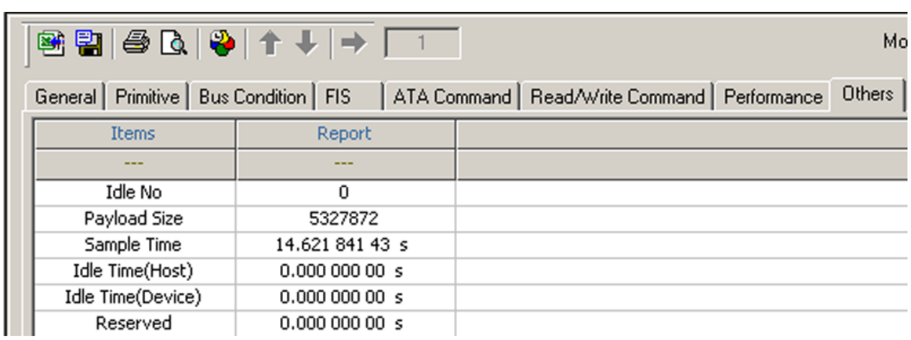
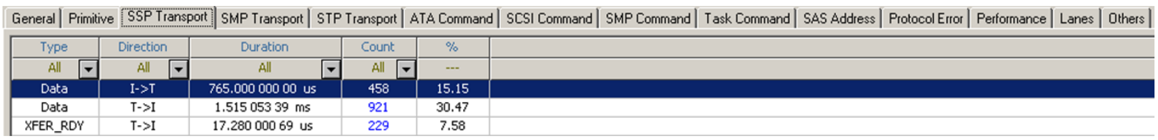


Figure 276 Others Report

SSP Transport Report (SAS)

To display the SSP Transport Report, click the **SSP Transport** tab. The SSP Transport Report displays the report data in columns with the following information:

- Type
- Direction
- Duration
- Count
- % of count



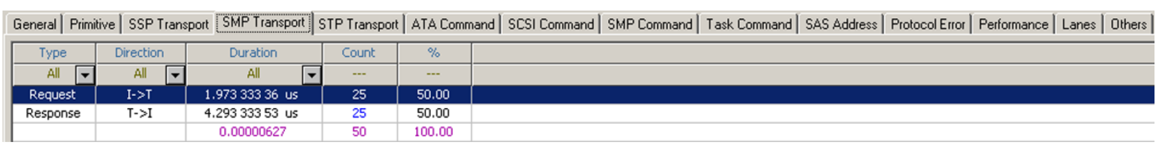
Type	Direction	Duration	Count	%
All	All	All	All	---
Data	I->T	765.000 000 00 us	458	15.15
Data	T->I	1.515 053 39 ms	921	30.47
XFER_RDY	T->I	17.280 000 69 us	229	7.58

Figure 277 SAS: SSP Transport Report

SMP Transport Report (SAS)

To display the SMP Transport Report, click the **SMP Transport** tab. The SMP Transport Report displays the report data in columns with the following information:

- Type
- Direction
- Duration
- Count
- % of count



Type	Direction	Duration	Count	%
All	All	All	---	---
Request	I->T	1.973 333 36 us	25	50.00
Response	T->I	4.293 333 53 us	25	50.00
		0.00000627	50	100.00

Figure 278 SAS: SMP Transport Report

STP Transport Report (SAS)

To display the STP Transport Report, click the **STP Transport** tab. The STP Transport Report displays the report data in columns with the following information:

- FIS Type
- PM Port
- Direction
- Duration
- Count
- % of count

General | Primitive | SSP Transport | SMP Transport | STP Transport | ATA Command | SCSI Command | SMP Command | Task Command | SAS Address | Protocol Error | Performance | Lanes | Others

FIS Type	PM Port	Direction	Duration	Count	%
All	---	All	All	All	---
Register Host to Device	0	I->T	340.293 334 96 us	301	30.16
Register Device to Host	0	T->I	352.640 014 65 us	300	30.06
DMA Activate	0	T->I	102.239 997 86 us	95	9.52

Figure 279 SAS: STP Transport Report

SCSI Command Report (SAS)

To display the SCSI Command Report, click the **SCSI Command** tab.The SCSI Command Report displays the report data in columns with the following information:

- Command
- Direction
- Number of Transport
- Payload Size
- Status
- Task Attribute
- Duration
- Count
- % of count

General | Primitive | SSP Transport | SMP Transport | STP Transport | ATA Command | SCSI Command | SMP Command | Task Command | SAS Address | Protocol Error | Performance | Lanes | Others

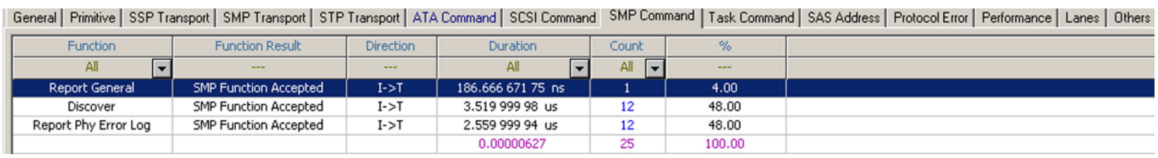
Command	Direction	Number Of Transport	Payload Size	Status	Task Attribute	Duration	Count	%
All	---	All	All	All	---	All	All	---
Write10	I->T	5	2048	Good	Simple	1.756 386 64 ms	229	34.24
Inquiry	I->T	3	128	Good	Simple	960.000 000 00 ns	1	0.02
Read10	I->T	4	2048	Good	Simple	3.351 399 90 ms	447	65.33

Figure 280 SAS: SCSI Command Report

SMP Command Report (SAS)

To display the SMP Command Report, click the **SMP Command** tab. The SMP Command Report displays the report data in columns with the following information:

- Function
- Function Result
- Direction
- Duration
- Count
- % of count



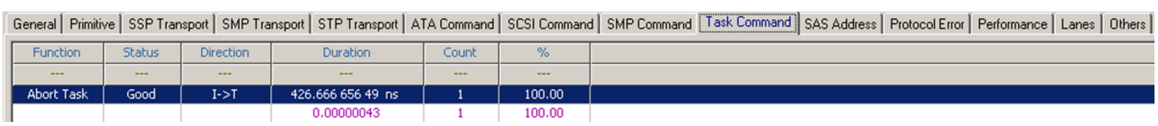
Function	Function Result	Direction	Duration	Count	%
All	---	---	All	All	---
Report General	SMP Function Accepted	I->T	186.666 671 75 ns	1	4.00
Discover	SMP Function Accepted	I->T	3.519 999 98 us	12	48.00
Report Phy Error Log	SMP Function Accepted	I->T	2.559 999 94 us	12	48.00
			0.00000627	25	100.00

Figure 281 SAS: SMP Command Report

Task Command Report (SAS)

To display the Task Command Report, click the **TASK Command** tab. The Task Command Report displays the report data in columns with the following information:

- Function
- Status
- Direction
- Duration
- Count
- % of count



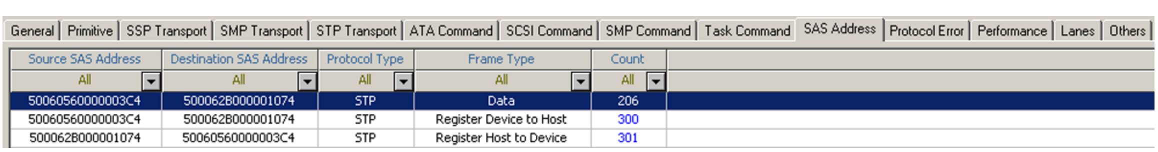
Function	Status	Direction	Duration	Count	%
---	---	---	---	---	---
Abort Task	Good	I->T	426.666 656 49 ns	1	100.00
			0.00000043	1	100.00

Figure 282 SAS: TASK Command Report

SAS Address Report (SAS)

To display the SAS Address Report, click the **SAS Address** tab.The SAS Address report displays the report data in columns with the following information:

- Source SAS Address
- Destination SAS Address
- Protocol Type
- Frame Type
- Count



Source SAS Address	Destination SAS Address	Protocol Type	Frame Type	Count
All	All	All	All	All
50060560000003C4	500062B000001074	STP	Data	206
50060560000003C4	500062B000001074	STP	Register Device to Host	300
500062B000001074	50060560000003C4	STP	Register Host to Device	301

Figure 283 SAS: SAS Address Report

Lanes Report (SAS)

To display the Lanes Report, click the **Lanes** tab. The Lanes Report displays the report data in columns with the following information:

- Port
- Open Accept
- Open Reject
- AIP Waiting on Con.
- Break
- SCSI Command
- ATA Command
- SMP Command
- Out Standing Command
- Transfer Bytes
- Link Utilization
- Link Utilization %

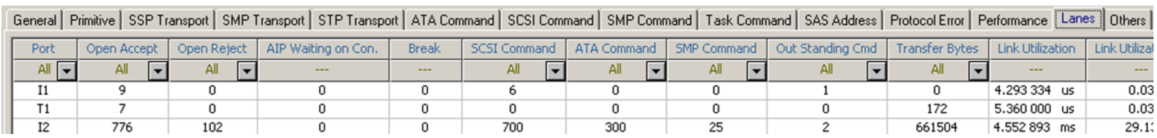


Figure 284 SAS Lanes Report

Read/Write Command Report (SAS)

To display the Read/Write Command Report, click the **Read/Write Command** tab. You can enable or disable creation of this page under Software Settings (see “Software Settings” on page 200). The Read/Write Command report displays the report data in columns with the following information:

- Source SAS Address
- Destination SAS Address
- Protocol Type
- OpCode/Command
- Tag
- LBA
- Sector Count
- Xfer Length
- Payload Size
- Status
- Completion Time
- Performance
- Standard Deviation
- Count

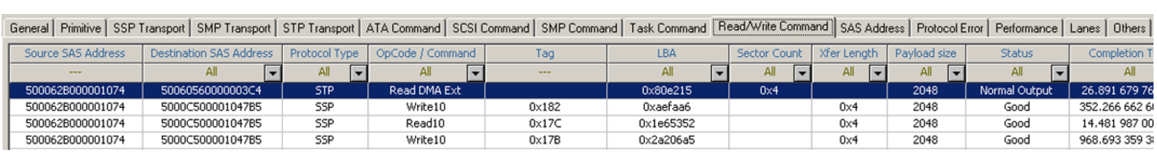
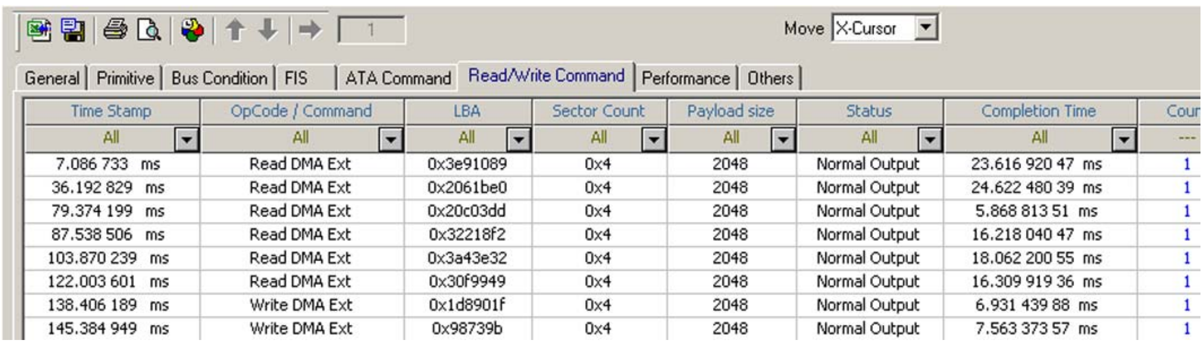


Figure 285 SAS: Read Write Command Report

Read Write Command Report View (SATA)

To display the Read/Write Command Report view, click the **Read/Write Command** tab. You can enable or disable creation of this page under Software Settings (see page 200). The Read/Write Command Report view displays information in the following columns:

- Time Stamp
- OpCode/Command
- LBA
- Sector Count
- Payload size
- Status
- Completion Time
- Count



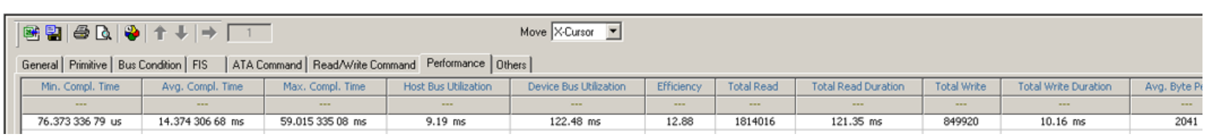
Time Stamp	OpCode / Command	LBA	Sector Count	Payload size	Status	Completion Time	Cour
All	All	All	All	All	All	All	---
7.086 733 ms	Read DMA Ext	0x3e91089	0x4	2048	Normal Output	23.616 920 47 ms	1
36.192 829 ms	Read DMA Ext	0x2061be0	0x4	2048	Normal Output	24.622 480 39 ms	1
79.374 199 ms	Read DMA Ext	0x20c03dd	0x4	2048	Normal Output	5.868 813 51 ms	1
87.538 506 ms	Read DMA Ext	0x32218f2	0x4	2048	Normal Output	16.218 040 47 ms	1
103.870 239 ms	Read DMA Ext	0x3a43e32	0x4	2048	Normal Output	18.062 200 55 ms	1
122.003 601 ms	Read DMA Ext	0x30f9949	0x4	2048	Normal Output	16.309 919 36 ms	1
138.406 189 ms	Write DMA Ext	0x1d8901f	0x4	2048	Normal Output	6.931 439 88 ms	1
145.384 949 ms	Write DMA Ext	0x98739b	0x4	2048	Normal Output	7.563 373 57 ms	1

Figure 286 SATA: Read Write Command Report

Performance Report View (SATA)

To display the Performance Report view, click the **Performance** tab. The Performance Report view displays information in the following columns:

- Minimum Completion time
- Average Completion time
- Maximum Completion time
- Host Bus Utilization
- Device Bus Utilization
- Efficiency (%)
- Total Read (DWords)
- Total Read Duration
- Total Write DWords
- Total Write Duration (time)
- Average Byte Per FIS



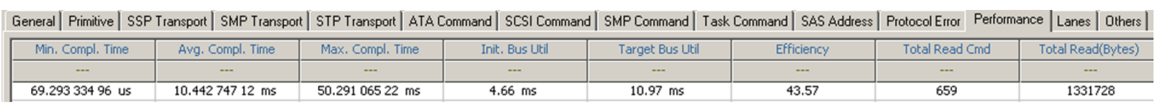
Min. Compl. Time	Avg. Compl. Time	Max. Compl. Time	Host Bus Utilization	Device Bus Utilization	Efficiency	Total Read	Total Read Duration	Total Write	Total Write Duration	Avg. Byte P
---	---	---	---	---	---	---	---	---	---	---
76.373 336 79 us	14.374 306 68 ms	59.015 335 08 ms	9.19 ms	122.48 ms	12.88	1814016	121.35 ms	849920	10.16 ms	2041

Figure 287 SATA: Performance Report

Performance Report (SAS)

To display the Performance Report, click the **Performance** tab.The Performance report displays the report data in columns with the following information:

- Min. Compl. Time
- Avg. Compl. Time
- Max. Compl. Time
- Init. Bus Utilization
- Target Bus Utilization
- Efficiency
- Total Read CMD
- Total Read Duration
- Cmd Min. Read (MB/S)
- Cmd Avg. Read (MB/S)
- Cmd Max. Read (MB/S)
- Total Write Cmd
- Total Write (Bytes)
- Total Write Dur.
- Cmd Min. Write (MB/S)
- Cmd Avg. Write (MB/S)
- Cmd Max. Write (MB/S)
- Total Write Duration
- Avg. Byte per SSP Frame
- Avg, Byte Per STP Frame



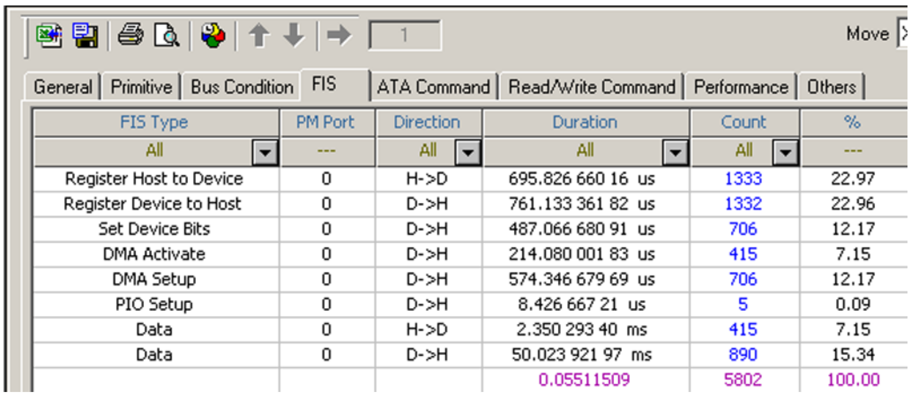
Min. Compl. Time	Avg. Compl. Time	Max. Compl. Time	Init. Bus Util	Target Bus Util	Efficiency	Total Read Cmd	Total Read(Bytes)
---	---	---	---	---	---	---	---
69.293 334 96 us	10.442 747 12 ms	50.291 065 22 ms	4.66 ms	10.97 ms	43.57	659	1331728

Figure 288 SAS: Performance Report

FIS Report View (SATA)

To display the FIS Report, click the **FIS** tab. The FIS Report view displays information in the following columns:

- FIS Type
- PM Port
- Direction
- Duration time (accumulative)
- Count (number of occurrences)
- % of total count



FIS Type	PM Port	Direction	Duration	Count	%
All	---	All	All	All	---
Register Host to Device	0	H->D	695.826 660 16 us	1333	22.97
Register Device to Host	0	D->H	761.133 361 82 us	1332	22.96
Set Device Bits	0	D->H	487.066 680 91 us	706	12.17
DMA Activate	0	D->H	214.080 001 83 us	415	7.15
DMA Setup	0	D->H	574.346 679 69 us	706	12.17
PIO Setup	0	D->H	8.426 667 21 us	5	0.09
Data	0	H->D	2.350 293 40 ms	415	7.15
Data	0	D->H	50.023 921 97 ms	890	15.34
			0.05511509	5802	100.00

Figure 289 SATA: FIS Report

PM Statistic Report (SATA)

To display the PM Statistic Report, click the **PM Statistic** tab. The PM Statistic Report view displays information in the following columns:

- Request Type
- Request Port
- Response Type
- Response Time
- Request Entering Delay
- Response Entering Delay
- Wakeup type
- Request DC Idle Time
- Response DC Idle Time
- Request Wakeup Time
- Response Wakeup Time
- Count

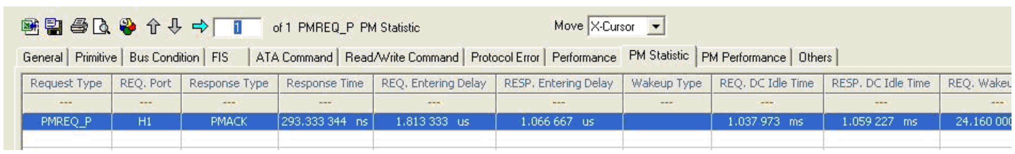


Figure 290 SATA: PM Statistic Report

PM Performance Report (SATA)

To display the PM Performance Report, click the **PM Performance** tab. The PM Performance Report view displays information in the following columns:

- Port
- Partial Request
- Partial ACKed
- Partial NACKed
- Slumber Request
- Slumber ACKed
- Slumber NACKed
- Percent of Ratio of the Partial Time to Slumber Time
- Percent of Ratio of the Partial Time to Total Time
- Percent of Ratio of the Slumber Time to Total Time

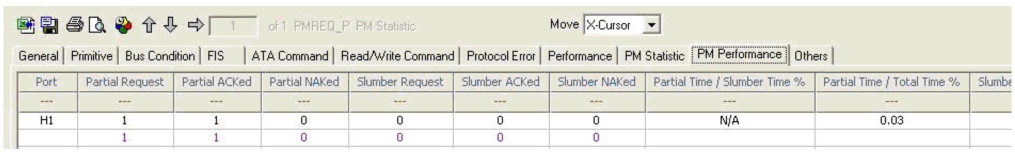
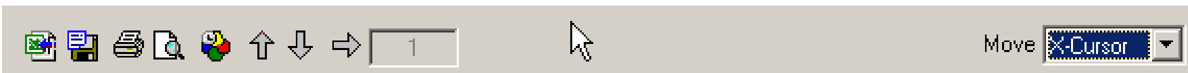


Figure 291 SATA: PM Performance Report

Statistical Report Toolbar

The Statistical Report toolbar provides the following functions accessible by buttons on the toolbar:

- Export to Excel
- Save as Text
- Print Report
- Print Preview
- Report Display Settings
- Move to **X-Cursor, Y-Cursor**, or **None**



Export as Microsoft® Excel file

The **Export to Excel** button opens the Export to Excel dialog. Choose a folder in which to save the Excel file, choose an appropriate file name, and click **Save.**

Save as Text file

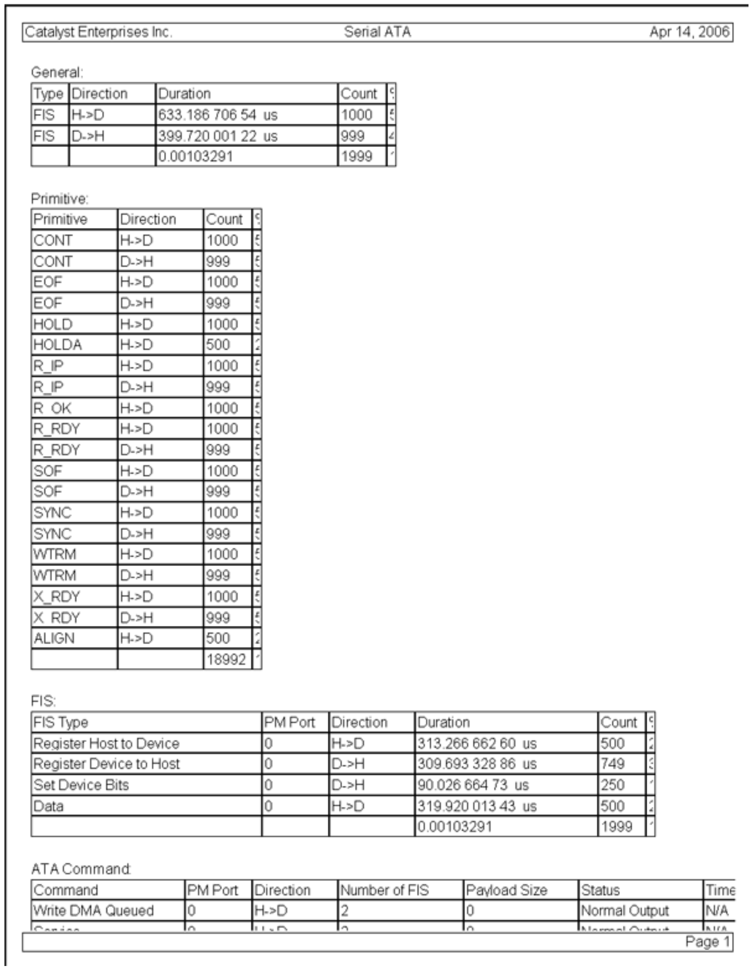
The **Save as Text** button opens the Export to Text dialog. Choose a folder in which to save the Text file, choose an appropriate file name, and click **Save.**

Print Statistical Report

The **Print** button opens the select printer dialog. Choose an available printer and click **OK.**

Print Preview

The **Print Preview** button displays a preview of the report to print**.**



Catalyst Enterprises Inc.	Serial ATA	Apr 14, 2006

General:

Type	Direction	Duration	Count
FIS	H->D	633.186 706 54 us	1000
FIS	D->H	399.720 001 22 us	999
		0.00103291	1999

Primitive:

Primitive	Direction	Count
CONT	H->D	1000
CONT	D->H	999
EOF	H->D	1000
EOF	D->H	999
HOLD	H->D	1000
HOLDA	H->D	500
R_IP	H->D	1000
R_IP	D->H	999
R_OK	H->D	1000
R_RDY	H->D	1000
R_RDY	D->H	999
SOF	H->D	1000
SOF	D->H	999
SYNC	H->D	1000
SYNC	D->H	999
WTRM	H->D	1000
WTRM	D->H	999
X_RDY	H->D	1000
X_RDY	D->H	999
ALIGN	H->D	500
		18992

FIS:

FIS Type	PM Port	Direction	Duration	Count
Register Host to Device	0	H->D	313.266 662 60 us	500
Register Device to Host	0	D->H	309.693 328 86 us	749
Set Device Bits	0	D->H	90.026 664 73 us	250
Data	0	H->D	319.920 013 43 us	500
			0.00103291	1999

ATA Command:

Command	PM Port	Direction	Number of FIS	Payload Size	Status	Time
Write DMA Queued	0	H->D	2	0	Normal Output	N/A

Page 1

Figure 292 Sample Print Preview of Report

Report Display Settings

The **Setting** button opens the Setting dialog.

You can set up the report columns for display to suit a particular analysis need, eliminating the need to show/hide columns individually. Use the **Setting** dialog to configure the display for each page.

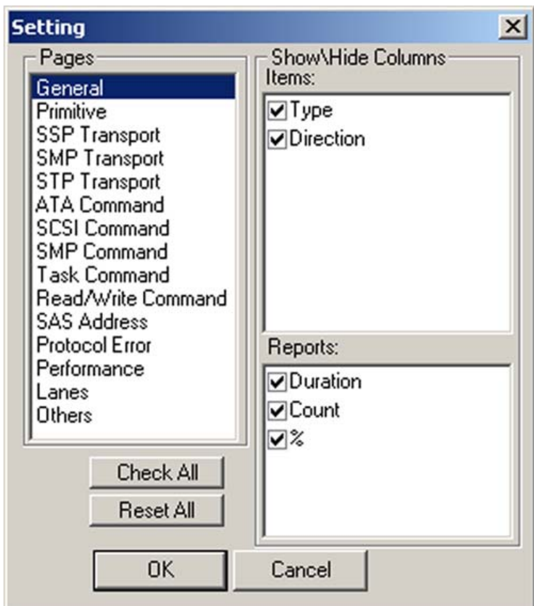


Figure 293 SAS: Statistical Report Column Setting

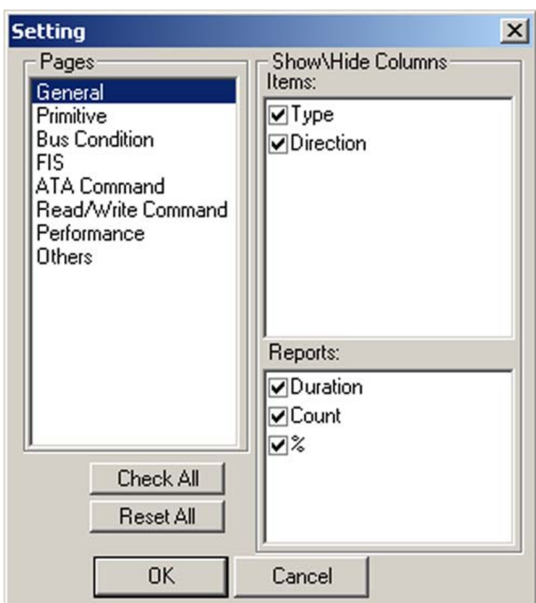


Figure 294 SATA: Statistical Report Column Setting

Link With Sample View

When you select a type on any page of the Statistical Report, a set of navigation buttons allows you to examine each instance of that type in the Sample Viewer.

The **Jump to Previous** button goes to the previous instance of the selected type in the Sample Viewer**.**

The **Jump to Next** button goes to the next instance of the selected type in the Sample Viewer**.**

The **Jump to Specific** button goes to the instance specified as N of M items on the Statistical Report toolbar**.**

The **Move** drop-down list moves to the X-Cursor, Y-Cursor, or None**.**

Formatting the Statistical Report View

Initially the Statistical Report View contains all of the information in columns, but you can customize the display by:

- Filtering columns by item
- Sorting items by column
- Hiding any column on the display

Filtering Column Content

To filter column content, click the down arrow in the heading for that column and choose the items to display. The default is All. By checking a specific item, you exclude everything but that item for display.

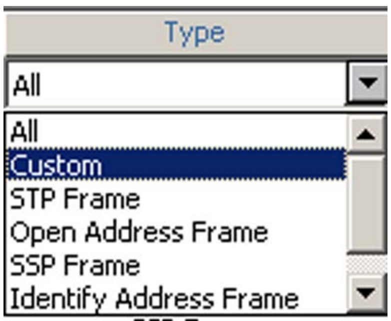


Figure 295 SAS: Type

Choosing **Custom** allows you to specify more than one item for display.

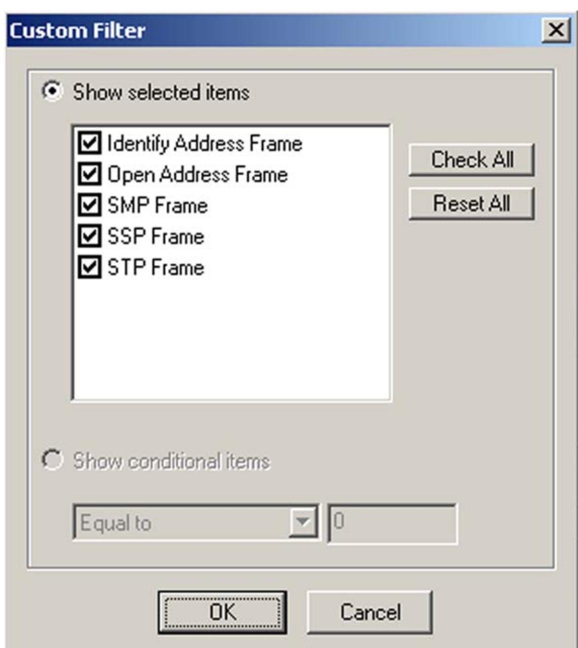


Figure 296 SAS: Custom Filter

.

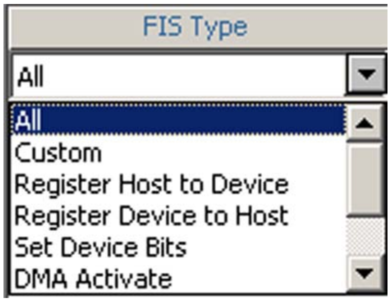


Figure 297 SATA: FIS Type

Choosing **Custom** allows you to specify more than one item for display.

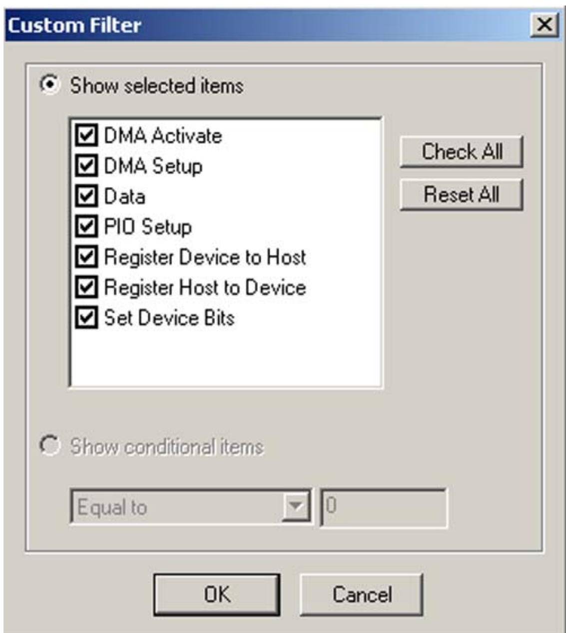


Figure 298 SATA: Custom Filter

Check the items to display and click **OK**.

Sorting Column Content

To sort column content, click the **heading** for that column. Repeated clicking of the column heading sorts the column in ascending or descending order.

Type ▲	Direction	Duration	Count	%
All	All	All	All	---
Open Address Frame	I->T	18.39999962 us	69	28.51
SMP Frame	T->I	4.53333330 us	17	7.02
SMP Frame	I->T	1.81333339 us	17	7.02
SSP Frame	T->I	23.12000084 us	53	21.90
SSP Frame	I->T	14.48000050 us	35	14.46
STP Frame	T->I	85.89333344 us	34	14.05
STP Frame	I->T	7.03999996 us	17	7.02
		0.00015528	242	100.00

Type ▼	Direction	Duration	Count	%
All	All	All	All	---
STP Frame	I->T	7.03999996 us	17	7.02
STP Frame	T->I	85.89333344 us	34	14.05
SSP Frame	I->T	14.48000050 us	35	14.46
SSP Frame	T->I	23.12000084 us	53	21.90
SMP Frame	I->T	1.81333339 us	17	7.02
SMP Frame	T->I	4.53333330 us	17	7.02
Open Address Frame	I->T	18.39999962 us	69	28.51
		0.00015528	242	100.00

Figure 299 Toggling Type Sort Order

Hiding Columns

To hide a column, right-click in the column and choose **Hide**. To unhide a column, right-click any column and choose **Unhide**.

Data Report

When a captured sample is in the Sample Viewer, the Data Report button is on the Viewer toolbar, and Data Report is in the Report menu.

The data report displays all the data sent from the host to the device and from the device to the host. All PIO In =>In commands are grouped as a data packet until the occurrence of a PIO Out =>Out command, creating a new data packet.

To display a Data Report, click the  **Data Report** button on the Viewer toolbar or select **Report > Data Report**.

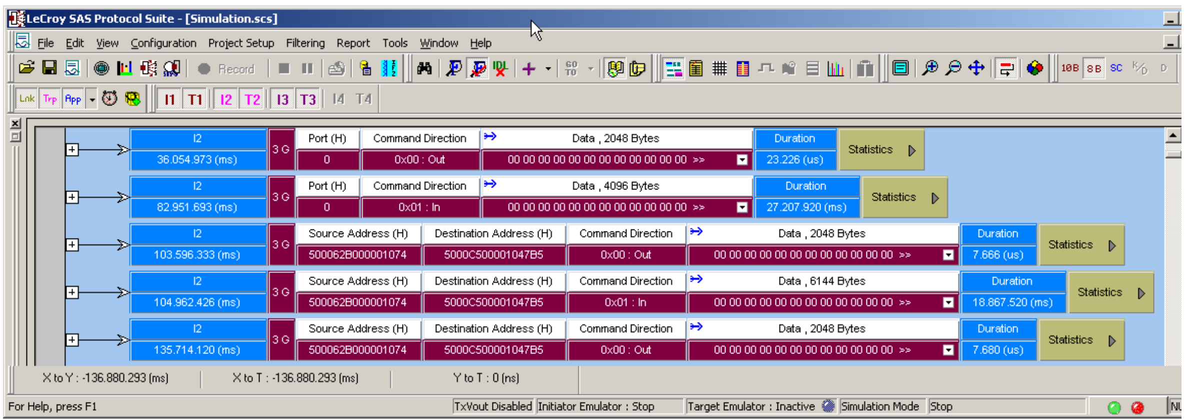


Figure 300 SAS: Data Report

Click the **Down Arrow** in a data field to display Data Report details.

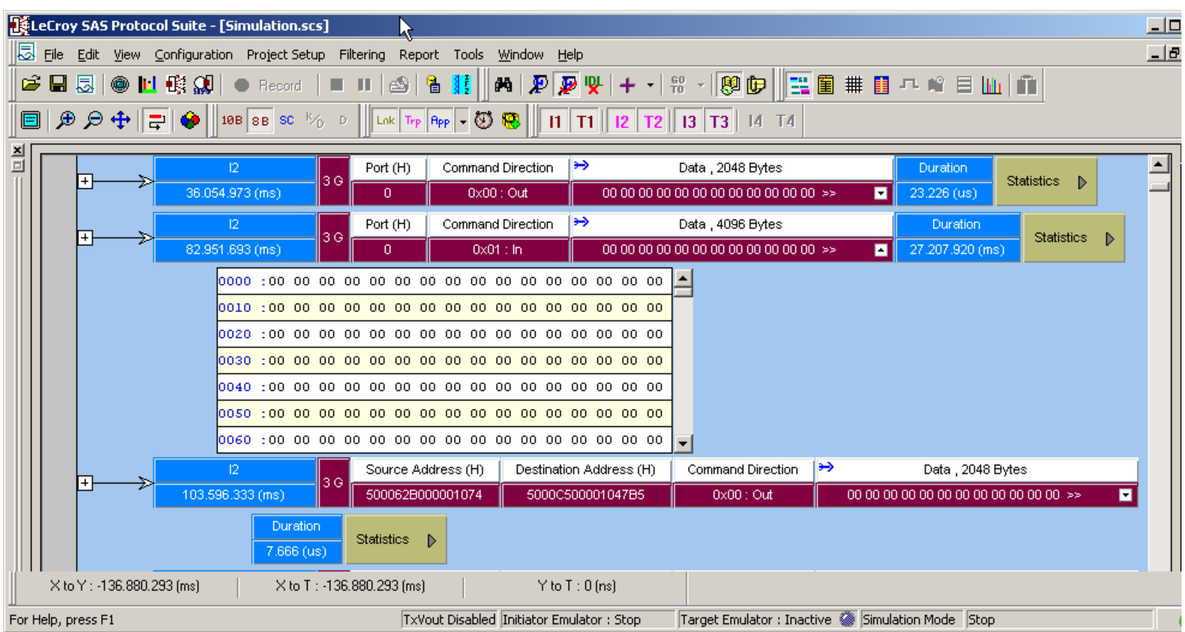


Figure 301 SAS: Data Report Details

Click the **Statistics** button 

at the end of a row to display data report statistics.

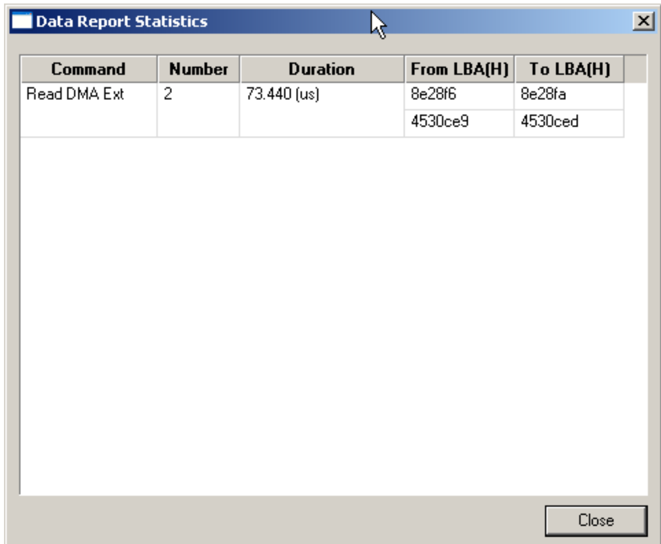


Figure 302 SAS: Data Report Statistics

Tools

The Tools are Self Test and Find Device.

Self Test

You can use the built-in RAM self-test utility. Select **Tools** on the main menu bar and choose **Self Test**.

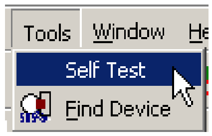


Figure 303 SAS: Self Test Command on Tools Menu

SAS vs. SATA: SATA adds Compliance Test.

The Self Test dialog opens.

Memory Check

To perform a SDRAM or Exerciser RAM memory check, select the **Memory** tab.

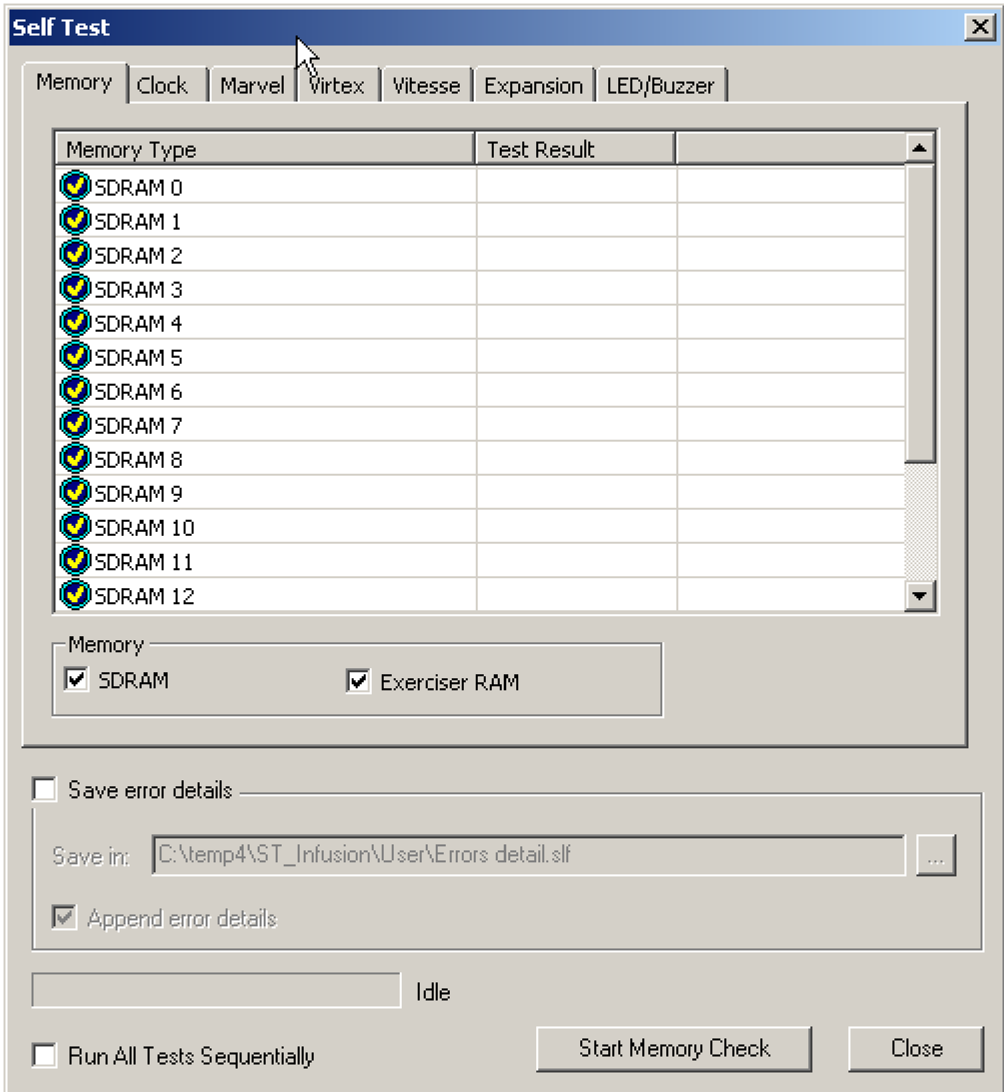


Figure 304 Self Test Dialog Memory Tab

Choose the SDRAM, Exerciser Data, or Exerciser Instruction to test and click the **Start Memory Check** button. After a short time, the Test Result appears to the right of the selected line.

Test Result: OK or Error

If a test is OK and you specified one run, the Test Result is **OK: 1 times**.

If a test has an error and you specified one run, the Test Result is **Error: 1 times**.

Saving

You can save any check result by checking the **Save error details** check box and specifying a destination file name.

Number of Runs Each Test

You can specify to run a test more than once.

Run All Tests Sequentially

This option runs all items in the Clock, Memory, Serdes, Crosspoint, Main FPGA, Expansion, and LED/Buzzer tests in order. After you check this check box, the command button becomes **Start All Tests**. You must click the **Stop Test** button on the LED/Buzzer tab to stop the check.

Clock Check

To perform a Clock check, choose the clock to test and click the **Start Clock Check** button. After a short time, the Test Result appears to the right of the selected line.

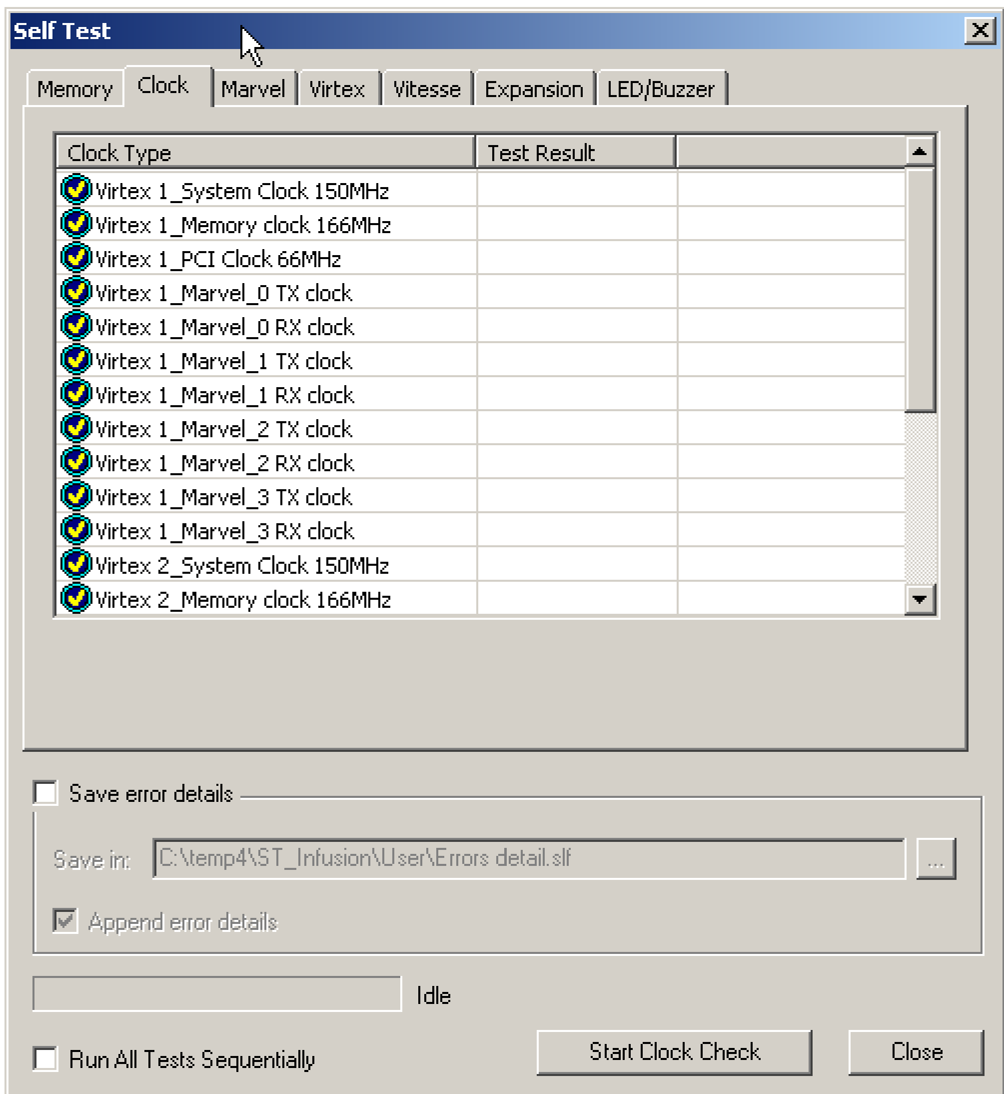


Figure 305 Self Test Dialog Clock Tab

Marvel Check

To perform a Marvel Chip check, select the **Marvel** tab.

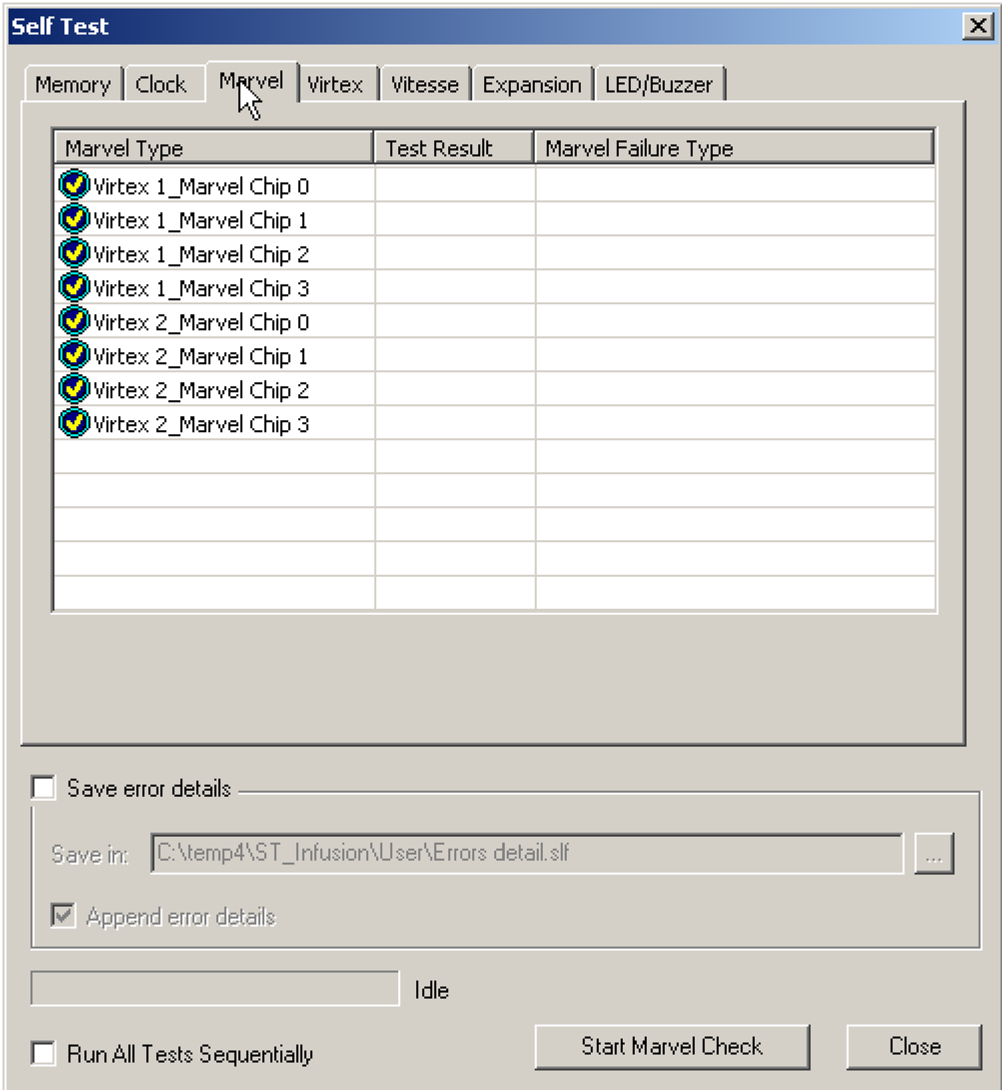


Figure 306 Self Test Dialog Serdes Tab

Choose the Marvel Chip to test and click the **Start Marvel Check** button. After a short time, the Test Result and Marvel Failure Type appear to the right of the selected line. Marvel Failure Type indicates the error type.

Virtex Check

To perform a Virtex-Virtex bus test check, select the **Virtex** tab.

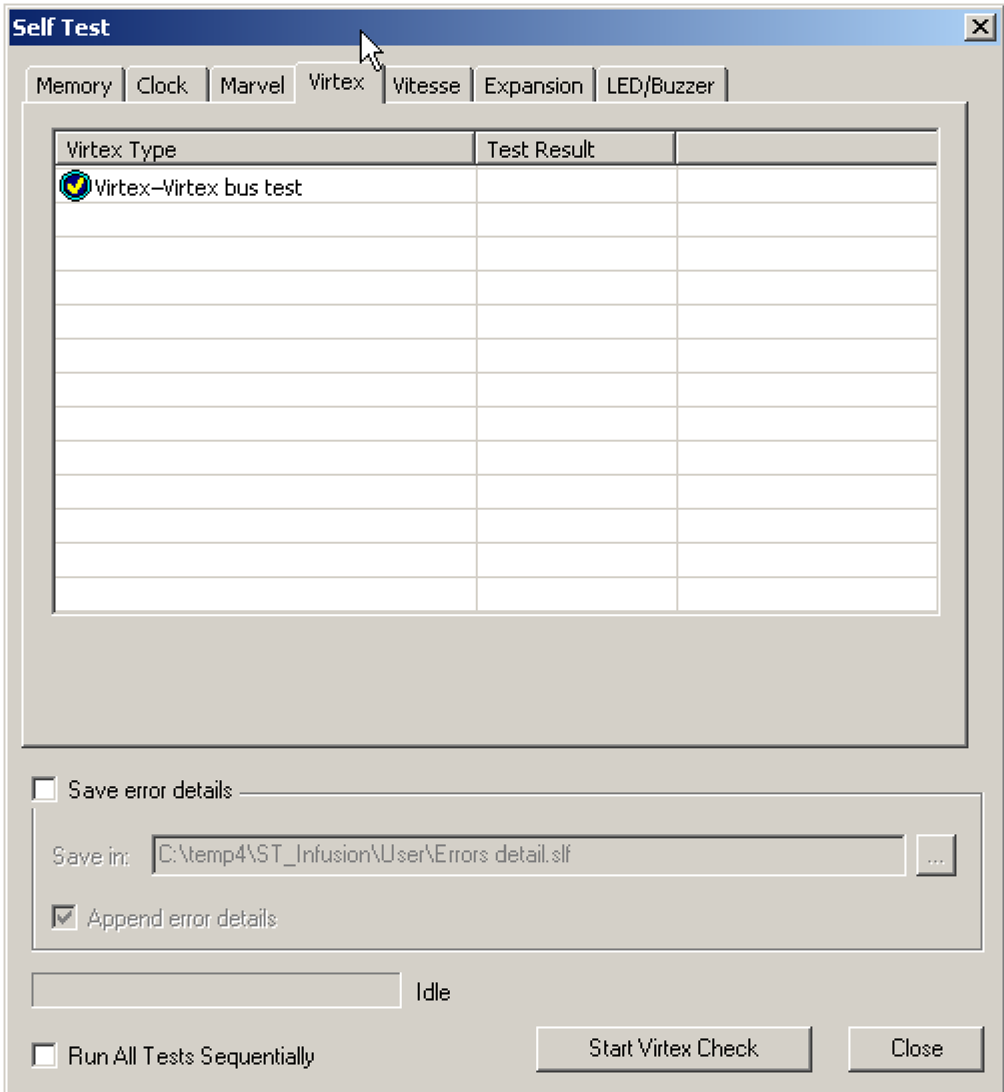


Figure 307 Self Test Dialog Crosspoint Tab

Choose the Virtex-Virtex bus test to test and click the **Start Virtex Check** button. After a short time, the Test Result appears to the right of the selected line.

Vitesse Check

To perform a Virtex Pair Line or Virtex Link check, select the **Vitesse** tab.

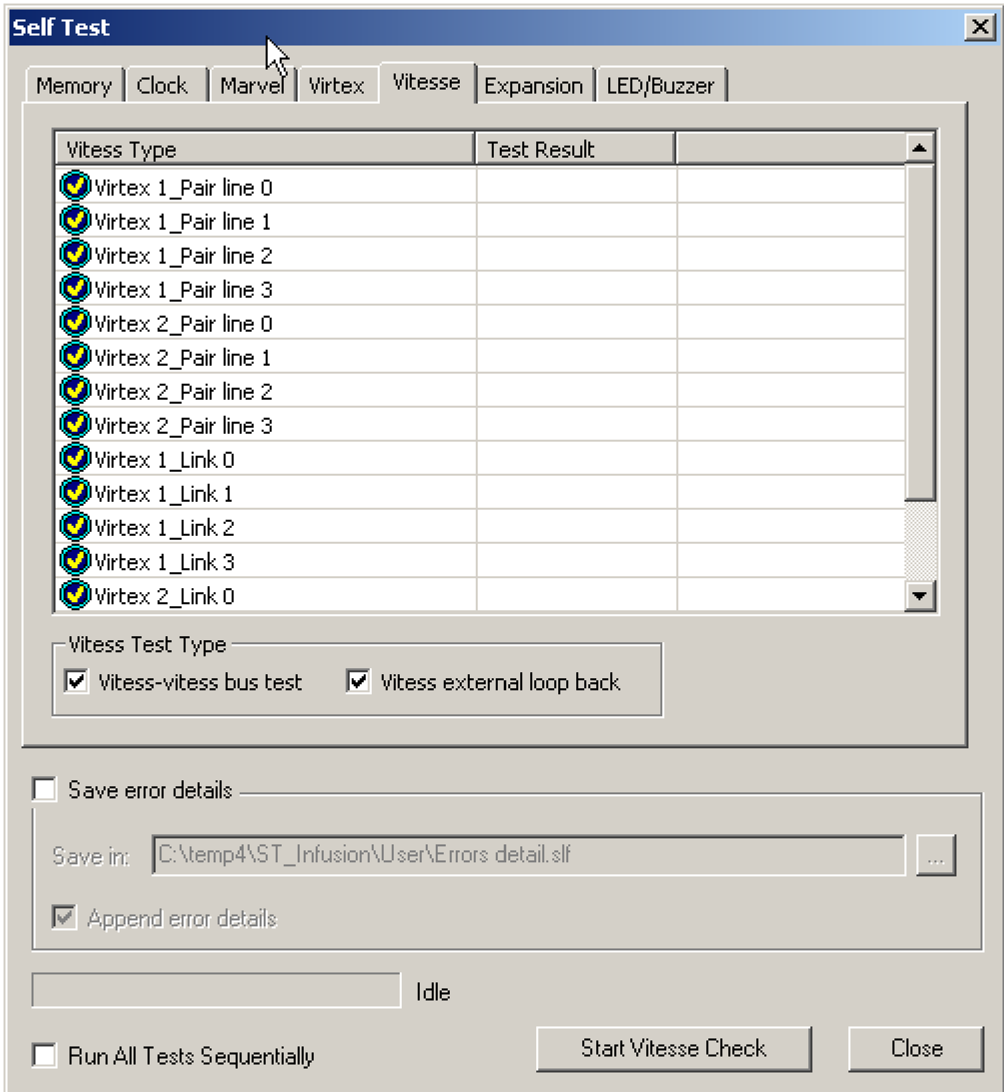


Figure 308 Self Test Dialog Main FPGA Tab

Choose the Virtex Pair Line or Virtex Link to test and click the **Start Vitesse Check** button. After a short time, the Test Result appears to the right of the selected line.

Expansion Check

To perform a Expansion Card Data Status or Clock Status check, select the **Expansion** tab.

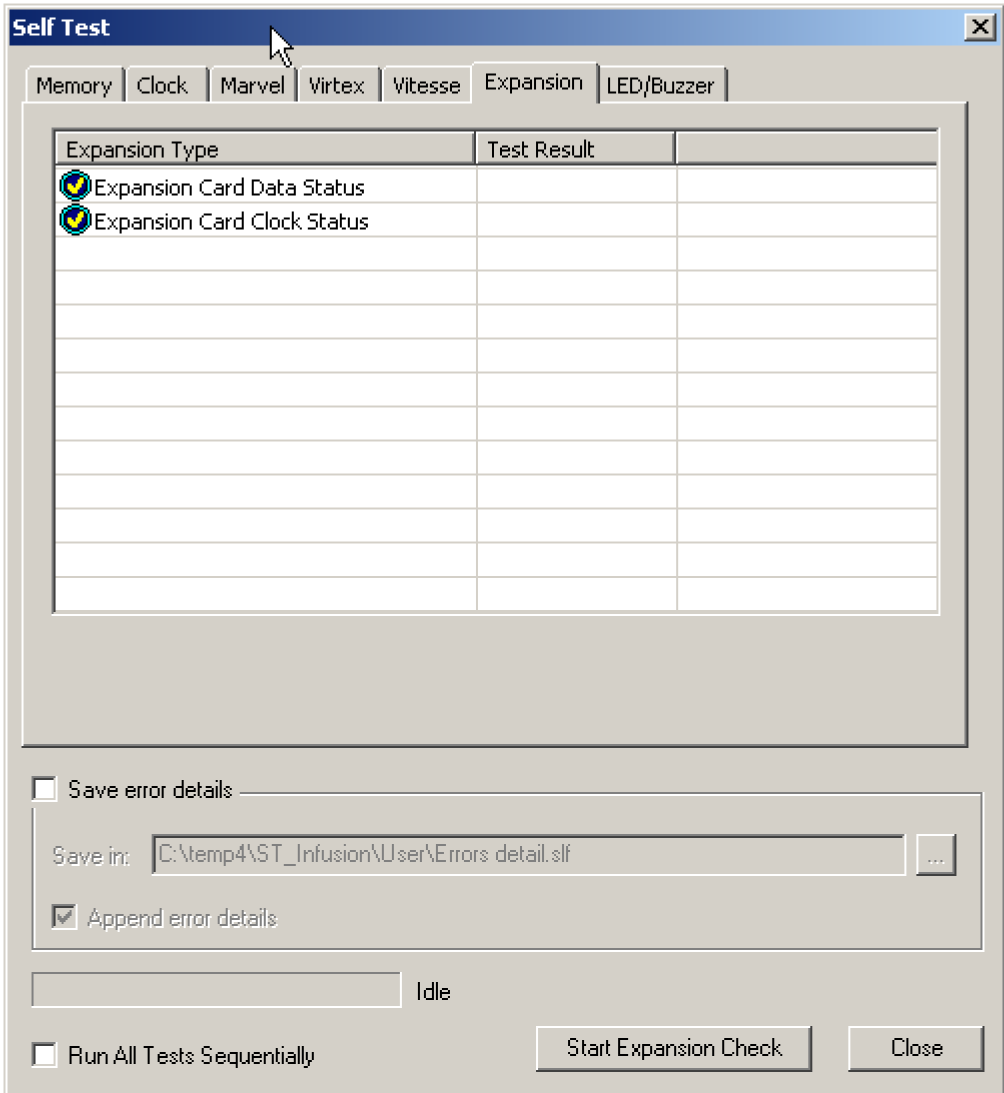


Figure 309 Self Test Dialog Expansion Tab

Choose the Expansion Card Data Status or Clock Status to test and click the **Start Expansion Check** button. After a short time, the Test Result appears to the right of the selected line.

LED/Buzzer Check

To perform a LED or Buzzer check, select the **LED/Buzzer** tab.

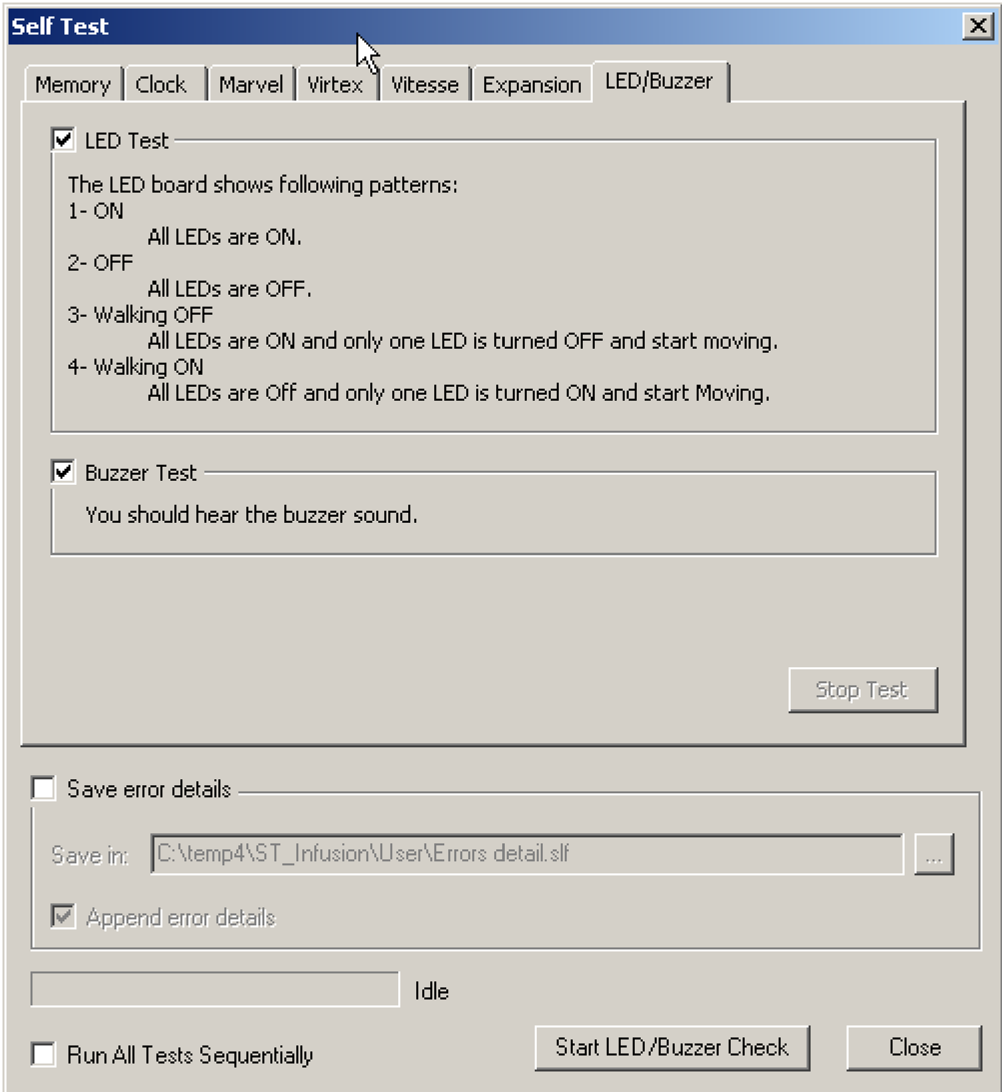


Figure 310 Self Test Dialog LED/Buzzer Tab

Check **LED Test** or **Buzzer Test** and click the **Start LED/Buzzer Check** button. For the LED, you should see the LED pattern. For the buzzer, you should hear it sound. You must click the **Stop Test** button to stop the check.

Find Device

Saving device information allows you to import the specific device information into the Target/Device emulator.

The Find Device utility obtains all vendor-specific information and detailed device parameters.

Select **Tools** on the main menu bar and choose **Find Device**.

Figure 311 SATA: Find Device Command on Tools Menu

SAS vs. SATA: SATA adds Compliance Test.

The Device Identifier dialog opens.

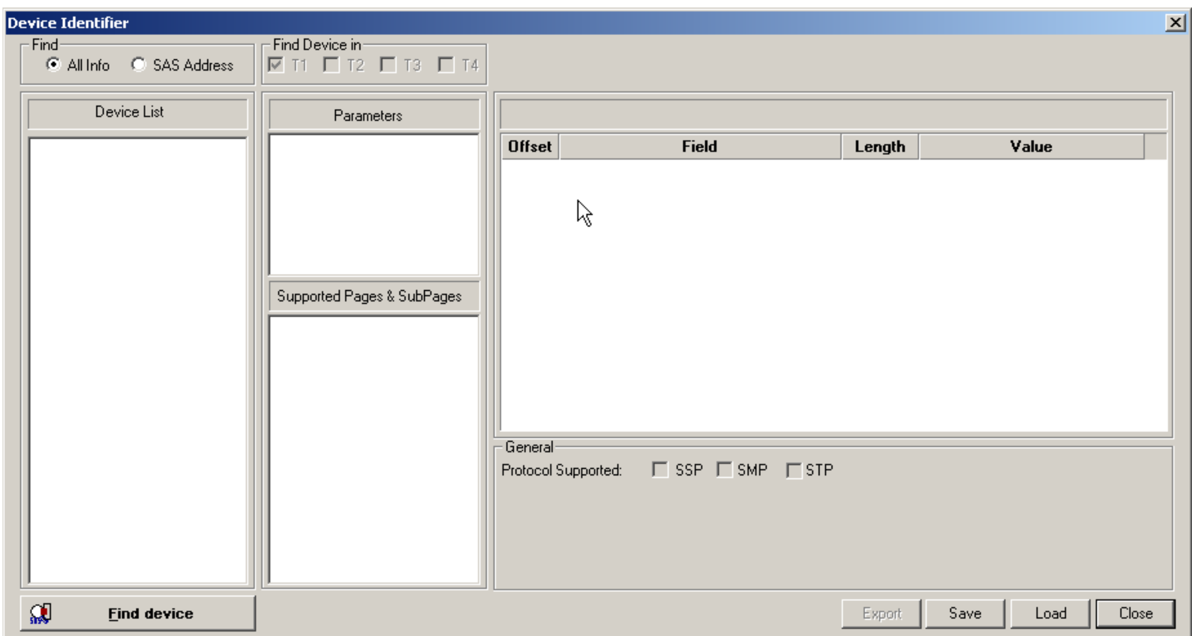


Figure 312 Device Identifier Dialog

Click the **Find Device** button to search for connected devices. After a brief period, the dialog displays all device information.

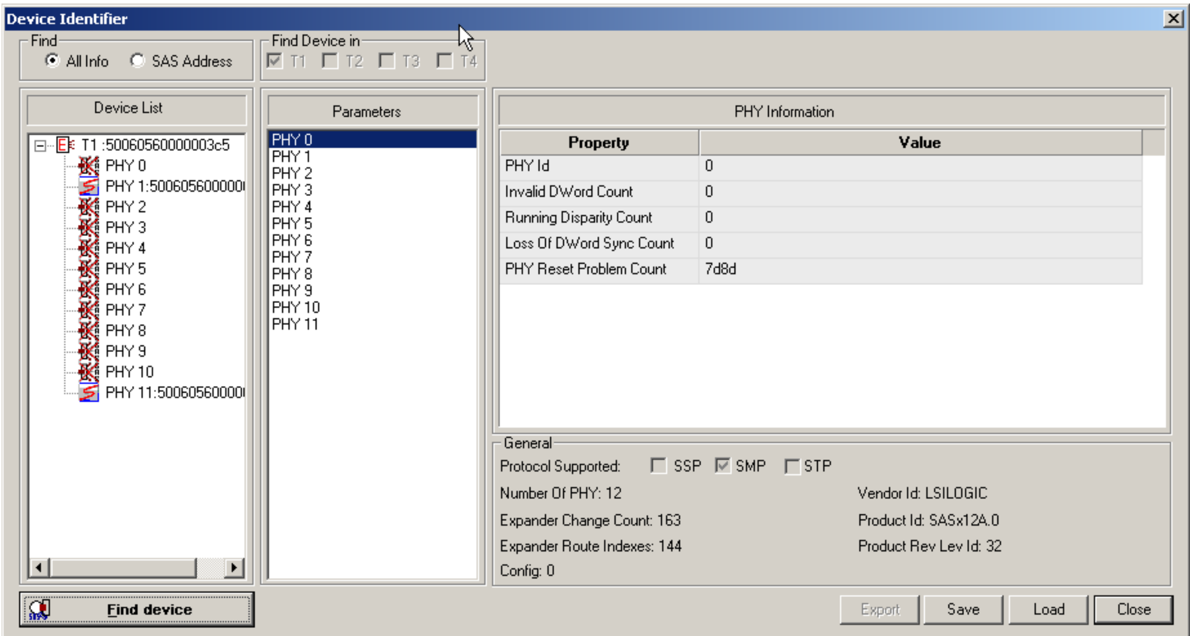


Figure 313 Identified Devices

Click a device in the Device List to display information about that device.

Compliance Test (SATA)

The Compliance Test consists of a set of selectable tests to verify compliance with the SATA specification.

To run a Compliance Test:

1. Select **Tools** on the main toolbar and choose **Compliance Test** to open the Compliance Test dialog.

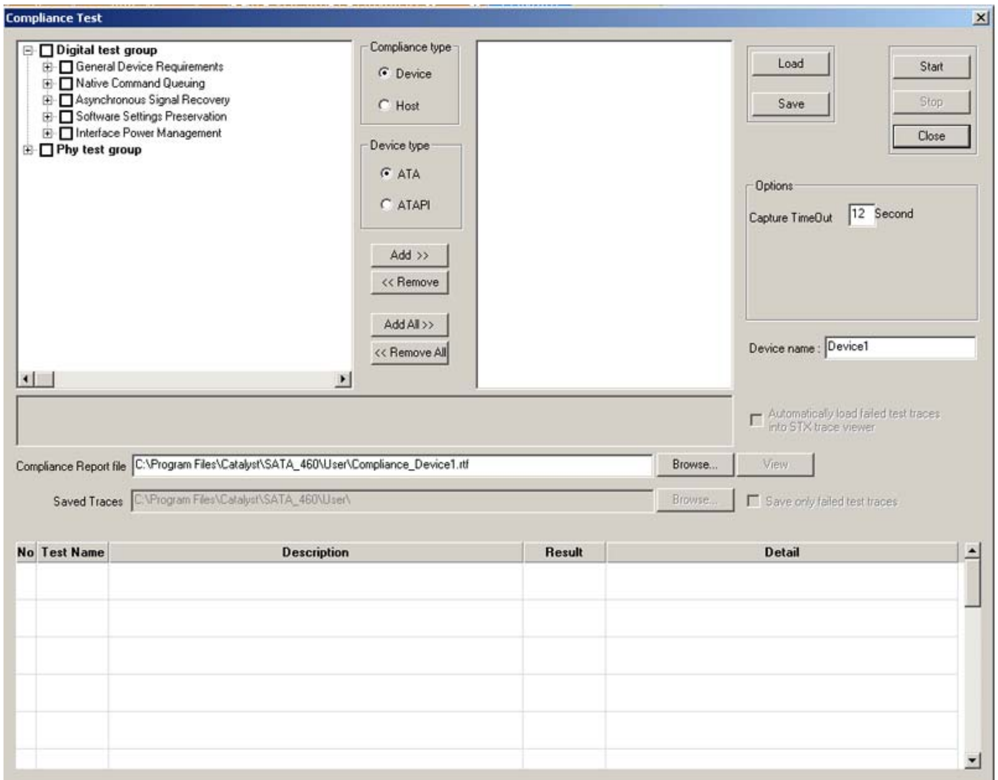


Figure 314 SATA: Compliance Test Selection

2. Choose the tests in the left pane of the dialog and click the **Add>>** button.
3. Enter a value for **Capture Timeout**.

Note: If test running time exceeds the Capture Timeout value, the test terminates.

4. To view failed test traces in the sample viewer, check the **Automatically load failed test traces** check box.
5. To save the failed test traces only, check the **Save only failed test traces** check box.
6. After you select tests, click **Start**.

7. The test runs and, after a brief period, displays the result.

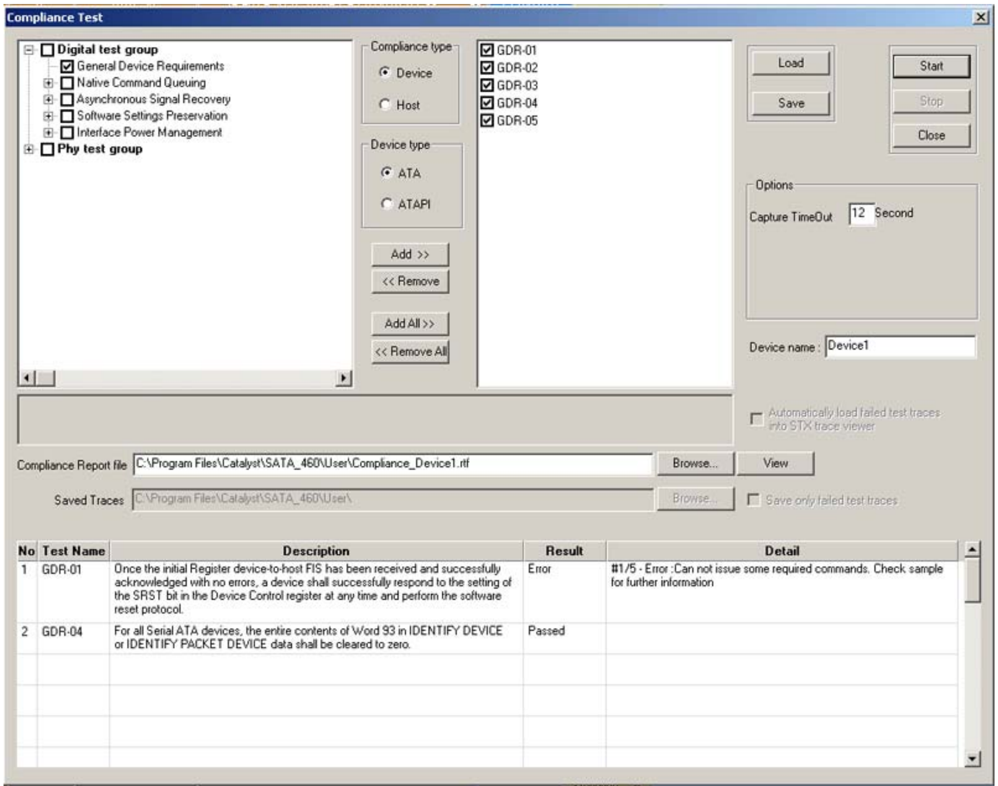


Figure 315 Compliance Test Result

8. To save the current compliance setup for later use, click the **Save** button to open the Save As dialog. Assign a meaningful name to the setup and save it as a ***.cst** compliance file.
9. To run a previously defined setup, click the **Load** button and choose a previously defined setup to run.

Infusion Overview

The LeCroy Infusion™ Error Injector and Traffic Modifier is an error injector and traffic modification tool that allows you to verify real-world fault handling for Serial Attached SCSI (SAS) and Serial ATA (SATA) systems. Infusion can sit unobtrusively in the data path on a live system to programmatically alter or corrupt traffic. Infusion is the ideal tool for stress-testing systems using actual workloads.

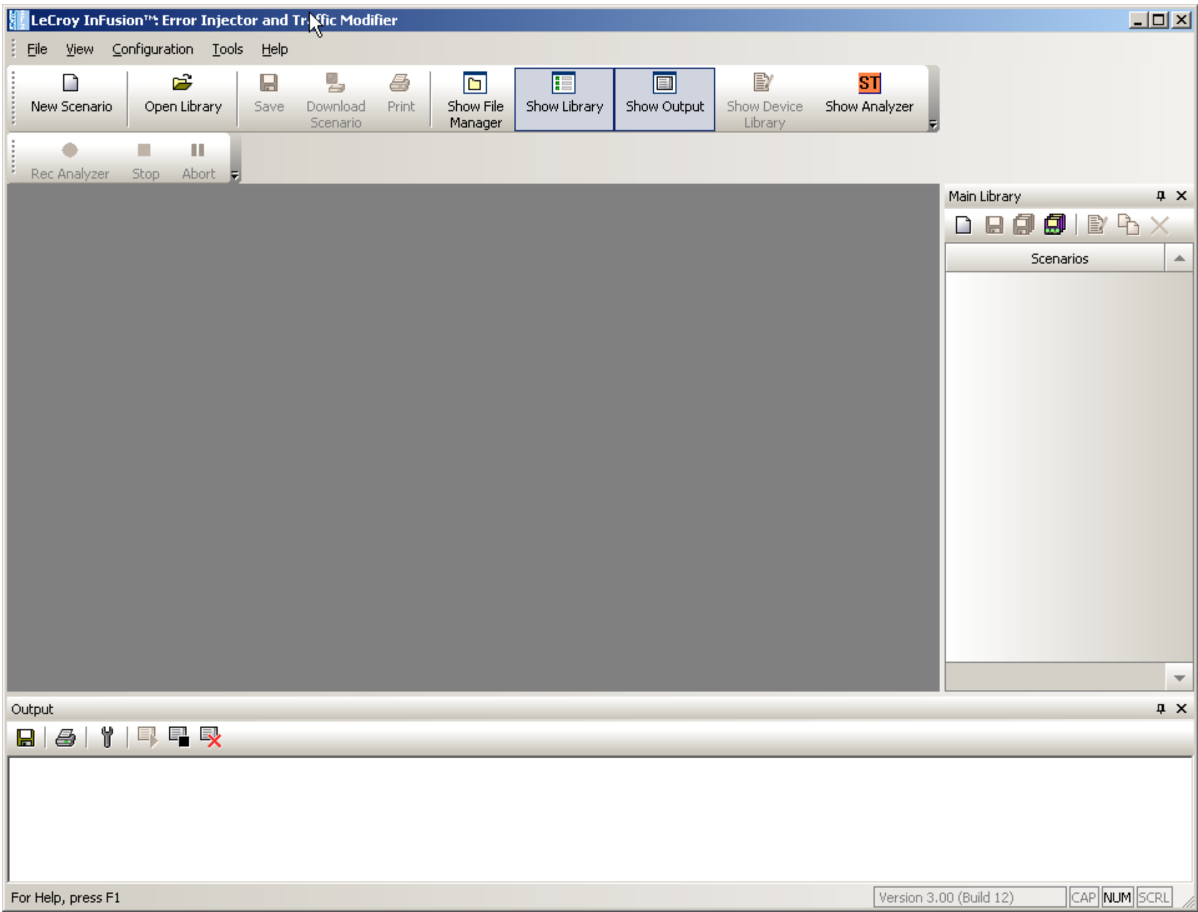


Figure 316 Infusion Windows

Infusion supports SAS SSP, SMP, STP, and SATA-based protocols operating across a single SAS or SATA link up to 6 G. Infusion monitors traffic from both directions in real-time and relies on predefined rules to replace any bit, primitive, or parameter with one you specify. Infusion can change traffic when it detects a specific sequence or reaches a designated time interval, yet it requires no complicated scripts, programming, or simulation tools.

Infusion can monitor traffic in both directions and act on events occurring in either direction of the communications link. Infusion can modify traffic in only one direction within a given test scenario, but that direction can be either from the Initiator or from the Target.

Infusion is specifically designed to verify recovery characteristics within a subsystem. An easy pop-up menu interface allows you to create specific test scenarios in just minutes.

Once a Infusion session starts, the system automatically handles protocol handshaking between devices. Infusion transmits a faithful copy of the original data stream down to the CRC value which, if needed, it recalculates. Infusion allows test engineers to systematically verify error recovery in ways not possible with other test platforms.

Key Features

The key features of Infusion are:

- **Error Injection**: Injects CRC, disparity, 8b/10b encoding, framing, and coding errors.
- **Break Link Recovery**: Programmatically breaks the connection to test link recovery.
- **Value Replacement**: Monitors the link for specific values, patterns, or primitives (as low as bit level) and replace with user-defined values. You can replace values on every occurrence, after a specified number of occurrences, or after a specified time interval.
- **Packet Drop**: Removes individual primitives, address frames, or data frames from the stream to verify retry behavior.
- **Primitive Manipulation**: Replaces handshaking and flow control primitives to help validate robustness of a design.
- **Traffic Monitoring:** Operates as a traffic monitor, collecting statistical data on user-specified parameters. In this mode, data passes unchanged in both directions.
- **Menu-Driven Interface:** Allows easy set-up of test scenarios.
- **API based on C++:** Allows development of custom test applications.

With respect to traffic modification, in the Link Layer you can modify primitives, CRC, scrambled traffic, and SSP, SMP, and STP connection events. You cannot modify clock skew management, OOB and power management, and signal integrity.

Infusion consists of a hardware device that connects to the line under test and a Windows-based software application used to create and download test scripts to the device. You also can use the software application to configure and control the device across an Ethernet link.

Infusion test scripts are called scenarios. Scenarios determine how the hardware device monitors and modifies line traffic. You must use the application to create and download scenarios.

For the Infusion connections, the device is connected between the SAS/SATA host and the PHY of the test target (DUT).

Interface

Buttons

The Infusion interface has the following command buttons:

New Scenario: Begins the scenario creation process by listing Scenario Name, Direction for traffic changes, and Global Rules in the scenario window.

Open Library: Lists the Infusion Library Files (**.infdb**), which contain the available scenarios, in an Open dialog.

Save: Saves the current scenario in the UserData folder.

Download Scenario: Downloads a scenario.

Print: Prints the current scenario.

Show File Manager: Displays/hides the File Manager window (on the right), which displays folders and files in a Windows-Explorer type listing, so that you can locate the main and other library files and their scenarios.

Show Library: Displays/hides the Main Library window (on the right), which displays the available scenarios. You can create a new scenario, save a selected scenario, save the library, save a copy of the library, display the selected scenario, insert a copy of the selected item, or delete the selected scenario.

Show Output: Displays/hides the Output window (at the bottom), which displays Infusion output. Use the buttons to save output, print output, display options (automatically save the log file, with a path and size), start logging, stop logging, and clear the Output window.

Show Device Library: Displays/hides the scenarios of the current device library.

Show Analyzer: Returns to the Protocol Analyzer or Target/Host Emulator window.

Rec Analyzer: Starts recording on the current analyzer, using the current scenario.

Stop: Stops recording on the current analyzer.

Abort: Aborts recording.

Menus

The Infusion interface has the following menus:

File: New Scenario, Open Scenario, New Library, Open Library, Close Library, Save Library, Save a Copy of Library As, Open Log File, and Print Setup (see command descriptions in the "Buttons" section above).

View: Views (File Manager, Library, Output, Customize; see window descriptions in the "Buttons" section above), Smart Docking, Toolbar, and Status Bar

Configuration: Update Sierra Device (see "Update Sierra Device" on page 203)
Configure Device (see "Show Device Library" above)
Port Configuration (see "Port Configuration for Infusion" on page 246)
External Trig Setting (see "External Trig Setting" on page 203)

Tools: Browse UserData, System, or Infusion folder.

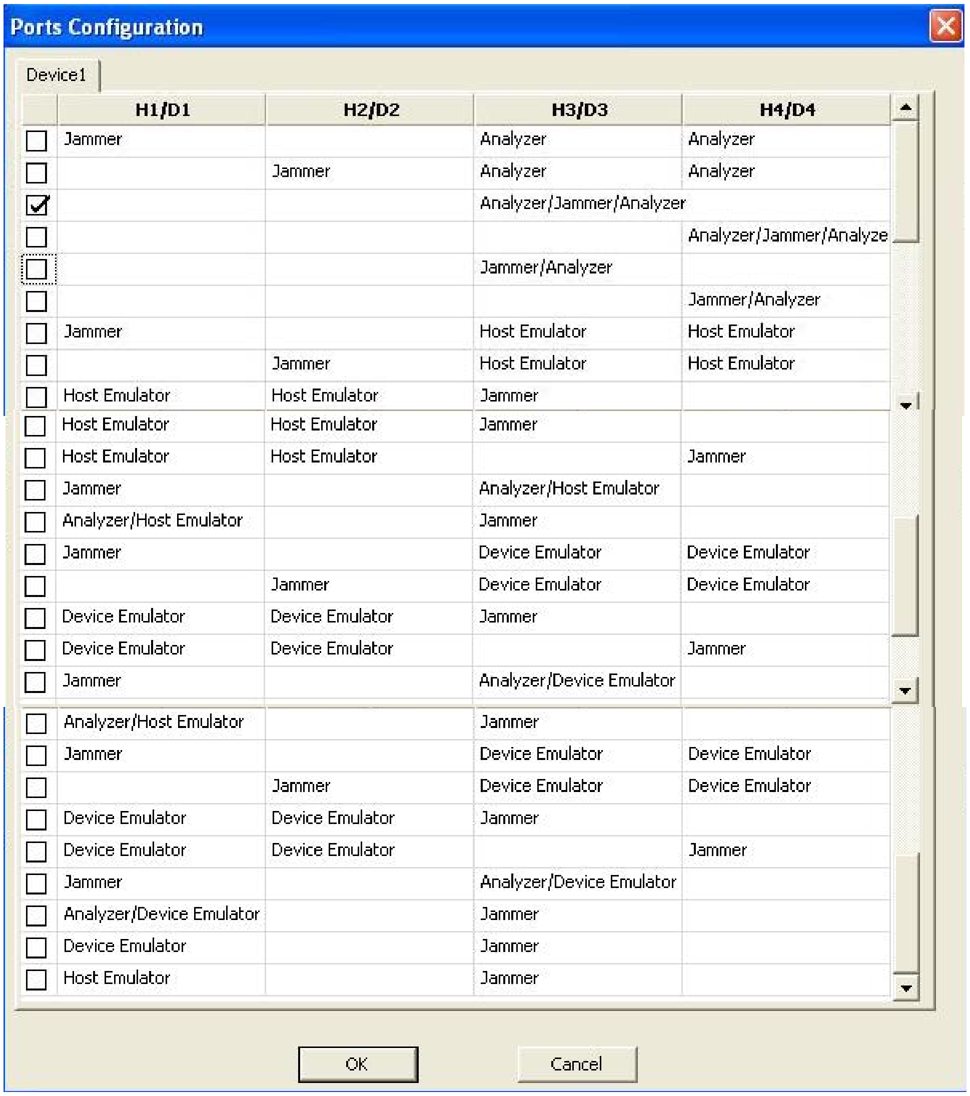
Help: Help Topics and About Infusion.

Port Configuration for Infusion

The Infusion (Jammer) port configurations must match the Analyzer port configurations for the infusion-analyzer to work.

Select **Configuration > Ports Configuration** to display the Ports Configuration dialog. Port configuration depends on the application you run. To act as an infusion-analyzer, select the **Analyzer/Jammer/Analyzer** port configuration.

In the following figure, the third row has a match on the H3/D3 port.



	H1/D1	H2/D2	H3/D3	H4/D4
[ ]	Jammer		Analyzer	Analyzer
[ ]		Jammer	Analyzer	Analyzer
[x]			Analyzer/Jammer/Analyzer	
[ ]				Analyzer/Jammer/Analyze
[ ]			Jammer/Analyzer	
[ ]				Jammer/Analyzer
[ ]	Jammer		Host Emulator	Host Emulator
[ ]		Jammer	Host Emulator	Host Emulator
[ ]	Host Emulator	Host Emulator	Jammer	
[ ]	Host Emulator	Host Emulator	Jammer	
[ ]	Host Emulator	Host Emulator		Jammer
[ ]	Jammer		Analyzer/Host Emulator	
[ ]	Analyzer/Host Emulator		Jammer	
[ ]	Jammer		Device Emulator	Device Emulator
[ ]		Jammer	Device Emulator	Device Emulator
[ ]	Device Emulator	Device Emulator	Jammer	
[ ]	Device Emulator	Device Emulator		Jammer
[ ]	Jammer		Analyzer/Device Emulator	
[ ]	Analyzer/Host Emulator		Jammer	
[ ]	Jammer		Device Emulator	Device Emulator
[ ]		Jammer	Device Emulator	Device Emulator
[ ]	Device Emulator	Device Emulator	Jammer	
[ ]	Device Emulator	Device Emulator		Jammer
[ ]	Jammer		Analyzer/Device Emulator	
[ ]	Analyzer/Device Emulator		Jammer	
[ ]	Device Emulator		Jammer	
[ ]	Host Emulator		Jammer	

Figure 317 Ports Configuration Window with Infusion/Analyzer Port Match

Infusion Scenarios

You can create and execute Infusion scenarios. A scenario is a test script that defines how Infusion monitors and modifies line traffic.

Note: When specifying the direction of traffic in scenario events, you have a choice of eight directions (from I1, T1, I2, T2, and so on). Only “From I1” and “From T1” are valid selections, since only one channel is supported.Any other selection generates an error message.

Scenarios Overview

You create scenarios on a PC running the Infusion application. You then download the scenarios for execution on an Infusion device. You can download up to ten scenarios to each Infusion device.

The Infusion application provides a menu-driven interface for building scenarios. The interface prompts you for simple decisions and choices from drop-down menus. As you make your selections, the script takes shape automatically in the scenario window. The script is in the form of simple English sentences. You need not understand any formal scripting language.

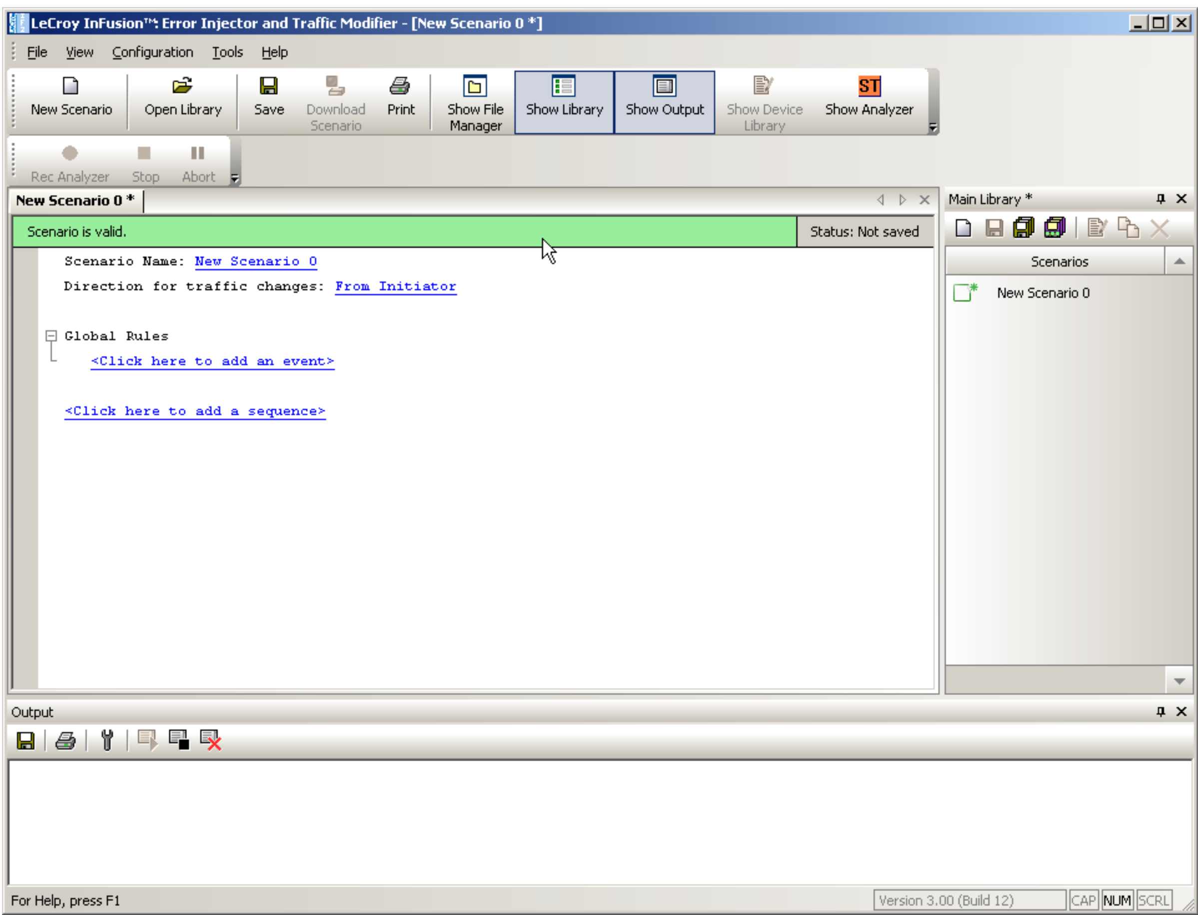


Figure 318 New Scenario in Infusion Window

As described later in this chapter, you can create any number of scenarios and store them in libraries on the PC hard drive. Scenario library files names are in the following format:

`<filename>.infdb`

Creating Infusion scenarios is easy, but it requires an understanding of the following terms defined in Table 1.

Key Scenario Terms

Term	**Definition**
Action	Infusion response to an event.
Event	Condition that is detectable by Infusion.
Combined Event	Logical OR association of events (for example, event A OR event B).
Global Rules	Portion of a scenario that can define a single Infusion test state. You can think of the Global Rules and each sequence as a separate test routine or program operating within the scenario. Each operates independently and in parallel with the others. The purpose of each is to detect events and then respond with the appropriate action or set of actions. In essence, you can operate up to three test states simultaneously within Infusion.
Sequence	Portion of a scenario that can define multiple Infusion test states. More flexible than the Global Rules, a sequence allows more powerful scenarios that include branching and looping between test states (Global Rules can define only a single test state, so there is no branching).
State	“Behavior” of the Global Rules or a sequence at any point in time. In terms of Infusion testing, behavior is “waiting” for a set of events and responding with a set of actions.

Global Rules

Global Rules are a portion of the scenario that can define only one test state. To create the Global Rules, you use the menu-driven interface to enter an event or combined event and the corresponding action or set of actions (the response of Infusion hardware to the event).

In the case of a combined event, the action is taken upon occurrence of any of the events stated for the event combination. It is a logical OR association, meaning any of the events can trigger the action.

After you enter the event or combined event, the interface prompts you for actions. An action might be, for example, injecting a particular primitive or error into the traffic stream. You can enter multiple actions, which take place simultaneously.

After defining the event and actions within the Global Rule area, you can save the scenario and download it to a Infusion device.

Sequences

The Global Rules are all you need for simple test scenarios. However, a scenario also can contain one or two sequences, which can define multiple states and allow branching between states. With a sequence, you also can do looping, which allows you to repeat a test state or to execute a test for a specified period of time.

As with Global Rules, the menu-driven interface guides you in building a sequence. Some of the prompts are different, however, because you now are encapsulating groups of events and actions as distinct states. Recall that a state is a combination of events and actions at a specific point in time. If the event or combined event defined by a state occurs, the corresponding action or set of actions follows.

```
Scenario Name: Test 328
Direction for traffic changes: From Initiator

Global Rules
    Wait for SOF (from Initiator) <Click here to add combined event>
        then Beep (500 ms) <Click here to add another action>
    <Click here to add another event>

Sequence 0
    State 0
        Wait for CRC Error (from Initiator) <Click here to add combined event>
            then Branch to 'State 1' <Click here to add another action>
        <Click here to add another event>
```

Figure 319 Global Rules and Sequence Areas of a Scenario

Infusion hardware provides the capacity to have up to two sequences co-existing in a scenario in addition to the Global Rules. Recall that both the Global Rules and any sequences are active at all times. Each is a separate “state machine,” having the behavior of a particular test state at any point in time. Because the Global Rules has the capacity for only one state, you can view it as a “degenerative state machine.”

Scenario Libraries

You can create any number of scenarios, which you then can archive on your PC hard drive. You also can download up to ten scenarios to each Infusion device for test execution. You can think of the libraries as windows that hold scenarios.

Recall that each library is a separate ***.infdb** file.

Main Library

When you launch the Infusion application, it opens a window called the Main Library. The main library is the default workspace for creating and storing new scenarios. The main library corresponds with the following file in the Infusion folder on the PC hard drive:

```
DEFAULT.INFDB
```

File Libraries

You can save the main library with a name other than default (while still using the **.infdb** file extension). The new file becomes a file library that is functionally equivalent to the main library with the following exception: It does not open by default in the Main Library window. You can navigate to other file libraries using the File Manager of the Infusion application.

In this manual, the main library and other **.infdb** file libraries are collectively called general libraries.

If you select **Open Library,** you see a window similar to the following:

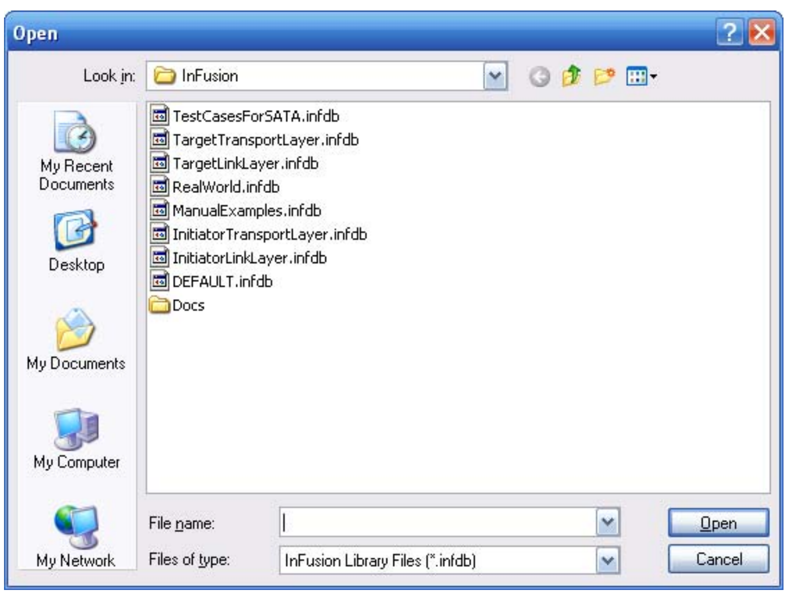


Figure 320 Open Library File List

By selecting the **TestCasesForSATA.infbd** file, you get an additional library window with predefined SATA test cases, similar to the following:

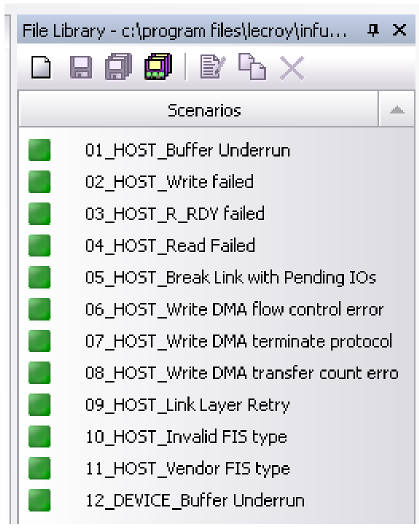


Figure 321 Test Cases for SATA Library

Device Libraries

In addition to general libraries, the application defines device libraries. Each device library is associated with a specific Infusion device. Each device library opens in a separate Device Library window and holds up to ten Infusion scenarios for the device. When you connect to the device and click the entry for that device in the Device List, the device library for the device opens automatically.

The scenarios that appear in the device library are those currently stored on the corresponding device. They were uploaded from the device to your PC when you opened the device library. You can click any of the scenarios listed to open it for editing. When you are finished with your edits, you can use the buttons on the Device Library toolbar to download the revised scenario to the device.

Scenario Properties

To begin the scenario creation process, you click the **New Scenario** button in a library window or on the Infusion application toolbar. As the first step in creating a scenario, the application prompts you for scenario name, a short description (optional), and the direction of traffic to which any traffic changes apply. Changes are, for example, injection or removal of data or a primitive.

You identify direction of traffic change, or modification, in terms of traffic origin. The application uses the following conventions:

- **From Initiator**: Change is made to traffic coming from test host (for example, CRC error is injected into traffic stream sent from initiator to target).
- **From Target**: Modification is made to traffic coming from the target (for example, CRC error is injected into traffic stream sent from target to initiator).

The figure shows the first prompt in the scenario creation process.

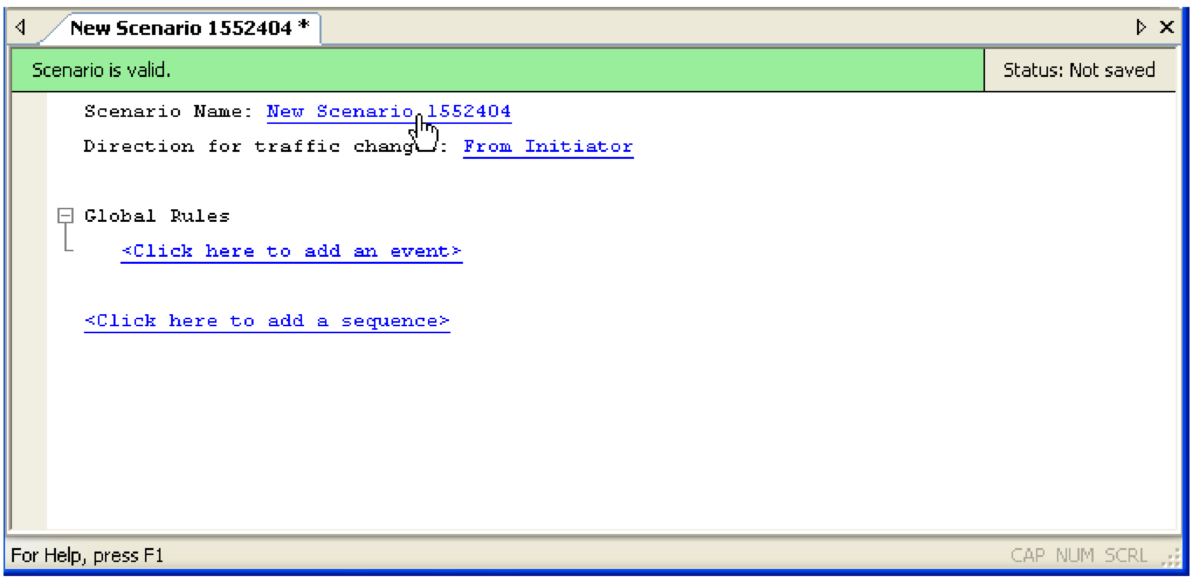


Figure 322 Entering Basic Scenario Information

When you click the Scenario Name or the Direction For Traffic Changes, the Scenario Properties dialog box appears, allowing you to enter the scenario name, a short description, and direction of traffic change.

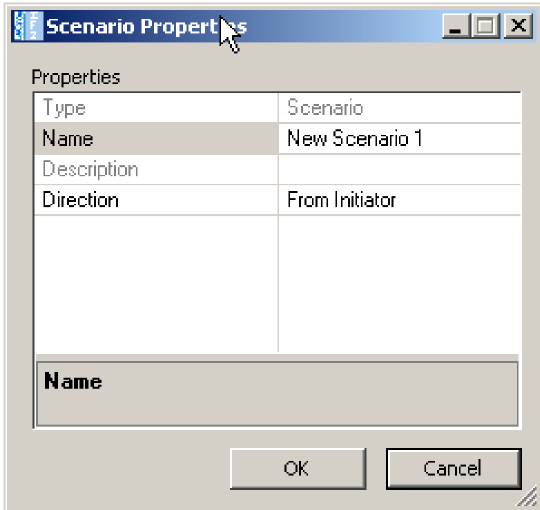


Figure 323 Scenario Properties Dialog Box

In the Scenario Properties screen, the direction for traffic modification is defined on a global basis for the entire scenario. In other words, any scenario action that modifies line traffic only affects the traffic flowing in the direction established at the top of the scenario, in the Scenario Properties. Scenario events can be monitored in either direction, and therefore the parameters for events provide the ability to specify the intended direction for monitoring traffic for that event.

Scenario Events

A scenario is a script you create using simple mouse clicks and text entries. As you work, the script takes shape in the scenario area of the application display. You can think of the scenario area itself as consisting of two subareas: A Global Rules area at the top, where you create the Global Rules, and a Sequence area beneath the Global Rules, where you create any sequences. Whether you are creating Global Rules or a Sequence, the menu-driven interface prompts you to specify the event(s) for which you want to trigger actions.

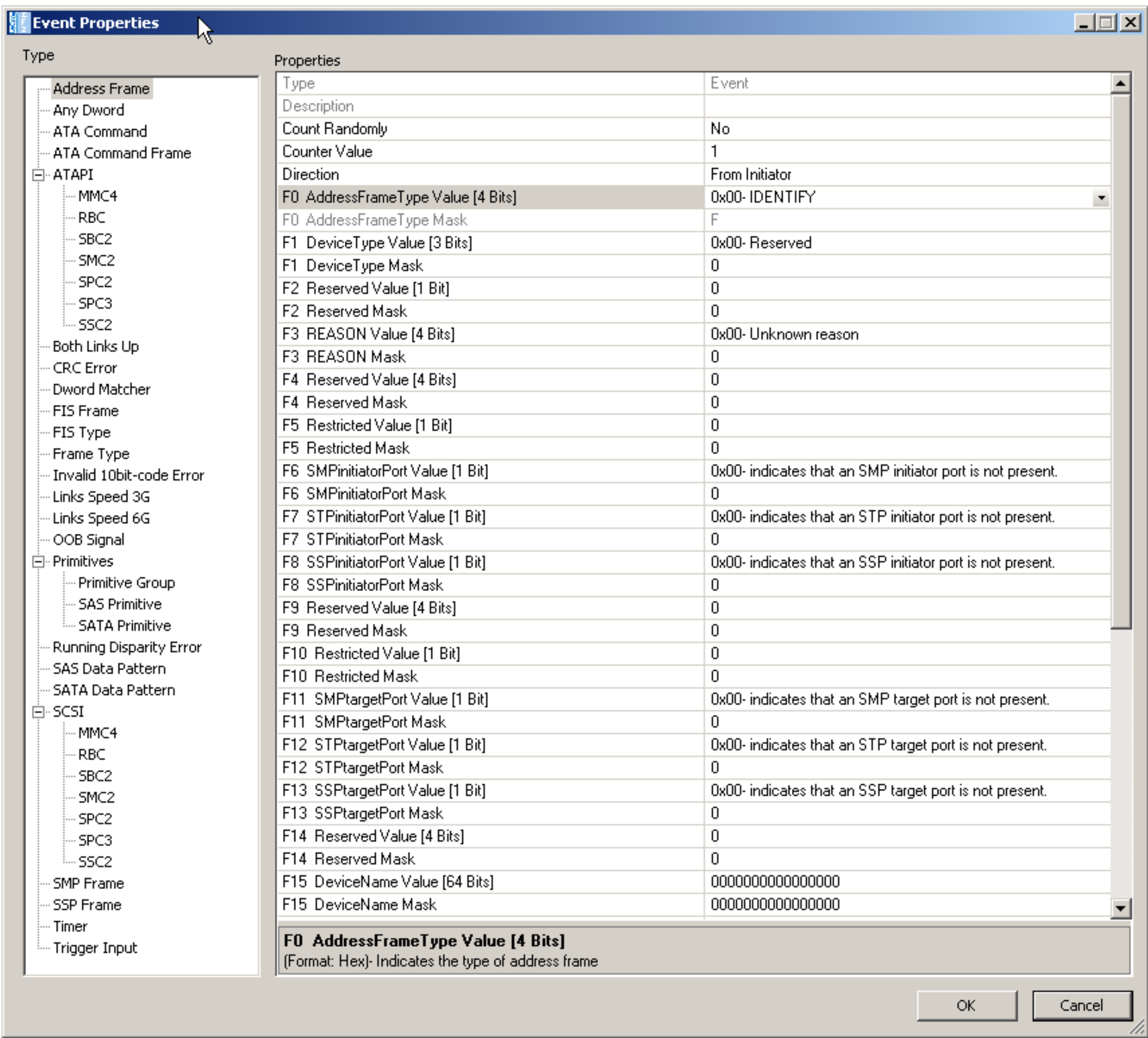


Figure 324 Event Properties Dialog

While many events are line conditions, an event also can be a condition that occurs within a Infusion device (for example, detection of a trigger signal from another device).

The following table lists supported events. Note that some events are applicable only in the context of creating sequences (those events appear on the drop-down list only if you are creating a sequence). Sequences can have multiple states, and they allow branching between states.

Events

Event	Description
Address Frame	Occurrence of a specified address frame.
Any Dword	Occurrence of any dword.
ATA Command	Occurrence of a particular ATA command.
ATA Command Frame	Occurrence of a particular ATA command frame.
[+] ATAPI	Occurrence of a particular ATAPI command from the list: MMC4, RBC, SBC2, SMC2, SPC2, SPC3, or SSC2.
Both Links Up	Occurrence of both line ports active (not idling).
CRC Error	Occurrence of a CRC error.
Dword Matcher	Occurrence of a particular dword.
FIS Frame	Occurrence of a particular FIS frame.
FIS Type	Occurrence of a particular SATA FIS type.
Frame Type	Occurrence of a particular frame type.
Invalid 10bit-code Error	Occurrence of an invalid 10b code.
Links Speed 3G	Both lines operating at 3 Gbps.
Links Speed 6G	Both lines operating at 6 Gbps.
OOB Signal	Occurrence of OOB signal.
[+] Primitives	Occurrence of Primitive Group, SAS Primitive, or SATA Primitive.
Running Disparity Error	Occurrence of Running Disparity (RD) error.
SAS Data Pattern	Occurrence of a particular data pattern in a SAS frame.
SATA Data Pattern	Occurrence of a particular data pattern in a SATA frame.
{+} SCSI	Occurrence of a particular SCSI command from the list: MMC4, RBC, SBC2, SMC2, SPC2, SPC3, or SSC2.
SMP Frame	Occurrence of a particular SMP frame.
SSP Frame	Occurrence of a particular SSP frame.
Timer	Occurrence of a particular elapsed time (time period).
Trigger Input	Occurrence of input trigger.

The following sections provide some additional details about three of the above events.

Dword Matcher

Dword Matcher is a dword pattern matcher that presents match and mask fields and a K-Code Mask field. K-Codes are control characters that are always used in the first byte of a four-byte primitive. Of the K-Code masks listed in the menu, D-D-D-D is used for data bytes, and K-D-D-D is used for all primitives.

When you create a dword match, keep the following in mind:

- The pattern can be inside or outside of frames (it does not matter if the pattern is inside a frame or not).
- Because the pattern can be inside or outside of frames, there is no offset.
- You can make user-defined primitives. (This is the reason this feature was created.)
- You can use any K/D pattern.

SAS Data Pattern

When you create a SAS data pattern, keep the following in mind:

- The pattern must be defined inside a frame that starts with a SOF or SOAF.
- The pattern must be data only (no K-codes/primitives).
- The pattern must be defined at a specific offset in the frame.
- The pattern and mask must be specified in the same format as specified in the SAS standard:
  0x12345678 (hex)
  where “1” is the first digit on the cable and is the MSB as given in the SAS Standard.

For example, for an SMP Request:

```
Pattern: 0x40000000
Mask: 0xFF000000
Offset: 0
SOF Type: SOF
```

SATA Data Pattern

When you create a SATA data pattern, keep the following in mind:

- The pattern must be defined inside a frame that starts with a SATA_SOF.
- The pattern must be data only (no K-codes/primitives).
- The pattern must be defined at a specific offset in the frame.
- The pattern and mask must be specified in the same format as specified in the SATA Standard.

For example, for Register H -> D FIS:

```
Pattern: 0x00000027
Mask: 0x000000FF
Offset: 0
SOF Type: SATA_SOF
```

Scenario Actions

After you enter the set of events for a test state, the menu-driven interface prompts you for the corresponding action or set of actions. If you define multiple actions, the actions occur simultaneously.

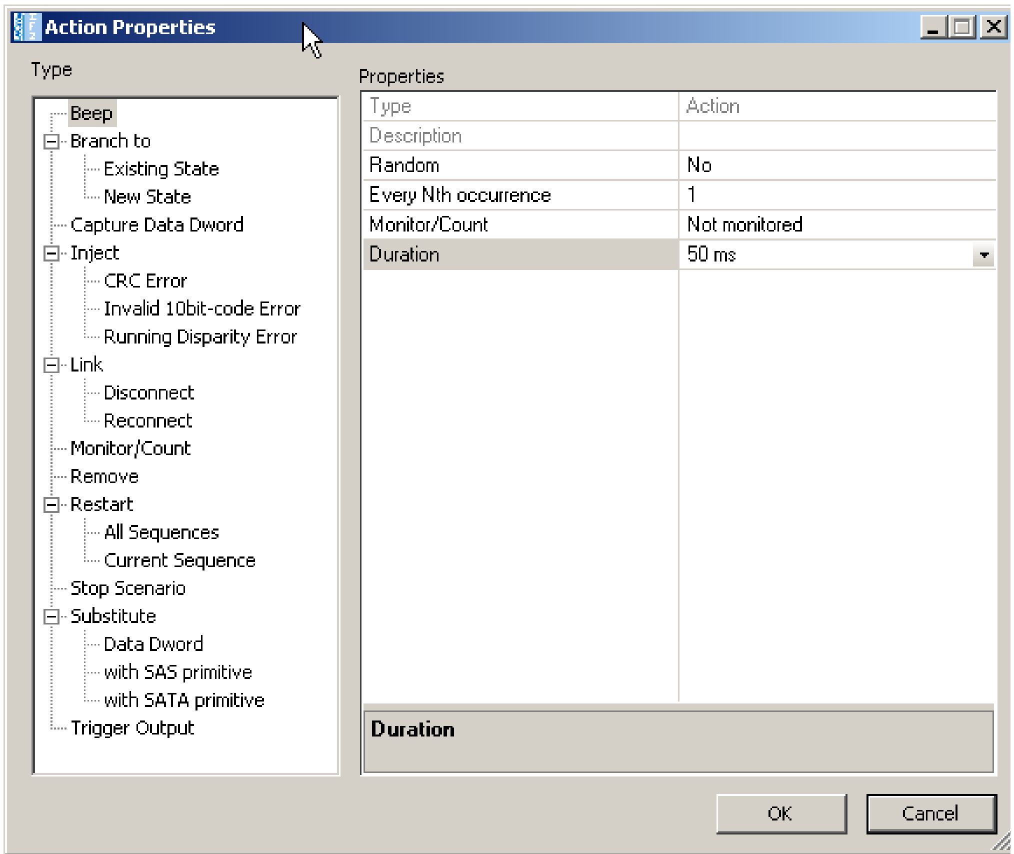


Figure 325 Action Properties Dialog

The following table lists supported actions. Note that some of these actions only apply to creating sequences.

Test State Actions

Action		Description
Beep		Emits audible sound of duration selectable via drop-down list.
Branch to	Existing State[1]	Go to a state in this sequence that is already defined.[1]
	New State[1]	Go to a state in this sequence that is not yet defined (you need to define it).[1]
Capture Data Dword		Captures a data dword into one of four registers.
Inject	CRC Error	Injects a CRC error into the line.
	Invalid 10bit-code Error	Injects invalid 10b code into the line.
	Running Disparity Error	Injects a Running Disparity (RD) error into traffic.
Link	Disconnect	Puts both Infusion SAS ports at electrical idle immediately.
	Reconnect	Starts traffic pass-through immediately. This action restarts traffic after a previous disconnect command. Once traffic is passing through, the initiator and target resume OOB signaling.
Monitor/Count		Opens a window to count the number of events that occur during a session. A session is a time interval during which a scenario runs.
Remove		Removes the targeted event from the traffic.In Infusion, a Remove primitive action is implemented by replacing the primitive with an idle data dword. A Remove frame action is implemented by replacing the start-of-frame and end-of-frame primitives with an idle data dword.
Restart	All Sequences[1]	Restart all sequences in the scenario.[1]
	Current Sequence[1]	Restart the sequence that contains this action definition. [1]
Stop Scenario		Stops all scenario activity.
Substitute	Data Dword	Substitutes a data Dword in the traffic.
	with SAS Primitive	Substitutes a SAS primitive in the traffic.
	with SATA Primitive	Substitutes a SATA primitive in the traffic.
Trigger Output		Sends a signal out the trigger port to the device downstream.

[1] Only shown in Action Properties dialog box when creating a sequence.

Using Counters in Events and Actions

Many of the events and actions supported by Infusion also support counters that can control functions.

Within events, counters determine how many times the event must occur before the associated actions are triggered. Event counters typically have two properties:

- **Count Randomly**: Can be set to “Yes” or “No” (default value is “No”).
  If set to “Yes”, the event repeats a random number of times (between 1 and the value set in the property **Max Random Count**, which replaces the property **Counter Value** when “Yes” is selected), before the action is triggered.
- **Counter Value**: Number of repeats required when **Count Randomly** is set to “No”. The default value is 1.

Within actions, counters determine how many times the system calls the action before it acts. Action counters typically have two properties:

- **Random**: Can be set to “Yes” or “No” (default value is “No”).
  If set to “Yes”, the action triggers a number of occurrences before the action takes place. That number ranges randomly between 1 and the value set in the property **At least every Nth occurrence**, which replaces the property **Every Nth occurrence** when “Yes” is selected.
- **Every Nth occurrence**: Number of times the system calls the action before it acts.

Note that there is some overlap in the way these counters can be used. For example, in the simple case of a single event leading to a single action, it makes no difference whether you specify the event to require five repeats before triggering the action, or the action to require five occurrences before it acts.

However, in the case of combined events and/or actions, the separate counters provide flexibility in designing test cases. For example, consider the case where Event_1 OR Event_2 leads to Action. If Event_1 has a counter of 5, then the Action triggers either when Event_1 has repeated five times or when Event_2 happens the first time, whichever occurs first.

But if the event counters are set to 1 and the Action counter is set to 5, then the Action happens after five occurrences of EITHER Event_1 or Event_2.

Capturing a Data Dword

Infusion provides the ability to capture individual data dwords and provides four different registers to store captured dwords (Dword #0, #1, #2 and #3).

To capture a data dword, select **Capture Data Dword** from the Action Properties screen, as shown below. Select the register to be used to store the dword from the drop-down menu under the **Capture Register** property.

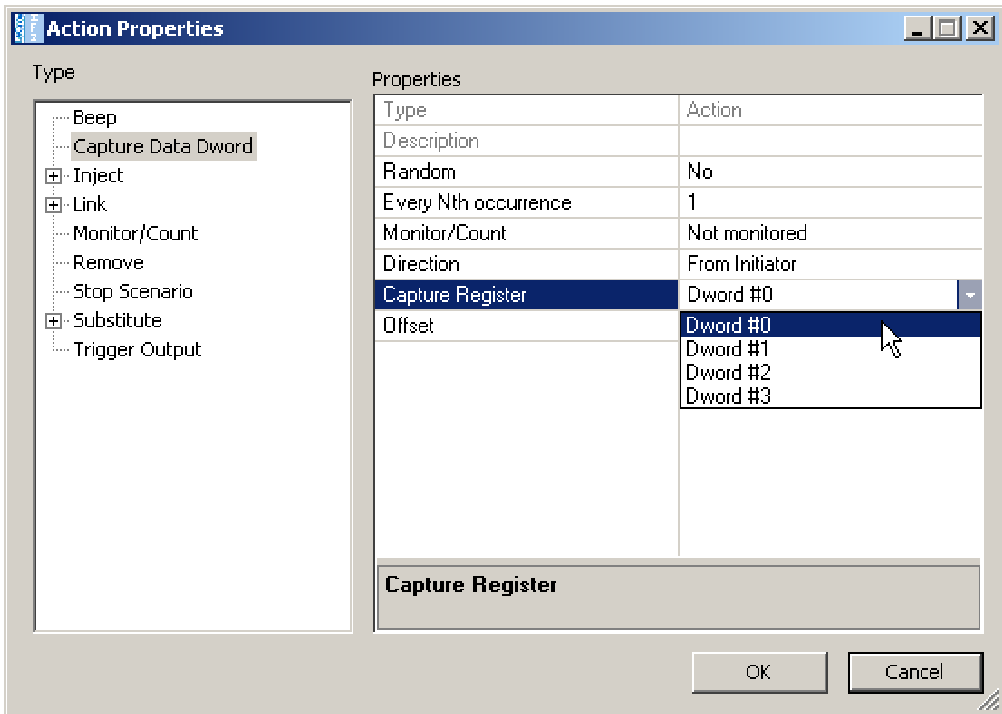


Figure 326 Capture Data Dword Action

Using Captured Data Dwords

Captured data dwords can be used in creating events for data that match the captured dword(s), or in creating actions to substitute the captured dword(s) into the data stream.

To create an event using the captured dword, in the Event Properties menu, select **SAS Data Pattern** (or **SATA Data Pattern**), and then select any of the 12 dwords (**Dword 0 Type** through **Dword 11 Type**). The drop-down menu provides the choice of a custom dword or any of the four captured dwords. If you select a captured dword, the **Value** field beneath this selection is hidden (the **Value** field is only used for specifying custom dwords). Note that choice of a mask and an offset are still available when using captured dwords.

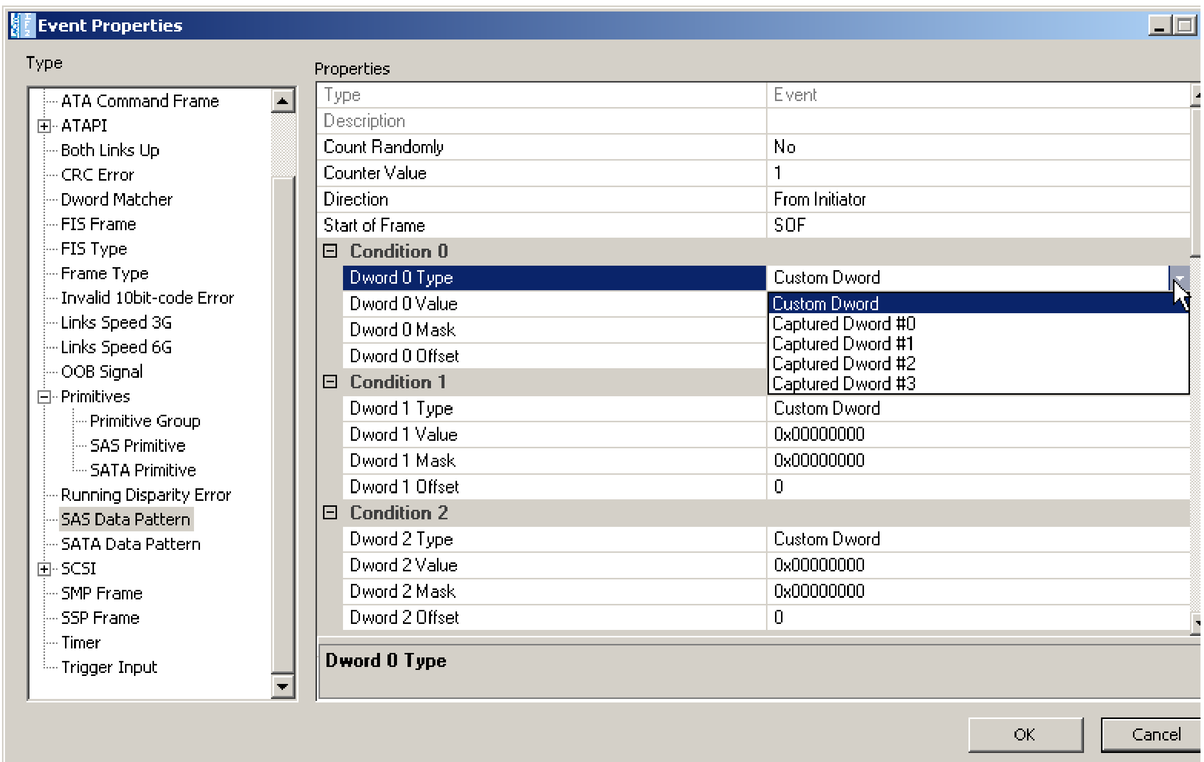


Figure 327 Using a Captured Dword in a SAS Data Pattern

Captured data dwords may also be used in the **Substitute Data Dword** test state action. From the Action Properties screen, choose **Substitute Data Dword** and then select the **Substitute for** property. A drop-down menu is provided (see below) that allows the choice of a custom dword or any of the four captured dword registers.

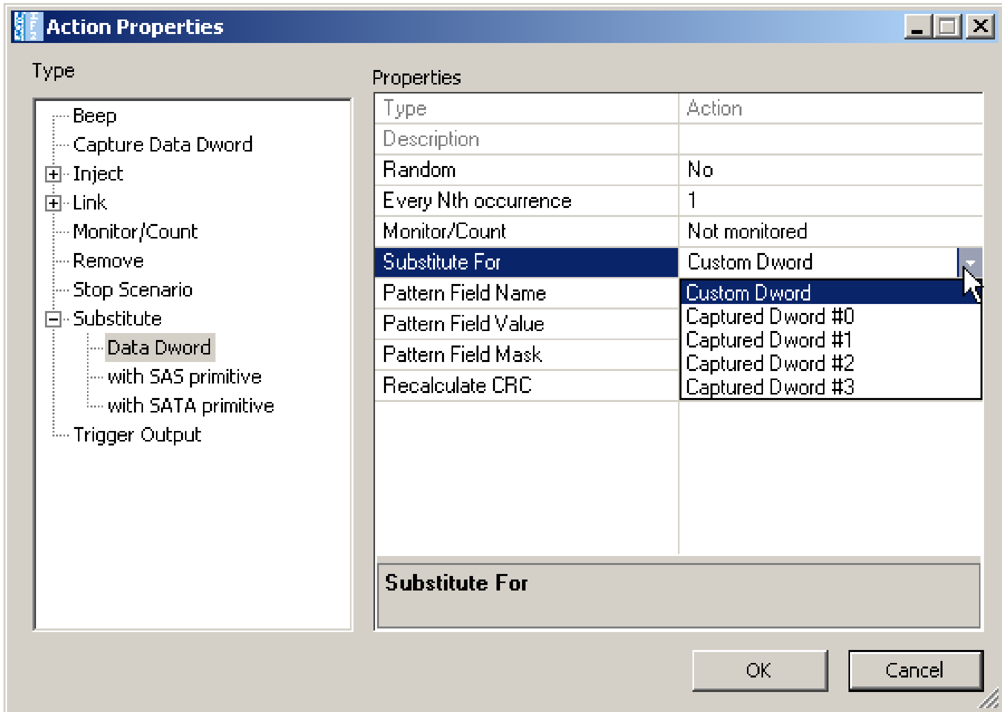


Figure 328 Using a Captured Data Dword in Substitute Dword Test Action

Summary of Scenario Creation

The suggested process of creating and executing a scenario is as follows:

Step 1 Create a scenario in the main library.

Step 2 Copy the scenario from main library to a device library by drag-and-drop with a mouse. (Each device library is associated with a specific Infusion device.)

Step 3 Download all scenarios in the device library to a Infusion device.

Step 4 Select the scenario in the device library that you want to run on the device.

Step 5 To run the scenario, click the **Start Scenario** button from the Device Library toolbar. The device starts to monitor/modify traffic.

Note: Step 1 is described in detail for each example in following sections. Steps 2 to 5 are described in detail at the end of this chapter.

Creating Global Rules

This section gives examples for creating the Global Rules area of a scenario. Recall that the Global Rules area defines a single test state. The Global Rules do not have the capacity for multiple states, so that area of a scenario cannot change state.

In terms of Infusion testing, a state defines test “behavior.” In this context, behavior is “waiting” for an event and responding with an action or set of actions that happen simultaneously.

Keep in mind that a test state you implement with the Global Rules operates in parallel with the active test state of each sequence in the scenario.

In effect, Infusion lets you do up to three line tests at the same time. You can do one test with the Global Rules and a separate test with each sequence you create. You can have up to two sequences in a scenario.

The following table summarizes the Global Rules examples that follow.

Global Rules Examples

Example	Description
1	Creating a single event and action (removes a primitive).
2	Creating a single event and action (replaces a primitive).
3	Creating a combined event (a logical OR association of multiple events) and an action.
4	Creating multiple triggers and actions.
5	Creating multiple actions on a single event.
6	Using timers.

Example 1: Creating a Single Event and Action that Removes a Primitive

In this example, the Global Rules area of the scenario waits for each RRDY Normal primitive from the initiator and removes it.

Step 1 Click the **New Scenario** button in the main library or one of the device libraries.

Step 2 In the Scenario Properties dialog, enter the scenario name, description, and direction of traffic change (see Figure 323 on page 253).

Step 3 In the Global Rules area, click the prompt to **add an event**.

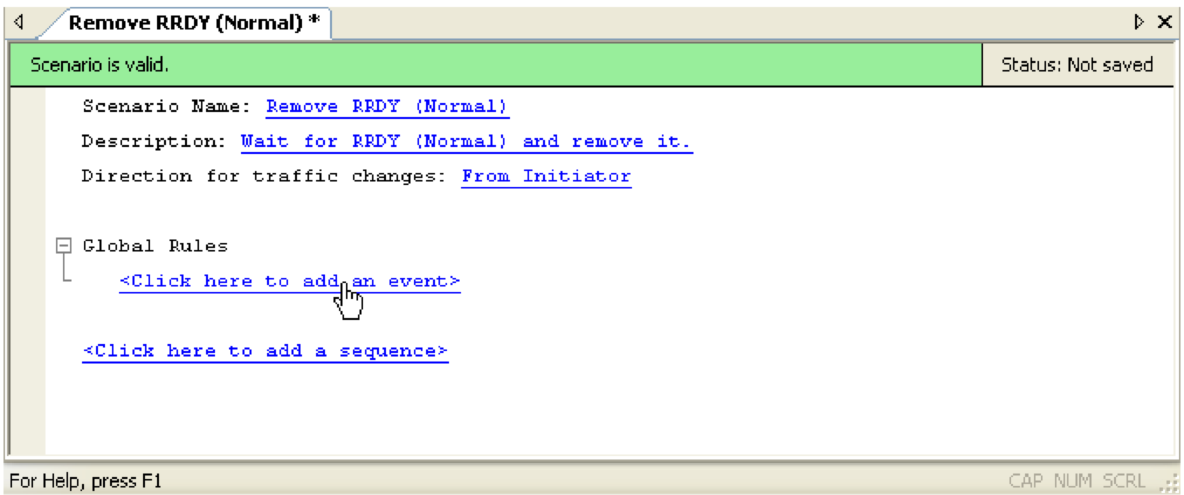


Figure 329 Example 1: Adding an Event

The Event Properties dialog box appears (see Figure 324 on page 254).

Step 4 In the Type column of the Event Properties dialog, choose **Primitive > SAS Primitive**.

Step 5 In the Type column in the middle of the dialog box, click **Description** if you want to add a description of the event.

Step 6 Click **Direction** to choose the direction of traffic to monitor for the selected event (the default is **From Initiator**, which is what you want for this example).

Step 7 Still in the middle column of the Event Properties dialog box, click **Primitive** to display a drop-down menu that lets you choose the type of primitive for which you want to wait in this scenario. In this example, it is **RRDY (Normal)**.

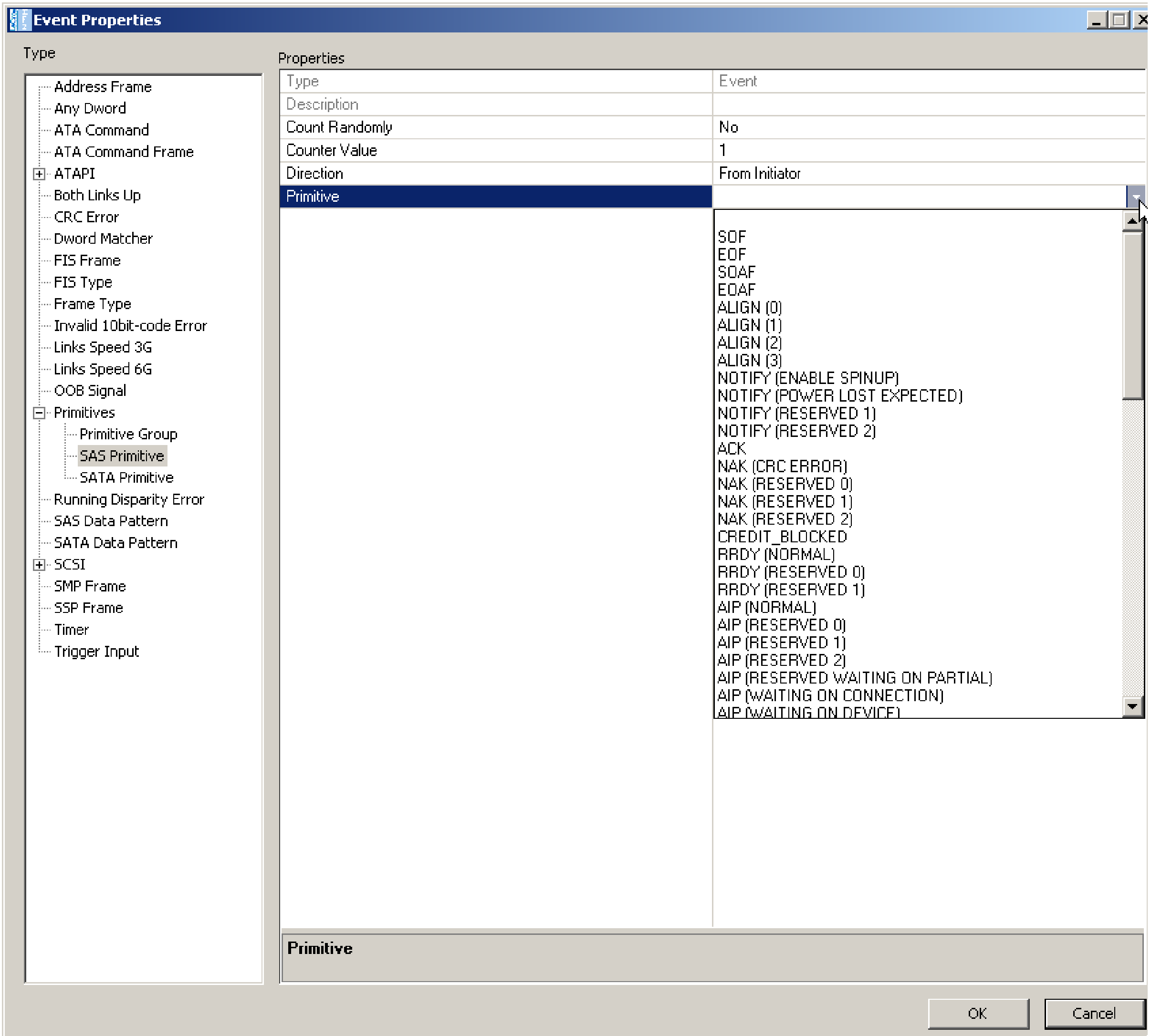


Figure 330 Example 1: Event Drop-Down List

Step 8 Click **OK** to close the Event Properties dialog box.

Step 9 In the Global Rules area, click the prompt to **add an action**.

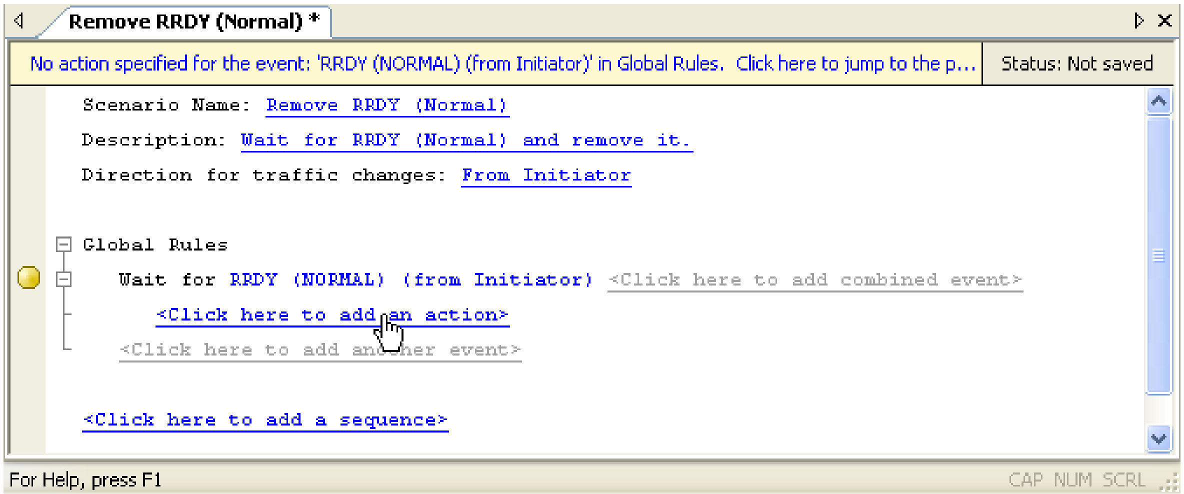


Figure 331 Example 1: Entering an Action

The Action Properties dialog box appears (see Figure 325 on page 257).

Step 10 In the Type column on the left, choose the action that you want to occur when an RRDY is detected. In this example, it is the **Remove** action. In Infusion, a Remove primitive action is implemented by replacing the primitive with an idle data dword.

Step 11 Click **OK** to close the Action Properties dialog box.

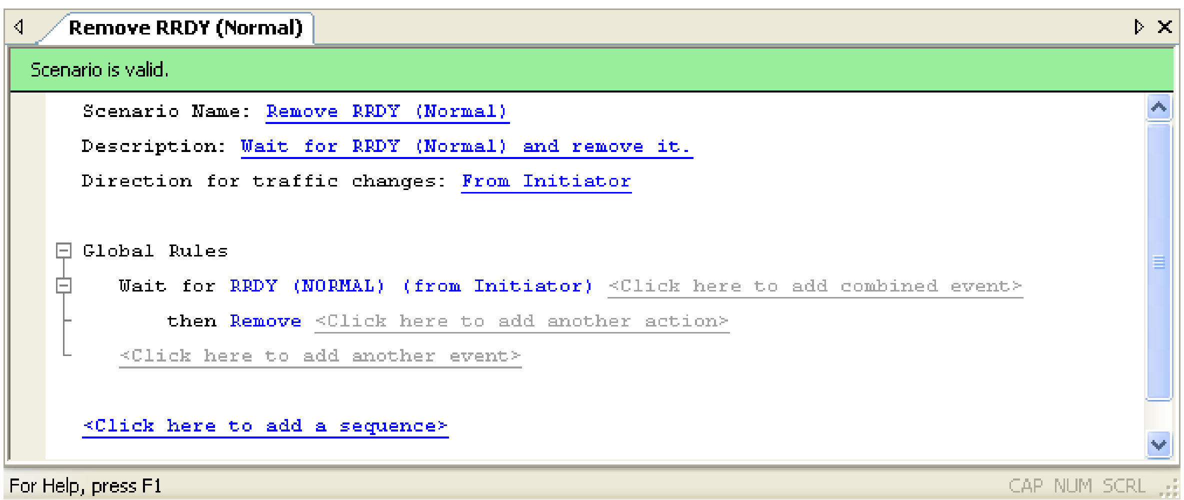


Figure 332 Example1: Complete Scenario

Step 12 In the File menu, select **Save Scenario** to save the scenario.

Example 2: Wait for a Primitive and Replace It with an Error

In this example, the Global Rules portion of the scenario waits for each RRDY Normal primitive and replaces it with an ERROR primitive.

Step 1 Click the **New Scenario** button in the main library or one of the device libraries. In the Scenario Properties dialog, enter the scenario name, description, and direction of traffic change.

Step 2 In the Global Rules area, click the prompt to **add an event** to display the Event Properties dialog box.

Step 3 As you did in the previous example, choose **RRDY (Normal)** as the type of primitive to monitor.

Step 4 In the Global Rules area, click the prompt to **add an action** to display the Action Properties dialog box.

Step 5 In the Type column on the left, choose **Substitute > with SAS Primitive** as the action that you want when an RRDY (Normal) occurs.

Step 6 In the middle column of the dialog box, click **Description** if you want to add a description of the action.

Step 7 Still in the middle column of the Event Properties dialog box, click **Primitive** to display a drop-down menu that lets you choose the type of primitive for which to substitute for RRDY (Normal) (see Figure 330 on page 265). Choose **ERROR**.

Step 8 Click **OK** to close the Action Properties dialog box.

Step 9 In the File menu, select **Save Scenario** to save the scenario.

In this example, you set the substitution action to happen at every occurrence of an RRDY (Normal) (as shown in the figure, the action is set for every occurrence). However, you can set an action to happen at other multiples of event occurrence (for example 5, 25, 1000 and so on). You also can set the action to happen at random, within a specified number of event occurrences.

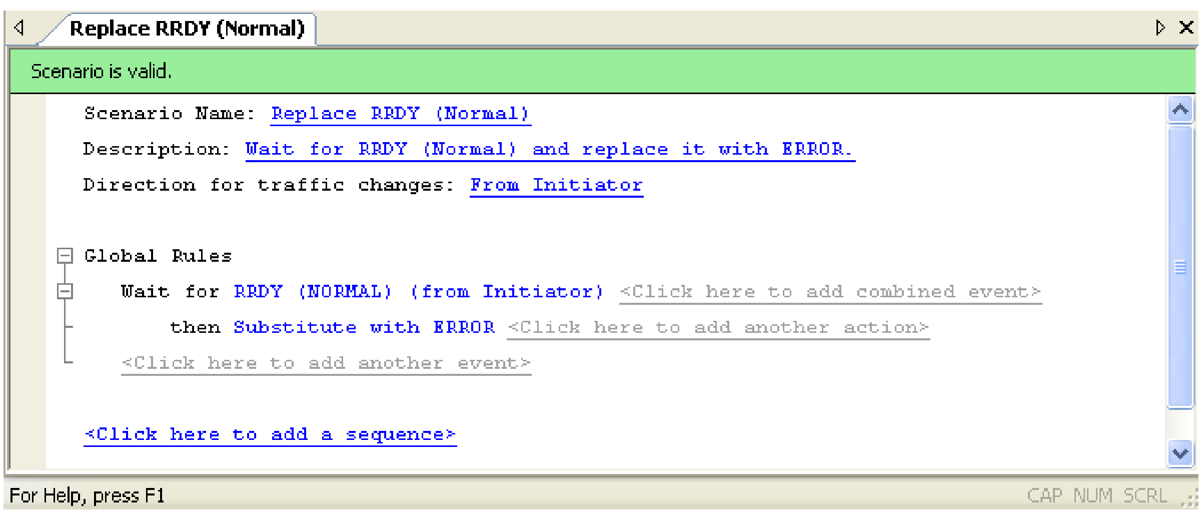


Figure 333 Example 2: Complete Scenario

Example 3: Creating OR Conditions

In this example, the Global Rules area of the scenario waits for either of two types of RRDY primitive and replaces them with an ERROR primitive.

This example includes a combined event (a logical OR association of two or more single events). Here, the combined event consists of any occurrence of RRDY (Normal) or RRDY (Reserved 0).

Step 1 Click the **New Scenario** button in the main library or one of the device libraries. In the Scenario Properties dialog, enter the scenario name, description, and direction of traffic change.

Step 2 In the Global Rules area, click the prompt to **add an event** to display the Event Properties dialog box.

Step 3 As you did in example 1 of this chapter, choose **RRDY (Normal)** as the first primitive that you want to monitor.

Step 4 Click the **add combined event** prompt to add a second event.

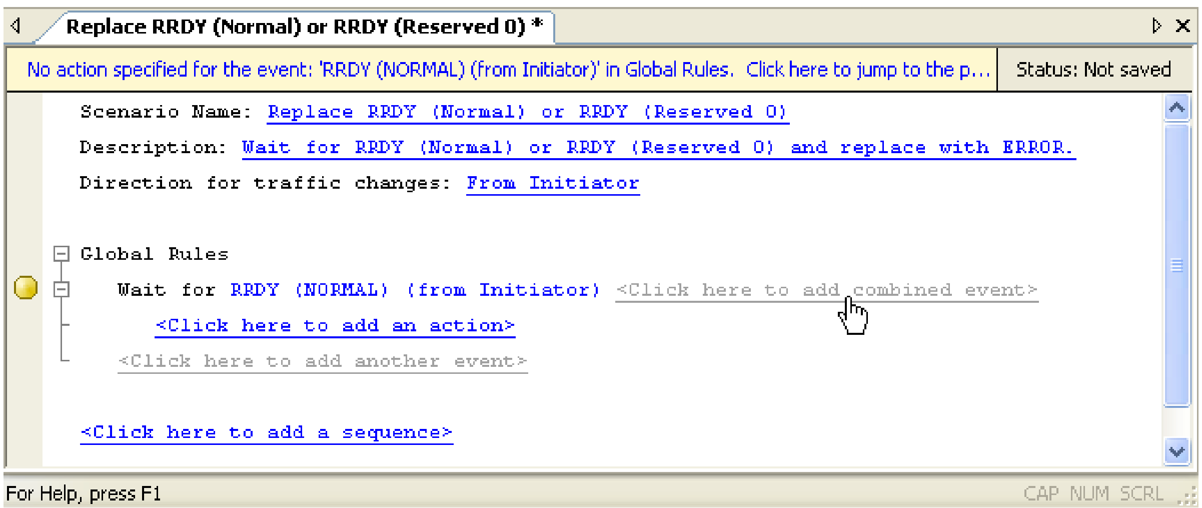


Figure 334 Example 3: Entering the Second Event

The Event Properties dialog box appears.

Step 5 Choose **RRDY (Reserved 0)** as the second primitive that you want to monitor.

Step 6 Click **OK** to close the Event Properties dialog box.

Step 7 In the Global Rules area, click the prompt to **add an action** to display the Action Properties dialog box.

Step 8 In the Type list on the left, choose **Substitute SAS Primitive** as the action that you want when either RRDY Reserved 0 or RRDY Normal occurs.

Step 9 Click **OK** to close the Action Properties dialog box.

Step 10 In the File menu, select **Save Scenario** to save the scenario.

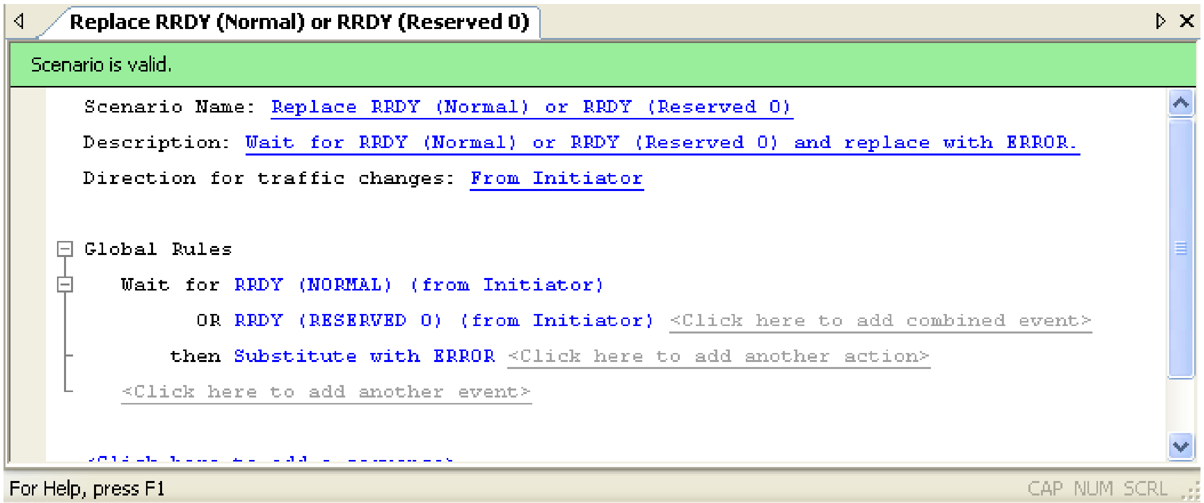


Figure 335 Example 3: Complete Scenario

Example 4: Multiple Triggers and Actions

In this example, the Global Rules area of the scenario waits for two events, each of which triggers a different action.

Step 1 Click the **New Scenario** button in the main library or one of the device libraries. In the Scenario Properties dialog, enter the scenario name, description, and direction of traffic change.

Step 2 As you did in example 2, choose **RRDY (Normal)** as the first event to monitor, and substitute with the SAS primitive **ERROR** as action.

Step 3 In the Global Rules area, click the prompt to **add the next event** (keep in mind this is not a combined event).

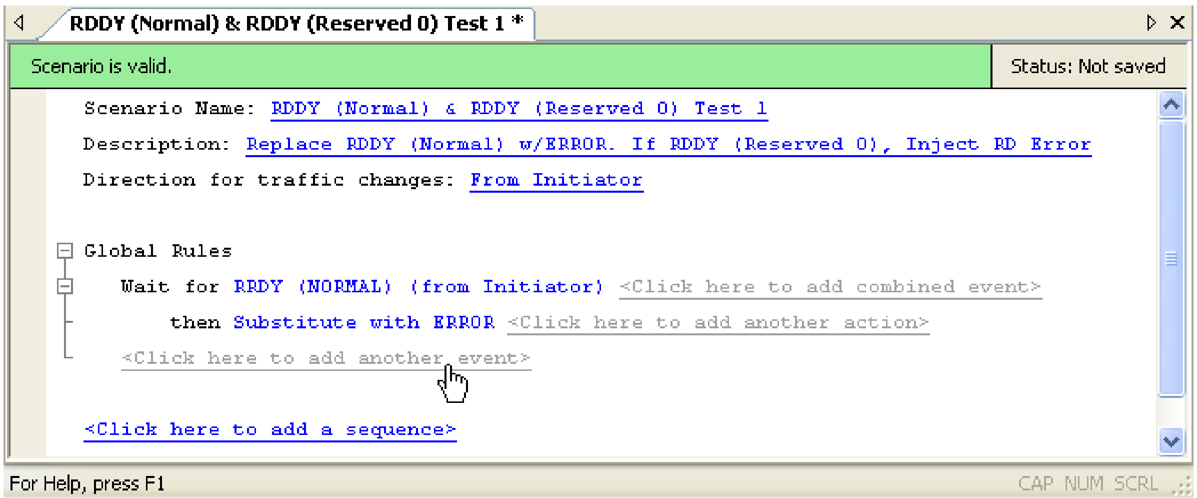


Figure 336 Example 4: Entering Second Event

The Event Properties dialog box appears.

In this example, there is a parallel set of events, but each event is associated with its own action. In a combined event, there is a parallel set of events sharing the same action.

Step 4 Using the drop-down menu, choose **RRDY (Reserved 0)** as the second event to monitor.

Step 5 Click **OK** to close the Event Properties dialog box.

Step 6 In the Global Rules area, click the prompt to **add an action** to be triggered by the RRDY (Reserved 0).

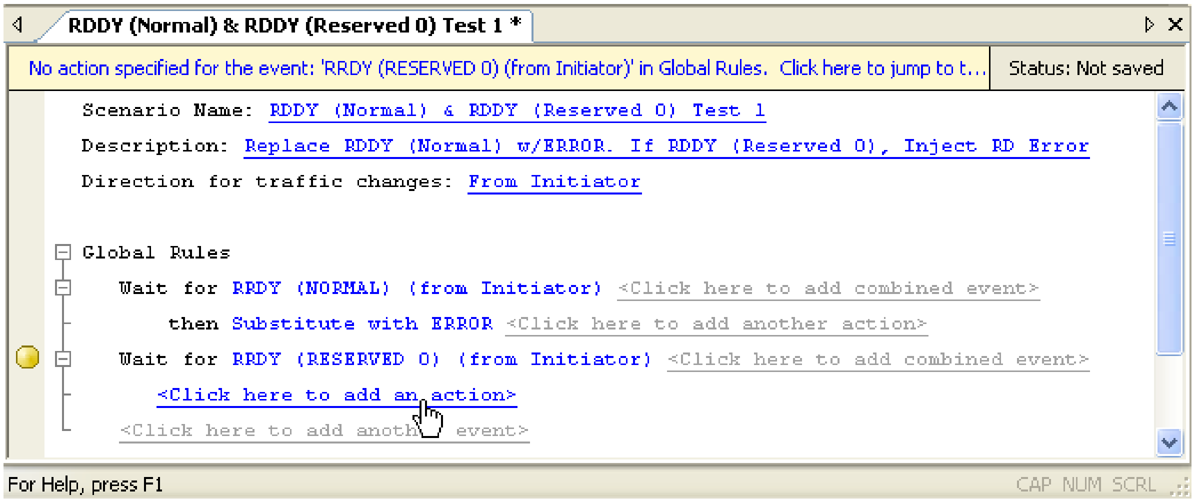


Figure 337 Example 4: Entering Second Action

The Action Properties dialog box appears.

Step 7 Use it to choose **Inject RD Error** as the action triggered by RRDY (Reserved 0).

Step 8 Click **OK** to close the Action Properties dialog box.

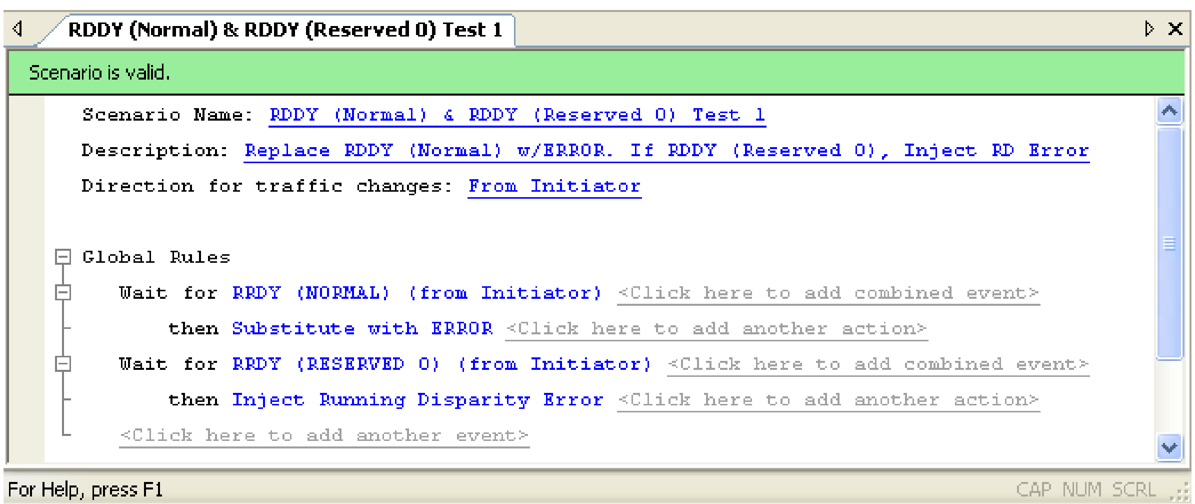


Figure 338 Example 4: Complete Scenario

Step 9 In the File menu, select **Save Scenario** to save the scenario.

Example 5: Multiple Actions on a Single Event

In this example, an event triggers a set of actions. The actions occur at the same time. The device waits for an ACK from the initiator. When it occurs, the device beeps, injects an RD error, and increments a counter monitoring for that event (ACK from initiator).

Step 1 Click the **New Scenario** button in the main library or one of the device libraries. In the Scenario Properties dialog, enter the scenario name, description, and direction of traffic change.

Step 2 As in previous examples, configure the first event and its response in the Global Rules area. Choose **ACK** primitive as the event and **Beep** as the action. From the Action Properties drop-down menu, enter **500 ms** as the duration of the beep.

Step 3 Click the **add another action** prompt to add a second action.

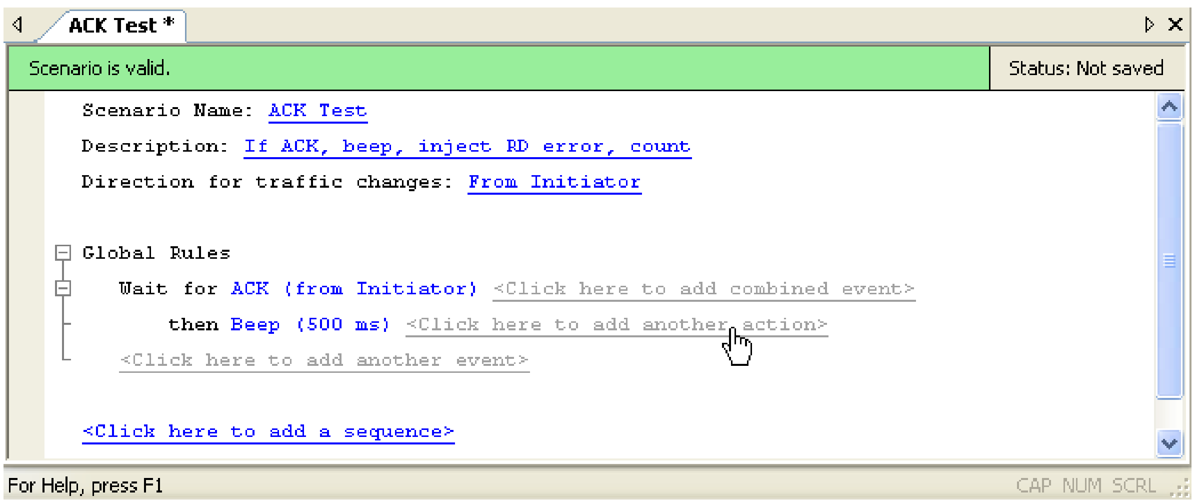


Figure 339 Example 5: Entering the Second Action

The Action Properties dialog box appears.

Step 4 Choose **Inject RD Error** as the second action.

Step 5 Click the **add another action** prompt to add a third action.

The Action Properties dialog box appears.

Step 6 Choose **Monitor/Count** as the third action.

Step 7 Click **OK** to close the Action Properties dialog box.

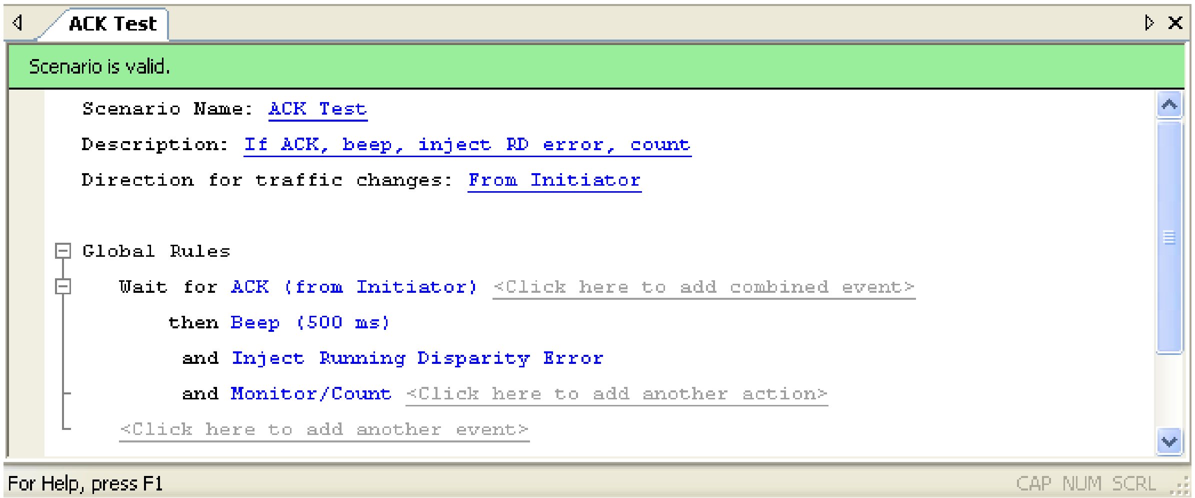


Figure 340 Example 5: Complete Scenario

Step 8 In the File menu, select **Save Scenario** to save the scenario.

This example sets the counter to increment at each occurrence of an ACK (every 1 ACK).

Example 6: Using Timers

In this example, the Global Rules portion of the scenario waits for an ACK primitive from the initiator. Each time the device detects an ACK, it injects an RD Error into the traffic stream. This state continues for a random period of time, not to exceed 1.790 seconds. After the time period has elapsed (timer times out), the scenario stops.

Although this example sets the timer for a random period, you also can set the timer for known values (2 ms., 5 mins., 1 hr., and so on).

Step 1 Click the **New Scenario** button in the main library or one of the device libraries. In the Scenario Properties dialog, enter the scenario name, description, and direction of traffic change.

Step 2 As in previous examples, configure the first event and its response in the Global Rules area. Choose **ACK** primitive as the event and **Inject RD Error** as the action.

Step 3 Click the prompt to **add another event** (keep in mind this is not a combined event).

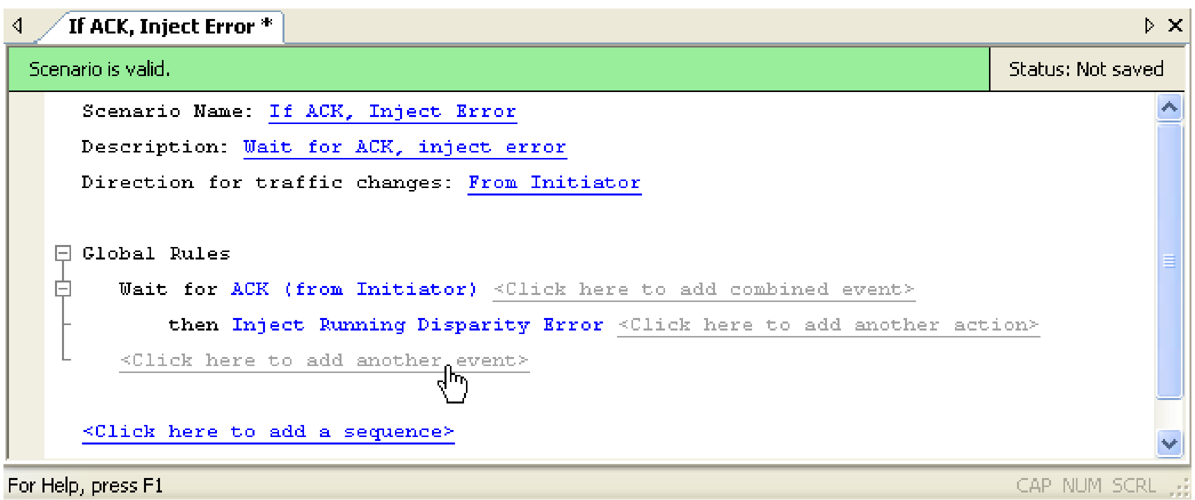


Figure 341 Example 6: Entering the Second Event

The Event Properties dialog box appears.

Step 4 In the Type column on the left, choose **Timer**. Set the timer for random timing with a maximum time limit of 1.790 seconds.

Step 5 Click **OK** to close the Event Properties dialog box.

Step 6 Click the prompt to **add an action** to correspond with the second event.

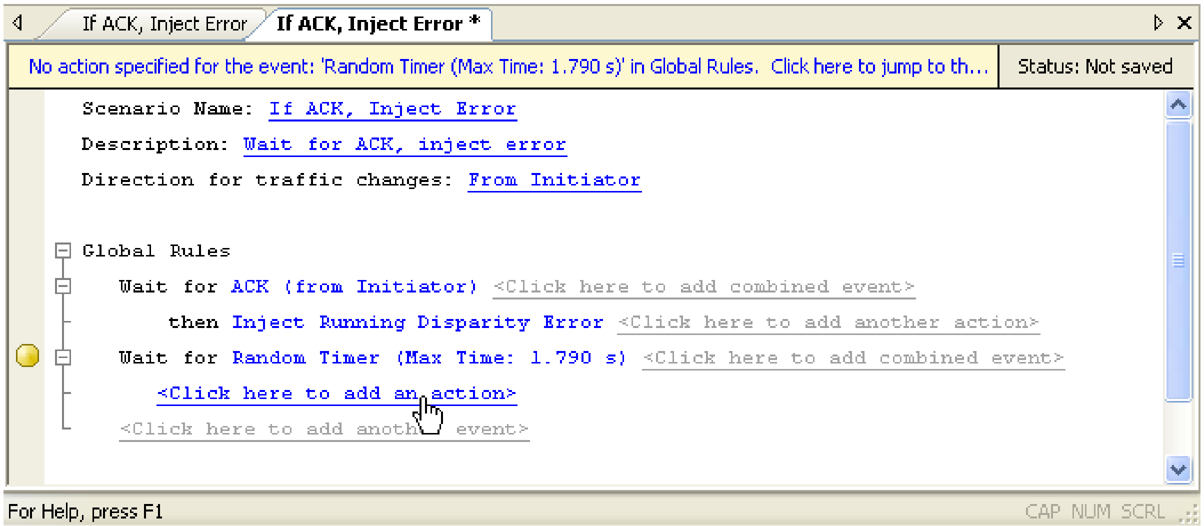


Figure 342 Example 6: Entering Second Action

The Action Properties dialog box appears.

Step 7 In the Type list on the left, choose **Stop Scenario** as the action that you want after the timer has expired.

Step 8 Click **OK** to close the Action Properties dialog box.

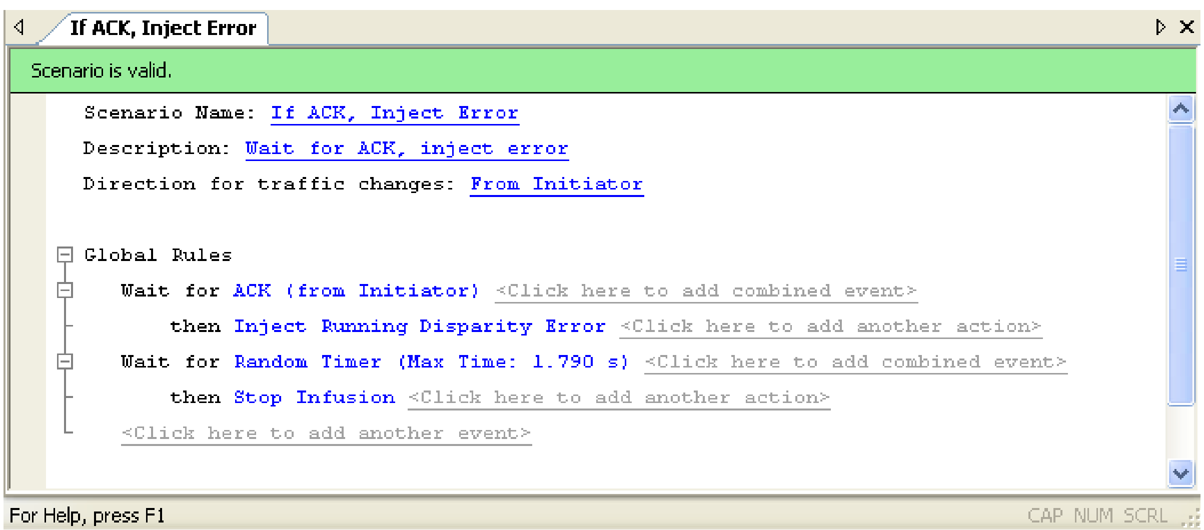


Figure 343 Example 6: Complete Scenario

Step 9 In the File menu, select **Save Scenario** to save the scenario.

Creating a Sequence

This section gives several examples for creating sequences. Recall that a sequence can have multiple states, but only one state is active at any time. In other words, at any point in time, a sequence “waits” for one event (or combined event) and responds with the corresponding action or set of actions when the event occurs.

A sequence is more powerful than Global Rules, because you can create branching or looping test logic with a sequence.You can include up to two sequences in a scenario, but each is completely independent of the other. There is no branching or other interaction between the two, except through the Restart All Sequences action.

You must follow some simple rules when creating sequences:

Sequence Rules

You can use only two branch actions per state. When you specify actions for a state, you can only use two instances of **Branch to an Existing State** or **Branch to a New State.** If you try to use more than two, a red error message appears in the status area of the application that says “Too Many Actions.”
You can use only one restart sequence action per state. When you specify actions for a state, you can only use one instance of **Restart Current Sequence** or **Restart All Sequences**. If you try to use more than one, a red error message appears in the status area of the application that says “Too Many Actions.”
You can use a maximum of 255 states per sequence. If you try to use more than 255 states, a red error message appears in the status area of the application.

The following table summarizes the examples that follow.

Sequence Examples

Example	Description
7	**Creating two sequences and Global Rules**: This scenario has two objectives that you implement with Global Rules and two sequences. 1) You use Global Rules to replace any of three types of primitives. 2) You use two sequences to detect the order in which a type of frame is received from initiator and target.
8	**Creating a sequence with many states #1**: The objective of this scenario is to detect an incorrect order of primitives and to cause the device to beep when it happens. You implement this scenario with a single five-state sequence.
9	**Creating a sequence with many states #2**: This scenario is an enhancement of example 8. In this scenario, the objective is to detect an incorrect order of primitives, fix it, and cause the device to beep when this happens. As with example 8, you implement this scenario with a single five-state sequence.

Example 7: Creating Two Sequences and Global Rules

In this example, Global Rules substitute an Align (0) primitive for each of the following received from the initiator: Align (1), Align (2), and Align (3). As a separate test operation, two sequences determine the order in which each Identify Address frame is received from initiator and target.

The following tables summarize the logic implemented by each of the sequences.

Example 7: Logic of Sequence 0

State	Description
State 0	If Address Frame is detected from initiator, go to State 1; otherwise, continue to check incoming frames (do not change state).
State 1	If next Address Frame detected is from target, beep 1 second.

Example 7: Logic of Sequence 1

State	Description
State 0	If Address Frame is detected from target, go to State 1; otherwise, continue to check incoming frames (do not change state).
State 1	If next Address Frame detected is from initiator, beep 2 seconds.

There is no interaction between the two sequences. Each of them operates independently (and is independent of the Global Rules). However, the two sequences complement each other with their logic. In this sense, they both combine to implement a test objective.

Step 1 Click the **New Scenario** button in the main library or one of the device libraries. In the Scenario Properties dialog, enter the scenario name, description, and direction of traffic change.

Step 2 As in previous examples, create the Global Rules area.

Step 3 Click the prompt to **add a sequence**. Prompts for the sequence appear beneath the Global Rules area. You create a sequence one state at a time. The application numbers states consecutively from 0 up (1, 2, 3, and so on).

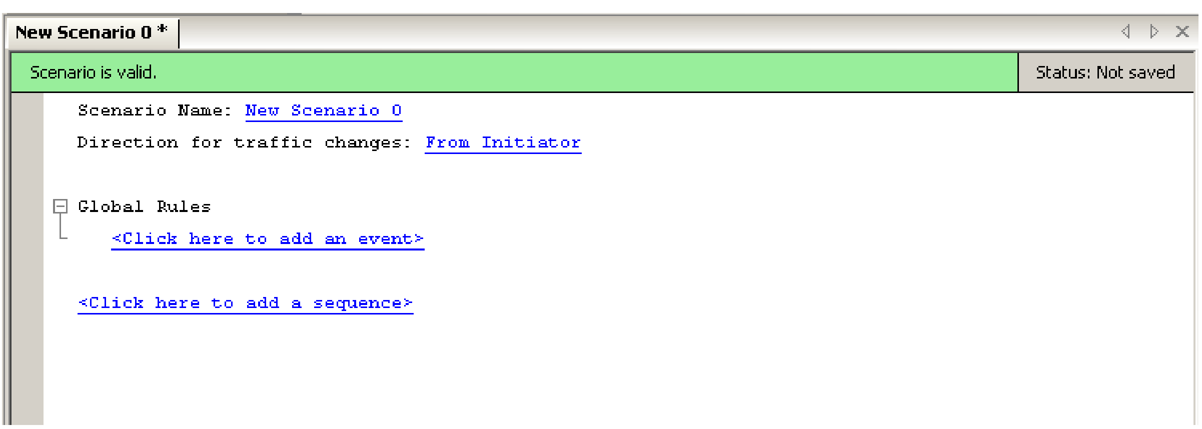


Figure 344 Example 7: Adding a Sequence

By default, the name of the first sequence in a scenario is Sequence 0. The name of the first state is State 0. To change the name of a sequence or state, or to associate a description with it, click the name of the sequence or state. A dialog box appears that allows you to enter that information.

Note: The description does not appear on screen, but you can bring it up by clicking the name of the sequence or state.

Step 4 In the State 0 area, click the prompt to **add an event**.

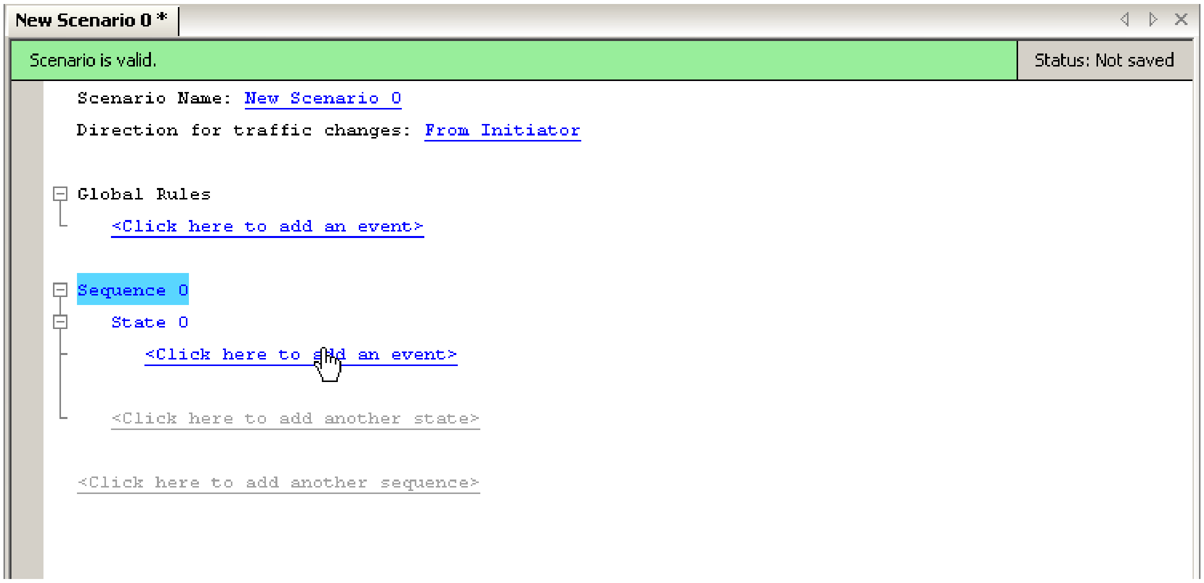


Figure 345 Example 7: Adding an Event for the First State

The Event Properties dialog box appears.

Step 5 In the Event Properties dialog box, select **Address Frame** as the event.

Step 6 Click **OK** to close the Event Properties dialog box.

Step 7 In the State 0 area, click the prompt to **add an action**.

Figure 346 Example 7: Adding an Action for the First State

The Action Properties dialog box appears

Step 8 For the action, select **Branch to > New State**.

Step 9 Click the **OK** button to close the Action Properties dialog box.

This saves the action and automatically creates an area for State 1 in the scenario.

Step 10 In the State 1 area, click the prompt to **add an event**. The Event Properties dialog box appears.

Step 11 Choose the **Address Frame** event. In the Direction column, select **From Target** (you want State 1 to trigger on an Identify Address frame received from the target).

Step 12 Click **OK** to close the Event Properties dialog box.

Step 13 Click the prompt to **add an action** for State 1.

Figure 347 Example 7: Adding an Action to the Second State

The Action Properties dialog box appears.

Step 14 In this example, you enter the action **Beep**, and you set the duration of the beep for 1 second.

Step 15 Click **OK** to close the Action Properties dialog box.

Step 16 You are finished creating the first sequence. Click the **add another sequence** prompt to create an area in the scenario for the second sequence (Sequence 1).

Figure 348 Example 7: Adding a Second Sequence

Step 17 Create two states in the second sequence with the characteristics shown in the following table.

Example 7: States for Second Sequence

State	Event	Action
0	Address Frame from Target	Branch to State 1
1	Address Frame from Initiator	Beep for 2 seconds.

Step 18 In the File menu, select **Save Scenario** to save the scenario.

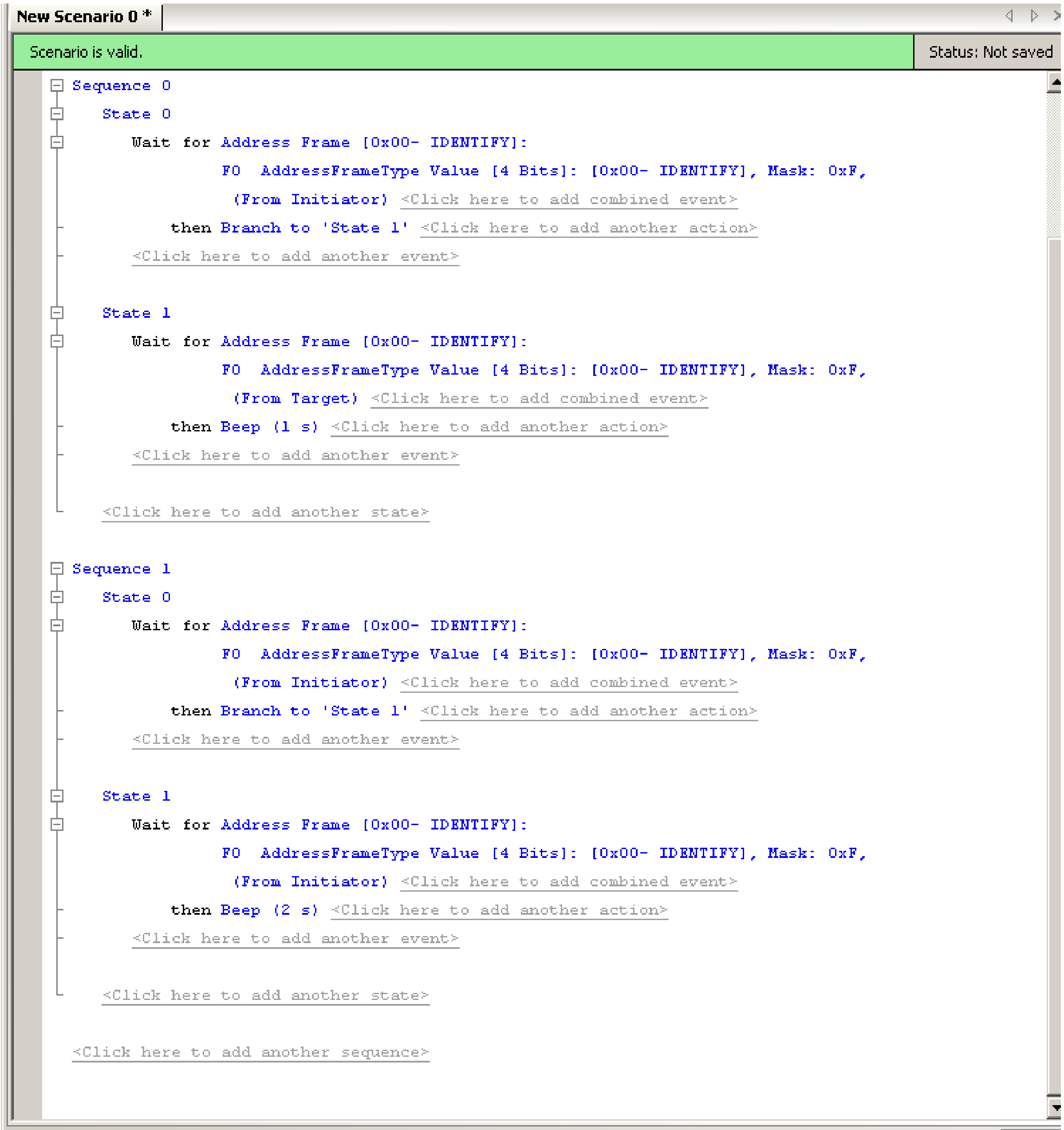


Figure 349 Example 7: Sequence Area of Scenario

Example 8: Creating a Sequence With Many States #1

In this example, a five-state sequence detects if a group of primitives is received out-of-order from the initiator. The expected order is: Align (0), Align (1), Align (2), Align (3). If this scenario detects any other order of these primitives, it causes the device to beep and the scenario to restart.

This example is designed to give you an idea of the powerful logic that you can implement with sequences.

Note that the states in this sequence have been renamed (do not have their default names). The following table summarizes the sequence logic.

Example 8: Logic of Sequence 0

State	Description
Wait for Align (0)	When an Align (0) is received, go to Wait for Align (1).
Wait for Align (1)	If an Align (1) is received next, go to Wait for Align (2); otherwise, go to Indicate Error.
Wait for Align (2)	If an Align (2) is received next, go to Wait for Align (3); otherwise, go to Indicate Error.
Wait for Align (3)	If an Align (3) is received next, restart test; otherwise go to Indicate Error.
Indicate Error	Indicate error and restart test.

Step 1 Click the **New Scenario** button in the main library or one of the device libraries. In the Scenario Properties dialog, enter the scenario name, description, and direction of traffic change.

Step 2 As in previous examples, create the five states for this sequence.

Step 3 In the File menu, select **Save Scenario** to save the scenario.

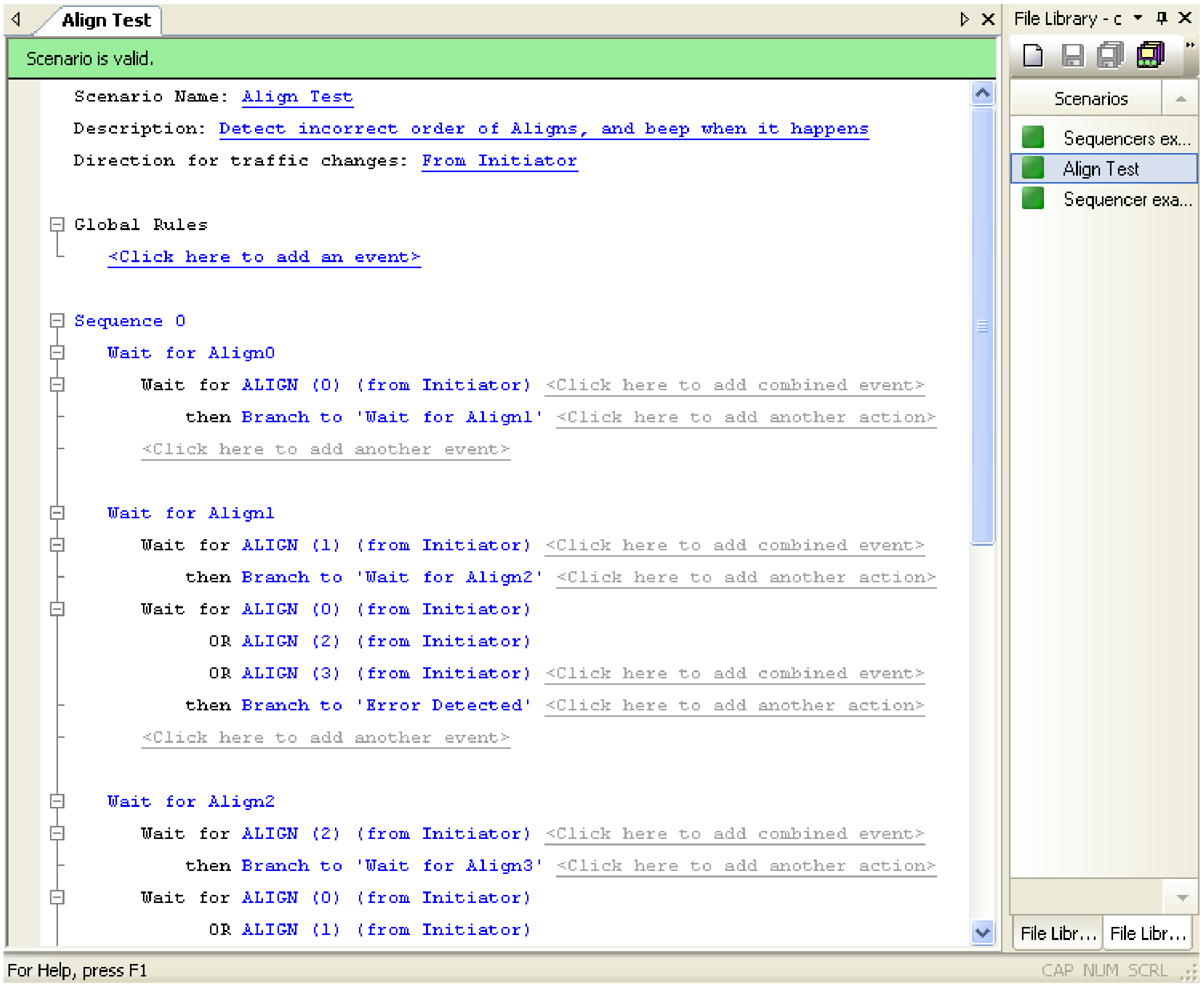


Figure 350 Example 8: Top Half of Scenario

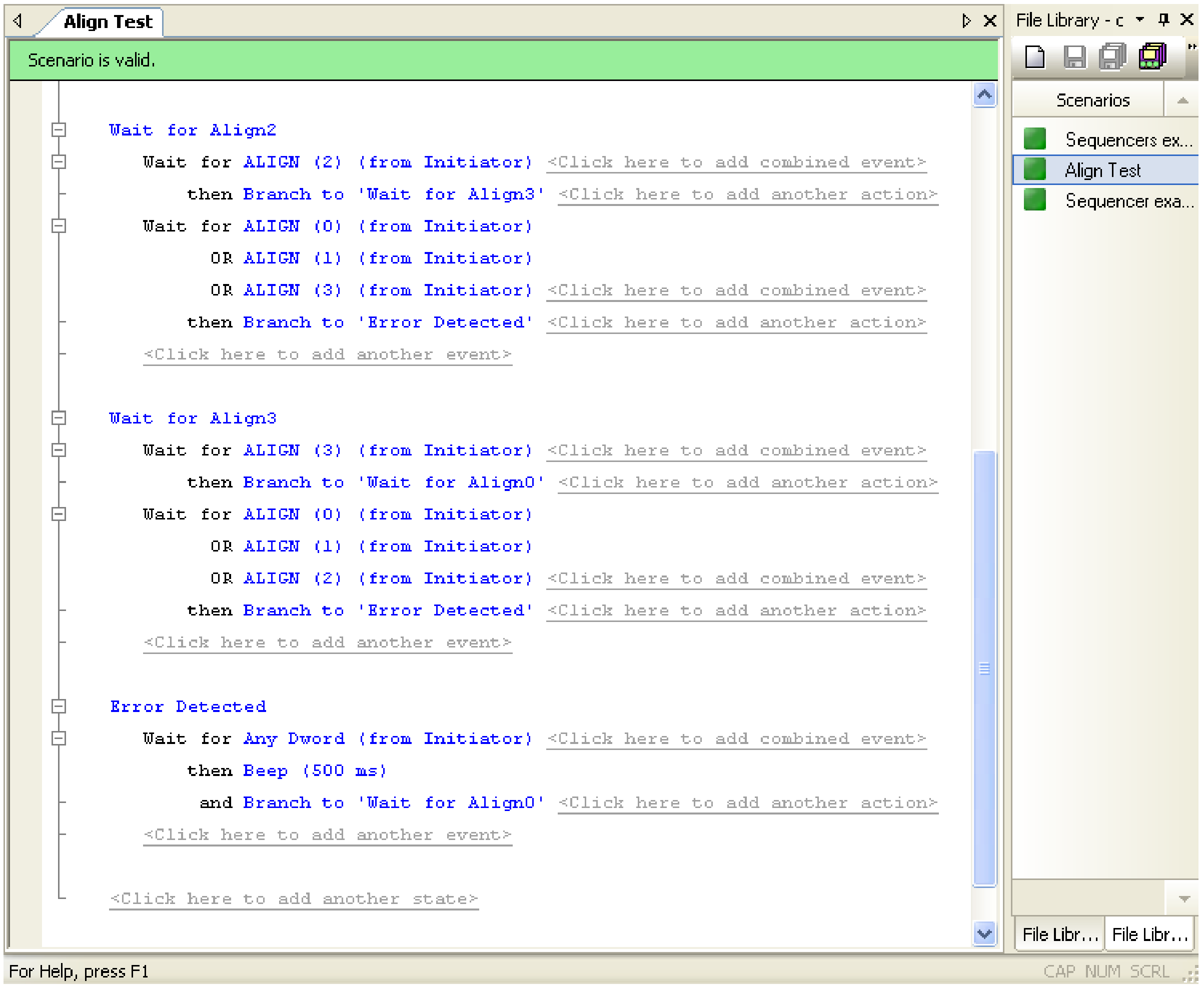


Figure 351 Example 8: Bottom Half of Scenario

Example 9: Creating a Sequence With Many States #2

In this example, a five-state sequence not only detects if a group of primitives is received out-of-order, but it fixes any incorrect order. The logic is similar to that of example 8 with a few small changes. The following table summarizes each state.

Example 9: Logic of Sequence 0

State	Description
Wait for Align (0)	When an Align (0) is received, go to Wait for Align (1).
Wait for Align (1)	If an Align (1) is received next, go to Wait for Align (2); otherwise, replace primitive with Align (1) and go to Indicate Error.
Wait for Align (2)	If an Align (2) is received next, go to Wait for Align (3); otherwise, replace primitive with Align (2) and go to Indicate Error.
Wait for Align (3)	If an Align (3) is received next, restart test; otherwise, replace primitive with Align (3) and go to Indicate Error.
Indicate Error	Indicate error and restart test.

Step 1 Click the **New Scenario** button in the main library or one of the device libraries. In the Scenario Properties dialog, enter the scenario name, description, and direction of traffic change.

Step 2 As in previous examples, create the five states for this sequence.

Step 3 In the File menu, select **Save Scenario** to save the scenario.

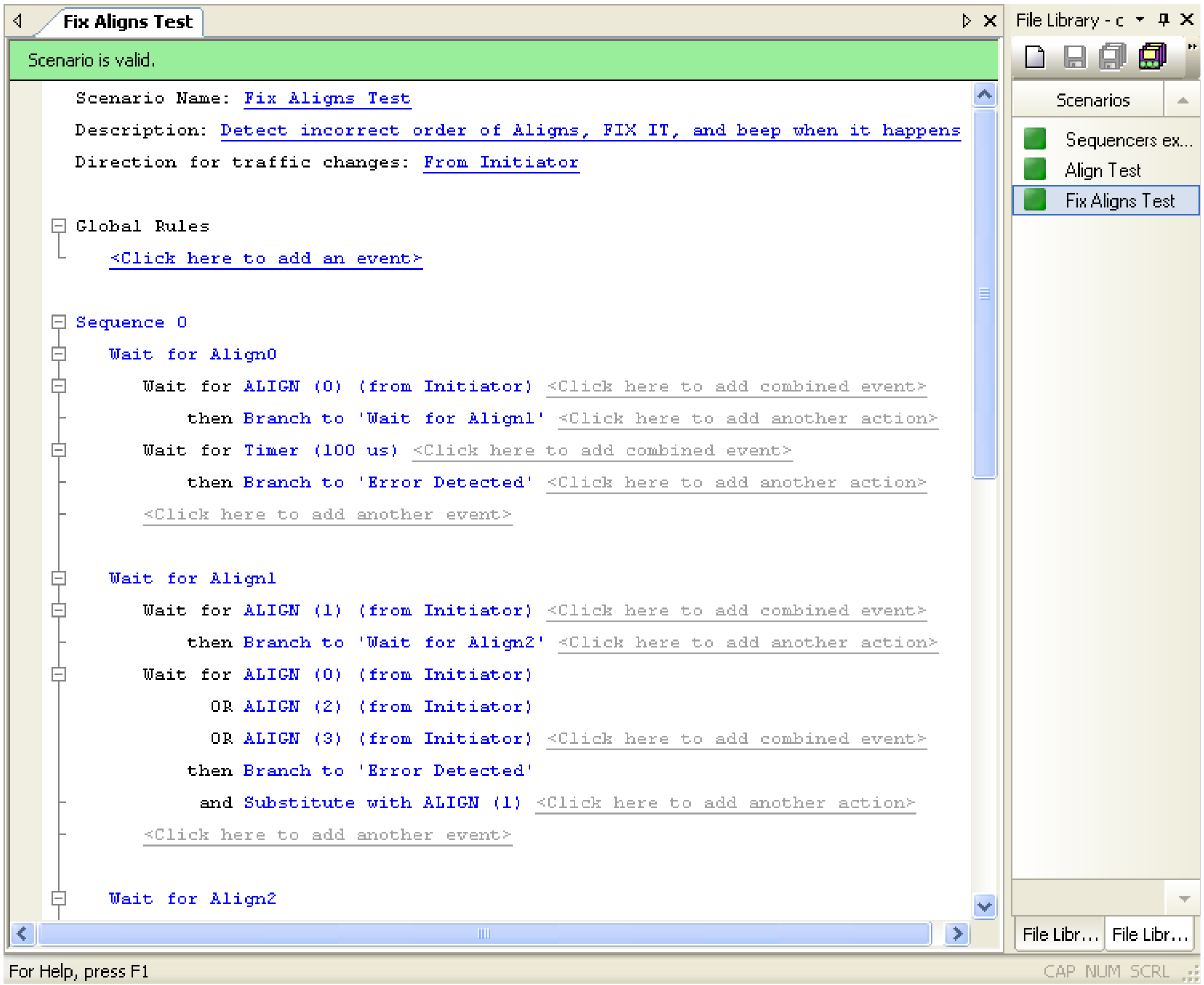


Figure 352 Example 9: Top Half of Scenario

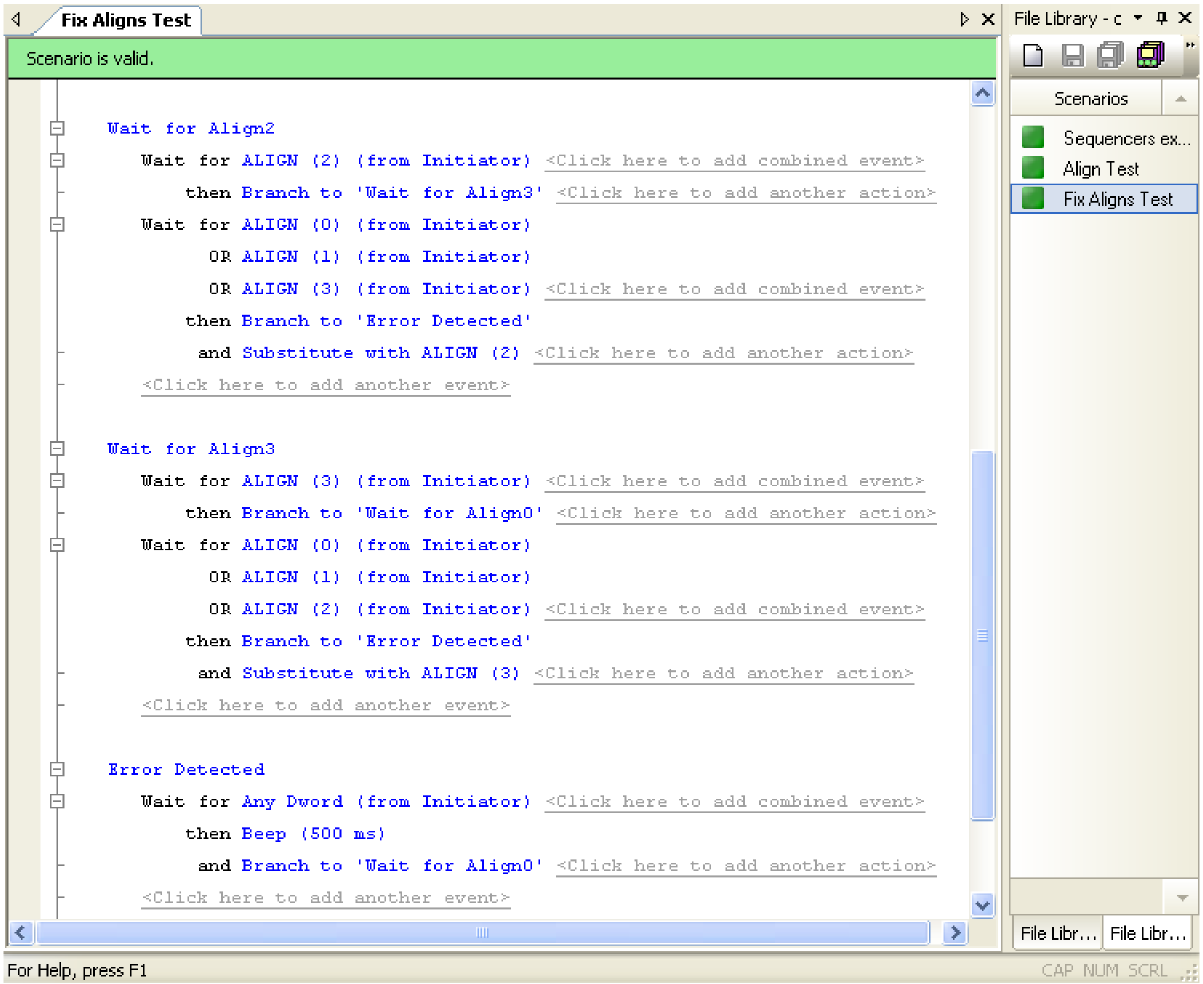


Figure 353 Example 9: Bottom Half of Scenario

Downloading Scenarios

After you have created a scenario, you need to download it to the Infusion device for execution.

If you use a general library as a scenario archive, then the process of creating and downloading a scenario is as follows:

Step 1 Open the general library (Main library or a File library). Scenarios in the library are listed in the Main Library window.

Step 2 Open the Device Library window by clicking the **Show Device Library** button on application toolbar.

Step 3 Open the Device Library for the device to which you want to download a scenario or scenarios. You can open the device library in two ways: by clicking the **Device Library icon** in the device list window or by double-clicking the **device name**.

Step 4 Copy the scenario from general library to device library by dragging it with the mouse.

Step 5 Download all scenarios in the device library to the Infusion device. To do so, click the **Download all Scenarios** button on the Device Library toolbar (second button from left).

Running Scenarios

If you use a general library as a scenario archive, then the process of executing a scenario is as follows:

Step 1 Select the scenario to run by clicking it.

Step 2 To run the scenario, click the **Run Scenario** button on the Device Library toolbar (second button from the right). The Infusion device then begins its session.

Appendix A

Creating a Pattern Generator File

You can use any text editor or word processor to create a pattern generator file (***.spg**), using the following conventions:

Keywords

- ALIGN
- CONT
- DMAT
- EOF
- HOLD
- HOLDA
- PMACK
- PMNAK
- PMREQ_P
- PMREQ_S
- R_ERR
- R_IP
- R_OK
- R_RDY
- SOF
- SYNC
- WTRM
- X_RDY
- XXXX
- LOOP
- Enable
- Disable
- Host
- Device
- Scramble
- Role
- END_OF_FILE

Comment Format

/*Comment text*/

Primitive Definition Format

To add an ALIGN primitive, use ALIGN or 27.3 10.2 10.2 K28.5
To add a CONT primitive, use CONT or 25.4 25.4 10.5 K28.3

Loop Definition Format

You can write a defined pattern into memory repeatedly by enabling a loop.
Loop definition allows either “Enable” or Disable”.
To enable looping, use: Loop=Enable

Scramble Definition Format

Scramble definition allows either “Enable” or Disable”.
To enable scramble, use: Scramble=Enable

Role Definition Format

To specify SATA hardware role, use: Role=Host or Role=Device

END_OF_FILE Definition

A pattern generator file must include END_OF_FILE as the last statement in the file.

Example Pattern Generator File

Figure 354 illustrates a typical Pattern Generator file.

```
/*…………Set Device Bits…………*/
/*Device*/
23.2 23.2.21.5 K28.3            /*X_RDY*/
23.2 23.2.21.5 K28.3            /*X_RDY*/
25.4 25.4.10.5 K28.3            /*CONT*/
XXXX
XXXX
XXXX
XXXX
XXXX
XXXX
XXXX
23.1 23.1 21.5 K28.3            /*SOF*/
00 50 40 A1
E0 00 00 00
21.6 21.6 21.5 K28.3            /*EOF*/
24.2 24.2 21.5 K28.3            /*WTRM*/
24.2 24.2 21.5 K28.3            /*WTRM*/
25.4 25.4 10.5 K28.3            /*CONT*/
XXXX
XXXX
XXXX
XXXX
21.5 21.5 21.4 K28.3            /*SYNC*/
21.5 21.5 21.4 K28.3            /*SYNC*/
25.4 25.4 10.5 K28.3            /*CONT*/
XXXX
XXXX
XXXX
XXXX
Role=Device
Loop=Enable
Scramble=Disable
END_OF_FILE
/*……………………………………………..*/
```

Figure 354 Example Pattern Generator File *spg

Appendix B

China Restriction of Hazardous Substances Table

The following tables are supplied in compliance with China's Restriction of Hazardous Substances (China RoHS) requirements:

部件名称	有毒有害物质和元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr^{6+})	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
PCBAs	X	O	X	X	X	X
机械硬件	O	O	X	O	O	O
金属片	O	O	X	O	O	O
塑料部件	O	O	O	O	X	X
电源	X	X	X	O	X	X
电源线	X	O	X	O	X	X
保护外壳(如有)	O	O	O	O	X	X
电缆组件(如有)	X	O	X	O	X	X
风扇(如有)	X	O	X	O	X	X
交流滤波器和熔丝组件(如有)	X	O	X	O	O	O
外部电源(如有)	X	X	X	O	X	X
探头(如有)	X	O	X	O	X	X

O: 表明该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求之下。

X: 表明该有毒有害物质至少在该部件的某一均质材料中的含量超过 SJ/T11363-2006 标准规定的限量要求。

EFUP (对环境友好的使用时间) 使用条件：
温度： 5摄氏度到40摄氏度
湿度： 5% - 95%最大相对湿度 (无冷凝)
高度： 最高2000米

Part Name	Toxic or Hazardous Substances and Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr^{6+})	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
PCBAs	X	O	X	X	X	X
Mechanical Hardware	O	O	X	O	O	O
Sheet Metal	O	O	X	O	O	O
Plastic Parts	O	O	O	O	X	X
Power Supply	X	X	X	O	X	X
Power Cord	X	O	X	O	X	X
Protective Case (if present)	O	O	O	O	X	X
Cable Assemblies (if present)	X	O	X	O	X	X
Fans (if present)	X	O	X	O	X	X
AC Filter/Fuse Assy (if present)	X	O	X	O	O	O
Ext Power Supply (if present)	X	X	X	O	X	X
Probes (if present)	X	O	X	O	X	X

O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement specified in SJ/T11363-2006.

X: Indicates that this toxic or hazardous substance contained in at least one of the homogenous materials used for this part is above the limit requirement specified in SJ/T11363-2006.

EFUP (Environmental Friendly Use Period) Use Conditions:

Temperature	5C to 40C
Humidity	5% to 95% max RH (non-condensing)
Altitude	Up to 2000 meters

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Symbols