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LeCroy *SASInFusion*TM

Error Injection Platform for

Serial Attached SCSI and Serial ATA

User Manual



**For SASInFusion Software Version 1.1
Manual Version 1.1**

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SAFETY REQUIREMENTS

This section contains information and warnings that must be observed to keep the *SASInFusion/SATAInFusion* operating in a correct and safe condition. You are required to follow generally accepted safety procedures in addition to the safety precautions specified in this section.

Safety Symbols and Terms

Where the following symbols or terms appear on front or rear panels of *SASInFusion/SATAInFusion*, or in this manual, they alert you to important safety considerations.

Symbol	Description
	This symbol is used where caution is required. Refer to accompanying information or documents in order to protect against personal injury or damage to the instrument.
	This symbol is used to denote a safety ground connection.
	On (Supply)
	Off (Supply)
	This symbol is used to denote "Alternating Current."
CAUTION	The CAUTION sign indicates a potential hazard. It calls attention to a procedure, practice or condition which, if not followed, could possibly cause damage to equipment. If a CAUTION is indicated, do not proceed until its conditions are fully understood and met.
WARNING	The WARNING sign indicates a potential hazard. It calls attention to a procedure, practice or condition which, if not followed, could possibly cause bodily injury or death. If a WARNING is indicated, do not proceed until its conditions are fully understood and met.

Operating Environment

The *SASInFusion/SATAInFusion* is intended for indoor use and should be operated in a clean, dry environment.

NOTE:

Direct sunlight, radiators, and other heat sources should be taken into account when assessing the ambient temperature.

Before using this product, ensure that its operating environment will be maintained within these parameters:

- Temperature: 5 to 40 Centigrade.
 - Humidity: Maximum relative humidity 80% for temperatures up to 31 Centigrade, decreasing linearly to 50% relative humidity at 40 Centigrade.
 - Altitude: Up to 2,000 m.
-

**WARNING**

The *SASInFusion/SATAInFusion* must not be operated in explosive, dusty, or wet atmospheres.

The design of the *SASInFusion/SATAInFusion* has been verified to conform to the applicable safety standards (EN 61010-1:2001, UL 61010-1 2nd Edition and CAN/CSA C22.2 No.61010-1-04) per the following limits:

- Installation (Overvoltage) Category II.
 - Pollution Degree 2.
 - Protection Class I.
-

NOTES:

Installation (Overvoltage) Category II refers to local distribution level, which is applicable to equipment connected to main supply (AC power source).

Pollution Degree 2 refers to an operating environment where normally only dry non-conductive pollution occurs. Occasionally, a temporary conductivity caused by condensation must be expected.

Protection Class 1 refers to grounded equipment, in which protection against electric shock is achieved by Basic Insulation and by means of a connection to the protective earthing conductor in the building wiring.

Cooling

The SASInFusion/SATAInFusion relies on forced air cooling with internal fans and ventilation openings. Care must be taken to avoid restricting the airflow around the apertures (fan holes). To ensure adequate ventilation, it is required to leave a 10 cm (4 inch) minimum gap around the sides of the instrument.



CAUTION

Do not block ventilation holes located on both sides of SASInFusion/SATAInFusion.

AC Power Source

The SASInFusion/SATAInFusion operates from a single-phase, 100-240 Vrms (+/-10%) AC power source at 50/60 Hz (+/-5%).

No manual voltage selection is required because the instrument automatically adapts to line voltage.

Depending on the accessories installed (PC port plug-ins, etc.), the instrument can draw up to 55 W (55 VA).

The power supply of the SASInFusion/SATAInFusion is protected against short circuit and overload by a 5x20 mm fuse (T1.0 A/250 V). See "Fuse Replacement" in this section for replacement instructions.

NOTE:

The SASInFusion/SATAInFusion automatically adapts itself to the AC line input within the following ranges:

Voltage Range: 90 - 264 Vrms.

Frequency Range: 47-63 Hz.

Power and Ground Connections

The SASInFusion/SATAInFusion is provided with a grounded cord set containing a molded three-terminal polarized plug and a standard IEC320 (Type C13) connector for making line voltage and safety ground connection. The AC inlet ground terminal is connected directly to the frame of the instrument. For adequate protection against electrical shock hazard, the power cord plug must be inserted into a mating AC outlet containing a safety ground contact.

**WARNING**

Electrical Shock Hazard!

Any interruption of the protective conductor inside or outside of the SAS*InFusion*/SATA*InFusion*, or disconnection of the safety ground terminal creates a hazardous situation.

Intentional interruption is prohibited.

Fuse Replacement

Set the SSAS*InFusion*/SATA*InFusion* power switch to OFF and disconnect the power cord before inspecting or replacing the fuse. Open the black fuse holder using a small, flat-bladed screwdriver. Remove the old fuse, replace it with a new 5x20 mm "T" rated 1.0 A/250 V fuse, and reinstall the fuse holder.

**WARNING**

For continued fire protection at all line voltages, replace fuse with the specified type and rating only. Disconnect the power cord before replacing fuse.

Cleaning

Clean only the exterior of the SAS/SATA *InFusion*, using a damp, soft cloth. Do not use chemicals or abrasive elements. Under no circumstances allow moisture to penetrate the instrument. To avoid electrical shock, unplug the power cord from the AC outlet before cleaning.

**WARNING**

No operator serviceable parts inside. Do not remove covers.

Refer servicing to qualified personnel.

1. Overview

SASInFusion is an error injector and traffic modification tool that allows users to verify real-world fault handling for Serial Attached SCSI (SAS) and Serial ATA (SATA) systems. *SASInFusion* is designed to sit unobtrusively in the data path on a live system and to programmatically alter or corrupt traffic. This makes *SASInFusion* the ideal tool for stress-testing systems using actual workloads.

SASInFusion supports SAS SSP, SMP, STP and SATA-based protocols operating across a single 1.5G or 3.0G SAS or SATA link. *SASInFusion* monitors traffic from both directions in real-time and relies on predefined rules to replace any bit(s), primitive, or parameter with one specified by the user. The *SASInFusion* system can change traffic when it detects a specific sequence or within a designated time interval, yet it requires no complicated scripts, programming, or simulation tools.

Small, flexible, and easy to use, *SASInFusion* is specifically designed to verify recovery characteristics within a subsystem. An easy pop-up menu interface allows users to create specific test scenarios in just minutes.

Once a *SASInFusion* session is started, the system automatically handles protocol handshaking between devices. *SASInFusion* transmits a faithful copy of the original data stream down to the CRC value which, if needed, it recalculates. *SASInFusion* allows test engineers to systematically verify error recovery in ways not possible with other test platforms.

1.1 Key Features

- **Error Injection:** Can inject CRC, disparity, 8b/10b encoding, framing, and coding errors.
- **Break Link Recovery:** Can programmatically break the connection to test link recovery.
- **Value Replacement:** Can monitor 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:** Can remove individual primitives, address frames, or data frames from the stream to verify retry behavior.
- **Primitive Manipulation:** Can replace handshaking and flow control primitives to help validate robustness of a design.

- **Traffic Monitoring:** Can operate as a traffic monitor, collecting statistical data on user-specified parameters. In this mode, data are passed unchanged in both directions.
- **Menu-Driven Interface:** Allows easy set-up of test scenarios.
- **API based on C++:** Allows users to develop custom test applications.

With respect to traffic modification, elements you can modify in the Link Layer include primitives, CRC, scrambled traffic, and SSP, SMP and STP connection events. Elements you can not modify in traffic include clock skew management, OOB & power management, and signal integrity.

1.2 Stand-alone vs. Networked Mode

The *SASInFusion* platform 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 *SASInFusion* software application to configure and control the device across an Ethernet link. This is called networked mode.

SASInFusion test scripts are called scenarios. Scenarios determine how the *SASInFusion* hardware device monitors and modifies line traffic. You must use the *SASInFusion* application to create and download scenarios.

However, once you have downloaded scenarios to the *SASInFusion* device, you can break the Ethernet link to the application and operate the device in stand-alone mode. In stand-alone mode, you can easily relocate the device, and you use the device LCD panel to select and execute scenarios.

Regardless of the mode you choose to control testing, the *SASInFusion* connections to the line are the same: the device is connected between the SAS/SATA host and the PHY of the test target (DUT).

2. General Description

This chapter describes the *SASInFusion* hardware device.

2.1 System Components/Packing List

- *SASInFusion* hardware device.
- One power cable.
- One BNC cable.
- Two external-to-internal SATA/SAS Cables.
- Two internal-to-external Junction Boards.
- Five internal-to-internal Junction Boards.
- *SASInFusion* software application program on CD-ROM.
- User Manual.

Note: For brevity, this manual calls the *SASInFusion* hardware device the *SASInFusion* box.

2.2 *SASInFusion* Front Panel

The front panel of the *SASInFusion* box consists of an LCD panel, three control buttons, two external SAS/SATA connectors, and three LEDs (Figure 2.1).



Figure 2.1 *SASInFusion* Front Panel

LCD Panel

The LCD panel displays backlit four-line, twenty-four character messages. It is a menu-driven interface that allows a user to configure the box, view status, select scenarios to run, and stop and start scenarios.

Chapter 6 describes the LCD panel menus. The first menu to appear after boot-up is the Root menu (shown in Figure 2.1). When *SASInFusion* box is turned ON for the first time, the LCD panel shows two menu items:

Box Setup

SAS Configuration

After you have downloaded some scenarios to the *SASInFusion* box, the Root menu shows four items:

- Box Setup
- SAS Configuration
- Start Infusion
- Infusion Setup

Front Panel Control Buttons

The control buttons are located on the right side of the control panel. They consist of two buttons to navigate LCD menus, the Up and Down buttons, and a Center button to select menu items.

Initiator and Target SAS/SATA Cable Connectors

The two external SAS/SATA connectors provide high-speed, differential connections to the test initiator (host) and target (device-under-test, or for brevity, DUT). These connectors support the external-to-internal SATA cables provided.

2.3 SASInFusion Rear Panel

The *SASInFusion* rear panel consists of two BNC Input/Output connectors, one USB connector, an Ethernet port, and a power connector (Figure 2.2).



Figure 2.2 SASInFusion Rear Panel

BNC Input/Output Connectors

The two BNC connectors are ports for Trigger In and Trigger Out signals for the box. They allow you to daisy-chain the box with other SASInFusion boxes for multi-link tests. They also allow you to connect the SASInFusion box to an external test device, such as an analyzer or oscilloscope.

The Trigger In signal is used to inject an error or other action into the protocol data stream at a specific instance in time, while the Trigger Out signal can be asserted when a pattern match or error injection occurs during SASInFusion operation.

Ethernet Connector

The 10/100 Ethernet host connector allows you to link the SASInFusion box to a PC running the SASInFusion software application. You use this link to download scenarios. If you choose to operate the box in networked mode, you also can use the link to control the box across an Ethernet LAN.

Scenarios are test scripts that define how the box monitors and modifies line traffic. You can only create scenarios on a PC running the SASInFusion application. You can not create scenarios via the box LCD panel.

Once you have created and downloaded scenarios to the SASInFusion box, you can either use the SASInFusion software on the PC or the LCD panel on the SASInFusion box to select the scenario that you wish to run and to start and stop that scenario.

By default, SASInFusion is set up to use Dynamic Host Control Protocol (DHCP). This means that, under normal circumstances, you will not have to set an IP address and subnet mask. If you prefer to set a static IP address, you can do so via the box LCD panel.

If you want to eventually run SASInFusion in stand-alone mode (without an Ethernet connection), you can do so only after creating the scenarios on the PC and downloading them to the box. However, once you have downloaded scenarios, you can break the Ethernet link between the PC and box and use the box LCD panel to select and execute a scenario.

USB Connector

The USB connector will be enabled in a future release. It will provide an alternative to the Ethernet port for connecting the box to a PC running the SASInFusion application.

Power Supply

The internal, 125 watt triple-output (+3.3V, +5V, +12V) power supply can accept 110 to 240 VAC at 50 to 60 Hz.

3. Installation and Setup

This chapter describes how to install and setup the *SASInFusion* software application and hardware device (the *SASInFusion* box).

3.1 PC Requirements

SASInFusion software installs on a Windows XP or Windows 2000 PC.

Refer to the readme file on the installation CD for PC requirements.

3.2 PC Firewall and Other Communication Settings

Software firewalls, IP filtering, IP security policies, and other items can limit the types of messages that a PC can receive from the *SASInFusion* box. This can particularly affect users attempting to dial-into a network and administer *SASInFusion* remotely.

Note: In order for *SASInFusion* boxes to be visible on the network and to communicate correctly, set communication parameters on the PC as follows.

- Allow to initiate outbound TCP connections using ports 4000 and 4001
- Allow to send UDP broadcast messages using port 4002
- Allow to accept and process UDP messages using ports 4003 and 4004 (Dial-in users must set communication parameters in the dial-in software.)

Note: The mechanism by which *SASInFusion* software discovers (establishes communication with) boxes on the network only allows one instance of the *SASInFusion* software to run at a time. This limitation includes applications based on the *SASInFusion* API that the user has created.

3.3 Installing *SASInFusion* Software

SASInFusion software installs on a windows-based PC. To install the software:

- Step 1** Insert the *SASInFusion* software CD into the CD ROM drive of the PC that you will use to create *SASInFusion* scenarios. The CD software installer application runs.
- Step 2** Follow the onscreen instructions for installing the software on the PC hard drive.

- Step 3** To start the application, launch the LeCroy *SASInFusion* program from the Start menu (Start > Programs > LeCroy > InFusion > LeCroy InFusion). The application display appears.

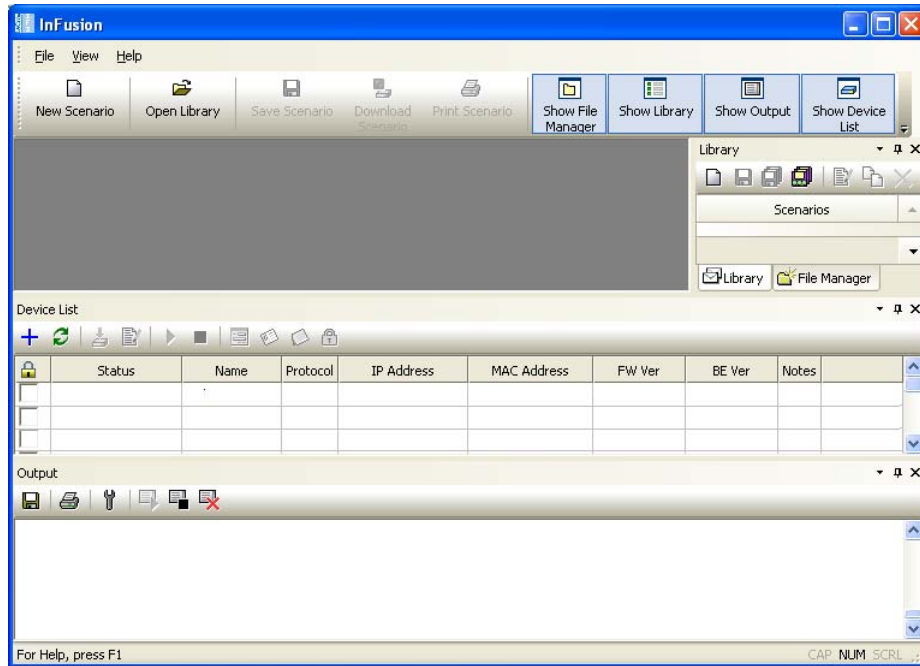


Figure 3.1 SASInFusion Software Application Interface

Note: You can use the software without connecting to a *SASInFusion* box. When not connected, you can create and store scenarios for later download and use.

3.4 Connecting *SASInFusion* to an Ethernet LAN

An Ethernet connection provides the means to download scenarios from the *SASInFusion* software to a box. If you intend to run the box in a networked mode, it is also the primary means to control the box.

While many users will probably set up both their Ethernet and SAS/SATA line connections at the same time, it is not necessary to do so. If preferred, you can install *SASInFusion* anywhere on your LAN, download scenarios to it, and then later move it to your test lab.

Once in the lab, you can run the box in stand-alone mode (without Ethernet) and use the LCD panel to select a scenario and execute it.

To connect *SASInFusion* via Ethernet:

- Step 1** Remove *SASInFusion* from its shipping container.
- Step 2** Connect the unit to a 100-volt to 240-volt, 50 Hz to 60 Hz, 120 W power outlet using the power cord provided.
- Step 3** Connect a standard Ethernet cable between the Ethernet port on the back of the *SASInFusion* box and your Ethernet LAN.
- Step 4** Turn ON the power switch on the rear of the box. After power is ON, the *SASInFusion* box boots up. This initialization process lasts a few seconds. During boot-up the box displays initialization messages and beeps once.

If your LAN uses Dynamic Host Connection Protocol (DHCP), plugging the box into your LAN will cause your DHCP server to allocate an IP address and subnet mask and bring *SASInFusion* up onto the network. If your LAN uses static IP addressing, you will need to use the LCD panel to assign an IP address, subnet mask, and default gateway.

Assigning a Static IP Address Using the LCD Panel

If your network does not use DHCP, you can assign a static IP address via the LCD panel.

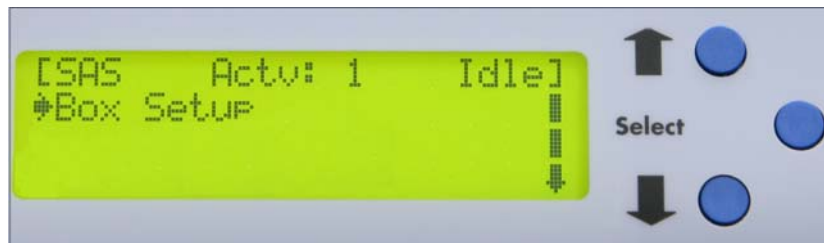


Figure 3.2 LCD Panel Root Menu at Initial Set-up

- Step 1** From the Root menu on the LCD panel, press the **Select** (middle) button to go to the Box Setup menu. The Box Setup menu appears (Figure 3.3).



Figure 3.3 LCD Panel Box Setup Menu

- Step 2 Press the **Bottom** button once on the LCD panel to move the selection arrow next to **IP Mode**.
- Step 3 Press the **Select** button to select **IP Mode**. The IP Mode menu appears (Figure 3.4). It shows two options: Static and Dynamic. The default selection is Dynamic.



Figure 3.4 LCD Panel IP Mode Menu

- Step 4 Press the **Select** button to select **Static**.
- Step 5 Return to the previous menu by pressing the **Bottom** button twice to move the Selection arrow to **[Back]**, then press the **Select** button to select it. The Box Setup menu appears (Figure 3.5). The Selection arrow points to **IP Mode**.



Figure 3.5 LCD Panel Box Setup Menu: Arrow at IP Mode

- Step 6 Press the **bottom** button once to move to **IP Address**, and then press the **select** button to select it. The IP Address appears (Figure 3.6).



Figure 3.6 LCD Panel: IP Address Display

- Step 7** To edit the IP address, use the buttons as follows:
- Bottom button: To move the cursor.
 - Top button: To edit the numbers.
 - Select (center) button: To go to the previous menu.
- Step 8** When finished editing, press the **Select** button to return to the previous menu.
- Step 9** Repeat steps 6 and 7 for the subnet mask and default gateway.
- Step 10** Once you have completed the IP addressing, reboot the box by returning to the Box Setup menu and then pressing the **Bottom** button until you see Reboot.



Figure 3.7 LCD Panel Box Setup Menu: Reboot Display

- Step 11** Press Select to select **Reboot** and then select **Confirm** to start the reboot.

Rebooting saves the configurations. **Do not simply power cycle the box.** Power cycling will not save your new settings.

Assuming that the SASInFusion box is physically connected to an Ethernet LAN, and that you have configured it correctly, it should immediately come up on the network.

Checking the IP Address Using the LCD Panel

To verify the box IP address:

- Step 1 From the Root menu, press the **Select** button to select **Box Setup**.
- Step 2 Press the **Down** button eight times on the front of the *SASInFusion* device to display **About**.
- Step 3 Press the **Enter** button on the front panel to select **About**. Scroll until the IP address of the box appears (Figure 3.8).



```

[SAS Actv:1 Idle]
Board Type: SAS
MAC: 00:10:4C:80:00:0E
IP: 10.10.10.100
  
```

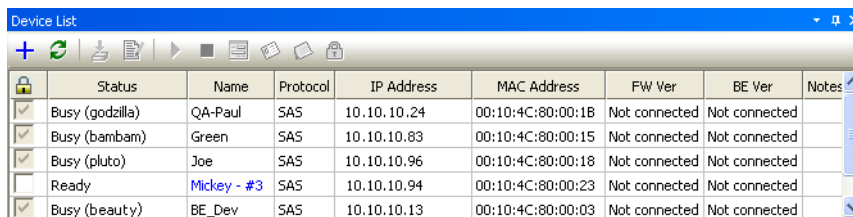
Figure 3.8 LCD Panel About Menu

Checking the DHCP Setting Using the LCD Panel

The **About** menu now displays the **IP Mode** settings. You can verify that *SASInFusion* is set to use DHCP by going to the **About** menu (as shown above) and scrolling down to **IP Mode**.

3.5 Linking the *SASInFusion* Device and Software

Once the *SASInFusion* box is running and has been connected to a LAN, it should be visible in the Device List window in the *SASInFusion* software. If it is not, you may need to wait or refresh the software in order for the box to appear. To refresh the software, click Refresh Devices button, second from the left on the Device List Window toolbar.



Status	Name	Protocol	IP Address	MAC Address	FW Ver	BE Ver	Notes
Busy (godzilla)	QA-Paul	SAS	10.10.10.24	00:10:4C:80:00:1B	Not connected	Not connected	
Busy (bambam)	Green	SAS	10.10.10.83	00:10:4C:80:00:15	Not connected	Not connected	
Busy (pluto)	Joe	SAS	10.10.10.96	00:10:4C:80:00:18	Not connected	Not connected	
Ready	Mickey - #3	SAS	10.10.10.94	00:10:4C:80:00:23	Not connected	Not connected	
Busy (beauty)	BE_Dev	SAS	10.10.10.13	00:10:4C:80:00:03	Not connected	Not connected	

Figure 3.9 Device List Window

Note: To display the Device List window, select View > Views > Devices from the menu or press the Device List button from the application task bar.

3.6 Updating Firmware and Bus Engine

In general, when software upgrades are released, the new software requires that you update the *SASInFusion* firmware and BusEngine.

To update the firmware and the BusEngine:

- Step 1** Click in the checkbox in the first column (under the Lock symbol) to select the *SASInFusion* device (box).
- Step 2** After selecting the device, right click and choose **Update Device** from the Popup menu (Figure 3.10).
- Step 3** The software automatically chooses the proper image from the InFusion v1.1 directory. Click **Update Devices** to begin the update process.
- Step 4** The Update Devices window closes and a progress indicator displays status of the update process (Figure 3.11). When update has completed, the display should reflect the updated firmware and BusEngine rev:

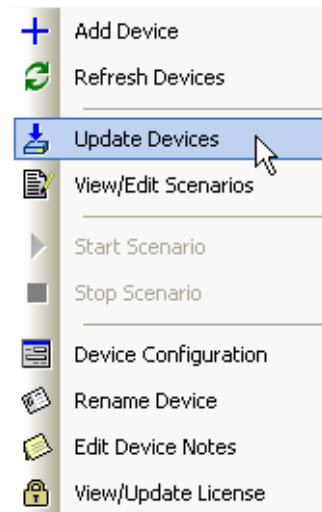


Figure 3.10 Device Pop-Up Menu

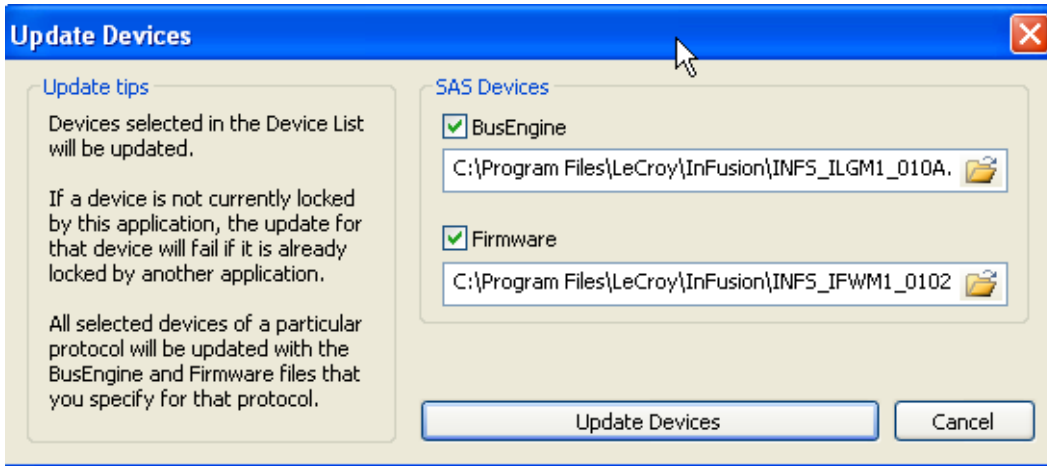


Figure 3.11 Update Devices Dialog Box

Status	Name	Protocol	IP Address	MAC Address	FW Ver	BE Ver	Notes
Unknown		None	155.155.155.1	Unknown	Unknown (Req: 1.02)	Unknown (Req: 1.10)	Notes
Connected	InFusion	SAS	172.16.128.88	00:10:4C:80:00:54	1.02	1.10	
Ready	QA-5	SAS	172.16.128.137	00:10:4C:80:00:6E	Unknown (Req: 1.02)	Unknown (Req: 1.10)	
Ready	ZDougDoug	SAS	172.16.128.173	00:10:4C:80:00:00			
Busy (butthead)	InFusion	SAS	172.16.128.161	00:10:4C:80:00:00			
Busy (pluto)	InFusion	SAS	172.16.128.166	00:10:4C:80:00:00			

FW Ver	BE Ver
Unknown (Req: 1.02)	Unknown (Req: 1.10)
1.02	1.10
Unknown (Req: 1.02)	Unknown (Req: 1.10)

Figure 3.12 Device List Window: Update Version IDs

3.7 Connecting SASInFusion to the SAS/SATA DUT

There are three ways to set-up SASInFusion:

- Direct connect without analyzer
- Direct connect with analyzer
- Multiple connections using octopus cables

Connection without Analyzer

The simplest way to set up SASInFusion is to connect the box over a single line to a device and host (Figure 3.13).

This set-up uses two external-to-internal SATA cables.



Figure 3.13 Connection Without Analyzer

Connection with Analyzer: One-Channel Configuration

You can easily add an analyzer to the configuration above by placing it between the SASInFusion box and the DUT or the box and the host controller.



Figure 3.14 Connection with Analyzer: One-Channel Configuration

Connection with Analyzer: Two Channel Configuration

With a two channel analyzer, you can set up the analyzer so that it records traffic before and after modification by the SASInFusion box (Figure 3.15).

The host controller sends unmodified traffic to the analyzer. The traffic is recorded by the analyzer and then sent to the SASInFusion box where it is modified. Afterwards, the modified traffic is looped back into a second channel on the analyzer and recorded again. From there, the traffic passes back through to the device. The result will be a two-channel recording.



Figure 3.15 Connection With Analyzer: Two-Channel Configuration

Multiple Connections using "Octopus" Cables

To use internal "octopus" cables with the SASInFusion box you will also need to use LeCroy-provided junction boards and two external SATA cables.

Junction boards function as an interconnect between the external cables and the octopus cables.



Figure 3.16 Multiple Connections Using "Octopus" Cables

4. Software Overview

This chapter describes key features of *SASInFusion* software.

4.1 Starting the *SASInFusion* Program

To start the *SASInFusion* Program from the PC Start menu:

- Step 1 Click **Start**.
- Step 2 Select **Programs**.
- Step 3 Select **LeCroy**.
- Step 4 Select **InFusion**.
- Step 5 Click **LeCroy InFusion**.

The application display appears (Figure 4.1).

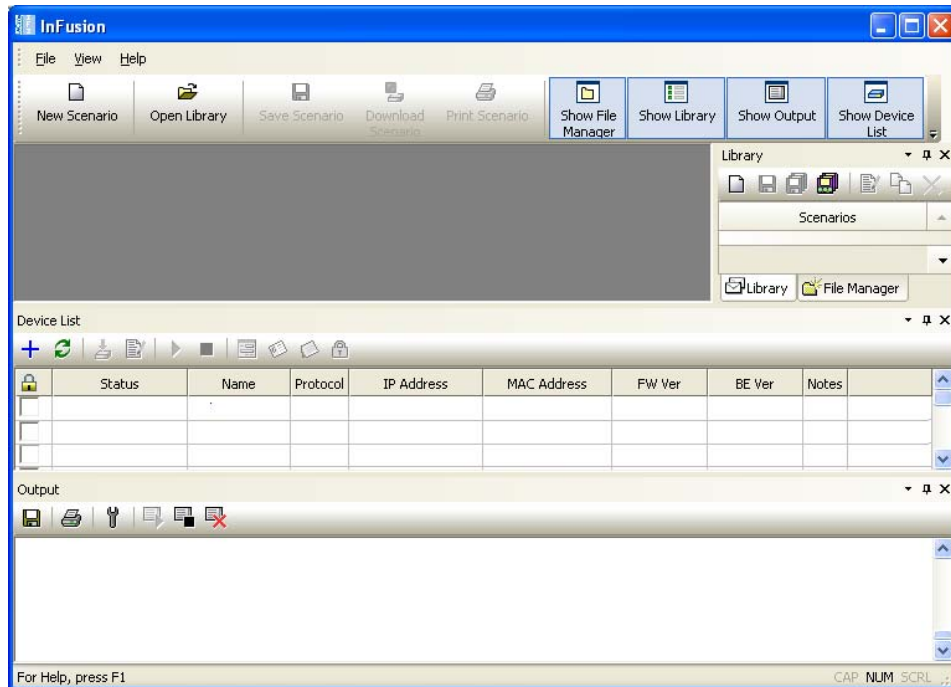


Figure 4.1 SASInFusion Application Display: No Scenarios Open

4.2 Application Layout and Description

The SASInFusion software application presents a multi-windowed interface that consists of the following elements (Figure 4.2):

- File manager.
- Libraries. There are two types: main library (shown below) and device libraries (not shown).
- Work area.
- Log window.
- Device list.

You can choose to hide most of these windows.

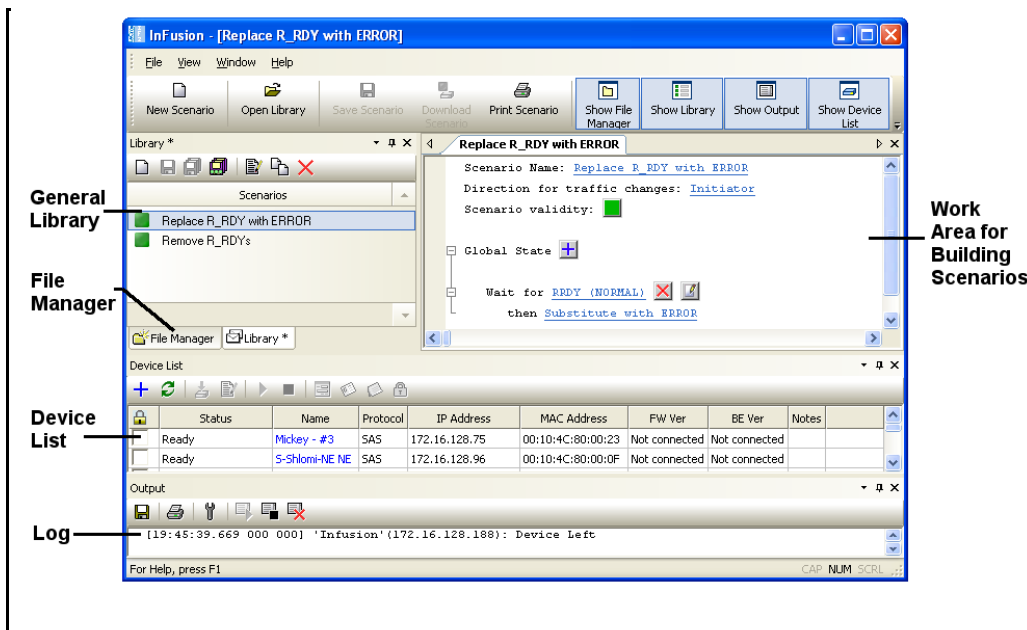


Figure 4.2 SASInFusion Application Display: Main Elements

File Manager

File Manager is a tool for navigating to SASInFusion library files (*.infdb) and the folders they are stored in.

Libraries

Libraries are windows responsible for holding scenarios. Scenarios are test scripts that specify how SASInFusion monitors and modifies line traffic.

There are two types of libraries: device libraries, which are associated with each SASInFusion device, and general libraries that serve as archives. You can download up to ten scenarios to each device library. The software limits you to ten scenarios because ten is the limit that the SASInFusion hardware can store in flash memory.

General libraries can hold any number of scenarios. You can create multiple general libraries and put them at any location on your hard drive.

Table 4.1 General Library Buttons


















 General Library Toolbar			
	Create New Scenario		View/Edit Scenarios. Opens the Scenario window for editing scenario settings.
	Save Scenario		Insert Copy of Selected Item. Makes a copy of selected scenario and adds it to the library.
	Save Library		Delete Selected Scenario
	Save Copy of Library		

Table 4.2 Device Library Buttons

 Device Library Toolbar			
	Download Scenario to Device		Delete Selected Scenario
	Download All Scenarios To Device		Refresh Scenario
	Save Copy of Library		Start Scenario
	View/Edit Scenarios. Opens the Scenario window for editing scenario settings		Stop Scenario







Work Area

The Work Area displays scenario contents. To see scenario contents, Click on the **New Scenario** button or double-click on one of the listed scenarios (if present) in a library.

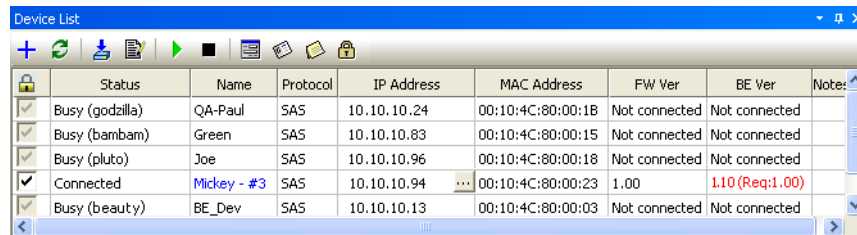
Output Window

The Output Window logs status on commands and user actions.

Table 4.3 Log Buttons

Output Toolbar			
	Save Log		Start Logging
	Print Log		Stop Logging
	Log Options		Clear Log

Device List




	Status	Name	Protocol	IP Address	MAC Address	FW Ver	BE Ver	Note
<input checked="" type="checkbox"/>	Busy (godzilla)	QA-Paul	SAS	10.10.10.24	00:10:4C:80:00:1B	Not connected	Not connected	
<input checked="" type="checkbox"/>	Busy (bambam)	Green	SAS	10.10.10.83	00:10:4C:80:00:15	Not connected	Not connected	
<input checked="" type="checkbox"/>	Busy (pluto)	Joe	SAS	10.10.10.96	00:10:4C:80:00:18	Not connected	Not connected	
<input checked="" type="checkbox"/>	Connected	Mickey - #3	SAS	10.10.10.94	00:10:4C:80:00:23	1.00	1.10 (Req:1.00)	
<input checked="" type="checkbox"/>	Busy (beauty)	BE_Dev	SAS	10.10.10.13	00:10:4C:80:00:03	Not connected	Not connected	

Figure 4.3 Device List Window

The Device List window keeps track of *SASInFusion* boxes that it detects on the Ethernet network (Figure 4.3). It shows identity information about each box, such as its name, IP address, and license status. It also allows you to change the values in these fields.

Device List Fields

The fields in the Device List window have the following functions:

 : Selects the box for use and locks it so that other users cannot use it. Only one user can control a box at a time.

Status: Indicates if the box is ready for use or busy. For example, if a box has been locked by another user, it will show up in the Status field as Busy. The Status field also shows the name of the host PC connected to the box.

Name: Displays the name of the SAS*InFusion* platform. This is a user-configurable field.

Protocol: Indicates the protocol of the *InFusion* box. At present, SAS is the only option. Future *InFusion* products will be based upon other protocols.

IP Address: Lists the IP address of each device.

MAC Address: Lists the MAC address of the box. The MAC address is a factory-assigned setting that can not be changed. You can confirm the MAC address by looking at the MAC address sticker affixed to the bottom of the SAS*InFusion* box. It is also listed in the LCD menu (Box Setup > About).

Firmware Version: Lists the firmware version of the box.

Bus Engine Version: Lists the BusEngine version of the box.

Notes: Provides a field for adding comments about each device.












Device List Buttons

The Device toolbar lets you change the settings for SAS*InFusion* boxes. It also lets you open the Device List library for a selected box and start traffic modification.

To use the toolbar, first select a device by placing a check in the checkbox in the row representing the box of interest.

Selecting a box causes the software to establish an Ethernet connection to the box. When a connection is established, the status for the device will read Connected and the toolbar buttons activate.

Table 4.4 Device List Buttons

 Device List Toolbar			
	Add Device to List. Opens a dialog for entering a static IP address, device name, and notes		Stop Scenario
	Refresh Device List. Causes the software to poll the Ethernet LAN for <i>InFusion</i> devices and to repopulate the Device List with its findings.		Device Configuration. Opens a dialog for viewing the SATA Hold Handling & Scrambling settings for each device. Also controls swing voltages, SSC, OOB select.
	Update Device. Opens a dialog for updating BusEngine & Firmware files.		Rename Device. Changes the name of the device as it appears in the Device List.
	View Edit Scenarios. Opens the Device Library window for the selected SASInFusion device ¹ . The Device Library will display a list of scenarios for the device and let you view and edit them.		Edit Device Notes. Allows notes to be added or edited to the Notes column in the Device List window
	Start Scenario. If a Device Library is open and a scenario has been selected, this button will instruct the SASInFusion device to begin modifying traffic.		View/Update License. Opens a dialog for displaying license status and updating the license. See chapter 7 for an explanation.

¹ You also can open the device library by double-clicking on the device name in the device list.

4.3 Modifying Window Layout

You can use *SASInFusion* windows in three modes: Tabbed style, frame style, and mixed style.

The modes are set apart by the presence/absence of tabs at the bottom of the windows. Tabbed-style windows have tabs. Frame-style windows do not. Mixed-style windows have some windows with tabs and some without.

Tabs are used to navigate from one window to the next.

Tabbed-Style Layout

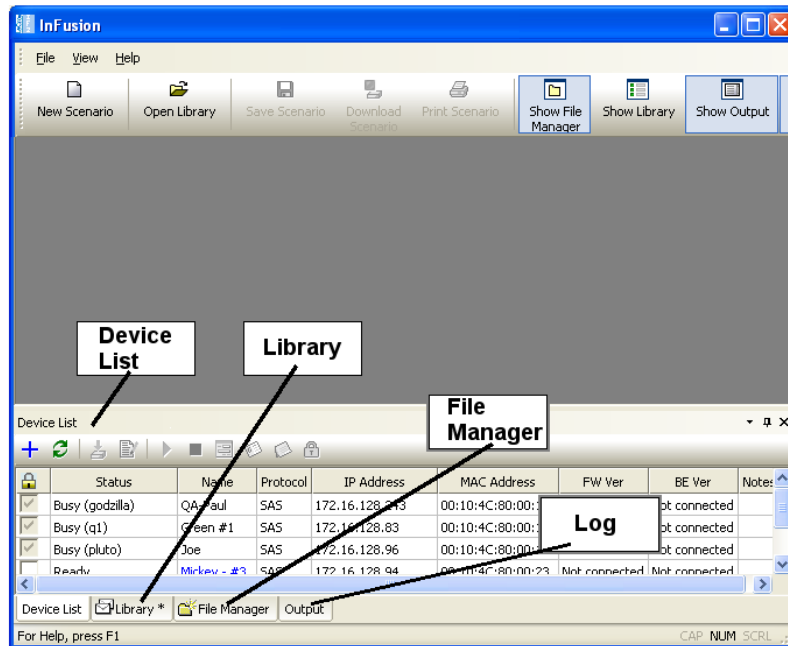


Figure 4.4 Application Window Layout: Tabbed Style

Tabbed-style windows stack one on top of the other so that only the top window is visible (Figure 4.4). Tabs allow you to navigate to the underlying windows.

Frame-style windows do not have tabs and appear side-by-side (Figure 4.5).

Mixed-style windows have some windows that are of a tabbed style and others that are of frame style (Figure 4.6).

Framed-Style Layout

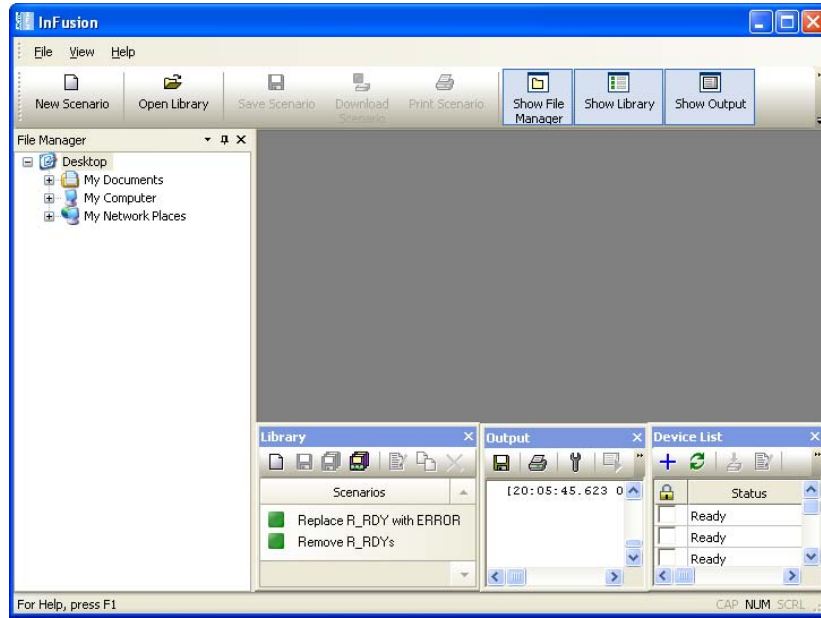


Figure 4.5 Application Window Layout: Framed Style

Mixed-Style Layout

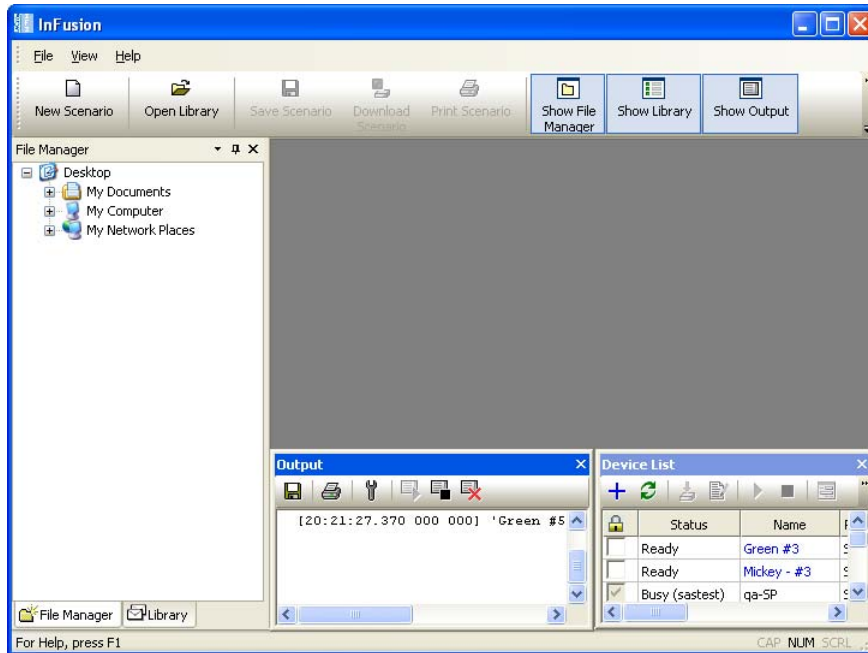


Figure 4.6 Application Window Display: Mixed Style

Moving Windows with "Smart Docking"

SASInFusion has a window-positioning feature called "Smart Docking" It allows precise positioning of windows within the application. When Smart Docking is enabled, Positioning buttons appear whenever you move a window (Figure 4.7 and Figure 4.8).

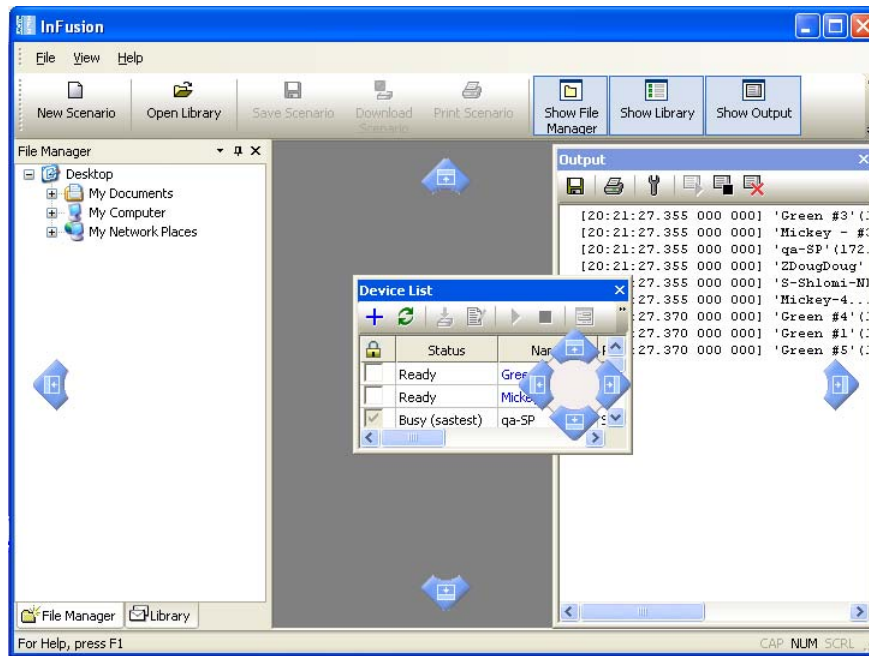


Figure 4.7 Application Display: Smart Docking Activated

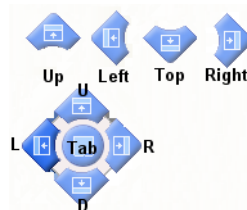


Figure 4.8 Smart Docking Positioning Buttons

The function of positioning buttons is to allow windows to be precisely positioned within the application.

Smart Docking is enabled by default and can be turned OFF or ON by selecting View > Smart Docking from the application menu.

If enabled, two sizes of buttons appear as soon as you move a window. Small buttons let you move the window in one direction. The larger button lets you position left, right, up or down within the center of the application window.

The larger button can also let you create tabbed windows. To create tabbed windows, drag the mouse over the central part of the positioning button (the Tab button in Figure 4.8).

To use move a window via the Positioning buttons:

- Step 1** Position your mouse pointer over a title bar of a window and click and hold the Mouse button. To reposition a tabbed window, click and hold on the Windows tab. The Positioning buttons appear as shown in Figure 4.8.
- Step 2** Drag the window over one of the Positioning buttons. When the mouse pointer is over the Positioning button, a ghost-like window pane appears (Figure 4.9). It shows you a preview of the new location of the window.
- Step 3** Release the mouse button. The window repositions itself.

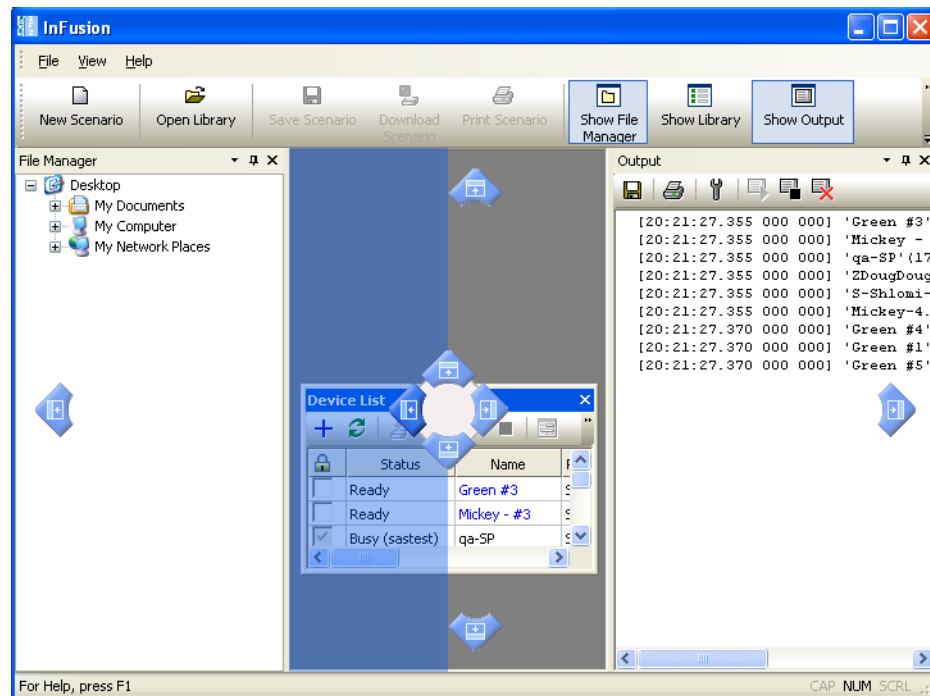


Figure 4.9 Application Display: New Location of Window

4.4 Tool Tips

Throughout the application, Tool Tips provide useful information about buttons on the toolbars.

To display a Tool Tip, position the mouse pointer over an item of interest ().

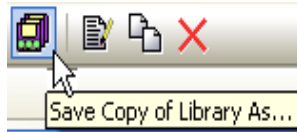


Figure 4.10 Tool Tip

4.5 The Menu Bar

Table 4.5 lists commands in the *SASInFusion* menu bar.

Table 4.5 SASInFusion Menu Bar Menus and Menu Options

Menu/Option	Function
File	
New Scenario	Opens an area for creating a new scenario. Scenarios are test scripts that determine how <i>SASInFusion</i> monitors and modifies traffic.
Open Library ...	Opens a dialog for selecting library files (*.INFDB)
Close Scenario	If open, closes the selected scenario.
Save Scenario	Saves any changes that have been made to an open scenario.
Print Scenario...	Prints part or all of the scenario.
Print Preview	Shows what the scenario will look like when printed.
Print Setup...	Sets up your current or new printer.
Exit	Exits the <i>SASInFusion</i> program.
View	
Views >>	Shows or hides the File Manager, Library, Output and Devices windows. Also has a Customize option for customizing or resetting menus, toolbars and tooltips.
Smart Docking	If enabled, causes Positioning buttons to appear onscreen any time a window is moved. These buttons allow windows to be precisely positioned and docked within the application.
Toolbars	Displays list of available toolbars.
Status Bar	Shows or hides the Status bar.

Menu/Option	Function
Window	
New Window	Opens a copy of the current scenario window.
Cascade	Displays all open windows in an overlapping arrangement.
Tile	Displays all open windows as a series of strips across the display.
Arrange Icons	Arranges minimized windows at the bottom of the display.
Windows ...	Displays a list of open windows and provides controls for activating or closing them.
Help	
Help Topics ...	Opens this manual.
About SASInFusion	Displays version information about SASInFusion.











4.6 Toolbars

Toolbars provide quick access to most of the *SASInFusion* software functions. You can learn the function of each button by passing the mouse pointer over them.

Descriptions of the buttons appear on the status bar at the bottom of the window and as tooltips above each button.


The application toolbar allows you to create, save and print scenarios and to open libraries and windows within the application.

Table 4.6 Application Toolbar Buttons

			
	New Scenario.		Show File Manager
	Open Library. Opens a dialog for browsing to a library file (*.INFDB).		Show Library
	Save Scenario		Show Output
	Download Scenario		Show Device List
	Print Scenario		

4.7 Status Bar

The Status bar is located at the bottom of the Main Display window. The Status bar provides status information on *SASInFusion* and also provides descriptions of buttons in the application whenever the mouse pointer is held over a button.

A horizontal status bar with a light gray background and a thin border. The text "Set viewing options for the device list" is displayed in a small, dark font within the bar.

Set viewing options for the device list

Figure 4.11 Status Bar

5. Test Scenarios

This chapter describes how to create and execute *SASInFusion* scenarios. A scenario is a test script that defines how the *SASInFusion* box monitors and modifies line traffic.

5.1 Scenarios Overview

You create scenarios on a PC running the *SASInFusion* application. You then download the scenarios for execution on a *SASInFusion* box. You can download up to ten scenarios to each *SASInFusion* box. You can start and stop a scenario either at the box, using the device LCD panel, or at the PC, using the *SASInFusion* software application.

The *SASInFusion* 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.

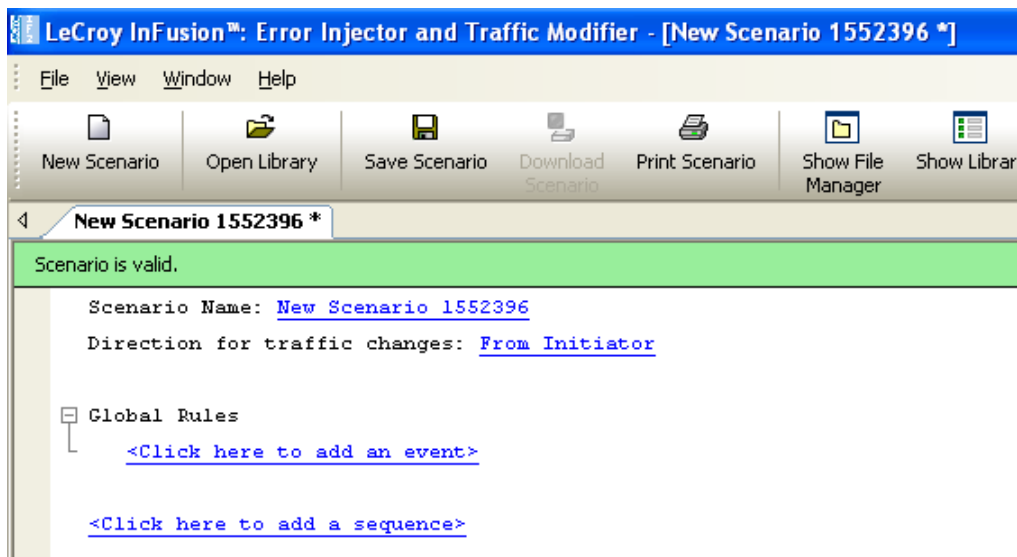


Figure 5.1 Open Scenario in Application Window

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 are named in the following format:

```
<filename>.infdb
```

Creating *SASInFusion* scenarios is easy, but it requires an understanding of the following terms: action, event, combined event, global rules, sequence, and state.

Table 5.1 Key Scenario Terms

Term	Definition
Action	<i>SASInFusion</i> response to an event.
Event	Condition that is detectable by <i>SASInFusion</i> .
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 <i>SASInFusion</i> test state.
Sequence	Portion of a scenario that can define multiple <i>SASInFusion</i> test states. More flexible than the Global Rules, a sequence allows more powerful scenarios that include branching and looping between test states (the 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 <i>SASInFusion</i> testing, behavior is "waiting" for a certain set of events and responding with a certain set of actions.

You can think of the Global Rules and each sequence as 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, they allow you to operate up to three test states simultaneously within *SASInFusion*.

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 *SASInFusion* 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 will 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 will take place simultaneously.

After defining the event and actions within the Global Rule area, you can save the scenario and download it to a *SASInFusion* box.

Sequences

The Global Rules are all you will need for simple test scenarios. However, a scenario also can contain one or two sequences, more powerful programs that can define multiple states and allow branching between states. You also can do looping with a sequence, 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.

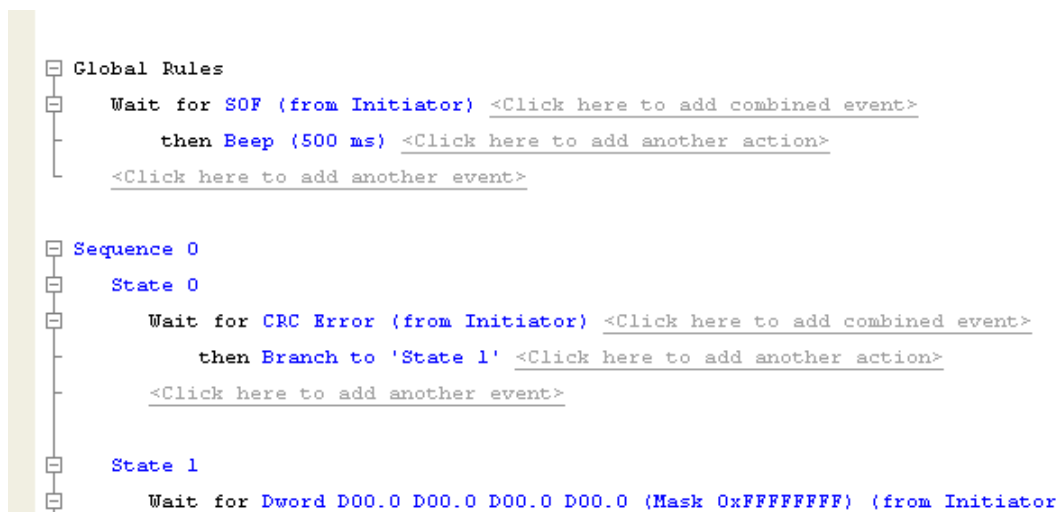


Figure 5.2 Global Rules and Sequence Areas of a Scenario

SASInFusion 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."

Multi-Link Testing

SASInFusion hardware supports testing of SAS wide-link configurations. Wide-link uses multiple physical links to aggregate traffic from up to four separate lines into one logical link.

Each *SASInFusion* box has two BNC connectors on its rear panel that allow it to connect to other *SASInFusion* boxes in a daisy-chain. One connector is for signal input, the other for signal output.

The BNC connectivity allows you develop wide-link test schemes. In such schemes, four boxes are connected in a daisy-chain, with the BNC output on an upstream box linked to the BNC input on its downstream neighbor.

A separate scenario runs on each box, but the scenarios interact through trigger signals exchanged via their BNC ports. For example, you can set the first box in the daisy-chain to send a trigger downstream when it detects a specific line condition. The trigger can cause a state change in the scenario running on the downstream box. That box, in turn, can cause a state change in the scenario running on its neighbor.

Each of the four boxes is monitoring/modifying its own line, but there is a synergy between the four by way of the BNC daisy-chain. In this fashion, you can use a *SASInFusion* daisy-chain to coordinate error injection across multiple SAS or SATA physical links.

5.2 Scenario Libraries

As described, 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 *SASInFusion* box 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 *SASInFusion* 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 *SASInFusion* application.

Note: In this manual, the main library and other .infdb file libraries are collectively called general libraries.

Device Libraries

In addition to general libraries, the application defines device libraries. Each device library is associated with a specific SASInFusion box. Each device library opens in a separate Device Library window and holds up to ten SASInFusion scenarios for the box. When you connect to the box and click on the entry for that box in the Device List, the device library for the box opens automatically.

The scenarios that appear in the device library are those currently stored on the corresponding box. They were uploaded from the box to your PC when you opened the device library. You can click on 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.

5.3 Test Events

As described, 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 the Global Rules or a sequence, the menu-driven interface prompts you to specify the event(s) for which you want to trigger actions.

While many events are line conditions, an event also can be a condition that occurs within a SASInFusion box (for example, detection of a BNC trigger signal from another box).

Table 5.2 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.

5.4 Test 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.

Table 5.3 lists supported actions. Note that some of these actions only apply to creating sequences.

Table 5.2 Test State Events

Event	Description
Any Dword	Occurrence of any Dword on the line.
BNC Input	Occurrence of BNC input trigger.
Both Links Up	Occurrence of both line ports active (not idling).
CRC Error	Occurrence of a CRC error on the line.
Dword Matcher	Occurrence of a particular Dword on the line.
FIS	Occurrence of a particular SATA FIS on the line.
Frame	Occurrence of a particular frame on the line.
Invalid 10b Code	Occurrence of an invalid 10b code.
Links Speed 3G	Both lines operating at 3 Gbps.
OOB Signal	Occurrence of OOB signal.
Primitive Group	Occurrence of particular primitive group on the line.
Running Disparity Error	Occurrence of Running Disparity (RD) error.
SAS Data Pattern	Occurrence of a particular data pattern in a SAS frame.
SAS Primitive	Occurrence of a particular SAS primitive.
SATA Data Pattern	Occurrence of a particular data pattern in a SATA frame.
SATA Primitive	Occurrence of a particular SATA primitive.
Timer	Occurrence of a particular elapsed time (time period).

Following sections provide some additional details on three of the 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
- Must be data only (no K-codes/primitives)
- 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

Table 5.3 Test State Actions

Action	Description
Beep	Emit audible sound of duration selectable via drop-down list.
BNC Output	Send a signal out the BNC port to the box downstream.
Branch to Existing State	Go to a state in this sequence that is already defined. ¹
Branch to New State	Go to a state in this sequence that is not yet defined (you need to define it). ¹
Disconnect	Put both SASInFusion SAS ports at electrical idle immediately.
Inject CRC Error	Inject a CRC error into the line.
Inject Invalid 10b Code	Inject invalid 10b code into the line.
Inject RD Error	Inject a Running Disparity (RD) error into traffic.
Monitor/Count	Open a window to count the number of events that occur during a session. A session is the time period during which a scenario runs.
Reconnect	Start traffic pass-through immediately. This action is used to restart traffic after a previous disconnect command. Once traffic is passing-through, the initiator and target resume OOB signaling.
Remove	Remove the targeted event from the traffic. ²
Restart All Sequences	Restart all sequences in the scenario. ¹
Restart Current Sequence	Restart the sequence that contains this action definition. ¹
Stop Scenario	Stop all scenario activity.
Substitute Data Dword	Substitute a data Dword in the traffic.
Substitute SAS Primitive	Substitute a SAS primitive in the traffic.
Substitute SATA Primitive	Substitute a SATA primitive in the traffic.

¹ Only shown in Action Properties dialog box when creating a sequence.

² In SASInFusion, 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.

5.5 Test Initiator and Target

To begin the scenario creation process, you press the **New Scenario** button in a library window or on the *SASInFusion* 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).

Figure 5.3 shows the first prompt in the scenario creation process. When you click on it, the Scenario Properties dialog box appears, allowing you to enter the scenario name, a short description, and direction of traffic change (Figure 5.4).

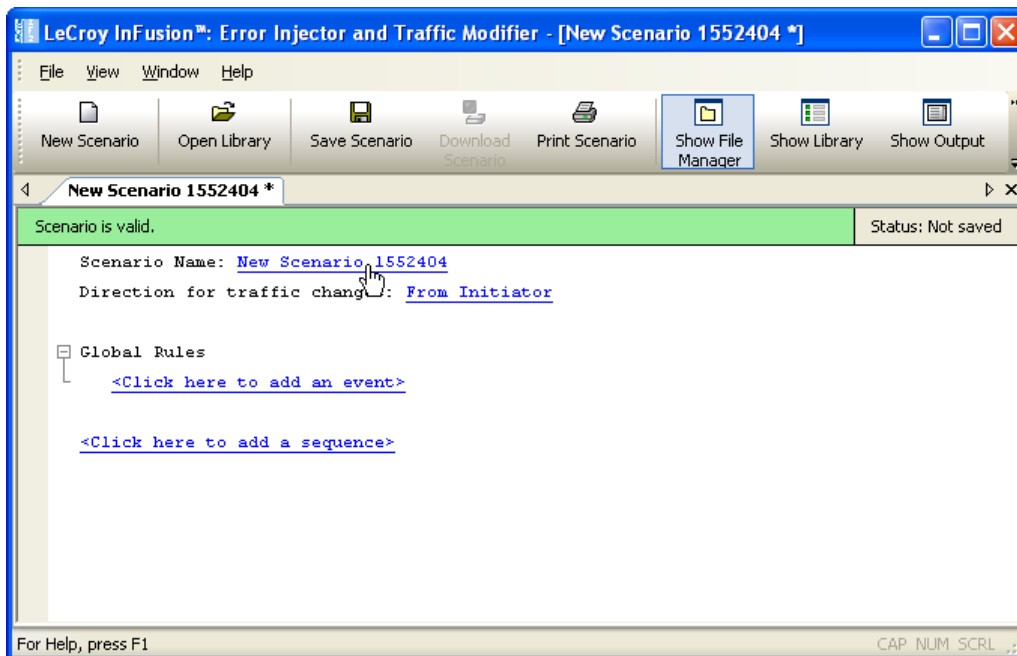


Figure 5.3 Entering Basic Scenario Information

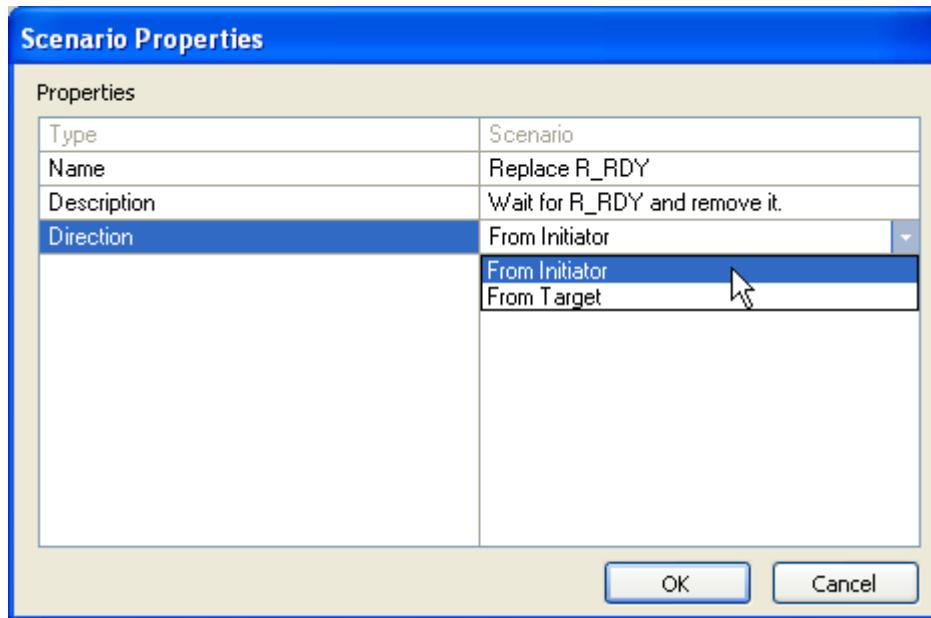


Figure 5.4 Scenario Properties Dialog Box

Note: You define direction of these traffic changes on a global basis for the entire scenario. In other words, any scenario action that modifies line traffic follows the rule established at the top of the scenario.

5.6 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 the desired device library by drag-and-drop with a mouse. (Each device library is associated with a specific *SASInFusion* box.)
- Step 3** Download all scenarios in device library to the *SASInFusion* box.
- Step 4** Select the scenario in the device library that you want to run on the box.
- Step 5** To run the scenario, click the Start Scenario button from the Device Library toolbar. The box will start 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.

5.7 Creating Global Rules

This section gives several 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 *SASInFusion* 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, *SASInFusion* 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.

Table 5.4 summarizes the Global Rules examples that follow.

Table 5.4 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 (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. At the top of the scenario area, enter general scenario information, including scenario name, description, and direction of traffic change.

Note: For an example of filling-in the general scenario information fields, see Figure 5.3 and Figure 5.4.

- Step 2 In the Global Rules area, click on the prompt to **add an event** (Figure 5.5).
- Step 3 The Event Properties dialog box appears (Figure 5.6). In the Type column on the left, choose **SAS Primitive**.

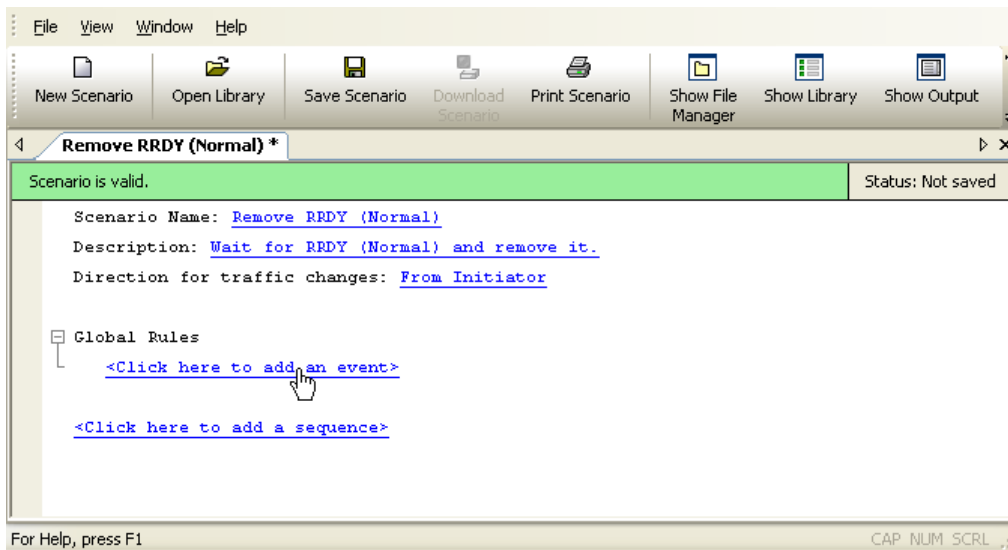


Figure 5.5 Example 1: Entering an Event

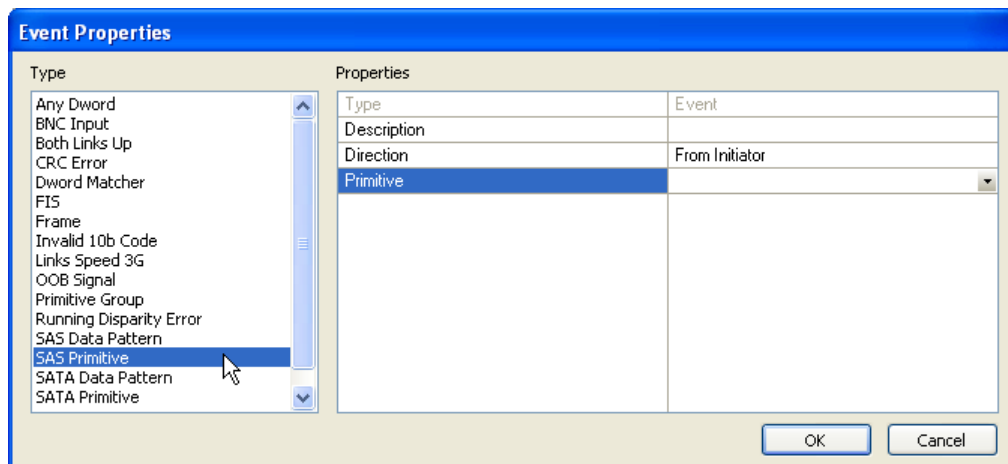


Figure 5.6 Example 1: Event Properties Dialog Box

- Step 4** In the Type column in the middle of the dialog box, click on **Description** if you want to add a description of the event. Click on **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 5** Still in the middle column of the Event Properties dialog box, click on **Primitive** to bring up a drop-down menu that lets you choose the type of primitive you want to wait for in this scenario (Figure 5.7). In this example, it is RRDY (Normal).
- Step 6** Click **OK** to close the Event Properties dialog box.
- Step 7** In the Global Rules area, click on the prompt to add an action (Figure 5.8).
- Step 8** The Action Properties dialog box appears (Figure 5.9). In the Type column on the left, choose the action you want to occur when an RRDY is detected. In this example, it is the Remove action.
- Note:** In *SASInFusion*, a Remove primitive action is implemented by replacing the primitive with an idle data dword.
- Step 9** Click **OK** to close the Action Properties dialog box.
- Step 10** In the File menu, select **Save Scenario** to save the scenario.

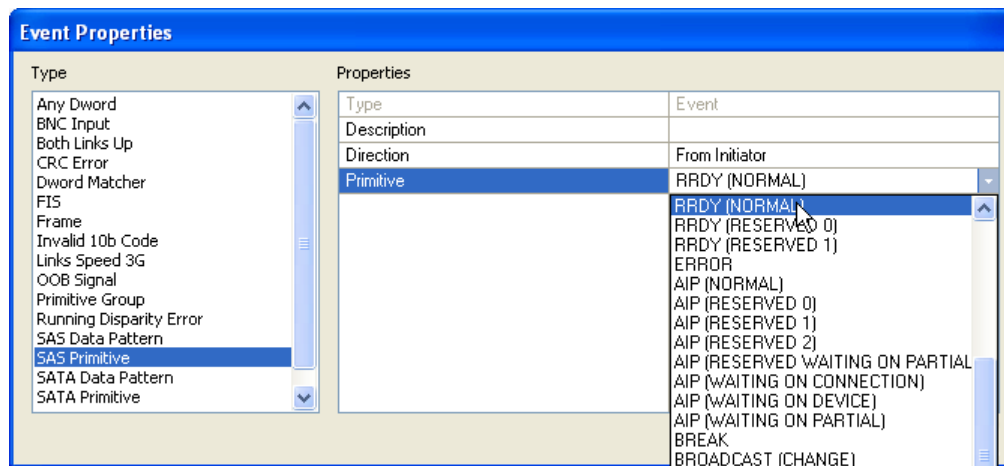


Figure 5.7 Example 1: Event Drop-Down List

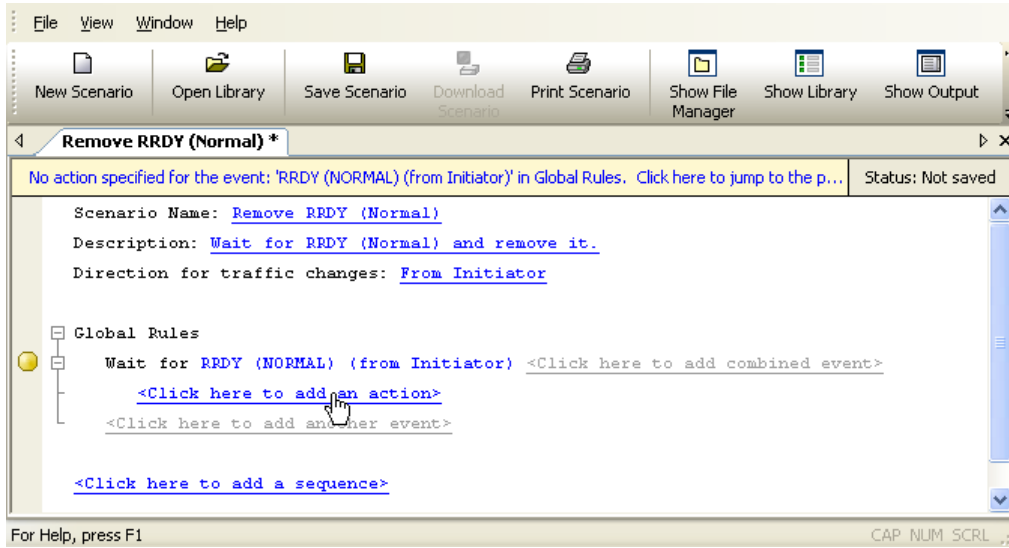


Figure 5.8 Example 1: Entering an Action

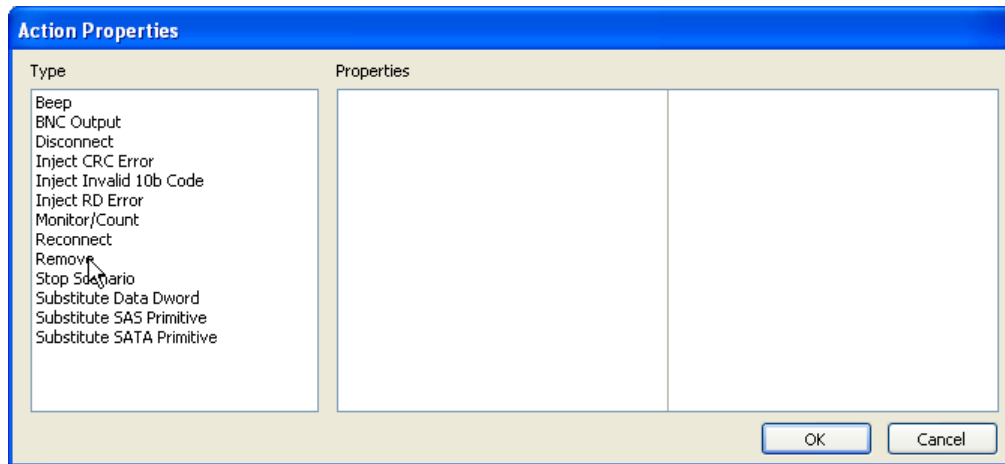


Figure 5.9 Example 1: Action Properties Dialog Box

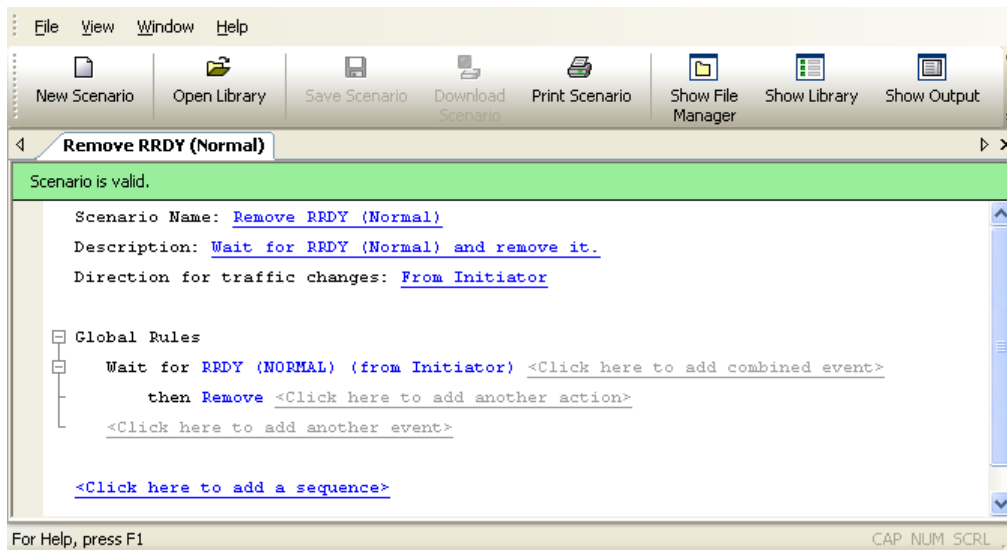


Figure 5.10 Example1: Complete Scenario

Example 2: Wait for 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. At the top of the scenario area, enter general scenario information, including scenario name, description, and direction of traffic change.

Note: For an example of filling-in the general scenario information fields, see Figure 5.3 and Figure 5.4.

Step 2 In the Global Rules area, click on the prompt to **add an event** (Figure 5.11). This brings up the Event dialog box.

Step 3 As you did in steps 1 through 6 of the previous example, choose RRDY (Normal) as the type of primitive you want to monitor.

Step 4 In the Global Rules area, click on the prompt to **add an action** (Figure 5.12).

Step 5 The Action Properties dialog box appears (Figure 5.13). In the Type column on the left, choose **Substitute SAS Primitive** as the action you want when an RRDY (Normal) occurs.

Step 6 In the middle column of the dialog box, click on **Description** if you want to add a description of the action.

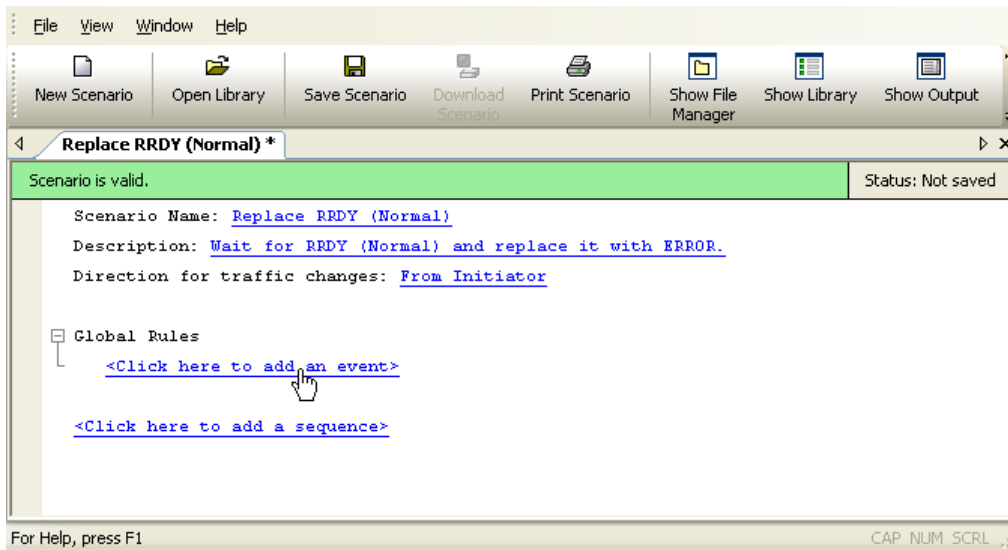


Figure 5.11 Example 2: Entering the Event

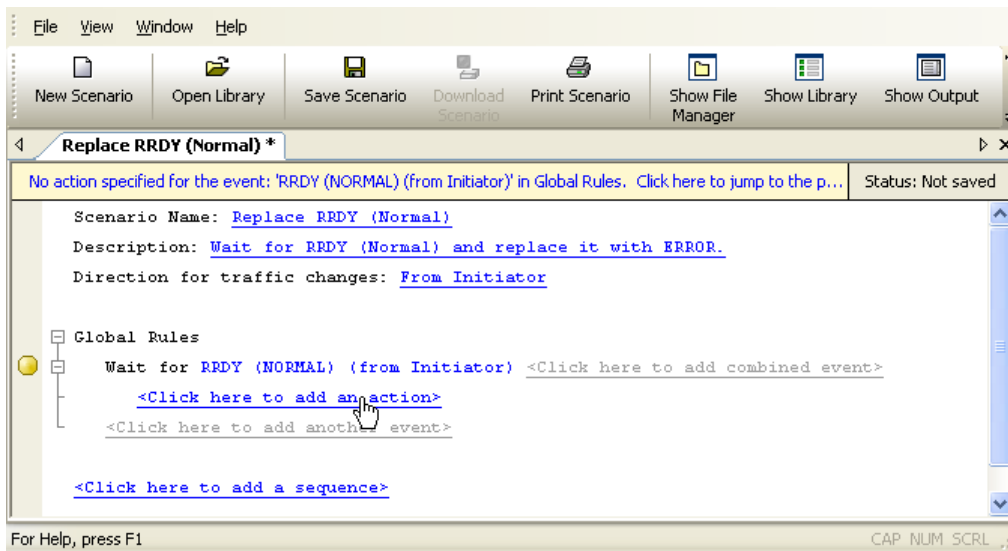


Figure 5.12 Example 2: Entering the Action

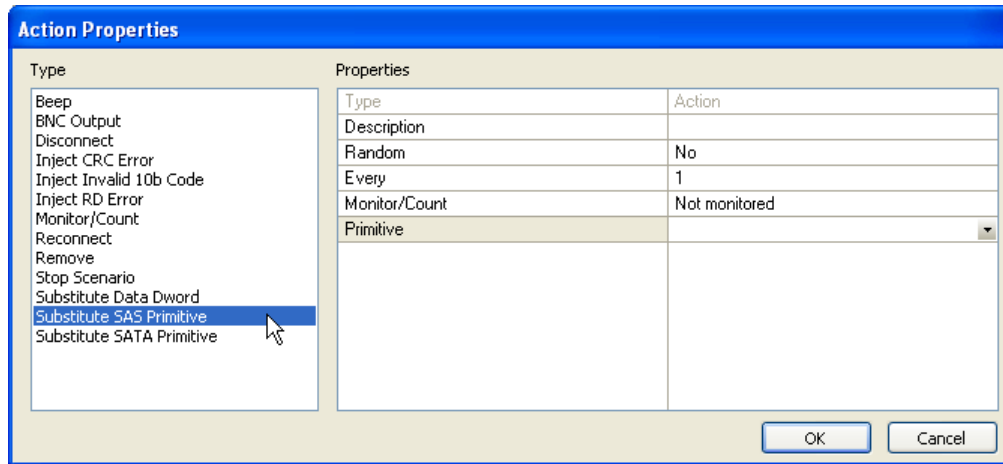


Figure 5.13 Example 2: Action Properties Dialog Box

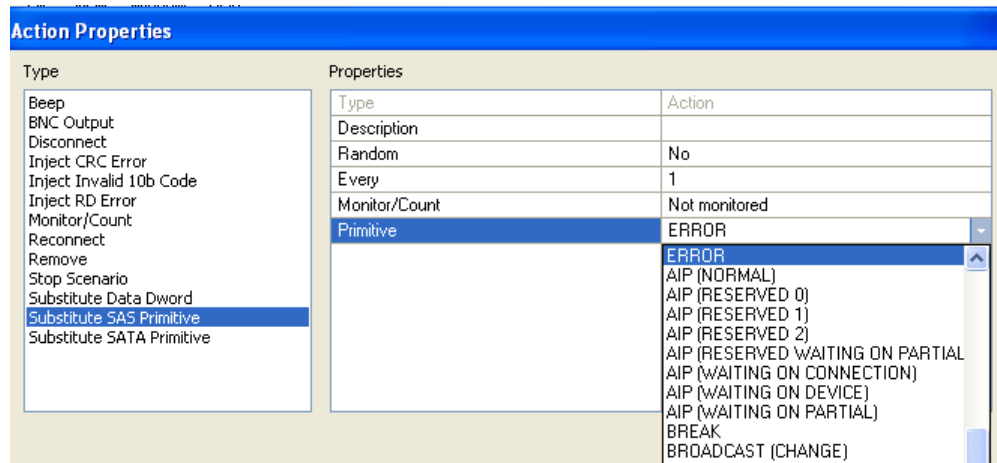


Figure 5.14 Example 2: Action Drop-Down List

- Step 7** Still in the middle column of the Event Properties dialog box, click on **Primitive** to bring up a drop-down menu that lets you choose the type of primitive to substitute for RRDY (Normal) (Figure 5.14). 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.

Note: In this example, you set the substitution action to happen at every occurrence of an RRDY (Normal) (as shown in Figure 5.14, 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.

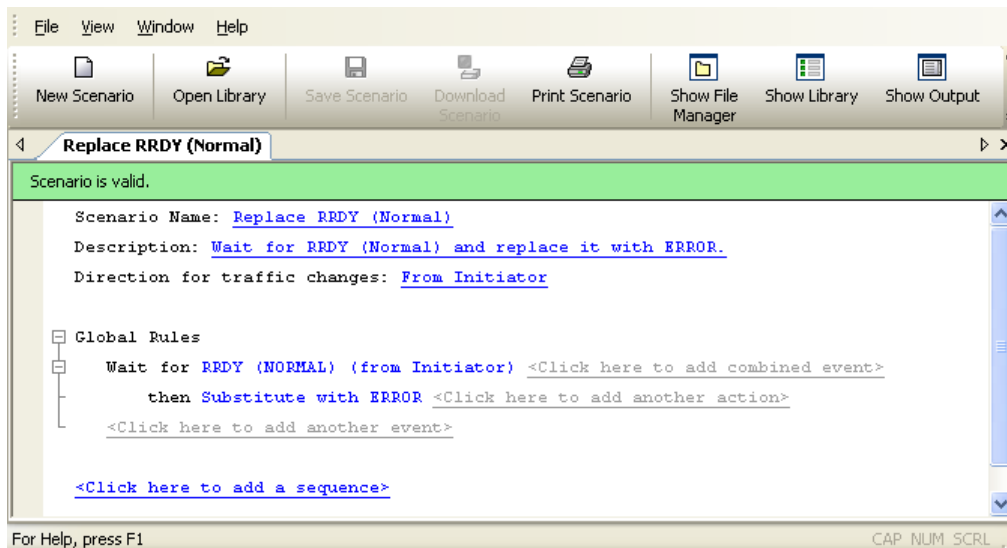


Figure 5.15 Example 2: Complete Scenario

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. At the top of the scenario area, enter general scenario information, including scenario name, description, and direction of traffic change.

Note: For an example of filling-in the general scenario information fields, see Figure 5.3 and Figure 5.4.

Step 2 In the Global Rules area, click on the prompt to **add an event**.

Step 3 The Event Properties dialog box appears. As you did in example 1 of this chapter, choose **RRDY (Normal)** as the first primitive you want to monitor.

- Step 4** Click on the **add combined event** prompt to add a second event (Figure 5.16).
- Step 5** The Event Properties dialog box appears (Figure 5.17). Choose **RRDY (Reserved 0)** as the second primitive you want to monitor.
- Step 6** Click **OK** to close the Event Properties dialog box.
- Step 7** In the Global Rules area, click on the prompt to **add an action** (Figure 5.18).
- Step 8** The Action Properties dialog box appears (Figure 5.19). In the Type list on the left, choose **Substitute SAS Primitive** as the action you want when either RRDY Reserved 0 or RRDY Normal occurs.

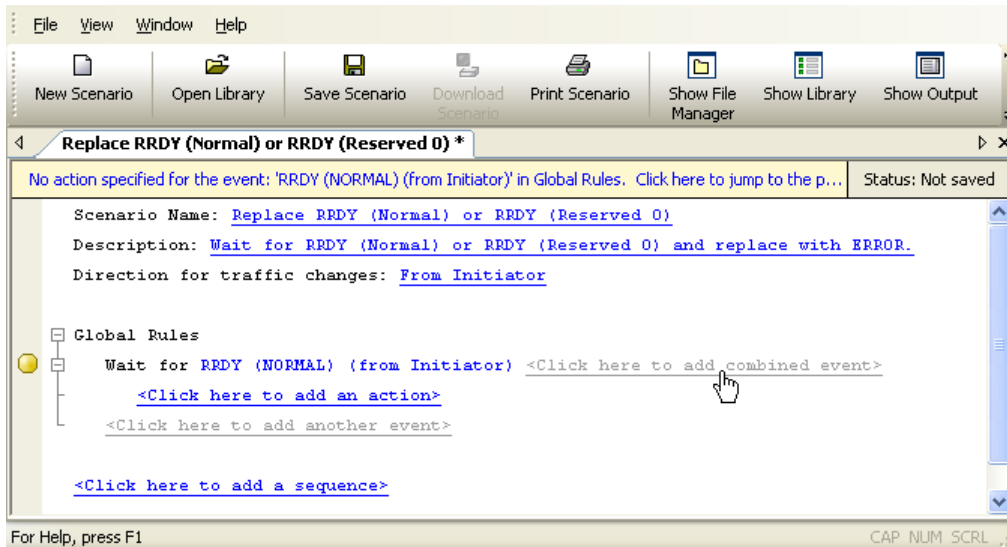


Figure 5.16 Example 3: Entering the Second Event

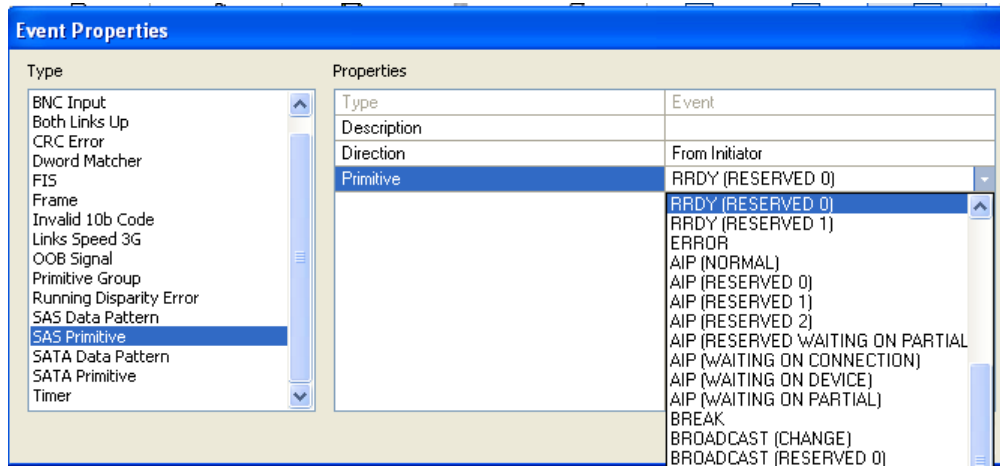


Figure 5.17 Example 3: Event Properties Dialog Box

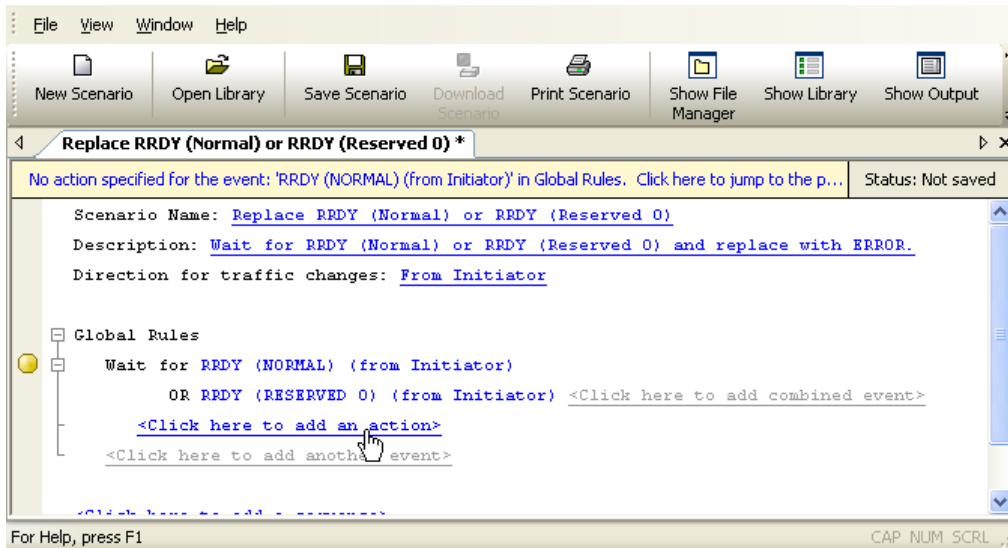


Figure 5.18 Example 3: Entering the Action

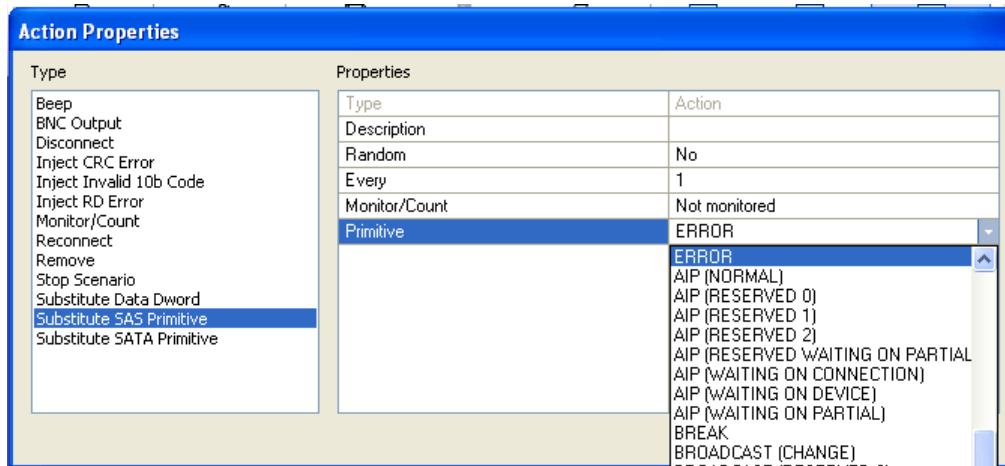


Figure 5.19 Example 3: Action Drop-Down List

Step 9 Click **OK** to close the Action Properties dialog box.

Step 10 In the File menu, select **Save Scenario** to save the scenario.

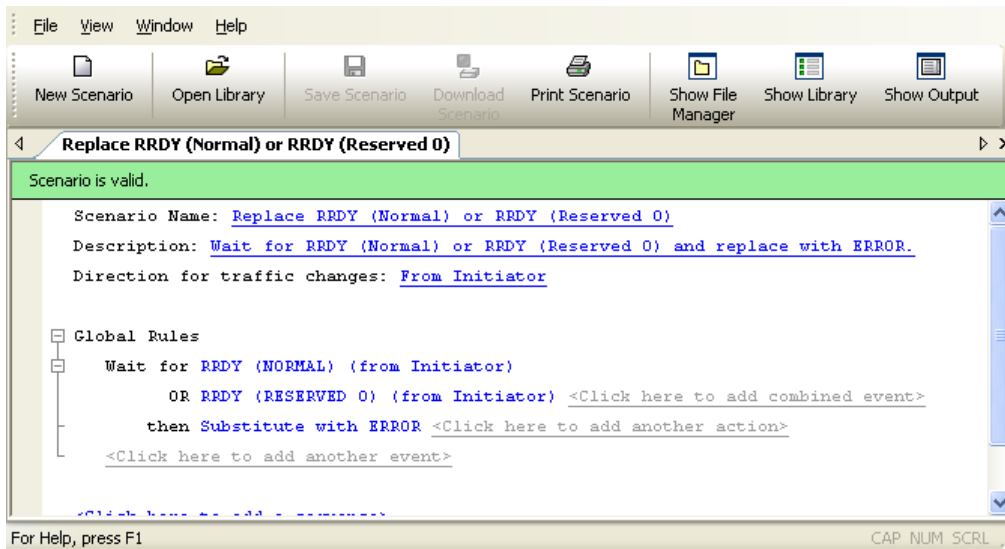


Figure 5.20 Example 3: Complete Scenario

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. At the top of the scenario area, enter general scenario information, including scenario name, description, and direction of traffic change.

Note: For an example of filling-in the general scenario information fields, see Figure 5.3 and Figure 5.4.

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 on the prompt to **add the next event** (keep in mind this is not a combined event) (Figure 5.21).

Note: 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 The Event Properties dialog box appears. Using the drop-down menu, choose **RRDY (Reserved 0)** as the second event to monitor (Figure 5.22).

Step 5 Click **OK** to close the Event Properties dialog box.

Step 6 In the Global Rules area, click on the prompt to **add an action** to be triggered by the RRDY (Reserved 0) (Figure 5.23).

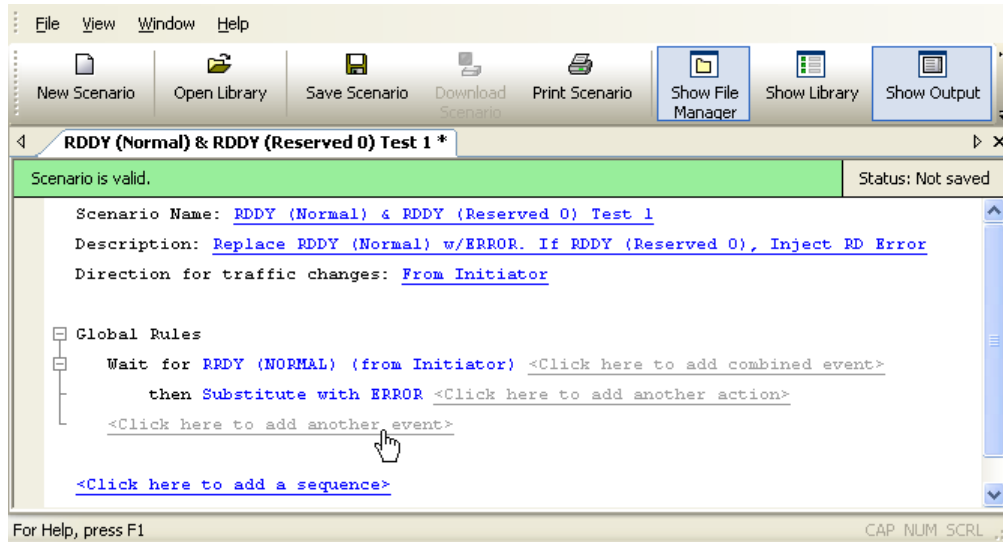


Figure 5.21 Example 4: Entering Second Event

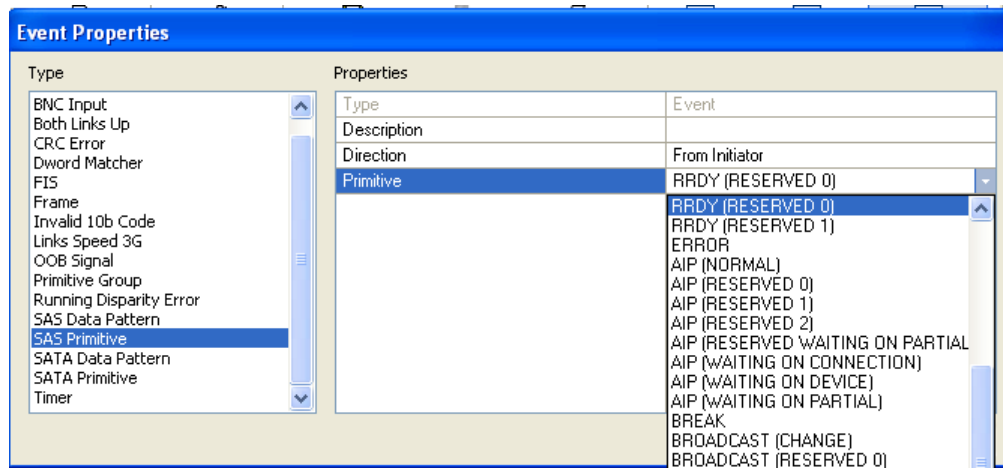


Figure 5.22 Example 4: Event Drop-Down List

- Step 7 The Action Properties dialog box appears (Figure 5.24). Use it to choose **Inject RD Error** as the action triggered by RDDY (Reserved 0).
- Step 8 Click **OK** to close the Action Properties dialog box.
- Step 9 In the File menu, select **Save Scenario** to save the scenario.

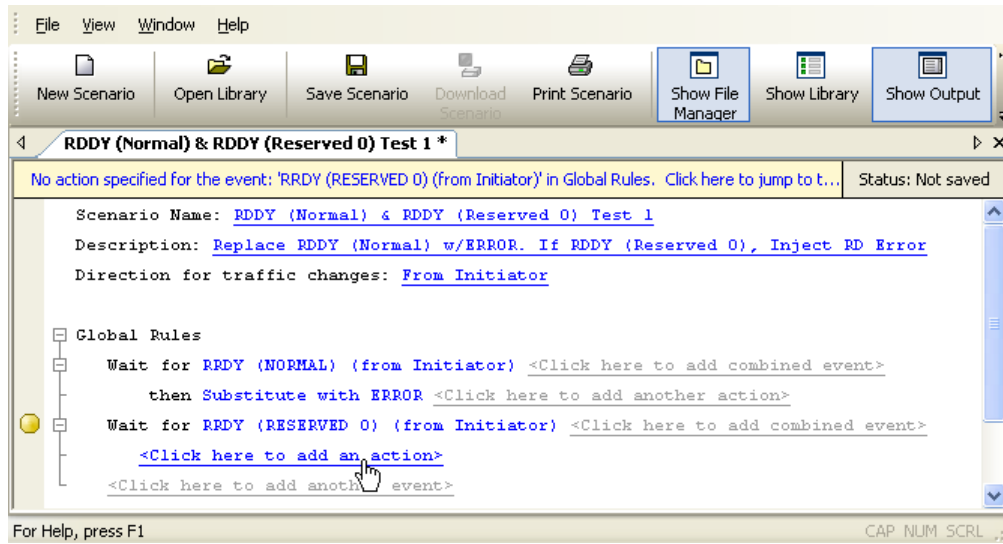


Figure 5.23 Example 4: Entering Second Action

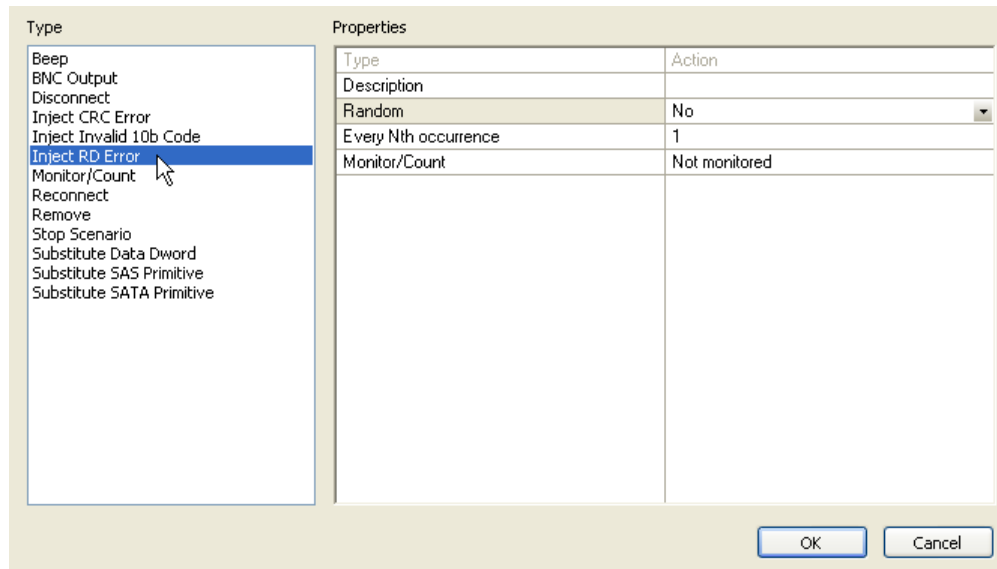


Figure 5.24 Example 4: Action Drop-Down List

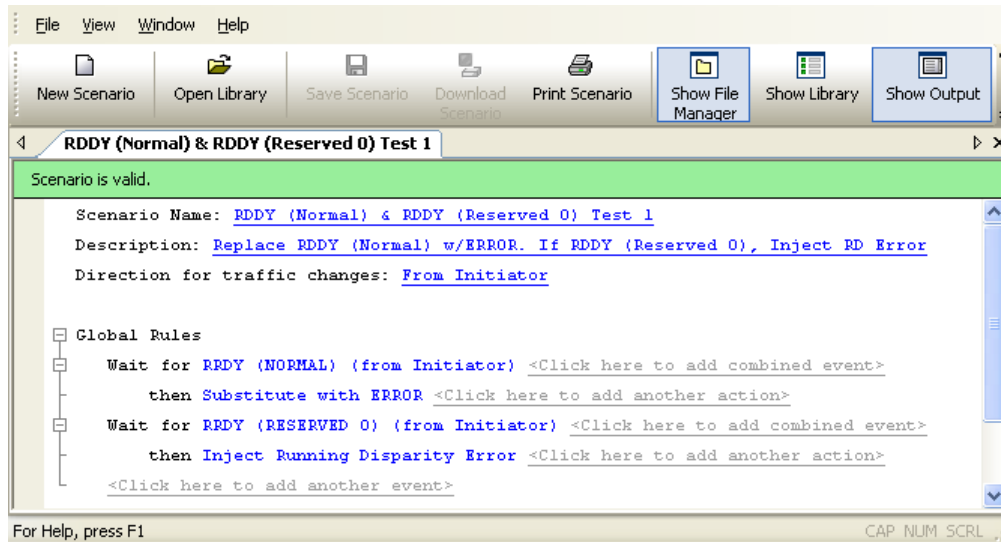


Figure 5.25 Example 4: Complete Scenario

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 box waits for an ACK from the initiator. When it occurs, the box 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. At the top of the scenario area, enter general scenario information, including scenario name, description, and direction of traffic change.

Note: For an example of filling-in the general scenario information fields, see Figure 5.3 and Figure 5.4.

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, configure 500 ms as the duration of the beep.

Step 3 Click on the **add another action** prompt to add a second action (Figure 5.26).

Step 4 The Action Properties dialog box appears. Choose **Inject RD Error** as the second action (Figure 5.27).

Step 5 Click on the **add another action** prompt to add a third action (Figure 5.28).

Step 6 The Action Properties dialog box appears. Choose **Monitor/Count** as the third action (Figure 5.29).

Step 7 Click **OK** to close the Action Properties dialog box.

Step 8 In the File menu, select **Save Scenario** to save the scenario.

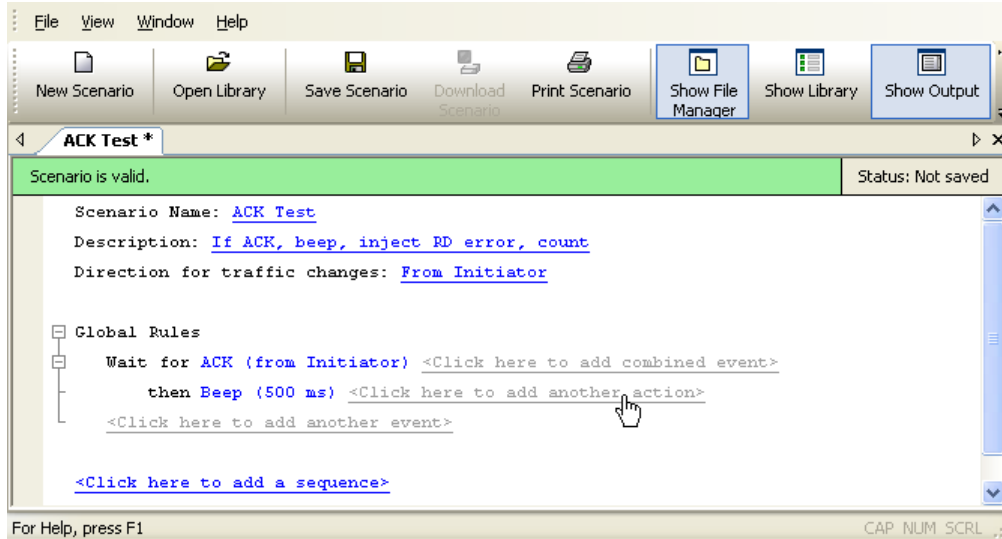


Figure 5.26 Example 5: Entering the Second Action

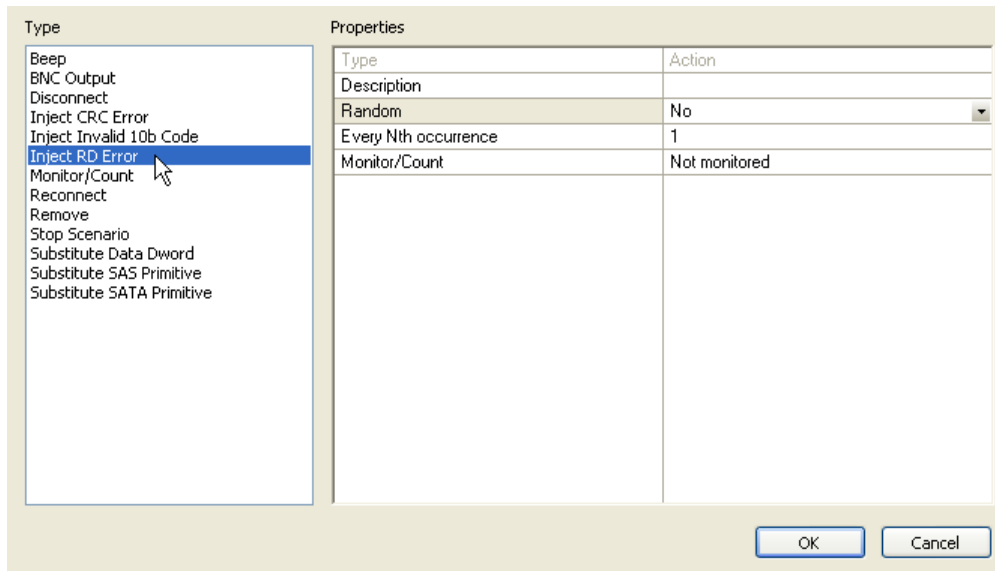


Figure 5.27 Example 5: Action Drop-Down List (For Second Action)

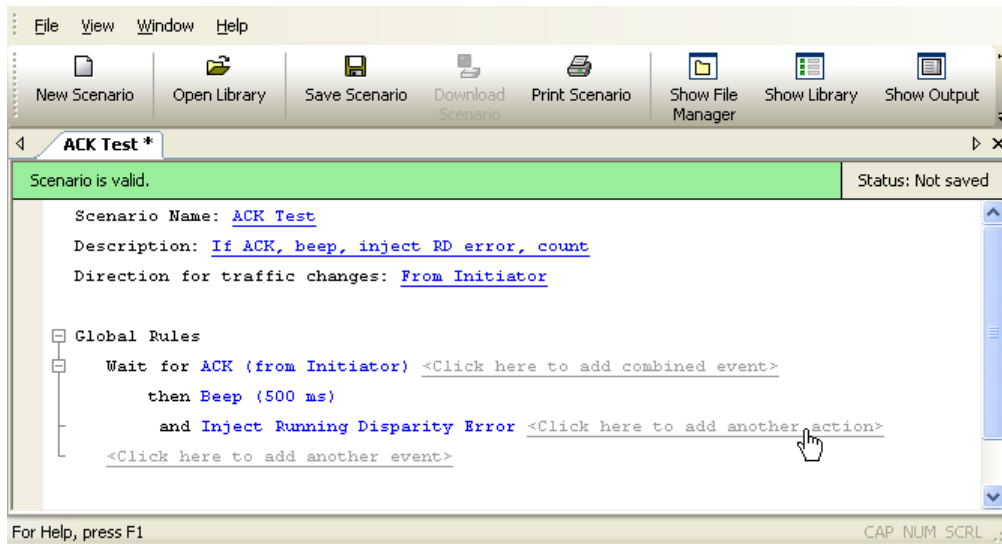


Figure 5.28 Example 5: Entering the Third Action

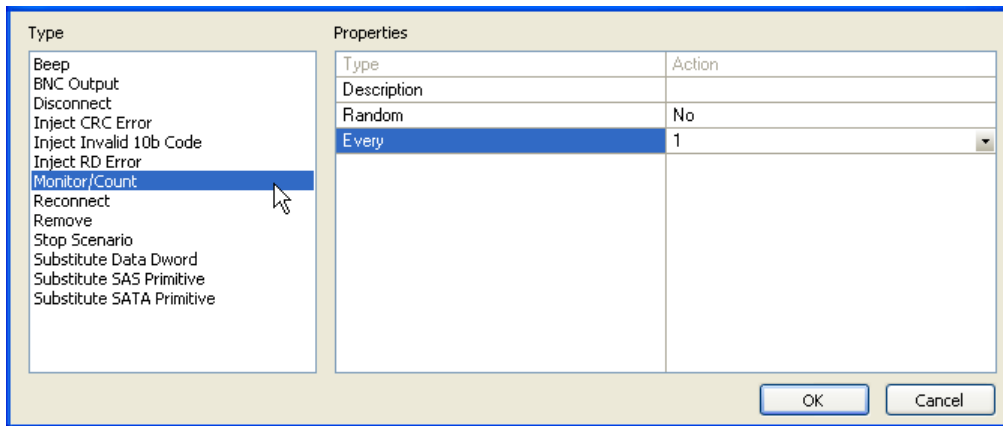


Figure 5.29 Example 5: Action Drop-Down List (For Third Action)

Note: This example sets the counter to increment at each occurrence of an ACK (every 1 ACK). However, you can set the timer to increment at other multiples of occurrence (for example, every 5, every 25, every 50, and so on).

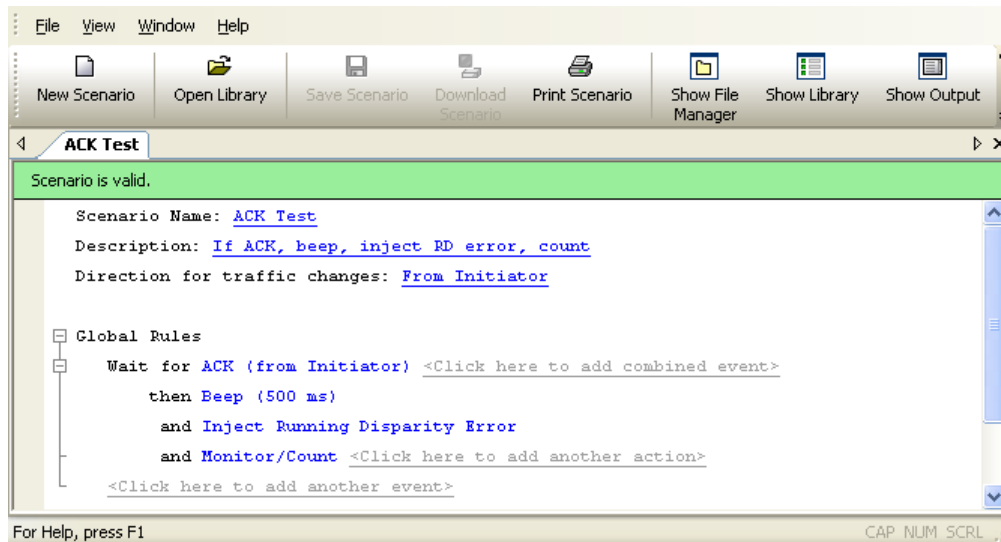


Figure 5.30 Example 5: Complete Scenario

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 box 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.

Note: 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. At the top of the scenario area, enter general scenario information, including scenario name, description, and direction of traffic change.

Note: For an example of filling-in the general scenario information fields, see Figure 5.3 and Figure 5.4.

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 on the prompt to **add another event** (keep in mind this is not a combined event) (Figure 5.31).

- Step 4** The Event Properties dialog box appears (Figure 5.32). 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 on the prompt to **add an action** to correspond with the second event (Figure 5.33).
- Step 7** The Action Properties dialog box appears (Figure 5.34). In the Type list on the left, choose **Stop Scenario** as the action you want after the timer has expired.
- Step 8** Click **OK** to close the Action Properties dialog box.
- Step 9** In the File menu, select **Save Scenario** to save the scenario.

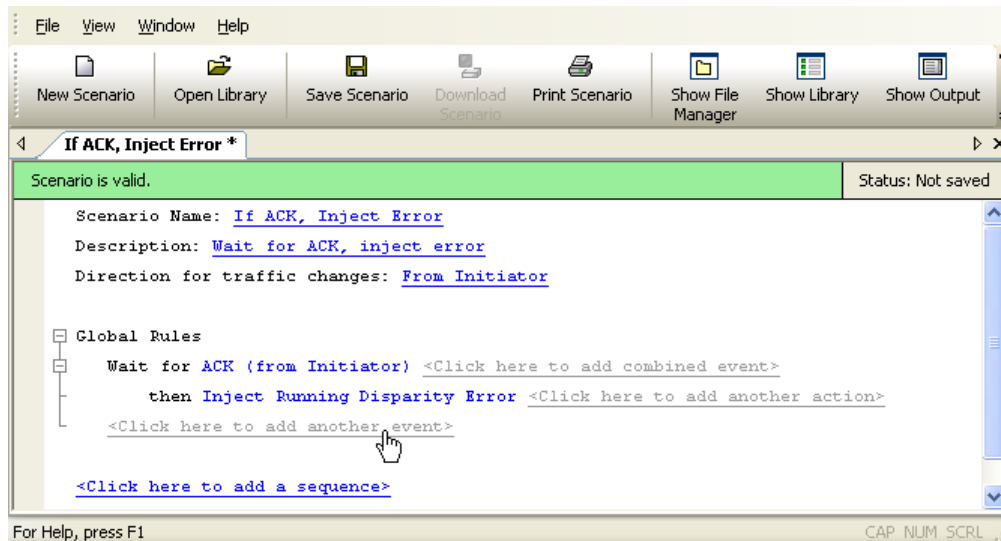


Figure 5.31 Example 6: Entering the Second Event

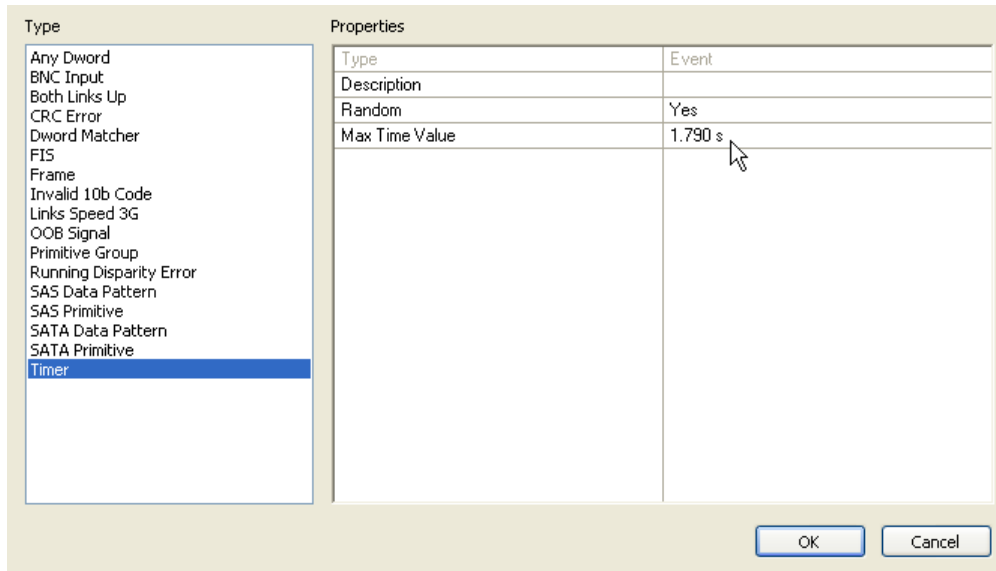


Figure 5.32 Example 6: Event Drop-Down List

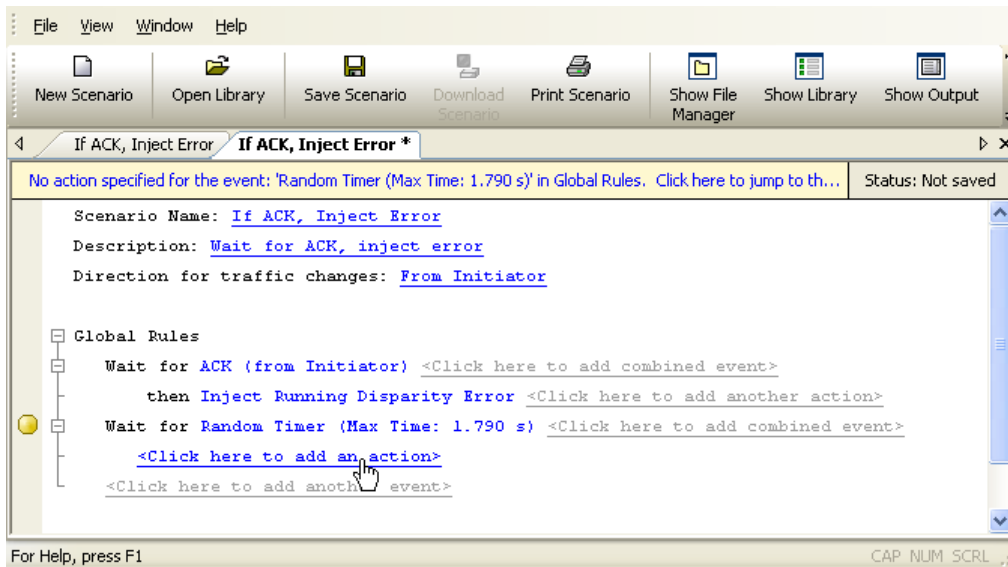


Figure 5.33 Example 6: Entering Second Action

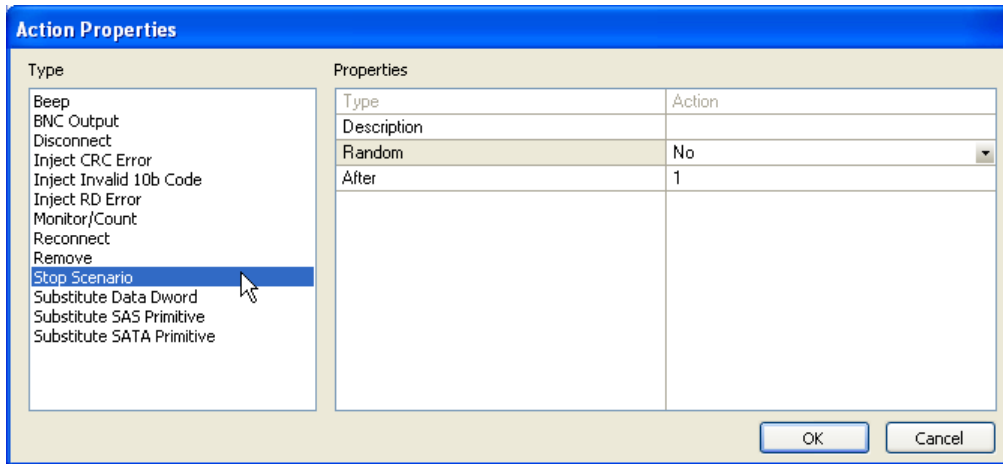


Figure 5.34 Example 6: Action Drop-Down List

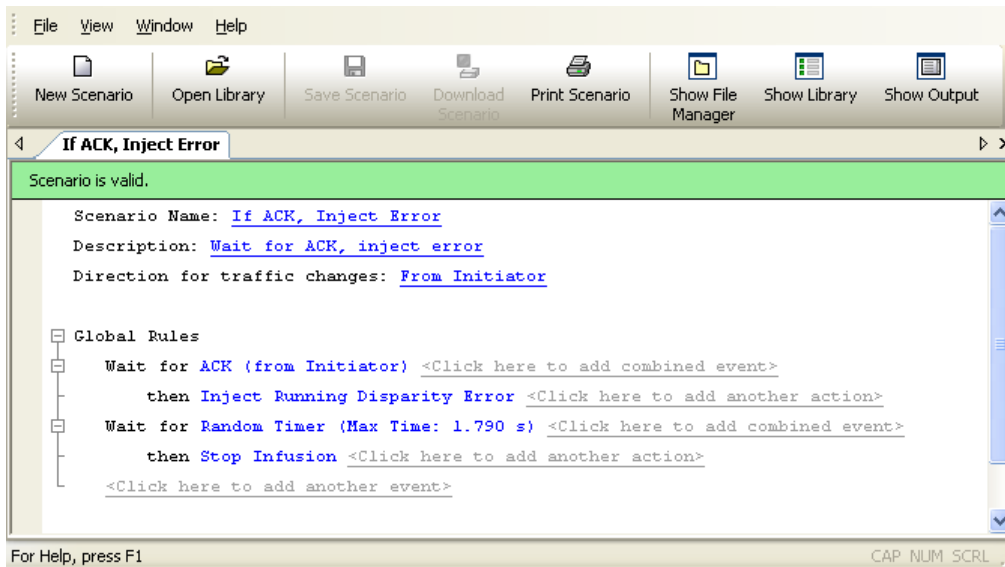


Figure 5.35 Example 6: Complete Scenario

5.8 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 sequences "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 (Table 5.5):

Table 5.5 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.)

Table 5.6 summarizes the examples that follow.

Table 5.6 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 box 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 on example 8. In this scenario, the objective is to detect an incorrect order of primitives, fix it, and to cause the box to beep when this happens. As with example 8, you implement this scanner 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.

Table 5.7 and Table 5.8 summarize the logic implemented by each of the sequences.

Table 5.7 Example 7: Logic of Sequence 0

State	Description
State 0	If Identify Address frame is detected from initiator, go to State 1; otherwise, continue to check incoming frames (do not change state).
State 1	If next Identity Address frame detected is from target, beep 1 second.

Table 5.8 Example 7: Logic of Sequence 1

State	Description
State 0	If Identify Address frame is detected from target, go to State 1; otherwise, continue to check incoming frames (do not change state).
State 1	If next Identity Address frame detected is from initiator, beep 2 second.

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. At the top of the scenario area, enter general scenario information, including scenario name, description, and direction of traffic change.

Note: For an example of filling-in the general scenario information fields, see Figure 5.3 and Figure 5.4.

Step 2 As in previous examples, create the Global Rules area as shown in Figure 5.36.

Step 3 Click on 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).

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 on the name of the sequence or state. A dialog box appears that allows you to enter that information.

Note: The description does not appear onscreen, but you can bring it up by clicking on the name of the sequence or state.

- Step 4** In the State 0 area, click on the prompt to **add an event** (Figure 5.37).
- Step 5** The Event Properties dialog box appears (Figure 5.38). In the Event Properties dialog box, select **Identify Address Frame** as the event.
- Step 6** Click OK to close the Event Properties dialog box.
- Step 7** In the State 0 area, click on the prompt to **add an action** (Figure 5.39).

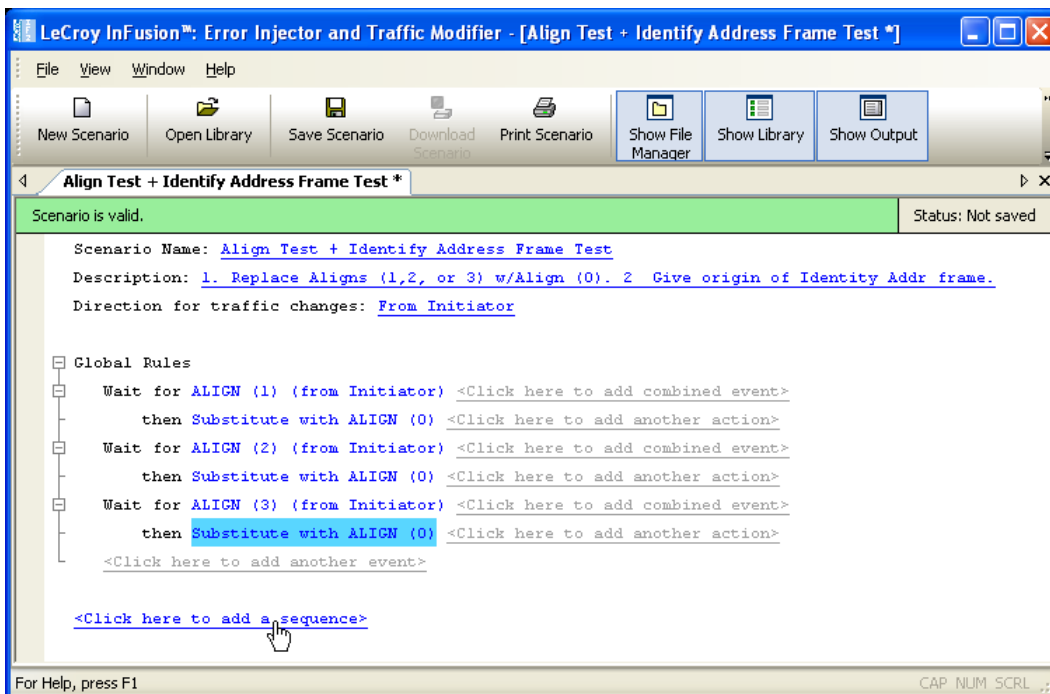


Figure 5.36 Example 7: Adding the First Sequence

- Step 8** The Action Properties dialog box appears (Figure 5.40). For the action, select **Branch to a New State**.
- Step 9** Click on 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 on the prompt to **add an event** (Figure 5.41).
- Step 11** The Event Properties dialog box appears. In the Event Properties dialog box, choose the **Identify 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 on the prompt to **add an action** for State 1 (Figure 5.42).

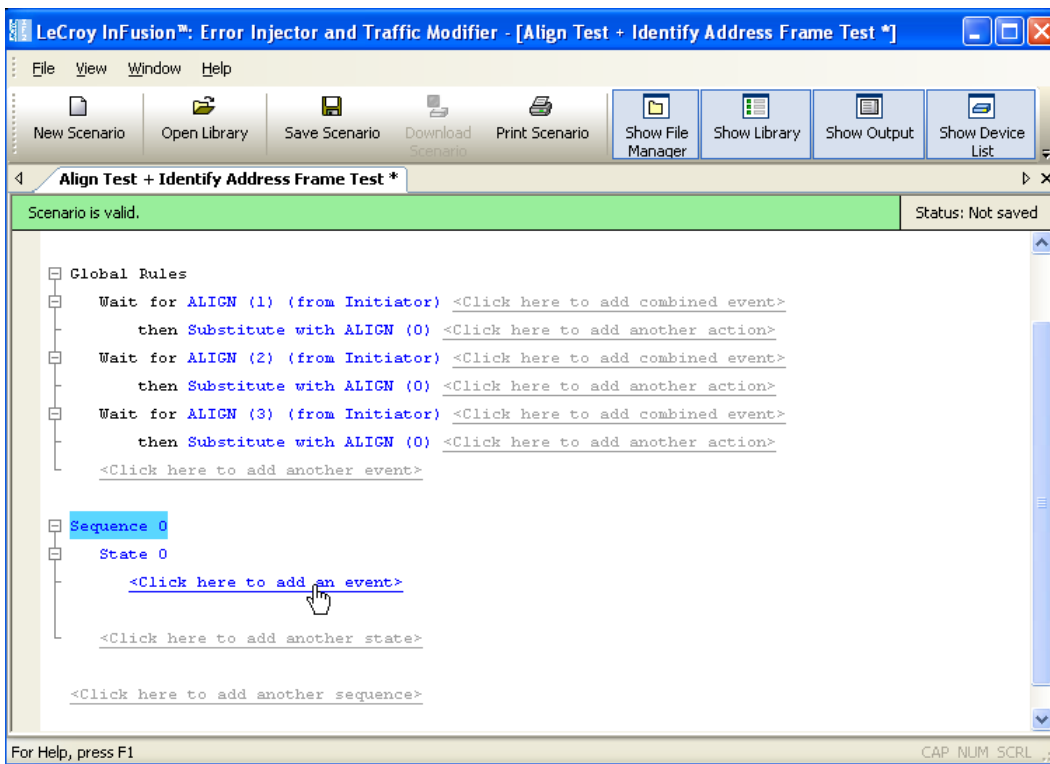


Figure 5.37 Example 7: Adding an Event for the First State

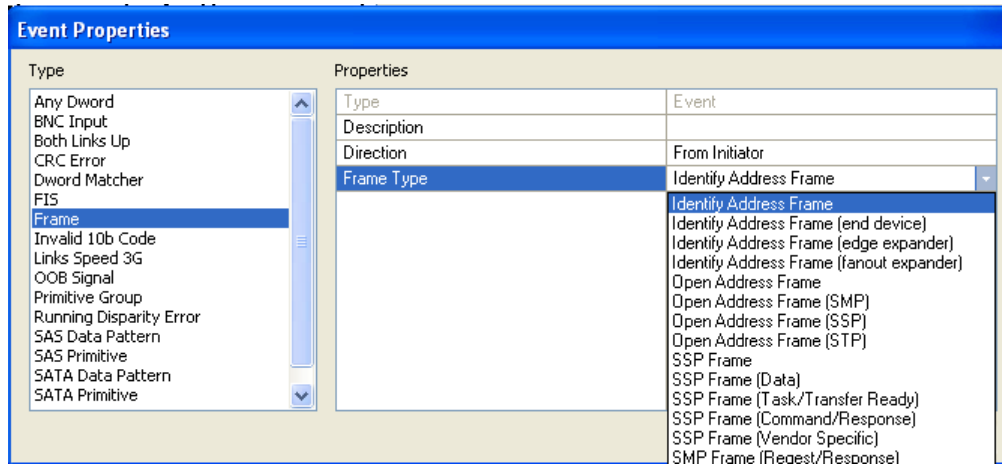


Figure 5.38 Example 7: Event Properties Dialog Box

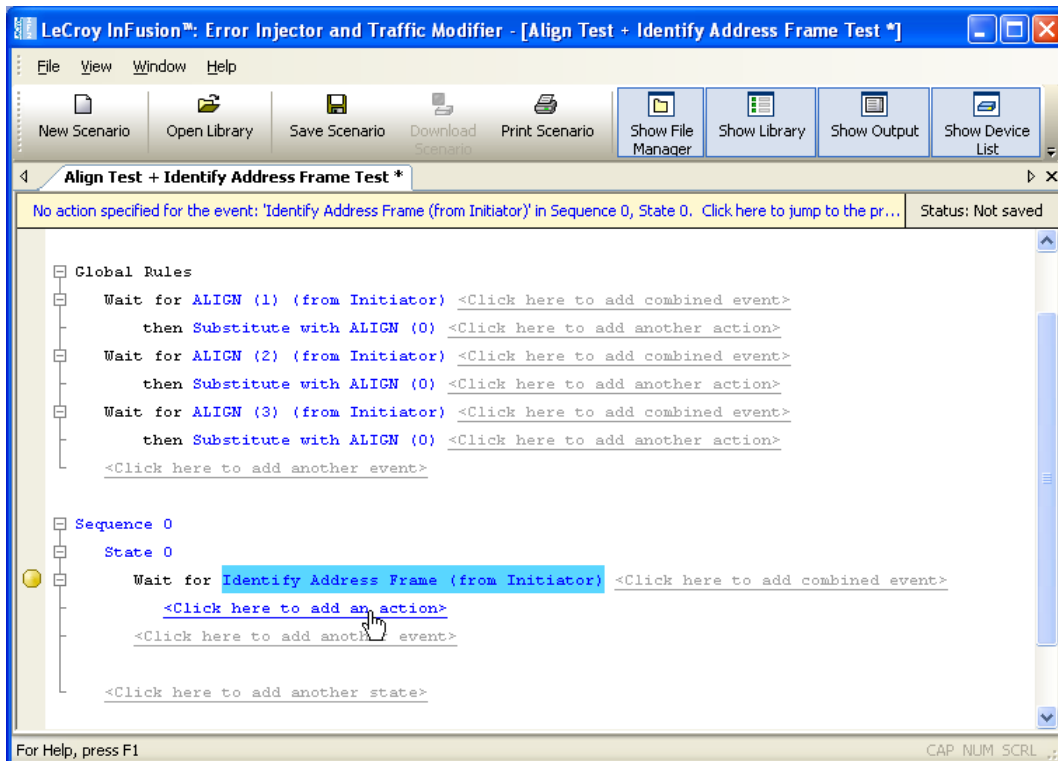


Figure 5.39 Example 7: Adding an Action for the First State

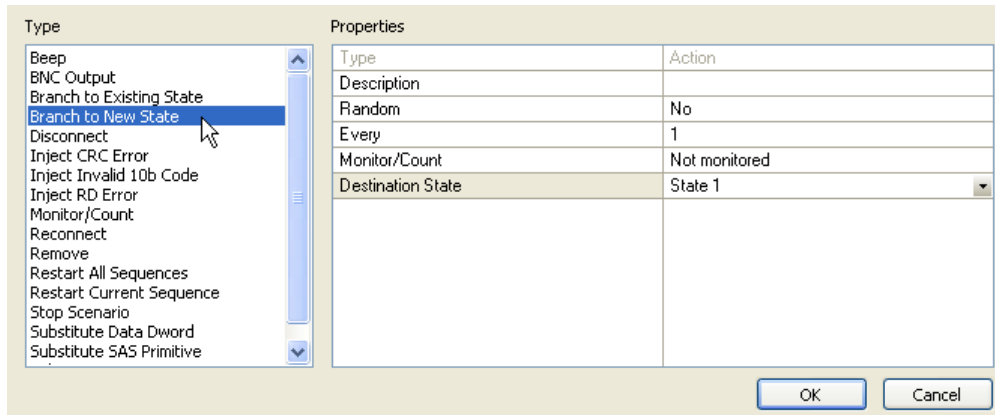


Figure 5.40 Example 7: Action Properties Dialog Box

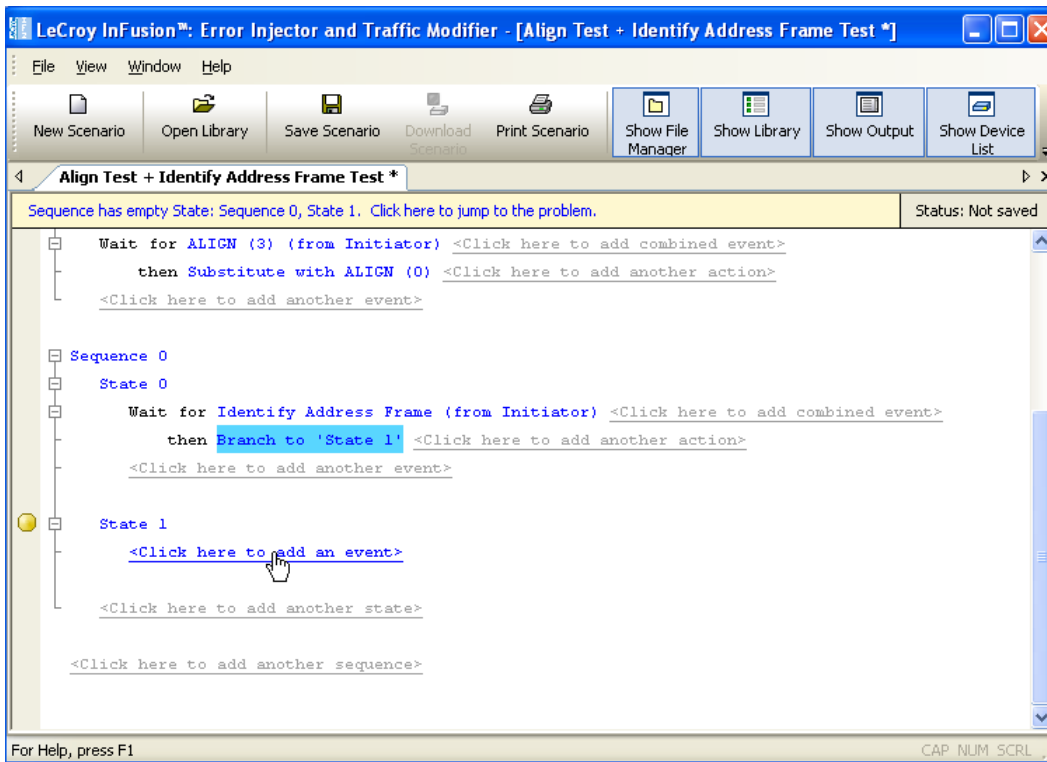


Figure 5.41 Example 7: Adding an Event for the Second State

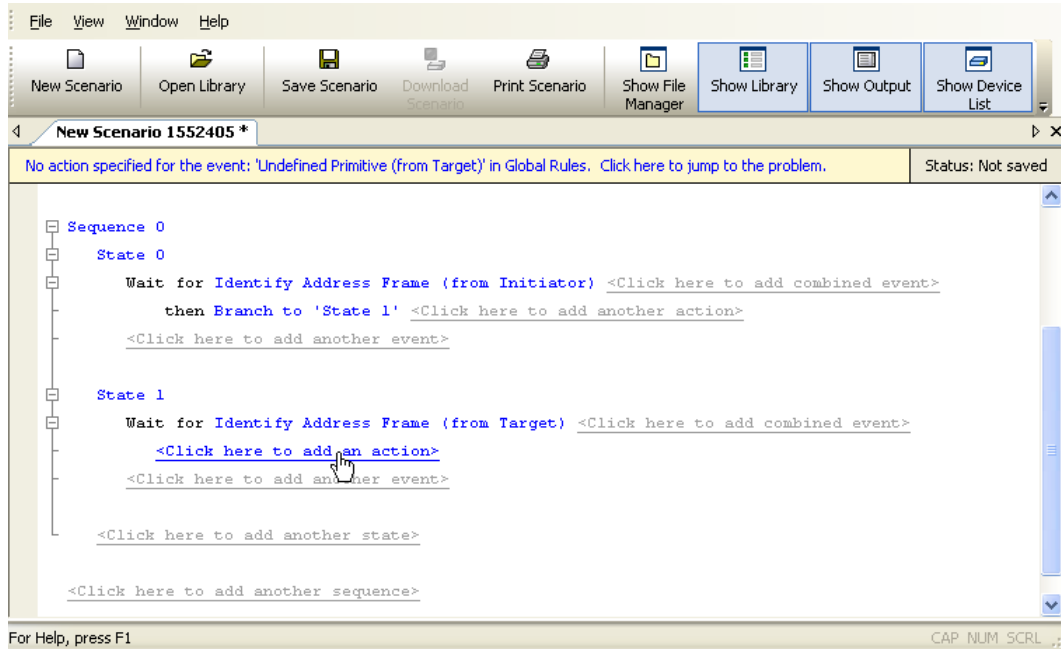


Figure 5.42 Example 7: Adding an Action to the Second State

- Step 14** The Action Properties dialog box appears. In this example, you enter the action **Beep**, and you set the duration of the beep for 1 second.
- Step 15** Click on **OK** to close the Action Properties dialog box.
- Step 16** You are finished creating the first sequence. Click on the **add another sequence** prompt to create an area in the scenario for the second sequence (Sequence 1) (Figure 5.43).
- Step 17** Create two states in the second sequence with the characteristics shown in Table 5.9.
- Step 18** In the File menu, select **Save Scenario** to save the scenario (Figure 5.44).

Table 5.9 Example 7: States for Second Sequence

State	Event	Action
0	Identify Address Frame from Target	Branch to State 1
1	Identify Address Frame from Initiator	Beep for 2 seconds.

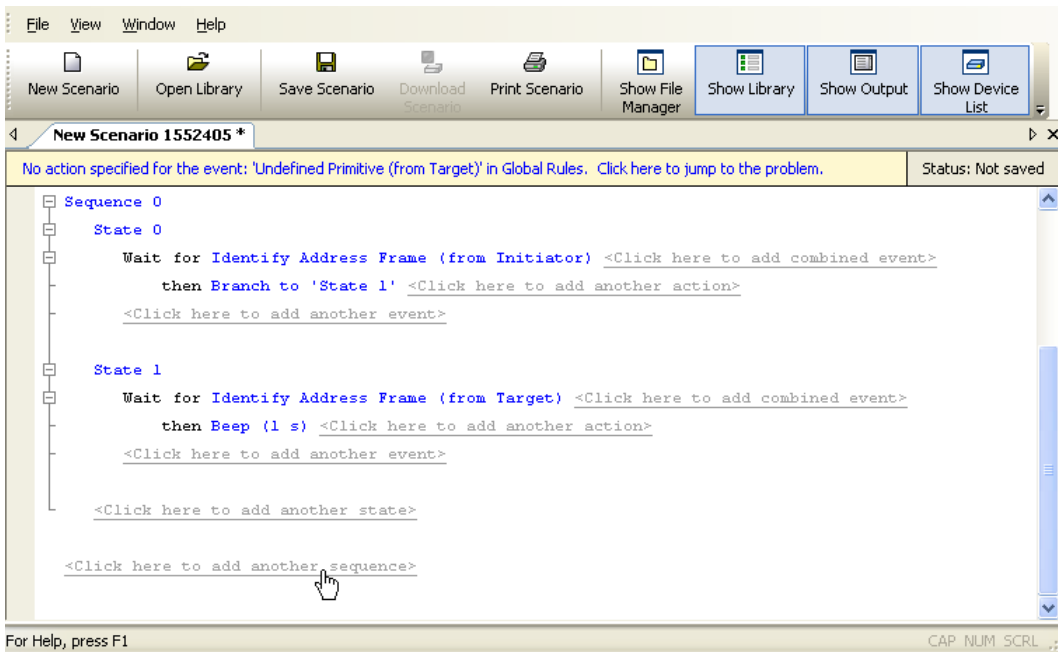


Figure 5.43 Example 7: Adding a Second Sequence

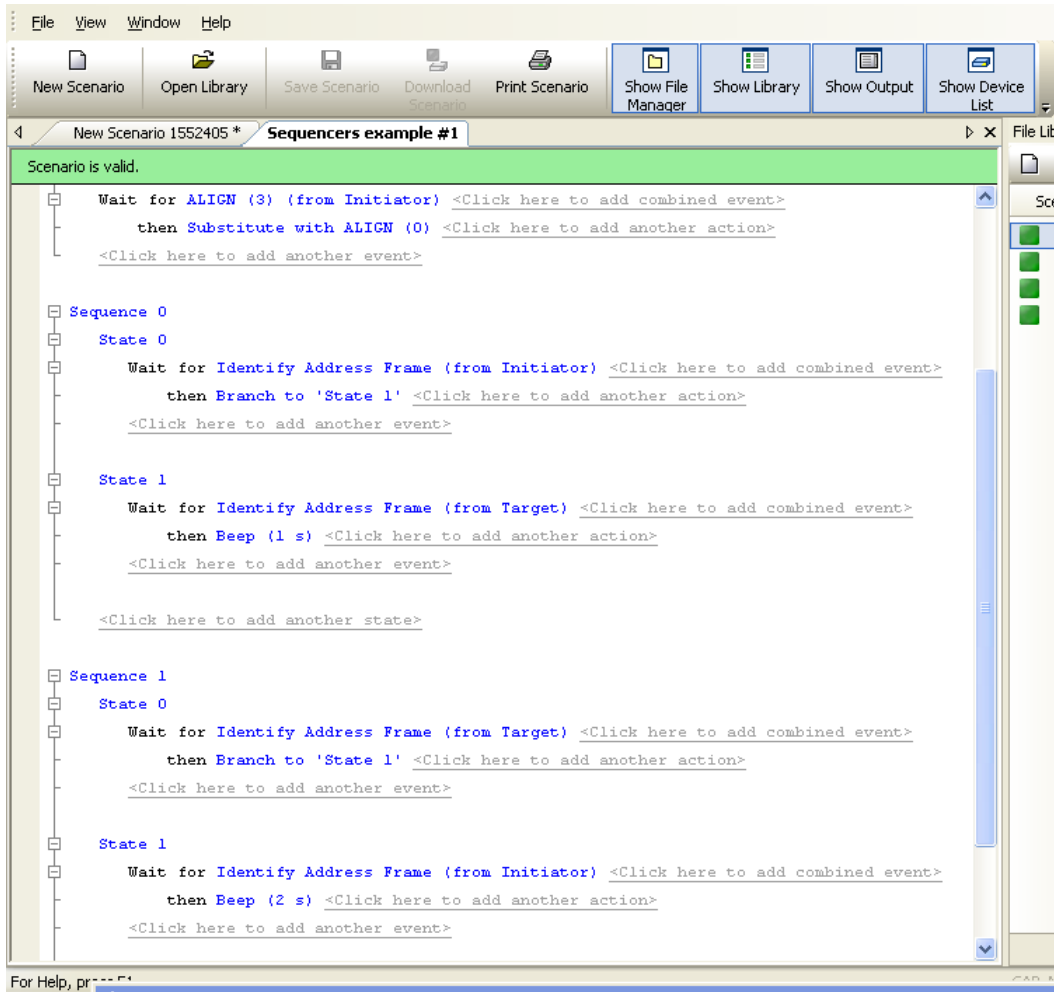


Figure 5.44 Example 7: Sequence Area of Scenario

Note: Figure 5.39 shows the Global Rules area of the 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 box 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). Table 5.10 summarizes the sequence logic.

Table 5.10 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. At the top of the scenario area, enter general scenario information, including scenario name, description, and direction of traffic change.

Note: For an example of filling-in the general scenario information fields, see Figure 5.3 and Figure 5.4.

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 5.45 and Figure 5.46).

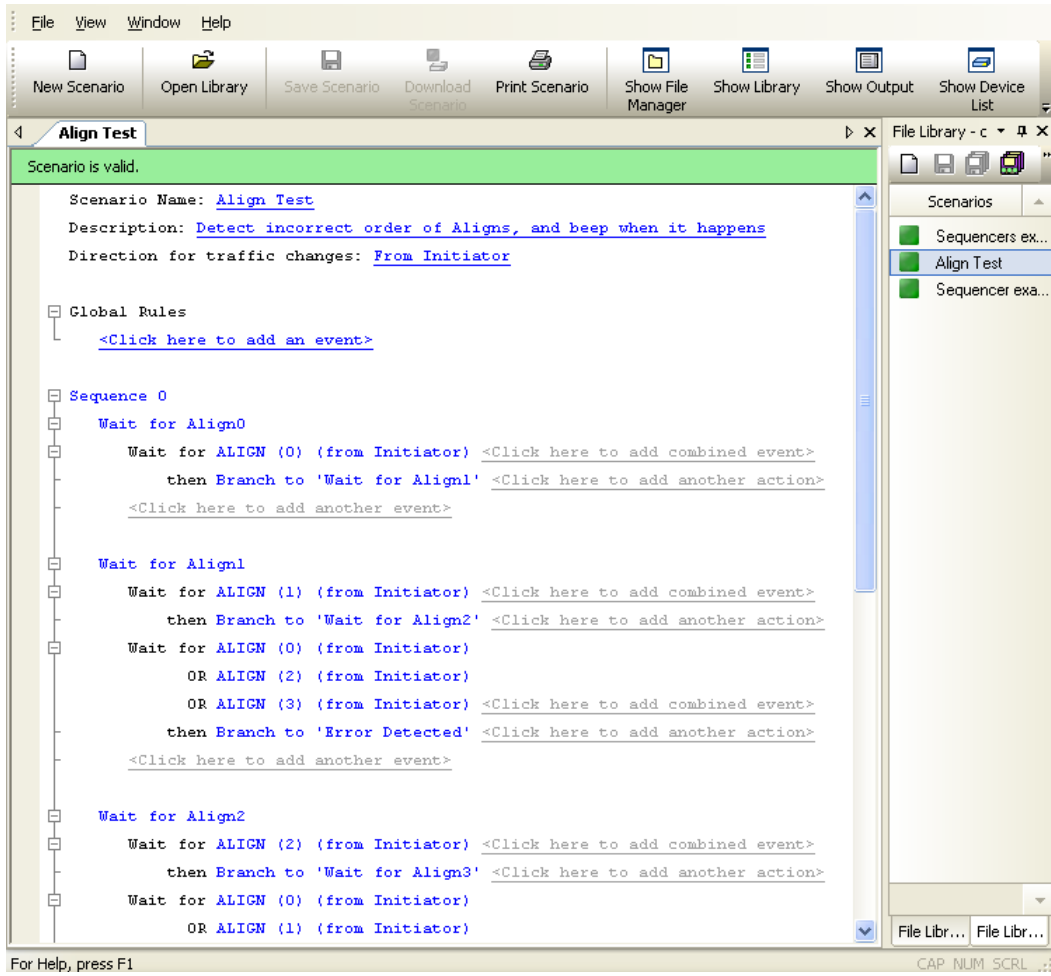


Figure 5.45 Example 8: Top Half of Scenario

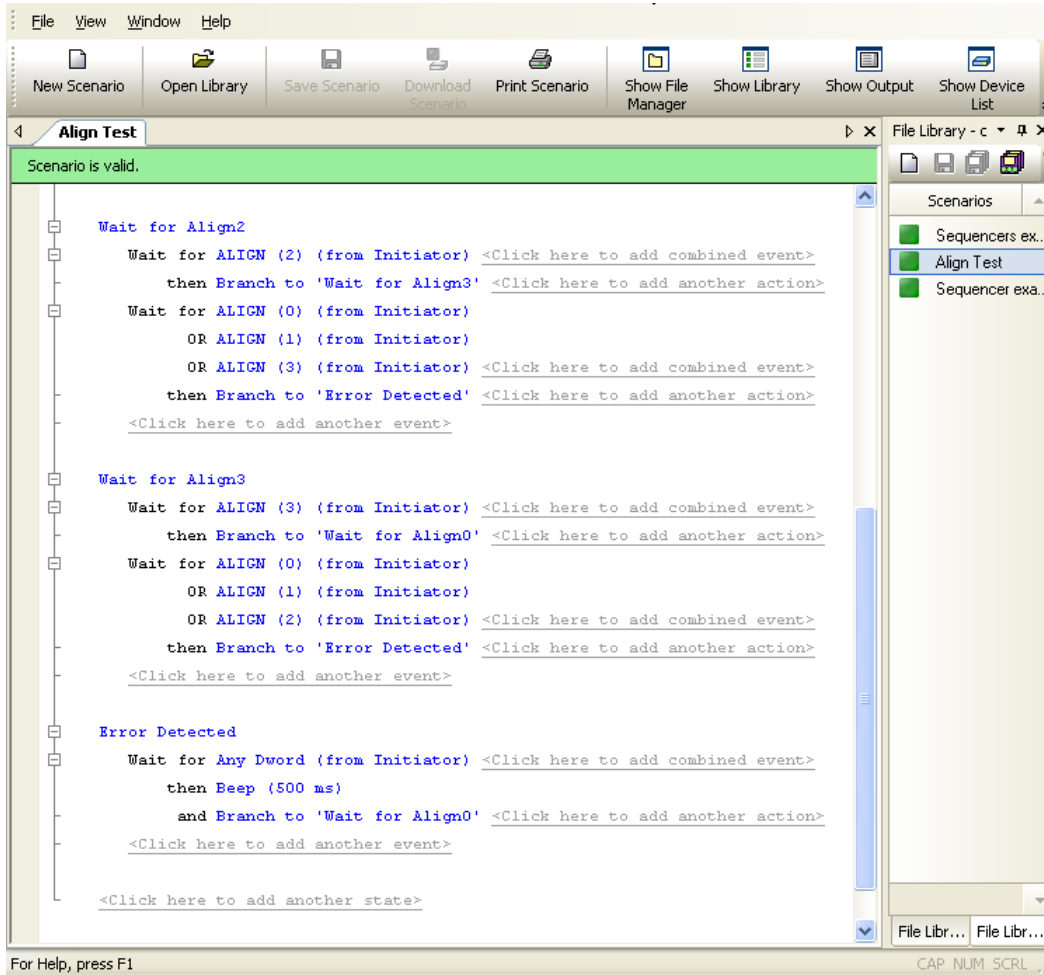


Figure 5.46 Example 8: Bottom Half of Scenario

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. Table 5.11 summarizes each state.

Table 5.11 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. At the top of the scenario area, enter general scenario information, including scenario name, description, and direction of traffic change.

Note: For an example of filling-in the general scenario information fields, see Figure 5.3 and Figure 5.4.

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 5.47 and Figure 5.48).

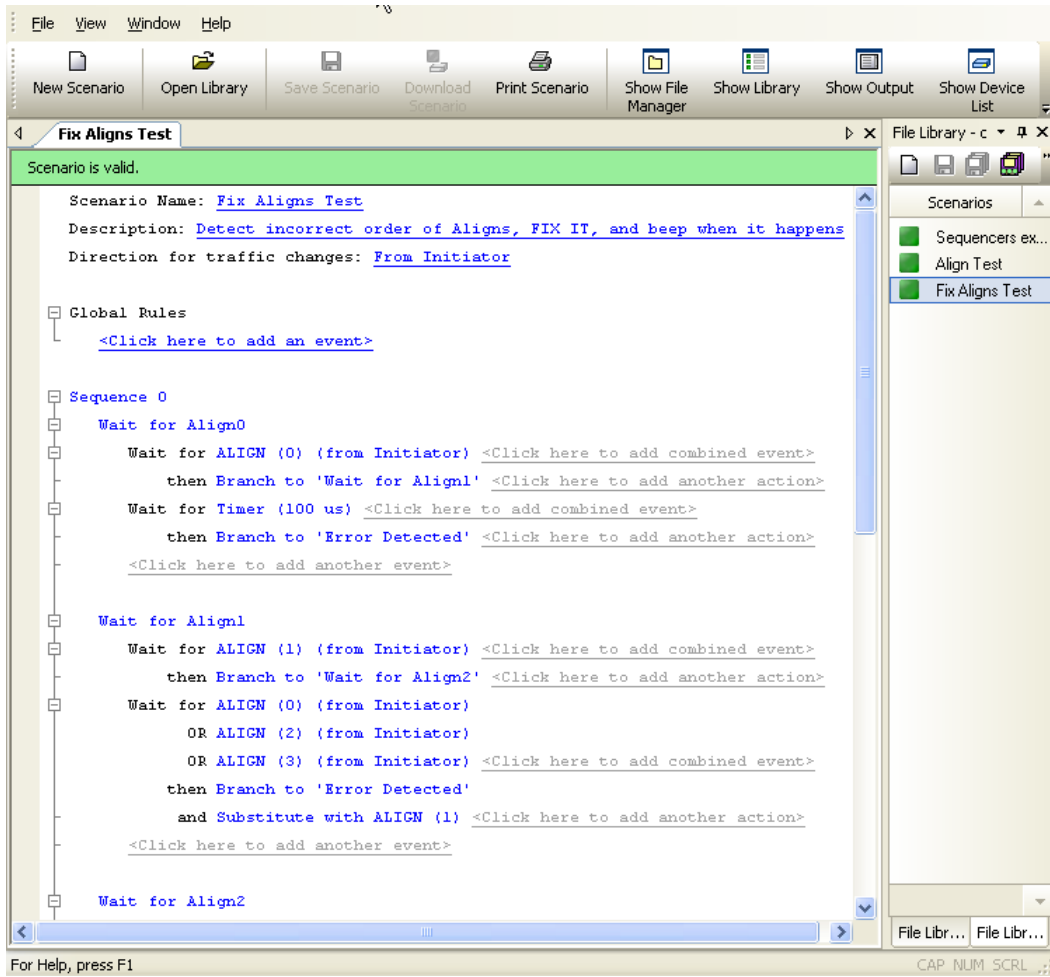


Figure 5.47 Example 9: Top Half of Scenario

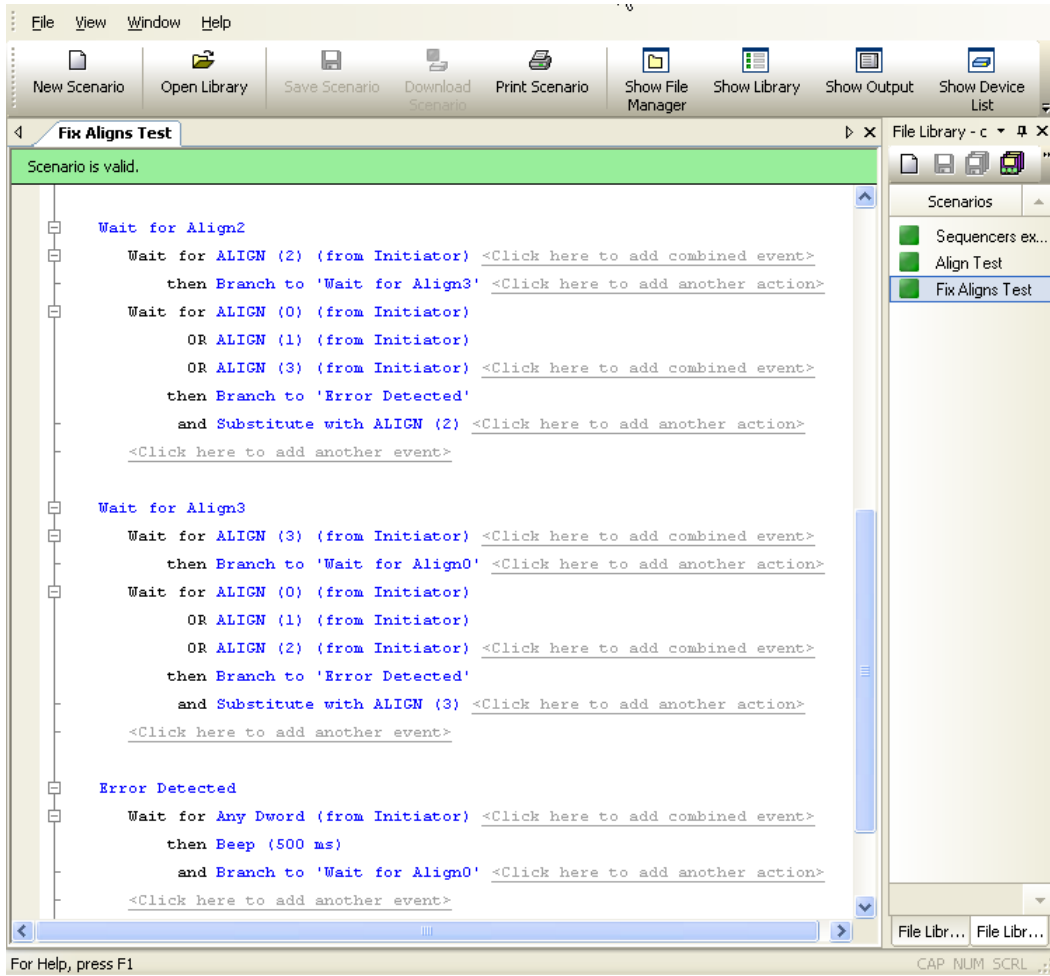


Figure 5.48 Example 9: Bottom Half of Scenario

5.9 Creating Multi-Link Tests

As described, each *SASInFusion* box has two BNC connectors on its rear panel that allow it to connect to other *SASInFusion* boxes in a daisy-chain. One connector is for signal input, the other for signal output.

The BNC connectivity allows you develop wide-link test schemes. In such schemes, BNC output on an upstream box is linked to the BNC input on its downstream neighbor.

The scenarios that runs on each box interacts with the scenarios that run on its neighbors through trigger signals exchanged via the box BNC ports. The trigger signals are called toggle events: BNC Input Toggle and BNC Output Toggle.

Each of the boxes in the daisy-chain monitors/modifies its own line only, but there is synergy between the boxes by way of the BNC daisy-chain. In this fashion, you can use a *SASInFusion* daisy-chain to coordinate events and actions across multiple SAS or SATA physical links.

In the example that follows, four boxes are connected in a daisy-chain. In this test, each box runs the same scenario. The boxes are linked as follows:

Box 1 BNC Output connects to Box 2 BNC Input

Box 2 BNC Output connects to Box 3 BNC Input

Box 3 BNC Output connects to Box 4 BNC Input

Box 4 BNC Output connects to Box 1 BNC Input

Example 10: Multi-Link Test

In this example, the four separate links act as a wide link, and the same scenario runs in each *SASInFusion* box. This set-up allows detection of an Open Address Frame on any of the four links, that is responded to on any of the other four links. The detected `OPEN_ACCEPT`, regardless of which link it was detected on, is replaced with `OPEN_REJECT`.

To achieve this result, the scenario has each box wating either for an Open Address Frame or for a BNC signal from its neighboring box, meaning that it has detected an Open Address Frame. In either case, the BNC output is toggled to signal the next box in the BNC daisy-chain that the Open Address Frame has been detected, and that the box can now transition to its next state (waiting for an `OPEN_ACCEPT`). This way, as soon as one of the links gets an Open Address Frame, all four boxes will transition to state 1. State 1 waits for an `OPEN_ACCEPT` and replaces it with `OPEN_REJECT`, and this will happen regardless of which link it is sent on, because ALL links are waiting for the same event.

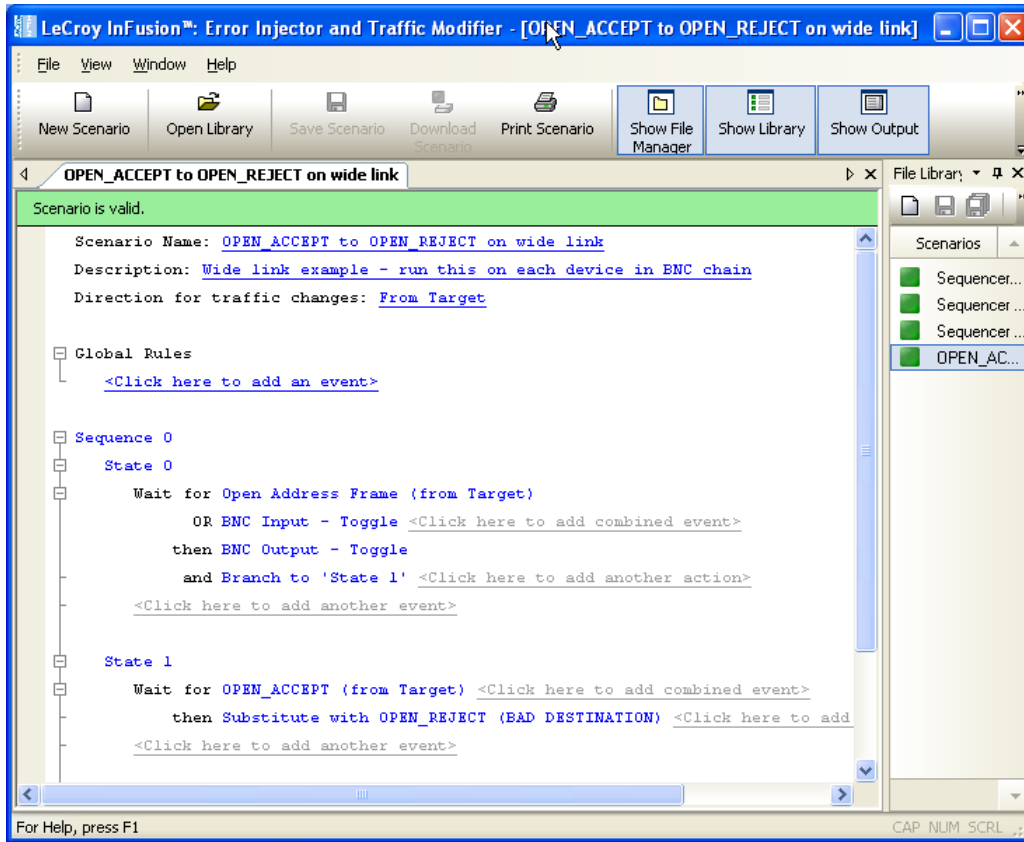


Figure 5.49 Example 10: Test Scenario for Each Box

5.10 Downloading Scenarios

After you have created a scenario, you need to download it to the *SASInFusion* box for execution.

If you use a general library as a scenario archive, then the process of creating and executing 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 library window (left side Figure 5.50).
- Step 2** Open the Device List window by clicking on the Show Device List button on application toolbar.
- Step 3** Open the Device library for the box to which you want to download a scenario or scenarios. You can open the device library in two ways: by clicking on the device library icon in the device list window or by double-clicking on the device name.
- Step 4** Copy the scenario from general library to device library by dragging it with the mouse (Figure 5.50).

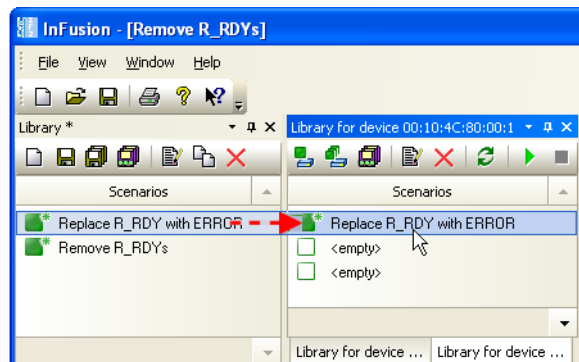


Figure 5.50 Downloading Scenarios

- Step 5** Download all scenarios in device library to the *SASInFusion* device. To do so, click the **Download all Scenarios** button on the Device library toolbar (second button from left).
- Step 6** Select the scenario to be run by clicking it.
- Step 7** To run the scenario, click the **Run Scenario** button on the Device library toolbar (second button from the right). The *SASInFusion* device will then begin its session.

6. LCD Panel Menus

This chapter describes menus that appear on the LCD panel of the SASInFusion box.

Note: As described in chapter 2, the LCD panel displays commands for configuring the device and starting and stopping scenarios.



Figure 6.1 SASInFusion LCD Panel

6.1 LCD Panel Overview

If you are using the SASInFusion box in networked mode, you typically use the LCD panel only to set an IP address so the box can be controlled by the SASInFusion software application. However, if you operate SASInFusion box in stand-alone mode, you might continue to use the panel as the primary means to control tests (view status, set start and stop scenarios, and so on).

Note: Regardless if you operate in stand-alone mode or networked mode, you must use the SASInFusion application to create scenarios. You can not do so using the box LCD panel.

Recall that you can download up to ten scenarios for storage on the box. To download the scenarios, you need an Ethernet link between the box and the PC that runs the SASInFusion software application.

6.2 Boot Sequence

The boot sequence for the SASInFusion box takes about three seconds. As the box boots, it initializes itself, beeps, and shows status on the LCD panel. If the box boots successfully, the LCD panel Root menu appears.

During initialization, several status messages flash by in rapid sequence:

```
"LeCroy Infusion"  
"Initializing ..."  
"Configuring FPGA"  
"BE Frequency Test"  
"BE Beeper Test"  
"Temp. Sensor Pass"
```

6.3 Booting from Boot-Code

If the SASInFusion box does not boot successfully, or if it becomes non-responsive, you can boot from default settings called boot-code.

Boot-code is a simplified version of SASInFusion firmware. It allows the SASInFusion box to boot to the point where it can communicate with the SASInFusion software application. After communication is established between the box and software application, you can download a different version of firmware and BusEngine files to the box.

Note: You can not download scenarios to the SASInFusion box while operating in boot-code.

To boot from boot-code,

Step 1 Press and hold any of the three buttons on the SASInFusion box front panel.

Step 2 While holding the buttons DOWN, turn the box ON.

After you complete these steps, download the new version of BusEngine and firmware files, then reboot the box from the LCD panel menu (Box Setup > Reboot).

6.4 Root Menu

As mentioned, the Root menu appears after successful boot-up. There are submenus beneath the Root menu, but most are just one layer deep (beyond the Root menu). The deepest submenu is just two layers deep.

Figure 6.1 shows the LCD panel Root menu. Following are key items on this menu:

[SAS]: Indicates the InFusion hardware platform.

Actv: 1: Shows which scenario is active. The *SASInFusion* box can hold ten scenarios. The scenarios are numbered 1 through 10. You can use the LCD panel to select the scenario to run via the Infusion Setup menu (Root menu > Infusion Setup).

Idle: Shows traffic generation status. Status can be Idle or Busy. When the box is not running a scenario, status is Idle. When running a scenario, status is Busy.

6.5 Submenus

The Root menu has four options:

- Box Setup submenu (Table 6:1).
- SAS Configuration submenu (Table 6:2).
- Start Infusion command.
- Infusion Setup submenu (Table 6:3).

Within each of the submenus are second-level submenus.

Note: When lists of options are presented in a menu, current selections are indicated with an asterisk

Box Setup Submenu

Table 6:1 Box Setup Submenu

Menu	Submenu	Command
IP Mode	Static Dynamic	Static = you assign an IP address Dynamic = A DHCP server assigns an IP address
IP Address		Default is 0.0.0.0. If IP Mode = Dynamic, this field is ignored.
Subnet Mask		Default is 0.0.0.0 If IP Mode = Dynamic, this field is ignored.
Default Gateway		Default is 0.0.0.0 If IP Mode = Dynamic, this field is ignored.
Reboot	Cancel Confirm	Selecting Confirm causes <i>SASInFusion</i> to save the current configuration and reboot.
Shutdown	Cancel Confirm	Selecting Confirm causes <i>SASInFusion</i> to save the current configuration and shutdown.
About		Displays status on the following parameters: Subnet Mask: Default Gateway: BootCode: Firmware: Bus Engine: IP Mode: (Dynamic or Static) Loop Mode: (Infusion) - This option is disabled. NOTE: To go back to the previous menu, press the Select button (i.e., the middle button)
[Back]		

SAS Configuration Submenu

Table 6:2 SAS Configuration Submenu

Menu	Submenu	Command
SATA Hold Handling Scramble To Target Descramble Frm Tar. Scramble To Ini. Descramble Frm. Ini. High Swing To Init. High Swing To Targ. SSC To Initiator SSC To Target OOB Frm Init. OOB Frm Targ. Save & Return Cancel		Lists settings to enable/disable scrambling and SATA Hold handling.

Start Infusion

This command causes *SASInFusion* to start running the active scenario, which is the one selected in the Infusion Setup menu.

When Start is selected, the menu changes to Stop Infusion.

Infusion Setup Submenu

Table 6:3 Infusion Setup Submenu

Menu	Submenu	Command
1. <N/A> 2. <N/A> 3. <N/A> 4. <N/A> 5. <N/A> 6. <N/A> 7. <N/A> 8. <N/A> 9. <N/A> 10. <N/A> [Back]		Lists whatever scenarios you downloaded from the <i>SASInFusion</i> application on your PC. If no scenarios have been downloaded, the InFusion Setup menu will not display - only Box Setup menu and SAS Configuration menu will display.

7. Licensing

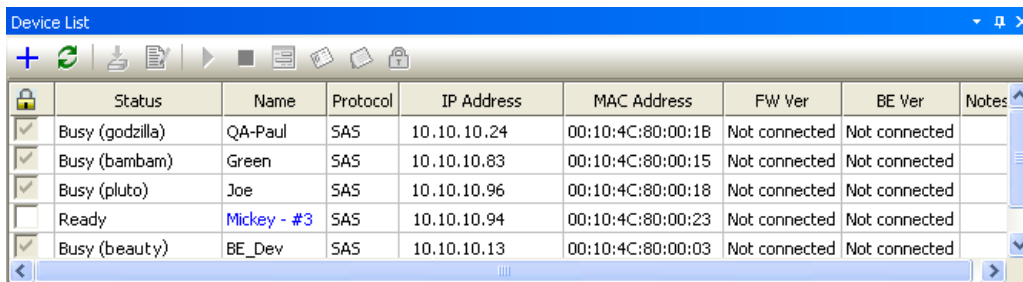
Each *SASInFusion* box comes with a one year license that entitles the user to software updates. This chapter describes how to view and update the licensing information.

7.1 Displaying License Information

You display and update licensing information in the Device List window.

To display the licensing information for your *SASInFusion* box:

- Step 1** If needed, power on your *SASInFusion* box and make sure that it is attached to your Ethernet LAN. The licensing information for the box is managed via *SASInFusion* software.
- Step 2** In the *SASInFusion* software, open the Device List (if needed) by selecting **View > Views > Devices**. The Device List window opens (Figure 7.1).



	Status	Name	Protocol	IP Address	MAC Address	FW Ver	BE Ver	Notes
<input checked="" type="checkbox"/>	Busy (godzilla)	QA-Paul	SAS	10.10.10.24	00:10:4C:80:00:1B	Not connected	Not connected	
<input checked="" type="checkbox"/>	Busy (bambam)	Green	SAS	10.10.10.83	00:10:4C:80:00:15	Not connected	Not connected	
<input checked="" type="checkbox"/>	Busy (pluto)	Joe	SAS	10.10.10.96	00:10:4C:80:00:18	Not connected	Not connected	
<input type="checkbox"/>	Ready	Mickey - #3	SAS	10.10.10.94	00:10:4C:80:00:23	Not connected	Not connected	
<input checked="" type="checkbox"/>	Busy (beauty)	BE_Dev	SAS	10.10.10.13	00:10:4C:80:00:03	Not connected	Not connected	

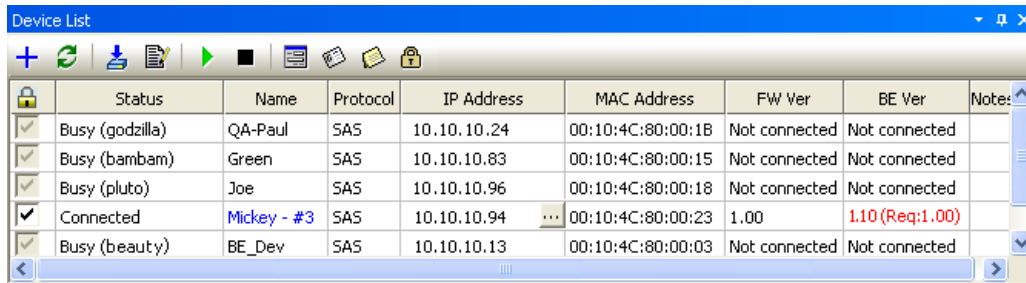
Figure 7.1 Device List Window: Selecting a Box

- Step 3** To select your box, click in the checkbox in the first column (under the Lock symbol). Selecting the box creates an Ethernet connection to the device and locks out other users from accessing it.

Selecting the device also activates the buttons on the Device List toolbar and allows the software to read the firmware, BusEngine, and licensing information within the *SASInFusion* box.

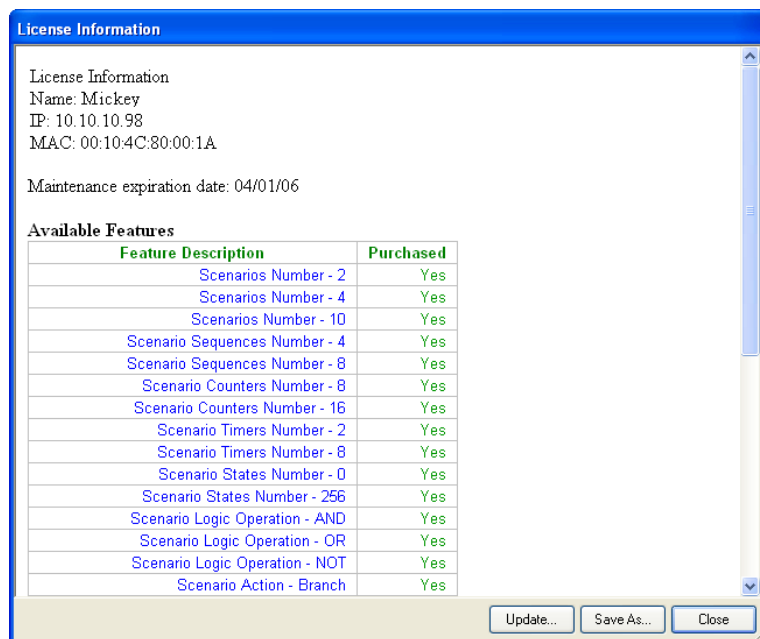
- Step 4** Click the Licensing button in the toolbar (looks like a lock). The License dialog box opens (Figure 7.3).

The dialog shows the expiration date and a list of enabled features.



	Status	Name	Protocol	IP Address	MAC Address	FW Ver	BE Ver	Note:
<input checked="" type="checkbox"/>	Busy (godzilla)	QA-Paul	SAS	10.10.10.24	00:10:4C:80:00:1B	Not connected	Not connected	
<input checked="" type="checkbox"/>	Busy (bambam)	Green	SAS	10.10.10.83	00:10:4C:80:00:15	Not connected	Not connected	
<input checked="" type="checkbox"/>	Busy (pluto)	Joe	SAS	10.10.10.96	00:10:4C:80:00:18	Not connected	Not connected	
<input checked="" type="checkbox"/>	Connected	Mickey - #3	SAS	10.10.10.94	00:10:4C:80:00:23	1.00	1.10 (Req:1.00)	
<input checked="" type="checkbox"/>	Busy (beauty)	BE_Dev	SAS	10.10.10.13	00:10:4C:80:00:03	Not connected	Not connected	

Figure 7.2 Device List Window: Box is Selected



License Information

Name: Mickey
 IP: 10.10.10.98
 MAC: 00:10:4C:80:00:1A

Maintenance expiration date: 04/01/06

Feature Description	Purchased
Scenarios Number - 2	Yes
Scenarios Number - 4	Yes
Scenarios Number - 10	Yes
Scenario Sequences Number - 4	Yes
Scenario Sequences Number - 8	Yes
Scenario Counters Number - 8	Yes
Scenario Counters Number - 16	Yes
Scenario Timers Number - 2	Yes
Scenario Timers Number - 8	Yes
Scenario States Number - 0	Yes
Scenario States Number - 256	Yes
Scenario Logic Operation - AND	Yes
Scenario Logic Operation - OR	Yes
Scenario Logic Operation - NOT	Yes
Scenario Action - Branch	Yes

Update... Save As... Close

Figure 7.3 Licensing Dialog Box

7.2 Updating the License

Before your *SASInFusion* license expires, contact LeCroy Technical Support to obtain a new one (see How to Contact LeCroy.) A license key file will be emailed to you.

To install the new license key file do the following:

- Step 1 Open the License dialog box (Figure 7.3).
- Step 2 When the License Information dialog opens, click the **Update** button. The Update License dialog box opens (Figure 7.4).

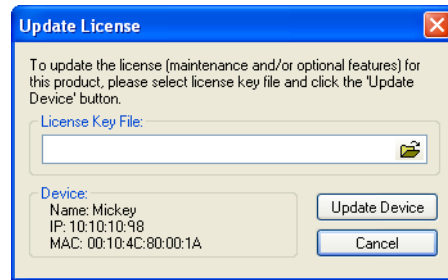


Figure 7.4 Update License Dialog Box

- Step 3** Click the Browse button and browse for the emailed license key file.
- Step 4** Click **Update Device**. The License Key file is transmitted to the SASInFusion box and will be reflected in the License information dialog box.

A. Specifications

Power Requirements

90-264Vrms, 47-63Hz (universal input), 55W (55VA) maximum, internal power supply with detachable cord.

Fuse

Enclosed 5x20mm 1.0A/250V 'T' rated glass fuse. A spare fuse is included in the fuse holder.

Environmental Conditions

Temperature, Operating: 5 to 40 Centigrade.

Temperature, Storage: -20 to 60 Centigrade.

Humidity: Maximum relative humidity 80% for temperatures up to 31 Centigrade, decreasing linearly to 50% relative humidity at 40 Centigrade.

Altitude, Operating: Up to 2,000 m.

Certifications

EC Declaration of Conformity

Meets intent of the European Council Directives 73/23/EEC for product safety and 89/336/EEC for electromagnetic compatibility. This declaration is based upon compliance of the SAS/SATA *InFusion* to the standards listed in Table A.1.

Table A.1 EC Declaration of Conformity

EN 61326: 1997 +A1:1998 +A2:2001 +A3:2003 EMC requirements for electrical equipment for measurement, control, and laboratory use.
<p>Emissions:</p> <p>EN 55011: 1998+A2:2002 Radiated & Conducted Emissions (Class A)</p> <p>EN 61000-3-2:2000 Harmonic Current Emissions</p>
<p>Immunity:</p> <p>EN 61000-4-2:1999 Electrostatic discharge (+/-4kV contact discharge; +/-8kV air discharge)</p> <p>EN 61000-4-3: 2002+A1:2003 RF Radiated Fields (3V/m, 80 MHz to 1 GHz, 80% amplitude modulated)</p> <p>EN 61000-4-4: 2004) Electrical Fast Transient/Burst (1 kV on AC mains)</p> <p>EN 61000-4-5: 1995+A1:2001 Surge (1 kV differential mode, 2 kV common mode)</p>

Table A.1 EC Declaration of Conformity (continued)

<p>Immunity (continued):</p> <p>EN 61000-4-6: 1996+A1:2001 RF Conducted Field (3 V, 150 kHz to 80 MHz, amplitude modulated with 1kHz sine wave)</p> <p>EN 61000-4-11: 2004 Mains Dips and Interruptions (100% interruption for 1 full AC cycle)</p>
<p>EN 61010-1: 2001 Safety requirements for electrical equipment for measurement control and laboratory use (with the following limits):</p> <p>Installation (Overvoltage) Category II (Line voltage in equipment and to wall outlet)</p> <p>Installation (Overvoltage) Category I (All mains isolated terminals)</p> <p>Pollution Degree 2</p> <p>Protection Class I</p>

UL and cUL Listed

Conforms to UL 61010-1, 2nd Edition and CAN/CSA C22.2 No. 61010-1-04.

How to Contact LeCroy

Type of Service	Contact
Call for technical support...	US and Canada: 1 (800) 909-2282
	Worldwide: 1 (408) 727-6600
Fax your questions...	Worldwide: 1 (408) 727-6622
Write a letter...	LeCroy Customer Support 3385 Scott Blvd. Santa Clara, CA 95054
Send e-mail...	support@catc.com
Visit LeCroy's web site...	http://www.lecroy.com/

Limited Hardware Warranty

So long as you or your authorized representative ("you" or "your"), fully complete and return the registration card provided with the applicable hardware product or peripheral hardware products (each a "Product") within fifteen days of the date of receipt from LeCroy or one of its authorized representatives, LeCroy warrants that the Product will be free from defects in materials and workmanship for a period of three years (the "Warranty Period"). You may also complete your registration form via the internet by visiting <http://www.catc.com/support/register/>. The Warranty Period commences on the earlier of the date of delivery by LeCroy of a Product to a common carrier for shipment to you or to LeCroy's authorized representative from whom you purchase the Product.



What this Warranty Does Not Cover

This warranty does not cover damage due to external causes including accident, damage during shipment after delivery to a common carrier by LeCroy, abuse, misuse, problems with electrical power, including power surges and outages, servicing not authorized by LeCroy, usage or operation not in accordance with Product instructions, failure to perform required preventive maintenance, software related problems (whether or not provided by LeCroy), problems caused by use of accessories, parts or components not supplied by LeCroy, Products that have been modified or altered by someone other than LeCroy, Products with missing or altered service tags or serial numbers, and Products for which LeCroy has not received payment in full.

Coverage During Warranty Period

During the Warranty Period, LeCroy or its authorized representatives will repair or replace Products, at LeCroy's sole discretion, covered under this limited warranty that are returned directly to LeCroy's facility or through LeCroy's authorized representatives.

How to Obtain Warranty Service

To request warranty service, you must complete and return the registration card or register via the internet within the fifteen day period described above and report your covered warranty claim by contacting LeCroy Technical Support or its authorized representative.

You can reach LeCroy Technical Support at 800-909-7112 or via email at support@catc.com. You may also refer to the LeCroy website at <http://www.lecroy.com> for more information on how to contact an authorized representative in your region. If warranty service is required, LeCroy or its authorized representative will issue a Return Material Authorization Number. You must ship the Product back to LeCroy or its authorized representative, in its original or equivalent packaging, prepay shipping charges, and insure the shipment or accept the risk of loss or damage during shipment. LeCroy must receive the Product prior to expiration of the Warranty Period for the repair(s) to be covered. LeCroy or its authorized representative will thereafter ship the repaired or replacement Product to you freight prepaid by LeCroy if you are located in the continental United States. Shipments made outside the continental United States will be sent freight collect.

Please remove any peripheral accessories or parts before you ship the Product. LeCroy does not accept liability for lost or damaged peripheral accessories, data or software.

LeCroy owns all parts removed from Products it repairs. LeCroy may use new and/or reconditioned parts, at its sole discretion, made by various manufacturers in performing warranty repairs. If LeCroy repairs or replaces a Product, the Warranty Period for the Product is not extended.

If LeCroy evaluates and determines there is "no trouble found" in any Product returned or that the returned Product is not eligible for warranty coverage, LeCroy will inform you of its determination. If you thereafter request LeCroy to repair the Product, such labor and service shall be performed under the terms and conditions

of LeCroy's then current repair policy. If you chose not to have the Product repaired by LeCroy, you agree to pay LeCroy for the cost to return the Product to you and that LeCroy may require payment in advance of shipment.

General Provisions

THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS. YOU MAY HAVE ADDITIONAL RIGHTS THAT VARY BY JURISDICTION. LECROY'S RESPONSIBILITY FOR DEFECTS IN MATERIALS AND WORKMANSHIP IS LIMITED TO REPAIR AND REPLACEMENT AS SET FORTH IN THIS LIMITED WARRANTY STATEMENT. EXCEPT AS EXPRESSLY STATED IN THIS WARRANTY STATEMENT, LECROY DISCLAIMS ALL EXPRESS AND IMPLIED WARRANTIES FOR ANY PRODUCT INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF AND CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES THAT MAY ARISE FROM ANY COURSE OF DEALING, COURSE OF PERFORMANCE OR TRADE USAGE. SOME JURISDICTIONS MAY NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE PRECEDING LIMITATION MAY NOT APPLY TO YOU.

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The limited warranty on a Product may be transferred for the remaining term if the then current owner transfers ownership of the Product and notifies LeCroy of the transfer. You may notify LeCroy of the transfer by writing to Technical Support at LeCroy, 3385 Scott Blvd., Santa Clara, CA 95054 USA or by email at: support@catc.com. Please include the transferring owner's name and address, the name and address of the new owner, the date of transfer, and the Product serial number.

