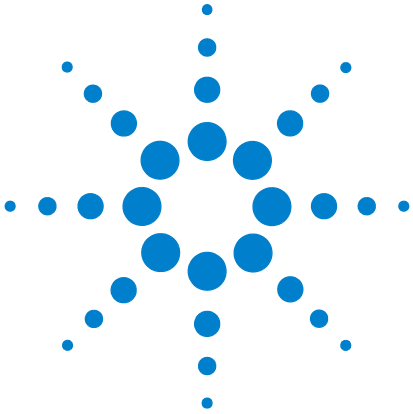

Agilent Protocol Exerciser and Analyzer for Advanced Switching Interconnect

User Guide

Agilent Technologies

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You can find the installation guides for different components of the product on the product CD. Agilent recommends you to do not switch on the instrument before you have understood all the applicable installation instructions and have met all the installation prerequisites.

Where to find more information

You can find more information about ASI from the following link:

http://www.agilent.com/find/asi

You can also look for search a local contact for assistance on the following link:

http://www.http/agilent/find/assist

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Indicates that antistatic precautions should be taken.

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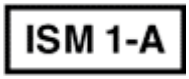

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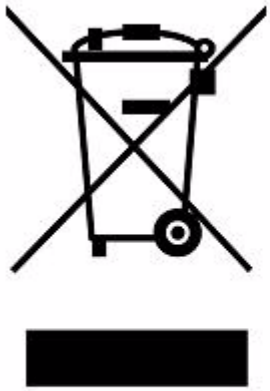

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1 Introduction

This chapter introduces you to the Advanced Switching Interconnect (ASI) protocol and provides a brief overview of its architecture. This chapter also introduces you to the E2980 series that provides a test and measurement solution for the ASI protocol.

About ASI

ASI is a packet-based transaction layer protocol that makes use of the physical and data link layers of PCI Express. The objective of the ASI protocol is to provide a native interconnect solution for multi-host, peer-to-peer communications without any additional bridges or media access control. This protocol is the only interconnect technology used for both chip-to-chip and backplane applications to minimize the overall system costs and interconnect latencies.

ASI provides a rich set of features to its users. Some such features are:

- Enhanced packet routing
- Congestion management
- Support for multicast
- Fabric redundancy and fail over mechanisms
- Protocol encapsulation
- Simple load and store
- Simple queuing of data packets
- Secure data transportation

Understanding the ASI Architecture

Figure 1 displays the layered architecture of ASI.

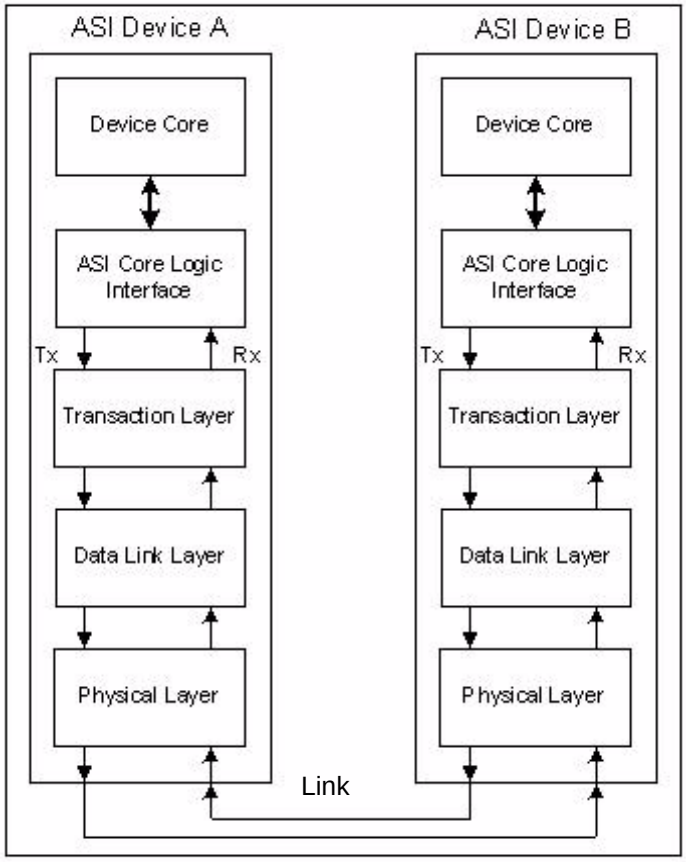

Figure 1 ASI Architecture

Figure 1 shows data transfer between ASI layers: Transaction, Data Link, and Physical. It also shows that data transfer between ASI layers take place in the following phases:

- Transmit
- Receive

In the *transmit* phase:

1. A data packet is formed in the transaction layer and transmitted to the data link layer.
2. In the data link layer, information to check data packets errors at the receiving device is added to the data packet. The data packet is then transferred to the physical layer.

3 In the physical layer, the data packet is encoded. Then, it is transmitted on the link by the analog portion of the physical layer. From there, it is transmitted to the receiving device using the available lanes of the link.

In the *receive* phase:

1 The receiver device decodes the incoming the data packet in the physical layer and forwards the resulting contents to the data link layer.

2 The data link layer checks for error in the incoming data packet. If there are no errors, it forwards the data packet up to the transaction layer.

3 The transaction layer buffers the incoming data packet and convert it to a format that the device core and ASI core logic interface understand.

About the E2980 Series

To thoroughly test your ASI systems and devices, you need to create system conditions that are difficult to reproduce with existing ASI equipment. The Protocol Exerciser and Analyzer applications of the E2980 series enable you to quickly and easily simulate traffic or capture traffic conditions and recreate them.

This section includes the following topics:

E2980 Series Architecture

Figure 2 displays the architecture of the E2980 series.

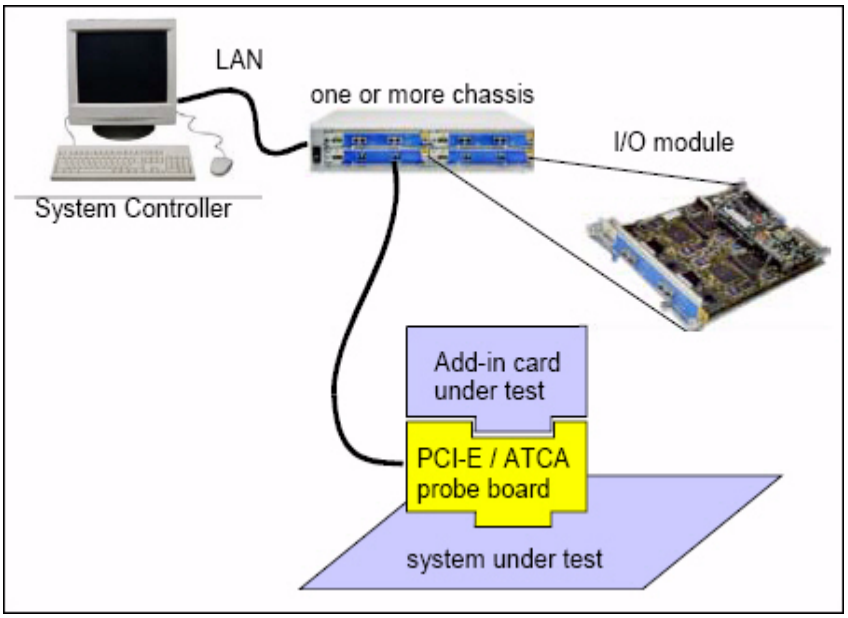

Figure 2 E2980 Architecture

In E2980, the Protocol Exerciser and Protocol Analyzer applications utilize the general hardware and software architecture of the Serial Protocol Tester platform.

In E2980, a system controller (PC) is connected to one or more chassis through LAN. You can also connect multiple chassis using special cables to form a synchronized, multi-port measurement system. Each chassis can hold two or four independent I/O modules.

An I/O module contains a CPU daughter board, the main FPGA logic, and memories for the functionality of Protocol Exerciser and Analyzer. Also, each I/O module handles exactly one ASI link up to 8x link width.

A list of the components of the E2980 platform is given below:

- Chassis (2 slot or 4 slot)
- I/O Module
- Probe Board (PCIe Slot/Interposer, ATCA active/passive, or Midbus probe)
- Protocol Exerciser and/or Analyzer software packages
- PC connected with the chassis via 100 Mbit LAN to control the system.

NOTE PC and LAN interface are not included in the shipment of the E2980 platform. You have to purchase them separately from your preferred vendor.

NOTE For more information on hardware set up, refer to the *System Protocol Tester Installation Guide*.

Protocol Exerciser for ASI

Protocol Exerciser for ASI enables you to generate and respond to all types of ASI transactions. For example, it enables you to emulate any ASI device and topology, generate ASI packets, and respond to any ASI packet. You can also use it to emulate stress conditions for components on system boards and cards.

A brief list of the capabilities and benefits of the Protocol Exerciser application is given below:

- Enables you to perform worst-case-scenario tests.
- Provides flexible control to set up basic ASI packets quickly and easily.
- Enables you to easily simulate the Transaction layer and test the Data Link layer capabilities of an ASI device.

- Ensures inter-operability and stability of all data paths and gets largest possible test coverage with links to root cause analysis of problems.
- Enables you develop a test design according to the specification.
- Enables you to view and edit the to-be-transmitted ASI packets, decode and display the received and transmitted ASI packets, and display and edit the capabilities of an emulated device easily.
- Enables you to perform realistic tests with device emulation. This helps minimize the number of real devices needed to create a large-scale test environment.
- Increases test coverage with configurable traffic generation.
- Provides real-time statistics to help you view immediate changes in the system performance.
- Enables you to customize your measurements with test automation and scripting capabilities.

With these capabilities and benefits, you can use Protocol Exerciser to efficiently test and validate the x1, x2, x3, x4, and x8 ASI designs.

NOTE Protocol Exerciser for ASI has two interfaces: GUI and API. This guide covers only the GUI aspect of the Protocol Exerciser application. For information on API, please refer to the online help.

Protocol Analyzer for ASI

Protocol Analyzer for ASI enables you to capture the traffic or transactions on a ASI link, and analyze and troubleshoot the problems to find the root cause. It captures and analyzes the Data Link layer and Transaction layer packets, training sequences, and ordered sets. It also provides non-intrusive monitoring of traffic between two ASI nodes.

A brief list of the capabilities and benefits of the Protocol Analyzer application is given below:

- Provides easy visibility into ASI transactions. For this, it displays the traffic activity, port link status, and trace content simultaneously. It also provides sophisticated and fast screen based traffic upload.
- Provides a trigger sequencer with sophisticated trigger capabilities.

- Provides tabular traffic display that speeds the debug process.
- Provides multi-port display for better insight into your system.
- Provides powerful search, filter, and error detection functionality.
- Enables you to customize your measurements with test automation and scripting capabilities.

With these capabilities in analyzing generated ASI traffic, Protocol Analyzer is perfectly suited for debugging the ASI systems and designs.

NOTE Protocol Analyzer for ASI has two interfaces: GUI and API. This guide covers only the GUI aspect of the Protocol Analyzer application. For information on API, please refer to the online help.

2
Getting Started With Protocol Exerciser

This chapter introduces you the method of accessing the Protocol Exerciser application. This chapter also introduces you to the various GUI components of the Protocol Exerciser application.

About Protocol Exerciser

The Protocol Exerciser application enables you to send and receive TLP packets, and control various protocol variations and violations over ASI. Using this application, you can generate and insert errors on different ASI layers.

Accessing Protocol Exerciser

Before you get started with Protocol Exerciser, you need to know how to access it. Accessing Protocol Exerciser requires you to specify whether you want to connect to a new or an existing session, and the name of the server where you want to start the session. Accessing Protocol Exerciser also requires you to specify the port to use if you are trying to connect to a new session.

To specify all required inputs, Protocol Exerciser provides two dialog boxes: Select type of connection (Figure 3) and Select port to use (Figure 4).

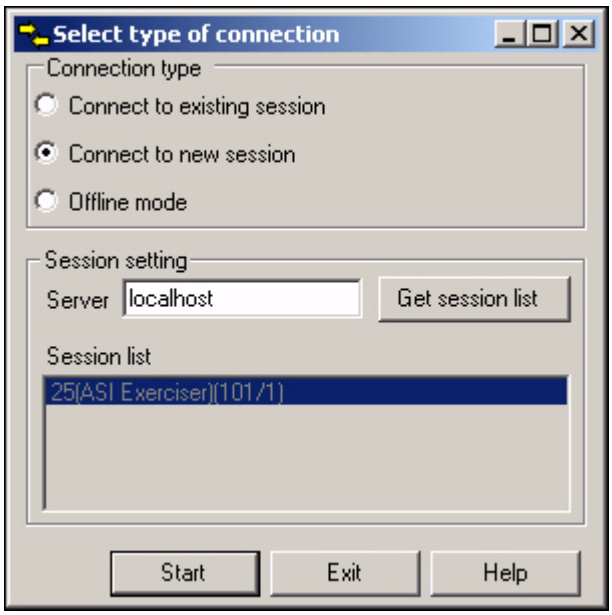

Figure 3 Select type of connection dialog box

Table 1 briefly describes the components of the Select type of connection dialog box.

Table 1 Components of the Select type of connection dialog box

Component	Description
Connect to existing session	Select **Connect to existing session** if you want to use an existing session of Protocol Exerciser on a known server.
Connect to new session	Select **Connect to new session** if you want to create a new Protocol Exerciser session on a known server.
Offline mode	Select **Offline mode** if you want to work in off-line mode. Working in off-line mode does not connect you to the hardware.
Server	Specifies the name or IP address of the server, where you want to start a new or join an existing Protocol Exerciser session. Its default value is **localhost**. Also, this text field is disabled if you have selected the **Offline mode** option.
Get session list	Click **Get session list** to retrieve a list of existing Protocol Exerciser sessions from the server you specified in the **Server** text field. This button works only if you have selected the **Connect to existing session** option.
Session list	Displays a list of sessions existing on the server you specified in the **Server** text field.
Start	Click **Start** to log on to the Protocol Exerciser application.
Exit	Click **Exit** to close the dialog box without starting the Protocol Exerciser application.
Help	Click **Help** to display the online help.

Figure 4 displays the Select Port to use dialog box.

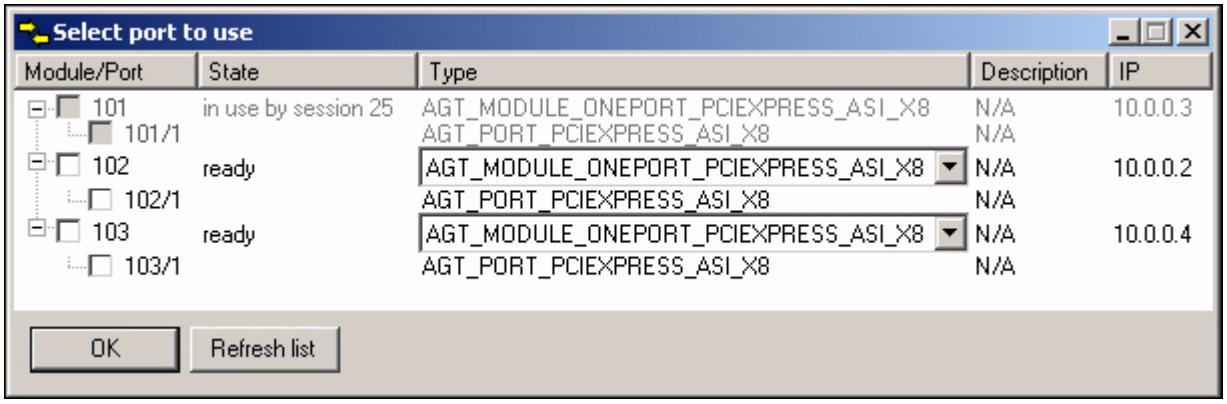

Figure 4 Select Port to use dialog box

Table 2 briefly describes the components of the Select port to use dialog box.

Table 2 Components of the Select port to use dialog box

Component	Description
Module/Port	Provides a check box list of modules and its ports. Here, select a module or a port to start a new Protocol Exerciser session.
State	Displays the current state of the ports, e.g., *ready*, *rebooting*, or *in use by session*.
Type	Provides a drop-down list of type of modules. Here, selecting a module displays the names of its ports, below the drop-down list.
Description	Displays the description of the selected module or port.
IP	Displays the IP address of the selected port.
OK	Click **OK** to start an instance of Protocol Exerciser on the selected port.
Refresh list	Click **Refresh list** to refresh the content shown in the **Port** list box.

To access Protocol Exerciser

1 On the Windows task bar, click **Start > Programs > Agilent System Protocol Tester > Exerciser for ASI**.

The Select type of connection dialog box appears.

2 Do one of the following:

   a Click **Connect to existing session** to use an existing Protocol Exerciser session.

   b Click **Connect to new session** to start a new Protocol Exerciser session.

   c Click **Offline mode** to access Protocol Exerciser without connecting to the hardware.

3 Type in the name or IP address of the server, where you want to start a new or join an existing Protocol Exerciser session, in the **Server** text field.

4 If you are trying to use an existing Protocol Exerciser session, do the following:

   a Click **Get session list**. A list of sessions currently running on the server specified in the Server text field is displayed in **Session list**.

   b Select the required session from **Session list**.

   c Click **Start**. The main Protocol Exerciser window appears.

5 If you are trying to create a new Protocol Exerciser session, do the following:

   a Click **Start**. The Select port to use dialog box appears.

   b Select a module or port check box from the **Module/Port** column.

   c Select a module name from the corresponding **Type** column.

   d Click **OK**. The main Protocol Exerciser window appears.

Exiting Protocol Exerciser

You can exit from the Protocol Exerciser application by closing the current sessions and the Protocol Exerciser window.

To close a Protocol Exerciser session

1 Select the Protocol Exerciser session, which you want to close, from the ***<Setup_Filename>*** pane.

   For information on the ***<Setup_Filename>*** pane, refer to Using Panes on page 25.

2 Click **File > Close**.

NOTE If there is only one Protocol Exerciser session, then you do not have to select it to close it.

NOTE For more information on the <*Setup_Filename*> pane, refer to Navigation on page 25.

To exit Protocol Exerciser

1 Click **File > Exit**.

If no other GUI instance is connected to this session, the Closing Session message box appears.

2 Do one of the following:

a Click **Yes**. This closes the Protocol Exerciser window and also removes the associated session.

b Click **No**. This closes the Protocol Exerciser window without removing its associated session. To again connect to this session, refer to To access Protocol Exerciser on page 18.

About the Protocol Exerciser Components

Protocol Exerciser provides various components that you can use to access its various features.

Figure 5 displays the Protocol Exerciser application window with its main components.

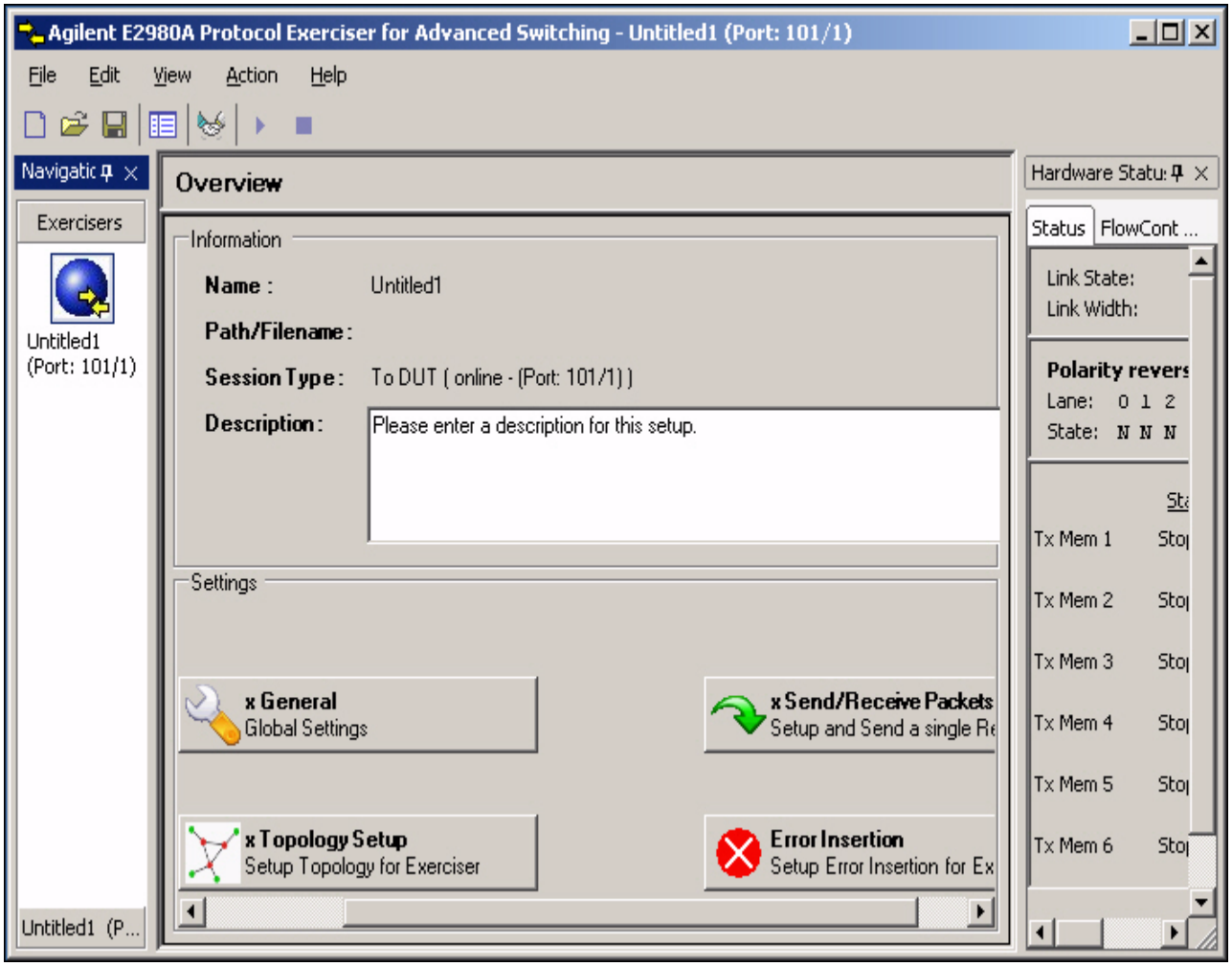

Figure 5 Protocol Exerciser window

This section covers the following topics:

- Using the Menu Bar
- Using the Toolbar
- Using Panes

Using the Menu Bar

The **Menu Bar** is one way to access the functionality of the application. In Protocol Exerciser, menu bar provides the following menus:

- File menu
- Edit menu
- View menu
- Action menu
- Help menu

File menu

Table 3 provides a brief description of the File menu commands.

Table 3 File menu commands

Menu command	Description
New	Creates a new setup file of the Exerciser template.
Open	Displays the Open dialog box that enables you to open the saved session information.
Save	Displays the Save dialog box that enables you to save the session information. If you are saving it for the first time, then this menu command saves the session information at the default location. Otherwise, this menu command saves it on the last saved location.
Save As	Displays the Save As dialog box that enables you to specify the desired location to save the session information.
Close	Closes the selected session.
Import	Displays the Import dialog box that you use to import the saved data packets.
Export	Displays the Export dialog box that you use to save the data packets to be send.
Software Packages	Displays the Software Package Management dialog box that shows you the already installed software and provides a list of new software to be installed.
Exit	Closes the Protocol Exerciser application.

Edit menu

Table 4 provides a brief description of the Edit menu commands.

Table 4 Edit menu commands

Menu command	Description
Copy	Copies single packets, block transfers, or completions to the clipboard.
Paste	Pastes the clipboard data. You can also use this command to paste data from Protocol Analyzer.

View menu

Table 5 provides a brief description of the View menu commands.

Table 5 View menu commands

Menu command	Description
Navigation Window	Displays the Navigation pane.
Hardware Status Window	Displays the Hardware Status pane.
Preferences	Displays the Preferences dialog box.
Arrange Tabs Vertically	Arranges the tabs of the current window, vertically.
Arrange Tabs Horizontally	Arranges the tabs of the current window, horizontally.
Arrange Tabs In One Group	Groups the tabs of the current window.
Reset View	Resets the tabs of the current window to their default view.

Action menu

Table 6 provides a brief description of the Action menu commands.

Table 6 Action menu commands

Menu command	Description
Link Up	Starts link training.
Run	Starts sending packets (single or block transfer).
Stop	Stops sending packets.

Help menu

Table 7 provides a brief description of the Help menu commands.

Table 7 Help menu commands

Menu command	Description
Online Help	Displays the online help for Protocol Exerciser.
Session Information	Displays the Session Information message box with the current session information.
Version Information	Displays the version information of the Protocol Exerciser application.
About	Displays information about the System Protocol Tester platform.

Using the Toolbar

Toolbar provides a quick access to the features of the Protocol Exerciser application (Figure 6).

Figure 6 Toolbar

Table 8 specifies the names of all toolbar icons.

Table 8 Toolbar icons

Icon	Name
	New
	Open
	Save
	Navigation Window
	Link Up
	Run Exerciser

Table 8 Toolbar icons

Icon	Name
	Stop Exerciser
	Send All
	Send Selected
	Receive DLLP

Using Panes

Protocol Exerciser provides the following panes:

- Navigation
- Hardware Status

NOTE These two panes are flowing components. To move these panes to a new location on the screen, select them from their titles and drag them to the new location. Double-click on their title to place them back to their default location.

Navigation

The **Navigation** pane further provides the following panes:

- **Exerciser**: This pane enables you to navigate between multiple setup files.
- ***<Setup_Filename>***: *Setup_Filename* refers to the name of the setup file, e.g., `Test_02`. This pane provides options to use Protocol Exerciser for your test application.

Figure 7 displays the Navigation pane.

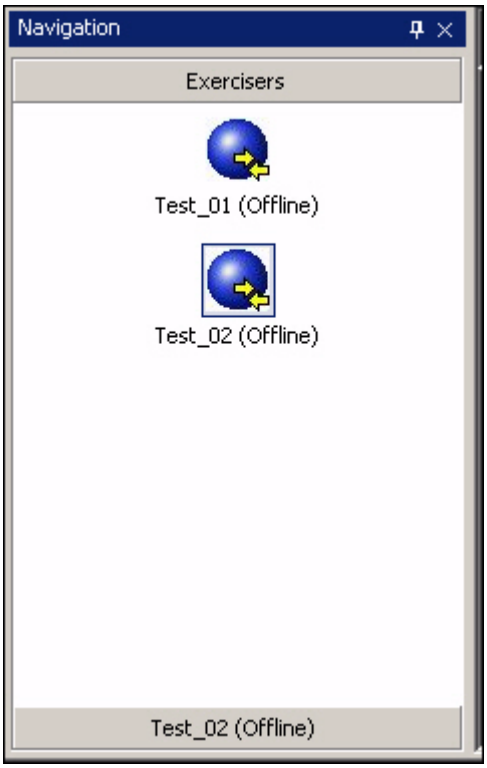

Figure 7 Navigation pane

Hardware Status

The **Hardware Status** pane has the following tabs:

- **Status**: This tab provides the status information of the link width, link state, receiver's (Rx) priority reversal, and transmit memories.
- **Flow Control**: This tab provides information about the credits of the transmit memories.
- **VC Status**: This tab provides information about which traffic class is mapped to which Tx Memory.

Figure 8 displays the Hardware Status pane.

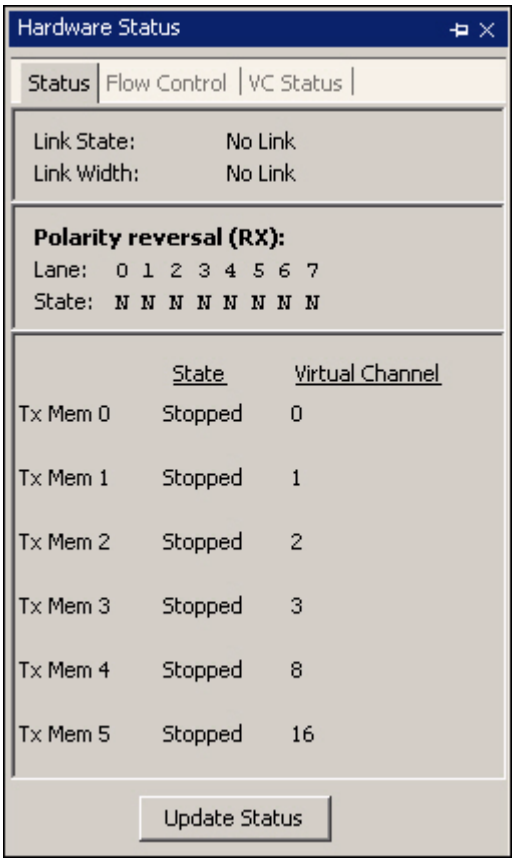

Figure 8 Hardware Status pane

3
Getting Started With Protocol Analyzer

This chapter introduces you the method of accessing the Protocol Analyzer application. This chapter also introduces you to the various GUI components of the Protocol Analyzer application.

About Protocol Analyzer

The Protocol Analyzer application enables you to capture and analyze traffic between two ASI nodes. Using Protocol Analyzer, you can capture data packets simultaneously from both directions. This includes capturing training sequences, Data Link Layer Packets (DLLPs), and Transaction Layer Packets (TLPs).

To capture data packets, Protocol Analyzer provides a trigger sequencer, which you use to specify the criteria to capture the data packets.

Accessing Protocol Analyzer

Before you get started with Protocol Analyzer, you need to know how to access it. Accessing Protocol Analyzer requires you to specify whether you want to connect to a new or an existing session, and the name of the server where you want to start the session. Accessing Protocol Analyzer also requires you to specify the port to use if you are trying to connect to a new session.

To specify all required inputs, Protocol Exerciser provides two dialog boxes: Select type of connection (Figure 9) and Port Selection (Figure 10).

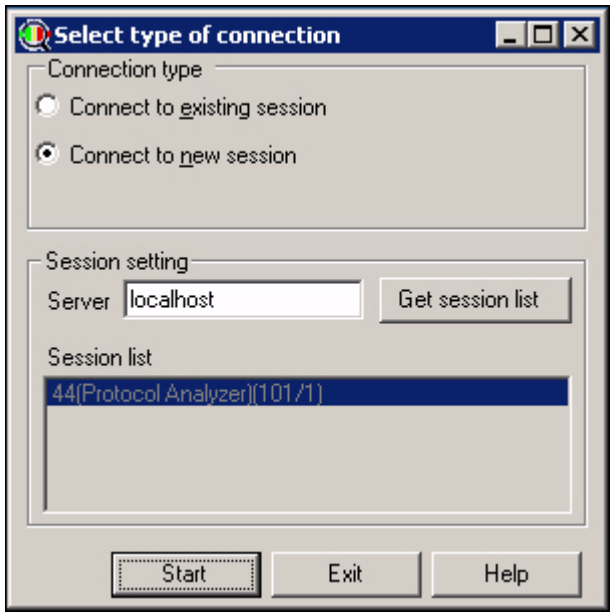

Figure 9 Select type of connection dialog box

Table 9 briefly describes the components of the Select type of connection dialog box.

Table 9 Components of the Select type of connection dialog box

Component	Description
Connect to existing session	Select **Connect to existing session** if you want to use an existing session of Protocol Analyzer on a known server.
Connect to new session	Select **Connect to new session** if you want to create a new Protocol Analyzer session on a known server.
Server	Specifies the name or IP address of the server, where you want to start a new or join an existing Protocol Analyzer session. Its default value is **localhost**.
Get session list	Click **Get session list** to retrieve a list of existing Protocol Analyzer sessions from the server you specified in the **Server** text field. This button works only if you have selected the **Connect to existing session** option.
Session list	Displays a list of sessions existing on the server you specified in the **Server** text field.
Start	Click **Start** to log on to the Protocol Analyzer application.
Exit	Click **Exit** to close the dialog box without starting the Protocol Analyzer application.
Help	Click **Help** to display the online help.

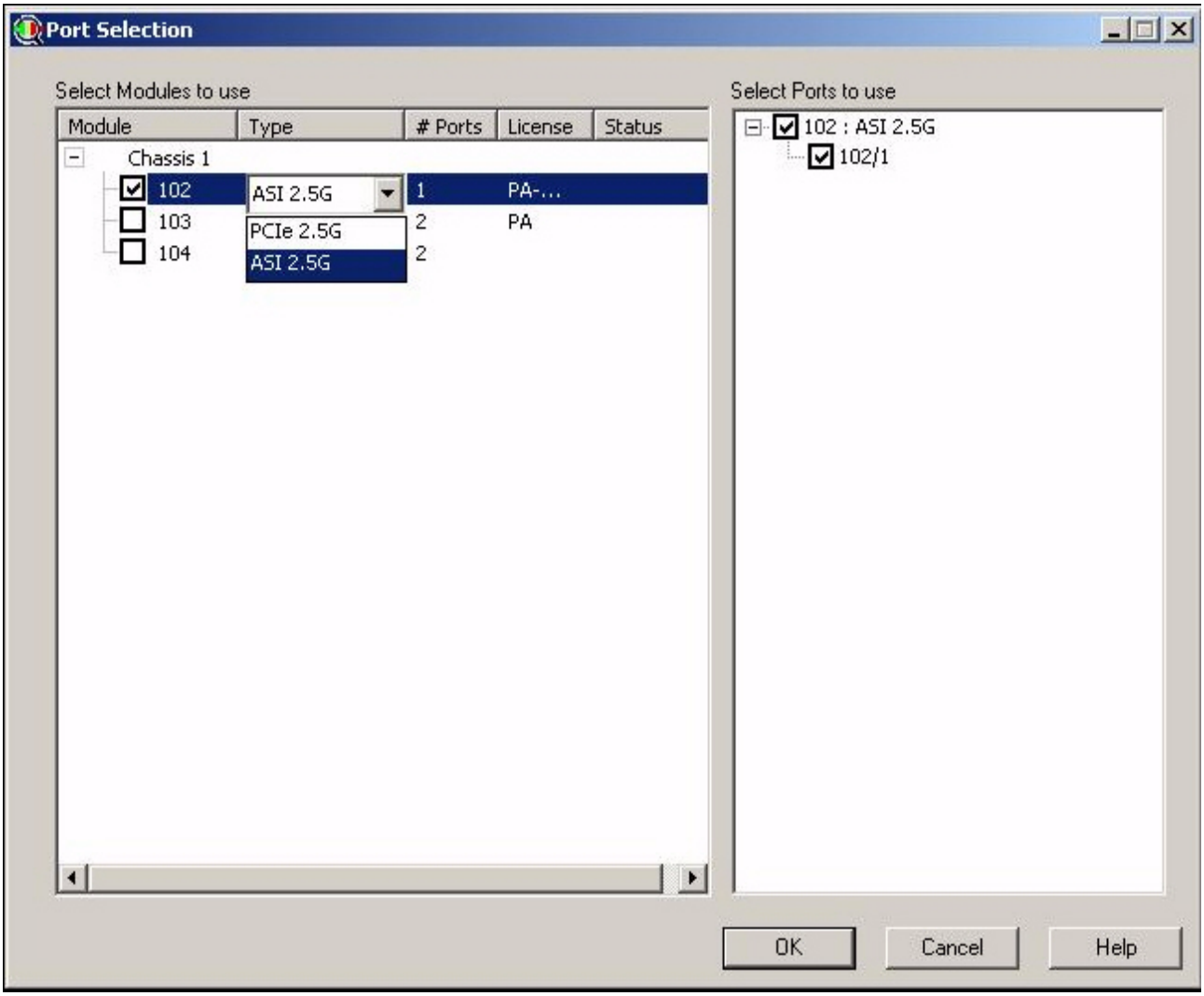

Figure 10 Port Selection dialog box

Table 10 briefly describes the components of the Port Selection dialog box.

Table 10 Components of the Port Selection dialog box

Component	Description
Module	Provides a chassis-wise check box list of modules.
Type	Enables you to select the type of port, PCIe or ASI, to use.
# Ports	Displays the number of ports for each module.
License	Displays the license details of each module.
Status	Displays the status of each module.

Table 10 Components of the Port Selection dialog box

Component	Description
Select Ports to use	Select the port to use from the **Select Ports to use** list box.
OK	Click **OK** to start an instance of Protocol Analyzer on the selected port.
Refresh List	Click **Refresh list** to refresh the content shown in the **Module** and **Port** list boxes.

NOTE

In the License column, the following text appears:

- PA-ASI-x1 or PA-ASI-x4 for Protocol Analyzer
- EX-ASI-x1 or EX-ASI-x4 for Protocol Exerciser

To access Protocol Analyzer

1 On the Windows task bar, click **Start > Programs > Agilent System Protocol Tester > Protocol Analyzer**.

The Select type of connection dialog box appears.

2 Do one of the followings:

a Click **Connect to existing session** to use an existing Protocol Analyzer session.

b Click **Connect to new session** to start a new Protocol Analyzer session.

3 Type in the name or IP address of the server, where you want to start a new or join an existing Protocol Analyzer session, in the **Server** text field.

4 If you are trying to use an existing Protocol Analyzer session, do the following:

a Click **Get session list**. A list of sessions that are currently running on the server specified in the Server text field is displayed in **Session list**.

b Select the required session from **Session list**.

c Click **Start**. The main Protocol Analyzer window appears.

5 If you are trying to create a new Protocol Analyzer session, do the following:

   a Click **Start**. The Port Selection dialog box appears.

   b Select a module check box from the **Module** column.

   c Select the option for ASI from the **Type** drop-down list.

   d Click **OK**. The main Protocol Analyzer window appears.

Exiting Protocol Analyzer

You can exit from the Protocol Analyzer application by closing the opened trace file and the Protocol Analyzer window.

To close a trace file

- Click **File > Close**.

To exit Protocol Analyzer

1 Click **File > Exit**.

   The Session still open message box appears.

2 Do one of the following:

   a Click **Yes**. This closes the Protocol Analyzer window and also removes the associated session.

   b Click **No**. This closes the Protocol Analyzer window without removing its associated session.

About the Protocol Analyzer Components

Protocol Analyzer provides various components that you can use to access its various features.

Figure 11 displays the Protocol Analyzer application window with its main components.

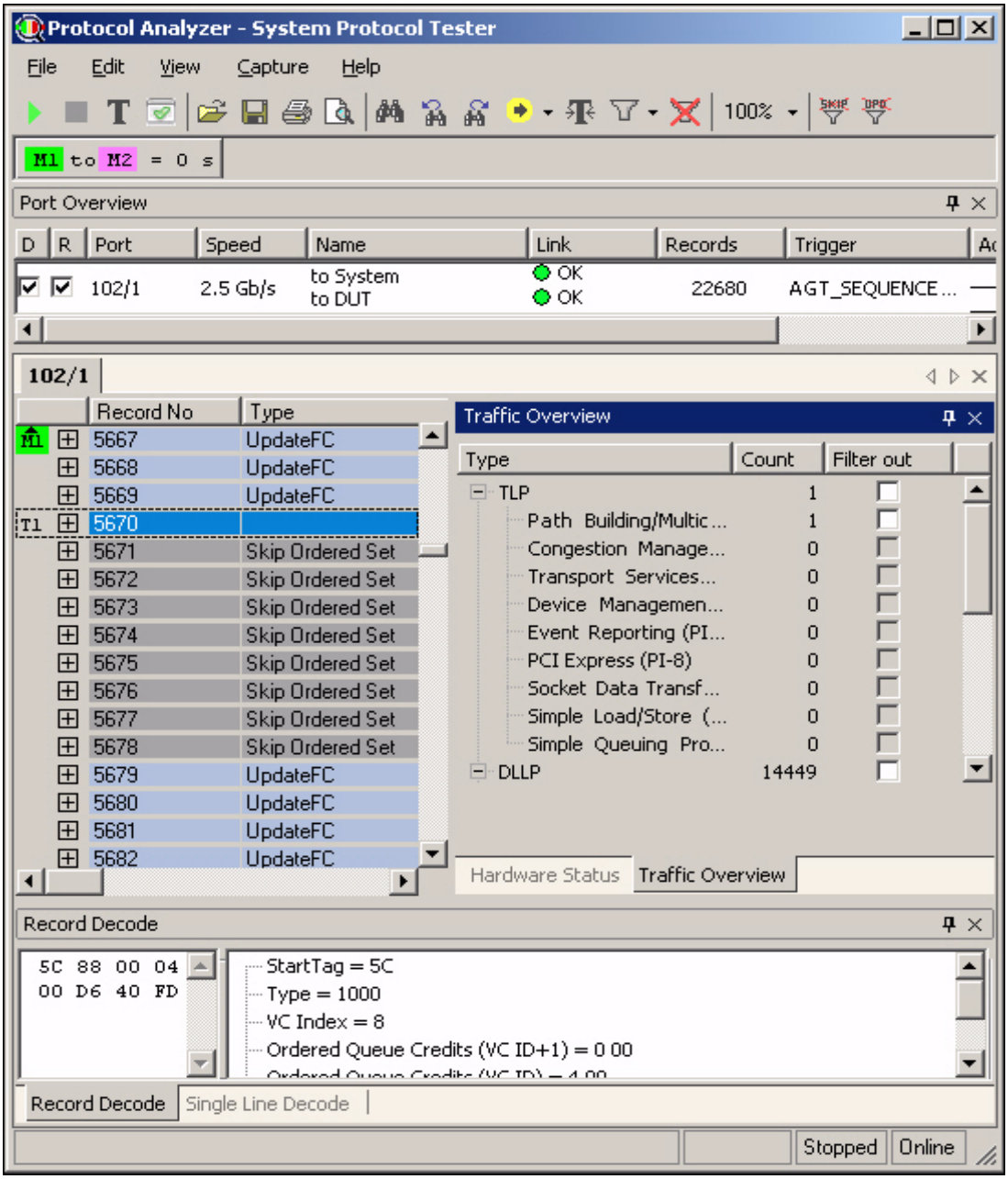

Figure 11 Protocol Analyzer window

This section covers the following topics:

- Using the Menu Bar
- Using the Toolbar

Using the Menu Bar

The **Menu Bar** is one way to access the functionality of the application. In the Protocol Analyzer application, menu bar provides the following menus:

- File menu
- Edit menu
- View menu
- Capture menu
- Help menu

File menu

Table 11 provides a brief description of the File menu commands.

Table 11 File menu commands

Menu command	Description
Open	Displays the Open dialog box that enables you to open a trace or XML file. A trace file is a `.pad` file that contains the trace data of a port. On the other hand, an XML file contains pointers to multiple trace files and contains other information, such as makers.
Save As	Displays the Save As dialog box that enables you to save the trace to a file.
Close	Enables you to close the session.
Page Setup	Displays the Page Setup dialog box that enables you to specify the page settings for printing the trace.
Print	Displays the Print dialog box that enables you to print the traced data.
Software Packages	Displays the Software Package Management dialog box that shows you the already installed software and provides a list of new software to be installed. It not only displays licenses, but also allows you to add new licenses.
Exit	Closes the Protocol Analyzer application.

Edit menu

Table 12 provides a brief description of the Edit menu commands.

Table 12 Edit menu commands

Menu command	Description
Copy	Enables you to copy Analyzer data to clipboard. For example, you can copy one or more data packet records and paste them in Protocol Exerciser to generate same or similar type of data packets.
Find	Displays the Find dialog box that enables you to specify the criteria to search data packets.
Find Previous	Searches the previous occurrence of the data packet using the search criteria specified in the Find dialog box.
Find Next	Searches the next occurrence of the data packet using the search criteria specified in the Find dialog box.
New Marker	Creates a new marker at the beginning of a selected data packet or frame.
Delete Marker	Removes the selected marker.
Marker Properties	Displays the Properties of marker dialog box that you can use to view and modify the properties of a marker.

View menu

Table 13 provides a brief description of the View menu commands.

Table 13 View menu command

Menu command	Description
Filter	Provides sub-menu commands that enable you to create filters on data packets trace, as well as remove filters.
Goto	Provides a sub-menu commands that enable you to move on to a trigger, marker, or a particular data packet record in the Packet Decode pane.
Zoom	Enables you to set the screen resolution of the data packet records shown in the Packet Decode pane.
Expand All Packets	Expands all the data packet records to show the details of their fields.
Collapse All Packets	Collapses all the data packets records to hide the details of their fields.

Table 13 View menu command

Menu command	Description
Record Decode View	Displays the Record Decode section that shows the hexadecimal representation of the fields of the selected data packet record in a tree-view format. In the Record Decode view, each element of the tree is a data packet field.
Single Line Decode View	Displays the Record Decode section that shows the hexadecimal representation of the fields of the selected data packet record in a contiguous manner.
Port Overview	Displays the details of the port that is connected with the current Protocol Analyzer session.
Preferences	Displays the Preferences dialog box.
Port Management	Displays the Port Selection dialog box that enables you to select the ports of a module for your test application.
Default Window Arrangement	Resets the GUI settings of the Protocol Analyzer application to default.

Capture menu

Table 14 provides a brief description of the Capture menu commands.

Table 14 Capture menu commands

Menu commands	Description
Start	Starts capturing data packets.
Stop	Stops capturing data packets.
Trigger Setup	Displays the Trigger Setup dialog box.
Hardware Setup	Displays the Hardware Setup pane.

Help menu

Table 15 provides a brief description of the Help menu commands.

Table 15 Help menu commands

Menu command	Description
Help Topics	Displays the online help for Protocol Analyzer.
Session Information	Displays the Session Information message box with the current session information.

Table 15 Help menu commands

Menu command	Description
About	Displays the information about the System Protocol Tester system.

Using the Toolbar

Toolbar provides a quick access to the features of the Protocol Analyzer application (Figure 12).

Figure 12 Toolbar

Table 16 specifies the names of all toolbar icons.

Table 16 Toolbar icons

Icon	Name
	Start hardware capturing
	Stop hardware capturing
	Show Trigger Setup
	Show port setup
	Open trace file
	Save trace to file
	Print
	Print preview
	Find packets

Table 16 Toolbar icons

Icon	Name
	Find previous occurrence
	Fine next occurrence
	Goto marker
	Goto trigger
	Filter packet display
	Disable all packet filters
	Zoom factor for packet views
	Filter all Skip Ordered Sets
	Filter all Update Flow control Packets and Skip Ordered Sets

4
Testing the System

This chapter provides you the information on how to use the Protocol Exerciser application for sending and receiving data packets. This chapter also provides information about editing data packets and their receive settings.

Creating an ASI Link

Once you have created a new or connected to existing Exerciser session, the next step is to create an ASI link with the device under test (DUT). To do this, you need to specify the link settings in the Link Settings tab (Figure 13).

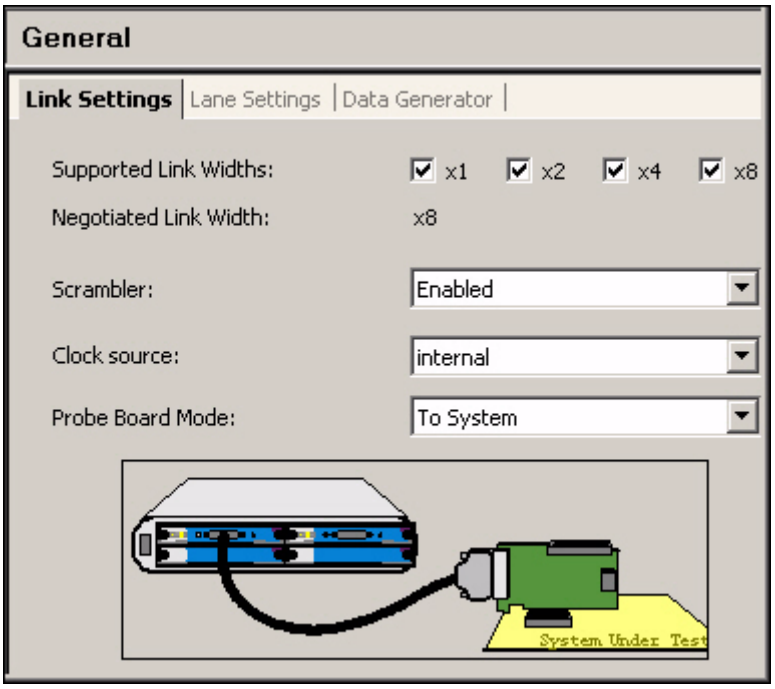

Figure 13 Link Settings tab

Table 17 briefly describes the components of the Link Settings tab.

Table 17 Components of the Link Settings tab

Component	Description
Supported Link Widths	Enables you to specify the desired link width to use for data transfer. The **x1** check box is selected by default.
Negotiated Link Width	Displays the link width that Protocol Exerciser and DUT have agreed upon after link up.

Table 17 Components of the Link Settings tab

Component	Description
Scrambler	Provides **Enabled** and **Disabled** options to enable or disable the Scrambler algorithm. Selecting **Disabled** disables the scrambling of data and also sets the Disable Scrambling bit in the link control field of training sequences during link training. Selecting **Enabled** enables or disables scrambling of data depending on the state of the Disable Scrambling bit of the link partner during link training. By default, scrambling is enabled.
Clock Source	Enables you to specify the internal or external clock source. This only works with the PCI Express Probe Boards (E2938/39A and E2968A), when a clock is provided on the system connector (to System configuration) or the external clock in SMA connector (to DUT configuration).
Probe Board Mode	Enables you to specify mode of the probe board. It can be either To DUT or To System.

To create an ASI link

1 Click the **General** icon in the <*Setup_Filename*> pane.

2 Click the **Link Settings** tab.

3 Select **x1**, **x2**, **x3**, or **x4** to specify the desired link width.

4 Select **Enabled** in the **Scrambler** drop-down list, if you want to scramble the data packets.

5 Select **internal** or **external**, as desired, from the **Clock source** drop-down list.

6 Select **To DUT** from the **Probe Board Mode** drop-down list to create a link between Protocol Exerciser and DUT.

Selecting this option works only if DUT is connected on the DUT connector of a PCIe or ATCA probe board.

7 Click **Action > Link Up**.

This creates a link between the Protocol Exerciser and DUT.

About Sending and Receiving Data Packets

Once you have created a link between Exerciser and DUT, you can start sending and receiving data packets.

This section covers the following topics:

- Sending and receiving data packets
- Editing data packets
- Modifying the settings for receiving data packets

Sending and receiving data packets

In Protocol Exerciser, you can send and receive data packets using the Send Packets (Figure 14) and Receive Packets (Figure 19) tabs. To access these tabs, click the **Send / Receive Packets** option from the <*Setup_Filename*> pane.

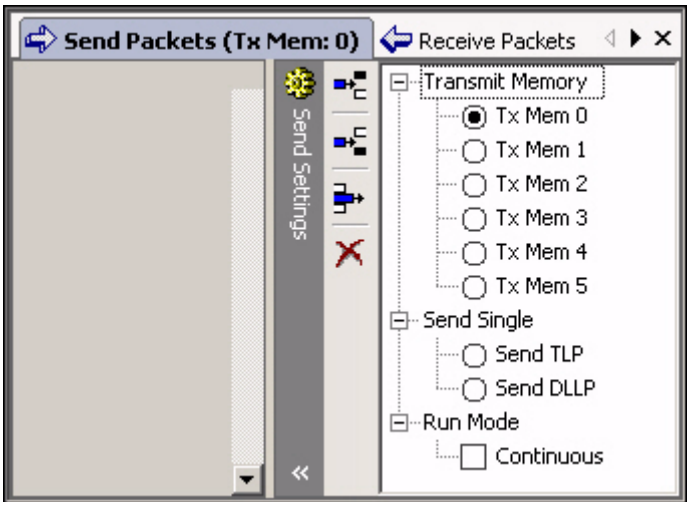

Figure 14 Send Packets tab

Table 18 briefly describes the components of the Send Packets tab.

Table 18 Components of the Send Packets tab

Component	Description
Insert single packet above the selected packet	Click **Insert single packet above the selected packet** to insert a new data packet above the selected data packet.

Table 18 Components of the Send Packets tab

Component	Description
Insert single packet below the selected packet	Click **Insert single packet below the selected packet** to insert a new data packet below the selected data packet.
Remove the selected packet	Click **Remove the selected packet** to remove the selected data packet.
Remove all the packets	Click **Remove all the packets** to remove all data packets.
Run Mode	Provides the Continuous check box that you can select if you want to send data packets for infinite time. If this check box is not selected, then Protocol Exerciser sends the data packet only for once. By default, the Continuous check box is not selected. Also, this check box is not available for the Send TLP and Send DLLP options.
Transmit Memory	Provides a list of six transmit memories, Tx Mem 1 to Tx Mem 6. You can choose a transmit memory and add data packets to it.
Send Single	Provides options to send a single TLP or DLLP.

To send and receive data packets

1 Select one of the Transmit Memory option buttons, **Send TLP**, or **Send DLLP** as required.

2 Click **Insert single packet above the selected packet** or **Insert single packet below the selected packet**.

The Select a Template dialog box appears (Figure 15).

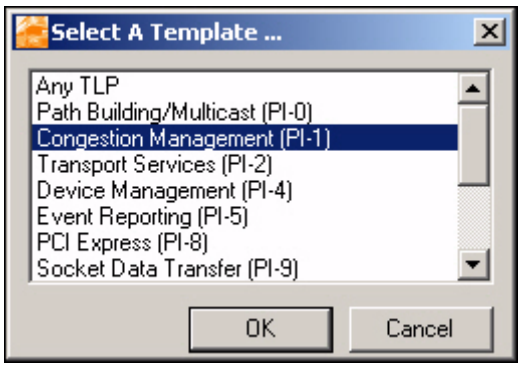

Figure 15 Select a Template dialog box

3 Select the desired data packet template.

4 Click **OK**.

This adds the new data packet in the Send Packets tab (Figure 16).

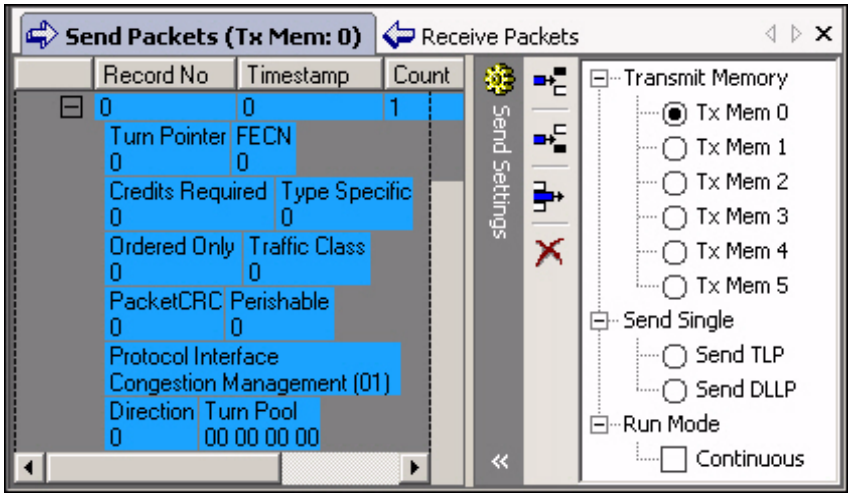

Figure 16 Send Packets tab with a data packet

5 Click **Send Selected** on the toolbar.

This transfers the selected data packet to the linked DUT.

Editing data packets

In addition to adding a data packet in the Send Packets tab, you can edit its default settings before sending it to the linked device. For this, Protocol Exerciser provides you the Edit Packet dialog box (Figure 17). The Edit Packet dialog box has two tabs: Packet Editor and Packet Behavior. In the Packet Editor tab, you can edit the contents of a data packet (Figure 17). In the Packet Behavior tab, you can edit the behavior of a data packet (Figure 18).

To access the Edit Packet dialog box, double-click the data packet in the Send Packets tab.

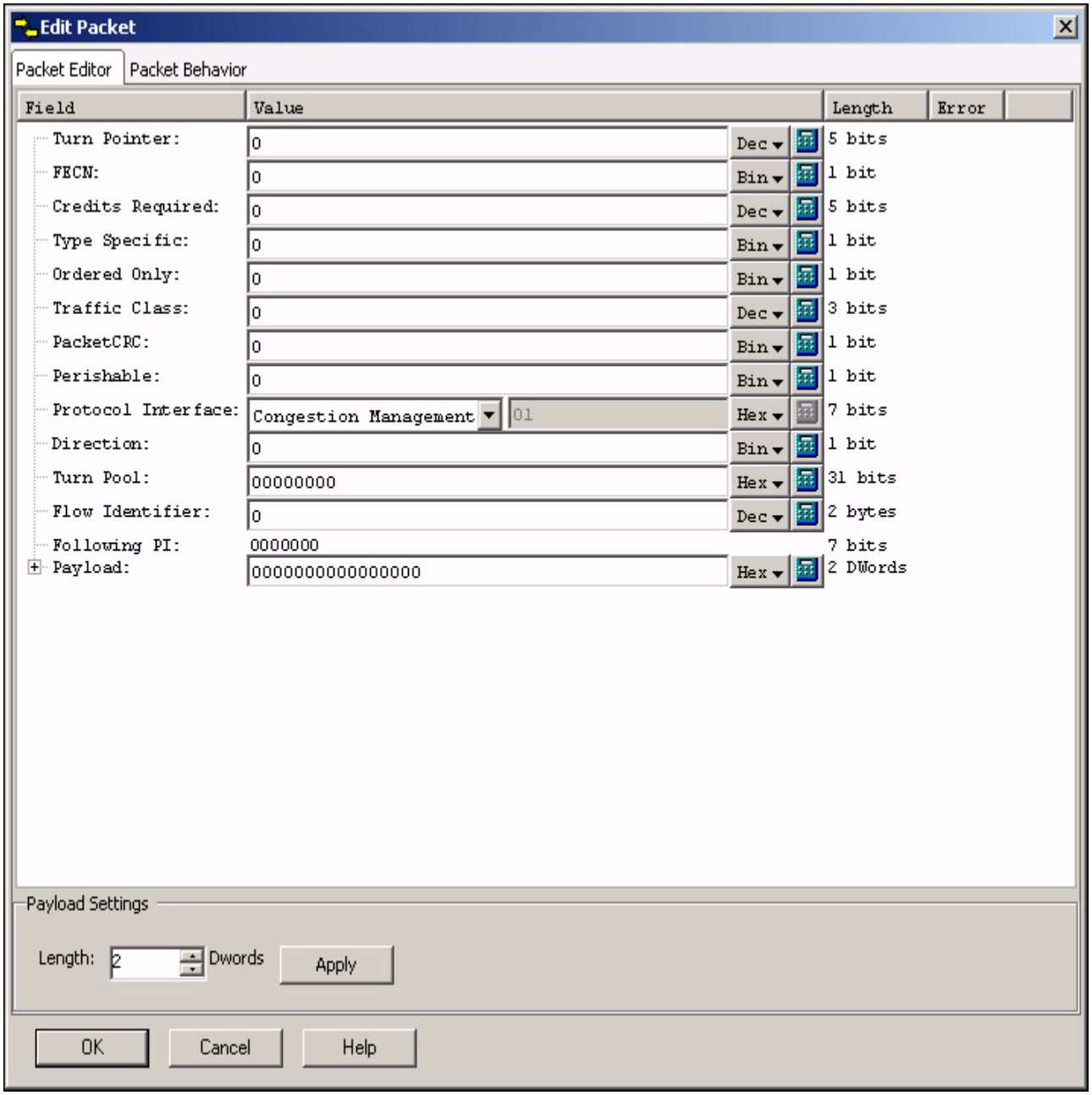

Figure 17 Packet Editor tab

Table 19 briefly describes the components of the Packet Editor tab.

Table 19 Components of the Packet Editor tab

Component	Description
Field	The **Field** column contains the names of the fields of a data packet. The number of fields displayed in this column may differ for different data packets.
Value	The **Value** column contains an input component for each data field. You can specify the desired inputs in these components to edit the selected data packet. This column also contains a drop-down list and a calculator for input assistance. The drop-down list enables you to specify your inputs in hexadecimal, binary, or decimal format. Clicking the calculator for input assistance displays the Input Assistant dialog box. Here, you can perform boolean operations over the hexadecimal, binary, and decimal values, and use the resulting value as the new value for the corresponding data packet field.
Length	The **Length** column displays the maximum length of a field in bits, bytes, or DWords.
Error	The **Error** column displays an error message produced for the field due to illegal input value.
Length	Specifies the length of the Payload data packet field in DWords.
Apply	Click **Apply** to assign the new length to the Payload data packet field.
OK	Click **OK** to close the Edit Packet dialog box and save the the changes made to the data packet.
Cancel	Click **Cancel** to close the Edit Packet dialog box without saving any changes.
Help	Click **Help** to display the online help.

NOTE If you send a data packet whose payload is greater than 541 DW, then you need to link up again before sending another data packet.

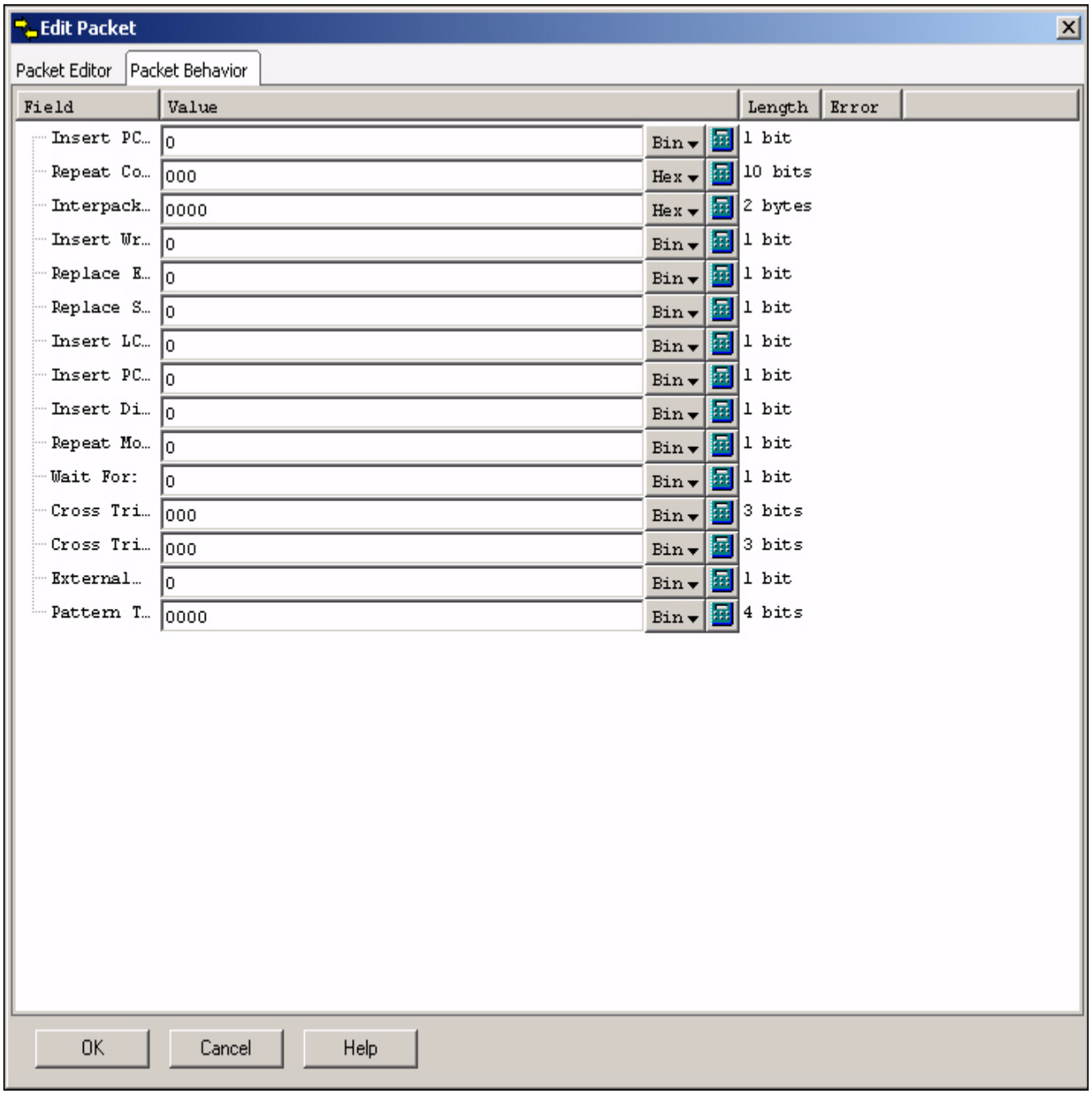

Figure 18 Packet Behavior tab

Table 20 briefly describes the components of the Packet Behavior tab.

Table 20 Components of the Packet Behavior tab

Component	Description
Field	The **Field** column contains the names of the fields of a data packet.
Value	The **Value** column contains an input component for each data field. You can specify the desired inputs in these components to edit the selected data packet. This column also contains a drop-down list and a calculator for input assistance. The drop-down list enables you to specify your inputs in hexadecimal, binary, or decimal format. Clicking the calculator for input assistance displays the Input Assistant dialog box. Here, you can perform boolean operations over the hexadecimal, binary, and decimal values, and use the resulting value as the new value for the corresponding data packet field.
Length	The **Length** column displays the maximum length of a field in bits, bytes, or DWords.
Error	The **Error** column displays an error message produced for the field due to illegal input value.
OK	Click **OK** to close the Edit Packet dialog box and save the the changes made to the data packet.
Cancel	Click **Cancel** to close the Edit Packet dialog box without saving any changes.
Help	Click **Help** to display the online help.

NOTE In the Packet Behavior tab, if you specify the repeat count for a data packet as N, Protocol Exerciser repeats that data packet for N+1 times. For example, If you set the repeat count of data packet as 2, Protocol Exerciser repeats that data packet for 3 times.

Modifying the settings for receiving data packets

The Receive Packets tab provides the following tabs that enable you to modify the settings for receiving data packets:

- **TLP Receive**: This tab enables you to specify the filter criteria for receiving TLPs. You can use this tab to receive or discard a particular type of TLPs.

- **DLLP Receive**: This tab enables you to specify the filter criteria for receiving DLLPs. You can use this tab to receive or discard a particular type of DLLP.
- **Receive Settings**: This tab enables you to specify the maximum number of data packets that are kept in the Receive Packets window at a time. There may be a situation when there are more packets than the specified limit. In this case, older packets are first discarded to make room for the new incoming packets.

Figure 19 displays the TLP Receive tab.

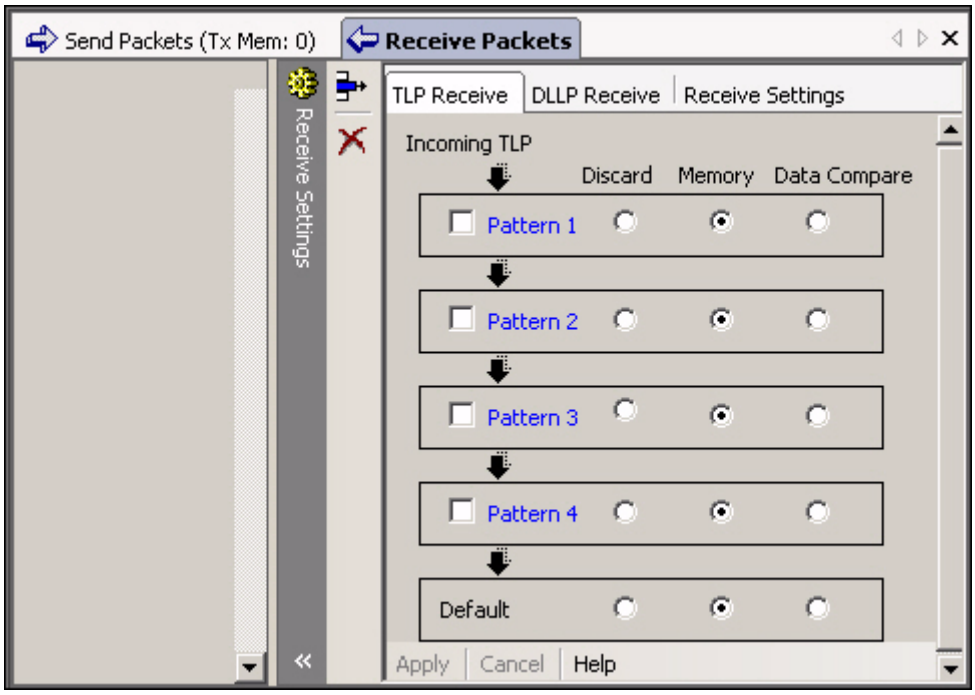

Figure 19 Receive Packets tab

Table 21 briefly describes the components of the TLP Receive tab.

Table 21 Components of the TLP Receive tab

Component	Description
Remove the selected packets	Click **Remove the selected packets** to remove the selected data packets from the buffer.
Remove all packets	Click **Remove all packets** to delete all the selected data packets from the buffer.

Table 21 Components of the TLP Receive tab

Component	Description
Pattern *N*	Click **Pattern *N*** to display the Select a Template dialog box. Here, *N* is a digit ranging from one to four. There is also a **Default** pattern. Data packets that do not fall into any pattern, by default fall into this pattern.
Discard	Select **Discard** to prevent receiving the type of data packets you specified in the corresponding pattern.
Memory	Select **Memory** to receive the type of data packets you specified in the corresponding pattern.
Data Analyzer	Select **Data Analyzer** to compare packet payload against the algorithmically generated data. This works only for the PI-8 (Memory Write) packets, where the destination memory address determines the data to be generated.
Apply	Click **Apply** to apply the changes you made in the TLP Receive tab.
Cancel	Click **Cancel** to cancel the changes you made in the TLP Receive tab.
Help	Click **Help** to display the online help.

Figure 20 displays the DLLP Receive tab.

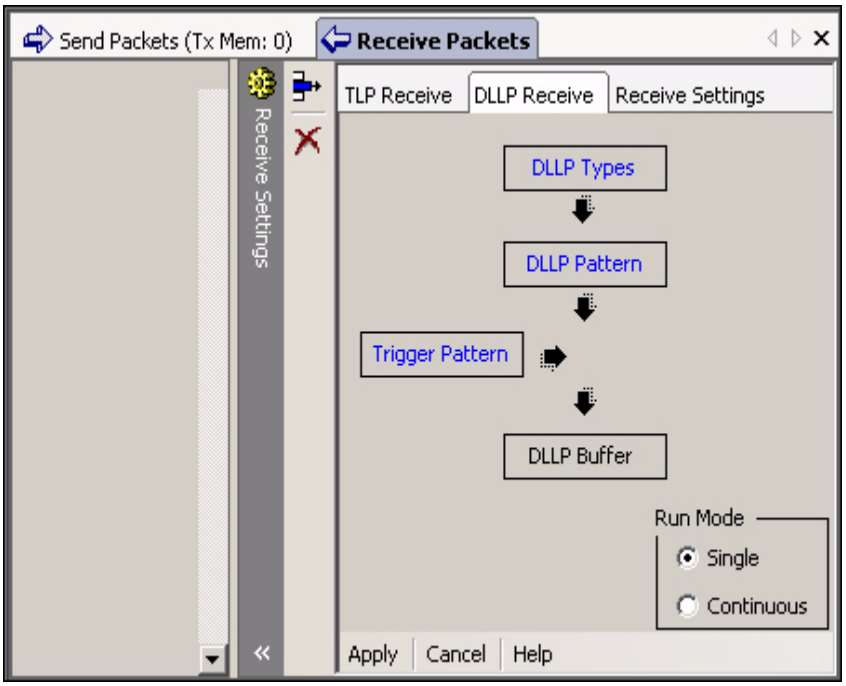

Figure 20 DLLP Receive tab

Table 22 briefly describes the components of the DLLP Receive tab.

Table 22 Components of the DLLP Receive tab

Component	Description
DLLP Types	Click **DLLP Types** to display the DLLP Types dialog box. In this dialog box, select the DLLP type to which you want to apply filters from the **Discard** list box and move it to the **Save** list box. Once you have moved all the required DLLPs to the Save list box, click **Apply**.
DLLP Pattern	Click **DLLP Pattern** to display the Pattern Editor dialog box. Here, select the pattern you want to receive, from the **Select Pattern** drop-down list. After this, edit its fields. Finally, click **OK** to apply the filter.
Trigger Pattern	Click **Trigger Pattern** to display the Pattern Editor dialog box. Here, you specify trigger pattern for a selected DLLP.
Single	Click **Single** to receive the data packet only once.
Continuous	Click **Continuous** to keep receiving data packets for infinite time.

Table 22 Components of the DLLP Receive tab

Component	Description
Apply	Click **Apply** to apply the changes you made in the DLLP Receive tab.
Cancel	Click **Cancel** to cancel the changes you made in the DLLP Receive tab and to restore the original hardware settings.
Help	Click **Help** to display the online help.

Figure 21 displays the Receive Settings tab.

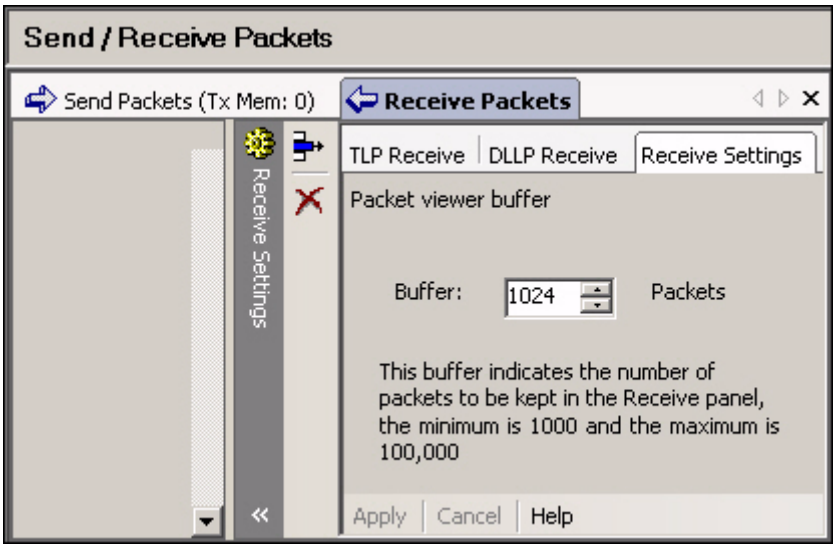

Figure 21 Receive Settings tab

Table 23 briefly describes the components of the Receive Settings tab.

Table 23 Components of the Receiving Settings tab

Component	Description
Buffer	Specifies the maximum number of data packets that can be buffered in the TLP Receive tab.
Apply	Click **Apply** to apply the changes you made in the Receive Settings tab.
Cancel	Click **Cancel** to cancel the changes you made in the Receive Settings tab and to restore the original hardware settings.
Help	Click **Help** to display the online help.

To modify the settings for receiving TLPs

1 Click **Pattern 1**.

The Select a Pattern dialog box appears.

2 Click **OK**.

The Packet Editor dialog box appears.

3 Select the desired data packet template from the **Packet Interface** drop-down list.

4 Make changes to the selected data packet template details, as desired.

5 Click **OK**.

6 Select the **Pattern 1** check box.

7 Select **Discard** for Pattern 1.

This ensures that data packets of the type you selected in the Packet Editor dialog box get discarded without going to memory.

8 Click **OK**.

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