IxExplorer

Release 9.39

User Guide

KEYSIGHT

202310131320+05:30

Notices

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Documentation conventions

The following documentation conventions are used in this guide:

Describing interactions with the UI

You can interact with products by using different input methods: keyboard, mouse, touch, and more. So in most parts of the user documentation, generic verbs have been used that work with any input method. In cases where input-neutral verbs do not work, mouse-specific verbs are used as the first choice, followed by touch-specific verbs as the second choice.

See the following table for examples on how you can interpret the different input methods.

Input-neutral	Mouse	Touch
Select **Modify**.	Click **Modify**.	Tap **Modify**.
Select **Accounts** > **Other accounts** > **Add an account**.	Click **Accounts** > **Other accounts** > **Add an account**.	Tap **Accounts** > **Other accounts** > **Add an account**.
To open the document in Outline view, select **View** > **Outline**.	To open the document in Outline view, click **View** > **Outline**.	To open the document in Outline view, tap **View** > **Outline**.
Select **Protocols**.	Click the **Protocols** tab.	Tap **Protocols**.
-NA-	Double-click the **Client** wizard.	Double-tap the **Client** wizard.
Open the **Packages** context menu.	Right-click **Packages** to open the shortcut menu.	Long tap **Packages** to open the shortcut menu.

Deprecated words

The following words have been replaced with new words, considering the audience profile, our modern approach to voice and style, and our emphasis to use input-neutral terms that support all input methods.

Old usage...	New usage...
shortcut menu, right-click menu	context menu
click, right-click	select
drag and drop	drag

Table of Contents

About This Guide

The information in this section is provided to help you navigate this guide and make better use of its content. A list of related documentation is also included.

The Third-Party Software License document is included with the download package.

Purpose

This guide provides information about IxExplorer theory, features, functions, and options, as well as additional test setup details. (5.70122909)

Manual Content

This guide contains the following sections:

Section	Description
About This Guide	Provides information on this guide, including its purpose, content, and related documentation. Also explains how to contact technical support.
Chapter 1, IxExplorer Overview	Provides an introduction to the operation and configuration of the Ixia system.
Chapter 2, IxExplorer Operation	Describes the means of operating the Ixia hardware through the IxExplorer software.
Chapter 3, Explore Network Resources	Discusses the main view of IxExplorer and how it provides access to all hardware features.
Chapter 4, Stream and Flow Control	Discusses the construction and assembly of data streams.
Chapter 5, Frame Data-Basic Frame Structure	Discusses the assembly of dynamically changeable data frames that are packaged into streams.
Chapter 6, Frame Data-Protocol Control	Discusses the assembly of Protocol information for insertion into stream packets.
Chapter 7, Frame Data-User Defined Fields (UDF)	Discusses the assembly of user defined data for insertion into stream packets.
Chapter 8, Packet View	Discusses the means by which frame data may be previewed before it is sent to the DUT.
Chapter 9, IxRouter Window	Discusses general use of the IxRouter window.
Chapter 10, Protocol Interfaces	Discusses the use of protocol interfaces through IxRouter.

Section	Description
Chapter 11, ARP	Discusses the use of the Address Resolution Protocol (ARP).
Chapter 12, ICMP/ PINGv4	Discusses the use of the Internet Control Message Protocol (ICMP) and Packet Internet Groper version 4 (PINGv4).
Chapter 13, Filter Properties	Discusses the programming and operation of the controls that dictate when and how much data is captured by each port's capture buffer. Programming of user defined statistics is also covered here.
Chapter 14, Capture View	Discusses the means by which the IxExplorer is used to view captured data from each port's capture buffer.
Chapter 15, Statistic View	Discusses the means by which statistics from one or more ports may be viewed.
Chapter 16, Packet Group Statistic View	Discusses the means by which latency can be studied for one or more ports.
Chapter 17, Transceiver Digital Optical Monitoring	Discusses the collection and reporting of different transceiver digital optical monitoring parameters.
Chapter 18, Card Properties	Discusses the properties associated with load modules.
Chapter 19, Port Properties - 10/100/1000 Ethernet Family	Discusses the properties of Ethernet ports and their programming.
Chapter 20, Port Properties- 40/100 GE Family	Discusses the properties of 40 and 100 Gigabit High Speed Ethernet ports and their programming.
Chapter 21, Port Properties- NGY Family	Discusses the properties of NGY ports and their programming.
Chapter 22, Port Properties- Xcellon-Flex Family	Discusses the properties of Flex ports belonging to Xcellon-Flex card family and their programming.
Chapter 23, Port Properties- Xcellon-Lava Load Module	Discusses the properties of Lava card family and their programming.
Chapter 24, Port Properties- Xcellon-Multis Load Module	Discusses the properties of Xcellon-Multis card family and their programming.
Chapter 25, Port Properties- Novus and Novus-R Load Modules	Discusses the properties of Novus card family and their programming.
Chapter 26, Port Properties– Novus DP and Novus NP 10GE/1GE/100M Ethernet Load Modules	Discusses the properties of Novus DP and Novus NP 10GE/1GE/100M card family and their programming.

Section	Description
Chapter 27, Port Properties-Novus10/1GE32S Load Modules	Discusses the properties of Novus 10/1GE32S card family and their programming.
Chapter 28, Port Properties-Novus 10GE/5GE/2.5GE/1GE/100M Ethernet Load Modules	Discusses the properties of Novus 10GE/5GE/2.5GE/1GE/100M card family and their programming.
Chapter 29, Port Properties NOVUS25/10GE8SFP28	Discusses the properties of NOVUS25/10GE8SFP28 card family and their programming.
Chapter 30, Port Properties QSFP-DD	Discusses the properties of QSFP-DD card family and their programming.
Chapter 31, Port Properties T400GD-8P-OSFP	Discusses the properties of T400GD-8P-OSFP card family and their programming.
Chapter 32, Port Properties CFP8	Discusses the properties of CFP8 card family and their programming.
Chapter 33, Port Properties T400GD-8P-QDD	Discusses the properties of T400GD-8P-QDD card family and their programming.
Chapter 34, Port Properties–T400GP-4P-QDD	Discusses the properties of T400GP-4P-QDD card family and their programming.
Chapter 35, Port Properties–T400GP-2P-QDD	Discusses the properties of T400GP-2P-QDD card family and their programming.
Chapter 36, Port Properties-S400GD-16P-QDD+FAN+NRZ	Discusses the S400GD-16P-QDD+FAN+NRZ port properties.
Chapter 37, Port Properties-800GE-4P-QDD	Discusses the 800GE-4P-QDD port properties.
Chapter 38, Port Properties-800GE-4P-QDD-C	Discusses the 800GE-4P-QDD-C port properties.
Chapter 39, Port Properties-800GE-4P-OSFP-C	Discusses the 800GE-4P-OSFP-C port properties.
Chapter 40, Port Properties-800GE-8P-QDD-M+NRZ	Discusses the 800GE-8P-QDD-M+NRZ port properties.
Chapter 41, Port Properties-800GE-8P-OSFP-M+NRZ	Discusses the 800GE-8P-OSFP-M+NRZ port properties.
Chapter 42, Port Properties-800GER-4P-QDD-OSFP-	Discusses the 800GER-4P-QDD-OSFP-M+NRZ port properties.

Section	Description
M+NRZ	
Chapter 43, Port Properties-VM	Discusses the IxVM port properties.
Chapter 44, MII Registers	Discusses the Media-Independent Interface (MII) registers.
Chapter 45, Stream Properties - Warnings/ Information Messages	Discusses the warning and informational messages which may appear on the Warnings page of IxExplorer Stream Properties during port configuration.
Chapter 46, IxVM	IxVM is Ixia's virtual test port product that enables you to use Linux virtual machines (VMs) to generate test traffic.
Appendix A, Using ScriptGen	Describes how to start and operate the ScriptGen application.

Related Documentation

The following manuals may help you learn more about IxExplorer. The manuals are available on the CD shipped with the application, as well as on the Ixia Web site at

- *Ixia Platform Reference Manual.* Provides a detailed list of all currently supported Ixia chassis and Ixia load modules, as well as general information regarding various technologies covered by Ixia products.
- *IxServer User Guide*. Details the usage of the IxServer GUI for operation on an Ixia chassis.
- *IxOS Tcl Development Guide.* Describes the structure and conventions of the IxExplorer Tcl API and provides detailed information on all API commands.

In addition to these manuals, IxExplorer context-sensitive Help is available. By pressing F1 or the application's Help button, information about the current application window appears. Help content can also be accessed from the Help's table of contents or index.

Technical Support

You can obtain technical support for any Ixia product by contacting Ixia Technical Support by any of the methods mentioned on the inside cover of this manual. Technical support from Ixia's corporate headquarters is available Monday through Friday from 06:00 to 18:00, Pacific Standard Time (excluding American holidays). Technical support from Ixia's EMEA and India locations is available Monday through Friday, 08:00 to 17:00 local time (excluding local holidays).

CHAPTER 1

IxExplorer Overview

This section contains information about the following:

- IxExplorer Manuals
- Advice to Readers

IxExplorer Manuals

The use of the IxExplorer GUI is covered in two separate manuals:

- IxExplorer User Guide (this manual)
- IxNetwork User Guide (IxNetwork must be installed)

Advice to Readers

The Getting Started Guide should be used during the installation of each Ixia chassis. The *Ixia Platform Reference Guide* should also be used.

Those unfamiliar with the Ixia architecture would find it best to read the *Theory of Operation: General* and *Theory of Operation: Protocols* chapters (in the *Ixia Platform Reference Guide*), followed by the IxExplorer Operation and Explore Network Resources *chapters. These provide a thorough understanding of the Ixia architecture, both in theory and in practice.*

The remaining chapters of the manual may be read in preparation for programming or as reference material as needed. The entire text of this manual is included with the IxExplorer software as help files. It may be referenced at any time during the operation of the software.

New in Version 9.39

The following new features are added in this release:

- AresONE 800GE OSFP800-M load modules. See 800GE-8P-OSFP-M+NRZ load modules.
- AresONE 800GER QDD-OSFP-M dual interface load modules. See 800GER-4P-QDD-OSFP-M+NRZ load modules.
- 1x200G-R8 NRZ 26G and 8x10G-R NRZ 10G speed modes for 800GE-8P-QDD-M+NRZ card. See RG Operation.
- Explicit Control support for 800GE-8P-QDD-M+NRZ and 800GE-8P-OSFP-M+NRZ cards. See the following:
  - 800GE-8P-QDD-M+NRZ Port Properties—QSFP-DD Control
  - 800GE-8P-OSFP-M+NRZ Port Properties—OSFP Control

- 800GER-4P-QDD-OSFP-M+NRZ Port Properties—QSFP-DD Control
- 800GE-4P-QDD-C Port Properties—QSFP-DD Control
- 800GE-4P-OSFP-C Port Properties—OSFP Control
- S400GD-16P-QDD+FAN+NRZ Port Properties—QSFP-DD Control

CHAPTER 2

IxExplorer Operation

The IxExplorer software is the principal means used to program Ixia hardware, and to perform testing on network devices. This chapter is an overview of the facilities provided by the IxExplorer software and a guide on how to use those facilities.

This chapter is divided into several sections:

- *General Operation: Discusses the means of starting IxExplorer and the general layout of its functional windows.*
- *Multi-User Operation: Discusses the simultaneous control operations of IxExplorer.*
- *Transmit Operations: Discusses the transmit operations available.*
- *Capture Operations: Discusses the capture operations available.*
- *Latency Operations: Discusses the operations associated with latency measurements.*
- *Statistics Operations Discusses the statistics operations available.*
- Other Operations: Discusses other possible operations:
  - Active Stream Configuration
  - Collect Diagnostic Logs

General Operation

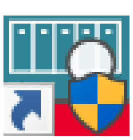
This section details starting IxExplorer and basic tasks, basic IxExplorer windows, and the concept of 'workspaces.' These topics are covered in the sections listed below:

- Starting IxExplorer
- IxExplorer Windows
- Chassis Save

Starting IxExplorer

The IxExplorer software comes preinstalled on the Ixia chassis computer; it can also be installed on any Windows-based system. In all cases, an icon is normally installed on the desktop and appears as shown in the following image. The IxExplorer application can be started by double-clicking the following icon:

Image: IxExplorer Icon

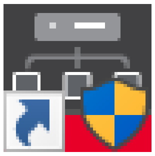


The Chassis Address dialog box appears.

Alternatively, IxExplorer can be started from the Start menu (*Start* > *Programs* > *Ixia* > *Ixia IxExplorer*), to view the *Chassis Address* dialog box, as described in Chassis Address dialog box.

IxExplorer can also be used with a simulated 'demonstration' chassis, running on a PC workstation. When using a demonstration chassis, the IxServer software should be started before IxExplorer; through *Start* > *Programs* > *Ixia* > *Ixia Server* or by double-selecting the IxServer icon. The IxServer icon is shown in the following image:

Image: IxServer Icon



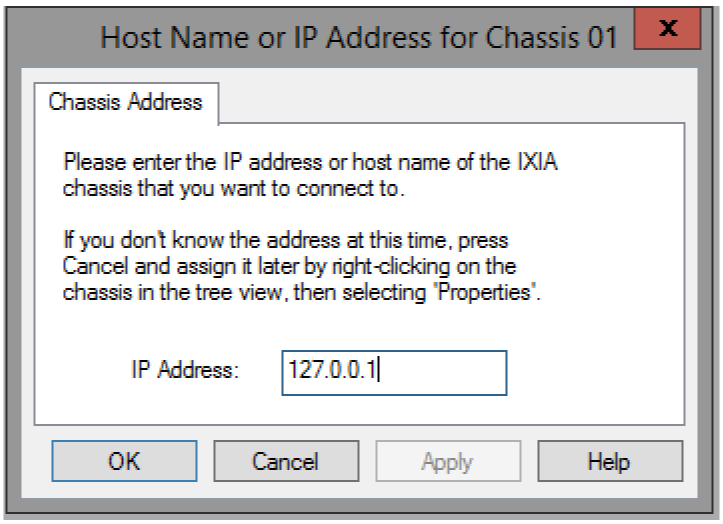
For more information on IxServer and the demonstration mode, see the *IxServer User Guide*.

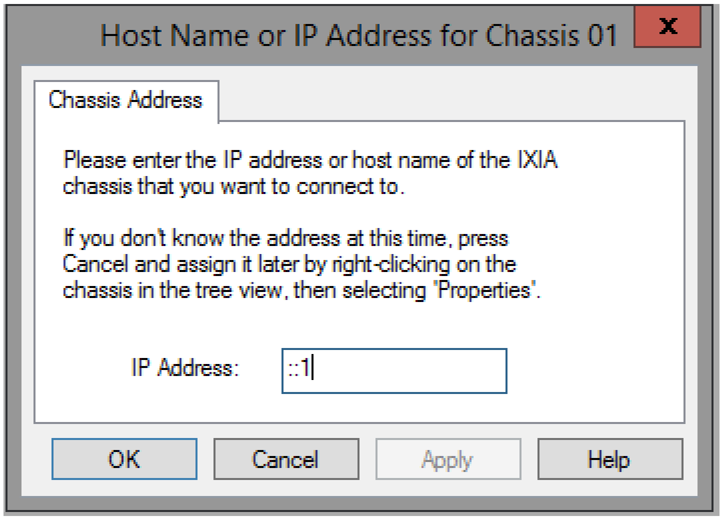
NOTE IxExplorer should not be run on a chassis, except for small test cases.

Chassis Address dialog box

After starting IxExplorer (by selecting the IxExplorer icon, or through the Start menu) a dialog box appears asking for the address of the chassis, as shown in the following image:

Image: Chassis Address dialog box



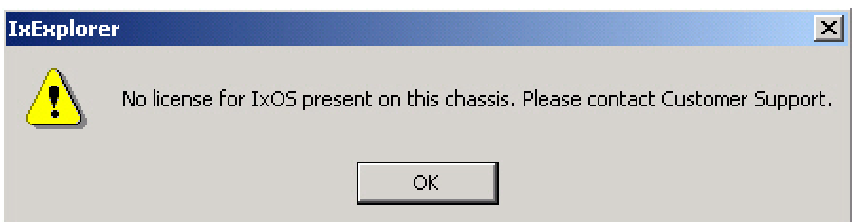


After entering the name of the chassis or its IPv4 (or IPv6) address, select *OK*. The IxExplorer main window appears, as shown in the following image.

NOTE If the demonstration server is installed and running, enter 'loopback' into this field to access simulated load modules.

If no valid license for the IxServer is detected, a warning appears, as shown in the following image:

Image: Warning: No License Detected



IxExplorer Windows

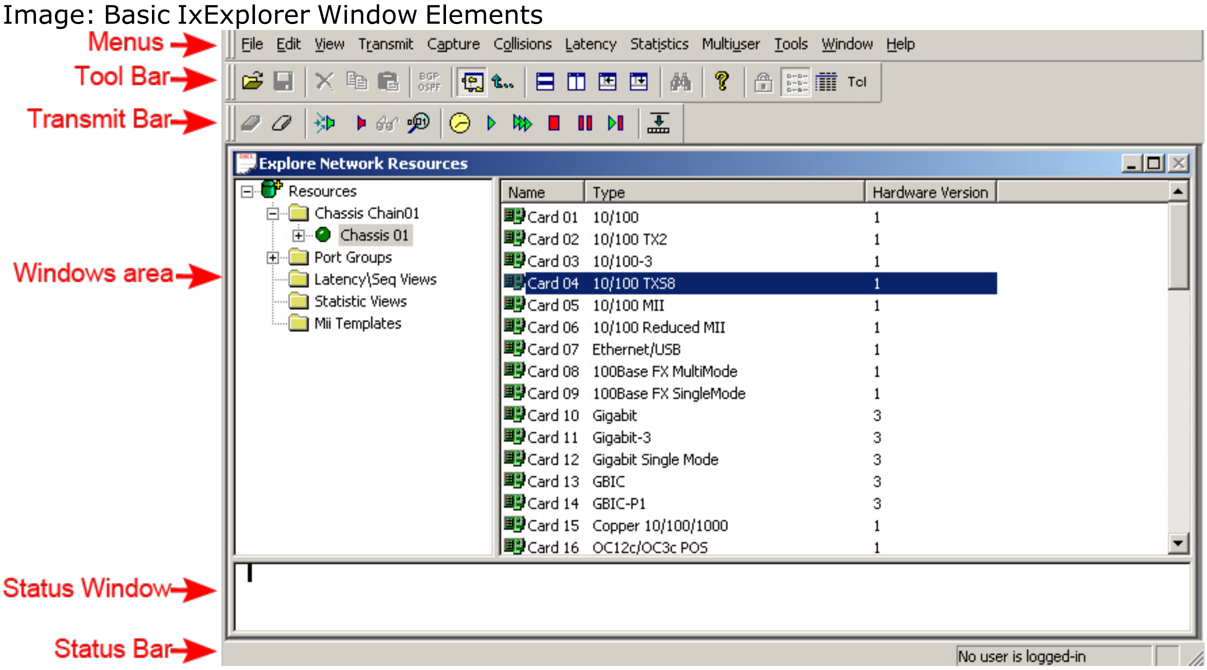
The main interface to the IxExplorer software, and therefore the Ixia hardware, is through the many windows, dialog boxes, and tabs that IxExplorer shows. The following sections describe some of the basic components of IxExplorer:

- Main Window
- Explore Network Resources Window
- Capture View Window
- Packet Group Statistics View Window
- Statistic View Window
- IxRouter Window

Main Window

The IxExplorer main window is the first window that appears when running IxExplorer, and the starting point for many operations. This window is opened by selecting the IxExplorer icon, or by selecting IxExplorer from the Start menu. The general layout of the IxExplorer main window is shown in the following image:

Image: Basic IxExplorer Window Elements



The basic elements of the IxExplorer Window are described in the following table:

Table: Basic IxExplorer Window Elements

Element	Description
Title Bar	Shows the name of the program (IxExplorer) plus the name of the workspace/configuration file in use. See Chassis Save for additional information.
Menu Bar	Location for the IxExplorer Menus. For information on the *File* > *Open* option, see Chassis Save.
Tool Bar	A standard Windows tool bar containing file, view, and help related icons.
Transmit Bar	An Ixia-specific toolbar that allows easy access to transmit and capture operations.
Windows Area	The bulk of the window accommodates one or more specific IxExplorer windows. These include: • Explore Network Resources Window • Capture View Window • Packet Group Statistics View Window • Statistic View Window • IxRouter Window
Status Window	Shows advisory messages sent from the server. Select the window to open the context menu allowing the window to be cleared and the font for the window to be

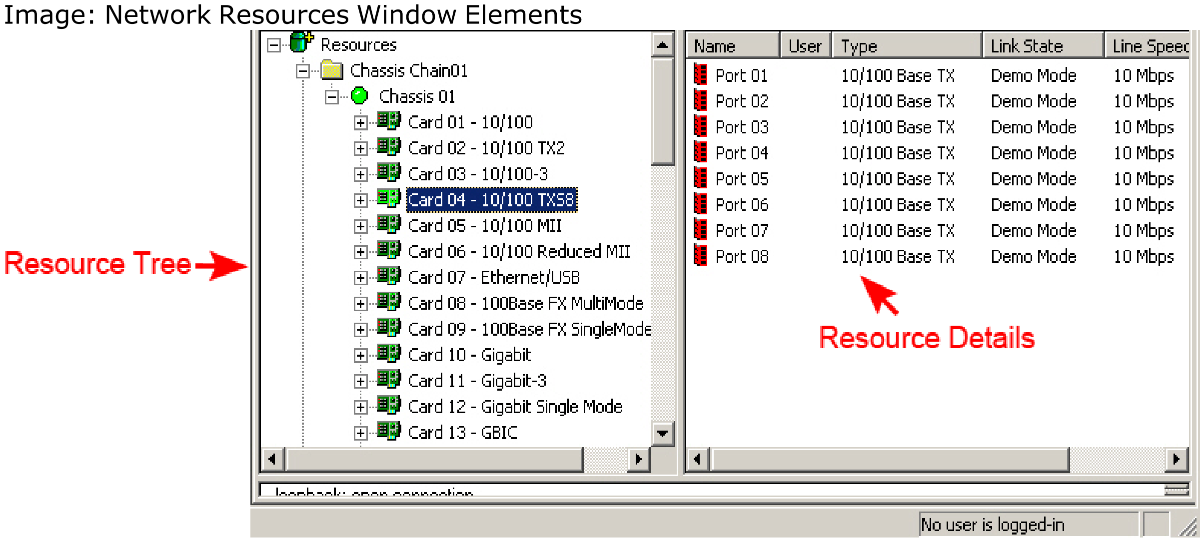
Element	Description
	set.
Status Bar	Shows various status messages during IxExplorer operation.

Explore Network Resources Window

The Explore Network Resources window is located within the IxExplorer Main window, and shows the hierarchy of Ixia hardware resources on the left side of the window. The details view on the right side shows detailed information for the item selected in the left side.

An example of the Explore Network Resources window is shown in the following image:

Image: Network Resources Window Elements



The Explore Network Resources window is where most setup and programming of Ixia hardware is performed. It is discussed fully in its own chapter (Explore Network Resources).

The left side of the view holds a tree which consists of the Ixia architecture hierarchy, from Chassis Chain down to Port level. For any item selected on the left side, the right side of the screen shows details for the selected item. This is sometimes a listing of contained items, and sometimes an active view, as in the Statistic View.

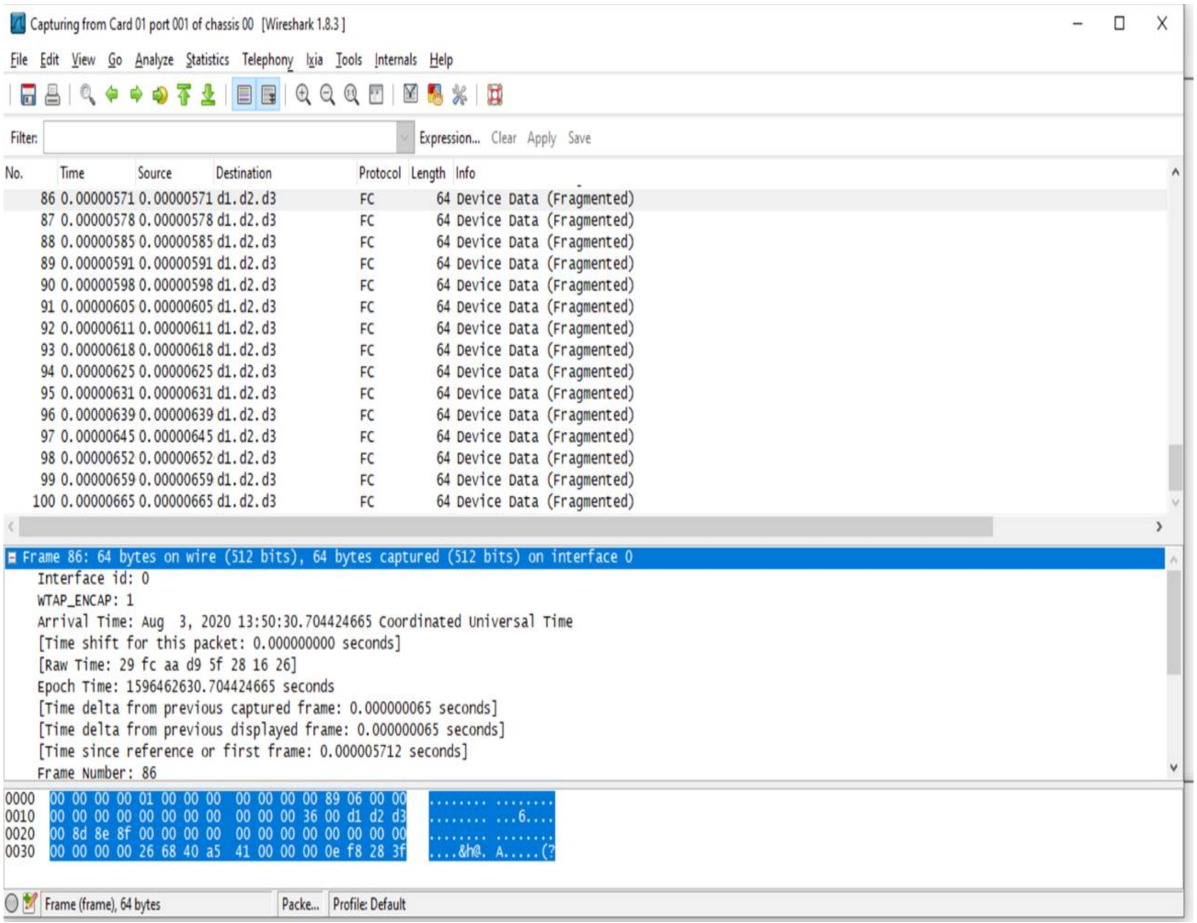
The various columns in the Resource details view may be rearranged to suit individual user preferences, by using the select-and-drag method to select the header of the column and move it to its new position.

Capture View Window

The Capture View is used to examine the data recorded from the DUT. The Capture View is accessed by selecting a port in the Resource tree, and then double-clicking *Capture View* from the list of options in the Resource details view. The Capture View is discussed more thoroughly in Capture View.

An example of the Capture View window is shown in the following image:

Image: Capture View Window–Standard Version



The standard *Capture View* window is split into panels, from top to bottom. These are described in the following table:

Table: Capture View dialog box

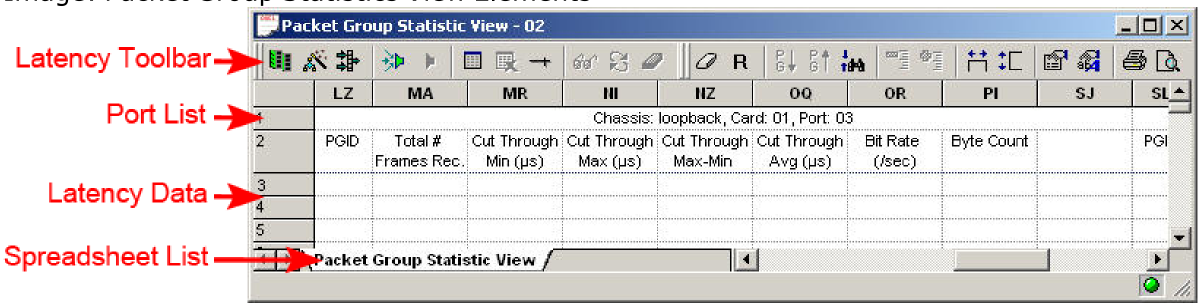
Window	Contents
Packet List (upper)	Packet List: A list that contains columns for a packet number, packet length, the destination address, the source address, timestamp data, and the error status of the frame. These fields are described in *Table: Capture View– Packet List Fields*.
Packet Tree View (lower)	Packet Tree View, expandable to show the parameters of the selected packet..
Hex and ASCII Data	Hexadecimal and ASCII byte view of the contents of the selected packet

Packet Group Statistics View Window

The Packet Group Statistics View is used to collect and analyze latency data across one or more ports, and to collect statistics on sequence checking. A new Packet Group Statistics View is opened by selecting *Packet Group StatisticsViews* under *Global Views* in the Resource tree, and then selecting the *New* option in the menu. An existing Packet Group Statistics View is opened by selecting *Packet Group StatisticsViews* under *Global Views* in the Resource tree, and then double-clicking one of the saved views in the Resource detail view. The Packet Group Statistics View is described thoroughly in Packet Group Statistic View.

An example of the Packet Group Statistics View window is shown in the following image:

Image: Packet Group Statistics View Elements



The elements of this window are described in the following table:

Table: Packet Group Statistics View Elements

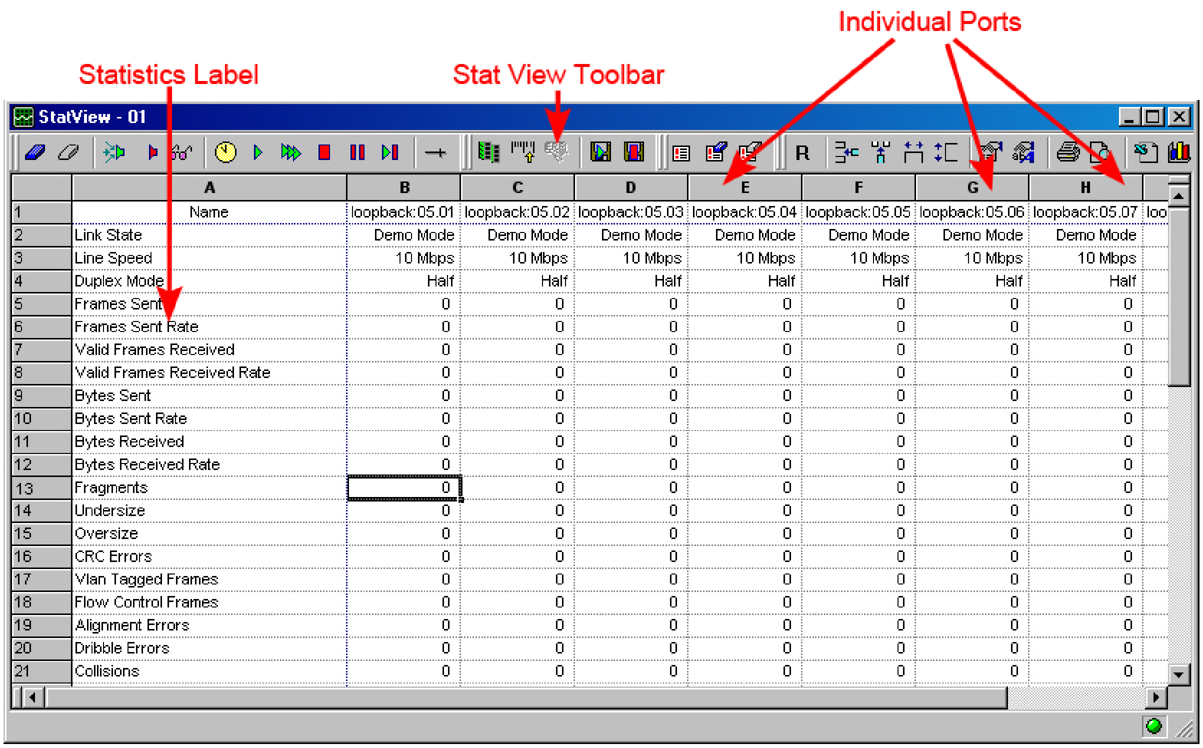
Element	Description
Latency Toolbar	A special toolbar used to initiate/terminate latency measurements and for the manipulation of latency data.
Port List	Table headings for each of the ports in the latency group.
Latency Data	The actual latency data. Data is listed by time slice (if used) and then by Packet Group ID.
Spreadsheet List	Data snapshots may be created and are saved as separate tabbed spreadsheets, listed here.

Statistic View Window

Statistic Views are used to monitor various statistics for a single port or a group of ports. A new Statistic View is opened by selecting the *Statistic Views* under *Global Views* in the Resource Tree, then selecting the *New* option from the menu. An existing Statistic View is opened by selecting *Statistic Views* in the Resource Tree, then double-clicking one of the saved views from Resource detail view. Statistic Views are discussed thoroughly in Statistic View.

An example of the Statistic View window is shown in the following image:

Image: Statistic View Window Elements



The elements of the Statistic View window described in the following table:

Table: Statistic View Elements

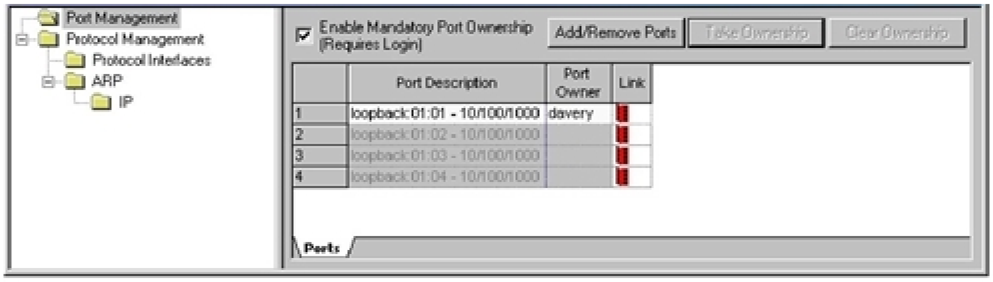
Element	Description
Stat View Toolbar	A custom toolbar used to control transmit, capture, and statistics operations.
Statistics Labels	The labels for each of the rows of the view. These are the statistics chosen for the set of ports in a Statistics Group.
Individual Ports	The column headings show the individual ports that are a part of the Statistics Group.

IxRouter Window

The IxRouter window allows configuration of routing protocols including BGP, OSPF, ISIS, RSVP-TE, LDP, RIP, RIPng, IGMP, and PIM-SM, as shown in the following image. See the *IxNetwork User Guide* for additional information on protocol configuration.

To open, select **IxRouter** in the toolbar.

Image: IxRouter Window



The fields and controls in the main IxRouter window (showing Protocol Selections) are described in the following table:

Table: Main IxRouter Window Elements

Field/Control	Description
Enable Mandatory Ownership	If this option is selected, port ownership is required before protocols can be configured for the port. First, log on as a user, and then take ownership of the port(s). This must be cleared for the list of protocols to appear.
List of Protocols	A tree structure which presents the protocols and access to various levels of configuration windows, depending on the protocol selected. Enable Mandatory Ownership must be cleared for the list of protocols to appear.
Port Selection window	The window where protocols are selected for use with available ports. The protocols in the grid are dimmed for ports that do not support those protocols.

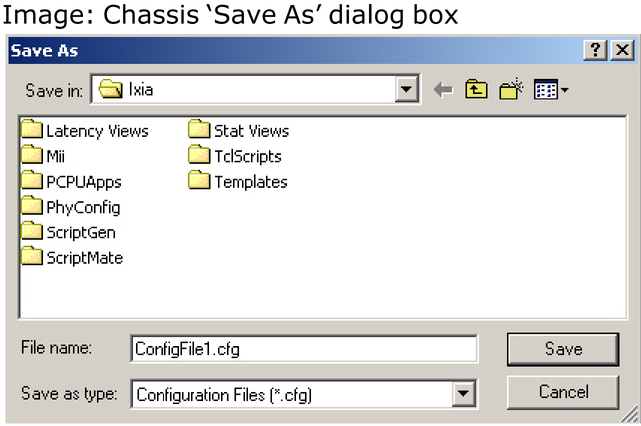
NOTE IxNetwork must be installed for full window functionality. Without IxNetwork, only limited ARP and Ping functions are allowed.

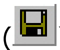
Chassis Save

All GUI configuration programming work can be saved in a configuration file.

When installed, each copy of IxExplorer is configured to use a default file named *Untitled.cfg* (file extension *.cfg* indicates it is a configuration file). The name of the file may be changed in the *File > Save As...* dialog box which is shown in the following image:

Image: Chassis 'Save As' dialog box



The default location for saving chassis is the same directory used to hold the Ixia software: `C:\Program Files\Ixia`, and all have the *.cfg* extension. In the image above, the current configuration is being saved into a new file named `ConfigFile1.cfg`. IxExplorer continues to use this file for future saves. The chassis is saved each time the *Save* operation is performed (either *File* > *Save*, or by using the *Save* icon () in the main toolbar). In addition, the chassis is automatically saved on exit if the *Auto Save on Close* option is set (either *File* > *Auto Save On Close* or through the *Tools* > *Options* dialog box).

See also Chassis, Card, and Port Files for information on saving files for individual parts of the configuration.

Workspace operations are explained in the following sections:

- Chassis Merge dialog box
- Creating a Chassis Icon
- Chassis, Card, and Port Files

Chassis Merge dialog box

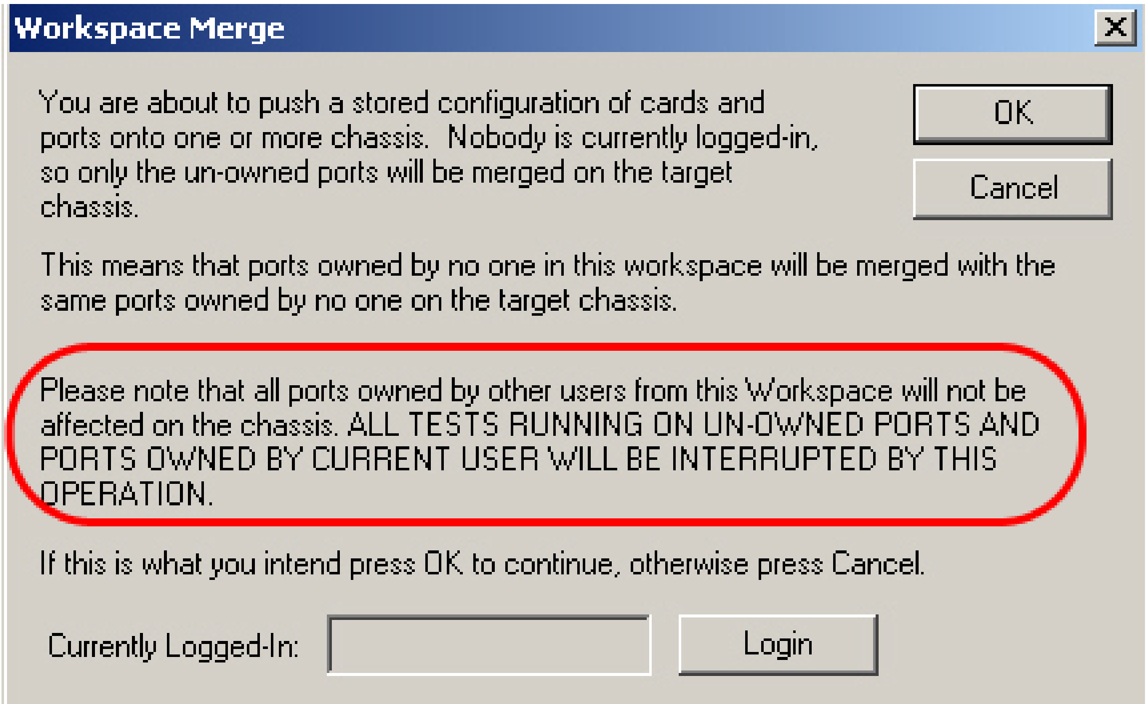
IxExplorer normally starts by opening the default `Untitled.cfg` workspace. A different, previously saved file may be opened with the open command (either *File* > *Open*, or by using the *Open* icon () in the main toolbar). When a saved *.cfg* file is opened, a dialog box appears, as shown in the following image.

It is extremely important to pay attention to the caution message in this dialog box:

All ports owned by other users from this chassis are not affected on the chassis. ALL TESTS RUNNING ON UN-OWNED PORTS AND PORTS OWNED BY THE CURRENT USER ARE INTERRUPTED BY THIS OPERATION.

The saved port configuration settings in the chassis file are pushed onto any unowned ports (and if you are logged on, onto ports owned by you). This initialization process stops any test that is currently in operation on those ports. Ports owned by other users are not affected.

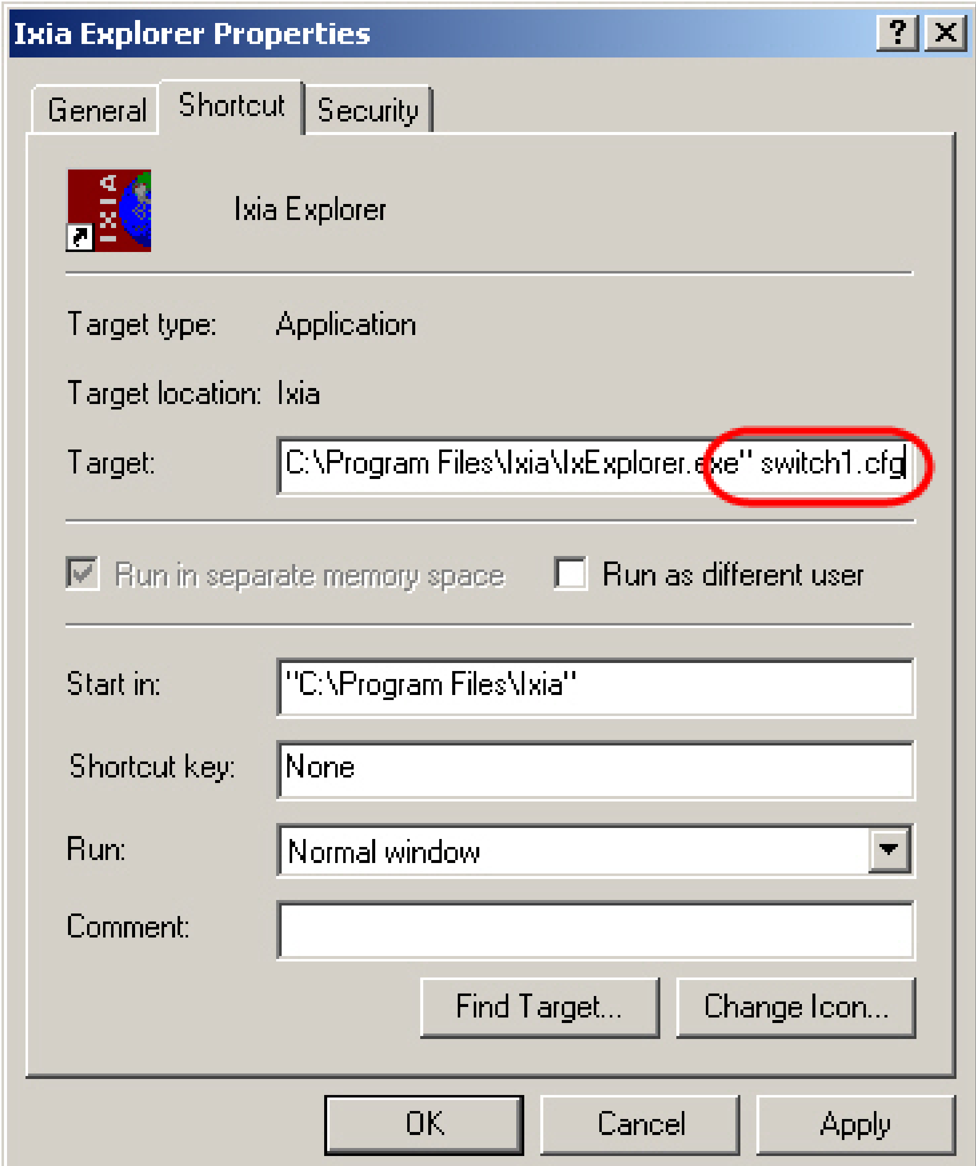
Image: Opening Saved *.cfg* File dialog box



Creating a Chassis Icon

It is also possible to invoke the IxExplorer application with the name of the chassis file as an argument. This is accomplished by modifying the properties of the IxExplorer icon (or a copy of the icon) to include the file as an argument. To modify the properties, select the Ixia IxExplorer desktop icon. Select *Properties* and add the file to the end of the entry in the *Target:* field as shown in the following image:

Image: Creating IxExplorer Icon for a Specific Chassis



Connecting to a Chassis

To connect to a specific chassis, do one of the following:

- Open **Properties** from the context menu of the IxExplorer icon. After the location of the IxExplorer.exe file in the **Target** box, type `--chassis <chassis IP>` and select **OK**.
- Open command prompt and type `cd <location of IxExplorer.exe in your computer>IxExplorer.exe --chassis <chassis IP>`.

Chassis, Card, and Port Files

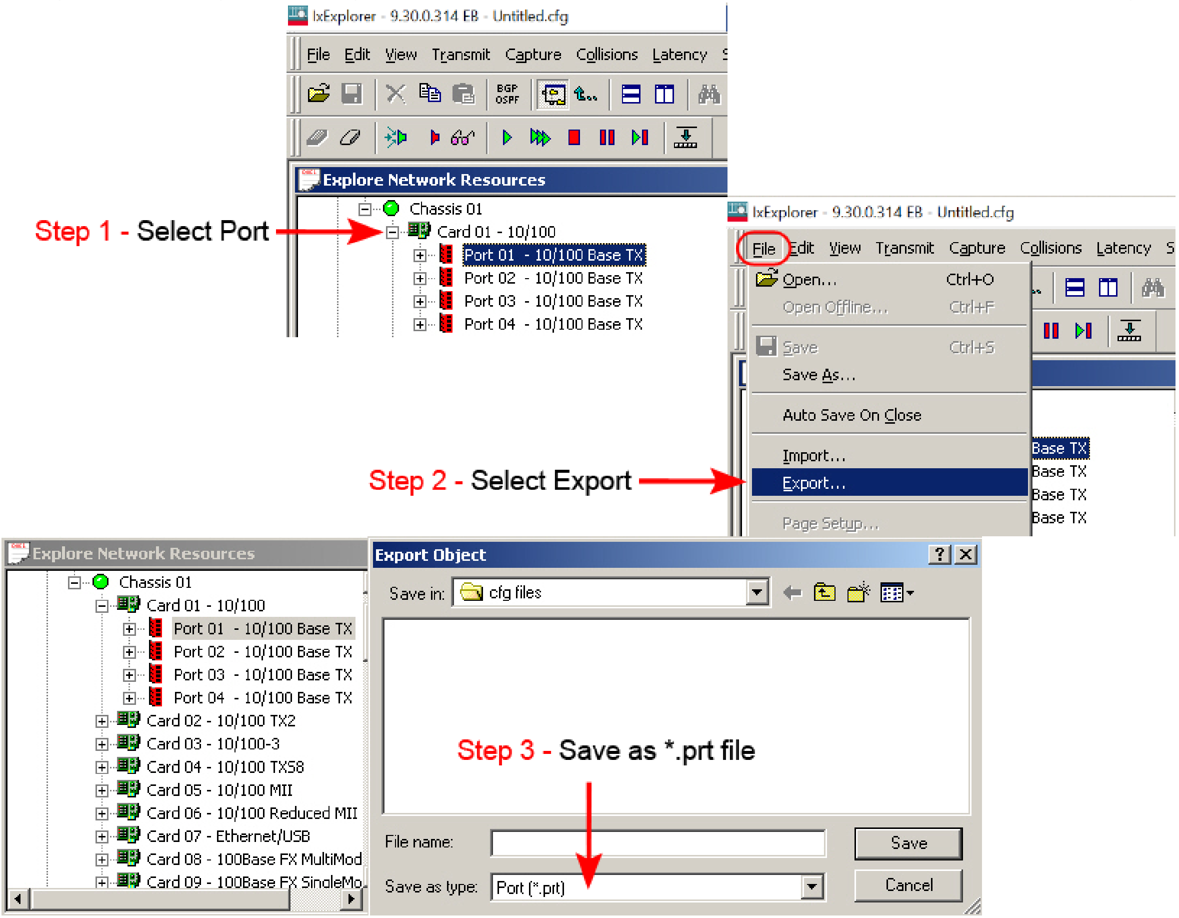
Configurations for individual elements, such as chassis or a port, may be exported to a named file, and then imported for use at a later time. The following file extensions are used:

- **.chs**—for a Chassis
- **.crd**—for a Card (Load Module)

- **.prt**—for a Port

The method for exporting or importing configuration files for these elements is shown in the following image. An example is shown for exporting a port (*.prt) file. The same method is used for import, using the *Import Object* dialog box, and for the other types of files (**.chs* and **.crd*). The files are saved to the Ixia program folder by default.

Image: Importing/Exporting Chassis, Card, and Port Files—Example (shown for exporting Port file)



Multi-User Operation

IxExplorer provides an optional means of coordinating the sharing of chassis ports among multiple users. If a single person is using a chassis, multi-user commands are not required. You may perform any operation on any port.

NOTE	For information on the IxRouter login, Login Window.

With IxExplorer's multi-user facilities, each user logs in with an arbitrary name. You may 'take ownership' of any and all ports that are not used by other users. The owner of a port has the ability to read data and program the port, while all other users have read-only access to the port. An owner may 'clear ownership' of their ports, making them available for other users. You may take ownership of a port owned by someone else, with an optional warning message. Any user may 'clear all ownership.'

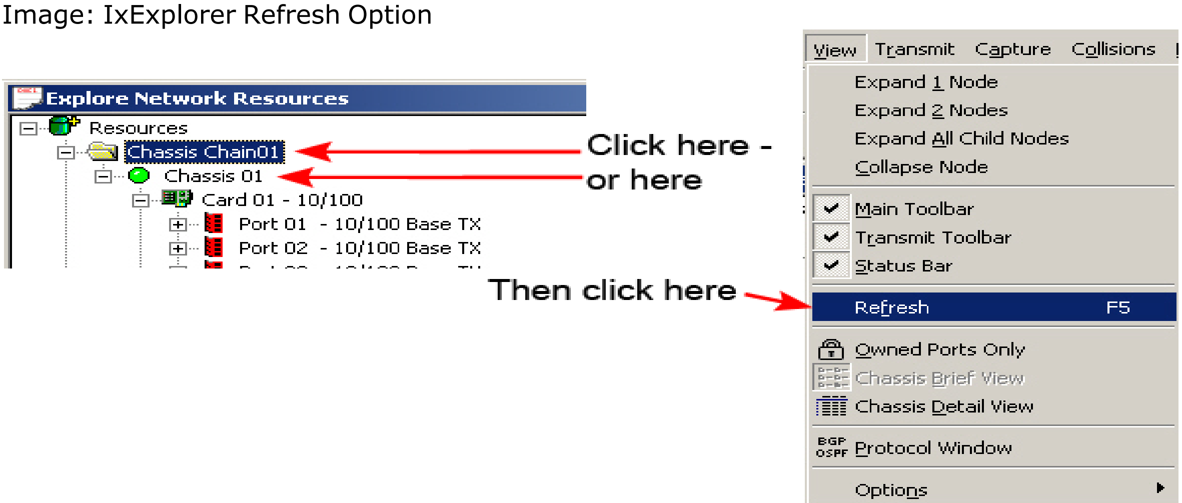
NOTE We NEVER support multiple clients simultaneously changing data on one port. The rule is: one port-one owner for each system test.The ownership model should not be used to have one script take ownership of a port and another script take ownership of that same port with the same username because one client may be working with a copy of the port configuration that has been made invalid by another owner.

The two basic modes of multi-user operation are referred to as:

- **Secured Mode**: Users are either Administrators or Operators. All users are required to be registered and to login. Administrators can login and take or clear ownership of ports. Operators can only view data. See Chassis Secure Mode and Secure Mode—User Properties dialog box for additional information on Secured Mode.
- **Unsecured Mode**: All users are considered 'Administrators' and login and take or clear ownership of ports on unsecured chassis, subject to multi-user port ownership rules. All chassis are initially configured in this mode. See Setting a Chassis Back to Unsecured Mode for information on returning a chassis to Unsecured mode.

Use the manual **Refresh** option (in the **View** menu) at any time to refresh the IxExplorer window. It shows a status update for a shared chassis or chassis chain, useful when tracking ownership of ports by other users.

Image: IxExplorer Refresh Option



IxExplorer provides a further distinction of roles between users. Administrators are privileged users who may take ownership of ports, configure their characteristics, and initiate tests using those ports. Operators are non-privileged users who may only view characteristics and measured data at the chassis, card, and port levels.

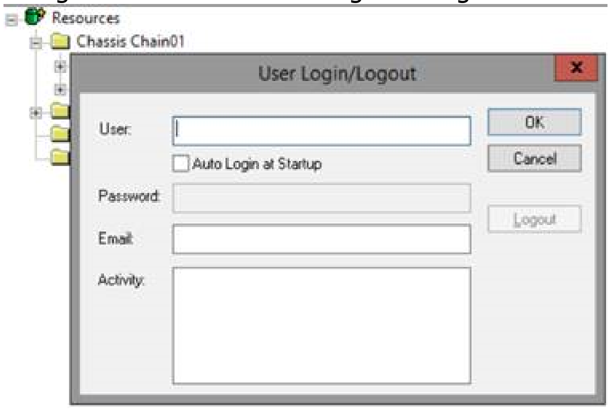
The following sections explain the use of Multi-User operations:

- IxExplorer Login
- User Management
- Show Owned Ports

IxExplorer Login

IxExplorer Multi-user mode starts with a Login, accessed from the top menu bar item, *Multiuser*, as shown in the following image:

Image: Multi-User Mode Login dialog box



The *User Login/Logout* dialog box sets a name for use when logging into the chassis. The name chosen should be distinct from other chassis users. Different login names can be used to distinguish different projects implemented within a single chassis.

Field	Description/Usage
Email	Port owner's email address.
Activity	Brief description regarding the usage of port.

The following sections detail Login operations, such as setting and unsetting Secure Mode.

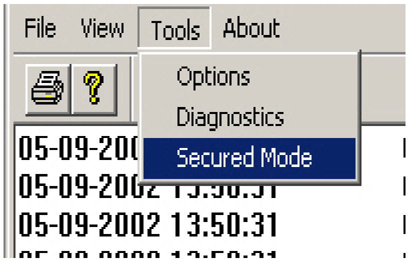
- Chassis Secure Mode
- Setting a Chassis Back to Unsecured Mode
- Logging into a Secured Chassis with IxExplorer
- Mandatory Ownership

NOTE The Auto Login at Startup check box allows IxExplorer to login previous connections. When selected, users who disconnected from the chassis but did not log out are automatically logged in when reestablishing a connection to the chassis (from the same client workstation).Login and the auto login does not establish ownership of ports.

Chassis Secure Mode

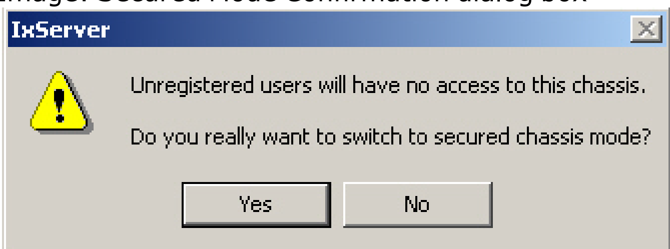
For the first-time login on a chassis, you have Administrative privileges by default, and can elect to enable Secure mode on the chassis. To enable Secured Mode on the chassis access the IxServer screen. In the main toolbar, select Tools, then Secured Mode, as shown in the following image:

Image: IxServer - Accessing Secured Mode



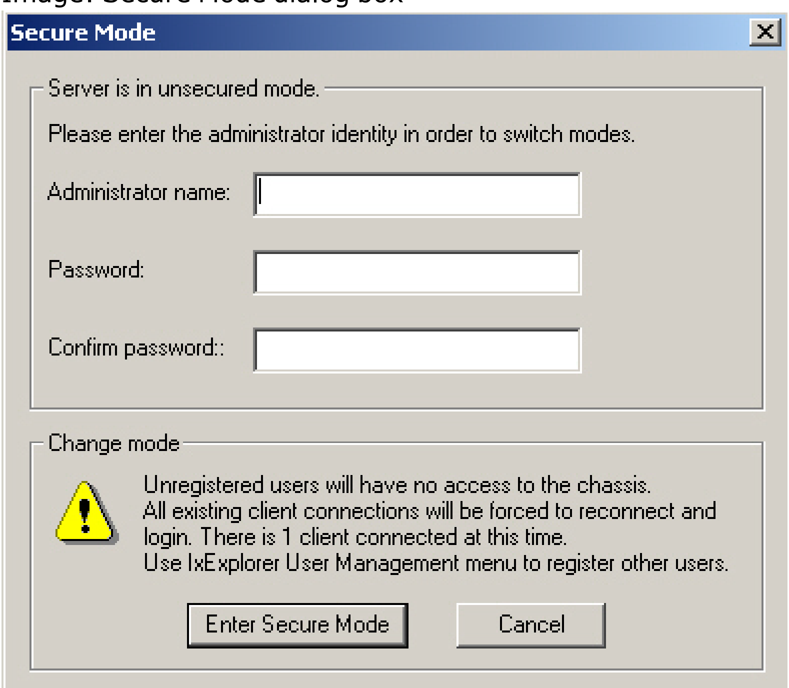
In the list, select *Secured Mode* to open the *Secured Mode* dialog box, shown in the following image:

Image: Secured Mode Confirmation dialog box



Select the *Yes* button to view the *Secure Mode* dialog box, which is shown in the following image:

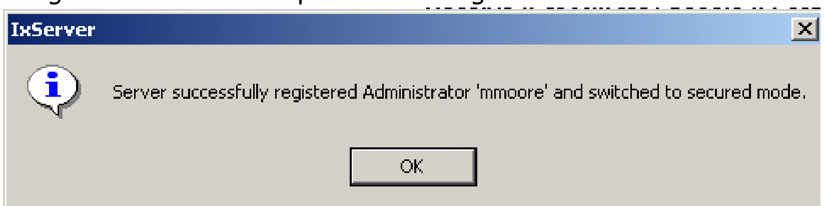
Image: Secure Mode dialog box



NOTE	The warning in this dialog box states: *All Unregistered Users will have no access to the chassis. All existing client connections will be forced to reconnect and login. There is (x) client connected at this time. Use **IxExplorer User Management** to register other users*.

To complete the process, select *Enter Secure Mode*. A completion message appears, as shown in the following image:

Image: Successful Completion Message

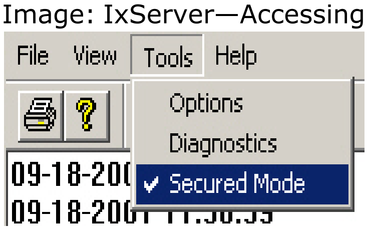


All users wanting to use a secured chassis must be registered. This is accomplished by using IxExplorer. See *Image: User Management dialog box—Secure Mode User List* for additional information.

Setting a Chassis Back to Unsecured Mode

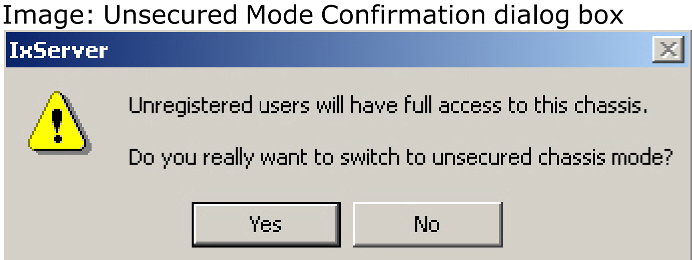
To change the chassis back to unsecured mode, access the IxServer and select Secure Mode, as shown in the following image:

Image: IxServer—Accessing Enabled Secure Mode



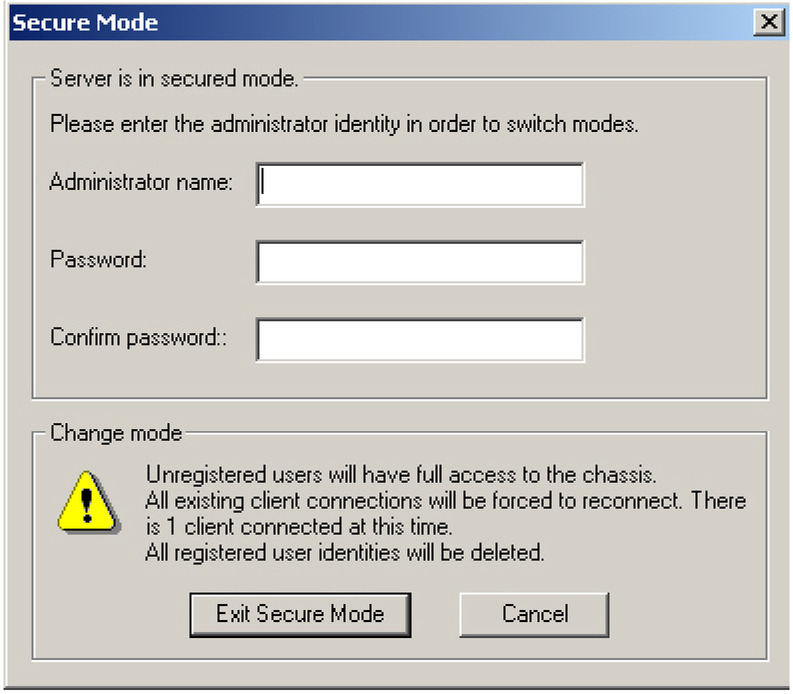
In the list, select **Secured Mode** to view a confirmation dialog box, shown in the following image:

Image: Unsecured Mode Confirmation dialog box



Select **Yes** to open the **Secure Mode** dialog box, which is shown in the enabled state in the following image:

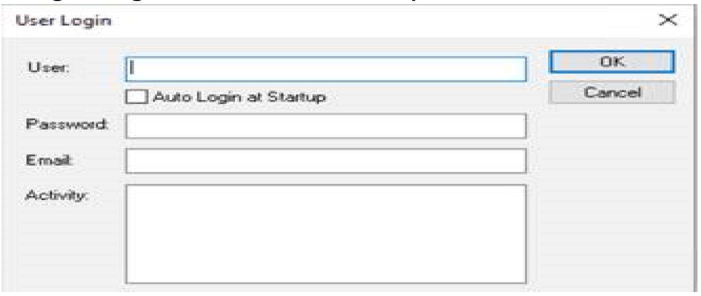
Image: Secure Mode dialog box (in Secured State)



Logging into a Secured Chassis with IxExplorer

The IxExplorer **User Login Password** field is enabled by the Secure mode, so from that point on, all users must enter a password to access the chassis. The Secure Mode login is shown in the following image:

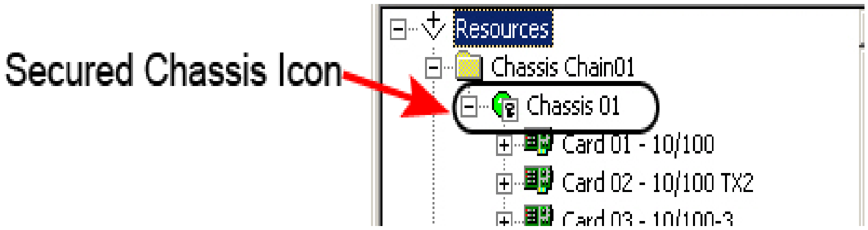
Image: Login for Secured Mode (with Password Protection)



Once a login name has been established, it appears in the lower right-hand corner of the IxExplorer main window status bar. Any of the multi-user commands may then be used. Multi-user operations work with respect to a set of one or more ports, which may cover any level of the resource chain, starting at the chassis level. When the set of ports is defined at a high level, such as the chassis, all lower level entities (cards and ports) are also enabled for multi-user operation.

The icon indicating a secured chassis is shown in the following image:

Image: Icon—Chassis in Secure Mode



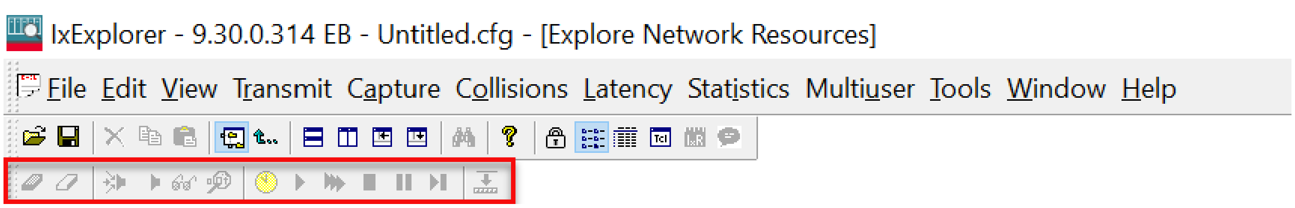
Port ownership appears in the resource chain view, in (parentheses), for each port. The multi-user operations at Chassis Chain, Chassis, Card, and Port levels are described in the following table:

Table: Multi-User Operations

Operation	Description
Clear My Ownership	Relinquishes ownership of all ports owned by the currently logged-in user in the current set of selected ports.
Clear All Ownership	Relinquishes ownership of all ports in the current set of selected ports. If any of the ports are owned by another user, then a warning may appear. The presence of the warning is determined by a setting in Options.
Take Ownership	Takes ownership of all the ports in the current set of ports. If any of the ports are owned by another user, then a warning may appear. The presence of the warning is determined by a setting in Options. *To view only the owned ports, see Show Owned Ports.*
User Management	Invokes a dialog box that allows easy global tracking of user ownership of resources. See User Management for more details.
Who's Logged In	Available only from the main menu bar, *Multiuser* menu. Shows a list of currently logged-in users in the Status window.

Mandatory Ownership

After you turn on the Mandatory Ownership option in IxServer, all chassis functions in [[[Undefined variable General.ProductMain]]] become unavailable, as shown in the following image.

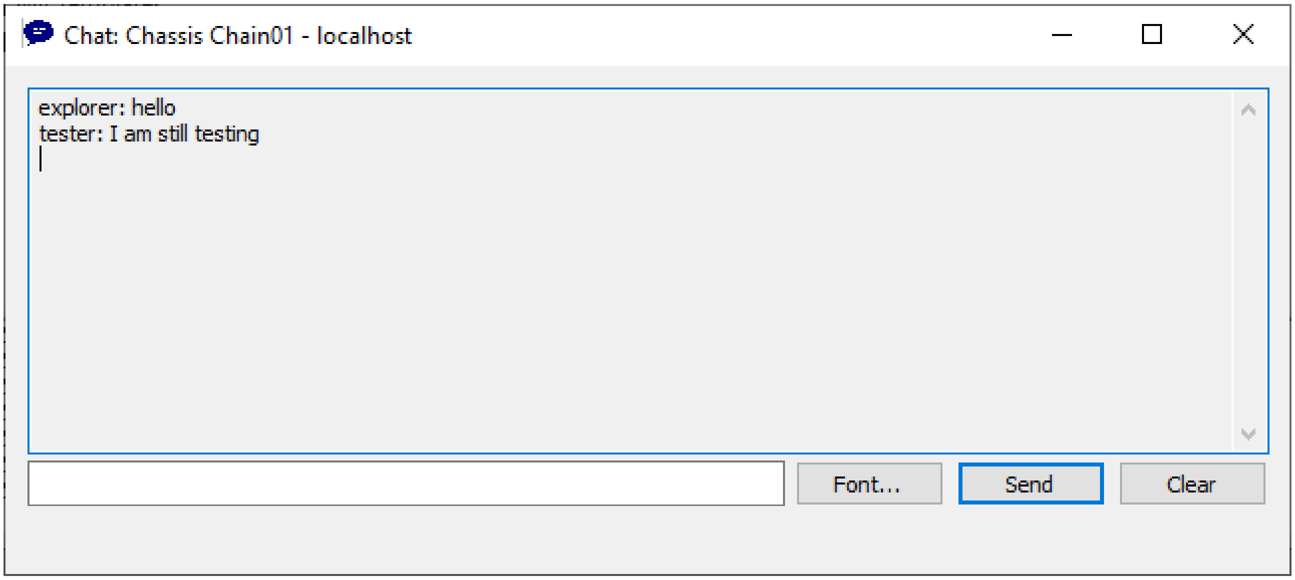


To make these functions available, do the following:

1. Select Multiuser > Login.
2. In the User box, type your user name and select OK.

Chat

You must log in to chat with other users logged in to the chassis. After you log in, do the following to chat with other members connected to the chassis. Select **Chat** from the context menu of **Chassis** to open the chat window.



You can change the font of the chat text from the **Font** button.

User Management

The User Management operation invokes a dialog box which allows all ownership to be viewed and/or modified within a single view. Three modes are available for this dialog box:

- User Management Port List.
- User Management User List.
- User Management—Secure Mode User List.

If an IxExplorer user is not utilizing a named configuration file, the Untitled.cfg file is used by default. In this case, the default configuration values are pulled from the chassis (IxServer). Additional users can share resources (owned ports) on the chassis without affecting tests in progress.But, if you have created or re-opened a named configuration file, IxExplorer pushes that chassis configuration to the chassis. In that case, multiple users/owners of ports on that chassis can stop tests in progress.Ongoing tests in a multi-user environment may be **stopped** under the following conditions:1) One user opens a named configuration file (xxxxxx.cfg), and starts a test sequence on owned ports.2) A second user logs on, or the same user logs on with a different login name.3) The second user is also an owner on some or all of the active ports.**Result:**The **ports** owned by the second user,**including ports shared with the first user**,**are updated by IxExplorer as part of the initialization process**. This means that, even if the shared ports were in the middle of a test,**all testing (including transmission of packets) is stopped on those ports**.*See*Chassis Merge dialog box*for additional information*.

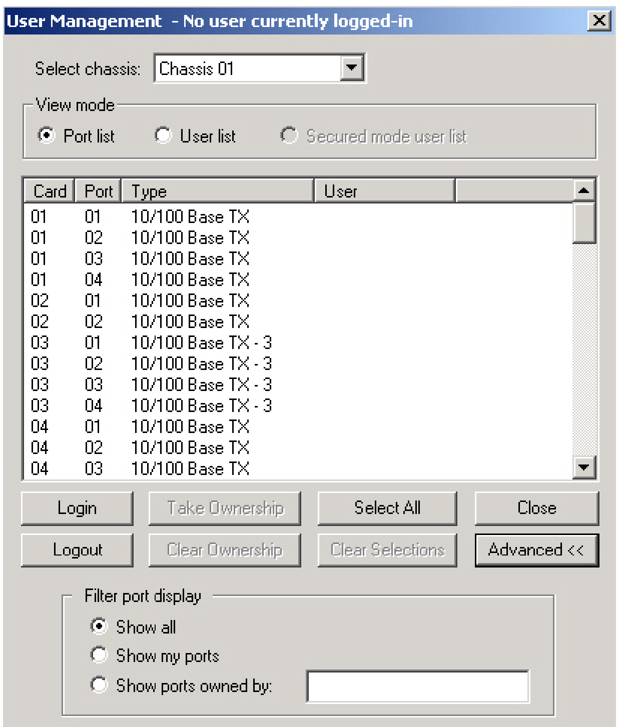
User Management Port List

The User Management Port list shows all ports with their port type and current owner. The list is accessed by opening the *User Management* dialog box (through *Multiuser* > *User Management*) and selecting the *Port List* option button.

NOTE We NEVER support multiple clients simultaneously changing data on one port. The rule is: one port-one owner for each system test.The ownership model should not be used to have one script take ownership of a port and another script take ownership of that same port with the same username because one client may be working with a copy of the port configuration that has been made invalid by another owner.

The User Management Port list is shown in the following image:

Image: User Management Port List dialog box



In this dialog box, ownership for all ports may be viewed and modified. The scrolling list shows information about port type and ownership. The controls available for this dialog box are described in the following table:

Table: User Management Port List Controls

Control	Description
Select chassis	Allows selection of a chassis defined in the Resource window.
Port List/User List/Secure	Alternates between the port list, user list, and the secure mode user list. If only a subset of all ports are shown in the view due to other dialog box operations, then

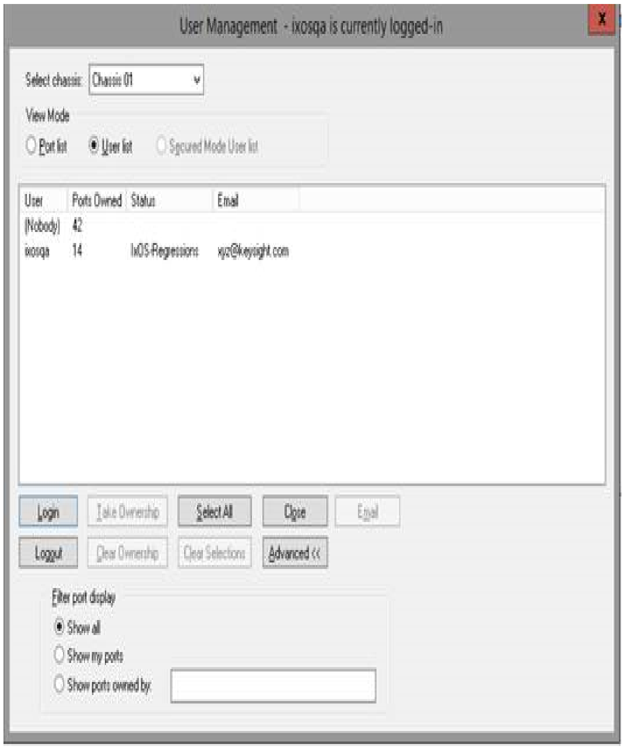
Control	Description
Mode User List	the phrase '** Port view is filtered **' appears. This filtering may be modified by the use of the *Advanced* dialog box (see below).
Login	Invokes the *Login* dialog box, allowing the current user to logout or login as a different user.
Take Ownership	Takes ownership of all of the ports selected in the scrolling region. Warnings may appear for ports owned by other users.
Clear Ownership	Clears ownership of all ports selected in the scrolling region. Warnings may appear for ports owned by other users.
Select All	Selects all ports in the scrolling regions.
Clear Selections	Clears all the selections in the scrolling region.
Close	Closes the dialog box.
Advanced	Opens the *Advanced* dialog box, which contains the **Filter Port Display** box at the bottom of the page.
Filter Port Display	Allows the list of ports in the scrolling window of the dialog box to be filtered for one of: • all users, • the currently logged in user, or • a particular user.

User Management User List

The User Management User list shows all users currently logged on to the chassis, and what ports they own. The list appears by opening the *User Management* dialog box (through *Multiuser* > *User Management*) and selecting the *User List* option button.

The User List view of the *User Management* dialog box is shown in the following image:

Image: User Management dialog box—User List



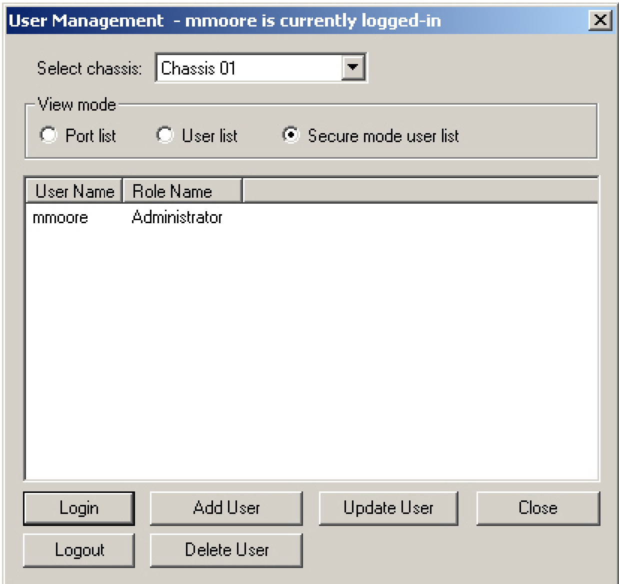
The view summarizes the number of ports owned by users as well as unowned ports. The controls available for this dialog box are described in the following table. In addition, double-clicking a single user's entry causes an automatic transition back to the Port List mode. In this mode, the view is filtered for the selected user.

User Management—Secure Mode User List

When a chassis chain has been enabled in Secure Mode, the Secure Mode User List choice is enabled. This view allows to be registered as users for secured chassis. The list appears by opening the *User Management* dialog box (through *Multiuser > User Management*) and selecting the *Secure mode user list* option button.

The Secure Mode User List view of the *User Management* dialog box is shown in the following image:

Image: User Management dialog box—Secure Mode User List



Rows of the scrolling region are filled with the User Names of secure mode users, and the Role for each user. The controls available for this dialog box are described in the following table:

Table: User Management Secure Mode User List Controls

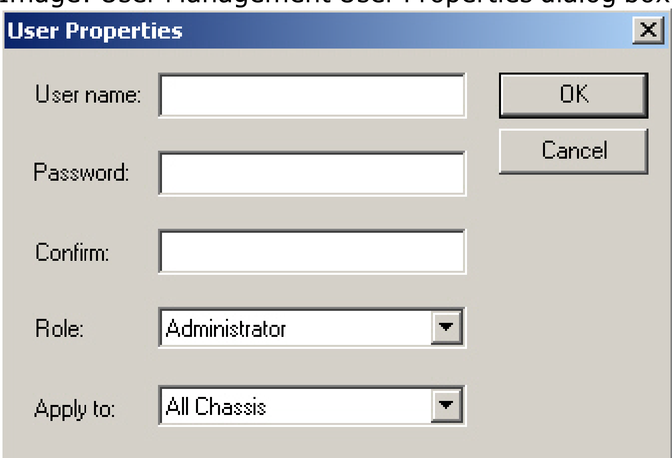
Control	Description
Select Chassis	Allows selection of any of the chassis defined in the Resource window.
Port List/User List/Secure Mode User List	Alternates between the Port list, User list, and Secure Mode User list. If only a subset of all ports are shown in the view due to other dialog box operations, then the phrase '** Port view is filtered **' appears. This filtering may be modified by the use of the *Advanced* dialog box (see below).
Login	Invokes the *Login* dialog box, allowing the current user to logout or login as a different user.
Logout	Allows the user to logout.
Add User	Invokes the *User Properties* dialog box, for entering additional secure mode users, their passwords, roles, and chassis to which they are allowed access. See Secure Mode—User Properties dialog box.
Delete User	Deletes a user from secure mode.
Update User	Invokes the *User Properties* dialog box, where the secure mode status can be modified for users. See Secure Mode—User Properties dialog box.
Close	Closes the dialog box.

Secure Mode—User Properties dialog box

The *User Properties* dialog box allows an administrator to add users to a chassis in Secure mode, and determine their user role. The dialog box is accessed by opening the *User Management* dialog box (through *Multiuser > User Management*), selecting the *Secure mode user list* option button, and then selecting the *Add User* button.

The *User Properties* dialog box is shown in the following image:

Image: User Management User Properties dialog box



The controls available for the *User Properties* dialog box are described in the following table:

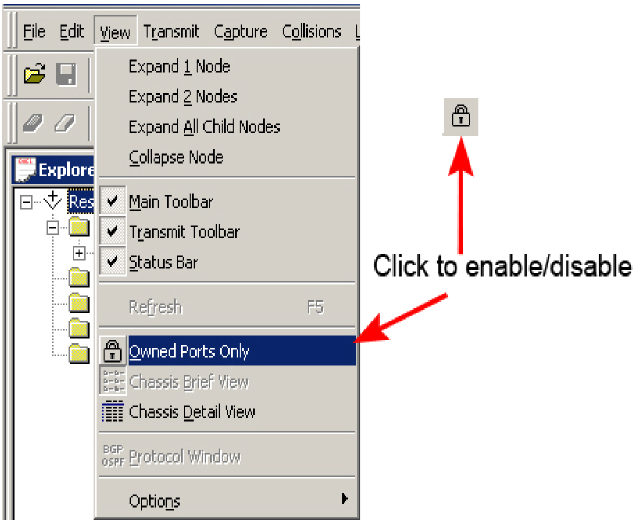
Table: User Management User Properties dialog box

Control	Description
User name	The name of the user. If this dialog box is used to update a user, this field should not be modified.
Password	The password for this user.
Confirm	Enter the password for this user again, for confirmation.
Role	One of: Administrator or Operator (Operator has view-only privileges.) The default is Administrator.
Apply to	A list of the chassis that you have access to. The default selection is *All Chassis*.

Show Owned Ports

Once you have taken ownership of selected ports, the Resources tree can be modified to show **only** the owned ports. With a Chassis Chain, Chassis, Card, or Port selected and highlighted, go to *View* in the main menu bar, and select *Owned Ports Only*, as shown in the following image. The icon appears to be selected, and only ports owned by the logged-in user appears in the Resources tree.

Image: Viewing Owned Ports Only



To disable this feature, return to the *View* menu, and reselect *Owned Ports Only*. All ports then appear. This feature may also be enabled/disabled by selecting the icon in the main IxExplorer toolbar.

Transmit Operations

Transmit operations work with respect to a set of ports. A set of ports may be at any level of the resource chain: chassis chain, chassis, card, or port. Each level of the chain includes all ports in lower levels. In addition, Port Groups and Statistics groups may be used to define a set of ports.

The transmit operations are described in the following table:

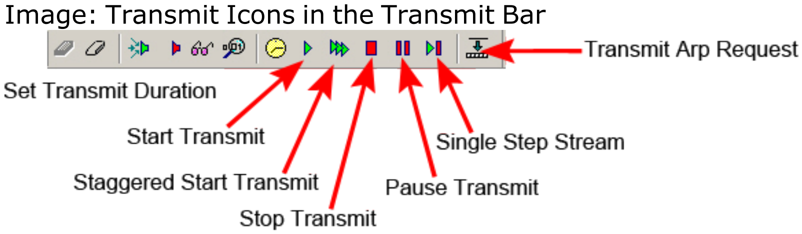
Table: Transmit Operations

Operation	Description
Start Transmit	Starts the transmission operation on all ports in the present set of ports. If no transmit operation has been performed, or if a Stop Transmit operation was last performed, then transmission begins from the first stream of each port. If a Pause Transmit operation was last performed, then transmission begins at the next packet on all ports.
Staggered Start Transmit	The same operation is performed as in Start Transmit, except that the start operation across ports is artificially staggered. The time between ports is in the range of 25-30 ms.
Stop Transmit	Stops the transmission operation on all ports in the present set of ports. A subsequent Start Transmission or Step Stream commences from the first stream of each port.
Pause Transmit	Stops the transmission operation on all ports in the present set of ports at the end of their current packet. A subsequent Start Transmission or Step Stream commences at the next packet.
Single Step	Causes one packet to be applied on all ports in the present set of ports.

Operation	Description
Stream (or Step Transmit)	NOTE Single step transmit causes a pause that interferes with the sending of async frames. Select single step and until a stop or start transmit is issued on a sync stream, async traffic is not sent.
Set Transmit Duration	Enables setting the days, hours, minutes, and seconds duration of the transmission operation.
Clear Timestamps	Timestamps are optionally embedded into transmitted data; Instrumentation Box *for details. This operation clears all timestamps on all ports back to 0.*
Transmit ARP Request (or Send ARP Request)	Causes an ARP request to be transmitted on the port for the first IP address found in the packet's streams. ARP requests are only available after ARP is enabled in the IxRouter window. Refer to ARP.

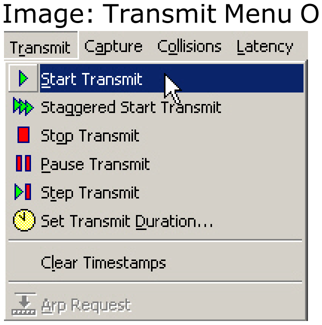
Once a set of ports is defined, transmission operations can be implemented from a number of locations. One place is in the Transmit toolbar as shown in the following image:

Image: Transmit Icons in the Transmit Bar



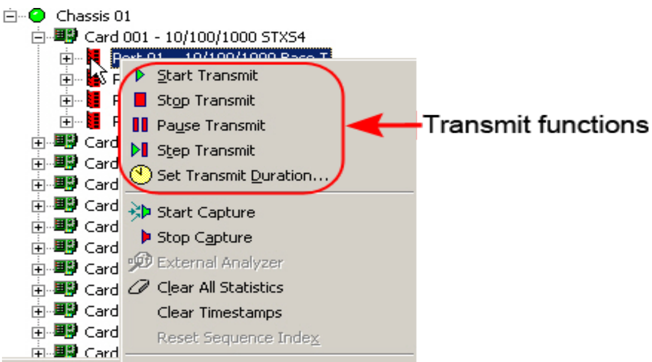
Another location where transmit functions can be accessed is through the menu bar at the top of the IxExplorer window as shown in the following image:

Image: Transmit Menu Options



Transmit functions can also be accessed through pop-up menus at any level of the Resource tree, as shown in the following image:

Image: Port Pop-Up Menu—Transmit Options



Capture Operations

Data Capture operations work with respect to a set of ports, similar to transmit operations.

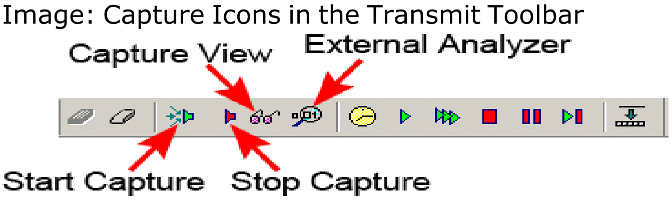
Most ports may be configured for 'raw' data capture or Packet Group/Latency operation. Refer to the *Ixia Platform Reference Manual* for a complete list of load module features. This setting is the *Receive Mode* for the port*.* In addition, some ports may be configured to force collisions within packets. The Capture operations are described in the following table:

Table: Capture Operations

Operation	Description
Start Capture	Enables capture on all ports in the present set of ports whose receive mode is set to data capture. Frames are not actually captured until the Capture Trigger condition is satisfied.
Stop Capture	Stops capture on all ports in the present set of ports.
Clear TimeStamps	Timestamps are optionally embedded into transmitted data; Instrumentation Box *for details. This operation clears all timestamps on all ports back to 0.*
View	Opens the Capture View window for a port which has been selected in the tree. Capture View Window for additional information.
Filters	Opens the Filter Properties dialog box for a port which has been selected in the tree.**Filter Properties** Tab for additional information.

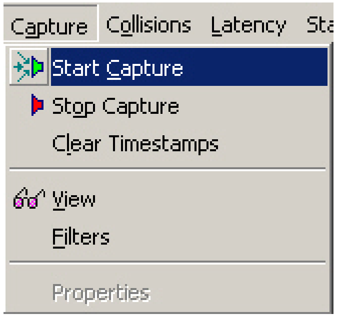
Once a set of ports has been defined, Capture operations can be implemented from a number of locations. One place is in the Transmit toolbar as shown in the following image:

Image: Capture Icons in the Transmit Toolbar



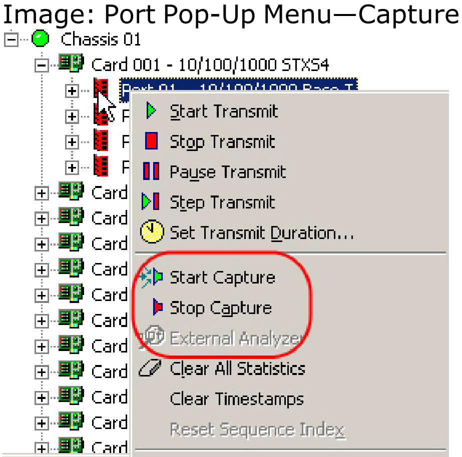
Another location is through the menu at the top of the IxExplorer window, as shown in the following image:

Image: Capture Menu Options



Capture operations can also be accessed through pop-up menus at any level in the Resources tree. An example of usage at the port level is shown in the following image:

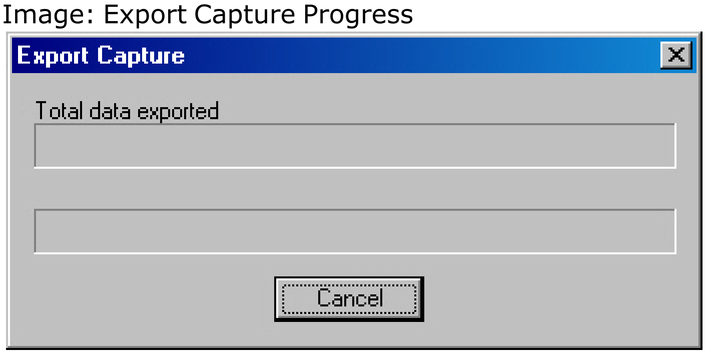
Image: Port Pop-Up Menu—Capture Options



External Analyzer

The External Analyzer feature can be used directly from the chassis chain, chassis, card, or port context menu by selecting the *External Analyzer* option, or by selecting the *External Analyzer* icon () in the Transmit toolbar. This feature exports captured data to a previously specified third party packet analyzer. When the icon (or command) is selected, the selected third party analyzer exports the capture data to a file. The progress of the capture export can be viewed in the *Export Capture* dialog box. The *Export Capture* dialog box is shown in the following image:

Image: Export Capture Progress



See External Analyzer Option for additional information.

Forced Collisions

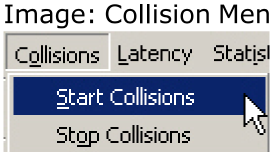
In addition to normal Capture operation, forced collisions can be generated on the receive side of 10/100 module ports, when the port is in half-duplex mode. Forced collisions operate by generating data as information is being received. See the section on Forced Collision Operation in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual* for a complete explanation of forced collisions. The collision operations are described in the following table:

Table: Collision Operations

Operation	Description
Start Collision	Enables collisions on all ports in the present set of ports on received data if programmed for the port and enabled (in the **Forced Collisions** tab of the *Port Properties* dialog box) and the 10/100 module is operating in half-duplex mode.
Stop Collision	Stops collision operation for all ports in the present set of ports.

Once a set of ports is established, collisions for 10/100 ports with the Forced Collisions option enabled can be generated through the menu at the top of the IxExplorer window as shown in the following image:

Image: Collision Menu Options

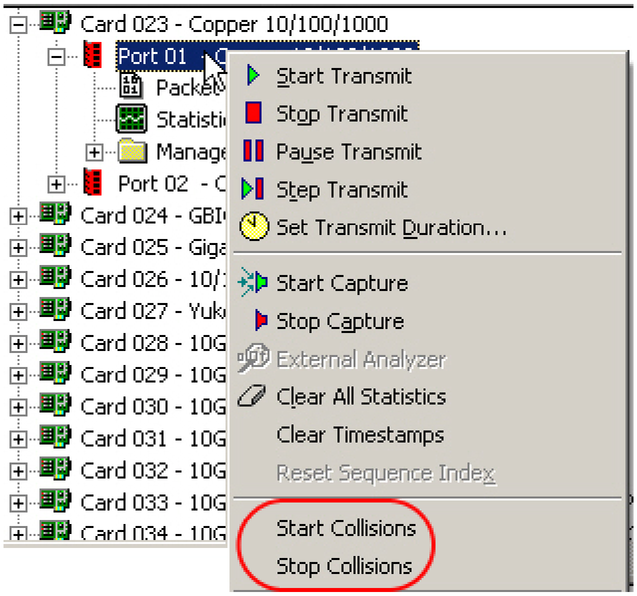


Collision operations are also available through pop-up menus at any level in the Resources tree for ports which support this feature.

NOTE: To use the Forced Collisions feature, first enable Forced Collisions in Port Properties (for 10/100 modules).

An example of usage at the port level is shown in the following image:

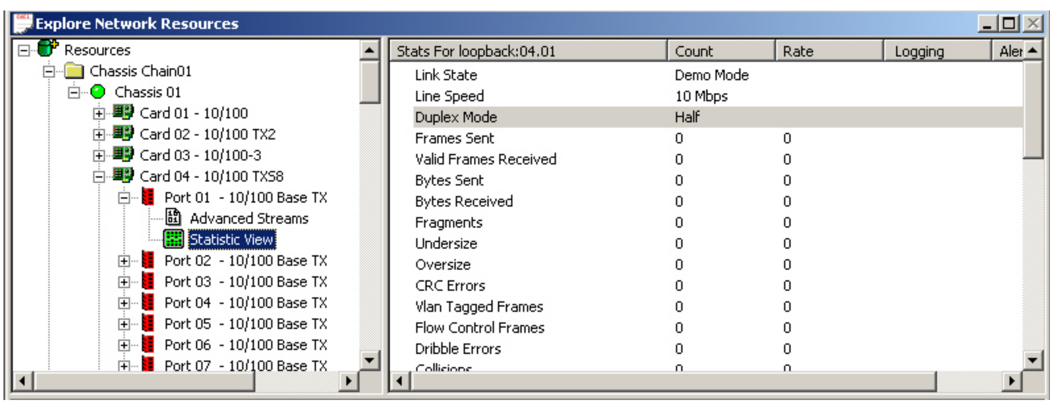
Image: Collision Menu Options



Statistics Operations

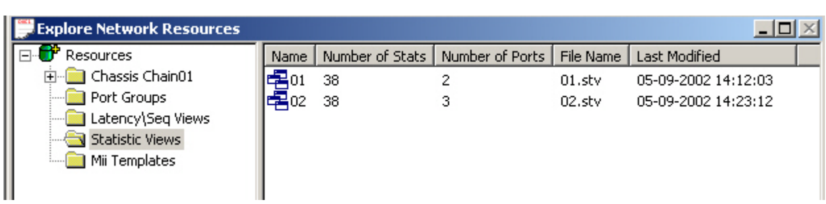
Statistics for any port may be obtained by selecting the Statistic View label listed below that port in the IxExplorer Resources tree, as shown in the following image:

Image: Statistics for Single Port



The selection of Statistics that appear for a port in the Resources window is not user-configurable. When multiple ports are to appear together, a Statistic View group should be defined and selected as shown in the following image. This option also allows to define selected lists of statistics.

Image: Statistic View Group Select



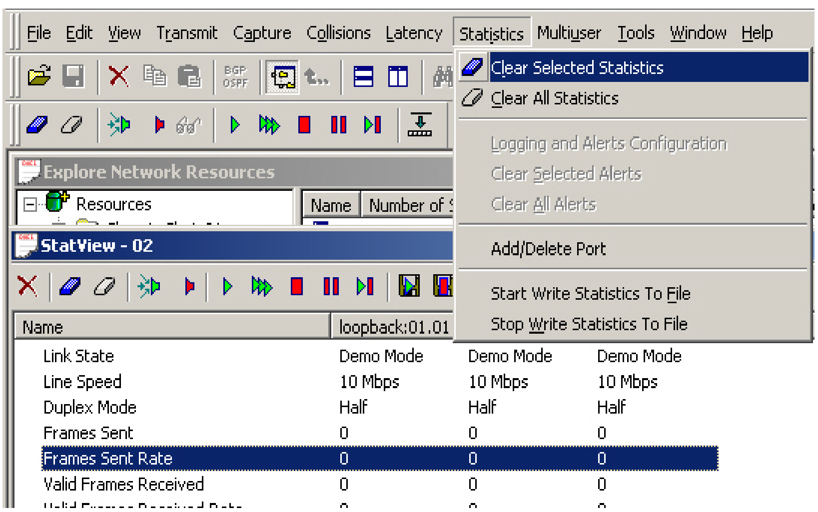
Double-clicking the Statistic View selection shows all of the applicable ports simultaneously, as shown in the following image. The default format for Statistic Views is spreadsheet mode, as shown in this graphic. The alternate view is the Standard View. The view mode may be selected in the *Tools* > *Options* > *Statistic View* dialog box.

Statistics, in any type of Statistic View, may be cleared (reset) at any time from a number of locations. One of those locations is the Statistic View toolbar, as shown in the following image:

Image: Clear Statistics Operation from the Statistic View Toolbar

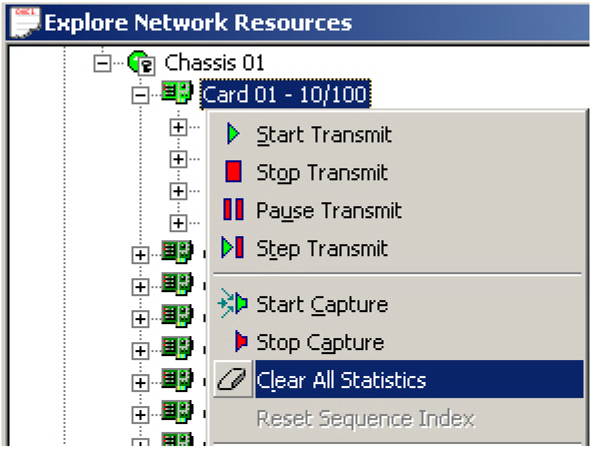
Another location is in the Statistics Menu, as shown in the following image. The options in this menu are not active unless a Statistic View window is currently open.

Image: Statistics Menu



The *Clear All Statistics* menu option clears **all** of the statistics for the current set of ports. Statistics can also be cleared from most pop-up menus in the Explore Network Resources view. An example for an individual load module is shown in the following image:

Image: Clear Statistics in Pop-Up Menu

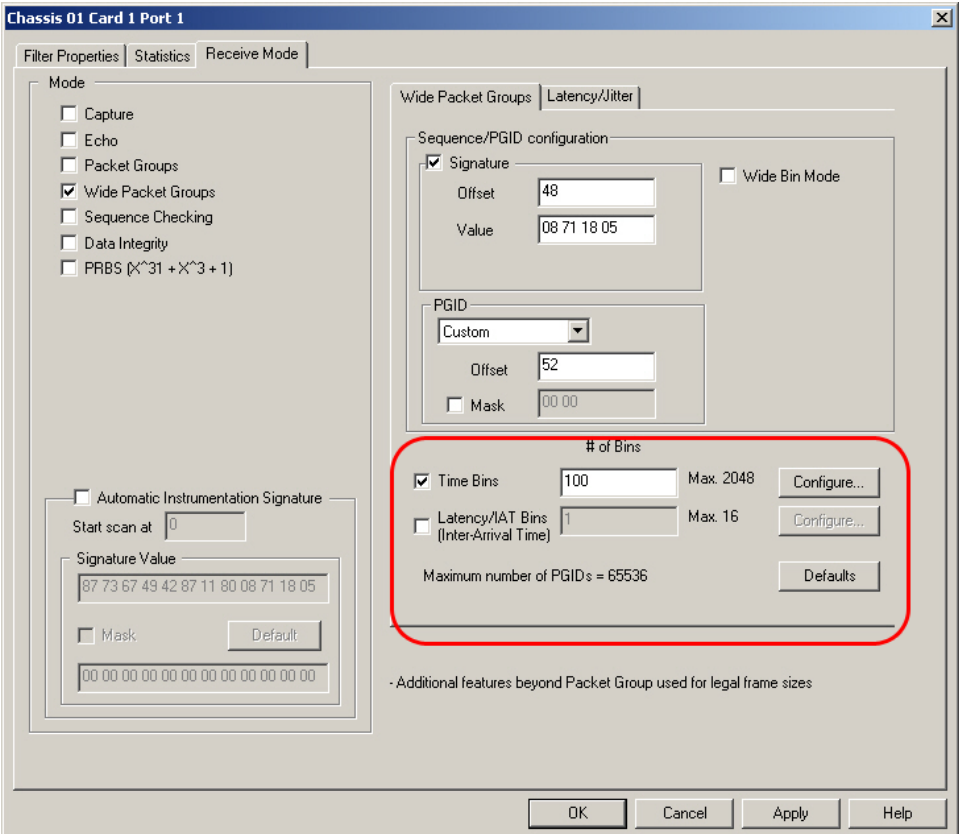


Latency Operations

For newer load modules, latency time bins are configured in each port's *Receive Mode*, **Wide Packet Groups** tab. Select **Time Bins** and the configuration fields are enabled. The latency measurements are viewed in the *Packet Group Statistic View*; refer to *Packet Group Statistic View for a complete description of Latency Views. Newer cards include these:*

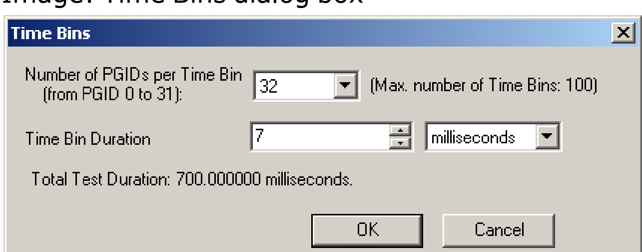
- 10/100/1000 ASM XMV12X
- 10/100/1000 STX(S)2, 4, and 24
- 10/100/1000 TX(S)4
- 10/100/1000 XMS(R)12
- 10/100/1000 LSM XMV(R)4 and 16
- 1000 SFP(S)4
- All 10GE LSM modules
- 2.5G MSM and 10G MSM
- ATM/POS 622 Multi-Rate

Image: Receive Mode, **Wide Packet Groups** Tab



Select the **Configure** button to open the Time Bins dialog box, where latency measurement can be configured.Table: Latency Options—**Latency Type** Tab for details.

Image: Time Bins dialog box



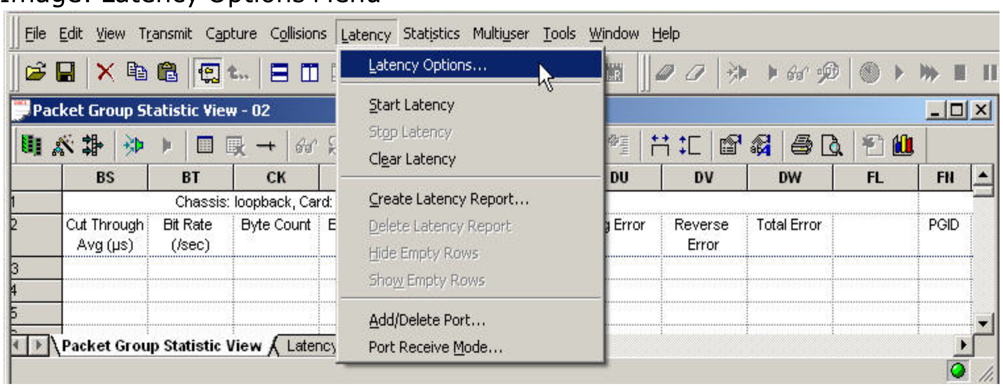
For older 'legacy' load modules, all latency operations are initiated from a *Latency View* dialog box, where one or more ports' latency stats appear. Legacy cards include these:

- 10GE modules (LM10GEXX and LM10GUXXX)
- OC192c POS modules (LMOC192cPOS)
- GBIC module (LM1000GBIC)
- Gigabit module (LM1000SX)
- 10/100 TXS8 module (LM100TXS8)
- OC12c/OC3c POS modules (LMOC12c and LMOC3c)

Refer to Packet Group Statistic View *for a complete description of Latency Views. The options in the Latency menu in the main menu bar are active only when a Latency View appears, as shown in the following image.*

NOTE **Clear Timestamps** simultaneously on Transmit and Receive ports together **BEFORE** starting Latency measurements.Some methods for clearing timestamps on multiple ports simultaneously are listed below:Create a Port Group for all of the transmit and receive ports to be used in the Latency measurement. Select the Port Group name in the details list, and select *Clear Timestamps*.If all of the Transmit and Receive ports are on a single card, and no other ports on that card are being used for other purposes, highlight the card in the Network Resources list, and go to the main menu bar. Select *Transmit or Capture* and select *Clear Timestamps* from the list.Create a Statistic View for all of the transmit and receive ports to be used in the Latency Measurement. In the Statistic View, highlight ALL of the port names in the column headers. Select the highlighted port names and select *Clear Timestamps* from the pop-up menu.

Image: Latency Options Menu



The latency operations available in the Latency menu are described in the following table:

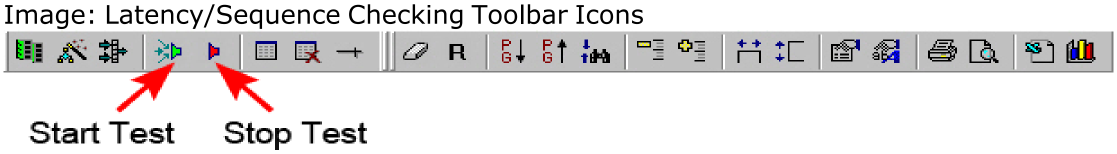
Table: Latency Operations

Operation	Description
Latency Options	Opens the *Latency Options* dialog box, where the type of latency measurements can be selected.
Start Latency	Initiates latency measurements on all ports in the present set of ports whose receive mode is set for packet group operation.
Stop Latency	Stops latency measurements on all ports in the present set of ports.
Clear Latency	Clears all accumulated latency data from the spreadsheet.
Create Latency Report	Opens the *Latency Report* dialog box, where a latency report can be named and added to the spreadsheet.
Delete	Deletes the currently selected **latency report** tab.

Operation	Description
Latency Report	
Hide Empty Rows	Only applies to a selected latency report. Deletes the rows that do not contain data in the latency report, to make the report more concise.
Show Empty Rows	Only applies to a selected Latency Report. Shows the empty rows that were hidden by the Hide Empty Rows option.
Add/Delete Port	Opens the *Select Port* dialog box so ports and be added to or deleted from the spreadsheet.
Port Receive Mode	Opens the *Receive Mode* dialog box for the port selected in the spreadsheet.

The toolbar at the top of the *Packet Group Statistic View* dialog box allows access to the two principal operations, starting and stopping the Latency test, as shown in the following image:

Image: Latency/Sequence Checking Toolbar Icons



These operations are described in the following table. Information on the rest of the icons in the toolbar is found in Packet Group Statistic View

Table: Latency Toolbar Operations

Operation	Description
Start Test	Initiates latency measurements on all ports in the present set of ports whose receive mode is set for packet group operation.
Stop Test	Stops latency measurements on all ports in the present set of ports.

Other Operations

Active Stream Configuration

An additional operation available in conjunction with the Statistic View is called Active Stream Configuration. It allows for continuous variation of the Frame Size and the Inter-Packet Gap across a range of ports, to determine the effect on the DUT. Active Stream Configuration *for a full description. This mode of operation is not available for ports whose transmit mode is set to flows.*

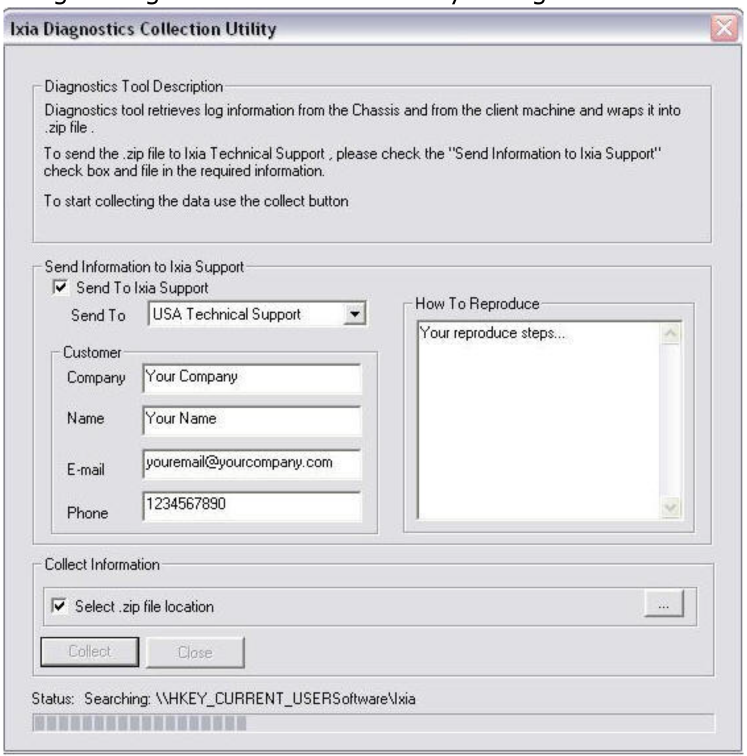
Collect Diagnostic Logs

The Diagnostics Collection Utility collects log information from the chassis and from the client computer and wraps it into a comclicked (.zip) file named ixos-logs-YYYYMMDDHHMM.zip. The file can be sent to Ixia Technical Support by completing the fields in the on-screen dialog box.

The Diagnostics tool is activated from the context menus for Chassis Chain, for Chassis, for Card, for Port, and from the Help menu in the top IxExplorer menu bar.

NOTE If you do not want to collect diagnostics older than 90 days, run Windows Disk Cleanup before collecting the IxOS Diagnostics.

Image: Diagnostics Collection Utility dialog box



When the log file has been uploaded to the Ixia FTP server, a message similar to that shown below appears. Note the token number for later reference when communicating with Ixia Technical Support.

Image: Diagnostics Success Message

Fields and controls are described in the following table:

Table: Diagnostics dialog box

Section	Field/Control	Description
Send Information to Ixia support	Send to Ixia Support	(check box to enable) NOTE No e-mail is sent unless this is selected. See note under Collect Information, below. Select the appropriate tech support destination: • Asia/PacificIndiaUSAEMEA (Europe, Middle East, Africa)
Customer	Company	Enter your company name
	Name	Enter your name
	E-mail	Enter your e-mail address (Ixia Technical Support will contact you at this address)
	Phone	Enter your telephone number, including country code (if outside USA) and area code (Ixia Technical Support will contact you at this phone).
How to Reproduce		Briefly describe the problem that the logs are related to. Tell Ixia Technical Support what you were doing (sequence of steps) when the problem occurred.
Collect Information	Select .zip file location	(check box to enable) Select the ellipsis (...) to open a standard Windows **Open** dialog box, to locate and choose the .zip file to be sent. NOTE When the check box 'Send To Ixia Support' is selected and the check box 'Select .zip file location' is cleared then a default zip file is created to send the log information. When the 'Send To Ixia Support' is cleared and the check box 'Select .zip file location' is selected then a zip file is created but not sent.
	Collect	Select **Collect** button when ready to send the diagnostics log file to Ixia. When selected, a Diagnostics Progress bar appears. NOTE Collect button remains disabled if **both** 'Send to Ixia Support' and 'Select zip file location' check boxes are cleared.
	Cancel	Cancel this operation and close the dialog box.
Status (and progress bar)		Text shows status of the log collection process, which includes searching for files, compressing files, and sending them to Ixia. The progress bar shows progress of the log collection

Section	Field/Control	Description
		process.

Electrical Interface Transmit and Receive Equalization

FFE (Feed Forward Equalization) is a form of equalization that improves the signal distortion of high speed data streams over lossy interconnects, such as a passive DACs (Direct Attach Cables). The end-to-end physical connection, which includes the connectors and interconnect, is called a channel. The channel attenuates the high frequency components of the data stream to different degrees, giving rise to inter-symbol interference (ISI), and making the recovery of the signal by a receiver either very difficult (with possible high bit error rates as a result) or impossible (link down situation). An ideal equalization environment at either the transmitter, receiver, or both stages would invert the channel's frequency response and remove all ISI distortions (although other signal impairments such as jitter or crosstalk would still remain).

Transmit FFE is a simple way of performing such channel inversion by modifying the amplitude of the bits (symbols) at the transitions, pre-distorting the signal to increase the ratio of high frequency to low frequency components before the serialized data stream traverses the channel with its low-pass frequency characteristic. Such shaping is called transmit pre-emphasis.Typically three bits or taps of the serialized data stream are most effective for this equalization; the sequence of bits used are the following:

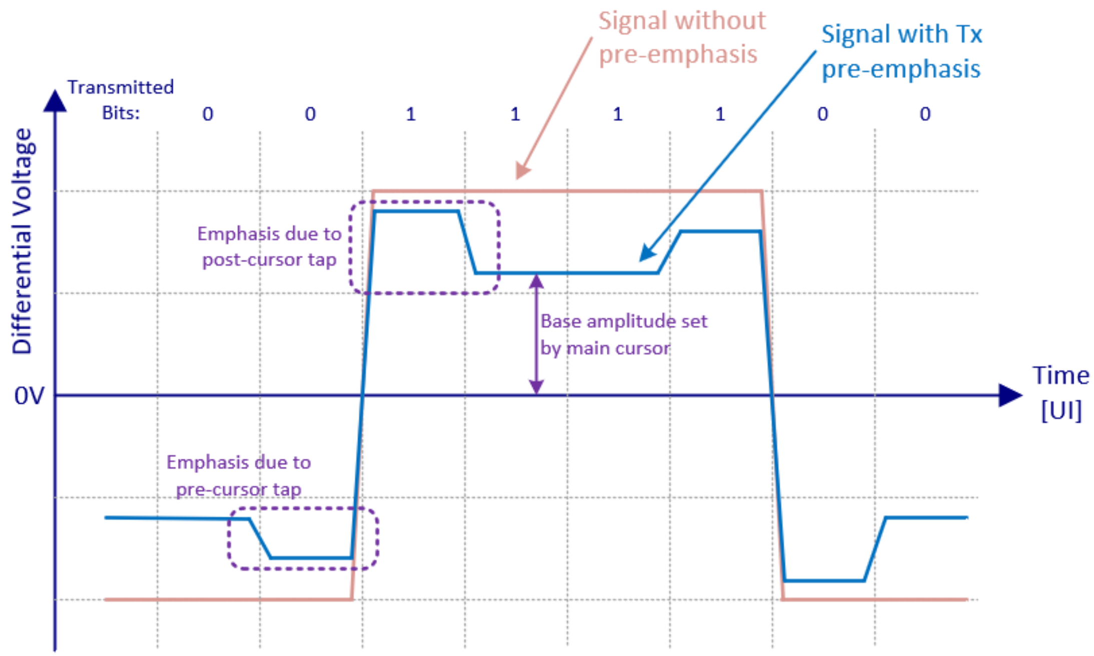
- pre-cursor tap (one bit in the future)
- main tap (the current bit)
- post-cursor tap (one bit in the past).

A modulation weight may be assigned individually to these three taps. There are two nomenclatures, emphasis (boost of the signal, a positive value), and de-emphasis (reduction of the signal, a negative value). Either method can be used depending on the SerDes (Serializer-Deserializer) vendor to obtain similar pre-emphasis results.

The main-cursor tap is responsible for driving the base amplitude of the differential output signal, which can be seen as the vertical part of the data eye on a sampling oscilloscope. The main tap default value used in the Ixia load modules is usually a large number compared to the pre-tap or post-tap values. Very lossy interconnects such as longer-length DACs can benefit from a higher number from the default, but caution is recommended since a very high drive level might saturate a receiver or excessively distort the output signal. Special care should be taken of not over-driving short interconnects and optical modules, where there is a short electrical channel from the Ixia module to the transceiver receive electronics. In these cases, the default main tap values should likely not be modified, or just slightly reduced.

The pre-cursor tap will make modifications to the signal on the last bit of a sequence, while the post-cursor tap will emphasize the first bit of a sequence. The combined effect of the pre and post taps results in boosting the high frequency components of the signal (the beginning or end of a sequence of 1's or 0's) relative to the main cursor, hence compensating for the high-frequency loss in the channel. Typically, the default values for the pre-cursor tap on many of the Ixia load modules will be a small positive number, while the default for the post-cursor tap will either be 0 or a smaller number than the pre-cursor tap. Very lossy interconnects might benefit from a small increase in the pre-cursor tap, and possibly a small increment in the post-cursor tap. Some Ixia load modules include

PHYs which have an affinity for the opposite in regards to pre and post cursor values, working better with higher post-cursor settings than pre-cursor.



NOTE	Large values of pre or post cursor taps can lead to over-equalizing of the signal at the receiver, increasing noise and cross-talk across adjacent lanes.

Some load modules also offer control over the receiver's CTLE (Continuous Time Linear Equalizer) stage, which is a linear filter that can attenuate the low-frequency components, boost the signal components at the Nyquist frequency, and attenuate higher frequencies past that peak. Long length DACs or similar lossy channels can require an additional increase in the CTLE gain at the receiver, while short channels such as external loopbacks or optical transceivers will likely work better with a reduced gain value close to zero.

T400 Retimer

The T400 retimer convolves the precursor and postcursor taps against the data stream to overcome frequency-dependent channel loss. If one wants to identify the quantized time-domain impulse response of the channel (including the input to the receiver), these taps are ideally set up to be the inverse of that response. This increases the signal-to-noise ratio at the receiver at the cost of increased crosstalk.

If that impulse response includes dips below unity due to overshoot, then negative precursor and postcursor tap values can be used to optimize the signal at the receiver. Furthermore, the addition of pre2, post2, and post3 taps allows for the longer tail impulse response of a copper cable to be mitigated.

Mathematically speaking, a PAM4 data stream can be expressed as a stream of {-3,-1,1,3} values: D_n, with increasing *n* values represent increasing time. Six TX FIR taps can be expressed as a sequence of coefficients c_n, each scaled from -1 to 1:

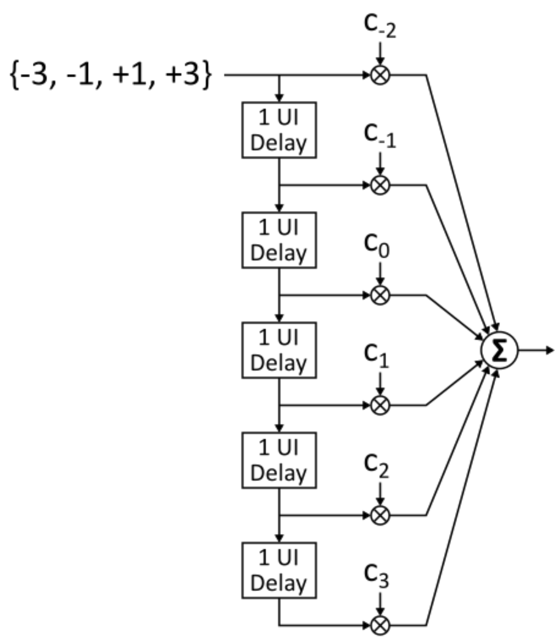
- c_{-2} is the pre2 tap (near 0, generally negative)
- c_{-1} is the pre tap (near 0, generally negative)
- c_0 is the main tap (scaled from 0 to 1)
- c_1 is the post tap (near 0, generally negative)
- c_2 is the post2 tap (near 0, generally negative)
- c_3 is the post3 tap (near 0, generally negative)

The negations of the pre and post taps reflect the fact that, while the normal convention is to express them as positive numbers, they are actually subtracted.

The sum of the absolute values of the c_n taps is no greater than 1 (the full scale of the transmitter)

$$\sum_{i=-2}^{3} |c_n| \leq 1$$

The TX FIR circuit is constructed as follows:



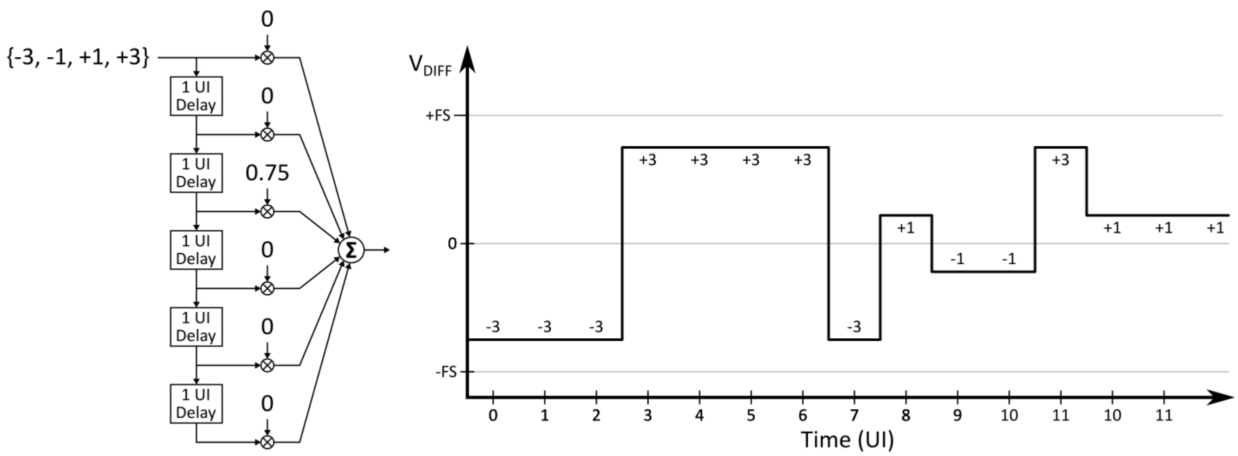
This filter is mathematically expressed as a convolution: $(D * c)[n]$.

The retimer on T400 uses integer values from -168 to +168 for its values, and IxExplorer, IxNetwork, IxTCL, and HAL follow the common convention of using positive values for the pre and post taps. Therefore, redefine the tap values as c'_n to scale and negate:

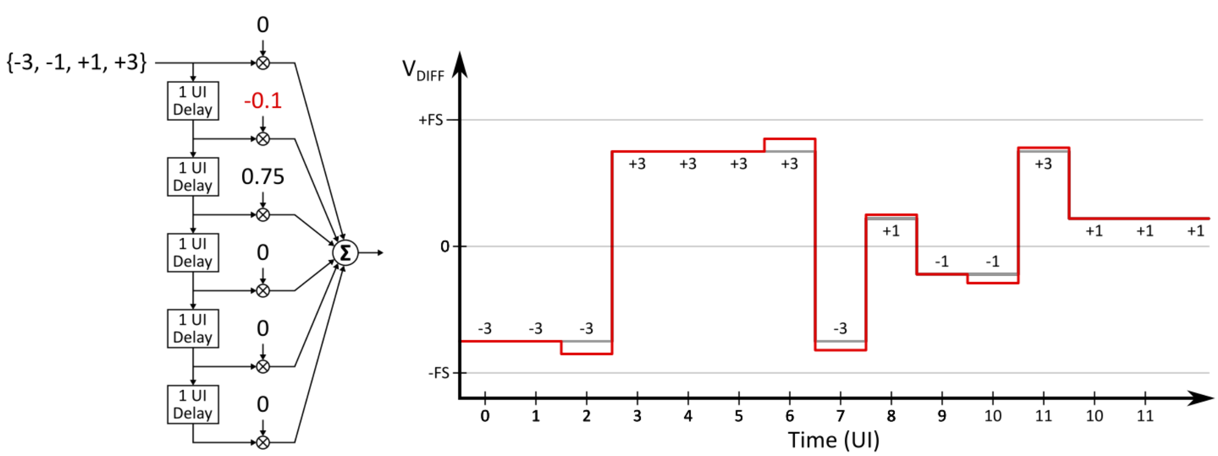
$$c'_n = \begin{cases} 168c_n, & n = 0 \\ -168c_n, & n \neq 0 \end{cases}$$

To illustrate the filter operation, consider a data stream with all pre and post taps set to zero. The main tap is defined as c_0 =0.75 (or c'_0 =126). This reduction in the main tap keeps the signal within

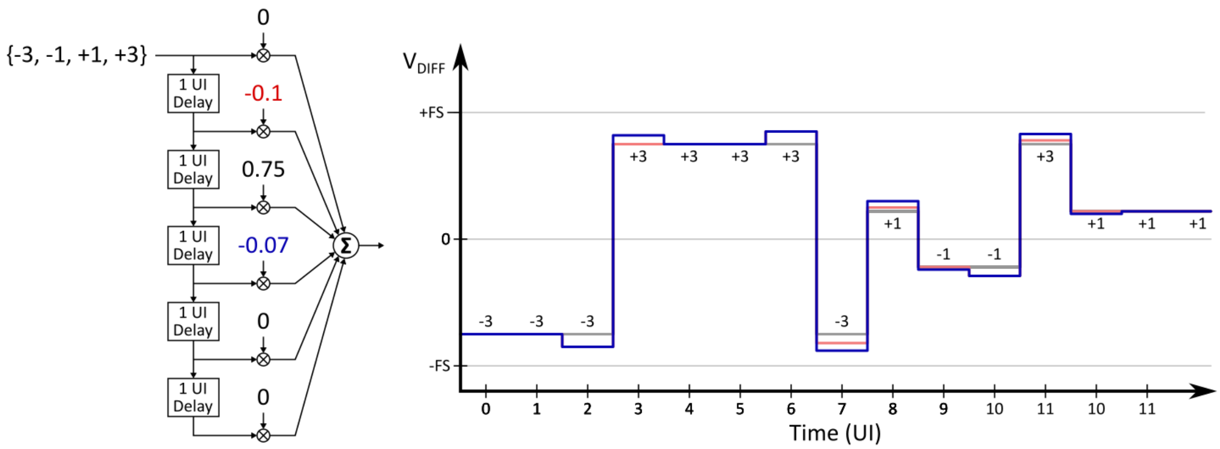
75% of full scale output, but does not provide any adjustment in frequency response. The filter and resulting output are shown in this diagram:



Adding a precursor tap $c_{-1} = -0.1$ (or $c'_{-1} \cong 17$) causes the bits before each transition to become stronger in relation to the next bit. The filter and resulting output (in red) are shown in this diagram:



Further adding a postcursor tap $c_{-1} = -0.07$ (or $c'_{-1} \cong 12$) causes the bits after each transition to become stronger in relation to the prior bit. The filter and resulting output (in blue) are shown in this diagram:



There are three constraints which must to be applied for T400. The first constraint is that the T400 retimer allows the following range:

$$-168 \leq c'_n \leq 168$$

168 uses the full strength of the DAC. You can modify the first constraint for more practical use on T400:

$$\begin{aligned} 0 \leq c'_0 \leq 168 \\ -10 \leq c'_n \leq 40 \ \text{for} \ n \neq 0 \end{aligned}$$

The second constraint avoids clipping in the transmit DAC:

$$\sum_{i=-2}^{3} |c'_n| \leq 168$$

The third constraint ensures that the maincursor tap has enough strength to overcome the precursor and postcursor taps.

$$c'_0 \gg \sum_{n=-2}^{-1} |c'_n| + \sum_{n=1}^{3} |c'_n|$$

The $\gg$ comparison indicates that c'_0 must be sufficiently larger than the right-hand side of the equation. That margin should be relatively significant, say, 40, but it is sufficient to simply replace with the ≥ comparison, as is already used on T400:

$$c'_0 \geq \sum_{n=-2}^{-1} |c'_n| + \sum_{n=1}^{3} |c'_n|$$

It should be noted that, if $c'_n = 0$ for all values of *i*, the transmitter will effectively be turned off, as an alternative to "Simulate Cable Disconnect" that can be applied on a per-lane basis. In other words, the user can squelch a single lane by selecting it and configuring values of 0 for all pre, main, and post cursor taps.The Pre2, Pre, Main, and Post taps are automatically adjusted by link training.

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Chapter 3

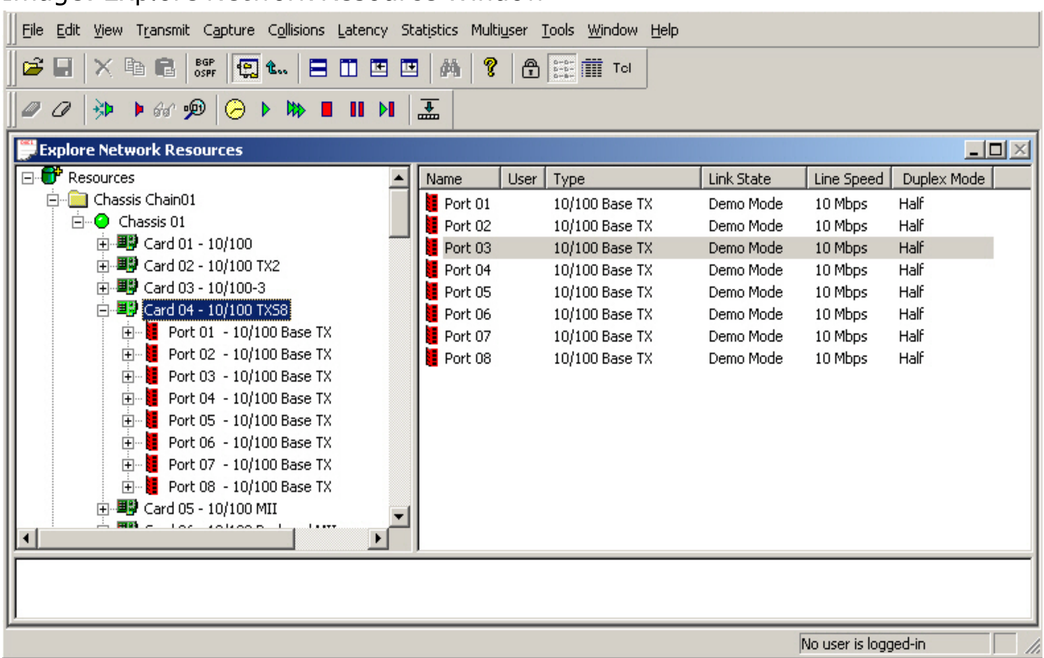
Explore Network Resources

The initial and most important view of IxExplorer is the Explore Network Resources window. It consists of a a Tree view, a Details view, a menu bar, and a toolbar.

The Explore Network Resources window is opened by double-clicking the IxExplorer icon on the desktop, or from the Start Menu by selecting *Start* > *Programs* > *Ixia* > *IxExplorer*.

The Explore Network Resources window is shown in the following image:

Image: Explore Network Resource Window



The Tree view on the left side of the window shows the hierarchy of Ixia hardware resources, while the Details view on the right side shows detailed information for the item selected in the left half.

This chapter covers the following major topics:

- Chassis Chains—Chains of chassis, including:
  - Chassis
  - Cards
  - Ports
- Port Groups—Sets of ports assigned to a group.
- Stream Groups—Sets of streams assigned to a group.

- Packet Group Statistic Views—Sets of ports grouped for Packet Group Statistic analysis.
- Statistic Views—Side-by-side views of statistics for multiple ports.
- Stream Statistic Views—Statistics for selected port streams.
- MII Templates—MII register template files.
- Layouts—Allows to save GUI layouts for future use.
- Tools Menu Functions—Options for IxExplorer configuration and other feature uses.

Resources

The Resources hierarchy in the Tree view consists of the following levels of devices:

Table: Resource Level Operations

Resources	**Contains all hardware definitions.**
Chassis Chain	A series of connected Ixia chassis.
Chassis	A single Ixia chassis.
Cards	Plug-in Ixia load modules.
Ports	Ports on the cards.
Capture View	Shows captured packets at the bit level.
IxRouter Window	Allows manipulation of Routing Protocols for the port.
Statistics	Statistics gathered by port.
Filter, Statistics Receive Mode	Controls the filter and trigger, statistics, and receive mode options.
Packet Streams	Streams and flows of data applied by the port.
Port Properties	Controls the port properties options.
Circuits	Configure circuits on a port.
Global Views	Contains group, statistics, and other views.
Port Groups	Sets of ports grouped under a group name.
Stream Groups	Sets of configured streams grouped under a group name.
Packet Group Statistic Views	Sets of ports grouped for latency/sequence checking analysis.
Statistic Views	Different side-by-side views of statistics.
Stream Statistic Views	Statistics on a per stream basis.
MII Templates	Sets of MII template files.

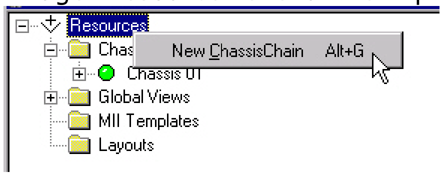
Resources	**Contains all hardware definitions.**
MII template file	Individual MII template files.
Layouts	Saves open windows layouts.

Each level of the tree may be expanded or contracted by selecting the ⊟ or ⊞ symbol to the left of the level's label or by double-selecting the label itself. Note that the name of the configuration file being used (with *.cfg* extension) appears in the title bar.

Tree Operations

The Resources level is shown highlighted in the following image, along with the pop-up menu, which is available by selecting *Resources*:

Image: Resource Level of the Explore Network Resource Window



The operations available when the Resources level is selected are described in the following table:

Table: Resource Level Operations

Operation	**Keys/Shortcut**	**Description**
Expand/Contract tree	Double-click label, select ⊟ or ⊞	Expand/contract tree elements below the current level.
New Chassis Chain	Alt+G	Add a new chassis chain. The chain is named Chassis Chain NN, where NN is the next available chain number. A chassis chain may be renamed. *Chassis Chains*.

Chassis Chains

The term *chassis chain* refers to a set of Ixia chassis that have been cabled together through their Sync In/Sync Out ports. They may also be coordinated by accurate time sources, such as GPSs, so that **all** of the ports on **all** of the chassis may be considered as a unit. It is the second level of the tree hierarchy, as shown highlighted in the following image along with the pop-up menu available by selecting *Chassis Chain*.

NOTE Plugging-in or removing the sync cable while IxServer is running can cause errors that prevent the IxOS software from running. If this occurs, restart all Ixia applications.

Within the chassis chain, there are three sub levels:

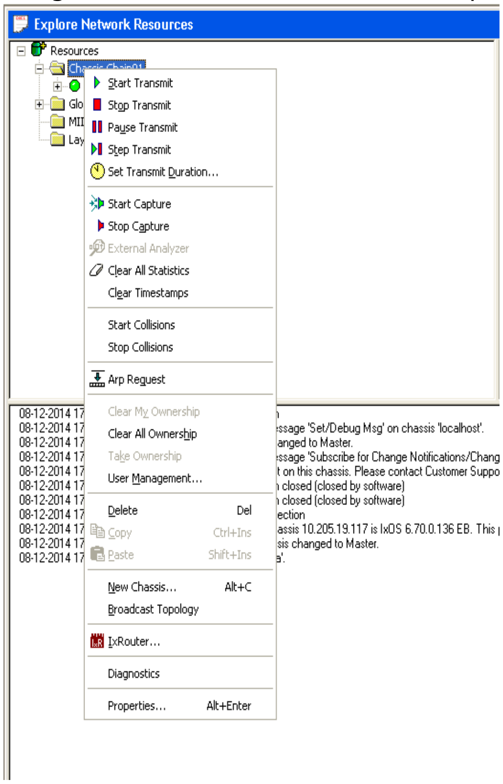
- Chassis
- Cards

- Ports

Tree Operations

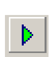
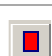
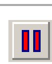
Chassis chain tree operations are accessed by selecting the Chassis Chain folder. A menu appears, as shown in the following image:

Image: Chassis Chain Level of the Explore Network Resource Window



The operations available at the Chassis Chain level are shown in the following table. Port operations are applied to all ports on all cards in the chassis chain.

Table: Chassis Chain Level Operations

Operation	Keys/Shortcut	Description
Expand/Contract tree	Double-click label, select ⊟ or ⊞	Expand or contract tree elements beneath the current level.
Start Transmit		Starts the transmission of data.
Stop Transmit		Stops the transmission of data.
Pause Transmit		Temporarily pauses the transmission of data. A *Start Transmit* or *Step Transmit* operation continues after a pause.

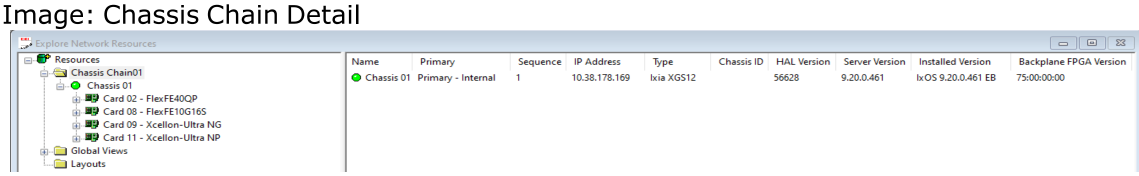
Operation	Keys/Shortcut	Description
Step Transmit		After a pause, causes a single packet to be transmitted.
Set Transmit Duration		Sets a specific time period for transmission. Selecting this icon opens the *Set Transmit Duration* dialog box, as described in Set Transmit Duration.
Start Capture		Enables the start of data capture operations.
Stop Capture		Disables data capture operations.
External Analyzer		Launches a third party packet analyzer. The type of analyzer launched is determined by the settings in the ***External Analyzer*** *tab*, as described in External Analyzer Option. This button is only active when the analyzer type is specified in ***External Analyzer*** tab.
Clear All Statistics		Clears all statistics. Refer to Statistics Operations *for details.*
Clear Timestamps		Clears the global time value used in timestamps which may be included in each frame. Refer to Instrumentation Box for details.
Start Collisions		Enables collision generation for received data, if programmed for the port and enabled.
Stop Collisions		Stops collision generation.
ARP Request		Send an ARP packet requesting port addresses. The first IP address found in the streams for each port is used for the ARP request. ARP requests are only available after ARP is enabled in the IxRouter window.
Clear My Ownership		The current user's ownership for all ports owned by the user in the chassis chain is cleared.
Clear All Ownership		The ownership for all ports in the chassis chain is cleared. A warning message may appear if a port is owned by another user.
Take Ownership		The current user's login is associated with all ports of the chassis chain. A warning message may appear if a port is owned by another user.
User Management		A dialog box appears, allowing centralized, per chassis control of port ownership.

Operation	Keys/Shortcut	Description
Delete	Del	Deletes the selected chassis chain, after answering 'Yes' to a confirmation dialog box.
Copy	Ctrl + Ins	Used with *Paste*. The item(s) selected (highlighted) are copied to the clipboard.
Paste	Shift + Ins	Used with *Copy*. The item(s) copied to the clipboard in the 'Copy' operation are pasted into the selected (highlighted) location.
New Chassis...	Alt+C	Shows the *Chassis Properties* dialog box, so a new chassis can be added. The chassis is automatically named 'Chassis NN,' where NN is the next available chassis number. The chassis may be renamed. Chassis
Broadcast Topology		Broadcast the current chassis chain topology, configuring the current attributes on the physical chain.
IxRouter		Opens the IxRouter window. For more information on IxRouter window function for IxExplorer, see IxRouter Window. For more information on other protocols available in this window, see the *IxNetworkUser Guide*.
Diagnostics		The Diagnostics Collection Utility collects log information from the chassis and from the client computer and wraps it into a comclicked (.zip) file named ixos-logs-YYYYMMDDHHMM.zip. The file can be sent to Ixia Technical Support. See Collect Diagnostic Logs.
Properties...	Alt + Enter	Invokes the *Chassis Chain Properties* dialog box. Chassis Chain Properties.

Chassis Chain Detail Data

The Details view for a selected chassis chain shows information for each chassis in the chassis chain. See *Chassis Chain Properties for procedures used to modify chassis chain properties.*

Image: Chassis Chain Detail



The detail data available is described in the following table:

Table: Detail Data for Chassis Chain

Column	Description
Name	The name of the chassis. Initially this is Chassis *NN*, where the number *NN* increments with each new chassis. These names, however, may be changed by you. Chassis.
Primary	(Read-only) Indicates the function of this chassis in the chain. • Primary-CDMA • Primary-GPS • Primary-Internal • Secondary See expanded definition in *Table: General Chassis Properties dialog box*
Sequence	This indicates where this chassis is placed in the physical chassis chain. See expanded definition in *Table: General Chassis Properties dialog box*.
IP Address	The IP Address or host name of the chassis, assigned to the chassis during installation.
Type	The chassis type. See *Ixia Platform Reference Manual* for a list of chassis types and capabilities.
Chassis ID	This is the assigned ID of the chassis. It is an arbitrarily assigned number which may be changed by you (from 0 to 255). The chassis ID should be unique among all of the chassis in a chassis chain.
HAL Version	The software version of the HAL—Hardware Abstraction Layer. The IxExplorer software refuses to talk to an IxServer or HAL instance that uses an incompatible version.
Server Version	Reserved for future use.
Installed Version	Installed version of IxOS software.
Backplane FPGA Version	Reserved for future use.
Topology	Indicates that the topology for the current chain is daisy.
Card	The card number.
Force Hotswap	This will emulate physical removal and insertion of the card identified by the number entered in the Card field. This is done for diagnostic purposes.

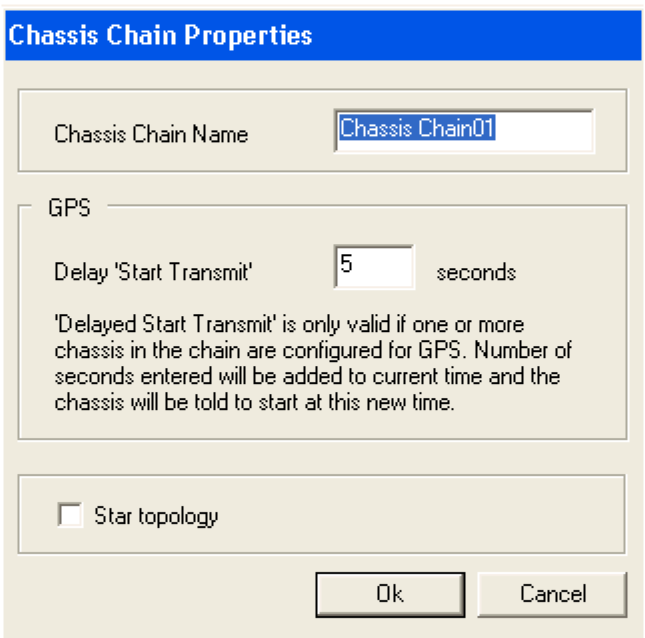
Column	Description
Reset Hardware	This button allows you to reset the hardware to factory defaults.

Chassis Chain Properties

A Chassis Chain has properties that can be modified after being created, using the Chassis Chain Properties dialog box. This dialog box is access by selecting Chassis Chain in the Tree view and then selecting the *Properties* command.

The *Chassis Chain Properties* dialog box is shown in the following image:

Image: Chassis Chain Properties dialog box



The fields and controls in the dialog box are described in the following table:

Table: Chassis Chain Properties dialog box elements

Field/Control	Description
Chassis Chain Name	The name of the entire chassis chain may be changed in this field.
Delay 'Start Transmit'	When synchronizing multiple chassis that are not physically connected through sync-in/sync-out cables, GPS servers may be used to provide the synchronization. A delay must be incorporated to allow the signal to travel from the local IxExplorer workstation to the farthest chassis and back. Distance is measured here in terms of the time that it takes to receive a return message from the remote system. A series of pings may be used to assess this time in advance.

Field/Control	Description
Star topology	Select the check box to enable star topology on the current chassis chain.

Chassis

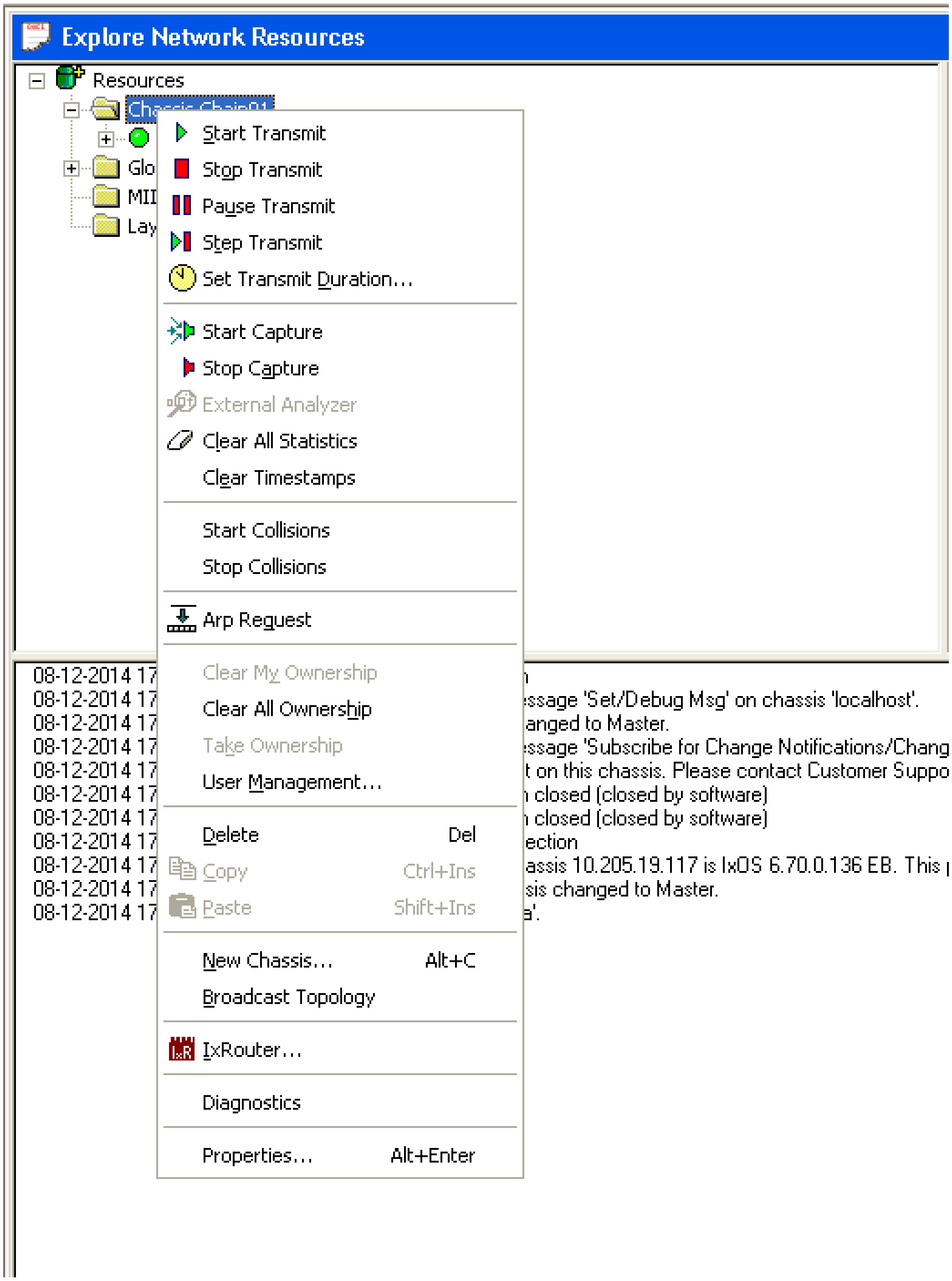
The term *Chassis* corresponds to a single Ixia chassis which holds multiple load modules. See the *Ixia Platform Reference Manual* for a list of chassis and their capabilities. One or more cards (load modules) are listed below the chassis name in the Resources tree. The IxExplorer software obtains the card type from the card itself and shows it within the tree and elsewhere.

The level of the chassis in the tree is shown in the following image:, along with the pop-up menu available by selecting *Chassis*.

Tree Operations

Chassis chain tree operations for a chassis are accessed by selecting the Chassis Chain folder. A menu appears, as shown in the following image:

Image: Chassis Level of the Explore Network Resource Window



The operations available at the chassis level of the tree are described in the following table. Port operations to all ports on all cards in the chassis.

Table: Chassis Level Operations

Operation	Keys/Shortcut	Description
Expand/Contract tree	Double-click label, select ⊟ or ⊞	Expand or contract tree elements beneath the current level.

Operation	**Keys/Shortcut**	**Description**
Start Transmit		Starts the transmission of data.
Stop Transmit		Stops the transmission of data.
Pause Transmit		Temporarily pauses the transmission of data. A *Start Transmit* or *Step Transmit* operation continues after a pause.
Step Transmit		After a pause, causes a single packet to be transmitted.
Set Transmit Duration		Sets a specific time period for transmission. Selecting this icon opens the *Set Transmit Duration* dialog box, as described in Set Transmit Duration.
Start Capture		Enables the start of data capture operations.
Stop Capture		Disables data capture operations for all ports on all cards on the selected chassis.
External Analyzer		Launches a third party packet analyzer. The type of analyzer launched is determined by the settings in the ***External Analyzer*** *tab*, as described in External Analyzer Option. This button is only active when the analyzer type is specified in ***External Analyzer*** tab.
Clear All Statistics		Clears all statistics. Refer to Statistics Operations for details.
Clear Timestamps		Clears the global time value used in timestamps which may be included in each frame. Refer to Instrumentation Box for details.
Reset Sequence Index		When Sequence checking is in use, this resets the sequence number for the selected ports back to 0. Refer to the section on Sequence Checking Operation in the 'Theory of Operation' chapter of the **Ixia Platform Reference Manual** for more information.
Start Collisions		Enables collision generation for received data, if programmed for the port and enabled.
Stop Collisions		Stops collision generation.
Send ARP Request		Send an ARP packet requesting addresses. The first IP address found in the streams for each port is used for the ARP request.

Operation	Keys/Shortcut	Description
Enable		Enables or disables the chassis. A chassis may be automatically disabled if it runs a version of the HAL or IxServer software which is incompatible with the IxExplorer operation.
Clear My Ownership		The current user's ownership for all ports owned by the user in the selected chassis is cleared.
Clear All Ownership		The ownership for all ports in the selected chassis is cleared. A warning message may appear if a port is owned by another user.
Take Ownership		The current user's login is associated with all ports in the selected chassis. A warning message may appear if a port is owned by another user.
User Management		A dialog box appears, allowing centralized, per chassis control of port ownership.
Delete	 Del	Deletes the selected chassis, after answering 'Yes' to a confirmation dialog box.
Copy	 Crtl + Ins	Used with *Paste*. The item(s) selected (highlighted) are copied to the clipboard.
Paste	 Shift + Ins	Used with *Copy*. The item(s) copied to the clipboard in the 'Copy' operation are pasted into the selected (highlighted) location.
New Chassis	Alt+C	Shows the Chassis Properties dialog box, so a new chassis can be added. The chassis is automatically named 'Chassis NN,' where NN is the next available chassis number. The chassis may be renamed. See Chassis.
Broadcast Topology		Broadcasts the current chassis chain topology, configuring the current attributes on the physical chain.
IxRouter		Opens the IxRouter window. For more information on IxRouter window function for IxExplorer, see IxRouter Window. For more information on Protocols available, see the *IxNetwork User Guide*.
Rename	Second select on	Change the name of the chassis chain

Operation	Keys/Shortcut	Description
	name or Rename pop-up option	
Generate Tcl Script		Activates the ScriptGen feature and allows for the generation of Tcl configuration script. See ScriptGen for details.
Run Tcl Script		Allows to run a Tcl script froma list of scripts. See Run Tcl Script for more information.
Diagnostics		The Diagnostics Collection Utility collects log information from the chassis and from the client computer and wraps it into a comclicked (.zip) file named ixos-logs-YYYYMMDDHHMM.zip. The file can be sent to Ixia Technical Support. See Collect Diagnostic Logs.
Properties	Alt+Enter	Invokes the Chassis Chain Properties dialog box. See Chassis Chain Properties.

Icon Colors

The color of the icon for the Chassis changes during system operation. The colors correspond to the states described in the following table:

Table: Chassis Status Icon States

Color	Meaning
Red	The chassis is not visible from the host running the IxExplorer software. This may be transitory as the software initializes, or due to an un-initialized, disconnected, or unpowered chassis. Also, the Ixia 'server' software running on the chassis' processor may not be ready. A red icon can also mean that the IxServer component on the chassis is not properly licensed. See the Getting Started Guide for more information on licensing.
Yellow	The chassis has been found and information is being read from the chassis into the IxExplorer software. The chassis may not be used for transmission or capture yet. The indicator may remain yellow if there is a version mismatch between the chassis and the IxExplorer software.
Green	The chassis is fully initialized and available for transmission and capture.
Gray	The chassis is disabled in the chassis' properties sheet, or there is an incompatibility between the versions of IxExplorer software, IxServer software, or HAL software.
Purple/Clear	The chassis and client have mismatching software, and cannot connect.

Color	Meaning
	The icon becomes purple when selected, and clear when not selected.
Half Green/Half White	The chassis and client have mismatching software, but still can connect. This occurs for minor software mismatches (in the case of a service pack update).
Concentric Circles around any icon	The chassis is operating using GPS timing.

Chassis Detail Data

The chassis Details view shows the cards contained in the selected chassis, as shown in the following image. See Cards *for details on how to modify these properties.*

The elements of the chassis Details view are described in the following table.

Table: Detail Data for Chassis

Column	Description
Name	The card number within the chassis.
Type	The type of card. See the *Ixia Platform Reference Manual* for a list of cards and their characteristics.
Hardware Version	The hardware version number of the card.

Chassis Properties

The *Chassis Properties* dialog box allows to modify some of the global chassis properties through several tab pages. The dialog box is accessed by selecting a Chassis icon and selecting *Properties*. The tab pages included in the dialog box are:

- Chassis Poperties—General
- Chassis Properties—Time Source
- Chassis Properties—Safety Features
- Chassis Properties—Logging and Alerts
- Chassis Properties—IxRemoteIp
- Chassis Properties—Virtual Ports

The *Chassis Properties* dialog box is shown in *Image: Chassis Properties dialog box*.

Chassis Properties—General

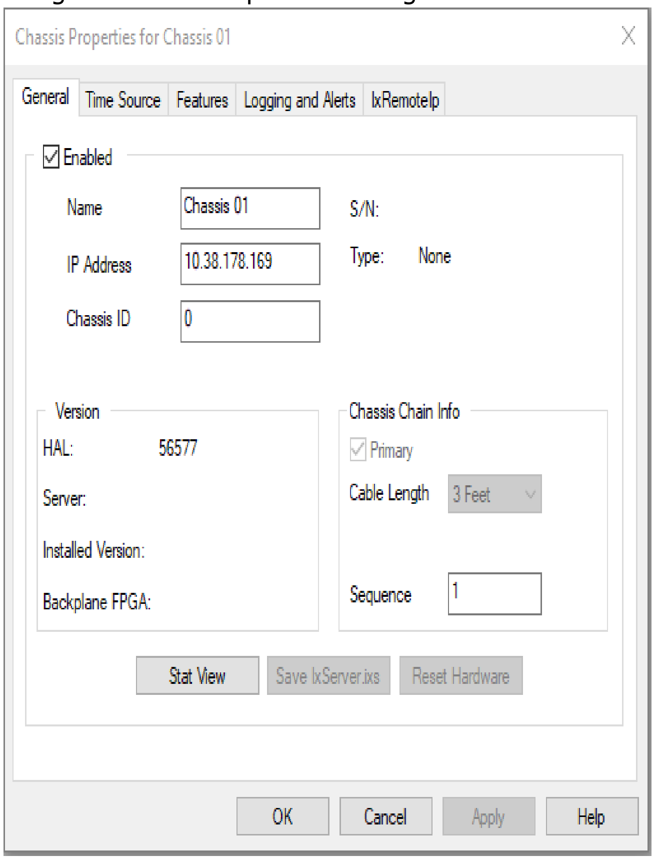
The **General** tab is used to set basic chassis information such as the chassis name, IP address, and ID number in the chassis chain. It is accessed by selecting a **Chassis** icon, selecting **Properties** in the menu, and then selecting the **General** tab (this is the **default** tab that appears).

NOTE This tab page also appears when adding a new chassis to a chassis chain. However, only the Name and IP Address fields become active. Further chassis information must be entered after the chassis is added to the chassis chain.

If the chassis is part of a chassis chain, it is very important to correctly configure the Chassis Info, to avoid undesired results and timing measurement errors.

The **General** tab is shown in *Image: Chassis Properties dialog box*.

Image: Chassis Properties dialog box



The fields and controls in this dialog box are described in the following table.

Table: General Chassis Properties dialog box

Field/Control	Description
Enabled	Enables or disables the chassis. A chassis may be automatically disabled if it runs a version of the IxHAL or IxServer software which is incompatible with the IxExplorer operation.
Name	The name of the chassis in the chassis chain.
IP Address	The IPv4 (or IPv6) address or computer name assigned to the chassis itself.
Chassis ID	This is the assigned ID of the chassis. It is an arbitrarily assigned number and is used in the timestamp that may be added to transmitted packets. The

Field/Control	**Description**
	chassis ID should be unique among all of the chassis in a chassis chain. Instrumentation Box for the process of using the chassis ID as part of a timestamp.
S/N	(Read-Only) The serial number of the chassis.
Type	(Read-Only) The type of chassis. See *Ixia Platform Reference Manual* for a list of chassis and capabilities.
HAL Version	(Read-Only) The software version and build number of the HAL software.
Server Version	The IxServer version.
Installed Version	Installed version of IxOS software.
Backplane FPGA Version	The Backplane FPGA version.
Primary	(Read-only) If set, this indicates that this chassis is at the head of a chassis chain. A chassis is Primary based on where the time source is coming from. • The chassis is in synchronous mode and no clock cable is connected to the Sync In port. • The chassis is configured to get time from a GPS or CDMA time source. A chassis is secondary when it has a Sync In cable from another chassis. Available options are: • Primary-CDMA • Primary-GPS • Primary-Internal • Secondary
Cable Length	(Read-only) For all but the Primary Chassis, this should be set to the length of Ixia-supplied cable which connects this chassis to the previous chassis in the chain. The choices are in increments of three feet. Pick the value to match the length of cable used. Sync cables longer than six feet are not supported. Use at your own risk.
Sequence	This indicates where this chassis is placed in the physical chassis chain.

Field/Control	Description
	NOTE Sequence numbers must be unique in a daisy chain. Within a daisy chain, there cannot be duplicate sequence numbers. The primary chassis must have the smallest sequence value in the physical chain. The order of sequence numbers must match the order of chassis (up to 4294967295). The numbers do not have to be sequentially contiguous (1, 2, 3, and so on.) but they must be sequentially increasing in value (1, 5, 8, and so on.).Example of an invalid sequence: 5, 1, 8 (invalid because the primary must be the smallest value in the sequence).
Stat View	This opens a view containing real time chassis statistics and sensors.
Save IxServer.ixs	When selected, saves the current IxServer configuration to an IxServer.ixs file on the server. The `IxServer.ixs` file is saved automatically when there is a orderly shutdown of IxServer. It may also be saved manually, by using this button, to ensure backup of the configuration without having to shut down the system, such as in service monitoring situations. If some unexpected shutdown occurs, the IxServer configuration is reloaded from the saved *.ixs* file on power-up.
Reset Hardware	When this button is selected, the chassis resets all the hardware, restarts port CPU, does local processor test, and rewrites the streams. This action does not modify existing port/stream configuration.
Card	Enter the card number of the load module you want to force hotswap.
Force Hotswap	Simulates the physical removal and reinsertion of a load module by turning off the power on the load module and then bringing it back up 5 seconds later.
Power Management	Select the check box to monitor the cards for inactivity. You can enter the time in minutes after which you want to automatically power off individual cards. The field is enabled when you select the **Power Management** check box.

1. Place your cursor in the area of the text frame ABOVE this cell. 2. Hold down the SHIFT key and select the LEFT ARROW key twice. 3. Copy the selected items, then go back to the body page and paste them in.

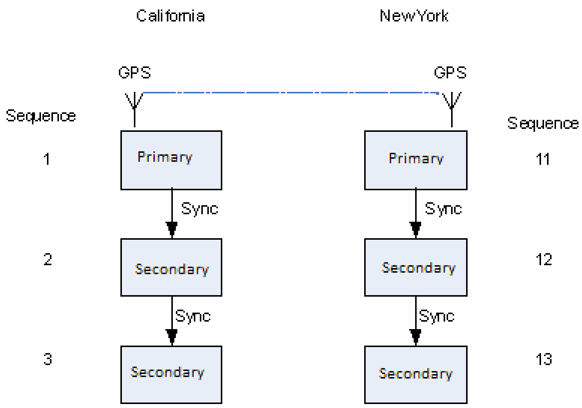
Virtual Chassis Chains

A virtual chassis chain consists of two or more physical chains that are linked together to operate as one. For example, there might be a physical chain in California (with a primary and two subordinate chassis) and another physical chain in New York. The two physical chains are linked through a GPS module or by using an Ixia 250 chassis with built-in CDMA. To configure this virtual chassis chain properly, the sequence numbers might have the array shown in the following image.

Image: Virtual Chassis Chain Example

Physically, the three California chassis are connected, so their sequence numbers must reflect this fact. The same applies to the three chassis in New York. The sequence numbers need to indicate which chassis is the primary (in each physical chain).

NOTE The sequence numbers for the different chains cannot be interleaved. In the example above, the California sequence cannot be 1, 2, 14 because '14' would be part of the range of New York sequence numbers.



Chassis Properties—Time Source

The ***Time Source*** tab provides facilities that allow for synchronization of independent Ixia chassis and chassis chains located anywhere in the world. The tab is accessed by selecting the *Chassis* icon, selecting the *Properties* command, and selecting the **Time Source** tab in the *Chassis Properties* dialog box.

Accurate timing can be used to obtain valid latency and other measurements in a live global network. Four scenarios are possible:

- **Independent operation**: Each Ixia chassis chain generates its own timing.
- **Ixia 100**: A one-slot chassis which includes a GPS or CDMA receiver.
- **Ixia AFD1 GPS Receiver**: A chassis is attached to the external Ixia GPS Receiver.
- **Metronome**: Provides time synchronization from multiple external time delivery sources.

NOTE When chassis are linked together into a chassis chain by sync cables, the time source selected for the primary chassis in the chain is the basis for the timing of ALL chassis in that chain. Any time source selected for an individual subordinate chassis is overridden by the timing supplied from the primary chassis. In the case of the Ixia AFD1 GPS receiver, it functions as the 'primary' timing source.

The timing choices are the following:

- Synchronous—Internal synchronization. If a chassis is used in a stand-alone manner or as primary

  in a chassis chain, it may generate its own start signal. In general, there is insufficient timing accuracy between timing primary chassis for measurements over distance. This is also known as synchronous timing.
  GPS—For use with the Ixia 100 GPS-equipped chassis or the Ixia AFD1 GPS receiver. The Ixia 100 requires connection to an external GPS antenna to 'capture' multiple GPS satellites. It

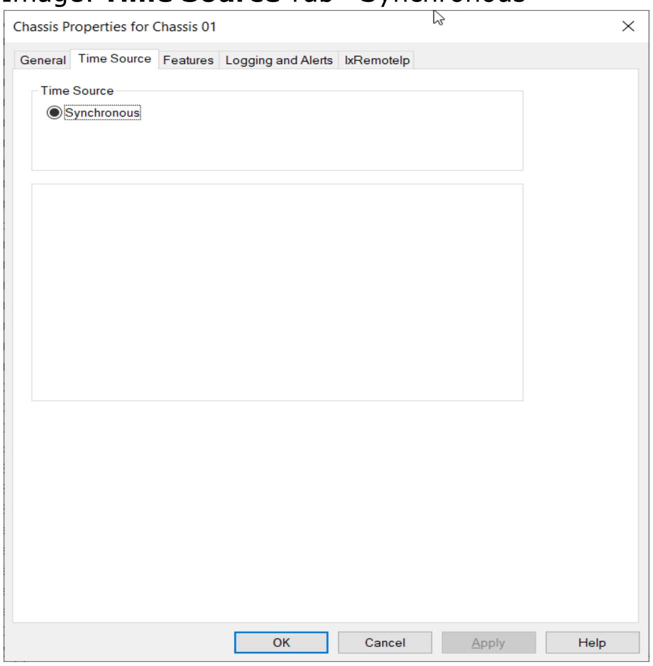
maintains accuracy of less than 150 nanoseconds.
This is also the options used for the external Ixia GPS Receiver.

- CDMA—The Code Division Multiple Access (CDMA) cellular network transmits an accurate time signal. It maintains an accuracy of less than 100 microseconds.
- Metronome—Metronomes provide time synchronization from multiple external time delivery sources like GPS, ToD, BNC and PTP, and translating that time into the IXIA time delivery interface.

Synchronous

The **Time Source** tab of the *Chassis Properties* dialog box is shown in the following image, with the Synchronous option selected.

Image: **Time Source** Tab—Synchronous



The fields and controls in this tab are described in the following table.

Table: **Time Source** Tab—Synchronous

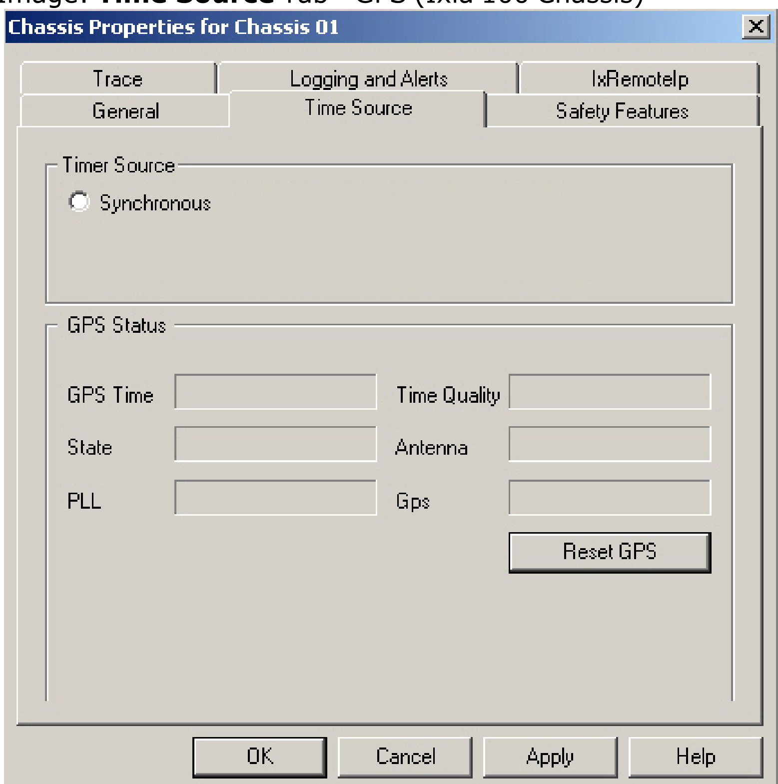
Section	Field/Control	Description
Time Source		Indicates which of the possible timing synchronization sources to use for this chassis.
	Synchronous	Uses the internally generated clock, or clocked from a sync-in line. No global synchronization is performed.
	GPS	For use with IXIA 100 GPS equipped chassis or IXIA AFD1 GPS receiver only, indicates the use of high-precision GPS signals for synchronization.
	CDMA	For use with IXIA 100 CDMA equipped chassis only, indicates the

Section	Field/Control	Description
		use of the Code Division Multiple Access (CDMA) cellular network which transmits an accurate time signal.

GPS

This option is for use with the IXIA 100 GPS-equipped chassis or the external Ixia AFD1 GPS receiver, and indicates the use of high-precision GPS signals for synchronization. The GPS options of the **Time Source** tab are shown in *Image: **Time Source** Tab—GPS (Ixia 100 Chassis)* and *Image: **Time Source** Tab—GPS (Ixia AFD1 GPS Receiver).*

Image: **Time Source** Tab—GPS (Ixia 100 Chassis)



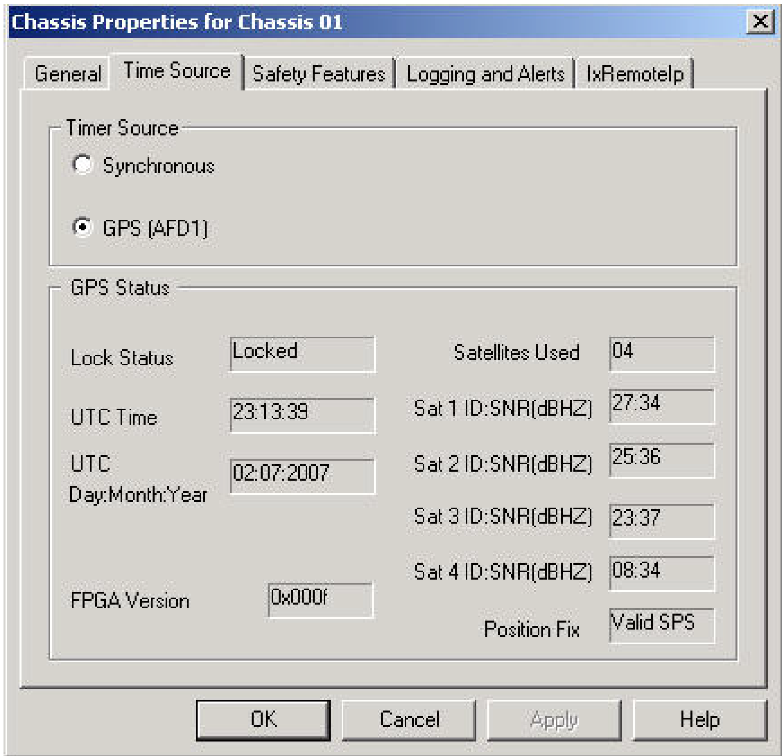
The fields and controls in this tab are described in the following table.

Table: **Time Source** Tab—GPS (Ixia 100 Chassis)

Section	Field/Control	Description
GPS Status		Indicates the status of the GPS unit. Some of these values are reflected in a series of lights on the front of the chassis. Refer to the *Ixia Platform Reference Manual* for details.
	GPS Time	The current time received from the GPS unit, or 'No Response' if nothing has been received from the GPS unit for a few seconds.
	State	The state of the GPS unit. This value must be 'Ready' or

Section	Field/Control	Description
		‘Searching’ for GPS synchronization to be triggered.
	PLL	The state of the GPS’s Phased Lock Loop. Either ‘OK’ or ‘Unlocked.’ The value must be ‘OK’ for GPS synchronization to be triggered.
	Time Quality	A value from 1 to 4 indicating the Stratum of the GPS connection. Each Stratum level indicates one connection removed from the GPS time source; thus, Stratum 1 is directly connected to a GPS source, while Stratum 4 is three connections removed. The time accuracy for each Stratum is as follows: • Stratum 1—within 100 ns of absolute GMT. • Stratum 2—within 1 us of absolute GMT • Stratum 3—within 10 us of absolute GMT • Stratum 4—within 100 us of absolute GMT
	Antenna	Select ‘OK,’ ‘Open,’ or ‘Short.’ The value must be ‘OK’ for GPS synchronization to be triggered.
	GPS	The state of the GPS unit, either ‘Locked’ or ‘Unlocked.’ ‘Locked’ appears when enough satellites have been detected. The value must be ‘Locked’ for GPS synchronization to be triggered.
	Reset GPS	Sends a reset signal to the GPS hardware, causing it to reacquire satellites.

Image: **Time Source** Tab—GPS (Ixia AFD1 GPS Receiver)



The fields and controls in this tab are described in the following table.

Table: **Time Source** Tab—GPS (Ixia GPS Receiver)

Section	Field/Control	Description
GPS Status		Indicates the status of the GPS unit. Some of these values are reflected in a series of lights on the front of the chassis. Refer to the *Ixia Platform Reference Manual* for details.
	Lock Status	Either locked or unlocked. Locked means that the Chassis is in synchronization with the time source provided by the GPS receiver. In the locked state, the chassis can be added to a Virtual chassis chain consisting of one or more GPS locked chassis and other chassis connected to these chassis as subordinates. Unlocked means the GPS interface is active but the GPS card or external GPS chassis is not able to determine correct time due to lack of access to the GPS satellite system. In the Unlocked state, the virtual chain will not operate when the chassis is connected.
	UTC Time	The current GPS time.
	UTC Day:Month:Year	The current GPS date.
	FPGA Version	The FPGA version of the GPS receiver.

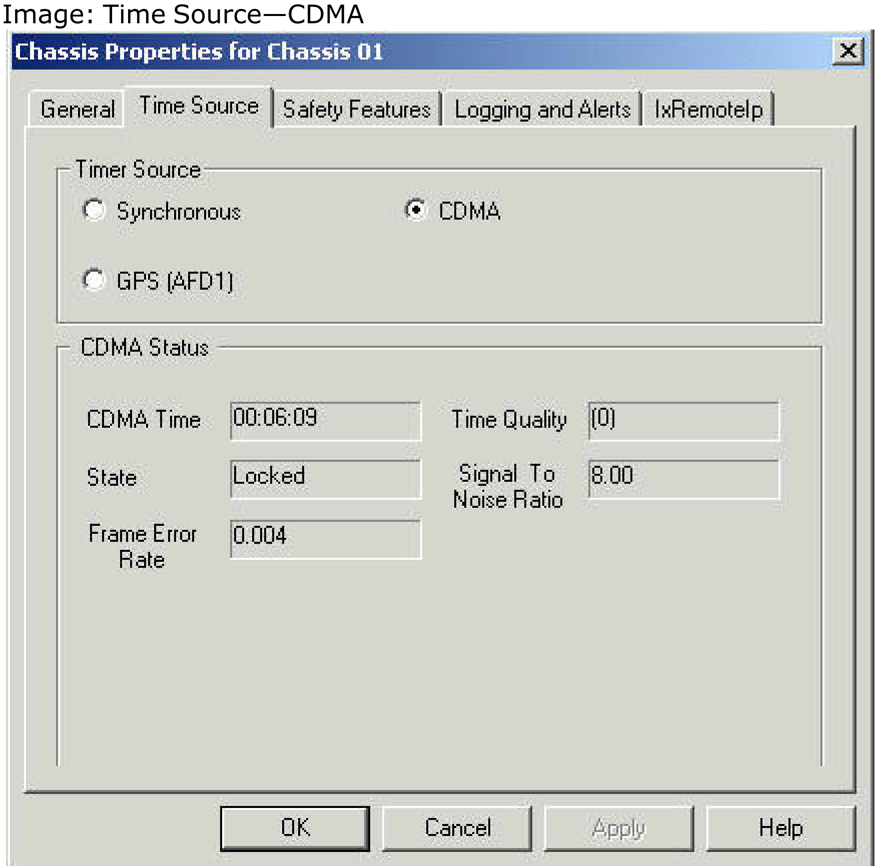
Section	Field/Control	Description
	Satellites Used	The number of satellites being used for time synchronization
	Sat 1 ID - Sat 4 ID	The list of the top four satellites in use. The top four satellites are determined by the highest signal to noise ration.
	Position Fix	Shows the type of GPS being used. Possible values are: • Invalid • Valid SPS • Valid DGPS • Valid PPS

CDMA

This option is for use with the IXIA 100 CDMA-equipped chassis only. CDMA (Code Division Multiple Access) cellular base-stations effectively act as GPS repeaters. The IXIA 100-CDMA has as built-in CDMA receiver with a small antenna on the back of the chassis that receives the CDMA signals passively (it is not necessary to subscribe to any service) and decodes the embedded time signal. Using this approach, the IXIA 100 can be time-synched to GPS with no external antenna on the roof.

The **Time Source** tab with the CDMA option selected is shown in the following image:

Image: Time Source—CDMA



The fields and controls for these sections of the dialog box are described in the following table.

Table: Time Source Properties dialog box

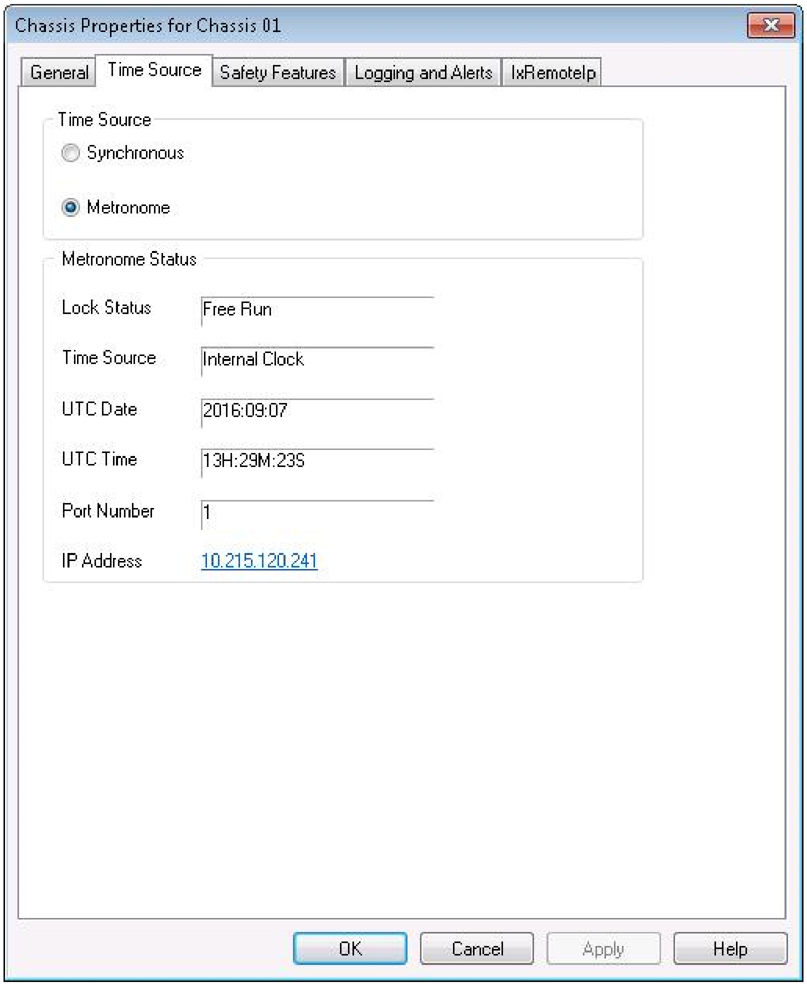
Section	Field/Control	Description
CDMA Status		For use with the Ixia 100 Chassis only. Indicates the status of the CDMA unit. Some of these values are reflected in a series of lights on the front on the chassis. Refer to the *Ixia Platform Reference Manual* for details.
	CDMA Time	The current time received from the CDMA unit or 'No Response' if nothing has been received from the CDMA unit for a few seconds.
	State	The state of the CDMA unit, which is one of the following: Acquiring, Signal Detected, Code Locking, Carrier Locking, Locked, or Unknown. The value must be 'Locked' for CDMA synchronization to be triggered.
	Frame Error Rate	The Frame Error Rate for the Sync Channel. The range is 0.000 to 1.000, where higher values indicate poorer quality. Higher values correlates with lower Signal to Noise ratios.
	Time Quality	A value from 0 to 5 indicating the time quality received from the CDMA unit. 0 is the best quality. A value of 0 or 1 must be shown for CDMA-based synchronization to be triggered.
	Signal to Noise Ratio	The carrier Signal to Noise Ratio (SNR). The typical range is from 2.5 to 11.0, in terms of the Sync Channel symbol rate bandwidth. A higher value is better.
	Reset CDMA	Sends a signal to the CDMA unit to restart the unit and reacquire the CDMA signal.

Metronome

This option is used with the XGS2-SD, XGS2-HS, XGS12-SD and XGS12-HS chassis. Every metronome in the system can provide timing and triggers to eight chassis.

The **Time Source** tab with the Metronome option selected is shown in the following image:

Image: Time Source—Metronome



The fields and controls for these sections of the dialog box are described in the following table.

Table: Time Source Properties dialog box

Section	Field/Control	Description
Metronome Status		Indicates the status of Metronome. Some of these values are reflected in a series of lights on the front of the chassis. Refer to the *Ixia Platform Reference Manual* for details.
	Lock Status	The status of the Metronome system clock. The possible states are: • Free run - Indicates that the system clock is currently not trying to discipline to any external time references. • Locking - Indicates that a time reference source switch has just taken place and the Metronome system clock is currently in the process of tracking the PLL to the external reference. • Frequency Locked - Indicates that the Metronome system clock is frequency locked to the external time reference.

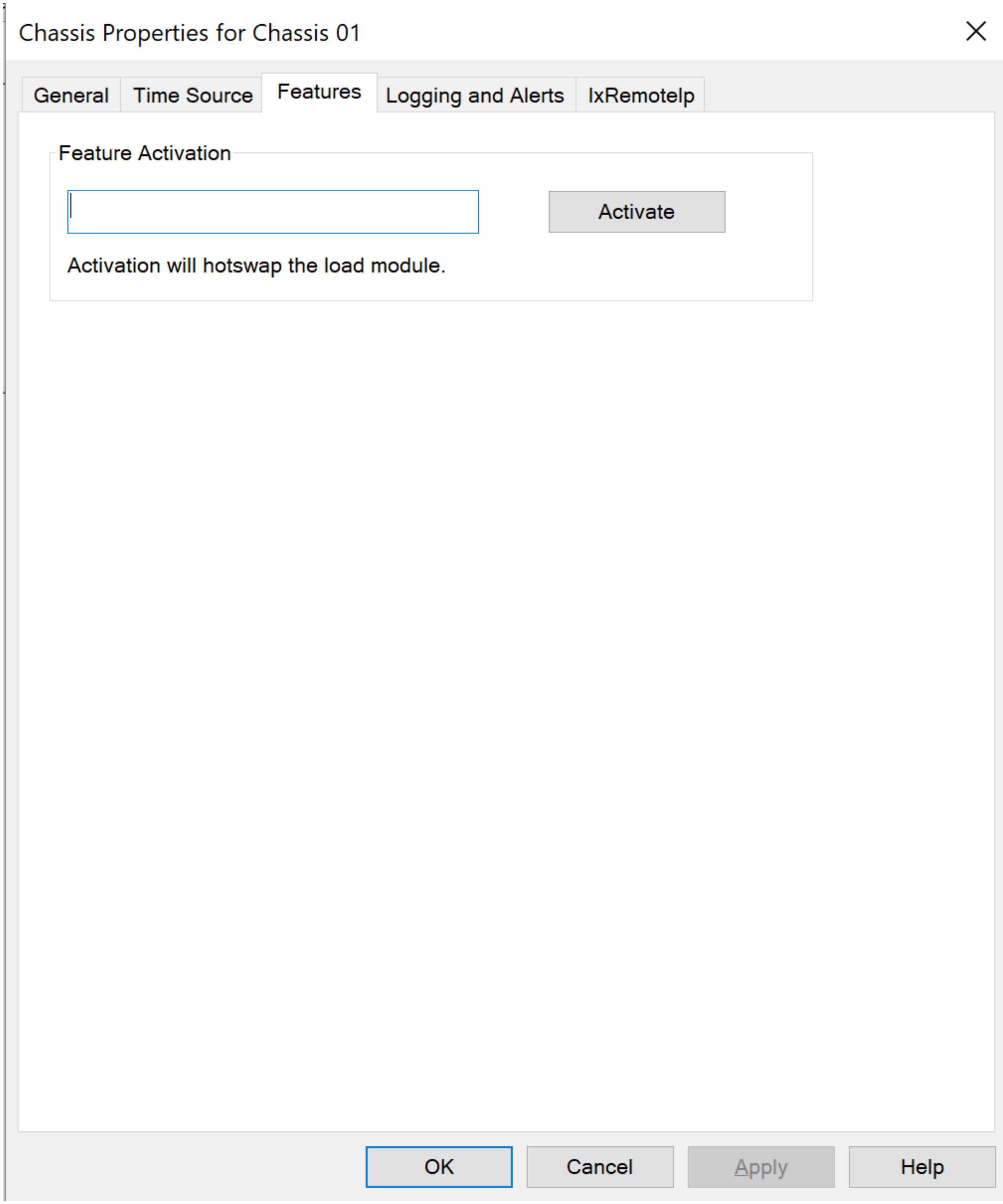
Section	Field/Control	Description
		• Time Locked - Indicates that the Metronome system clock is time locked to the external time reference, which can be any external reference sources. • Holdover - Holds the previous locked clock source and prevents loss of timing.
	Time Source	The type of time synchronization source. Available options are: • Internal Clock • Sync In • GPS • BNC
	UTC Date	The current date from Metronome's clock source.
	UTC Time	The current time from Metronome's clock source.
	Port Number	The Sync Out port number on which the chassis is connected to the Metronome.
	IP Address	The IP address of the Metronome to which the chassis is connected.

Chassis Properties—Features

The **Features** tab controls the use of a safety feature for high powered fiber optics cards. It is accessed by selecting the context menu of the *Chassis* icon in the Tree view, selecting the *Properties* command, and selecting the **Features** tab in the *Chassis Properties* dialog box.

The **Features** tab is shown in the following image:

Image: **Features** Tab



The fields and controls of this tab are described in the following table:

Table: **Properties** Tab

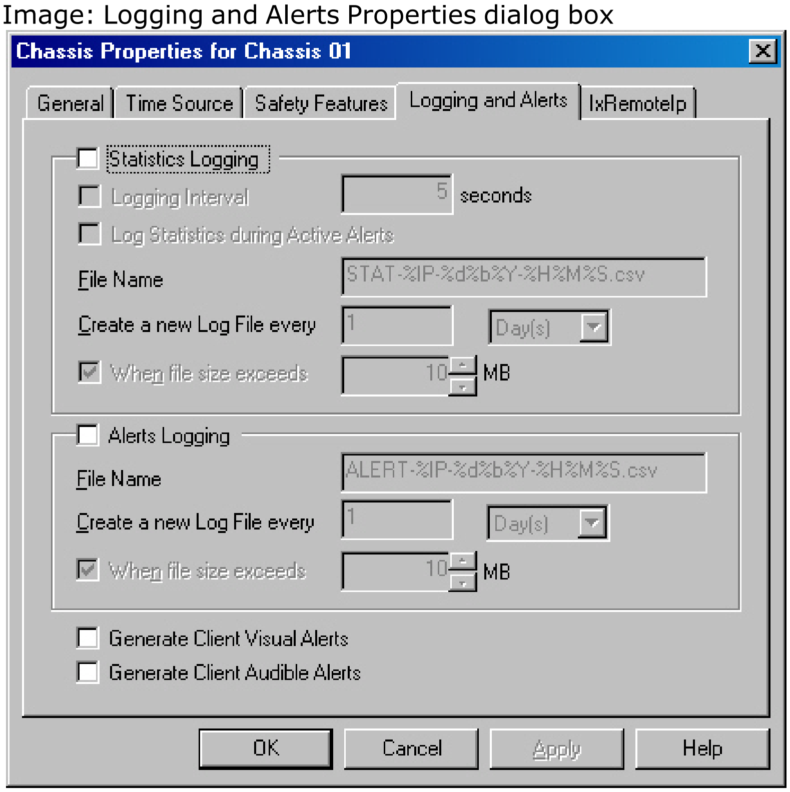
Fields/Controls	Description
Feature activation	Type the activation code in this box, to upgrade the load module. The load module will be hot-swapped by the software to complete the activation procedure. You must take ownership before you upgrade the load module.
Activate Button	IxServer searches the chassis for the serial number that is embedded in the activation code and permanently activates the feature on the load module. Example: You can upgrade your Xcellon Multis load modules to become 10G capable.

Chassis Properties—Logging and Alerts

The **Logging and Alerts** tab of the *Chassis Properties* dialog box controls the use of statistics logging and alerts for the chassis. The tab is accessed by selecting the *Chassis* icon in the Tree view, selecting the *Properties* command, and selecting the ***Logging and Alerts*** tab in the *Chassis Properties* dialog box.

The **Logging and Alerts** tab is shown in the following image:

Image: Logging and Alerts Properties dialog box



Four basic features are enabled in this dialog box:

- **Statistics Logging**:Logging of selected statistics at regular intervals.
- **Alerts Logging**: Logging of selected statistics while the statistics is outside of a defined range of values.

- **Generate Client Visual Alerts**:Colored highlighting of statistics that are being monitored. Highlighting occurs within Statistic Views.
- **Generate Client Audible Alerts**: Beeping of the client's PC when an configured alert has been signalled.

The theory of operation for each of these features is described in the Statistics Logging and Alerts sections of the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*. The specification of statistics to be logged or alerted is described in Statistics Logging and Alerts.

The fields and controls in this dialog box are described in the following table:

Table: Logging and Alerts dialog box

Section	Field/Control	Description
Statistics Logging		If this check box is selected, Statistics Logging is enabled for the chassis.
	Logging Interval	If this check box is selected, then statistics are logged at a regular interval. The value entered in the field (in seconds), is the logging interval. If the check box is cleared, then no repetitive logging occurs.
	Log Statistics during Active Alerts	If this check box is selected, then statistics logging occurs during active alert periods. That is, while a particular statistic generates an alert, its value is logged to the log file. The logging rate is between one and two times per second, depending on the card type.
	File Name	Sets the file name of the statistics log file. *File Naming Conventions* for further details.
	Create a new Log File every	This setting indicates how often to create a new log file to hold logged data. Set this time to a value that helps to find appropriate log files on the chassis.
	When file size exceeds	If this check box is selected, when the file size value (in MB) entered in the field is reached, it triggers the creation of a new log file. Set this value to a size that is convenient for copying, viewing, and archiving.
Alerts Logging		If this check box is selected, Alerts Logging is enabled for this chassis.
	File Name	Sets the file name of the alert log file. *File Naming Conventions* for further details.
	Create a new LogFile every	This setting indicates how often to create a new log file to hold logged data for alert conditions. Set this time to a value that helps to find appropriate log files on the chassis.
	When file size exceeds	If this check box is selected, when the file size value (in MB) entered in the field is reached, it triggers the creation of a new

Section	Field/Control	Description
		log file. Set this value to a size that is convenient for copying, viewing and archiving.
Generate Client Visual Alerts		If this check box is selected, visible alerts are generated on the client station(s). Alerts are sent to all clients connected to any chassis in the chassis chain.
Generate Client Audible Alerts		If this check box is selected, audible alerts are generated on the client station(s). Alerts are sent to all clients connected to any chassis in the chassis chain.

File Naming Conventions

The file names used for either the statistics log file or alert log file may be formatted to include information related to the date, time and other parameters. These values are preceded by a '%' symbol and are described in detail in *Table: Event Logging Properties*. The file name should contain the name of the chassis or some other distinguishing string so that log files from multiple chassis may be copied and coordinated in a single disk directory. In the example shown in the following image, the name of the chassis is used. A *.csv* extension is always added to the name of the file, which should not contain a dot ('.') character.

The log files may be placed on the chassis' local disk or on a disk on the local network associated with the chassis. The different methods for specifying file location are shown in the following table:.

Table: File Specification Formats

File Specification	Description
Simple file name:*Stat-regression3-%d%b%Y-%H%M%S*	The file is placed on the chassis' disk in the same directory used for the installation of the Ixia software, usually *c:\Program Files\Ixia\IxOS\version X*.
Absolute path name:*d:\logs\Stat-regression3-%d%b%Y-%H%M%S*	The file is placed at the absolute location on the chassis' disk. The file specification must start with a <drive letter> and a colon (':').
Network path name:*\\server\share\logs\Stat-regression3-%d%b%Y-%H%M%S*	The file is placed on the network location indicated by the Microsoft UNC (Universal Naming Convention) specification. Proper file sharing privileges must have been set up on the target server.

Logged File Format

Statistics files are formatted with commas separating all fields. The first line of the file contains headings that describes the fields in the first line of statistics logged for a port. If each port logs the same statistics, then the headings describes all of the logged data. If not, then some other means of interpreting the logged data must be used.

Image: Statistics Log File Sample shows an example of a statistics log file, as interpreted by Microsoft Excel. Excel reads the file and uses the commas embedded in the file to define new cells.

Image: Statistics Log File Sample

	A	B	C	D	E	F	G	H
1	Time (UTC)	Chas	Card	Port	Frames Sent Rate	Moving Average	Valid Frames Received Rate	Moving Average
2								
3	08Nov2000-22:18:33	0	4	1	0	0	0	0
4	08Nov2000-22:18:33	0	4	1	1135090	94591	15514098	1292841
5	08Nov2000-22:18:34	0	4	1	2087651	260679	44750392	4914303
6	08Nov2000-22:18:34	0	4	1	2087788	412938	73989372	10670559
7	08Nov2000-22:18:34	0	4	1	3035985	540685	2087753	552505
8	08Nov2000-22:18:35	0	4	1	2087747	680442	132462844	27889931
9	08Nov2000-22:18:35	0	4	1	2087881	797728	161699856	39040758
10	08Nov2000-22:18:36	0	4	1	2087306	905193	190931080	51698284
11	08Nov2000-22:18:36	0	4	1	2087478	1003716	220166966	65737341
12	08Nov2000-22:18:36	0	4	1	2087700	1094048	248556762	80972292

Statistics values which appear as 'Up' and 'Down' in the Statistic View is shown as values of '1' and '0,' respectively. Each logged value or rate is followed by its Moving Average value.

Alert files are also formatted with commas separating all fields. The first line of the file contains headings used for all alert log entries.

Image: Alert Log File Sample shows an example of an alert log file, as interpreted by Microsoft Excel.

Image: Alert Log File Sample

	A	B	C	D	E	F	G	H	I	J
1	Time (UTC)	Chas	Card	Port	Stat	Rate	State	Value	Condition	Action
2										
3	08Nov2000-23:20:18	0	4	1	23	1	2	4	CRC Errors Rate > 0	Set Log| Visual| Audible
4	08Nov2000-23:20:18	0	4	1	17	1	1	1345254	Valid Frames Received Rate < 2000000	Set Log| Visual| Audible
5	08Nov2000-23:20:18	0	4	1	23	1	3	0	CRC Errors Rate OK	Set Log| Visual| Audible
6	08Nov2000-23:20:18	0	4	1	17	1	3	2087904	Valid Frames Received Rate OK	Set Log| Visual| Audible
7	08Nov2000-23:20:18	0	4	1	12	1	2	7219	Path REI (FEBE) Rate > 0	Set Log| Visual| Audible
8	08Nov2000-23:20:18	0	4	1	13	1	2	3	Path BIP (B3) Rate > 0	Set Log| Visual| Audible
9	08Nov2000-23:20:18	0	4	1	8	1	2	459509	Line REI (FEBE) Rate > 0	Set Log| Visual| Audible
10	08Nov2000-23:20:18	0	4	1	123	1	3	0	Section BIP Severely Errored Seconds Rate OK	Set Log| Visual| Audible
11	08Nov2000-23:20:19	0	4	1	12	1	3	0	Path REI (FEBE) Rate OK	Set Log| Visual| Audible

The columns used in alert entries are described in *Table: Alert Log Entry Columns*.

Table: Alert Log Entry Columns

Column	Description
Time (UTC)	The time at which the alert happened.
Chas Card Port	The chassis ID, card number, and port number that generated the alert.
Stat	The Ixia internal statistics number, which is also shown in the condition column.
Rate	If the alert occurred for a **count** variable, then '0' appears. If the alert occurred for a **rate** variable, then '1' appears.
State	The state associated with the alert event. One of: • **0-clear**. The alert has been acknowledged. • **1-minimum threshold alert**. The value was below the minimum threshold.

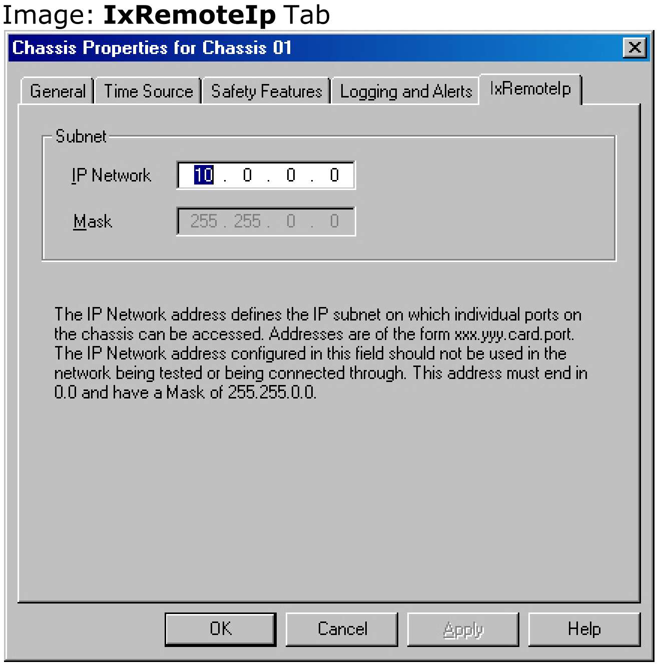
Column	Description
	• **2-maximum threshold alert**. The value was above the maximum threshold. • **3-disabled**. The alert was disabled by a client.
Value	The value of the statistics that generated the alert.
Condition	The alert condition that was triggered.
Action	The action that was performed as a result of the alert. One or more of: • **Log**—Log entries were added to the statistics file for the port while the alert condition was in effect. • **Visual**—A visual alert notification was sent to all connected clients. • **Audible**—An audible alert notification was sent to all connected clients.

Chassis Properties—IxRemoteIp

IxRemoteIp is a feature of a chassis that works with some card types. It provides a means by which individual Ixia chassis may be referenced by individual IP addresses for Ixia products. The tab is accessed by selecting the *Chassis* icon in the Tree view, selecting the *Properties* command, and selecting the ***IxRemoteIp*** tab in the *Chassis Properties* dialog box.

The **IxRemoteIp** tab is shown in *Image:* ***IxRemoteIp*** *Tab*.

Image: **IxRemoteIp** Tab



The IP Network address and network mask indicate the IP subnet for the ports on the chassis, and may be configured by you.

The IP Network address that you enter is stored in the registry into a registry key. When you upgrade to a new IxOS version, this address is read from the registry and hence the address is retained between IxOS versions.

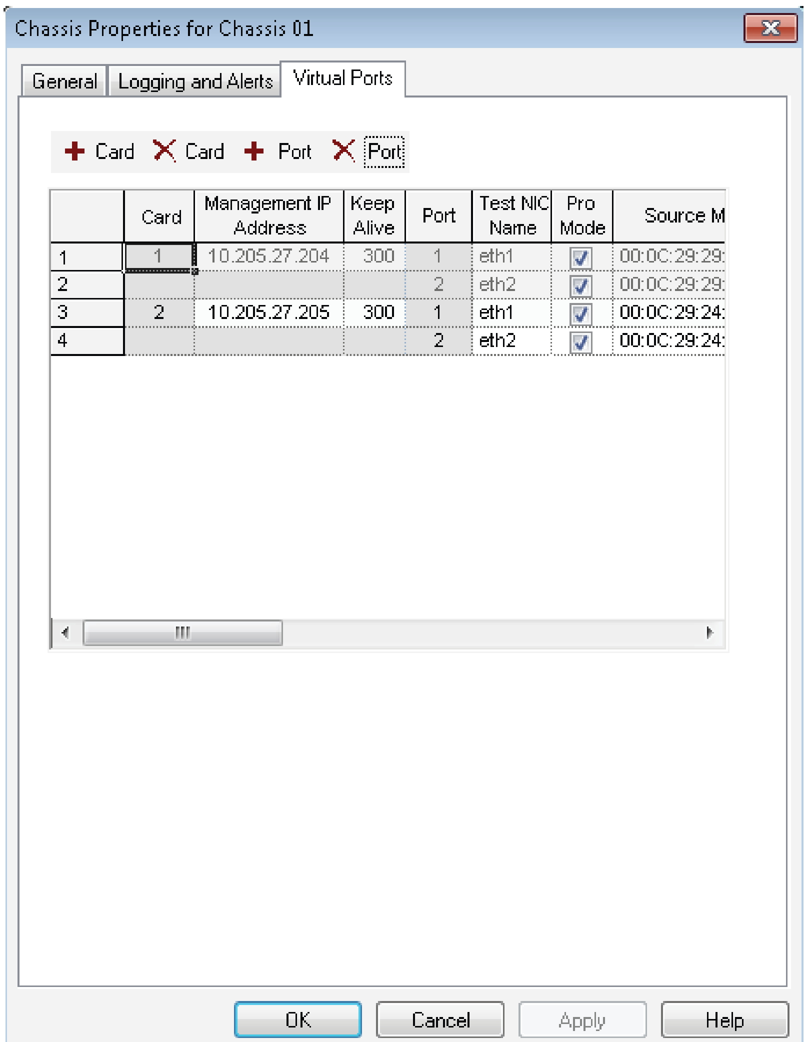
NOTE Protocol interfaces should not be created in the same subnet as the IxRemoteIP (the IxRemoteIP subnet default is 10.0.0.0/16). Creating protocol interfaces in this subnet causes problems and odd behavior.Protocol Interface Wizard Types for more information on creating protocol interfaces.

Chassis Properties—Virtual Ports

The **Virtual Ports** tab of the *Chassis Properties* dialog box is available for virtual machines and is accessed by selecting the *Chassis* icon in the Tree view, selecting the *Properties* command, and selecting the **Virtual Ports** tab in the *Chassis Properties* dialog box.

The **Virtual Port** tab is shown in the following image:

Image: Virtual Ports dialog box



The fields and controls in this dialog box are described in the following table:

Table: Virtual Ports dialog box

Section	Field/Control	Description
	Card	The card number.
	Management IP Address	Management IP address of the Linux machine with the IxVM software agent installed.
	Keep Alive	The keep-alive timeout in seconds. Each IxVM card has a keep-alive mechanism between the virtual chassis and the virtual card. In case either of these two components do not send or receive a keep-alive message for a certain amount of time, then the virtual card will disconnect from the virtual chassis.
	Port	The name of the port on the IxVM card to be used for traffic generation and measurement
	Test NIC Name	Name of the virtual interface that will be used as a traffic generator. Virtual interface must be created before adding the port.
	Pro Mode	Denotes the promiscuous or non-promiscuous mode in which a virtual port is added to a virtual card.
	Source MAC	The first source MAC address to be generated for the stream.
	Link MTU	MTU value of test interface from a virtual machine. The minimum value is 1500 and the maximum value is 9000 and should be changed mainly when there are control plane frames bigger than 1500.
	Ext. Type	Select the extended card type in the list. Options include the following: • IxVM • RackSim
	Line Speed (Mbps)	Select the line speed. Options include the following: • 100MBPS • 1000MBPS: 1 Gb speed • 10000MBPS: 10 Gb speed
+ Card		Adds a virtual load module.
✕ Card		Removes a virtual load module.
+ Port		Adds a port to the load module.
✕ Port		Removes a port from the load module.

You can add or remove a virtual load module and also add a port to load module by selecting the respective Card and Port buttons.

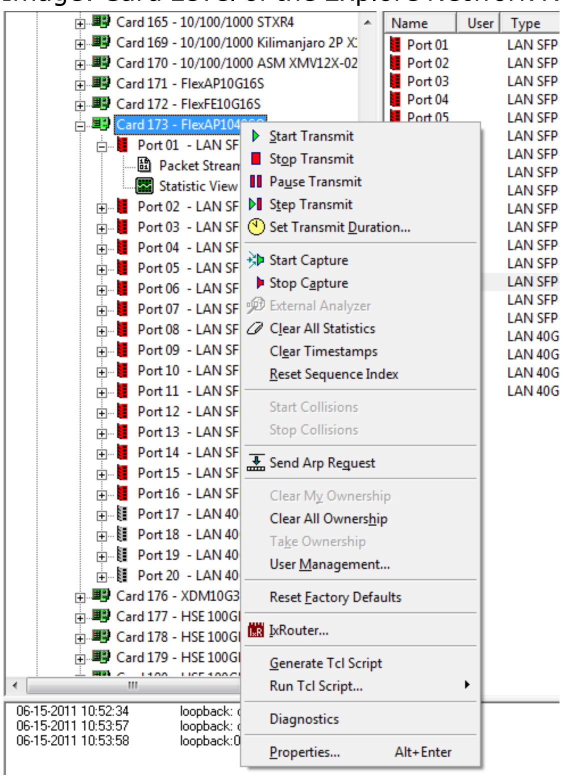
Cards

A card, also referred to as an interface load module, holds one or more ports. Each port on a card generally has the same characteristics. Cards always appear in the tree below a chassis and always contain Port definitions. The population of ports beneath a card happens automatically as the software queries the chassis for its contents. The position of the cards in the tree is shown in *Image: Card Level of the Explore Network Resource Window* along with the pop-up menu available by selecting the right mouse button.

Tree Operations

The tree operations for a card are accessed by selecting the Card icon in the Tree view. The menu is shown in *Image: Card Level of the Explore Network Resource Window*.

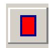
Image: Card Level of the Explore Network Resource Window



The operations available at the card level of the tree are described in *Table: Card Level Operations*. Port operations apply to all ports on the card.

Table: Card Level Operations

Operation	Keys/Shortcut	Description
Expand/Contract tree	Double-click label, select ⊟ or ⊞	Expand or contract tree elements beneath the current level.

Operation	Keys/Shortcut	Description
Start Transmit		Starts the transmission of data.
Stop Transmit		Stops the transmission of data.
Pause Transmit		Temporarily pauses the transmission of data. A 'Start Transmit' or 'Step Transmit' operation continues after a pause.
Step Transmit		After a pause, causes a single packet to be transmitted.
Set Transmit Duration		Sets a specific time period for transmission. Selecting this icon opens the *Set Transmit Duration* dialog box, as described in Set Transmit Duration.
Start Capture		Enables the start of data capture operations.
Stop Capture		Disables data capture operations.
External Analyzer		Launches a third party packet analyzer. The type of analyzer launched is determined by the settings in the ***External Analyzer** tab*, as described in *External Analyzer Option*. This button is only active when the analyzer type is specified in ***External Analyzer*** tab.
Clear All Statistics		Clears all statistics. Refer to Statistics Operations for details.
Clear Timestamps		Clears the global time value used in timestamps which may be included in each frame. Refer to Instrumentation Box for details.
Reset Sequence Index		When Sequence checking is in use, this resets the sequence number for the selected ports back to 0. Refer to the section on Sequence Checking Operation in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual* for more information.
Start Collisions		Enables collision generation for received data, if programmed for the ports and enabled.
Stop Collisions		Stops collision generation.
Send ARP Request		Send an ARP packet requesting addresses. The first IP address found in the streams for each port is used for the ARP request.

Operation	Keys/Shortcut	Description
		ARP must be enabled in the IxRouter window for at least one port on this card.
Clear My Ownership		The current user's ownership for all ports on the selected card owned by the user is cleared.
Clear All Ownership		The ownership for all ports on the selected card is cleared. A warning message may appear if a port is owned by another user.
Take Ownership		The current user's login is associated with all ports on the selected card. A warning message may appear if a port is owned by another user.
User Management		A dialog box appears, allowing centralized, per chassis control of port ownership.
Reset Factory Defaults		Resets the card to default factory card configuration, leaves one default stream (if applicable), and changes the card mode to the factory default (if applicable). NOTE • Resetting the card to factory default settings will not clear the timestamps. To clear the timestamps, you have to select **Clear Timestamps** option. • Resetting the card to factory default will not affect transceiver settings.
IxRouter		Opens the IxRouter window. For more information on IxRouter window function for IxExplorer, IxRouter Window. For more information on protocols available, see the *IxNetwork User Guide*.
Generate Tcl script		Activates the ScriptGen feature and allows for the generation of Tcl configuration script. ScriptGen for details.
Run Tcl Script		Allows to run a Tcl script from a list of scripts. Run Tcl Script...or more information.
Diagnostics		Opens the Ixia Diagnostics Collection Utility dialog box. You can collect log information from the chassis and from the client computer and wrap it into a comclicked (.zip) file named ixoslogs- YYYYMMDDHHMM.zip. See Collect Diagnostic Logs.

Operation	Keys/Shortcut	Description
Properties	Alt + Enter	Opens a separate dialog box for the properties related to the type of card in use. See Card Properties.

Card Detail Data

For each port on the card the Details view shows the following elements in *Table: Detail Data for Card*, as shown in *Image::Detail Data for Card*. See the section on Ports *for information on modifying these properties.*

Table: Detail Data for Card

Column	Description
Name	The port number within the card. The accompanying icon and color indicate the state of the port.Ports*for an explanation of the icons and colors.*
User	The login name of the user that has taken ownership of the port.
Type	The type of port. See *Ixia Platform Reference Manual* for a list of cards and their ports' characteristics.
Link State	Either up or down, depending on whether the port is connected to another device or not and an Ethernet link has been negotiated.
Line Speed	The data rate of the port(s) on the card. NOTE Maximum line speed supported is 1Gbps. For higher line speeds use IxNetwork VE.
Duplex Mode	(for Ethernet and Unframed BERT modules) Whether the port is operating in half or full duplex mode.
State	Running or not running. If you take ownership of the Port from IxExplorer or TCL, the *State* is 'Running'. If you do not take ownership or release ownership of ports, *State* and *Duration* are empty.
Duration	Duration shows the time of the current State in days / hrs / min format. See definition of *State*, above.

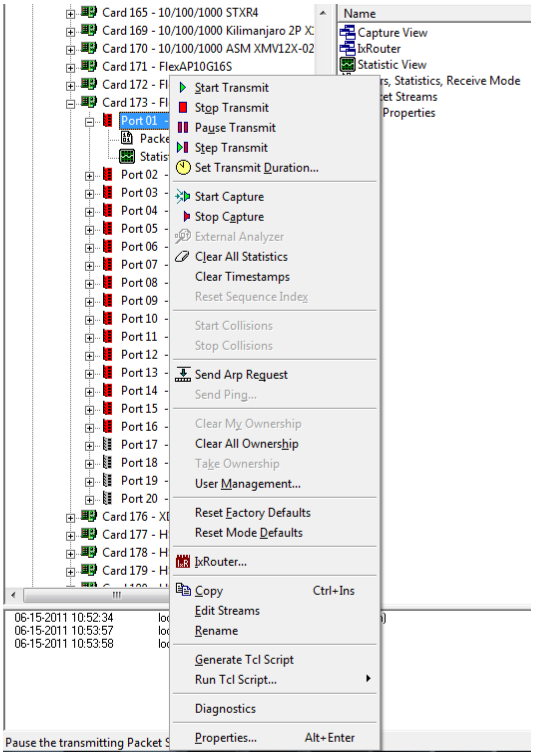
Ports

One or more ports are supported on each card, as shown in *Image: Port Level of the Explore Network Resource Window*, along with the pop-up menu available by selecting the mouse when a port is selected.

Tree Operation

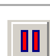
The tree operations for a chassis are accessed by selecting the Port icon in the Tree view. The menu is shown in *Image: Port Level of the Explore Network Resource Window*.

Image: Port Level of the Explore Network Resource Window



The operations available at the port level of the tree are described in *Table: Port Level Operations*.

Table: Port Level Operations

Operation	Keys/Shortcut	Description
Expand/Contract tree	Double-click label, select ⊟ or ⊞	Expand or contract tree elements beneath the current level.
Start Transmit		Starts the transmission of data.
Stop Transmit		Stops the transmission of data.
Pause Transmit		Temporarily pauses the transmission of data. A 'Start Transmit' or 'Step Transmit' operation continues after a pause.
Step Transmit		After a pause, causes a single packet to be transmitted.
Set Transmit Duration		Sets a specific time period for transmission. Selecting this icon opens the *Set Transmit Duration* dialog box, as described in Set Transmit Duration.
Start Capture		Enables the start of data capture operations.
Stop Capture		Disables data capture operations.

Operation	Keys/Shortcut	Description
External Analyzer		Launches a third party packet analyzer. The type of analyzer launched is determined by the settings in the ***External Analyzer*** *tab*, as described in External Analyzer Option. This button is only active when the analyzer type is specified in ***External Analyzer*** tab.
Clear All Statistics		Clears all statistics. Refer to Statistics Operations for details.
Clear Timestamps		Clears the global time value used in timestamps which may be included in each frame. Refer to Instrumentation Box for details.
Reset Sequence Number		When Sequence checking is in use, this resets the sequence number back to 0. Refer to the section on Sequence Checking Operation in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual* for more information.
Start Collisions		Enables collision generation for received data, if programmed for the port and enabled.
Stop Collisions		Stops collision generation.
Send ARP Request		Send an ARP packet requesting the addresses for the selected port. The first IP address found in the stream for the port is used for the ARP request. ARP must be enabled in the IxRouter window for the port.
Send Pause Control		Sends a single Pause Control Frame. The characteristics of the frame are specified in a dialog box identical to that used during frame data specification.See Pause Control.
Send Ping...		Opens the *Ping* dialog box. Allows to specify a destination address, clear the ARP table, and send a PING packet from an interface which has been configured on the selected port. NOTE An INTERFACE must be created in the Interfaces window of the IxRouter window, before the Ping option can be used. Refer to ICMP/PINGv4.
Clear My Ownership		The current user's ownership for the selected port is cleared.

Operation	Keys/Shortcut	Description
Clear All Ownership		The ownership for the selected port is cleared. A warning message may appear if a port is owned by another user.
Take Ownership		The current user's login is associated with the selected port. A warning message may appear if the port is owned by another user.
User Management		A dialog box appears, allowing centralized, per chassis control of port ownership.
Reset Factory Defaults		Resets the port to default factory port configuration, leaves one default stream (if applicable), and changes the port mode to the factory default (if applicable). NOTE Resetting the card properties to factory default settings will not clear the timestamps. To clear the timestamps, you have to select **Clear Timestamps** option.
Reset Mode Defaults		Resets the port to default factory port configuration and leaves one default stream (if applicable). This option does NOT reset the port mode (if applicable).
IxRouter		Opens the IxRouter window. For more information on IxRouter window function for IxExplorer, see IxRouter Window For more information on protocols available, see the *IxNetwork User Guide*.
Copy	Ctrl+Ins	Copies a number of port characteristics so that they may be pasted onto other ports. Refer to the section on Port Copying Operations Port Copying Operations *for a further explanation.*
Edit Streams		Invokes the *Frame Data/Streams* dialog box for the port.Stream and Flow Control and Frame Data Structure for details.
Rename		Allows a name to be added to the port or edited.
Generate Tcl Script		Activates the ScriptGen feature and allows for the generation of Tcl configuration script. See ScriptGen for details.
Run Tcl Script		Allows to run a Tcl script from a list of scripts. See Run Tcl Script... for more information.
Diagnostics		Opens the Ixia Diagnostics Collection Utility dialog box.

Operation	Keys/Shortcut	Description
		You can collect log information from the chassis and from the client computer and wrap it into a comclicked (.zip) file named ixoslogs- YYYYMMDDHHMM.zip. See Collect Diagnostic Logs.
Properties		Allows the properties for a port to be adjusted. For a full explanation of the port properties that may be modified, • Port Properties — 10/100/1000 Ethernet Family

Icon Colors

NOTE Port icons for Power over Ethernet (PoE) ports are different than regular port icons. *PoE Port Icons* and Appendix 3, PoE Port Icons for more information.

Port icons appear in the Resources window, and can alert you to different port states. The icon associated with each port varies in color with the state of the port, as described in *Table: Port Icon Color Codes*.

Table: Port Icon Color Codes

Color	Description
Red	Link is down on port.
Green	Link is up on port.
Yellow	Link is in loopback mode.
Gray	Link is unavailable because is it busy or is an unsupported port type.
Blue	Link is in OAM loopback mode and traffic is paused.

In addition, the port icon varies according the type of activity occurring on the port during testing, as described in *Table: Port Icons*.

Table: Port Icons

Icon	Description
	Port capture is progress; the trigger has been matched and the buffer is not yet full.
	The port is transmitting.
	The port is both transmitting and capturing.
	The port is in echo mode. For more information about echo mode,Echo.

PoE Port Icons

PoE port icons look slightly different than regular port icons. They also do not signal transmission or capture. *Table: PoE Port Icon Colors* below shows PoE port icons and what their colors signify.

Table: PoE Port Icon Colors

Icon Color	Description
	Green—port is tested and calibrated, and ready to emulate a Powered Device (PD).
	Gray—port is the middle of the testing/calibration process.
	Red—port has failed one or more of the calibration tests. It will not accept Power Sourcing Equipment (PSE) input.

Testing statistics can be viewed in the IxServer main window. For more information on the IxServer main window, see the *IxServer User Guide*.

PoE ports can be retested or recalibrated using the *Card Properties* dialog box. For more information on the *Card Properties* dialog box, Card Properties.

Port Detail Data

The Port Details list for a port selected in the Resources tree has elements that allow further programming of the port's operation, as shown in *Image::Detail Data for Port* and described in *Table: Detail Data for Port* .

Any of these details may be changed while the element is selected in the Tree view, or in the Details view in the right-hand panel.

Table: Detail Data for Port

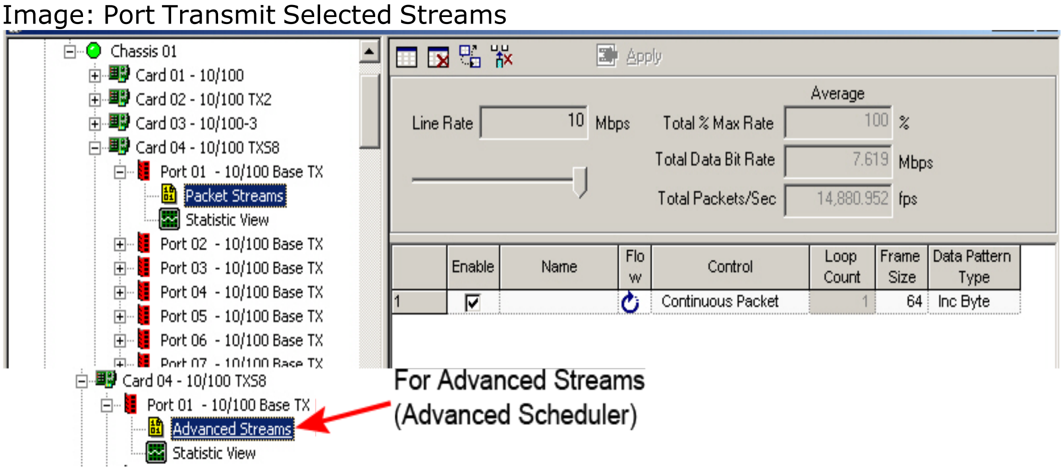
Name	Description
Capture View	Shows data for data captured on the port. See Capture View for full details.
IxRouter	Shows the IxRouter window that allows the configuration of the Protocol Server that controls IP/ARP addressing, BGP, OSPF, ISIS, RSVP, RIP, RIPng, IGMP, PIM-SM, and so forth, testing. Refer to the *IxNetwork User Guide* for additional information.
Statistic View	Shows statistics for captured data for the port.Statistic View for details.
Filters, Statistics, Receive Mode	Shows a dialog box which allows programming of the criteria for data capture, filtering, statistics gathering and asynchronous stream activation. See Filter Properties for full details.
Packet Streams orPacket Flows or Advanced Streams	Shows a dialog box which allows programming of packet contents and stream formation. See Stream and Flow Control and Frame Data Structure for details.

Name	Description
Port Properties	Allows the properties for a port to be adjusted. For a full explanation of the port properties that may be modified, see Port Properties — 10/100/1000 Ethernet Family.
BERT	Only for BERT-capable modules in BERT mode. Shows the BERT configuration dialog box.
VSR Statistics	Only for VSR-capable modules. Shows the *VSR Statistics* dialog box.

Special Streams Operations

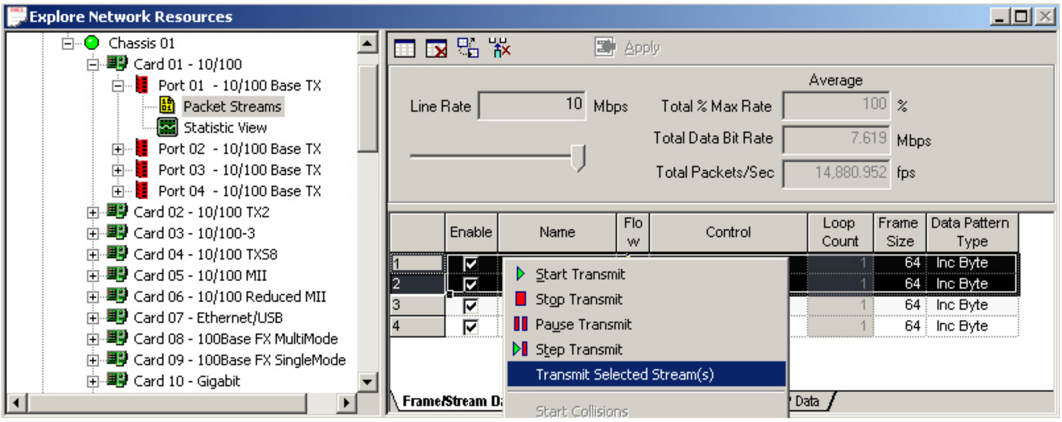
As shown in *Image: Port Transmit Selected Streams*, Packet Streams (or Packet Flows or Advanced Streams depending on the configuration of the port) and Statistic View are shown below the Port Level in the tree. If Packet Streams/Flows is selected, then the detail data for the port shows the defined streams/flows for the port. From this view, a number of operations related to streams/flows are possible (Stream and Flow Control.)

Image: Port Transmit Selected Streams



One particular operation is particularly valuable—the ability to execute a selected subset of streams/flows. To perform this operation, select the streams/flows in the table, and then use the *Transmit Selected Stream(s)* pop-up menu option. The normal application of streams is interrupted, and each of the selected streams/flows is applied once. This is illustrated in *Image: Transmit Selected Stream(s)*.

Image: Transmit Selected Stream(s)



In addition, the detail data for the port shows an editable spreadsheet for the actual transmitted data. This data may be edited from this view, as described in Stream Editing.

NOTE	Transmit Selected Streams: Do not use the configured frame rate. Do not obey continuous transmission settings. Do not enable the transmit arrow on the port icon. This function is intended for debug purposes during port configuration development.

Port Copying Operation

A number of the features of a port may be copied to any number of other ports. The Port Copy Wizard consists of four screens which are presented here to demonstrate the entire port copying operation. The Port Copy Wizard is accessed by selecting a port and selecting *Copy* from the menu.

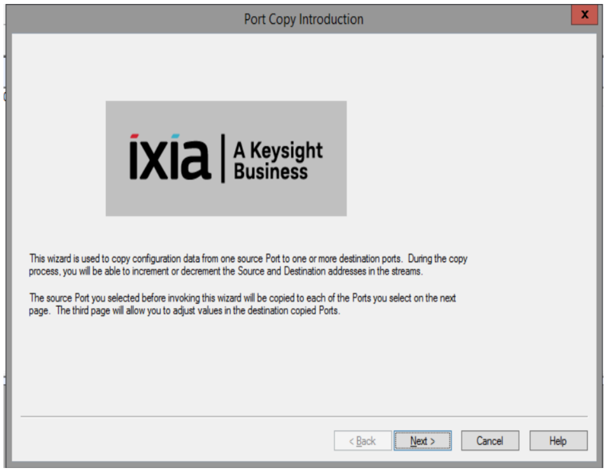
The four dialog boxes in the wizard are:

- Port Copying Introduction dialog box—Introductory instructions.
- Port Copy Select Port dialog box—Selects the ports to copy to.
- Port Copy Options dialog box—Selects the features of the port to copy.
- DA/SA Port Copy Address Adjustment dialog box—An optional dialog box that allows DA/SA dynamic adjustments.

Port Copy Introduction dialog box

When invoked with a single port selected, the Port Copy operation starts by showing a *Port Copy Introduction* screen, shown in *Image: Port Copy Wizard Introductory Screen*.

Image: Port Copy Wizard Introductory Screen

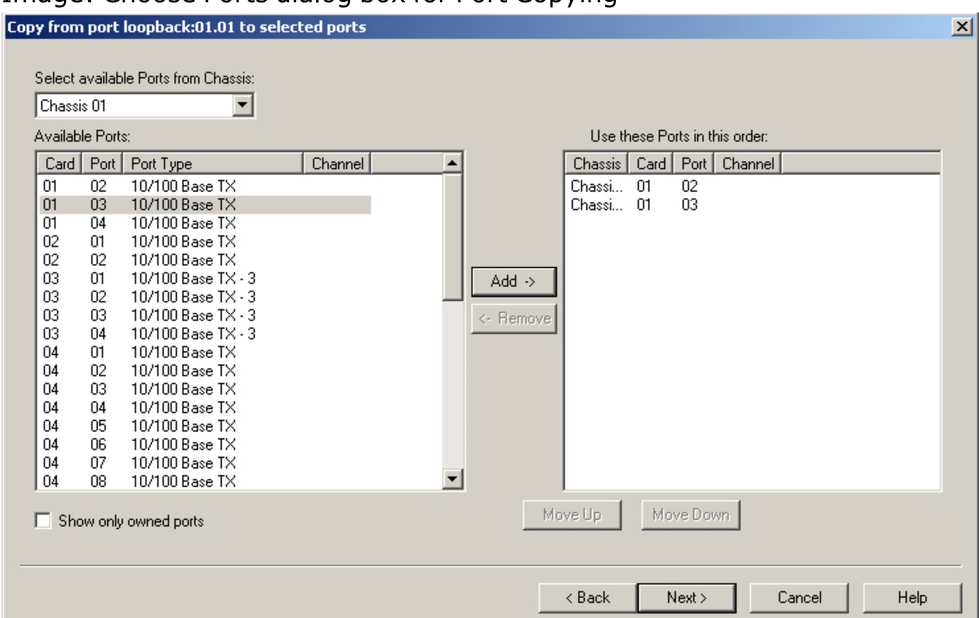


When the *Next* > button is clicked, a chooser dialog box is presented with a list of ports of the same type as the original port. [Port Copy Select Port dialog box](#)

Port Copy Select Port dialog box

The *Select Port* dialog box is a 'chooser' dialog box with a list of ports of the same type as the original port. On the left side of the window, highlight the desired ports using either the shift-select or control-select methods, and then select the *Add* button to place them in a list on the right side of the window. This dialog box is shown in *Image: Choose Ports dialog box for Port Copying*.

Image: Choose Ports dialog box for Port Copying

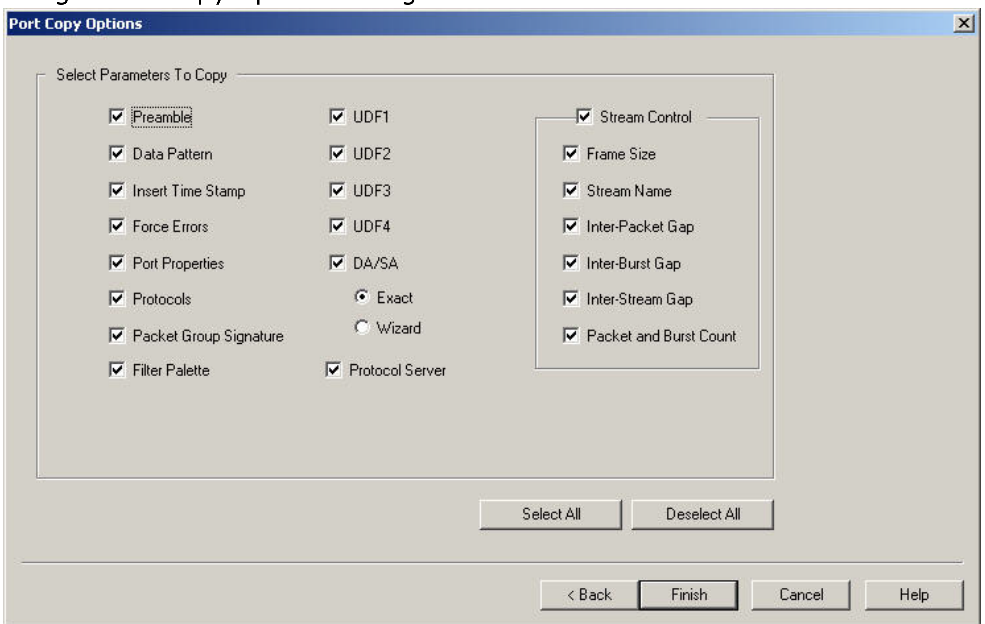


When the *Next* > button is selected, the [Port Copy Options dialog box](#) *is presented allowing the selection of which features of the port are to be copied.*

Port Copy Options dialog box

The *Port Copy Options* dialog box allows the selection of which features of the port are to be copied. This dialog box is shown in *Image: Port Copy Options dialog box*.

Image: Port Copy Options dialog box



The options available in this dialog box are described in *Table: Port Copy Options dialog box*.

Table: Port Copy Options dialog box

Option	Description
Preamble	If selected, the Preamble settings from the port's *Frame Data* dialog box are copied.
Data Pattern	If selected, the Data Pattern settings from the port's *Frame Data* dialog box are copied.
Insert Time Stamp	If selected, the Insert settings from the port's *Frame Data* dialog box are copied.
Force Errors	If selected, the Force Errors settings from the port's *Frame Data* dialog box are copied.
Port Properties	If selected, the Port's Properties are copied.
Protocols	If selected, the Protocols settings from the port's *Frame Data* dialog box are copied.
Packet Group Signature	If selected, the definition of the packet group signature from the *Frame Data* dialog box is copied.
Filter	If selected, the settings from the port's *Filter Properties* dialog box are copied.

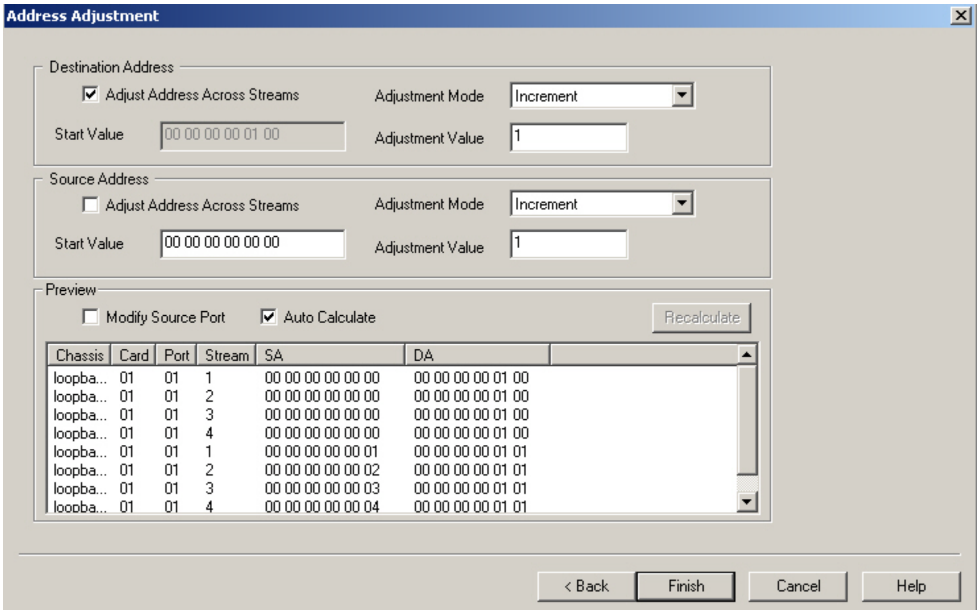
Option	Description
Palette	
UDF 1, 2, 3, 4	If selected, the UDF 1, 2, 3 or 4 settings from the port's *Frame Data* dialog box are copied.
DA/SA	If selected, the DA/SA settings from the port's *Frame Data* dialog box are copied. Two choices are available for setting DA/SA values: • **Exact**—The DA/SA values are copied exactly. • **Wizard**—A further wizard allows the DA and SA values to vary algorithmically; these are described below. If the DA/SA Wizard selection is made, then the [DA/SA Port Copy Address Adjustment dialog box] is presented.
Protocol Server	If selected, the settings from the *IxRouter* dialog box are copied.
Stream Control	If selected, the stream type selection from the port's *Stream Control* dialog box are copied along with other items not covered by the next six elements.
Frame Size	If selected, the Frame Size settings from the port's *Frame Data* dialog box are copied.
Stream Name	If selected, the Name settings from the port's *Stream Control* dialog box are copied.
Inter-Packet Gap	If selected, the Inter-Packet Gap settings from the port's *Stream Control* dialog box are copied.
Inter-Burst Gap	If selected, the Inter-Burst Gap settings from the port's *Stream Control* dialog box are copied.
Inter-Stream Gap	If selected, the Inter-Stream Gap settings from the port's *Stream Control* dialog box are copied.
Packet and Burst Count	If selected, the packet and burst counts from the port's *Stream Control* dialog box are copied.
Select All	If this button is used, all options are selected.
Deselect All	If this button is used, all options are cleared.

NOTE Port statistics and alert setup information is always copied, regardless of the selections made in this dialog box.

DA/SA Port Copy Address Adjustment dialog box

If the DA/SA Wizard is selected in the Port Copy Options dialog box, the DA/SA Port Copy *Address Adjustment* dialog box is shown in *Image: DA/SA Port Copying Wizard*.

Image: DA/SA Port Copying Wizard



This wizard allows Source and Destination Addresses to be modified so that an entire system may be tested based on the programming of a small number of ports. The DAs and SAs may be assigned across ports so that ports 'talk' to each other. Addresses associated with the source port (being copied from) are copied with modifications to all the destination ports (being copied to).

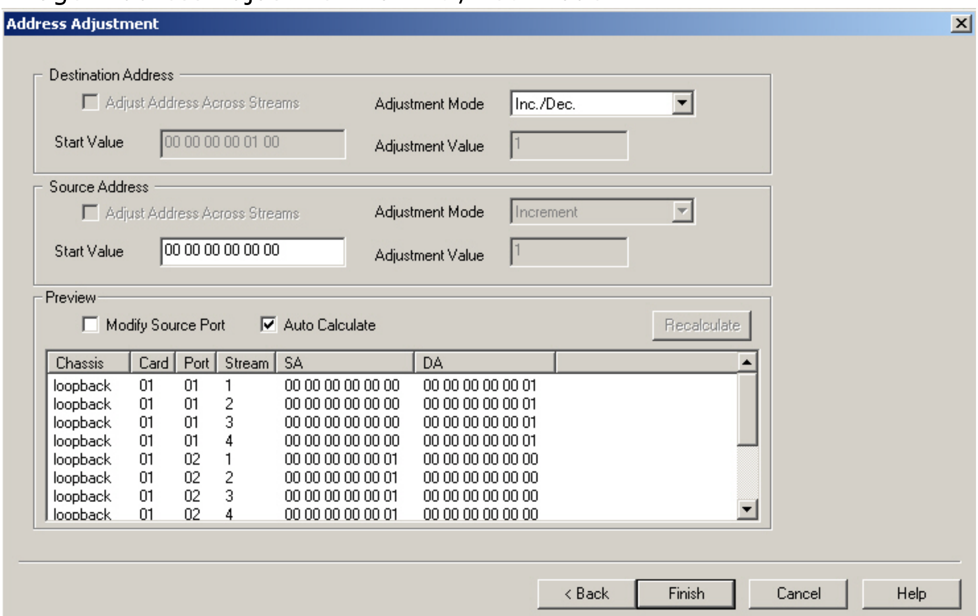
There are a number of copy modes that differ based on the values of the *Adjust Address Across Streams* setting in each dialog box. These modes are summarized in *Table: DA/SA Address Adjustment Modes*.

Table: DA/SA Address Adjustment Modes

Mode	**Usage without *Adjust Address Across Streams* (default)**	**Usage with *Adjust Address Across Streams***
Increment/Decrement	The Start Value is initially copied from the source port and may be user modified. This value is incremented/decremented by the Adjustment Value amount and assigned consecutively to each stream of each destination port, in order.	The Start Value is initially copied from the source port and cannot be modified. This value is incremented/decremented by the Adjustment Value amount and assigned consecutively to all streams of each destination port, in order.
Idle	The Start Value is initially copied from the source port and may be modified. This value is assigned to all streams of each destination port.	No difference.
Inc./Dec.	Modifies both the DA and SA values. See further explanation below.	No difference.

The Increment/Decrement mode manipulates both the SA and DA at the same time so that pairs of ports, including the source port, talk to each other. For example, in the image below, Card 1-Port 1 is being copied to Card 1 Port 2. Note in the Preview shown in *Image: Address Adjustment for Inc./Dec*. Mode how each pair of ports has each other's Source Address as their Destination address and vice versa.

Image: Address Adjustment for Inc./Dec. Mode



Note that the *Start Value* field for the Source Address shows the only variable address in this case, and that values all increment by one.

Three additional controls located within the Preview box are described in *Table: Port Copy Preview Controls*.

Table: Port Copy Preview Controls

Control	Description
Modify Source Port	If selected, the source port (being copied from) is modified at the same time as the destination ports, based on the Start Value.
Auto-Calculate	If selected, the values that appear in the Preview box are automatically updated as different selections are made.
Recalculate	If *Auto-Calculate* is cleared, this button is enabled. When selected, it updates the Preview box with correct values

Port Groups

Port Groups are collections of ports which may be used as a convenience in several places. The ports that are used in a port group may be drawn from any card in any chassis in any chassis chain. The position of the Port Groups in the tree is shown in *Image: Port Group Level of the Explore Network Resource Window*, along with the pop-up menu available by selecting the right mouse button.

Tree Operations

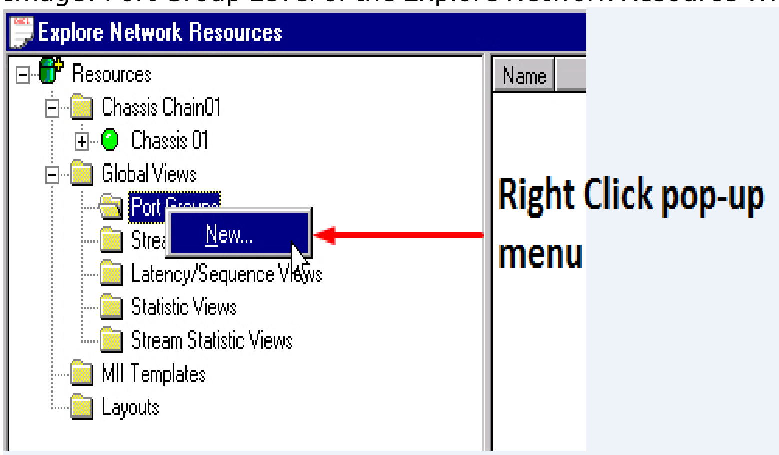
There are two sets of tree operations for Port Groups:

- Port Group top level (folder)—Allows for the creation of new Port Groups (Tree Operation for Port Group Folder).
- Port Group level—Used to manage existing Port Groups (Tree Operation for Port Groups).

Tree Operation for Port Group Folder

The tree operations for the Port Groups top level are accessed by selecting the Port Groups icon in the Tree view. The menu is shown in *Image: Port Group Level of the Explore Network Resource Window*.

Image: Port Group Level of the Explore Network Resource Window



The operations available at the Port Groups level of the tree are described in *Table: Port Groups Level Operations*.

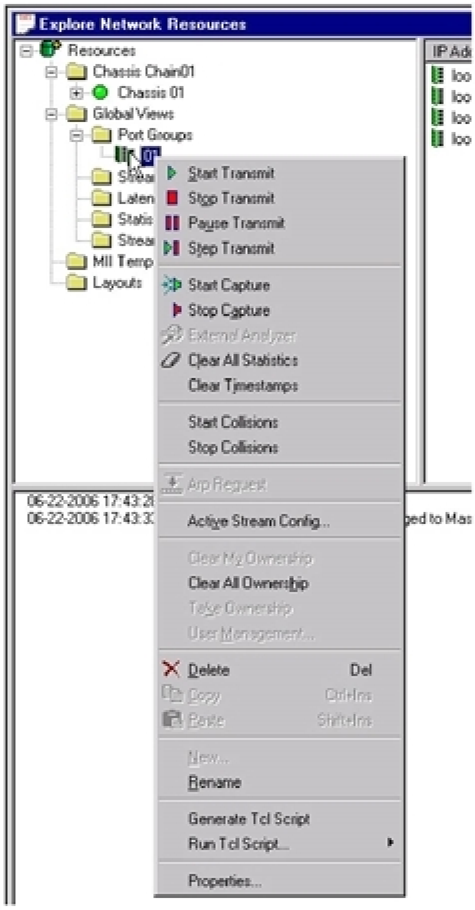
Table: Port Groups Level Operations

Operation	Keys/Shortcut	Description
New		Shows the *Select Port* dialog box, where available ports are selected to create a new Port Group. See Select Port dialog box for additional information. The name of the new port group is the next sequential number available. This may be renamed.

Tree Operation for Port Groups

The tree operations for individual Port Groups are accessed by selecting the Port Groups icon in the Tree view, then selecting a specific Port Group from a list of Port Groups. The menu is shown in *Image: Port Group Definition Level—Explore Network Resource Window*.

Image: Port Group Definition Level—Explore Network Resource Window



Port operations are performed on all ports in the selected port group. The operations available at the Port Groups level of the tree are described in the *Table: Port Group Level Operations*.

Table: Port Group Level Operations

Operation	Keys/Shortcut	Description
Expand/Contract tree	Double-click label, select ⊟ or ⊞	Expand or contract tree elements beneath the current level.
Start Transmit		Starts the transmission of data.
Stop Transmit		Stops the transmission of data.
Pause Transmit		Temporarily pauses the transmission of data. A ‘Start Transmit’ or ‘Step Transmit’ operation continues after a pause.
Step Transmit		After a pause, causes a single packet to be transmitted on all of the ports contained in the selected port group.
Start Capture		Starts data capture.

Operation	Keys/Shortcut	Description
Stop Capture		Stops data capture.
External Analyzer		Launches a third party packet analyzer. The type of analyzer launched is determined by the settings in the ***External Analyzer*** *tab*, as described in External Analyzer Option. This button is only active when the analyzer type is specified in ***External Analyzer*** tab.
Clear All Statistics		Clears all statistics. Refer to Statistics Operations for details.
Clear Timestamps		Clears the global time value used in time stamps which may be included in each frame. Refer to Instrumentation Box for details.
Start Collisions		Enables collision generation for received data, if programmed for the ports and enabled.
Stop Collisions		Stops collision generation.
Arp Request		Send an ARP packet requesting the addresses for the ports associated with the port group. The first IP address found in the stream for each port is used for the ARP request.
Active Stream Config		Allows one of several parameters to be varied across the ports in the port group.
Clear My Ownership		The current user's ownership for the ports associated with the port group is cleared.
Clear All Ownership		The ownership for the ports associated with the port group is cleared. A warning message may appear if a port is owned by another user.
Take Ownership		The current user's login is associated with the ports associated with the port group. A warning message may appear if the port is owned by another user.
Delete	 Del	Deletes the selected port group, after answering 'Yes' to a confirmation dialog box.
Rename Port Group		Enables editing of the port group name.
Generate Tcl Script		Activates the ScriptGen feature and allows for the generation of Tcl configuration script. ScriptGen for

Operation	Keys/Shortcut	Description
		details.
Run Tcl Script		Allows to run a Tcl script from a list of scripts. See Run Tcl Script... for more information.
Properties		Shows the *Select Port* dialog box which allows the selection/modification of which ports are members of the port group. See Select Port dialog box for additional information.

Port Group Detail Data

The Details view for the Port Groups level lists all of the user-defined port groups. If a specific Port Group is selected, then ports within the Port Group are listed.

For each port, the Details view shows the elements listed in *Table: Detail Data for Port Groups*.

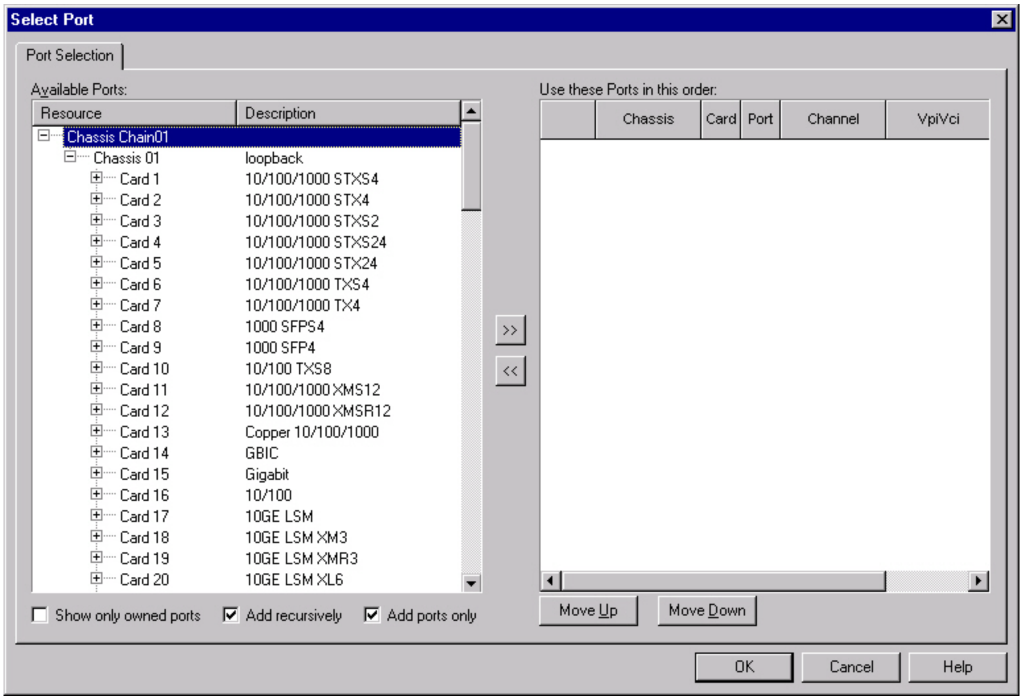
Table: Detail Data for Port Groups

Column	Description
IP Address	The IP address of the chassis where the port is located.
Chassis	The number of the chassis in the chassis chain where the port is located.
Card	The card number in the chassis where the port is located.
Port	The number of the port in the card.

Select Port dialog box

The *Select Port* dialog box is pictured in *Image: Select Port dialog box*. This dialog box allows ports to be assigned to a Port Group and Stream Group, as well as to Packet Group Statistic Views and Statistic Views. It is also used for selecting the source port for automatic Stream Generation.

Image: Select Port dialog box



The elements of this dialog box are described in *Table: Port Group Properties (Select Port) dialog box controls*.

Table: Port Group Properties (Select Port) dialog box controls

Element	Description
Available Ports	Shows the list of ports that are not currently members of the port group. For each port, the name of the chassis, card number, and port number appear. If applicable, Channel and VPI/VCI appear.
Use these Ports in this Order	Shows the list of ports that are currently selected for the port group. For each port, the name of the chassis, card number, and port number appear. If applicable, Channel and VPI/VCI appear.
Show only owned ports	If selected, only ports for which you have taken ownership appear in the *Available Ports* list.
Add recursively	The Add recursively check box enables the capability for adding groups of ports at one time. Select the Add recursively check box. Then select/highlight a higher level item in the list: Card (load module), Chassis, or Chassis Chain. Select the >> (Add) button, and all of the ports listed under that higher level item are added to the list of active ports in the right pane.
Add ports only	Selecting this check box limits the view to port information only.
Move Up	This button moves the selected port up one place in the port list order.
Move Down	This button moves the selected port down one place in the port list order.

Element	Description
>> (Add)	Select this button to add ports to the port group. Select one or more ports from the Available Ports list before selecting the *Add* button. Ports can also be added by double-clicking them.
<< (Remove)	Select this button to remove ports from the port group. Select one or more ports from the Use these Ports in this Order list before selecting the *Remove* button. Ports can also be removed by double-clicking them

Stream Groups

The Stream Groups view allows for grouping together streams in the chassis for group operation. The position of the Stream Groups view in the Resources tree, along with the pop-up menu that is available by selecting the right mouse button, is shown in *Image: Packet Group Statistic Views Level of the Explore Network Resource Window*.

Tree Operations

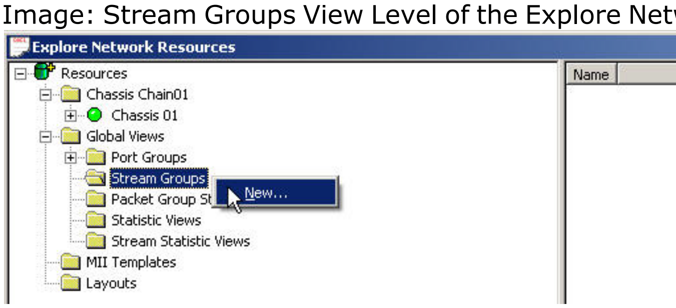
The tree operations of Stream Groups view are accessed by selecting the *Stream Groups* icon, as shown in *Image: Stream Groups View Level of the Explore Network Resource Window*.

There are two sets of tree operations for Stream Groups:

- Port Group top level (folder)—Allows for the creation of new Port Groups (Tree Operation for Stream Groups Folder).
- Port Group level—Used to manage existing Port Groups (Tree Operation for Stream Groups).

Tree Operation for Stream Groups Folder

Image: Stream Groups View Level of the Explore Network Resource Window



The operations available at the Stream Groups View level of the tree are described in *Table: Stream Group View Level Operations.*

Table: Stream Group View Level Operations

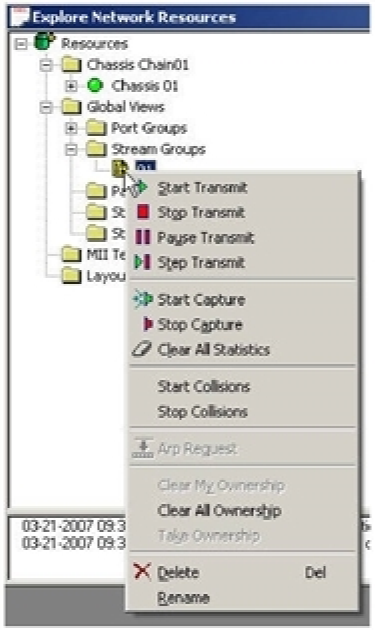
Operation	Keys/Shortcut	Description
New		Shows the *Select Port* dialog box, where available ports are selected to create a new Stream Group. See Select Port dialog box for additional information. Creates a new Stream Group with a name in the form 'NN', where NN is the next available

Operation	Keys/Shortcut	Description
		number.

Tree Operation for Stream Groups

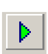
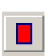
The tree operations for individual Stream Groups are accessed by selecting the Stream Groups icon in the Tree view, then selecting a specific Stream Group from a list of Stream Groups. The menu is shown in *Image: Stream Group Definition Level—Explore Network Resource Window*.

Image: Stream Group Definition Level—Explore Network Resource Window



Stream operations are performed on all streams in the selected stream group. The operations available at the Stream Groups level of the tree are described in the *Table: Stream Groups Level Operations*.

Table: Stream Groups Level Operations

Operation	Keys/Shortcut	Description
Start Transmit		Starts the transmission of data.
Stop Transmit		Stops the transmission of data.
Pause Transmit		Temporarily pauses the transmission of data. A 'Start Transmit' or 'Step Transmit' operation continues after a pause.
Step Transmit		After a pause, causes a single packet to be transmitted on all of the ports contained in the selected Stream Group.

Operation	Keys/Shortcut	Description
Start Capture		Starts data capture.
Stop Capture		Stops data capture.
Clear All Statistics		Clears all statistics. Refer to Statistics Operations for details.
Start Collisions		Enables collision generation for received data, if programmed for the ports and enabled.
Stop Collisions		Stops collision generation.
Arp Request		Send an ARP packet requesting the addresses for the ports associated with the Stream Group. The first IP address found in the stream for each port is used for the ARP request.
Clear My Ownership		The current user's ownership for the ports associated with the Stream Group is cleared.
Clear All Ownership		The ownership for the ports associated with the Stream Group is cleared. A warning message may appear if a port is owned by another user.
Take Ownership		The current user's login is associated with the ports associated with the Stream Group. A warning message may appear if the port is owned by another user.
Delete	 Del	Deletes the selected Stream Group, after answering 'Yes' to a confirmation dialog box.
Rename		Enables editing of the stream group name.

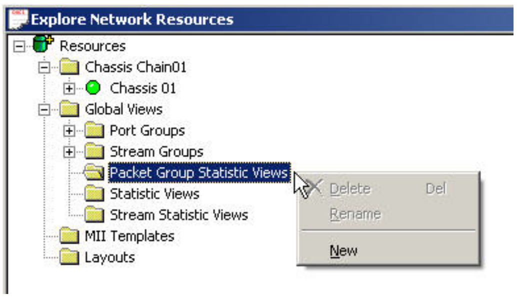
Packet Group Statistic Views

The Packet Group Statistic Views allows for the collection and analysis of latency data. For ports which support sequence checking based on user-defined thresholds, sequence checking data is also shown in this view. The position of the Packet Group Statistic Views in the Resources tree, along with the pop-up menu that is available by selecting the right mouse button, is shown in *Image: Packet Group Statistic Views Level of the Explore Network Resource Window*.

Tree Operations

The tree operations of Packet Group Statistic Views are accessed by selecting the *Packet Group Statistic Views* folder, as shown in *Image: Packet Group Statistic Views Level of the Explore Network Resource Window.*

Image: Packet Group Statistic Views Level of the Explore Network Resource Window



The operations available at the Packet Group Statistic Views level of the tree are described in *Table: Packet Group Statistic View Level Operations.*

Table: Packet Group Statistic View Level Operations

Operation	Keys/Shortcut	Description
Delete	 Del	Deletes an existing Packet Group Statistic View.
Rename		Allows editing of the name of the Packet Group Statistic View.
New		Shows the *Select Port* dialog box, where available ports are selected to create a new Packet Group Statistic View. Select Port dialog box for additional information. Creates a new Packet Group Statistic View with a name in the form 'NN', where NN is the next available number.

Packet Group Statistic Detail Data

The details pane for a Packet Group Statistic View shows a list of Packet Group Statistic View groups with the details described in *Table: Detail Data for Packet Group Statistic View*, as shown in.

Table: Detail Data for Packet Group Statistic View

Name	Usage
Name	The name of the Packet Group Statistic View.
Number of Ports	The number of ports in the Packet Group Statistic View.
File Name	The file associated with the packet group where settings are kept. These are stored in the directory *Latency Views* beneath the directory where IxExplorer was installed.
Last Modified	The date and time that the Packet Group Statistic View settings or data was last modified.

Statistic Views

The Statistic Views allow you to view the statistics for a set of ports. The ports that are used in a Statistic View may be drawn from any card in any chassis in any chassis chain. The position of the ports in the tree is shown in *Image: Statistic Views Level of the Explore Network Resource Window*, along with the pop-up menu available by selecting the right mouse button.

Tree Operations

Accessing the tree operations for Statistic Views is done by selecting the *Statistic View* icon in the Tree view, as shown in *Image: Statistic Views Level of the Explore Network Resource Window*.

Image: Statistic Views Level of the Explore Network Resource Window

The operations available at the Statistic Views level of the tree are described in *Table: Statistic Views Level Operations*.

Table: Statistic Views Level Operations

Operation	Keys/Shortcut	Description
Delete	 Del	Deletes an existing Statistic View.
Rename		Change the name of a Statistic View.
New		Shows the *Select Port* dialog box, where available ports are selected to create a new Statistic View. Select Port dialog box for additional information. Creates a new Statistic View with a name of the form 'NN', where NN is the next available number.

Detail Data

The details pane for a Statistic View shows a list of Statistic View groups. The column headings are described in *Table: Detail Data for Statistic View*.

Table: Detail Data for Statistic View

Columns	Description
Name	The name of the Statistic View group.

Columns	Description
Number of Stats	The number of statistics that appear in the view.
Number of Ports	The number of ports in the Statistic View group.

Properties associated with the Statistic Views are associated with *Options*.

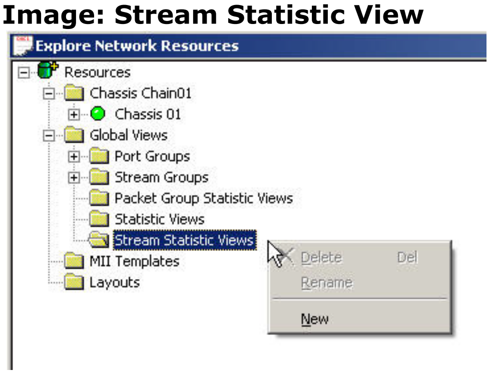
Stream Statistic Views

The Stream Statistic View allows to view statistics for a particular stream. The streams that are used in a Stream Statistic View may be drawn from any port and card in any chassis in any chassis chain. The position of the ports in the tree is shown in *Image: Stream Statistic View*, along with the pop-up menu available by selecting the right mouse button.

Tree Operation

The Tree operations for Stream Statistic Views are accessed by selecting the *Stream Statistic View* icon in the Tree view, as shown in *Image: Stream Statistic View*.

Image: Stream Statistic View



The operations available at the Stream Statistic Views level of the tree are described in *Table: Stream Statistic Views Level Operations*.

Table: Stream Statistic Views Level Operations

Operation	Keys/Shortcut	Description
Delete	 Del	Deletes an existing Stream Statistic View.
Rename		Change the name of a Stream Statistic View.
New		Shows the *Select Port* dialog box, where available ports are selected to create a new Stream Statistic View.Select Port dialog box for additional information. Creates a new Stream Statistic View with a name of the form NN, where NN is the next available number.

Detail Data

The details pane for a Stream Statistic View shows a list of Stream Statistic View groups.

Properties associated with the Stream Statistic Views can be controlled with *Options*.

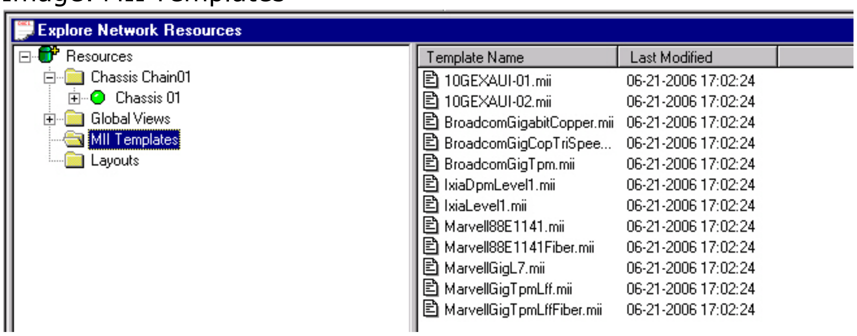
Stream Statistic Views are described in detail in Stream Statistic Views.

MII Templates

The MII template files control the correspondence between ports and Media Independent Interface (MII) register values. The creation and editing of MII templates is described in MII Register Files.

The MII template files control is shown in *Image: MII Templates*.

Image: MII Templates



Detail Data

The elements shown in the details pane of the MII Template are described in *Table: MII Template Details View*.

Table: MII Template Details View

Columns	Description
Template Name	Shows the MII Template file name.
Last Modified	Shows the date on which the file was last modified.

Layouts

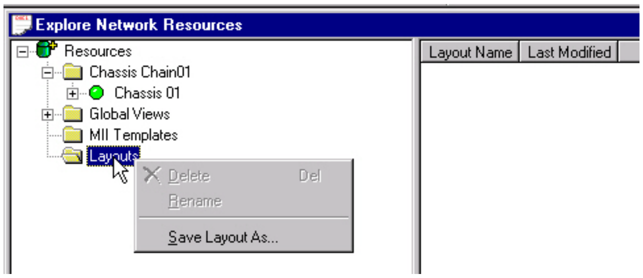
The Layouts folder allows to save and store IxExplorer view formats for future retrieval. A layout can be saved as a *.lay* file and then recalled by double-clicking the file.

For example, you save a layout where the Statistic Views, Packet GroupViews, and MII Templates are all open in the GUI as `layout1.lay`. Normally when IxExplorer is shutdown and reopened, you have to manually open all of these views. With a *.lay* file, select the file and all of the previously open views are automatically reopened.

Tree Operation

The Tree operations of Layouts are accessed by selecting the *Layouts* icon in the Tree view, as shown in *Image: Layouts View*.

Image: Layouts View



The operations available at the Statistic Views level of the tree are described in *Table: Layouts Level Operations*.

Table: Layouts Level Operations

Operation	Keys/Shortcut	Description
Delete	 Delete	Deletes an existing Layout View.
Rename		Change the name of a Layout View.
Save Layout As...		Save a layout with a specific name. This saved layout appears in the right window of the dialog box.

Data Detail

The elements in the details pane, as shown in *Table: Detail Data for Statistic View*, are described in *Table: Detail Data for Layout View*.

Table: Detail Data for Layout View

Columns	Description
Layout Name	The name of the Layout View.
Last modified	The date of the last modification to this Layout View.

Tools Menu Functions

The Tools menu functions provide access to various chassis controls and global features. The following is a list of the operations in the Tools menu:

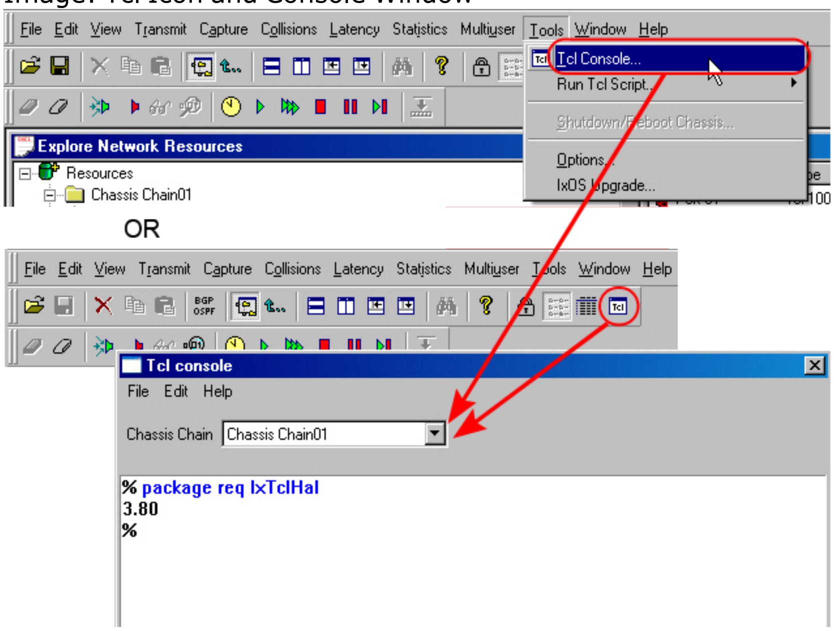
- Tcl Consol—Allows for the creation of Tcl scripts.
- Run Tcl Script...—Allows for the implementation of existing Tcl scripts.

- Chassis Shutdown/Reboot dialog box—Shuts down the chassis.
- Options—Opens the *IxExplorer Options* dialog box.
- IxOS Upgrade—Starts the IxOS remote client upgrade process.

Tcl Console

The Tcl console allows to create a Tcl script. The Tcl console is opened by selecting *Tools > TclConsole* in the menu options, or by selecting the *Tcl* icon ( ) in the toolbar. Both are shown in *Image: Tcl Icon and Console Window*.

Image: Tcl Icon and Console Window



Tcl applications can now be entered into the window and applied to a selected Chassis Chain (from a pull-down list). For information on Tcl and Ixia Tcl applications, see the **Ixia Tcl Development Guide**.

Previously created Tcl applications can also be edited or run using the *File > Source...* menu options in the Tcl window.

NOTE	When sourcing a script from the Tcl Console to a file, if the Exit command is used in the script, it shuts down IxExplorer.

Run Tcl Script

The *Run Tcl Scrip* option allows to select a Tcl script from a list of scripts. Tcl scripts can be used to perform operations that would otherwise be difficult or tedious to do manually.

Ixia provides a number of scripts that can be used on the chassis, card, or port level. This feature can be accessed in one of two ways:

- By selecting a chassis, card, or port in the resources window, then selecting the *Run Tcl Script* menu option, or
- By selecting *Run Tcl Script* from the *Tools* menu.

The available scripts are shown in another pop-up menu. The scripts in this list are stored in the directory *C:\Program Files\Ixia\TclScripts\IxExplorer\ Macros\Port*. Scripts that are added to this directory appear when selecting the *Run Tcl Script* option.

The *Run Tcl Script* menu option is shown in *Image: Run Tcl Script Option*.

Image: Run Tcl Script Option

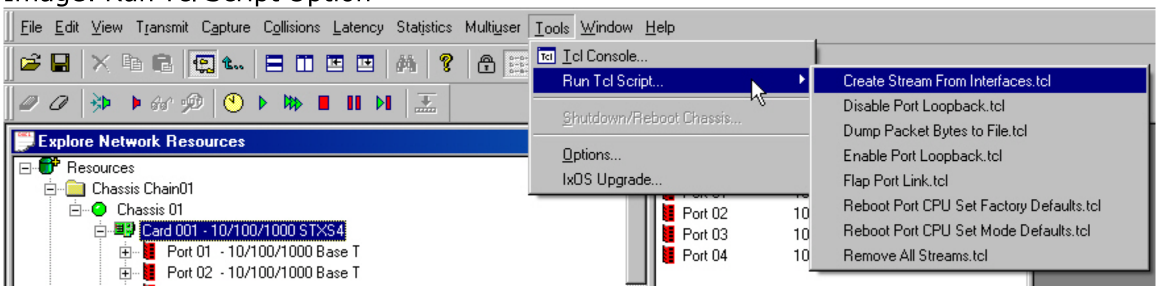


Table: Ixia Resource Tcl Scripts lists the Ixia provided scripts, and describes their functions. Users can create their own scripts and add them to the directory for use.

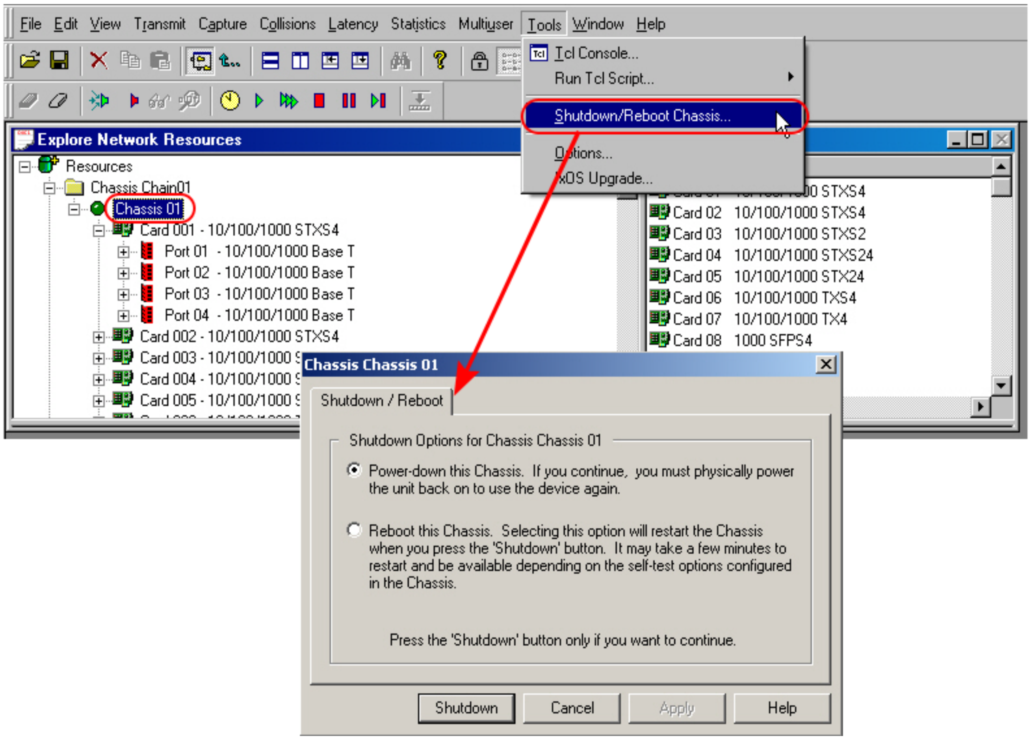
Table: Ixia Resource Tcl Scripts

Script	Description
Create Stream from Interfaces.tcl	Running this script creates a stream from a previously configured interface file on the selected port or ports.
Disable Port Loopback.tcl	Running this script takes the port or ports out of loopback mode.
Dump Packet Bytes to File.tcl	Running this script dumps the packet content info to a text file for the selected port streams.
Enable Port Loopback.tcl	Running this script puts the port or ports into loopback mode.
Flap Port Link.tcl	Running this script sends the selected port or ports into diagnostic loopback mode, then returns it to operational status.
Reboot Port CPU Set Factory Defaults.tcl	Running this script restarts the CPU on the selected port or ports, and resets the factory defaults as described in *Table: Port Level Operations*.
Reboot Port CPU Set Mode Defaults.tcl	Running this script restarts the CPU on the selected port or ports, and resets the mode defaults as described in *Table: Port Level Operations*.
Remove All Streams.tcl	Running this script removes all created streams for the selected port or ports.

Chassis Shutdown/Reboot dialog box

When a Chassis is selected/highlighted in the Resources window, the *Shutdown/Reboot Chassis...* option is available in the *Tools* submenu, as shown in *Image: Shutdown/Reboot Chassis dialog box*.

Image: Shutdown/Reboot Chassis dialog box



The choices in this dialog box are described in *Image: **Display Format** Tab*.

Table: Shutdown/Reboot Chassis dialog box

Section	Control	Description
Shutdown Options for Chassis *Chassis name*	Power-down this Chassis.	If selected, the unit must be physically powered back on to use the device again. Selecting this option turn off the Chassis when the *Shutdown* button is selected.
	Reboot this Chassis.	Selecting this option restarts the Chassis when the *Shutdown* button is selected. It may take a few minutes to restart and be available depending on the self-test options configured in the Chassis.
	Shutdown	Select the *Shutdown* button ONLY to continue with the shutdown or restart of the Chassis.
	Cancel	Select the *Cancel* button to close this dialog box without shutting down or restarting the Chassis.

Options

The global Options properties are available from the main IxExplorer menu bar, *Tools > Options* dialog box, which allows for the configuration of certain GUI general parameters. The **Options** dialog box consists of several tabs:

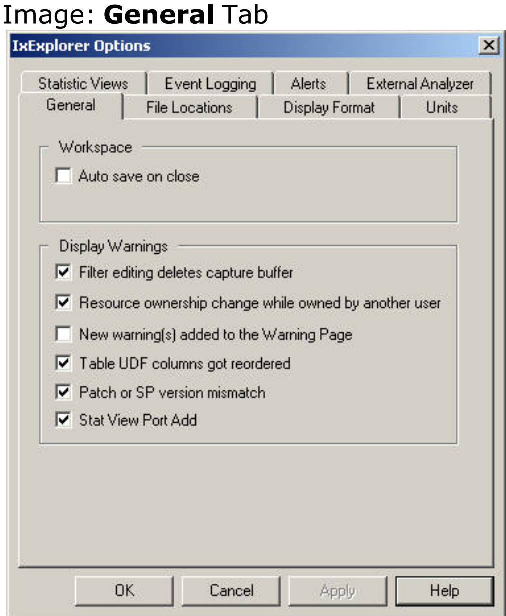
- General—Controls some of the global settings.
- Display Format—Controls the manner in which the information appears.
- Units—Controls what units are used when showing transmit and receive bits.
- Statistic Views—Controls the way Statistic Views appear.
- Event Logging—Controls the logging of events and errors.
- Alerts—Controls the handling of audible and visual alerts.
- External Analyzer Option—For exporting captured data to a 'sniffer' or other external analyzer program.

General

The **General** tab controls some global IxExplorer GUI settings, such as configuration save options and show warnings. The tab is accessed by selecting *Tools > Options* in the menu bar to open the *IxExplorer Options* dialog box, then selecting the **General** tab (this is the default view tab).

The **General** tab of the *IxExplorer Options* dialog box is shown in *Image: **General** Tab*.

Image: **General** Tab



The fields and controls in this tab are described in *Table: General Properties*.

Table: General Properties

Field/Control	Description
Auto save on close	Causes the current workspace to be saved every time IxExplorer is exited.
Filter editing deletes capture buffer	Causes a warning to appear when any of the filtering (trigger or filter) properties are edited, indicating that the capture buffer is to be erased.
Resource ownership	Causes a warning to appear when the ownership of a port not owned

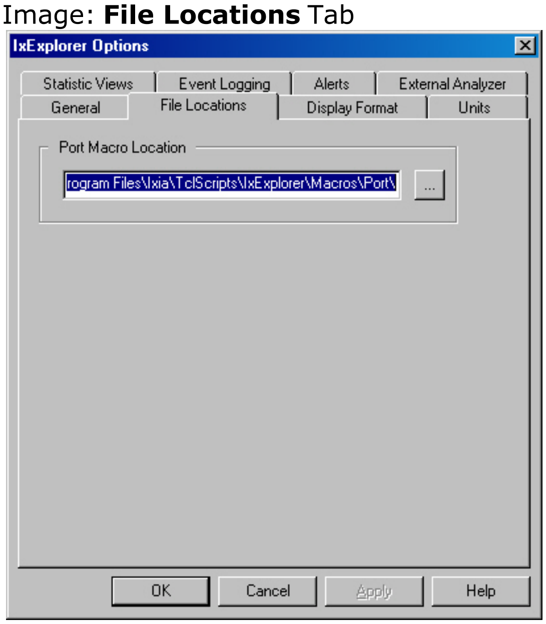
Field/Control	Description
change while owned by another user	by the current user is changed.
New warnings added to the Warning Page	Causes a warning when a message has been added to the Warnings/Information page of the *Stream Properties* dialog box.
Table UDF columns got reordered	Causes a warning if the Table UDF columns have been reordered.
Patch or SP version mismatch	Causes a warning when their is a mismatch between the version or service pack of IxServer and IxExplorer.
Stat View Port Add	Shows a warning about deletion of existing user defined columns when a port is added in Statistic View.

File Locations

The **File Locations** tab sets the default location for port macros. The tab is accessed by selecting *Tools > Options* in the menu bar to open the *IxExplorer Options* dialog box, then selecting the ***File Locations*** tab.

The ***File Locations*** tab in the *IxExplorer Options* dialog box is shown *Image:* ***File Locations*** *Tab*.

Image: **File Locations** Tab



The fields and controls in this tab are described in *Table: File Locations Properties*.

Table: File Locations Properties

Field/Control	Description
Port Macro Location	A path to the directory where the port macros are kept. Use the browse 

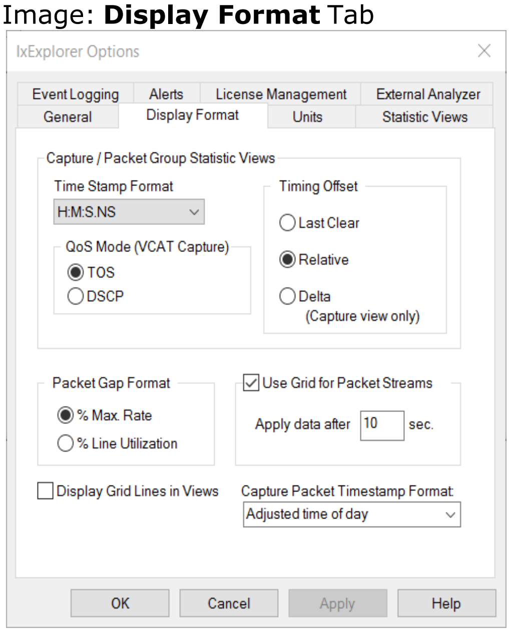
Field/Control	Description
	button to select a new directory.

Display Format

The ***Display Format*** tab controls the look of the GUI for various functions such as Capture and Packet Group Statistic Views. The tab is accessed by selecting *Tools > Options* in the menu bar to open the *IxExplorer Options* dialog box, then selecting the ***Display Format*** tab.

The **Display Format** tab of the *IxExplorer Options* dialog box is shown in *Image: **Display Format** Tab*

Image: **Display Format** Tab



The fields and controls in this tab are described in *Table: Display Format Properties*. When captured data is shown, the selections control the manner in which the information appears.

Table: Display Format Properties

Field/Control	Description
Time Stamp Format	This choice controls the general format of time values that are shown. The choices are: • H:M:S.NS—hours:minutes:seconds:nanoseconds. • H:M:S:MS:US:NS—hours:minutes:seconds:milliseconds:microseconds:nanoseconds. • S.NS—seconds:nanoseconds. • Raw—exclicked as multiples of the basic system clock. Note: If Raw format is selected, then only the Timing Offset *Last Clear* option is enabled.
Timing Offset	This choice controls which type of time value appears. The choices are:

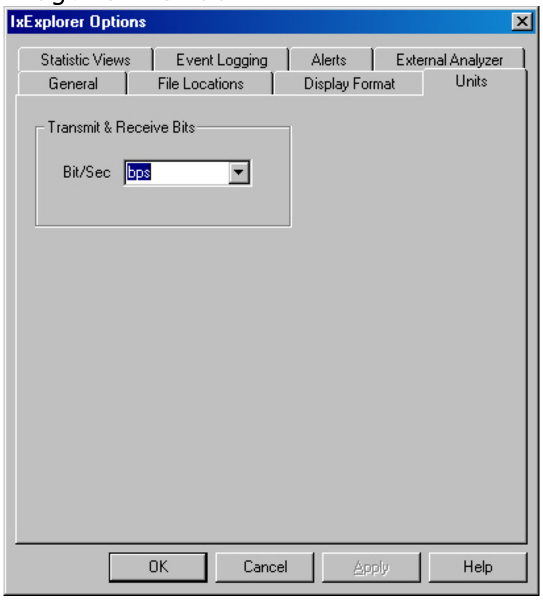
Field/Control	Description
	• Last Clear—This option shows the time since the last clearing of timestamps. Note: This is the only enabled option if *Raw* format is selected. • Relative—The time is shown relative to the beginning of first capture. The first capture appears as 0 and the last capture as *last capture* minus *first capture*. (Disabled if *Raw* format is selected.) • Delta—The time is shown relative to the immediately preceding timestamp. The timestamp of the most recent capture minus the timestamp of the immediately preceding capture. (Disabled if *Raw* format is selected.) NOTE Delta option is not supported in Latency Stat View.
QoS Mode (VCAT Capture)	The mode Quality of Service mode employed on captured packets. Select the option button for the desired type, either Type of Service (ToS), or Differentiated Services Code Point (DSCP) value.
Packet Gap Format	This option controls the manner in which Inter-Packet Gaps are programmed. The two choices are: • % Max Rate—The percentage of the maximum rate obtainable. From 1 to 100%. • % Line Utilization—The maximum line utilization, considering overhead periods and bytes. The percentage is always lower than 100% due to these overheads.
Use Grid for Packet Streams	When packet streams/flows/advanced streams are shown in the right hand IxExplorer panel, a spreadsheet (grid) representation is used. This allows for interactive stream and flow editing using spreadsheet manipulation techniques.See Stream Editing.
Apply data after ____ sec	This option controls the amount of delay time for changes in the Stream Editing grid to be applied. The default is 10 seconds.
Display Grid Lines in Views	Causes grid lines to appear in the Details view of the main window.
Capture Packet Timestamp Format	Select the time stamp format for the capture packet. Following are the available formats: • Adjusted time of day: Time stamp of the capture is adjusted to the time of the day. • Raw: Absolute value of a time stamp and its nanosecond precision shown in hexadecimal.

Units

The **Units** tab page in the *IxExplorer Options* dialog box is used to control the type of units being measured when setting the rate control. The rate control is set on the **Stream Control** tab page. For more information on stream control, Stream and Flow Control. The tab is accessed by selecting *Tools > Options* in the menu bar to open the *IxExplorer Options* dialog box, then selecting the ***Units*** tab.

The **Units** tab page is shown in *Image: **Units** Tab*.

Image: **Units** Tab



The *Bit/Sec* menu in the Transmit & Receive Bits section allows the selection of one of the following rates:

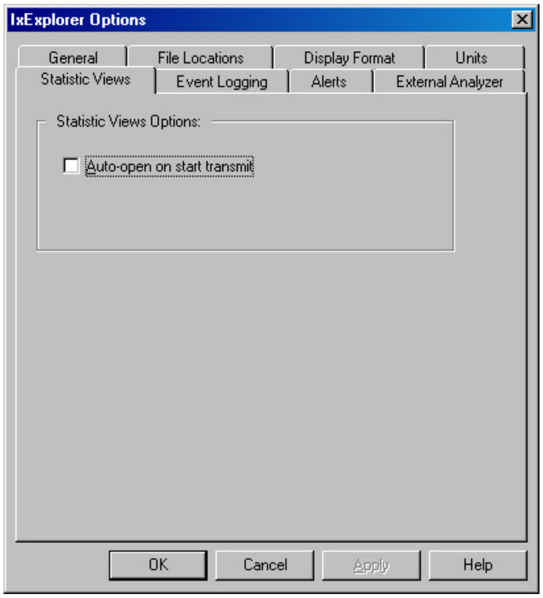
- bps—bits per second.
- Kbps—Kilobits per second.
- Mbps—Megabits per second.
- Gbps—Gigabits per second.

Statistic Views

The ***Statistic Views*** tab sets the default behavior of Statistic Views. The tab is accessed by selecting *Tools > Options* in the menu bar to open the *IxExplorer Options* dialog box, then selecting the ***Statistic Views*** tab.

The **Statistic Views** tab in the *IxExplorer Options* dialog box is shown in *Image: **Statistic Views** Tab*.

Image: **Statistic Views** Tab



The fields and controls in this tab are described in *Table: Statistic Views Properties*.

Table: Statistic Views Properties

Field/Control	Description
Auto open on start transmit	If this option is selected, then a Statistic View which contains all of the transmitting ports appears when a start transmit operation is applied. It uses or creates a Statistic View which is named based on the means by which the transmission is started. The format is <chassis>:CC:PP, where <chassis> is the IP address or name of the chassis, CC is the card number and PP is the port number. PP is '00' if an entire card or chassis is used. CC is '00' if an entire chassis is used.

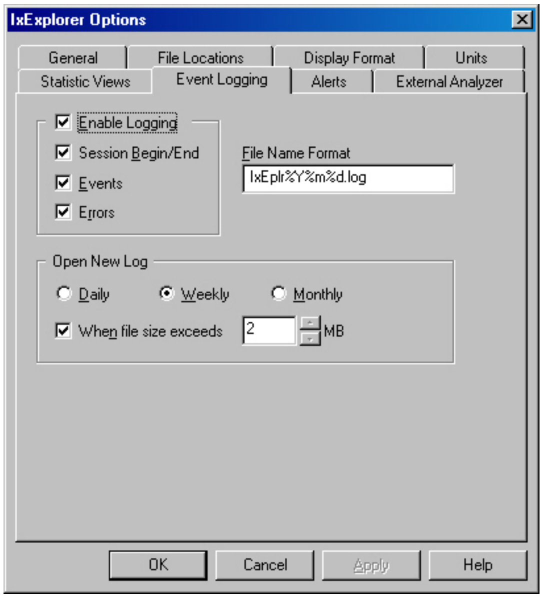
Event Logging

The **Event Logging** tab controls the behavior of logging functions in IxExplorer. The tab is accessed by selecting *Tools > Options* in the menu bar to open the *IxExplorer Options* dialog box, then selecting the ***Event Logging*** tab.

The **Event Logging** tab in the *IxExplorer Options* dialog box is shown in *Image: **Event Logging** Tab*.

NOTE: Event log files are also created when you switch from one IxOS version to another (in a multi-version environment).

Image: **Event Logging** Tab



The fields and controls in this tab are described in *Table: Event Logging Properties*.

Table: Event Logging Properties

Section	Field/Control	Description
Enable Logging		This check box must be selected for any event to be logged.
	Session Begin/End	If selected, the time period for each use of IxExplorer is logged.
	Events	If selected, enables logging of events.
	Errors	If selected, enables logging of errors.
File Name Format		Indicates the name under which the various log files are kept. The event files are logged into the same directory in which the Ixia IxExplorer was loaded (usually c:\Program Files\Ixia\IxOS\version X). The name may contain any of the following character sequences, which are substituted with actual values when each log file is created: • %Y: The four digit year number (for example, *2002)*. • %m: The two digit month number. For example, *01* for January. • %d: The two digit day number within the month. • %a: The abbreviated weekday name. • %A: The full weekday name. • %b: The abbreviated month name. • %B: The full month name.

Section	Field/Control	Description
		• %c: The date and time appropriate for the locale. • %H: The hour in 24-hour format. • %I: The hour in 12-hour format. • %j: The day of the year as a decimal number. • %M: The minute as a decimal number. • %p: The AM/PM indicator. • %S: The second as a decimal number. • %U: The week of the year as a decimal number. • %w: The weekday as a decimal number. • %W: The week of the year as a decimal number • %x: The date representation for the current locale • %y: The two digit year number (for example, *99).* • %z,%Z: The time-zone name or abbreviation. • %%: The percent sign.
Open New Log	Daily/Weekly/Monthly	A new log is started on a daily, weekly or monthly basis, depending on the selection.
	When file size exceeds _ _ MB	If this is selected, a new log is also started when the size of a log file exceeds a specified size.

Alerts

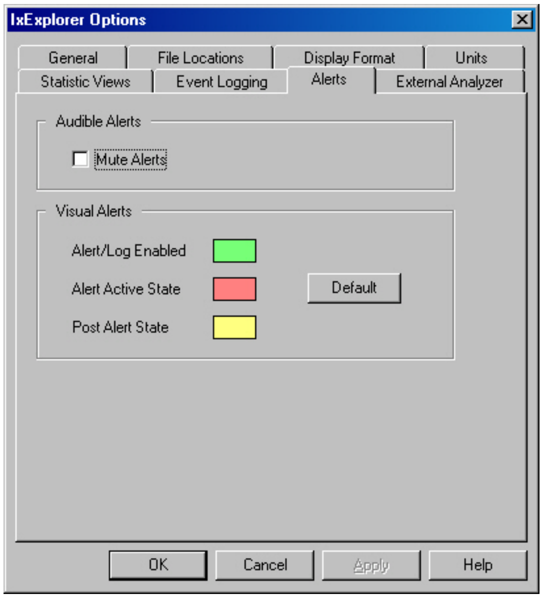
The **Alerts** tab in the *IxExplorer Options* dialog box controls the handling of audible and visual alerts as a whole. The tab is accessed by selecting *Tools > Options* in the menu bar to open the *IxExplorer Options* dialog box, then selecting the ***Alerts*** tab.

By default, audible alerts are broadcast through the Windows software ('Exclamation' sound) when Logging and Alerts has been enabled on a port, and there is an error (red) condition for a Statistics parameter. The volume setting can be modified by going to the *Windows Start > Settings > Control Panel > Sounds and Multimedia > Sounds*, and moving the slider bar. If this modification is not sufficient, you may choose to use external speakers.

Refer to the section on Statistics Logging and Alerts in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual* for more information.

The **Alerts** tab is shown in *Image: **Alerts** Tab*.

Image: **Alerts** Tab



The fields and controls in this tab are described in *Table: Alerts Properties*.

Table: Alerts Properties

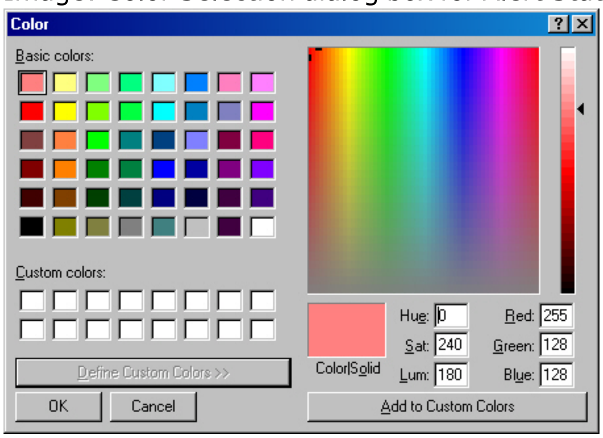
Section	Field/Control	Description
Audible Alerts	Mute Alerts	If cleared, when the (red) 'Alert Active State' is shown for one or more parameters in the Statistic View, a repeated, audible alarm sound is broadcast on the PC client station. If selected, all audible alarms are muted.
Visual Alerts		When user-selected statistics are configured for alerts, the cells in Statistic View (spreadsheet mode) are color-coded. Colors for the different alert status levels are defined in this dialog box. Left-click one of the color blocks to show the *Color* dialog box, shown in *Image: Color Selection dialog box for Alert Status with Custom Colors*.
	Alert/Log Enabled	This color indicates that logging and/or alerts has been enabled for the statistic, and no alerts are active (or have been active, with acknowledgment pending). The default color is green.
	Alert Active State	This color indicates that this statistic has been enabled for alerts to be sent when out-of-range conditions occur, and that an alert is active. The default is red.
	Post Alert State	This color indicates that an alert was active, but that conditions are currently within the valid range and an acknowledgment is pending. The default is yellow.

Alert Color Selection dialog box

The *Alert Color Selection* dialog box is used to control the color of alerts. It is accessed by double-clicking an alert color in the **Alerts** tab (shown in *Image: **Alerts** Tab*).

The *Color* dialog box for alert status colors is shown in *Image: Color Selection dialog box* for Alert Status with Custom Colors. It can be expanded to provide access to custom colors by selecting the *Define Custom Colors >>* button.

Image: Color Selection dialog box for Alert Status with Custom Colors



License Management

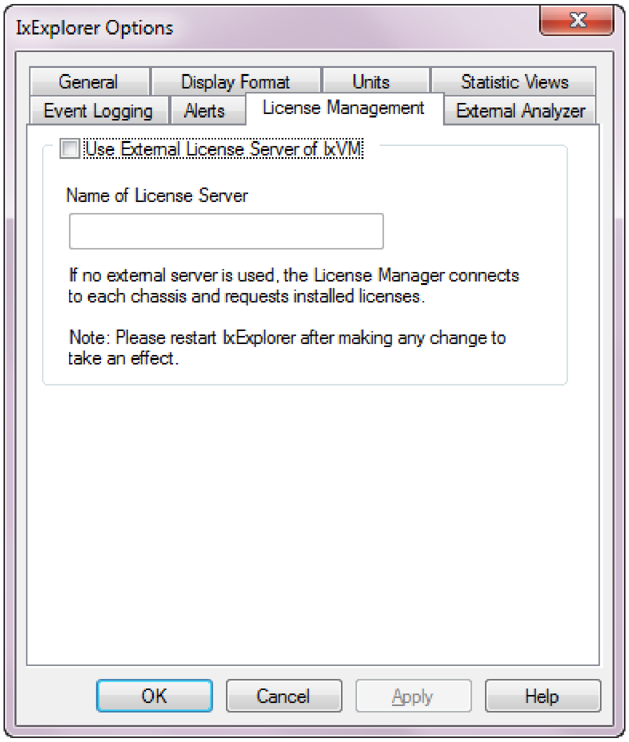
License management technique is the means by which Ixia ensures that its software is licensed and used appropriately. This allows Ixia customers to centralize and monitor their software usage.

For IxOS, only IxServer is licensed. The IxExplorer client can be installed anywhere, as many times as needed, without a license.

The ***License Management*** tab of the *IxExplorer Options* dialog box allows to select the usage of the external license server of IxVM. If you do not use this server, the License Manager requests installation licenses for each chassis.

The **License Management** tab is shown in *Image: **License Management** Tab*.

Image: **License Management** Tab



The fields and controls in this tab are described in *Table: **License Management** Tab*.

Table: **License Management** Tab

Field/Control	Description
Use External License Server of IxVM	Select the check box to use the external IxVM license server for server licenses.
Name of License Server	The name of the external license server.

External Analyzer Option

The **External Analyzer** tab of the *IxExplorer Options* dialog box allows to select a program to use as an external analyzer. The tab is accessed by selecting *Tools* > *Options* in the menu bar to open the *IxExplorer Options* dialog box, then selecting the ***External Analyzer*** tab.

These settings apply when an **External Analyzer** tab is used to export the output file from the analyzer program to a sub-directory in the Ixia Program Files directory. This is done using the *External Analyzer* icon () located in the IxExplorer toolbar, or the External Analyzer context menu in any chassis chain, chassis, card, or port. This menu is described in the sections listed below:

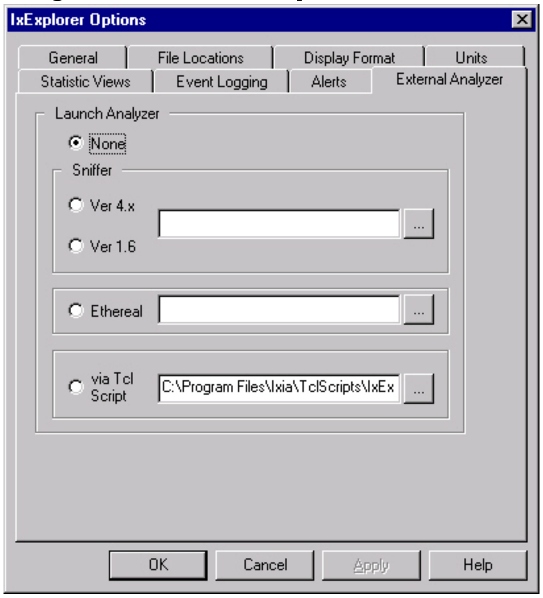
- Chassis Chains
- Chassis
- Cards
- Ports

The External Analyzer menu is also part of the Port Groups context menu, as described in the section listed below:

- Port Groups

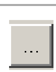
The **External Analyzer** tab is shown in *Image: **External Analyzer** Tab*.

Image: **External Analyzer** Tab



The fields and controls in this tab are described in *Table: **External Analyzer** Tab*.

Table: **External Analyzer** Tab

Section	Field/Control	Description
Analyzer	None	No external network protocol analyzer program is used.
	Sniffer	The Sniffer network protocol analyzer program is used. Select the version to be used: • Ver 4.x • Ver 1.6
	Ethereal	The (free) Ethereal network protocol analyzer program is used.
	via Tcl Script	A specified Tcl Script is used.
		Select this button to open the 'Cfg' sub-directory of the Ixia Program directory. Select a file, which appears in the field to the left.

IxOS Upgrade

This option is used to upgrade the IxExplorer client to match the version of IxServer on a chassis. You are prompted to select the *IxOS Upgrade* option when the IxExplorer client and IxServer are out of synchronization.

See *Automatic Update Feature* in the *IxOS Getting Started Guide*, for more information on the *IxOS Upgrade* option.

ScriptGen

ScriptGen (Generate Tcl Script) is a tool that may be used to generate a Tcl script that reflects the current configuration of Ixia ports. It is intended to be used after ports have been successfully configured using IxExplorer, IxAutomate (previously IxScriptmate), the Tcl API, the C++ API or other tool. The generated Tcl script can be used to recreate a port setup as the basis for a new Tcl test. ScriptGen may be used on both Windows-based and Unix-based computers.

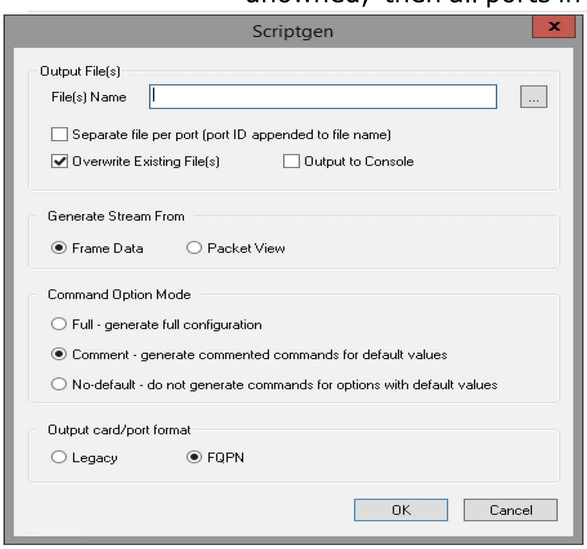
ScriptGen generates a complete Tcl program into an output file. All aspects of a port's configuration is reflected in the output.

Generate Tcl Script is a context menu option for:

- Chassis, as shown in Chassis.
- Cards, as shown in Cards.
- Ports, as shown in Ports.

When using ScriptGen, all ports below the selected tree level is included in the generated script.

NOTE	Port ownership can affect ScriptGen's file creation, in the following manner: If the first port is explicitly owned by a user, then all ports in the set of ports to be scripted must either be owned by that user or be 'unowned.' If the first port is 'unowned,' then all ports in the set must be 'unowned.'



The controls shown in the *ScriptGen* dialog box are explained in *Table: ScriptGen Usage*.

Table: ScriptGen Usage

Section	Control/Field	Usage
Output File (s)		Controls how the Tcl script is generated.
	File(s) name	The name of the output file to generate the output into. The name of the *.tcl* file should be changed for each port used.
	...	This button allows to browse for a location to save the file.
	Separate file per port	If selected, the output for each port is saved as a separate file. The file name is an amalgam of the name indicated in the **Output File Name** and the chassis, slot, and port.
	Overwrite Existing File(s)	If selected, the saved file or files overwrites any files with the same name. If not selected, the output is not saved, and a warning appears in the trace window.
	Output to Console	If selected script generation will be visible in TCL console at run time.
Generate Stream From		Determines if the stream is generated from the *Frame Control* dialog box, or the *Packet View* dialog box. For information on Frame Control, Frame Data Structure For information on Packet View,Packet View.
	Frame Data	Generate stream from Frame Data.
	Packet View	Generate stream from Packet View.
Command Option Mode		Sets how much of the default information should be included in the script.
	Full	Generates a script that includes all control information, whether it is default configuration or not.
	Comment	Generates a script that includes all control information, but all default configuration is set as a comment. Commented information does not affect card, port, or stream behavior.
	Non-Default	Generates a script that only includes non-default configuration information.
Output card/port format		Determines the port format legacy or FQPN in the generated TCL script. NOTE For cards other than AresOne-S, this option is greyed out with default option selected as **Legacy**.

NOTE When using ScriptGen with Port Groups, ports in the same Port Group from different chassis chains cause the ScriptGen option to fail. Likewise, ports from chassis that have the same chassis ID causes the ScriptGen option to fail.

CHAPTER 4

Stream and Flow Control

Any Ixia port can generate large numbers of packets during the course of a pattern transmission. Streams are the means by which these packets are organized and generated. Stream configuration controls how many packets are generated, the ordering of the packets, and the gaps between the packets.

The following major sections cover the use of the Stream Control functions:

- Types of Data Transmission
- Types of Packet Streams
- Types of Advanced Streams
- Stream Properties dialog box
- Stream Editing
- **Stream Grid–GFP** Tab
- DCC Packet Streams and Packet Flows
- ATM Streams
- Changing Streams Without Interruption

Types of Data Transmission

The Ixia system uses a sophisticated model for the programming of transmitted data. The main types of data transmission on Ixia ports are described in the following sections:

- Packet Streams
- Packet Flows
- Advanced Streams

For configuration and transmission of packet streams, refer to the following sections:

- **Frame Data** Tab is the means by which the contents of frames (packets) are formed.
- Stream Properties dialog box dictates how a set of streams is applied.
- Stream Editing describes how related streams can be grouped into sets which are used for pattern application or for triggered applications.

For DCC Packet Streams, Advanced Streams, and Packet Flows: DCC Packet Streams and Packet Flows for additional information.

For ATM Streams:

ATM Streams for additional information.

For GFP Streams: **Stream Grid–GFP** Tab for additional information.

Packet Streams

This model is supported by the Ixia load modules, where dedicated hardware can be used to generate up to 255 *streams*. The entire set of streams may be repeated indefinitely or for a count of times. The variability within the packets is necessarily generated algorithmically.

For ports that support more than one option, the *Transmit Mode* for each port must be set to indicate whether it will use streams, flows, or advanced streams. The programming of packet streams or packet flows uses the same programming model, with a few exceptions related to continuous bursts of packets. Since the model is so similar in both cases, we refer to both packet streams and packet flows as 'streams.' Individual streams are related to each other by their basic types.

Packet Flows

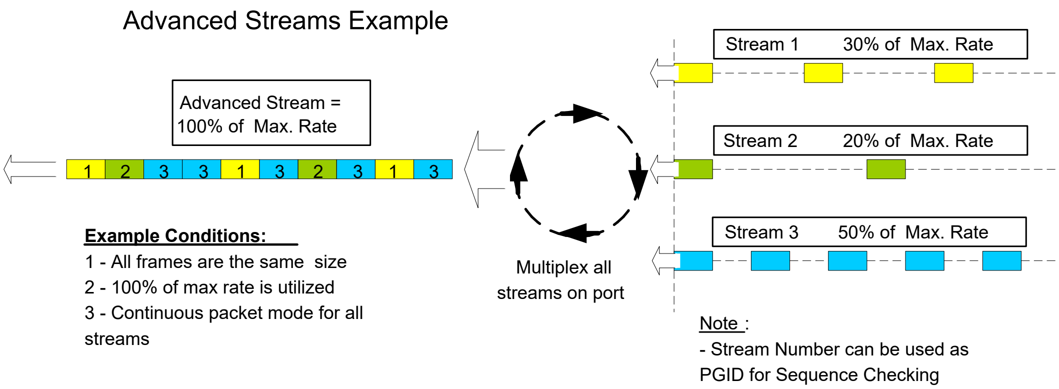
For some load modules, the transmitted data model is also supported through software, in which case the data is referred to as *flows*. Up to 15,872 unique packets may be generated by flows on ports that support this option. Because the flows are programmed in advance by the software, there can be more defined flows than streams. Flows can also transmit data configurations, which cannot be algorithmically described in streams. Flows may be created and edited in one of two ways, in the same manner as streams or (for some load modules) through a spreadsheet format flow image editor. The flow image editor saves the results in a disk file for later use.

Advanced Streams

A third type of stream configuration is called *Advanced Streams,* which involves interleaving of all defined streams for a port into a single, multiplexed stream. Each stream is assigned a percentage of the maximum rate. The frames of the streams are multiplexed so that each stream's long-term percentage of the total transmitted data rate is as-assigned. When the sum of all of the streams is less than 100% of the data rate, idle bytes are automatically inserted into the multiplexed stream, as appropriate.

Advanced Stream Scheduler is available for a number of different load modules; consult the *Ixia Platform Reference Manual*. Advanced stream configuration is explained in Stream Control for Advanced Streams.

Image: Example of Advanced Stream Generation



Types of Packet Streams

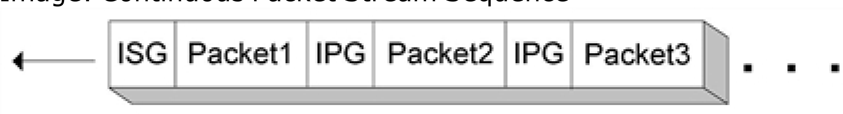
The types of packet streams which can be configured in the **Stream Control** tab are illustrated in the following sections:

- Continuous Packet Stream
- Continuous Burst Stream
- Stop After Stream
- Advance to Next Stream
- Return to ID
- Return to ID for Count

Continuous Packet Stream

A Continuous Packet stream is one in which an infinite number of packets are generated, with a programmable Inter-Packet Gap (IPG). Packets are generated until a 'Stop Transmit' operation is performed. Continuous packets are **not** available for use with packet flows. The continuous packet stream is illustrated in *Image: Continuous Packet Stream Sequence.*

Image: Continuous Packet Stream Sequence



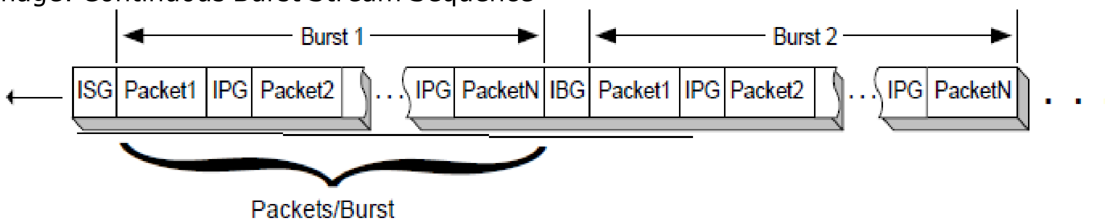
The elements of the stream are controlled by various sections of the *Stream Control* and *Frame Data* tabs, and are described in the following sections:

- Inter-Stream Gap (ISG)-*Inter-Stream Gap/Stream Gap*.
- Packet-**Frame Data** Tab.
- Inter-Packet Gap (IPG)-*Rate Control/Inter-Packet Gap*.***Note***: *An IPG does not follow the last packet.*

Continuous Burst Stream

A Continuous Burst stream is one in which an infinite number of bursts of packets are generated, with programmable inter-packet gaps (IPG) and inter-burst gaps (IBG). Bursts are generated until a Stop Transmit operation is performed. Continuous bursts are not available for use with flows. A continuous burst stream is illustrated in *Image: Continuous Burst Stream Sequence.*

Image: Continuous Burst Stream Sequence



NOTE An example of a stream with a finite number of bursts is shown in *Image: Single Stream Sequence with a Finite Number of Bursts.*

The elements of the stream are controlled by various sections of the *Stream Control* and *Frame Data* tabs, and are described in the following sections:

- Inter-Stream Gap (ISG): Inter-Stream Gap/Stream Gap.
- Packet: **Frame Data** Tab.
- Inter-Packet Gap (IPG): Rate Control/Inter-Packet Gap.
- Packets/Burst: Basic Stream Controls.
- Inter-Burst Gap (IBG): Inter-Burst Gap/Burst Gap.

NOTE An IBG does not follow the last packet in a stopped continuous burst stream or finite burst stream.

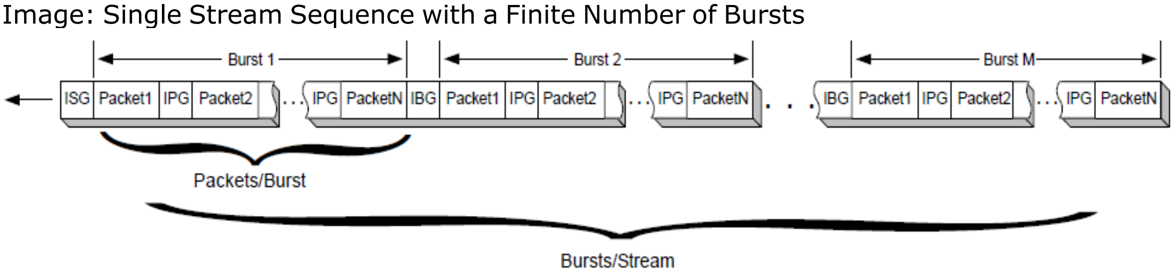
Stop After Stream

This option is used to generate a stream which is the *last* stream to be transmitted for a set of streams. Advancing from one stream to another is covered in Advance to Next Stream.

General Stream Structure

A stream in which a finite number of bursts is supported is illustrated in *Image: Single Stream Sequence with a Finite Number of Bursts.*

Image: Single Stream Sequence with a Finite Number of Bursts



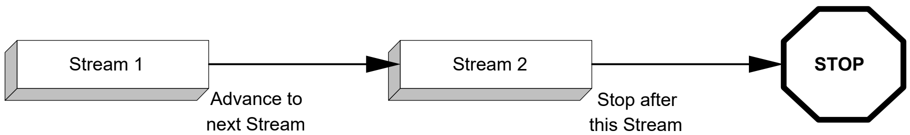
The elements of the stream are controlled by other boxes and dialog boxes and are described in the following sections:

- Inter-Stream Gap (ISG): Inter-Stream Gap/Stream Gap.
- Packet:**Frame Data** Tab.
- Inter-Packet Gap (IPG): Rate Control/Inter-Packet Gap.
- Packets/Burst: Basic Stream Controls.
- Inter-Burst Gap (IBG): Inter-Burst Gap/Burst Gap.
- Bursts/Stream: Basic Stream Controls.

Advance to Next Stream

This option is used to transmit a stream and then proceed to the next stream in the set of streams. Stopping after a stream is covered in Stop After Stream. *The sequencing of streams is illustrated in Image: Advance to Next Stream Sequence.*

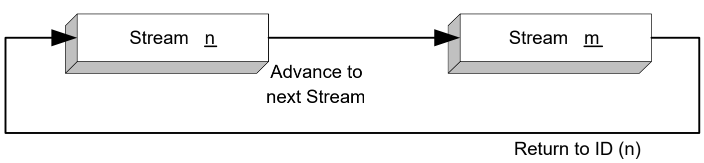
Image: Advance to Next Stream Sequence



Return to ID

This option is used to transmit a stream and then return to a previously transmitted stream configuration (within the set of defined streams) for the next stream transmission. The set of streams is transmitted until a Stop Transmit is processed. Advancing between streams and stopping after a stream is covered in Stop After Stream and *Advance to Next Stream. The sequencing of streams is illustrated in Image: Return to ID Stream Sequence.*

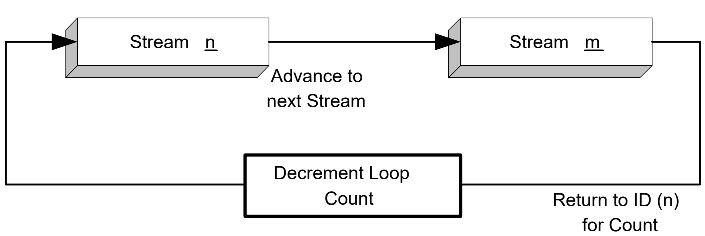
Image: Return to ID Stream Sequence



Return to ID for Count

This option is used to transmit a stream and then proceed to a previous stream (located by its stream ID) in the set of streams, forming a loop for transmitting the included subset of streams for a programmable number of times. Advancing between streams and stopping after a stream is covered in previous sections. The sequencing of streams is illustrated in *Image: Return to ID for Count Sequence.*

Image: Return to ID for Count Sequence



Types of Advanced Streams

The type of advanced streams which can be configured in the **Stream Control** tab are illustrated in the following sections:

- Continuous Packet Stream
- Continuous Burst Stream
- Stop After this Stream
- Fixed Count Burst Stream

Fixed Count Burst Stream

In this stream a fixed number of bursts of packets are generated with specified number of Packets per Burst and Bursts per Stream.

Stream Properties dialog box

The *Stream Properties* dialog box appears by double-clicking a row in the Packet Streams/Flows grid window, or by selecting a port and selecting the *Edit Streams* option in the menu. Within the dialog box, the **Stream Control** tab allows you to control the type and configuration of individual streams or flows.

There are several variations of the **Stream Control** tab, based on the type of load module, described in the following sections:

- Stream Control Tab for 10/100 Modules
- Stream Control Tab for Gigabit Modules
- Stream Control for Standard POS Modules
    - Also applies to optional DCC packet streams.
    - Does not apply to POS 622 (OC-12c/OC-3c POS) modules.
- Stream Control for POS 622 Modules
- Stream Control for 10 Gigabit Modules
- Stream Control for TXS Ethernet Modules
- Stream Control for Xcellon-Flex Modules
- Stream Control for Lava, Multis, Novus, and Novus-R Modules
- Stream Control for QSFP-DD and CFP8 Modules
- Stream Control for T400 QDD and T400 OSPF Modules
- ATM Streams

For the Advanced Stream Scheduler, refer to:

- Stream Control for Advanced Streams

For information on the GFP Stream Queue grid, refer to:

- Stream Grid–GFP Tab

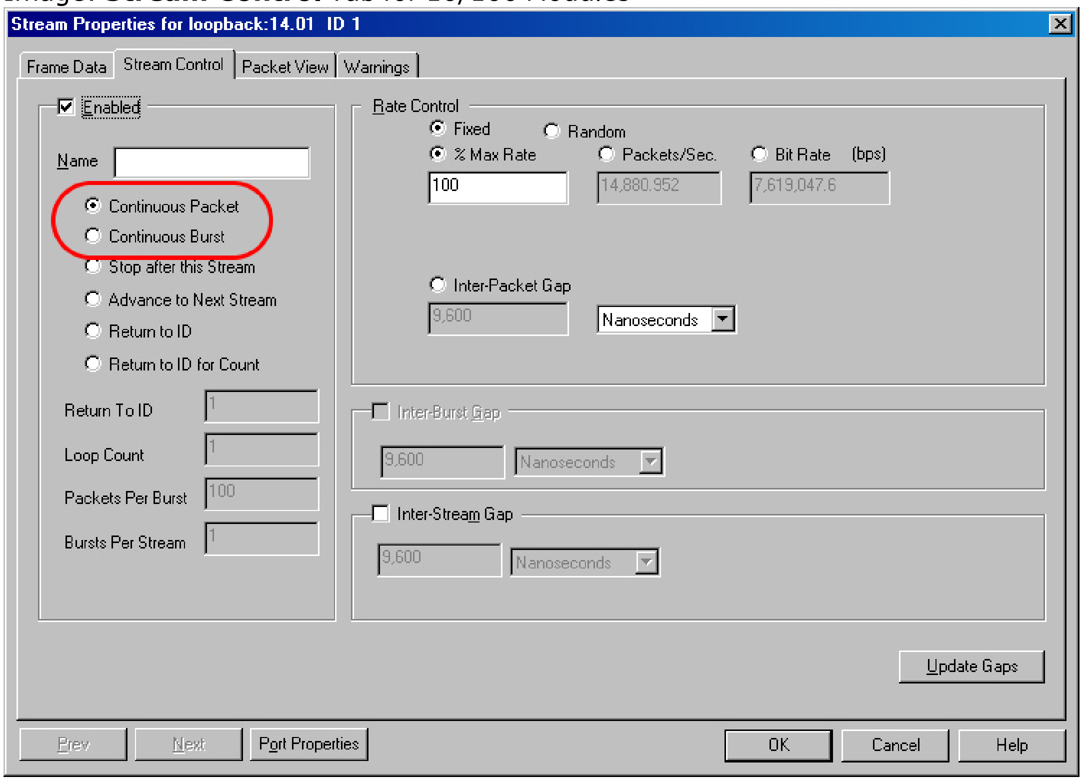
For ATM Stream Control, refer to:

- Stream Control for ATM

Stream Control Tab for 10/100 Modules

The **Stream Control** tab for 10/100 modules is shown in *Image: **Stream Control** Tab for 10/100 Modules*. The options within the dotted frame are not supported for Packet Flows. Refer to General Structure of Stream Control Tab for information on the content of the tab.

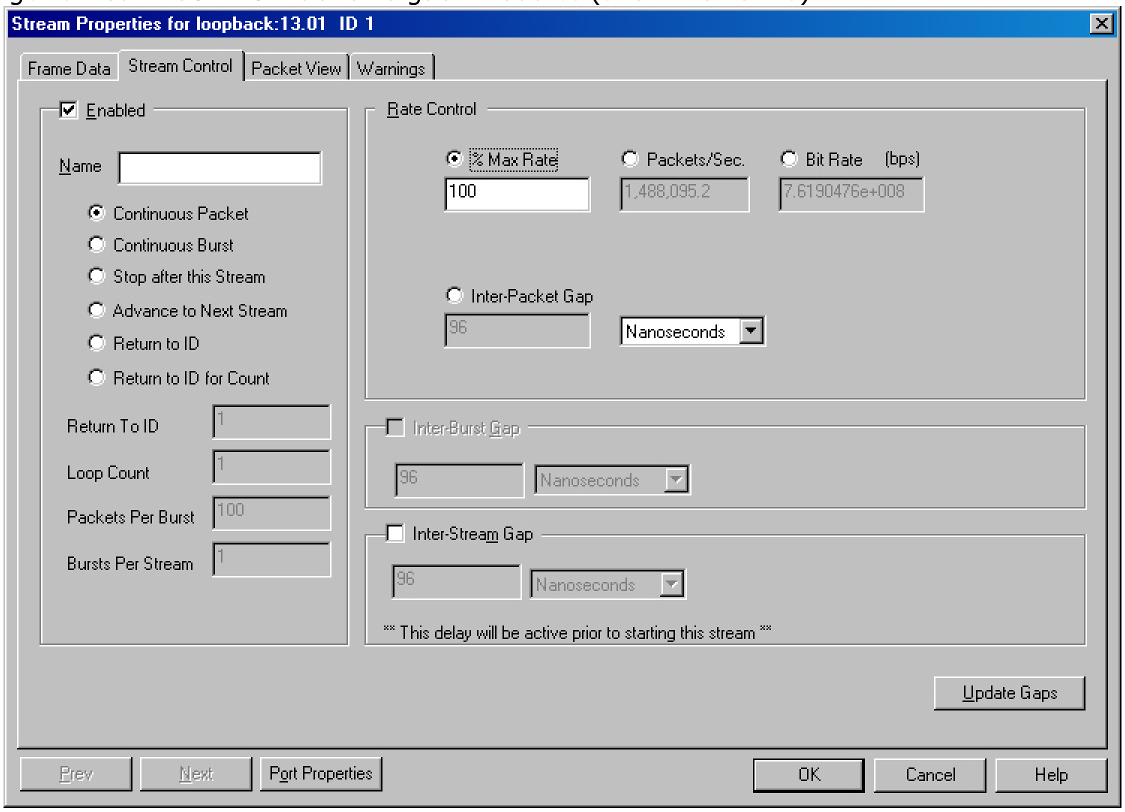
Image: **Stream Control** Tab for 10/100 Modules



Stream Control Tab for Gigabit Modules

The **Stream Control** tab for Gigabit modules is shown in *Image: **Stream Control** Tab for Gigabit Modules (shown for GBIC).* Refer to General Structure of Stream Control Tab for information on the content of the tab.

Image: **Stream Control** Tab for Gigabit Modules (shown for GBIC)

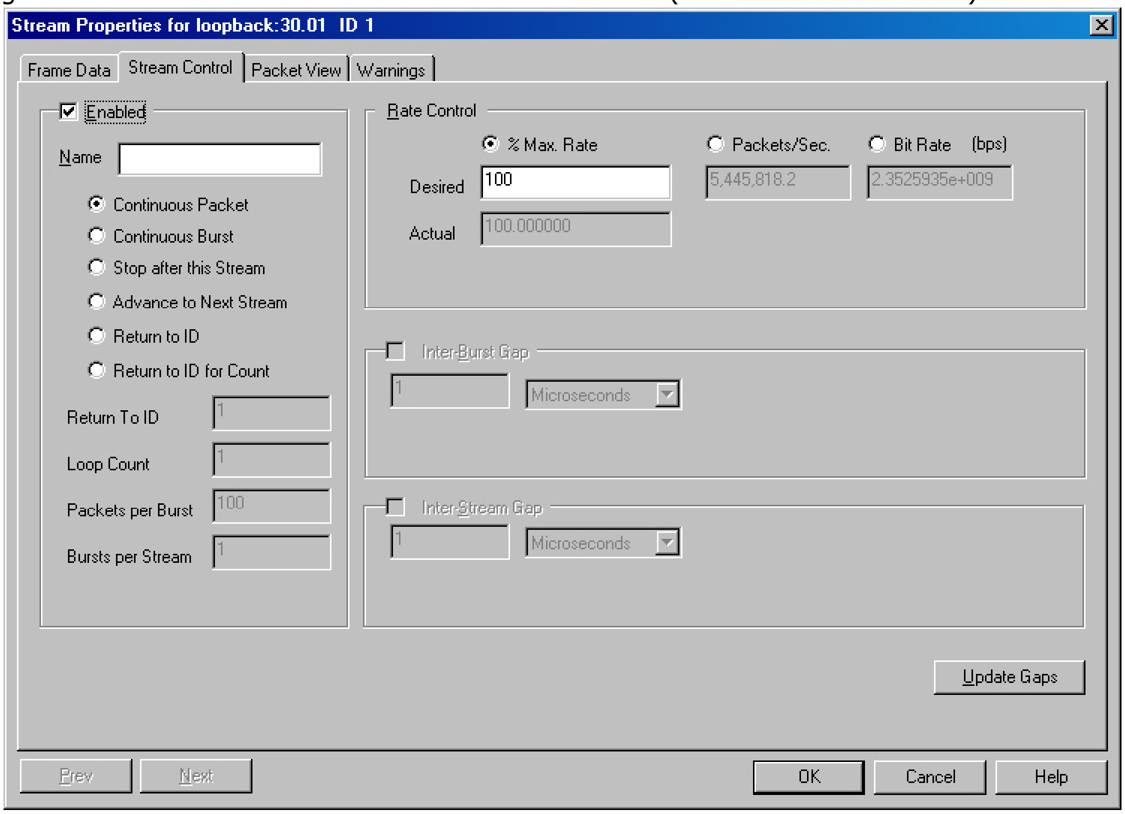


Stream Control for Standard POS Modules

The **Stream Control** tab for standard Packet over SONET (POS) modules is shown in *Image: **Stream Control** Tab for Standard POS Modules (shown for OC-48c POS).* Refer to General Structure of **Stream Control** Tab for information on the content of the tab.

NOTE **for DCC:** This tab is also used to set up DCC Packet Streams for the optional DCC feature. For additional information on DCC packet streams DCC Packet Streams and Packet Flows.

Image: **Stream Control** Tab for Standard POS Modules (shown for OC-48c POS)

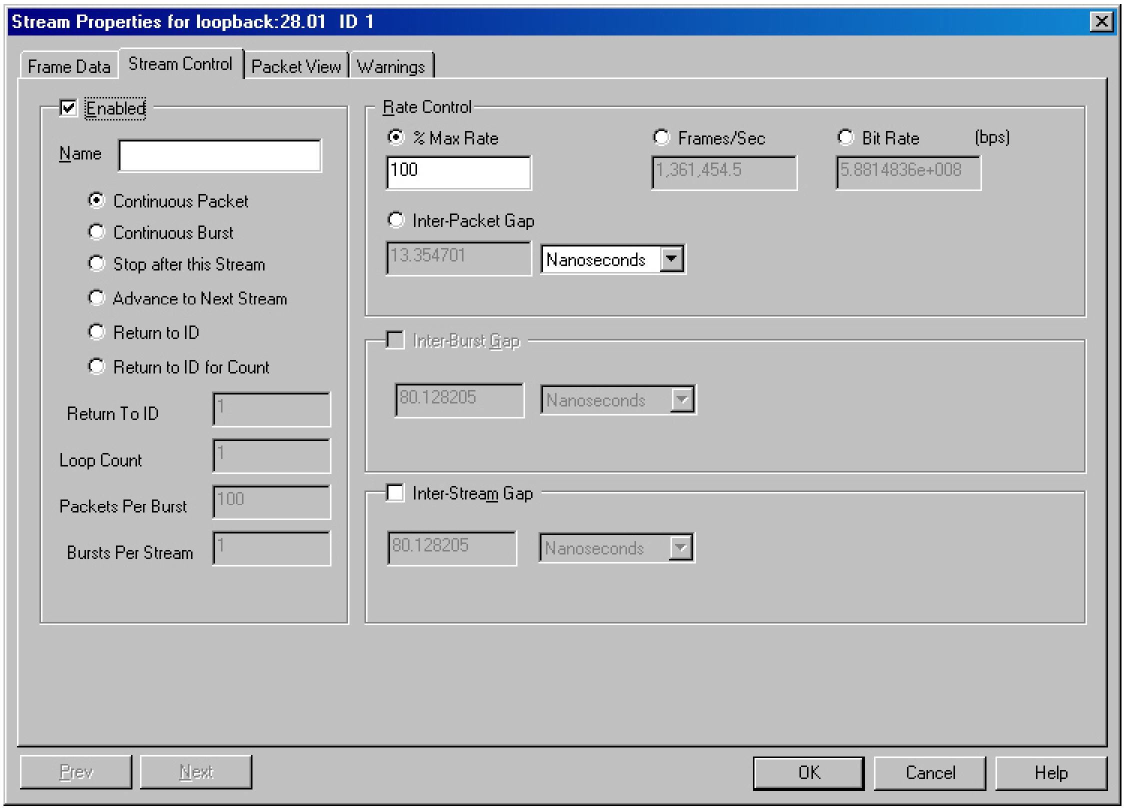


Stream Control for POS 622 Modules

The **Stream Control** tab for POS 622 (OC-12c/OC-3c POS) modules combines aspects of both TXS Ethernet and standard POS modules *Stream Control* tabs. Refer to General Structure of **Stream Control** Tab for information on the content of the tab.

The POS 622 **Stream Control** tab is shown in *Image: POS 622 **Stream Control** Tab Page.*

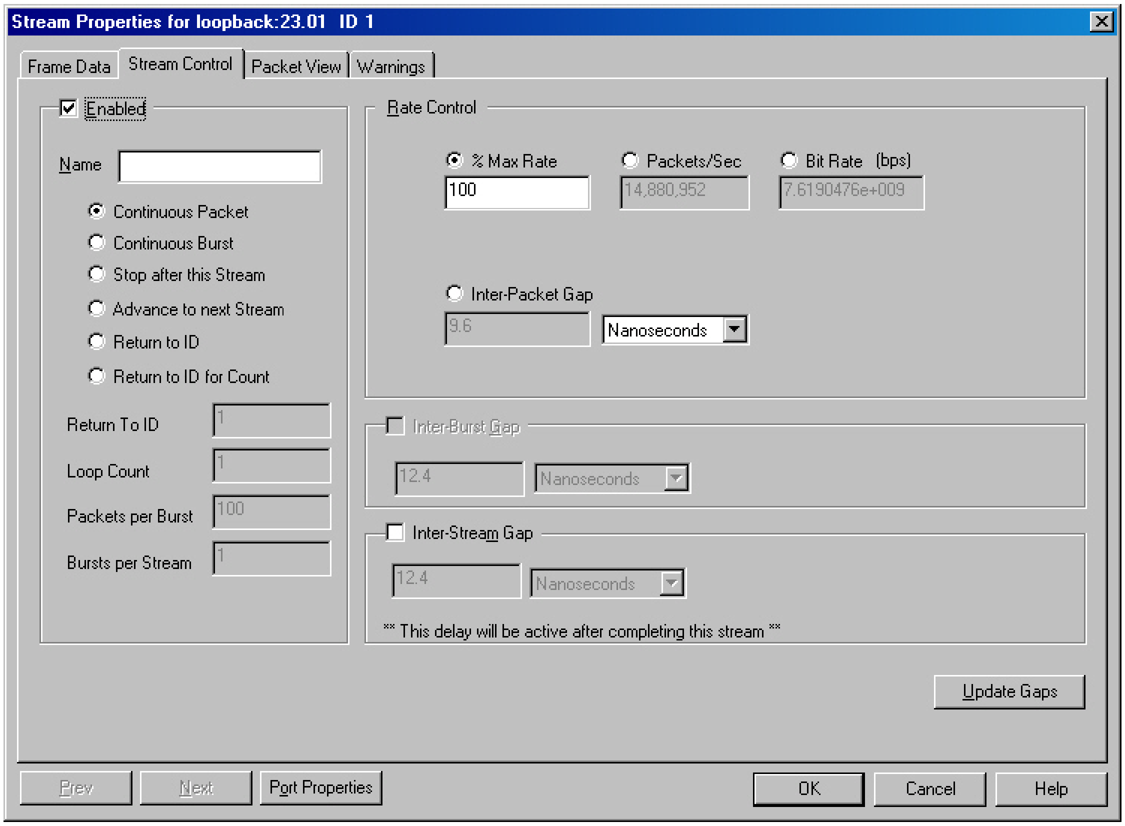
Image: POS 622 **Stream Control** Tab Page


Stream Properties for loopback:28.01 ID 1
Frame Data
Stream Control
Packet View
Warnings
Enabled
Name
Continuous Packet
Continuous Burst
Stop after this Stream
Advance to Next Stream
Return to ID
Return to ID for Count
Return To ID
1
Loop Count
1
Packets Per Burst
100
Bursts Per Stream
1
Rate Control
% Max Rate
100
Frames/Sec
1,361,454.5
Bit Rate
(bps)
5.8814836e+008
Inter-Packet Gap
13.354701
Nanoseconds
Inter-Burst Gap
80.128205
Nanoseconds
Inter-Stream Gap
80.128205
Nanoseconds
Prev
Next
OK
Cancel
Help

Stream Control for 10 Gigabit Modules

The **Stream Control** tab for 10 Gigabit modules is shown in *Image: **Stream Control** Tab for 10 Gigabit (shown for 10GE WAN).*Refer to General Structure of Stream Control Tab for information on the content of the tab.

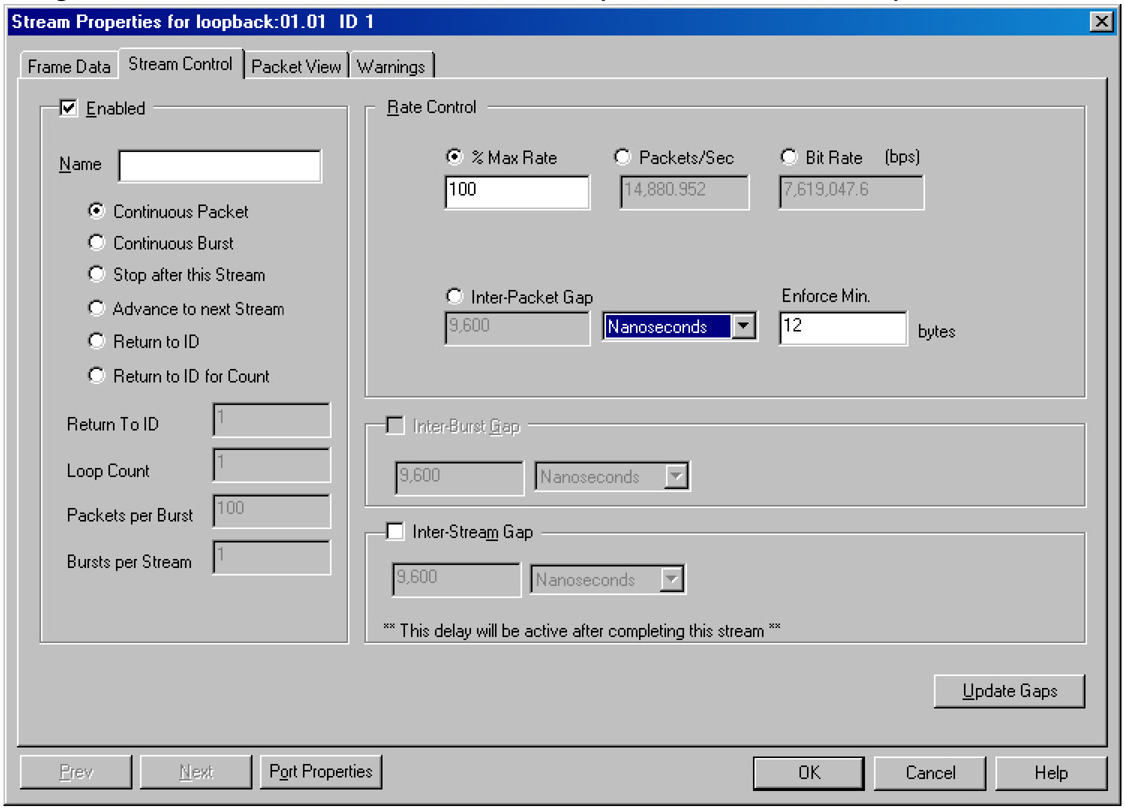
Image: **Stream Control** Tab for 10 Gigabit (shown for 10GE WAN)



Stream Control for TXS Ethernet Modules

The **Stream Control** tab for the TXS family of modules (10/100 TXS8, 10/100/1000 TXS4, and 1000 SFPS4) is shown in *Image: **Stream Control** Tab for TXS Modules (shown for 1000 SFPS4)*.Refer to General Structure of Stream Control Tab for information on the contents of the tab.

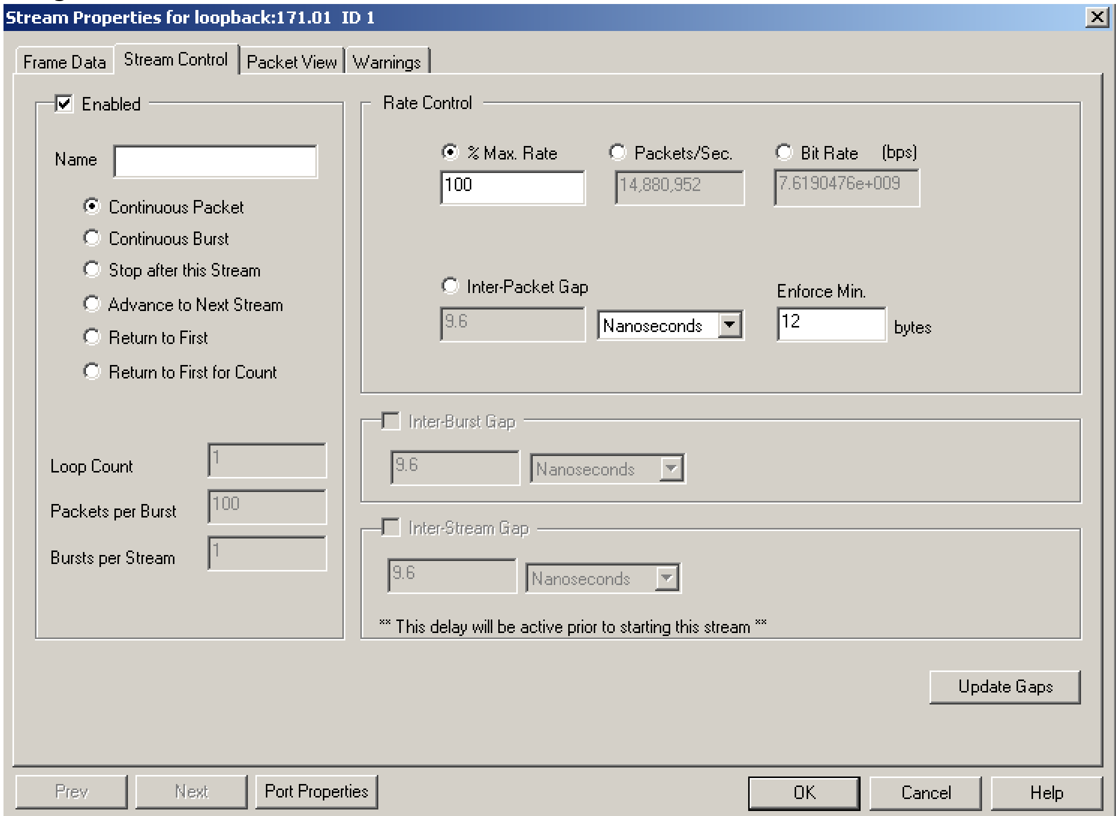
Image: **Stream Control** Tab for TXS Modules (shown for 1000 SFPS4)



Stream Control for Xcellon-Flex Modules

The **Stream Control** tab for the Xcellon-Flex family of modules (FlexAP10G16S and FlexFE10G16S) is shown in *Image:* ***Stream Control*** *Tab for Xcellon-Flex Modules.*Refer to General Structure of Stream Control Tab for information on the contents of the tab.

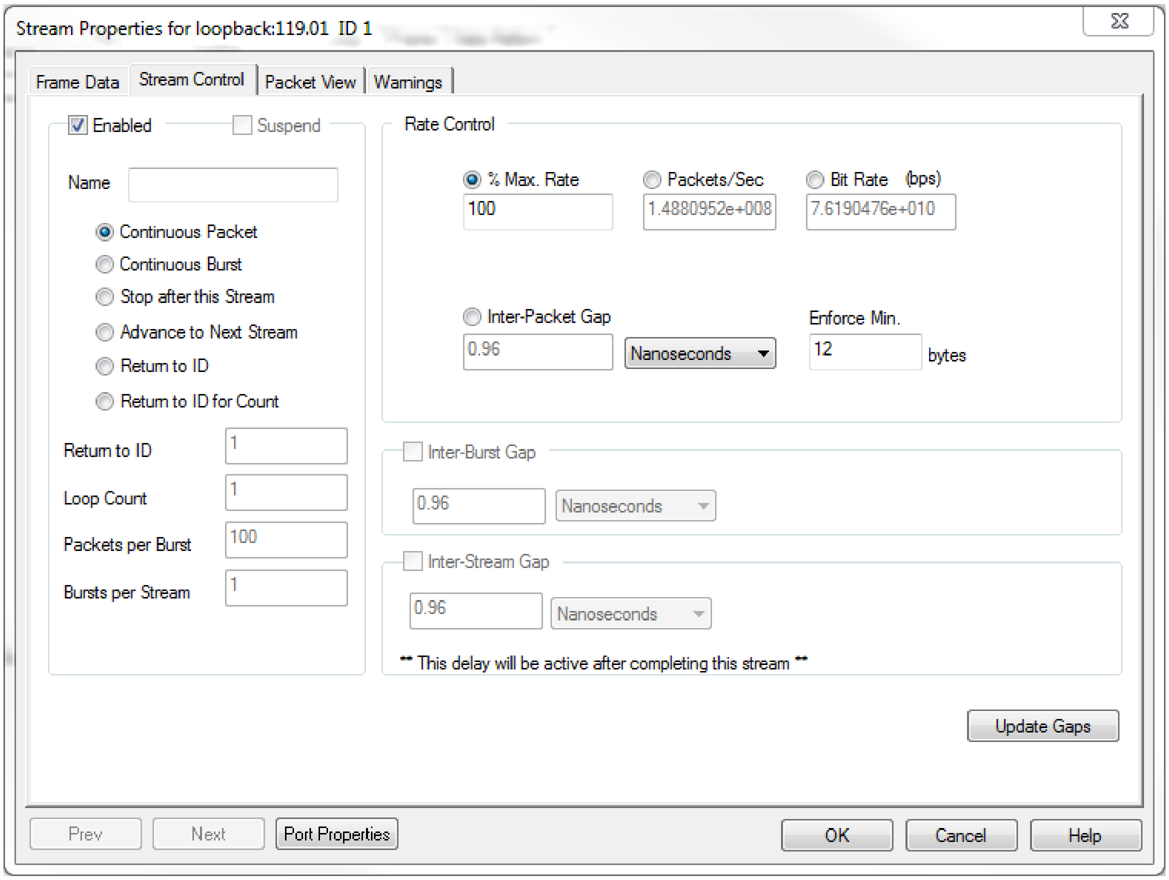
Image: **Stream Control** Tab for Xcellon-Flex Modules



Stream Control for Lava, Multis, Novus, and Novus-R Modules

The **Stream Control** tab for Lava, Multis, Novus, and Novus-R modules is shown as follows: Refer to General Structure of Stream Control Tab for information on the contents of the tab.

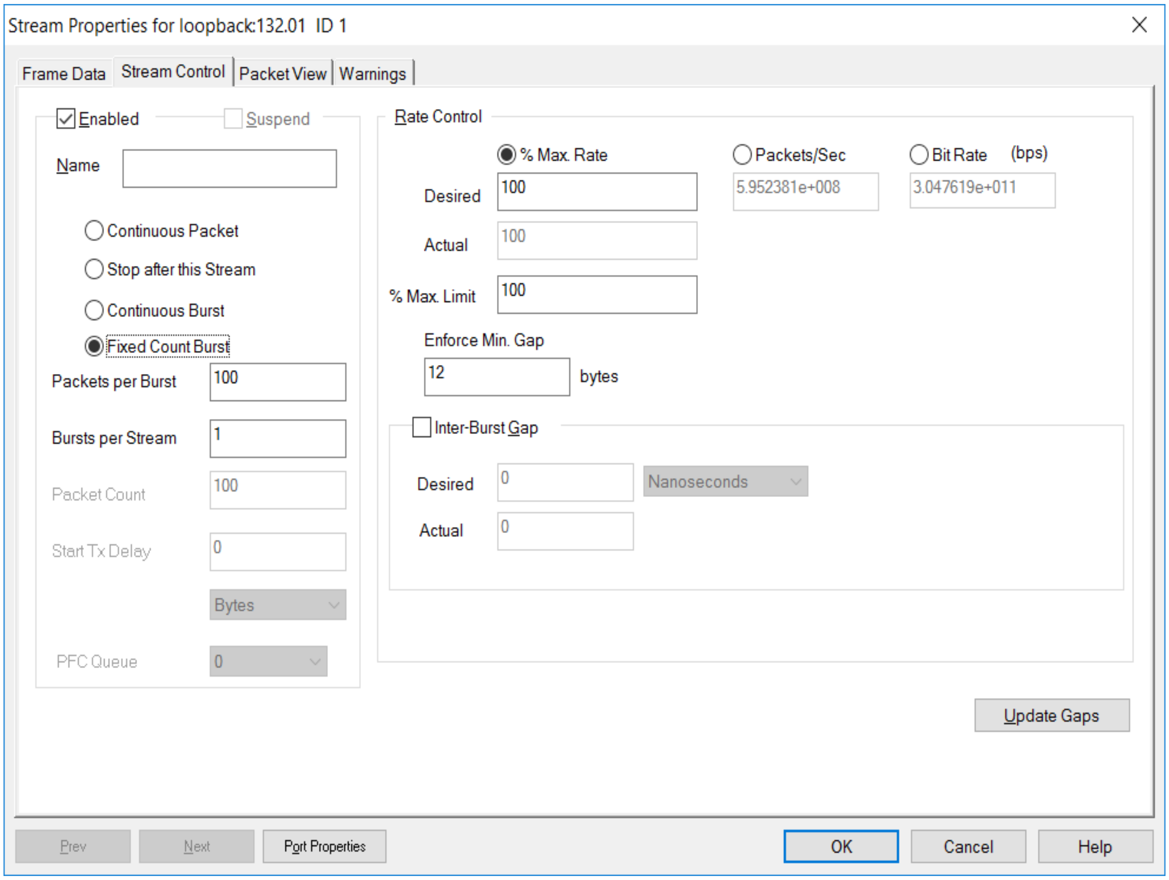
Image: **Stream Control** Tab for Lava, Multis, Novus, and Novus-R Modules



Stream Control for K400 QSFP-DD and CFP8 modules

The **Stream Control** tab for QSFP-DD and CFP8 modules is shown as follows: Refer to General Structure of Stream Control Tab for information on the contents of the tab.

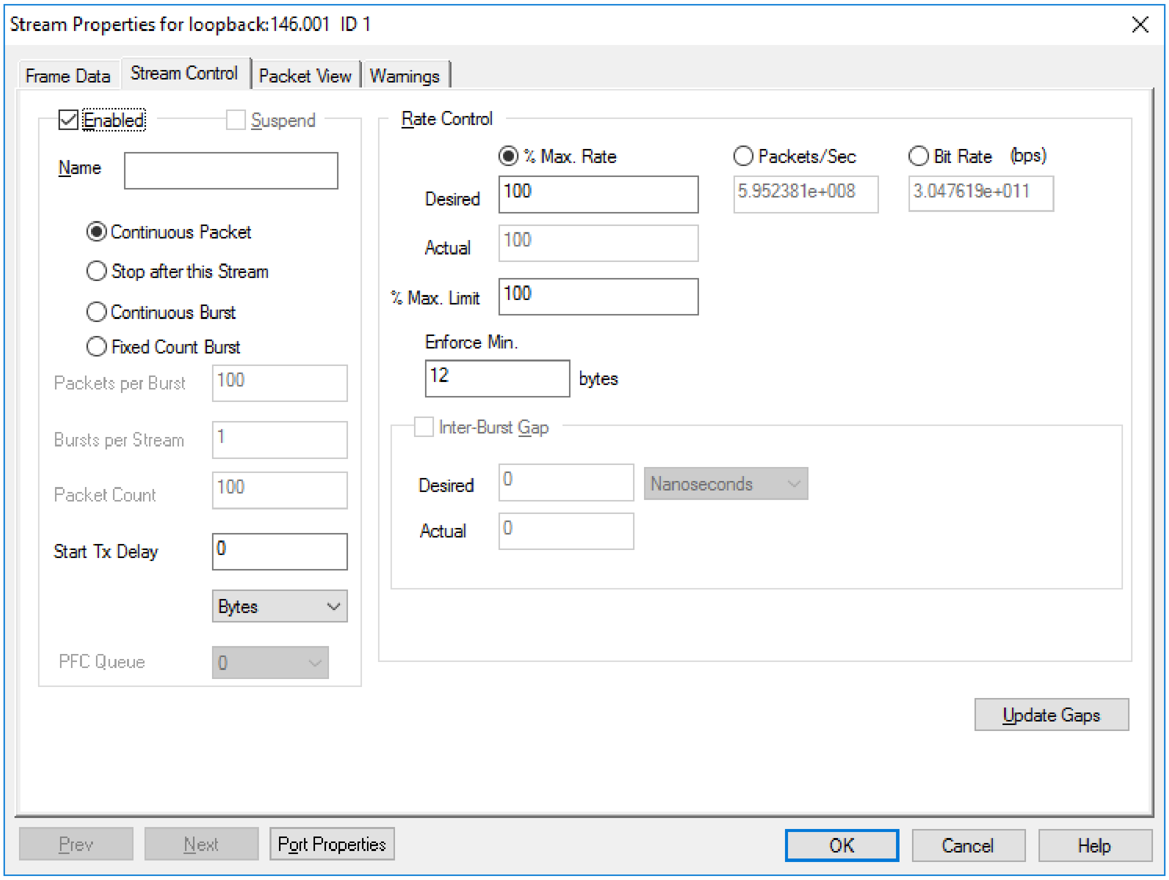
Image: **Stream Control** Tab for QSFP-DD and CFP8 Modules



Stream Control for T400 QDD and T400 OSFP modules

The **Stream Control** tab for T400 QDD and T400 OSFP modules is shown as follows: Refer to General Structure of Stream Control Tab for information on the contents of the tab.

Image: **Stream Control** Tab for QDD and OSFP Modules



General Structure of Stream Control Tab

The sections within the **Stream Control** tab control all aspects of stream formation. The general division is:

Basic Stream Controls	Within the left section of the tab. Controls the basic type of each stream as well as the counts for packets, bursts and loop counts. You may assign a name to each stream for reference purposes.
Rate Control/Inter-Packet Gap	Controls the time interval between packets.
Inter-Burst Gap/Burst Gap	Controls the time interval between bursts of packets.
Inter-Stream Gap/Stream Gap	Controls the time interval before each stream.
Update Gaps Button	When the values/units for parameters in the **Stream Control** tab are changed, select the *Update Gaps* button. This results in an update of the other related parameters.

Port Properties dialog box	Controls a number of basic port properties. This dialog box is discussed in the following chapters: • Chapter 18,Port Properties — 10/100/1000 Ethernet Family • Chapter 21,Port Properties–40/100 GE Family
Next/Prev	Shows the **Stream Control** tab for the Next or Previous stream.

Basic Stream Controls

The basic stream controls for all types of load modules are included in the *Enabled* box on the left hand side of the ***Stream Control*** tab, as shown in *Image: Basic Stream Controls.*

Image: Basic Stream Controls

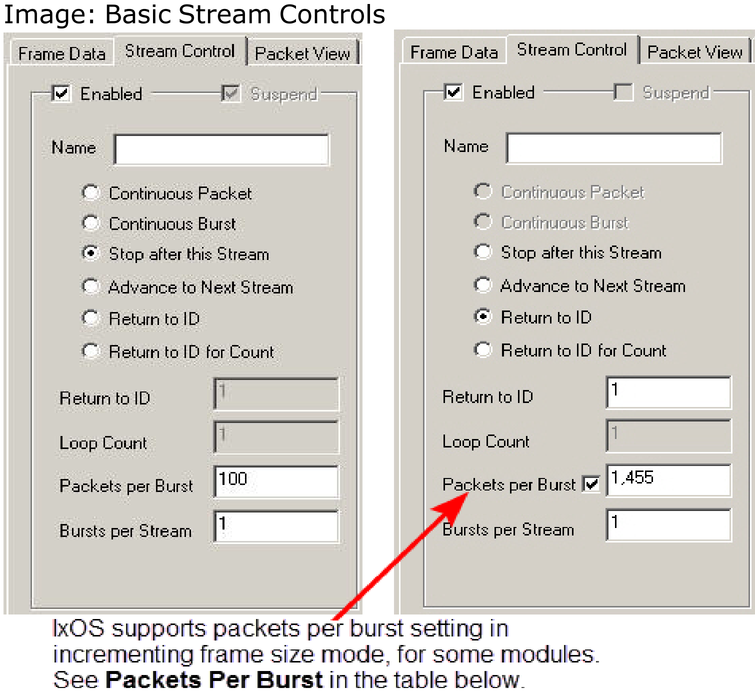


Image: Basic Stream Controls—Flex Module

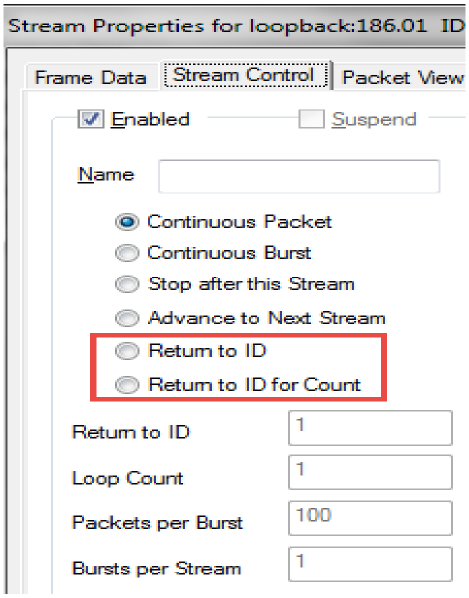


Image: Basic Stream Controls—Multis Module

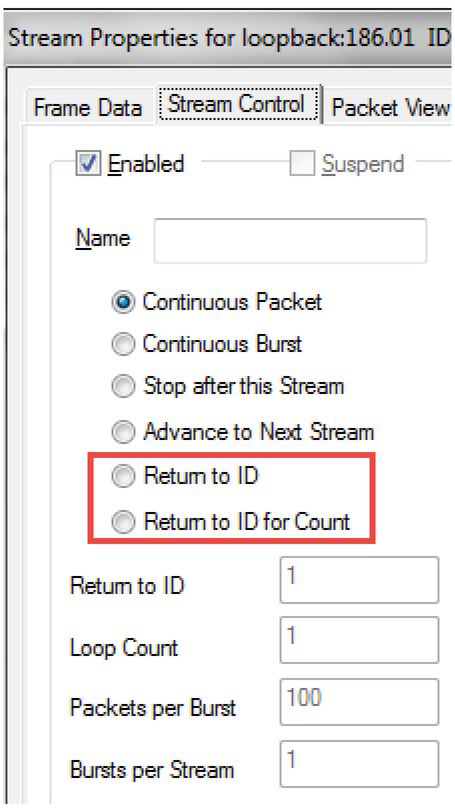


Image: Basic Stream Controls—QSFP-DD Module

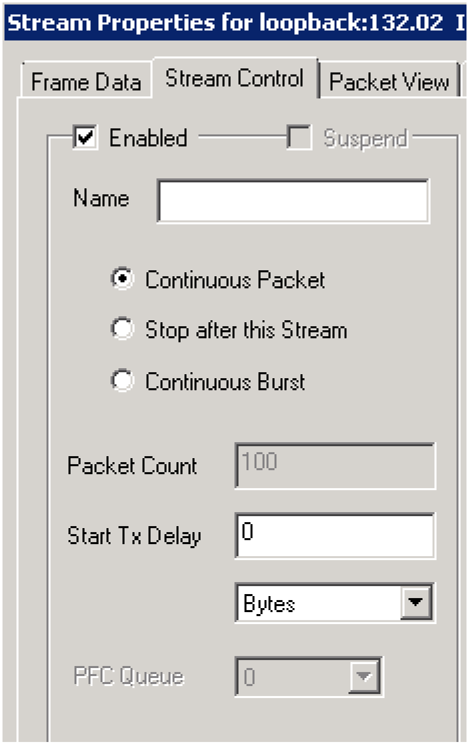


Image: Basic Stream Controls—CFP8 Module

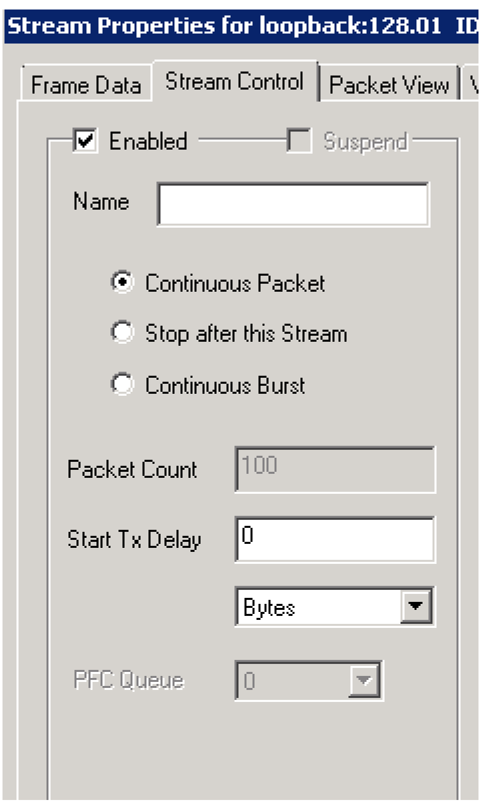


Image: Basic Stream Controls—T400-QDD Module

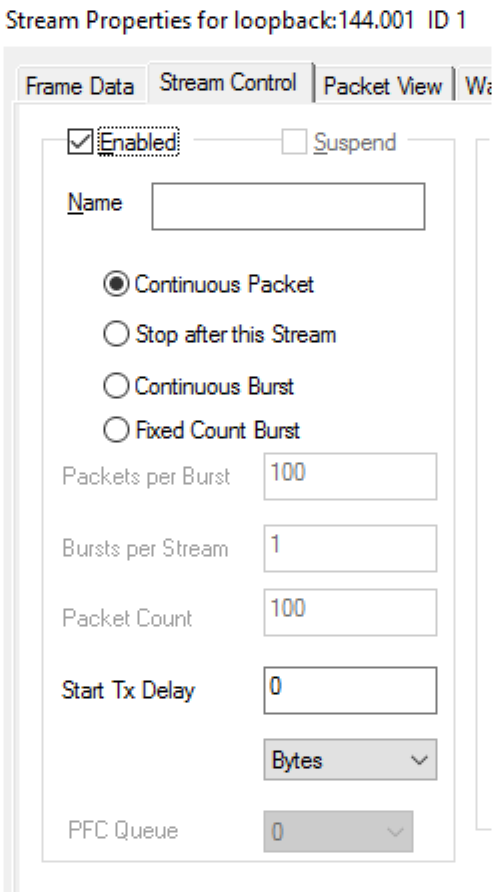
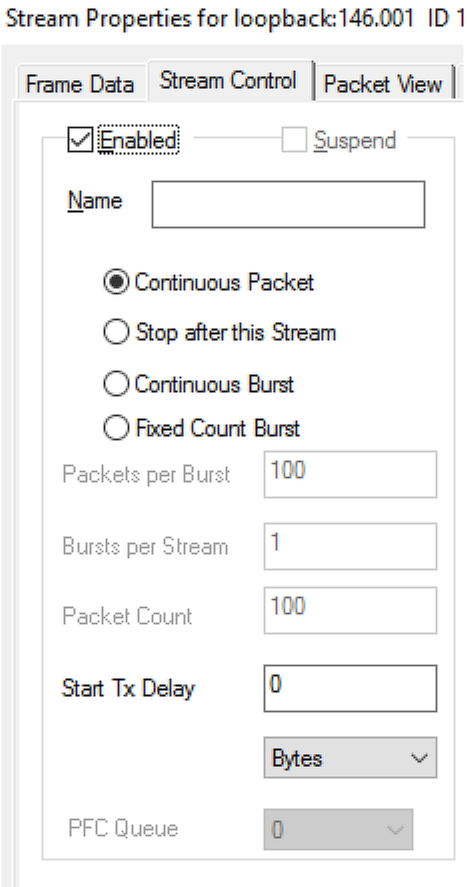


Image: Basic Stream Controls—T400-OSFP Module



The fields and controls in this box are described in *Table: Basic Stream Controls.*

Table: Basic Stream Controls

Field/Control	Description
Enabled	A stream must be enabled for it to be used. Up to 255 streams may be defined per port. Disabled streams are skipped over when the port transmits.
Suspend	Select check box to suspend selected stream(s). Uncheck to resume. This will cause the traffic to stop and restart. Changing Streams Without Interruption for details.
Name	This is a user-assigned name for the stream. This name need not be unique.
Continuous Packet	Designates a type of stream that sends out a continuous sequence of packets with the same inter-packet gap between packets. Continuous Packet mode may not be used with flows. Continuous Packet Stream.
Stop after this Stream	Designates that this stream is the end of a sequence of streams. Stop After Stream.

Field/Control	Description
Continuous Burst	Designates a type of stream that sends out a continuous set of packet bursts. Continuous Burst mode may not be used with flows. See **Note** below for information on maximum burst count. Continuous Burst Stream.
Fixed Count Burst	Designates a type of stream in which a fixed number of bursts of packets are generated with specified number of Packets per Burst and Bursts per Stream. Fixed Count Burst.
Advance to next Stream	Designates that the next stream is to be transmitted after the current stream is complete. Advance to Next Stream.
Return to First	Designates that the stream identified (with a Stream ID) in the *Return To First* field is to be used after the first stream is complete.
Return to First for Count	Designates that the stream identified in the *Return To First* field is to be used after the first stream is complete. The loop is repeated for number of times specified in the Loop Count parameter.
Return to ID	Designates that the stream identified (with a Stream ID) in the *Return To ID* field is to be used after the current stream is complete. Return to ID.
Return to ID for Count	Designates that the stream identified in the *Return To ID* field is to be used after the current stream is complete. The loop is repeated for number of times specified in the Loop Count parameter. Return to ID for Count.
Loop Count	The count used in a stream loop. Indicates the number of times that the stream identified in the *Return to ID* field is transmitted. Return to ID for Count.
Packets per Burst	Specifies the number of packets in each burst. Some load modules support packets per burst setting in incrementing frame size mode.Using the Packet/Burst Setting in Incrementing Frame Size Mode (Chapter 5) for information.
Bursts per Stream	Specifies the number of bursts in each stream. See **Note** below for information on maximum burst count.
Packet Count	Specifies the total number of packets to be sent in this configured stream.
Start Tx Delay	Entering a number in this field delays the start of the scheduled stream by the entered number (initially bytes). It is possible to change the value of the delay by selecting a value type in the pull-down menu directly below this field. Value options are:

Field/Control	Description
	• Nanoseconds • Microseconds • Milliseconds • Seconds • Bytes (default) Once a number is entered, selecting a new value converts the delay time number from the original format to reflect the new value. If Continuous Burst mode is selected, Start Tx Delay is disabled and Inter-Burst Gap is enabled. The setting for Start Tx Delay automatically duplicates the Inter-Burst Gap setting. The two are synchronized.
PFC Queue	Specifies Priority-based Flow Control. The PFC Queue can be mapped to the priority field in the frame.

NOTE **Maximum Memory for Stream Data Xcellon**-Multis load modules have 64KB memory per resource group for stream data. As the value list, frame size, and other stream properties become more complex, the maximum number of streams decrease.

NOTE **Maximum Burst Count** This field applies to burst counts on multi-speed load modules. The maximum burst count is different for different speeds on multi-speed load modules. If the value in the burst count field is larger than the maximum when the speed is changed, the value is changed to the new maximum. Refer to the *Ixia Platform Reference Manual* for the per speed limits.

Rate Control/Inter-Packet Gap

The rate control and inter-packet gap are controlled by the setting the Rate Control section of the ***Stream Control*** tab, shown in *Image: Stream Control—Rate Control and Inter-Packet Gap, Fixed Mode (shown for Standard 10/100 Ethernet Module)* for 10/100 and Gigabit modules. The tab for standard Packet over SONET modules is discussed in Rate Control for Standard POS Modules.

NOTE On older load modules, streams require a minimum period for setup which is equal to the time required to send 5 packets. When running at wire speeds, a stream with less than 5 packets may generate a trailing IPG before the start of transmission of the following stream. Flows do not exhibit this limitation. Also, using a long inter-frame gap that exceeds the timeout value of a protocol causes the protocol to fail.

Setting the inter-packet gap and the rate control is discussed in the following sections:

- Rate Control/Inter-Packet Gap
- Rate Control for Standard POS Modules

Rate Control/Inter-Packet Gap

The Rate Control and Inter-Packet Gap (IPG) can be set for 10/100 and Gigabit Ethernet modules, 10 Gigabit modules, and POS 622 (OC-12c/OC-3c POS). The sections for setting the IPG are described in the following sections:

- Rate Control/IPG for Standard 10/100 Ethernet
- Rate Control/IPG for Standard Gigabit, 10 Gigabit Ethernet, and POS 622 Modules
- Rate Control/IPG for TXS Ethernet Modules
- Rate Control/IPG for FC Modules

Rate Control/IPG for Standard 10/100 Ethernet

Image: Stream Control—Rate Control and Inter-Packet Gap, Fixed Mode (shown for Standard 10/100 Ethernet Module)

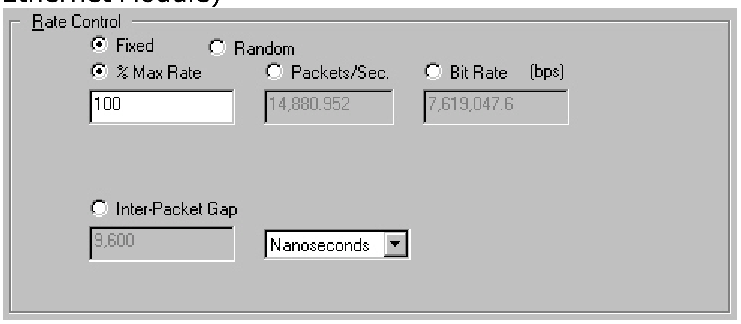
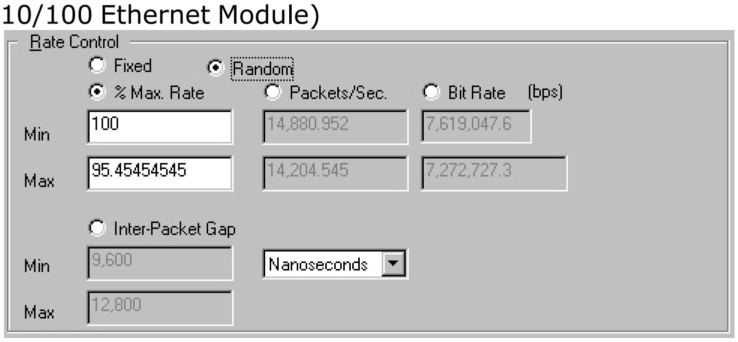


Image: Stream Control—Rate Control and Inter-Packet Gap, Random Mode (shown for Standard 10/100 Ethernet Module)



The inter-packet gap controls allow to specify the gap between packets. The gap can be specified in terms of time, desired packets/second, or percentage of utilization of the max rate. IPGs are inserted between packets, but not at the end of bursts or streams.

The minimum time, maximum time, and resolution varies depending on the load module type. Refer to *Ixia Platform Reference Manual* for a full description. The fields and controls in this box are described in *Table: Inter-Packet Gap Controls for Ethernet Modules.*

Table: Inter-Packet Gap Controls for Ethernet Modules

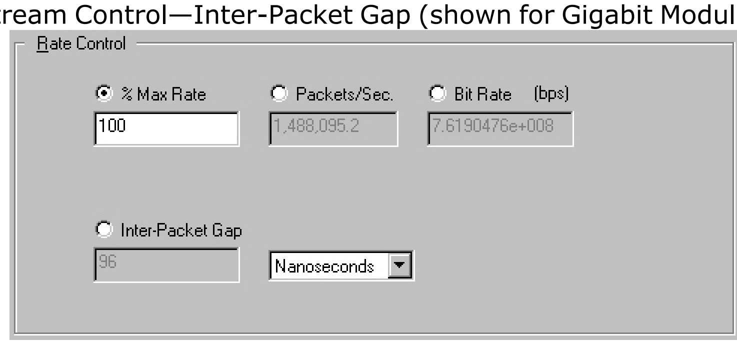
Section	Field/Control	Description
Choice of Generation Type	Fixed	When selected (as opposed to the *Random* selection), all inter-packet gaps are a constant value specified by the *Value* row.
	Random	When selected (as opposed to the *Fixed* selection), the size of inter-packet gaps is randomly generated within the range of

Section	Field/Control	Description
		values specified in the *Min* and *Max* rows.
% Max Rate		For fixed IPGs, this specifies the percentage of time to be used for packet transmission versus total transmission time. The actual inter-packet gap time is configured to allow that utilization. The actual rate may be adjusted slightly to allow for the clock rates associated with each type of port (see *Inter-Packet Gap* below). This value only relates the percentage utilization within a burst; except for *Continuous Packet* type streams the percentage is lower due to inter-burst and Inter-Stream gaps. The use of *% Max Rate* is controlled by Options.
Packets/Sec		For fixed IPG's, this specifies the intended number of packets to be transmitted per second. The actual inter-packet gap time is configured to allow that packet rate. The actual rate may be adjusted slightly to allow for the clock rates associated with each type of port (see *Inter-Packet Gap* below). This value only relates the packets transmitted per second within a burst; except for *Continuous Packet* type streams the actual packets per second is lower due to inter-burst and inter-stream gaps.
Bit Rate (bps)		The bit rate of the stream, in bits per seconds.
Inter-Packet Gap		This specifies the amount of time between packets within a burst. The time must be specified in multiples of the indicated time units.
Bit Rate		(Read-only) The bit rate of the stream, in bits per seconds.
Units		Selects the time units used for the *Inter-Packet Gap* column. The choices available depend on the type of load module: • Nanoseconds (default) • Microseconds • Milliseconds • Seconds • Clock Ticks: The length of a clock tick varies by load module type. Refer to the *Ixia Platform Reference Manual* for values. • Bytes
Min Gap (For Use with Random IPGs ONLY)	% Max Rate	For random IPGs, this specifies the lower end of the range of percentage utilization to be generated. See *% Max Rate* above for a full explanation of this field. The use of *% Max Rate* is controlled by Options.

Section	Field/Control	Description
	Packets/Sec	For random IPGs, this specifies the lower end of the range of packets per second to be generated. See *Packets/Sec* above for a full explanation of this field.
	Bit Rate	The bit rate of the stream, in bits per seconds.
	Inter-Packet Gap	For random IPGs, this specifies the lower end of the range of time values to be generated. See *Inter-Packet Gap* above for a full explanation of this field.
Max Gap (For Use with Random IPGs ONLY)	% Max Rate	For random IPGs, this specifies the upper end of the range of percentage utilization to be generated. See *% Max Rate* above for a full explanation of this field. The use of *% Max Rate* is controlled by Options.
	Packets/Sec	For random IPGs, this specifies the upper end of the range of packets per second to be generated. See *Packets/Sec* above for a full explanation of this field.
	Bit Rate	(Read-only) The bit rate of the stream, in bits per seconds.
	Inter-Packet Gap	For random IPGs, this specifies the upper end of the range of time values to be generated. See *Inter-Packet Gap* above for a full explanation of this field.

Rate Control/IPG for Standard Gigabit, 10 Gigabit Ethernet, and POS 622 Modules

Stream Control—Inter-Packet Gap (shown for Gigabit Module)



The Inter-Packet Gap Box controls allow to specify the gap between packets. The gap can be specified in terms of time, desired packets/second, or percentage utilization/Max Rate. IPGs are inserted between packets, but not at the end of bursts or streams.

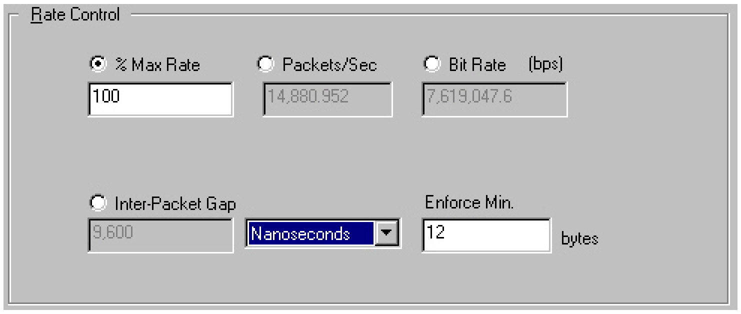
The fields and controls in this box are described in *Table: Inter-Packet Gap Controls for Gigabit and 10 Gigabit Modules.*

Table: Inter-Packet Gap Controls for Gigabit and 10 Gigabit Modules

Section	Field/Control	Description
% Max Rate		For fixed IPGs, this specifies the percentage of time to be used for packet transmission versus total transmission time. The actual inter-packet gap time is configured to allow that utilization. The actual rate may be adjusted slightly to allow for the clock rates associated with each type of port (see *Inter-Packet Gap* below). This value only relates the percentage utilization within a burst; except for *Continuous Packet* type streams the percentage is lower due to inter-burst and Inter-Stream gaps. The use of *% Max Rate* is controlled by Options.
Packets/Sec		For fixed IPGs, this specifies the intended number of packets to be transmitted per second. The actual inter-packet gap time is configured to allow that packet rate. The actual rate may be adjusted slightly to allow for the clock rates associated with each type of port (see *Inter-Packet Gap* below). This value only relates the packets transmitted per second within a burst; except for *Continuous Packet* type streams the actual packets per second is lower due to inter-burst and inter-stream gaps.
Bit Rate		The bit rate of the stream, in bits per seconds.
Inter-Packet Gap		This specifies the amount of time between packets within a burst. The time must be specified in multiples of the indicated time units.
Units		Selects the time units used for the *Inter-Packet Gap* column. The choices available depend on the type of load module: • Nanoseconds (default) • Microseconds • Milliseconds • Seconds • Clock Ticks: The length of a clock tick varies by load module type. Refer to the *Ixia Platform Reference Manual* for values. • Bytes

Rate Control/IPG for TXS Ethernet Modules

Image: Stream Control—Rate Control and Inter-Packet Gap (shown for TXS Module)



The Inter-Packet Gap Box allows to specify the gap between packets. The gap can be specified in terms of time, desired packets/second, or percentage utilization/Max Rate. IPGs are inserted between packets, but not at the end of bursts or streams.

The fields in this box are described in *Table: Inter-Packet Gap for TXS Ethernet Modules.*

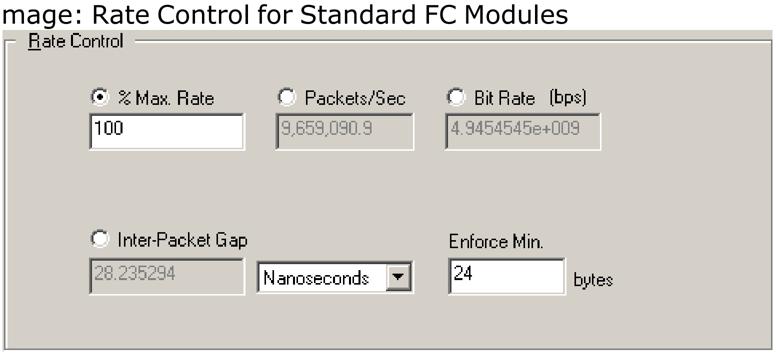
Table: Inter-Packet Gap for TXS Ethernet Modules

Section	Field/Control	Description
% Max Rate		For fixed IPGs, this specifies the percentage of time to be used for packet transmission versus total transmission time. The actual inter-packet gap time is configured to allow that utilization. The actual rate may be adjusted slightly to allow for the clock rates associated with each type of port (see *Inter-Packet Gap* below). This value only relates the percentage utilization within a burst; except for *Continuous Packet* type streams the percentage is lower due to inter-burst and Inter-Stream gaps. The use of %Max Rate is controlled by Options.
Packets/Sec		For fixed IPGs, this specifies the intended number of packets to be transmitted per second. The actual inter-packet gap time is configured to allow that packet rate. The actual rate may be adjusted slightly to allow for the clock rates associated with each type of port (see *Inter-Packet Gap* below). This value only relates the packets transmitted per second within a burst; except for *Continuous Packet* type streams the actual packets per second is lower due to inter-burst and inter-stream gaps.
Bit Rate		The bit rate of the stream, in bits per seconds.
Inter-Packet Gap		This specifies the amount of time between packets within a burst. The time must be specified in multiples of the indicated time units.
Units		Selects the time units used for the *Inter-Packet Gap* column. The choices available depend on the type of load module: • Nanoseconds (default) • Microseconds

Section	Field/Control	Description
		• Milliseconds • Seconds • Clock Ticks: The length of a clock tick varies by load module type. Refer to the *Ixia Platform Reference Manual* for values. • Bytes
Enforce Min Gap		(For TXS family of modules only.) (In bytes) Sets the smallest inter-packet gap (IPG) that is allowed. The default is 12 bytes.

Rate Control/IPG for FC Modules

Image: Rate Control for Standard FC Modules



The Inter-Packet Gap box allows to specify the gap between packets. The gap can be specified in terms of time, desired packets/second, or percentage utilization/Max Rate. IPGs are inserted between packets, but not at the end of bursts or streams.

The fields in this box are described in *Table: Inter-Packet Gap for FC Modules.*

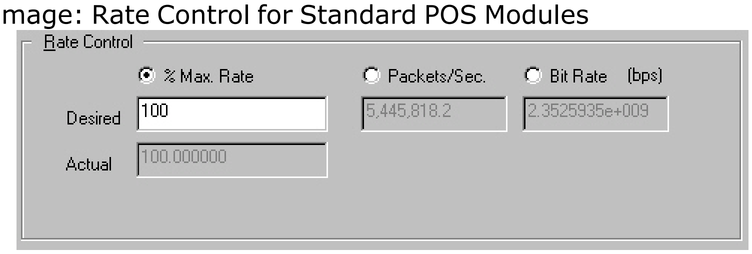
Table: Inter-Packet Gap for FC Modules

Section	Field/Control	Description
% Max Rate		For fixed IPGs, this specifies the percentage of time to be used for packet transmission versus total transmission time. The actual inter-packet gap time is configured to allow that utilization. The actual rate may be adjusted slightly to allow for the clock rates associated with each type of port (see *Inter-Packet Gap* below). This value only relates the percentage utilization within a burst; except for *Continuous Packet* type streams the percentage is lower due to inter-burst and Inter-Stream gaps.
Packets/Sec		For fixed IPGs, this specifies the intended number of packets to be transmitted per second. The actual inter-packet gap time is configured to allow that packet rate. The actual rate

Section	Field/Control	Description
		may be adjusted slightly to allow for the clock rates associated with each type of port (see *Inter-Packet Gap* below). This value only relates the packets transmitted per second within a burst; except for *Continuous Packet* type streams the actual packets per second is lower due to inter-burst and inter-stream gaps.
Bit Rate		The bit rate of the stream, in bits per seconds.
Inter-Packet Gap		This specifies the amount of time between packets within a burst. The time must be specified in multiples of the indicated time units.
Units		Selects the time units used for the *Inter-Packet Gap* column. The choices available depend on the type of load module: • Nanoseconds (default) • Microseconds • Milliseconds • Seconds • Bytes
Enforce Min.		(In bytes) Sets the smallest inter-packet gap (IPG) that is allowed. The minimum IPG can be set at 24 bytes for FC modules.

Rate Control for Standard POS Modules

Image: Rate Control for Standard POS Modules



Rate control is available for standard Packet over SONET modules controls the average rate of transmitting packets. Rate control is also available for, which is described in Stream Control for POS 622 Modules

NOTE POS 622 modules use Inter-Packet Gap (IPG) fields instead of Rate Control fields. For information on setting POS 622 module IPG, Rate Control/Inter-Packet Gap.

The fields and controls in this box are described in *Table: Rate Controls for Standard (POS) Modules.*

Table: Rate Controls for Standard (POS) Modules

Field/Control	Description
% Max Rate	Allows the average packet rate to be exclicked as a percentage of the maximum rate.
Actual	An automatic calculation of the actual packet rate, based on the capabilities of the port, exclicked as a percentage of the maximum rate.
Packets Per Second	An automatic calculation of the number of packets per second based on the Packet Rate.
Bit Rate	The bit rate of the stream, in bits per seconds.

Inter-Burst Gap/Burst Gap

Inter-Burst Gaps (IBGs)/Burst Gaps are inserted between packet bursts, but not at the end of bursts or streams. The minimum and maximum time and resolution vary, depending on the load module type. (Refer to *Ixia Platform Reference Manual*.)

The gap interval between packet bursts within a stream is defined differently for Ethernet-type and POS modules. These types are explained in the following sections:

- Inter-Burst Gap (IBG)
- Inter-Stream Gap/Stream Gap

Inter-Burst Gap (IBG)

The gap between bursts of transmitted packets is controlled by the Inter-Burst Gap (IBG) box, as shown in *Image: Inter-Burst Gap.*

Image: Inter-Burst Gap

The fields and controls in this box are described in *Table: Inter-Burst Gap Controls for Ethernet-Type Modules.*

Table: Inter-Burst Gap Controls for Ethernet-Type Modules

Field/Control	Description
Inter-Burst Gap	Select this box to enable the generation of inter-burst gaps.
Value–Time or Value–Time/Bytes	This specifies the amount of time between bursts within a stream. The time must be specified in multiples of the indicated time units. For 10 Gigabit, 10/100/1000 TXS8, 1000 SFPS4, and 10/100/1000 TXS4 modules, the gap can be specified in bytes instead of time units.
Units	Selects the time units used for the *Time* column. The choices available depend on the type of load module:

Field/Control	Description
	• Nanoseconds (not available on standard POS modules) • Microseconds • Milliseconds • Seconds • Clock Ticks: The length of a clock tick varies by load module type. Refer to the *Ixia Platform Reference Manual* for values (not available on standard POS modules). • Bytes (not available for standard POS or POS 622 modules)

Inter-Stream Gap/Stream Gap

Inter-Stream Gaps precede nearly all types of streams, even Continuous Packet and Continuous Burst streams. Advanced Streams are not preceded by inter-stream gaps, and for 10 Gigabit ports, the inter-stream gap is active AFTER the stream rather than before. The minimum and maximum time and resolution varies depending on the load module type (refer to the *Ixia Platform Reference Manual*).

The gap interval between streams is defined differently for Ethernet-type and POS modules. These types are described in the following sections:

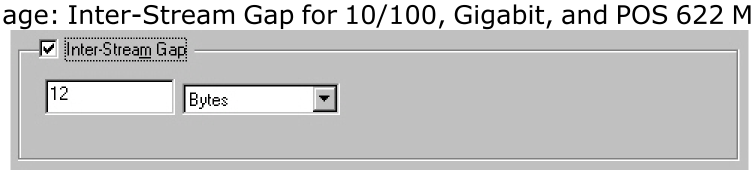
- Inter-Stream Gap (ISG) for Ethernet-Type and POS 622 Modules
- Stream Gap for Standard POS Modules

NOTE No Inter-Stream Gap (ISG) is used for Advanced Streams.

Inter-Stream Gap (ISG) for Ethernet-Type and POS 622 Modules

The gap before an Ethernet or POS 622 stream is controlled by a setting in the Inter-Stream Gap box, as shown in *Image: Inter-Stream Gap for 10/100, Gigabit, and POS 622 Modules.*

Image: Inter-Stream Gap for 10/100, Gigabit, and POS 622 Modules



The fields and controls in this box are described in *Table: Inter-Stream Gap Controls for 10/100 Ethernet, Gigabit, and POS 622 Modules.*

Table: Inter-Stream Gap Controls for 10/100 Ethernet, Gigabit, and POS 622 Modules

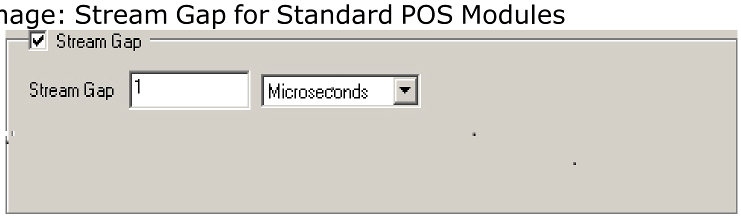
Field/Control	Description
Inter-Stream Gap	If selected, enables generation of the inter-stream gap.
Units	Selects the time units used for the *Time* field. The choices available depend on the type of load module:

Field/Control	Description
	• Nanoseconds • Microseconds • Milliseconds • Seconds • Clock Ticks: The length of a clock tick varies by load module type. Refer to the *Ixia Hardware Manual* for values. • Bytes (not available for POS 622).
Time or Time/Bytes	This specifies the amount of time between streams. The time must be specified in multiples of the indicated time units. For 10 Gigabit, 10/100/1000 TXS8, 1000 SFPS4, and 10/100/1000 TXS4 modules, the gap can be specified in bytes instead of time units.

Stream Gap for Standard POS Modules

The Stream Gap for Packet over SONET Modules controls the amount of time before another stream is applied. The Stream Gap box is shown in *Image: Stream Gap for Standard POS Modules.*

Image: Stream Gap for Standard POS Modules



The fields and controls in this box are described in *Table: Stream Gap Controls for Packet over SONET Modules.*

Table: Stream Gap Controls for Packet over SONET Modules

Field/Control	Description
Stream Gap	Check this box to enable generation of the inter-stream gap.
Stream Gap	This specifies the amount of time between streams. The time must be specific in multiples of the simulated time units.
(Time units)	Selects the time units for the *Time* column. The choices are: • Microseconds • Milliseconds • Seconds

Stream Control for Advanced Streams

The Advanced Stream Scheduler feature, which is available on a number of modules, as detailed in the *Ixia Platform Reference Manual*, interleaves all of the individually configured streams for the port.

This allows to configure a number of streams which are concurrently active. They transmit packets in an interleaved fashion.

Refer to Advanced Streams for additional information on Advanced Streams.

There are two different tabs for advanced stream configuration, depending on the type of module, and these are described in the following sections:

- Advanced Streams for Standard POS and POS 622 Modules.
- Advanced Streams for Ethernet Modules . (10GE, 10/100 TXS8, 10/100/1000 TXS4, 1000 SFPS4)

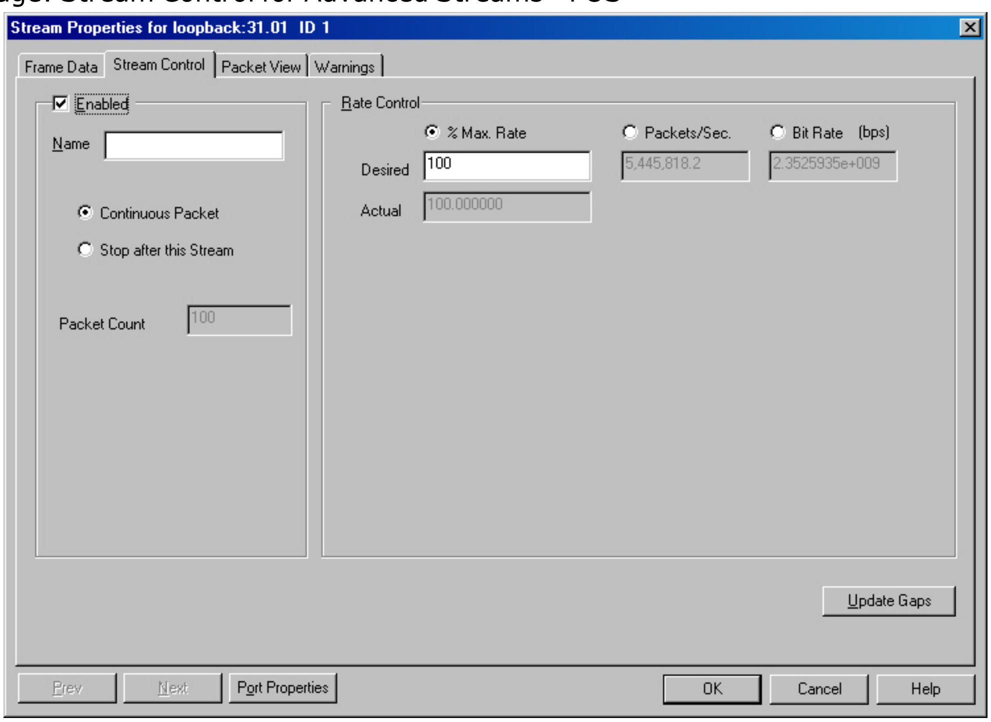
NOTE For DCC Advanced Streams Advanced Streams for Standard POS and POS 622 Modules.

Advanced Streams for Standard POS and POS 622 Modules

For standard Packet over SONET (POS) and POS 622 module advanced streams, the desired packet rate, as a percentage of the Maximum rate, can be configured for each of the streams. The **Stream Control** tab for POS Advanced Streams is shown in *Image: Stream Control for Advanced Streams—POS.*

NOTE **DCC** tab is also used to set up DCC Advanced Streams for the optional DCC feature. For additional information on DCC packet streams DCC Packet Streams and Packet Flows.

Image: Stream Control for Advanced Streams—POS



The fields and controls in this tab are described in *Table: Stream Control for Advanced Streams—POS.*

Table: Stream Control for Advanced Streams—POS

Section	Field/Control	Description
(Stream info)	Enabled	Check this box to enable the use of the stream configured in this tab.
	Name	(Optional) A user-assigned name for this stream.
	(Type of stream transmission)	Choose one of: • **Continuous Stream**: The configured stream is repeated until a Stop Transmit is sent. • **Stop After This Stream**: Transmission stops after this stream is sent. The length of the stream is determined by the value entered into the *Packet Count* field.
	Packets Count	The total number of packets to be sent in this configured stream.
Packet (rate)	% Max Rate	Default is 100%. The percentage of the available bandwidth requested for use by this stream is set in the *Desired* field, while (Read-only) the actual percentage of the available bandwidth used by this stream is shown in the *Actual* field.
	Actual	(Read-only) The actual percentage of the available bandwidth used by this stream.
	Packets per Second	The packet rate, based on the actual percentage of the available bandwidth used.
	Bit Rate (bps)	The bit rate of the stream, in bits per seconds.
Update Gaps		When this button is selected, values that are entered into the fields for the inter-packet gap are reflected in the read-only fields.

Advanced Streams for Ethernet Modules

For module families which support advanced streams, the desired packet rate (as a percentage of the maximum rate) can be configured for each of the streams. In addition, a minimum inter-packet gap is required.

Module families for which this is true include these:

- LSM10GE
- LM1000(S)TXS4/24
- LSM1000XMS12
- LSM1000XMV4/8/12/16-01
- LSM1000XMVDC4/8/12/16
- LSM1000XMVDC4-NG
- ASM1000XMV12X
- LM622-MR POS
- MSM 2.5G/10G

- XM100GE4CXP
- XM100GE4CXP+FAN
- XM40GE12QSFP+FAN
- XM10/40GE12QSFP+FAN
- XM10/40GE6QSFP+FAN
- XM100GE4QSFP28
- XM100GE4CFP4
- XMAVB10/40GE6QSFP+FAN
- XM100GE4QSFP28+ENH
- XM100GE4CFP4+ENH
- XMAVB10/40GE6QSFP+FAN
- Novus100GE8Q28+FAN
- Novus100GE8Q28+FAN+25G
- Novus100GE8Q28+FAN+50G
- Novus100GE8Q28+FAN+25G+50G
- Novus100GE8Q28+FAN+10G+25G+40G+50G
- Novus10/5/2.5/1/100M16DP
- Novus10/5/2.5/1/100M8DP
- Novus10/5/2.5/1/100M16DP-R
- Novus10/5/2.5/1/100M8DP-R
- QSFP-DD-400GE+200G+100G+50G
- QSFP-DD-R400GE+200G+100G+50G
- UPG-QSFP-DD-R400GE+200G+100G+50G
- CFP8-400GE
- CFP8-R400GE
- UPG-CFP8-R400GE
- T400GD-8P-QDD+200G+100G+50G
- T400GD-8P-OSPF+200G+100G+50G
- S400GD-16P-QDD+FAN+NRZ

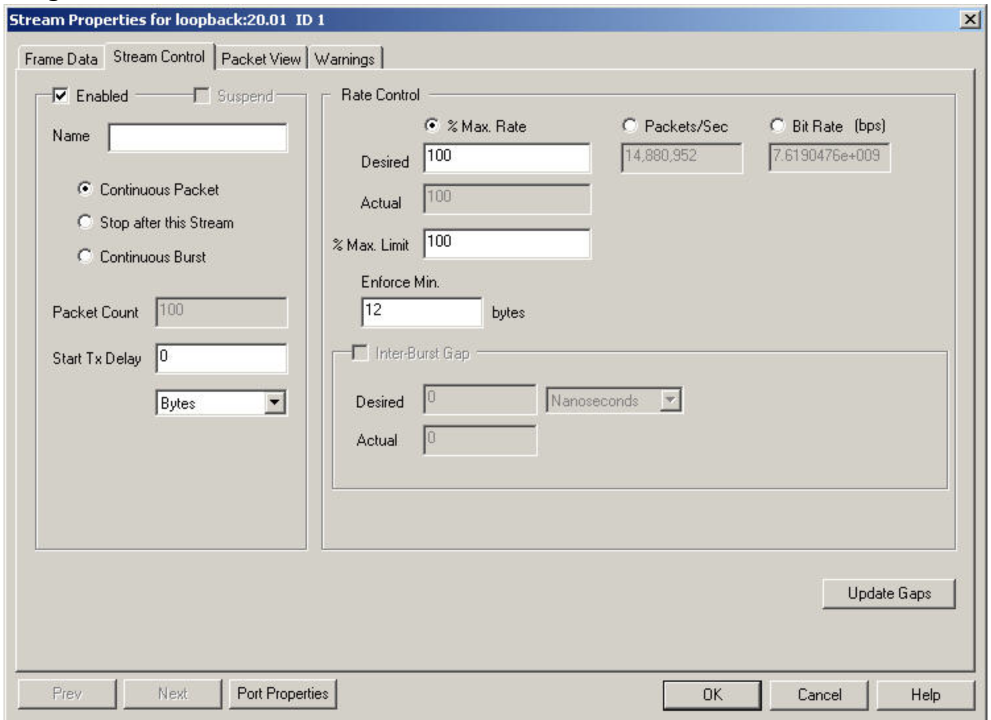
Each stream in the Advanced Stream Scheduler in Continuous Burst mode has its own Inter-Burst Gap and Packet Count. The Inter-Burst Gap and Start Tx Delay share the same counter. The Packet Count is used to count the packets per burst.

For information on the corresponding data rates for various module types, see the *Ixia Platform Reference Manual*.

When FCoE protocol is implemented on a NGY module, and the selected flow control type is Priority-based (PFC), the **Stream Control** tab of the Advanced Streams properties includes the assignment of a PFC Queue. Priority-based Flow Control for information.

The ***Advanced Stream*** tab for 10GE and TXS Ethernet modules is shown in *Image: Advanced Streams—Ethernet.*

Image: Advanced Streams—Ethernet



The fields and controls in this tab are described in *Table: Advanced Streams—Ethernet.*

Table: Advanced Streams—Ethernet

Section	Field/Control	Description
(Stream info)	Enabled	If selected, enables the use of the stream configured in this tab.
	Name	(Optional) A user-assigned name for this stream.
	(Type of stream transmission)	Choose one of: • **Continuous Packet**: The configured packet stream is repeated until a Stop Transmit is received. • **Stop After This Stream**: Transmission stops after this stream is sent. The transmit duration of the stream (packets transmitted) is determined by the value entered into the *Packet Count* field. • **Continuous Burst**: Sends out a continuous set of packet bursts.If selected, the Start Tx Delay option is automatically synchronized with the Inter-Burst Gap setting. (See Start Tx Delay, below.) *Continuous Burst* mode may not be used with flows. See **Note** following *Table: Basic Stream Controls* for information on maximum burst count.

Section	Field/Control	Description
	Packet Count	The total number of packets to be sent in this configured stream.
	Start Tx Delay	(Not applicable to POS modules) Entering a number in this field delays the start of the scheduled stream by the entered number (initially bytes). It is possible to change the value of the delay by selecting a value type in the pull-down menu directly below this field. Value options are: • Nanoseconds • Microseconds • Milliseconds • Seconds • Bytes (default) Once a number is entered, selecting a new value converts the delay time number from the original format to reflect the new value. NOTE If Continuous Burst mode is selected, Start Tx Delay is disabled and Inter-Burst Gap is enabled. The setting for Start Tx Delay automatically duplicates the Inter-Burst Gap setting. The two are synchronized.
Packet (rate)	% Max Rate	Default is 100%. The percentage of the available bandwidth requested for use by this stream is set in the *Desired* field, while the actual percentage of the available bandwidth used by this stream is shown in the *Actual* field (read-only). This is the IEEE-defined full speed line rate (theoretical speed) for Ethernet port.
	% Max Limit	The maximum rate the stream can attain when its rate is dynamically adjusted (in stream editor grid). Example: You set the %Max Limit to 50%, then the stream rate can be dynamically changed to any rate from 0% to 50% in the stream editor grid. The stream rate cannot be changed to 80%.
	Packets per Second	The packet rate, based on the actual percentage of the available bandwidth used.
	Bit Rate (bps)	The bit rate of the stream, in bits per second.
	Enforce Min. Gap (bytes)	Default is 12 bytes.
Inter-Burst Gap	DesiredActual	*Inter-Burst Gap/Burst Gap. For definitions, Table: Inter-Burst Gap Controls for Ethernet-Type Modules.*

Section	Field/Control	Description
		NOTE If Continuous Burst mode is selected, Start Tx Delay is disabled and Inter-Burst Gap is enabled. The setting for Start Tx Delay automatically duplicates the Inter-Burst Gap setting. The two are synchronized.
Update Gaps		When this button is selected, values that are entered into the fields for the inter-packet gap are reflected in the read-only fields.

Update Gaps Button

When one of the Inter-Packet Gap quantities, *Time, Packets/Sec*, or *% Util (% Max Rate)* is changed, the use of this button causes the other parameters to be correspondingly updated.

Port Properties Button

The *Port Properties* button opens the *Port Properties* dialog box for the port being configured for stream control. Refer to the following chapters for further details:

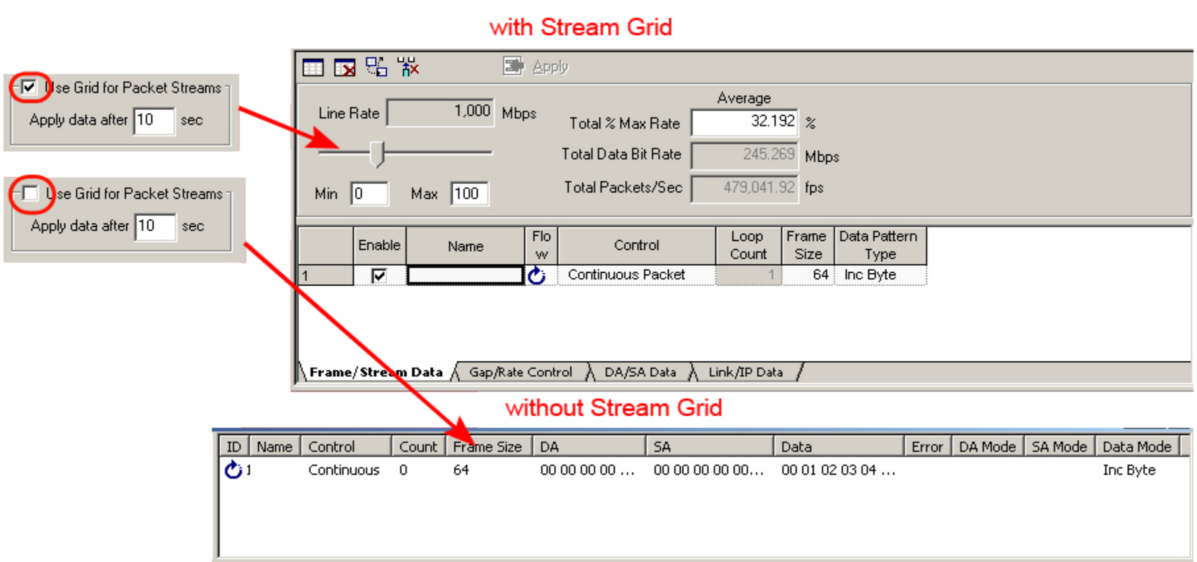
- Chapter 18,Port Properties — 10/100/1000

Stream Editing

Stream editing is the primary means of configuring Packet Streams and Flows. Stream editing requires that the *Use Grid for Packet Streams option* of the *Tools > Options > Display* menu be selected. See Display Format*. If this option is not enabled, the Packet Stream information appears in list format, as shown in Image: Packet Stream View.*

NOTE For information on ATM Stream Editing, see ATM Stream Queue Grid.

Image: Packet Stream View



The stream editing grid provides a spreadsheetf representation of the packet contents, allowing direct viewing and configuration. Various spreadsheet operations are available to create useful sequences of packets.

Data within the spreadsheet may be configured in two ways:

- Entered directly into the spreadsheet, or
- Entered in the standard **Frame Data** tab in the Stream Properties page.Frame Data Structure.

Stream editing is described in the following sections:

- Stream Editing Window
- Stream View Options
- Stream Data Manipulation

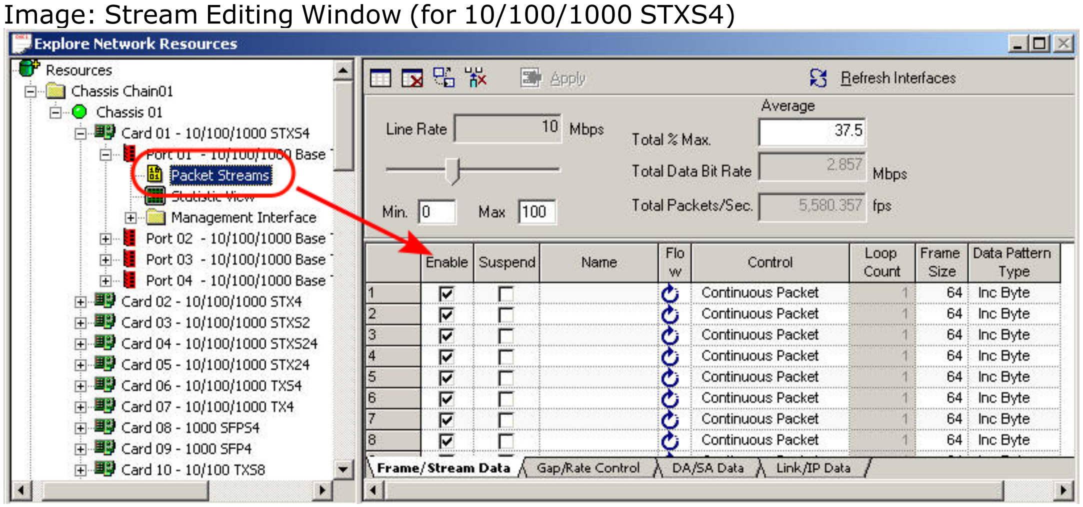
NOTE Auto Apply Feature: It is important to remember that each time a change is made to a row in the stream configuration grid, and 'Enter' is selected in that row again, the 'Auto Apply' function is started. This function runs for 10 seconds before the actual change is made, and this countdown appears in the header of the window. During the 10 seconds, the *Apply* button can be selected to apply the changes immediately (the 10-second countdown stops). During the 10 seconds, the Auto Apply can be stopped by selecting the cursor in the row again.

Stream Editing Window

Stream editing is enabled whenever the '... Streams' or '... Flows' item is selected (selected) for a port in the Explore Network Resources tree, as shown in *Image: Stream Editing Window (for 10/100/1000 STXS4).* This window allows to configure multiple streams on a port at one time. Each of the streams or flows occupies a row in the table. This window is used for editing both normal scheduler streams and Advanced Scheduler streams.

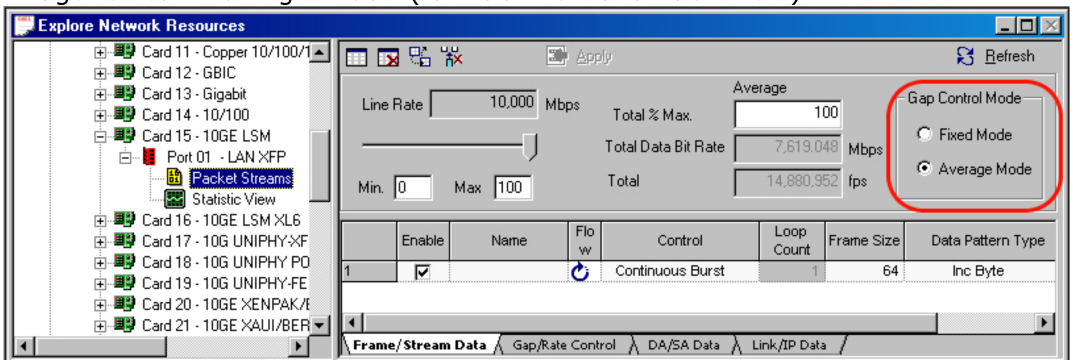
NOTE DCC Packet Streams and Packet Flows for information on editing DCC Packet Flows and Streams.

Image: Stream Editing Window (for 10/100/1000 STXS4)



The 10GE LSM and 10G MSM modules (when in LAN or WAN mode) have one additional feature in the Stream Editing window called *Gap Control Mode*. This is shown in *Image: Stream Editing Window (for 10GE LSM and 10GE MSM).*

Image: Stream Editing Window (for 10GE LSM and 10GE MSM)



- For information on the Header fields, Stream Editing Window Header.
- For information on the Stream Edit Views/Columns, *Stream View Options. (Each of the possible frame data and stream control data items represents a column in the view.)*
- For information on customizing the windows and use of the pop-up menu Customizing the Stream Edit Window.
- For simplified examples using the Stream Editing window, Stream Editing Example—Normal Scheduler and Stream Editing Example—Advanced Scheduler.

Stream Editing Window Header

The fields in the Stream Editing window header control global settings, and are described in *Table: Stream Editing Window—Header Fields (Global Settings).*

Table: Stream Editing Window—Header Fields (Global Settings)

Field/Control	Description
Line Rate	(Read-Only) The maximum possible line speed (in Megabits per Second) for this port.
Slider Bar	(Linked with the *Total % Max Rate* field) The value in the *Total % Max Rate (Average)* field reflects the setting of the slider bar. Changes in that field causes the setting of the slider bar to change. Select the pointer and drag it to the percentage value of the *Total % Max Rate* to set. If the slider is set to '0,' all ratio settings for the individual streams in this window are lost. The slider bar or *Total % Max Rate* field can be used to change the line rate of stream(s) without interrupting traffic Changing Streams Without Interruption.
Min.	This is the minimum setting possible for the Slider Bar (in %). The default is 0%, but you may enter a different value to set the lower end of a different range, for greater accuracy in setting rate values.

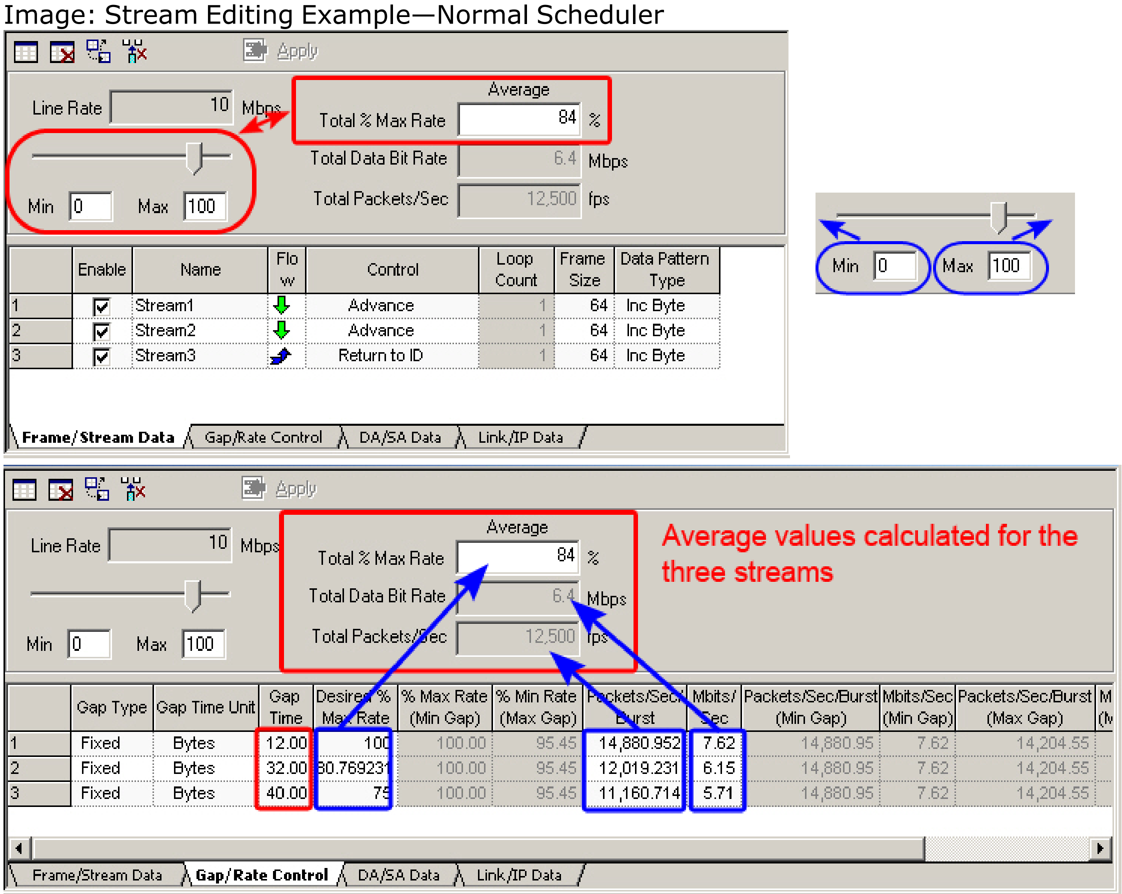
Field/Control	Description
Max.	This is the maximum setting possible for the Slider Bar (in %). The default is 100%, but you may enter a different value to set the higher end of a different range, for greater accuracy in setting rate values.
Total % Max Rate	This value is based on the **maximum possible** portion of the line rate that is used for transmitting data bits on this type of port. (This value can be changed by using the slider bar or by entering a value directly into this field.) • For **Normal Scheduler** streams, this value may be averaged over the *Desired % Max Rates* for the various streams (depending on the types of streams). For a Continuous Packet or Continuous Burst stream, this is equal to the *Desired % Max Rate* for that selected stream. • For **Advanced Scheduler** streams, this value is the sum of the *Desired % Max Rates* for the various streams. If the sum of the rates entered is greater than 100%, the 'Oversubscribed' warning banner appears. A value of 100% means that 100% of the **maximum possible data bit rate** for that port is used. The calculation of the data bit rate does not include gap bytes, SONET overhead bytes, and so on. **CAUTION:** If the value in this field is set to '0', all ratio settings for the individual streams in this window is lost.The *Total % Max Rate* field or the slider bar can be used to change the line rate of stream(s) without interrupting traffic.Changing Streams Without Interruption.
Total Data Bit Rate	(Read-Only) This is the total rate (in Megabits per Second) at which data bits are transmitted on this port. This value is dependent on stream configuration settings, such as Inter-Packet Gap, and so forth. For example, setting the IPG to a larger value, while keeping the other variables unchanged, decreases the data bit rate. For a Continuous Packet stream, this is equal to the 'Mbits/Sec' for that stream. For other stream control types and sequences of streams, this value may be an average of the 'Mbits/Sec' values for the streams. For **Ethernet** ports, the calculation of this value includes the data bits in the frames, but excludes the bits in the preamble. For **SONET** ports, the calculation of this value includes the data bits in the frames, but excludes SONET Overhead bits and bits in the Flag byte.
Total Packets/Sec	This is the total number of packets that are transmitted each second on this port, based on the value for the *Total Data Bit Rate* divided by the number of bits in the packets. For a Continuous Packet stream, this is equal to the 'Packets/Sec/Burst' for that stream. For other stream control types and sequences of streams, this value may be an average of the 'Packets/Sec/Burst' values for the streams.

Field/Control	Description
Gap Control Mode	(For 10GE LSM and 10GE MSM modules only.) Controls the inserted packet gap behavior for the stream, as defined by IEEE. The options are: • Fixed Mode: Gap is adjusted to conform so that packets plus the gap are a multiple of 4. The value set is a minimum enforced gap. • Average Mode: Gap is adjust during each transmission so that packets plus gaps are a multiple of 4, plus or minus three bytes. This conforms to the Idle Deficit Count method defined in IEEE 802.3ae, so as to keep the average gap to the requested value.

Stream Editing Example—Normal Scheduler

A simple example for use of the stream editing window in normal stream scheduler mode is shown in *Image: Stream Editing Example—Normal Scheduler.* This example is for a 10/100 TXS8 Ethernet module, operating at 10 Mbps. Three streams are configured, all using default values except for the gap size, which has been configured with a different size gap for each stream. The Gap Type is *Fixed*, so all of the columns associated with Min and Max Gaps for Random gaps are dimmed and unavailable. The 8-byte (default) preamble bits and the gap bytes are not included in the calculation for the Total Data Bit Rate (Average). The *Min* and *Max* values fields for the *Total % Max Rate* slider bar are kept at the defaults of 0% and 100%, respectively.

Image: Stream Editing Example—Normal Scheduler

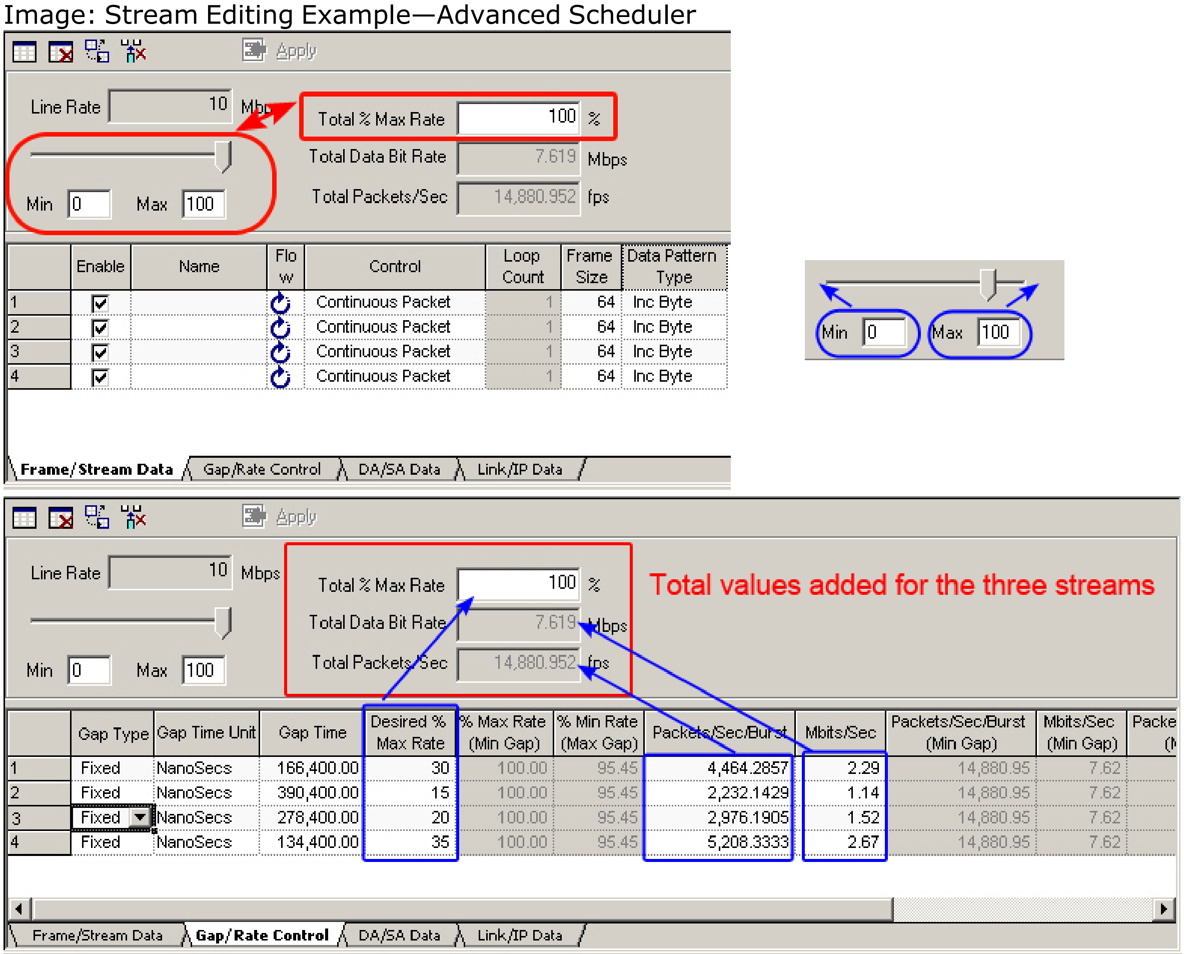


Stream Editing Example—Advanced Scheduler

A simple example for use of the stream editing window in Advanced Stream Scheduler mode is shown in *Image: Stream Editing Example—Advanced Scheduler.* This example is for a 10/100 TXS8 Ethernet module, operating at 10 Mbps. Four streams are configured, all using default values except for the *Desired % Max Rate* for each individual stream. The sum of the % max rates equals 100%. The Gap Type is *Fixed*, so all of the columns associated with *Min* and *Max* gaps for random gaps are dimmed and unavailable. The 8-byte (default) preamble bits and the gap bytes are not included in the calculation for the *Total Data Bit Rate* (Average).

The *Min* and *Max* values for the *Total % Max Rate* slider bar are kept at the defaults of 0% and 100%, respectively. If the *Total % Max Rate* slider bar or edit box are changed, it causes the desired rates for all of the stream to change proportionately, maintaining the percent ratio between the streams to remain constant. The exception to the maintained ratio is when any stream’s modified percentage exceeds the capacity of the hardware for gap times.

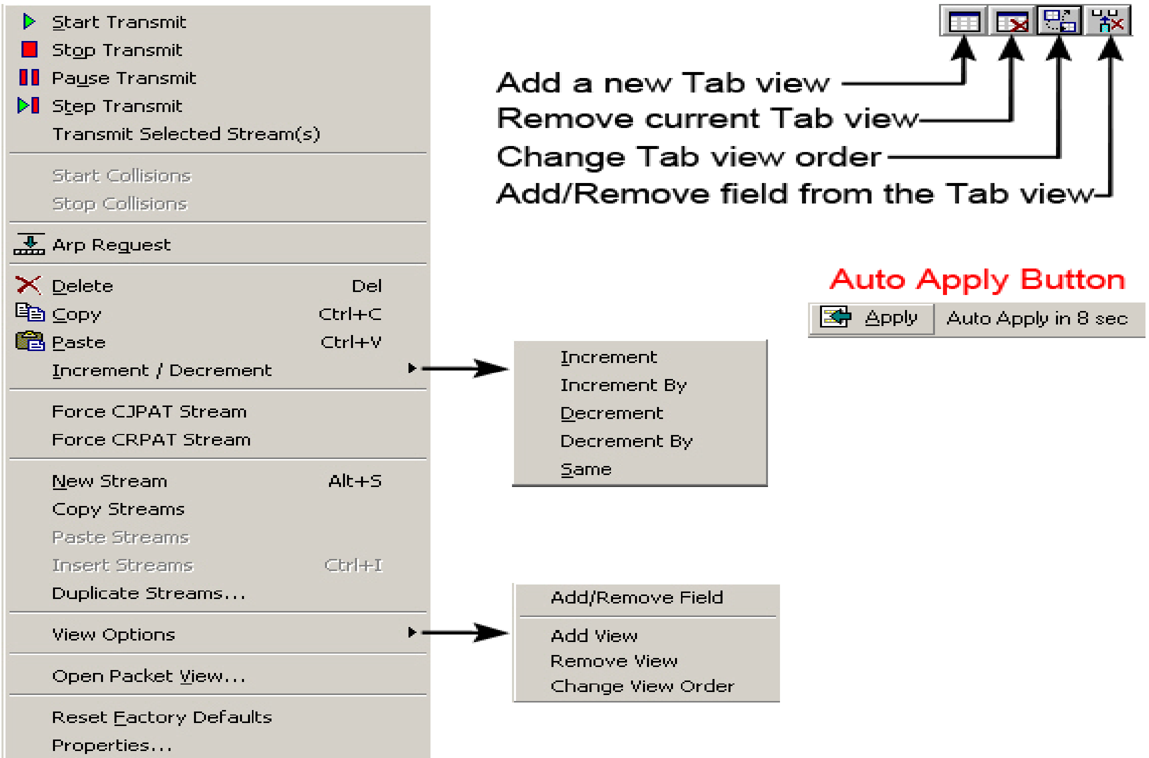
Image: Stream Editing Example—Advanced Scheduler



Customizing the Stream Edit Window

The particular columns to be shown may be selected. A selection of columns is called a ‘view,’ and multiple views may be created. The creation of multiple views and selection of columns, as well as other operations is accomplished through the pop-up menu and the menu bar, shown in *Image: Stream Editing Pop-Up Menu and Menu Bar (shown for 10GE LAN).*

Image: Stream Editing Pop-Up Menu and Menu Bar (shown for 10GE LAN)

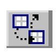


The menu choices available in the pop-up menu and menu bar are described in *Table: Stream Editing Pop-Up Menu Choices.*

Table: Stream Editing Pop-Up Menu Choices

Command	Keys/Shortcuts	Description
Start Transmit		Starts the transmission of data.
Stop Transmit		Stops the transmission of data.
Pause Transmit		Temporarily pauses the transmission of data. A 'Start Transmit' or 'Step Transmit' operation continues after a pause.
Step Transmit		After a pause, causes a single packet to be transmitted.
Transmit Selected Stream(s)		Starts transmit on the selected/highlighted stream(s).
Start Collisions		Enables collision generation for received data, if programmed for the port and enabled.
Stop Collisions		Stops collision generation.

Command	Keys/Shortcuts	Description
ARP Request		Send an ARP packet requesting addresses. The first IP address found in the streams for each port is used for the ARP request.
Delete	 Del	The selected row(s) are deleted.
Copy	 Ctrl+C	Copies the selected rectangle of cells to the clipboard.
Paste	 Ctrl+V	Pastes the contents of the clipboard onto the currently selected cells. Note that this pasting operation always succeeds, but may not necessarily make sense. For example, pasting stream names onto loop counts results in an enormous number being pasted. In general, like numeric representations may be cut and pasted to produce the expected results.
Force CJPAT Stream		(For 10GE modules only) Forces the configuration values for the selected stream to the values specified by IEEE 802.3ae Annex A, for Continuous Jitter Test Pattern (CJPAT) testing.
Force CRPAT Stream		(For 10GE modules only) Forces the configuration values for the selected stream to the values specified by IEEE 802.3ae Annex A, for Continuous Random Test Pattern (CRPAT) testing.
Increment/Decrement > IncrementIncrement By...DecrementDecrement By...Same		These options are available when any rectangle is selected within the spreadsheet. The values within the selected cells are automatically manipulated. Stream Data Manipulation.
New Stream	Alt+S	A new stream is inserted after the last currently selected cell.
Copy Streams...		If one or more rows (streams) are selected, these are copied to the clipboard.
Paste Streams...		If one or more rows (streams) are selected, the contents of the clipboard replace these

Command	Keys/Shortcuts	Description
		rows.
Insert Streams	Ctrl+I	Used with the copy option, when one or more streams are copied to the clipboard. Insert the cursor into a row in the list of streams, and select Insert Streams. The streams are inserted in the list, with one row per stream, immediately below the row with the cursor.
Duplicate Streams...		The currently selected rows (streams) are duplicated following the current selection. A dialog box prompts for the number of times to duplicate the stream(s).
View Options >Add View		Opens the *Add/Remove Field* dialog box. Stream View Options for more information.
View Options >Remove View		The current view is removed. The last view may not be removed.
View Options >Change View Order		The order of the views may be changed through the use of the dialog box. Change View Order Option for a description of this dialog box.
View Options >Add/Remove Field		Offers the dialog box shown in Stream View Options, which allows selection of the fields (columns) shown in the current view.
Open Packet View...		The *Packet View* dialog box, as described in Packet View Tab, is invoked to show the first packet associated with the selected stream.
Reset Factory Defaults		Resets to the factory default values.
Properties... (or Double-click row in the stream grid)		Shows the *Stream Control* dialog box for the currently selected stream. It is described in Stream Properties dialog box.

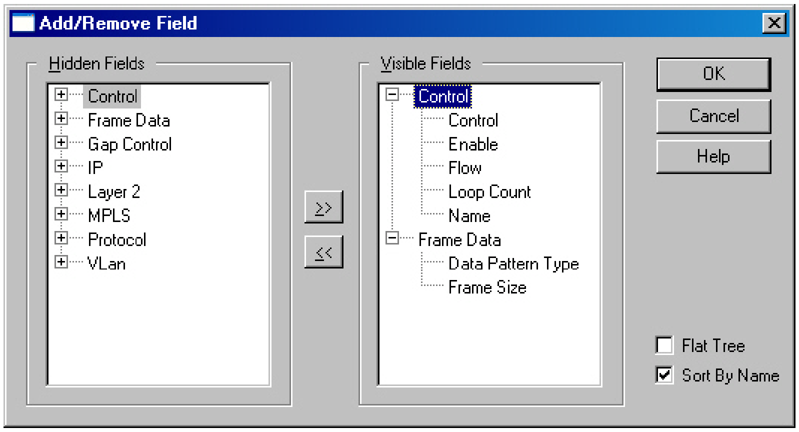
Stream View Options

The fields (columns) that are s in the spreadsheet are controlled by the pop-up menu option, *View Options > Add/Remove Field.*

NOTE For the *Add/Remove Field* dialog box for Logging and Alerts, Add/Remove Field Option.

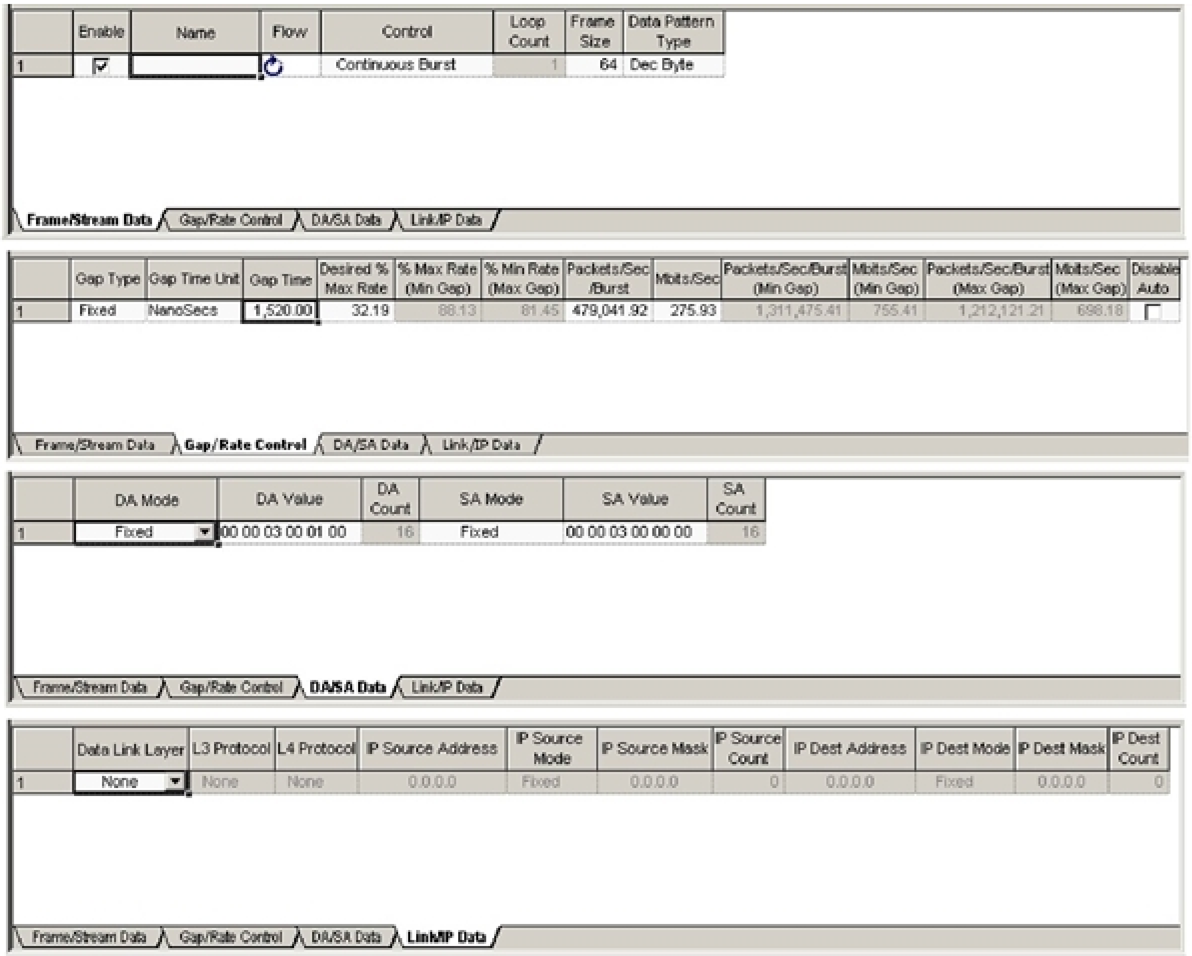
Selecting this option opens the *Add/Remove Field* dialog box which is shown in *Image: Stream Edit—Add/Remove Field dialog box.*

Image: Stream Edit—Add/Remove Field dialog box



To create or modify a customized spreadsheet view, use the >> arrow to move a *Hidden Field* to the *Visible Fields* list and << to move a *Visible Field* to the *Hidden Fields* list. The columns in a view may be moved by selecting a column in the spreadsheet and moving it to its new location (using the mouse select-and-drag method). A red line indicates where it will be placed when the mouse button is released. Four views are pre-programmed. (For POS modules, only the Frame/Stream Data and Gap/Rate Control views are available.) These views are shown in *Image: Pre-Programmed Stream/Flow Views (shown for 10/100 TXS8)* and described in *Table: Columns Available for Pre-Programmed Views.*

Image: Pre-Programmed Stream/Flow Views (shown for 10/100 TXS8)



The columns available for each of the four pre-programmed views are:

Table: Columns Available for Pre-Programmed Views

View	Columns Available
Frame/Stream Data	EnableNameFlowControlLoop CountFrame SizeData Pattern Type
Gap/Rate Control	Gap TypeGap Time UnitsGap TimeDesired % Max Rate% Max Rate (Min Gap)% Min Rate (Max Gap)Packets/Sec/BurstBits/SecPackets/Sec/Burst (Min Gap)Bits/Sec (Min Gap)Packets/Sec/Burst (Max Gap)Bits/Sec (Max Gap)Disable Auto
DA/SA Data	DA ModeDA ValueDA CountSA ModeSA ValueSA Count
Link/IP Data	Data Link LayerL3 ProtocolL4 ProtocolIP Source AddressIP Source ModeIP Source MaskIP Source CountIP Dest AddressIP Dest ModeIP Dest Count

The available columns and their usage are shown in *Table: Stream Edit Available Fields.Not all of the fields available in the Stream Properties dialog box or* Frame Data Structure are available in the spreadsheet view. The table below shows the fields listed in the default order for the Add/Remove Field dialog box, which is Sort by Name and presents the fields alphabetically in a multilevel tree.

Table: Stream Edit Available Fields

Category	Field	Type	Description
Control	Allow Auto Delete	check box	Allows for auto deletion of a stream if selected. If streams are generated from IxRouter/IxNetwork, and **Allow Auto Delete** is selected, then existing streams are first deleted, then created. If auto delete is not selected, then streams are appended to existing streams.
	Bursts Per Stream	Integer	If stream control is set to other than Continuous packet or burst, this is the # of bursts in the stream. Basic Stream Controls.
	Control	Choices	Indicates what happens after the stream is applied. Choose one of: • Continuous Packet • Continuous Burst • End • Advance • Return to ID • Return For Count Basic Stream Controls.
	Enable	check box	Enables or disables the stream. Basic Stream Controls.
	Flow	Read-only icon	Indicates what happens after the stream is applied. Choose one of: —Continuous packet/burst —End —Advance —Return to ID —Return for Count Basic Stream Controls.

Category	Field	Type	Description
	Loop Count	Integer	If *Control* is set to *Return for Count*, this is the number of times to loop back. Basic Stream Controls.
	Name	Text	The name of the stream. Basic Stream Controls.
	Packets Per Burst	Integer	If *Control* is other than *Continuous packet*, this is the number of packets in each burst. Basic Stream Controls.
	Return To ID	Integer	If *Control* is set to one of *Return for ID* or *Return for Count*, this is the stream ID to return to while looping. Basic Stream Controls.
Frame Data	Data Pattern Data	Hex value - 4-octet	The data pattern associated with the selected data pattern type. Data Pattern Box.
	Data Pattern Type	Choice	The type of data pattern to apply to the body of a frame. Choose one of: • Inc Byte • Inc Word • Dec Byte • Dec Word • Random • Repeating • Fixed • ARP/Discovery Data Pattern Box. *The patterns associated with the Repeating, Fixed, and ARP/Discovery choices must be set through the **Frame Data** tab, which may be invoked by double-clicking anywhere in the row.*
	Forced Error	Choice	The type of error to insert in the packets in the stream. Choose one of: • No Errors • Alignment

Category	Field	Type	Description
			• Dribble Bit • Bad CRC • No CRC Force Errors Box.
	Frame Size	Integer	If *Size Type* is set to *Fixed*, then this field is used to set the size of each frame. Frame Size.
	Frame Size Type	Choice	The manner in which the frame size is set for generated packets. Choose one of: • Fixed • Random • Increment • Auto Frame Size. NOTE For **OC-48c POS, OC-192c POS,** and **10GE** modules, only one stream of incrementing frame size can be created per group of streams. Overall, up to 254 non-incrementing frame size streams, plus one incrementing frame size stream, may be configured concurrently for a port on one of these modules.
	Max Frame Size	Integer	If *Size Type* is set to *Random* or *Increment*, then this is the largest frame size that is generated. Frame Size.
	Min Frame Size	Integer	If *Size Type* is set to *Random* or *Increment*, then this is the smallest frame size that is generated. Frame Size.
	Preamble Size	Integer	The size, in bytes, of the preamble.

Category	Field	Type	Description
			Preamble Size Box.
Signature (sub-category)	Data Integrity Signature	check box	(Only appear if available for the load module type.) If selected, data integrity values are inserted for each outbound packet. Instrumentation Box.
	Packet Group Signature	check box	If selected, this indicates that transmitted packets will have a packet group signature and packet group ID inserted into the packet. If selected, timestamp is also implied. Instrumentation Box.
	Sequence Signature	check box	If selected, sequence numbers are inserted in each outbound packet. Instrumentation Box.
	Time Stamp	check box	If selected, indicates that the six bytes before the FCS should hold a 48-bit timestamp with a 20ns resolution from the start of packet stream application. Instrumentation Box.
UDF1 through UDF4 (sub-category)	For Data 1-4: UDF__ Bit Mask 1 - 4	Mask	For counter 1, 2, 3, or 4, a correspondingly large set of bit values which control whether each value is held at 0, 1, or allowed to change ('X'). Chapter 7,Frame Data–User Defined Fields (UDF) .
	UDF __ Init Value 1 - 4	Integer	The initial value for the Counter 1, 2, 3, or 4, as masked by the Bit Mask Value. Chapter 7,Frame Data–User Defined Fields (UDF).
	UDF __ Mode 1 - 4	Choice	Up or Down controls the direction of counting for Counter 1, 2, 3, or 4. Chapter 7,Frame Data–User Defined Fields (UDF).
	Counter Type	Integers (variable)	The use and division of the 32-bit counter. The choices cover all possible counter lengths and combinations. For example: '8', '16', '24' and '32' indicate single counters of their respective lengths, '8x16' indicates an

Category	Field	Type	Description
			8-bit counter followed by a 16-bit counter, and '8x8x16' indicates an 8-bit counter followed by an 8-bit counter followed by a 16-bit counter. This causes the appropriate number of counters to be shown in the remainder of the tab (up to 4). Chapter 7,Frame Data–User Defined Fields (UDF).
	Continuously Counting	check box	If the Continuous Counting box is selected, then the counter will continuously count. Chapter 7,Frame Data–User Defined Fields (UDF).
	Enable	check box	Must be selected for the particular UDF to be active. Chapter 7,Frame Data–User Defined Fields (UDF).
	Offset	Integer	The offset from the start of the frame. Chapter 7,Frame Data–User Defined Fields (UDF).
	Random	check box	If selected, the counter values changes randomly. Chapter 7,Frame Data–User Defined Fields (UDF).
	Repeat Count	Integer	If the *Continuous Counting* box is not selected, then the value in the *Repeat Count* field is used to control the number of times that the counter increments. When the Repeat Count is exhausted, the value resets to 0 and counting is continued. Chapter 7,Frame Data–User Defined Fields (UDF).
	Bit Mask 1 - 4	Mask	For counter 1, 2, 3, or 4, a correspondingly large set of bit values which control whether each value is held at 0, 1, or allowed to change ('X'). Chapter 7,Frame Data–User Defined Fields (UDF).
	Init Value 1 - 4	Integer	The initial value for the Counter 1, 2, 3, or 4, as masked by the Bit Mask Value.

Category	Field	Type	Description
			Chapter 7,Frame Data–User Defined Fields (UDF).
	Mode 1 - 4	Choice	Up or Down controls the direction of counting for Counter 1, 2, 3, or 4. Chapter 7,Frame Data–User Defined Fields (UDF).
Gap/Rate Control	% Max Rate (Min Gap)	Integer	This is the minimum size of the generated random gaps as a percentage of the maximum rate possible. Either this field or the *Packets/Sec (Min Gap)* field may be used to make this setting; the other one reflects the calculated value. Rate Control/Inter-Packet Gap.
	%Min Rate (Max Gap)	Integer	This is the maximum size of the generated random gaps as a percentage of the maximum rate possible. Either this field or the *Packets/Sec (Max Gap)* field may be used to make this setting; the other one reflects the calculated value. Rate Control/Inter-Packet Gap.
	Actual % of Max Rate		This is the percentage of the maximum rate that is being used by stream traffic, not including the gaps.
	Bits/Sec		(For *Gap Type-Fixed* only) The Data Bit Rate for this stream, specified in bits per second.
	Bits/Sec (Max Gap)		(**For Gap Type-Random only**) The Data Bit Rate for this stream, specified in bits per second, when the maximum value for the random gap is being used.
	Bits/Sec (Min Gap)		(**For Gap Type-Random only**) The Data Bit Rate for this stream, specified in bits per second, when the minimum value for the random gap is being used.
	Desired % of Max Rate	Integer	Allows to set a percentage of the maximum line rate that stream traffic should be sent at.
	Disable Auto Scale	check box	When it is selected, this check box disables

Category	Field	Type	Description
			the ability to change the gap time if you change the line rate for a particular stream. The rate for the stream will not change if the global rate for all streams changes.
	Gap Time	Integer	(For *Gap Type-Fixed* only) This is the size of the fixed gap in *Gap Time Units*. Either this field or the *% Max Rate,* or the *Packets/Sec* field may be used to make this setting; the others reflect the calculated value. Rate Control/Inter-Packet Gap.
	Gap Time Unit	Choice	The time unit used with the Gap Time value. Choose one of: • NanoSecs • MicroSecs • MilliSecs • Seconds • Clock Ticks (if available) • Bytes (if available)
	Gap Type	Choice	The type of Inter-Packet Gap generation. Choose one of: • **Fixed**: Gaps are all of a fixed size, as determined by the *Time Units, Gap Time* and *Gap Time* columns. • **Random**: Gaps are randomly generated within the range specified by *% Max Rate (Min Gap)* and *% Max Rate (Max Gap)*. Rate Control/Inter-Packet Gap.
	Inter-Burst	Inter-Burst Enable	Enables the generation of inter-burst gaps. See Inter-Burst Gap/Burst Gap.
		Inter-Burst Gap Time	If the *Inter-Burst Enable* box is selected, then this is the size of the inter-burst gap, exclicked in *Gap Unit* units. See Inter-Burst Gap/Burst Gap.
		Inter-Burst Gap Time Unit	The units used to specify the *Gap Time*. The available choices depend on the type of module.

Category	Field	Type	Description
			Choose one of: • NanoSecs • MicroSecs • MilliSecs • Seconds • Clock Ticks (if available) • Bytes (if available) See Rate Control/Inter-Packet Gap.
	Inter-Stream	Inter-Stream Enable	Enables the generation of inter-stream gaps. See Inter-Stream Gap/Stream Gap.
		Inter-Stream Gap Time	The size of the inter-stream gap, exclicked in *Gap Unit* units. See Inter-Stream Gap/Stream Gap.
		Inter-Stream Gap Time Unit	The units used to specify the *Gap Time*. Choose one of: Choose one of: • NanoSecs • MicroSecs • MilliSecs • Seconds • Clock Ticks (if available) • Bytes (if available) See Rate Control/Inter-Packet Gap
	Packets/Sec/Burst	Integer	(For *Gap Type-Fixed* only) This is the number of packets to generate each second. Either this field or the *Gap Time*, or the *% Max Rate* field may be used to make this setting; the others reflects the calculated value. See Rate Control/Inter-Packet Gap.
	Packets/Sec/Burst (Max Gap)	Integer	If the value for *Gap Type* is *Random*, then this is the maximum size of the generated random gaps as a number of packets per second. Either this field or the *% Max Rate (Max Gap)* field may be used to make this setting; the other one reflects the calculated

Category	Field	Type	Description
			value. See Rate Control/Inter-Packet Gap.
	Packets/Sec/Burst (Min Gap)	Integer	If the value for *Gap Type* is *Random*, then this is the minimum size of the generated random gaps as a number of packets per second. Either this field or the *% Max Rate (Min Gap)* field may be used to make this setting; the other one reflects the calculated value. See Rate Control/Inter-Packet Gap.
	Time Units	Choice	The units used to specify the *Gap Time*. Choose one of: • NanoSecs • MicroSecs • MilliSecs • Seconds • Clock Ticks Rate Control/Inter-Packet Gap.
IP	IP Dest Address	IP Address	For those layer 3 protocols that require IP addresses, this is the starting destination IP address for packets in this stream. See Source and Destination IPv4 Addresses.
	IP Dest Count	Integer	Available only for *Incr.* or *Decr. Host* and *Incr.* or *Decr. Network* options. This is count of increments/decrements until the address is reset to the *IP Dest Address* value and counting starts again. See Source and Destination IPv4 Addresses.
	IP Dest Mask	IPv4 or IPv6 Address Mask	(Not available for IPv6) Used with the IP Destination Address to create a range of addresses.
	IP Dest Mode	Choice	The means of generating subsequent IP addresses as in *IP Source Mode.* See Source and Destination IPv4 Addresses.
	IP Source Address	IP Address	For those Layer 3 protocols that require IP addresses, this is the starting source IP address for packets in this stream.

Category	Field	Type	Description
			See Source and Destination IPv4 Addresses.
	IP Source Count	Integer	Available only for *Incr.* or *Decr. Host* and *Incr.* or *Decr. Network.* This is count of increments/decrements until the address is reset to the *IP Source Address* value and counting starts again. Source and Destination IPv4 Addresses.
	IP Source Mask	IPv4 or IPv6 Address Mask	(Not available for IPv6) Used with the IP Destination Address to create a range of addresses.
	IP Source Mode	Choice	The means of generating subsequent IP addresses. Choose one of: • Fixed • Incr. Host • Decr. Host • Cont. Incr. Host • Cont. Decr. Host • Incr. Network • Decr. Network • Cont. Incr. Net • Cont. Decr. Net • Random • Custom Mask Increment • Custom Mask Decrement • Custom Mask Continuous Increment • Custom Mask Continuous Decrement • Custom Mask Random See Source and Destination IPv4 Addresses.
IPv4 DSCP (IP Sub-category)			Controls the configuration of the DSCP header information.
	IP DSCP Assured Forwarding Class Selector	Choice	Allows to select the DSCP Assured Forwarding class for the stream traffic. The options are:

Category	Field	Type	Description
			• Class 1 • Class 2 • Class 3 • Class 4
	IP DSCP Assured Forwarding Precedence	Choice	Allows to select the DSCP Assured Forwarding Precedence for the stream traffic. The options are: • Low Drop Precedence • Medium Drop Precedence • High Drop Precedence
	IP DSCP Class Selector	Choice	Allows to select the DSCP Class for the stream traffic. The options are: • Class 1 = 001000 • Class 2 = 010000 • Class 3 = 011000 • Class 4 = 100000 • Class 5 = 101000 • Class 6 = 110000 • Class 7 = 111000
	IP DSCP Custom	Binary notation	Allows to set a custom binary value for the DSCP header information.
	IP DSCP Mode	Choice	Allows to select the DSCP mode for the stream traffic. The options are: • Default • Class Selector • Assured Forwarding • Expedited Forwarding • Custom
	IP DSCP Enable	check box	Enables the DSCP protocol.
IPv4 TOS (IP Sub-category)			These settings are for the Type of Service (TOS) bits in the IPv4 header.
	IP TOS Bit3 (Delay)		Choose one of: • 0 - Normal

Category	Field	Type	Description
			• 1 - Low
	IP TOS Bit4 (Throughput)		Choose one of: • 0 - Normal • 1 - Low
	IP TOS Bit5 (Reliability)		Choose one of: • 0 - Normal • 1 - Low
	IP TOS Bit6 (Cost)		Choose one of: • 0 - Normal • 1 - Low
	IP TOS Bits0-2 (Precedence)		Choose one of: • 000 - Routine • 001 - Priority • 010 - Immediate • 011 - Flash • 100 - Flash Override • 101 - CRITIC/ECP • 110 - Internet Control • 111 - Network Control
	IPv4 TOS Enable	check box	Enables the TOS feature
IPv6 specific (IP Sub-category)			These settings are used to configure the IPv6 specific fields in the IPv6 header.
	IPv6 Dest. Step Size	Integer	Sets the step size when incrementing or decrementing the IPv6 Destination Address.
	IPv6 Flow Label	Integer	Labels a sequence of packets for which it requests special handling by IPv6-capable routers. Routers that do not support this function must set this field to zero when creating, forwarding, or receiving the packet.
	IPv6 Hop Limit	Integer	The Hop limit is decremented by 1 by each node that forwards the packet. When the value reaches 0, the packet is discarded.

Category	Field	Type	Description
	IPv6 Next Header	Integer	Identifies the type of the next extension header. When value = 59, means 'No Next Header.'
	IPv6 Payload Length	Integer	Length of the IPv6 payload, which is the length of the entire packet which follows the IPv6 header (in octets). The payload includes any extension headers.
	IPv6 Source Step Size	Integer	Sets the step size when incrementing or decrementing the IPv6 SourceAddress.
	IPv6 Traffic Class	Integer	Identifies the class or priority of the IPv6 packet.
Layer 2	DA Count	Integer	If *DA Mode* is either *Increment* or *Decrement*, then this is the number of times that the address increments before being reset and started again. See DA/SA Property Sheet.
	DA Mask	4-octet address (hex)	The mask associated with the DA mask.
	DA Mode	Choice	The type of destination MAC address generation. Choose one of: • Increment • Continuous Inc. • Decrement • Continuous Dec. • Fixed • Random • ARP/Discovery See DA/SA Property Sheet.
	DA Value	MAC Address	The first destination MAC address to be generated for the stream. DA/SA Property Sheet
	SA Count	Integer	If *SA Mode* is either *Increment* or *Decrement*, then this is the number of times that the address increments before being reset and started again.

Category	Field	Type	Description
			See DA/SA Property Sheet.
	SA Mask	4-octet address (hex)	The mask associated with the SA mask.
	SA Mode	Choice	The type of source MAC address generation. Choose one of: • Increment • Continuous Inc. • Decrement • Continuous Dec. • Fixed • Random See DA/SA Property Sheet.
	SA Value	MAC Address	The first source MAC address to be generated for the stream. See DA/SA Property Sheet
MPLS	MPLS Auto Set 'Bottom of the Stack' Bit	check box	If selected, the Bottom of Stack field above is dimmed and unavailable. The 'S' (bottom of stack) bit is automatically set for the bottom stack entry and reset for all other entries.
	MPLS Auto Set Label	check box	If selected, the Label field is dimmed (inactive). The label values is automatically assigned. If cleared, you can enter a custom value for the label that is highlighted in the MPLS Labels list.
	MPLS Enable	check box	Enables the MPLS specific header information.
	MPLS Type	Choice	Sets the overall packet type for the MPLS data. The options are: • MPLS Unicast • MPLS Multicast
MPLS Label 1/Label 2 (Sub	Bottom of the Stack	Integer	A single bit that represents the last entry (bottom) of the stack.

Category	Field	Type	Description
Categories)			
	Experimental Use	Integer	A three-bit field that may be used for experimental purposes.
	Label	Integer	The value of the label element of the entry. Several values have specific interpretations which are exclicked to the right of the label value: • 0: IPv4 Explicit NULL Label. Only valid as the one and only entry on the stack, indicating that the entry should be popped and forwarding of the packet should be done based on the IPv4 header. • 1: Router Alert Label. Valid anywhere in the stack except at the bottom. Used to signal an alert to the software associated with the router that finds this at the top of the stack. • 2: IPv6 Explicit NULL Label. As in '0', but with IPv6 header interpretation. • 3: Implicit NULL Label. A reserved value used within a router. • 4 to15: Reserved.
	Time To Live	Integer	The TTL field. It is decremented by routers as they process label stack entries.
Protocol	Data Link Layer	Choice	The type of data link encapsulation. Choose one of: • None • Ethernet II • Ethernet SNAP • 802.3 Raw • 802.3 (IPX) See Frame Data–User Defined Fields (UDF).
	L3 Protocol	Choice	This is the Layer 3 protocol to be used. Choose one of: • None • IPv4 • IPv6

Category	Field	Type	Description
			• IPv6 Over IPv4 • IPv4 Over IPv6 • IPX • ARP • Pause Chapter 7, Frame Data–User Defined Fields (UDF).
	L4 Protocol	Choice	This is the Layer 4 protocol to be used. Choose one of: • None • TCP • UDP • ICMP • IGMP • RIP • DHCP • OSPF Frame Data–Protocol Control.
IGMP (Protocols Sub-category)	IGMP Checksum	Integer	The 16-bit one's complement of the one's complement sum of the 8-octet IGMP message.
	IGMP Group	Dotted decimal	The IP address of the group associated with the message.
	IGMP Max Response Time	Integer	Maximum expected response time.
	IGMP Max Response Time Type	Integer	The type of response time for IGMP.
	IGMP Mode	Choice	Choose one of: • Fixed • Increment • Decrement • Continuous increment • Continuous decrement
	IGMP Repeat Count	Integer	Number of times to repeat the information in

Category	Field	Type	Description
			the IGMP header.
	IGMP Type	Choice	The IGMP message. Choose one of: • Membership Query • Membership Report • Leave Group (for Version 2 only)
	IGMP Valid Checksum	Integer	The checksum type for IGMP.
	IGMP Version	Choice	IGMP Version Number. Choose one of: • Unknown • 1 • 2 - the version described in this table. • 3 - changes the composition of this dialog box(The default is Version 2)
Stream Control	Bursts Per Stream	Integer	If stream control is set to other than Continuous packet or burst, this is the # of bursts in the stream. Basic Stream Controls.
	Control	Choices	Indicates what happens after the stream is applied. Choose one of: • Continuous packet • Continuous burst • End • Advance • Return to ID • Return for Count Basic Stream Controls.
	Enable	check box	Enables or disables the stream. Basic Stream Controls.
	Flow	Read-only icon	This icon matches the Control choice, and indicates what happens after the stream is applied. Choose one of: - Continuous packet/burst - End

Category	Field	Type	Description
			- Advance - Return to ID - Return for Count Basic Stream Controls.
	Loop Count	Integer	If *Control* is set to *Return for Count*, this is the number of times to loop back. Basic Stream Controls.
	Name	Text	The name of the stream. Basic Stream Controls.
	Packets Per Burst	Integer	If *Control* is set to other than *Continuous packet*, this is the number of packets in each burst. Basic Stream Controls.
	Return To ID	Integer	If *Control* is set to one of *Return for ID* or *Return for Count*, this is the stream ID to return to while looping. Basic Stream Controls.
Stacked VLAN	CE-VLAN	Group	If selected, shows the Inner Stacked VLAN settings, which are: • CE-VLAN Bit Mask • CE-VLAN CFI • CE-VLAN ID • CE-VLAN ID Count Mode • CE-VLAN Repeat Count • CE-VLAN Step • CE-VLAN Tag Control Info • CE-VLAN Tag Protocol ID • CE-VLAN User Priority
	SP-VLAN	Group	If selected, shows the Outer Stacked VLAN settings, which are: • SP-VLAN Bit Mask • SP-VLAN CFI • SP-VLAN ID • SP-VLAN ID Count Mode • SP-VLAN Repeat Count

Category	Field	Type	Description
			• SP-VLAN Step • SP-VLAN Tag Control Info • SP-VLAN Tag Protocol ID • User Priority
Stacked VLAN Enable		Choice	Enables the Stacked VLAN option.
VLAN	VLAN	check box	Indicates that a VLAN tag is to be added to the header. Edit VLAN.
	VLAN Canonical Format	Choices	The Canonical Format Indicator is a single bit flag value. Choose one of: • Reset • Set
	VLAN ID	Integer	The VLAN ID to be added to the header. Edit VLAN.
	VLAN ID Count Mode	Choices	Used to set the mode by which the VLAN ID (VID) varies. Choose one of: • **Fixed**: The single ID specified in the *VID* field is used. • **Increment**: The ID specified in the *VID* field is used as the start of a number of repeated sequence of VIDs as indicated by the *Repeat Count* field and the *Bit Mask* field. • **Decrement**: The ID specified in the *VID* field is used as the start of a number of repeated sequence of VIDs as indicated by the *Repeat Count* field and the *Bit Mask* field. • **Continuous Increment**: The ID specified in the *VID* field is used as the start of an infinite sequence of VIDs as indicated by the *Bit Mask* field. • **Continuous Decrement**: The ID specified in the *VID* field is used as the start of an infinite sequence of VIDs as indicated by the *Bit Mask* field.

Category	Field	Type	Description
			• **Random**: The VID is varied randomly as indicated by the *Bit Mask* field.
	Repeat Count	Integer	For the Increment and Decrement VLAN ID Count Mode choices, this indicates the number of repeats for the cycle of varied VIDs.
	VLAN User Priority	Integer	The user priority of the tag: a value from 0 through 7. The use and interpretation of this field is defined in ISO/IEC 15802-3.

Stream Data Manipulation

Data may be created and moved by a variety of techniques as shown in *Table: Stream Data Manipulation Techniques.* Data within the spreadsheet may be selected as a single cell or as any rectangular area.

Table: Stream Data Manipulation Techniques

Task	KeyboardShortcut	Menu Option	Description
Delete Row	Del	Delete	Removes the selected row.
Copy Data	Ctrl + C	Copy	Makes a copy of the selected data, which may be copied on top of another location through the use of Paste.
Paste Data	Ctrl + V	Paste	Data copied through Copy replaces the currently selected data. If the copied data is larger than the current selection, the current selection is extended down and to the right to accommodate the size. Data may only be pasted over compatible items.
Move Row(s)			Any number of selected rows may be moved to another place by selecting the row(s) and holding the left mouse button down while moving the cursor to the new position. A red line shows the new location that the rows possess when the mouse button is released.

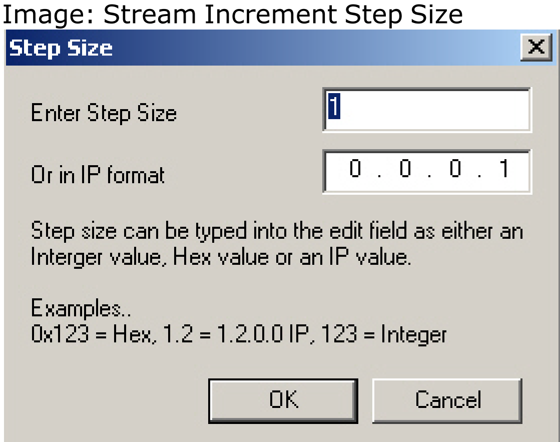
Additional pop-up options make it possible for a cell to be incremented by a fixed value with respect to the cell just above it. Any rectangular selection involving two or more adjacent rows and one or more adjacent columns may be used. All of the elements in a column may be selected by selecting a column heading. The pop-up menu choices that apply are shown in *Table: Stream Increment/Decrement Operations.*

Table: Stream Increment/Decrement Operations

Menu Option	Description
Increment	Each cell is one greater than the cell above.
Increment By...	Each cell is incremented by a specified amount.
Decrement	Each cell is one less than the cell above.
Decrement By...	Each cell is decremented by a specified amount.
Same	Each cell is the same as the cell above.

When *Increment By...* or *Decrement By...* are selected, the *Step Size* dialog box appears. This dialog box is shown in *Image: Stream Increment Step Size.*

Image: Stream Increment Step Size

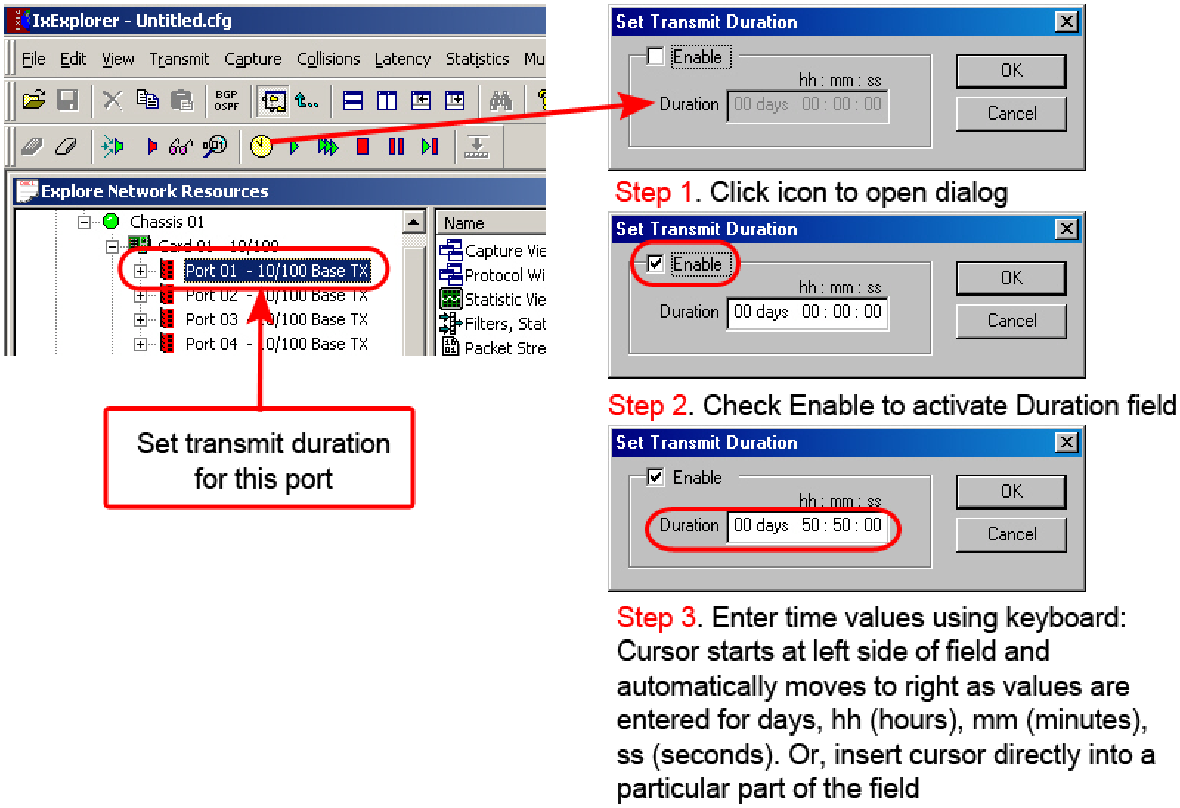


The increment step size used is a 32-bit unsigned quantity, which may be exclicked in decimal, in hexadecimal (with a preceding *0x*) notation, or as an IP address. When the data to be incremented/decremented is larger than 32 bits, only the last 32 bits of data are incremented or decremented.

Set Transmit Duration

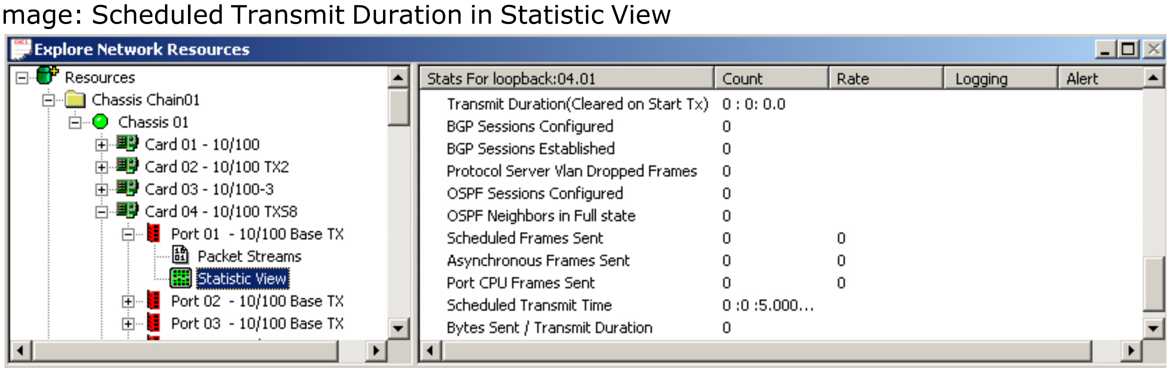
The Set Transmit Duration option allows to set the Scheduled Transmit Duration for stream transmission, as shown in *Image: Transmit Duration dialog box.* This option is available for the following levels in the Network Resources Tree: Chassis Chain, Chassis, Load Module, Port, and Packet Streams. The time settings are entered directly into the *Duration* field. An example for setting the Transmit Clock for streams on a port is shown in *Image: Transmit Duration dialog box.*

Image: Transmit Duration dialog box



The *Scheduled Transmit Duration* appears in the Statistic View for the port, as shown in *Image: Scheduled Transmit Duration in Statistic View,*along with the *Bytes Sent/Transmit Duration* and *Transmit Duration* statistics. This statisitic is only accurate to within one second.

Image: Scheduled Transmit Duration in Statistic View



Stream Grid–GFP Tab

When employing Generic Framing Procedure (GFP) on OC-48c POS load modules, a separate **GFP Data** tab appears in the Stream Grid window allowing to view and modify the various GFP stream settings. The **GFP Data** tab is only visible if GFP has been selected in Port Properties, as described in Frame Data for GFP.

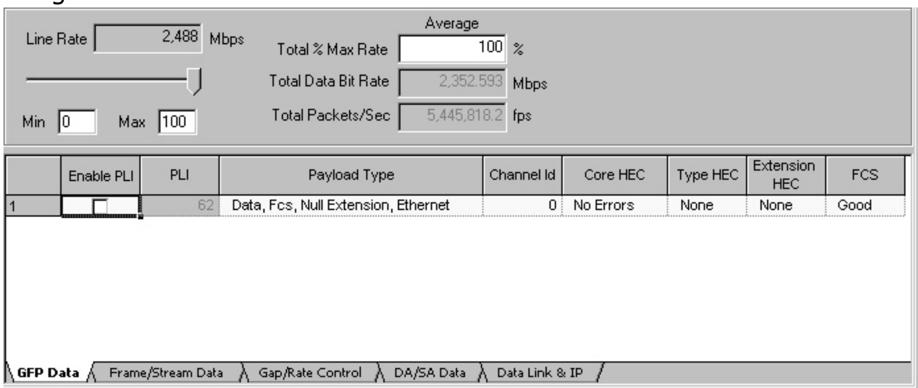
For more in formation on GFP, refer to the GFP - Generic Framing Procedure in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.

GFP Data Tab in Stream Grid

The **GFP Data** tab in the Stream Grid is shown in *Image: **GFP Data Stream Grid** Tab.*

The tabs other than the **GFP Data** tab are described in Stream View Options.

Image: **GFP Data Stream Grid** Tab



The controls in the top half of the Stream Queue grid operate as described in Stream Editing Window.

The **GFP Data** tab in the Stream grid options are described in *Image**: GFP Data** Tab View.*

Table: **GFP Data** Tab View

Field/Control	Usage
Enable PLI	Enables the Payload Length Indicator (PLI) field in the GFP frame.
PLI	Shows the Payload Length Indicator (PLI). The PLI is a two octet field containing a binary number that represents the number of octets in the GFP Payload Area. The absolute minimum value of the PLI field in a GFP client frame is 4 octets. PLI values 0-3 are reserved for GFP control frame usage. This field is only active when the *Enable PLI* check box is selected.
Payload Type	Shows the selected Payload type. Payload types are enumerated in Frame Data for GFP.
Channel ID	Sets the Channel ID. The Channel ID is an 8-bit binary number used to indicate one of 256 communications channels at a GFP initiation/termination point.
Core HEC	Sets the error type for the Core Header Error Control (cHEC) to *No Errors*, *1 bit Error*, or *Multiple bit Errors*. The cHEC is a two octet field containing a CRC-16 error control code that protects the integrity of the Core Header contents by enabling both single-bit error correction and multi-bit error detection.
Type HEC	Sets the error level for the Type Header Error Control (tHEC). The tHEC is a two octet field containing a CRC-16 error control code that protects the integrity of the Type Field contents by enabling both single-bit error correction and multi-bit error detection.
Extension HEC	Set the error level for the Extension Header Error Control (eHEC). The eHEC is

Field/Control	Usage
	a two octet field containing a CRC-16 error control code that protects the integrity of the extension header contents by enabling both single-bit error correction (optional) and multi-bit error detection.
FCS	Set the Frame Check Sequence (FCS) to be *Good* (transmitted frame is accurate), *Bad* (transmitted frame contains errors), or absent (not included with the transmitted frame). The GFP Payload FCS is an optional, four octet frame check sequence containing a CRC-32 sequence that protects the GFP Payload Information field contents.

DCC Packet Streams and Packet Flows

The Data Communication Channel (DCC) packets can be used to control and monitor SONET network devices, through the DCC bytes in the Transport Overhead of each SONET frame, which is the traditional link layer for Operation, Administration, and Maintenance (OAM) functions.

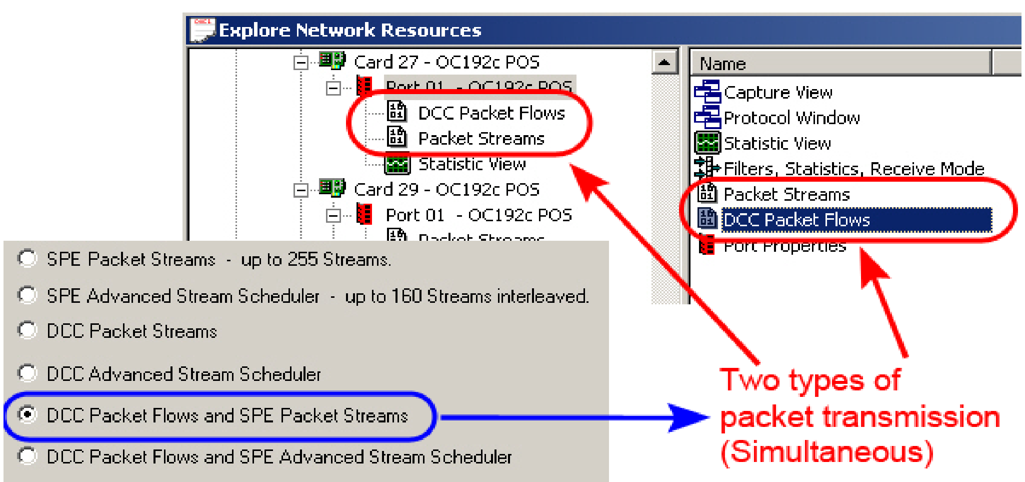
In addition, sending control plane information over the DCC channel allows rapid provisioning of end-to-end connections.

In the port properties for an OC-192c module which supports the optional DCC feature, the **Transmit Modes** tab allows to select DCC Packet Streams or Advanced Streams, or DCC Packet Flows in combination with the standard Synchronous Payload Envelope (SPE) transmission of packet streams or advanced streams.

DCC Packet Flows

When a combination mode with DCC packet flow plus SPE packet or advanced streams is selected in Transmit Modes, **TWO** packet transmission types are listed in the Network Resources tree and Port Details list, as shown in *Image: DCC Packet Transmission Types.*

Image: DCC Packet Transmission Types



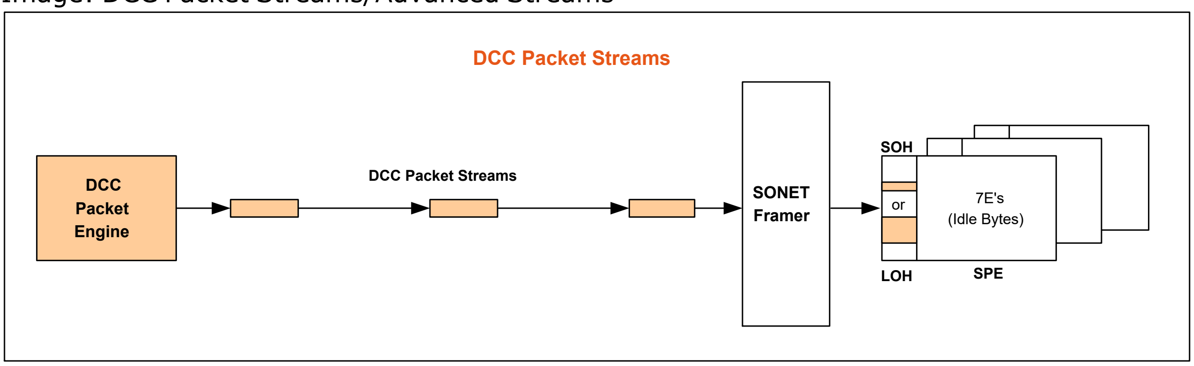
BOTH transmission types must be configured for this DCC option. The packets in the DCC Packet Flows are transmitted in the SONET frame overhead either over the LOH or SOH. Simultaneously, packets are transmitted in the normal manner, as packet streams or advanced streams, within the SPE payload of the SONET frame. To configure the different transmission types, refer to the sections listed below:

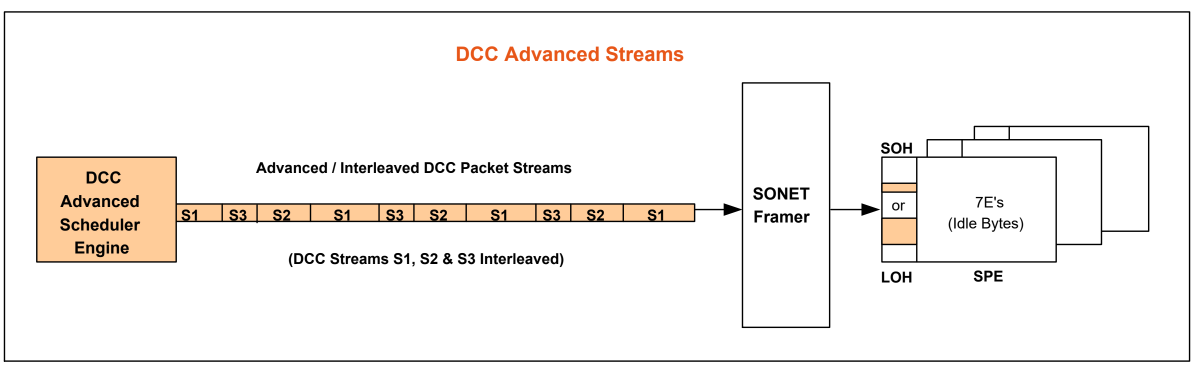
- DCC Packet Streams: DCC Packet Streams and DCC Advanced Streams.
- DCC Packet Flows: DCC Packet Flows.
- DCC Advanced Stream Scheduler: DCC Packet Streams and DCC Advanced Streams.
- SPE (normal) Packet Streams: Stream Control for Standard POS Modules.
- SPE (normal) Advanced Streams: Advanced Streams for Standard POS and POS 622 Modules.

DCC Packet Streams and DCC Advanced Streams

A simplified diagram illustrating how DCC Packet Streams and DCC Advanced Streams are generated is shown in *Image: DCC Packet Streams/Advanced Streams.*

Image: DCC Packet Streams/Advanced Streams





DCC Packet Streams

DCC Packet Streams are configured like normal (SPE) packet streams over SONET, but with a greatly reduced speed. Since only three bytes for SOH, or nine bytes for LOH, per SONET frame are being used to create the DCC channel, the rates are 192 Kbps or 576 Kbps, respectively.

To configure the DCC packet streams, first double-click 'DCC Packet Streams' to show the DCC stream grid. Then double-click a stream entry in the table to open the *Stream Properties* dialog box, and select the **Stream Control** tab. Configure the stream properties as for a normal packet stream. Stream Control for Standard POS Modules for additional information.

DCC Advanced Streams

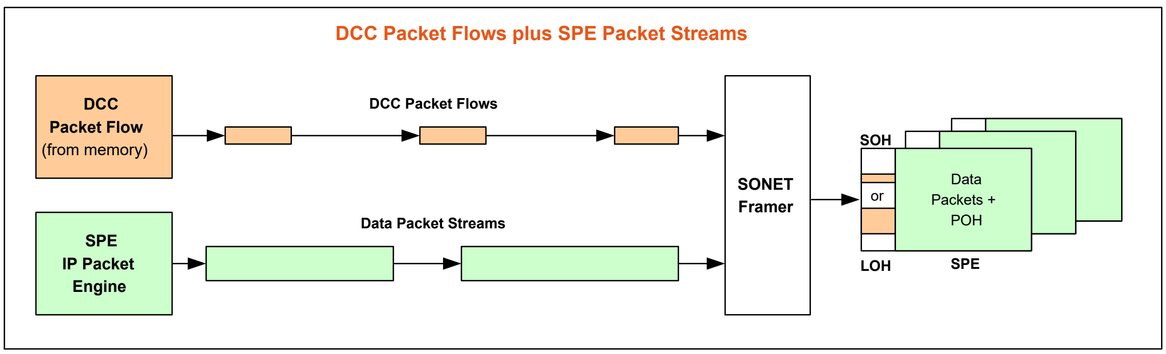
DCC Advanced Streams are configured like normal (SPE) advanced packet streams over SONET, but with a greatly reduced speed. Since only three bytes for SOH, or nine bytes for LOH, per SONET frame are being used to create the DCC channel, the rates are 192 Kbps or 576 Kbps, respectively.

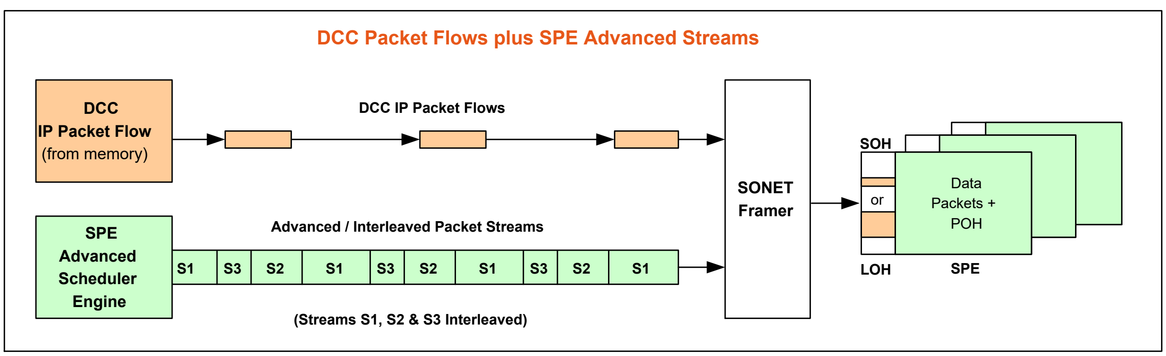
To configure the DCC advanced streams, first double-click *DCC Advanced Streams* to show the DCC stream grid. Double-click a stream entry in the table to open the *Stream Properties* dialog box, then select the **Stream Control** tab. Configure the stream properties as for a normal advanced packet stream. Advanced Streams for Standard POS and POS 622 Modules for additional information.

DCC Packet Flows

A simplified diagram illustrating how DCC Packet Flows are generated simultaneously with normal (SPE) packet streams and advanced streams is shown in

DCC Packet Flows with SPE Packet Streams/Advanced Streams



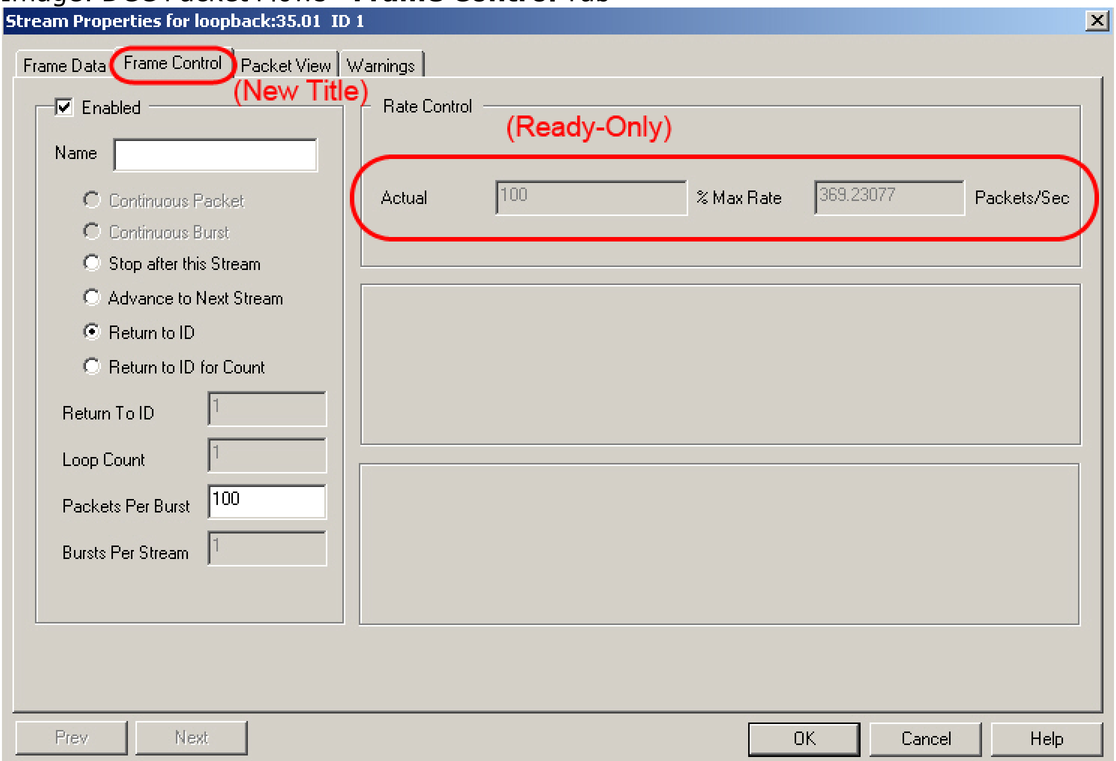


DCC Packet Flows are set up by the Ixia software in a manner similar to that used for packet flows on 10/100 modules. The IP flow packets are created by the software, and then saved in memory until time for transmission. The flow packets are then sent on a *Start Transmit*, but with a greatly reduced speed compared to the full OC-192c rate. Since only three bytes for SOH, or nine bytes for LOH, per SONET frame are being used to create the DCC channel, the rates are 192 Kbps or 576 Kbps, respectively.

To configure the DCC packet flows, first double-click *DCC Packet Flows* to show the DCC stream grid. Double-click a flow entry in the table to open the *Stream Properties* dialog box. A modified version of the **Stream Control** tab is available for stream configuration. The tab is renamed to *Frame Control* to more accurately reflect the type of configuration, as shown in *Image: DCC Packet Flows—**Frame Control** Tab.*

Stream Control for Standard POS Modules and Instrumentation Box for additional information.

Image: DCC Packet Flows—**Frame Control** Tab



In general, for various applications of this tab, the same terminology is used in configuring either packet streams or flows, for example, 'Advance to Next Stream.'

The fields and controls in this tab are described in *Table: DCC Packet Flows—**Frame Control** Tab.*

Table: DCC Packet Flows—**Frame Control** Tab

Section	Field/Control	Description
Basic Stream Controls	Enabled	A packet flow must be enabled for it to be used. Disabled flows are skipped over when the port transmits.
	Name	This is an arbitrary, user-defined label assigned to the packet flow. The name need not be unique.
(Transmission Sequence)	(Continuous Packet)	(Not available)
	(Continuous Burst)	(Not available)
	Stop after this	Designates that this stream (flow) is the last of a sequence

Section	Field/Control	Description
	Stream	of streams (flows). Stop After Stream.
	Advance to Next Stream	Designates that the next stream (flow) is to be transmitted after transmission of the current stream is complete. Advance to Next Stream.
	Return to ID	Designates that the stream (flow) whose ID number is shown in the *Return To ID* field is to be transmitted after transmission of the current stream (flow) is complete. It is used for continuous transmission. Choose *Return to ID* for continuous packet/burst. See Return to ID.
	Return to ID for Count	Designates that the stream (flow) whose ID number is shown in the *Return To ID* field is to be (re-)transmitted a number of times after transmission of the current stream (flow) is complete. This loop is repeated for the number of times specified in the *Loop Count* field. See Return to ID for Count.
	Return to ID	The ID number of the stream (flow) that is to be (re-)transmitted after transmission of the current stream (flow) is complete. See Return to ID. This value is forced to 1 for DCC Packet Flows.
	Loop Count	Active only when *Return to ID for Count* mode is selected above. The count used in a stream (flow) loop. It indicates the number of times to retransmit the stream (flow) identified in the *Return to ID* field. See Return to ID for Count.
	Packets Per Burst	Specifies the number of packets in the burst. NOTE Since the number of bursts per stream is forced to 1 for DCC Packet Flows, this value specifies the **total number of packets in this flow.**
	Bursts Per Stream	Specifies the number of bursts in the stream (flow). This value is forced to 1 for DCC Packet Flows.

Section	Field/Control	Description
Rate Control	% Max Rate	(Read-only) The percentage of the maximum bit rate.
	Packets/Sec	(Read-only) The number of packets per second that corresponds to the % Max Rate.

ATM Streams

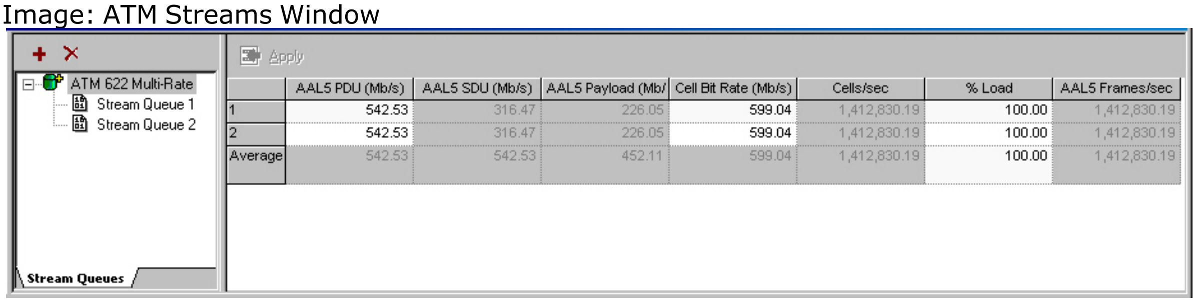
ATM Streams Window

When the Packet Streams item is selected, the ATM Streams window appears, as shown in *Image: ATM Streams Window.*

NOTE Stream control for the POS 622 module is described in Stream Control for POS 622 Modules.

Up to 15 Stream Queues, each consisting of multiple streams, may be configured for each port. Up to 4,096 transmit streams can be defined per port, divided among multiple stream queues or all assigned to a single queue. These stream queues are transmitted in parallel.

Image: ATM Streams Window



The fields and controls in this dialog box are described in *Table: ATM Packet Stream View.*

Table: ATM Packet Stream View

Section	Field/Control	Description
Header		Add an entry.
		Deleted selected entry(ies).
		Select to apply the changes which have been made in the window. NOTE If this option is not selected after changes are made, the Auto-Apply timer applies the changes automatically after 10 seconds have passed.
Stream Queue grid	AAL5 PDU (Mb/s)	The rate of AAL5 CSPS-PDU data in Megabits per second.

Section	Field/Control	Description
	AAL5 SDU (Mb/s)	The rate of AAL5 CSPS-SDU data in Megabits per second.
	AAL5 Payload (Mb/s)	The rate of AAL5 payload data in Megabits per second.
	Cell Bit Rate (Mb/sec)	The rate exclicked in Megabits per second.
	Cells/sec	The rate exclicked in (53-byte) cells per second. For each individual stream queue, the cell rate is specified only on the Summary page.
	% Load	Each Stream Queue can be assigned a load of up to 100% of line rate.
	AAL5 Frames/Sec	The rate exclicked in AAL5 Frames (PDUs) per second.
Average		The averages for the values in the column.

ATM Stream Queue Grid

When a Stream Queue in the list under the port is selected, the Stream Queue grid appears (with five sub-tabs) for a list of streams, as shown in *Image: ATM Stream Queue Grid–ATM Data* through *Image: ATM Stream Queue Grid–Link/IP Data.*

Although up to 4,096 transmit streams can be defined per port—divided among multiple stream queues or all assigned to a single queue—only a total of 127 entries can be actively monitored on an individual stream level. So the check box *Statistic* in the ATM Data grid is used to select the streams that are monitored. In the example below, Stream 1 and Stream 4 of Stream Queue 3 are enabled, while Streams 2 and 3 are not. (This discussion continues at topic Per Stream Statistic View.)

When you add a new stream, the default state of the *Statistic* check box is enabled. But once the number of entries that can be monitored reaches 127, adding a new stream results in entries with the *Statistic* check box cleared. At the maximum state, no additional statistics can be monitored until you explicitly free up some previously selected entries, by clearing them.

Image: ATM Stream Queue Grid–ATM Data

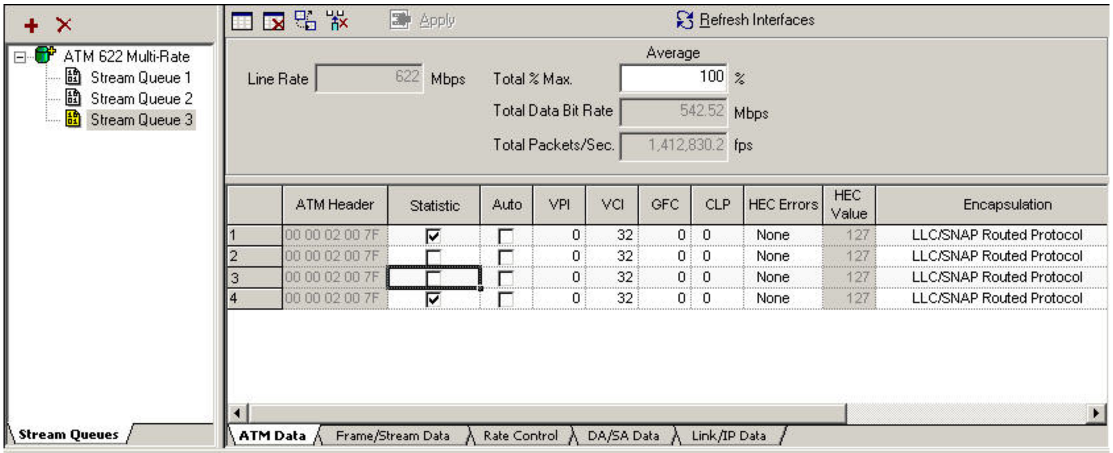


Image: ATM Stream Queue Grid–Frame/Stream Data

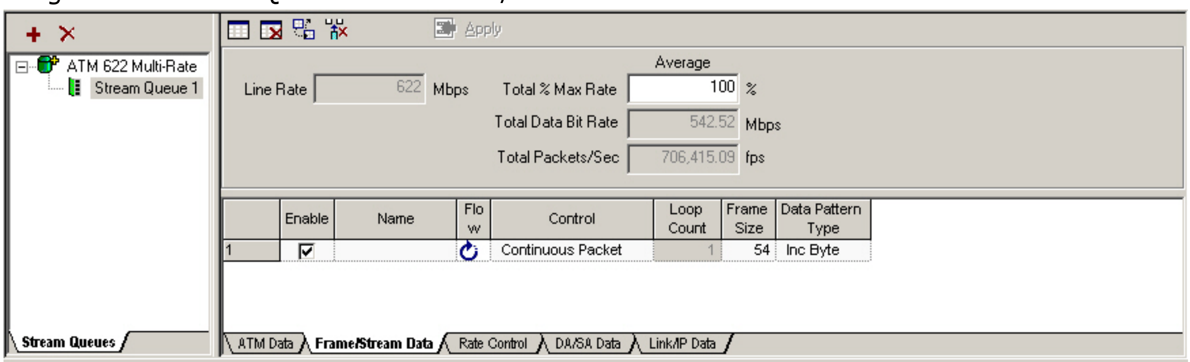


Image: ATM Stream Queue Grid–Rate Control

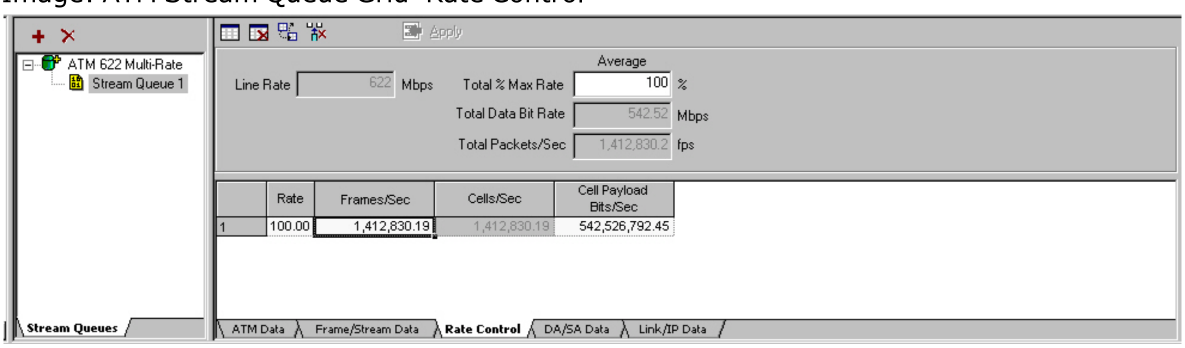


Image: ATM Stream Queue Grid–DA/SA Data

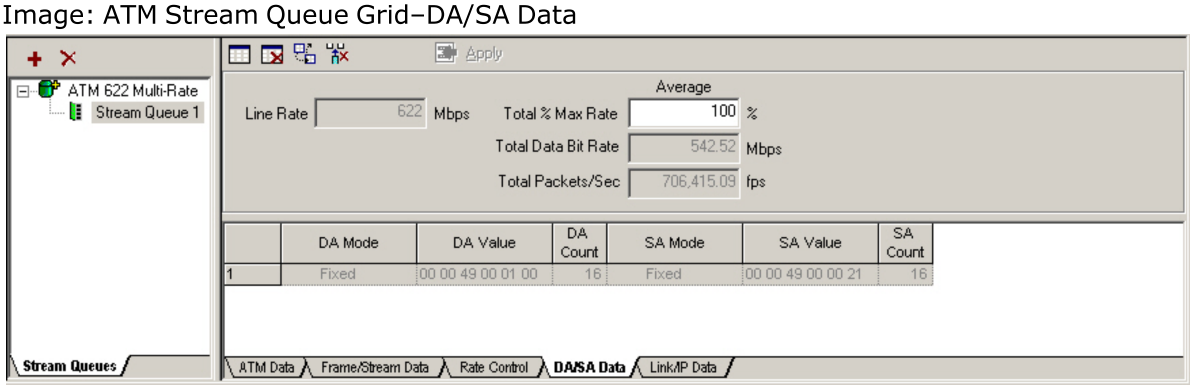
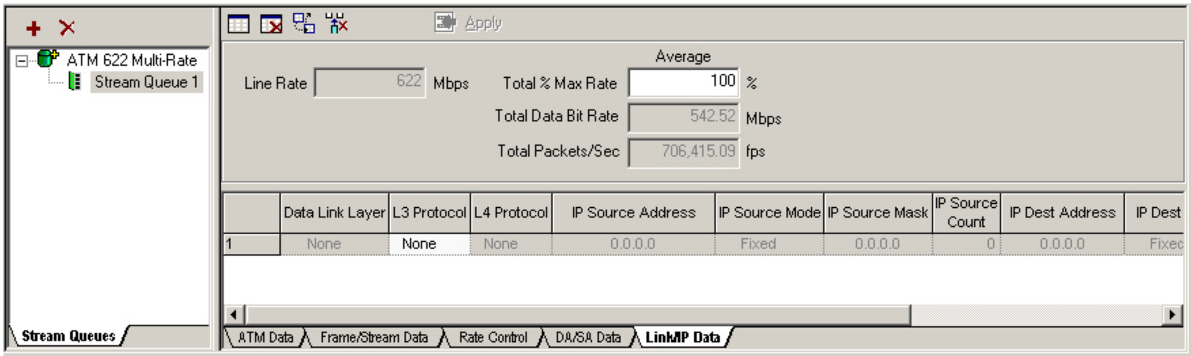


Image: ATM Stream Queue Grid–Link/IP Data



The fields and controls in these dialog boxes are described in *Table: ATM Stream Queue Grid.*

Table: ATM Stream Queue Grid

Section/View	Field/Control	Description
Header	Line Rate	(Read-only) Line Rate of the OC-3c/OC-12c port (in Mbps).
	Average -Total % Max Rate	(in %) The average of the user defined data rates for the VCs (as a percentage).
	Average - Total Data Bit Rate	(Read-only) (in Mbps) The average of the data rates for the VCs (with data rates automatically calculated from the user settings for percentage of Max Rate) (in Mbps).
	Average - Total Packets/Sec	(Read-only) (in Mbps) The average of the data rates for the VCs (with packet rates automatically calculated from the user settings for percentage of Max Rate) (in Mbps).
ATM Data	ATM Header	Shows the bytes in the 5-byte ATM Cell header.
	Statistic	If selected, transmit statistic for this stream is monitored
	Auto	If selected, the VPI and VCI are read-only and the values are automatically assigned (0/32). If not selected, you can assign the VPI and VCI.
	VPI	Virtual Path Identifier for this stream.
	VCI	Virtual Circuit/Connection Identifier for this stream.
	GFC	Generic Flow Control, for device control signalling. Uncontrolled equipment uses a setting of 0000 (Null value).
	CLP	Cell Loss Priority setting for this stream queue/VC. Used for setting discard priority level for ATM cells. A CLP value = 0 has higher priority than a CLP value = 1.
	HEC Errors	Header Error Correction Errors.

Section/View	Field/Control	Description
		Choose the number of bit errors to insert in the HEC byte: • None (errors not inserted) • 1 Bit • 2 Bits • 3 Bits • 4 Bits • 5 Bits • 6 Bits • 8 Bits
	HEC Value	(Read-only) The decimal value corresponding to the HEC Error setting in the field to the left. It is the calculated HEC value with the HEC error setting applied. (It changes with the VPI/VCI.)
	Encapsulation	The type of RFC 2684 multiplexing encapsulation used. Choose one of: • LLC/SNAP Routed Protocol • LLC Bridged Ethernet/802.3 • LLC Bridged Ethernet/802.3 no FCS • VC MUX Routed Protocol • VC MUX Bridged Ethernet/802.3 • VC MUX Bridged Ethernet/802.3 no FCS
	User Management	Bit 1 of the *PT* field. This bit has to do with user management and indicates if the ATM cell is a control or data cell. 0 - ATM data cell 1 - ATM control cell
	Congestion	Bit 2 of the *PT* field. This bit indicates Congestion/No Congestion. Choose one of: 0 - Congestion Not Experienced 1 - Congestion Experienced
	Last Cell	Bit 3 of the *PT* field. This bit indicates if this is the last ATM cell of the frame. [ATM User to ATM user indication (AUU) = 0 for the first and intermediate ATM cells. AUU = 1 for the last ATM cell.]

Section/View	Field/Control	Description
	Force AAL5 Error	Option to force an error in the AAL5 frame CRC. Choose one of: • No Error • Bad CRC
Frame/Stream Data	Enable	Enables the use of the options in this sub-view. These choices are described more fully in the **ATM Stream Control** tab and *Frame Data* sections.
	Name	The user-defined name for this stream queue/VC.
	Flow	(Shows an icon associated with the selection in the *Control* field to the right.)
	Control	The type of stream control to use for this ATM stream. Choose one of: • Continuous Packet • Continuous Burst • End • Advance • Return to ID* • Return For Count* These options are discussed more fully in Stream Control for ATM. NOTE An ATM stream cannot be set to *Return to ID* or *Return For Count* unless it is the last stream in the queue. If it is not the last stream, it is automatically forced to *Advance* stream mode. Also, *Return to ID* can only be set to '1'. If the user enters any other value, it is forced to a value of '1'.
	Loop Count	Applies to Return for Count control mode. Enter the number of loops for the stream queue/VC.
	Frame Size	The size of the frame, in bytes.
	Data Pattern Type	The type of data pattern used in the payload of the frame. Choose one of: • Inc Byte • Inc Word • Dec Byte

Section/View	Field/Control	Description
		• Dec Word • Random • Repeating • Fixed
Rate Control	Rate	The setting on this stream queue/VC for the percentage of the maximum available rate.
	Frames/Sec	The average number of frames per second transmitted by this stream, based on the set *Rate*.
	Cells/Sec	(Read-only) The average number of full ATM cells per second transmitted by this stream, based on the set *Rate*.
	Cell Payload Bits/Sec	The average number of cell payload bits per seconds transmitted by this stream, based on the set *Rate*.
DA/SA Data	DA Mode	The type of destination MAC address generation. Choose one of: • Increment • Continuous Inc. • Decrement • Continuous Dec. • Fixed • Random • ARP/Discovery
	DA Value	The first destination MAC address to be generated for the stream.
	DA Count	(Read-only) If *DA Mode* is either *Increment* or *Decrement*, then this is the number of times that the address increments before being reset and started again.
	SA Mode	The type of source MAC address generation. Choose one of: • Increment • Continuous Inc. • Decrement • Continuous Dec. • Fixed • Random

Section/View	Field/Control	Description
	SA Value	The first source MAC address to be generated for the stream.
	SA Count	(Read-only) If *SA Mode* is either *Increment* or *Decrement*, then this is the number of times that the address increments before being reset and started again.
Link/IP Data	Data Link Layer	(Read-only) The type of data link encapsulation. One of: • None • Ethernet II • Ethernet SNAP • 802.3 RAW • 802.3 (IPX) Reflects the setting in the **Frame Data** tab Protocols section.
	L3 Protocol	This is the Layer 3 protocol to be used. Choose one of: • None • IPv4 • IPv6 • IPv6 Over IPv4 • IPv4 Over IPv6 • IPX • Arp • Pause
	L4 Protocol	This is the Layer 4 protocol to be used. Choose one of: • None • TCP • UDP • ICMP • IGMP • RIP • DHCP • OSPF
	IP Source Address	For those Layer 3 protocols that require IP addresses, this is the starting source IP address for packets in this stream queue.

Section/View	Field/Control	Description
	IP Source Mode	The means of generating subsequent IP addresses. Choose one of: • Fixed • Incr. Host • Decr. Host • Cont. Incr. Host • Cont. Decr. Host • Incr. Network • Decr. Network • Cont. Incr. Net • Cont. Decr. Net • Random • Custom Mask Increment • Custom Mask Decrement • Custom Mask Continuous Increment • Custom Mask Continuous Decrement • Custom Mask Random
	IP Source Mask	The mask associated with the SA address
	IP Source Count	If the *IP Source Mode* is any of the choices except *Fixed* or *Random*, this is count of increments/decrements until the address is reset to the *IP Source Address* value and counting starts again.
	IP Dest Address	For those layer 3 protocols that require IP addresses, this is the starting destination IP address for packets in this stream.
	IP Dest Mode	The means of generating subsequent IP addresses. Choose one of: • Fixed • Incr. Host • Decr. Host • Cont. Incr. Host • Cont. Decr. Host • Incr. Network • Decr. Network • Cont. Incr. Net

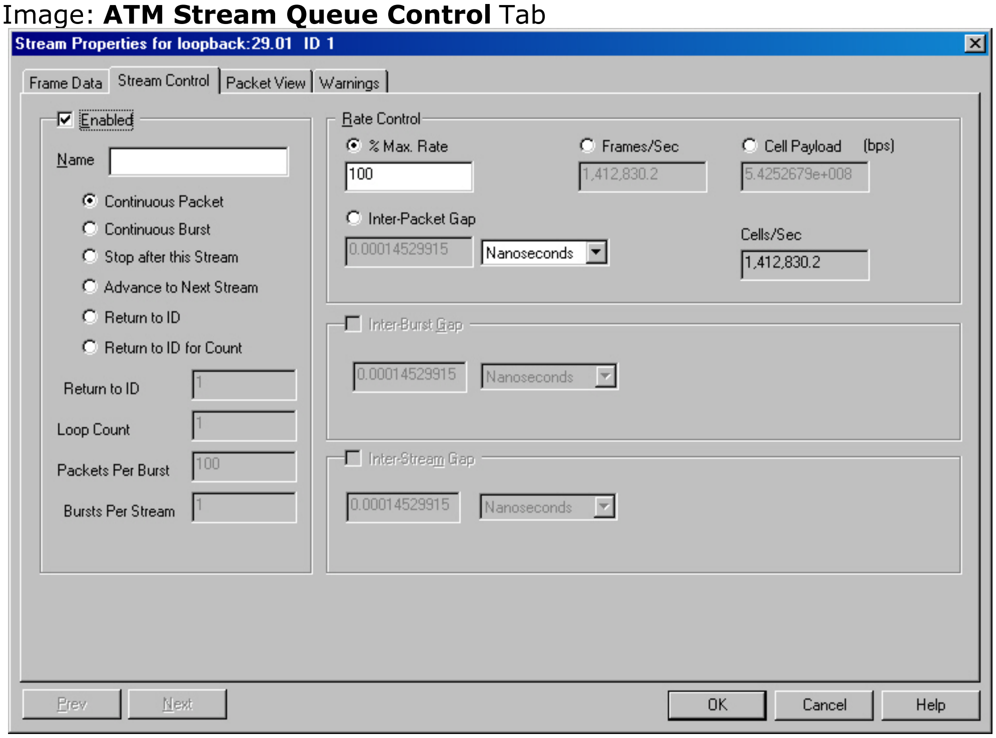
Section/View	Field/Control	Description
		• Cont. Decr. Net • Random • Custom Mask Increment • Custom Mask Decrement • Custom Mask Continuous Increment • Custom Mask Continuous Decrement • Custom Mask Random
	IP Dest Mask	The mask associated with the DA address.
	IP Dest Count	If the *IP Dest Mode* is any of the choices except *Fixed* or *Random*, this is count of increments/decrements until the address is reset to the *IP Dest Address* value and counting starts again.

Stream Control for ATM

The **Stream Control** tab for an individual ATM Stream Queue is shown in *Image: **ATM Stream Queue Control** Tab.*

NOTE For POS 622 (OC-12c/OC-3c POS) module **Stream Control** tab descriptions, Stream Control for POS 622 Modules.

Image: **ATM Stream Queue Control** Tab



The fields and controls in this box are described in *Table: Basic Stream Controls.*

Table: **ATM Stream Control** Tab

Section	Field/Control	Description
Basic Stream Controls	Enabled	A stream must be enabled for it to be used. Up to 255 streams may be defined per port. Disabled streams are skipped over when the port transmits.
	Name	This is a label assigned to the stream. The name need not be unique.
	Continuous Packet	A type of stream that sends out a continuous sequence of packets with the same inter-packet gap between packets. *Continuous Packet* mode may not be used with flows.
	Continuous Burst	A type of stream that sends out a continuous set of packet bursts. *Continuous Burst* mode may not be used with flows. **Note**following *Table: Basic Stream Controls* for information on maximum burst count.
	Stop after this Stream	Designates that this stream is the end of a sequence of streams.
	Advance to Next Stream	Designates that the next stream is to be transmitted after the current stream is complete.
	Return to ID	Designates that the stream identified (with a Stream ID) in the *Return To ID* field is to be used after the current stream is complete. NOTE An ATM stream cannot be set to *Return to ID* unless it is the last stream in the queue. If it is not the last stream in the queue, it is forced to *Advance to Next Stream*.
	Return to ID for Count	Designates that the stream identified in the *Return To ID* field is to be used after the current stream is complete. The loop is repeated for number of times specified in the Loop Count parameter. NOTE An ATM stream cannot be set to *Return to ID for Count* unless it is the last stream in the queue. If it is not the last stream in the queue, it is forced to *Advance to Next Stream*.
	Return To ID	The stream ID that runs after the current stream has run.
	Loop Count	The count used in a stream loop. Indicates the number of times that the stream identified in the *Return to ID* field is transmitted.
	Packets Per Burst	Specifies the number of packets in each ATM burst.

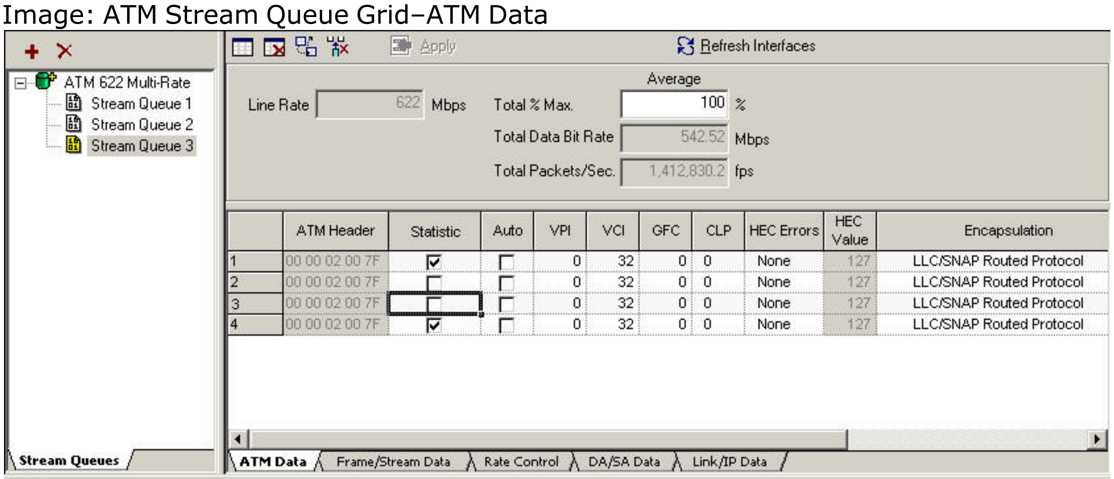
Section	Field/Control	Description
	Bursts Per Stream	Specifies the number of bursts in this ATM stream.
Rate Control		Rate control for ATM modules controls the average rate of transmitting packets/sec. Each Stream Queue may operate at 100% of Max Rate.
	% of Max Rate	This specifies the intended number of packets to be transmitted per second. The actual inter-packet gap time is configured to allow that packet rate. The actual rate may be adjusted slightly to allow for the clock rates associated with each type of port (see *Inter-Packet Gap* below). This value only relates the packets transmitted per second within a burst; except for *Continuous Packet* type streams the actual packets per second is lowered due to inter-burst and inter-stream gaps.
	Frames/Sec	This specifies the intended number of frames to be transmitted per second. The actual inter-packet gap time is configured to allow that packet rate. The actual rate may be adjusted slightly to allow for the clock rates associated with each type of port (see *Inter-Packet Gap* below). This value only relates the packets transmitted per second within a burst; except for *Continuous Packet* type streams the actual packets per second is lowered due to inter-burst and inter-stream gaps.
	Cell Payload (bps)	The average number of cell payload bits per seconds transmitted by this stream.
	Inter-Packet Gap	This specifies the amount of time between packets within a burst. The time must be specified in multiples of the indicated time units.
	Time	This specifies the amount of time between packets. The time must be specified in multiples of the indicated time units.
	Units	Selects the time units used for the *Time* field. The choices are: • Nanoseconds • Microseconds • Milliseconds • Seconds • Cells
	Cells/Sec	(Read-only)
	Inter-Burst Gap	Check this box to enable the generation of inter-burst gaps.
	Time	This specifies the amount of time between bursts within a stream. The time must be specified in multiples of the indicated time units.

Section	Field/Control	Description
		Selects the time units used for the *Time* column. The choices are: • Nanoseconds • Microseconds • Milliseconds • Seconds • Cells
	Inter-Stream Gap	If selected, enables generation of the inter-stream gap.
	Time	This specifies the amount of time between streams. The time must be specified in multiples of the indicated time units.
	Units	Selects the time units used for the *Time* field. The choices available depend on the type of load module: • Nanoseconds • Microseconds • Milliseconds • Seconds • Cells

Per Stream Statistic View

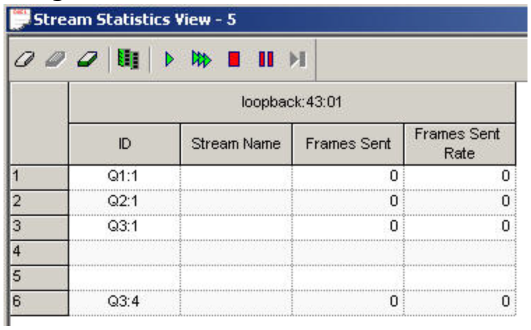
When in Per Stream Tx Stats mode, you can create a *Stream Statistic View* for that port. The per stream statistic view is only available when the ATM port is in Per Stream Tx Stats mode and not in Per VPIVCI mode (on the **ATM Data** tab, shown in *Image: ATM Stream Queue Grid–ATM Data.* For a general discussion of Stream Statistic View, Stream Statistic View.

Image: ATM Stream Queue Grid–ATM Data



An example of the Stream Statistic View is shown in *Image: Stream Statistic View for ATM Example.*The entries for Q3:2 and Q3:3 are blank because they are disabled in the Stream configuration (shown above). The Stream Statistic View reflects the latest state of the streams automatically in real-time (that is, you can add or delete a stream, toggle the *Statistics* check box, and immediately see the changes reflected in this view).

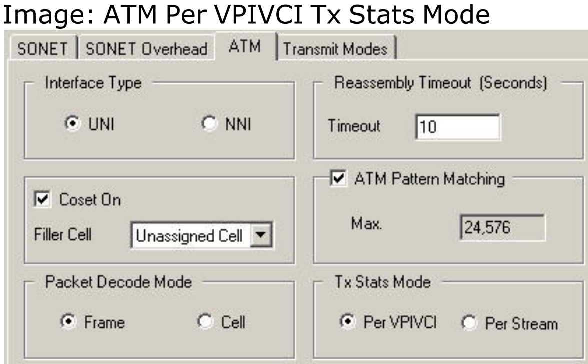
Image: Stream Statistic View for ATM Example



Per VPIVCI Statistic View

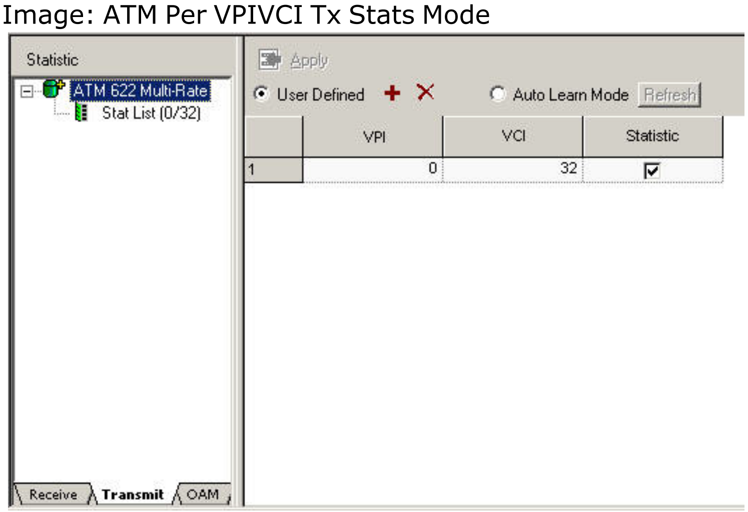
To configure stream entries for Per VPIVCI monitoring, configure the port property to Per VPIVCI mode (Tx Stats) as shown in *Image: ATM Per VPIVCI Tx Stats Mode.*

Image: ATM Per VPIVCI Tx Stats Mode



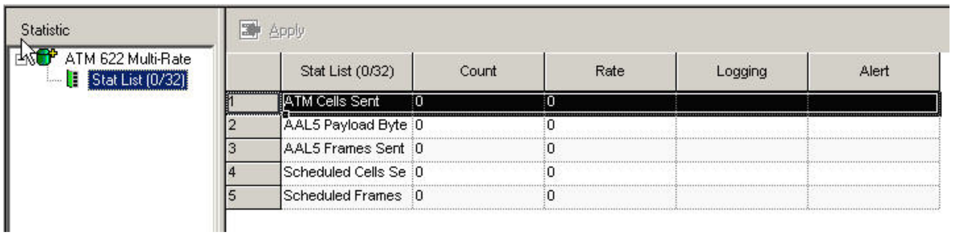
Then under the VPI/VCI Registration, configure the particular VPI/VCI entry to monitor, in addition to enabling the Tx *Statistic* check box, as shown in *Image: ATM Per VPIVCI Tx Stats Mode.*

Image: ATM Per VPIVCI Tx Stats Mode



Then the particular VPIVCI StatList becomes available, as shown in *Image: ATM Per VPIVCI Tx StatList.*

Image: ATM Per VPIVCI Tx StatList



Changing Streams Without Interruption

This feature applies to these load modules:

- LM1000(S)TX(S)2/4/24
- LM1000SFP(S)4
- LSM1000XMS(R)12
- ASM1000XMV(R)16
- MSM10G1
- LSM10G(L)1, LSM10GXL6
- LSM10GXM(R)3
- NGY LSM10GXM4(R), LSM10GXM8(R)

Both Packet and Advanced streams can be suspended and then resumed, and the Total % Line Rate can be changed, without affecting the overall traffic. When streams are suspended/resumed or adjusted for Total % Line Rate using the Stream Editing grid, the changes take effect without stopping/restarting traffic.

NOTE Use only the Stream Editing grid to make these changes. Changing streams from the Stream Properties page does **not** work the same way, and traffic **is** interrupted..

Packet Streams

Suspend/Resume

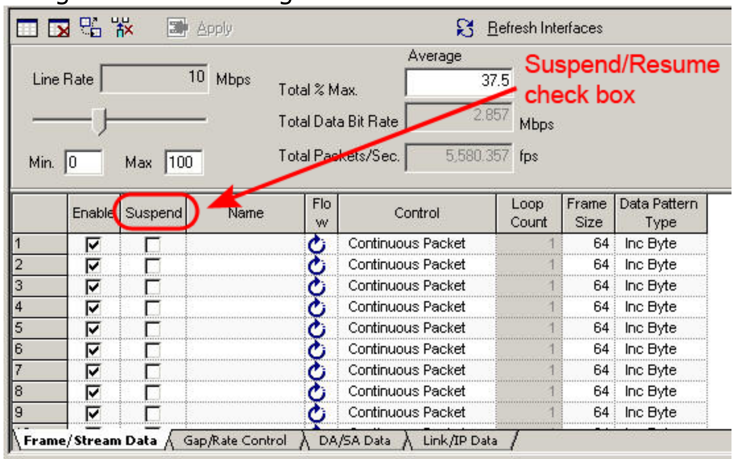
Packet streams (also known as basic or sequentially scheduled streams) can be suspended and resumed during transmission. However, if new streams are added, the stream traffic must stop and restart after the new configuration is loaded. When a packet stream is suspended and then resumed, a persistent UDF continues to count from where it left off when the stream was suspended.

If a currently active stream is suspended, it runs to completion and not execute again until it is resumed.

The Stream Editing grid features a Suspend check box, as shown in *Image: Stream Editing Grid for Advanced Streams.* Select the check box to suspend the stream, then select again (deselect) to resume traffic on that stream. After suspending or resuming one or more streams, you must select

Apply or wait for the Apply timer to expire, for the change to take effect. Changes to multiple streams are processed one-by-one.

Image: Stream Editing Grid for Packet Streams



Rate Change

The Total % Line Rate can be changed using either the slider or the Total % Line Rate field. When Total % Line Rate is changed, rates on all streams (on the port) are affected.

When changing the rate on a packet stream, the rate change takes effect after the next packet for the stream is scheduled.

After changing the rate of one or more streams, you must select **Apply** or wait for the Apply timer to expire, for the change to take effect. Changes to multiple streams are processed one-by-one.

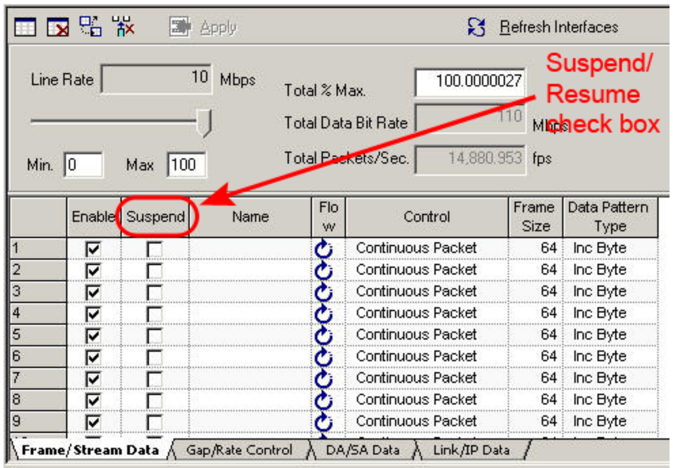
Advanced Streams

Suspend/Resume

Advanced streams (also known as concurrently scheduled streams) can be suspended and then resumed without interrupting traffic on other streams. However, new streams cannot be added without stopping and restarting traffic. When a running stream is suspended, it will not transmit packets until it is resumed. When a stream is suspended and then resumed, the stream continues from where it left off with regard to its packet count, UDFs, and so on.

The Stream Editing grid features a Suspend check box, as shown in *Image: Stream Editing Grid for Advanced Streams.* Select the check box to suspend the stream, then select again (deselect) to resume traffic on that stream. After suspending or resuming one or more streams, you must select **Apply** or wait for the Apply timer to expire, for the change to take effect. Changes to multiple streams are processed one-by-one.

Image: Stream Editing Grid for Advanced Streams



Rate Change

Like the Packet streams, when changing the rate on a Concurrent stream, the rate change takes effect after the next packet for the stream is scheduled. Each stream has a maximum rate so that the software can determine if it should go into a fast or slow counter in the hardware. For details, Advanced Streams for Ethernet Modules.

The Total % Line Rate can be changed using either the slider or thse Total % Line Rate field. When Total % Line Rate is changed, rates on all streams (on the port) are affected.

After changing the line rate of one or more streams, you must select **Apply** or wait for the Apply timer to expire, for the change to take effect. Changes to multiple streams are processed one-by-one.

Transparent Dynamic Rate Change

If selected (in the **Transit Modes** tab of Port Properties), this allows rate change across counters, for this port, without stopping transmit.

NOTE

The behavior of Transparent Dynamic Rate Change is not intuitive.Turn ON Transparent Dynamic Rate Change (in Transmit Modes, Port Properties), then switch to Advanced Streams, **Gap/Rate Control** tab. You see there is no limit (all are at 100%) in Max Limit % Line Rate.Then if you return to Port Properties / Transmit Modes and turn OFF the TDRC, and then go back to the **Gap/Rate Control** tab, you see there is a limit; only the first 16 streams are at 100%.At that point, if you return to Transmit Modes and again turn ON the TDRC, and then go back to **Gap/Rate Control** tab, you expect to see all streams at 100% (no limit), but in fact the status is unchanged—there is still a limit. This is a case of not being able to UNDO the effect of turning OFF, by turning ON again.

CHAPTER 5
Frame Data–Basic Frame Structure

Frame Data Structure

The ***Frame Data*** tab in the *Stream Properties* dialog box provides control over all aspects of packets transmitted by the Ixia hardware. These frames are also referred to as datagrams or packets in some contexts. Many frames may be generated in the processing of a stream. Many of the controls available allow the specification of a series of values applied to subsequent frames.

This chapter discusses basic frame data structure. For other parts of frame data construction, see:

- Frame Data–Protocol Control
- Frame Data–User Defined Fields (UDF)

The **Frame Data** tab is described in **Frame Data** Tab. The controls available in the **Frame Data** tab correspond to the manner in which the Ixia hardware formats frames. Two main types of frames are Ethernet frames and SONET frames, described in the following sections:

- Ethernet Frames
- SONET Frames

The main components of the **Frame Data** tab are described in the following sections (some of these components are described in other chapters):

- (For Ethernet ONLY) Preamble Size Box and the Preamble is a variable number of bytes of data, where each byte has an identical value of 0xAA. The preamble size range varies between cards, see Ixia Platform Reference Manual. The preamble contents is always a string of 0xAA bytes and is terminated by a SFD (Start Frame Descriptor) with a value of 0xAD. The Preamble Size count value that appearsin the field includes the SFD.
- (For SONET ONLY) Min Flags Box
- Data Pattern Box
- Frame Size
- Instrumentation Box
- Force Errors Box
- DA/SA Property Sheet

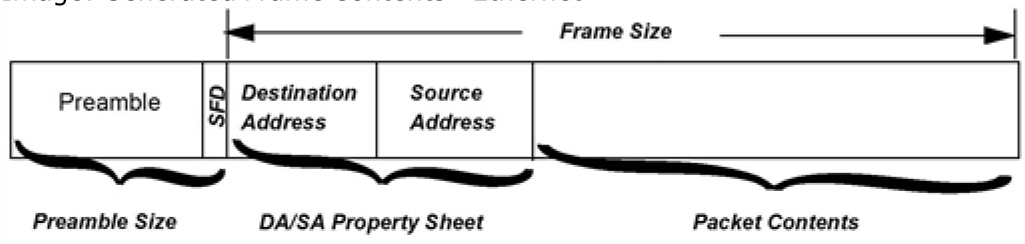
In addition, this chapter includes special sections on the **Frame Data** tab for the following features:

- Frame Data for GFP
- Frame Data for ATM/POS 622

Ethernet Frames

Every Ethernet frame has a basic structure as shown in *Image: Generated Frame Contents—Ethernet*.

Image: Generated Frame Contents—Ethernet



The Preamble is a variable number of bytes of data, where each byte has an identical value of 0xAA. For 10 Gigabit Ethernet cards, the preamble is 8 bytes long and has a value of 0x55 (though some of the preamble bytes may be modified by you). The permissible preamble size varies between cards, see the *Ixia Platform Reference Manual*. The length of the Preamble is controlled by the Frame Data for Ethernet Modules. *The Preamble is followed by the SFD—Start Frame Descriptor, which has a value of 0xAD (0xD5 for 10 Gigabit Ethernet cards). The SFD is considered as part of the preamble and is included in the preamble size calculation.*

The DA (Destination Address) and SA (Source Address) fields follow. They hold MAC addresses and are 6 bytes each. These values may contain a constant value, a random value, or may increment or decrement. The contents of these two fields is controlled by the fields of the DA/SA Property Sheet.

The Packet Contents are programmed by five types of data generators. The list below indicates the order in which the generators are applied. The data created by each generator overwrites data created by earlier generators, if they overlap. The data generators are:

1. Protocols:Controlled by the *Protocols* sub-tab, described in *Chapter 6, Frame Data–Protocol Control. The protocol generator allows for the formatting of protocol specific headers. Specific IP protocols, such as UDP, are supported in more detail. Protocol header fields start at offset 12 in the frame, immediately following the DA and SA fields.*
2. Data Patterns: Controlled in the Data Pattern Box. *The data patterns may be simple algorithmic values, random values, repetitions of fixed patterns or arbitrary sets of data retrieved from a disk. Data patterns start after the DA/SA fields and any protocol headers that are generated.*
3. UDF1, UDF2, UDF3, UDF4, and UDF5 (availability of UDF5 depends on type of module): These User Data Fields (UDFs) are not normally permitted to overlap and are controlled by the *User Defined Field* sub-tabs, as described in *Chapter 7,Frame Data–User Defined Fields (UDF). In the case of the Ixia ATM and Ethernet TXS modules, there are five UDFs. Each UDF controls a 32-bit counter. In general, each UDF may be positioned anywhere between the end of DA or SA fields and the end of the frame, although some modules allow the UDF to start at the beginning of the frame. See the Ixia Platform Reference Manual for information on the UDF types supported by each module.*
4. Frame Identity Record (FIR): This 6-byte quantity is Ixia hardware-generated data which can be used to uniquely identify each frame and is controlled by the Instrumentation Box. *The FIR record is usually positioned at the end of the packet, or just before the FCS, if it is present (though some modules allow for the manipulation of this position).*

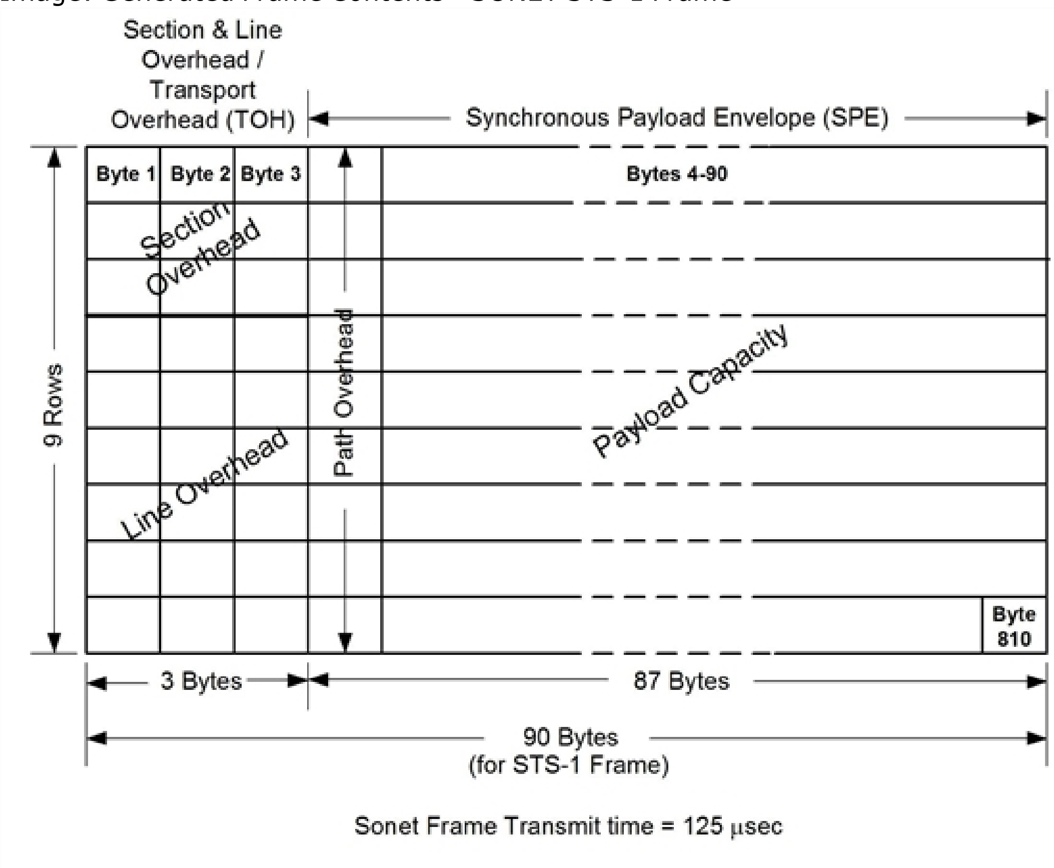
5. Frame Check Sequence (FCS): This four-byte quantity is controlled by the Force Errors Box. *It may be used to insert a normal CRC checksum, omit the checksum, or simulate various errors. If included, it is always positioned at the end of the frame.*

SONET Frames

A Synchronous Optical NETwork/Synchronous Digital Hierarchy (SONET/SDH) frame is based on the Synchronous Transport Signal-1 (STS-1) frame, whose structure is shown in *Image: Generated Frame Contents—SONET STS-1 Frame*. Transmission of SONET Frames of this size correspond to the Optical Carrier level 1 (OC-1).

An OC-3c, consists of three OC-1/STS-1 frames multiplexed together at the octet level. OC-12c, OC-48c, and OC-192c, are formed from higher multiples of the basic OC-1 format. The suffix 'c' indicates that the basic frames are concatenated to form the larger frame.

Image: Generated Frame Contents—SONET STS-1 Frame



The contents of the SONET STS-1 frame are described in *Table: SONET STS-1 Frame Contents*.

Table: SONET STS-1 Frame Contents

Section	Description
Section Overhead (SOH)	Consists of 9 bytes which include information relating to performance monitoring of the STS-n signal, and framing.

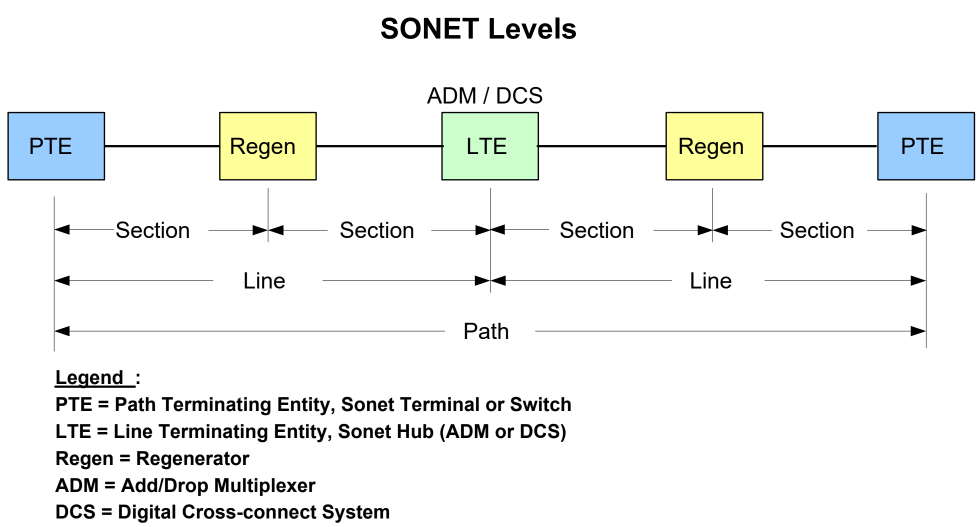
Section	Description
Line Overhead (LOH)	Consists of 18 bytes which include information relating to performance monitoring of the individual STS-1s, protection switching information, and line alarm indication signals.
Transport Overhead (TOH)	Consists of a combination of the Section Overhead and Line Overhead sections of the STS-1 frame.
Path Overhead (POH)	Part of the Synchronous Payload Envelope (SPE), contains information on the contents of the SPE, and handles quality monitoring.
Synchronous Payload Envelope (SPE)	Contains the payload information, the packets which are being transmitted, and includes the Path Overhead bytes.
Payload Capacity	Part of the SPE, and contains the packets being transmitted.

The SONET STS-1 frame is transmitted at a rate of 51.84 Mbps, with 49.5 Mbps reserved for the frame payload. A SONET frame is transmitted in 125 microseconds, with the order of transmission starting with Row 1, Byte 1 at the upper left of the frame, and proceeding by row from top to bottom and from left to right.

SONET Levels

The section, line, and path overhead elements are related to the manner in which SONET frames are transmitted, as shown in *Image: Example Diagram of SONET Levels and Network Elements*.

Image: Example Diagram of SONET Levels and Network Elements



Frame Data Tab

NOTE For information on protocol construction of frame data structure, Chapter 6,Frame Data–Protocol Control.

To access the ***Frame Data*** tab, double-click in a stream/flow entry in the *Packet Streams/Packet Flows/Advanced Streams* window, then select the **Frame Data** tab. Alternatively, select a port in the Resources window, and select *Edit Streams* from the menu that appears. The **Frame Data** tab varies for different types of load modules. The major types are:

- Frame Data for Ethernet Modules—which includes 10/100, 10/100/1000, Gigabit, and 10 Gigabit modules.
- Frame Data for SONET/POS Modules—which includes OC-12c/OC-3c, OC-48c, and OC-192c POS load modules.
- Frame Data for Flex—which includes FlexAP10G16S and FlexFE10G16S load modules.
- Frame Data for Lava 40GE/100GE—which includes Lava AP40GE/100GE 2P and Lava AP40GE/100GE 2RP
- Frame Data for Xcellon-Multis, Novus, and Novus-R—which includes Xcellon-Multis, Novus QSFP28, and Novus-R QSFP28 load modules
- Frame Data for QSFP-DD and CFP8—which includes QSFP-DD and CFP8 load modules
- Frame Data for T400-QDD and T400 OSFP—which includes QDD and OSFP load modules

For information on implementation of SONET-related special features in the ***Frame Data*** tab, see the following sections:

- Frame Data for DCC
- Frame Data for SRP
- Frame Data for RPR
- Frame Data for GFP
- Frame Data for ATM/POS 622

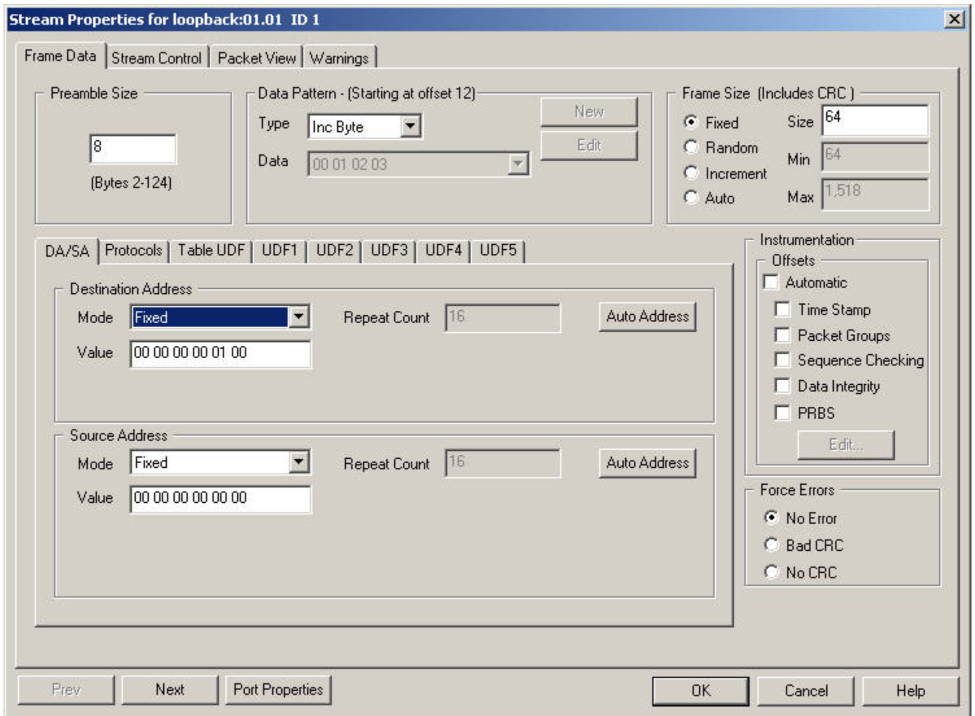
Frame Data for Ethernet Modules

The Ethernet load modules have two main versions of Frame Data tabs:

- 10/100/1000 Ethernet Frame Data Tab—The **Frame Data** tab for 10/100, Copper 10/100/1000, and Gigabit load modules is shown in *Image: Frame Data for 10/100, 10/100/1000, 10/100 TXS8, and Gigabit Modules (shown for 10/100/1000)*.
- 10 Gigabit Frame Data Tab—The **Frame Data** tab for 10 Gigabit modules is shown in Image: Frame Data for 10 Gigabit Modules.

10/100/1000 Ethernet Frame Data Tab

Image: Frame Data for 10/100, 10/100/1000, 10/100 TXS8, and Gigabit Modules (shown for 10/100/1000)

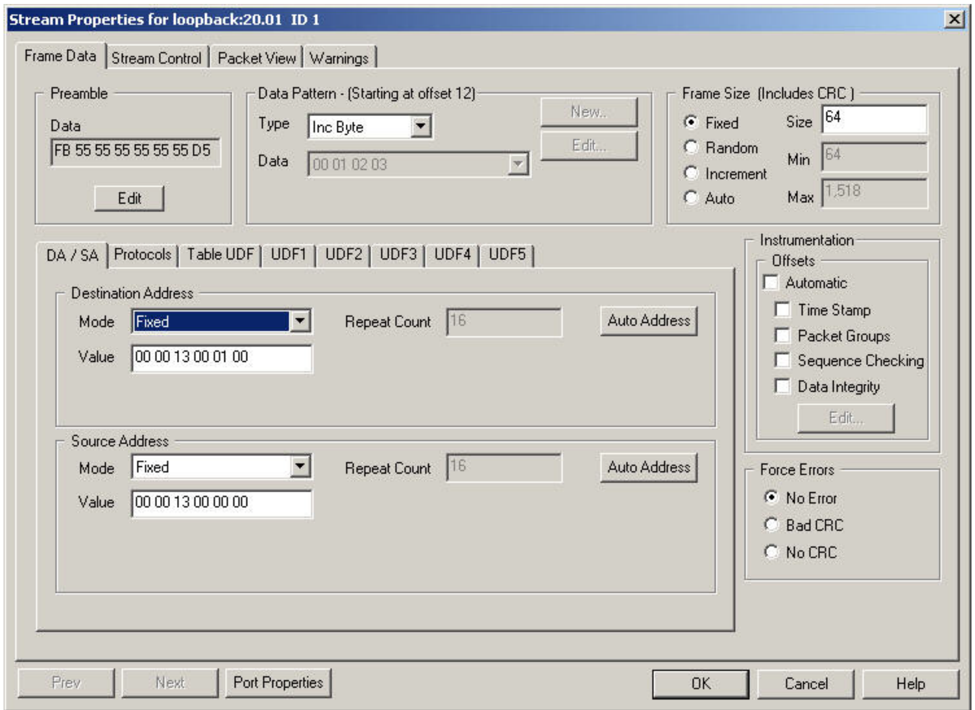


NOTE

These cards—10/100, 10/100/1000, 10/100 TXS8, and Gigabit modules—do not support PRBS. However, the following cards DO support PRBS: LM1000STXS4 familyLM1000TXS4 familyLM1000SFPS4 familyOLM1000STXS24 familyLSM1000XMS12 familyLSM1000XMV family (not in Data Center Mode)ASM1000XMV12 LSM10G1 and 10GL1NGY LSM10GXM family (not in Data Center Mode).

10 Gigabit Frame Data Tab

Image: Frame Data for 10 Gigabit Modules



NOTE Some 10 Gigabit Ethernet modules do not have an UDF 5 sub-tab.

Frame Data

The labeled boxes within the **Frame Data** tab control the formation of frames. The division of functionality is described below.

Controls Related to General Structure

- Preamble:
  - Preamble Size Box—for 10/100, 10/100 TXS8, and Gigabit. Controls the size of the preamble, including the SFD.
  - The Preamble is a variable number of bytes of data, where each byte has an identical value of 0xAA. The preamble size range varies between cards, see Ixia Platform Reference Manual. The preamble contents is always a string of 0xAA bytes and is terminated by a SFD (Start Frame Descriptor) with a value of 0xAD. The Preamble Size count value that appears in the field includes the SFD.—for 10 Gigabit modules. Shows the size and content of the preamble.
- Frame Size—controls the size of frames, not including the preamble and SFD.
- *Port Properties button*—opens the *Port Properties* dialog box which controls a number of basic port parameters. See the following chapters for more information on the *Port Properties* dialog box:
  - Chapter 18,Port Properties — 10/100/1000 Ethernet Family

Packet Contents

The packet contents are controlled by the various property sheets and dialog boxes. The list below corresponds to the order of placement of data within a packet:

- *DA/SA Property Sheet—configures Destination and Source MAC addresses.*
- Protocols Section (as described in Chapter 6,Frame Data–Protocol Control)—protocol headers formatted for both data link and network/transport layers, including the IP and IPX protocols.
- *Data Pattern Box—determines data values which may cover the remainder of the frame.*
- The User Defined Fields (as described in Chapter 7,Frame Data–User Defined Fields (UDF))—programming of configurable 32-bit counters.
- *Instrumentation Box—insertion of a timestamp, packet group signature, sequence signature, and data integrity signature.*
- *Force Errors Box—control over the CRC in the Frame Check Sequence field at the end of each frame, as well as the creation of alignment and dribble bit errors.*

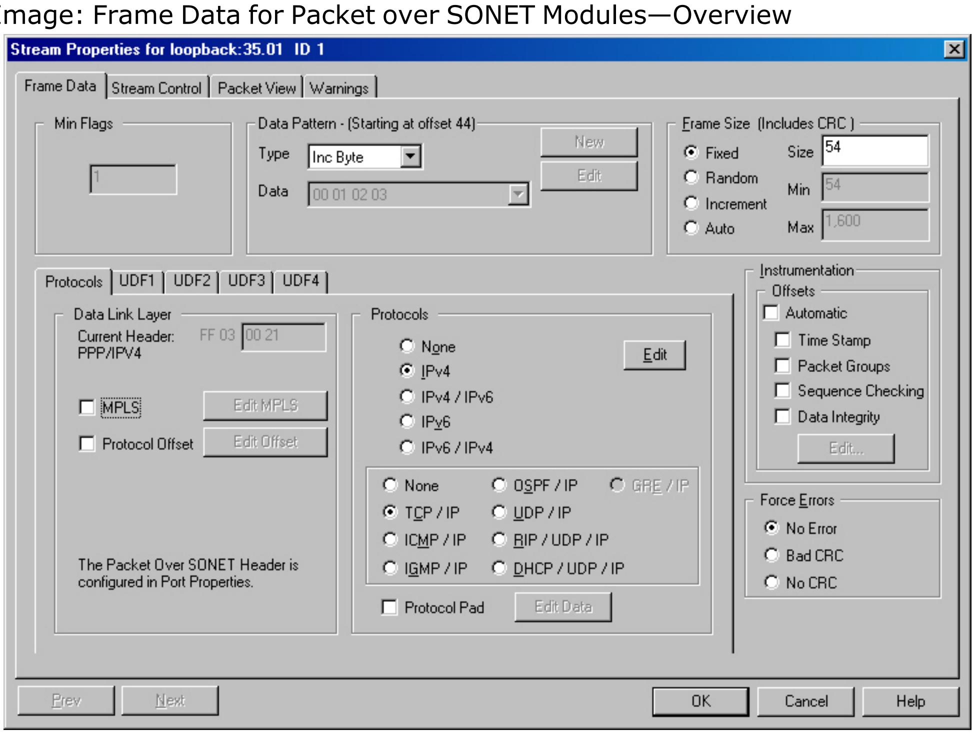
Each tab is shown separately, along with a description of its usage.

Frame Data for SONET/POS Modules

The ***Frame Data*** tab for Packet over SONET Modules is shown in Image: Frame Data for Packet over SONET Modules—Overview.

NOTE For POS 622 (OC-12c/OC-3c POS) see POS 622 Frame Data.

Image: Frame Data for Packet over SONET Modules—Overview



NOTE Some modules also have Table and UDF 5 sub-tabs (that is, 10GE MSM) when in WAN or OC-192c Transmit mode.

The labeled boxes within the tab control the formation of frames. The division of functionality is:

Controls Related to General Structure

- Min Flags Box—controls the minimum number of empty 'flag' frames sent between good POS packets.
- Frame Size—controls the size of frames.
- Port Properties—select the *Port Properties* button to show the set of *Port Properties* dialog boxes, which control a number of basic port parameters for the currently selected load module. See the following chapters for more information:
  - Chapter 18,Port Properties — 10/100/1000 Ethernet Family

Packet Contents

The packet contents are controlled by the various property sheets and dialog boxes. The list below corresponds to the order of placement of data within a packet:

- *DA/SA Property Sheet—configures Destination and Source MAC addresses.*
- Protocols Section (as described in Chapter 6,Frame Data–Protocol Control)—protocol headers formatted for both data link and network/transport layers, including the IP and IPX protocols.
- *Data Pattern Box—determines data values which may cover the remainder of the frame.*
- The User Defined Fields (as described in Chapter 7,Frame Data–User Defined Fields (UDF))—programming of configurable 32-bit counters.
- *Instrumentation Box—insertion of a timestamp, packet group signature, sequence signature, and data integrity signature.*
- *Force Errors Box—control over the CRC in the Frame Check Sequence field at the end of each frame, as well as the creation of alignment and dribble bit errors.*

Frame Data Sections

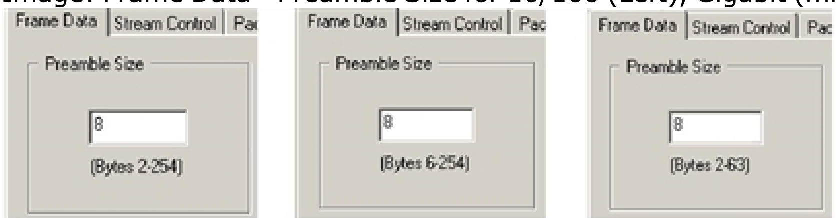
Each section of the **Frame Data** tab is shown separately below, along with a description of its usage:

- Preamble Size Box
- The Preamble is a variable number of bytes of data, where each byte has an identical value of 0xAA. The preamble size range varies between cards, see Ixia Platform Reference Manual. The preamble contents is always a string of 0xAA bytes and is terminated by a SFD (Start Frame Descriptor) with a value of 0xAD. The Preamble Size count value that appears in the field includes the SFD.
- Min Flags Box
- Frame Size
- DA/SA Property Sheet
- Data Pattern Box
- Protocols section, as described in Chapter 6,Frame Data–Protocol Control
- User Defined Fields, as described in Chapter 7,Frame Data–User Defined Fields (UDF)
- Instrumentation Box
- Force Errors Box

Preamble Size Box

The Preamble Size box is shown in *Image: Frame Data—Preamble Size for 10/100 (Left), Gigabit (middle), and 10/100 TXS8 (right)*.

Image: Frame Data—Preamble Size for 10/100 (Left), Gigabit (middle), and 10/100 TXS8 (right)



The Preamble is a variable number of bytes of data, where each byte has an identical value of 0xAA. The preamble size range varies between cards, see *Ixia Platform Reference Manual*. The preamble contents is always a string of 0xAA bytes and is terminated by a SFD (Start Frame Descriptor) with a value of 0xAD. The Preamble Size count value that appears in the field **includes** the SFD.

Preamble Data Box for 10 Gigabit Modules

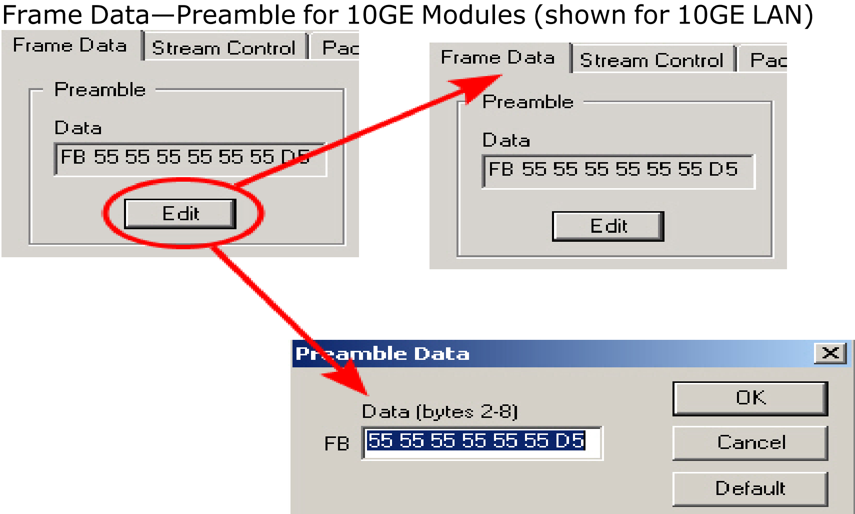
The Preamble Data box for 10 Gigabit Modules contains a read-only field showing the 8 bytes in the preamble of the 10 Gigabit Ethernet frame. This field reflects the setting that is made in the *Preamble Data* dialog box. The length of the preamble for 10 Gigabit modules is fixed at 8 bytes, but some of the bytes can be configured by you. The number of configurable bytes in the dialog box depends on the setting for the Transmit start-of-frame detection mode in the ***Preamble*** tab of the *Port Properties* dialog box.

SFD and Byte Count Modes

For SFD Detect Mode, Bytes 2 through 7 are configurable. For Byte Count Mode, Bytes 2 through 8 are configurable.

10GE LAN, 10GE XAUI, 10GE XENPAK, 10GE LSM, 10GE MSM, and 10GE WAN modules support both modes.The default values appear in the screen captures below. To return to these default values, select the *Default* button.

Frame Data—Preamble for 10GE Modules (shown for 10GE LAN)



Preamble Data Box for 40/100 GE Modules

The Preamble Data box for 40/100 Gigabit Modules contains a read-only field showing the 8 bytes in the preamble of the 40/100 Gigabit Ethernet frame. This field reflects the setting that is made in the Preamble Data dialog box. The length of the preamble for 40/100 Gigabit modules is fixed at 8 bytes, but some of the bytes can be configured only. You can configure Data from (2-8) bytes in the Preamble Data dialog box.

Byte Count Modes

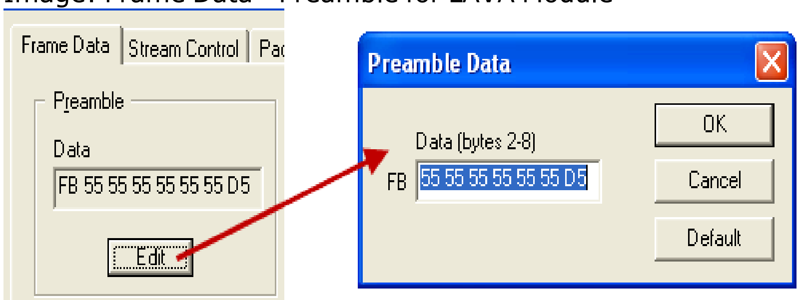
For Byte Count Mode, Bytes 2 through 8 are configurable. 40/100 GE supports this mode.

The Preamble box and the Preamble Data dialog box are shown in Image 5-8. The default values appear in the screen captures below. To return to these default values, select the Default button.

Lava AP40/100 GE— Preamble

The Lava AP40/100 GE **Preamble** tab allows you to select the option so that you can view Preamble in Packet View. The preamble precedes the frame, but is not part of the frame itself. The Preamble dialog box of Lava AP40/100 GE module is shown in the following image:

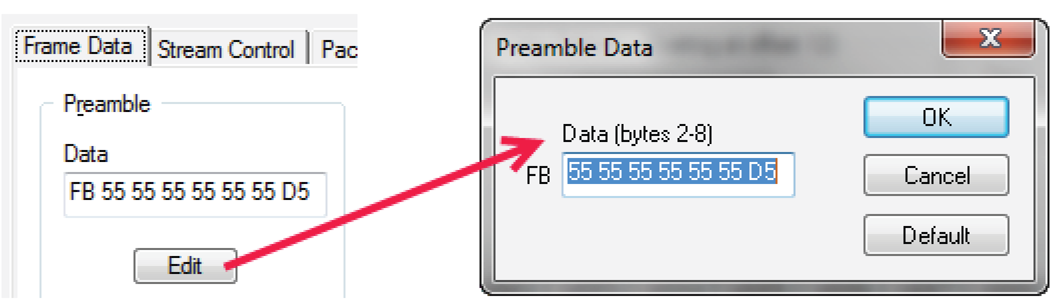
Image: Frame Data—Preamble for LAVA Module



Xcellon-Multis— Preamble

The Xcellon-Multis **Preamble** tab allows you to select the option so that you can view Preamble in Packet View. The preamble precedes the frame, but is not part of the frame itself. The Preamble dialog box of Xcellon-Multis module is shown in the following image:

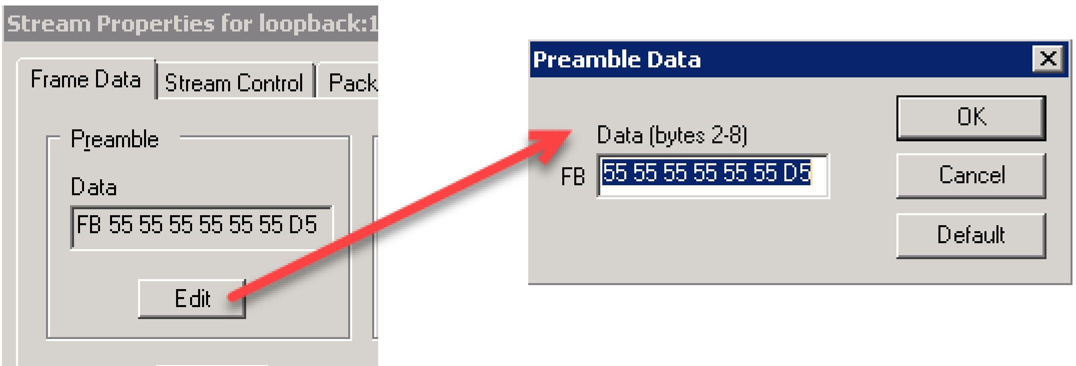
Frame Data—Preamble for Xcellon-Multis Module



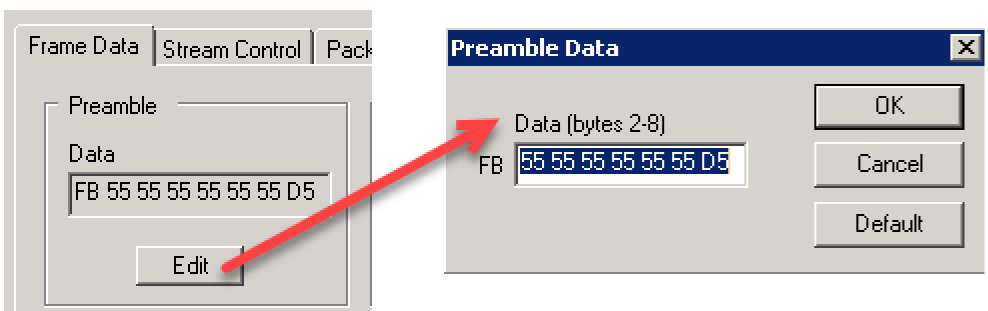
QSFP-DD and CFP8— Preamble

The QSFP-DD and CFP8 **Preamble** tab allows you to select the option so that you can view Preamble in Packet View. The preamble precedes the frame, but is not part of the frame itself. The Preamble dialog boxes of QSFP-DD and CFP8 modules are shown in the following images:

Frame Data—Preamble for QSFP-DD Module



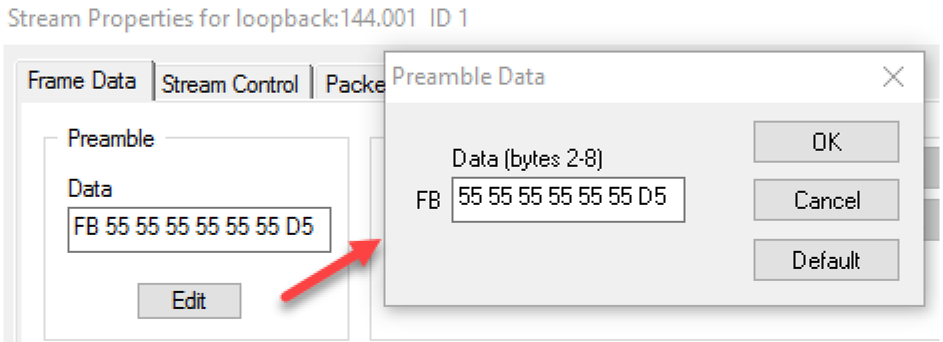
Frame Data—Preamble for CFP8 Module



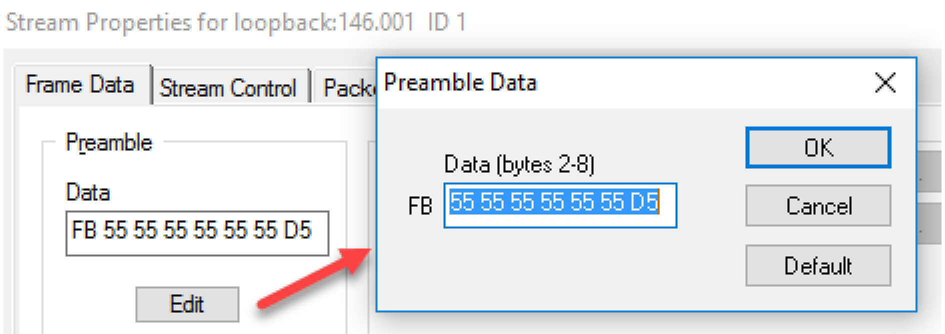
T400 QDD and OSFP— Preamble

The QDD and OSFP **Preamble** tab allows you to select the option so that you can view Preamble in Packet View. The preamble precedes the frame, but is not part of the frame itself. The Preamble dialog boxes of QDD and OSFP modules are shown in the following images:

Frame Data—Preamble for QDD Module



Frame Data—Preamble for OSFP Module



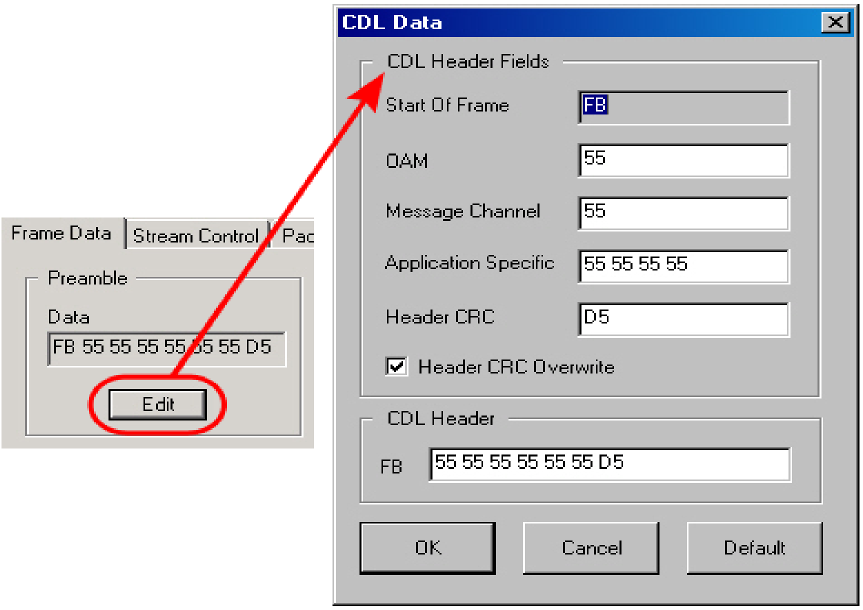
Cisco CDL Preamble Mode

10GE LAN, 10GE XAUI, 10GE XENPAK, 10GE WAN, and 10GE WAN UNIPHY modules all support the Cisco CDL preamble format.

Image: Frame Data—Preamble for Cisco CDL shows the *CDL Data* dialog box. This dialog box is enabled by selecting the *Cisco CDL* check box on the **Preamble** tab of the *Port Properties* dialog box.

The default values appear in the image below. To return to these default values, select the *Default* button. Bytes 1 through 6 are configurable. Byte 7 (the Header CRC) is also configurable but is not considered part of the CDL Data.

Image: Frame Data—Preamble for Cisco CDL



The configurable CDL fields are discussed in *Table: CDL Configurable Fields*.

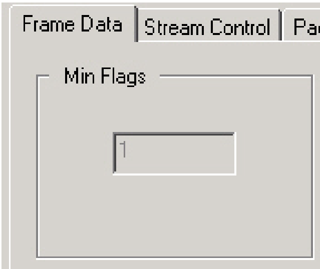
Table: CDL Configurable Fields

Section	Field/Control	Description
CDL Header Fields	Start of Frame	Signifies the start of the CDL frame. This field is not configurable.
	OAM	One byte, in Hex, specifying the Operation, Administration, and Maintenance field.
	Message Channel	One byte, in Hex, specifying the message channel.
	Application Specific	Four bytes, in Hex, specifying the application specific data.
	Header CRC	The Cyclical Redundancy Check checksum for the CDL header. This field is only configurable if the *Header CRC Overwrite* button is selected.
	Header CRC Overwrite	Allows the use to overwrite the calculated CRC.
CDL Header		This field shows the combination of all the CDL fields, modified as described above.

Min Flags Box

The *Min Flags* field is shown in *Image: Frame Data—Min Flags for POS Modules*.

Image: Frame Data—Min Flags for POS Modules

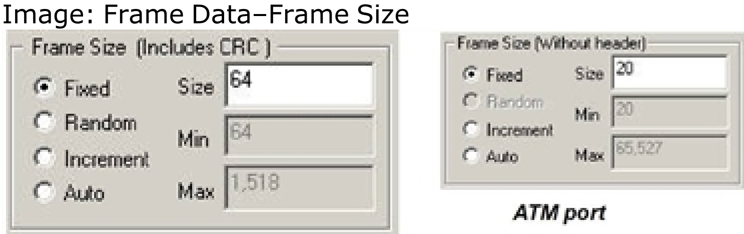


This section is read-only at the current time, and reflects the fact that at least one empty 'flag' frame is sent between transmitted SONET frames.

Frame Size

The Frame Size section is shown in *Image: Frame Data–Frame Size*.

Image: Frame Data–Frame Size



Four basic options are available to set the size of frames. The frame size ranges for different port types varies. The size includes everything following the SFD, through the FCS field. The frame size may be one of the following types. (See **Note** below for maximum frame size on OC-12c ports.)

- **Fixed** — sets all frames to a constant size, specified in bytes in the Size field.

  NOTE For ATM ports, the default setting for Fixed frame size is 20 bytes. Frame sizes for ATM less than 43 bytes do not run at the full line rate.

- **Random**—sets frames to have random sizes, varying between the specified *Min* and *Max* lengths, in bytes. For information on the 'Weighted Random Frame Size' feature, Weighted Random Frame Size.
- **Increment**—sets frames to have a set of incrementing sizes, between the specified *Min* and *Max*lengths, in bytes.The typical increment is 1 byte. For some load modules, a user-defined increment step can be configured. Frame Size User-Defined Increment Step for additional information. For some load modules, IxOS supports packets per burst setting in incrementing frame size mode. Using the Packet/Burst Setting in Incrementing Frame Size Mode for additional information.
- **Auto**—sets the frame size to the minimum required for the protocols selected, data fields, and UDFs selected.

The Random and Increment settings are not enabled for settings of *IPX* selections in the *Protocols* box. Since the range of frame sizes varies between cards, refer to *Ixia Platform Reference Manual*.

NOTE For **OC-48c POS, OC-192c POS,** and **10GE** modules, only one stream of incrementing frame size can be created per group of streams. Overall, up to 254 non-incrementing frame size streams, plus one incrementing frame size stream, may be configured concurrently for a port on one of these modules.

This does not apply to newer load modules in the LSM and MSM series, which support 256 incrementing streams.

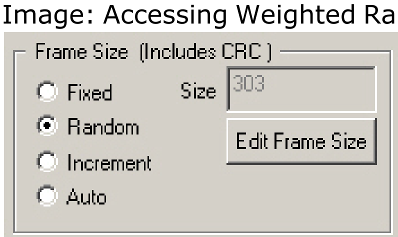
NOTE For **OC-12c POS** ports: 1) When any type of Data Pattern other than 'Fixed' is selected in the Data Pattern box, the maximum allowable Frame Size is 15,257 bytes for older POS modules. For the POS 622, the maximum frame size is 65,535 bytes.2) The minimum frame size for POS 622 is 12 bytes. For older POS modules (OC12 POS card), the minimum frame size is 34 bytes.2) For **asynchronous** streams:With a PPP header, but without PPP negotiation enabled, the maximum frame size is 1508 bytes (with CRC-32) or 1506 bytes (with CRC-16).With a PPP header, and with PPP negotiation enabled, the maximum frame size is 3200 bytes or PPP-negotiated MTU, whichever is less.With a Cisco HDLC header, the maximum frame size is 3,200 bytes.With a Frame Relay header, the maximum frame size is 1,500 bytes.

NOTE For **ATM** ports: Each ATM Stream Queue can have maximum 16 streams of Incremented Frame Sizes; other streams are forced to Fixed Frame Size.When using Incremented Frame Size with ATM ports with IP/TCP/UDP, the checksums are inaccurate. A warning message to this effect alerts you when Increment Frame Size is selected.

Weighted Random Frame Size

The Weighted Random Frame Size feature is accessed by first selecting the *Random* frame size option, as shown in *Image: Weighted Random Frame Size—Uniform Distribution*. Selecting the *Edit Frame Size* button shows the *Weighted Random Frame Size* dialog box.

Image: Accessing Weighted Random Frame Size



This feature is used to configure different possible modes of generating random frame sizes for a particular stream. The *Weighted Random Frame Size* dialog box lists the four available Random Modes. Each of the different Random Modes shows a different dialog box format, as described in the following sections:

- Weighted Random Frame Size—Uniform Distribution
- Weighted Random Frame Size—Weight Pairs
- Weighted Random Frame Size—Predefined Distributions
- Weighted Random Frame Size—Quad Gaussian

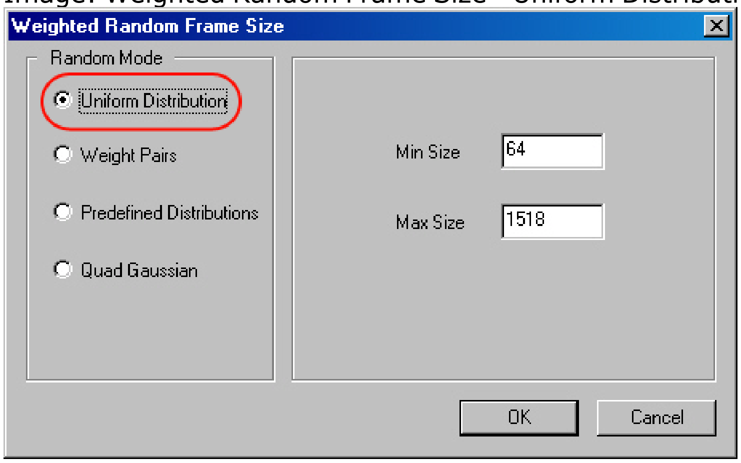
For the middle two types (Weight Pairs and Predefined Distribution), the weights for all of the frame sizes are added up. Each frame size is then given a proportion of the total number of frames, as dictated by its weight value. For example, one of the pre-programmed distributions is (64:7, 594:4, 1518:1). In this case, the total of the weights is 12 (7+4+1). Frames are randomly generated such that 64-byte frames are 7/12 of the total, 594-byte frames are 4/12 of the total, and 1518-byte frames are 1/12 of the total.

NOTE Code uses uniform distribution and relies on it being uniform. However, as with any other probability distribution, the sample distribution is close to theoretical only if the size of the sample is large. So what is described herein is approximate weight distribution—the approximation is better with bigger sample size (that is, larger number of frames). When the number of frames is very low (less than 100) the transmitted frames may not come close to the ratio described herein.

Weighted Random Frame Size—Uniform Distribution

The Uniform Distribution Random Mode version of the dialog box is shown in *Image: Weighted Random Frame Size—Uniform Distribution*. This is identical to the standard implementation of the random frame size feature. A uniform set of random values between a minimum and a maximum value are generated. The minimum and maximum frame size values are defined by you.

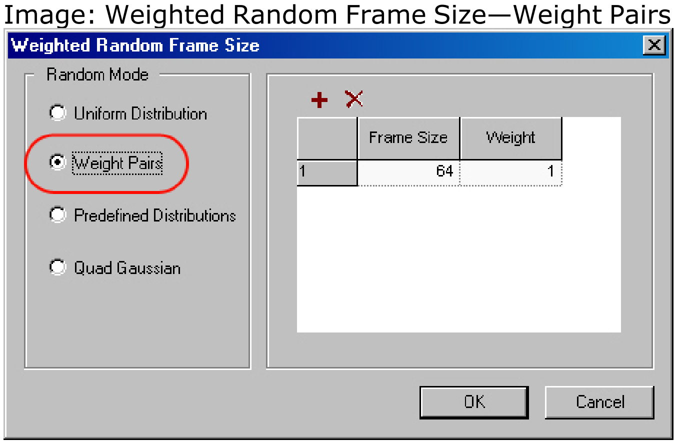
Image: Weighted Random Frame Size—Uniform Distribution



Weighted Random Frame Size—Weight Pairs

The Weight Pairs Random Mode version of the dialog box is shown in *Image: Weighted Random Frame Size—Weight Pairs*. This dialog box allows to custom-program a distribution for a stream. Frame sizes may be any value valid for the port. Weights may be any value, such that the total of all of the weights is less than 2,048.

Image: Weighted Random Frame Size—Weight Pairs



The fields and controls in this dialog box are described in *Table: Weighted Random Frame Size—Weight Pairs*.

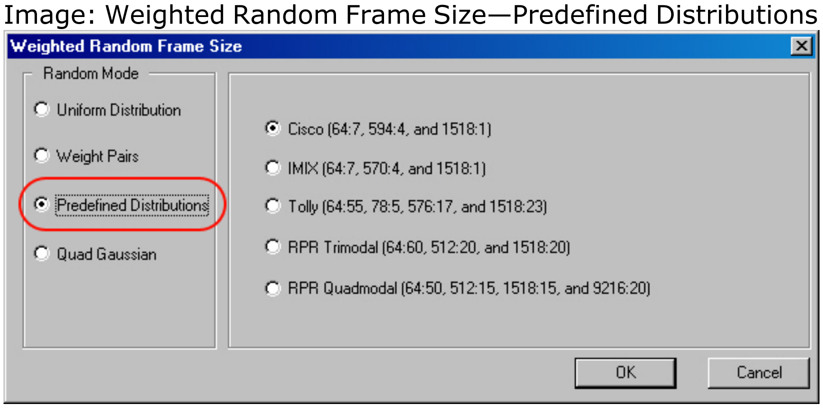
Table: Weighted Random Frame Size—Weight Pairs

Section	Field/Control	Description
(Header)		Select to add a Weight Pair to the table below.
		Select to delete the selected Weight Pair from the table below.
(Table)	Frame Size	(in bytes) The size of the frame for this Weight Pair.
	Weight	A user-defined, 32-bit integer (weight) assigned to the corresponding frame size in this Weight Pair.

Weighted Random Frame Size—Predefined Distributions

The Predefined Distributions Random Mode version of the dialog box is shown in *Image: Weighted Random Frame Size—Predefined Distributions*. The right pane of the dialog box lists the available types of pre-programmed distributions, corresponding to standard traffic models found in various applications.

Image: Weighted Random Frame Size—Predefined Distributions



The selections available in this version of the dialog box are described in *Table: Weighted Random Frame Size—Predefined Distributions*.

Table: Weighted Random Frame Size—Predefined Distributions

Predefined Distribution	Description
Cisco	A pre-programmed distribution, according to Cisco standards: 64:7, 594:4, and 1518:1.
IMIX	A pre-programmed distribution, according to IMIX standards: 64:7, 570:4, and 1518:1.
Tolly	A pre-programmed distribution, according to Tolly testing group standards:

Predefined Distribution	Description
	64:55, 78:5, 576:17, and 1518:23.
RPR Trimodal	A pre-programmed distribution: 64:60, 512:20,and 1518:20.
RPR Quadmodal	A pre-programmed distribution: 64:50, 512:15, 1518:15, and 9216:20.

Support for IMIX on Xdensity card

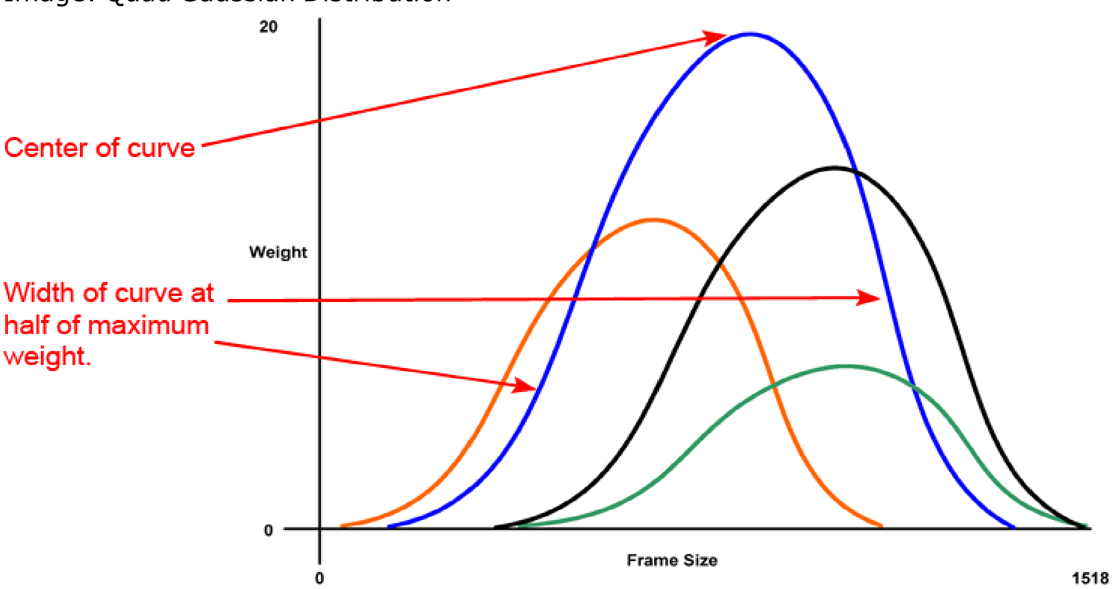
Only predefined distributions are supported in Xdensity card. These include 5 varieties (mentioned in the above table) which are supported on existing load modules. Weighted Pairs and Quad Distribution is not supported. This feature is supported for normal and data center mode.

Weighted Random Frame Size—Quad Gaussian

Quad Gaussian is the superposition of four gaussian distributions. You can specify the center (or mean), width of half maximum, and weight of each gaussian distribution. The distribution is then normalized to a single distribution and generates the random numbers according to the normalized distribution.

The graph in *Image: Quad Gaussian Distribution* demonstrates how Quad Gaussian Weighted Random Frame Size works.

Image: Quad Gaussian Distribution

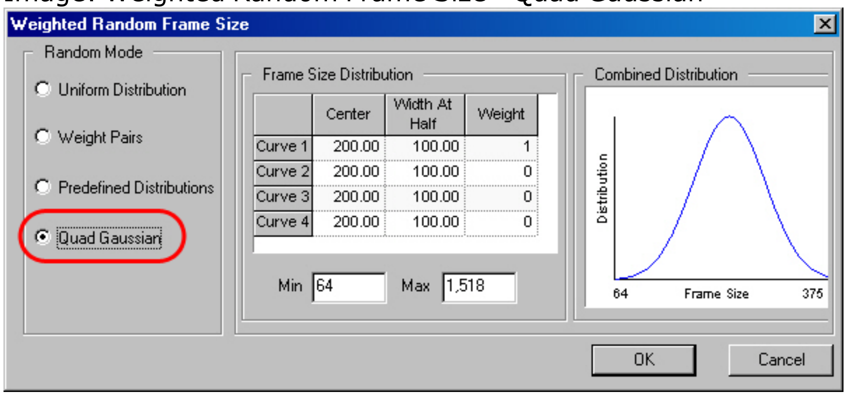


The graphic above shows four Gaussian distributions, reflected as weight over frame size. The frame size represented at the top of the curve is the frame size most likely to be transmitted, while the frame sizes at the beginning and end of each curve are the least likely to be transmitted.

The four curves are combined into a single distribution by the port. It is not necessary to use all four curves; one, two, or three curves can be generated as well as four.

The dialog box in *Image: Weighted Random Frame Size—Quad Gaussian* shows the configuration options for Quad Gaussian Weighted Random Frame Size.

Image: Weighted Random Frame Size—Quad Gaussian



The Quad Gaussian Configuration controls are discussed in *Table: Quad Gaussian Configuration Controls*

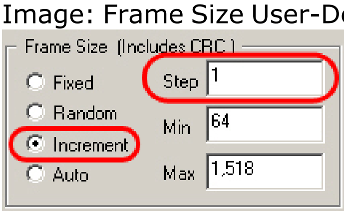
Table: Quad Gaussian Configuration Controls

Frame Size Min	The minimum frame size in bytes.
Frame Size Max	The maximum frame size in bytes.
Curve	The number of one of four curves that are amalgamated into a single distribution.
Center	The frame size for the center of the distribution curve.
Width at Half Max	The width of the distribution curve at half of the curve weight, exclicked as the difference between the minimum and maximum frame size in bytes.
Weight	The priority to give the distribution curve. The four weights are normalized into a ratio.

Frame Size User-Defined Increment Step

The user-defined increment step for frame sizes is shown in *Image: Frame Size User-Defined Increment Step*.

Image: Frame Size User-Defined Increment Step



When this option is selected, the frame size increases by the selected step size, beginning with the minimum set size and ending with the maximum set frame size.

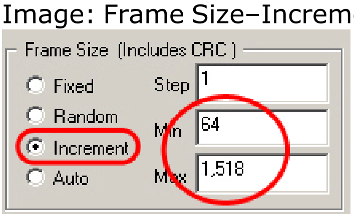
Using the Packet/Burst Setting in Incrementing Frame Size Mode

IxOS supports packets per burst setting in incrementing frame size mode for the following load modules in Packet Stream mode (and in Advanced Scheduler mode, where applicable):

- LM1000TX4, TXS4, STX4/24, STXS2/4/24, SFP4 and SFPS4
- LSM1000XMV family
- LSM10G1
- LSM10GXM2/4/8 family
- ASM1000XMV12X

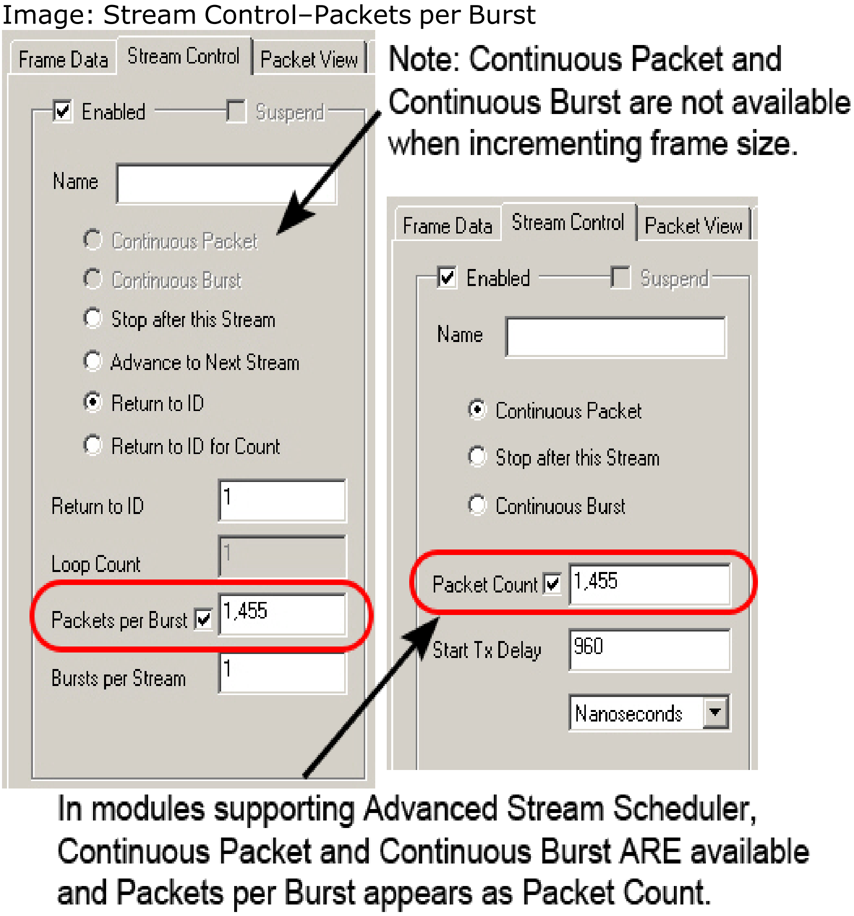
To configure this, in the *Stream Properties* screen, **Frame Data** tab, under *Frame Size*, select **Increment** and enter a **Min** and **Max** as shown in *Image: Frame Size–Increment*.

Image: Frame Size–Increment



Then on the **Stream Control** tab, at the *Packets per Burst* field, a check box appears. Select the check box and enter a *Packets per Burst* value.*Image: Stream Control–Packets per Burst* shows this.

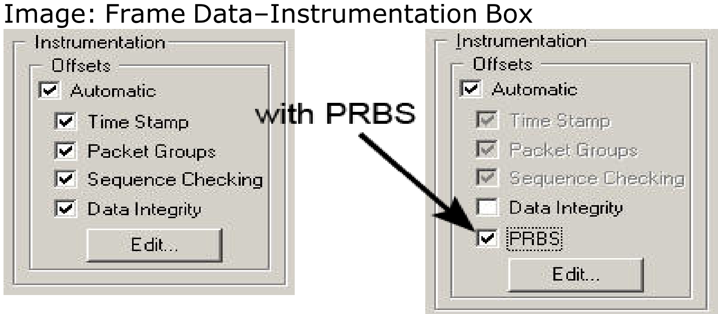
Image: Stream Control–Packets per Burst



Instrumentation Box

The *Instrumentation* feature is used in defining specialized fields within the packet to be transmitted. The data within these fields can then be processed at the receiving end, to determine sequence of arrival, latency, and the condition (data integrity) of the packets. Packet groups, sequence signature, data integrity checking, and PRBS may not be available with all modules. The Instrumentation Box on the ***Frame Data*** tab is shown in *Image: Frame Data–Instrumentation Box*.

Image: Frame Data–Instrumentation Box



The fields of the Frame Data Instrumentation Offsets box are described in *Table: Instrumentation Offsets Box Contents*.

Table: Instrumentation Offsets Box Contents

Field	Usage
Automatic	If selected, sets the other offset options to the required configuration for auto-detect instrumentation streams. You can clear any combination of the four options, or all of the four options, and the Automatic option can still be enabled. Select the *Edit* button to configure the parameters, as shown in Edit Instrumentation Options—Signature Placement. Automatic Instrumentation Signature for more information (for Auto Detect option of the Receive mode).
Time Stamp	(Not available for DCC Packet Flows.) If selected, indicates that the 6 bytes before the FCS should hold a 48-bit timestamp. This timestamp contains a 20ns resolution time value from the start of the data transmission.
Packet Groups	If selected, timestamp is also implied and the timestamp option is selected automatically. If selected, this indicates that transmitted packets includes a packet group signature and packet group ID. Select the *Edit* button to configure the parameters, as shown in Edit Instrumentation Options—Packet Groups/Sequence Checking.
Sequence Checking	If selected, sequence numbers are inserted in each outbound packet. Select the *Edit* button to configure the parameters, as shown in Edit Instrumentation Options—Packet Groups/Sequence Checking.
Data	If selected, Data Integrity values are inserted for each outbound packet. Select the

Field	Usage
Integrity	*Edit* button to configure the parameters, as shown in Edit Instrumentation Options—Data Integrity. If PRBS is enabled, Data Integrity is disabled.
PRBS	Refer to PRBS for more information. If selected, PRBS is enabled at stream level. If PRBS is enabled at the stream level, then Automatic configuration is enabled by default. If PRBS is enabled, Data Integrity is disabled, and vice-versa.
Edit	Shows the *Edit Instrumentation Options* dialog box. This dialog box allows the position and values of the signatures and inserted data items to be defined. Refer to Edit Instrumentation Options—Signature Placement, Edit Instrumentation Options—Packet Groups/Sequence Checking, and Edit Instrumentation Options—Data Integrity for more information. NOTE The offsets of the options cannot be changed. The options are either enabled with their default offsets, or not enabled.

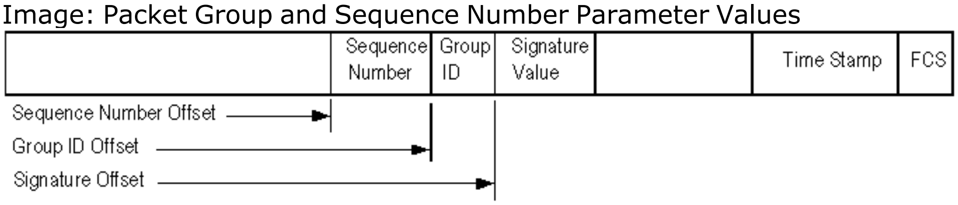
The Instrumentation Box also allows automatically to set the fields for auto-detect instrumentation transmission. Automatic Offsets.

The timestamp, packet group signature, and sequence signature fields are related. The position of these fields within a packet is shown in *Image: Packet Group and Sequence Number Parameter Values*. A single signature offset and value is shared by the packet group ID and the sequence number. The group ID and sequence number each have individual offsets and values. The signature value must occur at a 4-byte boundary, and the packet group ID must occur at a 2-byte boundary.

NOTE The Instrumentation Box should not be used to insert a timestamp and group ID in the packet when the 'No CRC' option is selected in the force errors box. It overrides any CRC set by other means and almost always results in a packet with a faulty CRC value.

Refer to the Packet Group Operation and Sequence Checking Operation sections in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual* for more information.

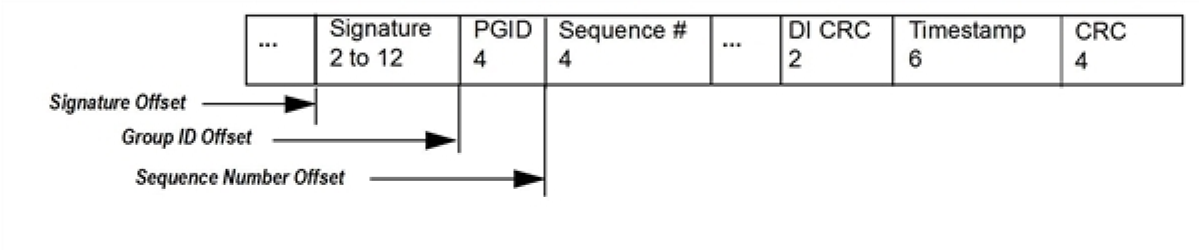
Image: Packet Group and Sequence Number Parameter Values



Automatic Offsets

If Automatic Offsets is enabled in Frame **Data** tab, Packet View have the enabled options with their default offsets as specified in *Image: Default Offsets and Field Sizes*. Either an option is there in that order/offset, or it is not there.

Image: Default Offsets and Field Sizes



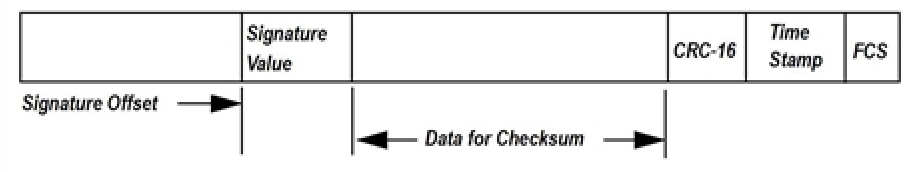
In the case of auto frame size packets, if both Packet Group and Sequence Checking are disabled, and if the frame size limit is so small that it causes DI CRC to immediately follow the Signature, then four bytes of background are padded. In this way, the payload for DI CRC calculation is not empty.

NOTE If Automatic offsets are enabled, the offsets of the options cannot be changed. The options are either enabled with their default offsets, or not enabled.

Data Integrity

A separate Signature value is used for Data Integrity, as shown in *Image: Data Integrity Parameter Values*. Refer to the Data Integrity Checking Operation section of the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual* for more information.

Image: Data Integrity Parameter Values



PRBS

If PRBS is enabled at the stream level, then Automatic configuration is enabled by default, as shown in *Image: Frame Data–Instrumentation Box*. For detailed information, including a description of the packet format when PRBS is enabled,PRBS Mode (Packet Group Statistics View) and PRBS Mode (Receive Mode).

NOTE For latency and sequence checking statistics to be active and accurate, it is necessary to create a latency/sequence checking view, as described in Chapter 16, Packet Group Statistic View.

Edit Instrumentation Options—Signature Placement

The Automatic Instrumentation Signature option allows the transmit port to place a signature at a variable offset from the start of frames. The instrumentation block supports Sequence Checking, Timestamp, Data Integrity functionality, with signature and Packet Group ID (when Automatic Offsets is enabled, these transmit port options are enabled as well).

For more information on Automatic Instrumentation Signature, Automatic Instrumentation Signature of Chapter 13, *Filter Properties*.

Image: Signature Placement

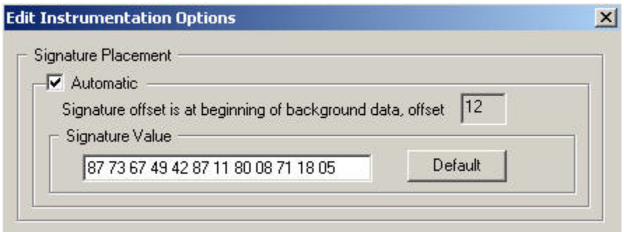


Table: Signature Placement Configuration describes the configuration options for Signature Placement.

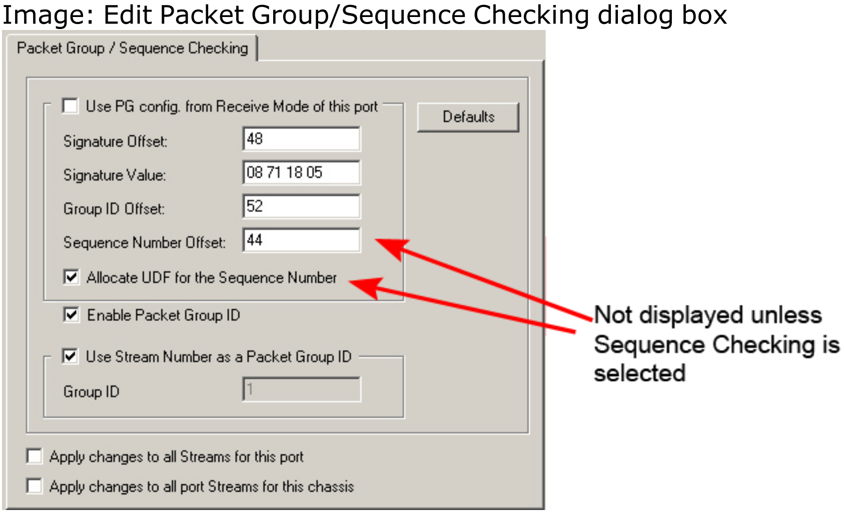
Table: Signature Placement Configuration

Control/Field	Description
Signature offset is at beginning of background data, offset	Where auto detect puts the signature in the packet for the instrumentation signature.
Signature Value	The data signature that is being matched. Editable field; minimum length 2 bytes, maximum length 12 bytes. When numbers are entered, zeroes (0) are padded to the left to make the number of bytes even, if needed.
Default	Resets the default signature block value.

Edit Instrumentation Options—Packet Groups/Sequence Checking

Since the packet group signature and sequence signature options use common values for signature offset, signature value, and group ID offset, one common dialog box appears for editing both packet group and sequence signature options. The dialog box with both options selected (but with Automatic deselected) is shown in *Image: Edit Packet Group/Sequence Checking dialog box.* Minor differences are present when only one of the options is selected, and these differences are described in the image.

Image: Edit Packet Group/Sequence Checking dialog box



The fields in this dialog box are described in *Table: Edit Packet Group/Sequence Checking dialog box*.

Table: Edit Packet Group/Sequence Checking dialog box

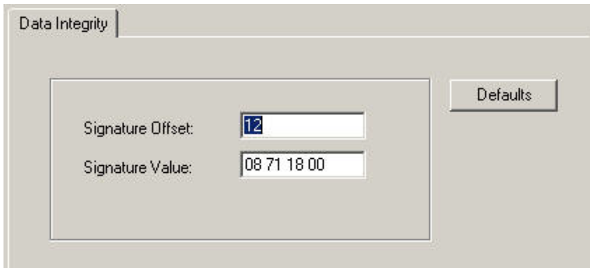
Field	Usage
Defaults	Select this button to restore the default settings for this dialog box: • Use PG config from Receive Mode of this port is cleared (disabled), and default numerical values appear. • Use Stream Number as a Packet Group ID is selected (enabled).
Use PG Config from Receive Mode of this port	If selected, the signature offset, signature value, and (packet) group ID are copied from the values configured for Receive Mode.
Signature Offset	The offset from the beginning of the packet to the start of the signature value field.
Signature Value	The 4-byte value to use as a signature value. Any value may be chosen, but it should be something unlikely to appear in ‘normal’ data, so it can be easily recognized in the captured data.
Group ID Offset	The offset from the beginning of the packet to the start of the (packet) group ID field.
Sequence Number Offset	The offset from the beginning of the packet to the start of the embedded sequence number field.
Allocate UDF for the Sequence Number	Automatically assigns one of the user-defined fields to be used as the sequence number field. If Sequence Checking is enabled, this option is forced to be enabled, but greyed out. If Sequence Checking is disabled, the option does not appear.
Use Stream Number as Packet Group ID	If selected, uses the ID number of the stream currently being configured as the packet group ID.
Group ID Value	If the check box above (for using stream number) is not selected, the value entered in this field is inserted into all transmitted packets for this stream, to be used as a packet group ID.
Apply changes to all Streams for this port	If selected, the values from this dialog box are copied to all other streams for this port.
Apply changes to all port Streams for this chassis	If selected, the values from this dialog box are copied to all streams for all ports on the current chassis.

NOTE For latency and sequence checking statistics to be active and accurate, it is necessary to create a latency/sequence checking view, as described in Chapter 16,Packet Group Statistic View.

Edit Instrumentation Options—Data Integrity

If Data Integrity Signature is selected in the Insert box, selecting **Edit** in the Insert box shows the **Data Integrity** dialog box, as shown in *Image: Edit Transmit Data Integrity dialog box*.

Image: Edit Transmit Data Integrity dialog box



The fields in this dialog box are described in *Table: Edit Transmit Data Integrity dialog box fields*.

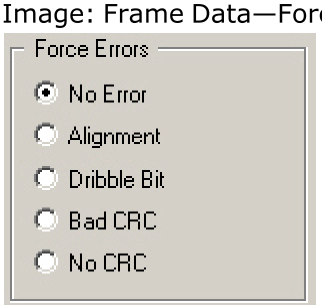
Table: Edit Transmit Data Integrity dialog box fields

Field	Description
Defaults	Restores the default settings for this dialog box.
Signature Offset	The offset from the beginning of the packet to the start of the data integrity signature value field.
Signature Value	The 4-byte value to use as a signature value. Any value may be chosen, but it should be something unlikely to appear in 'normal' data so it is easily recognized when viewing the captured data.

Force Errors Box

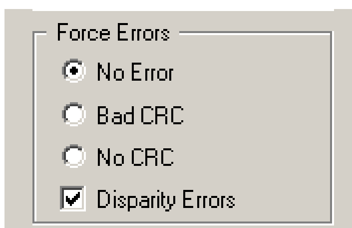
The Force Errors box is shown in *Image: Frame Data—Force Errors/CRC Control*

Image: Frame Data—Force Errors/CRC Control



The choices in this box control the inclusion and values of the 4-byte FCS (CRC) field located at the end of the packet's contents, as described in *Table: Force Error Choices*.

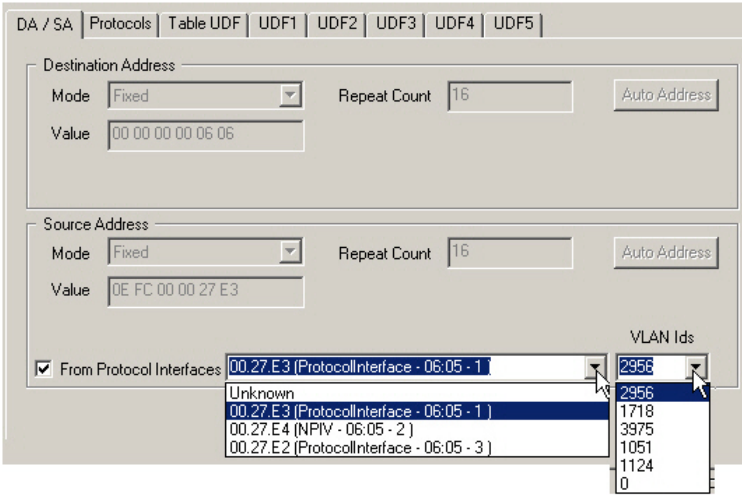
Table: Force Error Choices

Choice	Description
No Error	A correct CRC is placed at the end of the packet.
Alignment	For 10/100 and LM1000T5 cards and only. Four (4) bits are inserted after the end of the FCS. A bad CRC value is inserted.
Dribble Bit	For 10/100 and LM1000T5 cards only. Four extra bits are sent following the FCS. A correct CRC value is calculated and inserted.
Bad CRC	The value of the CRC is changed to force a bad CRC error.
No CRC	No CRC value is inserted. It is up to you to supply a CRC value through the use of the Data Pattern Box *or User Defined Fields, as described in Chapter 7,Frame Data–User Defined Fields (UDF).* NOTE Instrumentation Box The Instrumentation Box *should not be used to insert a Time Stamp and group ID in the packet when this option is selected; it overrides any CRC set by other means and almost always results in a packet with a faulty CRC value.*
Disparity Errors	For Fibre Channel Module only.  If selected, disparity errors are injected. Disparity error occurs when hardware wrongly selects 10B code for 8B hex value in the frame. It is 8B10B encoding error and is seen only in 10B encoded data.

DA/SA Property Sheet

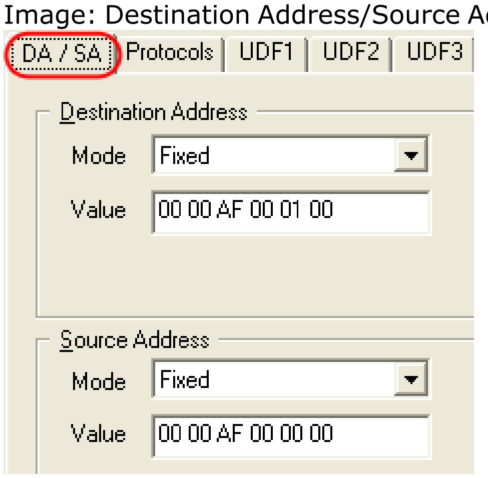
The DA/SA property sheet can be viewed by selecting the *DA/SA* sub-tab in the lower half of the **Frame Data** tab, for non-POS modules. The DA/SA property sheet is shown in the following image:

Image: Frame Data—Destination Address/Source Address (DA/SA)



The Fixed **DA/SA** mode tab is shown in the following image:

Image: Destination Address/Source Address (DA/SA)



The Destination Address and Source Address generation parameters are identical. A 6-byte MAC address is generated in each case. The Mode setting controls the values associated with the other fields, as described in *Table: DA/SA Mode Values*. The *Mask* field is not shown for the 10/100 TXS8, 10/100/1000 TXS4, or 1000 SFPS4 module, unless *Random* mode is selected.

Address Modes for incrementing or decrementing address values normally use a step size of '1.' For certain load modules, the step size may be specified by you. DA/SA Address User-Defined Step for additional information.

Table: DA/SA Mode Values

Mode	Description
Increment	The number of frames indicated by the *Repeat Count* field receive incremented MAC address values, subject to the *Mask* field. The values start with the address indicated in the *Value* field. When the *Repeat Count* is exhausted, the value is reset to the contents of the *Value* field and continues again for the *Repeat Count*. Selecting this option also enables the *Do not reset value at stream load* check

Mode	Description
	box. Selecting this check box means that the value of the increment continues after each new stream is sent.
Continuous Increment	Subsequent frames receive incremented MAC address values, subject to the forced '0' and '1' values set in the *Mask* field. The values start with the address indicated in the *Value* field. Selecting this option also enables the *Do not reset value at stream load* check box. Selecting this check box means that the value of the increment continues after each new stream is sent.
Decrement	The number of frames indicated by the *Repeat Count* field receive decremented MAC address values, subject to the forced '0' and '1' values set in the *Mask* field. The values start with the address indicated in the *Value* field. When the *Repeat Count* is exhausted, the value is reset to the contents of the *Value* field and continue again for the *Repeat Count*. Selecting this option also enables the *Do not reset value at stream load* check box. Selecting this check box means that the value of the decrement continues after each new stream is sent.
Continuous Decrement	Subsequent frames receive decremented MAC address values, subject to the forced '0' and '1' values set in the *Mask* field.The values start with the address indicated in the *Value* field. Selecting this option also enables the *Do not reset value at stream load* check box. Selecting this check box means that the value of the decrement continues after each new stream is sent.
Fixed	The address set in the *Value* field, as masked by the *Mask* field is used for all frames' MAC addresses.
Random	All frames have random MAC addresses, subject to the *Mask* field.
ARP/Discovery	(Available only for Destination Address.) The first destination IP address described in the IP dialog box (*Protocols—Network Layer) is ARP'd at the Default Gateway IP Address in the IxRouter dialog box, for IPv4. The ARP response, if received, is used as the DA, otherwise, the first MAC address from the ARP table is used.*
CJPAT	The fixed Continuous Jitter Test Pattern (CJPAT), specified in IETF 802.3ae Annex 48A, is supplied. The data field may not be edited.
CRPAT	The fixed Continuous Random Test Pattern (CRPAT), specified in IETF 802.3ae Annex 48A, is supplied. The data field may not be edited.

The *Auto Address* button automatically sets the Mode value to *Fixed*, with a value constructed from the chassis, card, and port number in such a way that pairs of ports on the same card address each other.*Table: Auto Address Assignment* indicates the assigned addresses for an example using a 4-port Ethernet card.

Table: Auto Address Assignment

Port on Card	Destination MAC Address	Source MAC Address
1	00 00 00 00 C1 HH	00 00 00 00 C0 HH
2	00 00 00 00 C0 HH	00 00 00 00 C1 HH
3	00 00 00 00 C3 HH	00 00 00 00 C2 HH
4	00 00 00 00 C2 HH	00 00 00 00 C3 HH

In this table, 'HH' is the chassis number, and 'C' is the card number within the chassis.

The *Mask* field serves to control which address bits may vary and which should stay constant. (The *Mask* field is not present in the *DA/SA* dialog box for the 10/100 TXS8 ports.) From the property sheet, individual nibbles (4-bit values) may be controlled. Individual bits of the Mask may be controlled from the Bit Mask dialog box*. Table: Mask Values describes the use of Mask values.*

Table: Mask Values

Mask Value	Description
0 through F	The corresponding four bits of the MAC address always contain this value.
X	The corresponding four bits of the MAC address varies according the Mode setting.
?	This indicates that the mask nibble value is a combination of 0's, 1's and X bit values. The *Bit Mask* dialog box must be used to view/edit this value.

From Protocol Interfaces Option

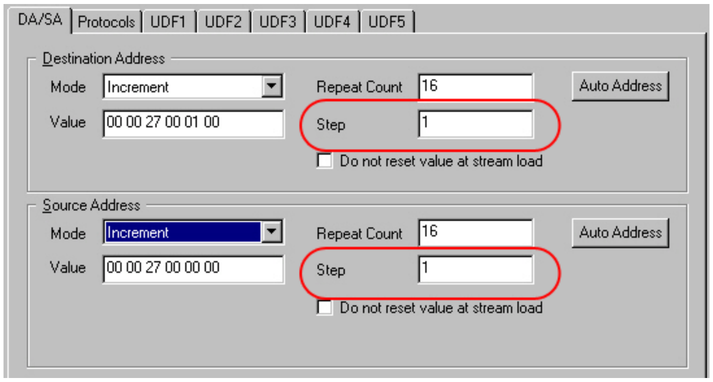
The *From Protocol Interfaces* check box, when selected, deactivates the other controls in the property sheet. A list is shown, listing all currently configured protocol interfaces. Another list, labelled VLAN Ids, allows the selection of all discovered and configured VLAN IDs for this interface if VLAN Discovery is enabled on FCoE Interface. For information on configuring interfaces,Chapter 10,Protocol Interfaces.

NOTE The *From Protocol Interfaces* check box only appears if an IP protocol is selected in the *Protocols* sub-tab of the **Frame Data** tab. See the topic in Chapter 6,Protocols—Network Layer for more information.

DA/SA Address User-Defined Step

DA and SA addresses are normally incremented or decremented by '1.' For certain modules, you may define the step size for the following Address Modes: Increment, Continuous Increment, Decrement, and Continuous Decrement. This option is shown for a 10/100 TXS8 module in *Image: DA/SA User-Defined Increment/Decrement Step*.

Image: DA/SA User-Defined Increment/Decrement Step



Note the *Do not reset value at stream load* control. When this option is selected, the values for the DA and SA do not get reset when the stream is reloaded.

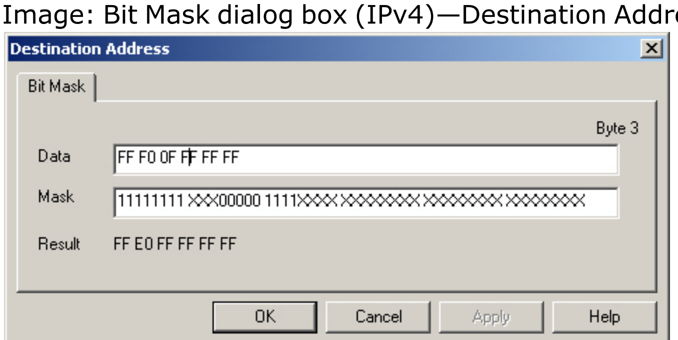
Bit Mask dialog box

The *Bit Mask* dialog box (for IPv4) is used throughout the IxExplorer when masked data values are needed. This dialog box is accessed by setting the Destination Address or Source Address mode to *Random*. The *Bit Mask...* button appears. Select this button.

NOTE This description is for the IPv4 Bit Mask dialog box only. The filter configuration Bit Mask dialog box is described in DA/SA Values.

The *Bit Mask* dialog box is shown in *Image: Bit Mask dialog box (IPv4)—Destination Address*.

Image: Bit Mask dialog box (IPv4)—Destination Address



The Data value that is being masked is shown in the upper field. Its value may be set using any hexadecimal character (0 through 9, a through f, and A through F); lowercase characters appear in uppercase. Each character corresponds to a 4-bit nibble, and spacing between bytes is automatically provided.

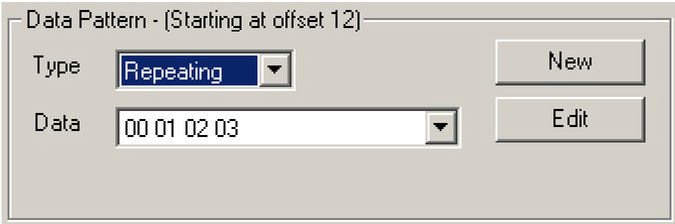
Each permitted byte of the mask consists of 8 symbols, with each symbol corresponding to one bit. Values of '0,' '1' or 'X' (or 'x') are permitted. Spacing between bytes of data is automatically provided. The first eight bits of mask operate on the first byte (2 nibbles) of the data value. Each '1'/'0' forces a value of '1'/'0' in the corresponding result, regardless of the data bit value. Each 'X' in the mask allows the data value to 'show through' to the result.

Data Pattern Box

The *Data Pattern* feature generates data following the value that is used in the *Type* and *Data* fields.

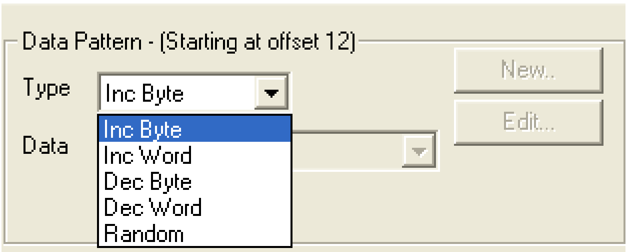
The Data Pattern pane is shown in the following image:

Image: Frame Data: Data Pattern



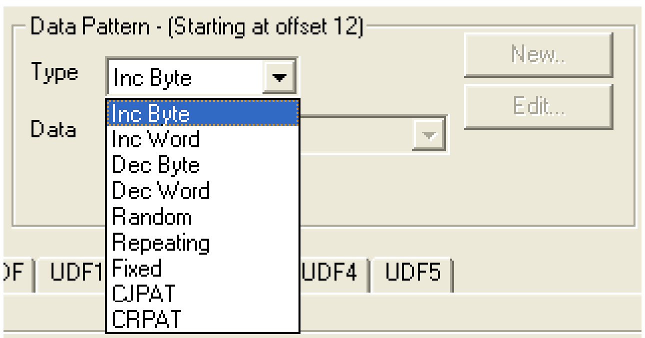
The Data Pattern pane for XDM10G32S is shown in the following image:

Image: XDM10G32S Data Pattern



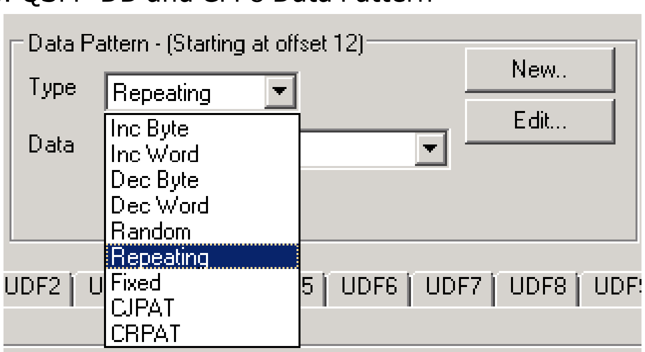
The Data Pattern pane for Lava is shown in the following image:

Image: Lava Data Pattern



The Data Pattern pane for QSFP-DD and CFP8 is shown in the following image:

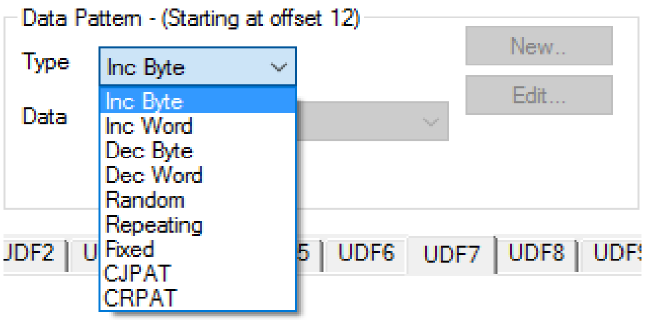
Image: QSFP-DD and CFP8 Data Pattern



NOTE The Data Pattern pane for CFP8 load module is similar to QSFP-DD.

The Data Pattern pane for T400 QDD and OSFP is shown in the following image:

Image: T400 QDD and OSFP Data Pattern



NOTE The Data Pattern pane for OSFP load module is similar to QDD.

The *Type* fields available and the corresponding interpretation of the *Data* field is described in *Table: Data Pattern Type Values and Usage*. (See **Note** below for data patterns on OC-12c ports.)

Table: Data Pattern Type Values and Usage

Type	Description
Inc Byte	The data starts with a byte of 0x00, followed by 0x01, 0x02, ... , 0xFE, 0xFF, 0x00 to the end of the packet. New packets start again with a value of 0x00. The data field may not be edited.
Inc Word	The data starts with a word of 0x0000, followed by 0x0001, 0x0002, ... , 0xFFFE, 0xFFFF, 0x0000 to the end of the packet. Data is transmitted most significant byte first. The data field may not be edited.
Dec Byte	The data starts with a byte of 0xFF, followed by 0xFE, 0xFD, and so forth, to the end of the packet. New packets start again with a value of 0xFF. The data field may not be edited.
Dec Word	The data starts with a word of 0xFFFF, followed by 0xFFFE, 0xFFFD, and so forth, to the end of the packet. Data is transmitted with most significant byte first. The data field may not be edited.
Random	Random data values are supplied. The data field may not be edited.
Repeating	Arbitrary data patterns may be supplied and repeated. These patterns may be created, edited, retrieved from disk, and/or stored to disk. Available patterns are shown in the *Data* field pull-down list.
Fixed	Fixed, arbitrary data patterns may be supplied and repeated. These patterns may be created, edited, and retrieved from disk and/or stored to disk. Available patterns are shown in the *Data* field pull-down list.
CJPAT	(For 10GE modules only.) The fixed Continuous Jitter Test Pattern (CJPAT), specified in IETF 802.3ae Annex 48A, is supplied. The data field may not be edited. 10GE Module Jitter Test Patterns—CJPAT & CRPAT for additional information.

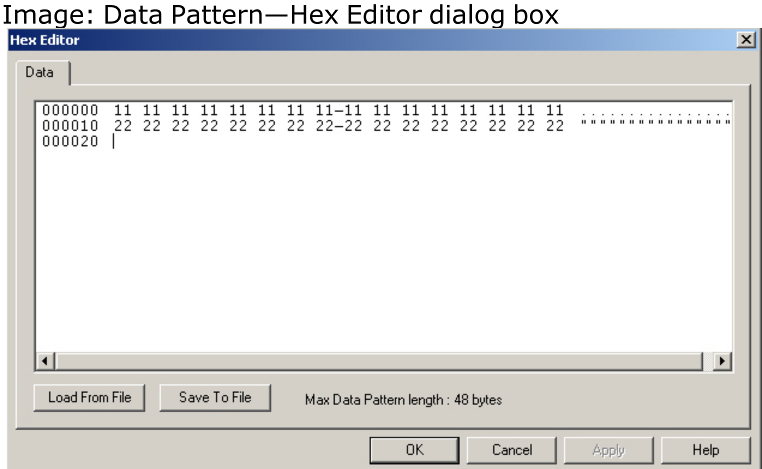
Type	Description
CRPAT	(For 10GE modules only.) The fixed Continuous Random Test Pattern (CRPAT), specified in IETF 802.3ae Annex 48A, is supplied. The data field may not be edited. 10GE Module Jitter Test Patterns—CJPAT & CRPAT for additional information.
New	(Available only for the *Repeating* and *Fixed* options.) Select this button to open the *Hex Editor* dialog box to create a new custom data pattern. Data Pattern–Hex Editor dialog box for additional information.
Edit	(Available only for the *Repeating* and *Fixed* choices.) Select this button to open the *Hex Editor* dialog box to edit an existing custom data pattern. Data Pattern–Hex Editor dialog box for additional information.

NOTE For OC-12c POS ports, when any Data Pattern other than *Fixed* is selected, the maximum frame size is 15,257 bytes.

Data Pattern–Hex Editor dialog box

The Data Pattern *New* button opens an empty data window in the *Hex Editor* dialog box. The Data Pattern *Edit* button opens a data window which contains the value to be edited, as shown in *Image: Data Pattern—Hex Editor dialog box*. You may create and edit a custom-defined data pattern in this dialog box.

Image: Data Pattern—Hex Editor dialog box



The fields and controls in this dialog box are described in *Table: Data Pattern—Hex Editor dialog box*.

Table: Data Pattern—Hex Editor dialog box

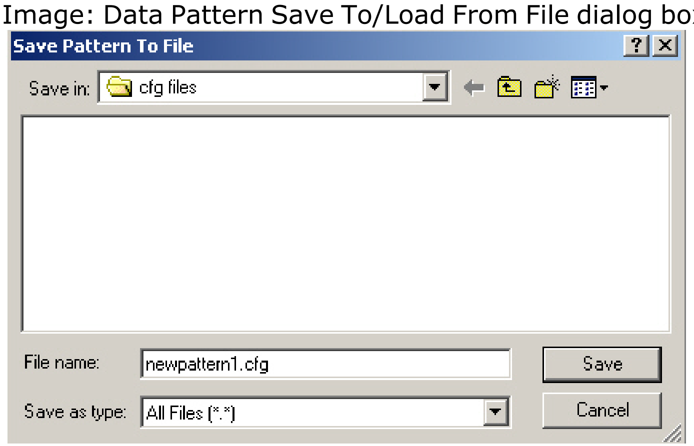
Type	Description
(window)	The first column is for view purposes only; it indicates the hex offset of the information for that row.

Type	Description
	The second column shows the data pattern in hex. Information may be entered or edited using any hexadecimal characters (0 through 9, a through f, and A through F). (Lowercase alpha characters is automatically converted to upper-case.)
Load From File	Select to open the **Load Pattern From File** dialog box, where a data pattern file, previously saved to disk, can be imported into the current data window. Save To/Load From File dialog box for additional information.
Save To File	Select to open the **Save Pattern To File** dialog box, where the data pattern in the current data window can be saved to a file and stored on disk. Save To/Load From File dialog box for additional information.
Max Pattern Length (xx) Bytes	The maximum allowable pattern length is automatically calculated and shown here. The number of bytes depends on the overall length of the packet and the number of bytes previously assigned for addressing and other uses.

Save To/Load From File dialog box

The *Save To File/Load From File* dialog box is shown in *Image: Data Pattern Save To/Load From File dialog box*.

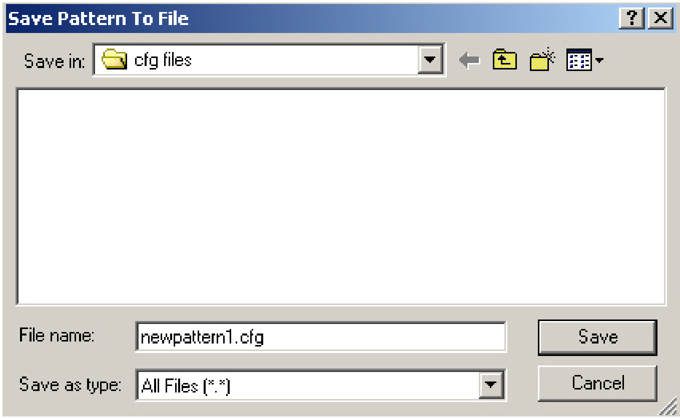
Image: Data Pattern Save To/Load From File dialog box



Save To/Load From File dialog box

The *Save To File/Load From File* dialog box is shown in *Image: Data Pattern Save To/Load From File dialog box*.

Image: Data Pattern Save To/Load From File dialog box



10GE Module Jitter Test Patterns—CJPAT and CRPAT

The 10GE module interfaces may be tested by using the CJPAT and CRPAT test patterns specified in IEEE 802.3ae Annex 48A.

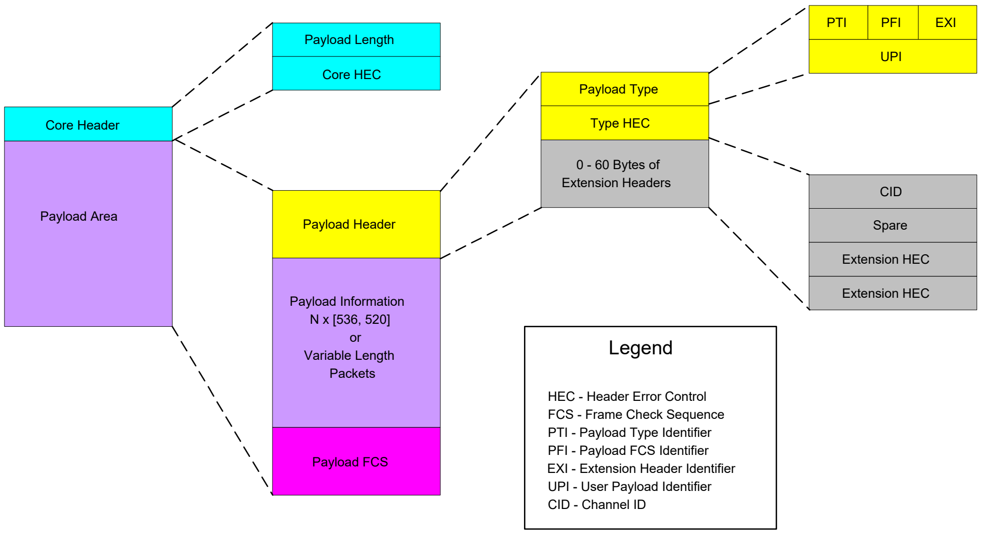
The ports may be configured for these tests in the *Packet Streams Grid* window, or through the **Frame Data** tab. In the *Packet Streams Grid* window, the configuration process is greatly simplified. After a stream entry is created in the grid, the pop-up menu offers the options: 'Force CJPAT Stream' and 'Force CRPAT Stream.' When one of these options is selected for that stream, the stream configuration values are forced to match the values specified by the specs. If the configuration is performed **manually**, numerous values must be set, as follows:

- Data Pattern - Select CJPAT or CRPAT
- Frame Size - Set to 1508 bytes for CJPAT, or 1492 for CRPAT
- Preamble = 8 bytes. Value = FB 55 55 55 55 55 55 D5
- Continuous Packet Stream mode
- IPG - 12 bytes (idle bytes) minimum
- No IP addresses - since these are MAC Layer tests
- No layer 2 or layer 3 protocol
- MAC DA:
  - Mode CJPAT - 0B 7E 7E 7E 7E 7E
  - Mode CRPAT - BE BE BE BE D7 D7
- MAC SA:
  - Mode CJPAT - 7E 7E 7E 7E 7E 7E
  - Mode CRPAT - D7 D7 23 23 23 23
- No UDFs configured
- No Timestamp
- CRC set to No Error—CRCs are specified exactly by the 802.3ae Annex 48 document, for each of the test modes.

Frame Data for GFP

Ixia's optional Generic Framing Procedure (GFP) feature is implemented on the OC-48c POS module, per ITU-T G.7041/Y.1303. A diagram of the format for a GFP frame, based on that specification, is shown in *Image: GFP Frame Elements*.

Image: GFP Frame Elements



The GFP frame data options appear by setting the port to GFP in the Port Properties dialog box.

The GFP section of the **Frame Data** tab for use in constructing GFP frames is shown in *Image: GFP Frame Data dialog box*.

Image: GFP Frame Data dialog box

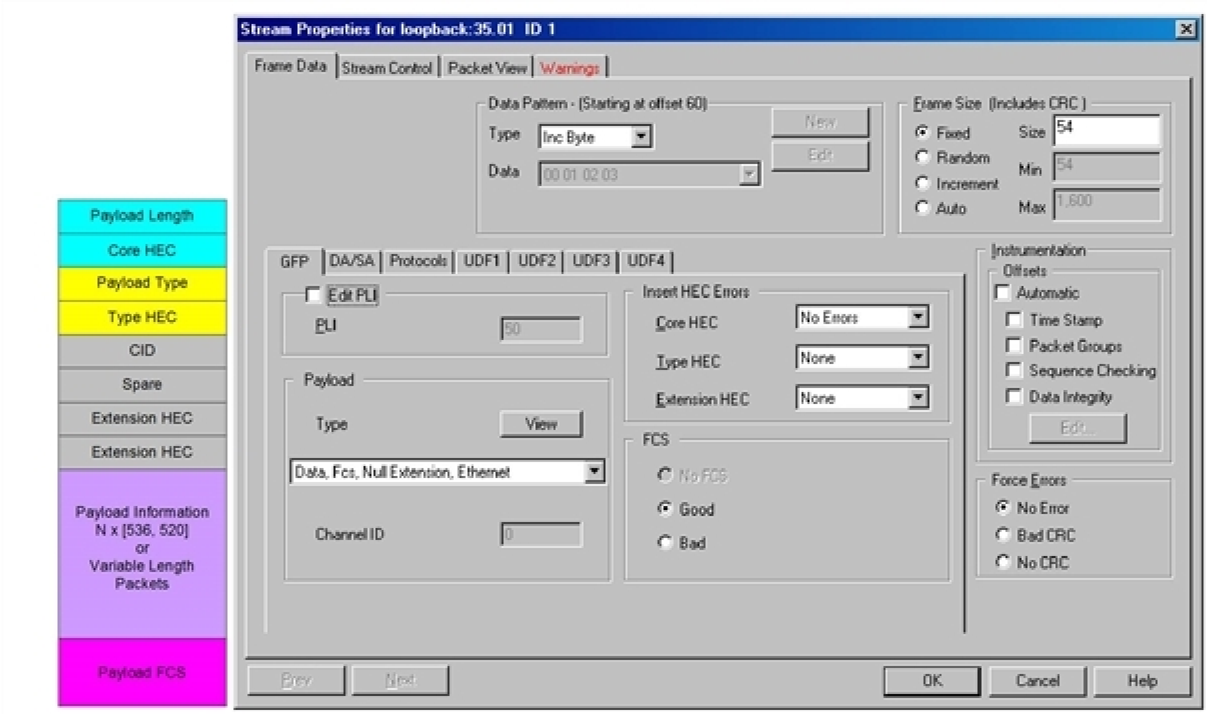


Table: GFP Configuration Fields describes the fields in the **GFP** tab.

Table: GFP Configuration Fields

Group	Field	Usage
Enable PLI		Selecting this check box enables the Payload Length Indicator in the GFP frame.
	PLI	Allows to set the Payload Length Indicator, in number of octets expected in the payload. The PLI is automatically adjusted to reflect what type of payload is set in the **Payload Type** pull-down menu.
Payload		This section allows to select a payload type for the GFP frame. Payload types are variants of Ethernet or PPP encapsulation, and either data or control frames.
	Type	Allows to select a payload type for the GFP frame from a pull-down list. Each payload type contains four elements: 1. Whether the payload is data or management information 2. Whether a Frame Check Sequence (FCS) is employed 3. Whether an eHEC is used 4. If the GFP is using Ethernet or PPP. The payload options are: • Data, FCS, Null Extension, Ethernet • Data, NoFCS, Null Extension, Ethernet • Data, FCS, Linear Extension, Ethernet • Data, NoFCS, Linear Extension, Ethernet • Management, FCS, Null Extension, Ethernet • Management, NoFCS, Null Extension, Ethernet • Management, FCS, Linear Extension, Ethernet • Management, NoFCS, Linear Extension, Ethernet • Data, FCS, Null Extension, PPP • Data, NoFCS, Null Extension, PPP • Data, FCS, Linear Extension, PPP • Data, NoFCS, Linear Extension, PPP • Management, FCS, Null Extension, PPP • Management, NoFCS, Null Extension, PPP • Management, FCS, Linear Extension, PPP • Management, NoFCS, Linear Extension, PPP When an Ethernet type payload is selected, the *DA/SA* sub-tab appears for MAC address manipulation. DA/SA Property Sheet for information on

Group	Field	Usage
		configuring MAC address usage.
	Channel ID	This field sets a Channel ID number for management GFP frames.
	View/Edit	This button opens the *Payload Header* dialog box, which shows what header types are included in the Payload Header. See GFP Payload Header dialog box for more information on Payload Headers.
Insert HEC Errors		Allows to insert errors into Header Error Correction (HEC) values, for Core, Type, and Extension HECs. NOTE Insert HEC Errors fields are not present for channelized mode POS boards.
	Core HEC	Core Header Error Correction Errors. The four octets of the GFP Core Header consist of a 16-bit PDU Length Indicator field and a 16-bit Core Header Error Check (cHEC) field. This header allows GFP frame delineation independent of the content of the higher layer PDUs. Choose the number of bit errors to insert in the HEC byte: • None (errors not inserted) • 1 Bit • Multiple Bits
	Type HEC	The two-octet Type Header Error Control field contains a CRC-16 error control code that protects the integrity of the contents of the Type Field by enabling both single-bit error correction and multi-bit error detection. Choose the number of bit errors to insert in the HEC byte, from **none** to **16**.
	Extension HEC	The two-octet Extension Header Error Control field contains a CRC-16 error control code that protects the integrity of the contents of the extension headers by enabling both single-bit error correction (optional) and multi-bit error detection. Choose the number of bit errors to insert in the HEC byte, from **none** to **16**.
FCS		The Payload Frame Check Sequence (FCS) is generated using the CRC-32 generating polynomial (ISO/IEC 3309) G(x) = x32 + x26 + x23 + x22 + x16 + x12 + x11 + x10 + x8 + x7 + x5 + x4 + x2 + x1 + 1 where x32 corresponds to the Most Significant Bit and x0 corresponds to the Least Significant Bit. Depending on the Payload Type, the FCS becomes enabled. You can select whether to use a **good** (meaning valid) FCS number, or a **bad** (meaning invalid) number
	No FCS	This is selected when the payload type used includes an FCS that is part

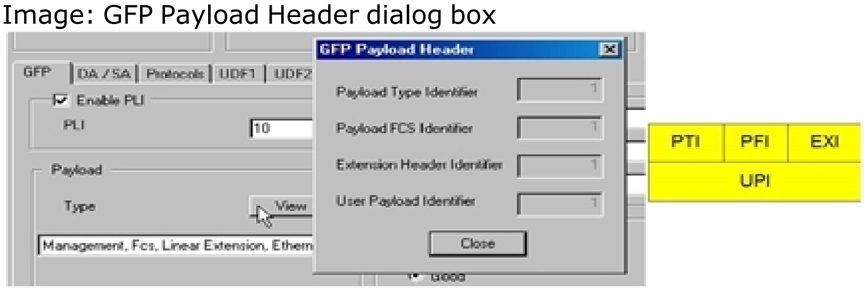
Group	Field	Usage
		of the GFP frame. NOTE No FCS is unavailable for channelized mode POS boards.
	Good	When a payload type is selected for the GFP that includes an FCS, this option button sets the FCS number to be a valid number.
	Bad	When a payload type is selected for the GFP that includes an FCS, this option button sets the FCS number to be an invalid number. NOTE Bad FCS is unavailable for channelized mode POS boards.

GFP Payload Header dialog box

The *GFP Payload Header* dialog box shows what identifiers are included in the Payload Header section of the GFP frame. It is accessed by selecting the *View/Edit* button as shown in *Image: GFP Frame Data dialog box*.

Image: GFP Payload Header dialog box shows the *GFP Payload Header* dialog box and the section of the GFP frame being modified.

Image: GFP Payload Header dialog box



The Identifier fields show either a **0** or a **1**.*Table: GFP Payload Header Configuration* explains the significance of these settings.

Table: GFP Payload Header Configuration

Field	Usage
Payload Type Identifier	A 3-bit subfield of the Type field identifying the type of GFP client frame. Two kinds of client frames are currently defined, User Data frames (PTI = 000) and Client Management frames (PTI = 100).
Payload FCS Identifier	A one bit subfield of the Type field indicating the presence (PFI = 1) or absence (PFI = 0) of the Payload FCS field.
Extension Header Identifier	A 4-bit subfield of the Type field identifying the type of Extension Header GFP. Three kinds of Extension Headers are currently defined, a Null Extension Header, a Linear Extension Header, and a Ring Extension Header. Ixia supports the Null and Linear

Field	Usage
	extensions, indicated by a **0** (Null extension) or a **1** (Linear extension).
User Payload Identifier	An 8-bit field identifying the type of payload conveyed in the GFP Payload Information field. Interpretation of the UPI field is relative to the type of GFP client frame as indicated by the PTI subfield.

These fields are automatically set when a payload type is selected, and cannot be changed.

Frame Data for ATM/POS 622

The following sections discuss the frame data for the ATM/POS 622 module. The different framing types are covered in:

- ATM Frames
- POS 622 Frame Data

ATM Frames

ATM Frame Data for information on the ATM **Frame Data** tab.

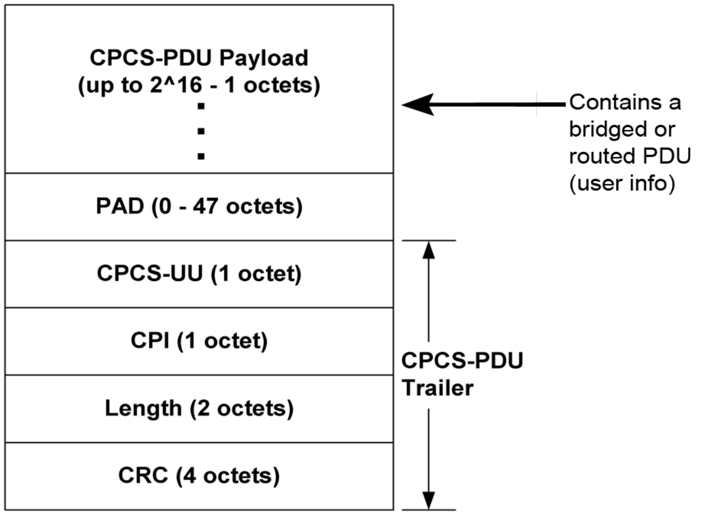
Connection-less routed and bridged PDUs, such as Ethernet frames, can be carried across a connection-oriented ATM link. Extensive fragmentation of a routed PDU such a as an IP packet is undesirable, so a method has been developed whereby they are first encapsulated as the payload of a CPCS PDU by the ATM AAL 5 layer defined in ITU-T I.363.5. The AAL5 CPCS PDUs (frames) are then fragmented into 48-byte sections which can be inserted into the payloads of ATM cells, ATM headers attached, and then transmitted across the ATM (over SONET) link. In cases where a CPCS PDU cannot be aligned, it is segmented into 48-byte sections and any remainder is aligned with added padding bytes. The IP packet is reassembled by the receiver.

When there is no Service Specific Convergence Sublayer (SSCS) present, routed and bridged PDUs traverse the AAL CPCS using one of the two following ATM multiplexing methods: LLC Encapsulation (multiplexing by protocol) or VC Multiplexing (multiplexing by virtual connection/VC). These methods are defined in RFC 2684.

- **LLC encapsulation** is used when one VC may carry more than one protocol, and requires that the protocol type be specified for routed PDUs. This information is carried in an IEEE 802.2 LLC header. Fewer VCs are required, since one VC can support multiple protocols.
- **VC Multiplexing** requires less payload overhead, such as PIDs, since it sets up the binding between the ATM VC and the network protocol on the VC. However, with one protocol per VC, more VCs are required for multiple protocols.

The bridged or routed PDU is then encapsulated within an AAL5 CPCS-PDU, as the payload, as shown in *Image: ATM AAL5 CPCS-PDU Format*.

Image: ATM AAL5 CPCS-PDU Format



The fields in this PDU are described in *Table: ATM AAL5 CPCS-PDU Format*.

Table: ATM AAL5 CPCS-PDU Format

Field	Description
CPCS-PDU Payload	The bridged or routed PDU of user information encapsulated within the AAL5 CPCS-PDU.
PAD	Padding for alignment—so the end of the CPCS-PDU trailer is right-justified in the last 48-byte cell created by the SAR. Range is from 0 to 47 octets of padding.
CPCS-UU	CPCS User-to-User Indication. Not used in the RFC 2684 implementations described in this document.
CPI	Common Part Indicator. Used for 64-bit alignment of the CPCS-PDU trailer. Must be 0x00.
Length	Length of the payload field—up to 65,535 octets.
CRC	The CRC-32 used to detect CPCS-PDU bit errors.

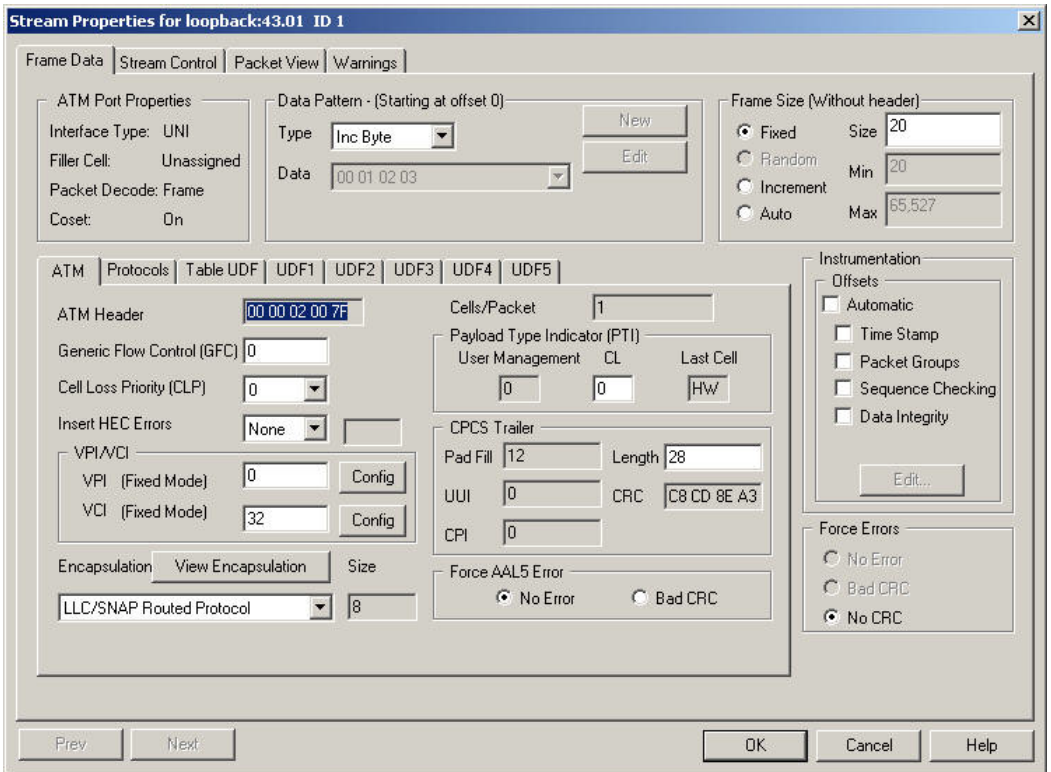
NOTE When using ATM ports, different types of ATM encapsulation result in different length headers. The data portion of the packet normally follows the header, except in the case of the two LLC Bridged Ethernet choices, where 12 octets of MAC address and 2 octets of Ethernet type follow the header. The offsets are with respect to the beginning of the AAL5 packet and must be adjusted by hand to account for the header.

ATM Frame Data

The Stream properties for the ATM 622 load module are set in the **Frame Data** and ***Stream Control*** tabs. The **Frame Data** tab with an ATM sub-tab is shown in *Image: ATM Streams—Frame Data*. This sub-tab is only visible if the port is set to ATM mode.

The contents of the ATM Frame and the encapsulation method are configured in the *ATM* sub-tab.See [Frame Data Structure](#) for information on the other parts of this dialog box.

Image: ATM Streams—Frame Data



The fields and controls in this dialog box are described in *Table: ATM Stream—**Frame Data** (**ATM** Tab)*.

Table: ATM Stream—**Frame Data** (**ATM** Tab)

Section	Field/Control	Description
ATM Port Properties		(Read-only) Shows the values for parameters configured in the ATM Port Properties page.
	Interface Type	(Read-only) One of: • **UNI** : The ATM Forum-defined User-to-Network-Interface. • **NNI**: The ATM Forum-defined Network-to-Node-Interface.
	Filler Cell	SONET frame transmission is continuous even when data or control messages are not being transmitted. The cell type to be transmitted during those intervals is one of the following: • Idle Cell (VPI/VCI = 0 and CLP = 1) • Unassigned Cell (VPI/VCI = 0 and CLP = 0)

Section	Field/Control	Description
	Packet Decode	Sets the mode for Packet View. Choose one of: • Frame (AAL5) • Cell (53-byte ATM cells)
	Coset	(Read-only)The *Coset On* check box allows the user to add/enable the Coset algorithm to be used with the Header Error Control (HEC). The code used for HEC is a cyclic code with generating polynomial x^8 + x^2 + x + 1. If Coset is turned on, the result of this polynomial is XOR'd with 0x55 (Coset Leader). One of: • On (Enabled) • Off (Disabled)
ATM	ATM Header	The 5 bytes used as the header for the ATM cell.
	Generic Flow Control (GFC)	(4 bits) For use with UNI mode only. For device control signalling. Uncontrolled equipment uses a setting of 0000 (Null value).
	Cell Loss Priority (CLP)	(1 bit) Used for setting discard priority level. It indicates whether the cell should be discarded if it encounters extreme congestion as it moves through the network. A CLP value = 0 has higher priority than a CLP value = 1.
	Insert HEC Errors	Header Error Correction Errors. Choose the number of bit errors to insert in the HEC byte: • None (errors not inserted) • 1 Bit • 2 Bits • 3 Bits • 4 Bits • 5 Bits • 6 Bits • 8 Bits
	HEC Value	(Read-only) The decimal value corresponding to the HEC Error setting in the field to the left. It is the calculated HEC value with the HEC error setting applied. (It changes with the VPI/VCI.)
VPI/VCI	VPI (Fxed Mode)	Virtual Path Identifier (VPI) for this stream.

Section	Field/Control	Description
	Config	Select to show the *VPI Configuration* dialog box. ATM VPI/VCI Configuration dialog boxes for additional information. The selected Mode appears in parenthesis.
	VCI (Fxed Mode)	Virtual Connection/Circuit Identifier (VCI) for this stream.
	Config	Select this button to show the *VCI Configuration* dialog box. ATM VPI/VCI Configuration dialog boxes for additional information. The selected Mode appears in parenthesis.
Encapsulation		The RFC 2684-defined ATM encapsulation mode groups are LLC Encapsulation and VC Multiplexing. The various types available for those modes are listed below.
	(encapsulation type) Choose one of:	LLC/SNAP Routed Protocol ATM LLC/SNAP Routed Protocol dialog box for additional information.
		LLC Bridged Ethernet/802.3 ATM LLC Bridged Ethernet/802.3 dialog box for additional information.
		LLC Bridged Ethernet/802.3 no FCS ATM LLC Bridged Ethernet/802.3 no FCS dialog box for additional information.
		LLC Encapsulated PPP ATM LLC Encapsulated PPP dialog box.
		VC Multiplexed PPP ATM VC Multiplexed PPP dialog box.
		VC MUX Routed Protocol (no configuration dialog box). ATM VC MUX Routed Protocol for additional information.
		VC MUX Bridged Ethernet ATM VC MUX Bridged Ethernet/802.3 dialog box for additional information.
		VC MUX Bridged Ethernet with No FCS ATM VC MUX Bridged Ethernet/802.3 no FCS dialog box for additional information.
	Edit/View Encapsulation	Select this button to access the specific dialog box for the selected type of encapsulation.

Section	Field/Control	Description
	(button)	This button changes from *Edit* to *View*, depending upon the encapsulation type. The specific options are discussed in the sections describing the encapsulation types.
	Size	(Read-only) Shows encapsulation header size.
Cells/Packet		(Read-only) Shows how many cells are occupied by a packet (once the packet has been defined).
Payload Type Indicator (PTI)		Overall, PTI field is 3 bits, and each bit has a different meaning.
	User Management	(Read-only) This bit indicates if the ATM cell is a control or data cell. 0 - ATM data cell 1 - ATM control cell
	CL	This bit indicates Congestion/No Congestion. Choose one of: 0 - Congestion Not Experienced 1 - Congestion Experienced
	Last Cell	(Read-only) This bit indicates if this is the last ATM cell of the frame. 'HW' means that Hardware inserts the appropriate values.[ATM User to ATM user indication = 0 for the first and intermediate ATM cells. AUU = 1 for the last ATM cell.]
CPCS Trailer		The fields that make up the CPCS Trailer at the end of a CPCS-PDU.
	Pad Fill	PAD Field of the CPCS Trailer. It is octet-aligned. The valid range is 0 to 47 bytes in length.
	UUI	CPCS-PDU User-to-User Indication.
	CPI	Common Part Indicator field of the CPCS Trailer, for aligning the trailer to 64 bits.
	Length	Encodes CPCS-PDU payload length, in number of octets.
	CRC	For transmission, the CRC is calculated over the CPCS-PDU, including PAD and the first 4 octets of the trailer.
Force AAL5 Error	No Error	If this option is selected, no AAL5 error is inserted.
	Bad CRC	If this option is selected, a Bad AAL5 CRC is inserted.

ATM VPI/VCI Configuration dialog boxes

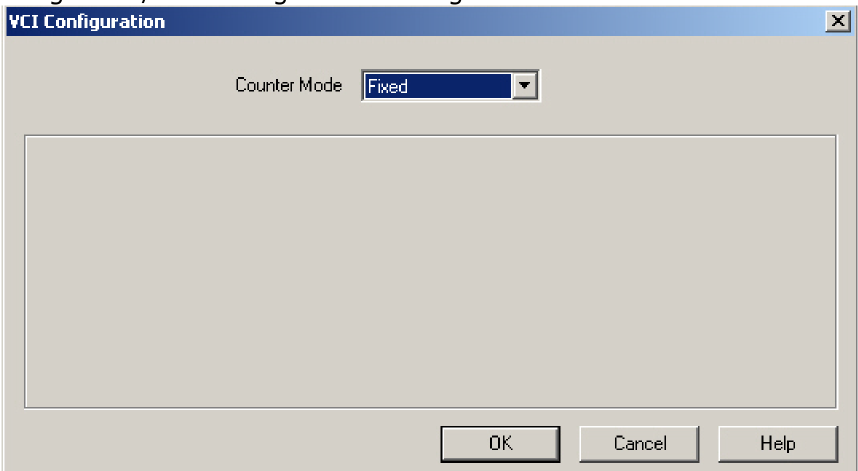
When the *VPI* or *VCI Config* button is selected, the *VPI/VCI Configuration* dialog box appears. The format for the dialog box is the same for configuration of the VPIs and VCIs. There are four counter modes for this dialog box, as described in the following sections:

- VPI/VCI Configuration dialog box—Fixed Counter Mode
- VPI/VCI Configuration dialog box—Counter Counter Mode
- VPI/VCI Configuration dialog box—Random Counter Mode
- VPI/VCI Configuration dialog box—Table Counter Mode

VPI/VCI Configuration dialog box—Fixed Counter Mode

The ATM *VPI/VCI Configuration* dialog box in Fixed Counter Mode is shown in *Image: VPI/VCI Configuration dialog box—Fixed Counter Mode*.

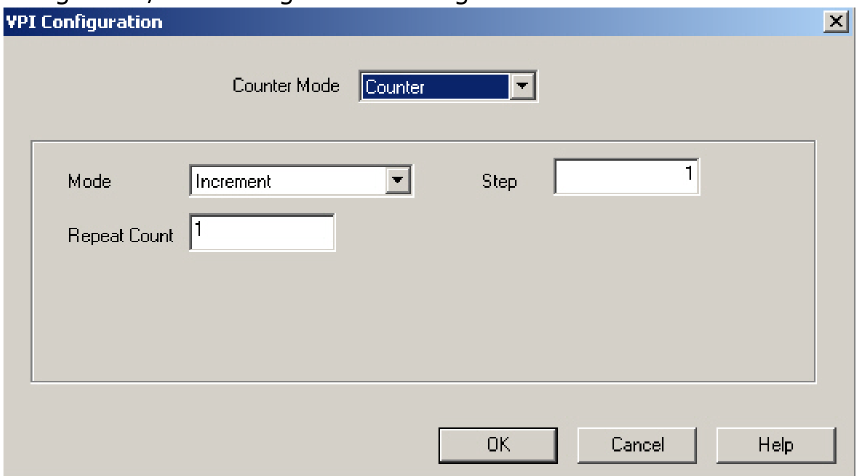
Image: VPI/VCI Configuration dialog box—Fixed Counter Mode



VPI/VCI Configuration dialog box—Counter Counter Mode

The ATM *VPI/VCI Configuration* dialog box in Counter Counter Mode is shown in *Image: VPI/VCI Configuration dialog box—Counter Counter Mode*.

Image: VPI/VCI Configuration dialog box—Counter Counter Mode



The fields in this dialog box are described in *Table: VPI/VCI Configuration dialog box—Counter Counter Mode*.

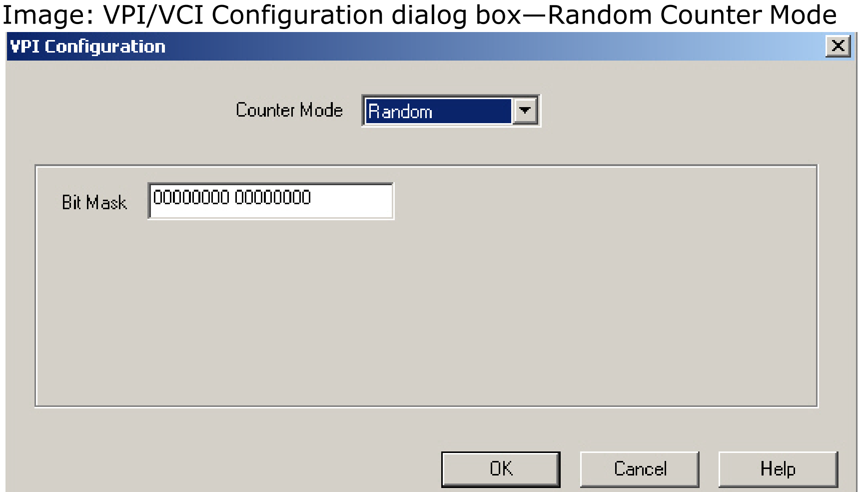
Table: VPI/VCI Configuration dialog box—Counter Counter Mode

Field/Control	Description
Counter Mode	Counter
Mode	Choose the method for counting: • Increment • Continuous Increment • Decrement • Continuous Decrement
Step	The amount by which the previous value is increased (incremented) or decreased (decremented).
Repeat Count	Available only for Increment or Decrement. The number of times that the counting process is implemented.

VPI/VCI Configuration dialog box—Random Counter Mode

The ATM *VPI/VCI Configuration* dialog box in Random Counter Mode is shown in *Image: VPI/VCI Configuration dialog box—Random Counter Mode*.

Image: VPI/VCI Configuration dialog box—Random Counter Mode



The fields in this dialog box are described in *Table: VPI/VCI Configuration dialog box—Random Counter Mode*.

Table: VPI/VCI Configuration dialog box—Random Counter Mode

Field/Control	Description
Counter Mode	Random

Field/Control	Description
Bit Mask	When the Random counter mode is selected, a 16-bit *Bit Mask* field appears. Random values are used in conjunction with the bit mask. You may control which mask bit values is set to '0' or '1,' or allowed to change ('X').

VPI/VCI Configuration dialog box—Table Counter Mode

The fields in this dialog box are described in *Table: VPI/VCI Configuration dialog box—Counter Counter Mode*.

Table: VPI/VCI Configuration dialog box—Counter Counter Mode

Field/Control	Description
Counter Mode	Table
Data	2-byte user-defined values. Open the context menu and select **New**, to add entries to the list.

Frame Data—ATM Encapsulation

The types of ATM encapsulation supported in the ATM **Frame Data** tab are described in the following sections:

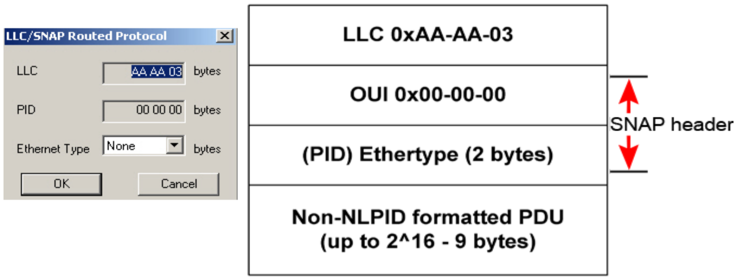
- LLC Encapsulation:
  - ATM LLC/SNAP Routed Protocol dialog box
  - ATM LLC Bridged Ethernet/802.3 dialog box
  - ATM LLC Bridged Ethernet/802.3 no FCS dialog box
  - ATM LLC Encapsulated PPP dialog box
- VC Multiplexing:
  - ATM VC Multiplexed PPP dialog box
  - ATM VC MUX Routed Protocol
  - ATM VC MUX Bridged Ethernet/802.3 dialog box
  - ATM VC MUX Bridged Ethernet/802.3 no FCS dialog box

ATM LLC/SNAP Routed Protocol dialog box

The ATM *LLC/SNAP Routed Protocol* dialog box is shown in *Image: ATM LLC/SNAP Routed Protocol dialog box*. This dialog box is accessed by selecting the *LLC/SNAP Routed Protocol* option from the Encapsulation list, and then selecting the *View Encapsulation* button.

This format is used for routed PDUs, and is the default format for IP datagrams. In addition, the default size of the IP MTU used with ATM AAL5 is 9180 bytes, per RFC 2225.

Image: ATM LLC/SNAP Routed Protocol dialog box



The fields and controls in this dialog box are described in *Table: ATM LLC/SNAP Routed Protocol dialog box*.

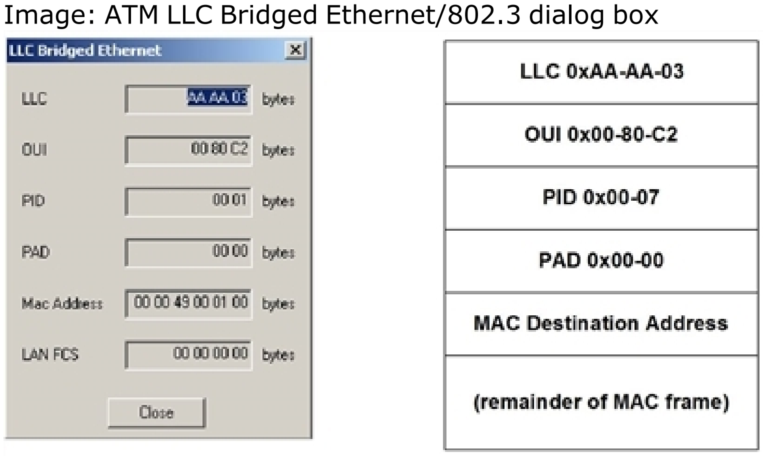
Table: ATM LLC/SNAP Routed Protocol dialog box

Field/Control	Description
LLC	(Read-only) Link Layer Control. An IEEE 802.2 LLC header is included in the PDU. The value 0xAA-AA-03 indicates that this is the payload format for a routed Formatted PDU.
PID	(Read-only) Protocol Identifier for Ethertype. (The OUI would be 0x00-00-00, indicating that the PID is Ethertype.)
Ethernet Type	Choose one of: • None • IPv4 • IPv6 • MPLS

ATM LLC Bridged Ethernet/802.3 dialog box

The ATM *LLC Bridged Ethernet* dialog box applies to Bridged Ethernet IEEE 802.3 PDUs, as shown in *Image: ATM LLC Bridged Ethernet/802.3 dialog box*. This dialog box is accessed by selecting the *LLC Bridged Ethernet/802.3* option from the Encapsulation list, and then selecting the *View Encapsulation* button.

Image: ATM LLC Bridged Ethernet/802.3 dialog box



NOTE When using ATM ports, different types of ATM encapsulation result in different length headers. The data portion of the packet normally follows the header, except in the case of the two LLC Bridged Ethernet choices, where 12 octets of MAC address and 2 octets of Ethernet type follow the header. the offsets are with respect to the beginning of the AAL5 packet and must be adjusted by hand to account for the header.

The fields and controls in this dialog box are described in *Table: ATM LLC Bridged Ethernet/802.3 dialog box*.

Table: ATM LLC Bridged Ethernet/802.3 dialog box

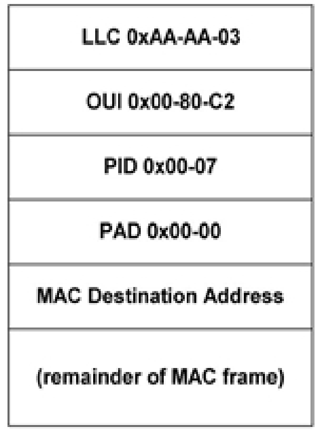
Field/Control	Description
LLC	(Read-only) Link Layer Control. An IEEE 802.2 LLC header is included in the PDU. The value 0xAA-AA-03 indicates that this is the payload format for a routed Formatted PDU.
OUI	(Read-only) Organizationally Unique Identifier: Part of the SNAP header.
PID	(Read-only) Protocol Identifier: Part of the SNAP header. The value 0x 00-01 indicates that the LAN FCS is present, which also means that padding must be included.
PAD	(Read-only) Indicates that padding is included.
MAC Address	(Read-only) The 6-byte MAC Address, in canonical form.
LAN FCS	(Read-only) The 4-byte LAN Frame Check Sequence. If present, the PID is 0x00-01.

NOTE When this encapsulation is selected, the option to use Cisco ISL also becomes available. If Cisco ISL is used, the IP statistics and checksum is not accurate.

ATM LLC Bridged Ethernet/802.3 no FCS dialog box

The ATM *LLC Bridged Ethernet* dialog box (with no FCS) applies to Bridged Ethernet IEEE 802.3 PDUs, as shown in *Image: ATM LLC Bridged Ethernet/802.3 no FCS dialog box*. This dialog box is accessed by selecting the *LLC Bridged Ethernet/802.3* option from the Encapsulation list, and then selecting the *View Encapsulation* button.

Image: ATM LLC Bridged Ethernet/802.3 no FCS dialog box



NOTE When using ATM ports, different types of ATM encapsulation result in different length headers. The data portion of the packet normally follows the header, except in the case of the two LLC Bridged Ethernet choices, where 12 octets of MAC address and 2 octets of Ethernet type follow the header. the offsets are with respect to the beginning of the AAL5 packet and must be adjusted by hand to account for the header.

The fields and controls in this dialog box are described in *Table: ATM LLC Bridged Ethernet/802.3 no FCS dialog box*.

Table: ATM LLC Bridged Ethernet/802.3 no FCS dialog box

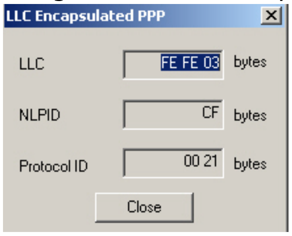
Field/Control	Description
LLC	(Read-only) Link Layer Control. An IEEE 802.2 LLC header is included in the PDU. The value 0xAA-AA-03 indicates that this is the payload format for a routed Formatted PDU.
OUI	(Read-only) Organizationally Unique Identifier: Part of the SNAP header.
PID	(Read-only) Protocol Identifier: Part of the SNAP header. The value 0x 00-07 indicates that the LAN FCS is not present, which also means that padding is optional.
PAD	(Read-only) Indicates that padding is included. Since no LAN FCS is included, padding is optional.
Mac Address	(Read-only) The 6-byte MAC Address, in canonical form.

NOTE When this encapsulation is selected, the option to use Cisco ISL also becomes available. If Cisco ISL is used, the IP statistics and checksum is not accurate.

ATM LLC Encapsulated PPP dialog box

The ATM *LLC Encapsulated PPP* dialog box is shown in *Image: ATM LLC Encapsulated PPP dialog box*. This dialog box is accessed by selecting the *LLC Encapsulated PPP* option from the Encapsulation list, and then selecting the *View Encapsulation* button.

Image: ATM LLC Encapsulated PPP dialog box



The fields in this dialog box are described in *Table: ATM LLC Encapsulated PPP dialog box*.

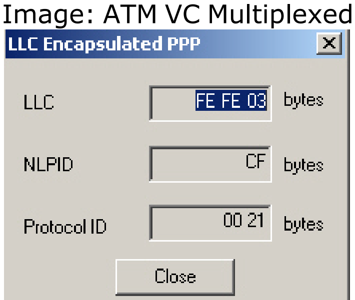
Table: ATM LLC Encapsulated PPP dialog box

Field/Control	Description
LLC	(Read-only) Link Layer Control. An IEEE 802.2 LLC header is included in the PDU.
NLPID	(Read-only) (in bytes) per ISO/IEC TR 9577, the Network Layer Protocol ID (NLPID) identifies the routing protocol. 0xCF = PPP
Protocol ID	(Read-only) The 2-byte Protocol Identifier.

ATM VC Multiplexed PPP dialog box

The ATM *VC Multiplexed PPP* dialog box is shown in *Image: ATM VC Multiplexed PPP dialog box*. This dialog box contains only the read-only 2-byte Protocol Identifier (ID). This dialog box is accessed by selecting the *VC Multiplexed PPP* option from the Encapsulation list, and then selecting the *View Encapsulation* button.

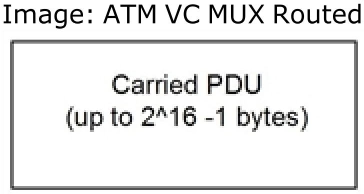
Image: ATM VC Multiplexed PPP dialog box



ATM VC MUX Routed Protocol

For routed protocols, the only content of the AA5 CPCS-PDU must be the routed protocol PDU, which is shown in *Image: ATM VC MUX Routed Protocol*. This dialog box is accessed by selecting the *VC MUX Routed Protocol* option from the Encapsulation list, and then selecting the *View Encapsulation* button.

Image: ATM VC MUX Routed Protocol



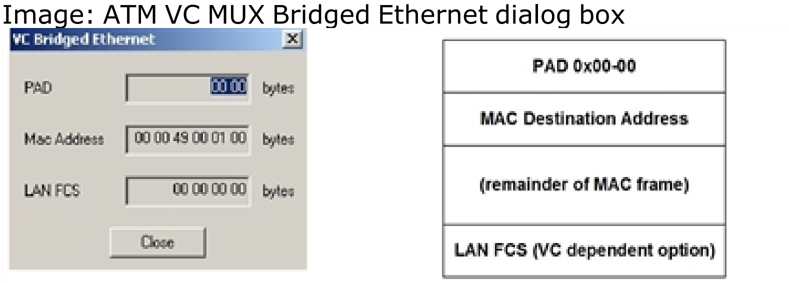
ATM VC MUX Bridged Ethernet/802.3 dialog box

NOTE

The software cannot determine whether this type of ATM encapsulation has a CRC unless there is a proper entry in the VCI/VPI map. Use the VCI/VPI and Encapsulation fields (on both the transmit and receive ports) to set up a proper mapping. When the transmitting and receiving ports are using the same encapsulation and it has been placed in the map, the software is able to easily determine what type of packet has been transmitted, and then accurately identify the timestamp and other information.

The ATM *VC MUX Bridged Ethernet* dialog box applies to IEEE 802.3 PDUs, and is shown in *Image: ATM VC MUX Bridged Ethernet dialog box*. This dialog box is accessed by selecting the *VC MUX Bridged Ethernet/802.3* option from the Encapsulation list, and then selecting the *View Encapsulation* button.

Image: ATM VC MUX Bridged Ethernet dialog box



The fields and controls in this dialog box are described in *Table: ATM VC MUX Bridged Ethernet/802.3 dialog box*.

Table: ATM VC MUX Bridged Ethernet/802.3 dialog box

Field/Control	Description
PAD	(Read-only) Padding bytes.
Mac Address	(Read-only) The Destination MAC Address.
LAN FCS	(Read-only) The 4-byte LAN Frame Check Sequence.

NOTE

When this encapsulation is selected, the option to use Cisco ISL also becomes available. If Cisco ISL is used, the IP statistics and checksum will not be accurate.

ATM VC MUX Bridged Ethernet/802.3 no FCS dialog box

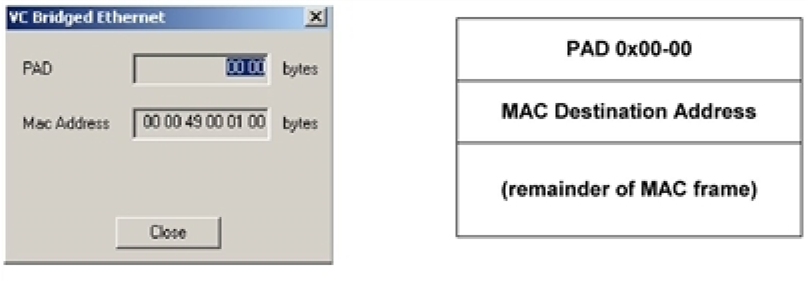
NOTE

The software cannot determine whether this type of ATM encapsulation has a CRC unless there is a proper entry in the VCI/VPI map. Use the VCI/VPI and Encapsulation fields (on both the transmit and receive ports) to set up a proper mapping. When the transmitting and receiving ports are using the same encapsulation and it has been placed in the map, the software is able to easily determine what type of packet has been transmitted, and then accurately identify the timestamp and other information.

The ATM *VC MUX Bridged Ethernet* dialog box (with no FCS) applies to IEEE 802.3 PDUs, and is shown in *Image: ATM VC MUX Bridged Ethernet/802.3 no FCS dialog box*. This dialog box is accessed by selecting the *VC MUX Bridged Ethernet/802.3 no FCS* option from the Encapsulation list, and then selecting the *View Encapsulation* button.

In this case, the AAL5 CPCS-PDU Payload field carries a bridged PDU, without including the LAN FCS.

Image: ATM VC MUX Bridged Ethernet/802.3 no FCS dialog box



The fields and controls in this dialog box are described in *Table: ATM VC MUX Bridged Ethernet/802.3 no FCS dialog box*.

Table: ATM VC MUX Bridged Ethernet/802.3 no FCS dialog box

Field/Control	Description
PAD	(Read-only) Padding bytes.
Mac Address	(Read-only) The Destination MAC Address.

NOTE When this encapsulation is selected, the option to use Cisco ISL also becomes available. If Cisco ISL is used, the IP statistics and checksum will not be accurate.

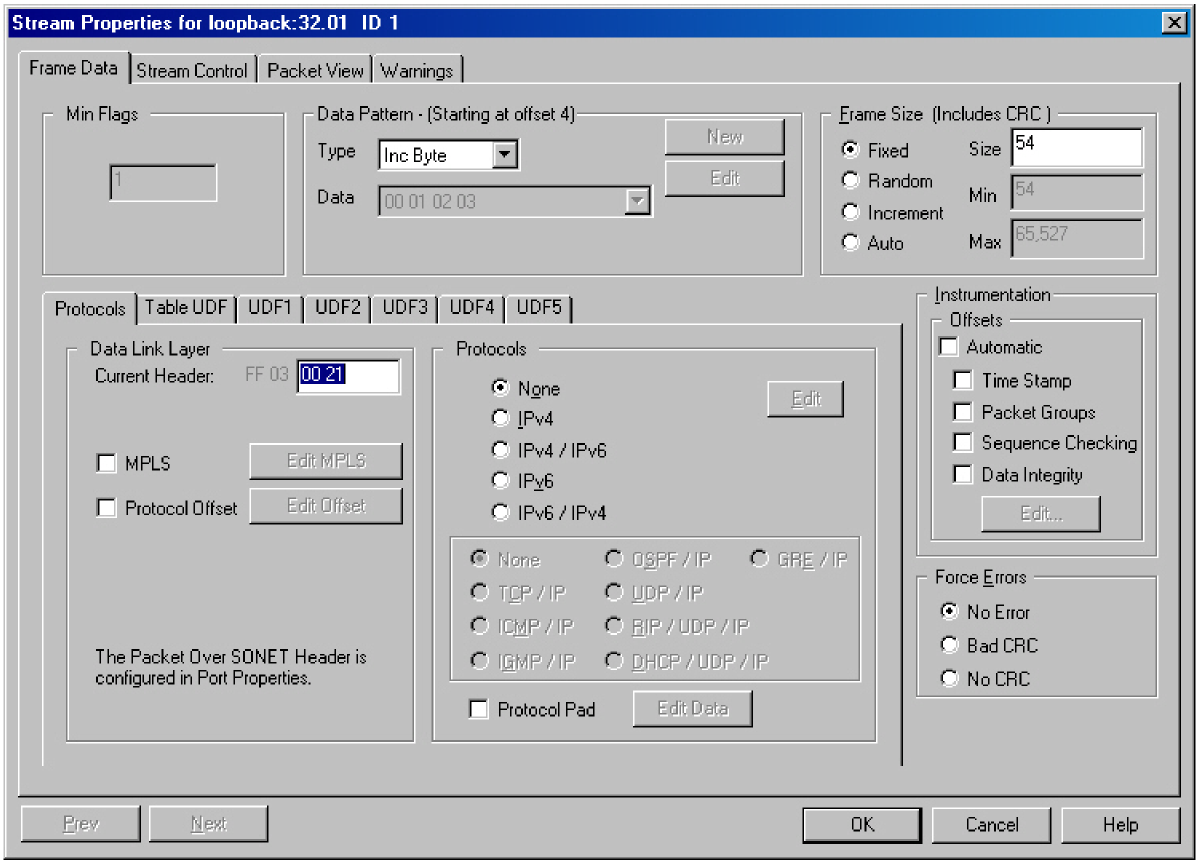
POS 622 Frame Data

The **Frame Data** tab for the ATM/POS 622 module in POS mode (OC-12c/OC-3c POS) combines aspects of the Frame Data configuration of both standard POS and TXS Ethernet modules.

This tab is only visible if the port is set to POS mode.

The **Frame Data** tab for the POS 622 (OC-12c/OC-3c POS) is shown in *Image: POS 622 **Frame Data** Tab*.

Image: POS 622 **Frame Data** Tab



The components of this tab are described in the following sections:

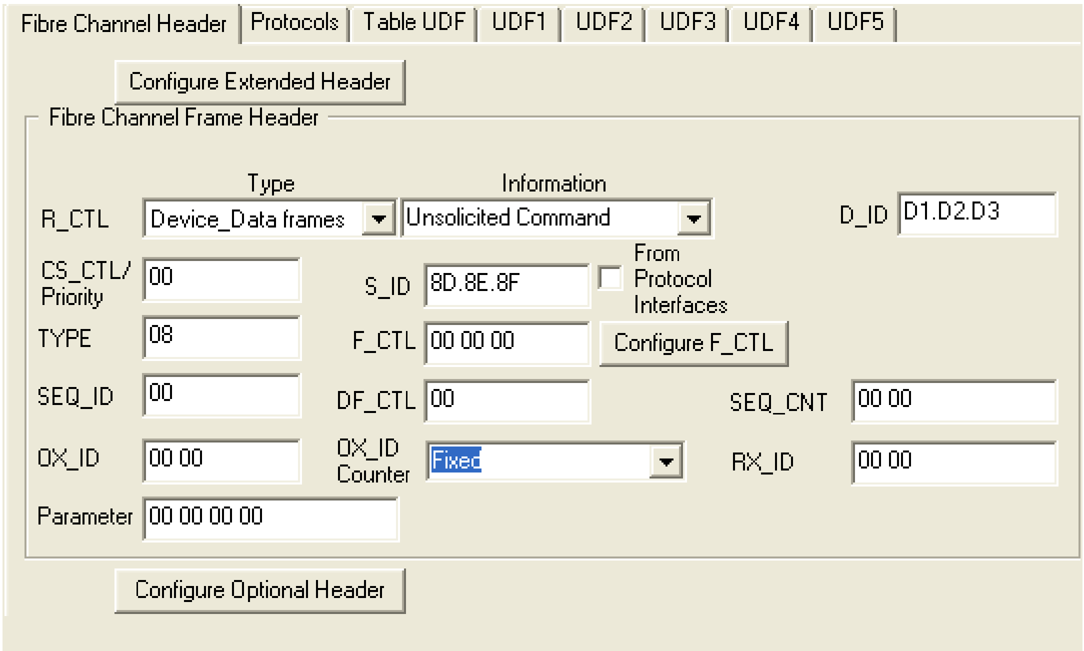
- Min Flags Box
- Data Pattern Box
- Frame Size
- Instrumentation Box
- Force Errors
- Protocols Section, as described in Chapter 6, Frame Data–Protocol Control
- User Defined Fields, as described in Chapter 7, Frame Data–User Defined Fields (UDF)

Fibre Channel Header

The smallest unit of data transmission and routing in Fibre Channel (FC) is the frame. FC frames contain Start-of-Frame (SOF), End-of-Frame (EOF) and the contents of the Fibre Channel Frame.

The **Fibre Channel Header** tab in the FC *Frame Data* dialog box is shown in *Image: **Frame Header** tab*.

Image: **Frame Header** tab



The fields and options present in the **Fibre Channel Header** tab are described in *Table: Frame Channel Header*.

Table: Frame Channel Header

Field/Control	Description
	Adds Extended Headers to a normal Frame Header in Fibre Channel. Select this button to open the *Extended Header* dialog box. Refer to Extended Header for more information.
Fibre Channel Frame Header	Configures the frame header of Fibre Channel module.
R_CTL	The Routing Control (R_CTL) field is a one-byte field in Word 0 Bits 31-24. It contains routing bits and information bits to categorize the frame function. When the R_CTL field is used in combination with the TYPE field (Word 2, bits 31-24), it provides an FC_ Port with assistance in frame routing, data routing, or addressing. The R_CTL field is further subdivided into the ROUTING field and the INFORMATION field.
R_CTL Type	The R_CTL Frame Types are as follows: • Device_Data frames • Extended Link Services

Field/Control	Description
	• FC-4 Link Data • Video_Data • Extender_Headers • Basic Link Services • Link_Control Frame • Extended Routing
R_CTL Information	The INFORMATION field is included in R_CTL to assist the receiver of a Data frame in directing the Data Field content to the appropriate buffer pool. Information categories for R_CTL Type = Device_ Data or FC-4 Link_Data are as follows: • Uncategorized information • Solicited Data • Unsolicited Control • Solicited Control • Unsolicited Data • Data Descriptor • Unsolicited Command • Command Status • Reserved Information categories for R_CTL Type = Extended Link Services: • Solicited Data • Request • Reply • Reserved Information categories for R_CTL Type = Video_ Data: • Unsolicited Data • Reserved Information categories for R_CTL Type = Extended Headers: • Virtual Fabric Tagging Head • Inter-Fabric Routing Header • Encapsulation Header • Reserved

Field/Control	Description
	Information categories for R_CTL Type = Basic Link Services: • No Operation • Abort Sequence • Remove Connection • Basic_Accept • Basic_Reject • Dedicated Connection Preempted • Reserved
R_CTL Information (continued)	Information categories for R_CTL Type = Link Control Frame: • Acknowledge_1 • Acknowledge_0 • Nx_Port Reject • Fabric Reject • Nx_Port Busy • Fabric Busy to Data Frame • Fabric Busy to Link_Control Frame • Link Credit Reset • Notify • End • Reserved Information categories for R_CTL Type = Extended Routing: • Vendor Unique • Reserved
D_ID	The Destination ID (D_ID) is a three-byte field (Word 0, Bits 23-0) that contains the address identifier of the destination Nx_Port.
CS_CTL/Priority	CS_CTL field is controlled by the CS_CTL/Priority Enable bit (F_CTL, bit 17). When the CS_CTL/Priority Enable bit is set to zero and word 1, bits 31-24 are interpreted to be CS_CTL information. When the CS_CTL/Priority Enable bit is set to one and word 1, bits 31-24 is interpreted to be Priority information.

Field/Control	**Description**
	When bit 17 of F_CTL is set to zero and Word 1, bits 31-24 of the Frame_Header is defined as the CS_CTL field. It contains management information for the class of service identified by the SOF. The meaning of the CS_CTL field is dependent on the class of service. The class of service are Class 1, Class 2, and Class 3 as shown in the following sections:

CS_CTL field-Class 1:

Bit	Abbr.	Meaning
31	Simplex - obsolete	Reserved
30	Stacked Connect-request	0 = Stacked Connect-request not requested 1 = Stacked Connect-request requested
29	COR - obsolete	Reserved
28	BCR - obsolete	Reserved
27-24		Reserved

CS_CTL field-Class 2:

Bits	Abbr.	Meaning
31	PREF	0 = Frame is delivered with no Preference 1 = Frame may be delivered with Preference
30		Reserved for additional Preference function
29-24	DSCP	Differentiated Services Code Point

CS_CTL field-Class 3:

Bit	Abbr.	Meaning
31	PREF	0 = Frame is delivered with no Preference 1 = Frame may be delivered with Preference
30		Reserved for additional Preference function
29-24	DSCP	Differentiated Services Code Point

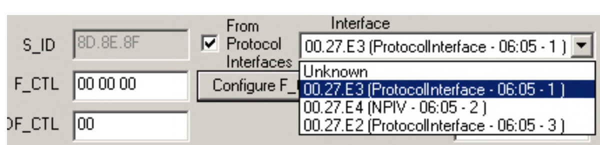
TYPE	The data structure type is a one-byte field that identifies the protocol of the frame content for Data frames. When R_CTL = Basic or Extended Link_Data, the TYPE value is as follows: • 00 = Basic Link Service

Field/Control	Description
	• 01 = Extended Link Service • 01 to CF = Reserved • D0 to FF = Vendor Specific When R_CTL = Video_Data, the TYPE value is as follows: • 02 to 5F = Reserved • 60 = FC-AV Container • 61 = ARINC 818 • 62 to 63 = Reserved for FC-AV • 64 to CF = Reserved • D0 to FF = Vendor Specific When R_CTL = Device_Data and Link_Data, the TYPE value is as follows: • 00 to 03 = Reserved • 04 = Obsolete • 05 = IPv4, IPv6, and ARP over Fibre Channel • 06 to 07 = Reserved • 08 = Fibre Channel Protocol • 09 = Obsolete • 0A to 0F = Reserved - SCSI • 10 = Reserved • 11 to 13 = Obsolete • 14 = Fibre Channel SATA Tunnelling Protocol
SEQ_ID	The Sequence ID (SEQ_ID) is a one-byte field (Word 3, Bits 31-24) assigned by the Sequence Initiator. It is unique for a specific D_ID and S_ID pair while the Sequence is open. It is independent of X_ID. Both the Sequence Initiator and the Sequence Recipient track the status of frames within the Sequence using fields within the Sequence_Qualifier. If its X_ID is unassigned, it uses any other field or fields (for example, S_ID, D_ID, or the other Nx_Port's X_ID) for tracking.
OX_ID	The Originator Exchange_ID (OX_ID) is a two-byte field (Word 4, Bits 31-16) that identifies the Exchange_ID assigned by the Originator of the Exchange. Each Exchange is assigned an identifier unique to the Originator or Originator-Responder

Field/Control	**Description**
	pair. If the Originator enforces uniqueness through the OX_ID mechanism, it sets a unique value for OX_ID other than FF FFh in the first Data frame of the first Sequence of an Exchange. An OX_ID of FF FFh indicates that the OX_ID is unassigned and that the Originator is not enforcing uniqueness through the OX_ID mechanism. If an Originator uses the unassigned value of FF FFh to identify the Exchange, it has only one Exchange (OX_ID set to FF FFh) with a given Responder.
Parameter	The Parameter field has meanings based on frame type. For Link_Control frames, the Parameter field is used to carry information specific to the individual Link_Control frame. For data frames with the relative offset present bit set to 1, the Parameter field specifies relative offset. For data frames with the relative offset Present bit set to zero, the Parameter field is set and interpreted in a protocol specific manner that may depend on the type of Information Unit carried by the frame.
S_ID	Three-byte field that contains the address identifier of the source Nx_Port. You can select the *From Protocol Interfaces* check box and get the value of the corresponding interface from the *Interface* list.
F_CTL	The Frame Control (F_CTL) field (Word 2, Bits 23-0) is a three-byte field that contains control information relating to the frame content. If an error in bit usage is detected, a reject frame (P_RJT) is transmitted in response with an appropriate reason code for Class 1, Class 2, and Class 6.
	Select this button to open the *FCoE F_CTL Configuration* dialog box. Refer F_CTL Configuration for more information on the format of the F_CTL bits.
DF_CTL	Data Field Control (DF_CTL) is a one-byte field that specifies the presence of optional headers at the beginning of the Data_Field. See DF_CTL Bit Definition given as follows:
DF_CTL Bit Definition:	

Field/Control	Description

Word 3, Bit(s)	Optional Header	Applicability
23	Reserved	all frames
22	0 = Neither ESP_Header nor ESP_Trailer 1 = Both ESP_Header and ESP_Trailer	all frames
21	0 = No Network_Header 1 = Network_Header	Device_Data and Video_Data frames
20	0 = No Association_Header 1 = Association_Header	Device_Data and Video_Data frames
19-18	Reserved	all frames
17-16	00b = No Device_Header 01b = 16 Byte Device_Header 10b = 32 Byte Device_Header 11b = 64 Byte Device_Header	Device_Data and Video_Data frames

Field/Control	Description
OX_ID Counter	The decrement/increment options enable changing the value for the Exchange IDs through UDFs instead of manually setting different values in the streams. Options are as follows: • Fixed • Increment • Decrement • Continuous Increment • Continuous Decrement • Random
From Protocol Interfaces (check box)	Selecting this check box synchronizes the S_ID with the values set in FCoE interfaces that have been created using the Protocol Interfaces wizards. Configured and Discovered VLAN IDs are also shown. When selected, choose the desired FCoE interface from the listing.  Chapter 10, Protocol Interfaces for more information. *From Protocol Interfaces* also shows up on the DA/SA page. See From Protocol Interfaces Option.

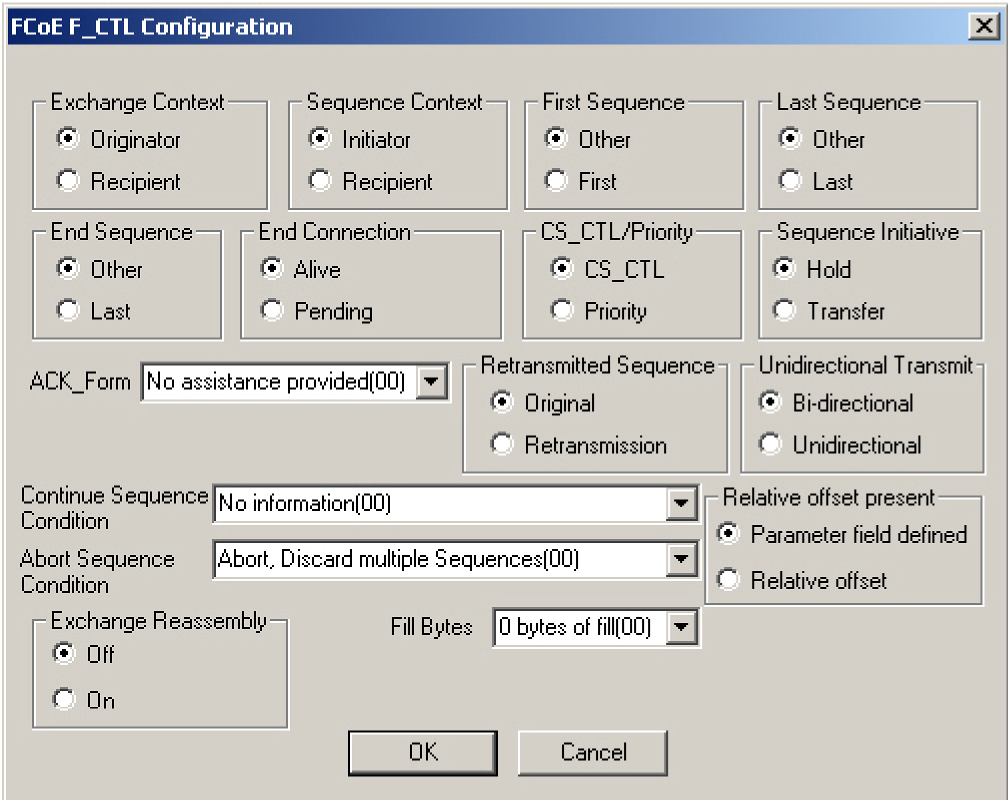
Field/Control	Description
SEQ_CNT	The sequence count is a two-byte field that indicates the sequential order of Data frame transmission within a single Sequence or multiple consecutive Sequences for the same Exchange. The SEQ_CNT of the first Data frame of the first Sequence of the Exchange transmitted by either the Originator or Responder is binary zero. The SEQ_CNT of each subsequent Data frame in the Sequence is incremented by one.
RX_ID	The Responder Exchange_ID is a two byte field assigned by the Responder that provides a unique, locally meaningful identifier at the Responder for an Exchange established by an Originator and identified by an OX_ID.
	Optional headers are provided for use of the FC-4 layer. Refer Optional Header for more information.

F_CTL Configuration

The *F_CTL Configuration* dialog box consists of options to configure the format of the F_CTL bits. When a bit is designated as meaningful under a set of conditions, this bit is ignored if the corresponding set of conditions are not present. For example, bit 18 is meaningful only when bit 19 is set to one. Bit 18 is ignored unless bit 19 is set to one.

The **F_CTL Configuration** dialog box is accessed by selecting  button. The dialog box is shown in *Image: F_CTL Configuration dialog box*.

Image: F_CTL Configuration dialog box



Field definitions for the *F_CTL Configuration* dialog box are described in *Table: F_CTL Configuration*.

Table: F_CTL Configuration

Field/Control	Description
Exchange Context	0 = Originator of exchange 1 = Recipient (responder) of exchange
Sequence Context	0 = Sequence Initiator 1 = Sequence Recipient
First Sequence	0 = Other–sequence other than first of exchange 1 = First sequence of exchange
Last Sequence	0 = Other–sequence other than last of exchange 1 = Last sequence of exchange
End Sequence	0 = Other–data frame other than last of sequence 1 = Last data frame of sequence
End Connection	0 = Alive–connection active 1 = Pending–end of connection pending

Field/Control	Description
CS_CTL/Priority	0 = CS_CTL 1 = Priority
Sequence Initiative	0 = Hold sequence initiative 1 = Transfer sequence initiative
ACK_Form	00 = No assistance provided 01 = Ack_1 Required 10 = reserved 11 = Ack_0 Required
Retransmitted Sequence	0 = Original Sequence transmission 1 = Retransmission of sequence
Unidirectional Transmit	0 = Bi-directional transmission 1 = Unidirectional transmission
Continue Sequence Condition	Last Data frame–Sequence Initiator 00 = No information 01 = Sequence to follow-immediately 10 = Sequence to follow-soon 11 = Sequence to follow-delayed
Abort Sequence Condition	ACK frame–(Sequence Context = Recipient) 00 = Continue sequence 01 = Abort Sequence, Perform ABTS 10 = Stop Sequence 11 = Immediate Sequence retransmission requested Data frame (1st of Exchange)–(Sequence Context = Initiator) 00 = Abort, Discard multiple Sequences 01 = Abort, Discard a single Sequence 10 = Process policy with infinite buffers 11 = Discard multiple Sequences with immediate retransmission
Exchange Reassembly	Off On
Fill Bytes	End of Payload - bytes of fill (following Payload) 00 = 0 bytes of fill 01 = 1 byte of fill

Field/Control	Description
	10 = 2 bytes of fill 11 = 3 bytes of fill
Relative offset present	0 = Parameter field defined for some frames 1 = Relative offset

Extended Header

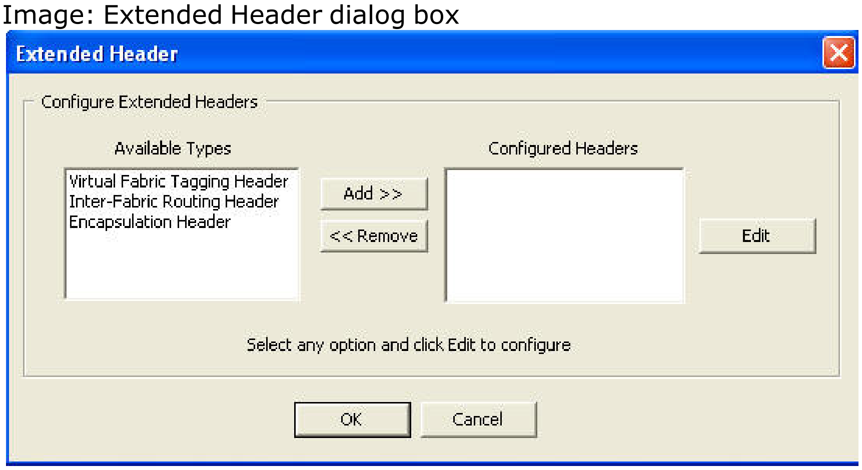
An Extended Header is a sequence of words that may be present in a frame between the SOF delimiter and the Frame_Header to support frame handling functions that are not enabled by the Frame_Header.

Extended Header, if present, immediately follows the SOF delimiter and precede the Frame Header. The presence or absence of Extended Headers in a frame does not affect the size of the Data_Field.

Extended Headers are used to extend the functionality provided by the Frame_Header. Each Extended Header, although of different length, is word aligned within the frame and has a length that is a multiple of four bytes.

Select the *Configure Extended Header* option button in the ***Fibre Channel Header*** tab to open the *Extended Header* dialog box. The *Extended Header* dialog box is shown in *Image: Extended Header dialog box*.

Image: Extended Header dialog box



To configure a extended header, do the following:

1. Select the type of header from *Available Types* box.
2. Select the *Add* button to shift the selected header type to *Configured Header* box.
   The selected header shifts to the *Configured Header* box.
3. Select the header type in the *Configured Header* box and select the *Edit* button.

The selected header opens in the edit mode in a separate dialog box where additional packet details are available for the specific type of extender header.

The fields in the *Extended Header* dialog box are described in *Table: Extended Header dialog box*

Table: Extended Header dialog box

<table>
<tr><th>Field/Control</th><th>Description</th></tr>
<tr><td>Available Types</td><td>The types of Extended Headers, one of the following:
Virtual Fabric Tagging Header (VFT_Header)
Inter-Fabric Routing Extended Header (IFR_Header)
Encapsulation Header
The specific values for each extended header in the R_ CTL field that determine the header length, are shown as follows:</td></tr>
<tr><td>Extended Header Types:<table><tr><th>R_CTL</th><th>Description</th><th>Extended_Header Length</th></tr><tr><td>50h</td><td>VFT_Header (Virtual Fabric Tagging Header, see 10.2)</td><td>8 bytes</td></tr><tr><td>51h</td><td>IFR_Header (Inter-Fabric Routing Header, see 10.3)</td><td>8 bytes</td></tr><tr><td>52h</td><td>Enc_Header (Encapsulation Header, see 10.4)</td><td>24 bytes</td></tr><tr><td>53h .. 5Fh</td><td>Reserved</td><td>—</td></tr></table></td><td></td></tr>
<tr><td>Add >></td><td>Select this button to add the selected type of extended header to the Configured Headers box.</td></tr>
<tr><td><< Remove</td><td>Select this button to remove an already added extended header type from the Configured Headers box.</td></tr>
<tr><td>Configured Headers</td><td>Shows the types of extended header selected for configuration.</td></tr>
<tr><td>Edit</td><td>Opens the selected extended header in edit mode in a separate dialog box where additional packet details are available for the specific type of extender header.</td></tr>
</table>

Field/Control	**Description**
	Select *OK* after configuring the extended header to complete the process.
	Select *Cancel* to exit from the operation.

The types of extended headers are as follows:

- Virtual Fabric Tagging Header (VFT Header)
- Inter Fabric Routing Header (IFR)
- Encapsulation Header (ENC)

Virtual Fabric Tagging Header (VFT Header)

The Virtual Fabric Tagging Header (VFT Header) allows Fibre Channel frames to be tagged with the Virtual Fabric Identifier (VF_ID) of the Virtual Fabric to which they belong. Tagged frames, that is frames with a VFT_Header, belonging to different Virtual Fabrics may be transmitted over the same physical link.

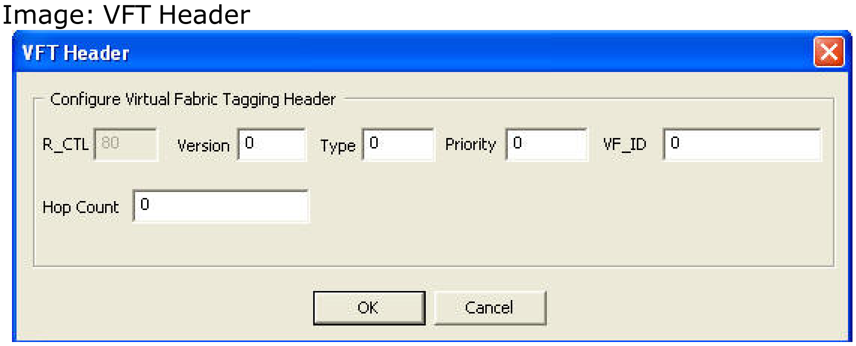
The VFT Header Format is shown in *Image: VFT Header Format*.

Image: VFT Header Format

Bits Word	31 .. 24	23	22	21 .. 18	17	16	15 .. 13	12 .. 01	0
0	R_CTL	Ver		Type	R	R	Priority	VF_ID	R
1	HopCt	Reserved							

The *VFT Header* dialog box is shown in *Image: VFT Header*.

Image: VFT Header



The fields in this dialog box are described in *Table: VFT Header dialog box*.

Table: VFT Header dialog box

Field/Control	**Description**
R_CTL	The R_CTL field is a one-

Field/Control	Description
	byte field that contains routing bits and information bits to categorize the frame function. The R_CTL is set to the value 50h to identify the VFT Extended Header.
Version	Specifies the version of the VFT Header. Default is 0.
Type	Specifies the kind of tagged frame. To use with Fibre Channel, type is set to 0h. The use of other values is beyond the scope of this standard. No device sends a VFT tagged frame with a Type value in the VFT_Header other than 0h. A device receiving a VFT tagged frame with a Type value in the VFT_ Header having a non-zero value discards the frame.
Priority	The Class Specific Priority of the VFT header. When set to zero, it is interpreted to contain management information for the class of service.
VF_ID	The ID of the VFT header. It specifies the Virtual Fabric Identifier of the Virtual Fabric to which the tagged frame belongs. The values are shown as follows:
VFT_ID Values:	

<table>
<tr><th>Field/Control</th><th>Description</th></tr>
<tr><td>
<table>
<tr><th>Value</th><th>Description</th></tr>
<tr><td>000h</td><td>Shall not be used as Virtual Fabric Identifier</td></tr>
<tr><td>001h .. EFFh</td><td>Available as Virtual Fabric Identifiers</td></tr>
<tr><td>F00h .. FEEh</td><td>Reserved</td></tr>
<tr><td>FEFh</td><td>Control VF_ID (see FC-LS and FC-SW-4)</td></tr>
<tr><td>FF0h .. FFEh</td><td>Vendor Specific</td></tr>
<tr><td>FFFh</td><td>Shall not be used as Virtual Fabric Identifier</td></tr>
</table>
</td><td></td></tr>
<tr><td>Hop Count</td><td>The count by which the VFT header packet is forwarded in the stream. It specifies the number of remaining hops that are traversed before the frame is discarded. A value of 00h indicates that the frame is not discarded due to number of hops traversed. A Switch receiving a VFT tagged frame with HopCt = 01h discards the frame. Each Switch, on forwarding a VFT tagged frame, decrements the HopCt by one. The default initial value for the HopCt field is 16 and it is configured for each tagging port. If a frame passes from a tagging link to a second tagging link through one or more non tagging links, the HopCt value is reset to the initial value configured for the egress FC_Port attached to the second tagging link upon egress onto the second tagging link.</td></tr>
</table>

Inter Fabric Routing Header (IFR)

The Inter-Fabric Routing Extended Header (IFR_Header) provides the necessary information to support fabric-to-fabric routing. The information includes the following:

- The fabric identifier of the destination fabric (DF_ID)
- The fabric identifier of the source fabric (SF_ID)
- Information appropriate to determine the expiration time or hop count

The IFR_Header is used at every Inter-Fabric Router to route the frame toward the destination fabric.

The IFR Header Format is shown in *Image: IFR Header Format*.

Image: IFR Header Format

Bits Word	31 .. 30	29 .. 27	26	25	24	23 .. 20	19 .. 8	7 .. 4	3 .. 0
0	R_CTL = 51h					R	DF_ID	Exp_Time	
1	Ver	Pri	R	etv	hcv	R	SF_ID	R	Hop_Cnt

The **IFR Header** dialog box is shown in *Image: IFR Header*.

Image: IFR Header

Bits Word	31 .. 30	29 .. 27	26	25	24	23 .. 20	19 .. 8	7 .. 4	3 .. 0
0	R_CTL = 51h					R	DF_ID	Exp_Time	
1	Ver	Pri	R	etv	hcv	R	SF_ID	R	Hop_Cnt

The fields in this dialog box are described in *Table: IFR Header dialog box*.

Table: IFR Header dialog box

Field/Control	Description
R_CTL	The R_CTL field is a one-byte field that contains routing bits and information bits to categorize the frame function. This field is set to the value 51h to identify the IFR_Header.
DF_ID	The Destination Fabric Identifier (DF_ID) field is set as specified in FC-IFR.
Version	Specifies the version of the IFR_Header. This field is set to a default value of 00b.
Priority	Specifies the Quality of Service (QoS) value for the frame. When set to zero, is interpreted to contain management information for the class of service.
Expiration Time Valid	If EXP_Time field is valid, Expiry Time Valid bit is set to one. If EXP_Time field is invalid, Expiry Time Valid bit is set to zero.
Hop Count Valid	If Hop Count field is valid, Hop Count Valid bit is set to one. If Hop Count field is invalid, Hop Count Valid bit is set to zero.
SF_ID	The Source Fabric Identifier (SF_ID) field is set as specified in FC-IFR.
Hop Count	The count by which the VFT header packet is forwarded in the stream.

Field/Control	Description
	If the Hop Count Valid (HCV) bit is set to one, the Hop Count (Hop_Cnt) field specifies the number of hops remaining before the frame is discarded.
EXP_Time	If the Expiration Time Valid (ETV) bit is set to one, the Expiration Time (Exp_Time) field is used by Inter-Fabric Routers to enforce frame lifetime requirements across the Inter-Fabric.

Encapsulation Header (ENC)

The Encapsulation Extended Header (ENC Header) is used to transmit frames between Inter-Fabric Routers when connected through an FC-SW-3 or FC-SW-4 compliant fabric. To preserve backward compatibility, the Inter-Fabric Routers appear as N_Ports to the FC-SW-3 or FC-SW-4 compliant Fabric.

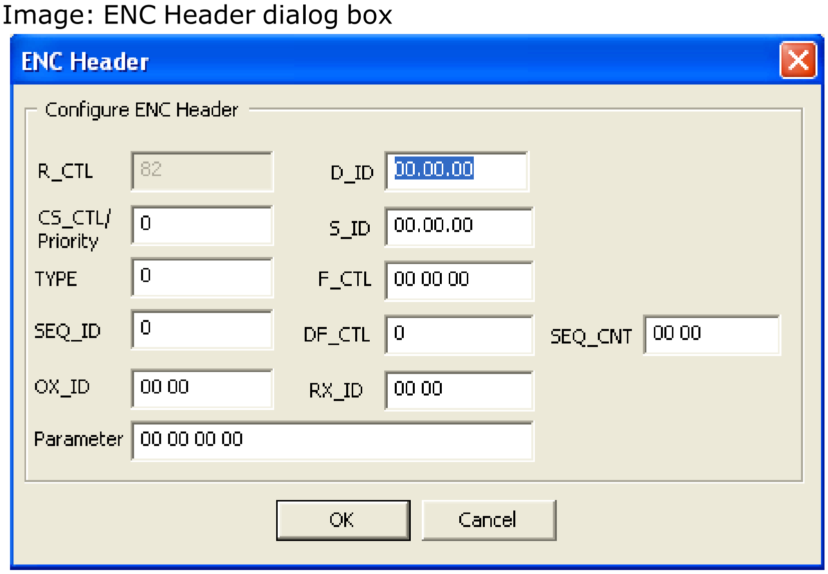
The ENC Header Format is shown in *Image: ENC Header Format*.

Image: ENC Header Format

Bits Word	31 .. 24	23 .. 16	15 .. 08	07 .. 00
0	R_CTL = 52h	D_ID		
1	CS_CTL/ Priority	S_ID		
2	TYPE	F_CTL		
3	SEQ_ID	DF_CTL	SEQ_CNT	
4	OX_ID		RX_ID	
5	Parameter			

The *ENC Header* dialog box is shown in *Image: ENC Header dialog box*.

Image: ENC Header dialog box



The fields in this dialog box are described in *Table: ENC Header dialog box*.

Table: ENC Header dialog box

Field/Control	Description
R_CTL	The R_CTL field is a one-byte field that contains routing bits and information bits to categorize the frame function. This field is set to the value 52h to identify the IFR_Header.
CS_CTL/Priority	CS_CTL field is controlled by the CS_CTL/Priority Enable bit (F_CTL, bit 17).
TYPE	The data structure type is a one-byte field that identifies the protocol of the frame content for Data frames.
SEQ_ID	The Sequence ID (SEQ_ID) is a one-byte field (Word 3, Bits 31-24) assigned by the Sequence Initiator.
OX_ID	The Originator Exchange_ID (OX_ID) is a two-byte field (Word 4, Bits 31-16) that identifies the Exchange_ID assigned by the Originator of the Exchange.
Parameter	The Parameter field has meanings based on frame type. For Link_Control frames, the Parameter field is used to carry information specific to the individual Link_Control frame. For Data frames with the relative offset present bit set to 1, the Parameter field specifies relative offset. For Data frames with the relative offset Present bit set to zero, the Parameter field is set and interpreted in a protocol specific manner that may depend on the type of Information Unit carried by the frame.
D_ID	The Destination ID (D_ID) is a three-byte field (Word 0, Bits 23-0) that contains the address identifier of the destination Nx_Port.
S_ID	The Source ID (S_ID) is a three-byte field that contains the address identifier of the source Nx_Port.
F_CTL	The Frame Control (F_CTL) field (Word 2, Bits 23-0) is a three-byte field that contains control information relating to the frame content. If an error in bit usage is detected, a reject frame (P_RJT) is transmitted in response with an appropriate reason code for Class 1, Class 2, and Class 6.
DF_CTL	Data Field Control (DF_CTL) is a one-byte field that specifies the presence of optional headers at the beginning of the Data_Field.
SEQ_CNT	The Sequence Count is a two-byte field that indicates the sequential order of Data frame transmission within a single Sequence or multiple consecutive Sequences for the same Exchange. The SEQ_CNT of the first Data frame of the first Sequence of the Exchange transmitted by either the Originator or Responder is binary zero. The SEQ_CNT of each subsequent Data frame in the Sequence is incremented by one.
RX_ID	The Responder Exchange_ID is a two byte field assigned by the Responder that provides a unique, locally meaningful identifier at the Responder for an

Field/Control	Description
	Exchange established by an Originator and identified by an OX_ID.

Optional Header

Optional headers are provided for use of the FC-4 layer. The use of the optional headers is not defined by this standard.

Optional headers, defined within the Data Field of a frame, are of the following types:

- Encapsulating Security Payload (ESP)
- Network Header
- Association Header

Control bits in the DF_CTL field of the Frame_Header define the presence of optional headers. The sum of the length in bytes of the Payload, the number of fill bytes, and the lengths in bytes of all optional headers shall not exceed 2 112.

The sequential order of the optional headers, Payload, and their sizes are shown in *Image: Frame Structure without ESP Header* and *Image: Frame Structure with ESP Header*.*Image: Frame Structure without ESP Header* shows the frame structure without adding the ESP header.

Image: Frame Structure without ESP Header

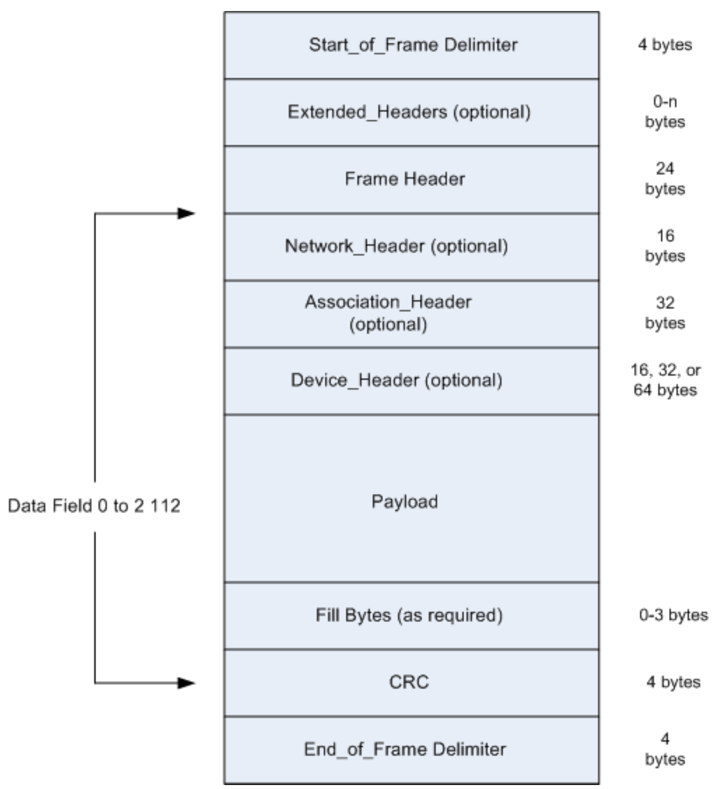
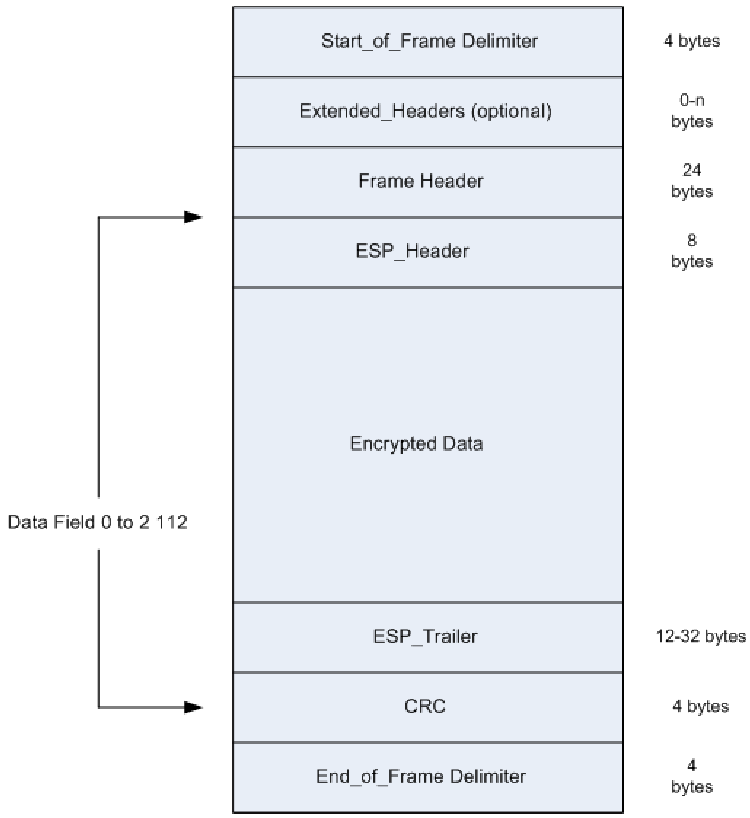


Image: Frame Structure with ESP Header shows the frame structure with the ESP header.

Image: Frame Structure with ESP Header

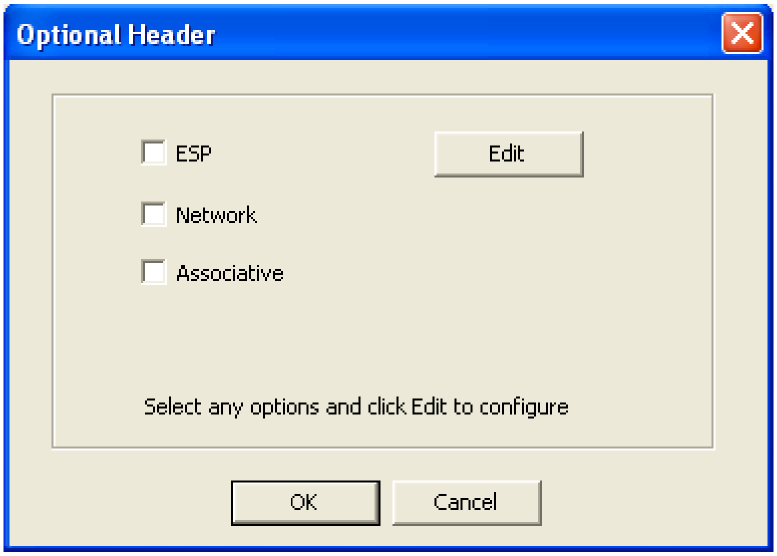


To open the *Optional Header* dialog box, select  button. The *Optional Header* dialog box opens, allowing you to select between ESP, Network, and Associative headers. One or more headers can be selected.

NOTE: Since more than one optional headers are allowed to select, the Edit menu has separate tabs for each of the optional headers.

The Optional Header dialog box is shown in *Image: Optional Header dialog box*.

Image: Optional Header dialog box



The fields in this dialog box are described in *Table: Optional Header dialog box*.

Table: Optional Header dialog box

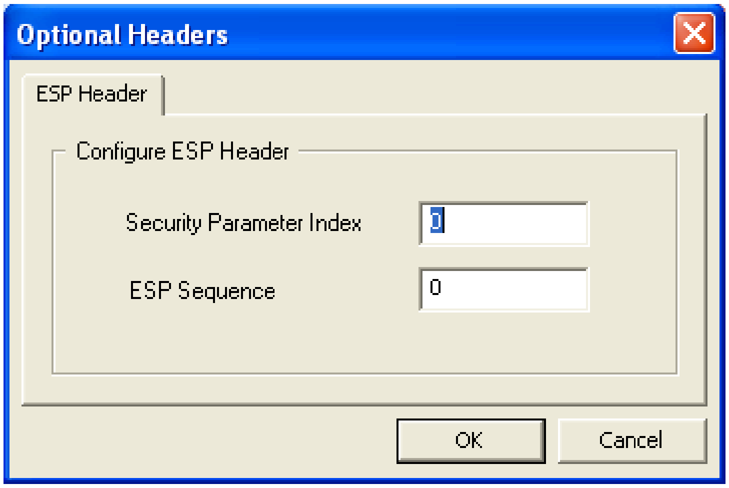
Field/Control	Description
ESP (check box)	If selected, allows to configure Encapsulating Security Payload (ESP) in the Edit menu. Refer Encapsulating Security Payload (ESP) for more information.
Network (check box)	If selected, allows to configure Network header in the Edit menu. Refer Network Header for more information.
Associative (check box)	If selected, allows to configure Associative header in the Edit menu. Refer Association Header for more information.
Edit	Select this button to open the selected optional header in the edit mode to configure the header.

Encapsulating Security Payload (ESP)

Encapsulating Security Payload (ESP) is a generic mechanism to provide confidentiality, data origin authentication, and anti-replay protection to IP packets. ESP is applied to Fibre Channel frames in transport mode.

To open the ***ESPHeader*** tab, select the *ESP* check box in the *Optional Header* dialog box and then select the Edit button. The **ESP Header** tab opens, as shown in *Image: **ESP Header** tab*.

Image: **ESP Header** tab



The fields in this tab are described in *Table: **ESP Header** tab*.

Table: **ESP Header** tab

Field/Control	Description
Security Parameter Index (SPI)	It is a 32-bit value that is used by a receiver to identify the source address to which an incoming packet is bound. The SPI field is mandatory in an ESP header.
ESP Sequence	It is an unsigned 32-bit field that contains a counter value that increases by one for each packet sent, as per the source address packet sequence number.

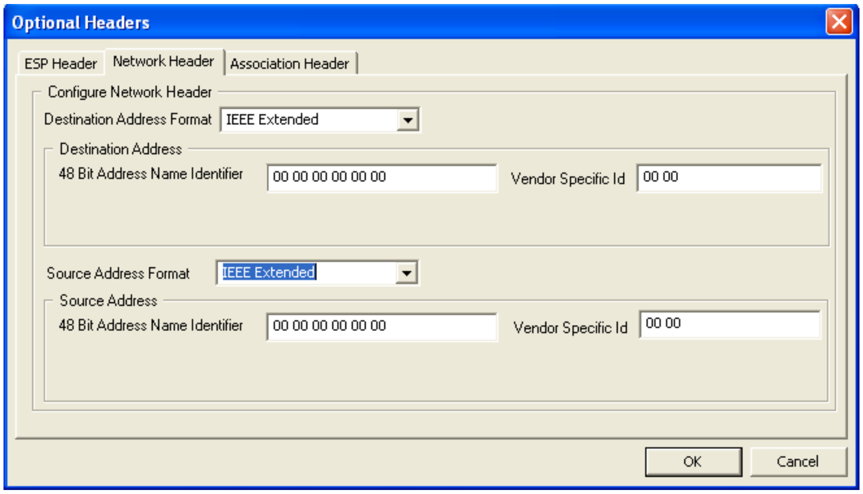
Network Header

The Network Header is an optional header within the Data_Field content. Its presence is indicated by bit 21 in the DF_CTL field being set to one. The Network Header may be used for routing between Fibre Channel networks of different Fabric address spaces, or Fibre Channel and non-Fibre Channel networks. The Network Header contains Name Identifiers for Network Destination Address and Network Source Address.

To open the ***Network Header*** tab, select the *Network* check box in the *Optional Header* dialog box and then select the 

button. The **Network Header** tab opens, as shown in *Image: **Network Header** tab*.

Image: **Network Header** tab



The fields in this tab are described in *Table: **Network Header** tab*.

Table: **Network Header** tab

Field/Control	Description
Destination Address Format	It indicates the format of the Name Identifier used for the network destination address. The format options are as follows: • IEEE 48 Bit Address • IEEE Extended • Locally Assigned • IEEE Registered • IEEE Registered Extended • EU164 Mapped See Name Identifier Formats for a description of the Name Identifier formats.
Destination Address	Contains the Name Identifiers depending on the destination address format selected.
48 Bit Address Name Identifier	The 48 bit address name identifier when the destination address format is IEEE 48 Bit Address.
Vendor Specific Id	The vendor specific identifier that is mapped with the address format. It is present only when destination address format is IEEE Extended.
Locally Administered Value	The locally administered value that is present only when destination address format is Locally Assigned.
IEEE Company Id	The IEEE Company Identifier that is present only when destination address format is IEEE Registered.
Vendor Specific Id Extension	The vendor specific identifier extension that is present only when destination address format is IEEE Registered Extended.

Field/Control	Description
Source Address Format	It indicates the format of the Name Identifier used for the network source address. The format options are as follows: • IEEE 48 Bit Address • IEEE Extended • Locally Assigned • IEEE Registered • IEEE Registered Extended • EU164 Mapped See Name Identifier Formats for a description of the Name Identifier formats.
Source Address	Contains the Name Identifiers depending on the source address format selected.
48 Bit Address Name Identifier	The 48 bit address name identifier when the source address format is IEEE 48 Bit Address.
Vendor Specific Id	The vendor specific identifier that is mapped with the address format. It is present only when source address format is IEEE Extended.
Locally Administered Value	The locally administered value that is present only when source address format is Locally Assigned.
IEEE Company Id	The IEEE Company Identifier that is present only when source address format is IEEE Registered.
Vendor Specific Id Extension	The vendor specific identifier extension that is present only when source address format is IEEE Registered Extended.

Name Identifier Formats

Name Identifiers are used to identify entities in Fibre Channel such as N_Port, Node, F_Port, Fabric, or other Fibre Channel objects. The Name Identifier for an entity is unique within the Fibre Channel interaction space.

The list of supported Name Identifier formats in Fibre Channel are given in *Table: Name Identifiers*

Table: Name Identifiers

Words 0, bits 31–28	Name Identifier	Length
0h	Name not present	-
1h	IEEE 48-bit Address	64
2h	IEEE Extended	64

Words 0, bits 31–28	Name Identifier	Length
3h	Locally Assigned	64
4h	Obsolete	64
5h	IEEE Registered	64
6h	IEEE Registered Extended	128
7h to Bh	Reserved	-
Ch	EUI64 Mapped	64
Dh	EUI-64 Mapped	64
Eh	EUI-64 Mapped	64
Fh	EUI-64 Mapped	64

IEEE 48-bit Address

When the Name_Identifier format is IEEE 48-bit Address, the name value field contains a 48-bit IEEE Standard 802.1A Universal LAN MAC Address (ULA). The ULA is represented as an ordered string of six bytes numbered from 0 to 5. ULA Bytes 0, 1, and 2 are generated using the IEEE Company_ID.

Image: IEEE 48-bit Address Name Identifier shows how the bytes of an ULA are mapped to two words in the IEEE 48-bit Address Name Identifier.

Image: IEEE 48-bit Address Name Identifier

Bits Word	31 .. 28	27 .. 24	23 .. 16	15 .. 10	9	8	07 .. 00
0	1h	0 00h		ULA Byte 0	U/ L	I/ G	ULA Byte 1
1	ULA Byte 2		ULA Byte 3	ULA Byte 4			ULA Byte 5

IEEE Extended

When the Name_Identifier format is IEEE Extended, the name value field contains the 48-bit IEEE address preceded by a 12 bit value. The 12 bit value is an extension to the company assigned address portion of the 48-bit address that forms a unique 60-bit value. The 48-bit IEEE address is defined same as for the IEEE 48-bit Address Name_Identifier format.

Image: IEEE Extended Name Identifier shows the IEEE Extended Name Identifier format.

Image: IEEE Extended Name Identifier

Bits Word	31 .. 28	27 .. 24	23 .. 16	15 .. 10	9	8	07 .. 00
0	2h	Vendor Specific		ULA Byte 0	U/ L	I/ G	ULA Byte 1
1	ULA Byte 2		ULA Byte 3	ULA Byte 4			ULA Byte 5

Locally Assigned

When the Name_Identifier format is locally assigned, the name value field is assigned in a manner determined by the administration of the Fabric in which it is assigned. A locally assigned Name_Identifier is unique within the Fibre Channel interaction space wherein it is assigned.

Image: Locally Assigned Name Identifier shows the Locally Assigned Name Identifier format.

Image: Locally Assigned Name Identifier

Bits / Word	31 .. 28	27 .. 24	23 .. 16	15 .. 08	07 .. 00
0	3h	Locally administered value			
1	Locally administered value				

IEEE Registered

When the Name_Identifier format is IEEE Registered, the name value field contains the 24-bit IEEE Company_ID in canonical form, as specified by IEEE, followed by a 36-bit unique Vendor Specified Identifier (VSID).

Image: IEEE Registered Name Identifier shows the IEEE Registered Name Identifier format.

Image: IEEE Registered Name Identifier

Bits / Word	31 .. 28	27 .. 24	23 .. 16	15 .. 8	07 .. 04	03 .. 00
0	5h	IEEE Company_ID				VSID (35-32)
1	VSID (31-0)					

IEEE Registered Extended

When the Name_Identifier format is IEEE Registered Extended, the name value field contains the 24-bit IEEE Company_ID in canonical form, as specified by IEEE, followed by a 36-bit unique vendor specified id (VSID). Name_Identifiers that identify Fibre Channel Nodes or FC_Ports are limited to 64 bits and therefore shall not use the IEEE Registered Extended format.

Image: IEEE Registered Extended Name Identifier shows the IEEE Registered Extended Name Identifier format.

Image: IEEE Registered Extended Name Identifier

Bits / Word	31 .. 28	27 .. 24	23 .. 16	15 .. 8	07 .. 04	03 .. 00
0	5h	IEEE Company_ID				VSID (35-32)
1	VSID (31-0)					

EUI64 Mapped

When the Name_Identifier format is EUI64 Mapped, The NAA field contains either 0Ch, 0Dh, 0Eh, or 0Fh. The name value field contains a modified 22-bit IEEE Company_ID, followed by a 40-bit unique VSID.

Image: EUI64 Mapped Name Identifier shows the EUI64 Mapped Name Identifier format.

Image: EUI64 Mapped Name Identifier

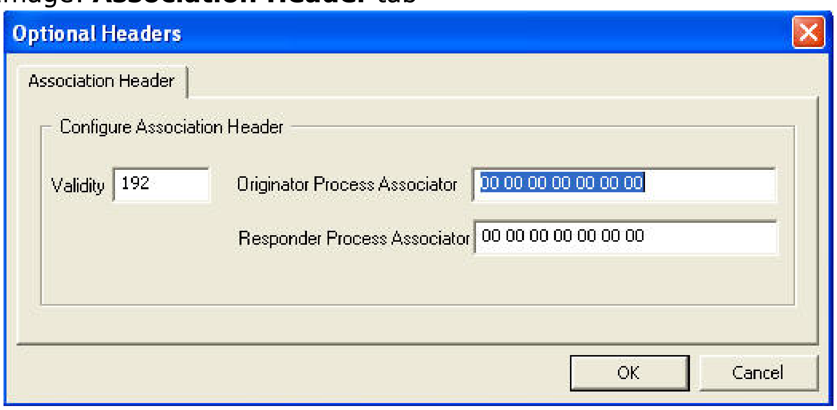
Bits / Word	31...30	29...24	23...16	15...8	7...0
0	11b	IEEE Company_ID (modified)			VSID (39-32)
1	VSID (31-0)				

Association Header

The Association Header is an optional header within the Data Field content. Its presence is indicated by bit 20 in the DF_CTL field, located in the Frame Header, being set to one. The Association Header is 32-bytes in size. The Association Header is used to identify a specific process or group of Processes within a node associated with an Exchange.

To open the ***Association Header*** tab, select the *Associative* check box in the *Optional Header* dialog box and then select the Edit button. The **Association Header** tab opens, as shown in *Image: **Association Header** tab*.

Image: **Association Header** tab



The fields in this tab are described in *Table: **Association Header** tab*.

Table: **Association Header** tab

Field/Control	Description
Validity	Denotes the validity of the Association Header.
Originator Process Associator	It is a value used in the Association Header to identify an originator process or a group of processes within a node.
Responder Process Associator	It is a value used in the Association Header to identify a responder process or a group of processes within a node.

Frame Data for Flex

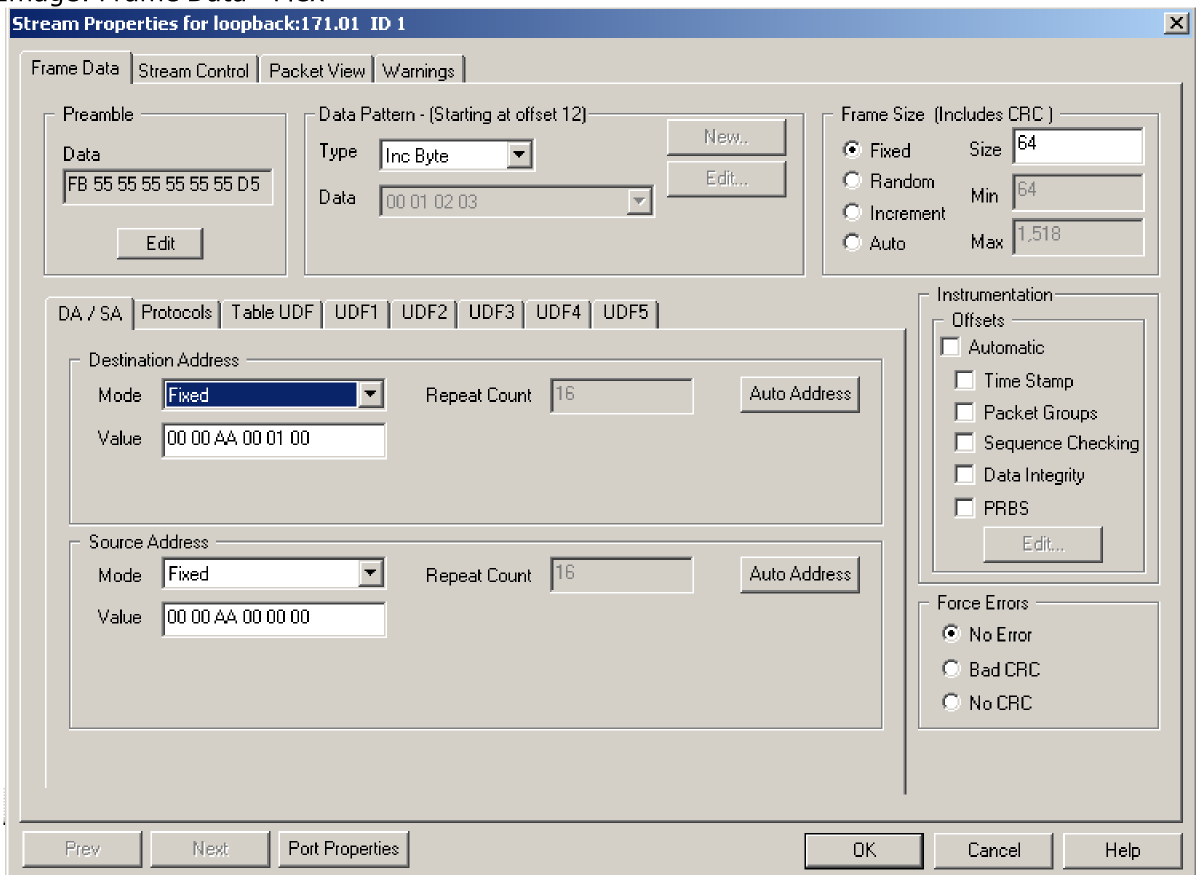
The Xcellon architecture features aggregation of multi-core CPUs and massive memory to meet testing needs for ultra-high scale and performance.

The Stream Properties for the Flex load module are set in the **Frame Data** and **Stream Control** tabs.

To access the **Frame Data** tab, double-click in a stream/flow entry in the Packet Streams/Packet Flows/Advanced Streams window, then select the **Frame Data** tab. Alternatively, select a port in the Resources window, and select Edit Streams from the menu that appears.

The **Frame Data** tab for Flex load modules is shown in *Image: Frame Data—Flex*.

Image: Frame Data—Flex



The options and controls in this tab are mentioned in *Table: **Frame Data** tab—Flex*.

Table: **Frame Data** tab—Flex

Field/Control	Description
Preamble	The Preamble is a variable number of bytes of data, where each byte has an identical value of 0xAA. The preamble size range varies between cards, see Ixia Platform Reference Manual. The preamble contents is always a string of 0xAA bytes and is terminated by a SFD (Start Frame Descriptor) with a value of 0xAD. The Preamble Size count value that appears in the field includes the SFD. for more information. See Preamble Size Box.
Data Pattern	See Data Pattern Box for more information.
Frame Size	See Frame Size for more information.
Instrumentation	See Instrumentation Box for more information.

Field/Control	Description
Offsets	
Force Errors	See Force Errors Box for more information.
DA/SA	See DA/SA Property Sheet for more information.
Protocols	See Data Link Layer Protocols Control for more information.
Table UDF	See Chapter 7, Frame Data–User Defined Fields (UDF) for more information.

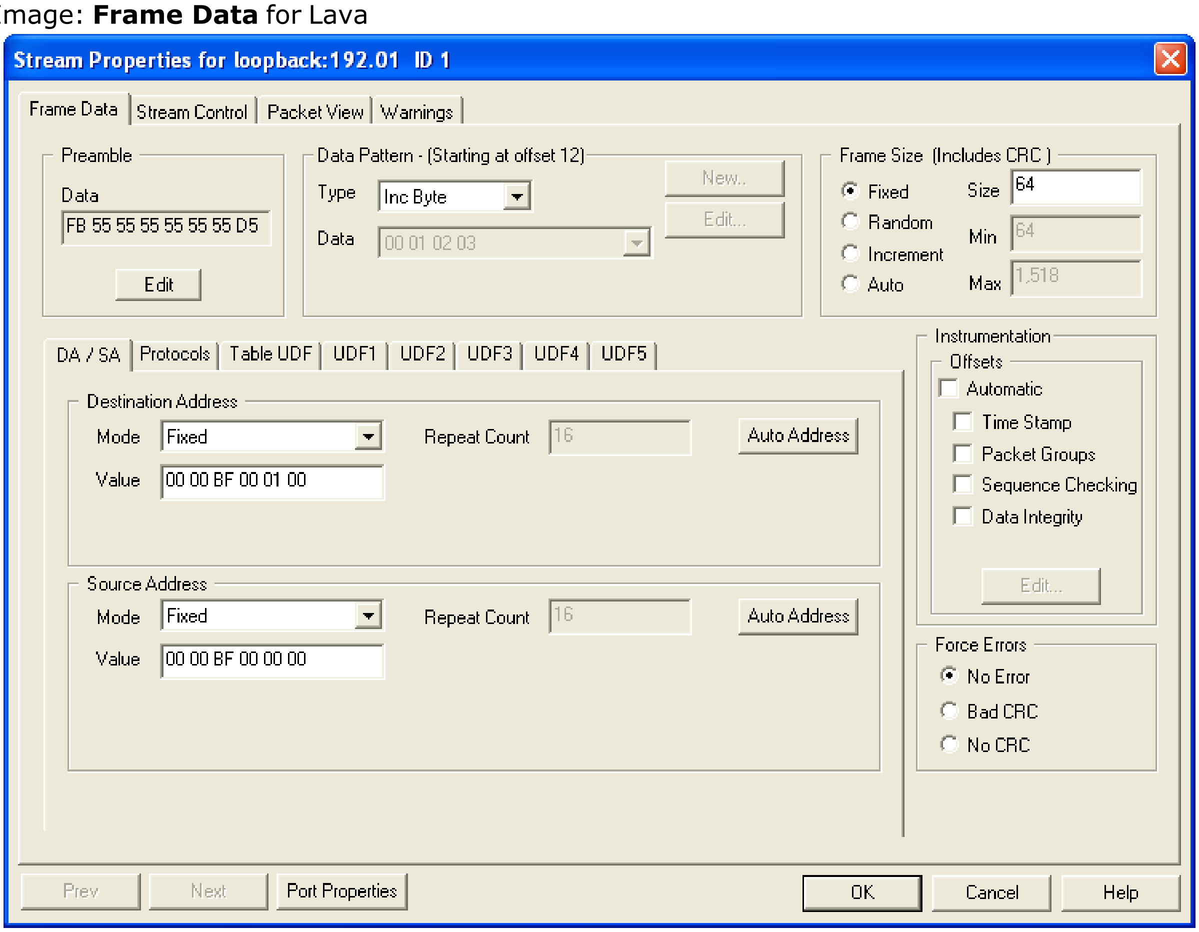
Frame Data for Lava 40GE/100GE

The Stream Properties for the Lava load module are set in the **Frame Data** and **Stream Control** tabs.

To access the **Frame Data** tab, double-click in a stream/flow entry in the Packet Streams/Packet Flows/Advanced Streams window, then select the **Frame Data** tab. Alternatively, select a port in the Resources window, and select Edit Streams from the menu that appears.

The **Frame Data** tab for Lava AP40/100GE is shown as follows:

Image: **Frame Data** for Lava



The options and controls in this tab are mentioned in the following table:

Table: **Frame Data** tab—Lava

Field/Control	Description
Preamble	See Lava AP40/100 GE— Preamble for more information.
Data Pattern	Lava supports Increment (word/byte), Decrement (word/byte), Random, Repeating, Fixed, CJPAT and CRPAT as Data Pattern types. See Data Pattern Box for more information.
Frame Size	Lava supports Fixed, Random, Increment and Auto Frame Size. Under Random it supports Uniform, Weight, Predefined and Quad Gaussian. See Frame Size and Weighted Random Frame Size—Uniform Distribution for more information.
Instrumentation Offsets	Lava supports Time Stamp, Packet Groups, Sequence Checking and Data Integrity options of Automatic Instrumentation Offsets. See Instrumentation Box for more information.
Force Errors	See Force Errors Box for more information.
DA/SA	Lava supports DA/SA mode. See DA/SA Property Sheet for more information.
Protocols	See Data Link Layer Protocols Control for more information. (OAM is not supported in Lava).
Table UDF	See Table UDF for more information.
UDF	Lava supports up to 5 UDFs. See Chapter 7,Frame Data–User Defined Fields (UDF) for more information.

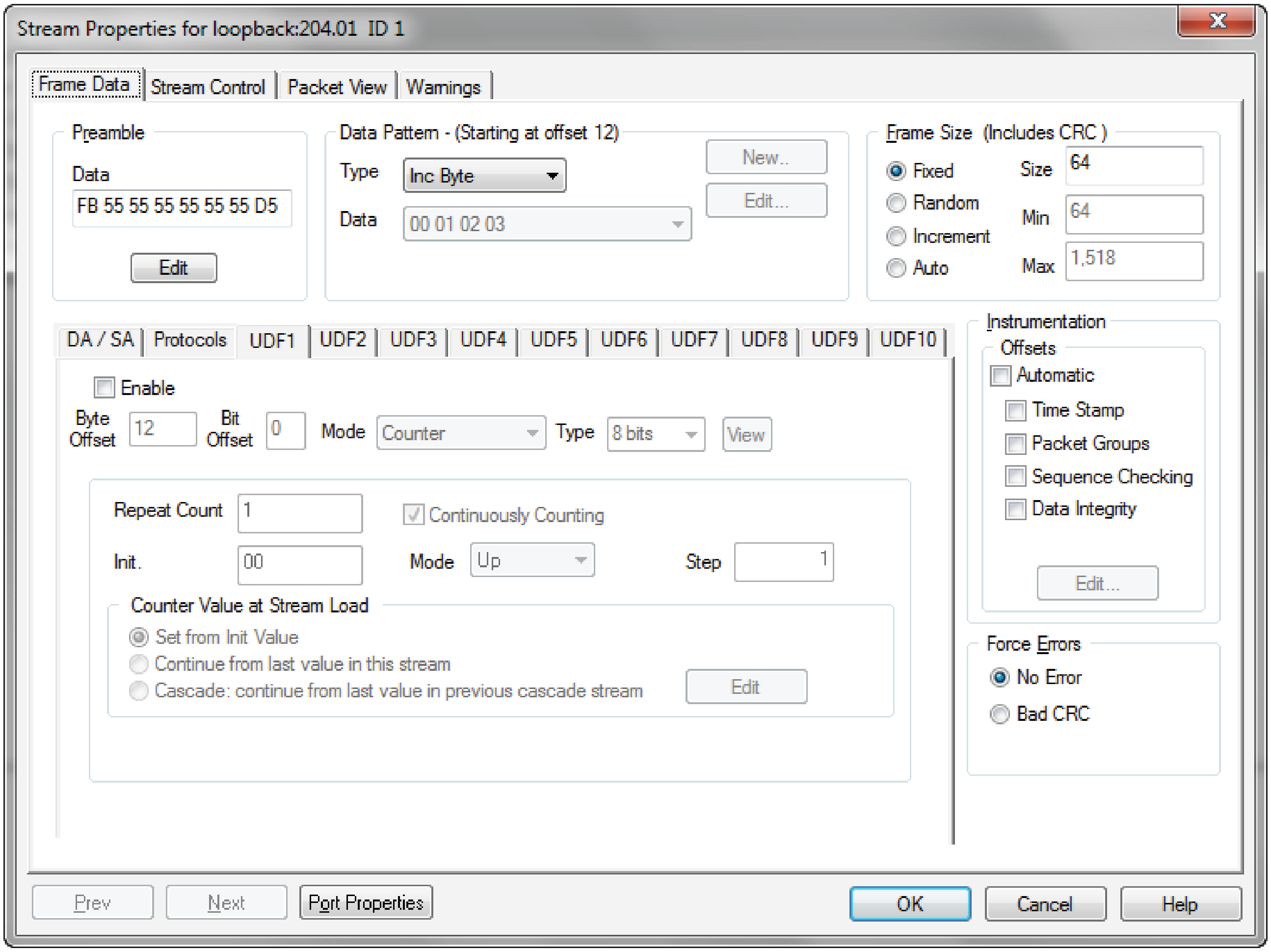
Frame Data for Xcellon-Multis, Novus, and Novus-R

The Stream Properties for the Xcellon-Multis load module are set in the **Frame Data** and **Stream Control** tabs.

To access the **Frame Data** tab, double-click in a stream/flow entry in the Packet Streams/Packet Flows/Advanced Streams window, then select the **Frame Data** tab. Alternatively, select a port in the Resources window, and select Edit Streams from the menu that appears.

The **Frame Data** tab for Xcellon-Multis is shown as follows:

Image: Frame Data for Xcellon-Multis, Novus, and Novus-R



The options and controls in this tab are mentioned in the following table: Table 5-44. **Frame Data** tab—Xcellon-Multis

Field/Control	Description
Preamble	See Xcellon-Multis— Preamble for more information.
Data Pattern	Multis supports Increment (word/byte), Decrement (word/byte), Random, Repeating, Fixed, CJPAT and CRPAT as Data Pattern types. See Data Pattern Box for more information.
Frame Size	Multis supports Fixed, Random, Increment and Auto Frame Size. Under Random it supports Uniform, Weight, Predefined and Quad Gaussian. See Frame Size and Weighted Random Frame Size—Uniform Distribution for more information.
Instrumentation Offsets	Multis supports Time Stamp, Packet Groups, Sequence Checking and Data Integrity options of Automatic Instrumentation Offsets.See Instrumentation Box for more information.
Force Errors	See Force Errors Box for more information.

Field/Control	Description
DA/SA	Multis supports DA/SA mode. See DA/SA Property Sheet for more information.
Protocols	See Data Link Layer Protocols Control for more information.
UDF	Multis supports up to 10 UDFs. See Chapter 7, Frame Data–User Defined Fields.

Frame Data for QSFP-DD and CFP8

The Stream Properties for the QSFP-DD and CFP8 load modules are set in the **Frame Data** and **Stream Control** tabs.

To access the **Frame Data** tab, double-click in a stream/flow entry in the Packet Streams/Packet Flows/Advanced Streams window, then select the **Frame Data** tab. Alternatively, select a port in the Resources window, and select Edit Streams from the menu that appears.

The **Frame Data** tab for QSFP-DD and CFP8 are shown as follows:

Image: **Frame Data** for QSFP-DD

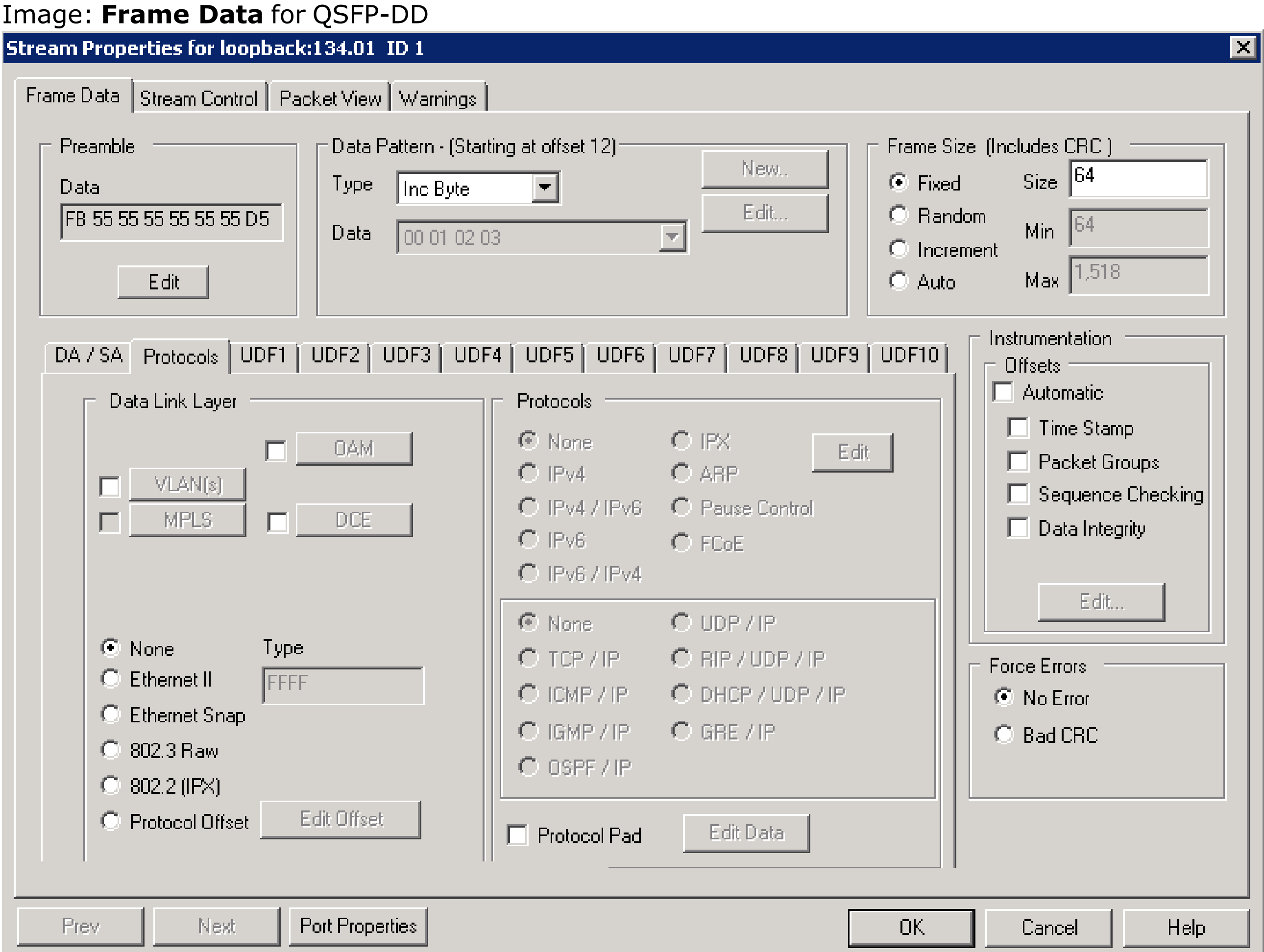
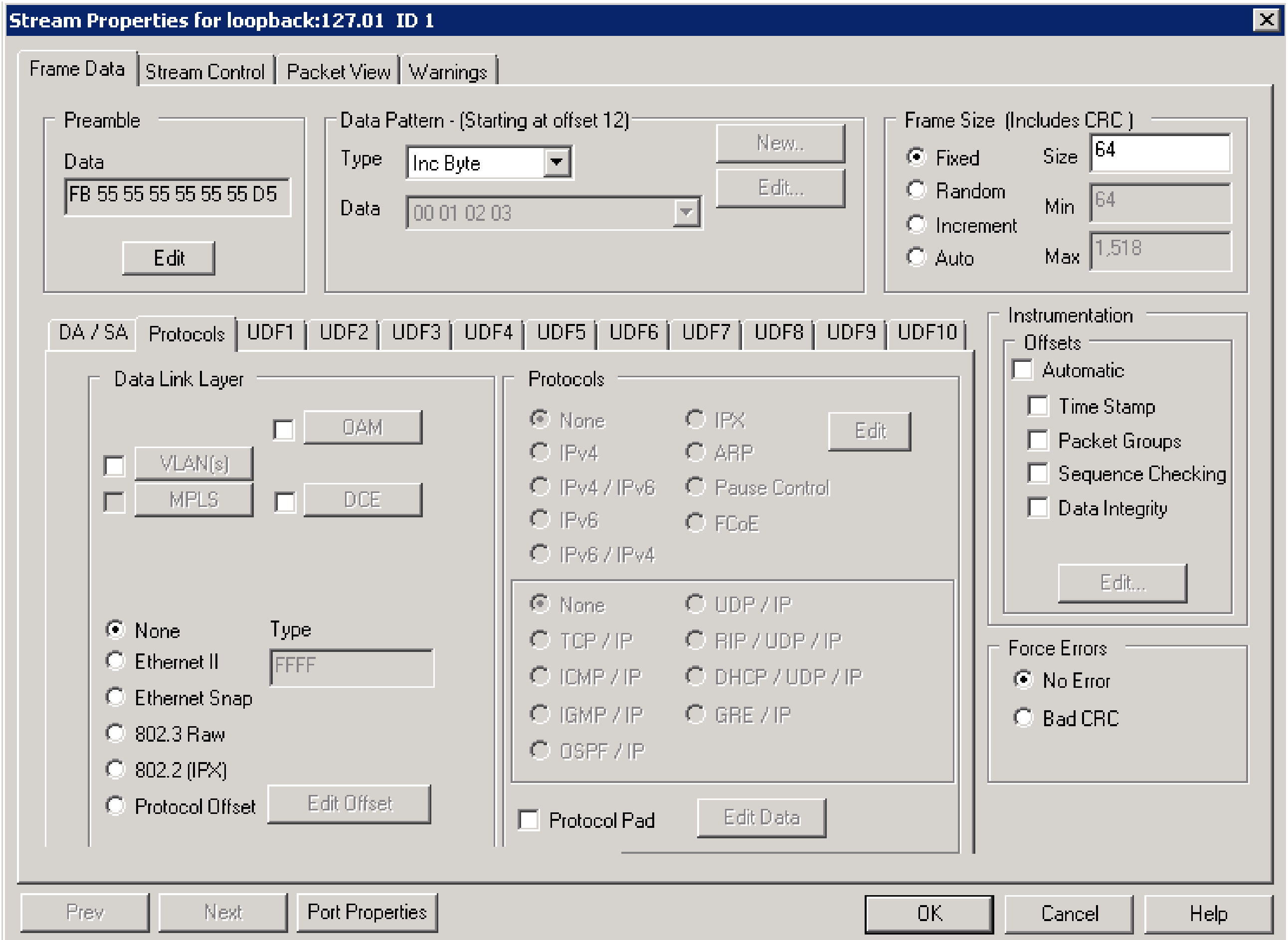


Image: Frame Data for CFP8



The options and controls in this tab are mentioned in the following table: Table 5-44. **Frame Data** tab—QSFP-DD and CFP8

Field/Control	Description
Preamble	See QSFP-DD and CFP8 — Preamble for more information.
Data Pattern	QSFP-DD and CFP8 support Increment (word/byte), Decrement (word/byte), Random, Repeating, Fixed, CJPAT and CRPAT as Data Pattern types. See Data Pattern Box for more information.
Frame Size	QSFP-DD and CFP8 support Fixed, Random, Increment and Auto Frame Size. Under Random it supports Uniform, Weight, Predefined and Quad Gaussian. See Frame Size and Weighted Random Frame Size—Uniform Distribution for more information.
Instrumentation Offsets	QSFP-DD and CFP8 support Time Stamp, Packet Groups, Sequence Checking and Data Integrity options of Automatic Instrumentation Offsets. NOTE Automatic instrumentation is by default selected on selecting any of these options. See Instrumentation Box for more information.

Field/Control	Description
Force Errors	See Force Errors Box for more information.
DA/SA	QSFP-DD and CFP8 support DA/SA mode. See DA/SA Property Sheet for more information.
Protocols	See Data Link Layer Protocols Control for more information.
UDF	QSFP-DD and CFP8 support up to 10 UDFs. See Chapter 7, Frame Data–User Defined Fields.

Frame Data for T400 QDD and T400 OSFP

The Stream Properties for the T400 QDD and T400 OSFP load modules are set in the **Frame Data** and **Stream Control** tabs.

To access the **Frame Data** tab, double-click in a stream/flow entry in the Packet Streams/Packet Flows/Advanced Streams window, then select the **Frame Data** tab. Alternatively, select a port in the Resources window, and select Edit Streams from the menu that appears.

The **Frame Data** tab for QDD and OSFP are shown as follows:

Image: **Frame Data** for QDD

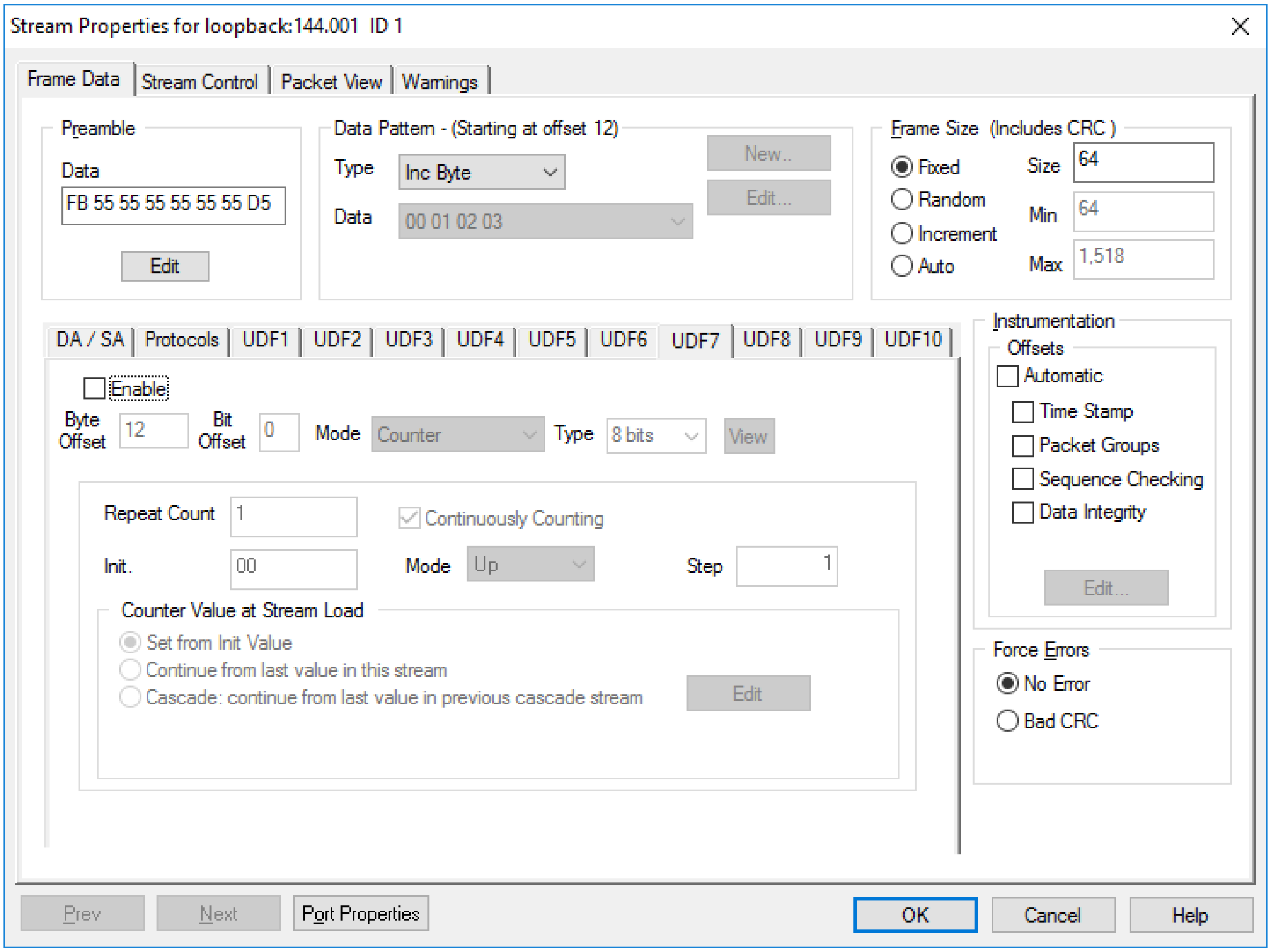
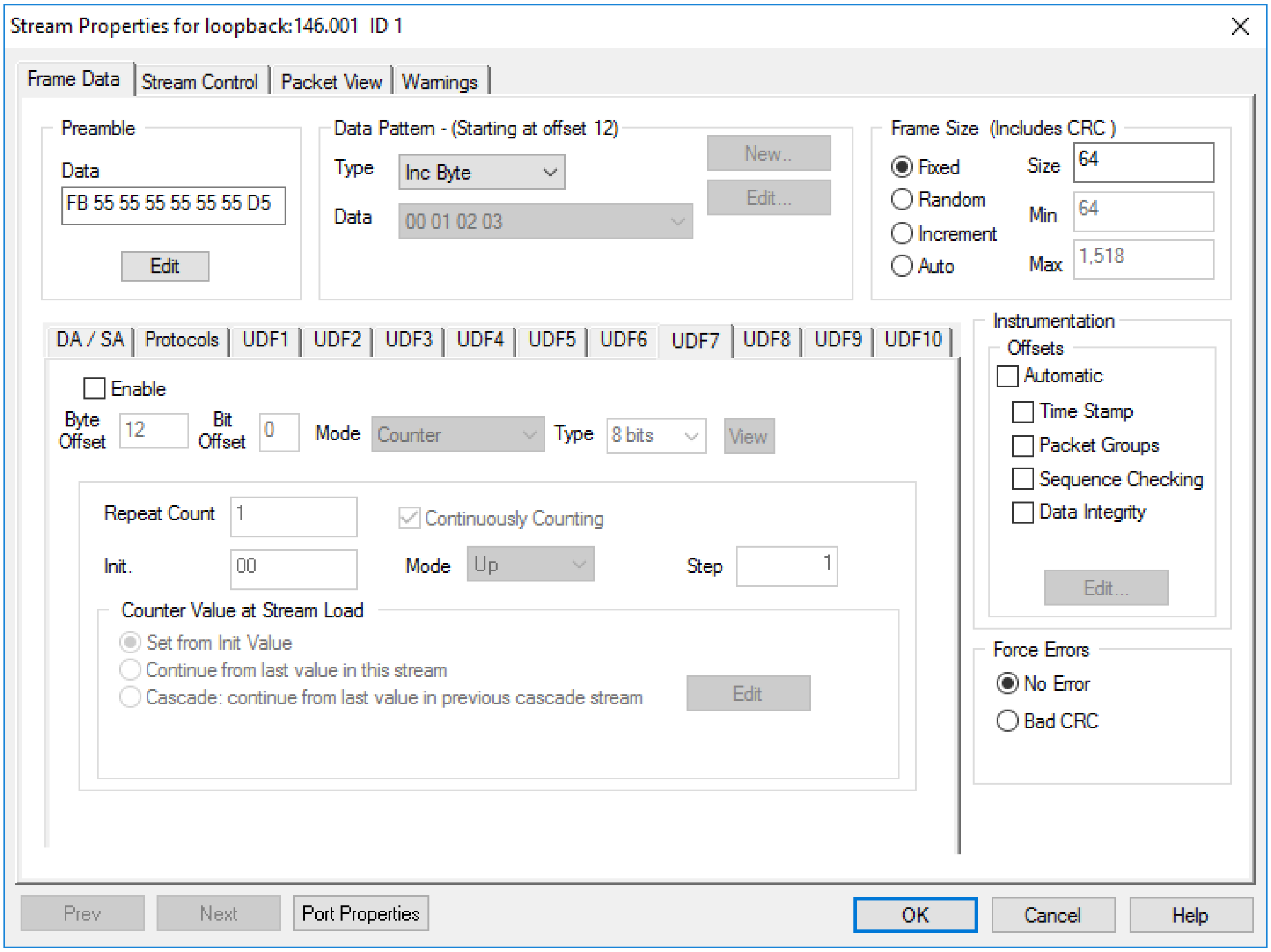


Image: Frame Data for OSFP



The options and controls in this tab are mentioned in the following table: Table 5-44. **Frame Data** tab—QDD and OSFP

Field/Control	Description
Preamble	See T400 QDD and OSFP — Preamble for more information.
Data Pattern	QDD and OSFP support Increment (word/byte), Decrement (word/byte), Random, Repeating, Fixed, CJPAT and CRPAT as Data Pattern types. See Data Pattern Box for more information.
Frame Size	QDD and OSFP support Fixed, Random, Increment and Auto Frame Size. Under Random it supports Uniform, Weight, Predefined and Quad Gaussian. See Frame Size and Weighted Random Frame Size—Uniform Distribution for more information.
Instrumentation Offsets	QDD and OSFP support Time Stamp, Packet Groups, Sequence Checking and Data Integrity options of Automatic Instrumentation Offsets. NOTE Automatic instrumentation is by default selected on selecting any of these options. See Instrumentation Box for more information.

Field/Control	Description
Force Errors	See Force Errors Box for more information.
DA/SA	QSFP-DD and CFP8 support DA/SA mode. See DA/SA Property Sheet for more information.
Protocols	See Data Link Layer Protocols Control for more information.
UDF	QSFP-DD and CFP8 support up to 10 UDFs. See Chapter 7, Frame Data–User Defined Fields.

CHAPTER 6

Frame Data–Protocol Control

The ***Frame Data*** tab in the *Stream Properties* dialog box provides control over all aspects of packets transmitted by the Ixia hardware. These frames are also referred to as datagrams or packets in some contexts. Many frames may be generated in the processing of a stream. Many of the controls available allow the specification of a series of values applied to subsequent frames.

This chapter discusses protocol frame data structure. For other parts of frame data construction, see:

- Frame Data–Basic Frame Structure
- Frame Data–User Defined Fields (UDF)

The Protocols section allows the header bytes of the packet to be formatted according to different conventions and protocols. This tab can be viewed by selecting the *Protocols* sub-tab in the lower area of the **Frame Data** tab. The different formats for this page are described in the following sections:

- Data Link Layer Protocols Control, which is covered in the following general sections:
  - Protocol Control for Ethernet and 10 GE Modules
  - Protocol Control for 10GE LSM MACSec Modules
- Protocols—Network Layer
- Frame Data for Fibre Channel Support.

The *Protocols* page is accessed by:

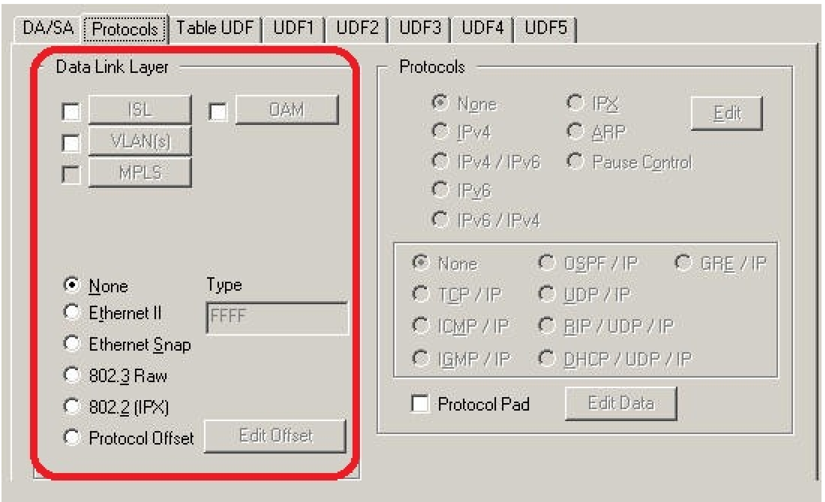
1. Selecting a port in the Resources window. This should cause several selections to appear in the right window of the main IxExplorer dialog box.
2. Double-click the *Packet Streams* icon. This should cause the *Stream Grid* view to appear.
3. Double-click any stream in the view. This should open the *Stream Properties* dialog box to appear.
4. Select the ***Frame Data*** tab.
5. Select the *Protocols* sub-tab.

Data Link Layer Protocols Control

Protocol Control for Ethernet and 10 GE Modules

The Protocols property page for Ethernet and 10 Gigabit Ethernet is shown in *Image: Frame Data–Protocols–Ethernet modules*.

Image: Frame Data–Protocols–Ethernet modules

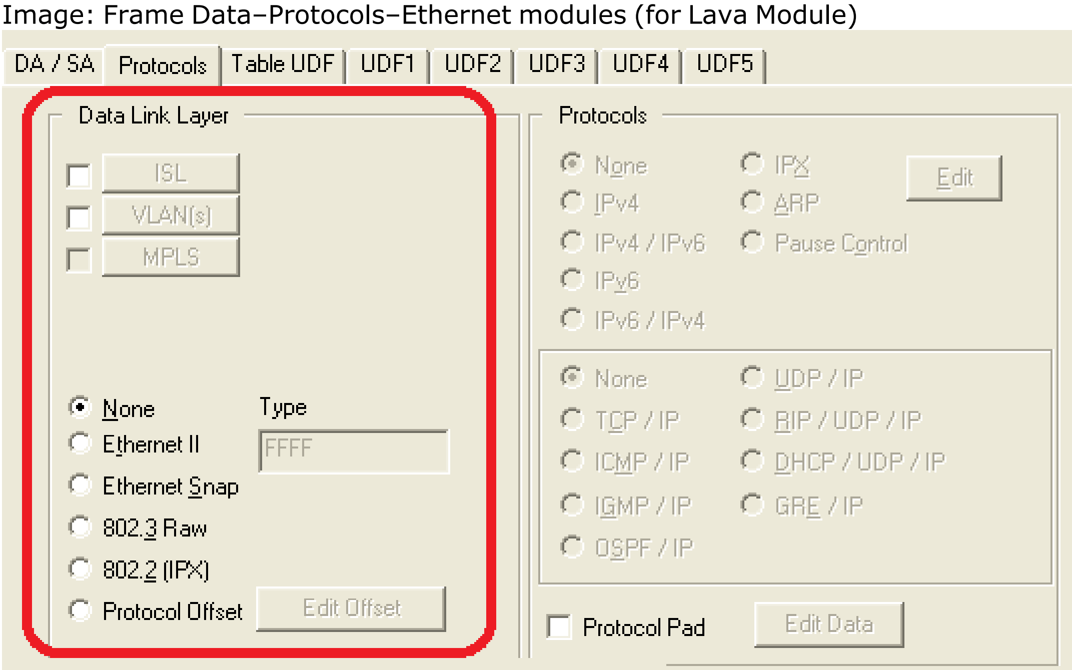


The two areas on this page relate to Data Link Layer (Layer 2 of the OSI Model) and Network Protocol (Layer 3) formatting. The *Edit* button in the Protocol section allows for the specification of header parameters specific to Transport and/or Network protocols.

Protocol Control for 40/100 GE Modules

The Protocols property page for 40/100 Gigabit Ethernet is shown in *Image: Frame Data–Protocols–Ethernet modules (for Lava Module)*.

Image: Frame Data–Protocols–Ethernet modules (for Lava Module)



For Ethernet-type modules, the choices available for Data Link Layer are described in *Table: Data Link Layer Protocols–Ethernet-Type Modules*.

Table: Data Link Layer Protocols–Ethernet-Type Modules

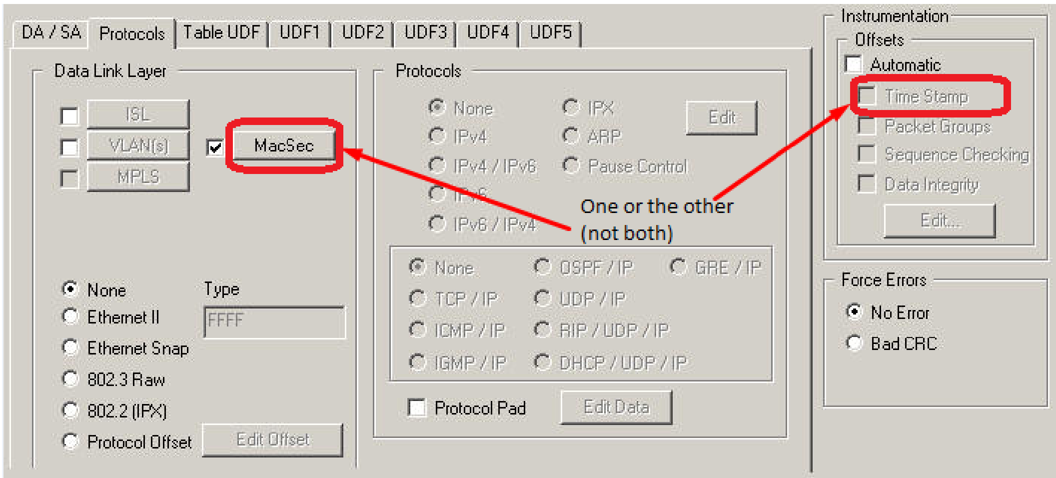
Data Link Layer Protocol	Description
ISL	Specifies that the packet is to be encapsulated according to Cisco Inter-Switch Link (ISL) encapsulation. Refer to Edit ISL.
VLAN	Specifies that a VLAN tag is to be added to the header. The contents of the tag may be edited by pressing the **VLAN(s)** button.Edit VLAN.
MPLS	Specifies that an MPLS label stack is to be added between the data link layer and the network layer (for example, IP layer). The contents of the tag may be edited by selecting **Edit MPLS**Edit MPLS.
OAM	The contents of the stream may be edited by pressing the **Edit OAM** button.Edit OAM. NOTE When OAM is selected, all other protocols are grayed-out. Instrumentation Offsets (automatic) is also grayed-out. The **DA/SA** tab is also changed when OAM is selected (the DA cannot be modified. DA is slow protocols multicast address).
None	No protocol-specific handling is performed.
Ethernet II	The packet is formatted according to the Ethernet II encapsulation. The format of an Ethernet II encapsulated packet is shown in the Ethernet II Packet Format.
Ethernet Snap	The packet is formatted according to the Ethernet SNAP protocol. The format of an Ethernet SNAP packet is shown in the Ethernet SNAP Packet Format.
802.3 Raw	The packet is a raw 802.3 packet. The format of a raw 802.3 is shown in 802.3 Raw Packet Format.
802.2 (IPX)	The packet is formatted according to 802.2 encapsulation for use with IPX. The format of this type of packet is shown in the 802.2 (IPX) Packet Format.
Protocol Offset	If selected, you may customize the configuration of the offset in the packet where the 2-byte *Protocol Type* field appears, as well as the data in the *Protocol Type* field. Protocol Offset dialog box for additional information.

Protocol Control for 10GE LSM MACSec Modules

Ixia incorporates MACsec in accord with *IEEE standard 802.1 AE-2006, Media Access Control (MAC) Security*. Refer to that specification for detailed explanations of MACsec functionality. When setting up MACsec, set up the port properties first, then the stream properties. To set up the MACSec Tx/Rx port properties.

The Protocols property page for 10GE LSM MACSec modules is shown in *Image: Frame Data–Protocols–MACSec Modules*.

Image: Frame Data–Protocols–MACSec Modules



For MACSec load modules, Auto Timestamp is the **only** way that Timestamp can be added to MACSec frames. Legacy Timestamp is always placed just before CRC. But MACSec frames place ICV at that location, so the only way to make a timestamp work is to allow it to ‘float’.

The following rules apply for MACSec.

- If MACSec protocol is **not** enabled:
  - Then legacy Timestamp and Auto Instrumentation with Timestamp are both available. (**Auto Instrumentation** Tab for Ethernet Modules.)
- If MACSec protocol is enabled, then legacy Timestamp is grayed out and not selectable.
  - If legacy Timestamp is enabled, and then MACSec is enabled, the application forces legacy Timestamp to become unavailable and grayed out.

For MACSec modules, the choices available for Data Link Layer include those described in *Table: Data Link Layer Protocols–Ethernet-Type Modules*, with the additional option shown in the table below,*Table: Data Link Layer Protocols–MACSec Modules*.

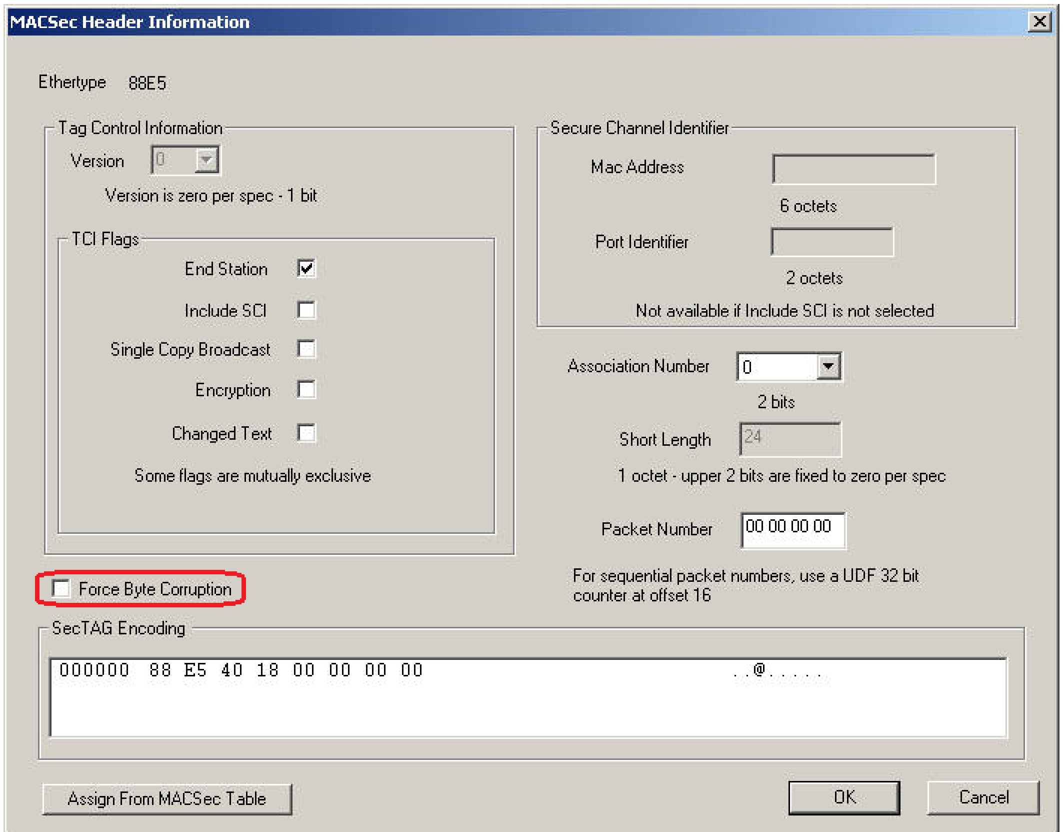
Table: Data Link Layer Protocols–MACSec Modules

Data Link Layer Protocol	Description
MacSec	If selected, MACSec button opens the MACSec Header Information window.

MACSec Header Information Editor

The MACSec Header Information editor is used to edit the Security TAG (SecTAG), and is shown in *Image: MACSec Header Information (SecTAG) Editor*. These fields comprises the encoding of the SecTAG, which is shown in the lower pane of the screen.

Image: MACSec Header Information (SecTAG) Editor



These fields of the MACSec Header Information window are defined in *Table: MACSec Header Information Editor*.

NOTE The IEEE Std. 802.1AE refers to TCI bits as bit 8 through 1, not 7 through 0. The information in the table below has been standardized to the 7-0 configuration used by Ixia.

Table: MACSec Header Information Editor

Heading	Field	Usage
Ethertype		Fixed value, set at 0x88E5.
Tag Control Information		Comprises bits 7 to 2 of octet 3 of the SecTAG.
	Version	The version is set to '0' in bit 7, per the spec (802.1 AE-2006).
TCI Flags		Note: Some flags are mutually exclusive.
	End Station	(Default) If selected, sets bit 6 of the TCI.
	Include SCI	If selected, sets bit 5 of the TCI. Then the *Secure Channel Identifier* section of this screen becomes available.
	Single Copy Broadcast	If selected, sets bit 4 of the TCI.

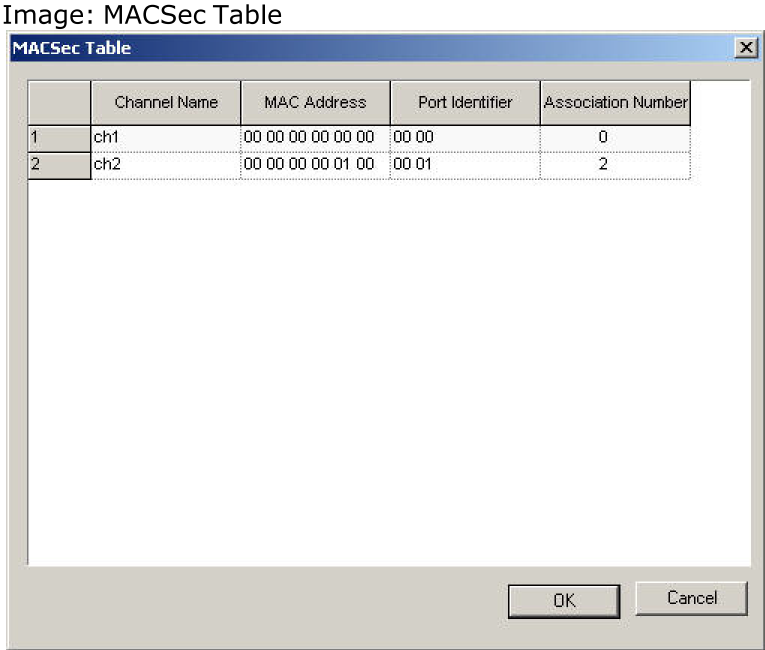
Heading	Field	Usage
	Encryption	If selected, sets bit 3 of the TCI.
	Changed Text	If selected, sets bit 2 of the TCI.
Secure Channel Identifier	MAC Address	Octets 9 through 14 of the SecTAG (six octets) encode a globally unique MAC address uniquely associated with the transmitting security entity. NOTE SCI is only available if **Include SCI** is selected. This corresponds to the MAC Address in Port Properties, **MACSec Tx or Rx** tab.
	Port Identifier	Octets 15 and 16 of the SecTAG encode the Port Identifier component of the SCI, as an integer. NOTE SCI is only available if **Include SCI** is selected. This corresponds to the Port Identifier in Port Properties, **MACSec Tx or Rx** tab.
Association Number		2 bits (bits 1 and 0 of the TCI) Choose 0, 1, 2, or 3. This corresponds to the Association Number AN 0 through AN 3 in Port Properties, **MACSec Tx or Rx** tab.
Short Length		The Short Length is the number of bytes between the last byte of the SecTAG and the first byte of the ICV, if that number is less than 48; otherwise, SL is set to 0. This number is hardware-generated, based on length of the frame, with the assumption that ICV immediately precedes FCS (the hardware does not currently support padding). NOTE 1 octet - upper 2 bits are fixed to '0' per spec
Packet Number		4 octets: Default is 00 00 00 00. NOTE For sequential packet numbers, use a UDF 32-bit counter at offset 16. If UDF is not used, this constant value goes out. If a UDF is used, the UDF overrides whatever value is entered in this field.
Force Byte Corruption		Enables byte corruption for Negative Testing.Negative Testing (Chapter 20: 10GE Port Properties).
SecTAG Encoding		The resulting header for this protocol. 8 bytes or (if Include SCI is enabled) 16 bytes.

Heading	Field	Usage
		This field shows the resulting code generated by the selections made above on this screen.
	Assign from MACSec Table	When selected, this button opens the MACSec Table shown below.

MACSec Table

The MACSec Table is populated with values that must be set up using the MACSec Tx/Rx port properties pages.

Image: MACSec Table



MACSec and VLAN

If both MACSec and VLAN protocols are enabled, the VLAN tag follows the MACSec header in the packet. *Image: MACSec Frame Format Showing VLAN Tag* for an illustration.

Protocols–Data Link Layer

The choices available for the Data Link Layer are based on the settings for the SONET header in the *Port Properties* dialog box, as shown in *Table: Data Link Layer Protocol Choices–Packet over SONET*. Only the corresponding header type appears.

Table: Data Link Layer Protocol Choices–Packet over SONET

Data Link Layer	Type	Description
Current Header		The current Data Link Layer header format, as selected in the Port Properties/SONET page. The hexadecimal format for the specific header appears in the field. This field cannot be directly edited unless the SONET header selection in Port Properties is set to *Other*.
	PPP/IPv4 or PPP/IPv6	The currently selected SONET frame header format is *PPP*, and a version of the IP protocol has been selected in the Protocol section. The two versions are IPv4 and IPv6.
	CISCO HDLC/IPv4 or CISCO HDLC/IPv6	The currently selected SONET frame header format is *Cisco HDLC*, and a version of the IP protocol has been selected in the Protocol section. The two versions are IPv4 and IPv6.
	Frame Relay	The current SONET frame header format is Frame Relay per RFC 2427. When this appears, the FR header can be edited by selecting the *Edit FR* button. Frame Relay Header (RFC 2427). The Frame Relay header is available for use with IPv4 only.
	Cisco Frame Relay	The current SONET frame header format is Cisco Frame Relay. When this appears, the FR header can be edited by selecting the *Edit FR* button. Cisco Frame Relay Header. The Cisco Frame Relay header is available for use with IPv4 only.
	Edit FR	This button is available for Frame Relay per RFC 2427 or Cisco Frame Relay header type. Select this button to show the corresponding *Frame Relay Configuration* dialog box—for either Frame Relay (RFC 2427) or Cisco Frame Relay. This button only appears if the Frame Relay option is selected in the Port Properties dialog box.Chapter 19.
	Blank (SRP)	For standard use, when Spatial Reuse Protocol (SRP) is selected for the SONET frame header format, no header type appears here, but the first two octets configured for the header in the SONET page appear here (for Address and Control). The SRP header is available for use with IPv4 only (not IPv6). NOTE FOR OPTIONAL SRP FEATURE: Frame Data for SRP for information on the SRP feature for OC-192c POS modules. When the optional SRP feature is being used on an OC-192c or OC-48c POS module, the SRP Header values appear in the

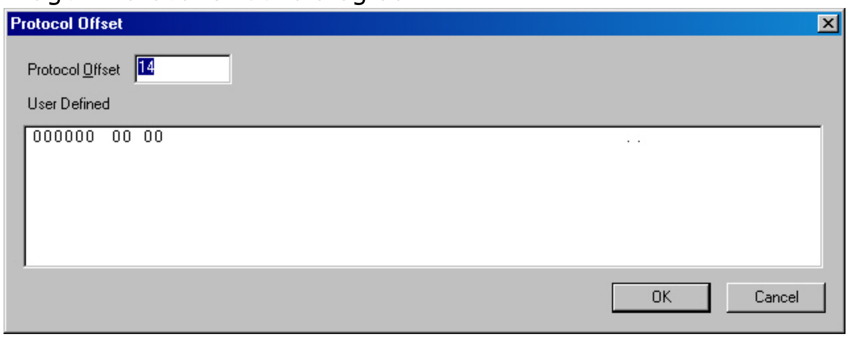
Data Link Layer	Type	Description
		Data Link Layer section (read-only), and an Edit SRP button is available.
	Edit SRP	Frame Data for SRP for information on the optional SRP feature on OC-192c and OC-48c POS modules. This button is available **only** for use with the optional SRP feature on an Ixia OC-192c or OC-48c POS module. Select this button to show the corresponding *SRP Header* dialog box.
	Ring Control	(Read-only) The 2-byte RPR *Ring Control* field. The value depends on the settings in the *RPR Ring Control* dialog box. Frame Data for RPR for information on the optional SRP feature on OC-192c and OC-48c POS modules.
	Edit Ring Control	This button is available **only** for use with the optional RPR feature on an Ixia OC-192c or OC-48c POS module. Select this button to show the corresponding *RPR Ring Control* dialog box. Frame Data for RPR for information on the optional SRP feature on OC-192c and OC-48c POS modules.
	Other	The current SONET frame header format is one other than those listed above. It can be configured manually in hexadecimal format in this *Data Link Layer Header* field, for Address, Control, and Protocol. The first two octets of the 'Other' header may be edited manually in the SONET header section of the Port Properties for Address and Control. This header type may be used with IPv4 or IPv6.
	MPLS	If selected, specifies that an MPLS label stack is to be added between the data link layer (Layer 2) and the network layer (Layer 3) in the packet. The MPLS button is available for port types which support MPLS. The contents of the MPLS tag may be edited through the Edit MPLS.
	Offset	If selected, you may custom-configure the offset in the packet where the 2-byte *Protocol Type* field appears, as well as the data in the *Protocol Type* field. Protocol Offset dialog box for additional information.

Protocol Offset dialog box

The *Protocol Offset* dialog box for certain modules is shown in *Image: Protocol Offset dialog box*. It allows to create a user-defined field after the MAC addresses and before the start of the network layer (Layer 3) protocol header, and is intended for use with IPv4 and IPv6. This field can be from 2 to 48 bytes in length, and may contain information such a PPPoE header (for use with other Ixia applications). This dialog box is accessed by selecting the Protocol Offset option button in the Protocols sub-tab. Protocol Control for Ethernet and 10 GE Modules for more information.

See an example of Protocol Offset configuration in Protocol Offset—Example.

Image: Protocol Offset dialog box



The fields in this dialog box are described in *Table: Protocol Offset dialog box*.

Table: Protocol Offset dialog box

Field	Description
Protocol Offset	(in bytes) The number of bytes from the start of the packet where the start of the protocol header is located. The default value is 14 bytes. Since the DA and SA MAC addresses occupy the first 12 bytes, this allows for a default of 2 bytes for the user-defined field. The valid range for the protocol offset is 14 bytes to the maximum stream frame size minus the size of the CRC (4 bytes). For older 10/100 and GBIC Modules, the maximum offset size is 40 bytes.
User Defined	Enter the desired user data in this field. This is the User Defined field/tag that is inserted into the packet between the end of the MAC addresses and the start of the Layer 3 protocol header. The valid range for the length of the *User Defined* field is from 2 to 48 bytes. If the data value entered here is smaller than the space between the old and new offsets, the remainder of the field is padded with zeroes. If the data value entered here is larger than the space between the old and new offsets, it is truncated.

Protocol Offset—Example

An example of a Protocol Offset configuration is shown in *Image: Protocol Offset—Example*,*Image: Protocol Offset—Example Diagram*, and *Image: Protocol Offset Example Shown in Packet View*. In this example, the Protocol Offset is 20 bytes, so the User Defined tag/field is 8 bytes long. The selected network protocol is IPv4.

Image: Protocol Offset—Example

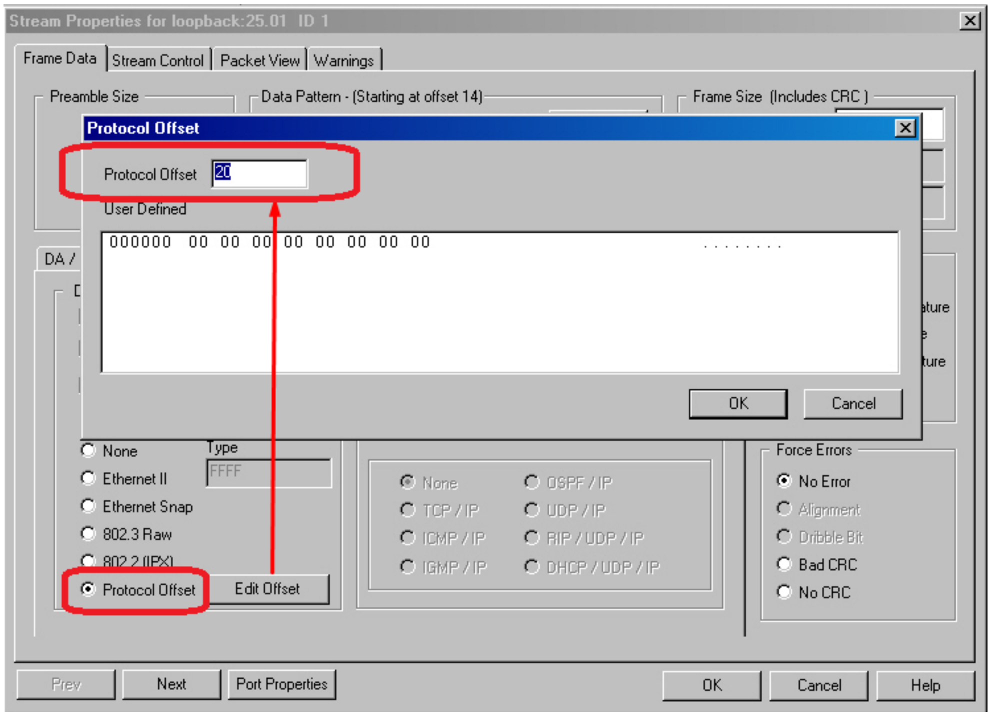


Image: Protocol Offset—Example Diagram

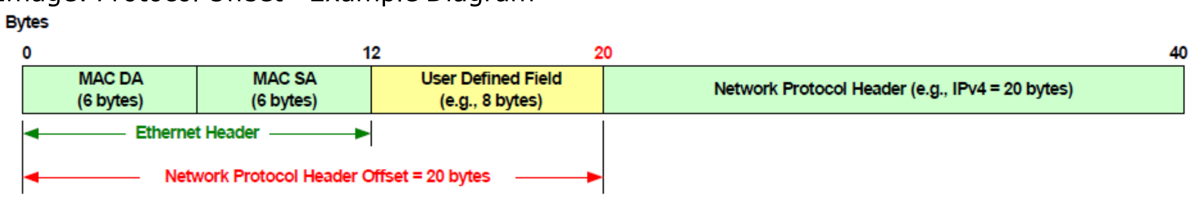
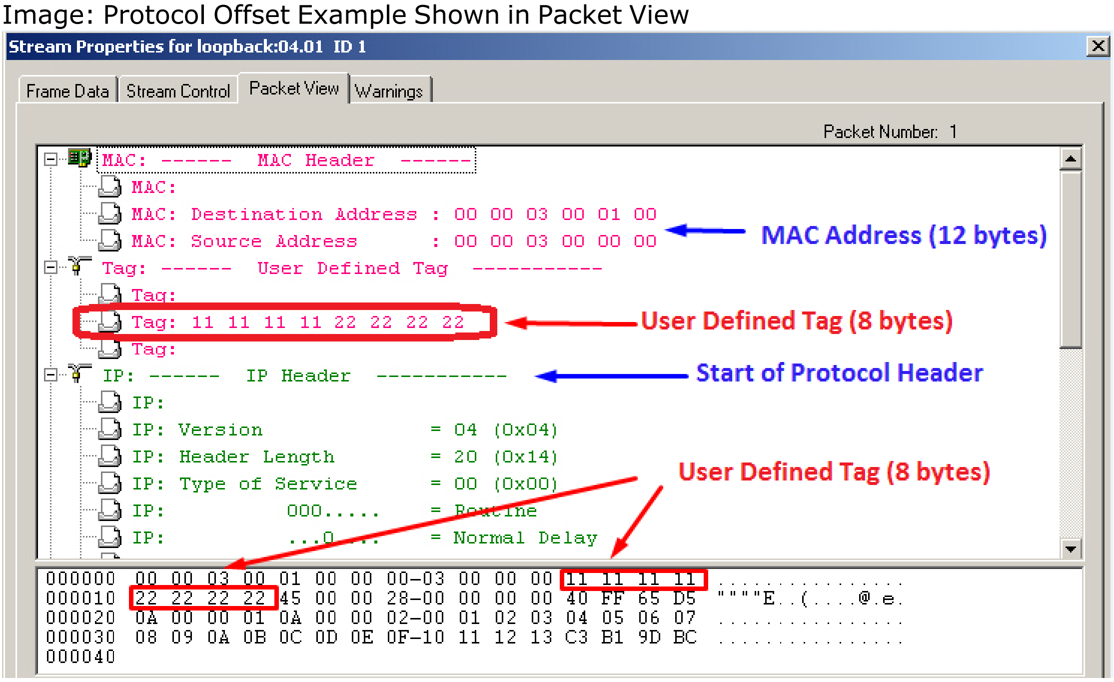


Image: Protocol Offset Example Shown in Packet View

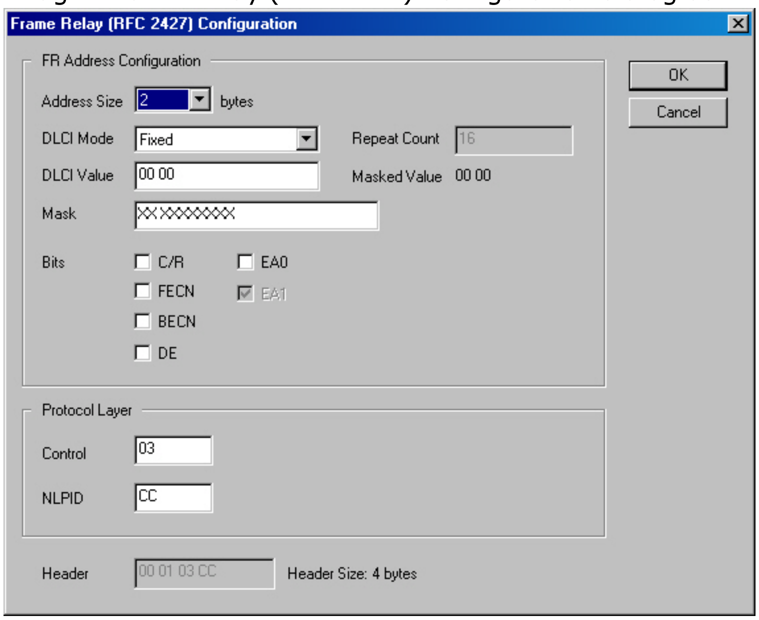


NOTE When employing the Protocol Offset feature, offset Layer 3 protocol information (in the Capture View) in received packets is not correctly decoded.

Frame Relay Header (RFC 2427)

The *Frame Relay (RFC 2427) Configuration* dialog box is shown in *Image: Frame Relay (RFC 2427) Configuration dialog box* . This dialog box is accessed by first selecting the *Frame Relay* option in the *Port Properties* dialog box, then selecting the *Edit FR* button in the Data Link Layer section of the *Protocols* sub-tab.

Image: Frame Relay (RFC 2427) Configuration dialog box



The bits check box options change depending on the selected number of bytes in the *Address Size* field.*Image: Bits Options for Address Sizes shows the different options*.

Image: Bits Options for Address Sizes

The fields and controls in the Frame Relay configuration dialog box are described in *Table: Frame Relay (RFC 2427) Configuration dialog box* .

Table: Frame Relay (RFC 2427) Configuration dialog box

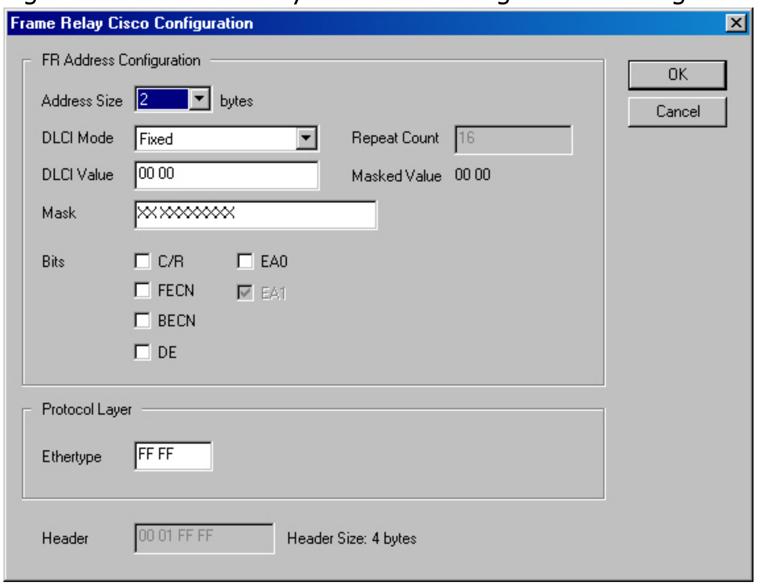
Section	Field/Control	Description
FR Address Configuration	Address size	The size of the Q.922 frame relay address in bytes. Choose one of: • 2 • 3 • 4
	DLCI Mode	For Multiple DLCIs (where supported). Data Link Connection Identifier (DLCI) incrementing mode. Choose one of: • Increment • Continuous Increment • Decrement • Continuous Decrement • Fixed • Random
	Repeat Count	For Multiple DLCIs (where supported). Enter an integer value for the number of times to repeat process (defined as DLCI mode) for creating DLCIs.
	DLCI Value	Data Link Connection Identifier value. Can be set to a maximum value of 00 7F FF FF
	Mask	For Multiple DLCIs (where supported). The mask is applied to the DLCI value (as exclicked in hexadecimal format). The mask length is defined by the number of bytes in the address—2, 3, or 4 bytes of 2 nibbles each. X's, 1's, and 0's may be entered. An 'X' allows the defined DLCI hex character to be visible, and active. A '1' or a '0' masks the DLCI character with that value, so only the entered '1' or '0' is visible and active. (The default is all X's.)
	Masked Value	The masked value that appears, is the DLCI Value (exclicked in hexadecimal format), with the Mask applied. When Multiple DLCIs are not supported, the default value is applied—all X's—so the complete DCLI value appears in hex format.
	Bits	Sets the bits in the Frame Relay header for: • C/R: Command Response bit.

Section	Field/Control	Description
		• FECN: Forward Explicit Congestion Notification. • BECN: Backward Explicit Congestion Notification. • DE: Discard Eligibility. • EA0: Address Field Extension 0 - available for 2, 3, and 4-byte addresses. • EA1: Address Field Extension 1 - available for 2, 3, and 4-byte addresses. • EA2: Address Field Extension 2 - available for 3, and 4-byte addresses. • EA3: Address Field Extension 3 - available for 4-byte addresses. • D/C: Available for 3 and 4-byte addresses. • DL-Core: Available for 3 and 4-byte address, when D/C is selected. When the D/C bit is turned on, the high six bits of the lowest byte in the Address represent DL-Core value. They are not part of DLCI value. NOTE EAs occur as the last bit in an address byte. They allow the indication of 3 and 4-byte headers. NOTE Regular (non 622) POS modules only support fixed mode (listed in **DLCI Modes** above) when using the D/C bit.
Protocol Layer		To indicate the type of protocol being encapsulated by the frame relay header.
	Control	(For Frame Relay per RFC 2427 only) The Q.922 Control field. The default is 0x03.
	NLPID	(For Frame Relay per RFC 2427 only) The *Network Level Protocol ID* field indicates the type of encapsulation protocol which follows. When any of the IP protocols is selected for that port in the Protocol section of the **Frame Data** tab, the NLPID default value is 0xCC (as defined for IPv.4).
	Ethertype	(For Cisco Frame Relay only) The PID (Protocol Identifier) is the Ethertype (FF FF). There is no defined NLPID for this protocol, so by default, a SNAP header is being used for IP routing—indicated by the Ethertype of FF FF.
Header		Header Size: 4, 5, or 6 bytes. If the Address size is set to 2 bytes, the overall frame header size is 4 bytes, if set to 3 the header is 5, if set to 4 the header is 6. The contents of the header appear in the field (not editable).

Cisco Frame Relay Header

The *Frame Relay Cisco Configuration* dialog box is shown in *Image: Cisco Frame Relay—Header Configuration dialog box*. This dialog box is accessed by first selecting the *CiscoFrame Relay* option in the *Port Properties* dialog box, then selecting the *Edit FR* button in the Data Link Layer section of the *Protocols* sub-tab.

Image: Cisco Frame Relay—Header Configuration dialog box



Refer to *Table: Frame Relay (RFC 2427) Configuration dialog box* for information on the fields and controls in this dialog box.

Ethernet II Packet Format

Image: Ethernet II Packet Format

The Destination Address (Dest Addr) and Source Address (Source Addr) are MAC addresses programmed through the use of the *DA/SA Property Sheet. The Frame Check Sequence (FCS) is calculated according to the CRC-32 format. The Type field is automatically set to correspond to the Network/Transport protocol selected, as shown in Table: Type Field Values.*

Table: Type Field Values

Network/Transport Packet Type	Type Value
IP	0x0800
IPX	0x8137
Pause Control	0x8808

Network/Transport Packet Type	Type Value
ARP	0x0806

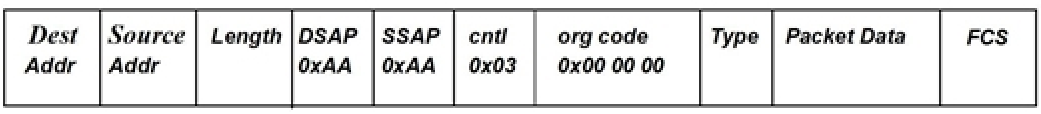
802.2 (IPX) Packet Format

Image: 802.2 (IPX) Packet Format

The Destination Address (Dest Addr) and Source Address (Source Addr) are MAC addresses programmed through the use of the *DA/SA Property Sheet. The Frame Check Sequence (FCS) is calculated according to the CRC-32 format. The length field is automatically calculated.*

Ethernet SNAP Packet Format

Image: Ethernet SNAP Packet Format



The Destination Address (Dest Addr) and Source Address (Source Addr) are MAC addresses programmed through the use of the *DA/SA Property Sheet. The Frame Check Sequence (FCS) is calculated according to the CRC-32 format. The length field is automatically calculated. The type field is automatically set to correspond to the Network/Transport protocol selected, as shown in Table: Type Field Values.*

Table: Type Field Values

Network/Transport Packet Type	Type Value
IP	0x0800
IPX	0x8137
Pause Control	0x8808
ARP	0x0806

802.3 Raw Packet Format

802.3 raw packets are only useful for the IPX protocol.

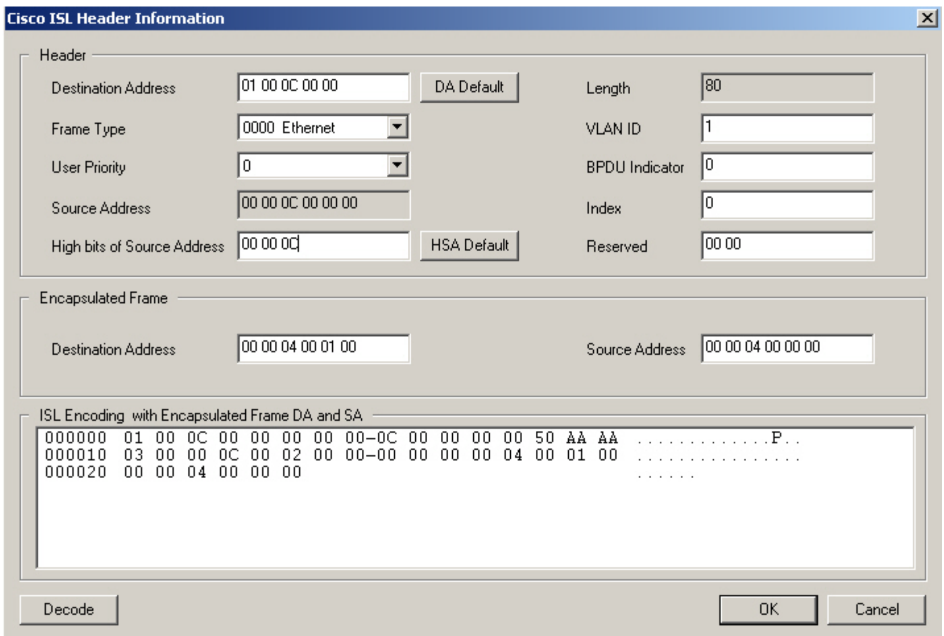
Image: 802.3 Raw Packet Format

The Destination Address (Dest Addr) and Source Address (Source Addr) are MAC addresses programmed through the use of the *DA/SA Property Sheet. The Frame Check Sequence (FCS) is calculated according to the CRC-32 format. The length field is automatically calculated. The first bytes of the packet data are 0xFFFF.*

Edit ISL

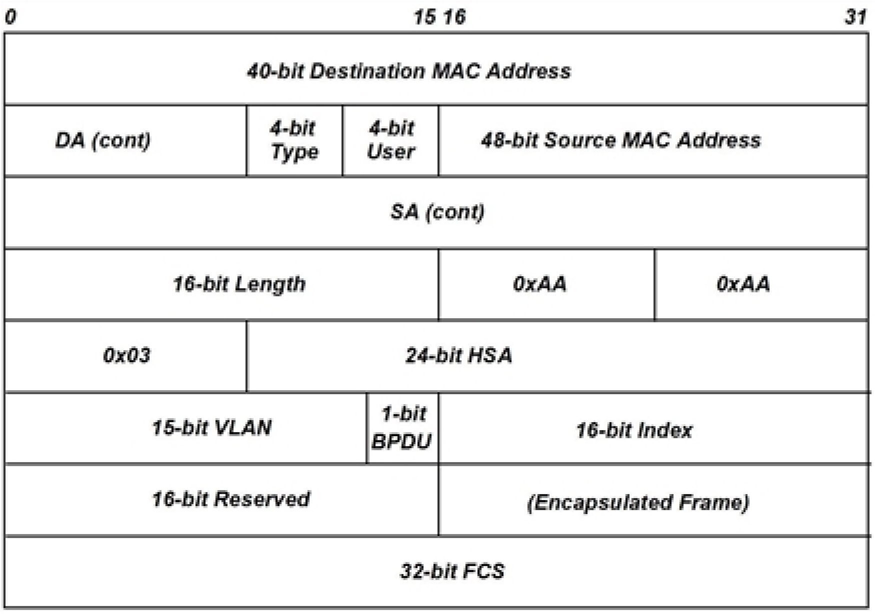
The *ISL* button opens the *Cisco ISL Header Information* dialog box is used to edit the attributes of Cisco-proprietary InterSwitch Link (ISL) encapsulation data. The dialog box is shown in *Image: Cisco ISL Header Information dialog box*.

Image: Cisco ISL Header Information dialog box



The format of an ISL encapsulation is shown in *Image: ISL Packet Format*.

Image: ISL Packet Format



The elements of the dialog box and their correspondence to the contents of an ISL packet are described in *Table: Cisco ISL Header Information dialog box elements*.

Table: Cisco ISL Header Information dialog box elements

ISL Packet Field	Dialog box field	Description
Destination MAC Address	Destination Address	This address is a multicast address and is currently set to 0x01 00 0C 00 00. This value, as the first 40 bits of the DA, signals the receiver that the packet is in ISL format. The DA *Default* button sets this value.
Type	Frame Type	The 4- bit type field indicates the type of frame that is encapsulated. The following options are available, with associated values: • 0000 - Ethernet • 0001 - Token-Ring • 0010 - FDDI • 0011 - ATM • 0100 through 1111 - Undefined
User	User Priority	For Ethernet frames, this 4-bit field indicates the priority of the packet as it passes through the switch. The valid range is 0 through 7.
Source MAC Address	Source Address	This is the MAC address of the packet source and is set from the [DA/SA Property Sheet](). *The upper 3 bytes of the SA are reflected in the HSA field, described below.*

ISL Packet Field	Dialog box field	Description
HSA	High bits of Source Address	The HSA is the upper 3 bytes of the Source Address, which corresponds to the manufacturers ID. The HSA *Default* button sets this to the Cisco value: 0x00 00 0C.
Length	Length	The length of the original packet (minus the 18 bytes of the DA, Type, User, SA, Length, and FCS fields).
VLAN	VLAN ID	The Virtual LAN Identifier of the packet.
BPDU	BPDU Indicator	This bit is set for all Bridge Protocol Data Unit packets that are encapsulated by the ISL frame.
Index	Index	For diagnostic purposes when used with switches, this 16-bit value is the port index of the packet as it exits the switch. It is ignored upon receipt of the packet.
Reserved	Reserved	Used when Token Ring or FDDI packets are encapsulated within an ISL packet. • For **Token Ring** packets, the AC and FC fields are placed here. • For **FDDI**, the FC field is placed in the least significant byte of this field. • For **Ethernet** packets, this field should be set to zeros.
Encapsulated Frame	Destination Address/Source Address	The *Encapsulated Frame* contains the original packet being sent. When the Ixia system sends ISL-encapsulated packets, the DA/SA fields are set from the ISL dialog box, rather than in the DA/SA Property Sheet.
FCS		The 4-byte Frame Check Sequence (FCS) field contains a 32-bit CRC that is automatically calculated and added to the end of the ISL frame.

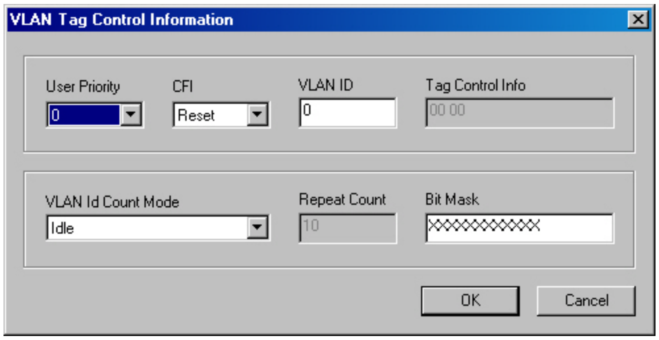
Edit VLAN

Depending on the module type, selecting the *VLAN* button opens the *VLAN Tag Control Information* dialog or the *VLAN(s)* dialog, allowing some of the contents of a VLAN tag header to be specified.

The TXS and LSM10G modules also allow for the creation of Q-in-Q VLANs (also known as stacked VLANs). The stacked VLAN configuration dialog is described in Stacked VLAN Configuration.

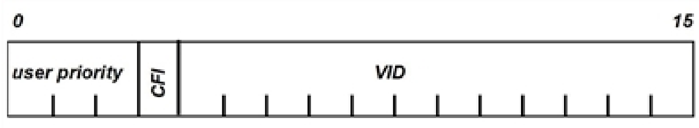
VLAN-tagged frames are used to direct data traffic for Virtual Local Area Networks (VLANs), per IEEE 802.1Q. This dialog is shown in *Image: VLAN Tag Control Information dialog box*.

Image: VLAN Tag Control Information dialog box



The format of a Tag Control Information (TCI) field for a VLAN tag header is shown in *Image: VLAN Tag Control Information (TCI) Format*. The *VLAN Tag Control Information* dialog allows to specify the contents of this field. This field is included in the VLAN tag headers for Ethernet frames (as part of the Ethernet Tag Protocol Identifier/ETPID), and for SNAP protocol frames (as part of the SNAP Tag Protocol Identifier/STPID).

Image: VLAN Tag Control Information (TCI) Format



The fields in this dialog are described in *Table: VLAN Tag Control dialog box*.

Table: VLAN Tag Control dialog box

Field	Description
User Priority	The user priority of the tag: a value from 0 through 7. The use and interpretation of this field is defined in ISO/IEC 15802-3.
CFI	The Canonical Format Indicator is a single bit flag. Choose one of: • Reset • Set
VLAN ID	A unique, 12-bit VLAN Identifier which specifies the VLAN with which this frame is associated.
Tag Control Information	(TCI) A read-only field that indicates the two octets formed by the combination of other values in the upper part of this dialog.
VLAN ID Count Mode	Used to set the mode by which the VID varies. The choices are: • **Fixed**: The single ID specified in the VID field is used. • **Increment**: The ID specified in the VID field is used as the start of a number of repeated sequence of VIDs as indicated by the Repeat Count field and the Step field. • **Decrement**: The ID specified in the VID field is used as the start of a number of repeated sequence of VIDs as indicated by the Repeat Count field and the Step field.

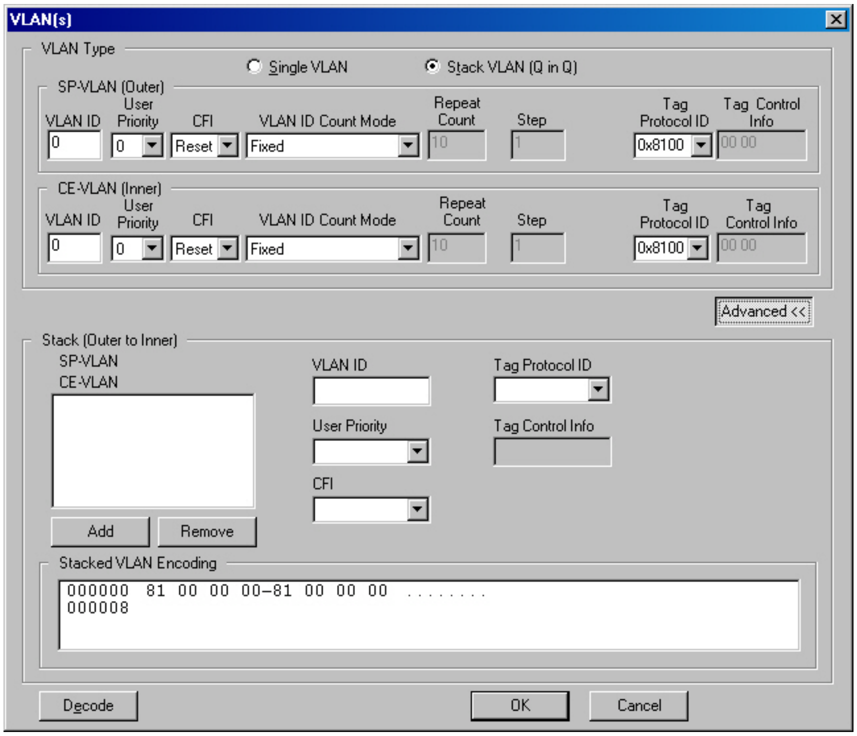
Field	Description
	• **Continuous Increment**: The ID specified in the VID field is used as the start of an infinite sequence of VIDs, with the increment based on the value in the Step field. • **Continuous Decrement**: The ID specified in the VID field is used as the start of an infinite sequence of VIDs, with the decrement based on the value in the Step field. • **Random**: The VID is varied randomly as indicated by the Bit Mask field.
Repeat Count	(Integer) For use with the Increment and Decrement VLAN ID Mode choices, this indicates the length of the cycle of varied VIDs.
Bit Mask	For use with the Random VLAN ID Count Mode, the Bit Mask field indicates which bits of the VID counter may vary and which must remain constant. The Bit Mask field may contain the following characters: • 0: the corresponding VID bit is always '0.' • 1: the corresponding VID bit is always '1.' • X: the corresponding VID bit may vary according to the VLAN ID Count Mode and Repeat Count fields.

Stacked VLAN Configuration

VLAN Stacking (also known as Q in Q) refers to a mechanism where one VLAN (Virtual Local Area Network) may be encapsulated within another VLAN. This allows a carrier to partition the network among several national ISPs, while allowing each ISP to still utilize VLANs to their full extent. For more information on stacked VLANs, refer to the Stacked VLANs (Q in Q) section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual* for more information.

The VLAN(s) dialog is used to configure stacked VLANs is shown in *Image: Stacked VLAN Configuration*.

Image: Stacked VLAN Configuration



The fields in this dialog are described in *Table: VLAN Tag Control dialog box*.

Image: Stacked VLAN Header Information shows the stacked VLAN packet composition within a packet header.

Image: Stacked VLAN Header Information

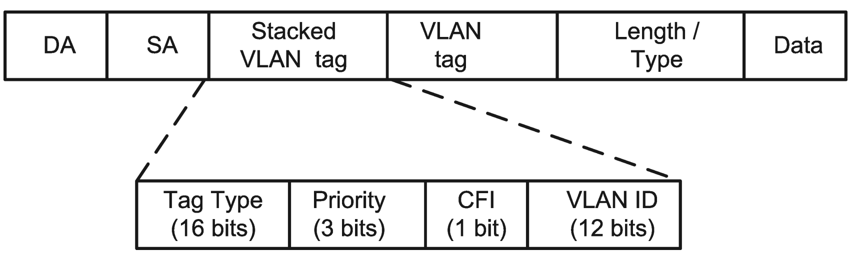


Image: MACSec Frame Format Showing VLAN Tag shows the VLAN tag within a MACSec frame .

Image: MACSec Frame Format Showing VLAN Tag

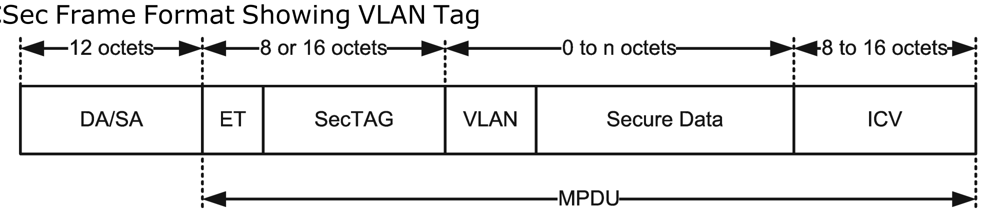


Table: VLAN Tag Control dialog box

Section	Field	Description
VLAN		Allows to select what type of VLAN is to be used.

Section	Field	Description
Type		
	Single VLAN	A simple, single VLAN is included with the packet.
	Stack VLAN (Q in Q)	A stacked VLAN configuration is included with the packet. Selecting this option expands the dialog so that both the outer and inner VLAN information can be configured.
SP-VLAN (Outer)		The Service Provider (SP) VLAN tag information.
	VLAN ID	A unique, 12-bit VLAN Identifier which specifies the VLAN with which this frame is associated.
	User Priority	The user priority of the tag: a value from 0 through 7. The use and interpretation of this field is defined in ISO/IEC 15802-3.
	CFI	The Canonical Format Indicator is a single bit flag. Choose one of the following: • Reset • Set
	VLAN ID Count Mode	Used to set the mode by which the VID varies. The choices are as follows: • **Fixed**: The single ID specified in the VID field is used. • **Increment**: The ID specified in the VID field is used as the start of a number of repeated sequence of VIDs as indicated by the Repeat Count field and the Step field. • **Decrement**: The ID specified in the VID field is used as the start of a number of repeated sequence of VIDs as indicated by the Repeat Count field and the Step field. • **Continuous Increment**: The ID specified in the VID field is used as the start of an infinite sequence of VIDs, with the increment based on the value in the Step field. • **Continuous Decrement**: The ID specified in the VID field is used as the start of an infinite sequence of VIDs, with the increment based on the value in the Step field. • **Random**: The VID is varied randomly as indicated by the Bit Mask field.
	Repeat Count	(Integer) For use with the Increment and Decrement VLAN ID Mode choices, this indicates the length of the cycle of varied VIDs.
	Step	(Not present for 10G LSM and MSM cards.)(Integer) For use with the Increment, Decrement, Continuous Increment, and Continuous Decrement fields. You can define the size the of the increment step.

Section	Field	Description
	Bit Mask	(Not present for 10G LSM and MSM cards.)For use with the Random VLAN ID Mode, the Bit Mask field indicates which bits of the VID counter may vary and which must remain constant. The Bit Mask field may contain the following characters: • 0: the corresponding VID bit is always '0.' • 1: the corresponding VID bit is always '1.' • X: the corresponding VID bit may vary according to the VLAN ID Mode and Repeat Count fields.
	Tag Protocol ID	EtherTypes identify the protocol that follows the VLAN header. Select from a list of hex options: • 0x8100 • 0x9100 • 0x9200 • 0x88A8 • 0x9300
	VLAN Tag Control Information	(TCI) A read-only field that indicates the two octets formed by the combination of other values in the upper part of this dialog.
CE-VLAN (Inner)		The Customer Edge (CE) VLAN tag information.
	VLAN ID	A unique,12-bit VLAN Identifier which specifies the VLAN with which this frame is associated.
	User Priority	The user priority of the tag: a value from 0 through 7. The use and interpretation of this field is defined in ISO/IEC 15802-3.
	CFI	The Canonical Format Indicator is a single bit flag. Choose one of: • Reset • Set
	VLAN ID Count Mode	Used to set the mode by which the VID varies. The choices are as follows: • **Fixed**: The single ID specified in the VID field is used. • **Increment**: The ID specified in the VID field is used as the start of a number of repeated sequence of VIDs as indicated by the Repeat Count field and the Step field. • **Decrement**: The ID specified in the VID field is used as the start of a number of repeated sequence of VIDs as indicated by the Repeat Count field and the Step field. • **Continuous Increment**: The ID specified in the VID field is

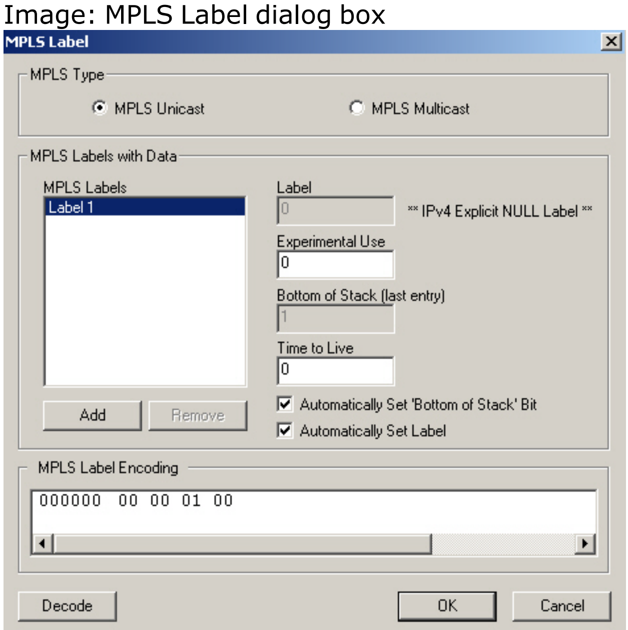
Section	Field	Description
		used as the start of an infinite sequence of VIDs, with the increment based on the value in the Step field. • **Continuous Decrement**: The ID specified in the VID field is used as the start of an infinite sequence of VIDs, with the increment based on the value in the Step field. • **Random**: The VID is varied randomly as indicated by the Bit Mask field.
	Repeat Count	(Integer) For use with the Increment and Decrement VLAN ID Count Mode choices, this indicates the length of the cycle of varied VIDs.
	Step	(Not present for 10G LSM and MSM cards.)(Integer) For use with the Increment, Decrement, Continuous Increment, and Continuous Decrement fields. You can define the size the of the increment step.
	Bit Mask	(Not present for 10G LSM and MSM cards.)For use with the Random VLAN ID Count Mode, the Bit Mask field indicates which bits of the VID counter may vary and which must remain constant. The Bit Mask field may contain the following characters: • 0: the corresponding VID bit is always '0.' • 1: the corresponding VID bit is always '1.' • X: the corresponding VID bit may vary according to the VLAN ID Count Mode and Repeat Count fields.
	Tag Protocol ID	EtherTypes identify the protocol that follows the VLAN header. Select from a list of hex options: • 0x8100
	VLAN Tag Control Information	(TCI) A read-only field that indicates the two octets formed by the combination of other values in the upper part of this dialog.
	Advanced button	Selecting this button opens an expanded set of stacked VLAN options, specifically the ability to add more than one inner VLAN.
Stack (Outer to Inner)		Allows to create more than one inner VLAN and arrange them into a stack.
	VLAN ID	A unique, 12-bit VLAN Identifier which specifies the VLAN with which this frame is associated.
	User Priority	The user priority of the tag: a value from 0 through 7. The use and interpretation of this field is defined in ISO/IEC 15802-3.
	CFI	The Canonical Format Indicator is a single bit flag. Choose one of: • Reset

Section	Field	Description
		• Set
	Tag Protocol ID	EtherTypes identify the protocol that follows the VLAN header. Select from a list of hex options: • 0x8100
	VLAN Tag Control Information	(TCI) A read-only field that indicates the two octets formed by the combination of other values in the upper part of this dialog.

Edit MPLS

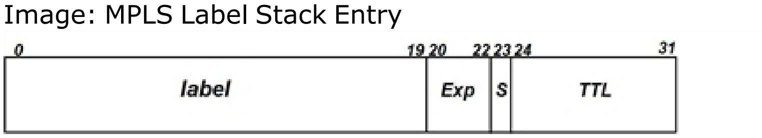
The *MPLS* button opens the *MPLS Label* dialog box, which allows for the configuration of some MPLS label information. The dialog box allows one or more MPLS labels to be inserted between the data link layer and network data layer of outgoing packets. The *MPLS Label* dialog box is shown in *Image: MPLS Label dialog box*.

Image: MPLS Label dialog box



The format of an MPLS stack entry is shown in *Image: MPLS Label Stack Entry*.

Image: MPLS Label Stack Entry



The fields and controls in this dialog box are described in *Table: MPLS Label dialog box*.

Table: MPLS Label dialog box

Section	Field/Control	Description
MPLS Type		Sets the overall packet type for the MPLS data.
	MPLS Unicast	Sets the overall packet type to unicast.
	MPLS Multicast	Sets the overall packet type to multicast.
MPLS Labels with Data		The data associated with all of the labels on the label stack.
	MPLS Labels	Representations of the labels on the label stack. Highlight an item in this list to edit its contents using the *Label* field. NOTE The *Label* field is available for use only if the *Automatically Set Label* check box is cleared.
	Label	The value of the label element of the entry. Several values have specific interpretations which are exclicked to the right of the label value: • 0: IPv4 Explicit NULL Label. Only valid as the one and only entry on the stack, indicating that the entry should be popped and forwarding of the packet should be done based on the IPv4 header. • 1: Router Alert Label. Valid anywhere in the stack except at the bottom. Used to signal an alert to the software associated with the router that finds this at the top of the stack. • 2: IPv6 Explicit NULL Label. As in '0', but with IPv6 header interpretation. • 3: Implicit NULL Label. A reserved value used within a router. • 4-15: Reserved.
	Experimental Use	A three-bit field that may be used for experimental purposes.
	Bottom of Stack (last entry)	A single bit that represents the last entry (bottom) of the stack.
	Time to Live	The TTL field. It is decremented by routers as they process label stack entries.
	Automatically Set 'Bottom of Stack' Bit	If selected, the *Bottom of Stack* field above is dimmed and made unavailable. The 'S' (bottom of stack) bit is automatically set for the bottom stack entry and reset for all other entries.

Section	Field/Control	Description
	Automatically Set Label	If selected, the *Label* field is dimmed (inactive). The label values are automatically assigned. If cleared, you can enter a custom value for the label that is highlighted in the *MPLS Labels* list.
	Add	Select this button to add a new label to the bottom of the label stack.
	Remove	Select this button to delete the highlighted label entry in the list. All entries below the deleted entry are renumbered up so that the stack always reads: *Label1, Label2, Label3, ...*
MPLS Label Encoding		The data view reflects the data associated with the entire stack. As changes are made in the *MPLS Labels with Data* field, they are reflected in this field. Changes can also be made in this field and then reflected back into the label stack through the *Decode* button.
	Decode	Used to move changes from the *MPLS Label Encoding* field back to the label stack.

Edit OAM

The *OAM* button opens the *OAM* dialog box, which allows for the configuration of all stateless OAM PDUs, such as Information, Event Notification, Variable Request, Variable Response, Loopback, and Organization Specific. The *OAM* dialog box differs depending on the Code field that is selected. It is shown (with Information code selected) in *Image: OAM dialog box–Information Code*. It is shown with other code selections on the next page.

Image: OAM dialog box–Information Code

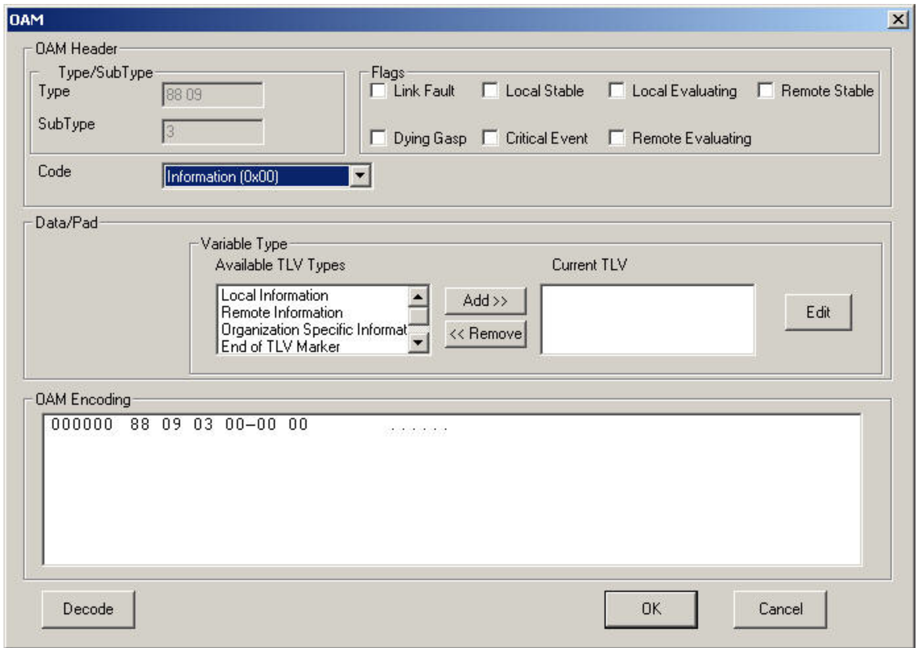


Image: OAM dialog box–Event Notification Code

Image: OAM dialog box–Variable Request Code

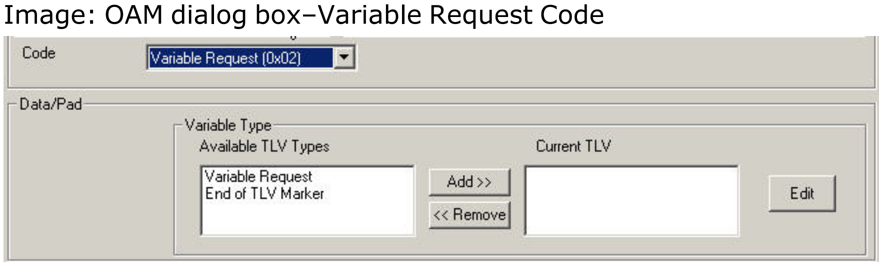


Image: OAM dialog box–Variable Response Code

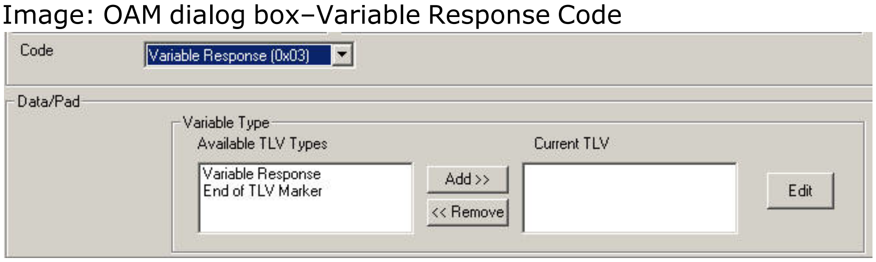


Image: OAM dialog box–Loopback Control Code

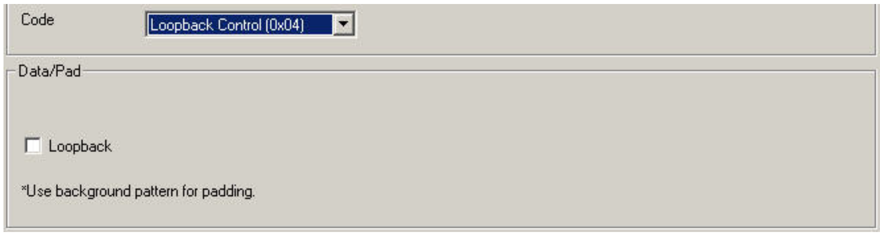
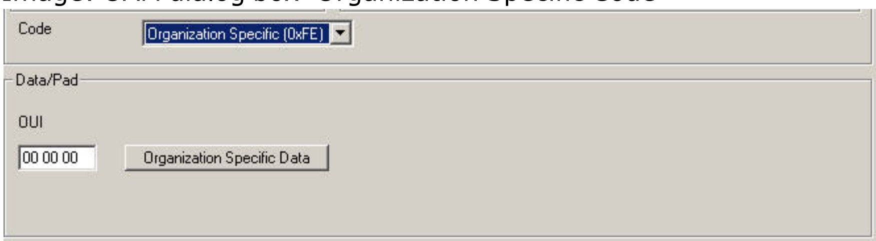


Image: OAM dialog box–Organization Specific Code



The fields and controls in this dialog box are described in *Table: OAM dialog box*.

Table: OAM dialog box

Section	Field/Control	Description
OAM Header	Type/Subtype	Type: 88 09 (Slow Protocols) Subtype: 3 (0x03 = OAM)
	Flags	check boxes to enable flags. A 2-byte flags field contains the discovery status of local and remote OAM entities, as well as fault indications. Link FaultLocal StableLocal EvaluatingRemote StableDying GaspCritical EventRemote Evaluating
	Code	OAM PDU types: Information [0x00]Event Notification [0x01]Variable Request [0x02]Variable Response [0x03]Loopback Control [0x04]Organization Specific [0xFE]
Data/Pad	Sequence	Only present when Code = Event Notification (*Image: OAM dialog box–Event Notification Code*) The OAM client increments the Sequence Number for each unique Event Notification OAMPDU formed by the OAM client. A particular Event Notification OAMPDU may be sent multiple times with the same sequence number. Upon receiving an Event Notification OAMPDU, the OAM client compares the Sequence Number with the last received Sequence Number. If equal, the current event is a duplicate and is ignored by the OAM client. Default = 0
	Loopback	Only present when Code = Loopback Control (*Image: OAM dialog box–Loopback Control Code*)

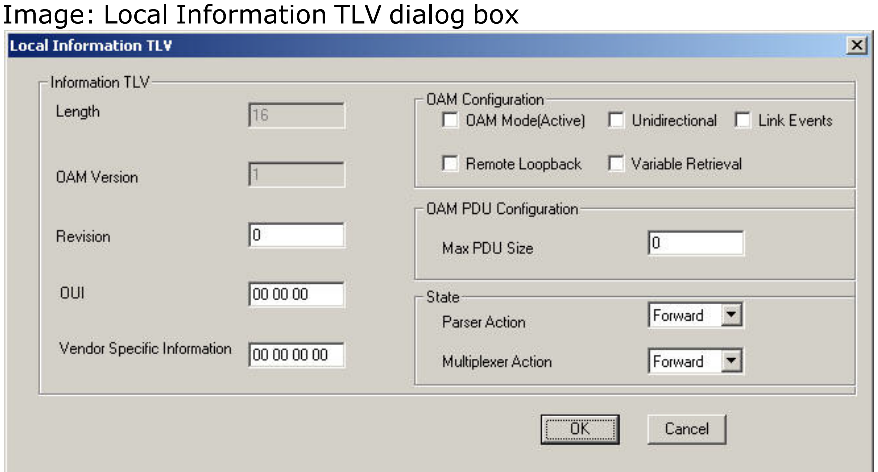
Section	Field/Control	Description
		check box (to enable) NOTE Use background pattern for padding.
	OUI	Only present when Code = Organization Specific (*Image: OAM dialog box–Organization Specific Code*)Organizationally Unique Identifier
	Organization Specific Data (button)	Select the **Organization Specific Data** button to open the editor to view and edit data. An example is shown below.
	Available TLV Types	List of TLV types depends on the Code selection For Code = Information [0x00] (*Image: OAM dialog box–Information Code*) Local Information (Local/Remote Information TLV dialog box) Remote Information (Local/Remote Information TLV dialog box) Organization Specific Information (Organization Specific Information/Event TLV dialog box) End of TLV Marker For Code = Event Notification [0x01] (*Image: OAM dialog box–Event Notification Code*) Errored Symbol Period (Errored Symbol Period TLV dialog box) Errored Frame (Errored Frame / Period TLV dialog box) Errored Frame Period (Errored Frame / Period TLV dialog box) Errored Frame Seconds Summary (Errored Frame Seconds Summary TLV dialog box) Organization Specific (Organization Specific Information/Event TLV dialog box) End of TLV Marker For Code = Variable Request [0x02] (*Image: OAM dialog box–Variable Request Code*) Variable Request (Variable Request TLV) End of TLV Marker For Code = Variable Response [0x03] (*Image: OAM dialog box–Variable Response Code*) Variable Response (Variable Request TLV) End of TLV Marker
	Current TLV	Select the **Edit** button to open the TLV editing dialog box for the selected TLV.

Section	Field/Control	Description
OAM Encoding		Editable OAM portion of packet view.
	Decode button	After editing in the OAM Encoding pane, select **Decode** to load the revised values into the appropriate fields in the OAM configuration.

Local/Remote Information TLV dialog box

The Local and Remote Information TLV dialog boxes are identical in content. Local and remote information is used in the discovery process. The Local Information TLV dialog box (identical to the Remote version) is shown in *Image: Local Information TLV dialog box*.

Image: Local Information TLV dialog box



The fields and controls are described in *Table: Local / Remote Information TLV dialog box*.

Table: Local / Remote Information TLV dialog box

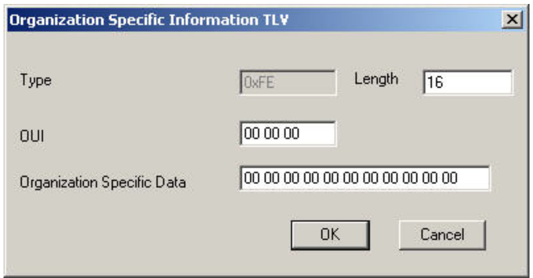
Section	Field/Control	Description
Information TLV	Length	*Read only.* Default = 0
	OAM Version	*Read only.* Value: 1 (0x01) The version supported by the DTE.
	Revision	Default = 0 The current revision of the Information TLV. The value of this field shall start at zero and be incremented each time something in the Information TLV changes.
	OUI	Default = 00 00 00 24-bit 3-octet field, Organizationally Unique Identifier.

Section	Field/Control	Description
	Vendor Specific Information	Default = 00 00 00 00 4-octet field, 32-bit identifier that may be used to differentiate a vendor's product models/versions.
OAM Configuration	OAM Mode (Active)	Active when selected, passive when cleared. DTE configured in active or passive mode.
	Unidirectional	OAM provides an OAM PDU-based mechanism to notify the remote DTE when one direction of a link is non-operational and therefore data transmission is disabled. The ability to operate a link in a unidirectional mode for diagnostic purposes supports failure detection and notification.
	Link Events	Selected = is capable of interpreting link events
	Remote Loopback	Selected = is capable of OAM remote loopback mode
	Variable Retrieval	Selected = is capable of variable retrieval (Variable Request TLV)
OAM PDU Configuration	Max PDU Size	Default = 0 11-bit field which represents the largest OAM PDU, in octets, supported by the DTE. This value is compared to the remote's Maximum PDU Size and the smaller of the two is used.
State	Parser Action	Forward: Lower layer forwards request to upper layer. Loopback: Lower layer will send back request. Discard: Lower layer will discard request.
	Multiplexer Action	Forward: Sends on the request over the wire. Discard: Discards the request.

Organization Specific Information/Event TLV dialog box

The Organization Specific Information TLV is used for vendor extensions. The 32-bit vendor specific information is not defined and is used to encode the model or version of the platform. The Organization Specific Information TLV dialog box is shown in *Image: Organization Specific Information TLV dialog box*.

Image: Organization Specific Information TLV dialog box



The fields and controls in this dialog box are described in *Table: Organization Specific Information TLV dialog box*.

Table: Organization Specific Information TLV dialog box

Field	Description
Type	*Read only.* 0xFE = Organization Specific Information
Length	Editable. Default = 16
OUI	Default = 00 00 00 24-bit 3-octet field, Organizationally Unique Identifier.
Organization Specific Data	The value of the Organization Specific Information TLV. This field's length and contents are editable.

Event Notification TLVs

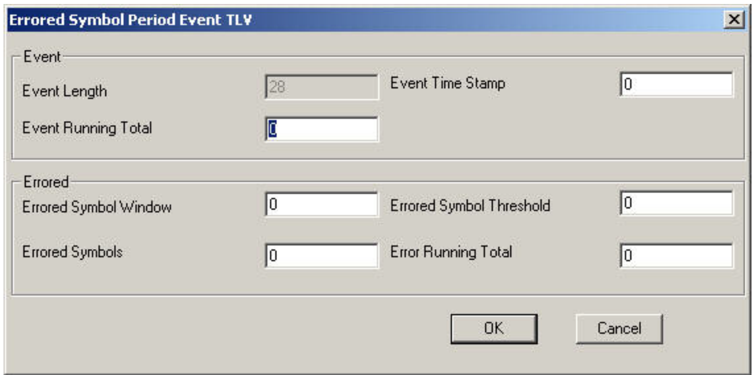
There are several types of Event Notification TLVs:

- Errored Symbol Period (Errored Symbol Period TLV dialog box)
- Errored Frame (Errored Frame / Period TLV dialog box)
- Errored Frame Period (Errored Frame / Period TLV dialog box)
- Errored Frame Seconds Summary (Errored Frame Seconds Summary TLV dialog box)
- Organization Specific (Organization Specific Information/Event TLV dialog box)

Errored Symbol Period TLV dialog box

The Errored Symbol Period Event TLV counts the number of symbol errors that occurred during the specified period. The period is specified by the number of symbols that can be received in a time interval on the underlying physical layer. This event is generated if the symbol error count is equal to or greater than the specified threshold for that period. The Errored Symbol Period Event TLV dialog box is shown in *Image: Errored Symbol Period Event TLV dialog box*.

Image: Errored Symbol Period Event TLV dialog box



The fields and controls are described in *Table: Errored Symbol Period Event TLV dialog box*.

Table: Errored Symbol Period Event TLV dialog box

Section	Field/Control	Description
Event	Event Length	This one-octet field indicates the length (in octets) of this TLV_ tuple. Errored Symbol Period Event uses a length value of 40 (0x28).
	Event Time Stamp	This two-octet field indicates the time reference when the event was generated, in terms of 100 ms intervals, encoded as a 16-bit unsigned integer.
	Event Running Total	This four-octet field indicates the number of Errored Symbol Period Event TLVs that have been generated since the OAM sublayer was reset, encoded as a 32-bit unsigned integer.
Errored	Errored Symbol Window	This eight-octet field indicates the number of symbols in the period, encoded as a 64-bit unsigned integer. Lower bound: the number of symbols in one second for the underlying physical layer. Upper bound: the number of symbols in one minute for the underlying physical layer.
	Errored Symbol Threshold	This eight-octet field indicates the number of errored symbols in the period is required to be equal to or greater than for the event to be generated, encoded as a 64-bit unsigned integer. Lower bound: zero symbol errors. Upper bound: unspecified.
	Errored Symbols	This eight-octet field indicates the number of symbol errors in the period, encoded as a 64-bit unsigned integer.
	Error Running Total	This eight-octet field indicates the sum of symbol errors since the OAM sublayer was reset.

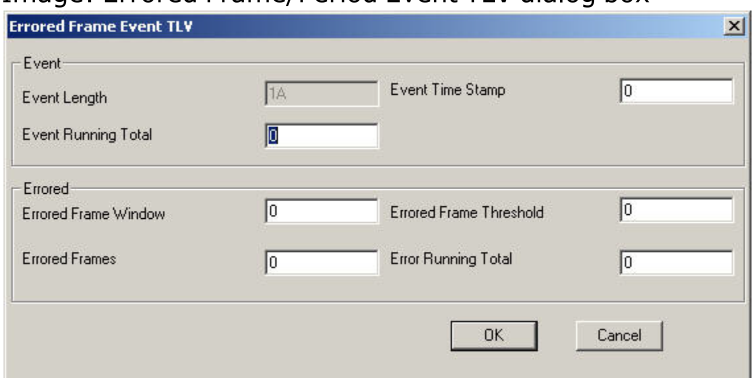
Errored Frame / Period TLV dialog box

The *Errored Frame Event TLV* counts the number of errored frames detected during the specified period. The period is specified by a time interval. This event is generated if the errored frame count is equal to or greater than the specified threshold for that period. This event is generated at the end of the event window rather than when the threshold is crossed.

The *Errored Frame Period Event TLV* counts the number of errored frames detected during the specified period. The period is specified by a number of received frames. This event is generated if the errored frame count is greater than or equal to the specified threshold for that period (for example, if the errored frame count is greater than or equal to 10 for the last 1,000,000 frames received). This event is generated at the end of the event window rather than when the threshold is crossed.

The *Errored Frame Event* and *Errored Frame Period Event* TLV dialog boxes are identical in content. The Errored Frame/Period Event TLV dialog box is shown in *Image: Errored Frame/Period Event TLV dialog box*.

Image: Errored Frame/Period Event TLV dialog box



The fields and controls are described in *Table: Errored Frame/Period Event TLV dialog box*.

Table: Errored Frame/Period Event TLV dialog box

Section	Field/Control	Description
Event	Event Length	This one-octet field indicates the length (in octets) of this TLV_ tuple. **Errored Frame Event**: uses a length value of 26 (0x1A). **Errored Frame Period Event**: uses a length value of 28 (0 x 1C).
	Event Time Stamp	This two-octet field indicates the time reference when the event was generated, in terms of 100 ms intervals, encoded as a 16-bit unsigned integer.
	Event Running Total	This four-octet field indicates the number of Errored Frame Event TLVs that have been generated since the OAM sublayer was reset, encoded as a 32-bit unsigned integer.

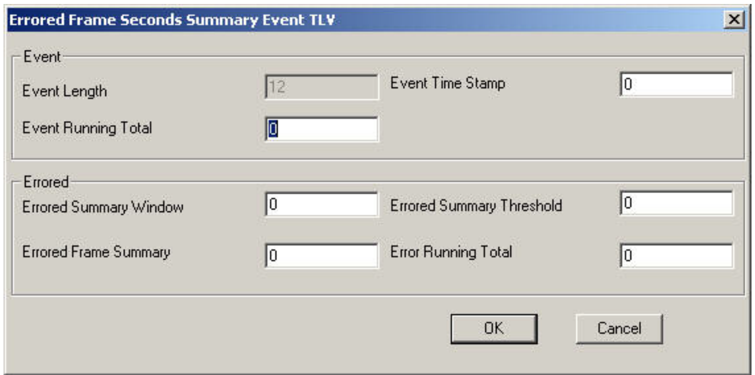
Section	Field/Control	Description
Errored	Errored Frame Window	**Frame Event**: this two-octet field indicates the duration of the period in terms of 100 ms intervals, encoded as a 16-bit unsigned integer. Lower bound - one second Upper bound - one minute **Frame Period Event**: this four-octet field indicates the duration of period in terms of frames, encoded as a 32-bit unsigned integer. Lower bound: the number of minFrameSize frames that can be received in 100 ms on the underlying physical layer. Upper bound: the number of minFrameSize frames that can be received in one minute on the underlying physical layer.
	Errored Frame Threshold	This four-octet field indicates the number of detected errored frames in the period is required to be equal to or greater than, for the event to be generated, encoded as a 32-bit unsigned integer. Lower bound: zero frame errors Upper bound: unspecified
	Errored Frames	This four-octet field indicates the number of detected errored frames in the period, encoded as a 32-bit unsigned integer.
	Error Running Total	This eight-octet field indicates the sum of errored frames that have been detected since the OAM sublayer was reset.

Errored Frame Seconds Summary TLV dialog box

The Errored Frame Seconds Summary Event TLV counts the number of errored frame seconds that occurred during the specified period. The period is specified by a time interval. This event is generated if the number of errored frame seconds is equal to or greater than the specified threshold for that period. An errored frame second is a one second interval wherein at least one frame error was detected. The Errored Frame Seconds Summary TLV dialog box is shown in *Image: Errored Frame Seconds Sumary TLV dialog box*.

This event is generated at the end of the event window rather than when the threshold is crossed.

Image: Errored Frame Seconds Sumary TLV dialog box



The fields and controls are described in *Table: Errored Frame Seconds Summary TLV dialog box*.

Table: Errored Frame Seconds Summary TLV dialog box

Section	Field/Control	Description
Event	Event Length	This one-octet field indicates the length (in octets) of this TLV_ tuple. Errored Frame Seconds Summary Event uses a length value of 18 (0x12).
	Event Time Stamp	This two-octet field indicates the time reference when the event was generated, in terms of 100 ms intervals, encoded as a 16-bit unsigned integer.
	Event Running Total	This four-octet field indicates the number of Errored Frame Seconds Summary Event TLVs that have been generated since the OAM sublayer was reset, encoded as a 32-bit unsigned integer.
Errored	Errored Summary Window	This two-octet field indicates the duration of the period in terms of 100 ms intervals, encoded as a 16-bit unsigned integer. Lower bound: 10 seconds Upper bound: 900 seconds
	Errored Summary Threshold	This two-octet field indicates the number of errored frame seconds in the period is required to be equal to or greater than, for the event to be generated, encoded as a 16-bit unsigned integer. Lower bound: zero errored seconds Upper bound: unspecified
	Errored Frame Summary	This two-octet field indicates the number of errored frame seconds in the period, encoded as a 16-bit unsigned integer.
	Error Running Total	This four-octet field indicates the sum of errored frame seconds that have been detected since the OAM sublayer was reset.

Variable Request TLV

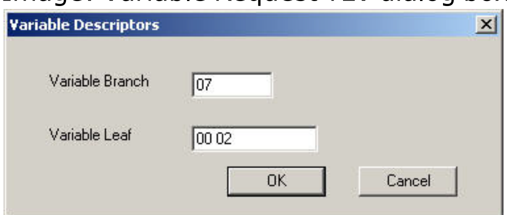
The process of variable retrieval involves transferring Ethernet counters and statistics through Variable Containers/Descriptors.

MIB variables are queried through the use of Variable Request OAMPDUs and returned through the use of Variable Response OAMPDUs. Variable Request OAMPDUs use data structures called Variable Descriptors. An OAM client may request one or more variables in each Variable Request OAMPDU.

Variable Response OAMPDUs use data structures called Variable Containers (Variable Response TLV). Each returned Variable Container resides within a single Variable Response OAMPDU. If a Variable Container does not fit within a Variable Response OAMPDU, an error code is returned. In returning requested variables, an OAM client generates at least one and perhaps additional Variable Response OAMPDUs per received Variable Request OAMPDU.

The Variable Request TLV dialog box (Variable Descriptors) is shown in *Image: Variable Request TLV dialog box*.

Image: Variable Request TLV dialog box



The fields and controls in this dialog box are described in *Table: Variable Request TLV dialog box*.

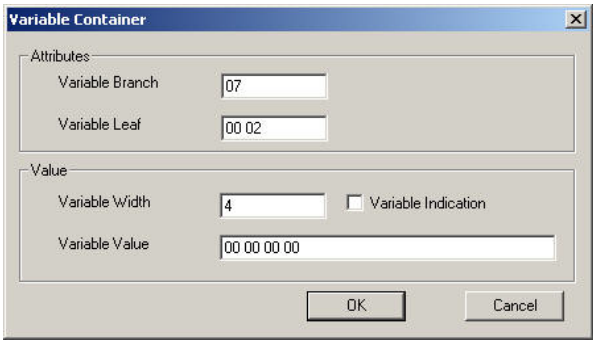
Table: Variable Request TLV dialog box

Field	Description
Variable Branch	One-byte hex number. *(default - 0x07)* Branch of data within the Management Information Base (MIB) Variable Branches may reference attributes, objects or packages. If an object or package is referenced, only the attributes within the object or package shall be found within the Variable Container.
Variable Leaf	Two-byte hex number. *(default - 00 02)* Sub-branch of data within the Management Information Base (MIB)

Variable Response TLV

The Variable Response TLV dialog box (Variable Container) is shown in *Image: Variable Response TLV dialog box*. Variable Containers are used to return MIB attributes, objects and packages. One or more Variable Containers may exist in the Data field of a Variable Response OAM PDU.

Image: Variable Response TLV dialog box



The fields and controls are described in *Table: Variable Response TLV dialog box*.

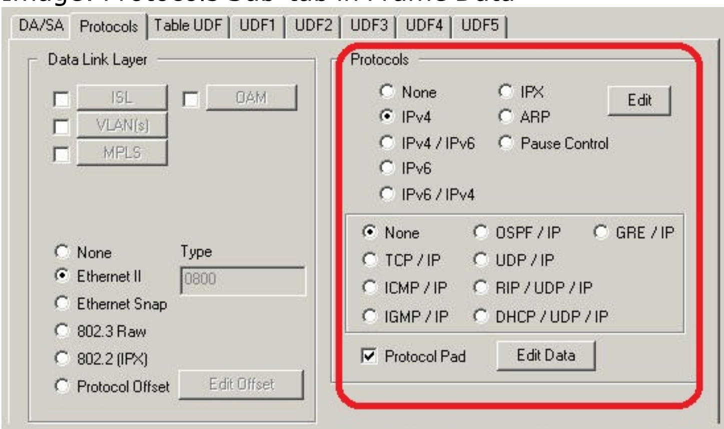
Table: Variable Response TLV dialog box

Section	Field/Control	Description
Attributes	Variable Branch	The one-octet Variable Branch field for the specific attribute, package or object being returned. NOTE At present, only attributes are supported (IxOS 5.10 SP2). Variable Branches may reference attributes, objects or packages. If an object or package is referenced, only the attributes within the object or package shall be found within the Variable Container.
	Variable Leaf	The two-octet Variable Leaf field for the specific attribute, package or object being returned.
Value	Variable Width	This field either contains the actual width of the attribute or a Variable Indication providing information as to the reason this particular attribute could not be returned. When bit 7 = 1, bits 6:0 represent a Variable Indication. There is no Variable Value field when bit 7 = 1. When bit 7 = 0, bits 6:0 represent the length of the Variable Value field in octets. An encoding of 0x00 equals 128 octets. All other encodings represent actual lengths.
	Variable Indication	See Variable Width, above. When selected, Variable Width changes to Indication Value.
	Variable Value	If the Variable Width field contains a width value, the fourth field is the Variable Value field, which contains the attribute. This field may be up to 128 octets in length. Octets of the attribute are ordered most significant first, followed by each successive octet. If the Variable Width field contains a Variable Indication, the Variable Value field does not exist.

Protocols—Network Layer

The network layer protocols are listed in *Table: Protocol Choices*. The *Edit* button in the Protocols section of the dialog box allows the header parameters to be modified. The header parameters of the IP Version 4 and Version 6 protocols may be edited from the *Edit* button. The IP protocol section of the *Protocols* sub-tab is shown in *Image: Protocols Sub-tab in Frame Data*.

Image: Protocols Sub-tab in Frame Data



The header parameters of the IPv4 sub-protocols (UDP, TCP, ICMP, IGMP, RIP, DHCP, OSPF, and GRE) may be edited from the *Edit* button of the IPv4 protocol page. Headers for IPv6 sub-protocols (UDP, TCP, and ICMP) may be edited from the *Edit* button of the IPv6 protocol page.

Table: Protocol Choices

Protocol Type	**Protocol Choice**	**Description**
Main Protocol (Network Layer)	None	No protocol specific handling is performed.
	IPv4	Internet Protocol Version 4. Includes all others with an /IP designation for use with IPv4. Configuring IPv4 Headers.
	IPv4/IPv6	This selection is for use with IPv4 packets which are tunneled over IPv6. When the *Edit* button is selected, the *IPv6 Header* dialog box opens first. That dialog box contains a button labeled *IPv4*, which opens the *IPv4 Header* dialog box. *Configuring IPv4 Headers and Configuring IPv6 Headers.*
	IPv6	Internet Protocol Version 6. Includes all others with an /IP designation for use with IPv6 (TCP/IP, UDP/IP, and ICMP/IP). Configuring IPv6 Headers.
	IPv6/IPv4	This selection is for use with IPv6 packets which are tunneled over IPv4. When the *Edit* button is selected, the *IPv4 Header* dialog box opens first. That dialog box contains a button labeled *IPv4*, which

Protocol Type	Protocol Choice	Description
		opens the *IPv6 Header* dialog box. *Configuring IPv4 Headers and Configuring IPv6 Headers*
	IPX	(Not available for POS modules.) Internetwork Packet Exchange. Used in Novell networking. IPX Protocol.
	ARP	(Not available for POS modules.) Address Resolution Protocol. An IP sub-protocol used to resolve IP addresses into MAC addresses. ARP Header dialog box.
	Pause Control	(Not available for POS modules.) A MAC/Layer 2 flow control mechanism used by switches and other network infrastructure elements. Pause Control.
Sub-protocol	None	No sub-protocol specific handling is performed.
	TCP/IP	Transmission Control Program. A connection-oriented, reliable IP sub-protocol. TCP Header dialog box. Available for use with IPv4 and IPv6.
	ICMP/IP	Internet Control Management Protocol. Used to control assorted IP parameters. ICMP Header dialog box. Available for use with IPv4 and IPv6.
	IGMP/IP	Internet Group Management Protocol. Used for multicast group management. IGMP Header dialog box. Available for use with IPv4.
	OSPF/IP	Open Shortest Path First Protocol. An internal routing protocol. OSPF Header dialog box. Available for use with IPv4.
	UDP/IP	User Datagram Protocol. A connection-less, unreliable IP sub-protocol.*UDP Header dialog box and RIP Header dialog box.* Available for use with IPv4 and IPv6.
	RIP/UDP/IP	Router Information Protocol. Used to communicate routing entries within a LAN.RIP Header dialog box. Available for use with IPv4.
	DHCP/UDP/IP	Dynamic Host Control Protocol and BOOTP. Used to set IP address and other parameters of hosts at host start time. DHCP Header dialog box. Available for use with IPv4.

Protocol Type	Protocol Choice	Description
	GRE/IP	Generic Routing Encapsulation.GRE Header dialog box. Available for use with IPv4.
Protocol Pad		Allows to add data padding between the Protocol Header and the Payload Data patterns.
Edit Data		Allows to edit the Protocol Pad data. This button is only active when the Protocol Pad check box is selected.Protocol Padding for information on the *Protocol Padding* dialog box.

Internet Protocol (IP) headers for Ethernet and POS frames can be configured for both IPv4 and IPv6 in the Protocol section of the Frame Data page. The Transport protocol-specific headers associated with the Internet Protocol frames may also be configured in this section.

Configuration dialog boxes for the IP and Transport protocols can be accessed by selecting the desired IP protocol version, the transport protocol, if any, and then selecting the *Edit* button. A dialog box appears for selected version of the IP protocol. *Edit* buttons in the main dialog box provide access to the dialog boxes for the transport protocol header configuration.

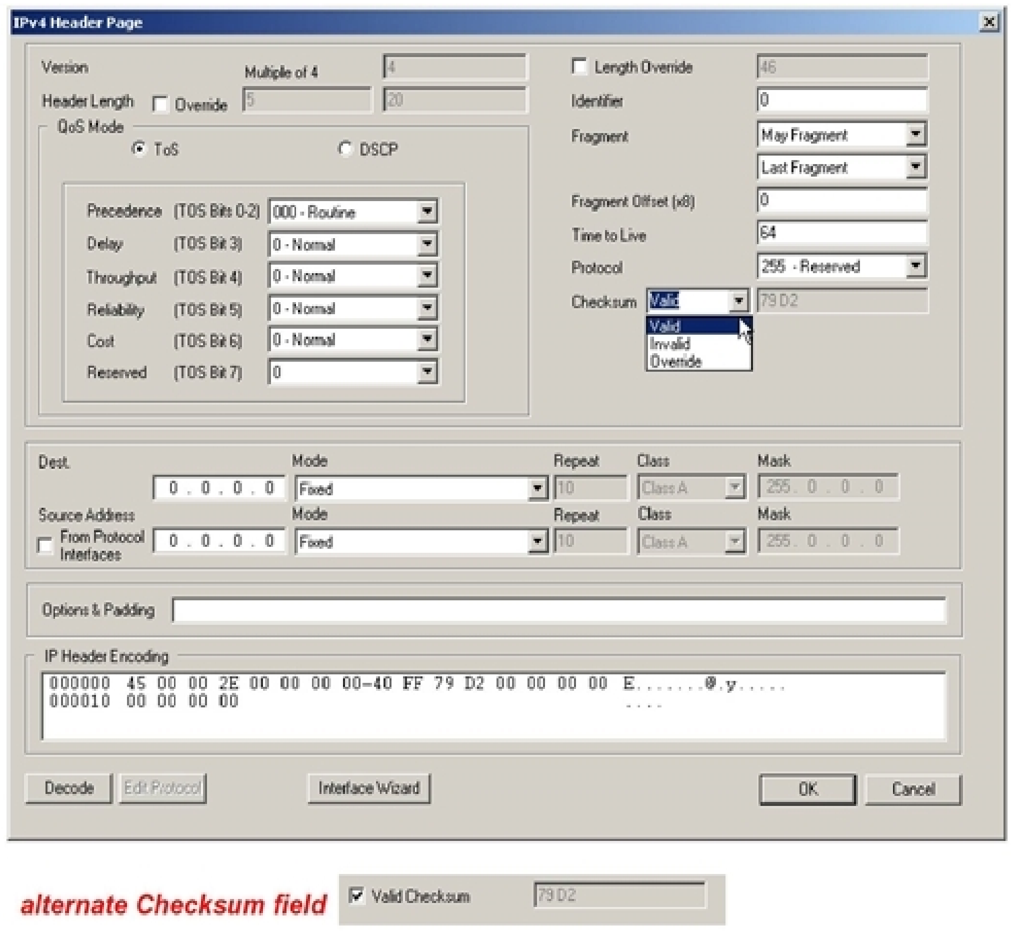
For information on configuring Internet Protocol frame headers, go to the appropriate section below.

- Configuring IPv4 Headers.
- Configuring IPv6 Headers.

Configuring IPv4 Headers

The *IPv4 Header* dialog box is shown in *Image: Protocols: IPv4 Header dialog box*. This dialog box is accessed by selecting the *IPv4* option button in the Protocols section, then selecting the *Edit* button.

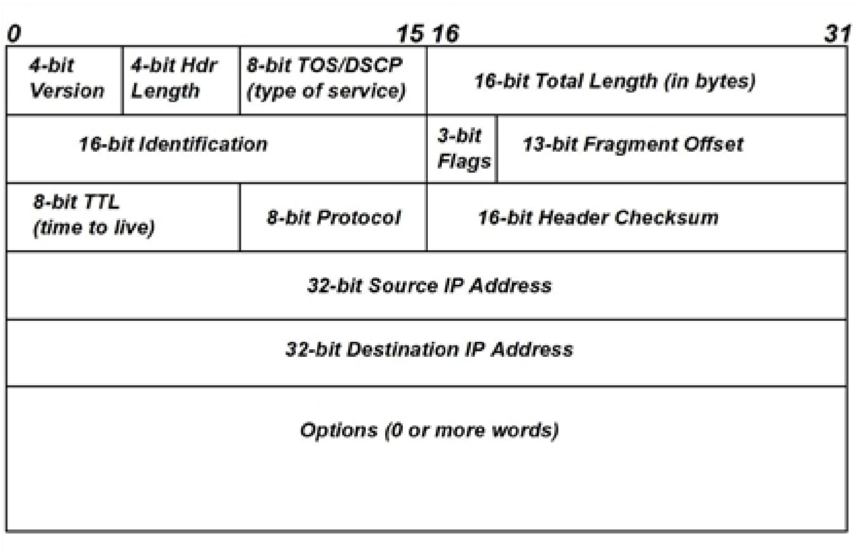
Image: Protocols: IPv4 Header dialog box



When the protocols choice is set to *IPv4* before the *Edit* button is selected, the dialog box is as shown with the Protocol set to *255 - reserved*. When protocols including *UDP* are selected before the *Edit* button is selected, the *Protocol* field is set to *17 - UDP*. For other protocols ending with /IP, the corresponding protocol is shown in the *Protocol* field, and *Edit* buttons for those protocols appear.

The fields in this dialog box allow all parts of an IPv4 header to be specified. The format of an IPv4 header is shown in *Image: Protocols: IPv4 Header Format*.

Image: Protocols: IPv4 Header Format



The correspondence between the fields of an IPv4 header and the elements of the *IPv4 Header* dialog box which set those fields are described in *Table: IPv4 Header Fields Set by the IPv4 Header dialog box*.

Table: IPv4 Header Fields Set by the IPv4 Header dialog box

IP Header Field	Dialog box fields	Description
Version	Version	Not editable. It is always set to 4.
Header Length	Header Length	Automatically calculated to include the minimum of five 32-bit words plus optional data and padding. Internet Header Length is the length of the internet header represented in 32- bit words or in multiples of 4 bytes. So max header length can be = 4*15 = 60 bytes. Minimum valid header length = 4*5 = 20 bytes.
	Overide	If selected, enables header length override.
	Multiple of 4	(default = 5) Enter a number that is multiplied by 4, resulting in the new header length.
QoS Mode		Select a option button for the QoS mode type, either TOS or DSCP.
TOS	Precedence (TOS Bits 0-2)	The precedence is set in the 3 most significant bits of the TOS. Eight choices are offered: • 000 - Routine • 001 - Priority • 010 - Immediate • 011 - Flash

IP Header Field	Dialog box fields	Description
		• 100 - Flash Override • 101 - CRITIC/ECP • 110 - Internet Control • 111 - Network Control.
	Delay (TOS Bit 3)	The next bit in the TOS signifies Delay, with choices of Normal and Low.
	Throughput (TOS Bit 4)	The next bit in the TOS signifies Throughput, with choices of Normal and High.
	Reliability (TOS Bit 5)	The next bit in the TOS signifies Reliability, with choices of Normal and High.
	Cost (TOS Bit 6)	The next bit is the TOS signifies Cost, with choices of Normal and Low.
	Reserved (TOS Bit 7)	The last bit in the TOS byte is reserved but may be set to 0 or 1.
DSCP	DSCP Mode	Allows you to select a DSCP mode from a list in the pull-down menu. Options are: • Default • Class Selector • Assured Forwarding • Expedited Forwarding • Custom The available configurable fields change depending on the DSCP mode choice. For more information regarding the options, DSCP QoS Options.
Total Length	Length Override	If the box is not selected, then the length field is automatically set, based on the Frame Size set in the **Frame Control** tab. If the box is selected, then the value may be overridden.
Identification	Identifier	Set according to the value in the dialog box.
Flags	Fragment	Two choice dialog boxes are available to set the two most significant bits: May Fragment/Don't Fragment; and Last Fragment/More Fragments.
Fragment Offset	Fragment Offset	Set according to the value in the dialog box.

IP Header Field	Dialog box fields	Description
TTL	Time to Live	Set according to the value in the dialog box.
Protocol	Protocol	Set according to the choice in the dialog box. NOTE A new protocol type is added to this list. The new type is PIM denoted by the numeric value of 103. This type defines the next protocol after the IPv4 header. If PIM filter is selected, the next protocol is PIM.
Header Checksum		NOTE Refer to the *Ixia Platform Reference Manual*, Table 1-7, for list of load modules supporting checksum override. Depending on the load module, there are 2 different ways in which Checksum is handled:
	ValidInvalidOverride (list)	For load modules supporting Checksum Override, choose one of the following checksum options from the list: • Valid: The calculated header checksum is automatically calculated. • Invalid: The calculated header checksum is automatically calculated (with error). • Override: The header checksum can be set to a user-defined, 2-octet value in the box to the right.
	Valid Checksum (check box)	If selected, this causes a valid header checksum to be generated. If cleared, an invalid checksum is generated.
Source IP Address	Source Address	May be set to a constant value, or incremented/decremented across a range of addresses.Source and Destination IPv4 Addresses*for additional information.*
	From Protocol Interfaces	Selecting this check box synchronizes the Source or Destination Address with the values set in the Protocol Interfaces wizards. Protocol Interfaces for more information. Note that this check box only appears on certain modules.
Destination IP	Destination Address	May be set to a constant value, or

IP Header Field	Dialog box fields	Description
Address		incremented/decremented across a range of addresses.Source and Destination IPv4 Addresses *for additional information.*
	Sync from PPP (Source and Destination Address	Selecting this check box synchronizes the Source or Destination Address with the values set in the PPP negotiation window. Note that these check boxes only appear on modules with PPP options enabled.
Options	Options & Padding	Additional IP options which may be added to the end of the IP headers. The header must be a multiple of words and therefore may require padding. Just type hex data into this field. When finished, select another field or select the *Decode* button.
Edit button		This button allows to edit the transport protocol selected on the Protocol sub-tab of the **Frame Data** tab (as discussed in Protocols—Network Layer). The button title changes depending on the selected protocol, and opens a different dialog box depending on the selected protocol. There may also be more than one edit button if more than one protocol is selected. The protocol options are: • UDP Header dialog box • RIP Header dialog box • TCP Header dialog box • IGMP Header dialog box • OSPF Header dialog box • ICMP Header dialog box • ARP Header dialog box • DHCP Header dialog box • GRE Header dialog box
Interface Wizard		Selecting this button opens a wizard that allows to create or edit protocol interfaces for use with DHCP. For more information on creating protocol interfaces,Chapter 10,Protocol Interfaces. This option is not available on all load modules.

DSCP QoS Options

Differentiated Services Code Point is a way of prioritizing traffic, like ToS. For more information on DSCP, refer to the DSCP—Differentiated Services Code Point—section in the 'Theory of Operation:

General' chapter of the *Ixia Platform Reference Manual*.

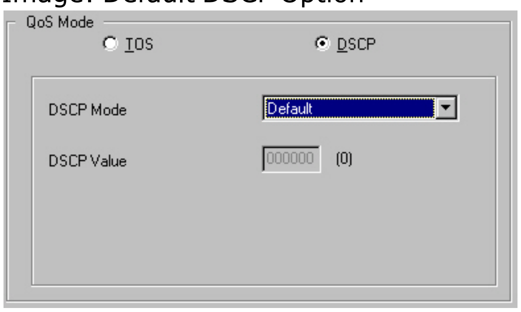
Depending on your selection, the list of configurable options changes. The following sections detail the DSCP options:

- Default
- Class Selector
- Assured Forwarding
- Expedited Forwarding
- Custom

Default

Selecting the *Default* DSCP options sets DSCP fields to the default setting of all zeros (0). This option is shown in *Image: Default DSCP Option*.

Image: Default DSCP Option

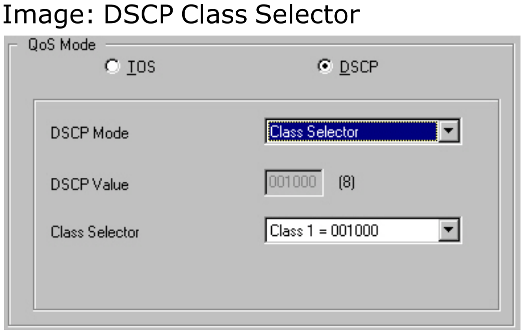


Note that the default mode sets the DSCP to 'best effort.' The DSCP value in bits is shown in the *DSCP Value* field.

Class Selector

The Class Selector option allows to specify the DSCP traffic class.*Image: DSCP Class Selector* shows the dialog box for the Class Selector option.

Image: DSCP Class Selector



Use the Class Selector pull-down menu to choose the class. The options are:

- Class 1 - 001000
- Class 2 - 010000
- Class 3 - 011000

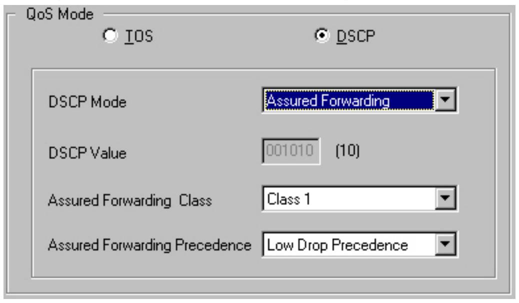
- Class 4 - 100000
- Class 5 - 101000
- Class 6 - 101000
- Class 7 - 111000

The DSCP value in bits is shown in the *DSCP Value* field.

Assured Forwarding

The *Assured Forwarding* option allows to set both the Class and Precedence DSCP bits. *Image: Assured Forwarding* shows the *Assured Forwarding* view.

Image: Assured Forwarding



Use the Class Selector pull-down menu to choose the class. The options are:

- Class 1 - 001000
- Class 2 - 010000
- Class 3 - 011000
- Class 4 - 100000
- Class 5 - 101000
- Class 6 - 101000
- Class 7 - 111000

Use the Assured Forwarding Precedence pull-down menu to select the drop. The options are:

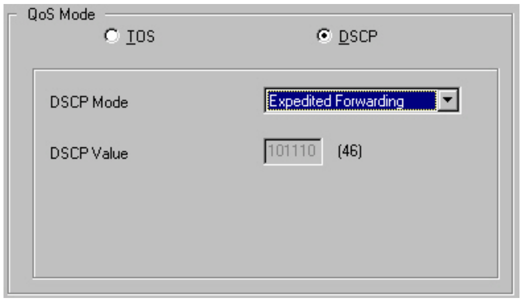
- Low
- Medium
- High

The DSCP value in bits is shown in the *DSCP Value* field.

Expedited Forwarding

The EF PHB can be used to build a low loss, low latency, low jitter, assured bandwidth, end-to-end service through DS (Diffserv) domains. Such a service appears to the endpoints like a point-to- point connection or a virtual leased line. This service has also been described as Premium service. *Image: Expedited Forwarding* shows the Expedited Forwarding option.

Image: Expedited Forwarding

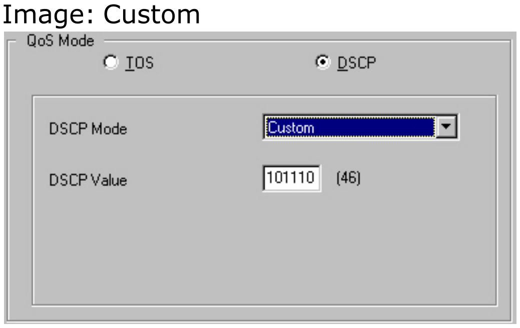


The DSCP value in bits is shown in the *DSCP Value* field. Expedited Forwarding sets the bit values to 101110.

Custom

This setting allows to set the DSCP bits to any combination.*Image: Custom* shows the *Custom* option.

Image: Custom



The DSCP value in bits is shown in the *DSCP Value* field. In Custom mode, it is possible to modify these bits directly.

Source and Destination IPv4 Addresses

The source and destination IPv4 addresses may be independently controlled and allowed to vary across a wide range of addresses. The Mode setting controls the interpretation of the other fields for each address, as described in *Table: IPv4 Address Mode Controls*.

Table: IPv4 Address Mode Controls

Mode	Fields Used	Usage
Fixed	Address	Indicates the single value that is used for all frames.
Increment Host/Decrement Host	AddressRepeatMask	The Increment Host and Decrement Host modes modify the host part of the IP address. The Address field indicates the starting value. The Repeat field controls the number of increments/decrements that occurs. When the repetition is completed, the address is reset to the starting value and incrementing/decrementing continues.

Mode	Fields Used	Usage
		The Mask field indicates which parts of the IP address range are network versus hosts. The '1's indicate network and the '0's indicate hosts.
Continuous Increment Host/Continuous Decrement Host	AddressMask	The Continuous Increment Host and Continuous Decrement Host modes modify the host part of the IP address. The Address field indicates the starting value. The Mask field indicates which parts of the IP address range are network versus hosts. The '1's indicate network and the '0's indicate hosts.
Increment Network/Decrement Network	AddressRepeatMask	The Increment Network and Decrement Network modes modify the network part of the IP address. The Address field indicates the starting value. The Repeat field controls the number of increments/decrements that occurs. When the repetition is completed, the address is reset to the starting value and incrementing/decrementing continues. The Class field indicates what range of networks to iterate over. See the table below for a description of class choices.
Continuous Increment Network/Continuous Decrement Network	AddressMask	The Continuous Increment Network and Continuous Decrement Network modes modify the host part of the IP address. The *Address* field indicates the starting value. The *Class* field indicates what range of networks to iterate over. See the table below for a description of class choices.
Random	AddressMask	The *Random* mode causes the IP address to vary randomly.
Custom Mask Increment	BitMask	You can custom-define the entire 32-bit mask to be used with the address—by entering 1's and 0's to replace the X's. The Address field indicates the starting value.
Custom Mask Decrement	BitMask	You can custom-define the entire 32-bit mask to be used with the address—by entering 1's and 0's to replace the X's. The Address field indicates the starting value.

Mode	Fields Used	Usage
Custom Mask Continuous Increment	BitMask	You can custom-define the entire 32-bit mask to be used with the address—by entering 1's and 0's to replace the X's. The Address field indicates the starting value.
Custom Mask Continuous Decrement	BitMask	You can custom-define the entire 32-bit mask to be used with the address—by entering 1's and 0's to replace the X's. The Address field indicates the starting value.
Custom Mask Random	BitMask	You can custom-define the entire 32-bit mask to be used with the address—by entering 1's and 0's to replace the X's. The Address field indicates the starting value.

The Class field is used for incrementing/decrementing the network bits of an IPv4 address. The class of the network determines which bits may change. In *Table: Class to Bit Mask Conversion Table*, an 'A' stands for a bit that is set from the *Address* field and 'X' are bits that will be allowed to change according to the counting mode and values.

Table: Class to Bit Mask Conversion Table

Class	Bit Mask
Class A	AAAAAAAA.XXXXXXXX.XXXXXXXX.XXXXXXXX
Class B	AAAAAAAA.AAAAAAAA.XXXXXXXX.XXXXXXXX
Class C	AAAAAAAA.AAAAAAAA.AAAAAAAA.XXXXXXXX
No mask	XXXXXXXX.XXXXXXXX.XXXXXXXX.XXXXXXXX

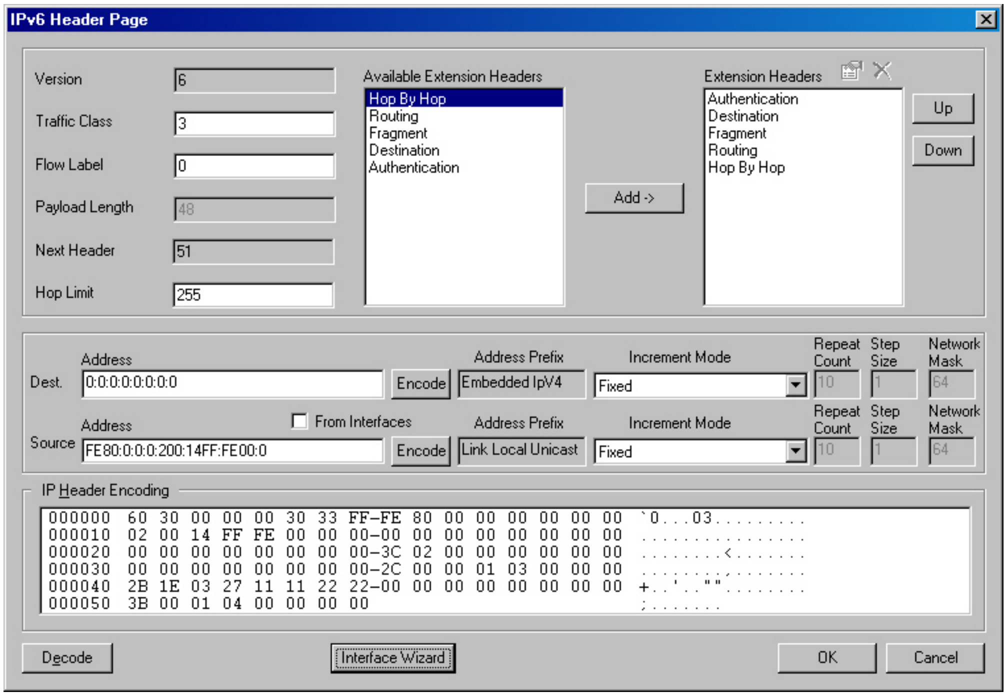
IPv4 Header Encoding

Values which are set in the dialog box are reflected in the hexadecimal view of the IP Header Encoding at the bottom of the dialog box. It is also possible to edit the IP Header directly from this view; all editing occurs in type-over mode. After any change, the *Decode* button should be selected to reflect these changes back into the dialog box fields.

Configuring IPv6 Headers

The *IPv6 Header* dialog box can be accessed when the IPv6 protocol is selected, by selecting the *Edit* button. The *IPv6 Header* dialog box is shown in *Image: IPv6 Header dialog box*.

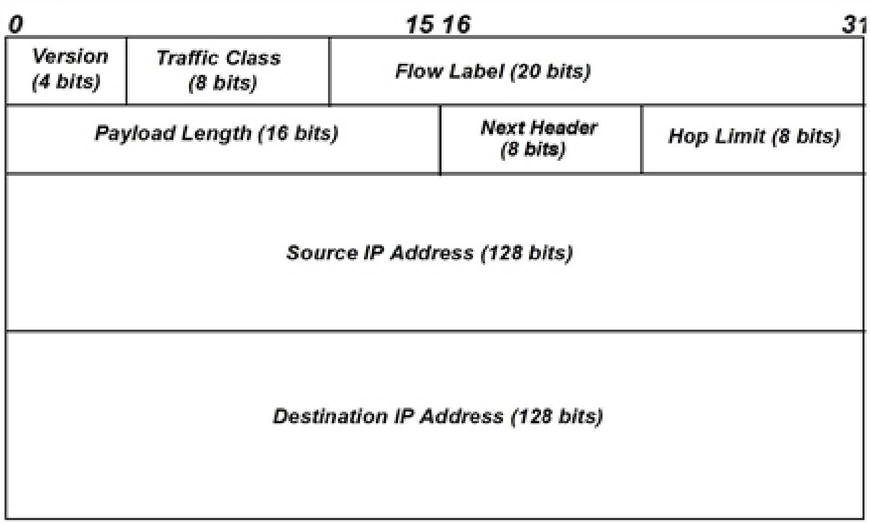
Image: IPv6 Header dialog box



The fields in this dialog box allow the parts of an IPv6 header to be specified. Note that when no IPv6 Extension headers are set up for the IPv6 header, the *Next Header* field value in the dialog box is ‘59.’ The format of an IPv6 header is shown in *Image: Protocols: IPv6 Header Format*.

IPv6 Header Format

Image: Protocols: IPv6 Header Format



The correspondence between the fields of an IPv6 header and the elements of the *IPv6 Header* dialog box which set those fields are described in *Table: IPv6 Header Fields Set by the IPv6 Header dialog box*.

Table: IPv6 Header Fields Set by the IPv6 Header dialog box

IP Header Field	**dialog box Field**	**Description**
Version	Version	(Read-only). Always set to 6 to indicate IP version 6 header.
	Traffic Class	Identifies the class or priority of the IPv6 packet.
Flow Label	Flow Label	Labels a sequence of packets for which it requests special handling by IPv6-capable routers. Routers that do not support this function must set this field to zero when creating, forwarding, or receiving the packet.
Payload Length	Payload Length	Length of the IPv6 payload, which is the length of the entire packet which follows the IPv6 header (in octets). The payload includes any extension headers.
Next Header	Next Header	(Read-only) Identifies the type of the next extension header. When value = 59, means 'No Next Header.'
Hop Limit	Hop Length	The Hop limit is decremented by 1 by each node that forwards the packet. When the value reaches 0, the packet is discarded.
	Extension Headers	A list of IPv6 extension headers, which contain optional internet-layer information.
	Available Extension Headers	The extension headers currently available are: • Hop By Hop. IPv6 Hop-by-Hop Extension Header for additional information. • Routing. IPv6 Routing Extension Header for additional information. • Fragment. IPv6 Fragment Extension Header for additional information. • Destination. IPv6 Destination Extension Header for additional information. • Authentication. IPv6 Authentication Extension Header for additional information.
	Add ->	Select/highlight an available Extension Header, and then select the *Add ->* button to add that header to the list of Extension Headers in the right pane.
	 Edit Icon	To edit an Extension header in the Extension Headers window. Highlight the Extension, then select the *Edit* icon. A corresponding dialog box appears.
	 Delete Icon	To delete an Extension header in the Extension Headers window. Highlight the Extension, then select the *Delete* icon.

IP Header Field	dialog box Field	Description
Destination Address	Destination Address	The 128-bit IPv6 destination address. May be set to a constant value, or incremented/decremented across a range of addresses. Source and Destination IPv6 Addresses for additional information.
Source Address	Source Address	The 128-bit IPv6 source address. May be set to a constant value, or incremented/decremented across a range of addresses. Source and Destination IPv6 Addresses for additional information.
	Sync from PPP (Source and Destination Address	Selecting this check box synchronizes the Source or Destination Address with the values set in the PPP negotiation window. Note that these check boxes only appear on modules with PPP options enabled.
	From Interfaces	Selecting this check box synchronizes the Source or Destination Address with the values set in the Protocol Interfaces wizards. Protocol Interfaces for more information. Note that this check box only appears on certain modules.
	Encode	Select the *Encode* button to show the *IPv6 Address* dialog box, where specific types of IPv6 addresses can be configured. IPv6 Address dialog box for additional information.
	Address Prefix	Shows the selected IPv6 address prefix as set in the *IPv6 Address* dialog box. IPv6 Address dialog box for additional information. Note when using the *User Defined* prefix, this field will not show *User Defined*. Instead, a prefix from the list of other prefixes appear, based on what the user defined prefix most closely resembles.
	ModeRepeat CountStep SizeNetwork Mask	Source and Destination IPv6 Addresses for additional information.
	IP Header Encoding	Values that are set in the dialog box are reflected in the hexadecimal view of the IPv6 Header Encoding at the bottom of the dialog box. It is also possible to edit the IP Header directly from the view. All editing occurs in type-over mode.
	Decode	After any change in the IP Header Encoding box, the *Decode* button, should be selected to reflect these the directly edited changes back into the dialog box fields.

Source and Destination IPv6 Addresses

The Source and Destination IPv6 addresses may be independently controlled and allowed to vary across a wide range of addresses. The Mode setting controls the interpretation of the other fields for each address, as described in *Table: IPv6 Address Mode Controls*.

Table: IPv6 Address Mode Controls

Mode	Fields Used	Usage
Fixed	Address	Indicates the single address value that will be used for all frames.
Increment Host/Decrement Host	AddressRepeat CountStep SizeNetwork Mask	The Increment Host and Decrement Host modes modify the host part of the IPv6 address. The **Address** field indicates the starting value. The **Repeat Count** field controls the number of increments/decrements that will occur. When the repetition is completed, the address is reset to the starting value and incrementing/decrementing continues. (Read-only and set to '1'.)The **Step Size** indicates the size of the increment/decrement. The **Network Mask** field indicates which parts of the IP address range are network versus hosts. It specifies the number of bits (counting from the left) in the network part of the 128-bit IPv6 address. The remainder of the bits specify the host part of the address (of which, only the last 32 bits may currently be configured). The default is 64 bits.
Increment Network/Decrement Network	AddressRepeat CountStep SizeNetwork Mask	The Increment Network and Decrement Network modes modify the network part of the IPv6 address. The **Address** field indicates the starting value. The **Repeat Count** field controls the number of increments/decrements that will occur. When the repetition is completed, the address is reset to the starting value and incrementing/decrementing continues. (Currently Read-only and set to '1'.)The **Step Size** indicates the size of the increment/decrement. The **Network Mask** field indicates which parts of the IP address range are network versus hosts. It specifies the number of bits (counting from the left) in the network part of the 128-bit IPv6 address. The remainder of the bits specify the host part of the address (of which, only the last 32 bits may currently be configured). The default is 64 bits.

In addition, the options available for Mode differ depending on the IPv6 prefix configuration, as set in the *IPv6 Address* dialog box (IPv6 Address dialog box *for more information*).Table: Mode Options for Prefix Settings shows the options available for each prefix setting.

Table: Mode Options for Prefix Settings.

IPv6 Address Prefix	Mode Options	Description
Reserved NSAP Allocation IPX Allocation User Defined Address	• Fixed • Incr/Decr Host • Incr/Dect Network	Fixed address, or increment/decrement the Host/Network addresses.
Global Unicast Address	• Fixed • Incr/Decr Interface ID • Incr/Decr Gbl Uni Top Lvl ID • Incr/Decr Gbl Next Lvl ID • Incr/Decr Gbl Site Lvl ID	Fixed address, or increment/decrement the Interface ID, Top Level ID, Next Level ID, or Site Level ID.
Link Local Unicast	• Fixed • Incr/Decr Interface ID	Fixed address, or increment/decrement the Interface ID.
Site Local Unicast	• Fixed • Incr/Decr Interface ID • Incr/Decr Site Local Uni Subnet ID	Fixed address, or increment/decrement the Interface ID or the Subnet ID.
Multicast Address	• Fixed • Incr/Decr Multicast Group ID	Fixed address, or increment/decrement the Multicast Group ID.

IPv6 Address dialog box

When the *Encode* button is selected for the IPv6 Source Address or Destination Address, the *IPv6 Address* dialog box set appears. The IPv6 address prefix comprises the leftmost contiguous bits (leading bits) of the address, and is of variable length, depending on the address type. This set of dialog boxes allows configuration for 8 prefix types, one for each of the 7 main types of IPv6 addresses, plus a user-defined dialog box for custom configuration.

- IPv6 Reserved Address.
- IPv6 NSAP Allocation Address.
- IPv6 IPX Allocation Address.
- IPv6 Global Unicast Address.
- IPv6 Link-Local Unicast.
- IPv6 Site-Local Unicast Address.
- IPv6 Multicast Address.
- IPv6 User-Defined Address.

IPv6 addressing provides 128-bit identifiers for individual interfaces and sets of interfaces. It is important to note that the IPv6 addresses apply **only** to interfaces, and not to nodes. The three types of IPv6 addresses are:

- **Unicast:** A unicast address identifies a single interface. A packet with this type of destination address is sent to that specific unicast interface.
- **Anycast:** An anycast address identifies a set of interfaces, usually for different nodes. A packet destined for an anycast address will be delivered to the 'nearest' single node in the set of interfaces, where the term 'nearest' refers to the node with the lowest routing metric cost.
- **Multicast:** A multicast address identifies a set of interfaces, usually for different nodes. A packet destined for a multicast address will be delivered to all of the nodes in the set of interfaces.

NOTE The IPv6 design does not support broadcast addresses. This function is replaced by the multicast addressing scheme.

IPv6 Address Shortcuts

Since the 128-bit IPv6 addresses are so long, RFC 2373 provides methods for creating comclicked versions of these addresses, in cases where there are long strings of consecutive zero bits.

- The standard form of an IPv6 address is written as:

  x : x : x : x : x : x : x : x

  where each 'x' represents 16 bits of data in hexadecimal format.

- If x = 16 zero bits (0000000000000000), x may be represented by a single '0', as in:

  x : x : x : x : 0 : x : x : x

- If several 16-bit groups in the middle of the address consist of all zero bits, they may be represented as shown in the example below:

  x : x : 0 : 0 : 0 : 0 : x : x

or, using another shortcut:

x : x **: :** x : x

- For environments where both IPv6 and IPv6 addresses are used, a convenient combination may be used, as shown in RFC 2373. This method uses the form:

  x : x : x : x : x : x : d.d.d.d

  where the x's in the six high order groups are combined with 32 low order bits exclicked as a decimal value, in the standard IPv4 address format. An example is:

  0 : 0 : 0 : 0 : 0 : 0 : 10.1.1.3

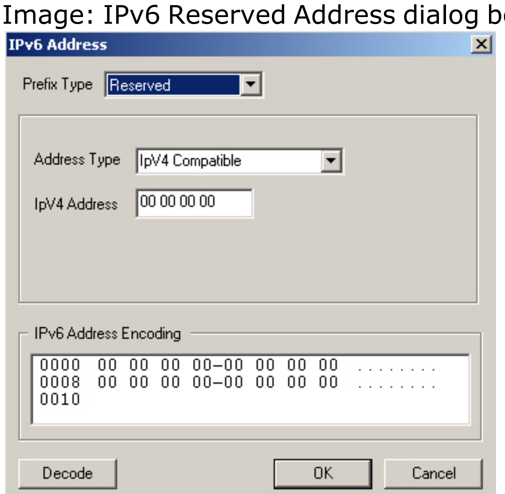
  which can be comclicked to the following form:

  : : 10.1.1.3

IPv6 Reserved Address

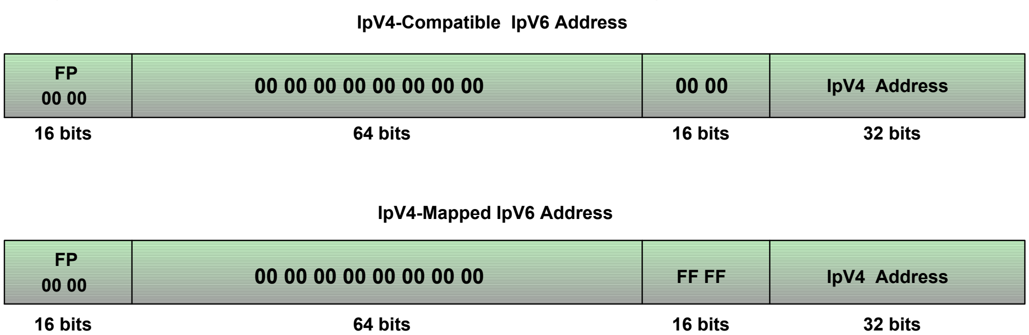
The dialog box for the IPv6 Reserved address is shown in *Image: IPv6 Reserved Address dialog box*. Its controls appear by selecting *Reserved* from the list in the *Prefix Type* field.

Image: IPv6 Reserved Address dialog box



The dialog box for the IPv6 Reserved address contains options which allow IPv6 traffic to be transmitted in IPv4 networks.

Image: Format of IPv6 Addresses in Reserved dialog box



The fields in this address format and the corresponding implementation in the IxExplorer IPv6 address dialog box is described in *Table: IPv6 Reserved Address Fields*.

Table: IPv6 Reserved Address Fields

Header Field	Dialog box element	Description
Format Prefix	Prefix Type: Reserved	The defined address prefix value = 0000 0000 (binary).
	Address Type	Choose one type of address: • **IpV4 Compatible**: With this method, IPv6 packets can be tunneled over IPv4 networks. • **IpV4 Mapped**: With this method, IPv6 nodes can communicate with IPv4 devices. However, a host or router must have an IPv4/IPv6 dual-stack for header translations.
	IpV4 Address	(4 octets) The IPv4 address of the interface (hex value).
	Ipv6 Address Encoding	Values which are set in the dialog box are reflected in the hexadecimal view of the IPv6 Header Encoding at the bottom of the dialog box. It is also possible to edit the IP Header directly from the view; all editing occurs in type-over mode.
	Decode	After any change in the IP Header Encoding box, the *Decode* button, should be selected to reflect these directly edited changes back into the dialog box fields.

IPv6 NSAP Allocation Address

The dialog box for the IPv6 NSAP Allocation address is shown in *Image: IPv6 NSAP Allocation Address dialog box*. Its controls appear by selecting *NSAP Allocation* from the list in the *Prefix Type* field.

Image: IPv6 NSAP Allocation Address dialog box

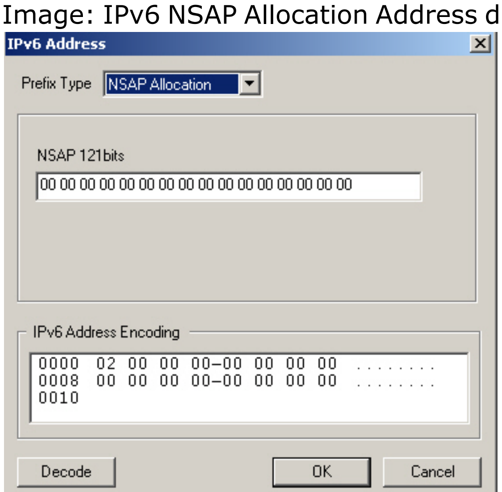
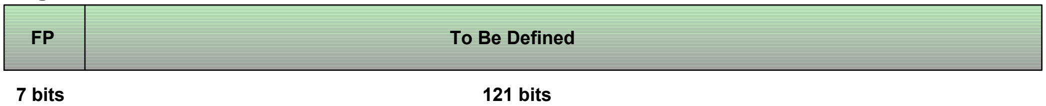


Image: Format of IPv6 NSAP Allocation Address



The fields in this address format and the corresponding implementation in the dialog box for the IPv6 NSAP Allocation address is described in *Table: IPv6 NSAP Allocation Address Fields*.

Table: IPv6 NSAP Allocation Address Fields

Header Field	Dialog box element	Description
Format Prefix	Prefix Type: NSAP Allocation	The defined address prefix value = 0000 001 (binary).
	NSAP 121 bits	These bits are to be entered by you.
	Ipv6 Address Encoding	Values which are set in the dialog box are reflected in the hexadecimal view of the IPv6 Header Encoding at the bottom of the dialog box. It is also possible to edit the IP Header directly from the view; all editing occurs in type-over mode.
	Decode	After any change in the IP Header Encoding box, the *Decode* button, should be selected to reflect these directly edited changes back into the dialog box fields.

IPv6 IPX Allocation Address

The dialog box for the IPv6 IPX Allocation address is shown in *Image: IPv6 IPX Allocation Address dialog box*. Its controls appear by selecting *IPX Allocation* from the list in the *Prefix Type* field.

Image: IPv6 IPX Allocation Address dialog box

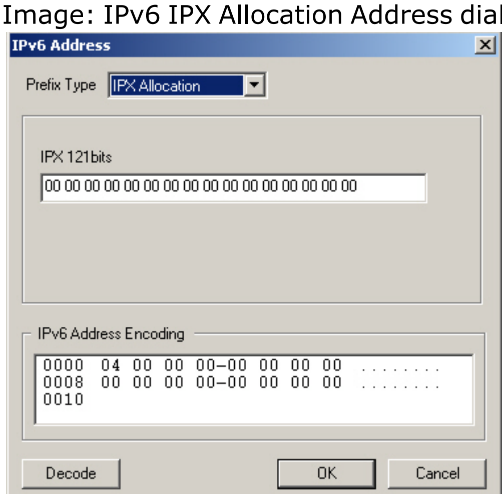
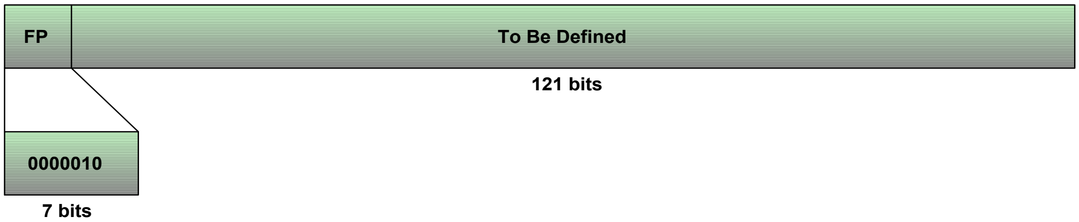


Image: Format of IPv6 IPX Allocation Address



The fields in this address format and the corresponding implementation in the dialog box for the IPv6 IPX Allocation address are described in *Table: IPv6 IPX Allocation Address Fields*.

Table: IPv6 IPX Allocation Address Fields

Header Field	Dialog box element	Description
Format Prefix	Prefix Type: IPX Allocation	The defined address prefix value = 0000 010 (binary).
To Be Defined	IPX 121 bits	These bits are to be entered by you.
	Ipv6 Address Encoding	Values which are set in the dialog box are reflected in the hexadecimal view of the IPv6 Header Encoding at the bottom of the dialog box. It is also possible to edit the IP Header directly from the view; all editing occurs in type-over mode.
	Decode	After any change in the IP Header Encoding box, the *Decode* button, should be selected to reflect these directly edited changes back into the dialog box fields.

IPv6 Global Unicast Address

The dialog box for an IPv6 Global Unicast address is shown in *Image: IPv6 Global Unicast Address dialog box*. Its controls appear by selecting *Global Unicast* from the list in the *Prefix Type* field.

Image: IPv6 Global Unicast Address dialog box

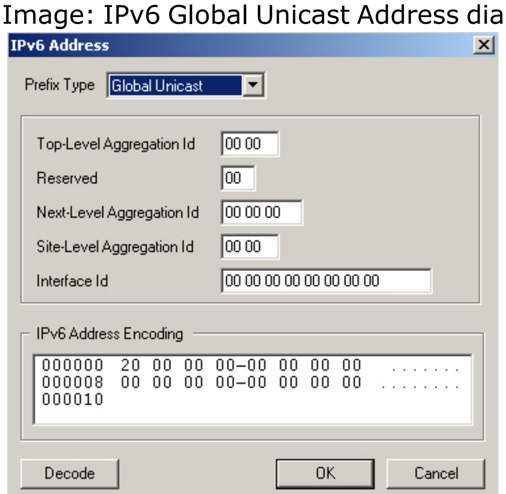
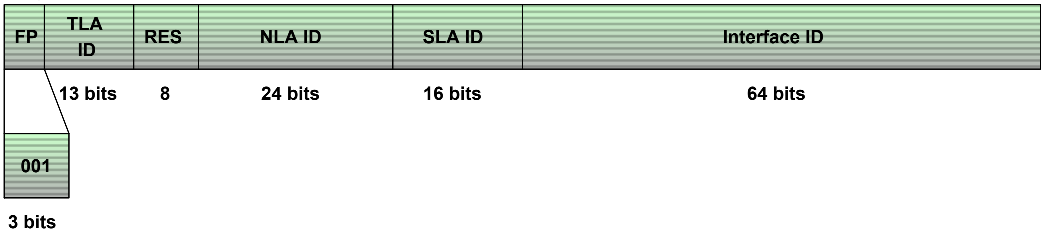


Image: Format of IPv6 Global Unicast Address



The format of the IPv6 aggregratable Global Unicast address is shown in this diagram. The fields in this address format and the corresponding implementation in the dialog box for an IPv6 Global Unicast address are described in *Table: IPv6 Global Unicast Address Fields*.

Table: IPv6 Global Unicast Address Fields

Header Field	Dialog box element	Description
Format Prefix (FP)	Format Prefix	The defined address prefix value = 001 (binary).
Top Level Aggregation ID (TLA ID)	Top Level Aggregation ID	Describes the highest level in the routing hierarchy. Values in Hex format.
Reserved (RSVD)	Reserved	Reserved for future use. Values in Hex format.
Next-Level Aggregator ID (NLA)	Next-Level Aggregator ID	To describe the next level down in the routing hierarchy. Values in Hex format.
Site-Level Aggregator ID (SLA)	Site-Level Aggregator ID	Local level in the hierarchy. Can be used to describe subnets at the site level. Local significance. Values in Hex format.
Interface ID	Interface ID	Describes the interface on the link, which must be unique on that link.
	IPv6 Address Encoding	Values that are set in the dialog box are reflected in the hexadecimal view of the IPv6 Header Encoding at the bottom of the dialog box. It is also possible to edit the IP Header directly from the view; all editing occurs in type-over mode.
	Decode	After any change in the IP Header Encoding box, the *Decode* button, should be selected to reflect these directly edited changes back into the dialog box fields.

IPv6 Global Unicast 3587 Address

The dialog box for an IPv6 Global Unicast address is shown in *Image: IPv6 Global Unicast 3587 Address dialog box*. Its controls appear by selecting *Global Unicast 3587* from the list in the *Address Prefix* field.

Image: IPv6 Global Unicast 3587 Address dialog box

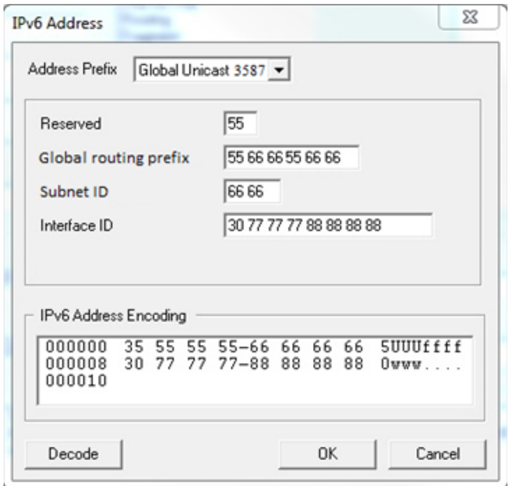


Image: Format of IPv6 Global Unicast 3587 Address

```
| 3 |      45 bits        |  16 bits  |         64 bits          |
+---+---------------------+-----------+--------------------------+
|001|global routing prefix| subnet ID |       interface ID       |
+---+---------------------+-----------+--------------------------+
```

The format of the IPv6 Global Unicast 3587 address is shown in this diagram.

IPv6 Link-Local Unicast

Every IPv6 interface must have at least one Link-Local Unicast address. The dialog box for the Link-Local Unicast address is shown in *Image: IPv6 Link-Local Unicast Address dialog box*. Its controls appear by selecting *Link-Local Unicast* from the list in the *Prefix Type* field.

Image: IPv6 Link-Local Unicast Address dialog box

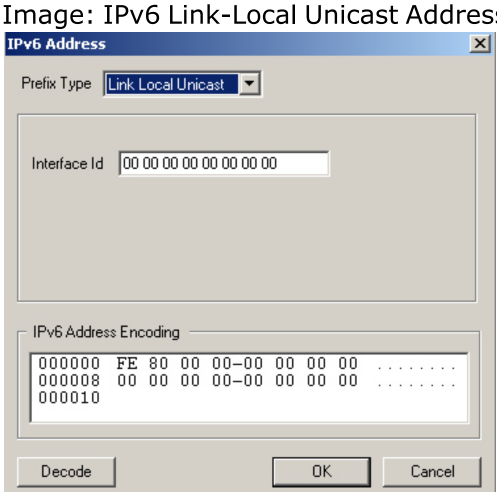
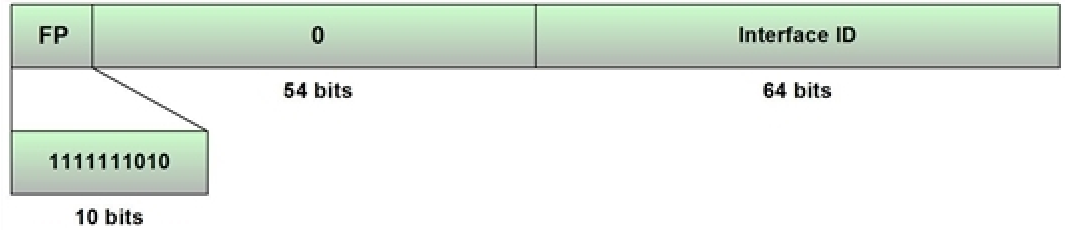


Image: Format of IPv6 Link-Local Address



Link-local addresses are one of the two local-use unicast addresses: link-local and site-local. Link-local addresses are used on a single link, for purposes such as neighbor discovery, or when there are no routers present. IPv6 packets which include this type of address may not be forwarded to other links by a router.

The fields in this address format and the corresponding implementation in the dialog box for the Link-Local Unicast address are described in *Table: IPv6 Link-Local Address Fields*.

Table: IPv6 Link-Local Address Fields

Header Field	Dialog box element	Description
Format Prefix	Prefix Type: Link-Local Unicast	The defined address prefix value = 1111 1110 10 (binary).
Interface ID	Interface ID	The interface of a node on this link.
	Ipv6 Address Encoding	Values that are set in the dialog box are reflected in the hexadecimal view of the IPv6 Header Encoding at the bottom of the dialog box. It is also possible to edit the IP Header directly from the view; all editing occurs in type-over mode.
	Decode	After any change in the IP Header Encoding box, the *Decode* button, should be selected to reflect these directly edited changes back into the dialog box fields.

IPv6 Site-Local Unicast Address

The dialog box for the IPv6 Site-Local Unicast address is shown in *Image: Site-Local Unicast Address dialog box*. Its controls appear by selecting *Site-Local Unicast* from the list in the *Prefix Type* field.

Image: Site-Local Unicast Address dialog box

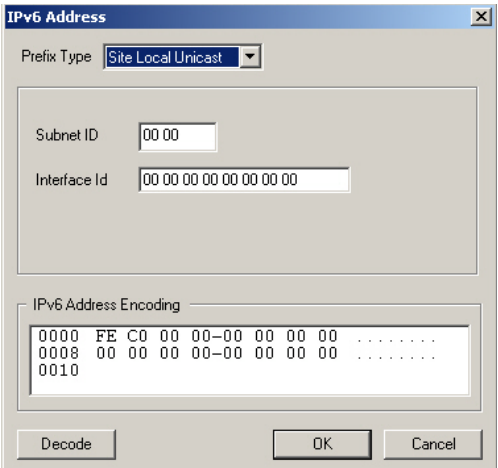
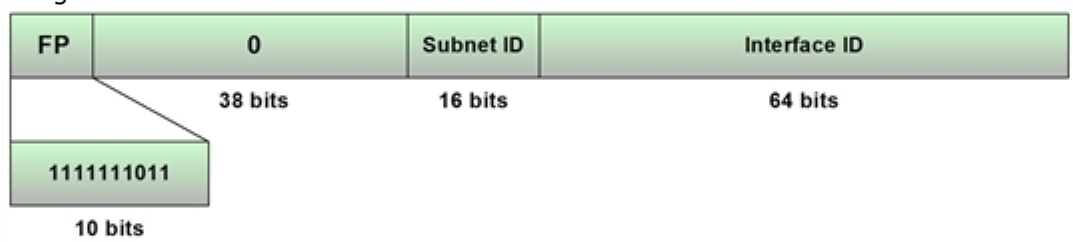


Image: Format of IPv6 Site-Local Address



Site-local addresses are one of the two local-use unicast addresses: site-local and link-local. Site-local addresses are used inside a single site, on one subnet, and no global prefix is required. IPv6 packets which include this type of address may not be forwarded outside of the site by a router.

The fields in this address format and the corresponding implementation in the dialog box for the IPv6 Site-Local Unicast address are described in *Table: IPv6 Site-local Unicast Address Fields*.

Table: IPv6 Site-local Unicast Address Fields

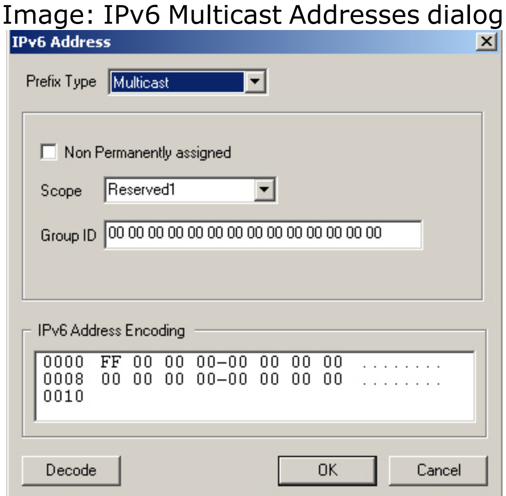
Header Field	Dialog box element	Description
Format Prefix	Prefix Type: Site-local Unicast	The defined address prefix value = 1111 1110 11 (binary).
Subnet ID	Subnet ID	The identifier for the subnet at this site.
Interface ID	Interface ID	The interface ID for a node at this site (on this defined subnet).
	Ipv6 Address Encoding	Values that are set in the dialog box are reflected in the hexadecimal view of the IPv6 Header Encoding at the bottom of the dialog box. It is also possible to edit the IP Header directly from the view; all editing occurs in type-over mode.

Header Field	Dialog box element	Description
	Decode	After any change in the IP Header Encoding box, the *Decode* button, should be selected to reflect these directly edited changes back into the dialog box fields.

IPv6 Multicast Address

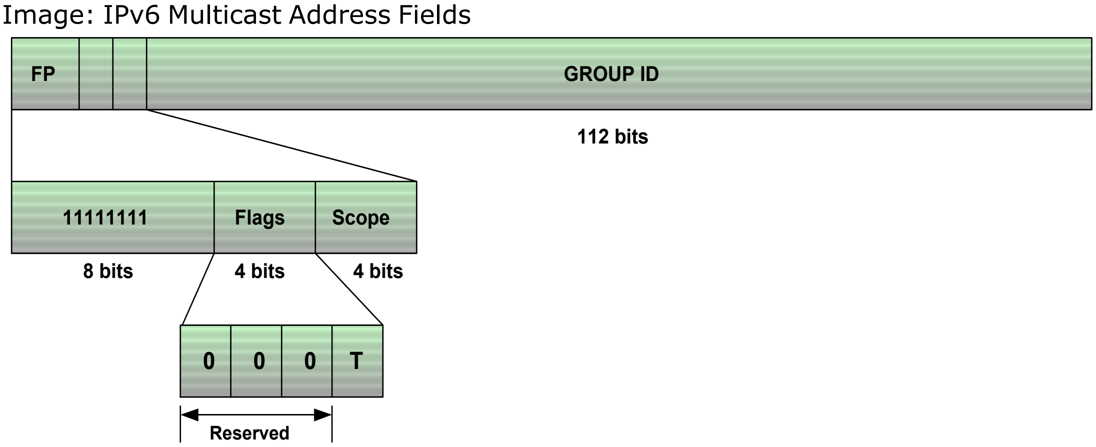
The dialog box for the IPv6 Multicast addresses is shown in *Image: IPv6 Multicast Addresses dialog box*. Its controls appear by selecting *Multicast* from the list in the *Prefix Type* field.

Image: IPv6 Multicast Addresses dialog box



The IPv6 Multicast addresses are used as identifiers for groups of nodes. They must not be used as source address in any IPv6 protocol routing packet header or in IPv6 packets.

Image: IPv6 Multicast Address Fields



The fields in this address format and the corresponding implementation in the dialog box for the IPv6 Multicast addresses are described in *Table: IPv6 Multicast Address Fields*.

Table: IPv6 Multicast Address Fields

Header Field	Dialog box element	Description
Format Prefix	Prefix Type: Multicast	The defined address prefix value = 1111 1111 (binary).
Flags	Non Permanently assigned	Checking this box indicates that the multicast address is 'transient' - not permanently-assigned. (The Flags field is set to 000**1**.) If box is left clear, indicates that this is a permanently-assigned ('well-known') multicast address, per the IANA. (The Flags field is set to 000**0**, which is the default.)
Scope	Scope	Limits the scope of a multicast group. The scope value identifies the type of scope.
		Unassigned: (Values = 3 & 4, 6 & 7, 9 through D)
		Reserved1: (Value = 0)
		Node-local scope: (Value = 1) This mutlicast address identifies the group of all IPv6 nodes within the Node-local scope. Also identifies the group of all IPv6 routers within the Node-local scope.
		Link-local scope: (Value = 2) This multicast address Identifies the group of all IPv6 nodes within the Link-local scope. Also identifies the group of all IPv6 routers within the Link-local scope.
		Site-local scope: (Value = 5) This multicast address Identifies the group of all IPv6 routers within the Site-local scope.
		Organization-local scope: (Value = 8) This multicast address Identifies the group of all IPv6 routers within the Organizational-local scope.
		Global scope: (Value = E) This multicast address Identifies the group of all IPv6 routers within the Global local scope.

Header Field	Dialog box element	Description
		Reserved2: (Value = F)
Group ID	Group ID	This value is an identifier for a multicast group (permanent or transient), within the given 'scope.'
	IPv6 Address Encoding	Values which are set in the dialog box are reflected in the hexadecimal view of the IPv6 Header Encoding at the bottom of the dialog box. It is also possible to edit the IP Header directly from the view; all editing occurs in type-over mode.
	Decode	After any change in the IP Header Encoding box, the *Decode* button, should be selected to reflect these directly edited changes back into the dialog box fields.

The default values for the pre-defined Well-Known Multicast Addresses are shown in *Table: IPv6 Default Well-Known Multicast Addresses*. These addresses can never be assigned to any multicast group

Table: IPv6 Default Well-Known Multicast Addresses

Multicast Address Type (as listed in dialog box)	Permanent Address
Reserved1	FF 00 00 00 00 00 00 00
Node-local	FF 01 00 00 00 00 00 00
Link-local	FF 02 00 00 00 00 00 00
Site-local	FF 05 00 00 00 00 00 00
Organization-local	FF 08 00 00 00 00 00 00
Global	FF 0E 00 00 00 00 00 00
Reserved2	FF 0F 00 00 00 00 00 00
*Unassigned	FF 03 00 00 00 00 00 00

NOTE Per RFC 2373, Multicast Addresses with a Scope value of 3, 4, 6, 7, 9, A, B, and C are all 'Unassigned.'

IPv6 User-Defined Address

The dialog box for a IPv6 User-Defined address is shown in *Image: IPv6 User-Defined Address dialog box*. Its controls appear by selecting *User Defined* from the list in the *Prefix Type* field.

Image: IPv6 User-Defined Address dialog box

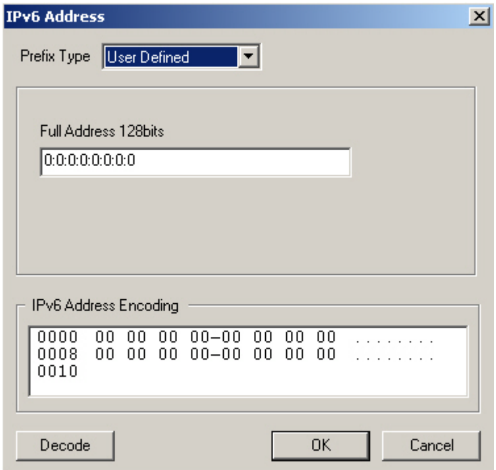
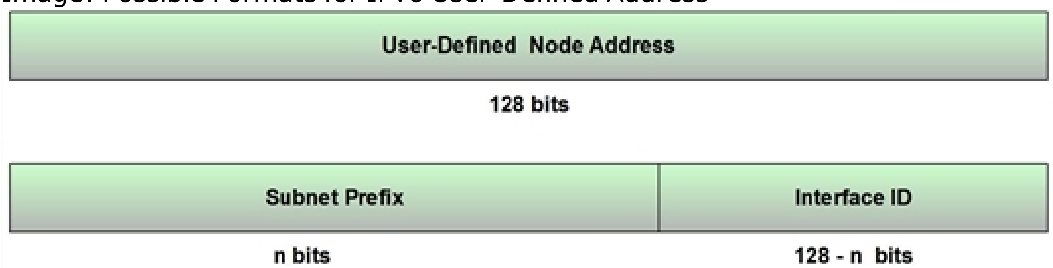


Image: Possible Formats for IPv6 User-Defined Address



The fields in this address format and the corresponding implementation in the dialog box for a IPv6 User-Defined address are described in *Table: IIPv6 User-Defined Address Fields*.

Table: IIPv6 User-Defined Address Fields

Header Field	**Dialog box element**	**Description**
N/A	Full Address (128 bits)	The 128-bit address can be set by you. However, the following rules apply: • 0:0:0:0:0:0:0:0, the 'unspecified address' must never be assigned to a node, and must not be used as a destination address in IPv6 packets or IPv6 routing protocol packet headers. • 0:0:0:0:0:0:0:1, the unicast 'loopback address' may never be assigned to any physical interface. It may be used when a node sends a packet to itself. It must not be the source address in IPv6 packets which are destined for another node or forwarded by a router.
	Ipv6 Address Encoding	Values which are set in the dialog box are reflected in the hexadecimal view of the IPv6 Header Encoding at the bottom of the dialog box. It is also possible to edit the IP Header directly from the view; all editing occurs in type-over mode.
	Decode	After any change in the IP Header Encoding box, the *Decode* button,

Header Field	Dialog box element	Description
		should be selected to reflect these directly edited changes back into the dialog box fields.

NOTE When using the *User Defined* prefix, the Address Prefix field (shown in *Image: IPv6 Header dialog box* and described in *Image: IPv6 Header Fields Set by the IPv6 Header*) does not show *User Defined*. Instead, a prefix from the list of other prefixes appear, based on what the user defined prefix most closely resembles.

IPv6 Extension Headers

Each of the IPv6 Header Extensions can be edited in dialog boxes which are accessed through the IPv6 Header dialog box. When multiple header extensions are used, the extensions are included in the IPv6 header in the following order:

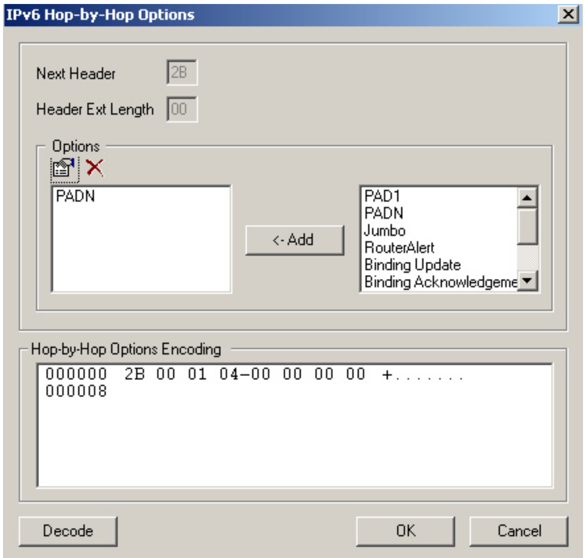
- IPv6 Hop-by-Hop Extension Header.
- IPv6 Routing Extension Header.
- IPv6 Fragment Extension Header.
- IPv6 Destination Extension Header.
- IPv6 Authentication Extension Header.

Header extensions are added by selecting a header in the *Available Extension Headers* field, and selecting the *Add* button. Alternatively, header extensions can be added by double-clicking a header in the *Available Extension Headers* field.

IPv6 Hop-by-Hop Extension Header

The *IPv6 Hop-by-Hop Options* dialog box is shown in *Image: IPv6 Extension Header —Hop-by-Hop Options*. It is accessed by selecting *Hop-by-Hop* in the *Header Extensions* field of the *IPv6 Header* dialog box, then selecting the *Edit Extension Header* icon ( ). Alternatively, this dialog box can be opened by double-clicking *Hop-by-Hop*.

Image: IPv6 Extension Header —Hop-by-Hop Options



The fields and controls for the *IPv6 Hop-by-Hop Options* dialog box are described in *Table: IPv6 Hop-by-Hop Options dialog box*.

Table: IPv6 Hop-by-Hop Options dialog box

Header Field	Dialog box element	Usage
Next Header	Next Header	(Read-only) 8 bits. The type of header which follows this header.
Hdr Ext Len	Header Ext Length	(Read-only) 8 bits. The length of this header in bytes.
Options	Selected Options List (left window)	A list of the selected options, shown in the left pane. These options will be added to the IPv6 Hop-by-Hop Extension header. Double-click a selected option to show the associated configuration dialog box.
	Available Options List	A list of different types of options which may be added to the IPv6 Hop-by-Hop Extension header. • PAD1 • PADN • Jumbo • RouterAlert • Binding Update • Binding Acknowledgment • Binding Request • MIpV6 Unique ID Sub • MIpV6AlternativeCoaSub

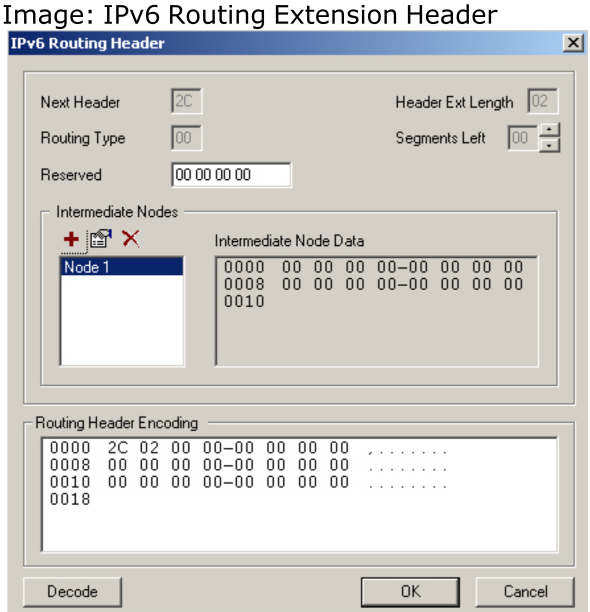
Header Field	**Dialog box element**	**Usage**
	<- Add	Select/highlight an available Extension Header, and then select the <- *Add* button to add that header to the list of selected options in the left pane.
	 Edit Option	When an option in the left window is highlighted, selecting this icon shows the *IPv6 Option* dialog box so that option can be modified.
	 Remove Option	When this icon is selected, deletes the highlighted option in the left pane.
	Hop-by-Hop Options Encoding	You may manually enter coding in this field.
Decode		After any change in the Hop-by-Hop Options Encoding box, the *Decode* button, should be selected to reflect these the directly edited changes back into the dialog box fields.

IPv6 Routing Extension Header

This dialog box is accessed by selecting *Routing* in the *Header Extensions* field of the *IPv6 Header* dialog box, then pressing the *Edit Extension Header* icon (). Alternatively, this dialog box can be opened by double-clicking *Routing*.

The *IPv6 Routing Header* dialog box is shown in *Image: IPv6 Routing Extension Header*.

Image: IPv6 Routing Extension Header



The fields and controls for the *IPv6 Routing Header* dialog box are described in *Table: IPv6 Routing Header dialog box*.

Table: IPv6 Routing Header dialog box

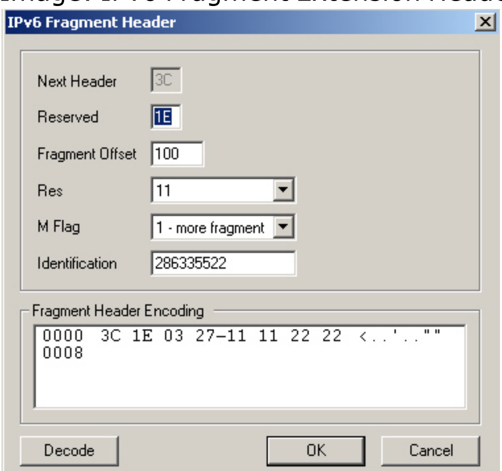
Header Field	Dialog box element	Usage
Next Header	Next Header	(Read-only) 8 bits. The type of header which follows this header.
Hdr Ext Len	Header Ext Length	(Read-only) 8 bits. Length of this header in bytes.
Routing Type	Routing Type	(Read-only) Identifies the routing type. Default is 0.
Segments Left	Segments Left	(Read-only) Used if Routing Type is not recognized by this node. If segments left =0, this node ignores this header and goes on to the next header. If value = non-0, packet is discarded.
Reserved	Reserved	This value is set to zero when packet is transmitted, and ignored by the destination node.
type-specific data	Intermediate Nodes	Variable Length field. Lists the nodes to be traversed by the packet. Node 1, Node 2, and so on.
	Add Node	When selected, adds a node to the list: Node 1, Node 2, and so on.
	Edit Node	When selected, shows the *IPv6 Address* dialog box.
	Remove Node	When selected, deletes the highlighted node in the list.
	Intermediate Node Data	(Read-only) Shows the 16-byte IPv6 addresses of the intermediate nodes. Shown as hex values.
	Routing Header Encoding	A view of the components of the Routing Header, shown as hex values.
Decode		After any change in the Routing Header Encoding box, the *Decode* button, should be selected to reflect these the directly edited changes back into the dialog box fields.

IPv6 Fragment Extension Header

Fragmentation of an IPv6 packet is done by the source node, and is done if the packet is larger than the Maximum Transmission Unit (MTU) for the path. The Next Header value for a Fragment extension header is 44. This dialog box is accessed by selecting *Fragment* in the *Header Extensions* field of the *IPv6 Header* dialog box, then pressing the *Edit Extension Header* icon (). Alternatively, this dialog box can be opened by double-clicking *Fragment*.

The *IPv6 Fragment Header* dialog box is shown in *Image: IPv6 Fragment Extension Header*.

Image: IPv6 Fragment Extension Header



The fields and controls for the *IPv6 Fragment Header* dialog box are described in *Table: IPv6 Fragment Header dialog box*.

Table: IPv6 Fragment Header dialog box

Header Field	Dialog box element	Description
Next Header	Next Header	(Read-only) 8 bits. The type of header which follows this header.
Reserved	Reserved	This value is set to zero when the packet is transmitted, and ignored by the destination node.
Fragment Offset	Fragment Offset	13-bits. The value of the offset for the data contained in this packet, relative to the start of the fragmentable part of the original packet. In 8-octet units. It is used in reassembling the data at the destination end of the link. If this is the first fragment, the offset value = 0. The fragmentable part of a packet contains extension headers which are processed ONLY at the final destination node, and the upper-layer header and data.
Res	Res	Reserved. This value is set to zero when packet is transmitted, and ignored by the destination node.

Header Field	Dialog box element	Description
M flag	M Flag	Indicates type of fragment packet. • If '1,' there are more fragments of the original, large packet to be received. • If '0,' it contains the last fragment of the original packet.
Identification	Identification	A 32-bit value that identifies the original packet which is to be fragmented. This value must not have been assigned to another fragmented packet with the same source and destination addresses which has been sent 'recently'—within the lifetime of this previous packet, including transmission and reassembly.
	Fragment Header Encoding	A view of the components of the Routing Header, shown as hex values.
Decode		After any change in the Fragment Encoding box, the *Decode* button, should be selected to reflect these the directly edited changes back into the dialog box fields.

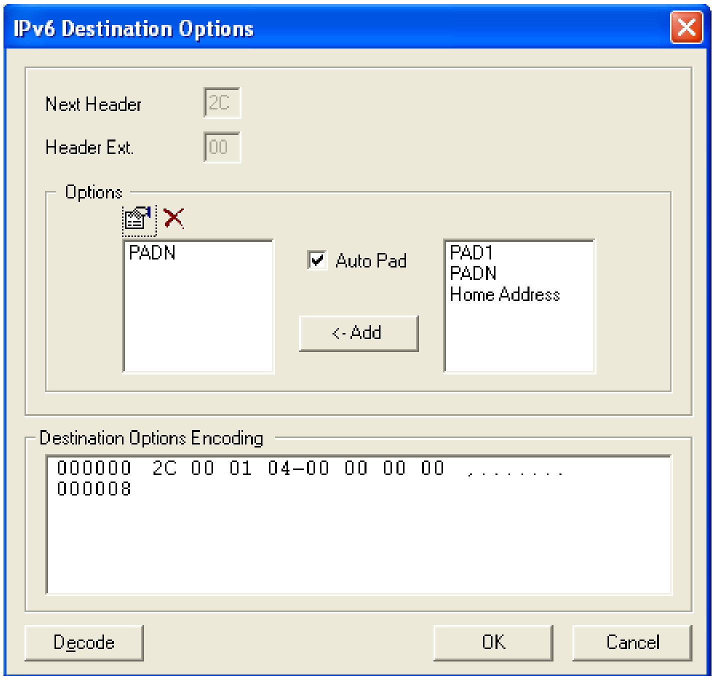
IPv6 Destination Extension Header

The Destination Options header is used to carry optional information that need to be examined only by a packet's destination node or nodes.

This dialog box is accessed by selecting *Destination* in the *ExtensionHeaders* field of the *IPv6 HeaderPage* dialog box, then selecting the *Edit Extension Header* icon (). Alternatively, this dialog box can be opened by double-clicking *Destination*.

The *IPv6 Destination Options* dialog box is shown in *Image: IPv6 Destination Options*.

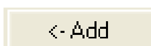
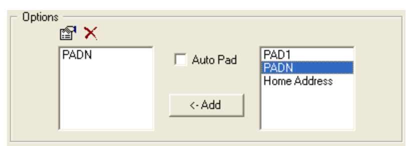
Image: IPv6 Destination Options



The fields and controls for the *IPv6 Destination Options* dialog box are described in *Table: IPv6 Destination Options dialog box*.

Table: IPv6 Destination Options dialog box

Header Field	Dialog box element	Description
Next Header	Next Header	(Read-only) 8 bits. The type of header which follows this header.
Header Ext.	Header Ext Length	(Read-only) 8 bits. Length of this header in bytes.
Options	Selected IPv6 Destination Options List (left window, as shown in Image: IPv6 Destination Options	A list of the IPv6 Destination header options, shown in the left pane. These options are added to the IPv6 Destination Extension header. The options in the list are as follows: • PAD1: The PAD1 option is used to insert one octet of padding into the Options area of a header. If more than one octet of padding is required, the PADN option is used, rather than multiple Pad1 options. • PADN: The PadN option is used to insert two or more octets of padding into the Options area of a header. • Home Address: It is the 16 byte in length IPv6 Destination Header option.

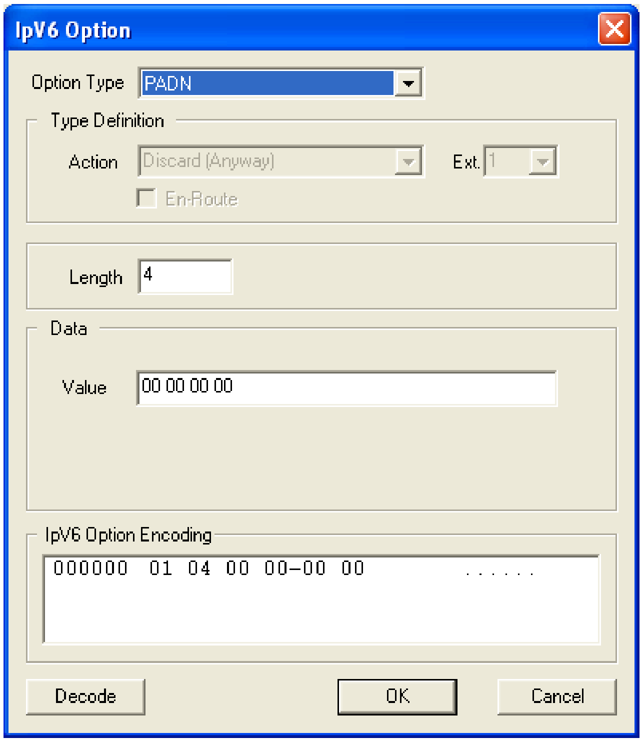
Header Field	Dialog box element	Description
		NOTE The sequence of options within the header is processed in the order they appear in the header. Double-click a selected option to view the associated configuration dialog box.
		When an option in the left window is highlighted, selecting this icon shows the *IPv6 Option* dialog box where that option can be modified. Refer IPv6 Option for more information.
		Select this icon to delete the highlighted option in the left pane.
	Auto Pad (check box)	If selected, adds a 'Pad N' option, if necessary, to make the option header extension length a multiple of 8 octets.
		Select or highlight an available Destination Extension Header in the right pane, and then select the <-Add button to add that header to the list of selected options in the left pane. The result is shown here: 
	Destination Options Encoding	You can manually enter coding in this field.
Decode		After any change in the *Destination Encoding* box, the *Decode* button is selected to reflect the directly edited changes back into the dialog box fields.

IPv6 Option

The *IPv6 Option* dialog box contains the editable parameters of IPv6 Destination Extension Header. This dialog box is accessed by selecting an available Destination Extension Header in the *IPv6 Destination Options* dialog box, then selecting the *Edit Option* icon (). Alternatively, this dialog box can be opened by double-clicking the selected or highlighted header option.

The IPv6 Option dialog box is shown in *Image: IPv6 Option dialog box*.

Image: IPv6 Option dialog box



The fields and controls for the *IPv6 Options* dialog box are described in *Table: IPv6 Options dialog box*.

Table: IPv6 Options dialog box

Section	Field	Description
Option Type		The list contains the IPv6 Destination header options. The options in the list are as follows.
Type Definition	Action	This field is disabled for IPv6 Destination Extension header options.
	Ext.	This field is disabled for IPv6 Destination Extension header options.
	En-Route	This field is disabled for IPv6 Destination Extension header options.
Length		Length of the header. NOTE The length value depends on the type of header selected.
Data	Value	Data value of the header. NOTE The data value depends on the type of header selected.
IPv6 Option Encoding		You can manually enter coding in this field.

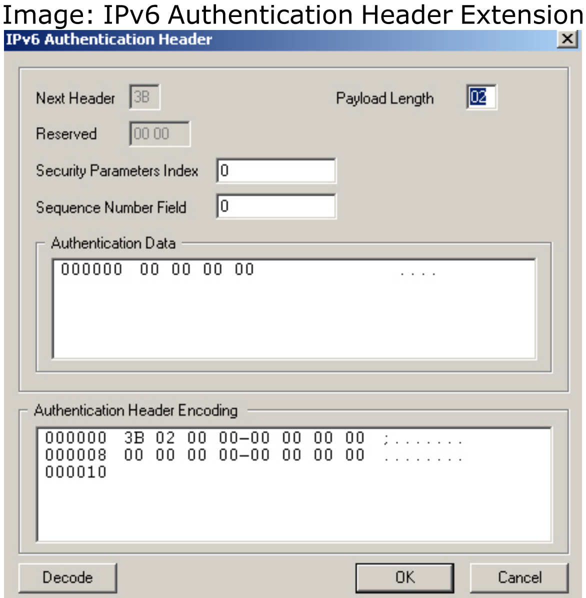
Section	Field	Description
Decode		After any change in the *IPv6 Option Encoding* box, the *Decode* button is clicked to reflect the directly edited changes back into the dialog box fields.

IPv6 Authentication Extension Header

This dialog box is accessed by selecting *Authentication* in the *Header Extensions* field of the *IPv6 Header* dialog box, then pressing the *Edit Extension Header* icon (). Alternatively, this dialog box can be opened by double-clicking *Authentication*.

The *IPv6 Authentication Header* dialog box is shown in *Image: IPv6 Authentication Header Extension*.

Image: IPv6 Authentication Header Extension



The fields and controls for the *IPv6 Authentication Header* dialog box are described in *Table: IPv6 Authentication Header dialog box*.

Table: IPv6 Authentication Header dialog box

Header Field	Dialog box element	Description
Next Header	Next Header	(Read-only) 8 bits. The type of payload which follows this header.
Payload Length	Payload Length	8 bits. Length of the Authentication Header in 32-bit words minus 2 (32-bit words).
Reserved	Reserved	(Read-only) Reserved for future use. Must be set to 0.
Security Parameters Index (SPI)	Security Parameters Index	Arbitrary 32-bit value which is added to the destination IP address and security protocol, to identify the Security

Header Field	Dialog box element	Description
		Association. Values 1-255 are reserved by the IANA. Value 0 cannot be used for external purposes.
Sequence Number Field	Sequence Number Field	Counter - Mandatory.
Authentication Data	Authentication Data	Variable length Contains the packet’s Integrity Check Value (ICV).
	Authentication Header Encoding	Reflects the values in the extension header fields in this dialog box, and the authentication data.
Decode		After any change in the Hop-by-Hop Options Encoding box, the *Decode* button, should be selected to reflect these the directly edited changes back into the dialog box fields.

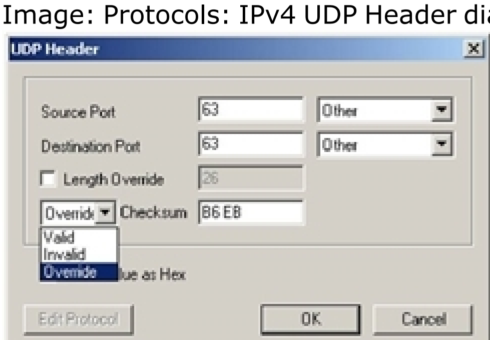
UDP Header dialog box

This dialog box is accessed by selecting the *UDP/IP* option button in the Protocols section of the **Frame Data** tab. Then, from the *IPv4* or *IPv6 Header* dialog box, select the *Edit UDP* button.

When the Protocol types are set to IPv4/6 and UDP (for UDP/IP, RIP/UDP/IP and DHCP/UDP/IP protocols), the *Edit UDP* button may be used to bring up a dialog box which allows editing of the IPv4/6 UDP header. The UDP header follows the IP header in the packet.

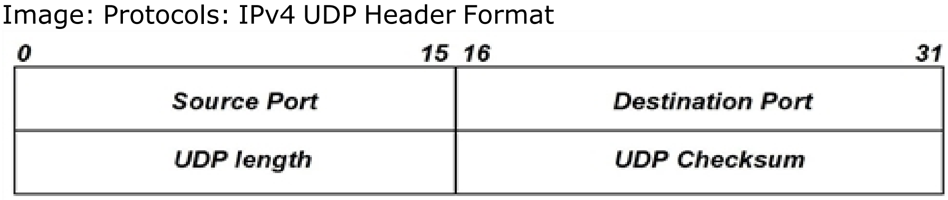
The *UDP Header* dialog box is shown in *Image: Protocols: IPv4 UDP Header dialog box*.

Image: Protocols: IPv4 UDP Header dialog box



The format of an IPv4 UDP header is shown in *Image: Protocols: IPv4 UDP Header Format*.

Image: Protocols: IPv4 UDP Header Format



The correspondence between the fields of an UDP header and the elements of the *UDP Header* dialog box which set those fields are described in *Table: UDP Header Fields Set by the IPv4 UDP dialog box*.

Table: UDP Header Fields Set by the IPv4 UDP dialog box

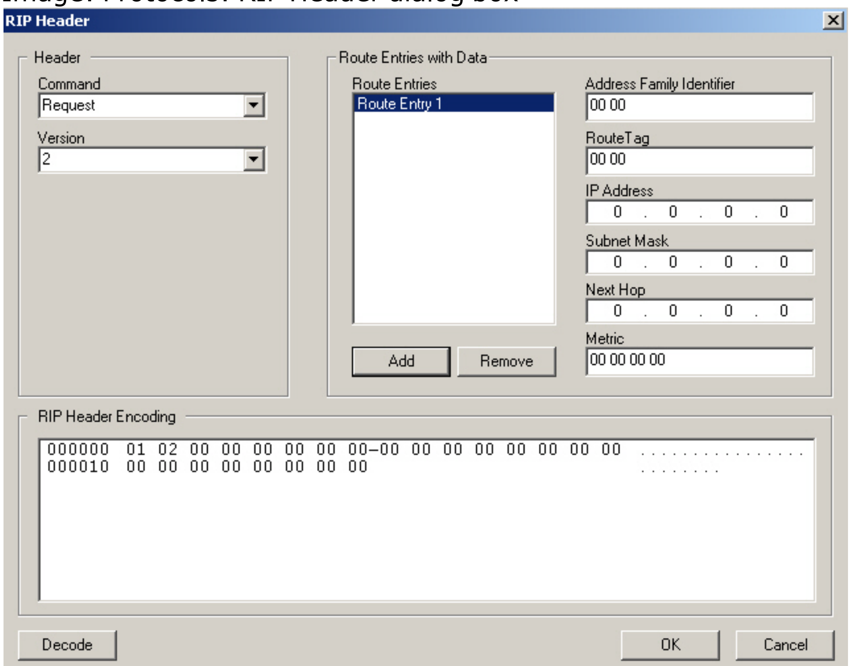
Header Field	Dialog box field	Description
Source Port	Source Port	Protocol source port number. One of: • RIP (Port 520) • DHCP Server (Port 67) • DHCP Client (Port 68) • PTP Event (Port 319) (*Image: UDP Header for PTP*.) • PTP General (Port 320)*Image: UDP Header for PTP* .) • Other (Port 63): If Other is selected, the *Edit Protocol* button is disabled (dimmed).
Destination Port	Destination Port	Protocol destination port number. One of: • RIP (Port 520) • DHCP Server (Port 67) • DHCP Client (Port 68) • PTP Event (Port 319)*Image: UDP Header for PTP* .) • PTP General (Port 320)*Image: UDP Header for PTP*.) • Other (Port 63)
UDP Length (Override)	Length	Length of the UDP header and data. This is set automatically by the Ixia hardware. By selecting the Length Override check box, the you can manually set the UDP length.
UDP Checksum	Checksum	Choose one of the following checksum options from the list: • **Valid**: The calculated checksum over the UDP header and UDP length is automatically calculated. • **Invalid**: The calculated checksum over the UDP header and UDP length is automatically calculated (with error). • **Override**: The UDP Checksum can be set to a user-defined, 2-octet value in the box to the right.
	Show value as Hex	If enabled through the check box, the values for Source Port, Destination Port, and Length appear as hexadecimal values.
	Edit Protocol	Enabled only if the protocol selected for the Source port is not set to 'Other.'

If either source or destination port address is set to the RIP port number (520), then the *Edit RIP* button is enabled. Selecting that button shows the RIP Header dialog box*. If both ports are set to DHCP (client or server), the Edit Protocol button is enabled, and changes to Edit DHCP.*

RIP Header dialog box

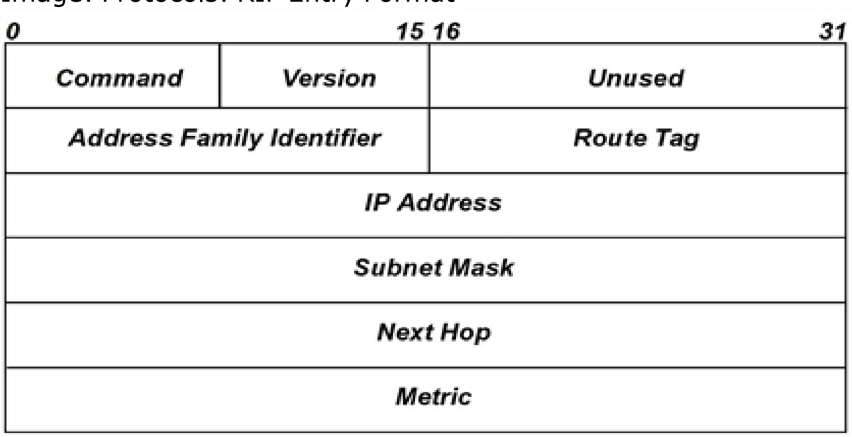
If either source or destination port address of the UDP Header dialog box *is set to the RIP port number (520), then the Edit RIP button is enabled. Selecting the button presents the dialog box below. Either RIP version 1 or version 2 packets may be built. The RIP dialog box may also be accessed from the IP Header dialog box shown in Image: Protocols: IPv4 Header dialog box.*

Image: Protocols: RIP Header dialog box



This dialog box allows the RIP specific header elements to be set. The format of a RIP packet is shown in *Image: Protocols: RIP Entry Format*.

Image: Protocols: RIP Entry Format



The first four bytes contain the RIP header. The remainder of the message may contain from 1 to 25 route entries.

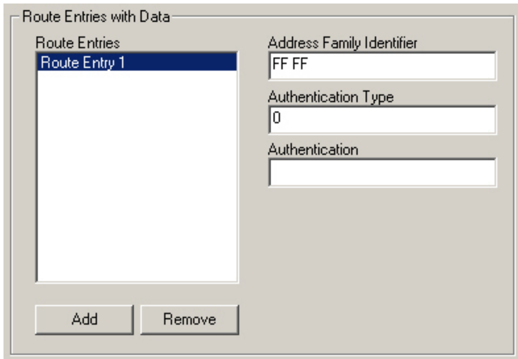
The *Route Entries with Data* box allows multiple entries to be created and edited. To edit an existing entry, select it from the *Route Entries* list and modify the entries on the right. To save the work, select the *OK* button or select a different entry from the list. To create a new entry select the *Add* button; an empty entry will be added to the end of the list. The correspondence between the fields of an RIP header and the elements of the *RIP Header* dialog box which set those fields are described in *Table: RIP Header Fields Set by the RIP dialog box*.

Table: RIP Header Fields Set by the RIP dialog box

Header Field	**Dialog box field**	**Description**
Command	Command	One of the RIP commands: • Unknown. • Request: A request for the responding system to send all or part of its routing table. • Response: Response or update information from a sender. • Trace On: An obsolete message. • Trace Off: An obsolete message. • Reserved: Reserved for use by Sun Microsystems.
Version	Version	RIP Version Number, values of 1 (RIP version 1) or 2 (RIP version 2) are valid.
Address Family Identifier	Address Family Identifier	Valid values are 2 (IP protocol), 0xFFFF (authentication entry, see below for a further description) and 0 (if Metric=16, indicates request for entire routing table).
Route Tag	Route Tag	A number used to distinguish the source of routing information.
IP Address	IP Address	The IP address of the routing table entry.
Subnet Mask	Subnet Mask	For Version 2 records, the subnet mask that applies to the IP address.
Next Hop	Next Hop	For Version 2 records, the IP address of the next routing hop for IP address and subnet mask.
Metric	Metric	The routing cost metric, from 1 to 16, with 16 interpreted as unreachable.

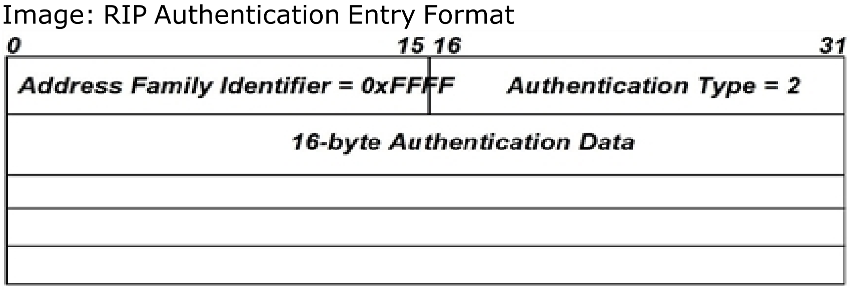
For Version 2 authentication records, when the *Address Family Identifier* is set to ‘0xFFFF,’ the route entry elements change in the dialog box, as shown in *Image: RIP Authentication Entry*.

Image: RIP Authentication Entry



The format of the authentication entry, which may only exist once as the first routing table entry, is shown in *Image: RIP Authentication Entry Format*.

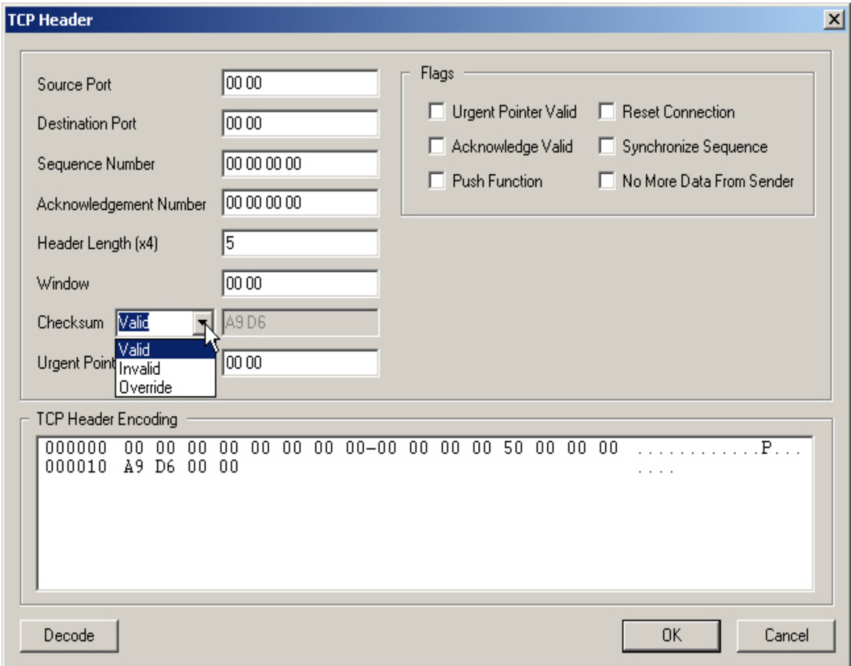
Image: RIP Authentication Entry Format

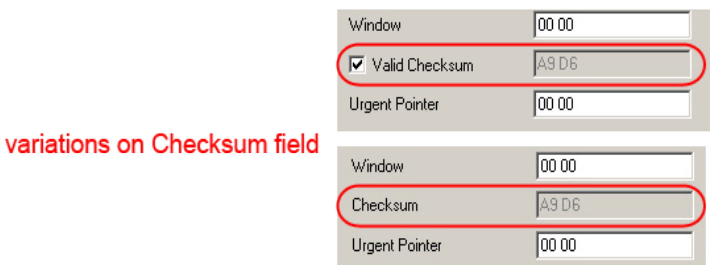


TCP Header dialog box

When the Protocol type is set to *TCP/IP* on the IP Header dialog box the *Edit TCP* button may be used to bring up a dialog box which allows editing of the TCP header. The TCP header follows the IP header. The *TCP Header* dialog box is shown in *Image: Protocols: TCP Header dialog box*.

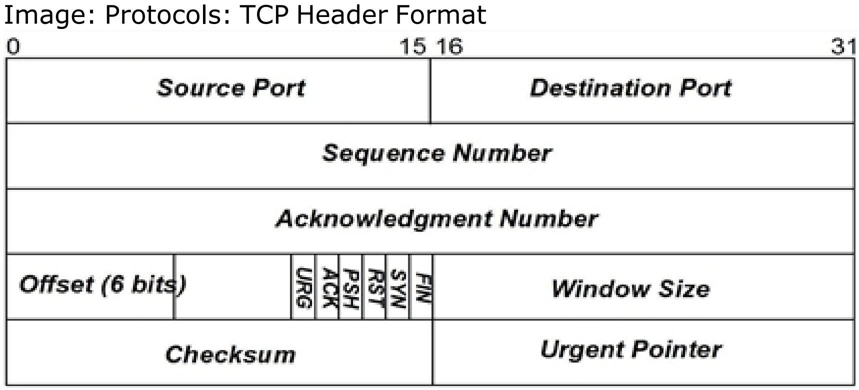
Image: Protocols: TCP Header dialog box





The format of a TCP header is shown in *Image: Protocols: TCP Header Format*.

Image: Protocols: TCP Header Format



The correlation between the fields of an TCP header and the elements of the *TCP Header* dialog box which set those fields are described in *Table: TCP Header Fields Set by the TCP dialog box*.

Table: TCP Header Fields Set by the TCP dialog box

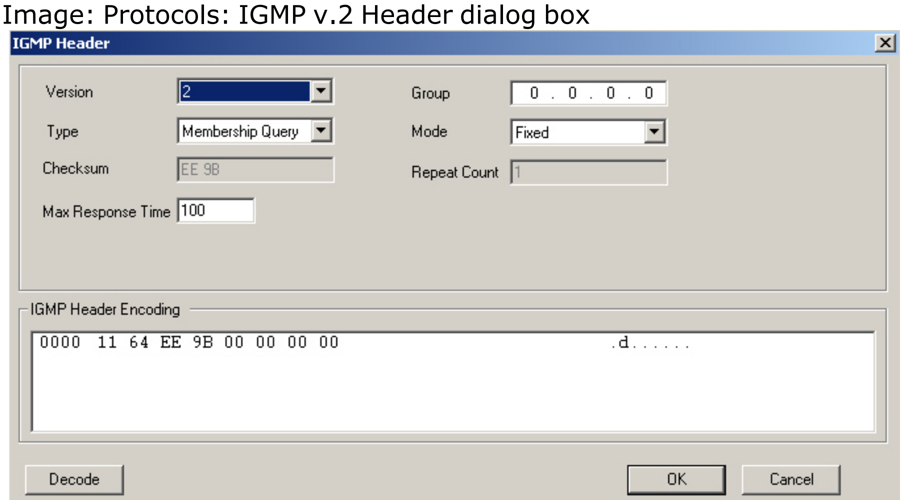
Header Field	Dialog box field	Description
Source Port	Source Port	Protocol source port number.
Destination Port	Destination Port	Protocol destination port number.
Sequence Number	Sequence Number	The packet sequence number for the connection.
Acknowledge-ment Number	Acknowledg-ment Number	The next byte number that the sender expects for the connection.
Offset	Header Length [x4]	Offset from the beginning of the TCP header to the data.
Flag–FIN	No More Data From Sender	The sender indicates that this is the last packet it will transmit for the connection.
Flag–SYN	Synchronize Sequence	Indicates either a connection request (ACK = 0) or a connection accepted (ACK = 1) condition.
Flag–RST	Reset Connection	Reset the connection signal.
Flag–PSH	Push Function	Request that receiver deliver the packet to the application without buffering.
Flag–ACK	Acknowledge Valid	The acknowledgment number field is valid. Also used in establishing connections (see SYN above).
Flag -- URG	Urgent Pointer Valid	The urgent pointer field is valid.
Window Size	Window	The number of bytes that the recipient may send to the sender, starting at the acknowledge byte.
Checksum		Depending on the load module, there are 3 different ways in which Checksum is handled:
	ValidInvalidOverride (list)	NOTE Refer to the *Ixia Platform Reference Manual*, Table 1-7, for list of load modules supporting checksum override. For load modules supporting Checksum Override, choose one of the following checksum options from the list: • Valid: The calculated checksum over the TCP header and TCP length is automatically calculated. • Invalid: The calculated checksum over the TCP header and TCP length is automatically calculated (with error).

Header Field	Dialog box field	Description
		• Override: The TCP Checksum can be set to a user-defined, 2-octet value in the box to the right.
	Checksum	(Read-only) The correct checksum will be automatically generated and transmitted.
	Valid Checksum (check box)	(Read-only) If selected, a valid checksum will be generated. If cleared, an invalid checksum will be generated.
Urgent Pointer	Urgent Pointer	Byte offset of the urgent data in the packet.

IGMP Header dialog box

When the Protocol type is set to *IGMP/IP* on the IP Header dialog box the *Edit IGMP* button may be used to bring up dialog box which allows editing of the IGMP message header. The IGMP header follows the IP header. The *IGMP Header* dialog box is shown in *Image: Protocols: IGMP v.2 Header dialog box*.

Image: Protocols: IGMP v.2 Header dialog box



The format for an IGMP v.2 message header (the default setting) is shown in *Image: Protocols: IGMP v. 2 Message Header Format*.

Image: Protocols: IGMP v. 2 Message Header Format

The correspondence between the fields of an IGMP header and the elements of the IGMP v. 2 message header dialog box which sets those fields are described in *Table: IGMP v.2 Message Header Fields Set by the IGMP dialog box*.

Table: IGMP v.2 Message Header Fields Set by the IGMP dialog box

Header Field	**Dialog box field**	**Description**
Version	Version	IGMP Version Number. Choose one of: • Unknown • 1 • 2 - the version described in this table. • 3 - changes the composition of this dialog box (*Image: Protocols: IGMP v.3 Membership Query Message dialog box* for a description of this dialog box) (The default is Version 2)
Type	Type	The IGMP message. Choose one of: • Membership Query • Membership Report • Leave Group (for Version 2 only)
Checksum	Checksum	The 16-bit ones complement of the ones complement sum of the 8-octet IGMP message.
Max Response Time	Max Response Time	
Group Address	Group	The IP address of the group associated with the message.
	Mode	Choose one of: • Fixed • Increment • Decrement • Continuous increment • Continuous decrement
	IGMP Header Encoding	After changes are made in the header dialog box, select the *Decode* button to update the corresponding data in the IGMP Encoding view.

The dialog box for an IGMP v.3 Membership Query header is shown in *Image: Protocols: IGMP v.3 Membership Query Message dialog box*.

Image: Protocols: IGMP v.3 Membership Query Message dialog box

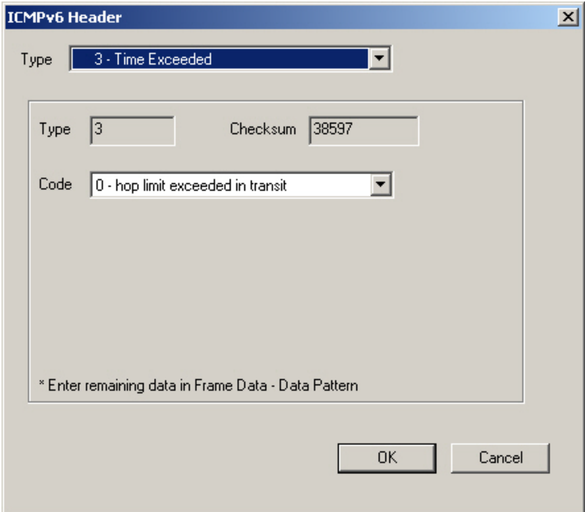
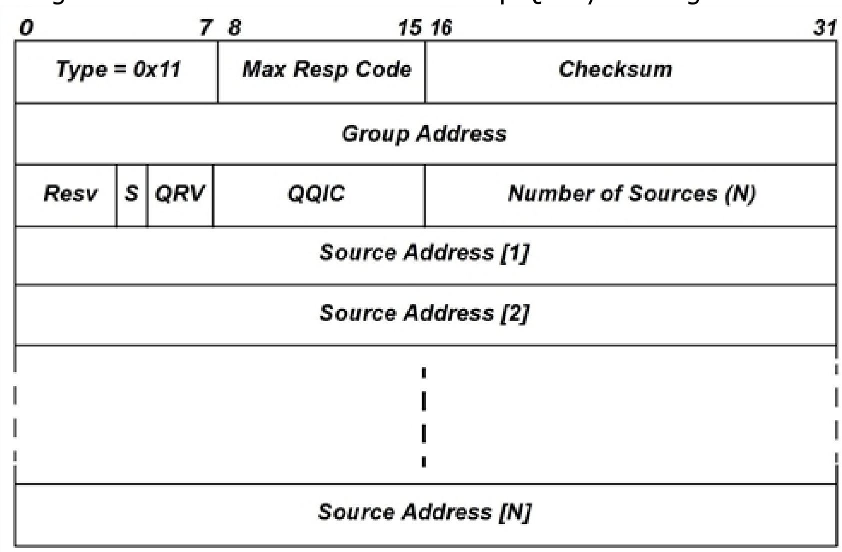


Image: Protocols: IGMP v.3 Membership Query Message Format

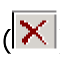


The correspondence between the fields of an IGMP v.3 Membership Query message and the elements of the IGMP v. 3 dialog box which sets those fields is described in *Table: IGMP v.3 Membership Query Message*.

Table: IGMP v.3 Membership Query Message

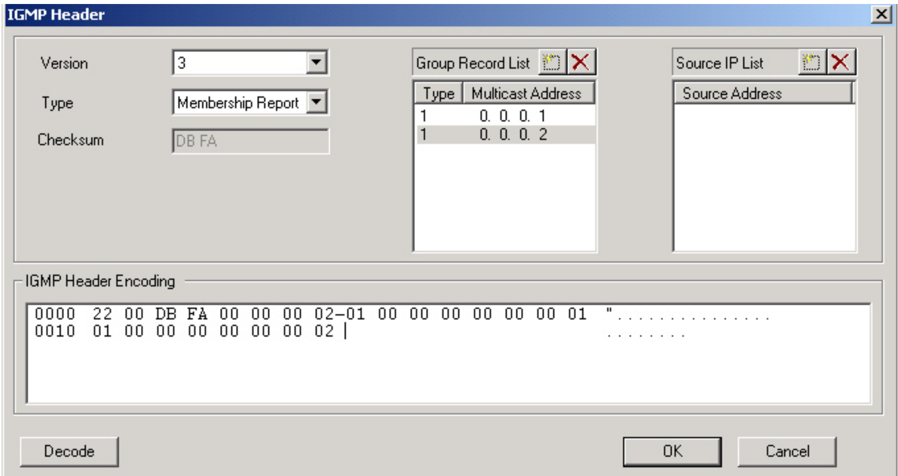
Header Field	Dialog box field	Description
Version	Version	IGMP Version Number. Select from: • Unknown • 1 • 2: this option changes the dialog box (*Image: Protocols: IGMP v. 2 Message Header Format* for a description) • 3: the version described in this table.

Header Field	Dialog box field	Description
		(The default is Version 2.)
Type	Type	The IGMP message, one of: • Membership Query • Membership Report • Leave Group (for Version 2 only)
Checksum	Checksum	The 16-bit ones complement of the ones complement sum of the entire IGMP message.
Max Response Code	Max Response Time	Specifies the maximum time allowed before sending a responding report. The actual time allowed is represented in units of 1/10 second and is configured in the following manner: • If Max Response Time is less than 128 (that is, less than 12.8 seconds), use the *Raw* option button and enter the number of 1/10 second units required. The maximum number allowed is 127 • If Max Response Time is greater than or equal to 128, it is represented by a floating-point value. Use the Float option button and enter a value between 12.8 to 16 (representing seconds). Note that because this is a floating point value, times entered will not necessarily be accurate to a tenth of a second. Small values of Max Response Time allow IGMPv3 routers to tune the 'leave latency' (the time between the moment the last host leaves a group and the moment the routing protocol is notified that there are no more members). Larger values, especially in the exponential range, allow tuning of the burstiness of IGMP traffic on a network.
Group Address	Group	The IP address of the group associated with the message.
	Mode	Choose one of: • Fixed • Increment • Decrement • Continuous increment • Continuous decrement
	Repeat Count	The number of times to modify the group address for increment or decrement modes.
Resv		Reserved for future use.
QQIC	QQIC	The Querier's Query Interval Code field specifies the Query Interval

Header Field	**Dialog box field**	**Description**
		used by the querier. The actual time allowed is represented in units of 1/10 second and is configured in the following manner: • If the interval less than 128 (that is, less than 12.8 seconds), use the *Raw* option button and enter the number of 1/10 second units required. The maximum number allowed is 127 • If interval is greater than or equal to 128, it is represented by a floating-point value. Use the Float option button and enter a value between 12.8 to 16 (representing seconds). Note that because this is a floating point value, times entered will not necessarily be accurate to a tenth of a second.
QRV	QRV	(Querier's Robustness Variable). If QRV is not equal to zero, it is the robustness variable for the querier. If the variable is >7, QRV = 0.
S	S	(Suppress Router-Side Processing) When the 'S' flag is set by selecting the check box, receiving multicast routers will not send timer updates in the normal manner when a query is received.
	Source IP	Enter an IP unicast address in the field above the list box, then select the *Add* icon () to add the address to the Source IP list. Select the *Delete* icon () to delete a highlighted address from the Source IP list.
	IGMP Header Encoding	After changes are made in the header dialog box, select the *Decode* button to update the corresponding data in the IGMP Encoding view.

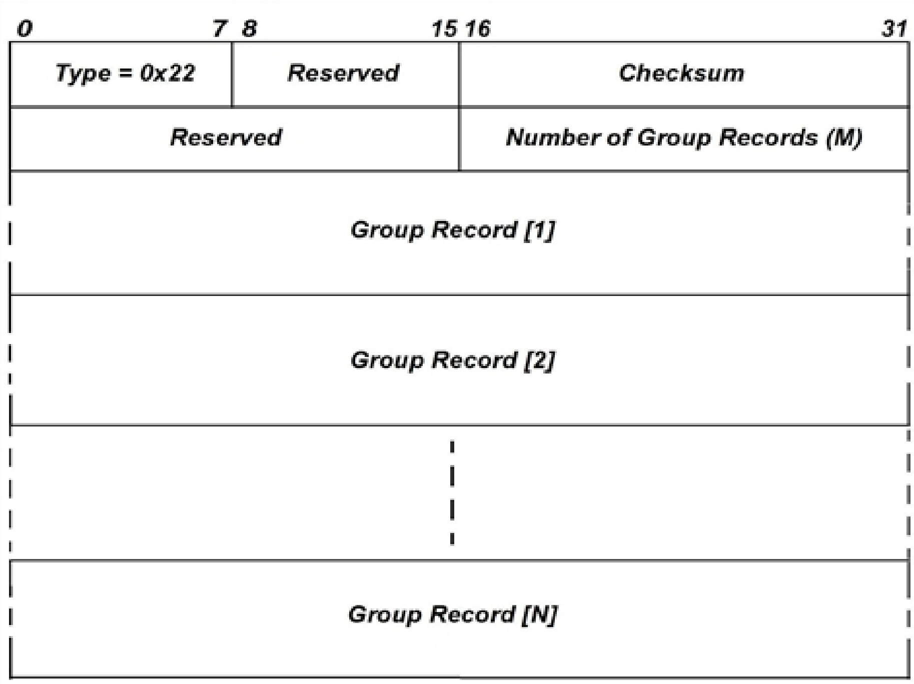
The dialog box for the IGMPv.3 Membership Report is shown in *Image: Protocols: IGMP v.3 Membership Report Message dialog box*.

Image: Protocols: IGMP v.3 Membership Report Message dialog box



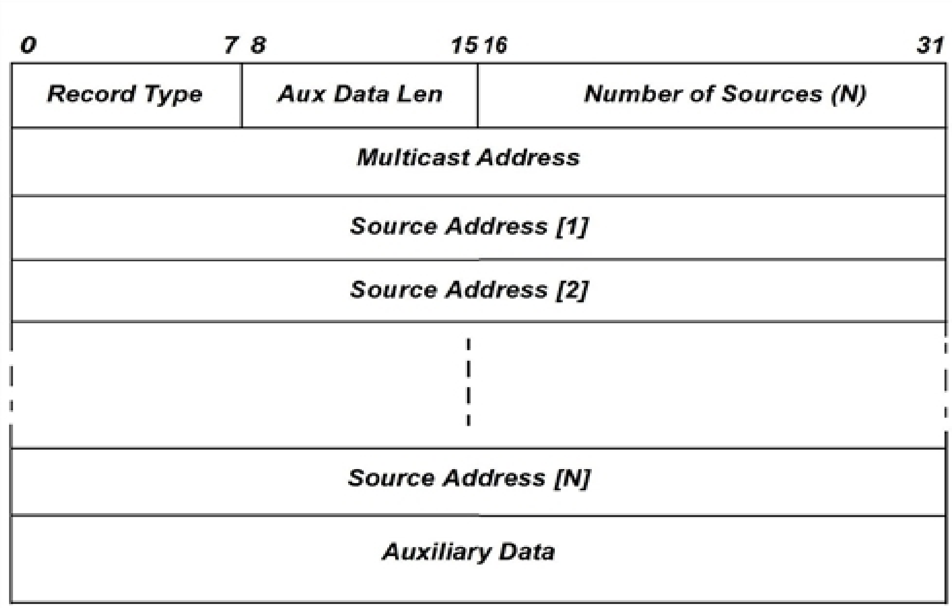
The format of an IGMP v.3 Membership Report Message is shown in *Image: Protocols: IGMP v.3 Membership Report Format*.

Image: Protocols: IGMP v.3 Membership Report Format



This IGMP message contains a number of Group Records. The format of an IGMP v.3 Group Record is shown in *Image: Protocols: IGMP v.3 Group Record Format*.

Image: Protocols: IGMP v.3 Group Record Format

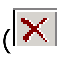


The correspondence between the fields of an IGMP Membership Report, including references to the Group Records, and the elements of the dialog box for IGMP Membership Report which set those fields is described in *Table: IGMP v.3 Membership Report Fields Set by the IGMP dialog box*.

Table: IGMP v.3 Membership Report Fields Set by the IGMP dialog box

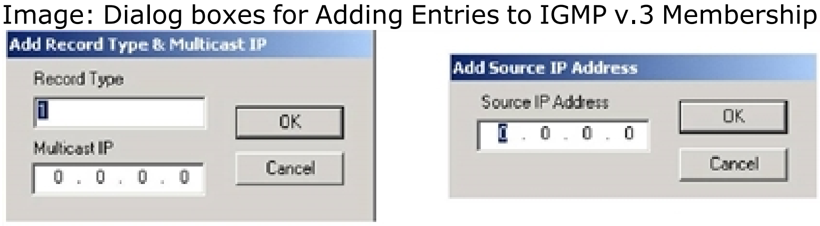
Header Field	Dialog box field	Description
	Version	IGMP Version Number. Choose one of: • Unknown • 1 • 2 • 3: The version described in this table.
Type	Type	The IGMP message. Choose one of: • Membership Query • Membership Report • Leave Group (for Version 2 only)
Reserved		Reserved for future use.
Checksum	Checksum	The 16-bit ones complement of the ones complement sum of the entire IGMP message.
Reserved		Reserved for future use.
Number of Group Records	Group Record List	The number of entries in this list defines the number of group records.

Header Field	Dialog box field	Description
		Select the *Add* button to add a new Group Record to the list. The *Add Record Type & Multicast IP* dialog box will appear. *Image: Dialog boxes for Adding Entries to IGMP v.3 Membership Reports*.
Group Record - Components		
Type	Type	Selects the group record type, from 1 through 6. The values are grouped into three categories. Current-State Records • Type 1 - MODE_IS_INCLUDE: Indicates that the interface has a filter mode of INCLUDE for the specified multicast address. The Source Address fields in this Group Record contain the interface's source list for the specified multicast address, if it is non-empty. • Type 2 - MODE_IS_EXCLUDE: Indicates that the interface has a filter mode of EXCLUDE for the specified multicast address. The Source Address fields in this Group Record contain the interface's source list for the specified multicast address, if it is non-empty. Filter-Mode-Change Records • Type 3 - CHANGE_TO_INCLUDE_MODE: Indicates that the interface has changed to INCLUDE filter mode for the specified multicast address. The Source Address fields in this Group Record contain the interface's new source list for the specified multicast address, if it is non-empty. • Type 4 - CHANGE_TO_EXCLUDE_MODE: Indicates that the interface has changed to EXCLUDE filter mode for the specified multicast address. The Source Address fields in this Group Record contain the interface's new source list for the specified multicast address, if it is non-empty. (continued next page)
Type	Type	(continued) Source-List-Change Record • Type 5 - ALLOW_NEW_SOURCES: Indicates that the Source Address fields in this Group Record contain a list of the additional sources that the system wishes to hear from, for packets sent to the specified multicast address. If the change was to an INCLUDE source list, these are the addresses that were added to the list; if the change was to an EXCLUDE source list, these are the addresses that were deleted from the list.

Header Field	Dialog box field	Description
		• Type 6 - BLOCK_OLD_SOURCES: Indicates that the Source Address fields in this Group Record contain a list of the sources that the system no longer wishes to hear from, for packets sent to the specified multicast address. If the change was to an INCLUDE source list, these are the addresses that were deleted from the list; if the change was to an EXCLUDE source list, these are the addresses that were added to the list.
Multicast Address	Multicast Address	A Multicast Address for a multicast group that this sender interface belongs to.
Number of Sources	Source IP List	The number of entries in this list defines the number of IP Source Addresses contained in this Group Record.
Source Address	Source Address	IP unicast addresses. Select the *Add* icon () to add a new address to the Source IP list. The *Add Source IP Address* dialog box will appear. *Image: Dialog boxes for Adding Entries to IGMP v.3 Membership Reports*. Select the *Delete* icon () to delete a highlighted address from the Source IP list.

The dialog boxes for adding entries to the lists in the IGMP v.3 Membership Report Messages are shown in *Image: Dialog boxes for Adding Entries to IGMP v.3 Membership Reports*.

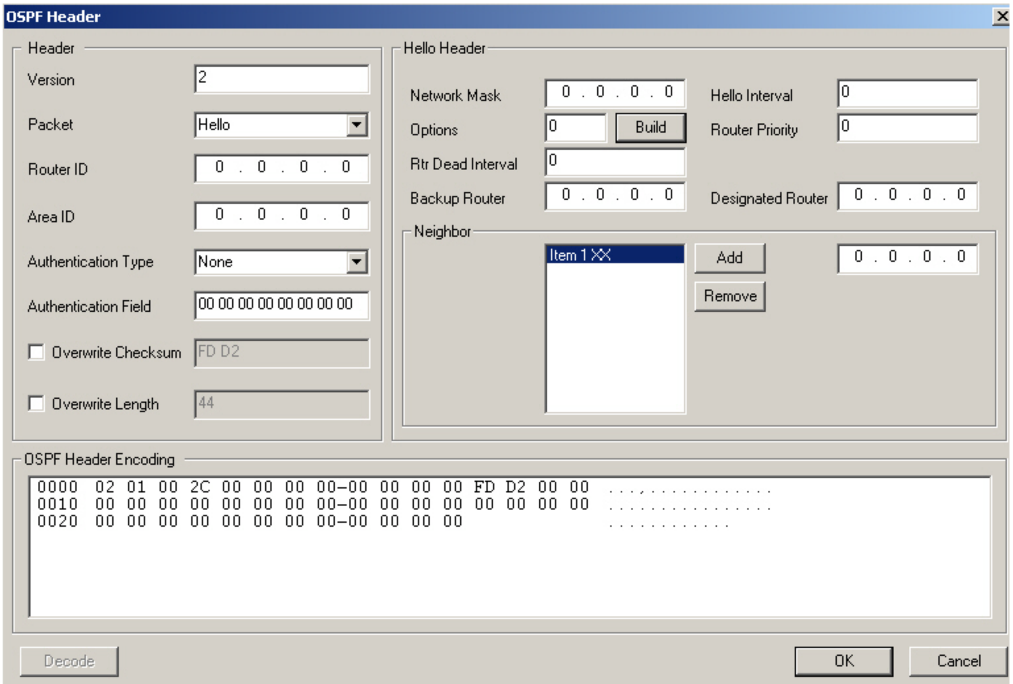
Image: Dialog boxes for Adding Entries to IGMP v.3 Membership Reports



OSPF Header dialog box

When the Protocol type is set to *OSPF/IP* in the *IP Header* dialog box, the *Edit OSPF* button may be used to bring up the dialog box which allows editing of the OSPF header. The OSPF header follows the IP header. The *OSPF Header* dialog box is shown in *Image: Protocols—OSPF Header dialog box*. Refer to the OSPF section in **Theory of Operation: Protocols** in the Protocols Manual for an overview of the OSPF protocol.

Image: Protocols—OSPF Header dialog box



The fields and controls in this dialog box are described in *Table: OSPF Header Fields Set by the OSPF Header dialog box*.

Table: OSPF Header Fields Set by the OSPF Header dialog box

IP Header Field	Dialog box element	Description
Version	Version	Set to 2. The current version of the OSPF protocol, per RFC 2328.
	Packet	The type of packet. Choose one of: • Unknown. • Hello—used to discover/maintain neighbors. • Database Description—a summary of the database contents. • Link State Request—request for database download. • Link State Update—the database update. • Link State Ack—flooding acknowledgment.
TOS	Precedence (TOS Bits 0-2)	The precedence is set in the 3 most significant bits of the TOS. Choose one of: • 000 - Routine • 001 - Priority • 010 - Immediate

IP Header Field	Dialog box element	Description
		• 011 - Flash • 100 - Flash Override • 101 - CRITIC/ECP • 110 - Internet Control • 111 - Network Control
	Router ID	The 32-bit Router ID for the simulated router. It can be a value such as the lowest or highest IP interface address for this router.
	Area ID	The ID of the area to which the attached network belongs.
	Authentication Type	Choose one of: • None • Simple • Cryptographic
	Authentication Field	The authentication data (key) associated with the Authentication Type. If Type is Simple, this is a 64-bit clear password in the OSPF header. If Type is Cryptographic, the data is a shared ‘secret’ between sender and receiver.
	Overwrite Checksum	check box. Disabled by default.
	Overwrite Length	check box. Disabled by default.
	Network Mask	The IP Interface mask. A subnet mask associated with the IP interface address, which Identifies the attached network.
	Options	The *Options* field value, exclicked in hex. Results from the settings of the options bits in the *Options* dialog box. The Options field is present in: • Hello packets • Database Description packets • All LSAs
	Build	Opens the *Options* dialog box. This dialog box allows the user to specify the OSPF options. Chose from a list of: • (7) Unused • (6) Opaque LSA’s Forwarded • (5) Demand Circuit

IP Header Field	Dialog box element	Description
		• (4) External Attributes • (3) NSSA Capabilities • (2) Multicast Capability • (1) External Routing • (0) Type of Service Routing
	Router Dead Interval	The number of seconds before declaring a silent router down.
	Backup Router	The IP address of the Backup Designated Router (BDR), based on 'election' by the Hello messages. It takes over the role of DR, in the case of failure of the DR.
	Hello Interval	The number of seconds between Hello packets sent from a router. The Ixia hardware sends Hello packets at this interval.
	Router Priority	The router's priority. Used in Designated Router and Backup Router negotiation. A 0 indicates that the router is ineligible to become either.
	Designated Router	The ID address of the Designated Router (DR), based on router priorities in the Hello messages. The Designated Router is the router which has the highest Router Priority in the network. It originates the Network LSAs for that network.
	Neighbor	Multiple OSPF neighbors which are attached to this network can be added by pressing the *Add* button: 'Item I XX', and so forth. The four-octet field to the right shows the IP address of the neighbor entry which is currently highlighted.
	OSPF Header Encoding/Encode	Values that are set in the dialog box are reflected in the hexadecimal view. It is also possible to edit the OSPF header directly from the view. All editing occurs in type-over mode. After any change, the *Decode* button should be selected to reflect these changes back into the dialog box fields.

ICMP Header dialog box

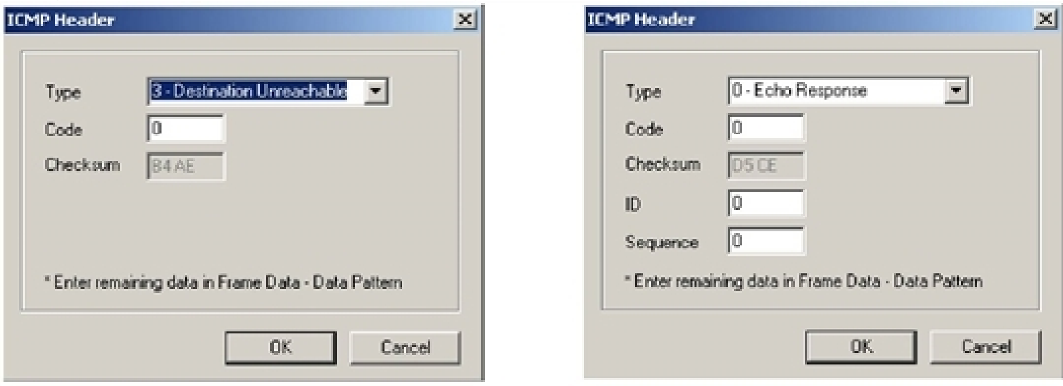
When the Protocol type is set to *ICMP/IP* in the *IP Header* dialog box, the *Edit ICMP* button may be used to bring up a dialog box which allows editing of the ICMP header. The ICMP header follows the IP header. There are two versions of ICMP:

- ICMP for IPv4.
- ICMP for IPv6.

ICMP for IPv4

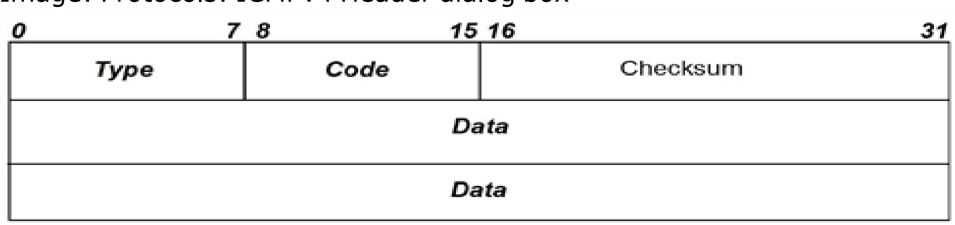
For configuring ICMP headers for IPv4, two dialog box formats are shown in *Image: Protocols: ICMP Header dialog boxes*. The dialog box format on the left applies to most ICMP messages, and the one on the right is specific to Echo Request/Reply.

Image: Protocols: ICMP Header dialog boxes



The format of an ICMPv4 header is shown in *Image: Protocols: ICMPv4 Header dialog box*.

Image: Protocols: ICMPv4 Header dialog box



The correlation between the fields of an ICMPv4 header and the elements of the *ICMPv4 Header* dialog box which set those fields are described in *Table: ICMPv4 Header Fields Set by the ICMPv4 dialog box*.

Table: ICMPv4 Header Fields Set by the ICMPv4 dialog box

Header Field	Dialog box field	Description
Type	Type	The type of ICMPv4 message. Choose one of: • 0 =Echo Response • 1 & 2 = Reserved • 3 =Destination Unreachable • 4 =Source Quench • 5 = Redirect • 6 & 7 = (No specified use) • 8 =Echo Request • 9 = Router Advertisement

Header Field	Dialog box field	Description
		• 10 = Router Solicitation • 11 =Time Exceeded • 12 =Parameter Fault • 13 =TimeStamp Request • 14 = TimeStamp Response • 15 = Information Request • 16 = Information Reply • 17 = Subnet Mask Request • 18 =Subnet Mask Reply • 19 = Reserved (for security) • 20 - 29 = Reserved (for robustness) • 30 = Traceroute • 31 = Conversion Error • 32 = Mobile Host Redirect • 35 = Mobile Registration Request • 36 = Mobile Registration Reply • 37 = Domain Name Request • 38 = Domain Name Reply • 39 = SKIP Algorithm Discovery • 40 = Photuris Security Failures
Checksum	Checksum	The 16-bit ones complement of the ones complement sum of the 8-octet ICMPv4 message.
Data	ID and Sequence	For Echo Request and Echo Reply messages only. It sets the first data 32 bits: the first 16 bits are the ID, and the second 16 bits are the Sequence.

In general, the ICMP header dialog box will not fill in the majority of the data bytes. These can be entered in the Data Pattern box of the **Frame Data** tab per RFCs 972 and 950.

ICMP for IPv6

There are two main groups of ICMPv6 messages—error messages (Types 0 to 127), and informational messages (Types 128 to 255). The ICMPv6 message headers are preceded by an IPv6 header, and may be preceded by IPv6 extension headers, and the Next Header value in the IPv6 part of the header with be '58.' The ICMP message header types for IPv6 are listed below.

- 1 - Destination Unreachable Message.
- 2 - Packet Too Big Message\`.

- 3 - Time Exceeded Message.
- 4 - Parameter Problem Message.
- 128 - Echo Request Message.
- 129 - Echo Reply Message.
- 130 - Multicast Listener Query.
- 131 - Multicast Listener Report.
- 132 - Multicast Listener Done.
- 133 - Router Solicitation Message Format.
- 134 - Router Advertisement Message Format.
- 135 - Neighbor Solicitation Message Format.
- 136 - Neighbor Advertisement Message dialog box.
- 137 - Redirect Message Format.

An additional dialog box is provided so that you can define custom IPv6 headers:

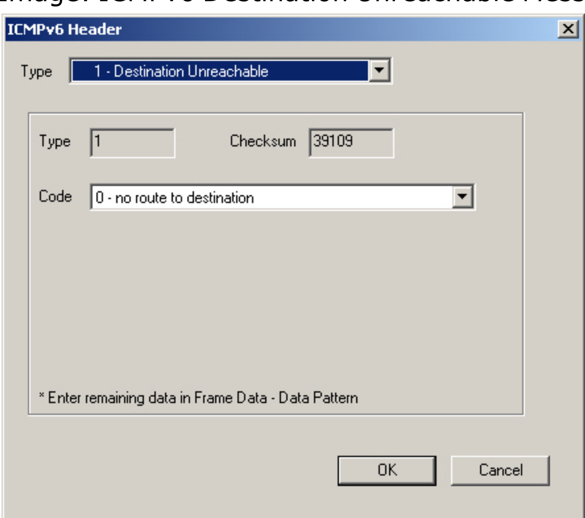
User Defined Message dialog box.

NOTE The **ICMPv6** dialog box is reached by selecting the **IPv6** and **ICMP/IP** option buttons in the *Protocols* section of the **Frame Data** tab, selecting the **Edit** button, and then selecting the **Edit ICMP** button from the *IPv6 Header* dialog box.

Destination Unreachable Message

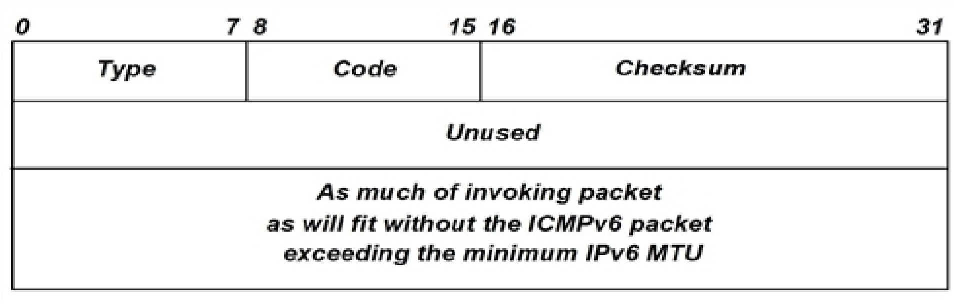
The controls in this version of the *ICMPv6* dialog box appear by selecting the *Destination Unreachable* option in the *Type* pull-down list. The *Destination Unreachable* option of the *ICMPv6 Header* dialog box is shown in *Image: ICMPv6 Destination Unreachable Message*.

Image: ICMPv6 Destination Unreachable Message



The format of an ICMPv6 Destination Unreachable Message header is shown in *Image: ICMPv6 Destination Unreachable Message Format*.

Image: ICMPv6 Destination Unreachable Message Format



The message header fields, and the corresponding fields in the dialog box, are described in *Table: ICMPv6 Destination Unreachable Message Header Fields*.

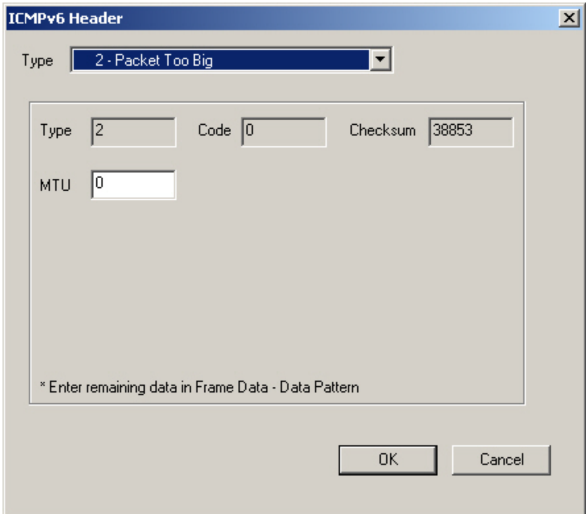
Table: ICMPv6 Destination Unreachable Message Header Fields

Header Field	Dialog box field	Description
Type	Type	The type for this message is: 1 - Destination Unreachable
Type	Type	(Read-only) The Type is defined as '1'.
Code	Code	Choose one of: • 0 - no route to destination • 1 - communication with destination administratively prohibited • 2 - (not assigned) • 3 - address unreachable • 4 - port unreachable
Checksum	Checksum	(Read-only) The 16-bit ICMPv6 checksum. This is the ones complement of the ones complement sum of the whole ICMPv6 message, which starts at the message type field. The 'whole' message includes the IPv6 header and extension header fields.
		NOTE Enter the remaining data in the Frame Data dialog box - Data Pattern box.

Packet Too Big Message

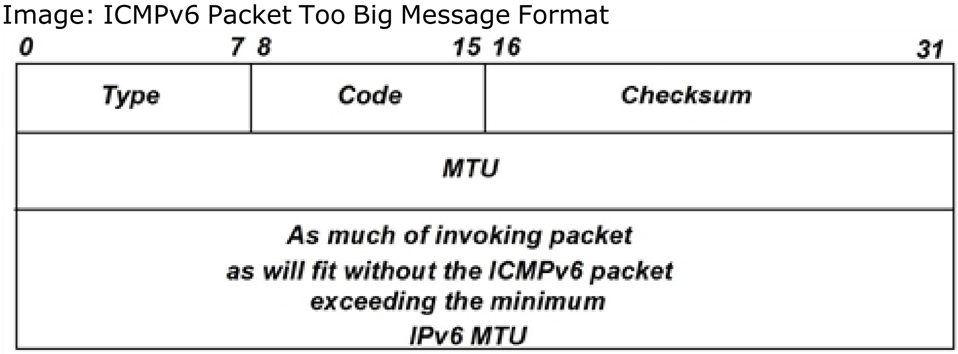
The controls in this version of the *ICMPv6* dialog box appear by selecting the *Packet Too Big* option in the *Type* pull-down list. The *Packet Too Big* option of the *ICMPv6 Header* dialog box is shown in *Image: ICMPv6 Packet Too Big Message*.

Image: ICMPv6 Packet Too Big Message



The format of an ICMPv6 Packet Too Big Message is shown in *Image: ICMPv6 Packet Too Big Message Format*.

Image: ICMPv6 Packet Too Big Message Format



The message header fields, and the corresponding fields in the dialog box, are described in *Table: ICMPv6 Packet Too Big Message Header Fields*.

Table: ICMPv6 Packet Too Big Message Header Fields

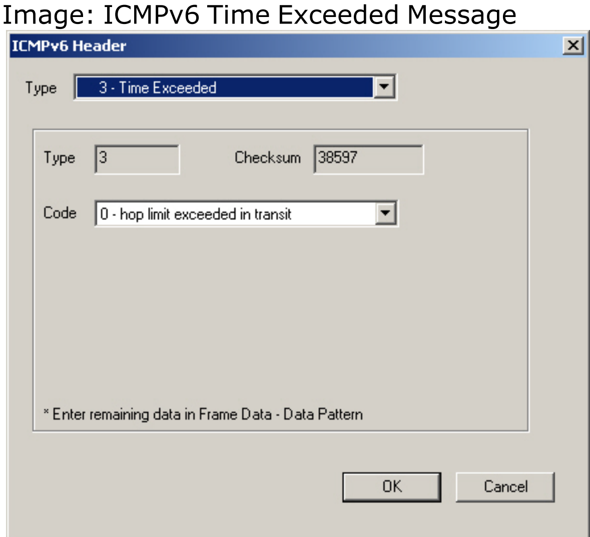
Header Field	Dialog box field	Description
Type	Type	The type for this message is: 2–Packet Too Big
Type	Type	(Read-only) The Type is defined as '2'.
Code	Code	(Read-only) Sender sets this to '0'.
Checksum	Checksum	(Read-only) The 16-bit ICMPv6 checksum. This is the ones complement of the ones complement sum of the whole ICMPv6 message, which starts at the message type field. The 'whole' message includes the IPv6 header and extension header fields.

Header Field	Dialog box field	Description
MTU	MTU	Max Transmission Unit: The maximum size of the message that can be sent on this link to the next hop.
		NOTE Enter the remaining data in the **Frame Data** tab - Data Pattern box.

Time Exceeded Message

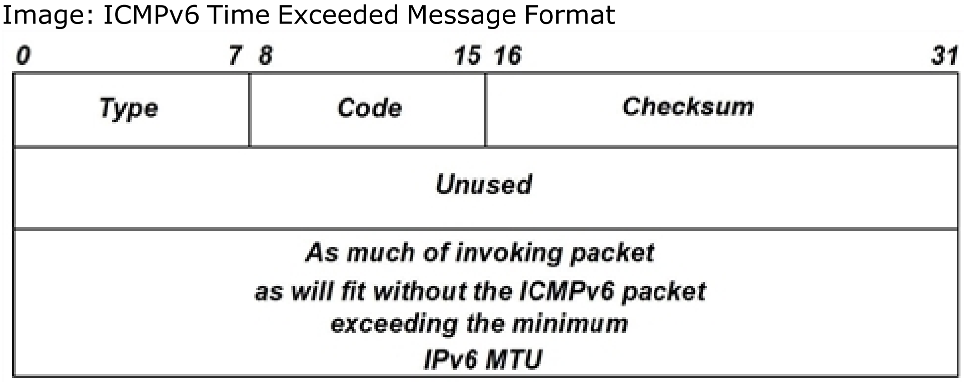
The controls in this version of the *ICMPv6* dialog box appear by selecting the *Time Exceeded* option in the *Type* pull-down list. The *Time Exceeded* option of the *ICMPv6 Header* dialog box is shown in *Image: ICMPv6 Time Exceeded Message*.

Image: ICMPv6 Time Exceeded Message



The format of an ICMPv6 Time Exceeded Message is shown in *Image: ICMPv6 Time Exceeded Message Format*.

Image: ICMPv6 Time Exceeded Message Format



The message header fields, and the corresponding fields in the dialog box, are described in *Table: ICMPv6 Time Exceeded Message Header Fields*.

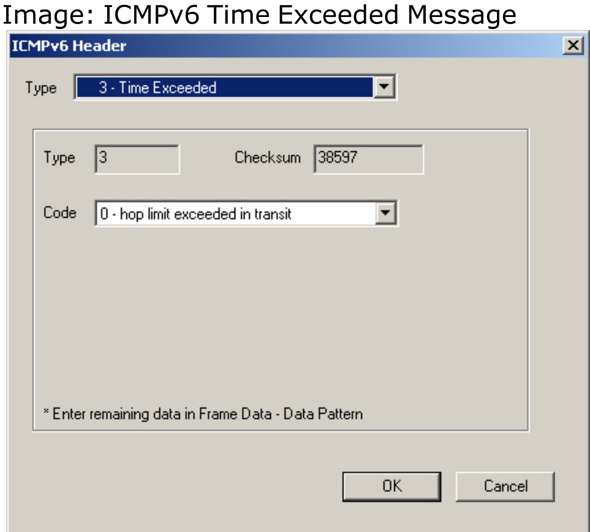
Table: ICMPv6 Time Exceeded Message Header Fields

Header Field	Dialog box field	Description
Type	Type	The type for this message is: 3 - Time Exceeded
Type	Type	(Read-only) The Type is defined as '3.'
Code	Code	Choose one of: • 0: hop limit exceeded in transit • 1: fragment reassembly time exceeded
Checksum	Checksum	(Read-only) The 16-bit ICMPv6 checksum. This is the ones complement of the ones complement sum of the whole ICMPv6 message, which starts at the message type field. The 'whole' message includes the IPv6 header and extension header fields.
		NOTE Enter the remaining data in the **Frame Data** tab - Data Pattern box.

Time Exceeded Message

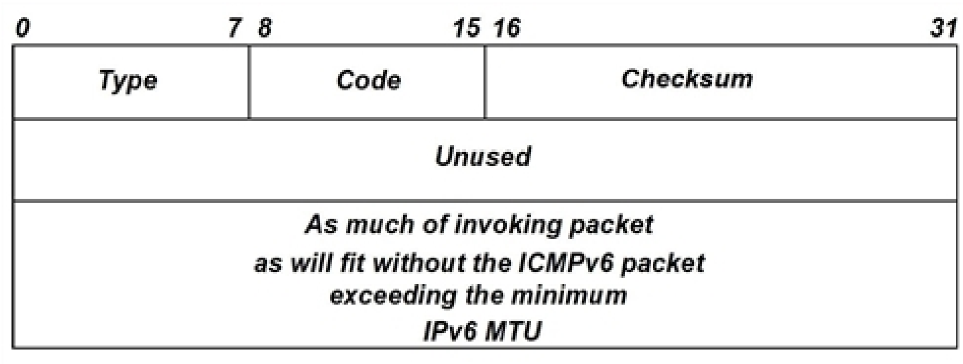
The controls in this version of the *ICMPv6* dialog box appear by selecting the *Time Exceeded* option in the *Type* pull-down list. The *Time Exceeded* option of the *ICMPv6 Header* dialog box is shown in *Image: ICMPv6 Time Exceeded Message*.

Image: ICMPv6 Time Exceeded Message



The format of an ICMPv6 Time Exceeded Message is shown in *Image: ICMPv6 Time Exceeded Message Format*.

Image: ICMPv6 Time Exceeded Message Format



The message header fields, and the corresponding fields in the dialog box, are described in *Table: ICMPv6 Time Exceeded Message Header Fields*.

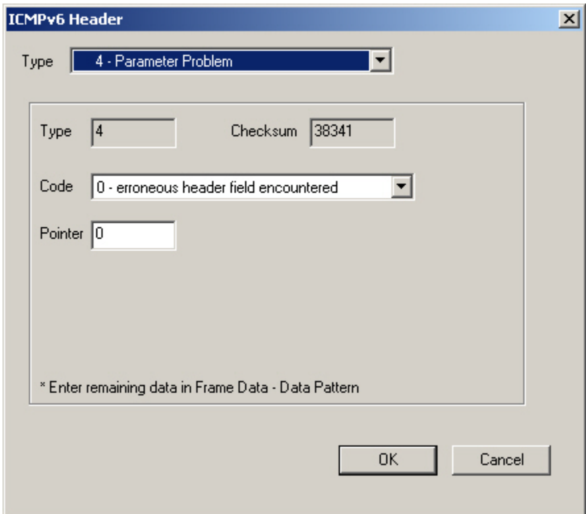
Table: ICMPv6 Time Exceeded Message Header Fields

Header Field	Dialog box field	Description
Type	Type	The type for this message is: 3 - Time Exceeded
Type	Type	(Read-only) The Type is defined as '3.'
Code	Code	Choose one of: • 0: hop limit exceeded in transit • 1: fragment reassembly time exceeded
Checksum	Checksum	(Read-only) The 16-bit ICMPv6 checksum. This is the ones complement of the ones complement sum of the whole ICMPv6 message, which starts at the message type field. The 'whole' message includes the IPv6 header and extension header fields.
		NOTE Enter the remaining data in the **Frame Data** tab - Data Pattern box.

Parameter Problem Message

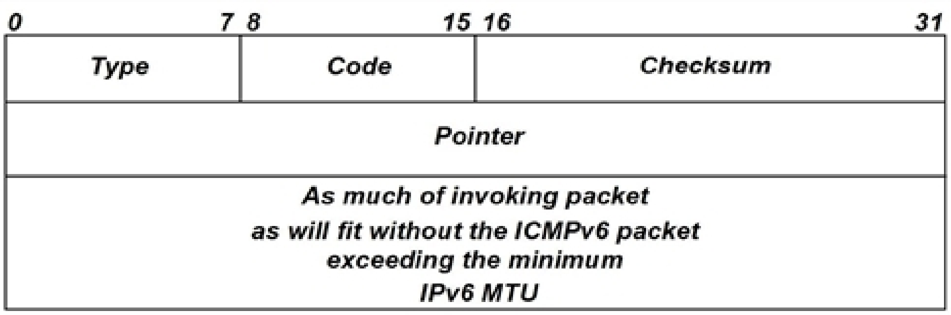
The controls in this version of the *ICMPv6* dialog box appear by selecting the *Parameter Problem* option in the *Type* pull-down list. The *Parameter Problem* option of the *ICMPv6 Header* dialog box is shown in *Image: ICMPv6 Parameter Problem Message*.

Image: ICMPv6 Parameter Problem Message



The format of an ICMPv6 Parameter Problem Message is shown in *Image: ICMPv6 Parameter Problem Message Format*.

Image: ICMPv6 Parameter Problem Message Format.



The message header fields, and the corresponding fields in the dialog box, are described in *Table: ICMPv6 Parameter Problem Message Header Fields*.

Table: ICMPv6 Parameter Problem Message Header Fields

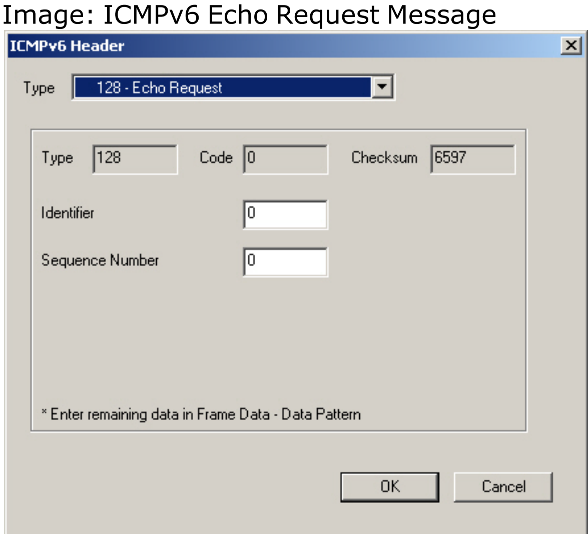
Header Field	Dialog box field	Description
Type	Type	The type for this message is: 4 - Parameter Problem Message
Type	Type	(Read-only) The Type is defined as '4'.
Code	Code	Choose one of: • 0: erroneous header field encountered • 1: unrecognized Next Header type encountered • 2: unrecognized IPv6 option encountered.
Checksum	Checksum	(Read-only)

Header Field	Dialog box field	Description
		The 16-bit ICMPv6 checksum. This is the ones complement of the ones complement sum of the whole ICMPv6 message, which starts at the message type field. The 'whole' message includes the IPv6 header and extension header fields.
Pointer	Pointer	To identify the offset (octet) where the error was detected in the packet.
		NOTE Enter the remaining data in the **Frame Data** tab - Data Pattern box.

Echo Request Message

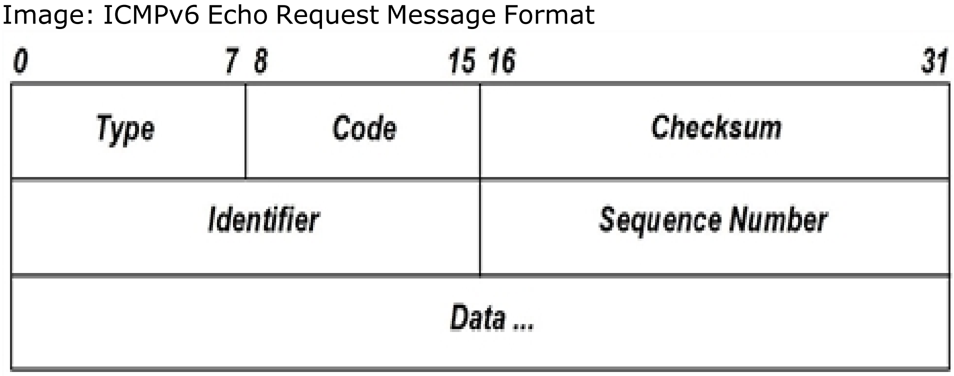
The controls in this version of the *ICMPv6* dialog box appear by selecting the *Echo Request* option in the *Type* pull-down list. The *Echo Request* option of the *ICMPv6 Header* dialog box is shown in *Image: ICMPv6 Echo Request Message.*

Image: ICMPv6 Echo Request Message



The format of an ICMPv6 Echo Request Message is shown in *Image: ICMPv6 Echo Request Message Format*.

Image: ICMPv6 Echo Request Message Format



The message header fields, and the corresponding fields in the dialog box, are described in *Table: ICMPv6 Echo Request Message Header Fields*.

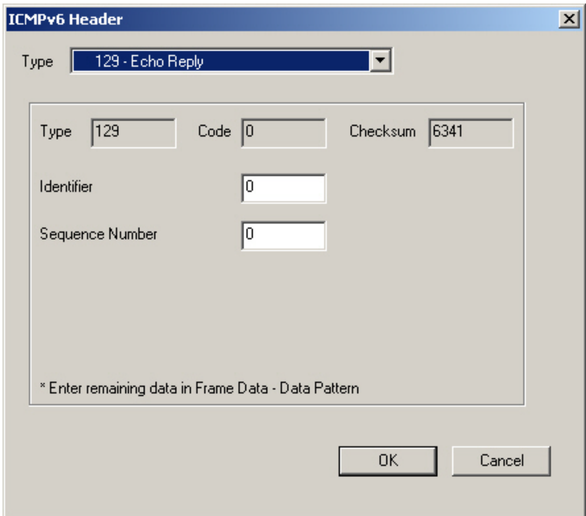
Table: ICMPv6 Echo Request Message Header Fields

Header Field	Dialog box field	Description
Type	Type	The type for this message is: 128 - Echo Request Message
Type	Type	(Read-only) The Type is defined as '128'.
Code	Code	(Read-only) '0'
Checksum	Checksum	(Read-only) The 16-bit ICMPv6 checksum. This is the ones complement of the ones complement sum of the whole ICMPv6 message, which starts at the message type field. The 'whole' message includes the IPv6 header and extension header fields.
Identifier	Identifier	(May be '0'.) Identifier for matching Echo Replies and the Echo Request.
Sequence Number	Sequence Number	(May be '0'.) Sequence number for matching Echo Replies and the Echo Request.
Data ...		(Arbitrary data) NOTE Enter the remaining data in the **Frame Data** tab - Data Pattern box.

Echo Reply Message

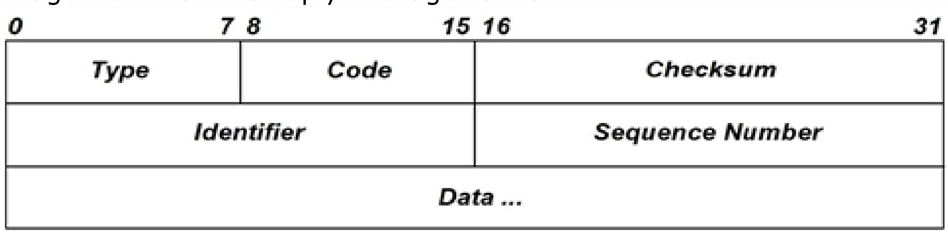
The controls in this version of the *ICMPv6* dialog box appear by selecting the *Echo Reply* option in the *Type* pull-down list. The *Echo Reply* option of the *ICMPv6 Header* dialog box is shown in *Image: ICMPv6 Echo Reply Message*.

Image: ICMPv6 Echo Reply Message



The format of an ICMPv6 Echo Reply Message is shown in *Image: ICMPv6 Echo Reply Message Format*.

Image: ICMPv6 Echo Reply Message Format



The message header fields, and the corresponding fields in the dialog box, are described in *Table: ICMPv6 Echo Reply Message Header Fields*.

Table: ICMPv6 Echo Reply Message Header Fields

Header Field	Dialog box field	Description
Type	Type	The type for this message is: 129 - Echo Reply Message
Type	Type	(Read-only) The Type is defined as '129'.
Code	Code	(Read-only) '0'.
Checksum	Checksum	(Read-only) The 16-bit ICMPv6 checksum. This is the ones complement of the ones complement sum of the whole ICMPv6 message, which starts at the message type field. The 'whole' message includes the IPv6 header and extension header fields.
Identifier	Identifier	The identifier used in the Echo Request message. (used for matching)

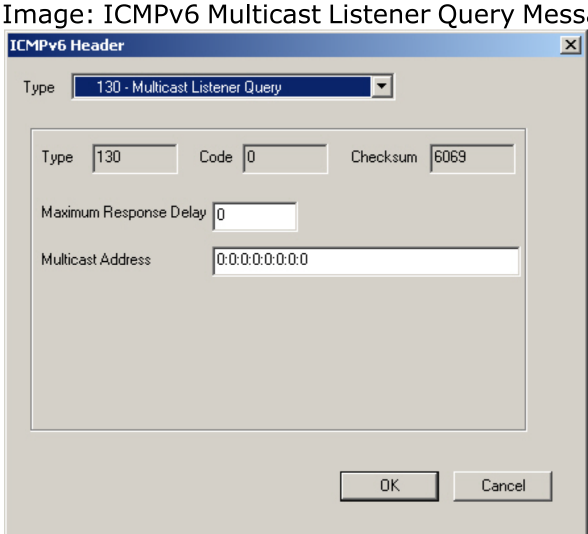
Header Field	Dialog box field	Description
Sequence Number	Sequence Number	The sequence number used in the Echo Request message. (used for matching)
Data ...		(The arbitrary data sent in the Echo Request message.) NOTE Enter the remaining data in the **Frame Data** tab - Data Pattern box.

Multicast Listener Query

The Multicast Listener Query option of the *ICMPv6 Header* dialog box is shown in *Image: ICMPv6 Multicast Listener Query Message*. It is part of the Multicast Listener Discovery (MLD) which is defined in RFC 2710, and the sender uses this message to learn about multicast listeners on directly connected links.

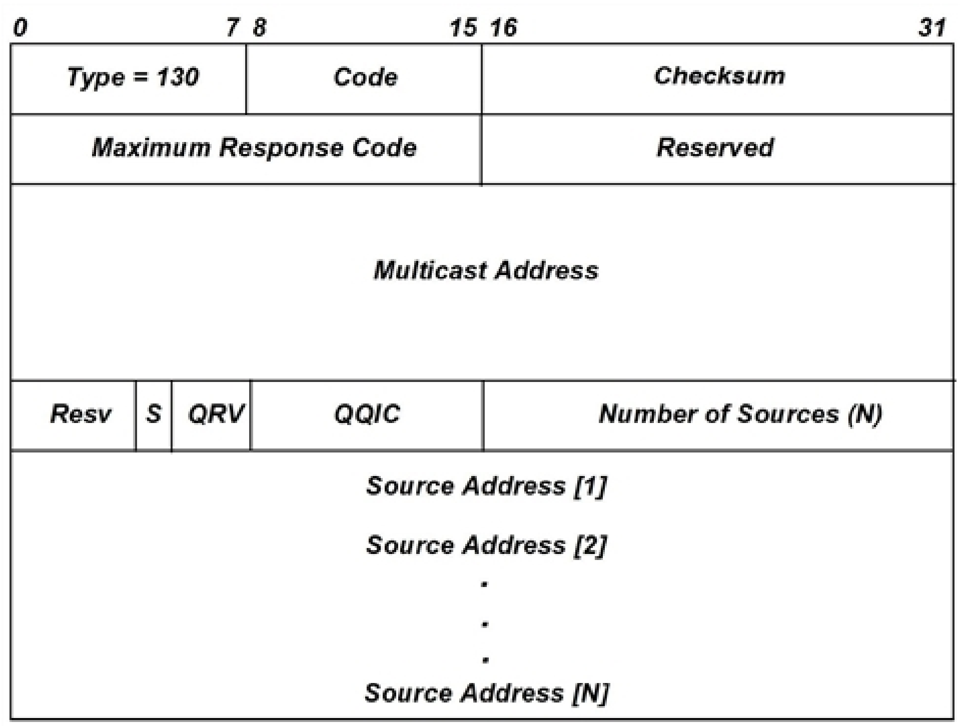
The controls in this version of the *ICMPv6* dialog box appear by selecting the *Multicast Listener Query* option in the *Type* pull-down list.

Image: ICMPv6 Multicast Listener Query Message



The format of an ICMPv6 Multicast Listener Query message is shown in *Image: ICMPv6 Multicast Listener Query Message Format*.

Image: ICMPv6 Multicast Listener Q uery Message Format



The message header fields, and the corresponding fields in the dialog box, are described in *Table: ICMPv6 Multicast Listener Query Message Header Fields*.

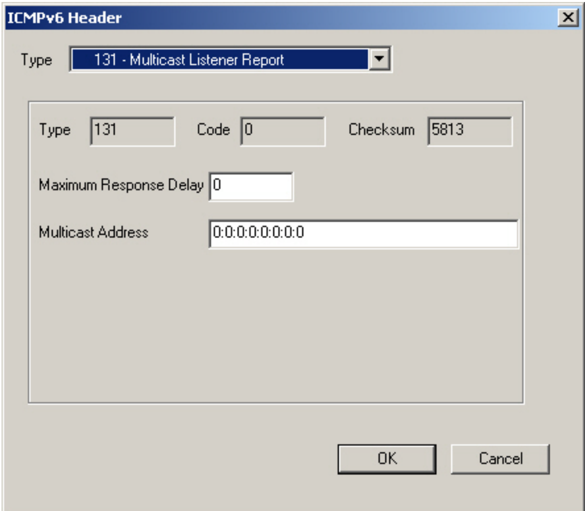
Table: ICMPv6 Multicast Listener Query Message Header Fields

Header Field	Dialog box field	Description
Type	Type	The type for this message is: 130 - Multicast Listener Query
Type	Type	(Read-only) The Type is defined as '130.'
Code	Code	(Read-only) Set to '0' by the sender.
Checksum	Checksum	(Read-only) The 16-bit ICMPv6 checksum. This is the ones complement of the ones complement sum of the whole ICMPv6 message, which starts at the message type field. The 'whole' message includes the IPv6 header and extension header fields.
Maximum Response Code	Maximum Response Delay	(In milliseconds) The maximum delay allowed before a responding Multicast Listener Report message must be sent.
Multicast Address	Multicast Address	For general query type, set to '0.' For Multicast-Address-Specific Query specify an IPv6 multicast address.

Multicast Listener Report

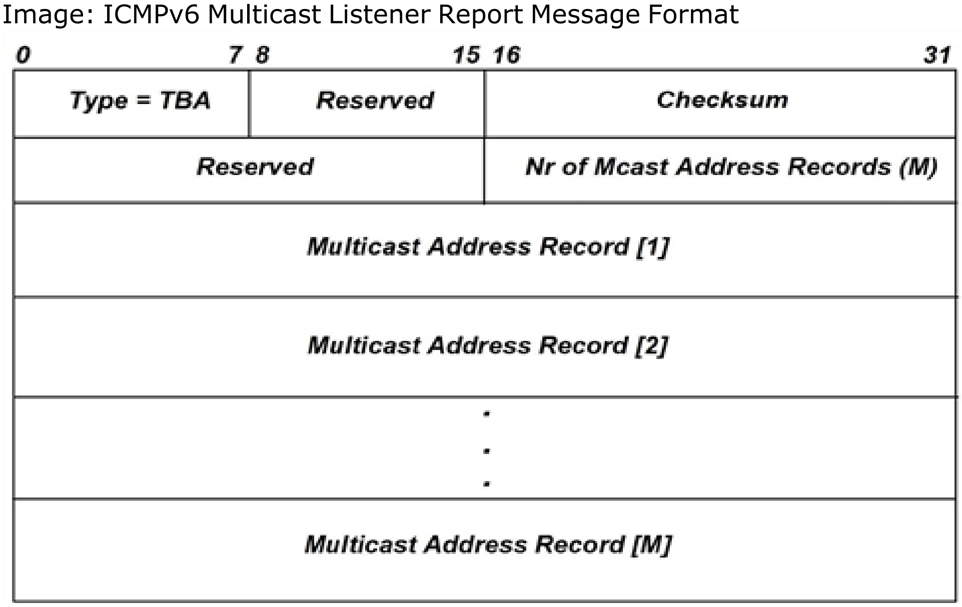
The controls in this version of the *ICMPv6* dialog box appear by selecting the *Multicast Listener Report* option in the *Type* pull-down list. The dialog box is shown in *Image: ICMPv6 Multicast Listener Report Message*.

Image: ICMPv6 Multicast Listener Report Message



The format of an ICMPv6 Multicast Listener Report message is shown in *Image: ICMPv6 Multicast Listener Report Message Format*.

Image: ICMPv6 Multicast Listener Report Message Format



The message header fields, and the corresponding fields in the dialog box, are described in *Table: ICMPv6 Multicast Listener Report Message Header Fields*.

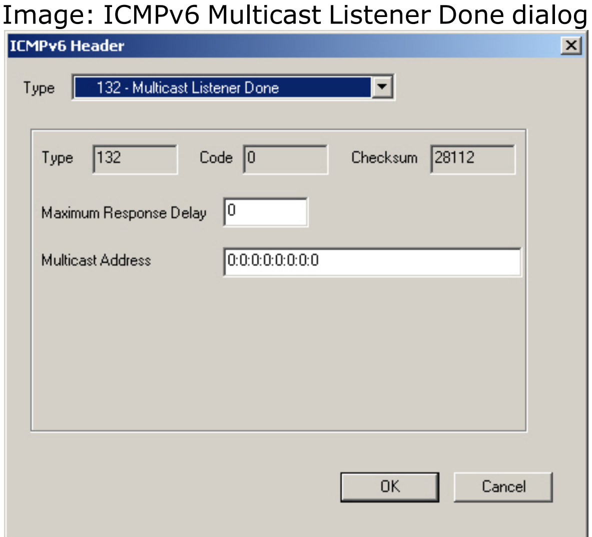
Table: ICMPv6 Multicast Listener Report Message Header Fields

Header Field	Dialog box field	Description
Type	Type	The type for this message is: 131- Multicast Listener Report
Type	Type	(Read-only) The Type is defined as '131'.
Code	Code	(Read-only) Set to '0' by the sender.
Checksum	Checksum	(Read-only) The 16-bit ICMPv6 checksum. This is the ones complement of the ones complement sum of the whole ICMPv6 message, which starts at the message type field. The 'whole' message includes the IPv6 header and extension header fields.
	Maximum Response Delay	(Used in Queries.) Set to '0' by sender; ignored by receiver.
	Multicast Address	The IPv6 multicast address specified by the sender's query.

Multicast Listener Done

The controls in this version of the *ICMPv6* dialog box appear by selecting the *Multicast Listener Done* option in the *Type* pull-down list. The Multicast Listener Done option of the *ICMPv6 Header* dialog box is shown in *Image: ICMPv6 Multicast Listener Done dialog box*.

Image: ICMPv6 Multicast Listener Done dialog box



The message header fields, and the corresponding fields in the dialog box, are described in *Table: ICMPv6 Multicast Listener Done Message Header Fields*.

Table: ICMPv6 Multicast Listener Done Message Header Fields

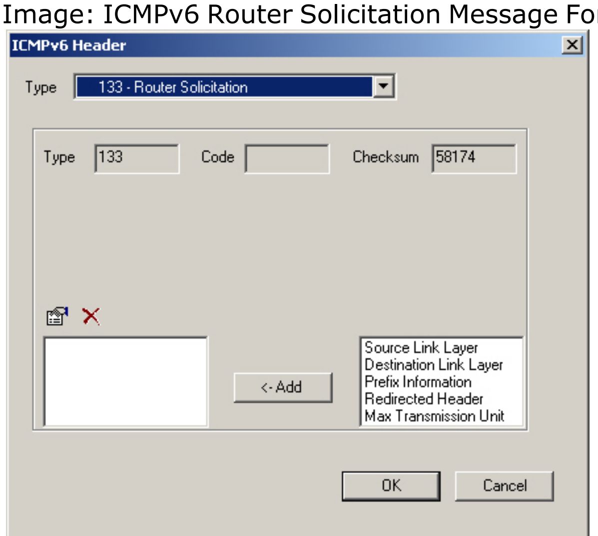
Header Field	Dialog box field	Description
Type	Type	The type for this message is: 132 - Multicast Listener Done
Type	Type	(Read-only) The Type is defined as '132'.
Code	Code	(Read-only) Set to '0' by the sender.
Checksum	Checksum	(Read-only) The 16-bit ICMPv6 checksum. This is the ones complement of the ones complement sum of the whole ICMPv6 message, which starts at the message type field. The 'whole' message includes the IPv6 header and extension header fields.
	Maximum Response Delay	(Used in Queries.) Set to '0' by sender; ignored by receiver.
	Multicast Address	The IPv6 multicast address specified by the sender's query.

Router Solicitation Message Format

The controls in this version of the *ICMPv6* dialog box appear by selecting the *Router Solicitation* option in the *Type* pull-down list. The Router Solicitation message format option of the *ICMPv6 Header* dialog box is shown in *Image: ICMPv6 Router Solicitation Message Format dialog box*.

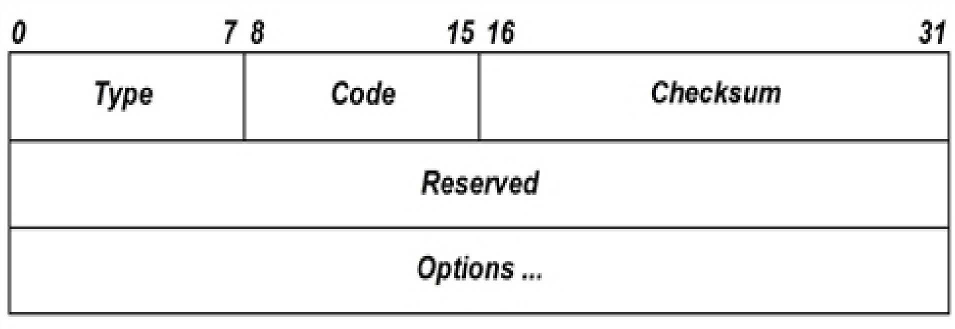
Message types 133 through 137 are defined in RFC 2463, 'Neighbor Discovery for IP Version 6 (IPv6).'

Image: ICMPv6 Router Solicitation Message Format dialog box



The format of an ICMPv6 Router Solicitation message is shown in *Image: ICMPv6 Router Solicitation Message Format*.

Image: ICMPv6 Router Solicitation Message Format



The message header fields, and the corresponding fields in the dialog box, are described in *Table: ICMPv6 Router Solicitation Message Header Fields*.

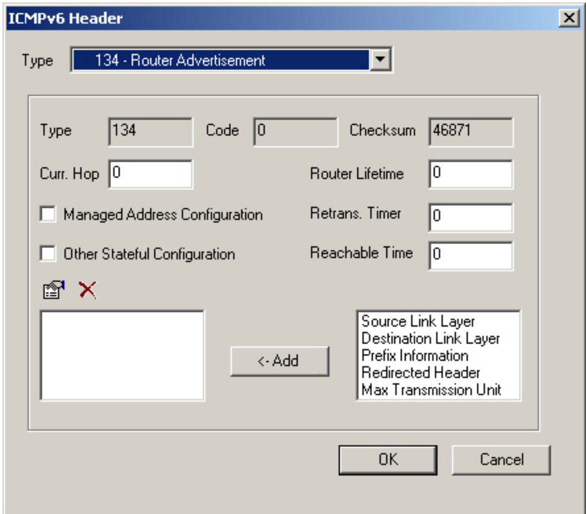
Table: ICMPv6 Router Solicitation Message Header Fields

Header Field	Dialog box field	Description
Type	Type	The type for this message is: 133 - Router Solicitation
Type	Type	(Read-only) The Type is defined as '133'.
Code	Code	(Read-only)
Checksum	Checksum	(Read-only) The 16-bit ICMPv6 checksum. This is the ones complement of the ones complement sum of the whole ICMPv6 message, which starts at the message type field. The 'whole' message includes the IPv6 header and extension header fields.
Options	(Options Box)	Options: • Source Link Layer—Sender's link-layer address. • Destination Link Layer • Prefix Information • Redirected Header • Max Transmission Unit NOTE ICMPv6 Option dialog boxes for additional information.

Router Advertisement Message Format

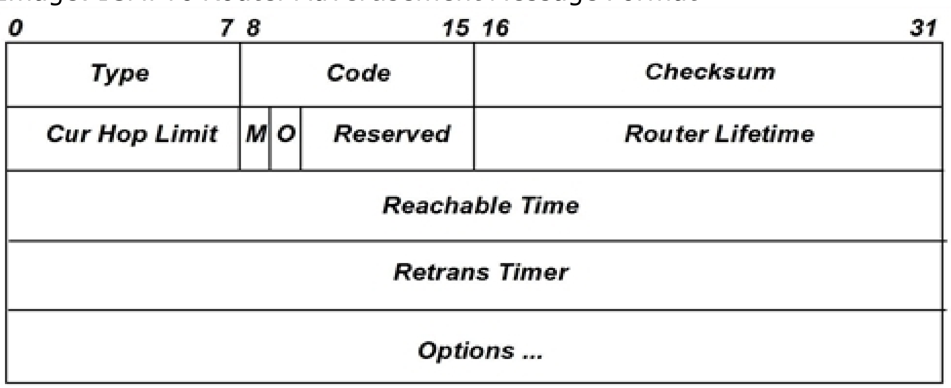
The controls in this version of the *ICMPv6* dialog box appear by selecting the *Router Advertisement* option in the *Type* pull-down list. The Router Advertisement message format option of the *ICMPv6 Header* dialog box is shown in *Image: ICMPv6 Router Advertisement Message Format dialog box*.

Image: ICMPv6 Router Advertisement Message Format dialog box



The format of an ICMPv6 Router Advertisement message is shown in *Image: ICMPv6 Router Advertisement Message Format*.

Image: ICMPv6 Router Advertisement Message Format



The message header fields, and the corresponding fields in the dialog box, are described in *Table: ICMPv6 Router Advertisement Message Header Fields*.

Table: ICMPv6 Router Advertisement Message Header Fields

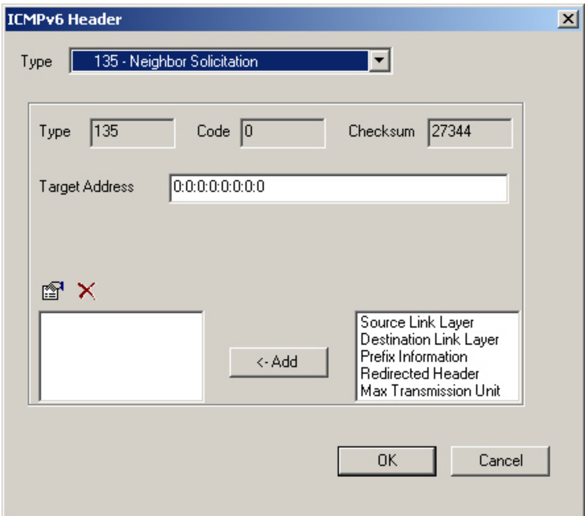
Header Field	Dialog box field	Description
Type	Type	The type for this message is: 134 - Router Advertisement
Type	Type	(Read-only) The Type is defined as '134.'
Code	Code	(Read-only) '0'
Checksum	Checksum	(Read-only) The 16-bit ICMPv6 checksum. This is the ones complement of the ones complement sum of the whole ICMPv6 message, which

Header Field	Dialog box field	Description
		starts at the message type field. The 'whole' message includes the IPv6 header and extension header fields.
Cur Hop Limit	Cur Hop Limit	Default value for the IP Header Hop Count field for outbound IP packets.
M	Managed Address Configuration	(1-bit flag) If selected, hosts use the stateful (administered) protocol for auto-configuration of addresses.
O	Other Stateful Configuration	(1-bit flag) If selected, hosts use the stateful (administered) protocol for auto-configuration of non-addressing (other) information.
Router Lifetime	Router Lifetime	Default router lifetime, in seconds. If Router Lifetime = 0, this is NOT a default router.
	Retrans Timer	(In milliseconds) Time interval between Neighbor Solicitation messages.
	Reachable Time	(In milliseconds) Amount of time that a neighbor is assumed to be reachable, following a confirmation of reachable.
	Options Box:	Options: • Source Link Layer • Destination Link Layer • Prefix Information • Redirected Header • Max Transmission Unit NOTE ICMPv6 Option dialog boxes for additional information.

Neighbor Solicitation Message Format

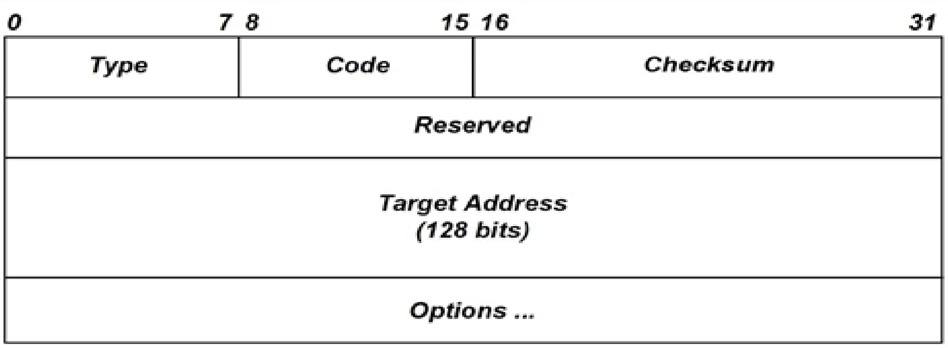
The controls in this version of the *ICMPv6* dialog box appear by selecting the *Neighbor Solicitation* option in the *Type* pull-down list. The Neighbor Solicitation Message Format option of the *ICMPv6 Header* dialog box is shown in *Image: ICMPv6 Neighbor Solicitation Message dialog box*.

Image: ICMPv6 Neighbor Solicitation Message dialog box



The format of an ICMPv6 Neighbor Solicitation Message is shown in *Image: ICMPv6 Neighbor Solicitation Message Format*.

Image: ICMPv6 Neighbor Solicitation Message Format



The message header fields, and the corresponding fields in the dialog box, are described in *Table: ICMPv6 Neighbor Solicitation Message Header Fields*.

Table: ICMPv6 Neighbor Solicitation Message Header Fields

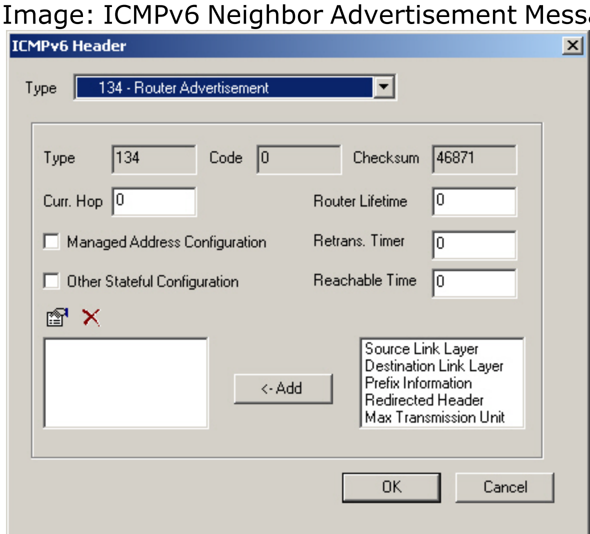
Header Field	Dialog box field	Description
Type	Type	The type for this message is: 135 - Neighbor Solicitation Message Format
Type	Type	(Read-only) The Type is defined as ‘135’.
Code	Code	(Read-only) ‘0’
Checksum	Checksum	(Read-only) The 16-bit ICMPv6 checksum. This is the ones complement of the ones complement sum of the whole ICMPv6 message, which starts at the message type field. The ‘whole’ message includes the IPv6

Header Field	Dialog box field	Description
		header and extension header fields.
	Target Address	The IPv6 address of the neighbor (target) to which the solicitation was sent. (MUST NOT be multicast IPv6 address.)
Options	(Options Box)	Options: • Source Link Layer • Destination Link Layer • Prefix Information • Redirected Header • Max Transmission Unit NOTE ICMPv6 Option dialog boxes for additional information.

Neighbor Advertisement Message dialog box

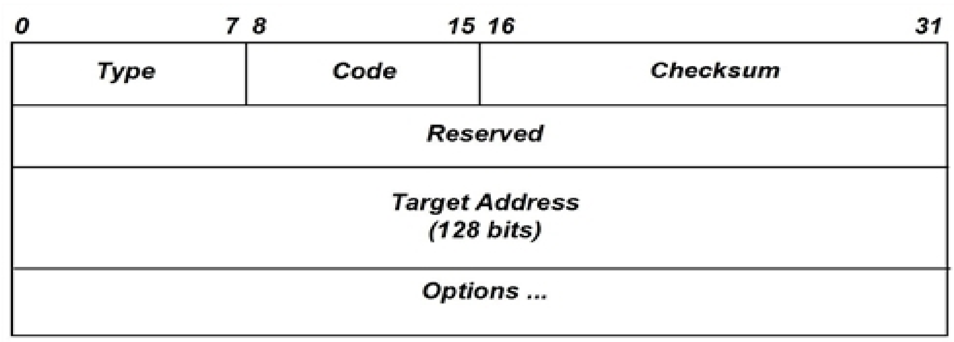
The controls in this version of the *ICMPv6* dialog box appear by selecting the *Neighbor Advertisement Message dialog box* option in the *Type* pull-down list. The Neighbor Advertisement Message Format option of the *ICMPv6 Header* dialog box is shown in *Image: ICMPv6 Neighbor Advertisement Message dialog box*.

Image: ICMPv6 Neighbor Advertisement Message Format



The format of an ICMPv6 Neighbor Advertisement Message is shown in *Image: ICMPv6 Neighbor Advertisement Message Format*.

Image: ICMPv6 Neighbor Advertisement Message Format



The message header fields, and the corresponding fields in the dialog box, are described in *Table: ICMPv6 Neighbor Advertisement Message Header Fields*.

Table: ICMPv6 Neighbor Advertisement Message Header Fields

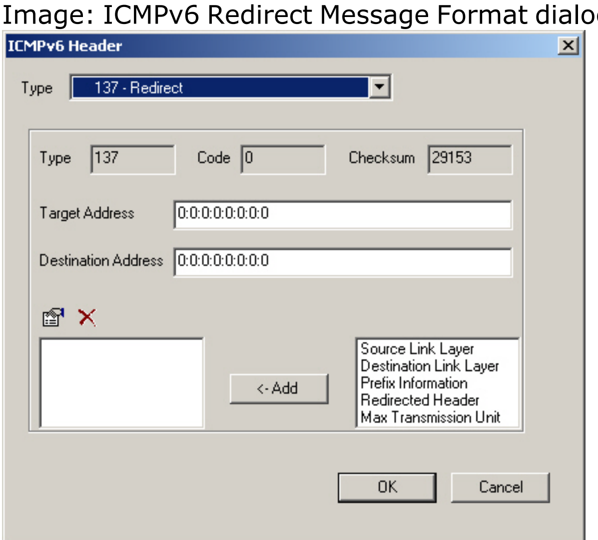
Header Field	**Dialog box field**	**Description**
Type	Type	The type for this message is: 136 - Neighbor Advertisement
Type	Type	(Read-only) The Type is defined as '136.'
Code	Code	(Read-only) '0.'
Checksum	Checksum	(Read-only) The 16-bit ICMPv6 checksum. This is the ones complement of the ones complement sum of the whole ICMPv6 message, which starts at the message type field. The 'whole' message includes the IPv6 header and extension header fields.
	Router	(1-bit flag) If selected, this sender is a router (not a host).
	Solicited	(1-bit flag) If selected, this neighbor advertisement is sent in response to a neighbor solicitation message.
	Override	(1-bit flag) If selected, the information in this advertisement should override the existing entry and update the link layer address. Not for use with anycast addresses.
	Target Address	128-bit IPv6 address. (MUST NOT be multicast IPv6 address.): • For solicited advertisements: It is the target address in the Neighbor Solicitation Message. • For unsolicited advertisements: It is the address with a link-layer address which has changed.
	Options Box:	Options: • Source Link Layer • Destination Link Layer

Header Field	Dialog box field	Description
		• Prefix Information • Redirected Header • Max Transmission Unit NOTE ICMPv6 Option dialog boxes for additional information.

Redirect Message Format

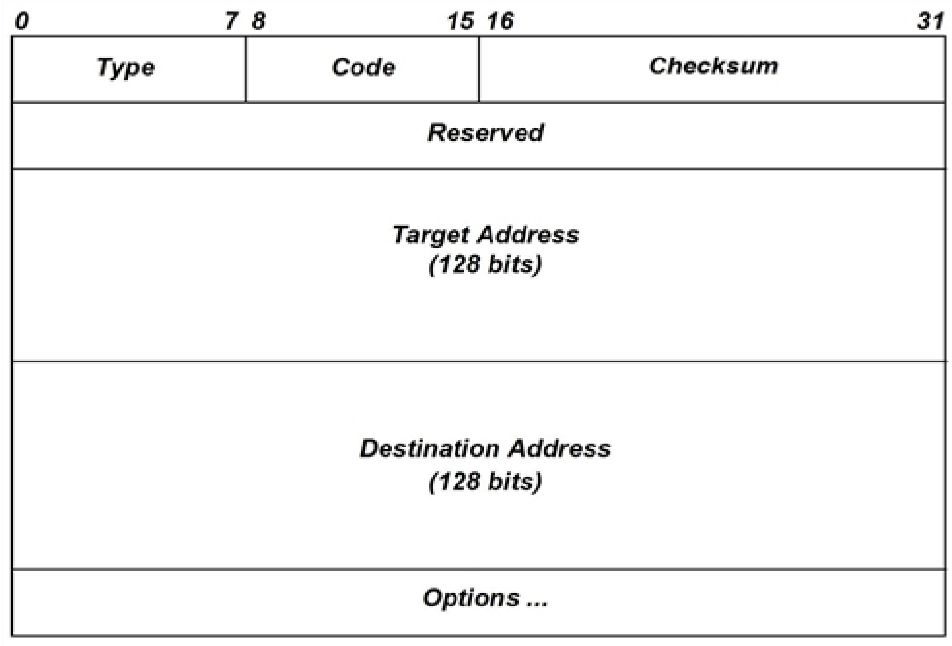
The controls in this version of the *ICMPv6* dialog box appear by selecting the *Redirect* option in the *Type* pull-down list. The Redirect message format option of the *ICMPv6 Header* dialog box is shown in *Image: ICMPv6 Redirect Message Format dialog box*.

Image: ICMPv6 Redirect Message Format dialog box



The format of an ICMPv6 Redirect Message is shown in *Image: ICMPv6 Redirect Message Format*.

Image: ICMPv6 Redirect Message Format



The message header fields and the corresponding fields in the dialog box are described in *Table: ICMPv6 Redirect Message Header Fields*.

Table: ICMPv6 Redirect Message Header Fields

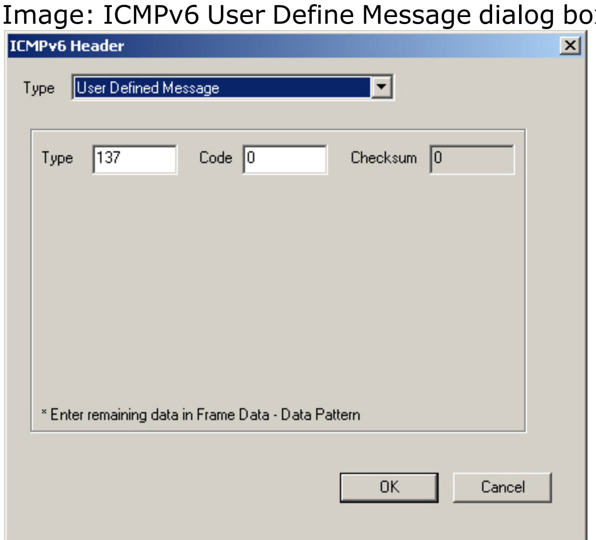
Header Field	Dialog box field	Description
Type	Type	The type for this message is: 137 - Redirect Message Format
Type	Type	(Read-only) The Type is defined as '137'.
Code	Code	(Read-only) '0'.
Checksum	Checksum	(Read-only) The 16-bit ICMPv6 checksum. This is the ones complement of the ones complement sum of the whole ICMPv6 message, which starts at the message type field. The 'whole' message includes the IPv6 header and extension header fields.
	Target Address	128-bit IPv6 address. This is the **same address** as the Destination address if the destination is a neighbor. If the target is **not** a neighbor, this is the address of a router which is a better first-hop node.
	Destination Address	128-bit IPv6 address. This is the IP address of the destination. If the destination is a neighbor, this address will be used as the Target address, also.

Header Field	Dialog box field	Description
	Options Box:	Options: • Source Link Layer • Destination Link Layer • Prefix Information • Redirected Header • Max Transmission Unit NOTE ICMPv6 Option dialog boxes for additional information.

User Defined Message dialog box

The controls in this version of the *ICMPv6* dialog box appear by selecting the *User Defined Message* option in the *Type* pull-down list. The User Defined Message option of the *ICMPv6 Header* dialog box is shown in *Image: ICMPv6 User Define Message dialog box.*

Image: ICMPv6 User Define Message dialog box



The message fields in the dialog box are described in *Table: ICMPv6 User Define Message Header Fields*.

Table: ICMPv6 User Define Message Header Fields

Dialog box field	Description
Type	The type for this message is: User Defined Message
Type	The user-definable Type value.

Dialog box field	Description
Code	The user-definable Code value.
Checksum	(Read-only) The 16-bit ICMPv6 checksum. This is the ones complement of the ones complement sum of the whole ICMPv6 message, which starts at the message type field. The 'whole' message includes the IPv6 header and extension header fields.
	NOTE Enter the remaining data in the **Frame Data** tab - Data Pattern box.

ICMPv6 Option dialog boxes

For the IPv6 Neighbor Discovery message types 133 through 137, there are multiple options which can be included. Applicability of these options varies by the type of message, and when they do not apply the options are 'silently ignored' by the nodes.

These options can be configured through the dialog boxes in the following sections:

- Source Link Layer Option dialog box.
- Destination Link Layer Option dialog box.
- Prefix Information Option dialog box.
- Redirected Header Option dialog box.
- Max Transmission Unit Option dialog box.

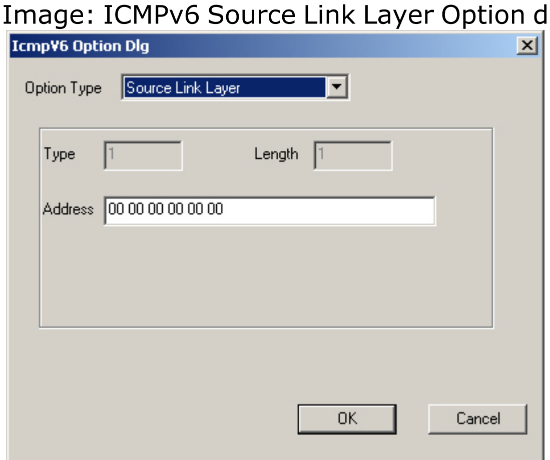
An additional option dialog box is available so you can define custom ICMPv6 options:

- User Define Option dialog box.

Source Link Layer Option dialog box

The Source Link Layer selection in the *ICMPv6 Option* dialog box is shown in *Image: ICMPv6 Source Link Layer Option dialog box*.

Image: ICMPv6 Source Link Layer Option dialog box



This option can be used in Neighbor Solicitation, Router Solicitation, and Router Advertisement messages. The option fields, and the corresponding fields in the dialog box, are described in *Table: ICMPv6 Source Link Layer Option Fields*.

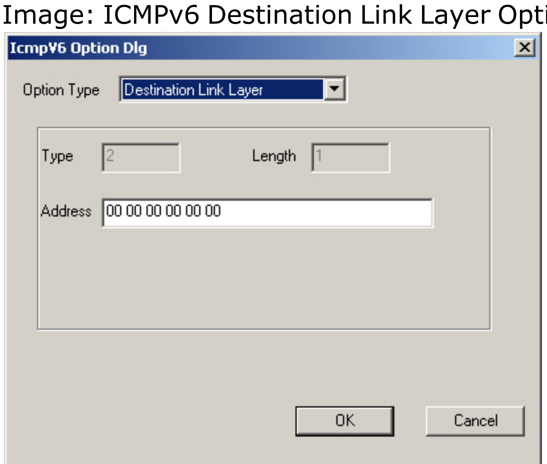
Table: ICMPv6 Source Link Layer Option Fields

Header Field	Dialog box field	Description
Type	Type	The type for this option is: Source Link Layer
Type	Type	(Read-only) The type value for this option = 1.
	Length	(Read-only) (8-bit integer) It is the length of the option, and includes type, length, and address fields. One unit of length = 8 octets. The default value = 2. A length value = 0 is invalid, and the node MUST silently discard a Neighbor Discovery packet where length = 0.
Link Layer Address	Address	(variable length) The link layer address of the node which sent the packet.

Destination Link Layer Option dialog box

The Destination Link Layer selection in the *ICMPv6 Option* dialog is shown *Image: ICMPv6 Destination Link Layer Option dialog box*.

Image: ICMPv6 Destination Link Layer Option dialog box



This option can be used in Neighbor Advertisement and Redirect messages. The option fields, and the corresponding fields in the dialog, are described in *Table: ICMPv6 Destination Link Layer Option Fields*.

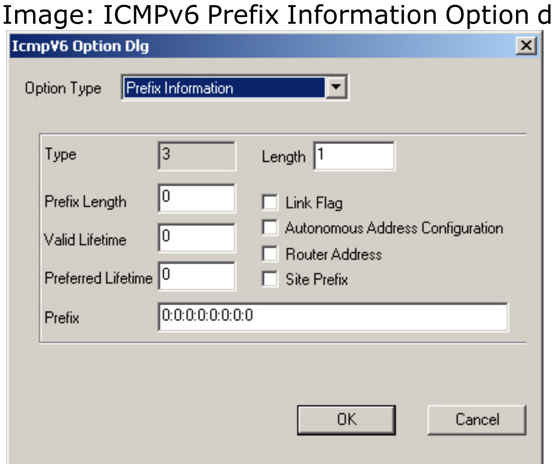
Table: ICMPv6 Destination Link Layer Option Fields

Option Field	Dialog box field	Description
Option Type	Type	The type for this message option is: Destination Link Layer
Type	Type	(Read-only) The type value for this option = 2.
Length	Length	(Read-only) (8-bit integer) The length of the option, and includes type, length, and address fields. One unit of length = 8 octets. The default value = 1. A length value = 0 is invalid, and the node MUST silently discard a Neighbor Discovery packet where length = 0.
Link-Layer Address	Address	(variable length) The target/destination link-layer address.

Prefix Information Option dialog box

The Prefix Information selection in the *ICMPv6 Option* dialog is shown in *Image: ICMPv6 Prefix Information Option dialog box*.

Image: ICMPv6 Prefix Information Option dialog box



This option may be used in Router Advertisement messages. The option fields, and the corresponding fields in the dialog, are described in *Table: ICMPv6 Prefix Information Option Fields*.

Table: ICMPv6 Prefix Information Option Fields

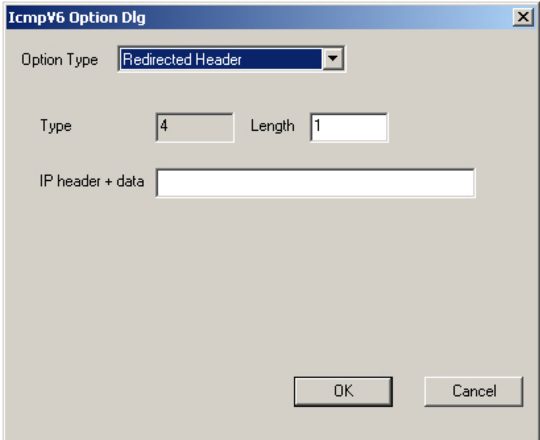
Option Field	Dialog box field	Description
Option Type	Type	The type for this message option is: Prefix Information.

Option Field	Dialog box field	Description
Type	Type	(Read-only) The type value for this option = 3.
Length	Length	(8-bit integer) Length = 4. One unit of length = 8 octets. A length value = 0 is invalid, and the node MUST silently discard a Neighbor Discovery packet where length = 0.
Prefix Length	PrefixLength	(8-bit integer) The number of valid bits in the prefix.
Valid Lifetime	Valid Lifetime	(32-bit integer) The time, starting from packet transmission, that the prefix is valid in seconds. (0xffffffff = infinity.)
Preferred Lifetime	Preferred Lifetime	(32-bit integer) The time, starting from packet transmission, that the addresses generated from the prefix are ‘preferred’ in seconds. (0xffffffff = infinity.)
L	Link Flag	(1-bit flag) If selected, this prefix can be used for determining if the prefix is on-link.
A	Autonomous Address Configuration	(1-bit flag) If selected, this prefix can be used for autonomous address configuration.
	Router Address	If selected, indicates a router. The prefix option should not be sent by a router for a link-local prefix.
	Site Prefix	If selected, indicates a host/site. The prefix option should be ignored by a host, for a link-local prefix.
Prefix	Prefix	Can be an IPv6 address or an IPv6 address prefix. The valid leading bits are specified by the setting in the ‘PrefixLength’ field. All following bits MUST be set to zero by the sending node and are ignored upon receipt.

Redirected Header Option dialog box

The Redirected Header selection in the *ICMPv6 Option* dialog is shown in *Image: ICMPv6 Redirected Header Option dialog box*.

Image: ICMPv6 Redirected Header Option dialog box



The option fields and the corresponding fields in the dialog are described in *Table: MPv6 Redirected Header Option Fields*.

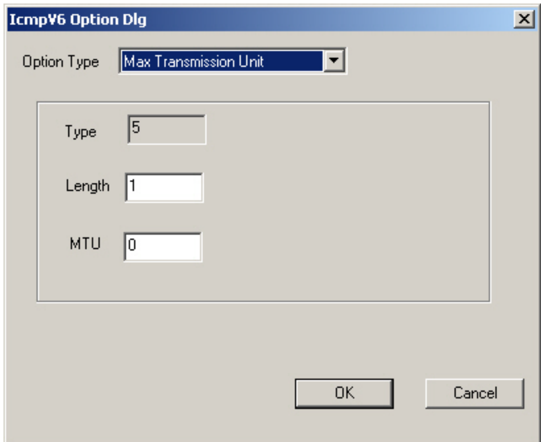
Table: MPv6 Redirected Header Option Fields

Option Field	Dialog box field	Description
Option Type	Type	The type for this message option is: Restricted Header
Type	Type	(Read-only) The type value for this option = 4.
Length	Length	(8-bit integer) The length of the option. One unit of length = 8 octets. A length value = 0 is invalid, and the node MUST silently discard a Neighbor Discovery packet where length = 0.
IP header + data	IP header + Data	Some of all of the contents of the original IP packet. It consists of as much of the original packet as can be carried in the Redirect message without going over the maximum allowed 1280 octets (bytes).

Max Transmission Unit Option dialog box

The Max Transmission Unit selection in the *ICMPv6 Option* dialog box is shown in *Image: ICMPv6 Max Transmission Unit Option dialog box*.

Image: ICMPv6 Max Transmission Unit Option dialog box



The option fields and the corresponding fields in the dialog box are described in *Table: ICMPv6 Max Transmission Unit Option Fields*.

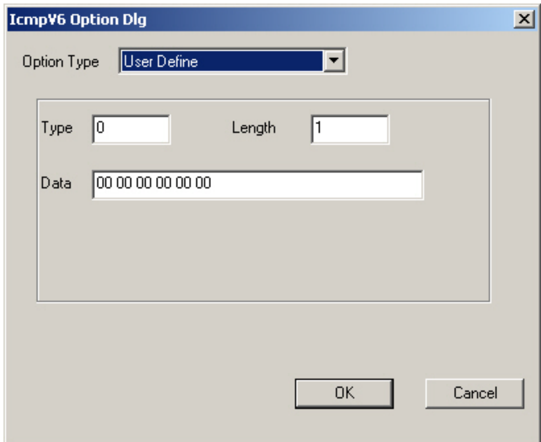
Table: ICMPv6 Max Transmission Unit Option Fields

Option Field	Dialog box field	Description
Option Type	Type	The type for this message option is: Max Transmission Unit
Type	Type	(Read-only) The type value for this option = 5.
Length	Length	(8-bit integer) Length = 1. A length value = 0 is invalid, and the node MUST silently discard a Neighbor Discovery packet where length = 0.
MTU	MTU	(32-bit integer) The recommended value of the Maximum Transmission Unit (MTU) on this link.

User Define Option dialog box

The User Define selection in the *ICMPv6 Option* dialog box is shown in *Image: ICMPv6 User Define Option dialog box*.

Image: ICMPv6 User Define Option dialog box



The option fields in the dialog box are described in *Table: ICMPv6 User Define Option Fields*.

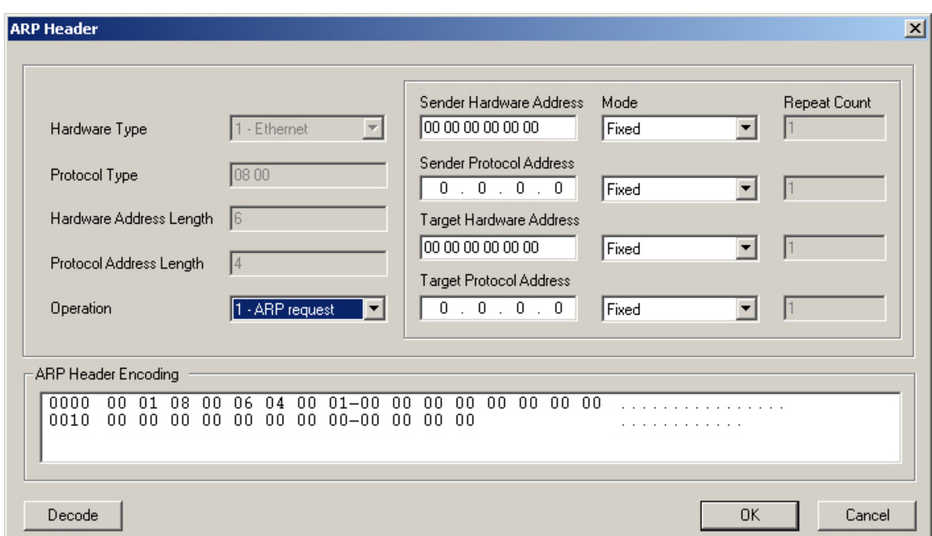
Table: ICMPv6 User Define Option Fields

Dialog box field	Description
Type	The type for this option is: User Define
Type	The user-definable Type value.
Length	The user-definable Length value, where one unit = one octet.
Data	The user-definable data field.

ARP Header dialog box

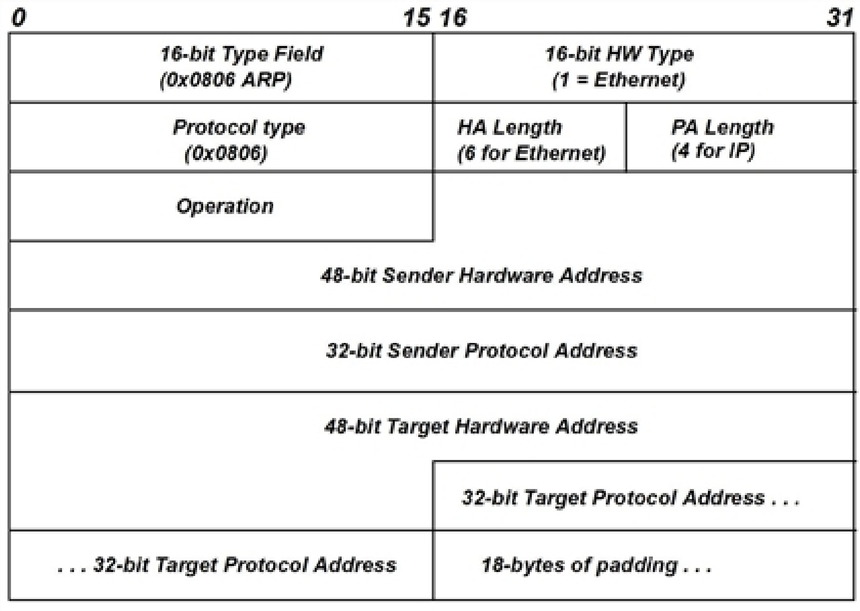
When the ARP option is selected in the Protocols section of the ***Frame Data*** tab, the *Edit* button opens the *ARP Header* dialog box. This dialog box allows for configuring various aspects of the ARP header information. The *ARP Header* dialog box is shown in *Image: Protocols: ARP Header dialog box*.

Image: Protocols: ARP Header dialog box



The format of an ARP packet is shown in *Image: Protocols: ARP Header Format.*

Image: Protocols: ARP Header Format



The correspondence between the fields of an ARP packet and the elements of the *ARP Header* dialog box which set those fields are described in *Table: ARP Header Fields Set by the ARP Header dialog box*.

Table: ARP Header Fields Set by the ARP Header dialog box

ARP Header Field	Dialog box element	Description
Type		Always 0x0806.
HW Type	Hardware Type	Always 1 for Ethernet.
Protocol Type	Protocol Type	Always 0x0806 for ARP.
HA Length	Hardware Address Length	Always 6 for Ethernet (in octets).
PA Length	Protocol Address Length	Always 4 for IP.
Operation	Operation	One of the ARP-related operations: • 0 - Unknown • 1 - ARP request • 2 - ARP reply • 3 - RARP request • 4 - RARP reply.

ARP Header Field	Dialog box element	Description
Sender Hardware Address	Sender Hardware Address	The MAC (Layer 2) address of the ARP packet sender. (See also Mode and Repeat Count.)
Sender Protocol Address	Sender Protocol Address	The IP (Layer 3) address of the ARP packet sender. (See also Mode and Repeat Count.)
Target Hardware Address	Target Hardware Address	The MAC (Layer 2) address of the target of the ARP packet. (See also Mode and Repeat Count.)
Target Protocol Address	Target Protocol Address	The IP (Layer 3) address of the target of the ARP packet. (See also Mode and Repeat Count.)
Pad		Extra padding to make a minimum-sized IP packet.
	Mode	The mode of modifying the IP address. Choose one of: • Fixed • Increment • Decrement • Continuous Increment • Continuous Decrement
	Repeat Count	The number of times to modify the IP address, using the selected mode for increment or decrement.

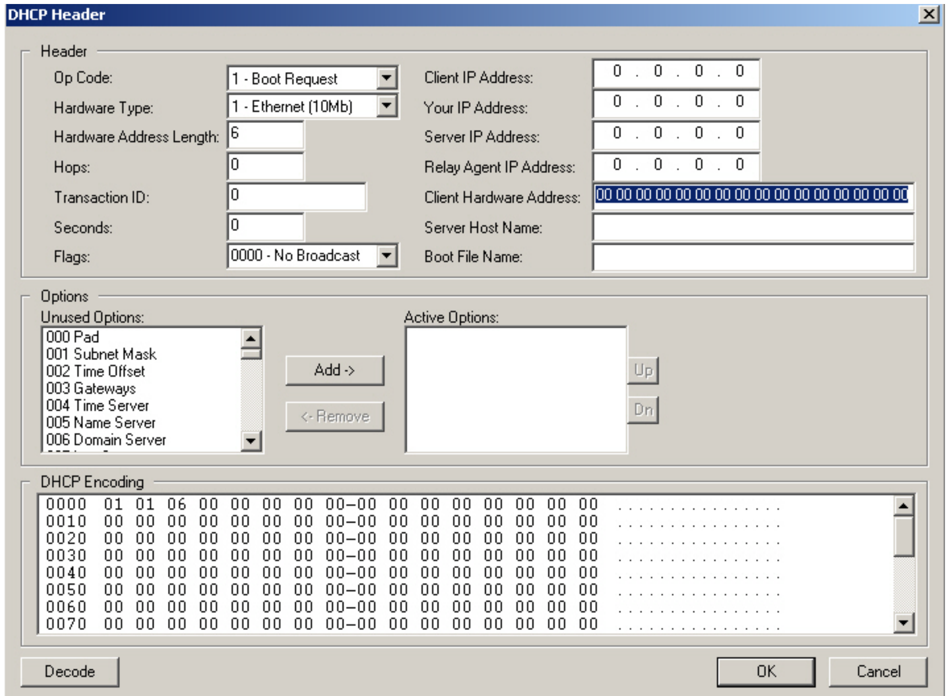
DHCP Header dialog box

The *DHCP Header* dialog box is viewed from the **Frame Data** tab Protocols section, using the following steps:

1. Select either the Ethernet II or the 802.2 SNAP choices from the Data Link Layer box.
2. Select DHCP/IP from the Protocols box, followed by the *Edit* button in the Protocols box.
3. In the resulting IP Header dialog box, select the *Edit DHCP* button.

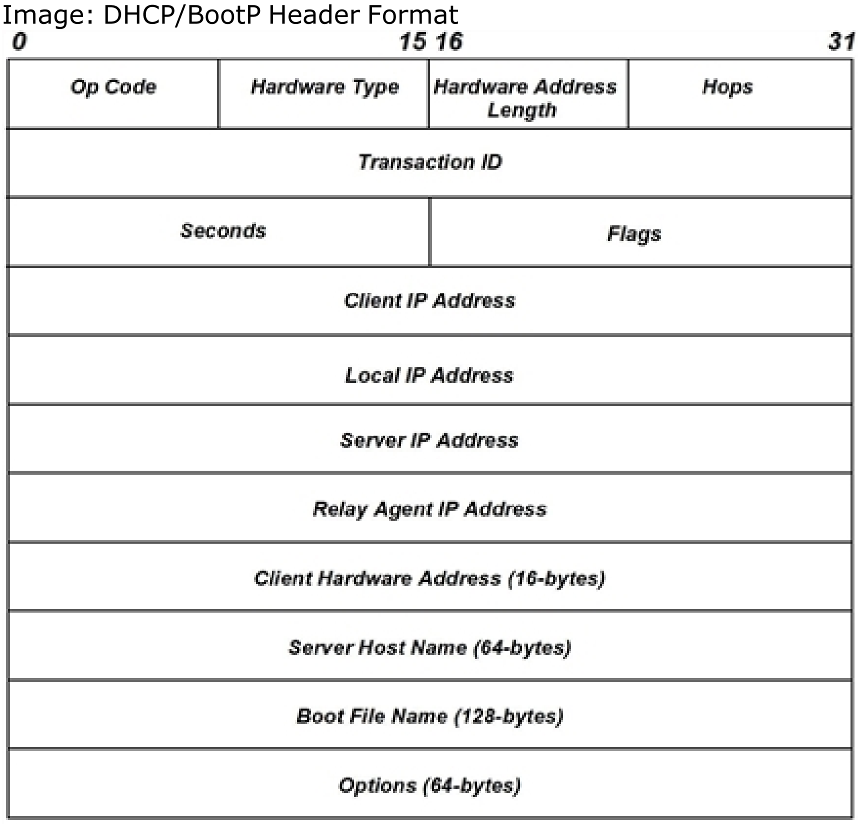
The *DHCP Header* dialog box is shown in *Image: DHCP Header dialog box*, followed by the format of a DHCP/BOOTP packet:

Image: DHCP Header dialog box



The elements of the DHCP header are shown in *Image: DHCP/BootP Header Format*.

Image: DHCP/BootP Header Format



The field names in the *DHCP Header* dialog box conform to the labels in the header format diagram and are described in *Table: DHCP/BootP Header Fields Set by the DHCP Header dialog box*.

Table: DHCP/BootP Header Fields Set by the DHCP Header dialog box

Field	Description
Op Code	One of: • 1 - Start Request. A request from a client to a server for information. • 2 - Start Reply. The server's response. • Unknown.
Hardware Type	The hardware address type. The default is '1' = 10Mb Ethernet. These numbers are drawn from the list of hardware types related to the ARP protocol. The most current version of this is found in http://www.isi.edu/in-notes/iana/assignments/arp-parameters.
Hardware Address Length	The length of address that corresponds to the Hardware Type. For example, '6' for Ethernet (MAC) addresses.
Hops	Number of hops. Clients set this to zero and servers may optionally use this in cross-gateway starting.
Transaction ID	A random number set by the client and used to match responses to requests.
Seconds	Filled in by the client and contains the number of seconds that have elapsed since the client started trying to start.
Flags	A single flag is defined: • 0000 - No Broadcast • 8000 - Broadcast • Unknown Broadcast is set by the client to indicate that it will require a broadcast response.
Client IP Address	Set by the client in a start request if it is known.
Local IP Address	Set by the server to indicate the client's IP address, if the client doesn't know its address.
Server IP Address	Returned by the server in its start reply.
Relay Agent IP Address	Set by the server, to be used in optional cross-gateway starting.
Client Hardware	The client's hardware address, the length of which is specified in the Hardware Address Length field.

Field	Description
Address	
Server Host Name	Set by the client to indicate the desired server it wishes to talk to.
Boot File Name	Set by the client to indicate a particular file name or operational mode. This is often used by the server to initiate a TFTP download of software to a client.
Options	An optional area used to transmit additional parameters. Option parameters are set using the 'Options' box in the center of the *DHCP Header* dialog box and are discussed below.

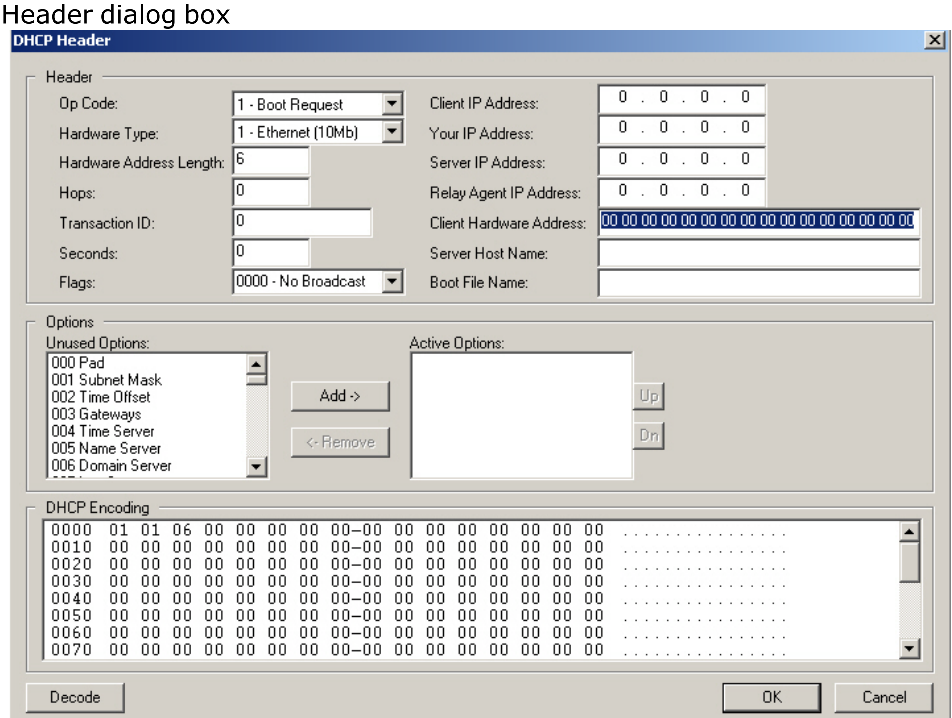
DHCP Header dialog box

The *DHCP Header* dialog box is viewed from the **Frame Data** tab Protocols section, using the following steps:

1. Select either the Ethernet II or the 802.2 SNAP choices from the Data Link Layer box.
2. Select DHCP/IP from the Protocols box, followed by the *Edit* button in the Protocols box.
3. In the resulting IP Header dialog box, select the *Edit DHCP* button.

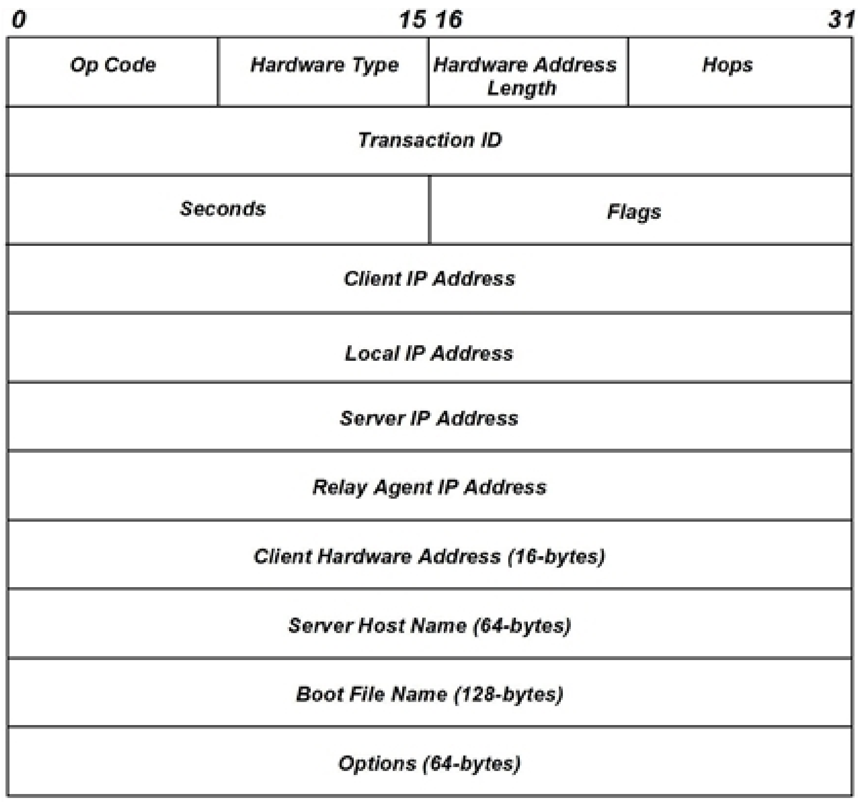
The *DHCP Header* dialog box is shown in *Image: DHCP Header dialog box*, followed by the format of a DHCP/BOOTP packet:

Image: DHCP Header dialog box



The elements of the DHCP header are shown in *Image: DHCP/BootP Header Format*.

Image: DHCP/BootP Header Format



The field names in the *DHCP Header* dialog box conform to the labels in the header format diagram and are described in *Table: DHCP/BootP Header Fields Set by the DHCP Header dialog box*.

Table: DHCP/BootP Header Fields Set by the DHCP Header dialog box

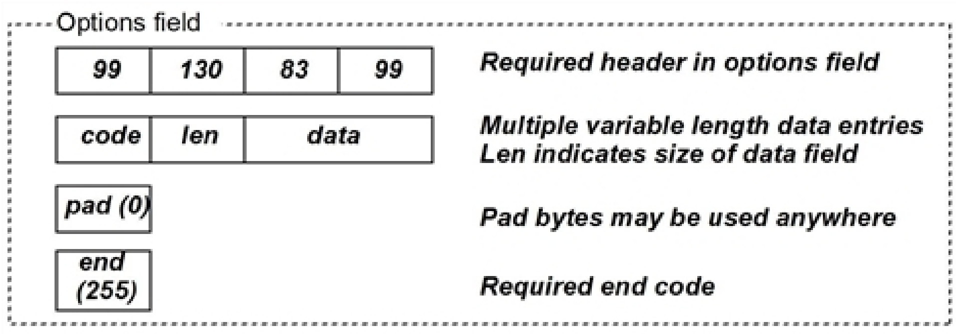
Field	Description
Op Code	One of: • 1 - Start Request. A request from a client to a server for information. • 2 - Start Reply. The server’s response. • Unknown.
Hardware Type	The hardware address type. The default is ‘1’ = 10Mb Ethernet. These numbers are drawn from the list of hardware types related to the ARP protocol. The most current version of this is found in http://www.isi.edu/in-notes/iana/assignments/arp-parameters.
Hardware Address Length	The length of address that corresponds to the Hardware Type. For example, ‘6’ for Ethernet (MAC) addresses.
Hops	Number of hops. Clients set this to zero and servers may optionally use this in cross-gateway starting.
Transaction ID	A random number set by the client and used to match responses to requests.

Field	Description
Seconds	Filled in by the client and contains the number of seconds that have elapsed since the client started trying to start.
Flags	A single flag is defined: • 0000 - No Broadcast • 8000 - Broadcast • Unknown Broadcast is set by the client to indicate that it will require a broadcast response.
Client IP Address	Set by the client in a start request if it is known.
Local IP Address	Set by the server to indicate the client's IP address, if the client doesn't know its address.
Server IP Address	Returned by the server in its start reply.
Relay Agent IP Address	Set by the server, to be used in optional cross-gateway starting.
Client Hardware Address	The client's hardware address, the length of which is specified in the Hardware Address Length field.
Server Host Name	Set by the client to indicate the desired server it wishes to talk to.
Boot File Name	Set by the client to indicate a particular file name or operational mode. This is often used by the server to initiate a TFTP download of software to a client.
Options	An optional area used to transmit additional parameters. Option parameters are set using the 'Options' box in the center of the *DHCP Header* dialog box and are discussed below.

DHCP Options

The DHCP options field is used to hold a wide variety of data. Its internal format, within the DHCP header, is shown in *Image: DHCP Options Field Format*.

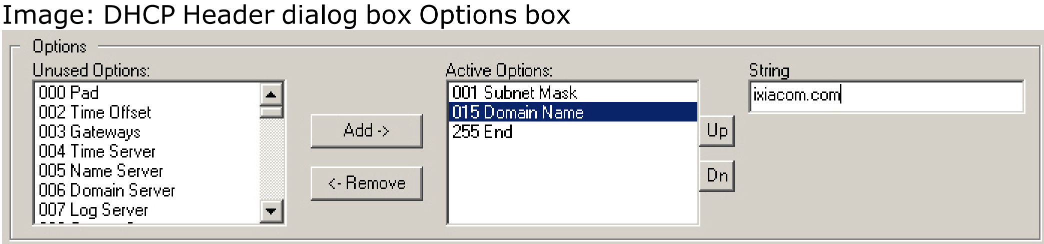
Image: DHCP Options Field Format



If a DHCP packet uses its options field it must start with the four octets 99.130.83.99 (decimal, or 63.82.53.63 hex). This is followed by any number of coded entries. Each entry has a one-byte opcode, followed by a length byte and the code dependent data indicated by the length field. A special opcode (pad = 0) is reserved to pad data to any needed boundary. An end opcode (255) must terminate all of the data. The particular codes in that may be used are described in RFC 2132 which can be located at http://info.internet.isi.edu/in-notes/rfc/files/rfc2132.txt.

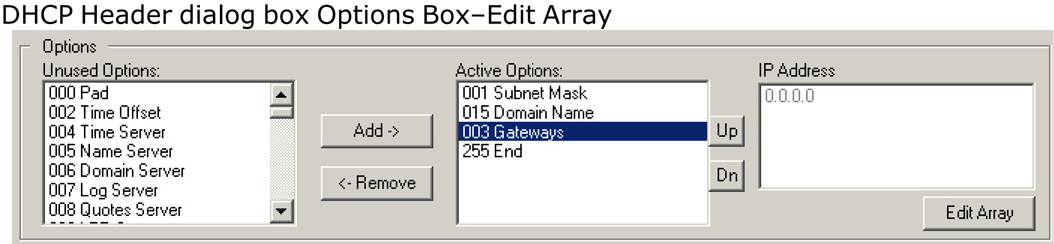
The options box, pictured in *Image: DHCP Header dialog box Options box*, may be used to set the options field of DHCP packets.

Image: DHCP Header dialog box Options box



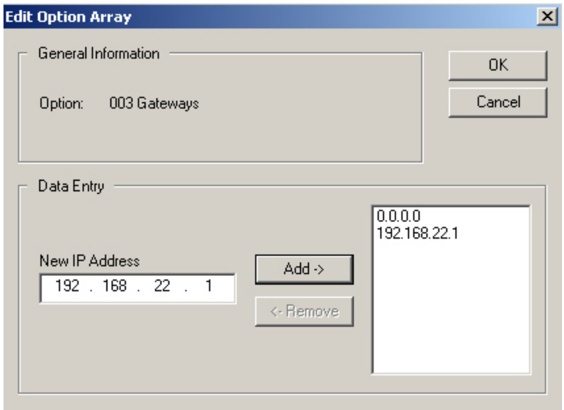
Unused Option codes are selected from the left list and moved into the Active Options code with the *Add* button. Active Options may be moved back into the unused category with the *Remove* button. Active options are rearranged through the use of the *Up* and *Dn* buttons. Each option may be configured by selecting the option and filling in the data in the right hand column, which asks for and formats data in a manner appropriate for the option selected. Where a list of data is called for, the Options box appears as shown in *Image: DHCP Header dialog box Options Box–Edit Array*.

Image: DHCP Header dialog box Options Box–Edit Array



To specify the number and content of the options data, select the *Edit Array* button. This presents the edit dialog box shown in *Image: DHCP Edit Options Array dialog box*.

Image: DHCP Edit Options Array dialog box



This dialog box allows to enter and remove array elements in the *Data Entry* box. New elements are entered in the edit box, whose format varies depending on the option under construction, and are added to the array with the *Add* button. Existing elements must be edited by removing them with the *Remove* button and adding them again.

DHCP Encoding

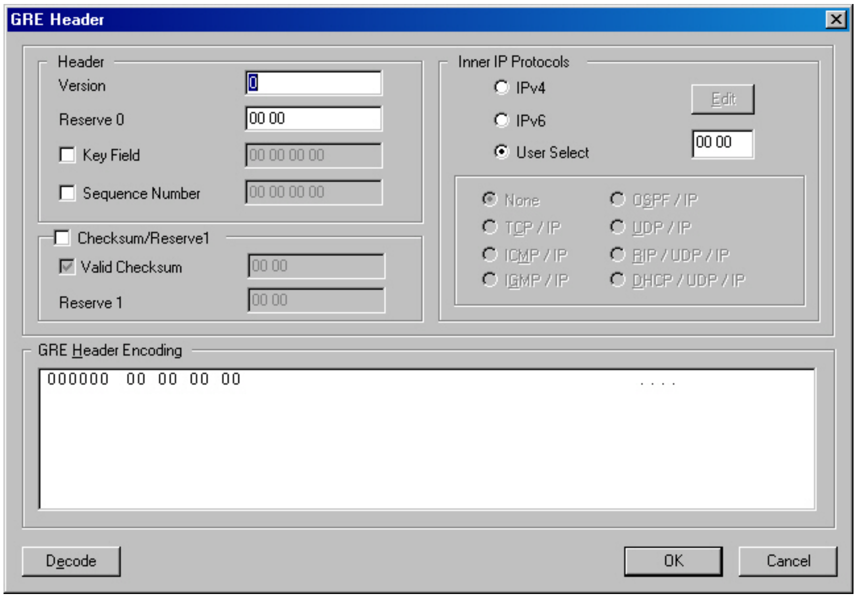
The bottom part of the *DHCP Header* dialog box is the DHCP Encoding window (*Image: DHCP Header dialog box*). The DHCP header is decoded in three columns: the hex offset from the beginning of the packet, the data interpreted in hex, and the data interpreted in ASCII. For data entered in the other parts of the screen to be reflected in the DHCP Encoding panel, it is necessary to move the cursor out of the data field using the TAB key, for example. DHCP data may be entered directly into the Encoding panel (hexadecimal or ASCII view) if desired. It is necessary to select the *Decode* button after editing in this manner.

GRE Header dialog box

General Routing Encapsulation (GRE) attempts to provide a simple, general purpose mechanism which reduces the problem of encapsulation from its current size to a more manageable size. Refer to the GRE—Generic Routing Encapsulation section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual* for more information.

The GRE Header dialog box is accessed by selecting IPv4 and GRE in the protocol sub-tab of the Frame Data tab and selecting the Edit button. From the IP Header dialog box, select the Edit GRE button. The GRE Header dialog box is shown in *Image: IP GRE Header dialog box*.

Image: IP GRE Header dialog box



The format for a GRE message header (the default setting) is shown in *Image: GRE Message Header*.

Image: GRE Message Header

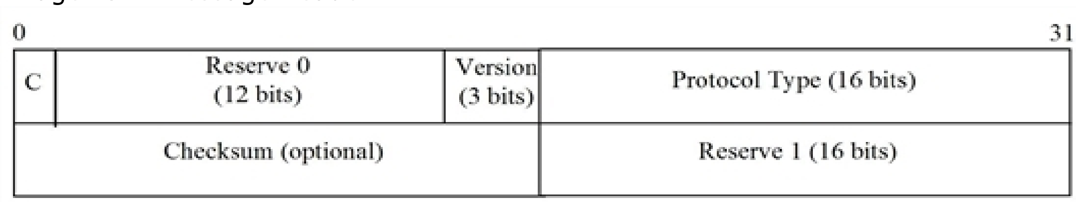


Table: GRE Configuration describes the controls for configuring the GRE header information.

Table: GRE Configuration

Section	Field/Control	Description
Header		Sets basic GRE header information
	Version	The version of GRE used. GRE headers are organized differently and contain varying information, depending on the version number.
	Reserve 0	Allows to set the Reserved 0 bits in the GRE header.
	Key Field	The GRE key is an authentication key used by the receiving router to validate the GRE packets. This check box allows to edit the GRE key.
	Sequence Number	The Sequence Number is used by the receiving router to establish the order in which packets have been transmitted. This check box allows to set the sequence number bits.
Inner IP Protocol		Sets the IP protocol used in the GRE.

Section	Field/Control	Description
	IPv4	Selects IPv4. This option enables the inner IP transport protocol option buttons as well.
	IPv6	Selects IPv6. This option enables the inner IP transport protocol option buttons as well.
	User Selected	Allows to set the IP field bits directly, using the edit box.
	Edit	Allows to edit the IPv4, IPv6, and transport options selected for the inner IP protocol.
Checksum/Reserve1		Allows to set the checksum value and the Reserve 1 value.
	Valid Checksum	Selecting this check box ensures the GRE checksum value is a valid value, and will return a 'Good' packet evaluation.
	Reserve1	Allows to set the Reserve 1 bits in the GRE header.
GRE Header Encoding		Shows the GRE bit information.

Protocol Padding

This dialog box allows to added data padding between the Protocol Header and Payload Data patterns. It is accessed by selecting the *Protocol Pad* check box and then selecting the *Edit Data* button in the *Protocols* sub-tab of the **Frame Data** tab.

The Protocol Pad dialog box is shown in *Image: Protocol Pad dialog box*.

Image: Protocol Pad dialog box

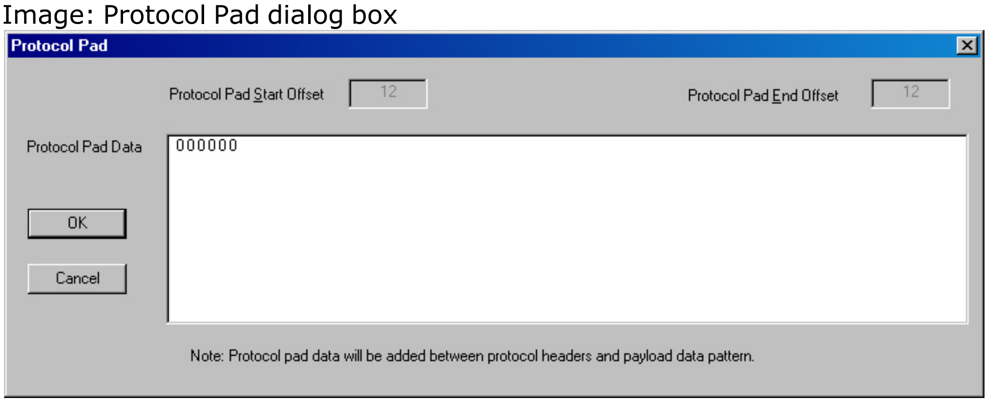


Table: Protocol Padding Configuration explains the controls in this dialog box.

Table: Protocol Padding Configuration

Field/Control	Description
Protocol Pad Start	**Read Only.** Shows the offset for the beginning of the padding data, from the

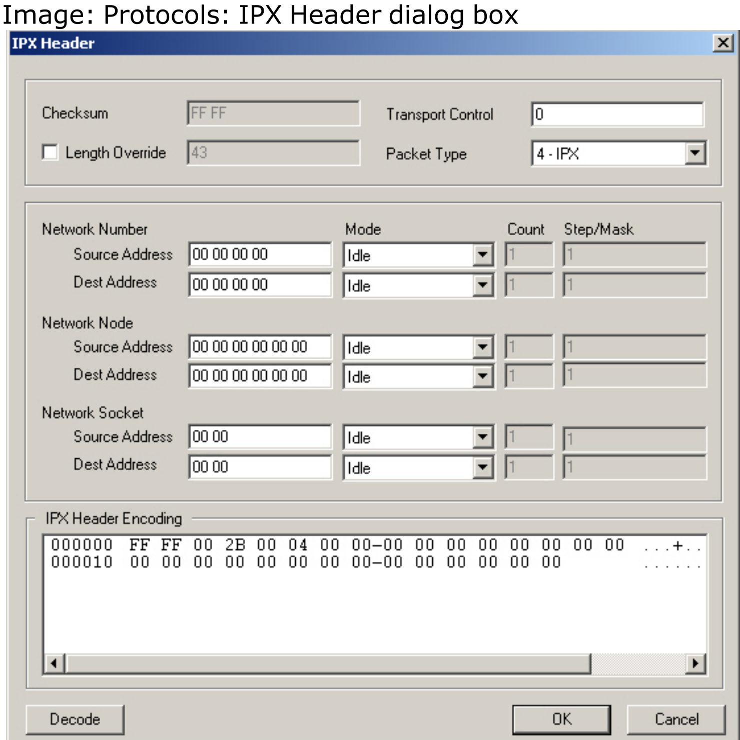
Field/Control	Description
Offset	beginning of the packet.
Protocol Pad End Offset	**Read Only.** Shows the end of the padding data, from the beginning of the packet.
Protocol Pad Data	Allows to enter hexadecimal data that is used as padding data.

IPX Protocol

The protocol specific headers may be conveniently specified using the *Edit* button in the Protocols section. To access the IPX protocol header configuration controls, select the *IPX* option in the *Protocols* sub-tab, then select the *Edit* button.

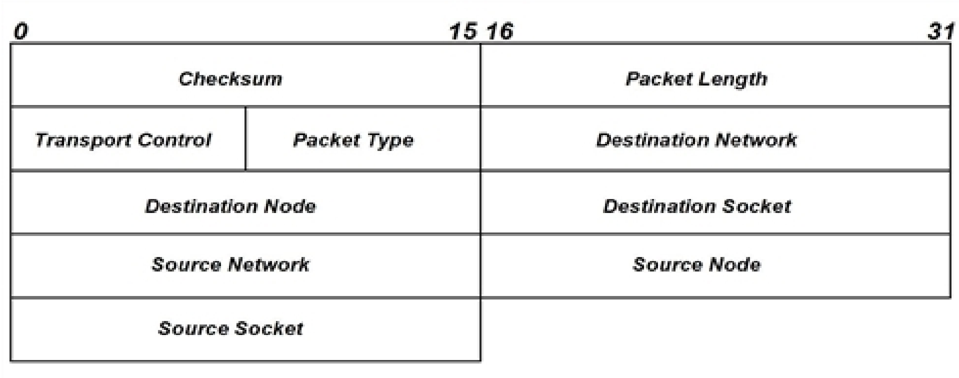
IPX protocols may not be used with Packet over SONET modules. The IPX selection shows the dialog box in *Image: Protocols: IPX Header dialog box*.

Image: Protocols: IPX Header dialog box



The format of an IPX header is shown in *Image: Protocols: IPX Header dialog box*.

Image: Protocols: IPX Header dialog box



The correlation between the fields of an IPX header and the elements of the *IPX Header* dialog box which set those fields are described in *Table: IPX Header Fields Set by the IPX dialog box*.

Table: IPX Header Fields Set by the IPX dialog box

Header Field	Dialog box field	Description
Checksum	Checksum	Automatically calculated checksum of the IPX header and packet data.
Packet Length	Length Override	If selected, the length field becomes active, and you may specify the length of the IPX datagram. If cleared, the length of the IPX datagram is automatically calculated.
	(Length field)	Length of the IPX datagram (in bytes).
Transport Control	Transport Control	Number of routers that the packet has passed through.
Packet Type	Packet Type	The type of IPX packet: • 0 - Unknown • 1 - Routing Info • 2 - Echo • 3 - Error • 4 - IPX • 5 - SPX • 17 - NCP NOTE Types 16, and 18-31 are reserved for Experimental Protocols.
Destination Network	Network Number - Dest Address	IPX Network number for the destination.

Header Field	Dialog box field	Description
Source Network	Network Number - Source Address	IPX Network number for the source.
Destination Node	Network Node - Dest Address	Destination node number within the Destination Network.
Source Node	Network Node - Source Address	Source node number within the source network.
Destination Socket	Network Socket - Dest Address	Socket on the destination node within the destination network.
Source Socket	Network Socket - Source Address	Socket on the source node within the source network.
	Mode	The mode of modifying the IP address. Choose one of: • Idle • Increment • Decrement • Continuous Increment • Continuous Decrement.
	Count	The number of times to modify the IP Address using the mode—increment or decrement.
	Mask	Defines the network mask to be used for IP addresses, used with increment, decrement, continuous increment, and continuous decrement.

IPX Header Encoding

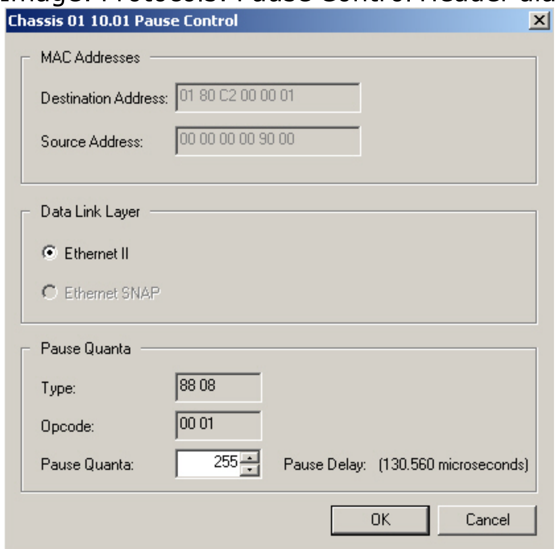
Values which are set in the dialog box are reflected in the hexadecimal view of the IPX Header Encoding at the bottom of the dialog box. It is also possible to edit the IPX Header directly from the view; all editing occurs in type-over mode. After any change, the *Decode* button should be selected to reflect these changes back into the dialog box fields.

Pause Control

The Pause control header is a means of implementing data flow control between attached devices, as defined in IEEE 802.3. The Pause control protocol is used only with the Ethernet II and Ethernet SNAP data link layer protocols.

The pause control message headers may be specified using the *Edit* button in the Protocols section of the **Frame Data** tab. The *Pause Control* dialog box is shown in *Image: Protocols: Pause Control Header dialog box*.

Image: Protocols: Pause Control Header dialog box



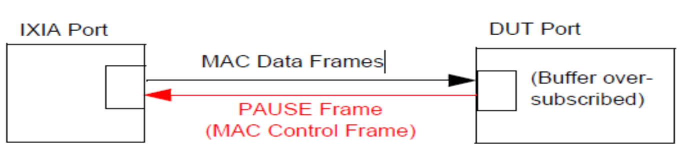
Pause Control is used to stop transmission of data frames for a certain length of time, as when a receiving port is becoming oversubscribed and cannot properly handle all of the incoming frames. This temporary delay prevents data frames from being lost. Pause control operates in full-duplex mode connections, and must be enabled on both ports on the link.

When the port transmitting the data frames receives a MAC PAUSE Control frame, it will stop sending data frames for the specified period of time. If frames were already in the process of being transmitted, their transmission will be completed, and then the PAUSE operation will begin.

NOTE	IEEE specifications are followed for flow control when only auto negotiation is enabled.

A Pause Quanta unit is the time required for one bit to be transmitted (= one 'bit time') multiplied by 512. The Pause Delay is calculated based on the combination of the Pause Quanta counter value and the line rate of the port. Ixia ports act as the data transmit ports in this scenario. They are configured to listen for PAUSE frames from the DUT port which is receiving the data frames.

Image: PAUSE Control—Example



The fields and controls in this dialog box are described in *Table: Pause Control dialog box (shown for 10/100 module)*.

Table: Pause Control dialog box (shown for 10/100 module)

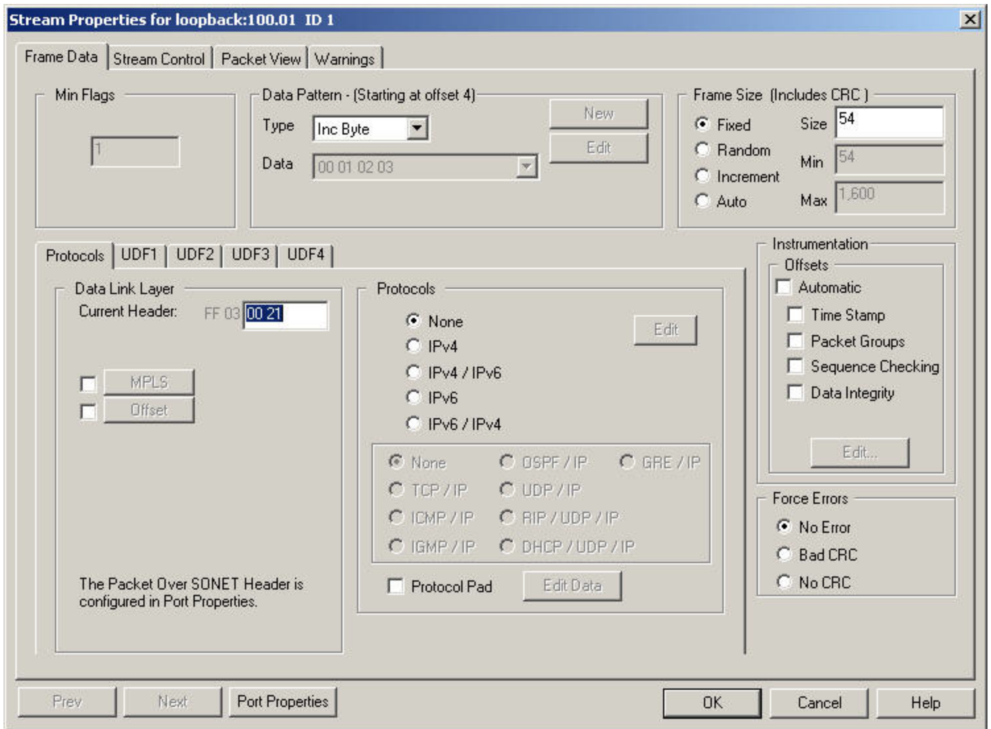
Category	Field/Control	Usage
MAC Addresses	Destination Address	(Read-Only except for 10GE modules) Set to the default Pause Control reserved multicast MAC address. When *Pause Control* is selected in the *Frame Data > Protocols > Protocols* box, this default address (0x01 80 C2 00 00 01) is entered automatically into the *MAC Destination Address* field in the DA/SA dialog box. As long as Pause Control is enabled, the MAC address in the DA/SA dialog box cannot be changed from this default address.
	Source Address	(Read-Only) This MAC address reflects the user-defined entry in the *MAC Source Address* field in the DA/SA dialog box. It is the address of the MAC Control client sending the PAUSE frame to the directly connected port which is transmitting data frames.
Data Link Layer	Ethernet II	(Reflects the setting in the *Frame Data > Protocols > Data Link Layer* box, either Ethernet II or Ethernet SNAP protocol.)
	Ethernet SNAP	(Reflects the setting in the *Frame Data > Protocols > Data Link Layer* box, either Ethernet II or Ethernet SNAP protocol.)
Pause Quanta	Type	(Read-Only) The Length/Type for a MAC Control frame. The value is specified as '88-08' by IEEE 802.3.
	Opcode	(Read-Only) The MAC Control Opcode for the PAUSE control function. The value is specified as '00-01' by IEEE 802.3.
	Pause Quanta	The user-specified pause counter value, measured in Pause Quanta units. (1 Pause Quanta = 512 bit times.) The valid range is 0 to 65535 pause quanta.
	Pause Delay	(Read-Only) The pause delay time, measured in standard time units (for example, milliseconds), and based on the Pause Quanta counter value and the line speed of the port.

Frame Data for DCC

Packet flows, packet streams, and advanced streams for the optional SONET Data Communication Channel (DCC) feature on OC-192c POS modules are set up with special conditions for rate, frame size, and so on. The DCC frame data options are accessed by selecting one of the DCC options in the **Transmit Modes** tab of the *Port Properties* dialog box.

The **Frame Data** tab for setting up DCC Packet Flows is shown in *Image: Frame Data for DCC Packet Flows.*

Image: Frame Data for DCC Packet Flows



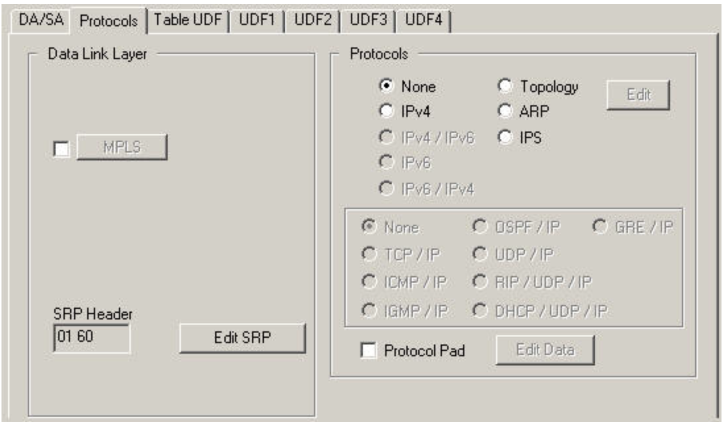
As shown in the image, no timestamps can be added to the packets for DCC Packet Flows. However, for DCC Packet Streams the timestamp option is available. The valid range of frame sizes for DCC is 40 to 64K (65,535) bytes. Frame Data for SONET/POS Modules for information on the rest of the options in this dialog box. Note that the *Protocols* > *Data Link Layer* > *MPLS* check box is not available for DCC Packet Flows, but it is available for DCC Packet Streams and DCC Advanced streams. It allows to insert MPLS labels after the POS header.

Frame Data for SRP

When the SRP feature is used on the OC-192c POS module, the usual POS header (PPP, and so on) is replaced by the SRP header, resulting in changed frame sizes. In addition, a special SRP CRC is calculated for each frame, in which the SRP header is excluded from the CRC calculation. The SRP frame data options are accessed by selecting the *SRP* option in the **SONET** tab of the *Port Properties* dialog box.

When Spatial Reuse Protocol (SRP) is enabled on an OC-192c POS module, the **Frame Data** tab Protocol section is modified, as shown in *Image: Frame Data Protocols for SRP*. This dialog box provides access to additional dialog boxes where headers for an SRP packet can be configured.

Image: Frame Data Protocols for SRP



The fields and controls in the Protocols section are described in *Table: Frame Data Protocols for SRP*.

Table: Frame Data Protocols for SRP

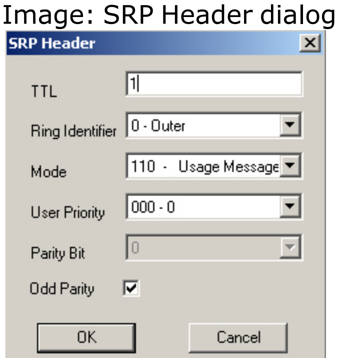
Section	**Field/Control**	**Description**
Data Link Layer	MPLS	Check this box to enable the use of MPLS labels in the header in SRP data frames. (Not available for use with SRP control frames: Topology, IPS, and SRP ARP.)
		Opens the *Edit MPLS* dialog box. See the section on the Edit MPLS *for additional information.*
	SRP Header	(Read-only) Shows the two bytes of the generic SRP Header.
	Edit SRP button	Opens the *SRP Header* dialog box. See the section on SRP Header dialog box for additional information.
Protocols (Choose one)	None	No Layer 3 protocol is selected.
	IPv4	Internet Protocol Version 4 is used. See the section on Protocols—Network Layer *for additional information.*
	Topology	When this protocol is selected and the *Edit* button is selected, the *Topology Discovery Header* dialog box will open. See the section on SRP Topology Discovery dialog box for additional information.
	ARP	Layer 2, Address Resolution Protocol (ARP) is used. See the section on ARP Header dialog box *for additional information.*

Section	Field/Control	Description
	IPS	Intelligent Protection Switching (IPS) is used. When this protocol is selected and the *Edit* button is selected, the *IPS Header* dialog box will open. See the section on SRP Protection Switching (IPS) dialog box for additional information.
	Edit	This button is active for all of the available protocols (not active for the *None* option). When the *Edit* button is selected, a corresponding dialog box will open to allow header configuration.
Sub-Protocols		*Table: Protocol Choices* for information on the Sub-Protocols.

SRP Header dialog box

This dialog box is accessed by selecting the *Edit SRP* button in the *Protocols* section of the **Frame Data** tab. The headers for Spatial Reuse Protocol (SRP) frames can be configured using the *SRP Header* dialog box, as shown in *Image: SRP Header dialog box*.

Image: SRP Header dialog box



NOTE

(SRP Usage Frame headers are set in the *SRP Usage* dialog box in Port Properties.) The fields and controls in this dialog box are used to set the headers for SRP Discovery, IPS, and data frames, and are described in *Table: SRP Generic Header dialog box*.

Table: SRP Generic Header dialog box

Field/Control	Description
TTL	The 8-bit Time-To-Live field specifies the node hop count. The maximum number of nodes is 128 (rather than 256, the maximum value for this 8-bit field). The range of values is 0 to 255. An originating SRP node must set the TTL to at least twice the number of nodes in the ring, to allow for the possibility of a wrapped ring due to a failure condition.
Ring Identifier	Choose one of: • Outer (default) • Inner

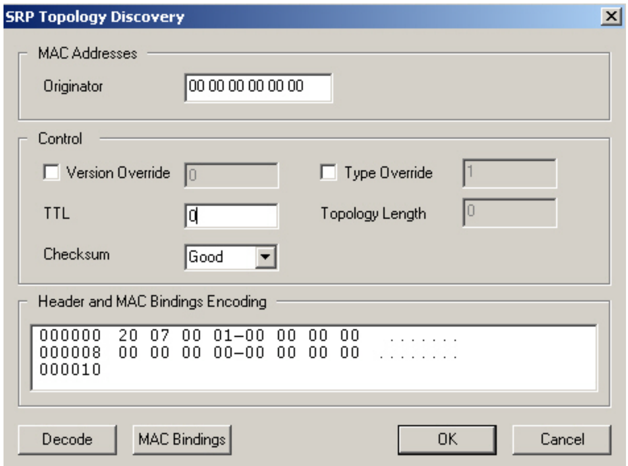
Field/Control	Description
Mode	The 3-bit field for the packet type. Choose one of: • 000 - Reserved • 001 - Reserved • 010 - Reserved • 011 - ATM cell • 100 - Control (pass): Control Message (Pass to host) used for SRP Discovery and SRP IPS frames • 101 - Control (local): Control Message (Locally buffered for host) • 110 - Usage Message: may be used when protocol is set to 'None' • 111 - Packet Data: used for IPv4 and ARP protocols NOTE When certain protocols are selected in the Frame Data - Protocols section, the type value in this field will be forced to the value which corresponds to the protocol. (for example, IPS protocol forces the value to 100 Control)
User Priority	The SRP User Priority (**not** IP TOS priority). Higher values have higher priorities. Choose one of: • 000 - 0 • 001 - 1 • 010 - 2 • 011 - 3 • 100 - 4 • 101 - 5 • 110 - 6 • 111 - 7
Parity Bit	(Read only) The Parity (P) bit field, used for data integrity over the preceding 15 bits of the SRP Usage frame header.
Odd Parity	If selected, odd parity will be used as a check on the SRP Usage frame header. The Parity bit will be forced to the value (1 or 0) that will be added to the value of the 15 preceding bits to create an odd value.

SRP Topology Discovery dialog box

Various types of control packets can be sent, including SRP Topology Discovery frames. The fields set in this dialog box are used for an SRP Topology Discovery frame, and will follow the basic SRP standard. The Topology Discovery frame is used to build a topology map of each node. Each node sends out Discovery frames on both rings. Each node acts as the originator, in turn, by adding its MAC address to the MAC binding field and updating the topology length before passing the frame to the next node.

The controls in this dialog box are accessed by first setting the port to use SRP, selecting the Topology option in the *Protocols* sub-tab of the **Frame Data** tab, then selecting the *Edit* button. The *SRP Topology Discovery* dialog box is shown in *Image: SRP Topology Discovery dialog box*.

Image: SRP Topology Discovery dialog box



The fields and controls in this dialog box are described in *Table: SRP Topology Discovery dialog box*.

Table: SRP Topology Discovery dialog box

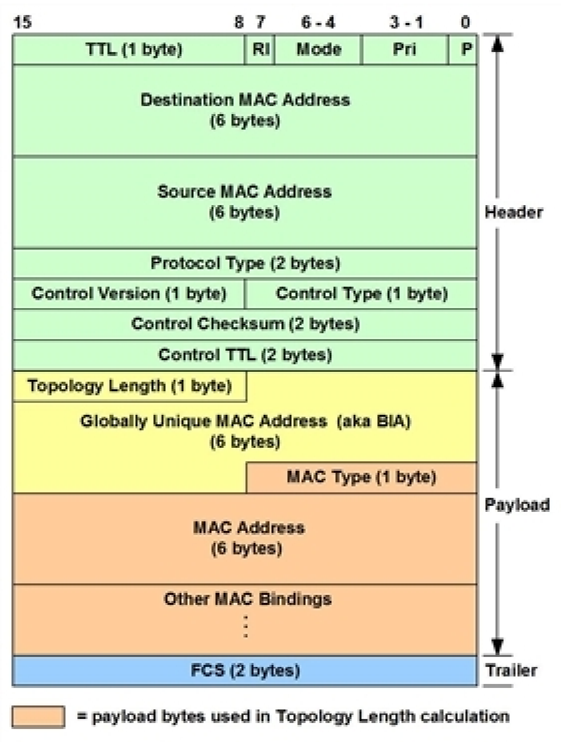
Section	Fields/Controls	Description
MAC Addresses	Originator	The 48-bit MAC address of the originating node.
Control (Defines the SRP ‘Control Message’ in the SRP Header)	Version Override (Control Version)	If selected, makes the corresponding field active, so a different version may be entered by you.
	TTL	Control Time-To-Live is the control layer node hop count. This value is decremented by each node that forwards the control frame.
	Checksum	32-bit CRC. Choose one of: • Bad • Good (default)
	Type Override (Control Type)	If selected, makes the corresponding field active, so a different Type value may be entered by you.
	Topology Length (Read Only)	(In bytes) This value is updated when MAC bindings are entered with 7 bytes added for each MAC binding. It is the calculated length value of the Topology frame payload. This value is found in the Length field of the Topology Discovery

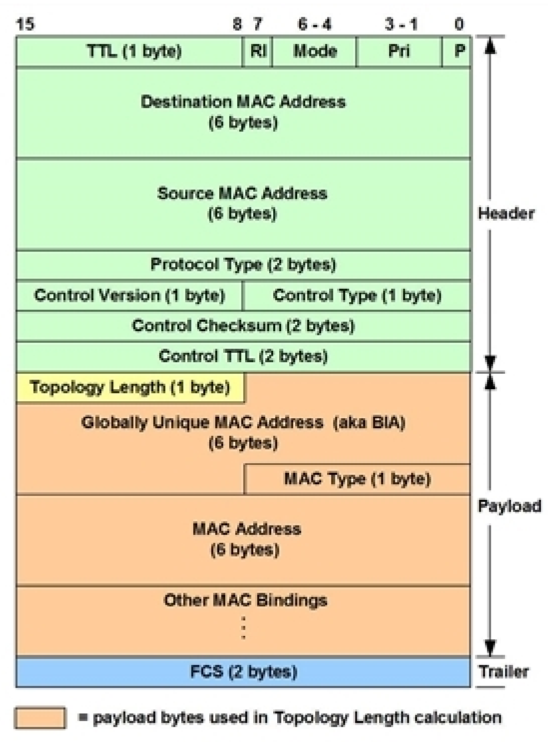
Section	Fields/Controls	Description
		frame header. NOTE For Cisco SRP:If *Cisco SRP* is enabled in Port Properties, the length value calculation will include the 6 bytes for the originator MAC address.If *Cisco SRP* in NOT enabled in Port Properties, the length value calculation will NOT include the 6 bytes for the originator MAC address. The SRP type used (Cisco SRP or non-Cisco SRP) for Topology frames must be the same for the transmitting port AND receiving port. If the type does not match, the frames will be decoded incorrectly upon receipt. See SRP Topology Discovery Packet 'Length Calculations' for diagrams showing how the Topology Length value is calculated for standard SRP and Cisco SRP. See Frame Data for SRP for additional information on Cisco SRP.
Header and MAC Bindings Encoding		This area contains the contents of the Topology Discovery Header and MAC Bindings. After changes have been made in the fields in this dialog box, select the *Decode* button to apply the changes to the contents of this window area.
	Decode	Select this button to update the contents of the fields in the Encoding window area.
MAC Bindings		Select this button to edit the fields for the MAC bindings of the nodes on the SRP ring. See the section on the MAC Bindings dialog box for additional information.

SRP Topology Discovery Packet 'Length Calculations'

The topology Length in the SRP Topology Discovery packet header is calculated differently for 'Standard SRP' (per RFC 2892) and 'Cisco SRP' implementations, as shown in *Image: Standard SRP and Cisco SRP 'Length Calculations'*. For Cisco SRP, the Topology Length is calculated over the Globally Unique originator MAC Address (BIA) plus the MAC bindings. For Standard SRP, only the MAC bindings are included.

Image: Standard SRP and Cisco SRP 'Length Calculations'

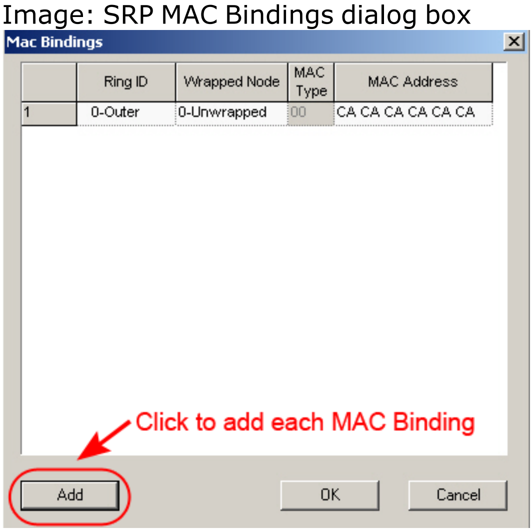




MAC Bindings dialog box

An SRP MAC Binding consists of a MAC address of a node, plus the associated MAC Type field for that address. To access this dialog box, select the *MAC Binding* button from the *SRP Topology Discovery* dialog box. The *MAC Binding* dialog box is shown in *Image: SRP MAC Bindings dialog box*.

Image: SRP MAC Bindings dialog box



The fields and controls in this dialog box are described in *Table: SRP MAC Bindings dialog box*.

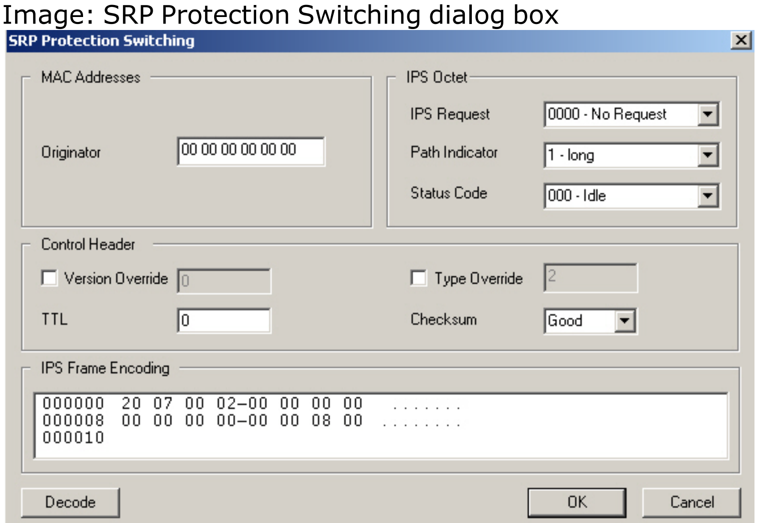
Table: SRP MAC Bindings dialog box

Field/Control	Description
Ring ID	The Ring Identifier. Choose one of: • 0 - Outer (default) • 1 - Inner
Attached Node	The type of ring that the attached node is on. Choose one of: • 0 - Wrapped (Node) on an SRP ring where wrapping has been established for failure protection. • 1 - Unwrapped (Node) on a normal SRP dual ring configuration.
MAC Type	(Read-only) The hex value of the 8-bit MAC Type field associated with this particular MAC address. The value reflects the user-defined settings for the Ring ID bit and the Wrapped/Unwrapped bit in this table entry.
MAC Address	The 48-bit MAC SA of the node
Add	Select this button to add one entry to the list of MAC Bindings. Repeat for additional entries.

SRP Protection Switching (IPS) dialog box

The *SRP Protection Switching* dialog box is shown in *Image: SRP Protection Switching dialog box*. This dialog box is reached by selecting the *IPS* option in the *Protocols* sub-tab of the ***Frame Data*** tab, and selecting the *Edit* button. This dialog box allows to specify the header for an SRP IPS frame.

Image: SRP Protection Switching dialog box



The fields and controls in this dialog box are described in *Table: SRP Protection Switching dialog box*.

Table: SRP Protection Switching dialog box

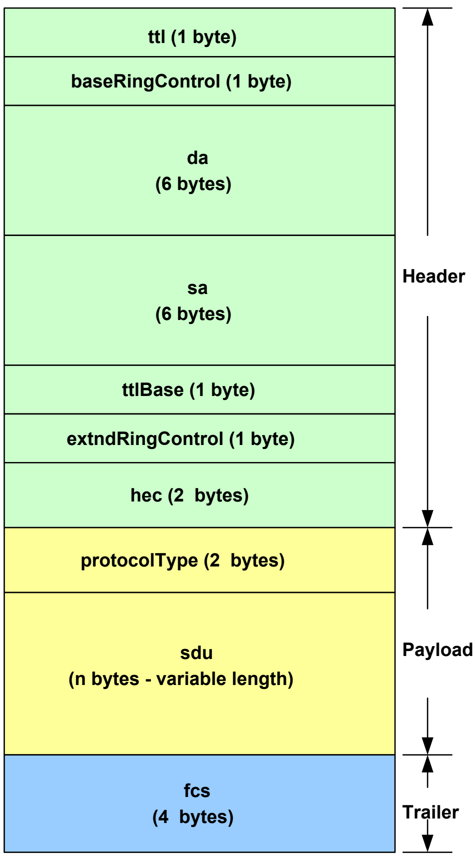
Section	Field/Control	Description
MAC Addresses	Originator	The 48-bit MAC address of the originating node.
IPS Octet	IPS Request	The IPS Request Type. Choose one of: • 0000 - No Request (IDLE) (default) • 0001 through 0100 - Invalid • 0101 - Wait to Restore (WTR) • 0110 - Manual Switch (MS) • 0111 - Invalid • 1000 - Signal Degrade (SD) • 1001 through 1010 - Invalid • 1011 - Signal Fail (SF) • 1100 - Invalid • 1101 - Forced Switch (FS) • 1110 through 1111 - Invalid
	Path Indicator	Choose one of: • 0 - short • 1 - long (default)
	Status Code	Choose one of: • 000 - Idle (default) • 010 - Traffic Wrapped (Protection Switch Completed) NOTE Values 001 through 111 are Invalid
Control Header	Version Override	If selected, makes the corresponding field active, so a different version may be entered by you.
	TTL	Control Time-To-Live is the control layer node hop count. This value is decremented by each node that forwards the control frame.
	Type Override	If selected, makes the corresponding field active, so a different type value may be entered by you.
	Checksum	Control checksum. Choose one of: • Bad • Good (default)
IPS Frame Encoding		This window area contains the contents of the IPS Frame. After changes have been made in the header fields in this dialog box, select the *Decode* button to apply the changes to the contents of

Section	Field/Control	Description
		this area.
	Decode	Select this button to update the contents of the fields in the Encoding window area.

Frame Data for RPR

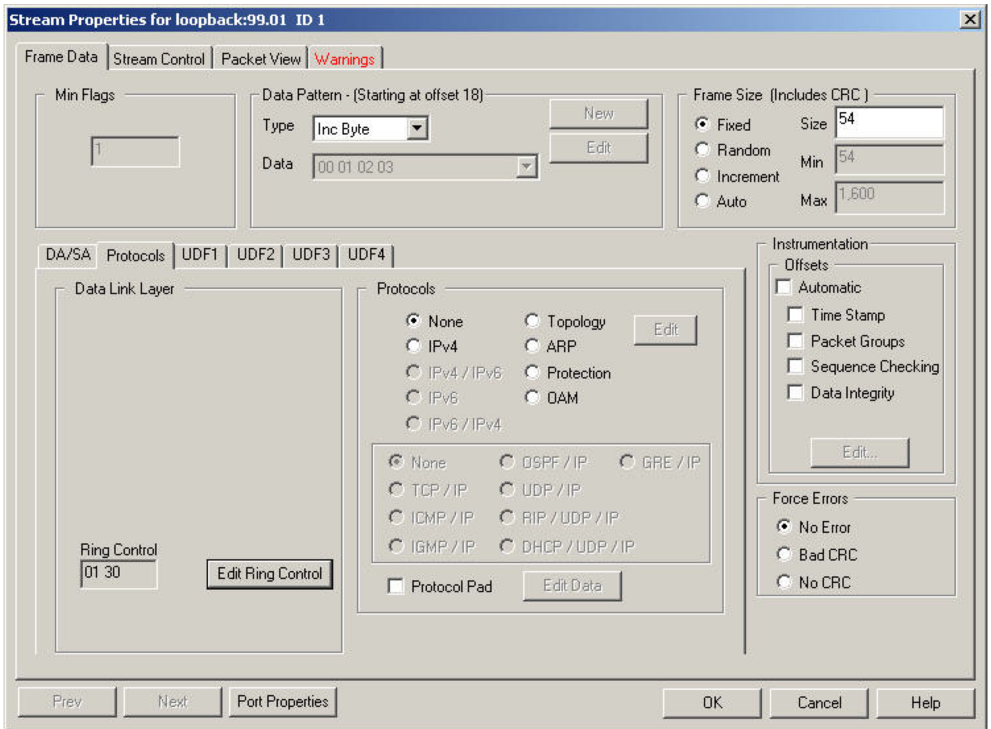
Ixia's optional Resilient Packet Ring (RPR) feature is implemented on the OC-48c and OC-192c POS modules, per IEEE P802.17/D2.1. A diagram of the format for an RPR data frame, based on that specification, is shown in *Image:RPR Data Frame Format*.

Image:RPR Data Frame Format



The Frame Data controls for RPR appear when the RPR option is selected in the **SONET** tab of the *Port Properties* dialog box. The **Frame Data** tab for use with RPR is shown in *Image:RPR **Frame Data** Tab*.

Image:RPR **Frame Data** Tab



The section of special interest to RPR in this dialog box is 'Protocols.' The fields and controls in this section are described in *Table:RPR Frame Data—Protocols*.

Table:RPR Frame Data—Protocols

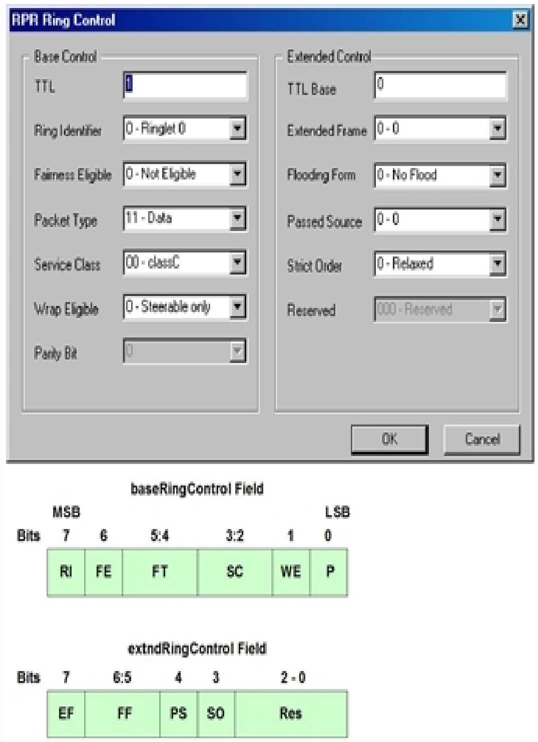
Section	Type	Description
Data Link Layer	Current Header	(Read-only) The current Data Link Layer header format, as selected in the Port Properties/SONET page. The hexadecimal format for the specific header appears in the field. This field cannot be directly edited unless the SONET header selection in Port Properties is set to *Other*.
	Ring Control	(Read-only) The value of the Ring Control header. The value shown here is dependent on the settings in *Edit Ring Control* dialog box. See RPR Ring Control dialog box for additional information. For standard use, when Resilient Packet Ring (RPR) is selected for the SONET frame header format, no header type appears here, but the first two octets configured for the header in the SONET page appear here (for Address and Control). The RPR header is available for use with IPv4 only (not IPv6). NOTE FOR OPTIONAL RPR FEATURE When the optional RPR feature is being used, the RPR Header values appear in the Data Link Layer section (read-only), and an *Edit Ring Control* button is available.

Section	Type	Description
	Edit Ring Control	Select this button to view the *Ring Control RPR Header* dialog box. See RPR Ring Control dialog box for additional information. This button is available **ONLY** for use with the optional RPR feature on an Ixia OC-48c and OC-192c POS modules.
Protocols		For selection of a network layer protocol to be included in the frame header.
	None	If this option is selected, no network layer protocol is desired.
	IPv4	If this option is selected and the *Edit* button is selected, IPv4 headers can be created for RPR data packets. When IPv4 is selected, the higher-level protocols, listed below in the dialog box, are made available for header configuration. See Configuring IPv4 Headers for additional information.
	Topology	If this option is selected, and the *Edit* button is selected, the *RPR Topology* dialog box appears. This dialog box allows to configure headers for RPR Topology messages. See RPR Topology Discovery for additional information.
	ARP	If this option is selected, and the *Edit* button is selected, the ARP dialog box appears. ARP Header dialog box for additional information.
	Protection	If this option is selected, and the *Edit* button is selected, the *RPR Protection* dialog box appears. This dialog box allows to configure headers for RPR Protection messages. See RPR Protection Switching dialog box for additional information.
	OAM	If this option is selected, and the *Edit* button is selected, the *RPR OAM Control* dialog box appears. See RPR OAM dialog box for additional information.

RPR Ring Control dialog box

The *RPR Ring Control* dialog box appears when the *Edit Ring Control* button is selected in the Protocols section of the *Frame Data* tab. An RPR frame header contains a 1-byte baseRingControl field and a 1-byte extndRingControl field. This dialog box allows to configure the contents and usage of both of those fields. The *RPR Ring Control* dialog box is shown in *Image: RPR Ring Control dialog box*.

Image: RPR Ring Control dialog box



The fields and controls in this dialog box are described in *Table: RPR Ring Control dialog box*.

Table: RPR Ring Control dialog box

Section	Field/Control	Description
Base Control	TTL	The first octet in an RPR frame header is the Time to Live hop count. The user indicates the maximum number of hops to the destination, to prevent an endless loop around the ring. In a Fairness Control Message, the originator sets the TTL to 255. When a single-choke FCM changes the SA to the local SA, it will also reset the TTL to 255.
	Ring Identifier (bit 7–RI)	The Ringlet Identifier (RI). The ringlet where the RPR frame was first transmitted. Choose one of: • 0 - Ringlet 0 • 1 - Ringlet 1
	Fairness Eligible (bit 6–FE)	Indicates RPR fairness eligibility (FE) status. Choose one of: • 0 - Not Eligible for fairness algorithm • 1 - Eligible for fairness algorithm
	Packet Type (bits 5-4–FT)	Corresponds to the RPR frame type (FT) field. Choose one of: • 01 - Control frame (excludes fairness frame)

Section	Field/Control	Description
		• 11 - Data frame
	Service Class (bits 3-2–SC)	The service class (SC) of the frame. Choose one of: • 00 - classC • 01- classB • 10 - classA1 • 11 - classA0
	Wrap Eligible (bit 1–WE)	To specify that the frame may be wrapped/wrap eligible (WE), as necessary. If it is not eligible for wrapping, it may be 'steered.' Choose one of: • 0 - Steerable (only) • 1 - Wrap Eligible
	Parity Bit (bit 0–P)	(1 bit - P field) (Read-only) Used for parity check of the ring control header, since there is no 'HEC' field in an RPR Fairness Frame.
Extended Ring Control	TTLBase	This 8-bit field should be set to the original TTL of the data packet before RPR encapsulation. • For data frames: This field is to be the same value as the TTL field upon transmission of the frame. • For all other frame types: This field is reserved for future use.
	Extended Frame (bit 1 - EF)	This bit indicates that this data frame is sent from a MAC source that is not a node on this ring, to a MAC destination that is not a node on this ring. If set to 1, the entire MAC layer packet is expected after the *hec* field in the RPR packet, including the destination and source MAC addresses. Choose one of: • 0 - 0 (default): frame not sent from a remote MAC source. • 1 - 1: indicates a frame with a remote MAC source address in the extended header.
	Flooding Form (bits 2-3 - FF)	This 2-bit field indicates whether the packet should be flooded, and the scope of the flooding. Choose one of: • 0 - No flood (default): no flooding. • 1 - Unidirectional Flooding: flood on in the ringlet specified in the ringIdentifier. • 2 - Bidirectional Flooding: flood on both ringlets.

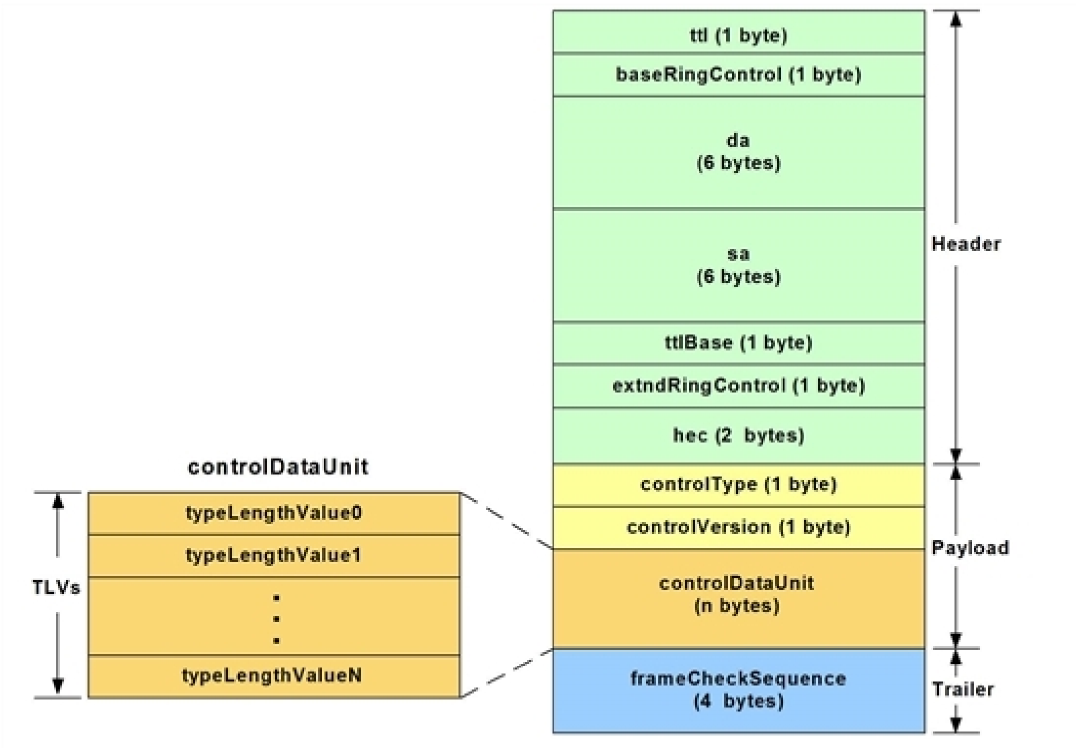
Section	Field/Control	Description
		• Reserved
	Passed Source (bit 4 - PS)	This 1-bit field is used by wrapping systems to prevent mis-order and duplication. It is normally set to 0 when a frame is first transmitted by a station and set to 1 when a wrapped frame passes the source station again. Choose one of: • 0 - 0 (default) • 1 - 1: wrapped frame passed the source station again.
	Strict Order (bit 5 - SO)	This 1-bit field indicates whether strict ordering or relaxed ordering requirements should be observed. Choose one of: • 0 - Relaxed (default) • 1 - Strict
	Reserved (bits 6-8 - res)	This 3-bit field is reserved for future use. It is: • Set to all 0s for transmission. • Ignored upon receipt.

RPR Topology Discovery

RPR Topology Discovery is handled with two types of messages, that are shown in *Image: RPR Topology TLV Message Format*:

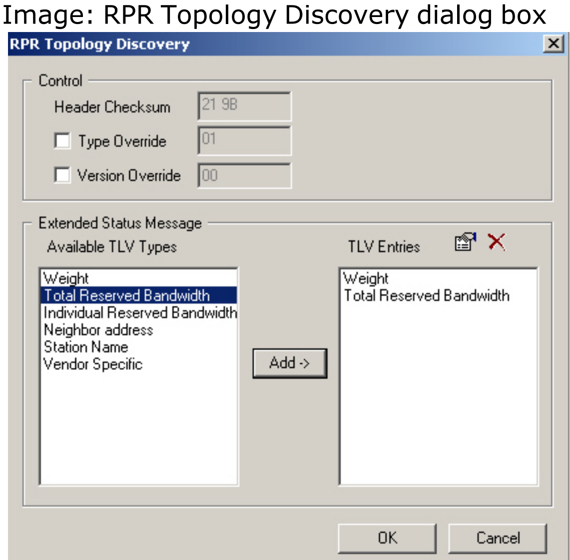
- **RPR Protection Message**—used for the discovery of the physical topology, due to its fast rate (sub-50 ms) and the fact that it is sent on triggers.
- **RPR Topology TLV Messages**—for the transmission of additional information from a source node/station about bandwidth and other configuration issues. The two types of TLV Messages are: Station TLV messages and Vendor-Specific TLV Messages.

Image: RPR Topology TLV Message Format



The *RPR Topology Discovery* dialog box is accessed by selecting *Topology* in the *Protocols* sub-tab of the **Frame Data** tab, and then selecting the *Edit* button. The *RPR Topology Discovery* dialog box is shown in *Image: RPR Ring Control dialog box*.

Image: RPR Topology Discovery dialog box



The fields and controls in this dialog box are described in *Table: RPR Topology Discovery dialog box*.

Table: RPR Topology Discovery dialog box

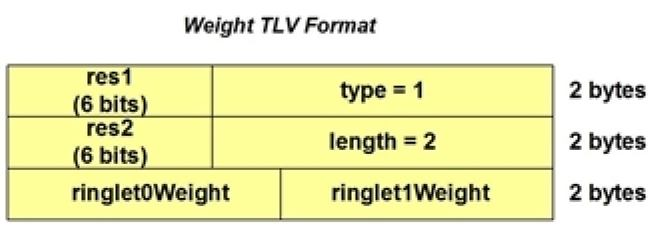
Section	Field/Control	Description
Control	Header Checksum	(Read-only) The 16-bit header error (**hec**) calculated over the control header CRC16 checksum.
	Type Override	(Control type - override) If this option is selected, the type may be changed in the field to the right. If cleared, the value field is read-only. The one-byte Control Frame type (hex) values are: • 01 - Topology Discovery • 02 - Protection Message • 03 - OAM Control Frame • ---(other values) - Reserved
	Version Override	The one-byte Version number related to the control type. Currently, control types are version 0. If this option is selected, the version number may be changed in the field to the right. If not selected, the value field is read-only.
Extended Status Message	Available TLV Types	A list of TLV types that can be added to the header of an RPR Topology Extended status message packet. TLVs carry additional information about the sending node, and can be added in any order. The Station TLVs are: • Weight— RPR Weight TLV dialog box. • Total Reserved Bandwidth— RPR Total Reserved Bandwidth TLV dialog box. • Individual Reserved Bandwidth— RPR Individual Reserved Bandwidth TLV dialog box. • Neighbor address— RPR Neighbor Address TLV dialog box. • Station Name— RPR Station Name TLV dialog box. • The Vendor Specific TLV is: • Vendor Specific— RPR Vendor Specific TLV dialog box.
	Add ->	Select (highlight) an available TLV Type in the list at the right. Then select the *Add* button to move it to the list of TLV Entries on the right. Some types of TLVs may be repeated in the list.
	TLV Entries	A user-defined list of the TLVs to be added to the header of the RPR Topology Discovery message packet currently being configured. Some types of TLVs may be repeated in the list. The TLVs in the list may be custom-configured by selecting the *Edit*

Section	Field/Control	Description
		button above the list.
		Edit TLV Header Select to view the *Edit* dialog box corresponding to selected (highlighted) TLV Entry in the list below.
		Remove TLV Header Select to delete a selected (highlighted) entry in the list of TLV Entries.

RPR Weight TLV dialog box

This dialog box is accessed by highlighting the *Weight* TLV entry from the list on the right, then selecting the *Edit TLV Header* icon (). Alternatively, double-click the *Weight* TLV entry. The RPR *Weight TLV* dialog box is shown in *Image: RPR Weight TLV dialog box*.

Image: RPR Weight TLV dialog box



The fields and controls in this dialog box are described in *Table: RPR Weight TLV dialog box*.

Table: RPR Weight TLV dialog box

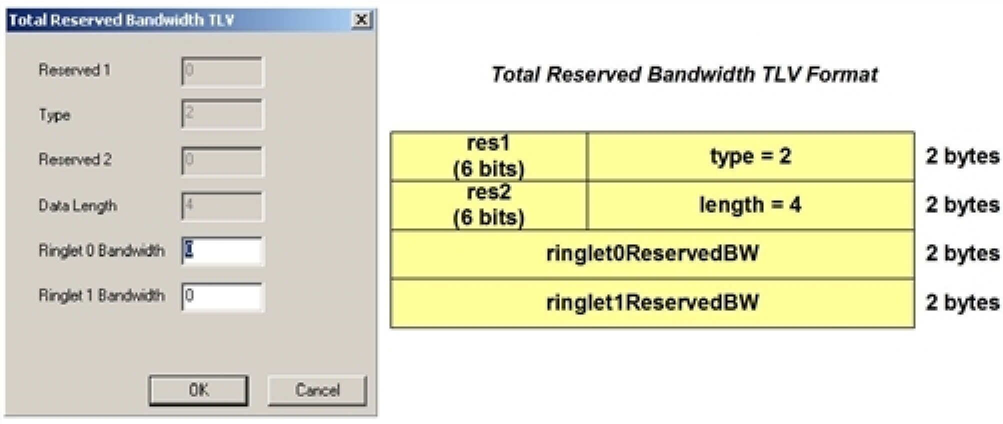
Field/Control	Description
Reserved 1	(Read-only) The 6-bit Reserved1 field is reserved for future use. It is set to 0, and is to be ignored by the receiving nodes.
Type	(Read-only) 10 bits. The type value is 1.
Reserved 2	(Read-only) The 6-bit Reserved2 field is reserved for future use. It is set to 0, and is to be ignored by the receiving nodes.
Data Length	(Read-only) 10 bits. The combined length of the data fields = 2 bytes.
Ringlet 0 Weight	The weight value of the Ringlet 0 node.

Field/Control	Description
Ringlet 1 Weight	The weight value of the Ringlet 1 node.

RPR Total Reserved Bandwidth TLV dialog box

This dialog box is accessed by highlighting the *Total Reserved Bandwidth* TLV entry from the list on the right, then selecting the *Edit TLV Header* icon ( ). Alternatively, double-click the *Total Reserved Bandwidth* TLV entry. The RPR *Total Reserved Bandwidth TLV* dialog box is shown in *Image: RPR Total Reserved Bandwidth TLV dialog box*.

Image: RPR Total Reserved Bandwidth TLV dialog box



The fields and controls in this dialog box are described in *Table: RPR Total Reserved Bandwidth TLV dialog box*.

Table: RPR Total Reserved Bandwidth TLV dialog box

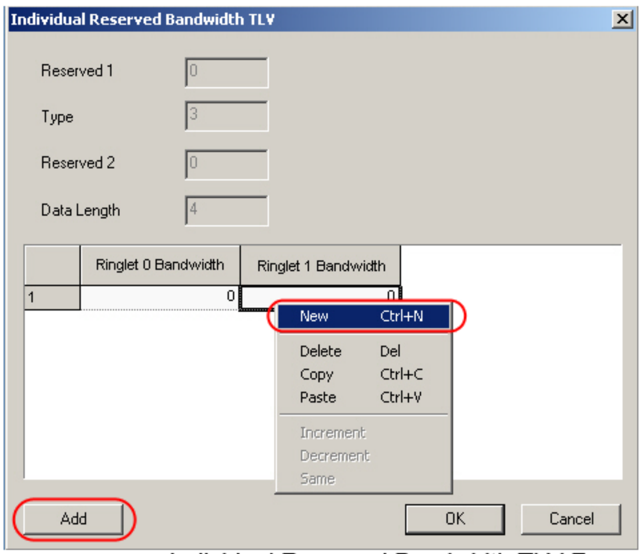
Field/Control	Description
Reserved 1	(Read-only) The 6-bit Reserved1 field is reserved for future use. It is set to 0, and is to be ignored by the receiving nodes.
Type	(Read-only) 10 bits. The type value is 2.
Reserved 2	(Read-only) The 6-bit Reserved2 field is reserved for future use. It is set to 0, and is to be ignored by the receiving nodes.
Data Length	(Read-only) 10 bits. The combined length of the data fields = 4 bytes.
Ringlet 0 Bandwidth	The total reserved subclassA0 bandwidth value of the Ringlet 0 node.
Ringlet 1 Bandwidth	The total reserved subclassA0 bandwidth value of the Ringlet 1 node.

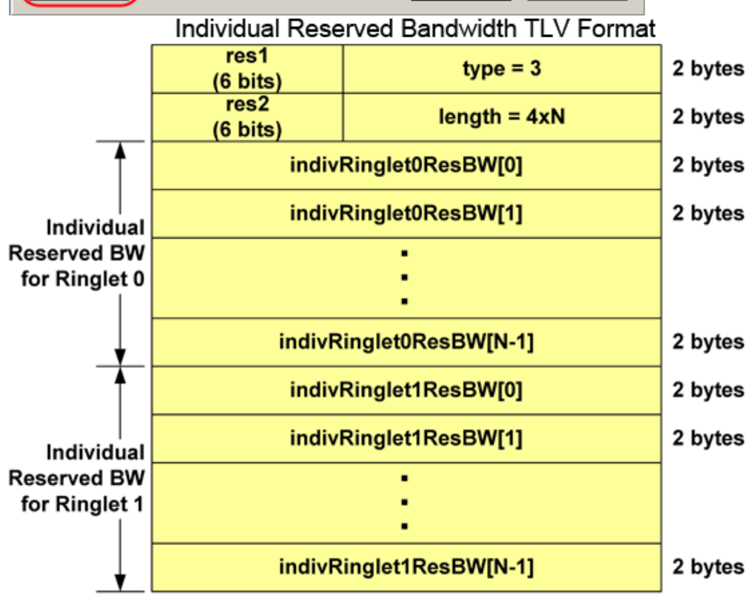
RPR Individual Reserved Bandwidth TLV dialog box

The RPR *Individual Reserved Bandwidth TLV* dialog box is used to set up the content of an RPR Individual Bandwidth TLV for use in an RPR Topology message. The data in this TLV is constructed by adding bandwidth pairs. Each bandwidth pair corresponds to the reserved bandwidth between this node and a node a number of hops away from this node. The first item in the pair represents the reserved bandwidth on Ringlet 0, and the second represents the reserved bandwidth on Ringlet 1. Bandwidth pairs must be added in order; that is, for the node one hop away, followed by the node two hops away, and so forth.

This dialog box is accessed by highlighting the *Individual Reserved Bandwidth* TLV entry from the list on the right, then selecting the *Edit TLV Header* icon (). Alternatively, double-click the *Individual Reserved Bandwidth* TLV entry. This dialog box is shown in *Image: RPR Individual Reserved Bandwidth TLV dialog box.*

Image: RPR Individual Reserved Bandwidth TLV dialog box





The fields and controls in this dialog box are described in *Table: RPR Individual Reserved Bandwidth TLV dialog box*.

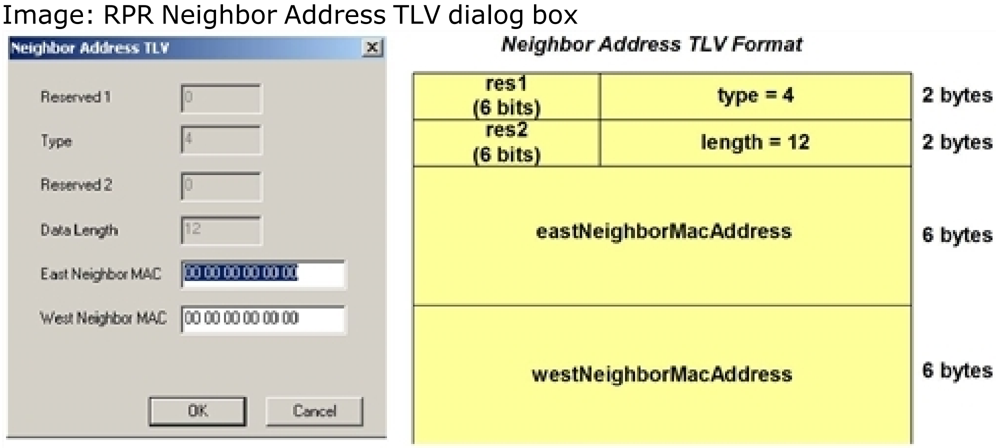
Table: RPR Individual Reserved Bandwidth TLV dialog box

Section	Field/Control	Description
(Header)	Reserved 1	(Read-only) The 6-bit Reserved1 field is reserved for future use. It is set to 0, and is to be ignored by the receiving nodes.
	Type	(Read-only) 10 bits. The type value is 3.
	Reserved 2	(Read-only) The 6-bit Reserved2 field is reserved for future use. It is set to 0, and is to be ignored by the receiving nodes.
	Data Length	(Read-only) 10 bits. The combined length of the data fields = 4 x N bytes (4 times the number/N of hops). Each hop on the link is described by a 2-byte bandwidth field for each of the two ringlets = total of 4 bytes.
Window		Allows to create entries where the bandwidth can be reserved separately—for each one-hop link on the ringlet.
	Ringlet 0 Bandwidth	The reserved subclassA0 bandwidth reserved for a one-hop link on the Ringlet 0 node.
	Ringlet 1 Bandwidth	The reserved subclassA0 bandwidth reserved for a one-hop link on the Ringlet 1node.

RPR Neighbor Address TLV dialog box

This dialog box is accessed by highlighting the *Neighbor Address* TLV entry from the list on the right, then selecting the *Edit TLV Header* icon (). Alternatively, double-click the *Neighbor Address* TLV entry. The RPR *Neighbor Address TLV* dialog box is shown in *Image: RPR Neighbor Address TLV dialog box*.

Image: RPR Neighbor Address TLV dialog box



The fields and controls in this dialog box are described in *Table: RPR Neighbor Address TLV dialog box*.

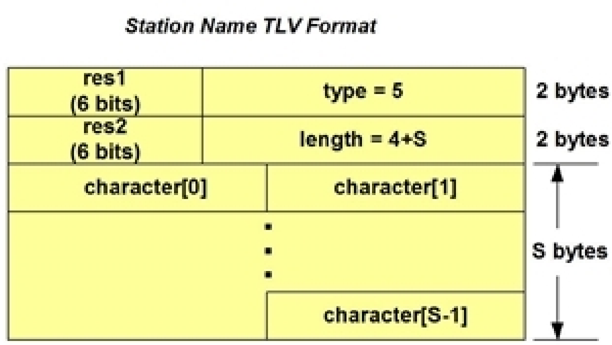
Table: RPR Neighbor Address TLV dialog box

Field/Control	Description
Reserved 1	(Read-only) The 6-bit Reserved1 field is reserved for future use. It is set to 0, and is to be ignored by the receiving nodes.
Type	(Read-only) 10 bits. The type value is 4.
Reserved 2	(Read-only) The 6-bit Reserved2 field is reserved for future use. It is set to 0, and is to be ignored by the receiving nodes.
Data Length	(Read-only) 10 bits. The combined length of the data fields = 12 bytes.
East Neighbor MAC	(6 bytes) The MAC address of the neighbor station connected to this station's east interface. Set to all zeros when the MAC address is unknown.
West Neighbor MAC	(6 bytes) The MAC address of the neighbor station connected to this station's west interface. Set to all zeros when the MAC address is unknown.

RPR Station Name TLV dialog box

This dialog box is accessed by highlighting the *Station Name* TLV entry from the list on the right, then selecting the *Edit TLV Header* icon (). Alternatively, double-click the *Station Name* TLV entry. The RPR *Station Name TLV* dialog box is shown in *Image: RPR Station Name TLV dialog box*.

Image: RPR Station Name TLV dialog box



The fields and controls in this dialog box are described in *Table: RPR Station Name TLV dialog box*.

Table: RPR Station Name TLV dialog box

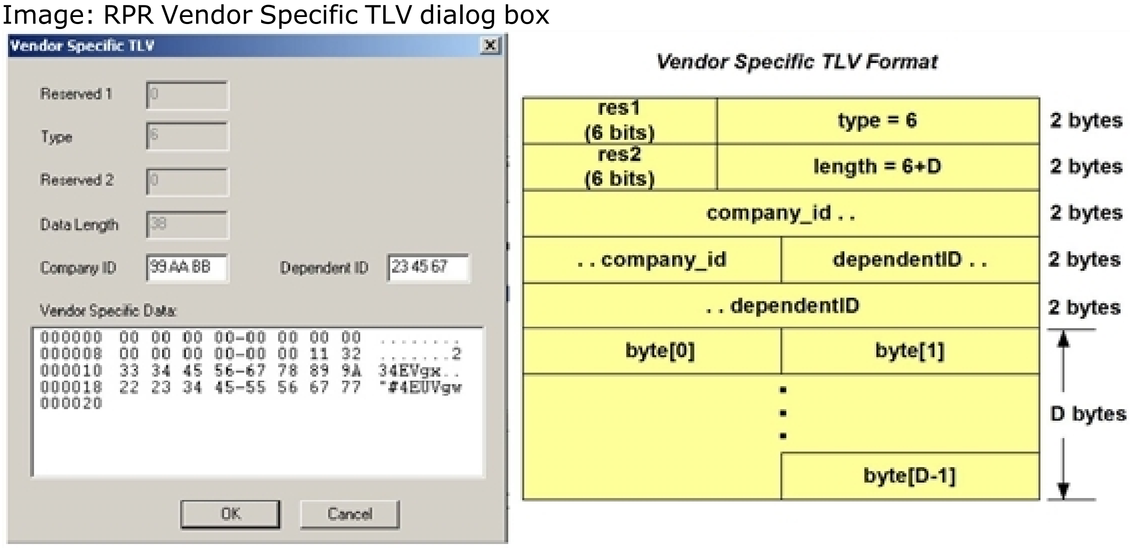
Field/Control	Description
Reserved 1	(Read-only) The 6-bit Reserved1 field is reserved for future use. It is set to 0, and is to be ignored by the receiving nodes.

Field/Control	Description
Type	(Read-only) 10 bits. The type value is 5.
Reserved 2	(Read-only) The 6-bit Reserved2 field is reserved for future use. It is set to 0, and is to be ignored by the receiving nodes.
Data Length	(Read-only) 10 bits. The number of ASCII characters (S) in the station name, plus 4 bytes for the TLV header.
Station Name	The optional, user-defined name for this station, exclicked as a string of ASCII characters. The number of characters in the station name = 'S.'

RPR Vendor Specific TLV dialog box

This dialog box is accessed by highlighting the *Vendor Specific* TLV entry from the list on the right, then selecting the *Edit TLV Header* icon ( ). Alternatively, double-click the *Vendor Specific* TLV entry. The RPR *Vendor Specific TLV* dialog box is shown in *Image: RPR Vendor Specific TLV dialog box*.

Image: RPR Vendor Specific TLV dialog box



The fields and controls in this dialog box are described in *Table: RPR Vendor Specific TLV dialog box*.

Table: RPR Vendor Specific TLV dialog box

Field/Control	Description
Reserved 1	(Read-only) The 6-bit Reserved1 field is reserved for future use. It is set to 0, and is to be ignored by the receiving nodes.
Type	(Read-only) 10 bits. The type value is 6.
Reserved 2	(Read-only) The 6-bit Reserved2 field is reserved for future use. It is set to 0, and is to be ignored by the receiving nodes.

Field/Control	Description
Data Length	(Read-only) 10 bits. The Data Length value = 6 + D (bytes). It is the combined length of: • 6 bytes for the Company ID plus Dependent ID, plus • D bytes of user-entered, vendor-specific data.
Company ID	A 3-byte value (hex). It is the 24-bit IEEE/RAC company identifier, which is the first part of the globally unique EUI-64 identifier.
Dependent ID	A 3-byte value (hex). It is the 24-bit identifier which is the second part of the globally unique EUI-64 identifier. This ID is supplied by the company, and is unique within the company.
Vendor Specific Data	This window allows to enter raw data relevant to the vendor. The number of bytes of data (D) is part of the overall Data Length for value. The view consists of 3 sections: • Left column—first byte number in each row (in hex), for example, 0000 • Middle column—8 bytes of data (hex) per row • Right column—shows the data for that row, shown in ASCII, if the byte can be shown as such; otherwise, the byte appears as a dot (.).

RPR Protection Switching dialog box

The *RPR Protection Switching* dialog box appears when the *Protection* option button is selected in the Protocols section of the **Frame Data** tab, and the *Edit* button has been selected.

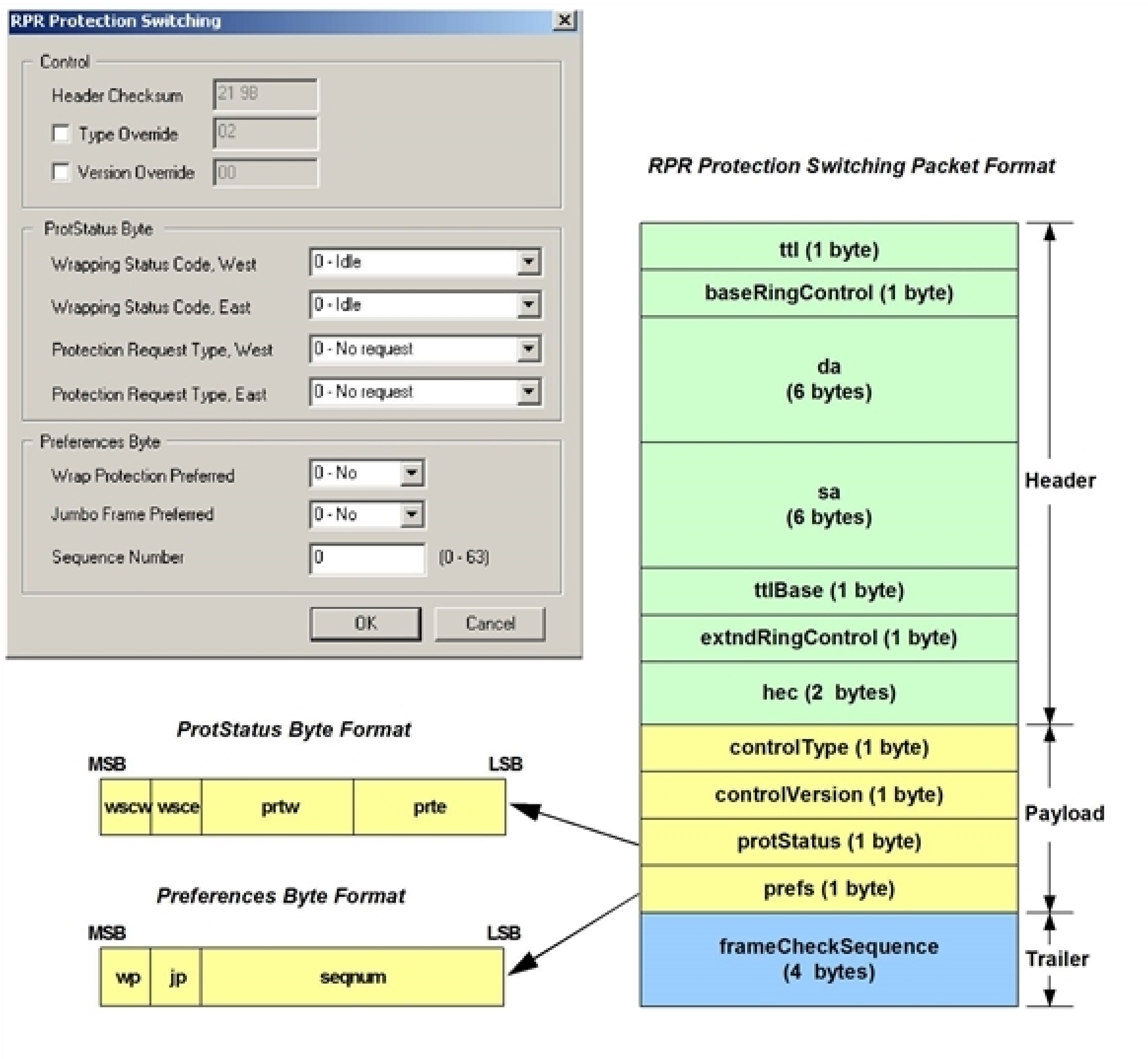
RPR operates over a dual-ring topology, with transmission from source station to destination station over a span of the ring. A single span or a single station can fail with a service interruption of only 50 milliseconds, if protection methods are employed, so that an alternate path can be used by the traffic.

Steering is supported by all stations. Steered traffic is discarded at the point of failure. To avoid continued discards, the source station redirects unicast traffic to the ringlet that retains connectivity to the destination. Multicast or broadcast traffic is normally directed to both ringlets, so as to reach all stations on the ring.

Wrapping is an optional capability that is only activated when all stations on the ring support this capability. Traffic is directed, at the point of failure, to the opposing ringlet. Wrapping is transparent to the source station and connectivity to all stations is retained.

The *RPR Protection Switch Packet* (message) dialog box is shown in *Image: RPR Protection Switching dialog box*.

Image: RPR Protection Switching dialog box



The fields and controls in this dialog box are described in *Table: RPR Protection Switching dialog box*.

Table: RPR Protection Switching dialog box

Section	Field/Control	Description
Control	Header Checksum	(Read-only) The 16-bit header error (hec) calculated over the control header—CRC16 checksum.
	Type Override	(Control type—override) If this option is selected, the type may be changed in the field to the right. If not selected, the value field is read-only. The one-byte Control Frame type (hex) values are: • 01 - Topology Discovery • 02 - Protection Message

Section	Field/Control	Description
		• 03 - OAM Control Frame • ---(other values) - Reserved
	Version Override	If this option is selected, the version number may be changed in the field to the right. If not selected, the value field is read-only. The one-byte Version number related to the control type. Currently control types are version 0.
ProtStatus Byte	Wrapping Status Code, West	The wrapping status for the traffic received on the west interface of this node/station. Choose one of: • 0 - Idle—Wrapping is not enabled. (This setting is used in steering rings.) • 1 - Wrapped—Traffic is wrapped on the ring (the Protection Switch has been completed). for traffic received on the east interface.
	Wrapping Status Code, East	The wrapping status for the traffic received on the east interface of this node/station. Choose one of: • 0 - Idle—Wrapping is not enabled. (This setting is used in steering rings.) • 1 - Wrapped—Traffic is wrapped on the ring (the Protection Switch has been completed) for traffic received on the west interface.
	Protection Request Type, West	(Binary values) The RPR Protection message type to report the protection state on the West receive interface of the node/station. Choose one of: • 0 - No request • 1 - Wait to restore • 2 - Manual switch—User specified command; indicated link should not be used (coerced) • 3 - Signal degrade—minor signal degradtioncondition. Link should not be used (coerced) • 4 - Signal fail—major signal degradation condition. Link cannot be used (forced) • 5 - Forced switch—User specified command; indicated link may not be used • 6 - Reserved

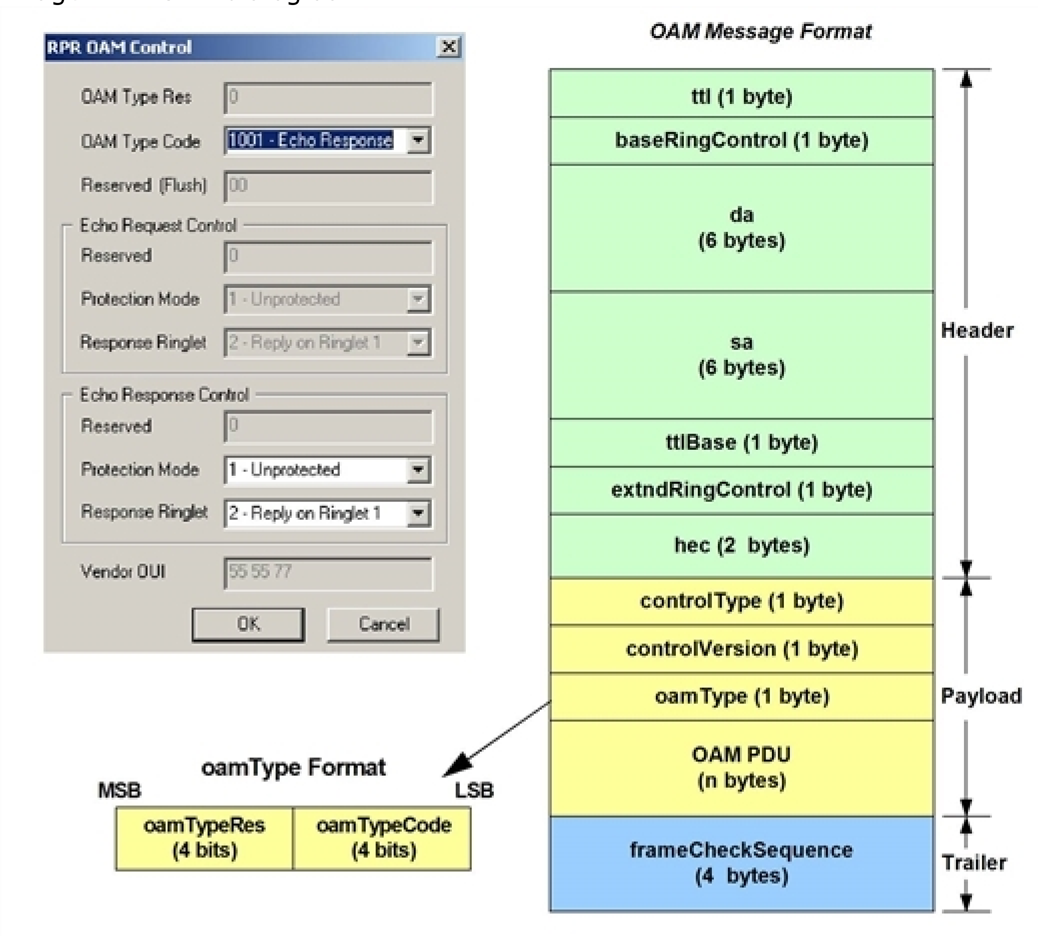
Section	Field/Control	Description
		• 7 - Reserved
	Protection Request Type, East	(Binary values) The RPR Protection message type to report the protection state on the East receive interface of the node/station. Choose one of: • 0 - No request • 1 - Wait to restore • 2 - Manual switch—User specified command; indicated link should not be used (coerced) • 3 - Signal degrade—minor signal degradtioncondition. Link should not be used (coerced) • 4 - Signal fail—major signal degradation condition. Link cannot be used (forced) • 5 - Forced switch—User specified command; indicated link may not be used • 6 - Reserved • 7 - Reserved
Preferences Byte	Wrap Protection Preferred	Indicates a station's ability and/or preference to support wrapping protection. Choose one of: • 0 - No—used by stations that cannot support wrap protection, and by stations that can support wrap protection but prefers not to do so. • 1 - Yes—used by a station which can support wrap protection and prefers to do so.
	Jumbo Frame Preferred	Indicates a station's ability and/or preference to support jumbo frames. Choose one of: • 0 - No—used by stations that cannot support jumbo frames, and by stations that can support jumbo frames but prefer not to receive them. • 1 - Yes—used by a station which can support jumbo frames and prefers to receive them.
	Sequence Number	(8 bits) Valid range is 0 to 63. This field indicates the sequence number used with all copies of a particular protection control message. The value is incremented only if the contents of the message packet change. It ensures that protection control messages will be processed in the correct order.

RPR OAM dialog box

The *RPR OAM Control* dialog box (Operations, Administration, and Maintenance) is shown in *Image: RPR OAM dialog box*. This dialog box allows to configure the contents of the OAM Control Message, per the IEEE 802.17 Draft 2.1 specification. These messages/frames are sent between stations to determine the operational status of the connection. There are three types of messages: Echo Request and Response frames for determining connectivity; Flush frames to prevent misordering of frames; and Vendor Specific frames for carrying a vendor's OAM information. All three types of frames can be configured in this dialog box.

This dialog box is accessed by selecting the OAM option in the *Protocols* sub-tab of the **Frame Data** tab.

Image: RPR OAM dialog box



The fields and controls in this dialog box are described in *Table: RPR OAM dialog box*.

Table: RPR OAM dialog box

Section	Field/Control	Description
	OAM Type Res	(Read-only) Reserved for future use.
	OAM Type Code	The OAM Type Code. This setting determines which of the fields

Section	Field/Control	Description
		in this dialog box are active. Choose one of: • 0000 - Reserved • 0001 - Flush • 0010 through 0111 - Reserved • 1000 - Echo Request • 1001 - Echo Response • 1010 though 1110 - Reserved • 1111 - Vendor Specific
	Reserved (Flush)	This field is active only when OAM Type Code = 0001 - Flush
Echo Request Control		These fields are active only when OAM Type Code = 1000 - Echo Request. It indicates that an Echo Request OAM frame will be sent.
	Reserved	(Read-only) Reserved for future use.
	Protection Mode	Choose one of: • 0 - Protected • 1 - Unprotected
	Response Ringlet	Choose one of: • 0 - Reply on Default • 1 - Reply on Ringlet 0 • 2 - Reply on Ringlet 1 • 3 - Reserved
Echo Response Control		These fields are active only when OAM Type Code = 1001 - Echo Response. It indicates that an Echo Response OAM frame will be sent.
	Reserved	(Read-only) Reserved for future use.
	Protection Mode	Choose one of: • 0 - Protected • 1 - Unprotected
	Response Ringlet	Choose one of: • 0 - Reply on Default • 1 - Reply on Ringlet 0 • 2 - Reply on Ringlet 1

Section	Field/Control	Description
		• 3 - Reserved
(Footer)	Vendor OUI	(Optional) This field is active only when OAM Type Code = 1111 - Vendor Specific. It indicates that a Vendor Specific OAM frame will be sent. This is the 3-octet IEEE company identifier for this vendor. OUI = Organizationally Unique Identifier.

Frame Data for FCoE Support

Fibre Channel over Ethernet (FCoE) has been implemented as an optional feature of NGY load modules (LSM10GXM family) and LSM1000XMVDC 4/8/12/ and 16-port load modules.

The load module will only show the FCoE feature if the EEPROM has been programmed.

1. To activate the FCoE feature, switch the port mode by selecting **Data Center Mode** in the Port Properties **General** tab (*Image: Port Properties, NGY, Data Center Mode*) of the NGY module, or checking Enable Data Center Mode in the Port Properties **General** tab (*Image: Port Properties, LSM1000XMVDC, Data Center Mode*) of the LSM1000XMVDC module.

   (A re-download of the FPGA occurs when the port mode is switched from Normal to Data Center, or vice-versa.)

   Image: Port Properties, NGY, Data Center Mode

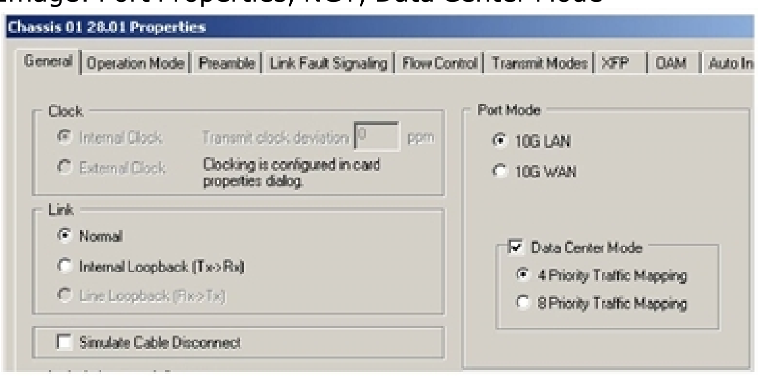
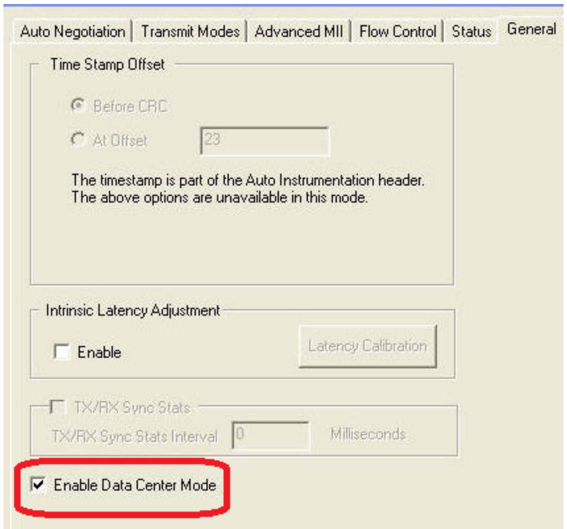
   

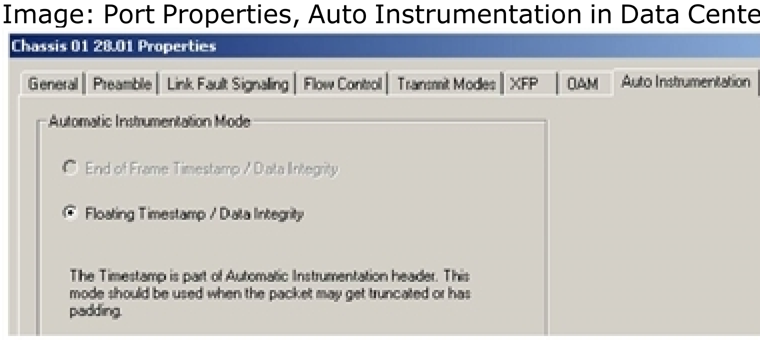
   Image: Port Properties, LSM1000XMVDC, Data Center Mode



2. Select 4- or 8-Priority traffic mapping option (NGY only).
3. Select **Apply**.

NOTE When Data Center Mode is selected: The port is automatically placed into Advanced Streams mode; Packet Stream mode is not supported.Only Auto Instrumentation mode (Floating Timestamp / Data Integrity) is supported, both for transmit and receive (*Image: Port Properties, Auto Instrumentation in Data Center Mode* below). End-of-frame Timestamp is not supported and PRBS is not supported.4-Priority and 8-Priority traffic mapping (NGY module) have different features and limits. NGY 4-PFC Mode and NGY 8-PFC Frame Size Limitation.Precision Time Protcol (PTP) is not enabled. (However, when Data Center Mode is not selected, PTP *is* enabled.)

Image: Port Properties, Auto Instrumentation in Data Center Mode



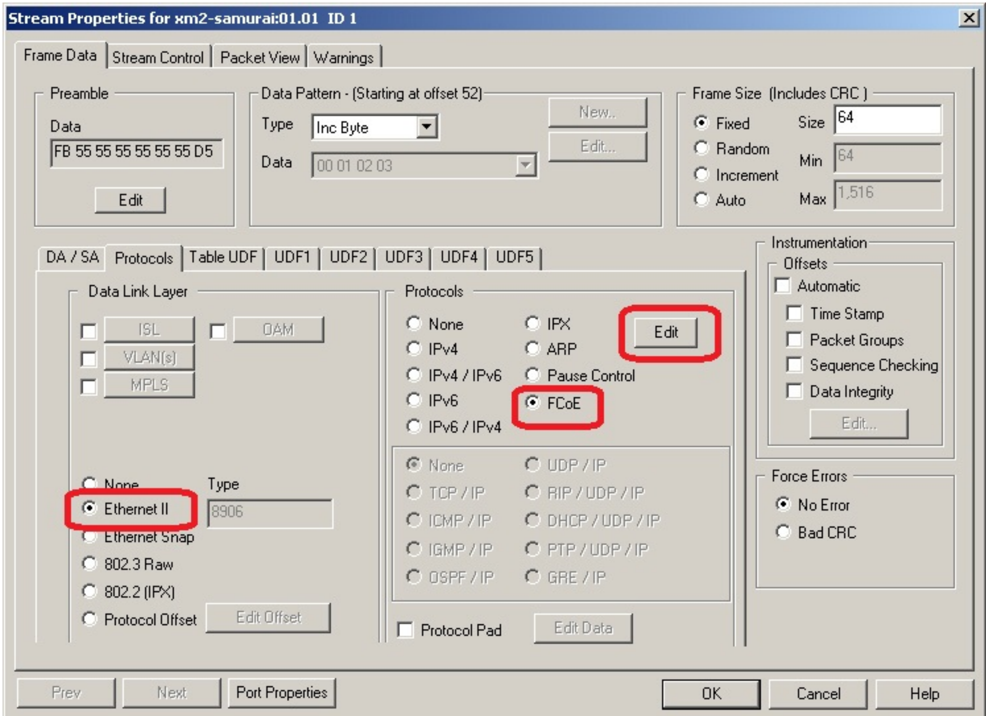
FCoE Configuration

After setting the port to Data Center Mode, the FCoE option is present in the list of selectable protocols (*Image: Stream Properties with FCoE Protocol*).

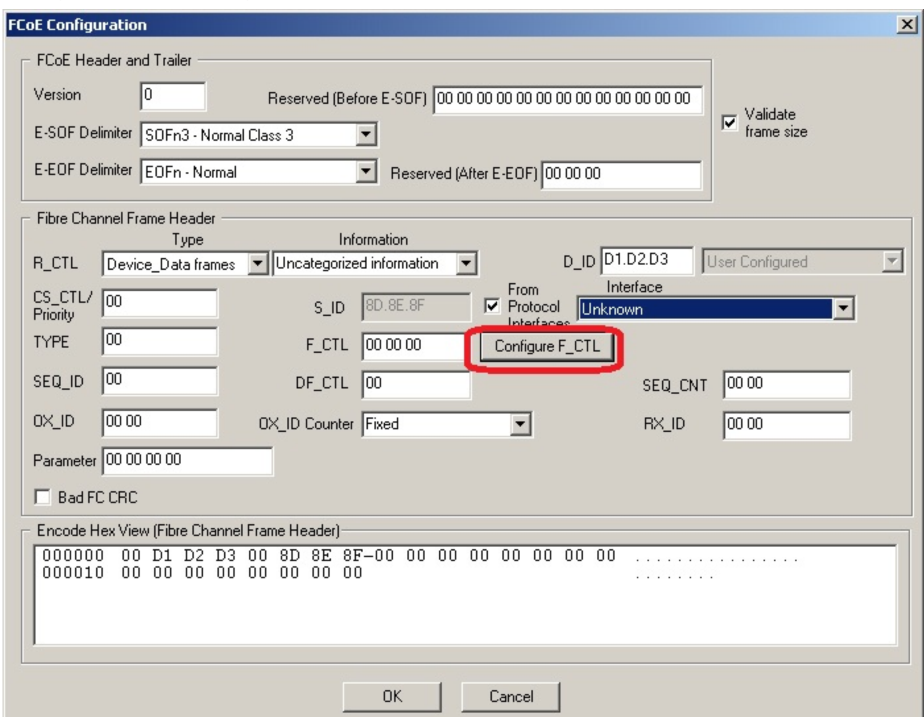
NOTE When FCoE is enabled, only 256 advanced streams are supported. In normal mode (non-FCoE), 512 advanced streams are supported.

1. Open the Stream Properties window, **Frame Data** tab, and select **Ethernet II** in the **Protocols** tab.

   Image: Stream Properties with FCoE Protocol

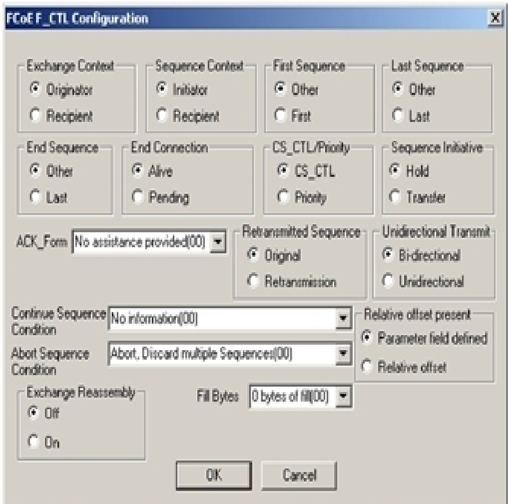


2. Select **FCoE** to select it, then select **Edit**.
   The FCoE Configuration dialog box will show (*Image: FCoE Configuration*).
   Image: FCoE Configuration

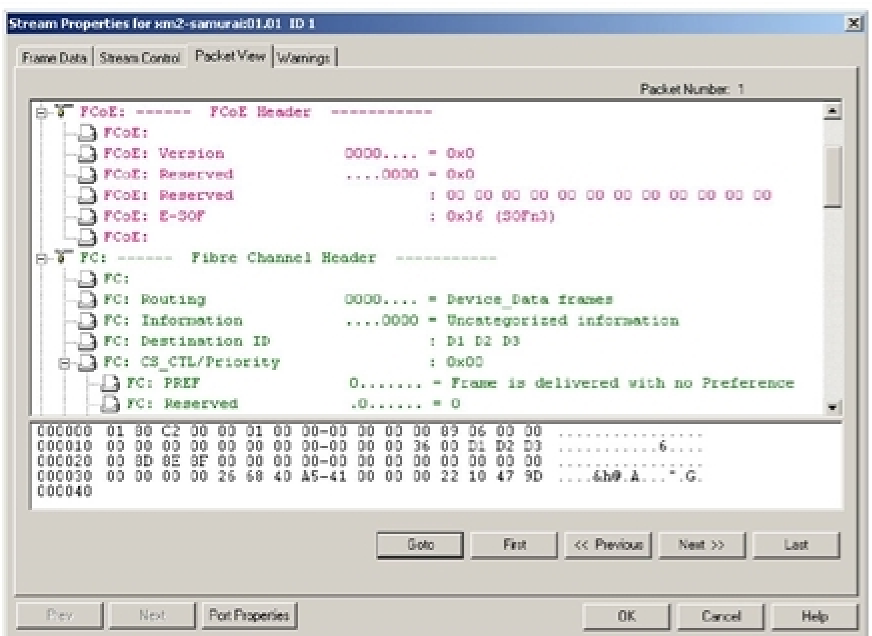


Field definitions for the FCoE Configuration dialog box are provided in *Table: FCoE Configuration dialog box*.

3. Adjacent to the F-CTL field, select the Configure F_CTL button.
   The FCoE F_CTL Configuration dialog box will show (*Image: FCoE F_CTL Configuration*).
   Image: FCoE F_CTL Configuration



   Field definitions for the F_CTL Configuration dialog box are provided in *Table: F_CTL Configuration dialog box*.
   The Stream Properties, **Packet View** tab will show the configured options (*Image: Packet View Showing FCoE Header*).
   Image: Packet View Showing FCoE Header



FCoE Configuration

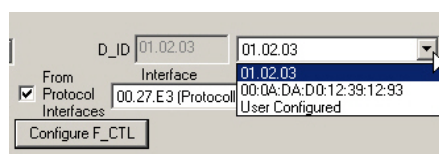
Field definitions for the FCoE Configuration dialog box are listed in *Table: FCoE Configuration dialog box*.

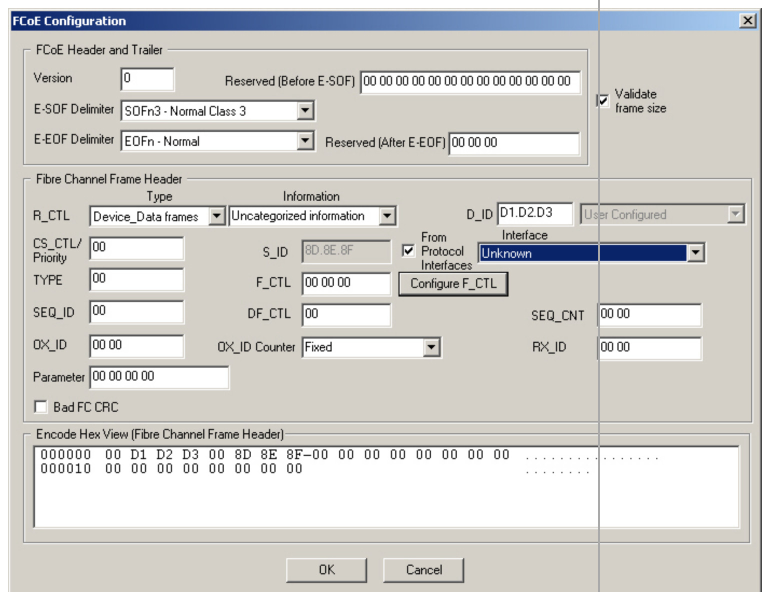
Table: FCoE Configuration dialog box

Sectio n	**Field/Control**	**Description**
FCoE Header and Trailer	Version	Configures the version (*default = 1*)
	Reserved (Before E-SOF)	Start-of-Frame reserved value(*default = '00 ... 00'*)
	E-SOF Delimiter	The Start-of-Frame (SOF) delimiter is an Ordered Set that immediately precedes the frame content. There are multiple SOF delimiters defined for Sequence control. • SOFn1 - Normal Class 1 or 6 • SOFn2 - Normal Class 2 • SOFn3 - Normal Class 3 (*default*) • SOFn4 - Normal Class 4 • SOFi2 - Initiate Class 2 • SOFi3 - Initiate Class 3 • SOFi4 - Initiate Class 4 • SOFc4 - Connect Class 4 • SOFf - Fabric
	E-EOF Delimiter	The End-of-Frame (EOF) delimiter is an Ordered Set that immediately follows the CRC. The EOF delimiter designates the end of the frame content. All frames other than the last frame of a Sequence shall be terminated with an EOFn delimiter. Valid frame content: • EOFn - EOF Normal identifies the end-of-frame • EOFt - EOF Terminate indicates that the Sequence associated with this SEQ_ID is complete. (*default*) • EOFrt - EOF Remove Terminate • EOFni - EOF Normal Invalid replaces an EOFn or EOFt, indicating that the frame content is invalid. • EOFrti - EOF Remove Terminate Invalid • EOFa (EOF Abort) terminates a partial

Section	Field/Control	Description
		frame due to a malfunction in a link facility during transmission.
	Reserved (After E-EOF)	Specifies the 3 rescued bytes after End-of-Frame delimiter
Validate Frame Size (check box)		When cleared, you can do negative testing using non-multiple of '4' frame size
Fibre Channel Frame Header	R_CTL Type	The R_CTL field is a one-byte field that contains routing bits and information bits to categorize the frame function. When the R_CTL field is used in combination with the TYPE field, it provides an FC_Port with assistance in frame routing, data routing, or addressing. The R_CTL field is further subdivided into the ROUTING field and the INFORMATION field. Frame Types: • Device_Data frames • Extended Link Services • FC-4 Link_Data • Video_Data • Extended_Headers • Basic Link Services • Link_Control Frame • Extended Routing
	R_CTL Information	The INFORMATION field is included in R_CTL to assist the receiver of a Data frame in directing the Data Field content to the appropriate buffer pool. Information categories for R_CTL Type = *Device_Data* or *FC-4 Link_Data*: • Uncategorized Information • Solicited Data • Unsolicited Control • Solicited Control

Sectio n	Field/Control	Description
		• Unsolicited Data • Data Descriptor • Unsolicited Command • Command Status • Reserved Information categories for R_CTL Type = *Extended Link Services:* • Solicited Data • Request • Reply • Reserved Information categories for R_CTL Type = *Video_Data:* • Unsolicited Data • Reserved Information categories for R_CTL Type = *Extended Headers:* • Virtual Fabric Tagging Head • Inter-Fabric Routing Header • Encapsulation Header • Reserved Information categories for R_CTL Type = *Basic Link Services:* • No Operation • Abort Sequence • Remove Connection • Basic_Accept • Basic_Reject • Dedicated Connection Preempted • Reserved (continued)
	R_CTL Information (continued)	Information categories for R_CTL Type = *Link Control Frame:* • Acknowledge_1 • Acknowledge_0

Section	Field/Control	Description
		• Nx_Port Reject • Fabric Reject • Nx_Port Busy • Fabric Busy to Data Frame • Fabric Busy to Link_Control Frame • Link Credit Reset • Notify • End • Reserved Information categories for R_CTL Type = *Extended Routing:* • Vendor Unique • Reserved
	D_ID	Three-byte field that contains the address identifier of the destination Nx_Port. If PLOGI Destination has been configured, the box will list these.  The first PLOGI Destination will be selected by default. If *User Configured* is selected, the D_ID field will become accessible (not grayed-out).
	CS-CTL/Priority	Class Specific Control/Priority (00 or 01) When set to zero, is interpreted to be CS_CTL information (containing management information for the class of service identified by the SOF). When set to one, is interpreted to be Priority information (containing priority information for the class of service identified by the SOF)
	S_ID	Three-byte field that contains the address identifier of the source Nx_Port or, select **From Protocol Interfaces** and the value will be supplied.

Section	Field/Control	Description
	From Protocol Interfaces (check box)	Selecting this check box synchronizes the S_ ID with the values set in FCoE interfaces that have been created using the Protocol Interfaces wizards. Configured and Discovered VLAN IDs will also appear. When selected, choose the desired FCoE interface from the listing.  Protocol Interfaces for more information. *From Protocol Interfaces* also shows up on the DA/SA page. From Protocol Interfaces Option.
	Type	The data structure type is a one-byte field that identifies the protocol of the frame content for Data frames. When R_CTL = *Basic* or *Extended Link_Data*: • 00 = Basic Link Service • 01 = Extended Link Service • 01 to CF = Reserved • D0 to FF = Vendor Specific When R_CTL = *Video_Data*: • 02 to 5F = Reserved • 60 = FC-AV Container • 61 = ARINC 818

Section	Field/Control	Description
		• 62 to 63 = Reserved for FC-AV • 64 to CF = Reserved • D0 to FF = Vendor Specific When R_CTL = *Device_Data* and *Link_Data*: • 00 to 03 = Reserved • 04 = Obsolete • 05 = IPv4, IPv6, and ARP over Fibre Channel • 06 to 07 = Reserved • 08 = Fibre Channel Protocol (see FCP-3) • 09 = Obsolete • 0A to 0F = Reserved - SCSI • 10 = Reserved • 11 to 13 = Obsolete • 14 = Fibre Channel SATA Tunnelling Protocol (see FC-SATA)
	F_CTL	Frame Control is a three-byte field that contains control information relating to the frame content.*Table: F_CTL Configuration dialog box*.
	SEQ_ID	The SEQ_ID is a one-byte field assigned by the Sequence Initiator that shall be unique for a specific D_ID and S_ID pair while the Sequence is open.
	DF_CTL	Data Field Control (DF_CTL) is a one-byte field that specifies the presence of optional headers at the beginning of the Data_Field. See DF_CTL Bit Definition, below.
	DF_CTL Bit Definition:	

<table>
<tr><th>Section</th><th>Field/Control</th><th>Description</th></tr>
<tr><td></td><td colspan="2">
<table>
<tr><th>Word 3, Bit(s)</th><th>Optional Header</th><th>Applicability</th></tr>
<tr><td>23</td><td>Reserved</td><td>all frames</td></tr>
<tr><td>22</td><td>0 = Neither ESP_Header nor ESP_Trailer
1 = Both ESP_Header and ESP_Trailer</td><td>all frames</td></tr>
<tr><td>21</td><td>0 = No Network_Header
1 = Network_Header</td><td>Device_Data and Video_Data frames</td></tr>
<tr><td>20</td><td>0 = No Association_Header
1 = Association_Header</td><td>Device_Data and Video_Data frames</td></tr>
<tr><td>19-18</td><td>Reserved</td><td>all frames</td></tr>
<tr><td>17-16</td><td>00b = No Device_Header
01b = 16 Byte Device_Header
10b = 32 Byte Device_Header
11b = 64 Byte Device_Header</td><td>Device_Data and Video_Data frames</td></tr>
</table>
</td></tr>
<tr><td></td><td>SEQ_CNT</td><td>The sequence count is a two-byte field that indicates the sequential order of Data frame transmission within a single Sequence or multiple consecutive Sequences for the same Exchange.

The SEQ_CNT of the first Data frame of the first Sequence of the Exchange transmitted by either the Originator or Responder is binary zero. The SEQ_CNT of each subsequent Data frame in the Sequence is incremented by one.</td></tr>
<tr><td></td><td>OX_ID</td><td>The Originator Exchange_ID is a two-byte field that identifies the Exchange_ID assigned by the Originator of the Exchange. Each Exchange is assigned an identifier unique to the Originator or Originator-Responder pair.</td></tr>
<tr><td></td><td>OX_ID Counter</td><td>The decrement/increment options enable changing the value for the Exchange IDs through UDFs instead of manually setting different values in the streams. Options are:

FixedIncrementDecrementContinuous IncrementContinuous DecrementRandom</td></tr>
<tr><td></td><td>RX_ID</td><td>The Responder Exchange_ID is a two byte field assigned by the Responder that provides a unique, locally meaningful identifier at the Responder for an Exchange established by an Originator and identified by an OX_ID.</td></tr>
</table>

Section	Field/Control	Description
	Parameter	The Parameter field has meanings based on frame type. For Link_Control frames, the Parameter field is used to carry information specific to the individual Link_Control frame. For Data frames with the relative offset present bit set to 1, the Parameter field specifies relative offset. For Data frames with the relative offset Present bit set to zero, the Parameter field is set and interpreted in a protocol specific manner that may depend on the type of Information Unit carried by the frame.
	Bad FC CRC (check box)	When selected, will ensure that the inner FC CRC that is generated by hardware will be wrong. If cleared, then the FC CRC should be a valid CRC.
Encode Hex View	Fibre Channel Frame Header	This view shows the configuration of the header, based on the options selected in the fields above.

F_CTL Configuration

Field definitions for the F_CTL Configuration dialog box are listed in *Table: F_CTL Configuration dialog box*.

Table: F_CTL Configuration dialog box

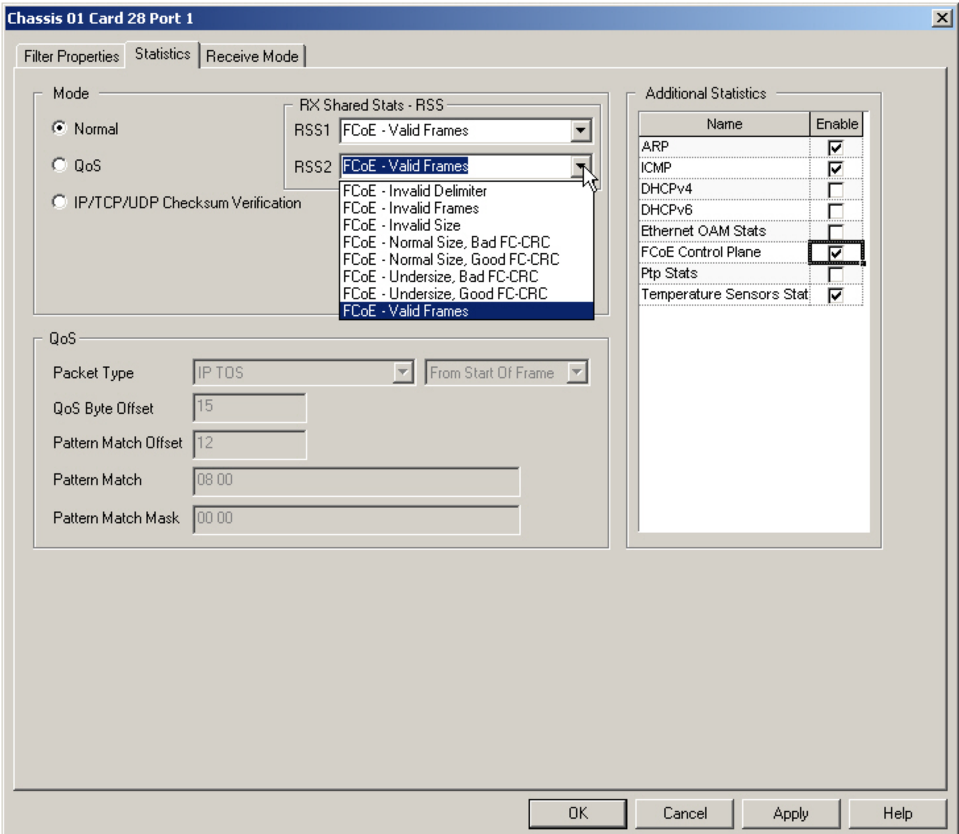
Field/Control	Description
Exchange Context	0 = Originator of exchange1 = Recipient (responder) of exchange
Sequence Context	0 = Sequence Initiator 1 = Sequence Recipient
First Sequence	0 = Other sequence other than first of exchange1 = First sequence of exchange
Last Sequence	0 = Other sequence other than last of exchange1 = Last sequence of exchange
End Sequence	0 = Other data frame other than last of sequence1 = Last data frame of sequence
End Connection	0 = Alive connection active1 = Pending end of connection pending
CS_CTL/Priority	0 = CS_CTL1 = Priority
Sequence Initiative	0 = Hold sequence initiative1 = Transfer sequence initiative

Field/Control	Description
ACK_Form	00 = No assistance provided 01 = Ack_1 Required 10 = reserved 11 = Ack_0 Required
Retransmitted Sequence	0 = Original Sequence transmission1 = Retransmission of sequence
Unidirectional Transmit	0 = Bi-directional transmission1 = Unidirectional transmission
Continue Sequence Condition	Last Data frame Sequence Initiator 00 = No information 01 = Sequence to follow-immediately 10 = Sequence to follow-soon 11 = Sequence to follow-delayed
Abort Sequence Condition	ACK frame (Sequence Context = Recipient) 00 = Continue sequence 01 = Abort Sequence, Perform ABTS 10 = Stop Sequence 11 = Immediate Sequence retransmission requested Data frame (1st of Exchange) (Sequence Context = Initiator) 00 = Abort, Discard multiple Sequences 01 = Abort, Discard a single Sequence 10 = Process policy with infinite buffers 11 = Discard multiple Sequences with immediate retransmission
Exchange Reassembly	OffOn
Fill Bytes	End of Payload - bytes of fill (following Payload) 00 = 0 bytes of fill 01 = 1 byte of fill 10 = 2 bytes of fill 11 = 3 bytes of fill
Relative offset present	0 = Parameter field defined for some frames1 = Relative offset

FCoE Statistics

Two additional dedicated statistics are provided with FCoE: RX Shared Stats1 and RX Shared Stats2. These two stats can be mapped to any of the stats defined below.

Image: **Statistics** Tab



The fields and controls in this dialog box are described in *Table: RX Shared Stats Configuration*.

Table: RX Shared Stats Configuration

Option	Description
FCoE Invalid Delimiter	Frame with invalid FC frame delimiter
FCoE Invalid Frames	Illegal size FCoE frame or Bad FC-CRC FCoE frame or Bad Ethernet CRC FCoE frame or invalid FC frame delimiter
FCoE Invalid Size	Frame size is not a multiple of 4 bytes with EType field set to FCoE frame.
FCoE Normal Size, Bad FC-CRC	Size of FCoE frame is legal, FC-CRF is badNormal size FCoE frame = frame size is multiple of 4 bytes with EType field set to FCoE:64 <= FrameSize <= 2176 NonVLAN 64 <= FrameSize <= 2180 VLAN
FCoE Normal Size, Good FC-CRC	Size of FCoE frame is legal, FC-CRF is good
FCoE	Undersize = legal size FCoE frame, FrameSize < 64FC-CRC is bad.

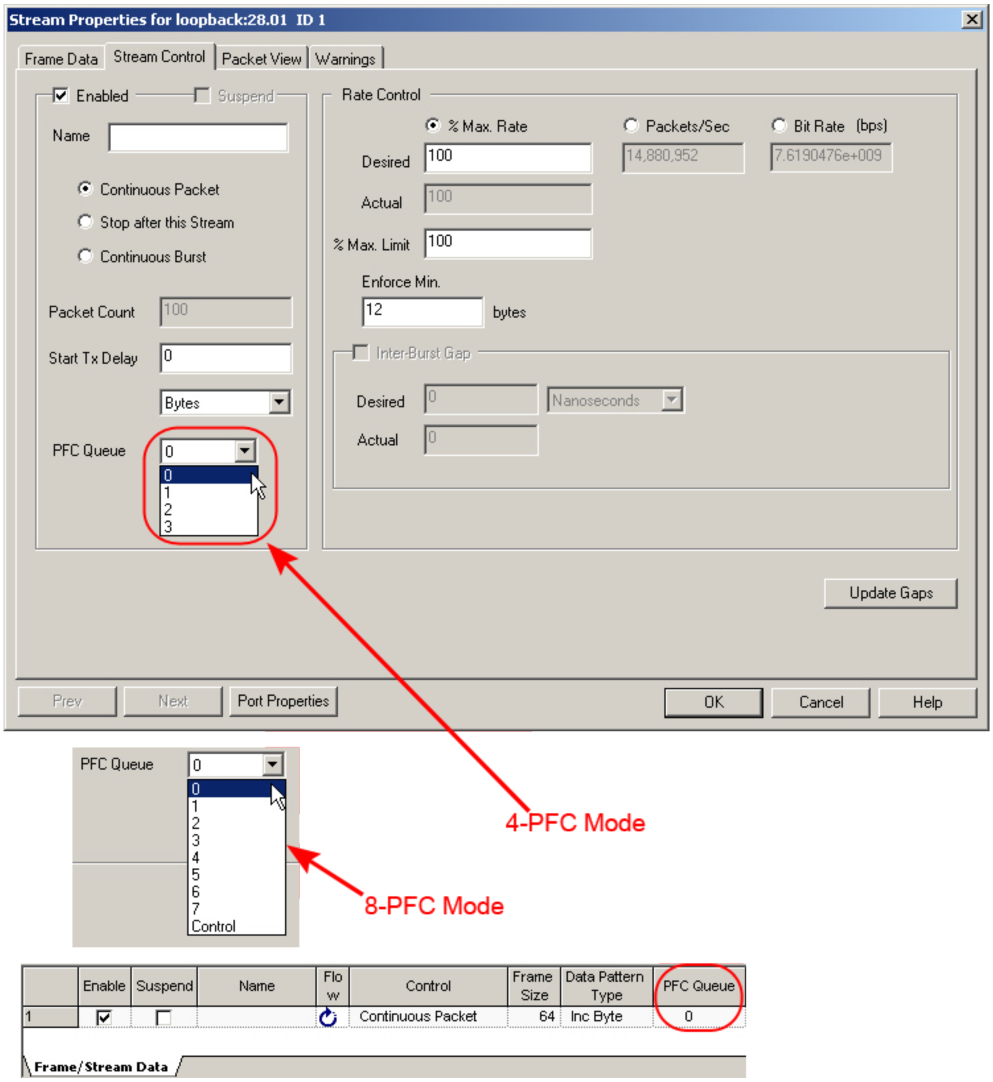
Option	Description
Undersize, Bad FC-CRC	
FCoE Undersize, Good FC-CRC	Undersize = legal size FCoE frame, FrameSize < 64FC-CRC is good.
FCoE Valid Frames	Frame size is multiple of 4 bytes with EType field set to FCoE frame.

Priority-based Flow Control

The Ixia port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame. The flow control type is determined by the selection made on the **Flow Control** tab of the Port Properties dialog box (*Image: Port Properties, Flow Control, 4-PFC Mode*).

The PFC scheduling function is based on the existing Advanced Scheduler. A new parameter **PFC Queue** is added to each stream (*Image: Mapping the PFC Queue, 4-PFC Mode*). The PFC Queue can be mapped to the priority field in the frame. Four or eight priorities of traffic can be implemented, with frame size up to 9216 bytes. This applies to both FCoE and non-FCoE frames.

Image: Mapping the PFC Queue, 4-PFC Mode

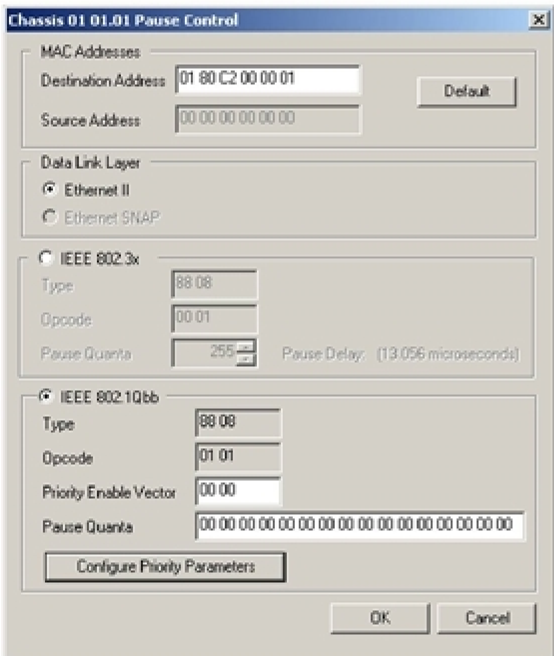


Pause Control dialog box

Priority parameters can be configured directly in the Pause Control dialog box or by using the PFC Configuration dialog box.

To access the Pause Control dialog box, from the Stream Properties window, **Frame Data** tab, **Protocols** tab, select **Ethernet II** and select **Pause Control**, then select **Edit**. The Pause Control dialog box will open (*Image: Pause Control dialog box*).

Image: Pause Control dialog box



You can configure priority parameters directly in the Priority Enable Vector field (which allows editing the pause timer) or select the **Configure Priority Parameters button**.

When the **Configure Priority Parameters** button is selected, the PFC Configuration dialog box shown in *Image: PFC Configuration dialog box* will appear, allowing the direct configuration of the detailed parameters (Pause Quanta).

Image: PFC Configuration dialog box

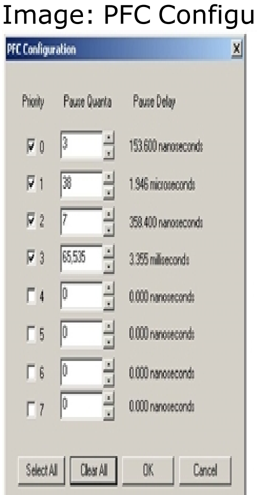
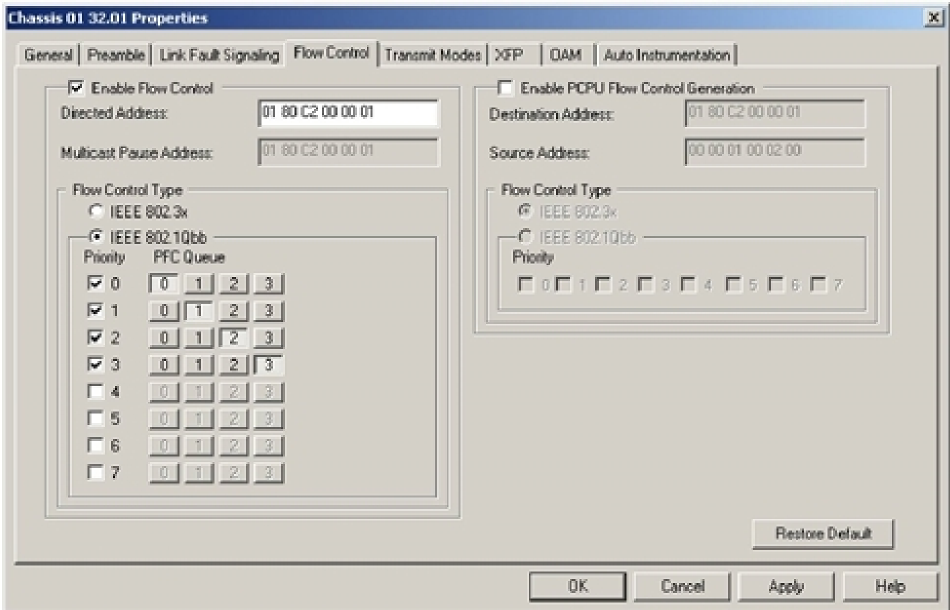


Image: Port Properties, Flow Control, 4-PFC Mode shows how to configure the port to respond to PFC, in the **Flow Control** tab of the Port Properties window.

NGY 4-PFC Mode

The NGY load module in Data Center Mode—with 4-Priority traffic mapping selected—supports only four PFC queues, with frame size 48 to 9K bytes on all four.

Image: Port Properties, Flow Control, 4-PFC Mode



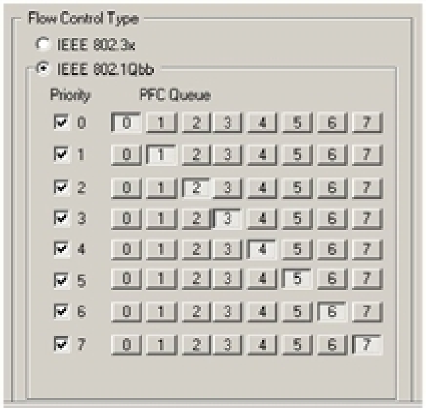
NGY 8-PFC Frame Size Limitation

The NGY load module in Data Center Mode—with 8-Priority traffic mapping selected—supports the following frame size for each PFC queue:.

Table: NGY 8-PFC Frame Sizes

PFC Queue	Min FrameSize	Max Frame Size
0	48 Byte	9216 Byte
1	48 Byte	2500 Byte
2	48 Byte	2500 Byte
3	48 Byte	2500 Byte
4	48 Byte	2500 Byte
5	48 Byte	2500 Byte
6	48 Byte	2500 Byte
7	48 Byte	2500 Byte
8	48 Byte	2500 Byte
Control traffic	48 Byte	2500 Byte

Image: Port Properties, Flow Control, 8-PFC Mode



LSM XMVDC Frame Size Limitation

There is limitation in LSM1000XMVDC load modules that all PFC queues will have a minimum frame size 48 bytes and maximum frame size 2500 bytes.

Frame Data for PTP Support

Precision Time Protocol (IEEE 1588v2) has been implemented as an optional feature of these load modules:

- NGY load modules (LSM10GXM family
- LSM1000XMV(R) 4/8/12/16 (not in Data Center Mode)
- LSM1000XMVDC 4/8/12/16 (not in Data Center Mode)

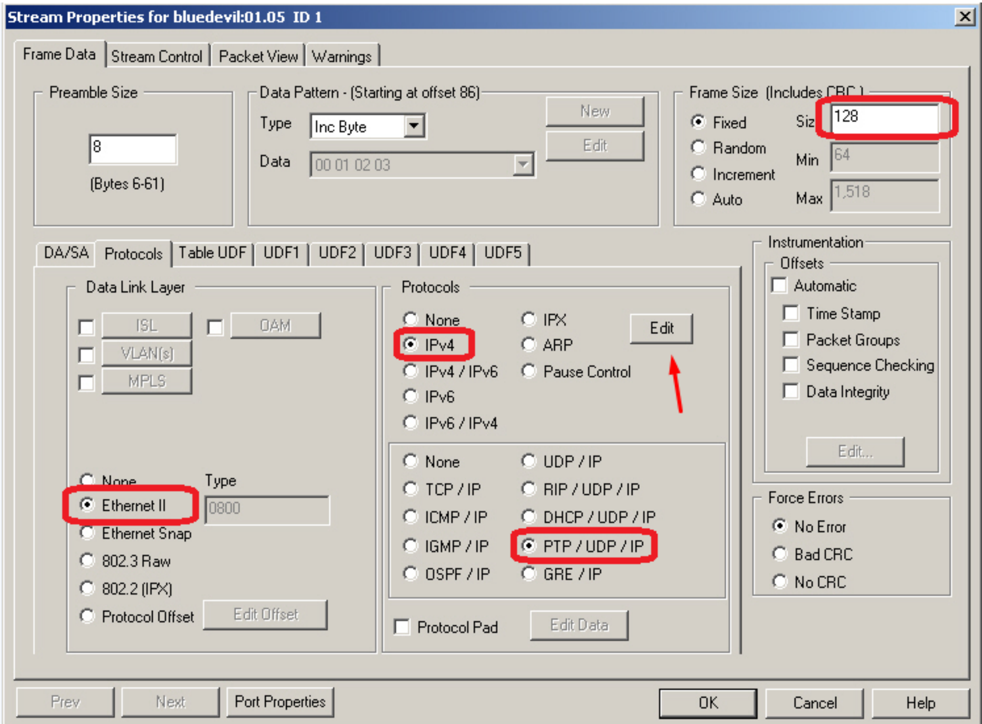
  NOTE PTP support in LSM1000XMVDC cards is available only if you purchase EEProm option.

- ASM1000XMV12V
- Xcellon-Ultra XP and NP

For a discussion of PTP theory, see Chapter 3 of the *Ixia Hardware and Reference Guide*.

1. To activate the PTP feature, begin at the **Frame Data** tab of the Stream Properties page (*Image: Frame Data, Stream Properties*).

   Image: Frame Data, Stream Properties



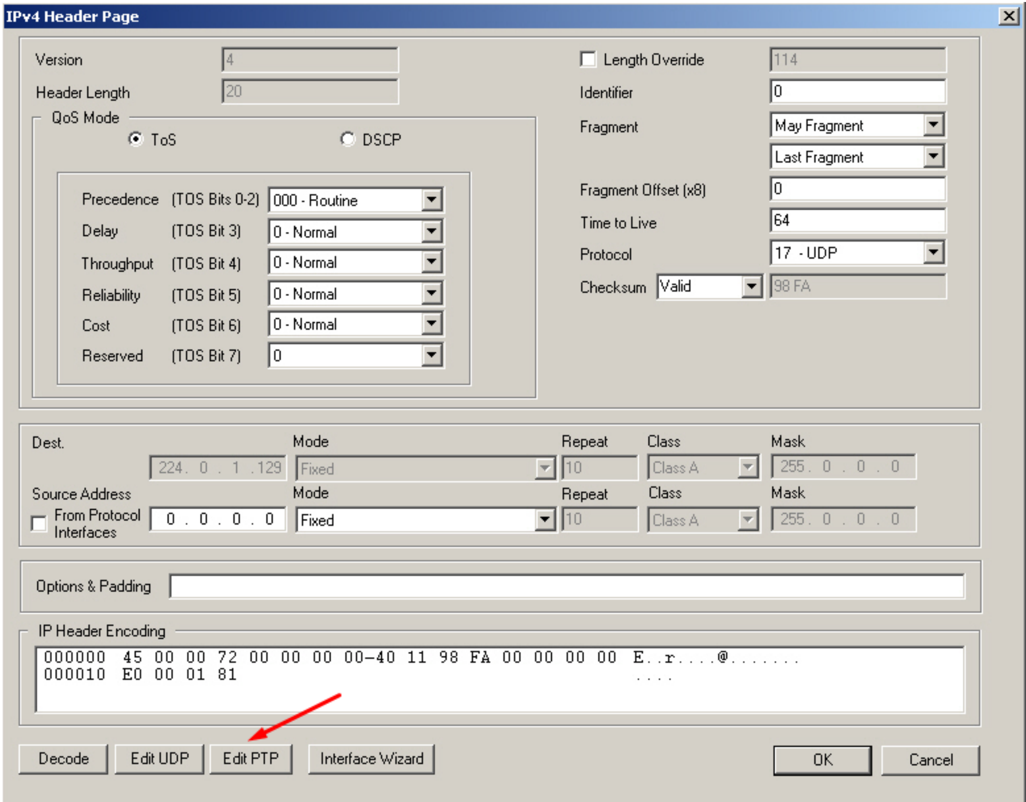
2. Choose Ethernet II, IPv4, and PTP/UDP/IP.
   (A Warning message will occur, regarding frame size.)
3. Change the Frame Size to 128 (so that it is long enough to accommodate the PTP header).

   Select **Edit**.

   The IPv4 Header configuration dialog box will appear (*Image: IPv4 Header Page*).

NOTE	When a stream is configured as PTP, the Destination Address on the Streams properties **DA/SA** tab will be deactivated and grayed out, due to the fact that Ethernet, IPv4 and UDP transmission of PTP packets relies on a reserved Destination Address.

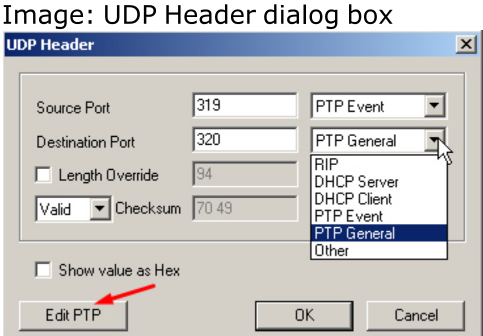
Image: IPv4 Header Page



4. Select **Edit PTP** to access the PTP Header configuration dialog box (Image: PTP Header Configuration dialog box).

   Select **Edit UDP** to access the UDP Header dialog box (*Image: UDP Header dialog box*, to set up the source and destination ports for PTP traffic. (The PTP Header config dialog box can also be accessed from the UDP config dialog box.)

   Image: UDP Header dialog box

5. 

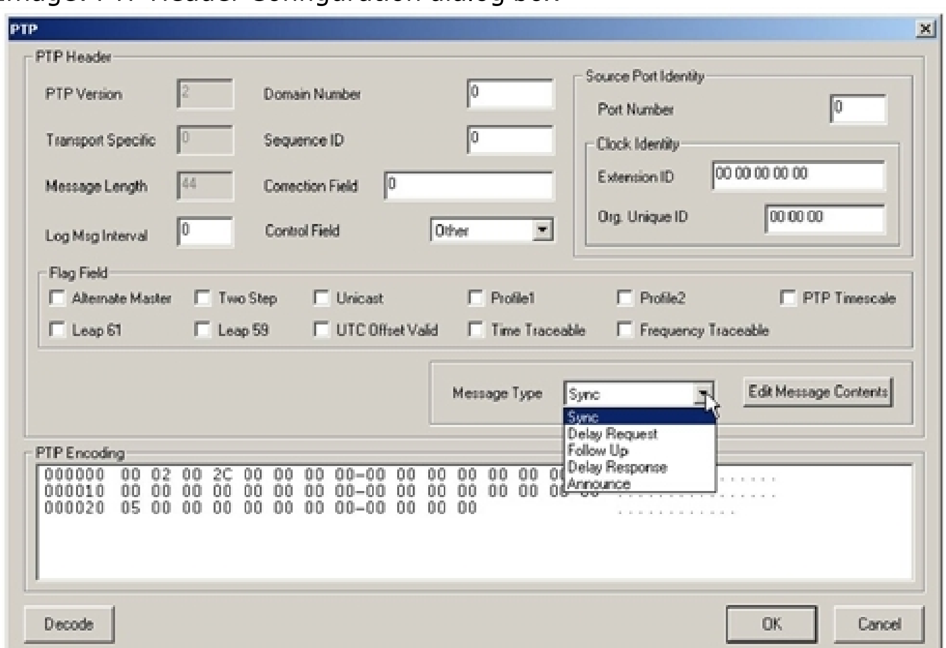
   Two PTP ports are available for both source and destination: PTP Event (port 319) and PTP General (port 320). The full range of choices appear in *Table: UDP Header for PTP*.

   Table: UDP Header for PTP

Field	Description
Source Port	Protocol source port number. One of: • RIP (Port 520)

Field	Description
	• DHCP Server (Port 67) • DHCP Client (Port 68) • PTP Event (Port 319) • PTP General (Port 320) • Other (Port 63)—If Other is selected, the *Edit Protocol* button is disabled (dimmed).
Destination Port	Protocol destination port number. One of: • RIP (Port 520) • DHCP Server (Port 67) • DHCP Client (Port 68) • PTP Event (Port 319) • PTP General (Port 320) • Other (Port 63)—If Other is selected, the *Edit Protocol* button is disabled (dimmed).
Length Override	See *Table: UDP Header Fields Set by the IPv4 UDP dialog box*.
Checksum	See *Table: UDP Header Fields Set by the IPv4 UDP dialog box*.

Image: PTP Header Configuration dialog box



6. Configure the desired PTP header using the fields on this page. *Table: PTP Header Configuration* contains field descriptions.

7. Choose a **Message Type** and select the **Edit Message Contents** button.

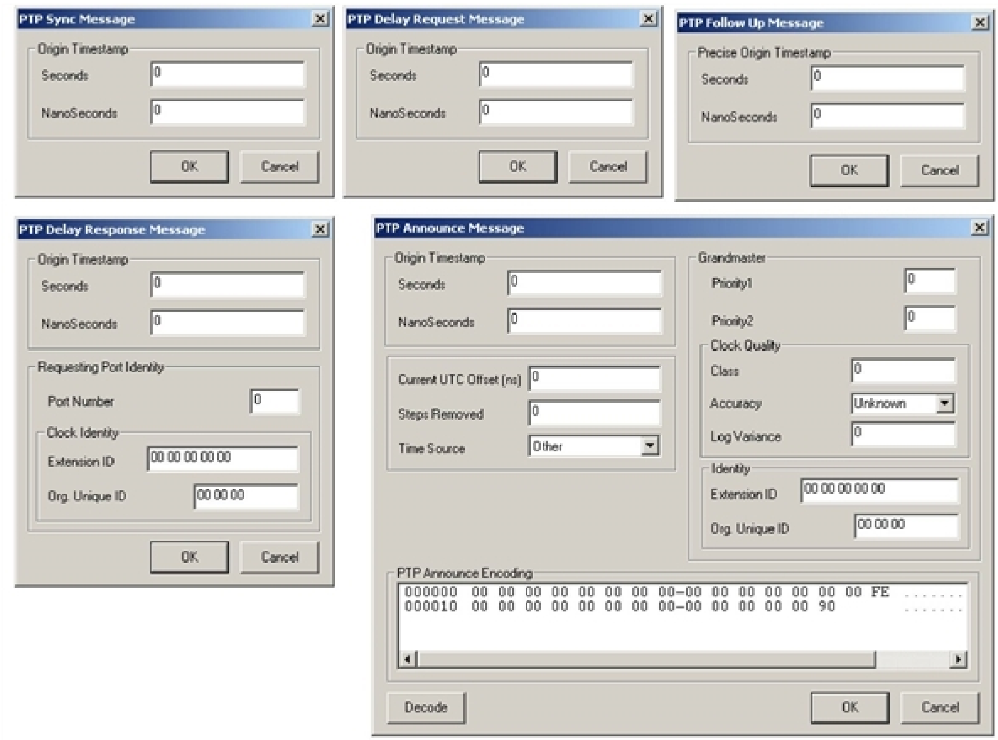
A message-specific configuration dialog box will open (*Table: PTP Message Configuration dialog boxes*).

Table: PTP Header Configuration

Section	Field/Control	Description
PTP Header	PTP Version	(Read only) Shows the PTP version.
	Domain Number	A domain consists of one or more PTP devices communicating with each other as defined by the protocol. Range 0 - 255. (*default = 0*)
	Transport Specific	(Read only) The Transport Specific field. (*default = 0*)
	Sequence ID	The sequence ID of the message shall be one greater than the sequence ID of the previous message of the same message type sent to the same message destination address by the transmitting port. (*default = 0*)
	Message Length	(Read only) The total number of octets that form the PTP message. The counted octets start with the first octet of the header and include and terminate with the last octet of any suffix or, if there are no suffix members with the last octet of the message. (*default = 44*)
	Correction Field	Exclicked in nanoseconds and fractions thereof. (*default = 0*) Transparent clocks forward PTP timing messages through the clock in the manner of an ordinary bridge or router but, in addition, measure the time spent by a PTP timing message within the transparent clock. These ‘residence’ times are accumulated in the Correction Field in the PTP timing messages, which allows the subordinate to correct the timestamps, effectively removing the timing fluctuations that would otherwise be introduced by the bridges.
	Log Msg Interval	The value is determined by the type of the message. (*default = 0*)
	Control Field	The value depends on the message type defined in the **Message Type** field. Select from pull-down: SyncDelay RequestFollow-upDelay ResponseManagementOther (*default*)
Source Port Identity	Port Number	Identifies a specific Precision Time Protocol (PTP) port on a PTP node.
	Clock	Extension identifier. (*default = ‘00 00 00 00 00’*)

Section	Field/Control	Description
	IdentityExtension ID	
	Org. Unique ID	Organization Unique Identifier (OUI): the value of the OUI assigned to the vendor or standards organization by the IEEE. The most significant 3 octets of the Clock Identity shall be an OUI. (*default = '00 00 00'*)
Flag Field	Alternate Master	Selected = Alternate Master
	Leap 61	Selected = Leap 61
	Two Step	Cleared = a one-step clock Selected = a two-step clock.
	Leap 59	Selected = Leap 59
	Unicast	Selected = the transport layer protocol address to which this message was sent is a unicast address. Cleared = the transport layer protocol address to which this message was sent is a multicast address.
	UTC Offset Valid	Selected = UTC Offset Valid
	Profile 1	Selected = Profile 1
	Time Traceable	Selected = Time Traceable
	Profile 2	Selected = Profile 2
	Frequency Traceable	Selected = Frequency Traceable
	PTP Timescale	Selected = PTP Timescale
	Message Type	Select type of PTP message from pulldown, then select **Edit Message Contents** button. Sync (*default*)Delay RequestFollow-upDelay ResponseAnnounce
	PTP Encoding	This window shows the encoding of the configuration choices made above. Select the **Decode** button to refresh this window.

Image: PTP Message Configuration dialog boxes



Field definitions for PTP messages are provided in *Table: PTP Message Configuration*.

Table: PTP Message Configuration

Section	Field/Control	Description
PTP Sync Message	Origin Timestamp	Seconds: The time interval, exclicked in seconds. (*default = 0*) Nanoseconds: The time interval, exclicked in nanoseconds. (*default = 0*)
PTP Delay Request Message	Origin Timestamp	Seconds: The time interval, exclicked in seconds. (*default = 0*) Nanoseconds: The time interval, exclicked in nanoseconds. (*default = 0*)
PTP Follow-Up Message	Precise Origin Timestamp	Seconds: The time interval, exclicked in seconds. (*default = 0*) Nanoseconds: The time interval, exclicked in nanoseconds. (*default = 0*)
PTP Delay Response Message	Origin Timestamp	Seconds: The time interval, exclicked in seconds. (*default = 0*) Nanoseconds: The time interval, exclicked in nanoseconds. (*default = 0*)
	Requesting Port Identity	Port Number: 16-bit port number associated with the clock. (*default = 0*) Clock Identity: Extension ID: Extension identifier. (*default = '00 00 00 00 00'*)

Section	Field/Control	Description
		Org. Unique ID - Organization Unique Identifier (OUI) - the value of the OUI assigned to the vendor or standards organization by the IEEE. The most significant 3 octets of the Clock Identity shall be an OUI. (*default = '00 00 00'*)
PTP Announce Message	Origin Timestamp	Seconds - The time interval, exclicked in seconds. (*default = 0*) Nanoseconds - The time interval, exclicked in nanoseconds. (*default = 0*)
	Current UTC Offset (ns)	Current UTC Offset (ns) - The UTC time differs from the TAI time by a constant offset. This is calculated as follows: TAI - UTC. (*default = 0*) Steps Removed - In addition to this precedence order, the distance measured by the number of boundary clocks between the local clock and the foreign master is used when two Announce messages reflect the same foreign master. (*default = 0*) Time Source - (select from pulldown) Indicates the source of time used by the grandmaster clock. • Other (*default*) • Atomic Clock • GPS • Terrestrial Radio • PTP • NTP • Hand Set • Internal Oscillator • Alternate PTP Profile (0 to 14)
	Grandmaster	Priority 1 - A user configurable designation that a clock belongs to an ordered set of clocks from which a master is selected. (*default = 0*) Priority 2 - A user configurable designation that provides finer grained ordering among otherwise equivalent clocks. (*default = 0*)
	Clock Quality	Class (*default = 0*) The clockClass attribute of an ordinary or boundary clock denotes the traceability of the time or frequency distributed by the grandmaster clock.
		Accuracy (select from pulldown) • Unknown (*default*)

Section	Field/Control	Description
		• 25 nanoseconds (ns) • 100 ns • 250 ns • 1 microsecond (us) • 2.5 us • 10 us • 25 us • 100 us • 250 us • 1 millisecond (ms) • 2.5 ms • 10 ms • 25 ms • 100 ms • 250 ms • 1 second • 10 seconds • greater than 10 seconds
		Log Variance (*default = 0*) Defines the stability of a clock.
	Identity	Extension ID - Extension identifier. (*default = '00 00 00 00 00'*) Org. Unique ID - Organization Unique Identifier (OUI) - the value of the OUI assigned to the vendor or standards organization by the IEEE. The most significant 3 octets of the Clock Identity shall be an OUI. (*default = '00 00 00'*)
	PTP Announce Encoding	Shows the coding based on the choices in the fields above. Select the **Decode** button to refresh this view.

PTP Statistics

PTP port-level statistics can be collected by checking the appropriate check box in the **Statistics** tab (*Image: PTP Statistics*).

Image: PTP Statistics

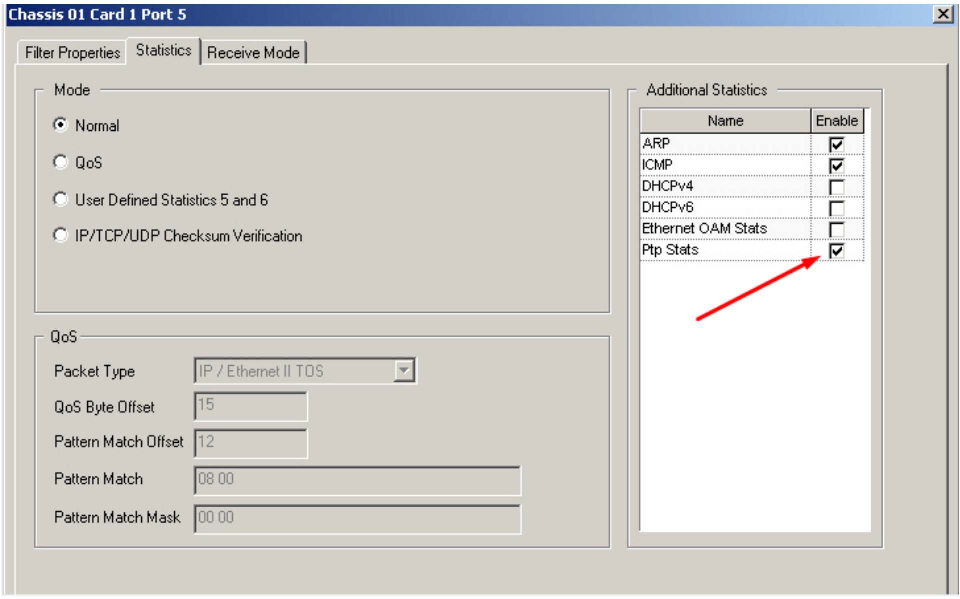
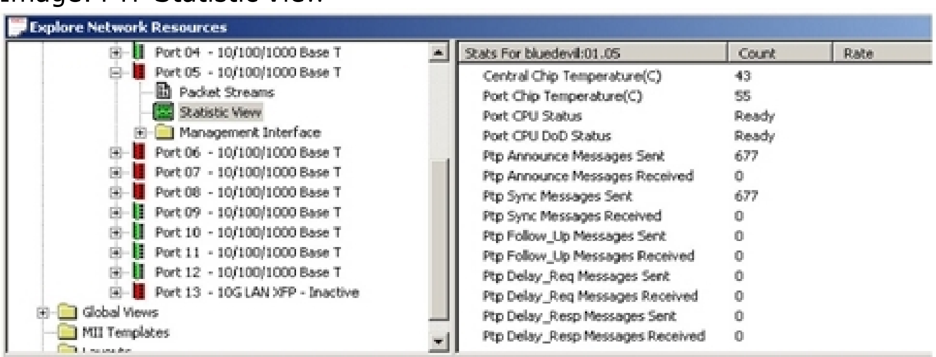


Image: PTP Statistic View shows the Statistics View with PTP statistics listed.

Image: PTP Statistic View



Frame Data for Fibre Channel Support

The **Protocols** tab in the Frame Data section for Fibre Channel has been implemented to configure protocol standards for Fibre Channel load module.

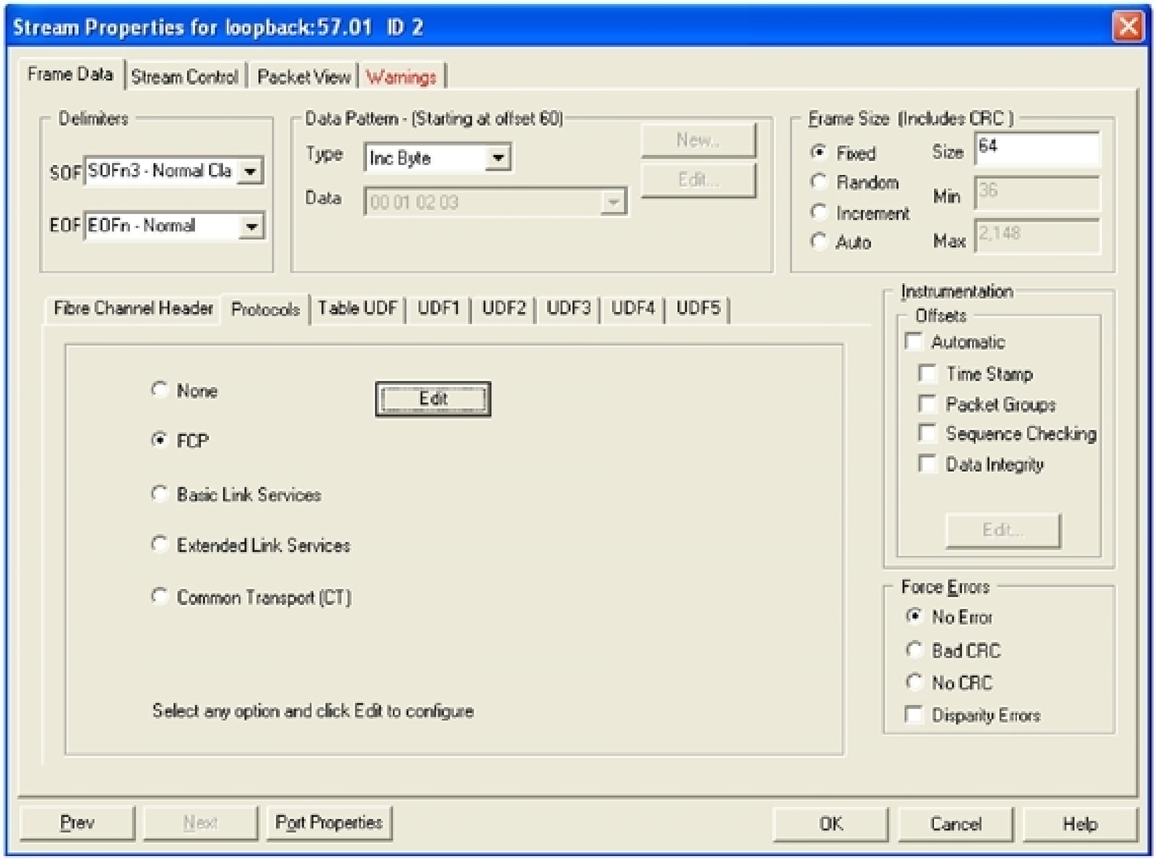
The protocol options are as follows:

- Fibre Channel Protocol (FCP)
- Basic Link Services
- Extended Link Services (ELS)
- Common Transport (CT)

To activate the **Protocols** tab, do the following:

1. Begin at the **Frame Data** tab of the *Stream Properties* window (*Image: **Frame Data Protocol** tab*).

   Image: **Frame Data Protocol** tab



2. Select the **Protocols** tab in the *Frame Data* section to access the Protocols section.

3. Select the option button for the protocol you want to configure and select the 

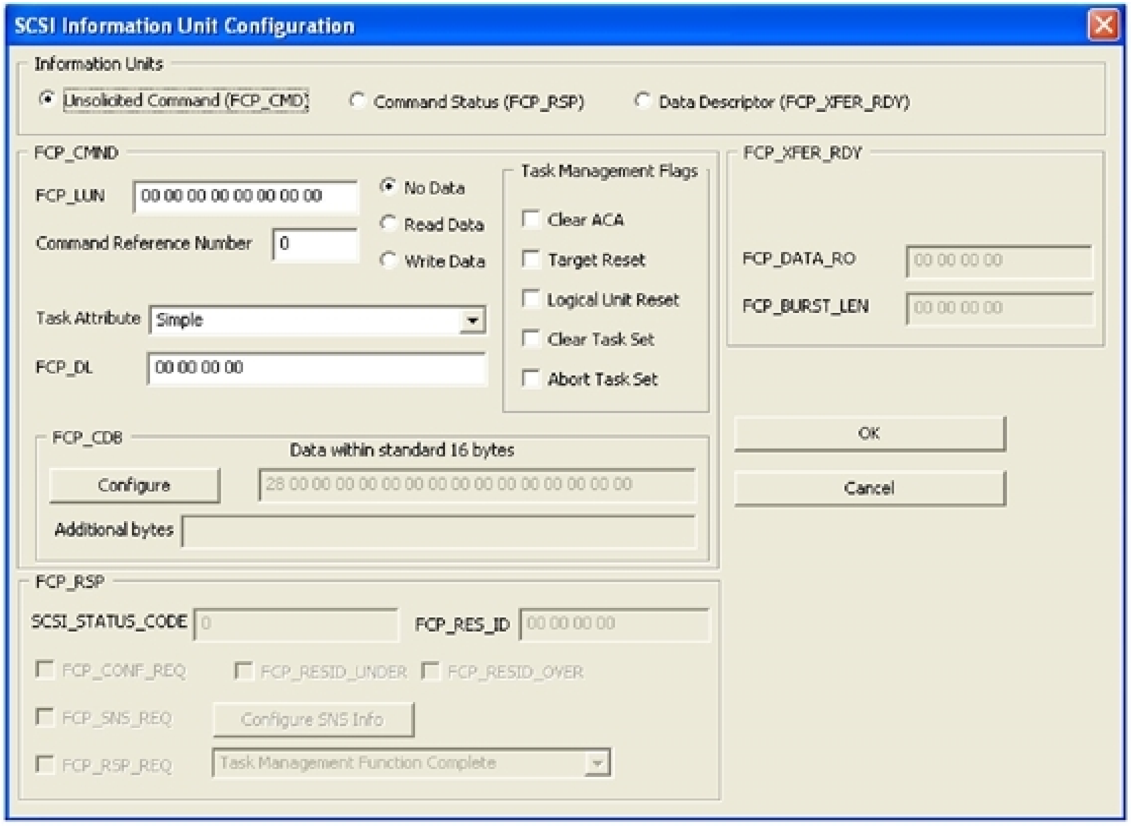
button to open the selected protocol in the edit mode.

Fibre Channel Protocol (FCP)

Fibre Channel Protocol (FCP) is a standard SCSI device interface using Fibre Channel communication. The Fibre Channel protocol provides a range of implementation possibilities extending to maximum performance. The transmission medium is isolated from the control protocol so that each implementation may use a technology best suited to the environment of use.

The SCSI Information Unit Configuration dialog box is shown in *Image: SCSI Information Unit Configuration.*

Image: SCSI Information Unit Configuration



The fields and controls in this dialog box are described in *Table: SCSI Information Unit Configuration dialog box*.

Table: SCSI Information Unit Configuration dialog box

Section	Fields/Controls	Description
Information Units	Unsolicited Command (FCP_CMD)	If selected, enables the *FCP_CMND* section.
	Command Status (FCP_RSP)	If selected, enables the *FCP_RSP* section.
	Data Descriptor (FCP_XFER_RDY)	If selected, enables the *FCP_XFER_RDY* section.
FCP_CMND	The options in this section are enabled only if *Unsolicited Command (FCP_CMD)* option is selected as the information unit.	
	FCP_LUN	The FCP Logical Unit Number (FCP_LUN) contains the address of the destination logical unit in the attached sub system. The default value is 00 00 00 00 00 00 00 00.

Section	Fields/Controls	Description
		If this field contains a valid logical unit address, the INQUIRY command is forwarded to the addressed logical unit.
	Command Reference Number	This field contains the number sent by the initiator to assist in performing precise delivery checking for FCP commands. The default value is 0.
	Task Attribute	This field contains values that specify the task attribute associated with the Command Descriptor Block (CDB). The options in the list are as follows: • Simple: This task attribute requests that the task be managed according to the rules for a SIMPLE task attribute. • Head of Queue: This task attribute requests that the task be managed according to the rules for a HEAD OF QUEUE task attribute. • Ordered: This task attribute requests that the task be managed according to the rules for an ORDERED task attribute. • Automatic Contingent Allegiance: This task attribute requests that the task be managed according to the rules for an Automatic Contingent Allegiance (ACA) task attribute.
	FCP_DL	This field contains a count of the maximum number of data bytes that is transferred to or from the application client data buffer by the SCSI CDB. The default value is 00 00 00 00.
	No Data	If selected, no data read or write operation is set.
	Read Data	This is a SCSI read operation. When the Read Data bit is set to one, it specifies that the frame data initiator expects FCP_DATA IUs to be in the direction opposite to the direction of the FCP_CMND IU.

Section	Fields/Controls	Description
	Write Data	This is a SCSI write operation. When the Write Data bit is set to one, it specifies that the initiator expects FCP_ DATA IUs to be in the same direction as the FCP_CMD IU.
Task Management Flags	This field contains flags that request for the execution of certain task management functions for the SCSI. The options in the list are as follows: • Clear ACA • Target Reset • Logical Unit Reset • Clear Task Set • Abort Task Set	
	Clear ACA	If selected, clears the Automatic Contingent Allegiance (ACA) condition.
	Target Reset	If selected, performs a TARGET RESET task management function to the FCP device. This flag is mandatory for the Fibre Channel protocol.
	Logical Unit Reset	If selected, performs a LOGICAL UNIT RESET task management function. It aborts all tasks in the task set for the logical unit and performs a LOGICAL UNIT RESET for all the dependent logical units. This flag is mandatory for the Fibre Channel protocol.
	Clear Task Set	If selected, aborts all tasks from all initiators in the specified task. A unit attention condition is created for all initiators other than the initiator that sent the CLEAR TASK SET that had tasks in the task set. This flag is mandatory for the Fibre Channel protocol.
	Abort Task Set	If selected, aborts all tasks in the task set from the initiator requesting the ABORT TASK SET. This flag is mandatory for the Fibre Channel protocol.

Section	**Fields/Controls**	**Description**
FCP_CDB	Fibre Channel Protocol Command Descriptor Block (FCP_CDB) field contains the CDB that is sent to the addressed logical unit.	
		Click to open the *CDB Configuration* dialog box. Refer CDB Configuration for more information.
	Data within standard 16 bytes	This is the maximum CDB length. 16 bytes is the maximum length.
	Additional bytes	This field contains additional bytes of data beyond the maximum 16 bytes limit of FCP_CDB. NOTE This field is disabled if any task management flag is set to one.
FCP_RSP	The options in this section are enabled only if *Command Status (FCP_RSP)* option is selected as the information unit. The FCP_RSP provides information on FCP operations that includes SCSI status, protocol verification, and any other applicable autosense data.	
	SCSI_STATUS_CODE	This field contains the status code for the completion of the SCSI command code.
	FCP_RES_ID	This field contains a count of the number of residual data bytes that were not transferred in the FCP_DATA for this SCSI command. The FCP_RES_ID is functional only if the FCP_RESID_OVER or FCP_RESID_UNDER bit is set to one.
	FCP_CONF_REQ	If selected, transmits an FCP_CONF to confirm receipt of the FCP_RSP Sequence.
	FCP_RESID_UNDER	If selected, indicates that the FCP_RESID field is valid and contains the number of bytes that were expected to be

Section	**Fields/Controls**	**Description**
		transferred, but were not transferred. The application client examines the FCP_RESID field in the context of the command to determine whether or not an error condition occurred.
	FCP_RESID_OVER	If selected, indicates that the FCP_RESID field is valid and contains the count of bytes that cannot be transferred because the FCP_DL was not sufficient. The application client should examine the FCP_RESID field in the context of the command to determine whether or not an error condition occurred.
	FCP_SNS_REQ	If selected, specifies the number of valid bytes of FCP_SNS_INFO.
		Click to open the *SNS_Info Configuration* dialog box. NOTE This button is enabled if FCP_SNS_REQ check box is selected. Refer SNS_Info Configuration for more information.
	FCP_RSP_REQ	If selected, specifies the number of valid bytes of FCP_RSP_INFO. The options in the list are as follows: • Task Management Function Complete • FCP_DATA length different than FCP_BURST_LEN • FCP_CMND fields invalid • FCP_DATA Parameter mismatch with FCP_DATA_RO • Task Management Function Rejected • Task Management Function Failed
FCP_XFER_RDY	The options in this section are enabled only if *Data Descriptor (FCP_XFER_RDY)* option is selected as the information unit. FCP_XFER_RDY indicates that the target is ready to receive a part or all of the data for a write command.	

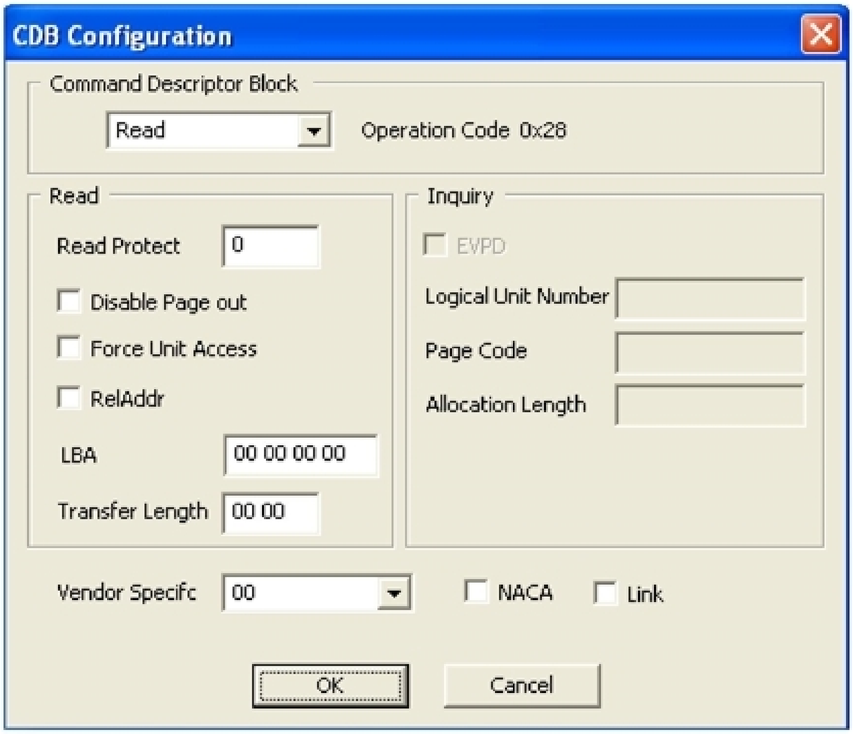
Section	Fields/Controls	Description
	The FCP_XFER_RDY contains parameters such as the length and initial relative offset of the FCP_ DATA as requested and required by the initiator.	
	FCP_DATA_RO	This field contains the value that specifies the relative offset in the PARAMETER field for the first data byte of the requested FCP_DATA. The default value is 00 00 00 00.
	FCP_BURST_LEN	This field contains the value that specifies the amount of buffer space prepared for the next FCP_DATA and requests the transfer from the initiator of an IU of that length. The value in the FCP_BURST_LEN field is the same as the SCSI data delivery request byte count. The default value is 00 00 00 00.

CDB Configuration

The Command Descriptor Block (CDB) is a structure that is used to communicate a command from an application client to a device server. The SCSI CDB defines the operation to be performed by the device server. If an invalid parameter is detected in the CDB by the logical unit, no command is processed by the logical unit.

The *CDB Configuration* dialog box is shown in *Image: CDB Configuration dialog box*.

Image: CDB Configuration dialog box



The fields and controls in this dialog box are described in *Table: CDB Configuration dialog box*.

Table: CDB Configuration dialog box

Section	Fields/Controls	Description
Command Descriptor Block	The CDB command options in the list are as follows: • Read • Write • Inquiry	
	Operation Code 0x28	The first byte in the CDB.
Read	Read Protect	Sends a READ command to return data to an application client. NOTE This section is enabled only if *Read* option is selected in the *Command Descriptor Block* list.
	Disable Page Out	If selected, allows the initiator to warn the target that the data being read is unlikely to be requested again soon and so is not worth keeping in the target’s data cache.
	Force Unit Access	If selected, initiates the target to fetch data

Section	Fields/Controls	Description
		from the media surface and not to use a cached copy of data.
	RelAddr	If selected, this bit is used to indicate that the LBA value is relative.
	LBA	The Logical Block Addressing value.
	Transfer Length	The 16 bit Transfer Length field used by the Read command.
Write	Write Protect	Sends a WRITE command to return data to an application client. NOTE This section is enabled only if *Write* option is selected in the *Command Descriptor Block* list.
	Disable Page Out	If selected, allows the initiator to warn the target that the data being written is unlikely to be requested again soon and so is not worth keeping in the target's data cache.
	Force Unit Access	If selected, initiates the target to fetch data from the media surface and not to use a cached copy of data.
	RelAddr	If selected, this bit is used to indicate that the LBA value is relative.
	LBA	The Logical Block Addressing value.
	Transfer Length	The 16 bit Transfer Length field used by the Read command.
Inquiry	Sends an ENQUIRY command to return data to an application client. NOTE This section is enabled only if *Inquiry* option is selected in the *Command Descriptor Block* list.	

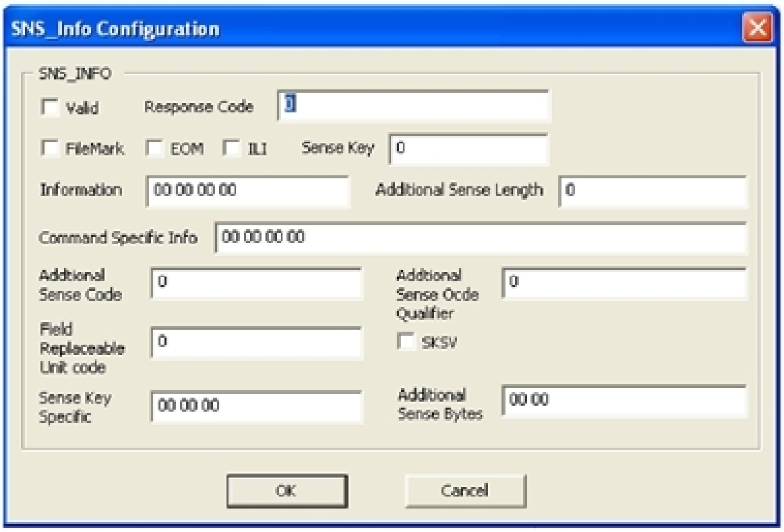
Section	Fields/Controls	Description
	EVPD	If selected, enables Vital Product Data.
	Logical Unit Number	The 3 bit identifier for a logical unit.
	Page Code	The page code parameter byte. If EVPD parameter bit is zero and the Page Code parameter byte is zero, the target returns the standard enquiry data.
	Allocation Length	The allocation length of the Inquiry command.
Vendor Specific		Specification of the referenced item is determined by the SCSI device vendor. The options in the list are as follows: • 00 • 01 • 10 • 11
NACA		The Normal Automatic Contingent Allegiance (NACA) bit specifies whether an ACA is established if the command returns with CHECK CONDITION status. If selected and NACA bit is set to one, an ACA is established. If cleared and NACA bit is set to zero, ACA is not established.
Link		If selected, establishes the link.

SNS_Info Configuration

The SNS_Info field for FCP contains the autosense data. The proper SNS_INFO is presented when the SCSI status byte of CHECK CONDITION is presented. If no condition requiring the presentation of SCSI sense data has occurred, the SNS_INFO field is not included in the FCP_RSP IU. The FCP_SNS_LEN_VALID bit is then zero. In this case, FCP devices to perform autosense.

The *SNS_Info Configuration* dialog box is shown in *Image: SNS_Info Configuration dialog box*.

Image: SNS_Info Configuration dialog box

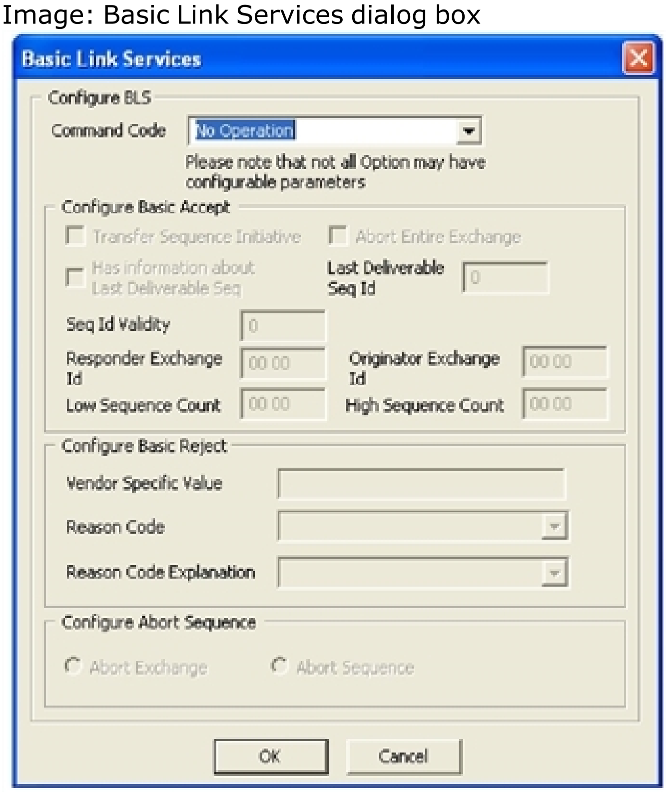


Basic Link Services

Basic Link Services are single frame, single sequence commands that are embedded in an unrelated exchange. Basic Link Services commands consist of only a single Basic Link_Data frame and are interspersed or are a part of a Sequence for an Exchange performing a specific protocol other than Basic Link Service. Basic Link Service commands support low-level functions and login is not required before using such commands.

The *Basic Link Services* dialog box is shown in *Image: Basic Link Services dialog box*.

Image: Basic Link Services dialog box



The fields and controls in this dialog box are described in *Table: Basic Link Services dialog box*.

Table: Basic Link Services dialog box

Section	Fields/Controls	Description
Command Code	The Command Code list contains the Basic Link Service commands. The options in the list are as follows: • No Operation • Abort Sequence • Remove Connection • Basic_Accept • Basic_Reject • Dedicated Connection Preempted NOTE Not all command options have configurable parameters. 'No Operation', 'Remove Connection', and 'Dedicated Connection Preempted', do not have configurable parameters in the present scope of Basic Link Service configuration.	
Configure Basic Accept	Basic Accept is a single frame Link Service Reply Sequence that notifies the transmitter of a Basic Link Service Request frame that the request has been completed. NOTE This section is enabled only if *Basic Accept* is selected as the Basic Link Service command.	
	Transfer Sequence Initiative	If selected, the Basic Accept Link Service

Section	Fields/Controls	Description
		Reply Sequence transfers the Sequence Initiative by setting the Sequence Initiative bit (Bit 16) to one in F_CTL on the last Data frame of the Reply Sequence.
	Abort Entire Exchange	If selected, aborts the transfer of Sequence Initiative.
	Has Information about Last Deliverable Seq	If selected, provides information about the last delivered Sequence Initiative.
	Last Deliverable Seq Id	Sets the last deliverable Sequence Identifier assigned by the Sequence Initiator.
	Seq Id Validity	The value validating the Sequence Identifier.
	Responder Exchange Id	Exchange Identifiers are used to uniquely identify an Exchange. The Responder assigns Responder ID (RX_ID) that is unique to the Responder or Responder-Originator pair and communicates it to the Originator before the end of the first Sequence of the Exchange.
	Originator Exchange Id	The Originator assigns each new Exchange an Originator Exchange ID (OX_ID) unique to the Originator or Originator-Responder pair and embeds it in all frames of the Exchange.
	Low Sequence Count	Indicates low Sequence Count. The sequence count (SEQ_CNT) is a two-byte field that indicates the sequential order of Data frame transmission within a single Sequence or multiple consecutive Sequences for the same Exchange.
	High Sequence Count	Indicates high Sequence Count.
Configure Basic Reject	Basic Reject is a single frame Link Service Reply Sequence that notifies the transmitter of a Basic Link Service Request frame that the request has been rejected.	

Section	Fields/Controls	Description
	NOTE This section is enabled only if *Basic Reject* is selected as the Basic Link Service command.	
	Vendor Specific Value	Specification of the referenced item is determined by the SCSI device vendor. The default value is 0.
	Reason Code	The Basic Reject reason codes in the list are as follows: • Invalid Command Code: The Command code in the Sequence being rejected is invalid. • Logical Error: The request identified by the Command code is invalid or logically inconsistent for the conditions present. • Logical Busy: The Basic Link Service is logically busy and unable to process the request at this time. • Protocol Error: This indicates that an error has been detected that violates the rules of FC-2 protocol that are not specified by other error codes. • Unable To Perform Command Request: The Recipient of a Link Service command is unable to perform the request at this time.
	Reason Code Explanation	The Basic Reject reason codes explanation in the list are as follows: • No Additional Explanation • Invalid OxId-RxId Combination • Sequence Aborted/No Sequence Information Provided
Configure Abort Sequence	Abort Sequence (ABTS) frame is used by the Sequence Initiator to request that the Sequence Recipient abort one or more Sequences and by the Sequence Recipient to request that	

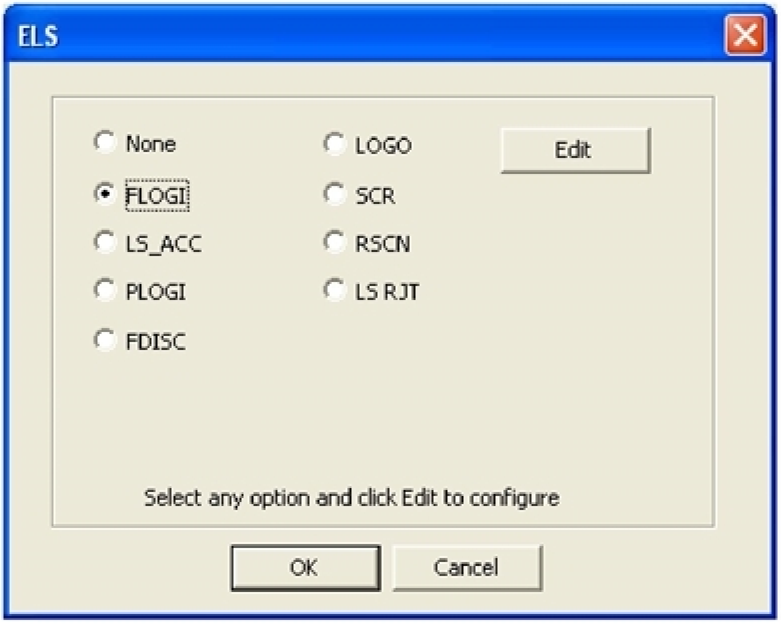
Section	Fields/Controls	Description
	the ABTS Recipient abort the entire Exchange. NOTE This section is enabled only if *Abort Sequence* is selected as the Basic Link Service command.	
	Abort Exchange	If selected, the Sequence Recipient elects to abort one or more Sequences or elect to abort the entire Exchange in a protocol specific manner.
	Abort Sequence	If selected, Sequence Recipient requests that one or more Sequences in progress be aborted by setting the Abort Sequence Condition bits to a value of 01b on an ACK frame.

Extended Link Services (ELS)

An Extended Link Service (ELS) request solicits a destination Nx_Port to perform a function. An ELS reply is transmitted in response to an ELS request, unless otherwise specified. Each request or reply is composed of a single Sequence with the ELS_Command code being specified in the first word of the Payload of the first frame of the Sequence.

The *ELS* dialog box is shown in *Image: Extended Link Services dialog box*.

Image: Extended Link Services dialog box



The fields and controls in this dialog box are described in *Table: Extended Link Services dialog box*.

Table: Extended Link Services dialog box

Field	Description
FLOGI	Select the *Flogi* option button and select *Edit* button to open the *FLOGI* configuration dialog box. Refer FLOGI for more information.
LS_ACC	Select the *LS_ACC* option button and select *Edit* button to open the *Ls_Acc* configuration dialog box. Refer LS_ACC for more information.
PLOGI	Select the *PLOGI* option button and select *Edit* button to open the *PLOGI* configuration dialog box. Refer PLOGI for more information.
FDISC	Select the *FDISC* option button and select *Edit* button to open the *F-DISC* configuration dialog box. Refer FDISC for more information.
LOGO	Select the *LOGO* option button and select *Edit* button to open the *ELS LOGO* configuration dialog box. Refer ELS Logo for more information.
SCR	Select the *SCR* option button and select *Edit* button to open the *ELS SCR* configuration dialog box. Refer SCR for more information.

Field	Description
RSCN	Select the *RSCN* option button and select *Edit* button to open the *ELS RSCN* configuration dialog box. Refer RSCN for more information.
LSRJT	Select the *LSRJT* option button and select *Edit* button to open the *ELS LS_RJT* configuration dialog box. Refer LS RJT for more information.

FLOGI

NOTE Refer LS_ACC, PLOGI, and FDISC for detailed information on each of these Extended Link services.

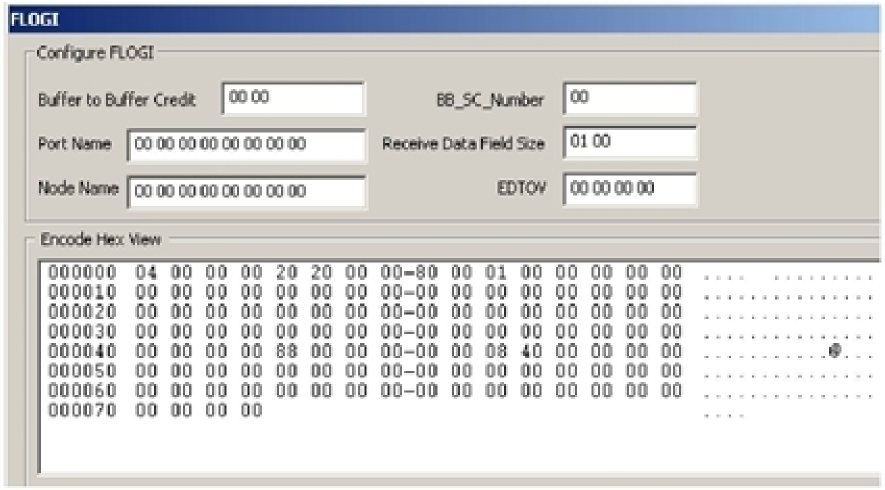
The Fabric Login (FLOGI) ELS transfers Service Parameters from the initiating Nx_Port to the FC_Port associated with the D_ID. The FLOGI frame provides the means by which an Nx_Port requests Login with the Fabric. Login with the Fabric is required for all Nx_Ports, regardless of the class supported. Communication with other Nx_Ports is not attempted until the Fabric Login procedure is complete.

The functions accomplished by a FLOGI login are as follows:

- It determines the presence or absence of a Fabric.
- If a Fabric is present, it provides the Nx_Port with the specific set of operating characteristics associated with the entire Fabric, F_Port_Name and Fabric_Name.
- If a Fabric is present, it provides the Fabric with the specific set of operating characteristics, N_Port_Name and Node_Name of the Nx_Port.
- If a Fabric is present, the Fabric optionally assigns or confirms the N_Port_ID of the Nx_Port that initiated the Login.
- If a Fabric is present, it initializes the buffer-to-buffer Credit.
- If the Nx_Port and the Fabric support Authentication, it enables the subsequent Nx_Port to Fabric Authentication.
- If the N_Port and the Fabric support Virtual Fabrics, it enables the subsequent negotiation of Virtual Fabrics parameters.

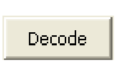
The *FLOGI* dialog box is shown in *Image: FLOGI dialog box.*

Image: FLOGI dialog box



The fields and controls in this dialog box are described in *Table: FLOGI dialog box*.

Table: FLOGI dialog box

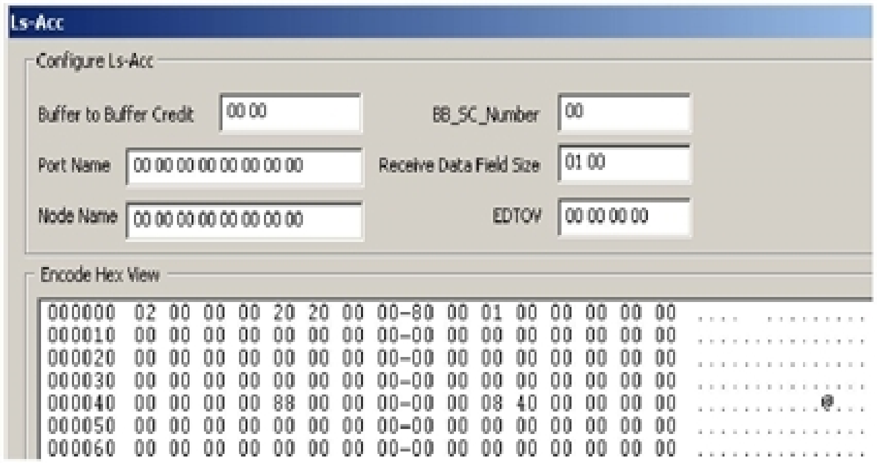
Field	Description
Buffer to Buffer Credit	It is the limiting value for BB_Credit_CNT in the buffer-to-buffer flow control model. If a Fabric is present, FLOGI initializes the buffer-to-buffer Credit.
BB_SC_ Number	The Buffer-to-buffer State Change Number (BB_SC_N) field specifies the Buffer-to-buffer State Change Number. It indicates that the sender of the FLOGI frame is requesting BB_SC_N number of frames to be sent between two consecutive BB_SCs primitives, and 2BB_SC_N number of R_RDY primitives to be sent between two consecutive BB_SCr primitives.
Port Name	The eight-byte field that identifies an FC_Port.
Node Name	The eight-byte name identifier associated with a node.
Receive Data Field Size	The field size of the data received from the FC_Port.
EDTOV	The EDTOV value.
Encode Hex View	The coded hexadecimal view.
	Select this button to decode.

LS_ACC

The Link Service Accept (LS_ACC) ELS reply Sequence notifies the originator of an ELS request that the ELS request Sequence has been completed. The Responder terminates the Exchange by setting the Last Sequence bit (Bit 20) in F_CTL on the last Data frame of the reply Sequence. The first byte of the Payload contains 02h. The remainder of the Payload is unique to the ELS request.

The Ls_Acc dialog box is shown in *Image: LS_ACC dialog box*.

Image: LS_ACC dialog box



The fields and controls in this dialog box are described in *Table: LS_ACC dialog box*.

Table: LS_ACC dialog box

Field	Description
Buffer to Buffer Credit	It is the limiting value for BB_Credit_CNT in the buffer-to-buffer flow control model.
BB_SC_ Number	The Buffer-to-buffer State Change Number (BB_SC_N) field specifies the Buffer-to-buffer State Change Number. It indicates that the sender of the FLOGI frame is requesting BB_SC_N number of frames to be sent between two consecutive BB_SCs primitives, and 2BB_SC_N number of R_RDY primitives to be sent between two consecutive BB_SCr primitives.
Port Name	The eight-byte field that identifies an FC_Port.
Node Name	The eight-byte name identifier associated with a node.
Receive Data Field Size	The field size of the data received from the FC_Port.
EDTOV	The EDTOV value.

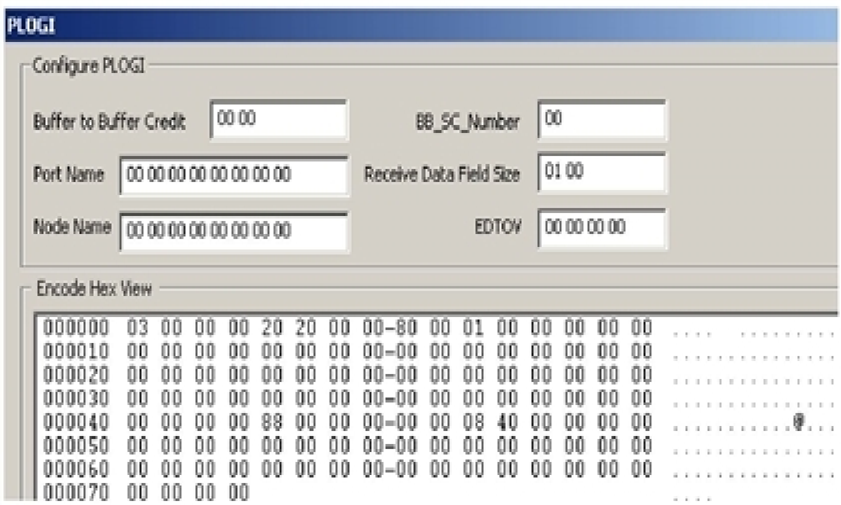
Field	Description
Encode Hex View	The coded hexadecimal view.
	Select this button to decode.

PLOGI

The PLOGI ELS transfers Service Parameters from the initiating Nx_Port to the FC_Port associated with the D_ID. The PLOGI frame provides the means by which an Nx_Port requests Login with another Nx_Port before other Data frame transfers.

The *PLOGI* dialog box is shown in *Image: PLOGI dialog box*.

Image: PLOGI dialog box



The fields and controls in this dialog box are described in *Table: PLOGI dialog box*.

Table: PLOGI dialog box

Field	Description
Buffer to Buffer Credit	It is the limiting value for BB_Credit_CNT in the buffer-to-buffer flow control model.
BB_SC_ Number	The Buffer-to-buffer State Change Number (BB_SC_N) field specifies the Buffer-to-buffer State Change Number. It indicates that the sender of the FLOGI frame is requesting BB_SC_N number of frames to be sent between two consecutive BB_SCs primitives, and 2BB_SC_N number of R_RDY primitives to be sent between two consecutive BB_SCr primitives.
Port Name	The eight-byte field that identifies an FC_Port.
Node	The eight-byte name identifier associated with a node.

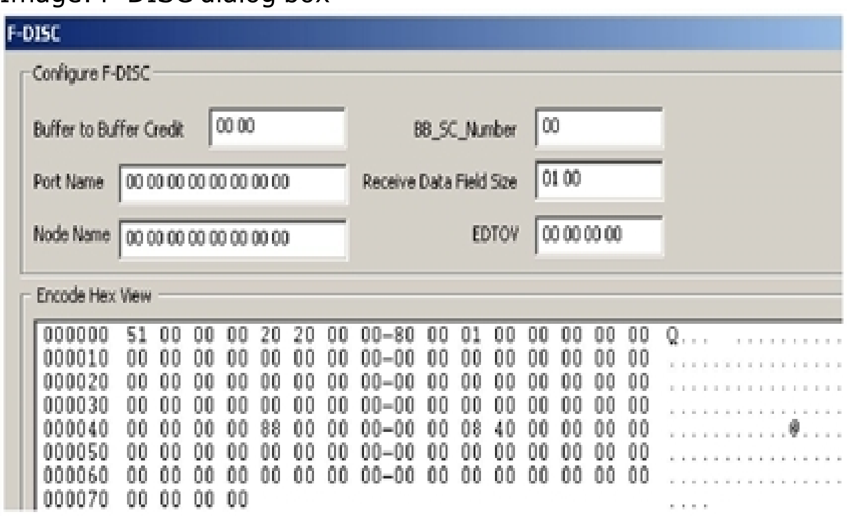
Field	Description
Name	
Receive Data Field Size	The field size of the data received from the FC_Port.
EDTOV	The EDTOV value.
Encode Hex View	The coded hexadecimal view.
	Select this button to decode.

FDISC

The Discover F_Port Service Parameters (FDISC) ELS transfers Service Parameters from the initiating Nx_Port to the Fx_Port at well-known F_Port_ID. This provides the means for the exchange of Service Parameters and the assignment of an additional N_Port_IDs without changing service parameters.

The *F-DISC* dialog box is shown in *Image: F-DISC dialog box*.

Image: F-DISC dialog box



The fields and controls in this dialog box are described in *Table: F-DISC dialog box*.

Table: F-DISC dialog box

Field	Description
Buffer to Buffer Credit	It is the limiting value for BB_Credit_CNT in the buffer-to-buffer flow control model.

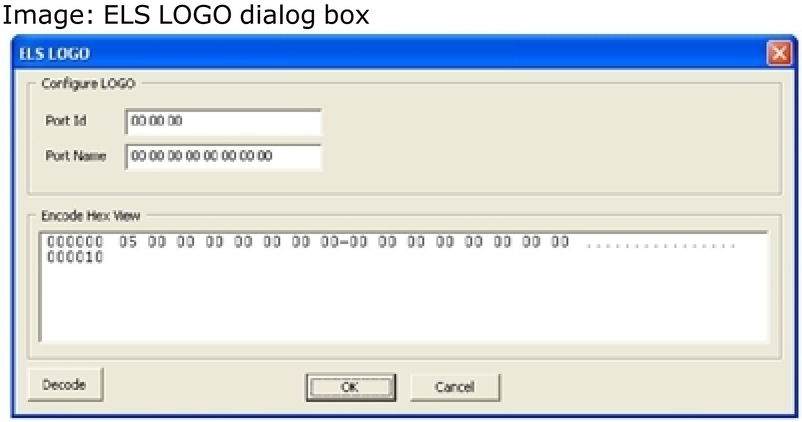
Field	Description
BB_SC_ Number	The Buffer-to-buffer State Change Number (BB_SC_N) field specifies the Buffer-to-buffer State Change Number. It indicates that the sender of the FLOGI frame is requesting BB_SC_N number of frames to be sent between two consecutive BB_SCs primitives, and 2BB_SC_N number of R_RDY primitives to be sent between two consecutive BB_SCr primitives.
Port Name	The eight-byte field that identifies an FC_Port.
Node Name	The eight-byte name identifier associated with a node.
Receive Data Field Size	The field size of the data received from the FC_Port.
EDTOV	The EDTOV value.
Encode Hex View	The coded hexadecimal view.
	Select this button to decode.

ELS Logo

The LOGO ELS provides a method for explicitly removing service between two Nx_Port_IDs or between an N_Port_ID and a Fabric. Logout releases resources, identifiers, and relationships associated with maintaining service between an Nx_Port_ID and a destination Nx_Port_ID or Fabric.

The ELS LOGO dialog box is shown in *Image: ELS LOGO dialog box*.

Image: ELS LOGO dialog box



The fields and controls in this dialog box are described in *Table: ELS LOGO dialog box*.

Table: ELS LOGO dialog box

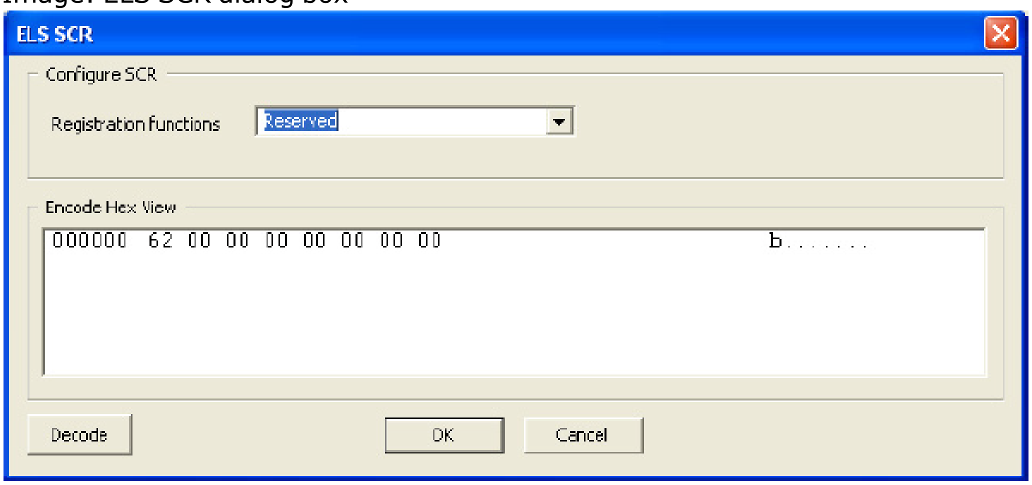
Field	Description
Port Id	The unique address identifier of the FC Port.
Port Name	The eight-byte field that identifies the FC Port.
Encode Hex View	The coded hexadecimal view.
	Select this button to decode.

SCR

The State Change Registration (SCR) ELS requests the Fabric Controller or Nx_Port to add the Nx_ Port that is sending the SCR Request to the list of Nx_Ports registered to receive the RSCN ELS.

The *ELS SCR* dialog box is shown in *Image: ELS SCR dialog box*.

Image: ELS SCR dialog box



The fields and controls in this dialog box are described in *Table: ELS SCR dialog box*.

Table: ELS SCR dialog box

Field	Description
Registration functions	The Registration Functions for SCR are available in the following formats: • Reserved: The reserved format with value 0. • Fabric Detection Registration: Register to receive all RSCN Requests issued by the Fabric Controller for events detected by the Fabric. • Nx-Port Detected Registration: Register to receive all RSCN Requests issued for events detected by the affected Nx_Port. • Full Registration: Register to receive all RSCN Requests issued. The RSCN Request returns all affected N_Port_ID pages. • Clear Registration: Removes any current RSCN registrations.

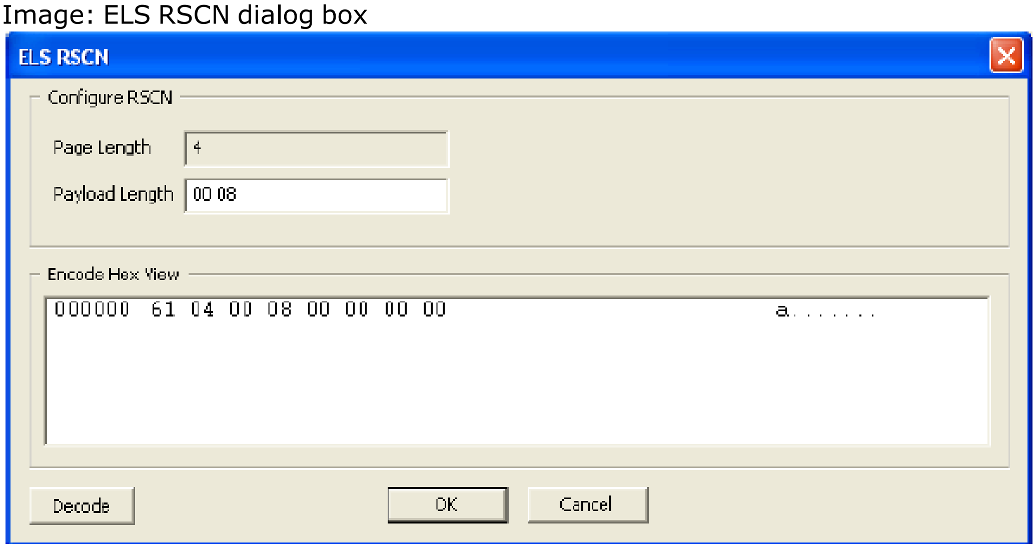
Field	Description
Encode Hex View	The coded hexadecimal view.
Decode	Select this button to decode.

RSCN

The Registered State Change Notification (RSCN) ELS is sent to registered Nx_Ports when an event occurs that may have affected the state of one or more Nx_Ports, or the ULP state within the Nx_Port. The term, state, is used here to refer to any condition of an Nx_Port that is considered important enough to notify other Nx_Ports of a change in that state. The RSCN provides an indication of the change of state that is being reported.

RSCN is intended to provide a timely indication of changes in nodes to avoid the considerable traffic that polling may generate. RSCN may be used to indicate a failed node, allowing the release of resources tied up by the failed node. RSCN may also be used to notify interested nodes of new devices coming online, and of changes within an online node that affect the operation of the system. The sender of the RSCN Request may coalesce several events into a single report.

Image: ELS RSCN dialog box



The fields and controls in this dialog box are described in *Table: ELS RSCN dialog box*.

Table: ELS RSCN dialog box

Field	Description
Page Length	This field is the length in bytes of an affected Port_ID page. This value is fixed at 04h.
Payload Length	This field is the length in bytes of the entire Payload, inclusive of the word 0. This value is a multiple of 4 bytes. The minimum value of this field is 8 bytes. The maximum value of this field is 1024 bytes.

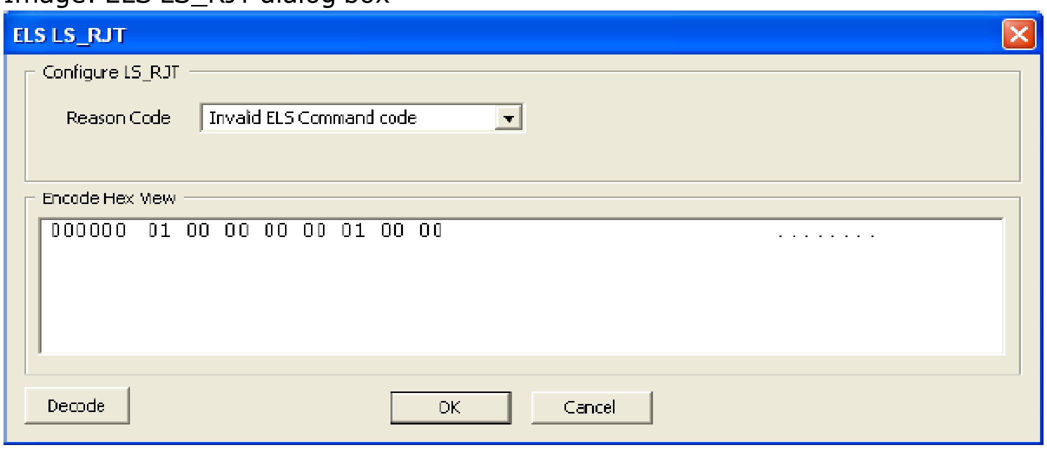
Field	Description
Encode Hex View	The coded hexadecimal view.
	Select this button to decode.

LS RJT

The Link Service Reject (LS_RJT) notifies the transmitter of a Link Service request that the Link Service request Sequence has been rejected. A four-byte reason code is contained in the Data Field. Link Service Reject is transmitted for a variety of conditions that are unique to a specific Link Service request. For example, if the Service Parameters specified in a Login frame were logically inconsistent or in error, a P_RJT frame would not be transmitted in response, but rather a Link Service Reject.

The ELS LS_RJT dialog box is shown in *Image: ELS LS_RJT dialog box*.

Image: ELS LS_RJT dialog box



The fields and controls in this dialog box are described in *Table: ELS LS_RJT dialog box*.

Table: ELS LS_RJT dialog box

Field	Description
Reason Code	The ELS LS_RJT reason codes are as follows: • Invalid ELS Command code: The ELS_Command code in the Sequence being rejected is invalid. • Logical Error: The request identified by the ELS_Command code and Payload content is invalid or logically inconsistent for the conditions present. • Logical busy: The Link Service is logically busy and unable to process the request at this time. • Protocol Error: This indicates that an error has been detected that violates the rules of the ELS Protocol that are not specified by other error codes. • Unable to Perform Command: The Recipient of a Link Service command is unable to perform the request at this time.

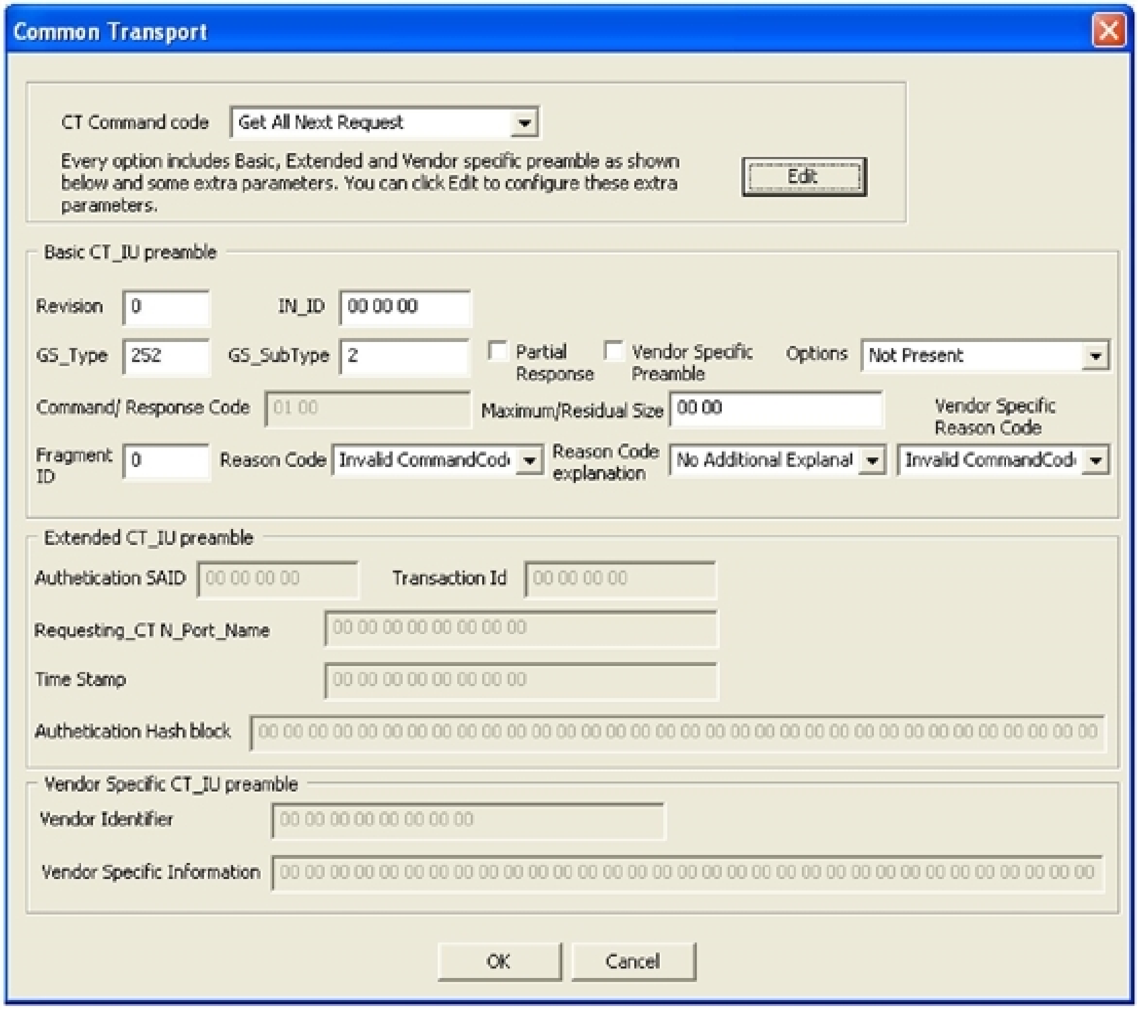
Field	Description
	• Command Not Supported: The Recipient of a Link Service command does not support the command requested. • Command Already In Progress: The command progress is tracked. • Vendor Specific Error: The Vendor specific error bits may be used by Vendors to specify additional reason codes.
Encode Hex View	The coded hexadecimal view.
	Select this button to decode.

Common Transport (CT)

Fibre Channel Generic Services share a Common Transport (CT) at the FC-4 level. The CT provides access to a Service with a set of service parameters that facilitates the usage of Fibre Channel properties. It also provides another level of multiplexing that simplifies the Server-to-Server communication for a distributed Service.

The Common Transport dialog box is shown in *Image: Common Transport dialog box*.

Image: Common Transport dialog box



The fields and controls in this dialog box are described in *Table: Common Transport dialog box*.

Table: Common Transport dialog box

Section	Fields/Controls	Description
CT Command Code	The Common Transport Command code options. The options in the list are as follows: • Get All Next Request • Get All Next Accept • Get Port Name Request • Get Port Name Accept	

Section	Fields/Controls	Description
	• Get Node Name Request • Get Node Name Accept • Get FC4 Type Request • Register Node Name Request NOTE Each CT Command code is included in Basic, Extended, and Vendor Specific preamble.	
	Edit	Select to open the *Common Transport Configuration* dialog box where

Section	Fields/Controls	Description
		you can configure various parameters for the selected CT Command Code.
Basic_CT_IU preamble	The 16-byte basic format in the Common Transport Information Unit preamble. It is shown as follows:	
Basic_CT_IU Preamble Format		

Word Bits	3322 2222 1098 7654	2222 1111 3210 9876	1111 1100 5432 1098	0000 0000 7654 3210
0	Revision	IN_ID		
1	GS_Type	GS_Subtype	Options	Reserved
2	Command/Response code		Maximum/Residual Size	
3	Fragment ID	Reason code	Reason Code Explanation	Vendor Specific

Section	Fields/Controls	Description
	Revision	This field denotes the revision of the CT protocol. If the revision version is 01h or 02h, it denotes a prior revision of the protocol. The default value is 0.
	GS_Type	This field denotes the type of Generic Service. The default value is 252.
	Command/Response Code	This field indicates whether the CT IU is a request or a response. If the CT_IU is a request, this field specifies the command to be

Section	Fields/Controls	Description
		performed. If the CT_IU is a response, this field indicates whether the request was accepted or rejected. The valid Command/Response code values are as follows: • Request CT_IU (0001-03FF) • Reserved for FC-SW-3 (0400-05FF) • Request CT_IU (0600-7EFF) • Common Request CT_IU (7F00-7FFF) • Reject Response CT_IU (8001) • Accept Response CT_IU (8002) • Reserved for FC-SW-3 (E000-FFFF) • Reserved (other values)
	Fragment ID	This field contains a value that identifies the fragment contained in the

Section	Fields/Controls	Description
		IU. The value contained in this field in the Request CT_IU is echoed by the service in the associated Response CT_IU.
	IN_ID	This field is provided to allow distributed Servers to communicate the identity of the original requestor. This field is not intended to enable third-party responses by distributed Servers. This field is set to zero by the Requesting_CT.
	GS_SubType	This field is used to indicate second level routing behind the N_ Port. It indicates the specific Server behind the Generic Service. The values in this field are provided by the individual service.
	Reason Code	This field contains the reason code associated with a Reject CT_IU. This field is reserved when the Command/Respon se code field indicates the CT_

Section	Fields/Controls	Description
		IU is not a Reject CT_IU. The Reason Code options in the list are as follows: • Invalid CommandCode: The command code passed in the Request CT_IU is not defined by the Server. • Invalid VersionLevel: The specified version level is not supported by the Server. • Logical Error: The request identified by the Request CT_IU command code and additional information content is invalid or logically inconsistent for the conditions present. • Invalid Ct Iu Size: The CT IU size is invalid for the Request CT IU

Section	Fields/Controls	Description
		command code. • Logical Busy: The Server is logically busy and unable to process the request at this time. • Protocol Error: This indicates that an error has been detected that violates the rules of the Server protocol that are not specified by other error codes. • Unable to PerformCommand Request: The Server is unable to perform the request. • Command Not Supported: The Server does not support the command requested. • Server Not Available: The server identified by the GS_Type and GS_

Section	Fields/Controls	Description
		Subtype is not available. • Session Could Not Be Established: A server session could not be established. • Vendor Specific Error: The Vendor Specific Field may be used by Vendors to specify additional reason codes.
	Partial Response	If selected, indicates that the response is incomplete. For example, when a Server is distributed amongst several switches, if one or more of the switches fails to respond, the Partial Response bit is used to indicate that those switches did not participate in the response cycle.
	Maximum/Residual Size	This field manages the size of the information returned in an Accept CT_IU.

Section	Fields/Controls	Description
		The default value is 00 00.
	Reason Code explanation	This field contains a reason code explanation associated with a Reject CT_IU. This field is reserved when the Command/Response code field indicates that the CT_IU is not a Reject CT_IU. The options in the field are as follows: • No Additional Explanation • Authorization Exception • Authentication Exception • DataBase Full • DataBase Empty • Processing Request • Unable To Verify Connection • Devices Not In Common Zone
	Vendor Specific Preamble	If selected, enables the *Vendor Specific CT_IU Preamble* section in the *Common Transport* section.

Section	Fields/Controls	Description
		This field contains a vendor specific reason code associated with a Reject CT_IU. This field is reserved when the Command/Response code field indicates that the CT_IU is not a Reject CT_IU.
	Options	This field denotes options used by the Requesting_ CT or Responding_ CT. The options are as follows: • Not Present • Retain Residual Info1 • Retain Residual Info2 • Transaction Id Valid1 • Transaction Id Valid2
	Vendor Specific reason Code	This field is associated with a Reject CT_IU.
Extended CT_IU preamble	The 88-byte extended format in the Common Transport Information Unit preamble. It is preceded by the 16-bytes basic CT IU preamble.	

Section	Fields/Controls	Description
	NOTE This section is enabled if any option, other than 'Not Present,' is selected in the *Options* list in *Basic_CT_IU preamble* section.	

Section	Fields/Controls	Description
Extended_CT_IU Preamble Format		

Word Bits	3322 2222 1098 7654	2222 1111 3210 9876	1111 1100 5432 1098	0000 0000 7654 3210
4	Authentication SAID			
5	transaction_id			
6...7	Requesting_CT N_Port_Name			
8...9	Time Stamp			
10...25	Authentication Hash Block			

Section	Fields/Controls	Description
	Authentication SAID	This field denotes the Secured Association Identifier that uniquely identifies the algorithm and key used to generate the Authentication Hash Block, as pre-arranged between the Requesting_CT and the Responding_CT. The default value is 00 00 00 00.
	Requesting_CT N_Port_Name	This field contains the value of the N_Port_Name of the Requesting_CT. The Responding_CT responds by using the same encoded N_Port_Name value in the Accept CT_IU or Reject CT_IU as is supplied in the Request CT_IU.

Section	Fields/Controls	Description
	Time Stamp	This field contains a time stamp value set by the CT sending the CT_IU. The Requesting_CT sets this value according to its time reference when it sends the CT_IU. The Responding_CT sets this value according to its time reference when it sends the CT_IU, or it may echo the value sent by the Requesting_CT. In all cases, the value of the time stamp consistently increases.
	Authentication Hash block	This field contains the encoded value of the hash generated by the identified algorithm and key.
	Transaction Id	This field contains an opaque value. The opaque value is not validated by the Responding_CT. The Responding_CT responds by using the same encoded transaction_id value in the Accept CT_IU or Reject CT_IU as is supplied in the Request CT_IU.

Section	Fields/Controls	Description
Vendor Specific CT_IU preamble	The vendor specific format in the Common Transport Information Unit preamble. The *Options* field in the Basic CT IU preamble indicates whether the Vendor Specific preamble is present. If the Vendor Specific preamble is present, it immediately follows the Basic CT_IU preamble if no Extended CT_IU preamble exists, or it immediately follows the Extended CT_IU preamble if that preamble exists.	

Section	Fields/Controls	Description
	NOTE This section is enabled if Vendor Specific Preamble check box in *Basic_CT_IU preamble* section is selected.	
Vendor Specific_CT_IU Preamble Format		

Word Bits	3322 2222 1098 7654	2222 1111 3210 9876	1111 1100 5432 1098	0000 0000 7654 3210
0..1	Vendor Identifier			
2...33	Vendor Specific Information			

Section	Fields/Controls	Description
(word layout above)		
	Vendor Identifier	This field contains the T10 Vendor ID of the vendor that defines the content of the Vendor Specific Information field.
	Vendor Specific Information	This field contains 32 words of vendor specific information.

CHAPTER 7

Frame Data–User Defined Fields (UDF)

The ***Frame Data*** tab in the *Stream Properties* dialog provides control over all aspects of packets transmitted by the Ixia hardware. These frames are also referred to as datagrams or packets in some contexts. Many frames may be generated in the processing of a stream. Many of the controls available allow the specification of a series of values applied to subsequent frames.

This chapter discusses UDF frame data structure. For other parts of frame data construction, see:

- Frame Data–Basic Frame Structure
- Frame Data–Protocol Control

This chapter covers:

- User Defined Fields
- UDF Counters for Individual Bytes
- UDF for Lava Load Module
- UDF for Xcellon-Multis Load Module
- UDF for QSFP-DD and CFP8 Load Modules
- UDF for T400 QDD and T400 OSFP Load Modules
- UDF for S400 QDD Load Modules
- UDF for CloudStorm Load Module
- UDF Configurable Step Size
- Standard UDF Configuration
- Advanced UDFs
- Table UDF

User Defined Fields

The User Defined Fields (UDF) control an independent 32-bit counter. There are several variations for the UDF fields, depending on the module. For all modules, at least four UDFs can be configured. For newer modules, five UDFs can be configured.

For many modules a *Table UDF* is available. Table UDF for more information. For a breakdown of which modules have specific UDF features, see Table 1-7 part 3 in the *Ixia Platform Reference Manual*.

For some modules there is a special set of UDFs with additional options. Advanced UDFs for additional information.

Table: UDF Characteristics per Module summarizes these variations.

Table: UDF Characteristics per Module

Module	Has UDF5	Has UDF8	Has Table UDF	Advanced UDFs
LM100TX / LM100TX3				
LM100TX8	X			X
LM100TXS8	X			X
LM100MII				
ALM1000T8 (no packet streams)				
ASM1000XMV12X-01	X		X	X
CPM1000T8 (no packet streams)				
ELM1000ST2 (no packet streams)				
LM1000T-5				
LM1000TX4 / LM1000TXS4	X		X	X
LM1000STX2	X		X	X
LM1000STX4	X		X	X
LM1000STXS2	X		X	X
LM1000STXS4	X		X	X
LSM1000XMS12-01 / LSM1000XMSR12-01	X		X	X
LSM1000XMV16-01 / LSM1000XMVR16-01	X		X	X
OLM1000STX24 / OLM1000STXS24	X		X	X
LM100FX / LM100FXSM				
LM1000SX / LM1000SX3				
LM1000LX				
LM1000GBIC / LM1000GBIC-P1				
LM1000SFP4 / LM1000SFPS4	X		X	X
LM622MR / LM622MR-512	X		X	X
LMOC12c / LMOC3c				
LMOC48c POS / LMOC48c POS-M				

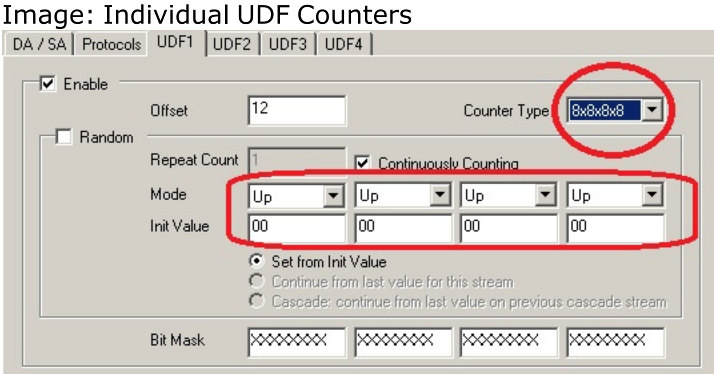
Module	Has UDF5	Has UDF8	Has Table UDF	Advanced UDFs
LMOC48c BERT / LMOC48 POS BERT				
LMOC48VAR				
LMOC192cPOS			X	
LMOC192c VSR-POS			X	
LMOC192c BERT				
LMOC192c VSR-BERT				
LMOC192c POS+BERT			X	
LMOC192c VSR-POS+BERT			X	
LMOC192c POS+WAN			X	
LMOC192c POS+BERT+WAN			X	
LM10GE LAN / LM10GE LAN-M			X	
LM10GE WAN			X	
LSM10G1-01	X		X	X
LSM10GL1-01	X		X	X
LSM10GXL6-01	X		X	X
LM10GE XAUI			X	
LM10GE XAUI+BERT			X	
LM10GE XAUI BERT only			X	
LM10GE XENPAK / LM10GE XENPAK-M			X	
LM10GE XENPAK+BERT / LM10GE XENPAK-MA+BERT			X	
LM10GE XENPAK BERT only			X	
LM10G			X	
LSM10GXM3-01 / LSM10GXMR3-01	X		X	X
LSM10GXM4-01 / LSM10GXMR4-01	X		X	X
LSM10GXM8-01 / LSM10GXMR8-01	X		X	X

Module	Has UDF5	Has UDF8	Has Table UDF	Advanced UDFs
MSM2.5G1-01	X		X	X
MSM10G1-01	X		X	X
PLM1000T4-PD (no packet streams)				
LSM1000POE4-02 (no packet streams)				
AFM1000SP-01 (no packet streams)				

UDF Counters for Individual Bytes

The Gigabit, LM-GBIC, LM100TX, LMOC12c/LMOC3c POS and LM1000T-5 modules have an option for configuring complex variations of the 32-bit counter, byte-by-byte, as shown for a Gigabit module in Image: Individual UDF Counters. In this example, the counter has been divided into four 8-bit counters, each with an 8-bit mask.

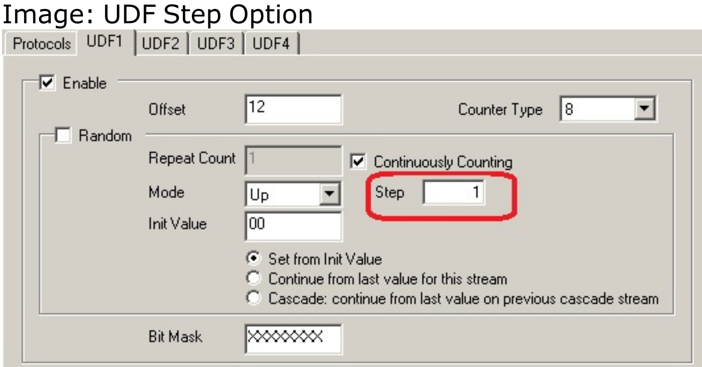
Image: Individual UDF Counters



UDF Configurable Step Size

Some load modules also have a configurable step size for counting, as shown in Image: UDF Step Option.

Image: UDF Step Option



The fields and controls in these dialogs are described in *Table: User Defined Fields, Standard*.

Standard UDF Configuration

For load modules with 4 UDFs, the fields are defined in the following table. (**Note**: Not all modules have all these fields.) Refer to *Table: UDF Characteristics per Module*to identify modules that do not have 5 UDFs..

Table: User Defined Fields, Standard

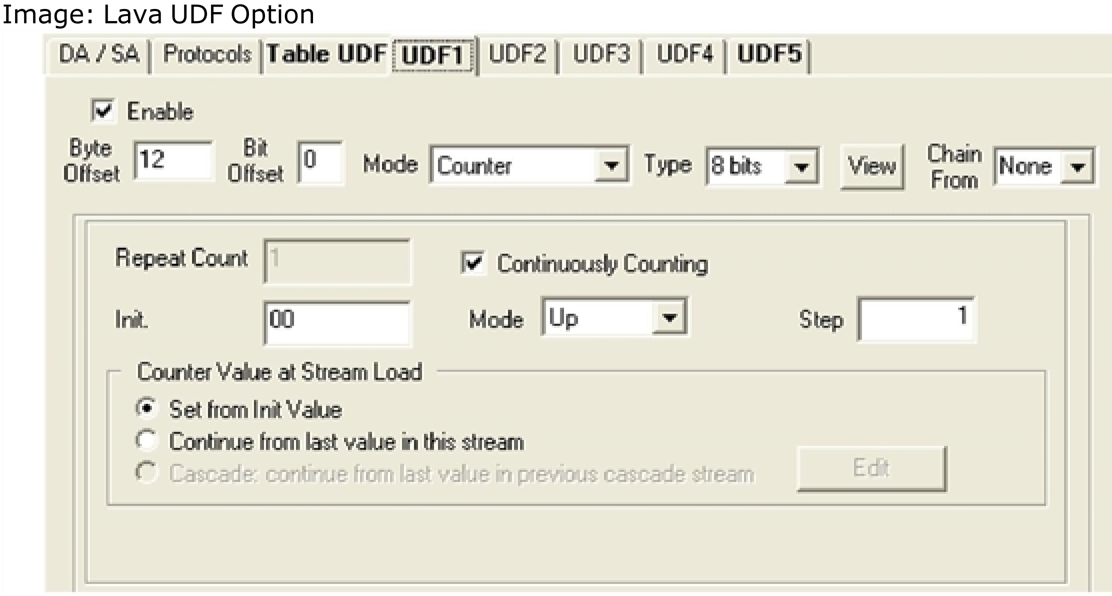
Field/Control	Description
Enable	Must be selected for the particular UDF to be active.
Offset	The offset from the start of the frame (in bytes).
Counter Type	The use and division of the 32-bit counter. The values '8,' '16,' '24,' and '32' indicate counters of their respective lengths. For modules that support configuration of individual bytes, the following counter types are available: • 8 • 16 • 8x8 • 24 • 16x8 • 8x16 • 8x8x8 • 32 • 24x8 • 16x16 • 16x8x8 • 8x24 • 8x16x8 • 8x8x16 • 8x8x8x8
Random	If selected, the counter values will change randomly, and the configuration fields in the box will be dimmed.
Repeat Count/Continuous Counting	If the Continuous Counting check box is selected, then the counter will continuously count. If not, then the value in the Repeat Count field is used to control the number of times that the counter will increment. When the Repeat Count is exhausted, the value resets to 0 and counting is continued.
Mode	Up or Down controls the direction of counting.
Step	(LMOC48c, LMOC-192c, & 10 Gig modules)

Field/Control	Description
	The increment step for Up or Down increment mode can be specified. (Default = 1).
Init Value	The initial value for the counter, as masked by the Bit Mask Value. This value will be incremented or decremented by the value specified in the *Step* field.
Set from Init Value	If selected, the counter resets and starts counting from the specified initial value.
Continue from last value for this stream	If selected, the counter will continue from the last value that was used for this stream.
Cascade: continue from last value on previous cascade stream	If selected, the Cascading UDF option will be enabled. This allows a UDF counter for a 'cascade' stream to continue from the value at the end of the previous cascade stream, rather than being reset.
Bit Mask	For each of the counters, a correspondingly large set of bit values which control whether each value will be held at '0,' '1' or allowed to change ('X').

UDF for Lava Load Module

Lava consists of five UDFs (UDFs 1 - 5) that provide additional counter modes and types. The structure is shown in the following image:

Image: Lava UDF Option



Refer to the following table for the UDFs supported by load module:

Table: User Defined Fields for Load Module

Field/Control	Description
Enable	Must be selected for the particular UDF to be active.
Byte Offset	The offset from the start of the frame (in bytes). The default value is 12 bytes.
Bit Offset	Adds another offset just after the bytes specified in Byte Offset. The range is 0 to 7 bits. Default = 0.
Mode	The available modes are the following: • Counter • Value List (For more information, see UDF Counter Mode–Value List) • Nested Counter (For more information, see UDF Counter Mode–Nested Counter) • Random • IPV4
Type	The choices of '8,' '16,' '24,' and '32' indicate single counters of their respective lengths.
Chain From	Allows to select what UDF the current UDF should chain from. When this option is employed, the UDF will stay in its initial value until the UDF it is chained from reaches its terminating value. The following rules apply to chaining UDFs: • Chain loops should not be created as it will cause data failures (that is, UDF 5 from UDF 3 from UDF 1 from UDF 5 is an illegal chain, as it creates a loop). • Only one UDF can be chained from, though multiple UDFs can chain from the same UDF. • Table UDFs cannot be chained from. • UDFs in random mode cannot be chained to. • For Nested Counter/IPv4 mode, the chain will trigger from the inner loop count and NOT the outer loop count. • If Cascade UDF (UDF2) uses the Chained From option, Cascade will be turned off. • UDF2 cannot be chained to if Cascade is enabled. • If UDF(n) is chained from a continuous mode UDF, the chained UDF will reach its terminating count after 2^32 iterations. Hence, UDF(n) will start after 2^32 iterations. The pull-down list always shows all UDFs, but only enabled UDFs can be chained to.

UDF for Xcellon-Multis Load Module

Xcellon-Multis consists of ten UDFs (UDFs 1 - 10) that provide additional counter modes and types. The structure is shown in the following image:

image:Xcellon-Multis UDF Option

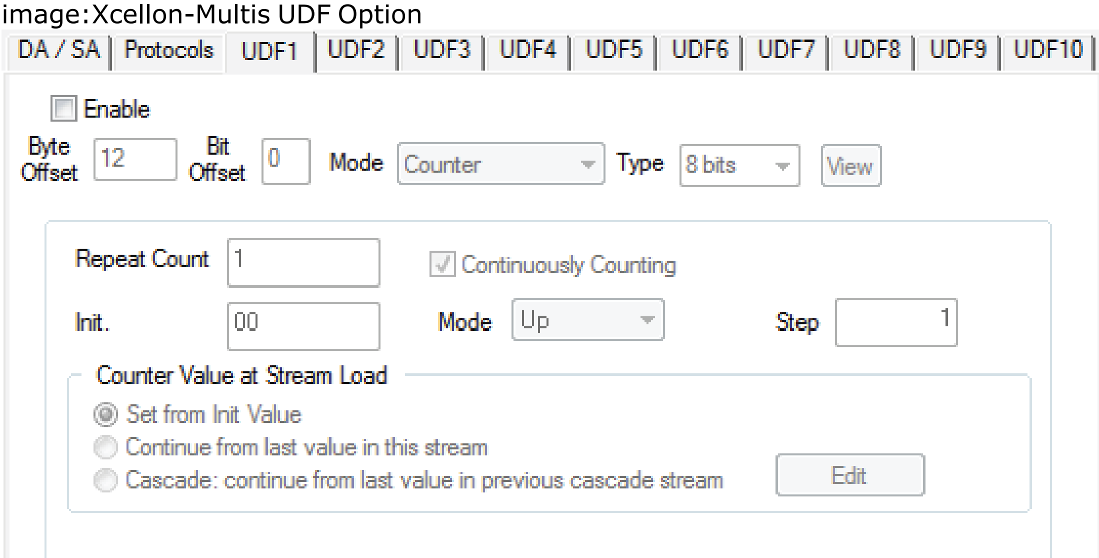


table:User Defined Fields for Load Module

Section	Field/Control	Usage
Header	Enable	Must be selected for the particular UDF to be active.
	Byte Offset	The offset from the start of the frame (in bytes).
	Bit Offset	Adds another offset just after the bytes specified in Byte Offset. The range is 0 to 7 bits. Default = 0.
	Mode	The available modes are the following: • Counter • Value List (For more information, see UDF Counter Mode–Value List) • Nested Counter (For more information, see UDF Counter Mode–Nested Counter) • Random
	Type	The choices of '8,' '16,' '24,' and '32' indicate single counters of their respective lengths.
	View	Select to view the Affected Bits. This is the UDF layout as currently configured. See View UDF Layout .
Window	Repeat Count	The Repeat Count field is active only when the Continuously Counting check box is not selected. This field is used to control the

Section	Field/Control	Usage
		number of times
	Continuously Counting	If the Continuously Counting box is selected, then the counter will continuously count, with default increment step = 1.
	Init. (Initial Value)	The initial value for the counter, as masked by the Bit Mask Value. It is incremented or decremented by a value specified in the Step field. The default value in Tcl is 08 00.
	Mode	Up or Down increment mode controls the direction of counting.
	Step	The increment step for Up or Down increment mode can be specified. (Default = 1).
	Set from Init Value	Select to reset the counter to the Initial Value for each stream.
	Continue from last value in this stream	('Self-cascading UDFs') Select to reset the counter to the last value of this stream.

UDF for QSFP-DD and CFP8 Load Module

QSFP-DD and CFP8 consist of ten UDFs (UDFs 1 - 10) that provide additional counter modes and types. The structure is shown in the following images:

image: QSFP-DD UDF Option

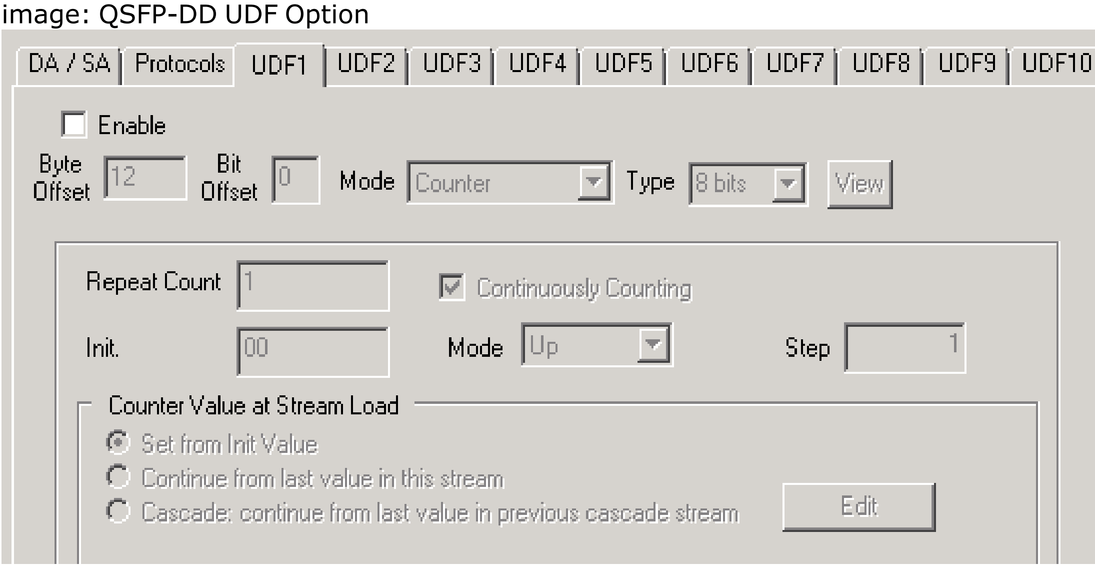


image: CFP8 UDF Option

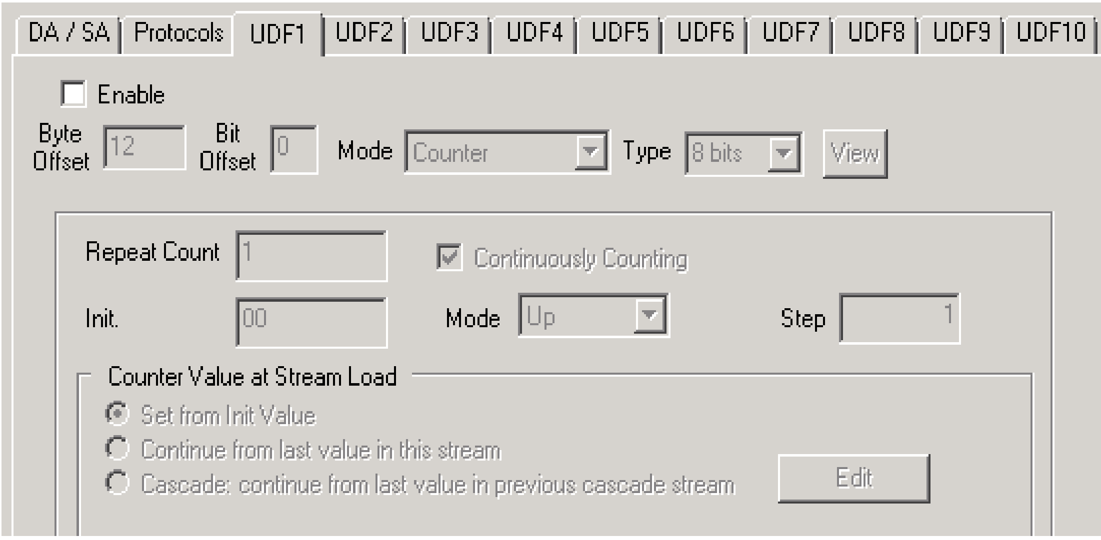


table: User Defined Fields for QSFP-DD and CFP8 Load Module

Section	Field/Control	Usage
Header	Enable	Must be selected for the particular UDF to be active.
	Byte Offset	The offset from the start of the frame (in bytes).
	Bit Offset	This feature is not supported on QSFP-DD and CFP8.
	Mode	The available modes are the following:Counter Value List (For more information, see UDF Counter Mode–Value List) Nested Counter (For more information, see UDF Counter Mode–Nested Counter) Random
	Type	The choices of '8,' '16,' '24,' and '32' indicate single counters of their respective lengths.
	View	This feature is not supported on QSFP-DD and CFP8.
Window	Repeat Count	The Repeat Count field is active only when the Continuously Counting check box is not selected. This field is used to control the number of times
	Continuously Counting	If the Continuously Counting box is selected, then the counter will continuously count, with default increment step = 1.
	Init. (Initial Value)	The initial value for the counter, as masked by the Bit Mask Value. It is incremented or decremented by a value specified in the Step field. The default value in Tcl is 08 00.
	Mode	Up or Down increment mode controls the direction of counting.
	Step	The increment step for Up or Down increment mode can be specified. (Default = 1).

Section	Field/Control	Usage
	Set from Init Value	Select to reset the counter to the Initial Value for each stream.
	Continue from last value in this stream	This feature is not supported on QSFP-DD and CFP8.
	Cascade: continue from last value on previous cascade stream	This feature is not supported on QSFP-DD and CFP8.

UDF for T400 QDD and T400 OSFP Load Modules

T400 QDD and T400 OSFP consist of ten UDFs (UDFs 1 - 10) that provide additional counter modes and types. The structure is shown in the following images:

image: QDD UDF Option

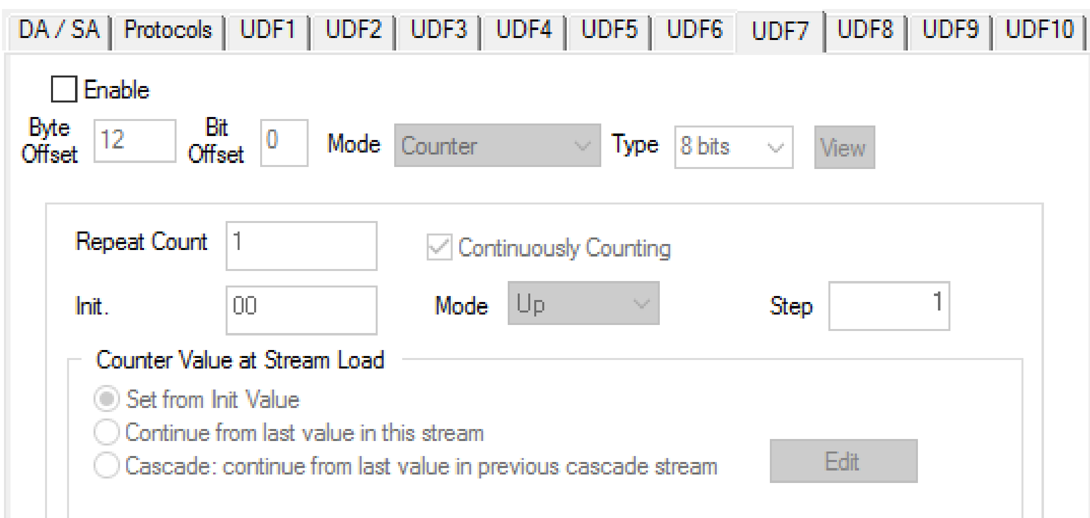


image: OSFP UDF Option

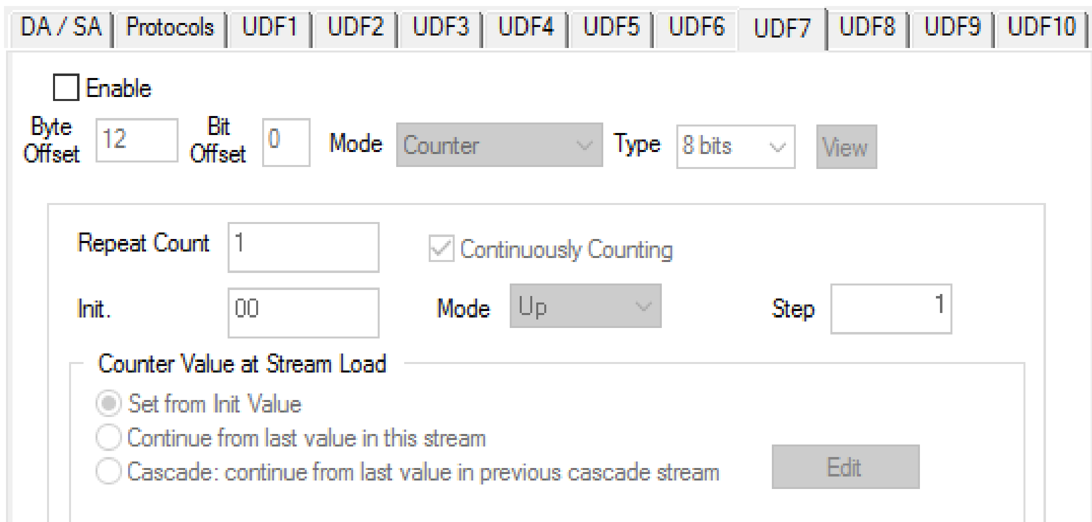


table: User Defined Fields for QDD and OSFP Load Modules

Section	Field/Control	Usage
Header	Enable	Must be selected for the particular UDF to be active.
	Byte Offset	The offset from the start of the frame (in bytes).
	Bit Offset	This feature is not supported on QDD and OSFP.
	Mode	The available modes are the following: Counter Value List (For more information, see UDF Counter Mode–Value List) Nested Counter (For more information, see UDF Counter Mode–Nested Counter) Random
	Type	The choices of '8,' '16,' '24,' and '32' indicate single counters of their respective lengths.
	View	This feature is not supported on QDD and OSFP.
Window	Repeat Count	The Repeat Count field is active only when the Continuously Counting check box is not selected. This field is used to control the number of times
	Continuously Counting	If the Continuously Counting box is selected, then the counter will continuously count, with default increment step = 1.
	Init. (Initial Value)	The initial value for the counter, as masked by the Bit Mask Value. It is incremented or decremented by a value specified in the Step field. The default value in Tcl is 08 00.
	Mode	Up or Down increment mode controls the direction of counting.
	Step	The increment step for Up or Down increment mode can be specified. (Default = 1).

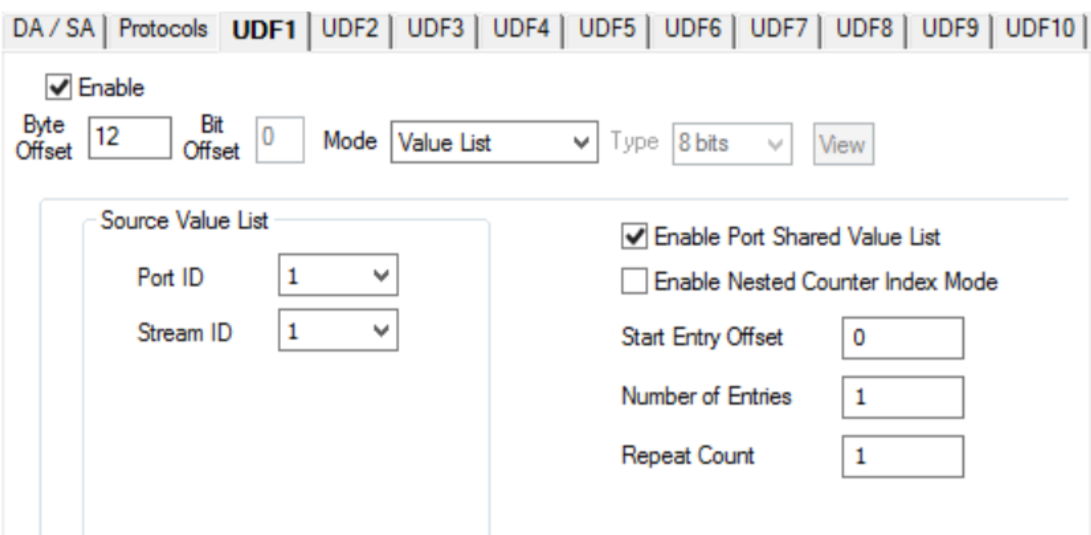
Section	Field/Control	Usage
	Set from Init Value	Select to reset the counter to the Initial Value for each stream.
	Continue from last value in this stream	This feature is not supported on QDD and OSFP.
	Cascade: continue from last value on previous cascade stream	This feature is not supported on QDD and OSFP.

UDF for S400 QDD Load Modules

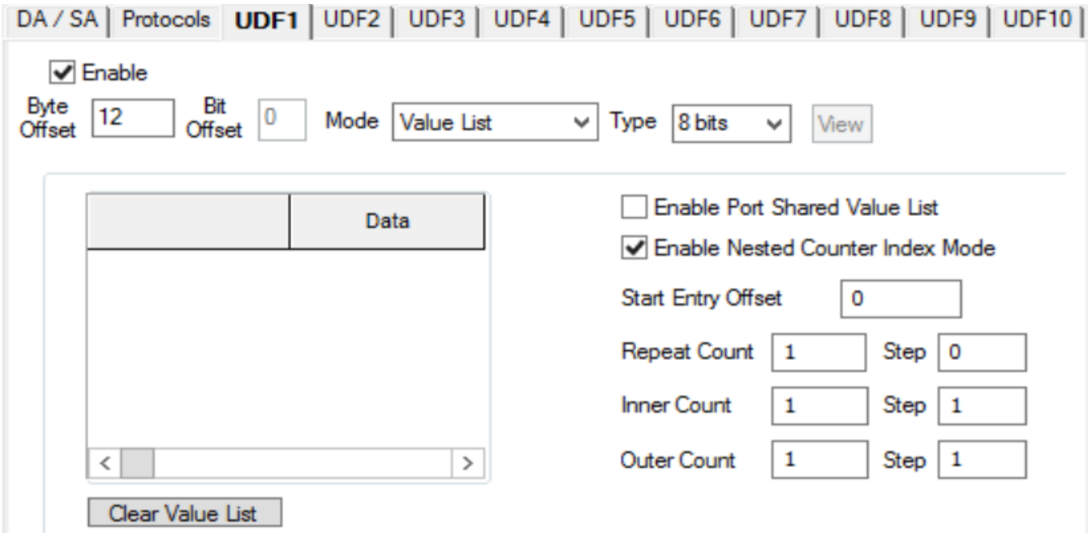
Compared to other load modules, value list size is significantly lower in this load module as the external value list memory has been removed and relocated to inside FPGA.

Port Shared Value List for S400 QDD LM

S400 QDD allows for packing of the Value List entries into 1 or 2 bytes, besides the default 4-byte entry size, in order to allow a more efficient usage of the smaller memory area.



Section	Field/Control	Usage
Header	Enable	Must be selected for the particular UDF to be active.
	Byte Offset	The offset from the start of the frame (in bytes).
	Bit Offset	This feature is not supported on QDD and OSFP.
	Mode	The available modes are the following: Counter Value List (For more information, see UDF Counter Mode–Value List) Nested Counter (For more information, see UDF Counter Mode–Nested Counter) Random
	Type	The choices of '8,' '16,' '24,' and '32' indicate single counters of their respective lengths.
	View	This feature is not supported on QDD and OSFP.
Source Value List	Port ID	The option to select the port from where the existing value list will be reused. The list of ports will be based on the front panel port list. The default is the current port.
	Stream ID	The option to select the stream from which the existing value list will be reused. The list of streams will be filled in based on the port selection and filtered to show only the streams with value list mode UDFs enabled. The source stream has to have a valid value list enabled, not a shared one. The default is the first stream from the list.
	Enable Port Shared Value List	The option to enable port shared value list option. The value list will be shared from the same UDF of another port and stream as provided in portID and StreamID under Source Value List box.
	Start Entry Offset	Specify which entry in the source value list will serve as the first entry in the current value list. It allows the reuse of a smaller area in the source value list. The default is zero.
	Number of Entries	Specify how many entries will be reused from the Start Entry Offset. The default is zero or the size of the selected value list. The maximum allowed is the size of the selected value list.
	Repeat Count	See Nested UDFs–Example.



Section	Field/Control	Usage
	Enable Nested Counter Index Mode	The option to enable the nested counter indexing mode based on the value list entries. In this mode the you can enter the value list entries in the grid. This option can also be used along with **Enable Port Shared Value List**. In that case, nested counter can also be used in the shared value list.
	Repeat Step	See Nested UDFs–Example.
	Inner Count	See Nested UDFs–Example.
	Inner Step	See Nested UDFs–Example.
	Outer Count	See Nested UDFs–Example.
	Outer Step	See Nested UDFs–Example.

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UDF for CloudStorm Load Module

CloudStorm consists of ten UDFs (UDF 1 - 10) that provide additional counter modes and types. The structure is shown in the following image:

image:CloudStorm UDF Option

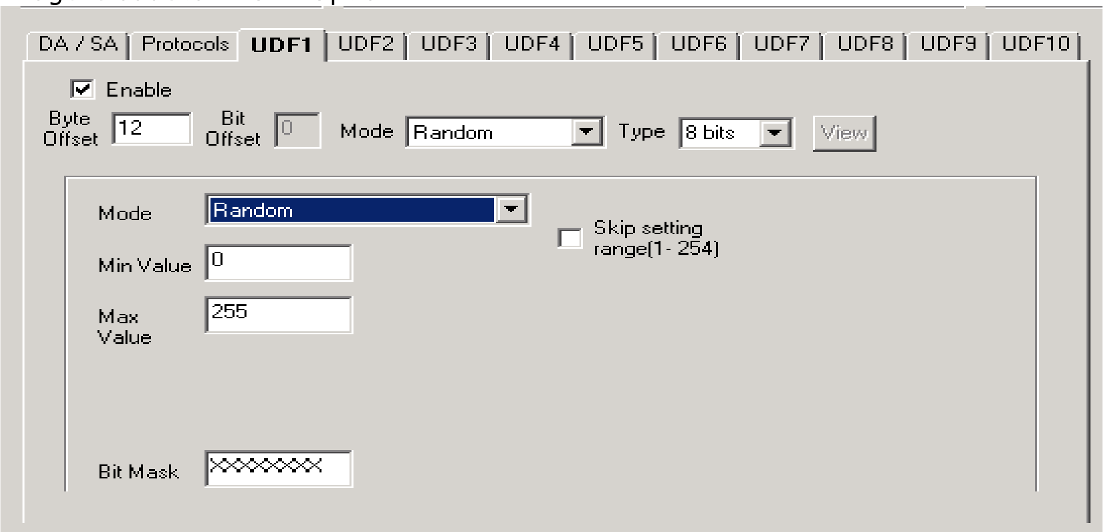


table:User Defined Fields for Load Module

Section	Field/Control	Usage
Header	Enable	Must be selected for the particular UDF to be active.
	Byte Offset	The offset from the start of the frame (in bytes).
	Bit Offset	This features is not supported on CloudStorm.
	Mode	The available modes are the following:Counter Value List (For more information, see UDF Counter Mode–Value List) Nested Counter (For more information, see UDF Counter Mode–Nested Counter) Random
	Type	The choices of '8,' '16,' '24,' and '32' indicate single counters of their respective lengths.
	View	Select to view the Affected Bits. This is the UDF layout as currently configured. See View UDF Layout .
Window	Repeat Count	The Repeat Count field is active only when the Continuously Counting check box is not selected. This field is used to control the number of times
	Continuously Counting	If the Continuously Counting box is selected, then the counter will continuously count, with default increment step = 1.
	Init. (Initial	The initial value for the counter, as masked by the Bit Mask Value. It is incremented

Section	Field/Control	Usage
	Value)	or decremented by a value specified in the Step field. The default value in Tcl is 00.
	Mode	Up or Down increment mode controls the direction of counting.
	Step	The increment step for Up or Down increment mode can be specified. (Default = 1).
	Set from Init Value	Select to reset the counter to the Initial Value for each stream.
	Continue from last value in this stream	This features is not supported on CloudStorm.
	Skip Setting	Value to skip for counter range. NOTE This option is available if **Continuously Counting** check box is not selected.

Advanced UDFs - UDF Counter mode - Random

The Random counter mode for CloudStorm is shown in the following image:

Image: UDF Counter Mode - Random

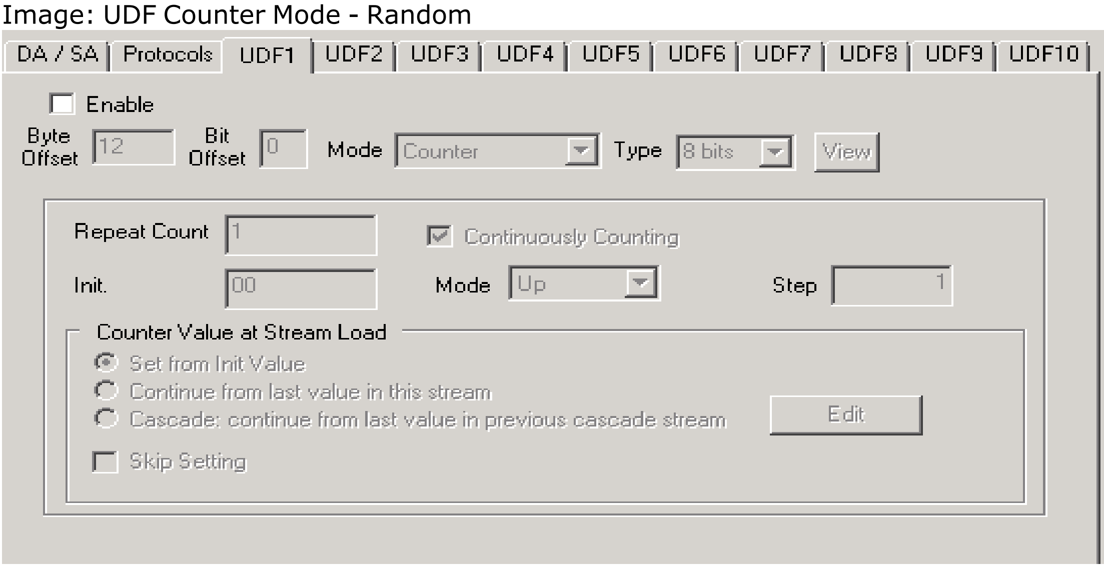


table:Advanced User Defined Fields for Load Module

Section	Field/Control	Usage
Header	Enable	Must be selected for the particular UDF to be active.

Section	Field/Control	Usage
	Byte Offset	The offset from the start of the frame (in bytes).
	Bit Offset	This features is not supported on CloudStorm.
	Mode	Shows the selected mode.
	Type	The choices of '8,' '16,' '24,' and '32' indicate single counters of their respective lengths.
	View	Select to view the Affected Bits. This is the UDF layout as currently configured. See View UDF Layout .
Window	Mode	The available modes are the following: • Random • Random with seed • Random with starting value
	Min. Value	Minimum value for random range.
	Max. Value	Maximum value for random range
	Skip Setting Range	This value will not be included. NOTE Skip UDF option is available only for UDF1, UDF3, UDF4, UDF5, UDF7 and UDF9.
	Bit mask	Configures which bit values will be set to '0', '1' or allowed to change ('X').
	Random with seed	Seed value used to generate random values. NOTE This option is available for random modes 'Random with seed' and 'Random with starting value'.
	Start Val	First value to be used for the generated random values. NOTE This option is available for random mode 'Random with starting value'.

When the Random counter mode is selected, a Bit Mask field appears. The length of this field matches the number of bits selected in the Counter Type field (8, 16, 24, or 32 bits). Random values, the selected number of bits in length, will be used in conjunction with the bit mask. You can control which mask bit values will be set to '0,' '1' or allowed to change ('X').

Advanced UDFs

For some modules there are five UDFs (UDFs 1 - 5) that provide advanced counter modes and types. Refer to *Table: UDF Characteristics per Module* to identify modules with this feature.

Availability depends on the UDF number. Furthermore, older OC-48c/OC-192c load modules can use two of the advanced UDFs. (UDF Counter Modes for Advanced UDFs for details.)

The contents of the lower part of the UDF are different depending on the setting in the Counter Mode field. The available counter modes are:

- UDF Counter Mode–Counter—The format for this mode is similar to those for the typical UDF. This mode is available for OC-48c and OC-192c cards.
- UDF Counter Mode–Random—This mode provides a configurable field for a Bit Mask. This mode is available for OC-48c and OC-192c cards.
- UDF Counter Mode–Value List—This mode allows to define data values for the UDF.
- UDF Counter Mode–Range List—This mode allows to define ranges of values for the UDF.
- UDF Counter Mode–Nested Counter—This mode allows to set up inner and outer counting loops for the UDF.
- UDF Counter Mode–IPv4—This mode allows to set up inner and outer counting loops for the UDF. For LM622MR cards, it is only available in POS mode.

Bit Size Counter

For some modules, the Counter Type parameter has been modified so that the size is exclicked in bit level, from 1 bit to 32 bits. The Offset Option can also specify the offset in bit level.

Affected modules include the following:

- LM1000STXS4, LM1000STXS24, LM1000XMS12,
- LM622MR / LM622MR-512
- LSM10G1-01, LSM10GL1-01, LSM10GXL6-01
- MSM2.5G1-01 and MSM10G1-01
- LSM1000XMV16-01

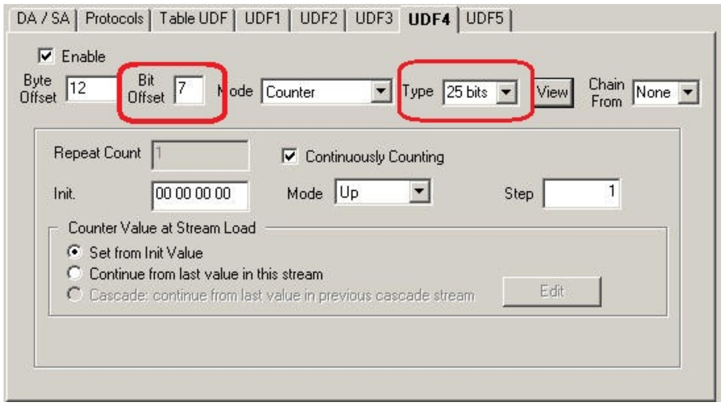
The following Advanced UDF Counter modes are affected, and field definitions are located in the respective topics:

- Counter Mode: UDF Counter Mode–Counter
- Range List Mode: UDF Counter Mode–Range List
- Nested Counter Mode:UDF Counter Mode–Nested Counter

The offset option has two components for these modules:

- **Byte Offset** :Origins from beginning of the packet, which is 0. The range is 0 to (FrameSize - 1) bytes.
- **Bit Offset** :Adds another offset just after the bytes specified in *Byte Offset*. The range is 0 to 7 bits.

Image: UDF Bit Size Counter Option



The maximum size of the UDF (a 32-bit counter) is 32 bits, so the size of the UDF depends on the Bit Offset. See *Table: Maximum Size of UDF*.

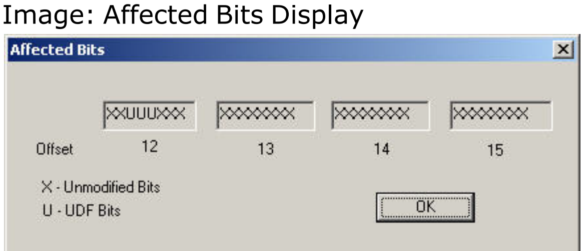
Table: Maximum Size of UDF

Bit Offset	0	1	2	3	4	5	6	7
Maximum Size (bits)	32	31	30	29	28	27	26	25

View UDF Layout

Select the **View** button (when active) to view the 32 bit map layout of the selected UDF.

Image: Affected Bits Display



For example if you select Bit Offset 2, Type (width) 3 bits and Byte Offset 12, then the UDF layout appears as shown above.

- X = unmodified bits from original packet
- U = UDF bits

So at Byte Offset 12, the first 2 bits (XX) are unmodified bits (from the packet). Then the next 3 bits UUU are from the UDF. And rest are again unmodified bits.

UDF Counter Modes for Advanced UDFs

The number and types of Counter Modes available for these UDFs vary depending on the UDF number, as shown in *Table: UDF Counter Modes for Advanced UDFs*.

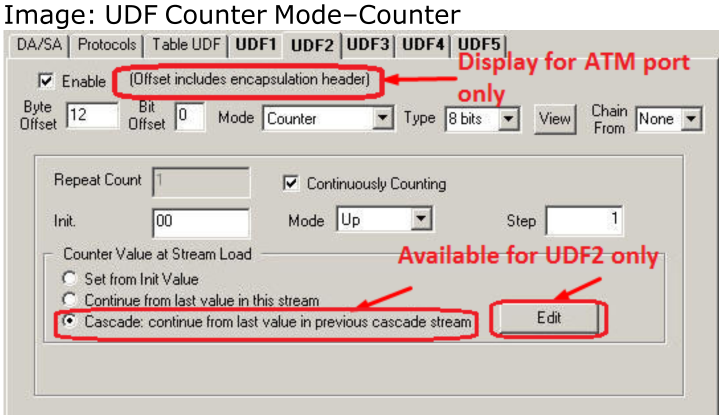
Table: UDF Counter Modes for Advanced UDFs

UDF Number	Counter Modes
UDF1	• Counter • Random • Value List • Range List (not available for ATM)
UDF2	• Counter • Random • Value List
UDF3	• Counter • Random • Value List
UDF4	• Counter • Random • Value List • Nested Counter • IPv4
UDF5	• Counter • Random • Value List • Nested Counter • IPv4

UDF Counter Mode–Counter

When the Counter Mode field is set to *Counter*, the UDF appears as shown in *Image: UDF Counter Mode–Counter*.

Image: UDF Counter Mode–Counter



The fields and controls in this dialog are described in *Table: UDF Counter Mode–Counter*.

Table: UDF Counter Mode–Counter

Section	Field/Control	Usage
Header	Enable	This check box enables the UDF. NOTE For ATM ports, the note shows 'Offset includes encapsulation header'
	Byte Offset	The offset (in bytes) from the start of the frame. The default is 12 bytes.
	Bit Offset	For modules with Advanced UDFs: Enter the offset in bits. This will add another offset just after the bytes specified in *Byte Offset*. The range is 0 to 7 bits. Default = 0.
	Mode	Selects the UDF Counter mode. In this case, **Counter**. The configuration options change depending on the mode selected. The options are shown in *Table: UDF Counter Modes for Advanced UDFs*.
	Type	The use and division of the 32-bit counter. For modules with Advanced UDFs: 1 bit to 32 bits. The values '8,' '16,' '24,' and '32' indicate counters of their respective lengths. For modules that support configuration of individual bytes, the following counter types are available: • 8 • 16 • 8x8 • 24 • 16x8 • 8x16 • 8x8x8 • 32 • 24x8 • 16x16 • 16x8x8 • 8x24 • 8x16x8 • 8x8x16 • 8x8x8x8
	View	Select to view the Affected Bits. This is the UDF layout as currently configured. View UDF Layout.

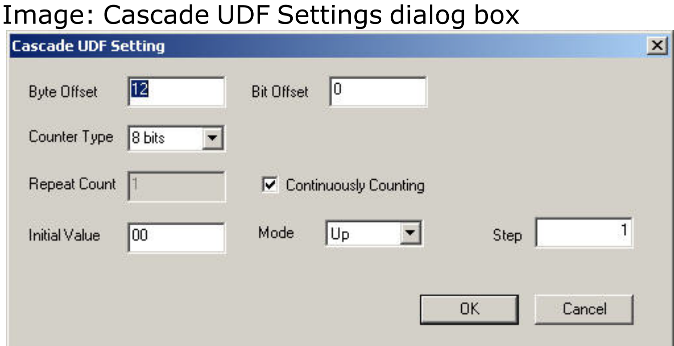
Section	Field/Control	Usage
	Chain From	Allows to select what UDF the current UDF should chain from. When this option is employed, the UDF will stay in its initial value until the UDF it is chained from reaches its terminating value. The following rules apply to chaining UDFs: • Chain loops should not be created as it will cause data failures (that is, UDF 5 from UDF 3 from UDF 1 from UDF 5 is an illegal chain, as it creates a loop). • Only one UDF can be chained from, though multiple UDFs can chain from the same UDF. • Table UDFs cannot be chained from. • UDFs in random mode cannot be chained to. • For ATM ports, a UDF cannot be chained from if it is in Value List mode. • For Nested Counter/IPv4 mode, the chain will trigger from the inner loop count and NOT the outer loop count. • If Cascade UDF (UDF2) uses the Chained From option, Cascade will be turned off. • UDF2 cannot be chained to if Cascade is enabled. • If UDF(n) is chained from a continuous mode UDF, the chained UDF will reach its terminating count after 2^32 iterations. Hence, UDF(n) will start after 2^32 iterations. The pull-down list always shows all UDFs, but only enabled UDFs can be chained to.
Window	Repeat Count	The *Repeat Count* field is active only when the *Continuously Counting* check box is not selected. This field is used to control the number of times that the counter will increment. When the Repeat Count is exhausted, the value resets to 0 and counting is continued.
	Continuously Counting	If the *Continuously Counting* box is selected, then the counter will continuously count, with default increment step = 1.
	Init.(Initial Value)	The initial value for the counter, as masked by the Bit Mask Value. It is incremented or decremented by a value specified in the *Step* field. NOTE The default value in Tcl is 08 00.
	Mode	Up or Down increment mode controls the direction of counting.
	Step	The increment step for Up or Down increment mode can be specified. (Default = 1).
	Set from Init Value	Select to reset the counter to the Initial Value for each stream.
	Continue from last	('Self-cascading UDFs') Select to reset the counter to the last value of this stream.

Section	Field/Control	Usage
	value in this stream	
	Cascade: continue from last value in previous cascade stream	(For use with UDF2 ONLY on modules with Advanced UDFs) If selected, the Cascading UDF option will be enabled. This allows a UDF counter for a cascade stream to continue from the last value of the previous cascade stream, rather than having the counter reset to the Initial value.
	Edit	(For use with UDF2 ONLY on on modules with Advanced UDFs) Select this button to view the *Cascade UDF Settings* dialog. Cascade UDF Settings for additional information.
		For each of the counters, a correspondingly large set of bit values which control whether each value will be held at '0,' '1' or allowed to change ('X'). The length of this field matches the number of bits selected in the Counter Type field (8, 16, 24, or 32 bits).

Cascade UDF Settings

The *Cascade UDF Settings* dialog box is shown in *Image: Cascade UDF Settings dialog box*.

Image: Cascade UDF Settings dialog box



The fields and controls in this dialog box are described in *Table: Cascade UDF Settings dialog box*.

Table: Cascade UDF Settings dialog box

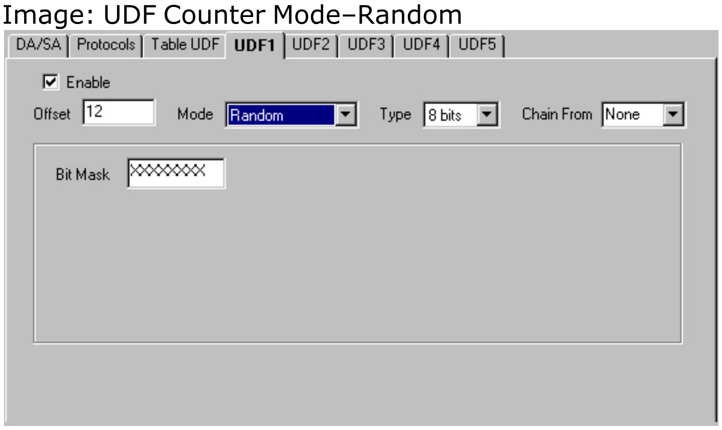
Field/Control	Usage
Byte Offset	The offset from the start of the frame—where the cascading UDF will be inserted.
Bit Offset	Enter the offset in bits. This will add another offset just after the bytes specified in *Byte Offset*. The range is 0 to 7 bits. Default = 0.
Counter Type	The use and division of the 32-bit counter. The choices '8,' '16,' '24,' and '32' indicate counters of their respective lengths.
Repeat Count	The *Repeat Count* field is active only when the *Continuously Counting* check box is not selected.

Field/Control	Usage
	This field is used to control the number of times that the counter will increment. When the Repeat Count is exhausted, the value resets to 0 and counting is continued.
Continuously Counting	If the *Continuously Counting* check box is selected, then the counter will continuously count, with default increment step = 1.
Init Value	The initial value for the counter, as masked by the Bit Mask Value. It is incremented or decremented by a value specified in the *Step* field.
Mode	Up or Down increment mode controls the direction of counting.
Step	The increment step for Up or Down increment mode can be specified. (Default = 1).

UDF Counter Mode–Random

The Random counter mode is shown in *Image: UDF Counter Mode–Random*.

Image: UDF Counter Mode–Random



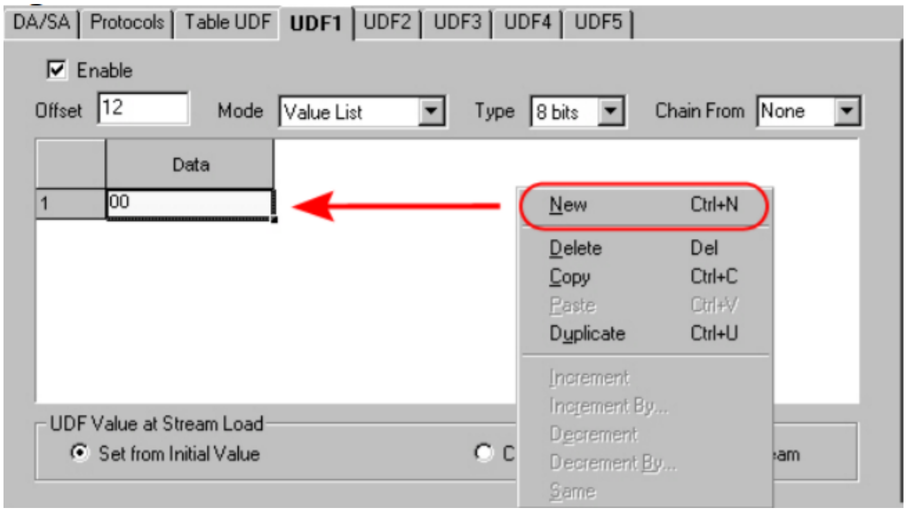
When the Random counter mode is selected, a Bit Mask field appears. The length of this field matches the number of bits selected in the Counter Type field (8, 16, 24, or 32 bits). Random values, the selected number of bits in length, will be used in conjunction with the bit mask. You can control which mask bit values will be set to '0,' '1' or allowed to change ('X').

UDF Counter Mode–Value List

The Value List counter mode is shown in the following image.

NOTE

For LSM1000XMV and ASM1000XMV load modules, full feature versions, in Wide Packet Group–Wide Bin Mode, the PGID count has been increased to 1 million. Also, the memory for Value List and Range List has been separated (whereas for other load modules, these are combined). So the Value List UDF counter mode can handle up to 1048576 individual entries, and the Range List can handle up to 32767 entries. However, the Value List entries on the different UDFs, when added together, cannot exceed this 1 million limit.



By using the context menu for the windows, you can add or edit entries in the Value list.

The fields and controls in this window are described in the following table.

Section	Field/Control	Usage
Header	Enable	Must be selected for the particular UDF to be active.
	Offset	The offset from the start of the frame (in bytes). The default is 12 bytes.
	Mode	**Value List**—This mode allows to define specific values for the UDF.
	Type	The use of the 32-bit counter. The choices of '8,' '16,' '24,' and '32' indicate single counters of their respective lengths.
	Chain From	Allows to select what UDF the current UDF should chain from. When this option is employed, the UDF will stay in its initial value until the UDF is chained from reaches its terminating value. Various rules apply to chaining UDFs: • Chain loops should not be created as it will cause data failures (that is, UDF 5 from UDF 3 from UDF 1 from UDF 5 is an illegal chain, as it creates a loop). • Only one UDF can be chained from, though multiple UDFs can chain from the same UDF. • Table UDFs cannot be chained from. • UDFs in random mode cannot be chained to. • For ATM ports, a UDF cannot be chained from if it is in Value List mode. • For Nested Counter/IPv4 mode, the chain will trigger from the inner loop count and NOT the outer loop count. • If Cascade UDF (UDF2) uses the Chained From option, Cascade will be turned off. • UDF2 cannot be chained to if Cascade is enabled.

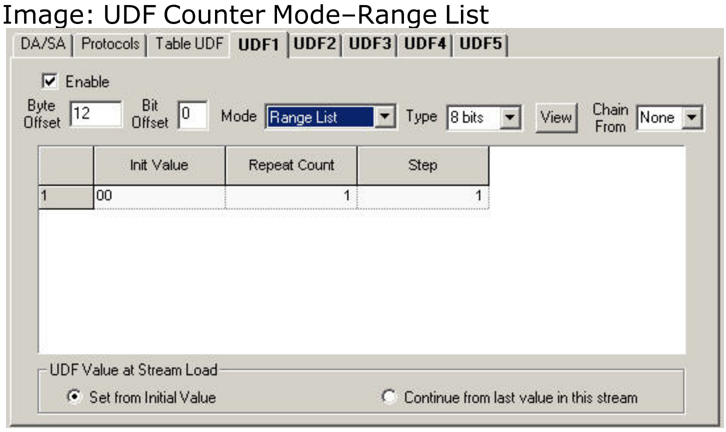
Section	Field/Control	Usage
		• If UDF(n) is chained from a continuous mode UDF, the chained UDF will reach its terminating count after 2^32 iterations. Hence, UDF(n) will start after 2^32 iterations. The pull-down list always shows all UDFs, but only enabled UDFs can be chained to.
List/Table	Data	This is the first value for the 32-bit counter. (This value is inserted into the packet at the specified offset. The first Init value in the list is inserted into the first packet in the stream - at the specified UDF offset, the second Init value in the second packet in the stream, and so on.)
UDF Value at Stream Load	Set from Initial Value	If selected, each new stream uses the UDF starting (initial) value for beginning the sequence of UDFs in the packets for the stream. The counting process starts over with the initial value.
	Continue from last value for this stream	If selected, each new stream starts counting from the last UDF value in the previous stream. The counting process does not start over, but continues across the group of streams.

UDF Counter Mode–Range List

The Range List counter mode is shown in *Image: UDF Counter Mode–Range List*.

NOTE For LSM1000XMV and ASM1000XMV load modules, full feature versions, in Wide Packet Group–Wide Bin Mode, the PGID count has been increased to 1 million. Also,the memory for Value List and Range List has been separated (whereas for other load modules, these are combined). So the Range List UDF counter mode can handle up to 32767 individual entries.

Image: UDF Counter Mode–Range List



By using the context menu for the window, entries may be added and/or edited in the Range list. The fields and controls in this window are described in *Table: UDF Counter Mode–Range List*.

Table: UDF Counter Mode–Range List

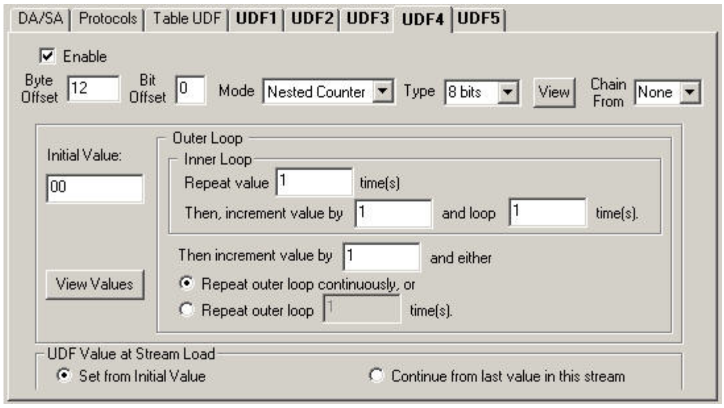
Section	Field/Control	Usage
Header	Enable	This check box enables the UDF.
	Byte Offset	The offset (in bytes) from the start of the frame. The default is 12 bytes.
	Bit Offset	For modules with Advanced UDFs: Enter the offset in bits. This will add another offset just after the bytes specified in *Byte Offset*. The range is 0 to 7 bits. Default = 0.
	Mode	**Range List**—This mode allows to define ranges of values for the UDF. The configuration options change depending on the mode selected. The options are shown in *Table: UDF Counter Modes for Advanced UDFs*.
	Type	The use and division of the 32-bit counter. For modules with Advanced UDFs: 1 bit to 32 bits. The values '8,' '16,' '24,' and '32' indicate counters of their respective lengths. For modules that support configuration of individual bytes, the following counter types are available: • 8 • 16 • 8x8 • 24 • 16x8 • 8x16 • 8x8x8 • 32 • 24x8 • 16x16 • 16x8x8 • 8x24 • 8x16x8 • 8x8x16 • 8x8x8x8
	View	Select to view the Affected Bits. This is the UDF layout as currently configured. View UDF Layout.
	Chain From	Allows to select what UDF the current UDF should chain from. When this option is employed, the UDF will stay in its initial value until the UDF it is chained from reaches its terminating value. The following rules apply to chaining UDFs:

Section	Field/Control	Usage
		• Chain loops should not be created as it will cause data failures (that is, UDF 5 from UDF 3 from UDF 1 from UDF 5 is an illegal chain, as it creates a loop). • Only one UDF can be chained from, though multiple UDFs can chain from the same UDF. • Table UDFs cannot be chained from. • UDFs in random mode cannot be chained to. • For ATM ports, a UDF cannot be chained from if it is in Value List mode. • For Nested Counter/IPv4 mode, the chain will trigger from the inner loop count and NOT the outer loop count. • If Cascade UDF (UDF2) uses the Chained From option, Cascade will be turned off. • UDF2 cannot be chained to if Cascade is enabled. • If UDF(n) is chained from a continuous mode UDF, the chained UDF will reach its terminating count after 2^32 iterations. Hence, UDF(n) will start after 2^32 iterations. The pull-down list always shows all UDFs, but only enabled UDFs can be chained to.
List/Table	Init Value	This is the first value in a range of values for the 32-bit counter. The successive values in this stream are defined by the number of repeats and the size of the increment/decrement steps. (This value is inserted into the packet at the specified offset. The first value in the list is inserted into the first packet in the stream - at the specified UDF offset, the second value in the second packet in the stream, and so on.)
	Repeat Count	The number of times that the initial value will be incremented, by an amount equal to the Step size. The default is '1.'
	Step	The increment step for the repeat count can be specified.
UDF Value at Stream Load	Set from Initial Value	If selected, each new stream uses the UDF starting (initial) value for beginning the sequence of UDFs in the packets for the stream. The counting process starts over with the initial value.
	Continue from last value for this stream	If selected, each new stream starts counting from the last UDF value in the previous stream. The counting process does not start over, but continues across the group of streams.

UDF Counter Mode–Nested Counter

This counter mode applies only for use with UDFs 4 and 5, and is shown for UDF4 in *Image: UDF Counter Mode–Nested Counter*.

Image: UDF Counter Mode–Nested Counter



The fields and controls in this window are described in *Table: UDF Counter Mode–Nested Counter*.

Table: UDF Counter Mode–Nested Counter

Section	**Controllable**	**Usage**
Header	Enable	This check box enables the UDF.
	Byte Offset	The offset (in bytes) from the start of the frame. The default is 12 bytes.
	Bit Offset	For modules with Advanced UDFs: Enter the offset in bits. This will add another offset just after the bytes specified in *Byte Offset*. The range is 0 to 7 bits. Default = 0.
	Mode	**Nested Counter**—This mode allows to create inner and outer counting loops for the UDF.
	Type	The use and division of the 32-bit counter. For modules with Advanced UDFs: 1 bit to 32 bits. The values '8,' '16,' '24,' and '32' indicate counters of their respective lengths. For modules that support configuration of individual bytes, the following counter types are available: • 8 • 16 • 8x8 • 24 • 16x8 • 8x16 • 8x8x8 • 32 • 24x8 • 16x16 • 16x8x8

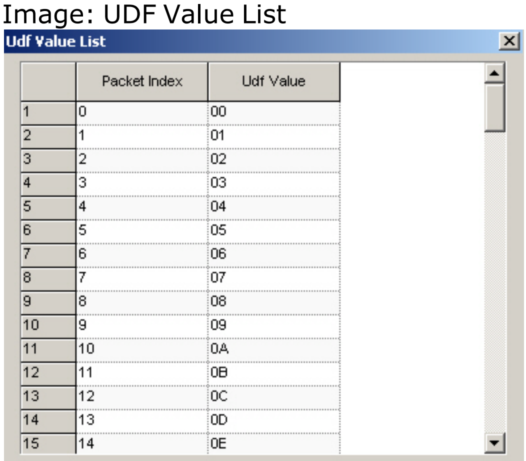
Section	Controllable	Usage
		• 8x24 • 8x16x8 • 8x8x16 • 8x8x8x8
	View	Select to view the Affected Bits. This is the UDF layout as currently configured. View UDF Layout.
	Chain From	Allows to select what UDF the current UDF should chain from. When this option is employed, the UDF will stay in its initial value until the UDF it is chained from reaches its terminating value. The following rules apply to chaining UDFs: • Chain loops should not be created as it will cause data failures (that is, UDF 5 from UDF 3 from UDF 1 from UDF 5 is an illegal chain, as it creates a loop). • Only one UDF can be chained from, though multiple UDFs can chain from the same UDF. • Table UDFs cannot be chained from. • UDFs in random mode cannot be chained to. • For ATM ports, a UDF cannot be chained from if it is in Value List mode. • For Nested Counter/IPv4 mode, the chain will trigger from the inner loop count and NOT the outer loop count. • If Cascade UDF (UDF2) uses the Chained From option, Cascade will be turned off. • UDF2 cannot be chained to if Cascade is enabled. • If UDF(n) is chained from a continuous mode UDF, the chained UDF will reach its terminating count after 2^32 iterations. Hence, UDF(n) will start after 2^32 iterations. The pull-down list always shows all UDFs, but only enabled UDFs can be chained to.
Initial Value:		(hex value) This is the starting UDF value.
View Values		Select this button to see the UDF Value List. It shows the list of UDF values that will be placed into the packets. UDF Value List for additional information.
Outer Loop	Inner Loop	(integers) Repeat Value ____ time(s)
		Then increment value by ____ and loop __ time(s). Enter the hex value for the increment size, and enter the integer for the number of

Section	Controllable	Usage
		times to repeat the inner loop.
	(For the Outer Loop) Then, increment value by ___ and either	Enter the hex value for the increment size for the outer loop. Then the select the type of outer looping desired. Choose one of: • Repeat outer loop continuously (with increasing values), or • Repeat outer loop ____ time(s): Repeating the outer looping sequence a specified number of times before restarting the counting sequence with the initial value. The entire counting sequence starts over with the initial value.
UDF Value at Stream Load	Set from Initial Value	If selected, each new stream uses the UDF starting (initial) value for beginning the sequence of UDFs in the packets for the stream. The counting process starts over with the initial value.
	Continue from last value for this stream	If selected, each new stream starts counting from the last UDF value in the previous stream. The counting process does not start over, but continues across the group of streams.

UDF Value List

The UDF Value List is shown in *Image: UDF Value List*.

Image: UDF Value List



	Packet Index	Udf Value
1	0	00
2	1	01
3	2	02
4	3	03
5	4	04
6	5	05
7	6	06
8	7	07
9	8	08
10	9	09
11	10	0A
12	11	0B
13	12	0C
14	13	0D
15	14	0E

The fields and columns in this window are described in *Table: UDF Value List*.

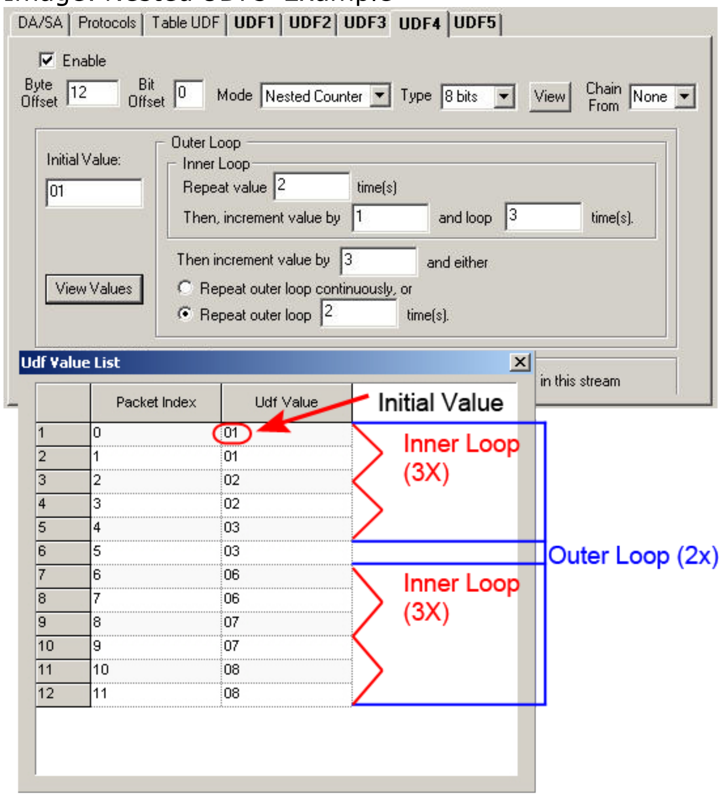
Table: UDF Value List

Field/Column	Description
Packet Index	The index number for the packet in the stream.
UDF Value	The hex value inserted into the UDF.

Nested UDFs–Example

An example of a simple configuration setup for use of the Nested Counter Mode is shown in *Image: Nested UDFs–Example*. The configuration values in the dialog and the corresponding values in the UDF Value List are shown.

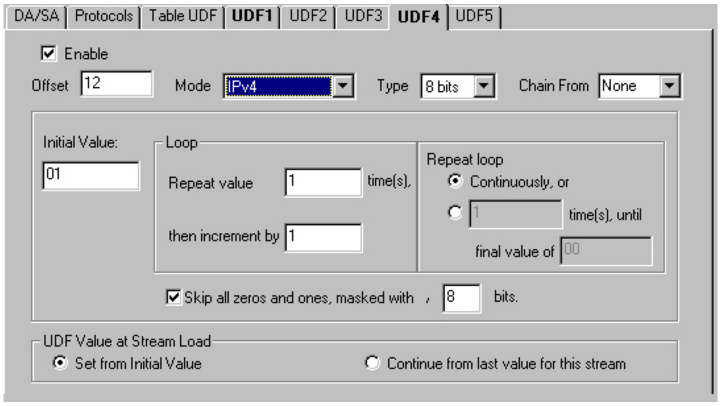
Image: Nested UDFs–Example



UDF Counter Mode–IPv4

This counter mode applies only to use with UDFs 4 and 5, and is shown for UDF5 in *Image: UDF Counter Mode–IPv4*.

Image: UDF Counter Mode–IPv4



The fields and controls in this window are described in *Table: UDF Counter Mode–IPv4*.

Table: UDF Counter Mode–IPv4

Section	Field/Control	Usage
Header	Enable	Must be selected for the particular UDF to be active.
	Offset	The offset from the start of the frame (in bytes). The default is 12 bytes.
	Mode	**IPv4**—This mode allows to create counting loops to be used with IPv4 addresses.
	Type	The use and division of the 32-bit counter. Choose one of: • 8 bits • 16 bits • 24 bits • 32 bits
Initial Value:	Chain From	Allows to select what UDF the current UDF should chain from. When this option is employed, the UDF will stay in its initial value until the UDF it is chained from reaches its terminating value. The following rules apply to chaining UDFs: • Chain loops should not be created as it will cause data failures (that is, UDF 5 from UDF 3 from UDF 1 from UDF 5 is an illegal chain, as it creates a loop). • Only one UDF can be chained from, though multiple UDFs can chain from the same UDF. • Table UDFs cannot be chained from. • UDFs in random mode cannot be chained to. • For ATM ports, a UDF cannot be chained from if it is in Value List mode. • For Nested Counter/IPv4 mode, the chain will trigger from the inner loop count and NOT the outer loop count. • If Cascade UDF (UDF2) uses the Chained From option, Cascade will be turned off. • UDF2 cannot be chained to if Cascade is enabled. • If UDF(n) is chained from a continuous mode UDF, the chained UDF will reach its terminating count after 2^32 iterations. Hence, UDF(n) will start after 2^32 iterations. The pull-down list always shows all UDFs, but only enabled UDFs can be chained to.
	Loop (for Inner Loop)	(integer) Repeat Value ____ time(s)
		then increment value by ____,

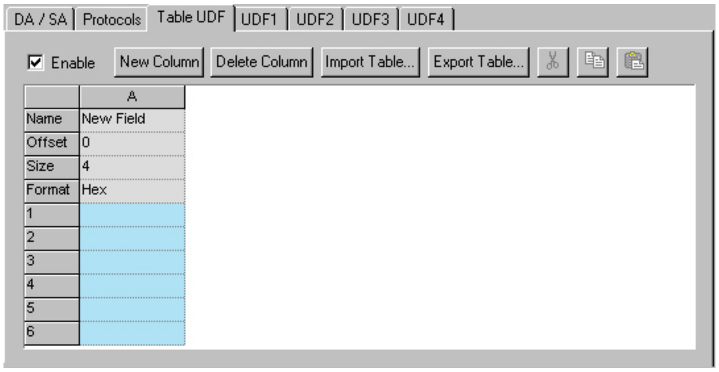
Section	Field/Control	Usage
		(For the Inner Loop) Enter the hex value for the increment size, and enter the integer for the number of times to repeat the inner loop.
	Repeat loop (for Outer Loop)	Choose one of: • Continuously, or • ____ times until final value of __ (final value is read-only) The final value of the count, based on values entered in the Initial Value, Loop, and Repeat loop fields.
		Select the desired type of outer loop. Choose one of: • Continuous looping with increasing values. • Repeating the outer looping sequence a specified number of times before restarting the counting sequence with the initial value. The entire counting sequence starts over with the initial value.
Skip all zeros and ones, masked with __ bits		If selected, values with all '1's and '0's in a particular part of the value may be skipped so as to avoid broadcast addresses.
UDF Value at Stream Load	Set from Initial Value	If selected, each new stream uses the UDF starting (initial) value for beginning the sequence of UDFs in the packets for the stream. The counting process starts over with the initial value.
	Continue from last value for this stream	If selected, each new stream starts counting from the last UDF value in the previous stream. The counting process does not start over, but continues across the group of streams.

Table UDF

Certain modules have a Table UDF option (refer to *Table: UDF Characteristics per Module*). Table UDFs allows to specify a number of lists of values to be placed at designated offsets within a stream. Each list consists of an Offset, a Size, and a list of values.

The **Table UDF** tab is shown in *Image: Table UDF*.

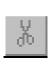
Image: Table UDF



You may create any number of lists, subject to implementation restrictions such as available memory, and import or export those lists.

Table: UDF Configuration describes the configuration options in the ***Table UDF*** tab.

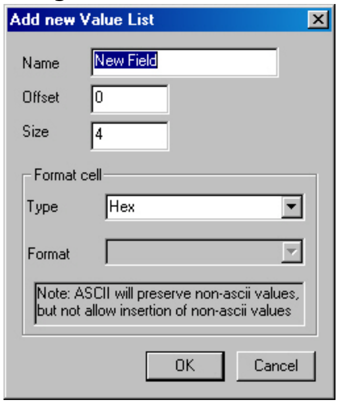
Table: UDF Configuration

Field/Control	**Usage**
Enable	This check box enables the Table UDF.
New Column	Selecting this button allows to create a value list. The parameters of the value list are set in the *Add a Value List* dialog, as discussed in Creating a Value List.
Delete Column	Selecting this button deletes the selected value list. Note the column letter at the very top of the column must be selected to use this function.
Import Table	Selecting this button allows to import table values from an Excel file.
Export Table	Selecting this button allows to export table values as an Excel file.
Name	Descriptive text for a value list. The name is set using the *Add a Value List* dialog, as discussed in Creating a Value List.
Offset	Offset is the beginning point for value insertion relative to byte 0 of the frame. Offset is measured in bytes. The Offset is set using the *Add a Value List* dialog, as discussed in Creating a Value List.
Size	Size is the length of each value in a value list, measured in bytes. The size is set using the *Add a Value List* dialog, as discussed in Creating a Value List.
Format	The Format is set using the *Add a Value List* dialog, as discussed in Creating a Value List.
	Selecting this icon cuts highlighted text in the data portion of the value list.
	Selecting this icon copies highlighted text in the data portion of the value list.
	Selecting this icon pastes text copied or cut from the data portion of the value list.

Creating a Value List

The *Add New Value List* dialog allows to configure the parameters of a value list. The *Add New Value List* dialog is shown in *Image: Add New Value List Configuration*.

Image: Add New Value List Configuration



The configurable parameters in this dialog are described in *Table: New Value List Configuration*.

Table: New Value List Configuration

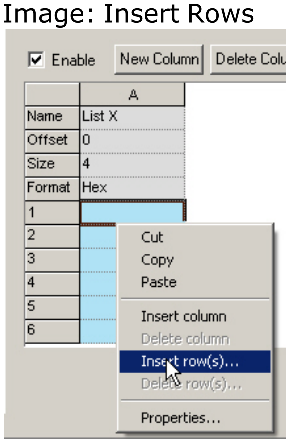
Field/Control	Usage
Name	Descriptive text for a value list. A value list name has no functional meaning in the implementation, but is useful for descriptive documentation of the packet field. Name may be blank and need not be unique across value lists in a value list group.
Offset	Offset is the beginning point for value insertion relative to byte 0 of the frame. Offset is measured in bytes and must be between 0 and 247.
Size	Size is the length of each value in a value list, measured in bytes. Size must be between 1 and 256. The offset + size must be less than or equal to 248.
Type	Sets the type of information that is to be inserted into the packet stream. • Hex • ASCII • Binary • Decimal • MAC • IPv4 • IPv6 • Custom The type of data selected assists in creating the data. For example, selecting 'IPv4' will force the data into dotted decimal notation (1.1.1.1). Selecting 'Custom' enables the Format field, described below.

Field/Control	Usage
Format	Allows to specify the data format for custom Table UDFs. Select from the following list: • 32d—thirty-two bit decimal format. • 32x—thirty-two bit hexadecimal format. • 32b—thirty-two bit binary format. • 32a—thirty-two bit ASCII format. • 8d.8d.8d.8d—Dotted decimal format, in eight bit sections. • 8x.8x.8x.8x—Dotted hex format, in eight bit sections. • 16d.16d—Dotted decimal format, in sixteen bit sections. • 16x.16x—Dotted hex format, in sixteen bit sections. Note that the Type setting must be 'Custom' for this field to be active.

Adding Rows (Table UDF Entries)

After creating a column, select in the body of the column and then select **Insert Row(s)** from the action menu, as shown in *Image: Insert Rows*.

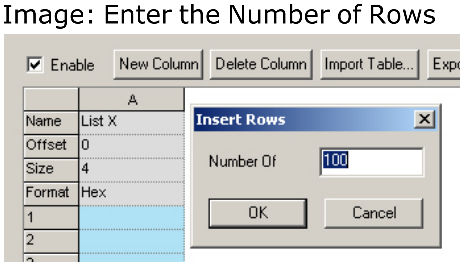
Image: Insert Rows



A dialog box will appear, prompting you to specify the number of rows (Table UDF entries). Different types of load modules have different limitations on the maximum number that can be created, depending of number and size of streams and frame size.

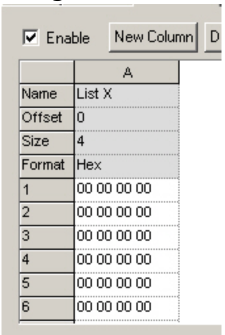
Enter the number of rows (entries), then select OK (*Image: Enter the Number of Rows*).

Image: Enter the Number of Rows



The newly created rows will appear, as shown in *Image: Rows are Created*.

Image: Rows are Created



CHAPTER 8

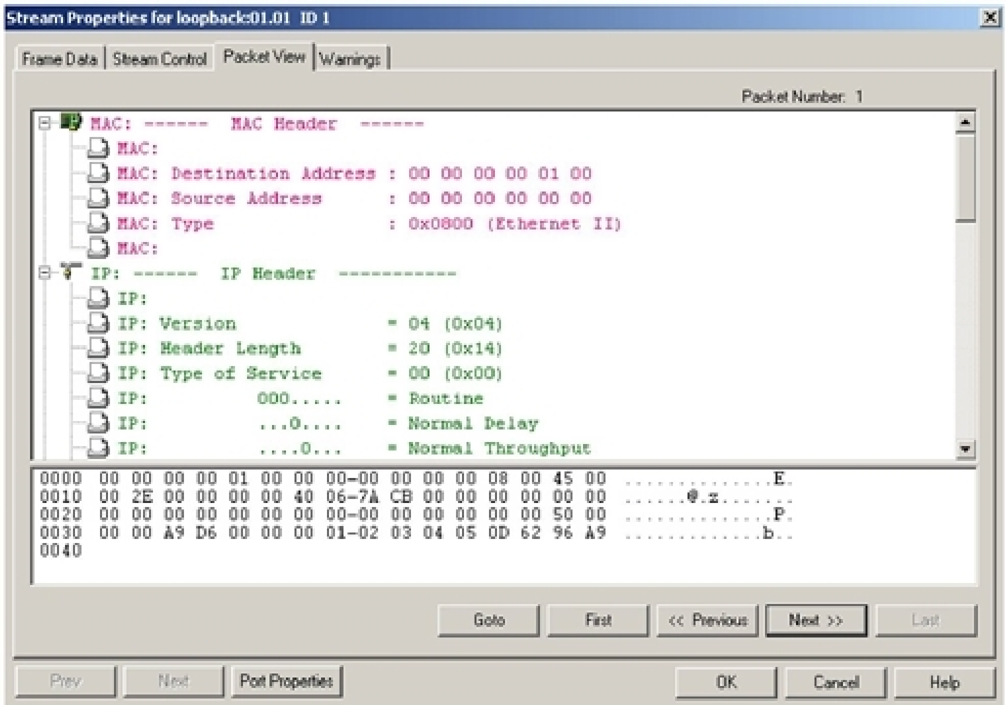
Packet View

The results of constructing packets through the **Frame Data** tab as described in **Frame Data** Tab *appear in the Packet View.*

Packet View Tab

The **Packet View** tab is pictured in *Image: **Packet View** Tab*.

Image: **Packet View** Tab



The parts of the view are:Controls for Use with Packet View

- Decode Panel—shows the packet decoded header contents.
- Raw Packet Panel—shows the hexadecimal and ASCII interpretation of the first packet of a stream region.
- —shows the additional controls available for use with ports configured for flows.

Decode Panel

The Decode Panel is a protocol dependent decode of the selected packet's contents. It reflects programming performed through the *Protocols* sub-tab (Frame Data–Protocol Control for more information) from the **Frame Data** Tab. The data in the view can be scrolled by conventional means: up/down arrow keys, up/down page keys, and use of the scroll bar.

Raw Packet Panel

The Raw Packet Panel shows the entire contents of the packet up to, but not including, the FCS. The left-hand column contains the packet offset, in hexadecimal. The middle column contains sixteen bytes of data, in hexadecimal. The right-hand column contains a view of the data in ASCII, if the byte can appear as such; otherwise the byte appears as a dot (.). The data in the view can be scrolled by conventional means: up/down arrow keys, up/down page keys, and use of the scroll bar.

Controls for Use with Packet View

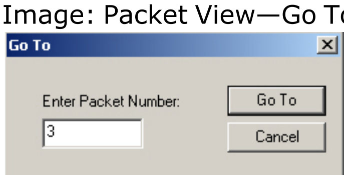
The **Packet View** tab is able to look at the fields of any individual packet configured by you. The controls that are available are described in *Table: Packet View Controls for Use with Flows*.

Table: Packet View Controls for Use with Flows

Control	Description
Go To	When selected, the *Go To* dialog box appears. For additional information, Go To dialog box.
First	Select once to go to the First packet in the flow. See Note 2 below.
<< Previous	Select once to go to the Previous packet in the flow. See Note 2 below.
Next >>	Select once to go to the Next packet in the flow. See Note 1 below.
Last	Select once to go to the Last packet in the flow. See Note 1 below.
Port Properties	Shows the *Port Properties* dialog box for this port.

Go To dialog box

The *Go To* dialog box allows to enter a positive integer that identifies the target packet, as shown in *Image: Packet View—Go To dialog box*.

Image: Packet View—Go To dialog box


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CHAPTER 9

IxRouter Window

This chapter covers the following topics:

Introduction to IxRouter

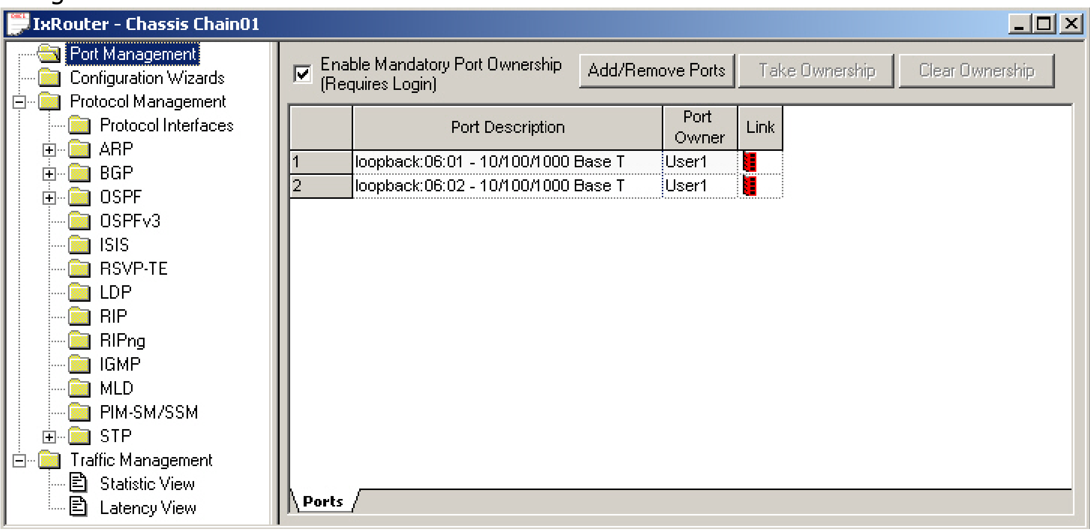
Most Ixia card types offer a Protocol Server. The Protocol Server includes a complete TCP/IP stack, allowing different forms of high-level protocol-based DUT testing. The Protocol Server is accessed through the IxRouter window in IxExplorer and can be configured to test a set of Level 2 and Level 3 protocols, which include MAC and IPv4/IPv6 addressing and routing. The information gathered by the IxRouter Window is used within generated frame data, also.

- The IxRouter Window is available by default in IxExplorer—for Ixia modules that support Internet traffic. This window provides a location for configuring protocol interfaces on selected ports. In addition, the IxRouter Protocol Management window allows to enable PING (ICMP) for IPv4 and ARP on the selected ports.
- Routing protocols are available in the IxRouter Window after installation of protocol emulation software bundles and/or individual protocol emulations. The protocols that are supported vary by load module type. Refer to the *Ixia Platform Reference Manual* for details. Refer to *Protocols Supported by the IxRouter Window* *for a list of the available protocols and the chapters covering those protocol emulations in detail.*

NOTE For information on installation of the IxRouter protocol emulation software, see the IxRouter Installation Chapter of the *IxNetwork User Guide*.

The IxRouter Window, with IxRouter Protocol Emulations installed, is shown in *Image: IxRouter Window with IxRouter Protocol Emulations Installed*.

Image: IxRouter Window with IxRouter Protocol Emulations Installed



IxRouter Window Architecture

In general, the IxRouter window 'tree' in the left pane shows the list of windows and protocol emulations that can be configured, while the details view in the right pane shows information, in spreadsheet or dialog box format, for the item selected in the tree.

There is a hierarchy for configuring services within each protocol, specialized for each protocol. For complex routing protocols such as OSPF, there are many levels in the hierarchy; those relationships are described in detail in the applicable sections. Once a protocol has been enabled for a selected port, the port name/number will appear in the tree below that protocol.

The IxRouter Window consists of the main divisions which are described in the sections listed in *Table: IxRouter Window Sections*.

Table: IxRouter Window Sections

Section	Description
Port Management Window	For Login, Port Selection, and Port Ownership functions. Refer to Port Management Window for additional information.
Configuration Wizards	(Available when IxNetwork protocol emulations are installed.) Sets of dialog boxes for easily configuring Layer 2 VPNs, Layer 3 VPNs, and test topologies for individual, or multiple, routing protocols. Refer to the Configuration Wizards Chapter in the *IxNetwork User Guide* for additional information.
Protocol	For enabling available protocol emulations on specific ports, and configuring

Section	Description
Management Window	protocols through sub-windows (in the protocol tree) for each protocol. Refer to Protocol Management Window for additional information.
Protocol Interfaces Window	For creating interfaces that can be configured for use with network protocols. Refer to Protocol Interfaces Window for additional information.
Protocol List	Protocol 'Tree'—list of IxRouter protocol emulations. • ARP and ICMP (PINGv4) are available by default. • Additional routing protocols are installed separately. Refer to Protocols Supported by the IxRouter Window for additional information.
Protocol Traffic Management Window	(Available when IxRouter protocol emulations are installed.) Protocol Traffic Management Window—for automatically generating (constructing) streams based on protocol configurations. Refer to the Protocol Traffic Management Window Chapter in the *IxNetwork User Guide.*

Protocols Supported by the IxRouter Window

NOTE The protocols supported by the IxRouter Window vary by load module type. Refer to the *Ixia Platform Reference Guide*for details.

The IxRouter Window supports the protocols listed in *Table: Protocols Supported by IxRouter Window*. ARP and ICMP (PING for IPv4) are available in the IxExplorer IxRouter Window; additional protocol emulations are available separately.

Table: Protocols Supported by IxRouter Window

Protocol	Description
ARP	Address Resolution Protocol (non-POS only) (Includes the IP table for IP to MAC addressing.) Refer to ARP for additional information.
PING for IPv4	'Packet Internet Groper/PING'—uses Internet Message Control Protocol (ICMP) echo messages and responses. Refer to ICMP/PINGv4 for additional information.
BGP	Border Gateway Protocol version 4—for IPv4 and IPv6, L3 VPNs, MVPNs. Refer to the BGP Chapter in the *IxNetwork Users Guide* for additional information.
OSPFv2	Open Shortest Path First Protocol Version 2—for IPv4. Refer to the OSPF Chapter in the *IxNetwork User Guide* for additional information.

Protocol	Description
OSPFv3	Open Shortest Path First Protocol Version 3—for IPv6. Refer to the OSPF Chapter in the *IxNetwork Users Guide* for additional information.
ISIS	Intermediate System to Intermediate System Protocol - for IPv4 and IPv6. Refer to the ISIS Chapter in the *IxNetwork Users Guid*e for additional information.
RSVP-TE	Resource ReServation Protocol with Traffic Engineering—for IPv4. Refer to the RSVP-TE Chapter in the *IxNetwork Users Guide* for additional information.
LDP	Label Distribution Protocol—for IPv4 and IPv6, L2 VPNs. Refer to the LDP Chapter in the *IxNetwork User Guid*e for additional information.
RIP	Routing Information Protocol—for IPv4. Refer to the RIP Chapter in the *IxNetwork User Guid*e for additional information.
RIPng	Routing Information Protocol—Next Generation (IPv6). Refer to the RIPng Chapter in the *IxNetwork User Guid*e for additional information.
IGMP	Internet Group Management Protocol—versions 1, 2, and 3, for IPv4. Refer to the IGMP Chapter in the *IxNetwork User Guid*e for additional information.
MLD	Multicast Listener Discovery—versions 1 and 2, for IPv6. Refer to the MLD Chapter in the *IxNetwork User Guid*e for additional information.
PIM-SM/SSM	Protocol Independent Multicast - Sparse Mode / Protocol Independent Multicast - Source Specific Multicast - for IPv4 and IPv6, MVPNs Refer to the PIM-SM/SSM Chapter in the *IxNetwork User Guid*e for additional information.

Opening the IxRouter Window

The IxRouter window provides a location in IxExplorer for configuring the routing protocol services. The IxRouter window is accessed in the IxExplorer window by using one of the following methods, which are shown in *Image: Opening the IxRouter Window*:

- Select a port and then select **IxRouter** in the Port Details list in the right pane, or
- Select the *IxRouter* icon in the toolbar, or
- Open the context menu by selecting a port or chassis and then select **IxRouter**.

Image: Opening the IxRouter Window

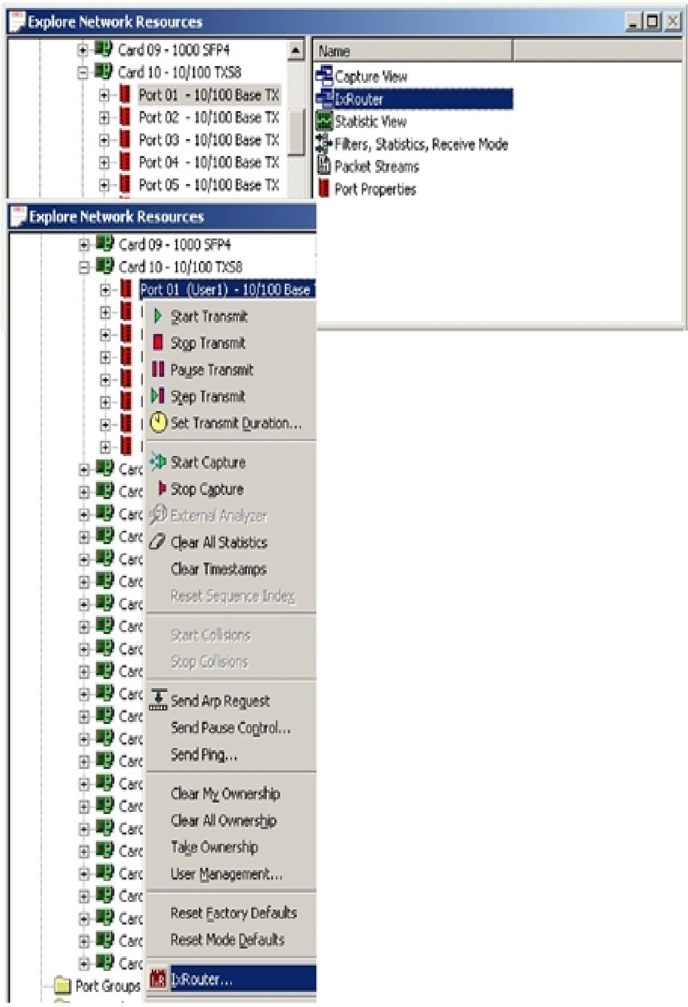


Image: Opening the IxRouter Window

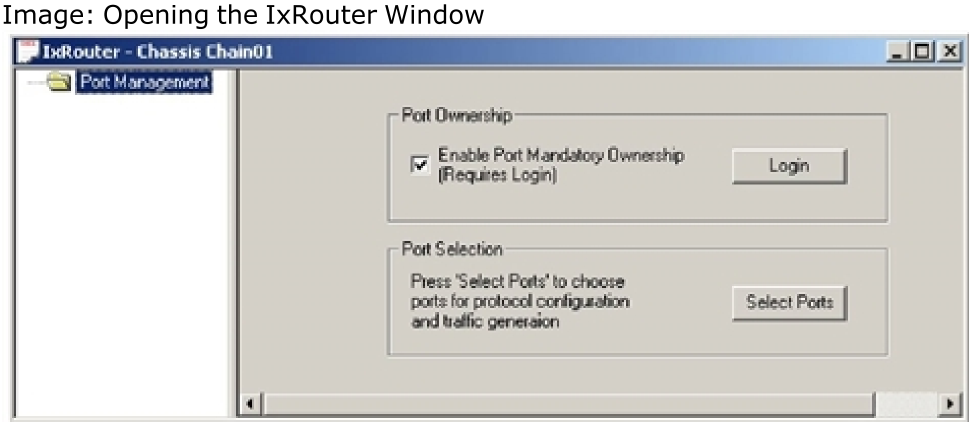
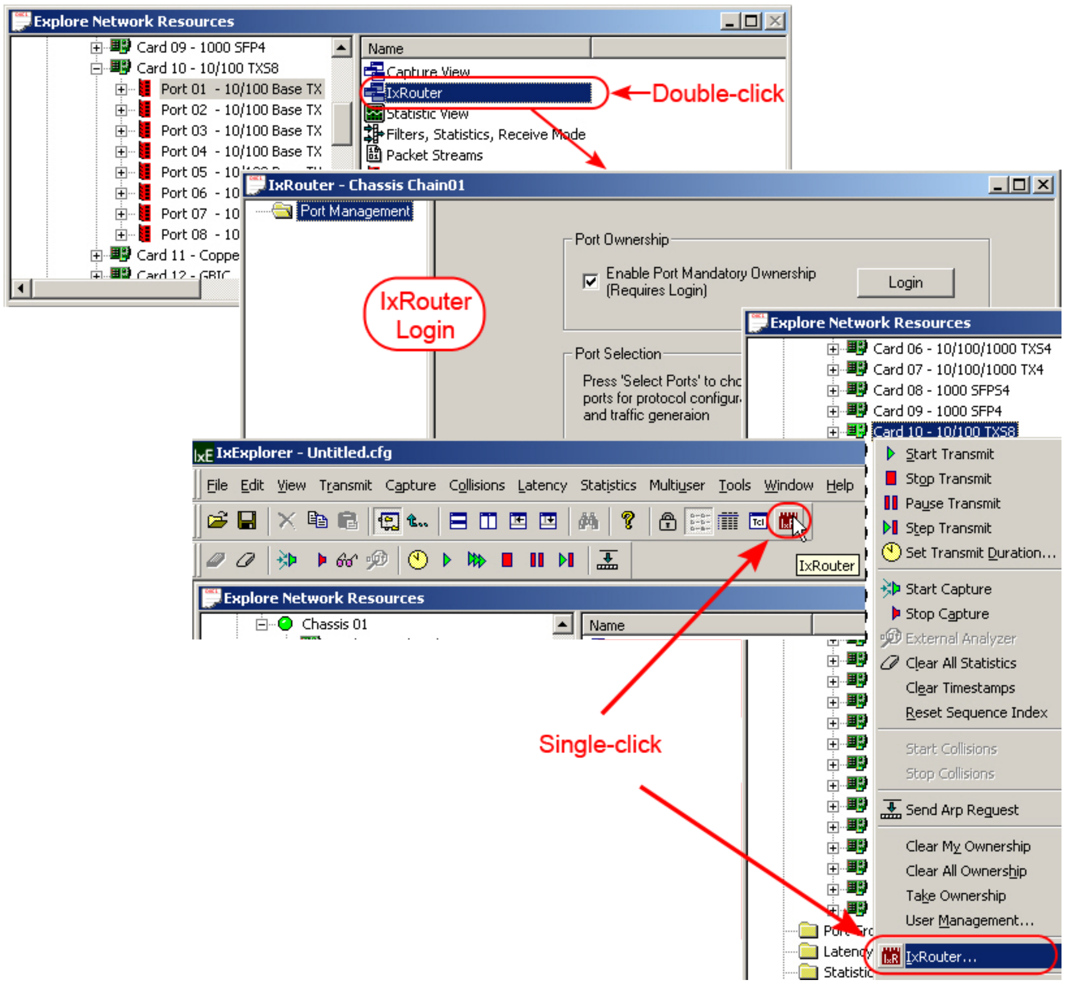


Image: Opening the IxRouter Window



Port Management Window

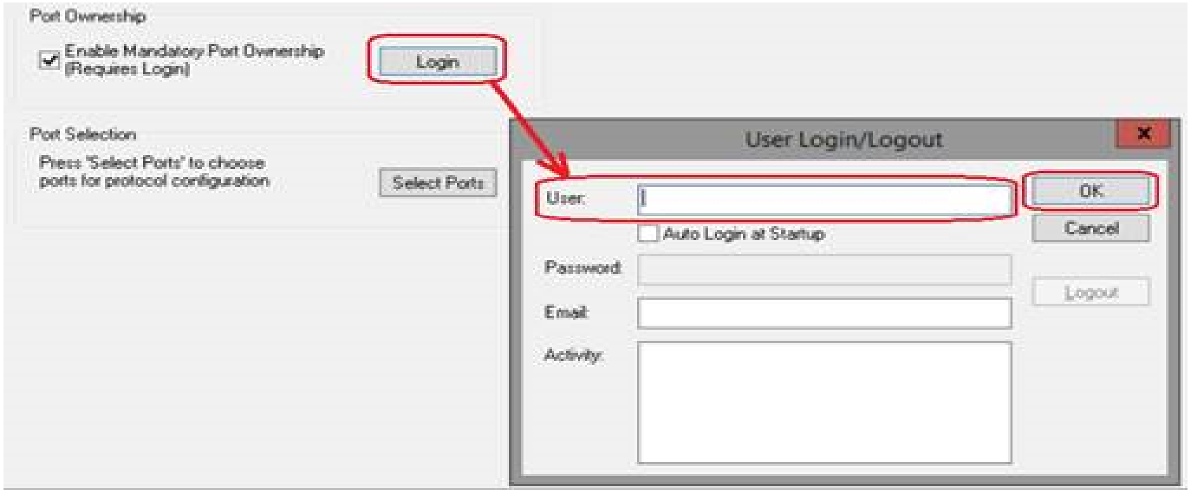
The IxRouter Port Management window is described in the following sections:

- Login Window
- Selecting Ports
- Mandatory Port Ownership

Login Window

When the IxRouter Window first opens, as shown in *Image: Port Management Window—Login*, the Port Management window, in Login mode, appears by default—with no additional items listed in the protocol tree (left pane).

Image: Port Management Window—Login



Login requirements depend on the setting for the Mandatory Port Ownership feature. Mandatory Port Ownership for additional information on Mandatory Port Ownership feature. There are two modes for the Mandatory Port Ownership—enabled or disabled, as described below:

- If the 'Enable Mandatory Port Ownership' option is selected (the default setting), Login is **required**. Select the *Login* button to log on as the user. Select *OK* to close the dialog box. After logging in, select the *Select Ports* button to open the Select Ports dialog box, which lists all of the available ports on the current chassis. Go to Selecting Ports for information on selecting ports.
- If the 'Enable Mandatory Port Ownership' option is NOT selected, no Login is required. Select the *Select Ports* button to open the Select Ports dialog box, which lists all of the available ports on the current chassis. Go to Selecting Ports for information on selecting ports.

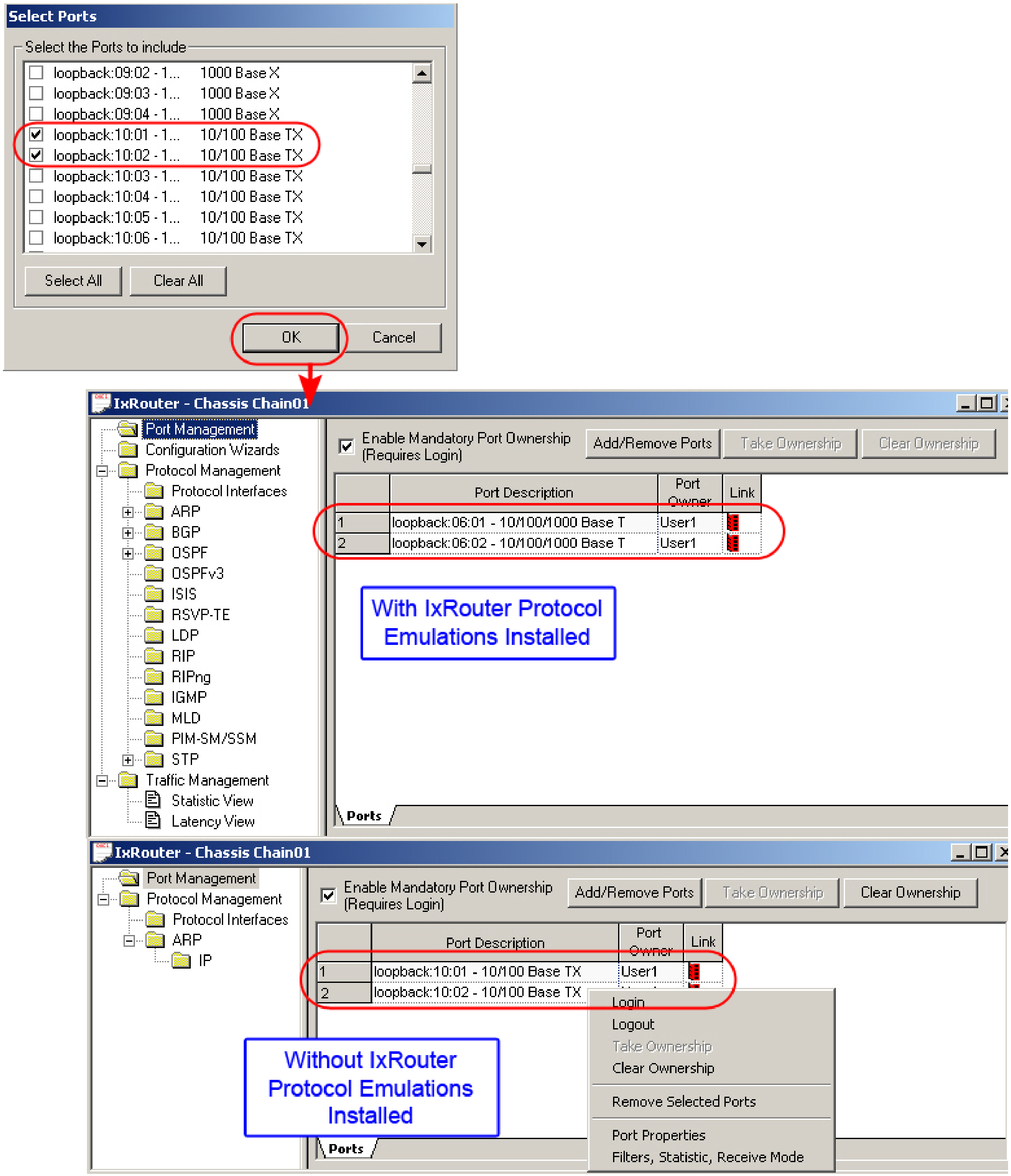
Enabling the **Auto Login at Startup** option allows to close and open IxRouter without logging in each time, as long as the IxExplorer window remains open. If the IxExplorer window is closed, and then re-opened, you must log on to IxRouter again.

Field	Description/Usage
Email	Port owner's email address.
Activity	Brief description regarding the usage of port.

Selecting Ports

The Select Ports dialog box is shown in *Image: Port Management Window—Port Selection*. In the dialog box, select the check boxes for the port(s) that will be configured for protocols. Select *OK* to close the Select Ports and Login dialog boxes. The Port Management window appears with the selected ports listed in the port grid (right pane). Examples are shown for IxRouter window configurations, with and without IxRouter Protocol emulations installed.

Image: Port Management Window—Port Selection



The fields and controls available in this window and in the context menu are described in *Table: Port Management Window*.

Table: Port Management Window

Section	Fields/Controls	Description
Header	Enable Mandatory Port Ownership	If this check box is selected, you MUST Login and take ownership of the port(s) to configure and use the port(s).

Section	Fields/Controls	Description
		If this check box is not selected, Login and port ownership are not required to configure and use the port(s). The default is selected. Mandatory Port Ownership for additional information.
	Add/Remove Ports	Select the *Add/Remove* button to open the Select Ports dialog box and select (add ports) or deselect (remove ports) the check boxes for desired ports, as shown in *Image: Port Management Window—Port Selection*. NOTE If ALL of the ports are removed from the table, the Port Management grid will be closed immediately, and the Login window appears.
	Take Ownership	NOTE You must already be logged in for this feature to be available. Select the *Take Ownership* button to reserve the ownership and use of the port(s) that have been selected in the table.
	Clear Ownership	Select the *Clear Ownership* button to release the ownership and use of the port(s) that have been selected in the table.
Table	Port Description	The description (port name, type, and so forth) of the port is listed.
	Port Owner	The name of the user who has taken ownership of this port. NOTE Port ownership is mandatory if the 'Enable Mandatory Port Ownership' option is enabled through the check box.
	Link	The color of this icon indicates the state of the link for this port: • **Green**—Link is Up. • **Red**—Link is Down. • **Yellow**—Link is in loopback mode. • **Gray** —Link is unavailable because it is busy or it is an unsupported link type.
Context Menu	Login	Select 'Login' to open the *User Login/Logout* dialog box for the Protocol Window. Enter the user name and select *OK*. The protcol tree will expand to show all of the available protocols.
	Logout	Select 'Logout' to logout from the Protocol Window. The port entries in the table will become unavailable, and the protocol tree will close—only 'Port Management' will be visible.

Section	Fields/Controls	Description
	Take Ownership	NOTE You must already be logged in for this feature to be available. Select 'Take Ownership' to reserve the ownership and use of the port(s) that have been selected in the table.
	Clear Ownership	Select 'Clear Ownership' to release the ownership and use of the port(s) that have been selected in the table.
	Remove Selected Ports	Select 'Remove Selected Ports' to immediately delete the selected port(s) from the table. NOTE If ALL of the ports are removed from the table, the Port Management grid will be closed immediately, and the Login window appears.
	Port Properties	(Operates for only **one port** at a time.) Select 'Port Properties' to open the Port Properties dialog box for the selected or highlighted port. Refer to *IxExplorer Users Guide - Port Properties* chapter, for additional information on Port Properties dialog boxes.
	Filter, Statistic, Receive Mode	(Operates for only **one port** at a time.) Select 'FIlter, Statistic, Receive Mode' to show the Filter, Statistic, Receive Mode dialog boxes for the selected/highlighted port. Refer to *IxExplorer Users Guide - Filter, Statistics, Receive Mode* chapter, for additional information on Filter, Statistic, Receive Mode dialog boxes.

Mandatory Port Ownership

The Mandatory Port Ownership feature prevents other users from overwriting port configurations and interrupting the test process on the port.

If the mandatory port ownership feature is enabled (the default setting), you must log on through the Port Management window—Login window, or, through the IxExplorer Login dialog box, available from the 'Multiuser' menu in the IxExplorer main toolbar).

New IxExplorer/IxRouter Session

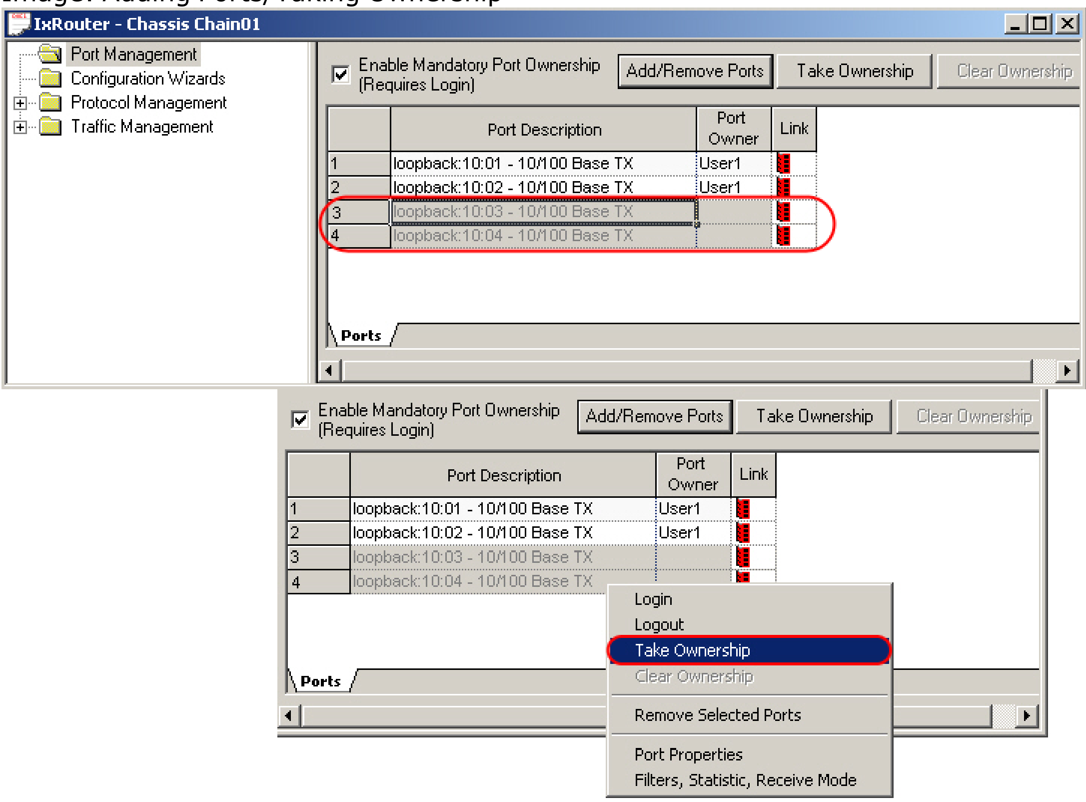
The procedure for logging in and setting up ports, when IxExplorer and IxRouter are first opened for a new session, or when all ports have been removed from the Port Management table, is covered in the following sections:

- Login Window
- Selecting Ports

Adding Ports/Taking Ownership

When ports are added after the initial (active) port selection, the new ports are listed in the Port Management window table, but are unavailable (dimmed), as shown in *Image: Adding Ports/Taking Ownership*. Use the context menu and select **Take Ownership** to make the selected ports available for configuration.

Image: Adding Ports/Taking Ownership



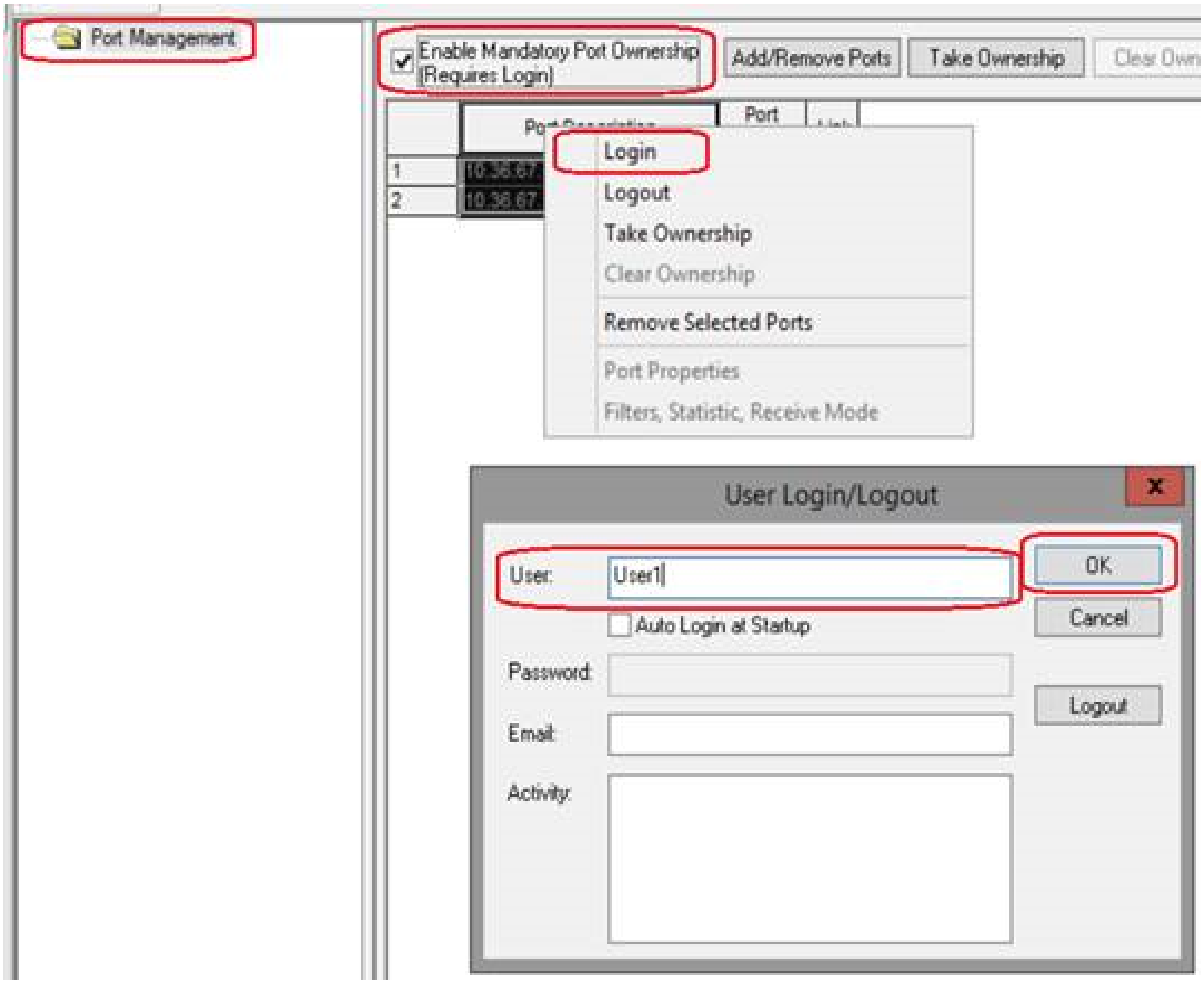
Reopening IxRouter Window

If the IxExplorer Window is closed, IxRouter is also closed. When IxExplorer is reopened while Mandatory Port Ownership is enabled, you will have to follow the procedure shown in *Image: Mandatory Port Ownership—Reopening IxRouter Window* to regain access to IxRouter and the previously selected ports.

After logging in, select a port entry in the Port Management window to open the context menu, as shown in *Image: Mandatory Port Ownership—Reopening IxRouter Window*. Select **Take Ownership**, or select the **Take Ownership** button in the window header, to assign the Login User name to the port.

NOTE Enabling the 'Auto Login at Startup' option allows to close and open IxRouter without logging in each time, as long as the IxExplorer window remains open. If the IxExplorer window is **closed**, and then re-opened, you must log on to IxRouter again.

Image: Mandatory Port Ownership—Reopening IxRouter Window



Protocol Management Window

The Protocol Management window allows to enable routing protocol emulations on a specified port, as shown in *Image: Protocol Management Window*. Examples are shown for IxRouter window configurations with and without IxRouter protocol emulations installed. The available routing protocols listed will depend on which protocol emulations have been purchased and installed.

The protocols can be enabled one at a time by selecting the check boxes. Or, all of the protocols available for the port can be enabled simultaneously by selecting the number field at the left end of the row and selecting 'Enable Selection' in the context menu, as shown in the image.

Note that when a protocol is selected and enabled for one or more ports, a '+' sign appears next to the name of the protocol 'tree' in the left pane of the window. This symbol indicates that configuration windows are available for that protocol—in a tree structure below the protocol name.

Image: Protocol Management Window

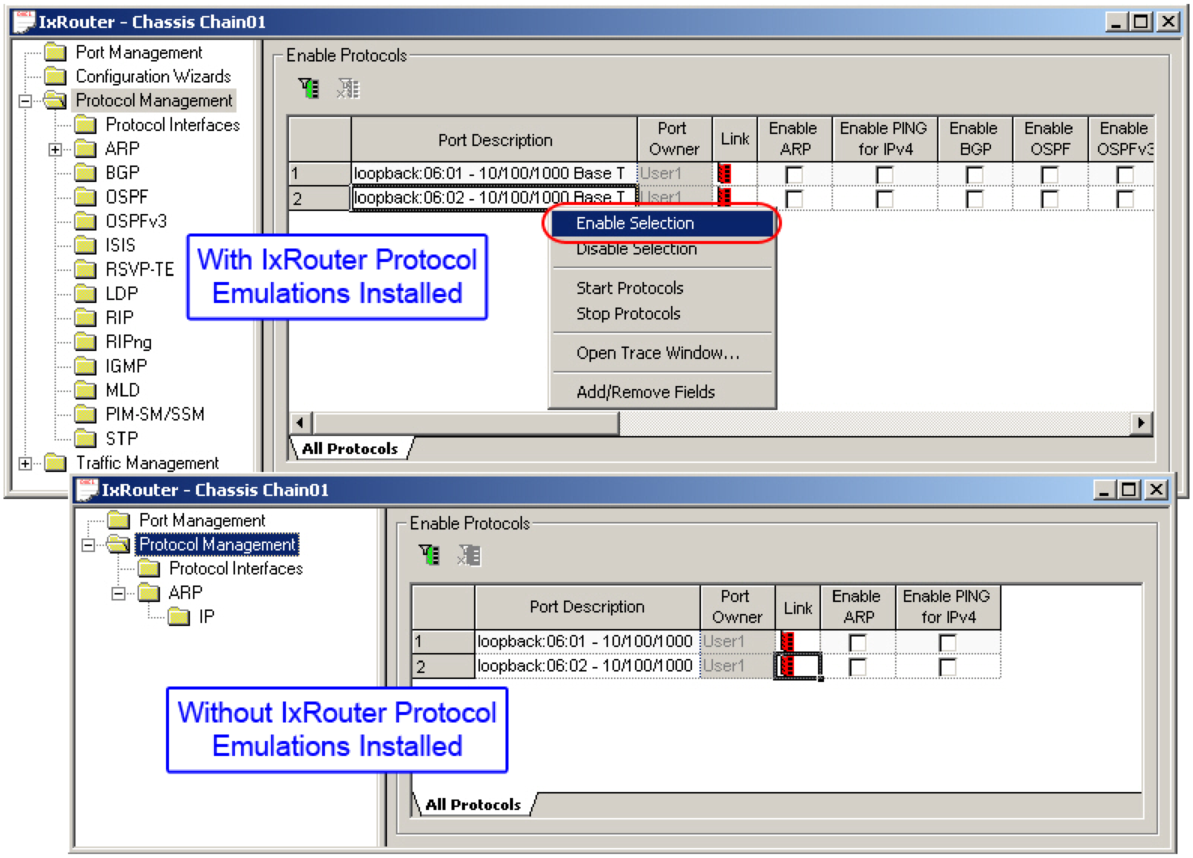
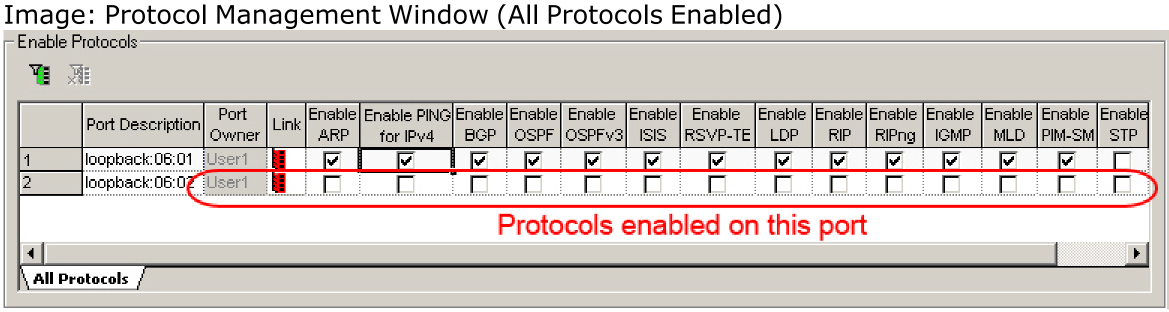
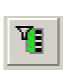


Image: Protocol Management Window (All Protocols Enabled)



The fields and controls in the Protocol Management window, including the context menu for the protocol grid, are described in *Table: Protocol Management Window*.

Table: Protocol Management Window

Section	Fields/Controls	Description
(Header)		Select the *Filter Selected Ports* button to open the Filter Ports dialog box. Ports selected in the Filter Ports dialog box appears in the grid, but any non-selected ports will be removed from the grid as long as the Filter Ports feature is enabled. Filter Ports dialog box for additional information.
		Select the *Remove Port Filter* button to disable the Filter Ports feature, and non-filtered ports will reappear in the

Section	Fields/Controls	Description
		grid. Filter Ports dialog box for additional information.
(Table/Grid)	Port Description	The description (port name, type, and so forth) of the selected ports are listed.
	Port Owner	(Read-Only) The name of the user who has taken ownership of this port. NOTE Port ownership is mandatory if the 'Enable Mandatory Ownership' option is enabled through the check box in the Port Management window
	Link	The color of this icon indicates the state of the link: • **Green**—Link is Up. • **Red**—Link is Down. • **Yellow**—Link is in loopback mode. • **Gray**—Link is unavailable because it is busy or it is an unsupported link type.
	Enable ARP	(Non-POS cards only) If selected, enables ARP requests and responses for this port. ARP requests are received at the MAC level. For additional information on configuring the ARP protocol,ARP.
	Enable PING for IPv4	If selected, enables IPv4 PING transmission and reception for this port. PING messages are IPv4 ICMP messages of type *Echo Request.* Responses are IPv4 ICMP message of type *Echo Response*. For additional information on configuring the ICMP/PING protocol, ICMP/PINGv4.
	Enable BGP	If selected, enables BGP testing for this port. Refer to the BGP Chapter in the *IxNetwork User Guide* for additional information.
	Enable OSPF(v2)	If selected, enables OSPF testing for this port. Refer to the OSPF Chapter in the *IxNetwork User Guide* for additional information.
	Enable OSPFv3	If selected, enables OSPFv3 testing for this port. Refer to the OSPF Chapter in the *IxNetwork User Guide* for additional information.

Section	Fields/Controls	Description
	Enable ISIS	If selected, enables ISIS testing for this port. Refer to the ISIS Chapter in the *IxNetwork User Guide* for additional information.
	Enable RSVP-TE	If selected, enables RSVP-TE testing for this port. Refer to the RSVP-TE Chapter in the *IxNetwork User Guide* for additional information.
	Enable LDP	If selected, enables LDP testing for this port. Refer to the LDP Chapter in the *IxNetwork User Guide* for additional information.
	Enable RIP	If selected, enables RIP testing for this port. Refer to the RIP Chapter in the *IxNetwork User Guide* for additional information.
	Enable RIPng	If selected, enables RIPng testing for this port. Refer to the RIPng Chapter in the *IxNetwork User Guid*e for additional information.
	Enable IGMP	If selected, enables IGMP testing for this port. Refer to the IGMP Chapter in the *IxNetwork User Guide* for additional information.
	Enable MLD	If selected, enables MLD testing for this port. Refer to the MLD Chapter in the *IxNetwork User Guide* for additional information.
	Enable PIM-SM	If selected, enables PIM-SM testing for this port. Refer to the PIM-SM/SSM Chapter in the *IxNetwork User Guide* for additional information.
Context Menu	Enable Selection	If one protocol is selected for a port, selecting 'Enable Selection' enables the configuration and use of that particular protocol on the port. If the entire row of protocols is selected for a port, selecting 'Enable Selection' enables the configuration and use of ALL of the listed protocols on that port.
	Disable Selection	If one protocol is selected for a port, selecting 'Disable Selection' disables the configuration and use of that particular protocol on the port. If the entire row of protocols is selected for a port, selecting 'Disable Selection' disables the configuration and use of ALL of the listed protocols on that port.

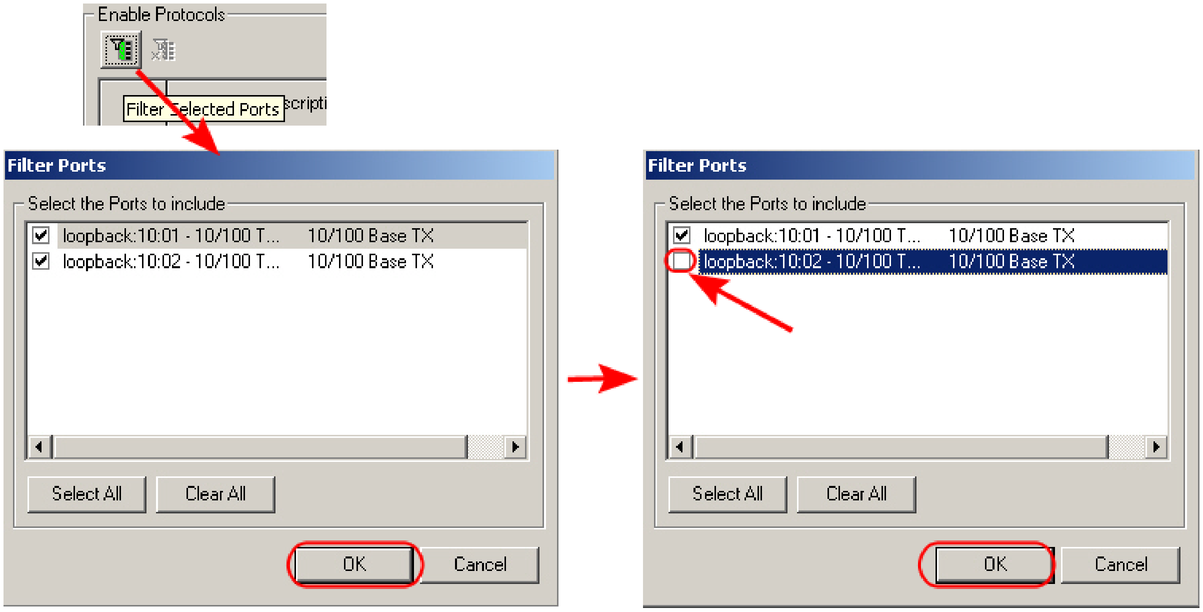
Section	Fields/Controls	Description
	Start Protocols	Starts all protocols on any of the ports in this window which have been configured for the protocols.
	Stop Protocols	Stops all protocols on any ports in this window which are currently running protocols.
	Open Trace Window...	NOTE Available only when Protocol emulations are installed. Selecting 'Open Trace Window...' opens the *Trace and Statistics Window*, plus one *Port Trace* window for each port that has been selected. Port Trace Window for additional information.
	Add/Remove Fields	NOTE Available only when Protocol emulations are installed. Selecting 'Add/Remove Fields' shows the Add/Remove Field dialog box for this window, where you may add or remove fields that appear in the grid, to customize the window. Add/Remove dialog box for additional information on the use of an Add/Remove Fields dialog box.

Filter Ports dialog box

The Filter Ports feature allows only the specific ports selected (enabled) in the Filter Ports dialog box to be shown in the Protocol Management Window grid, when working with a subset of available ports is preferred.

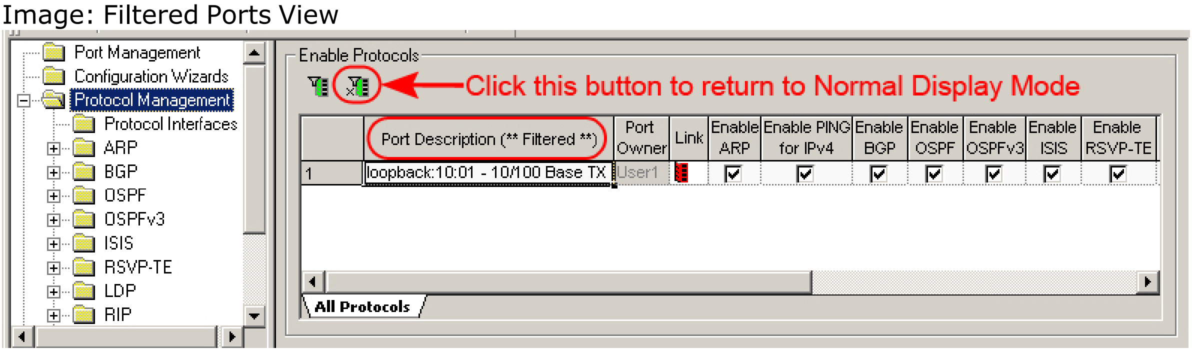
Select the *Filter Selected Ports* button in the Protocol Management window header, to open the Filter Ports dialog box, as shown in *Image: Filter Ports dialog box*. By default, all ports that have been selected in the Port Management window will be listed in the dialog box. Deselect (uncheck) any ports that are not to be shown in the Protocol Management window.

Image: Filter Ports dialog box



Only the specific ports selected in the Filter Ports dialog box appears in the Protocol Management Window grid, as shown in *Image: Filtered Ports View* listed under **'Port Description (**Filtered**)'**. Select the *Remove Port Filter* button to restore the original list of ports.

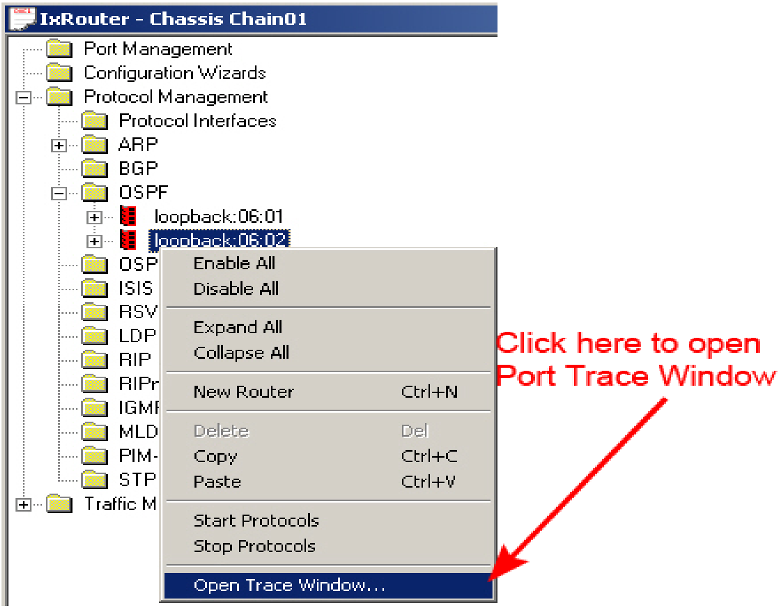
Image: Filtered Ports View



Port Trace Window

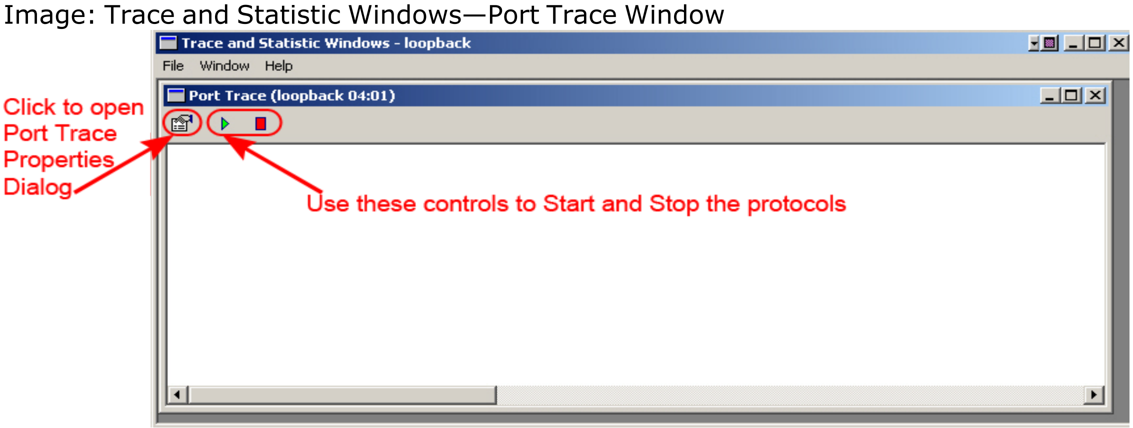
The Port Trace window can be accessed from a port item listed in the Protocol Window, or from the Protocol Management window pop-up menu. Selecting the port item opens a pop-up menu with a selection for 'Open Trace Window...,' as shown in *Image: Port Trace Command*.

Image: Port Trace Command



Selecting this menu option opens the Trace and Statistic Windows, with the Port Trace window included, as shown in *Image: Trace and Statistic Windows—Port Trace Window*.

Image: Trace and Statistic Windows—Port Trace Window

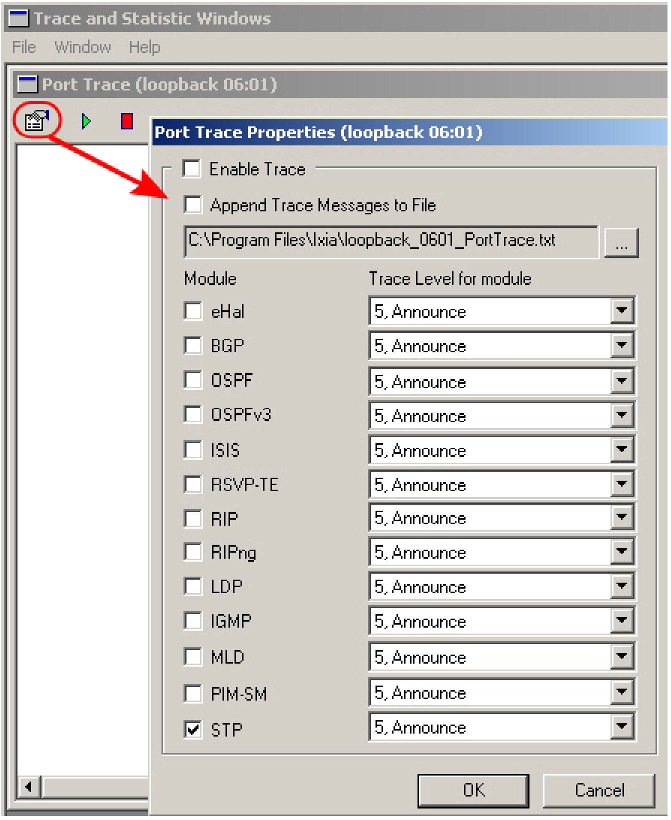


The information shown in this window about the status of a port depends on the selections made in the Port Trace Properties dialog box. Port Trace Properties dialog box for additional information on this dialog box.

Port Trace Properties dialog box

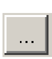
Select the *Edit* button in the Port Trace window toolbar to view the Port Trace Properties dialog box, which is shown in *Image: Port Trace Properties dialog box*.

Image: Port Trace Properties dialog box



The fields and controls in this dialog box are described in *Table: Port Trace Properties*.

Table: Port Trace Properties

Field/Control	**Description**
Enable Trace	Enables the Port Trace option for this port.
Append Trace Messages to File	Enables the saving of the port trace information to a file with the name automatically based on chassis/card/port plus '_PortTrace.txt.'
	Select this button to view the Save As dialog box, where the port trace information can be saved to a 'Trace' file, with the extension '.txt.'
Module	Choice of protocol to monitor in the Port Trace. Select one or more of the following protocols: • **eHal**—IxExplorer to IxServer communication • **BGP**—Border Gateway Protocol Version • **OSPF**—Open Shortest Path First • **ISIS**—Intermediate System - Intermediate System • **RSVP-TE**—Resource ReSerVation Protocol - Traffic Engineering • **RIP**—Routing Information Protocol • **LDP**—Label Distribution Protocol

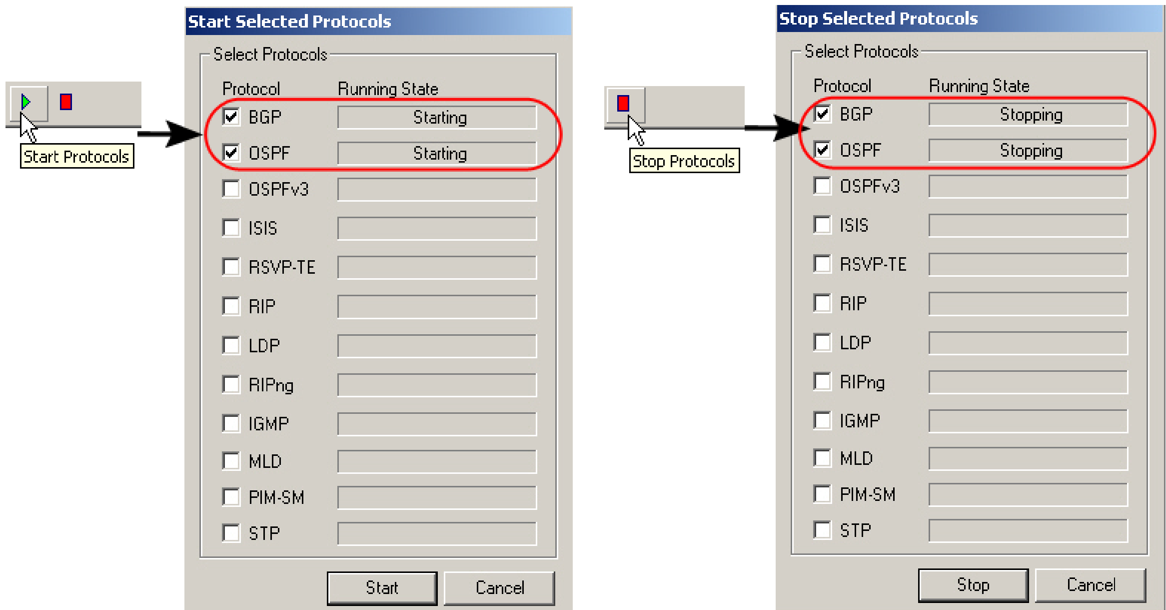
Field/Control	Description
	• **RIPng**—Routing Information Protocol Next Generation • **IGMP**—Internet Gateway Multicast Protocol • **MLD**—Multicast Listener Discovery Protocol • **PIM-SM/SSM**—Protocol Independent Multicast - Sparse Mode, Protocol Independent Multicast–Source-Specific Multicast
Trace Level for Module	Select one of: • **1, Critical**—Unexpected occurrences, such as running out of memory on system. • **2, Error**—Indicates legitimate error condition (such as incorrect protocol configuration) that will most likely prevent the test from running. • **3, Alert**—Reserved for future use. • **4, Warning**—Situations that are some sort of error condition for the current protocol that is running, but not due to user configuration, such as a line cut. • **5, Announce**—(Default setting) All messages and protocol states of a non-periodic nature (Start, Stop, and so on.) • **6, Info**—All protocol events with some level of details shown. • **7, Debug**—Same as info plus Hex dumps of frames received from the network. • **8, LowDebug**—Internal states of Ixia's protocol engine.
(Message)	'Trace is not enabled for the selected protocol(s). Select 'OK' to enable trace, 'Cancel' to leave it disabled.' The first time that you select 'Open Port Trace' for one of the port items listed under a particular protocol, this dialog box appears automatically, with a checkmark entered for the protocol. This indicates that the Port Trace function is not yet enabled—you must select *OK* buttonto enable Port Trace for that protocol.

NOTE 'Announce' level (the default) should be sufficient for most uses. Info, Debug, and Low Debug decrease performance due to increased processing.

Port Trace Window–Start/Stop Protocols

The Port Trace Window provides toolbar controls for starting and stopping *enabled* protocols, as shown in *Image: Port Trace—Start/Stop Protocols*.

Image: Port Trace—Start/Stop Protocols



Additional Features in IxRouter

Additional features available in the IxRouter window are covered in the following sections:

- IxRouter Window View Options
- Add/Remove dialog box
- Add View
- IxRouter Window 'Refresh'

IxRouter Window View Options

The number and type of options in a context menu will vary, depending on the type of parameters available for the window. An example showing the context menu for the BGP port-level grid is shown in *Image: IxRouter Window—Grid context menu example*.

Image: IxRouter Window—Grid context menu example

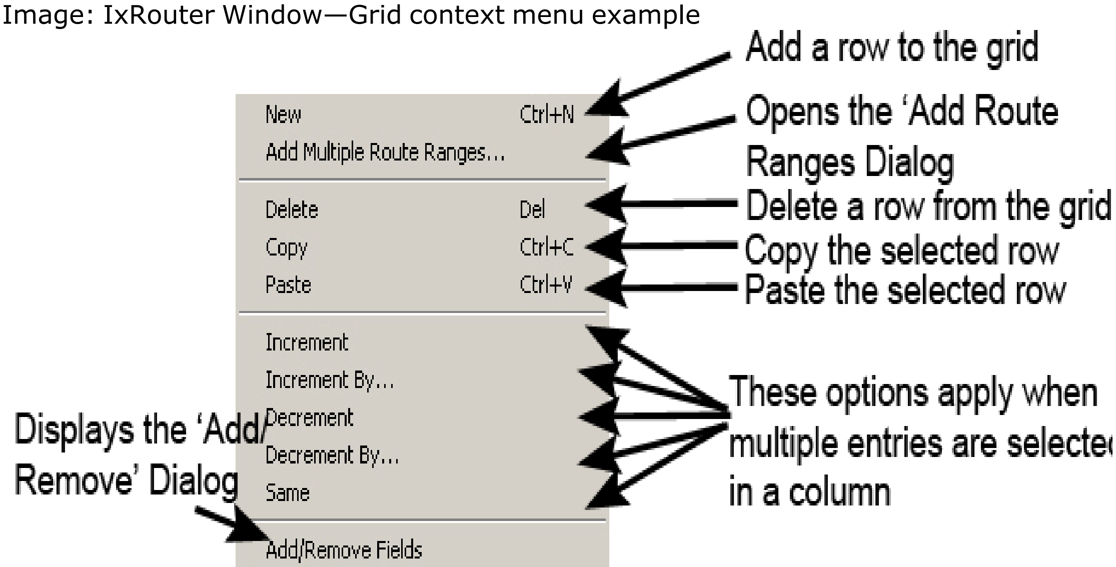
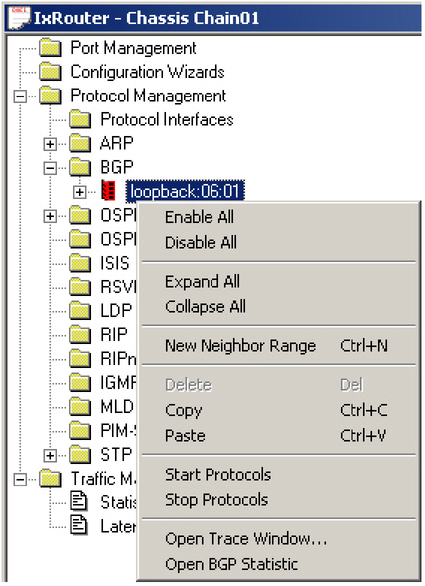


Image: IxRouter Protocol Tree context menu example (for BGP Neighbor level)



The fields and controls in this dialog box are described in *Table: IxRouter Protocol Tree context menu example (for BGP Neighbor level)*.

Table: IxRouter Protocol Tree context menu example (for BGP Neighbor level)

Field/Control	Description
Enable All	Enable all protocol items that have been configured for this level and levels below it in the tree.
Disable All	Disable all protocol items that have been configured for this level and levels below it in the tree.
Expand All	Open the protocol tree for all items below the selected item.
Collapse All	Close the protocol tree for all items below the selected item.
New Neighbor Range - Ctrl + N	(Other, different protocol items may be available depending the protocol and the level in the protocol tree.) In this example, adds a new BGP Neighbor Range for this port (in the grid to the right).
Delete - Del	If available, the selected item and all items below it in the tree will be deleted.
Copy - Ctrl + C	If available, copy the selected item and all of the items configured below it in the tree. For example, a BGP Neighbor configuration can be copied and pasted under the port.
Paste - Ctrl + V	If available, the selected item and all of the items configured below it in the tree can be pasted into the same level.

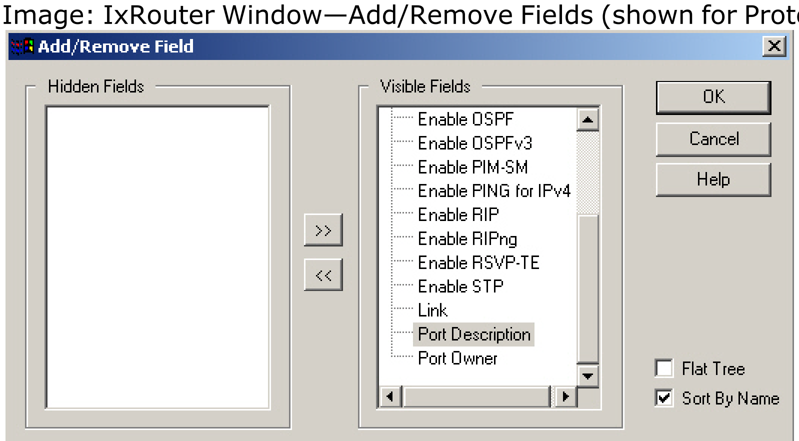
Field/Control	Description
	For example, a BGP Neighbor configuration can be copied and pasted under the port.
Start Protocols	Starts the protocol engines for all enabled, configured items on this port.
Stop Protocols	Stops the protocol engines for all enabled, configured items on this port.
Open Trace Window	Open the Port Trace Window for this port. Port Trace Window for additional information.
Open BGP Statistics	(This feature applies to BGP only) Open the BGP Port Stat Window for this port.

Add/Remove dialog box

The Add/Remove Field dialog box allows to customize a spreadsheet/grid view in the IxRouter window. An example of the Add/Remove Field dialog box is shown in *Image: IxRouter Window—Add/Remove Fields (shown for Protocol Management Window)*.

NOTE This feature is available when protocol emulations have been installed.

Image: IxRouter Window—Add/Remove Fields (shown for Protocol Management Window)



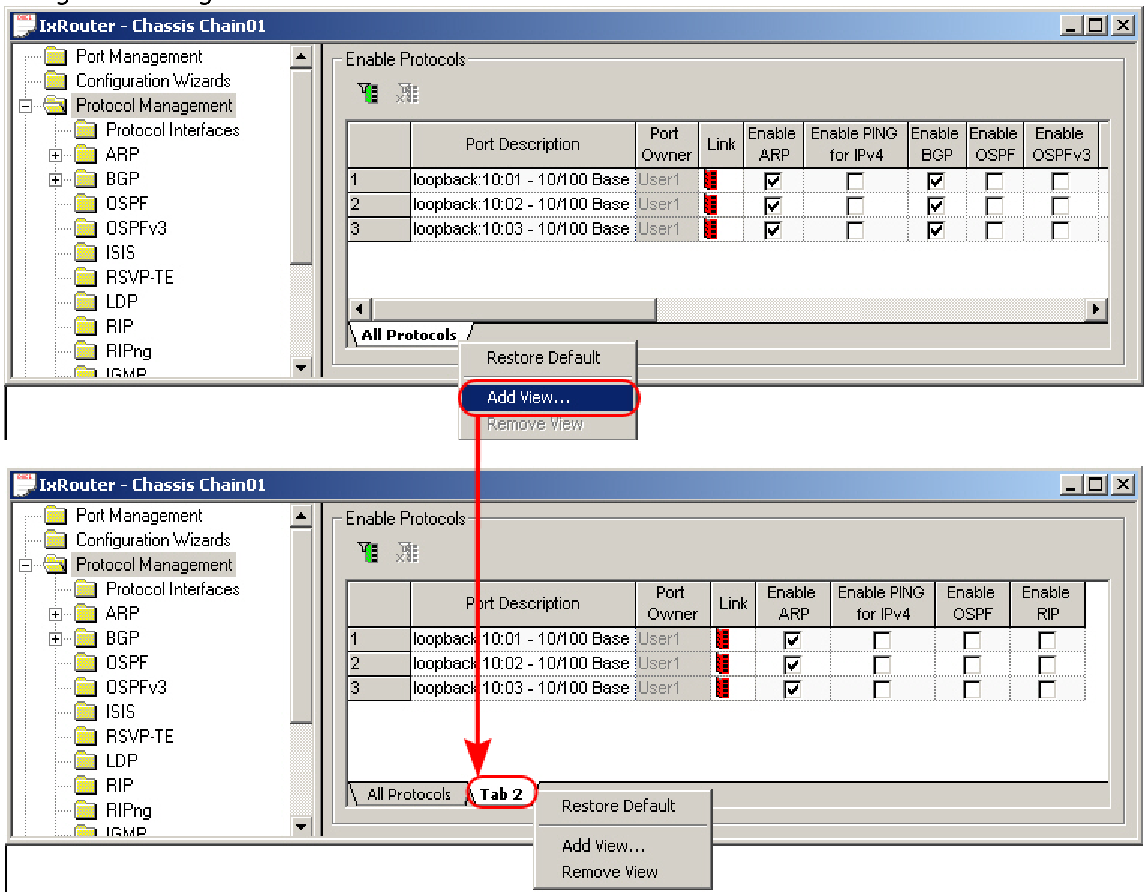
To create or modify a customized spreadsheet view, use the '>>' arrow to move a hidden field to the Visible Fields column and the '<<' arrow to move a visible field to the Hidden Fields column. Columns and rows may be rearranged by selecting the entire row or column and moving it (using the 'drag and drop' method) to its new location. The fields available depend on the particular protocol being configured, and the level of configuration within that protocol. The 'Flat Tree' check box allows to view lists which include all possible fields, without a hierarchy. The 'Sort by Name' check box allows to view lists with the field names in alphabetical order.

Add View

In the Protocol Management window, by default there is one tabbed spreadsheet view named **All Protocols**, which lists all available protocols.

An additional tabbed view with a subset of the listed items can be created. Select the tab name, and then select **Add View**. The Add/Remove dialog box (Add/Remove dialog box) will open so items can be moved to the **Hidden Fields** list in the left pane. A subset of items will remain in the Visible Fields list. Select **OK** to close the dialog box. The new subset view, Tab 2, appears in the Protocol Management window.

Image: Creating an Additional View

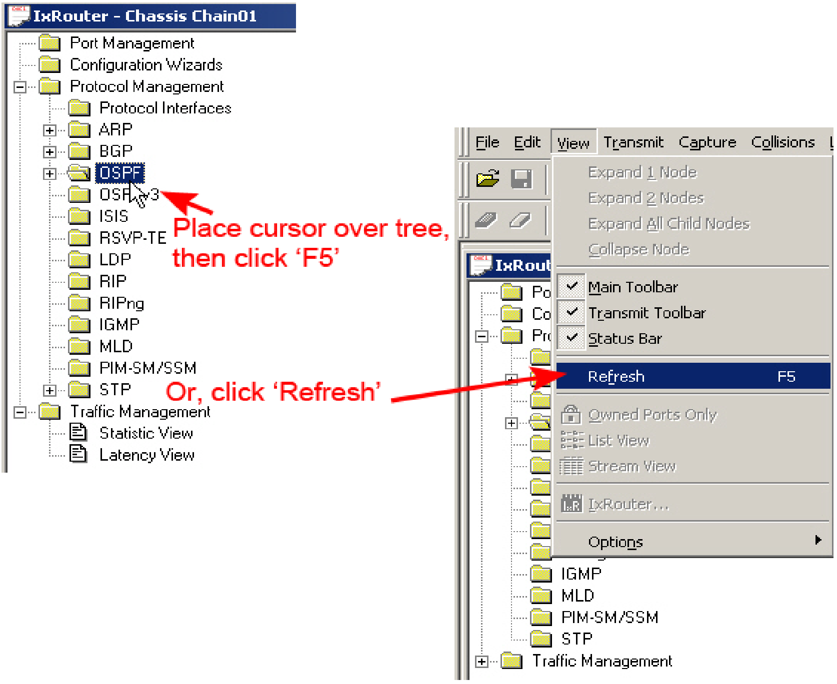


IxRouter Window 'Refresh'

The chassis configuration view can be 'refreshed' (updated) in the Protocol Window by:

- Selecting the *F5 (Refresh)* button when the focus is on the tree in the Protocol Window, or
- Going to the IxExplorer Main menu bar > View menu > Refresh, and by selecting 'Refresh.'

Image: IxRouter Window Refresh


IxRouter - Chassis Chain01
Port Management
Configuration Wizards
Protocol Management
Protocol Interfaces
ARP
BGP
OSPF
ISIS
RSVP-TE
LDP
RIP
RIPng
IGMP
MLD
PIM-SM/SSM
STP
Traffic Management
Statistic View
Latency View
Place cursor over tree, then click 'F5'
Or, click 'Refresh'
File Edit View Transmit Capture Collisions
Expand 1 Node
Expand 2 Nodes
Expand All Child Nodes
Collapse Node
Main Toolbar
Transmit Toolbar
Status Bar
Refresh F5
Owned Ports Only
List View
Stream View
IxRouter...
Options
IGMP
MLD
PIM-SM/SSM
STP
Traffic Management

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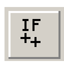
CHAPTER 10

Protocol Interfaces

Multiple protocol interfaces can be configured for Ixia ports that support this capability, with the number of protocol interfaces being dependent on the amount of memory available on the Ixia port.

There are two methods available for creating one or more Protocol Interfaces for an Ixia port:

Configuration Method	Access Via	Description
Protocol Interfaces Wizard	 Select this button to open the Protocol Interfaces Wizard. Available in Protocol Interfaces window and in various windows for individual protocols.	Enter configuration information in the dialog boxes of the Protocol Interfaces Wizard. Protocol Interface Wizard for additional information.
Manual	Open Protocol Interfaces window in IxRouter Window tree.	Enter configuration information directly in the Protocol Interfaces window/grid. Protocol Interfaces Window for additional information.

Protocol Interfaces Window

The main Protocol Interfaces window is made up of multiple tabbed views. The window with combined views for Protocol Interfaces is shown in *Image: **Protocol Interfaces** Tab*. The default Interface Description for the port is '[Empty],'until a protocol interface is created by you. The sets of tabbed windows are described in the following sections:

- Protocol Interfaces Tab
- PTP Clock Configuration
- Unconnected Interfaces
- GRE Tunnels
- NPIV Protocol Interface
- Discovered Neighbors
- Interface Addresses
- DHCPv4 Discovered Information

- [DHCPv6 Discovered Information]
- [FCoE Discovered Information]
- [PTP Discovered Information]

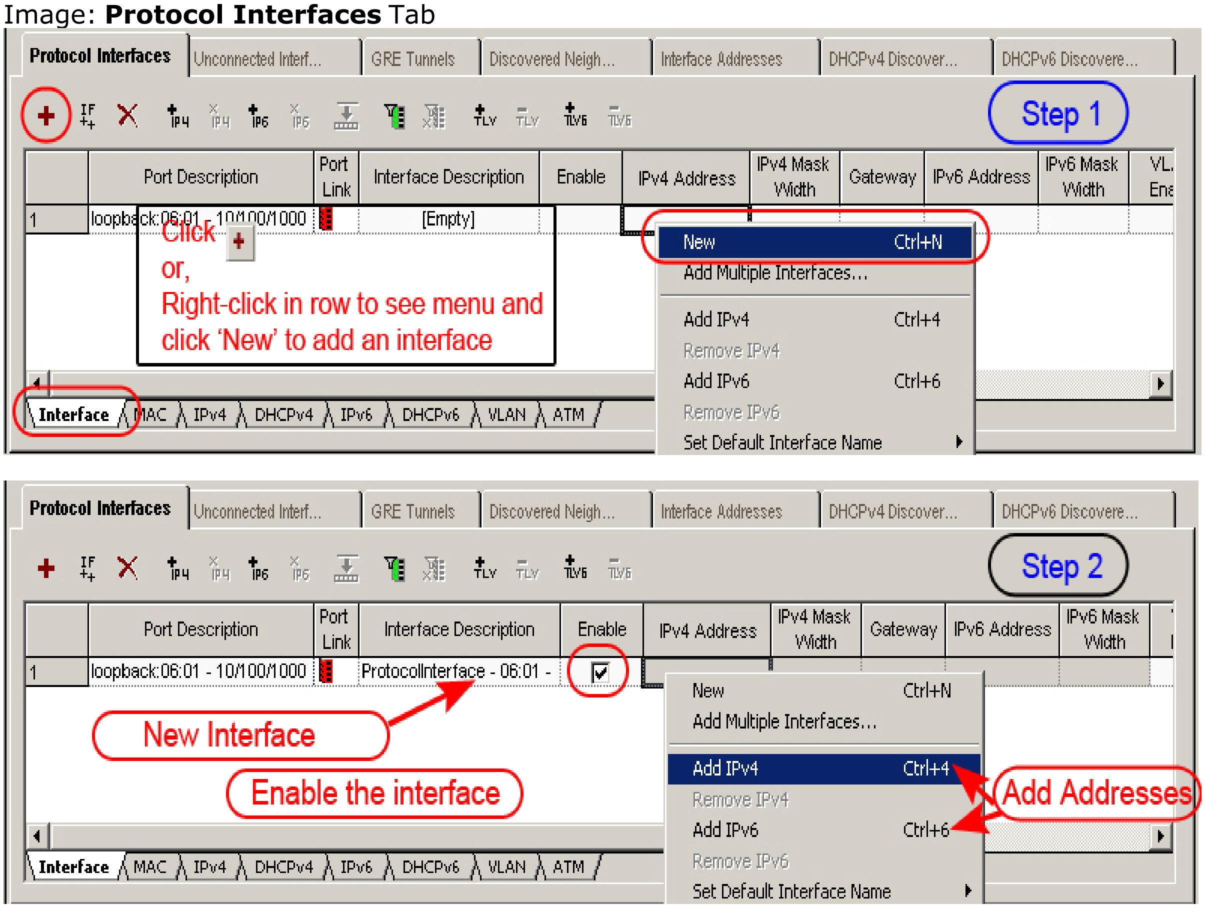
NOTE You will not be able to select DHCPv4-enabled interfaces for use with protocol emulations, with the exception of IGMP. You will not be able to select DHCPv6-enabled interfaces for use with protocol emulations.DHCP is applicable only to Ethernet ports and to ATM ports using Bridged Ethernet encapsulation.

Protocol Interfaces Tab

The **Protocol Interfaces** tab (for 'connected' protocol interfaces) is shown in *Image: **Protocol Interfaces** Tab*, below. Steps 1 and 2 show how to create a protocol interface for the port, add addresses, and then enable the interface.

NOTE The 'Enable' box MUST be selected to make a protocol interface active and available for configuration with routing protocols.

Image: **Protocol Interfaces** Tab



Individual views for MAC, IPv4, DHCPv4, IPv6, DHCPv6, and VLAN are shown in *Image: Protocol Interfaces (Views for MAC, IPv4, DHCPv4, IPv6 & DHCPv6)* and *Image: Protocol Interfaces—VLAN*. The ATM View, available for configuration for ATM-capable modules only, is shown in *Image: Protocol Interfaces—ATM (active for ATM ports ONLY)*. The FCoE View is shown in *Image: Protocol*

Interfaces—FC/FCoE and the PTP View is shown in *Image: Protocol Interfaces—PTP*. The DCBX view is shown in *Image: Protocol Interfaces—DCBX / LLDP*.

NOTE IPv6 has a minimum frame size of 1280 bytes. When creating IPv6 protocol interfaces for POS ports, it is important that the desired negotiated port Transmit MRU value is set to 1280 bytes or higher. If this is not done, protocol interfaces cannot be associated with the port.

Image: Protocol Interfaces (Views for MAC, IPv4, DHCPv4, IPv6 & DHCPv6)

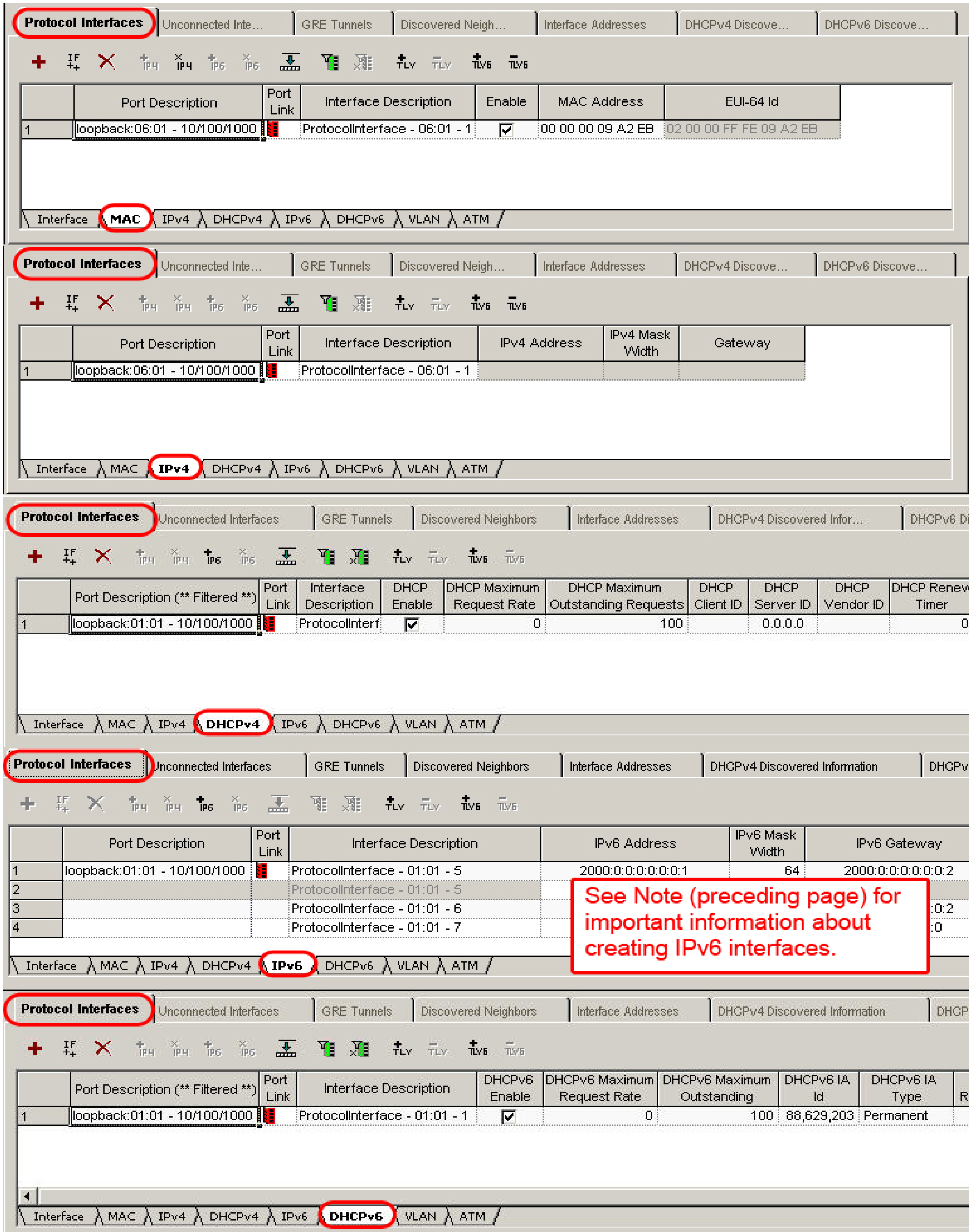


Image: Protocol Interfaces—VLAN

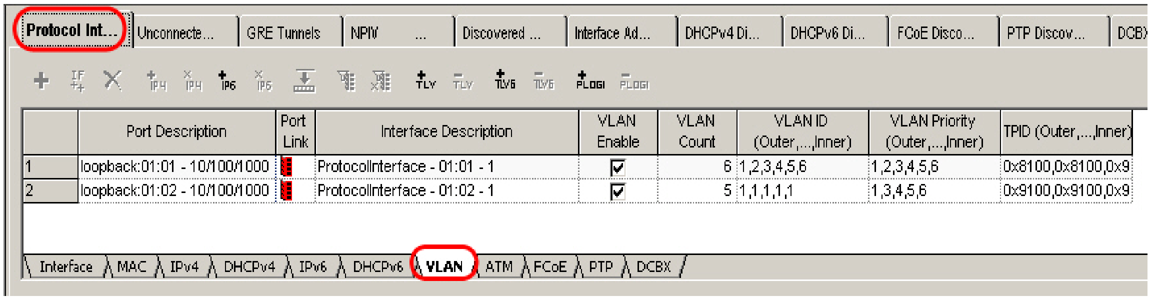


Image: Protocol Interfaces—ATM (active for ATM ports ONLY)

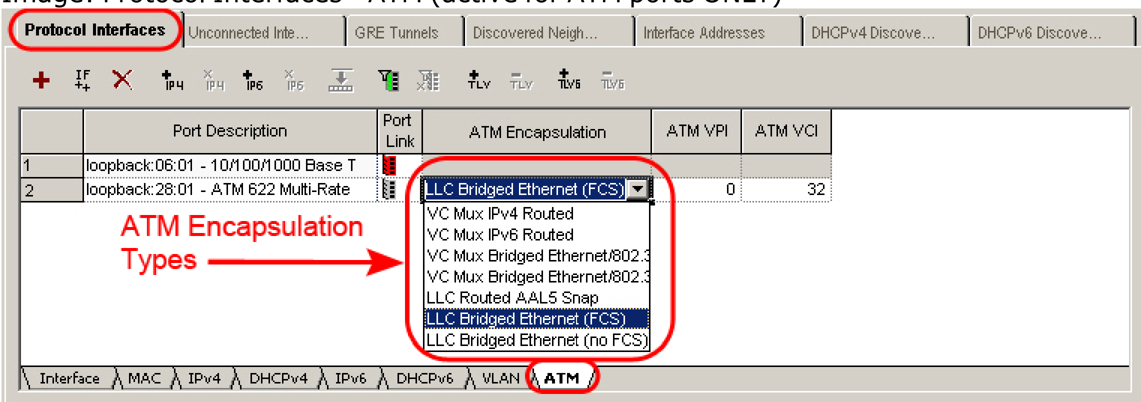


Image: Protocol Interfaces—FC/FCoE

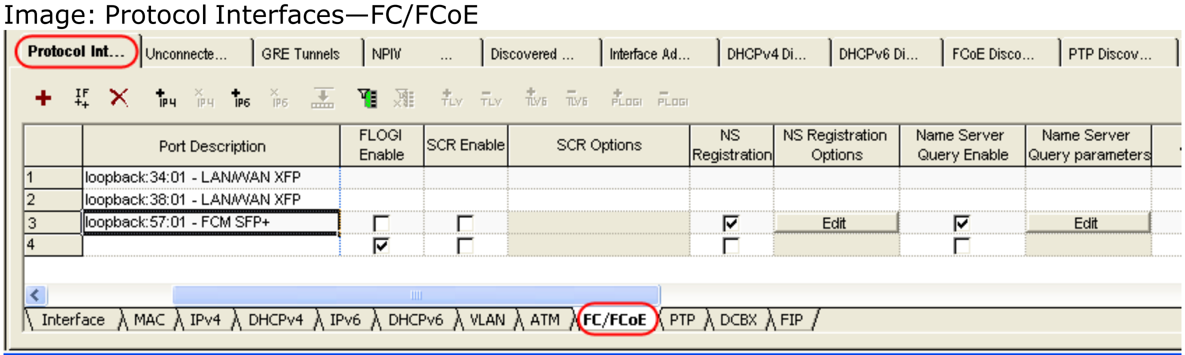


Image: Protocol Interfaces—PTP

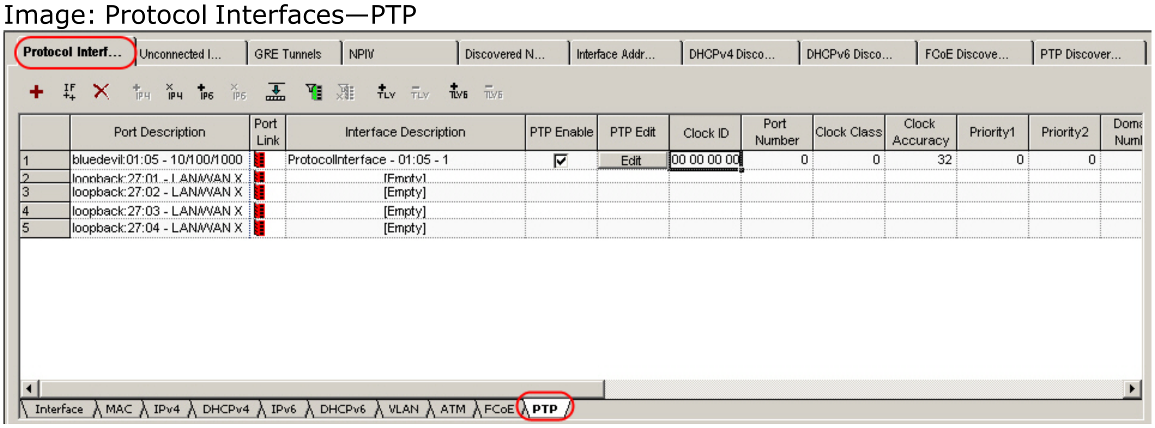
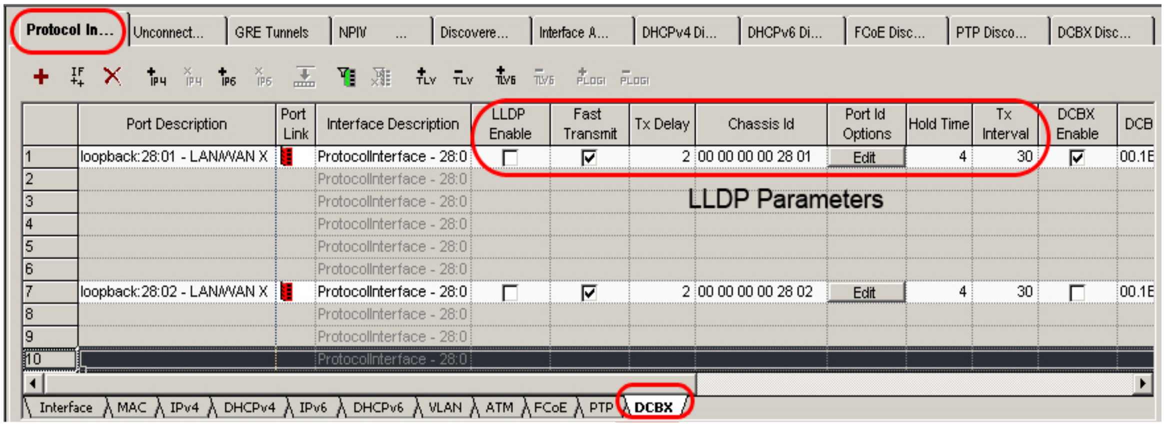


Image: Protocol Interfaces—DCBX / LLDP



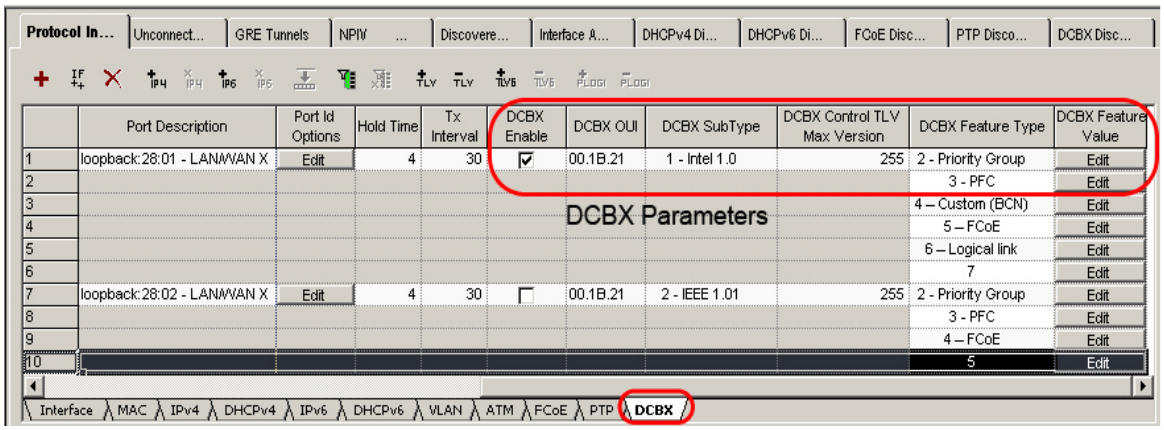
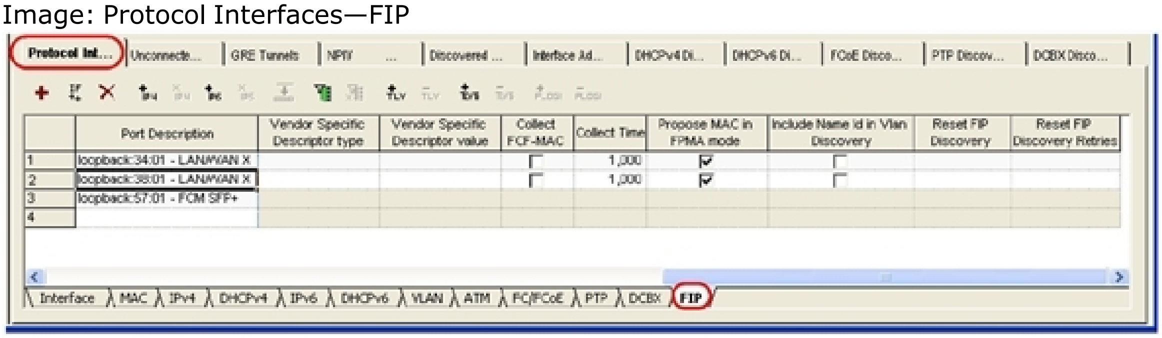


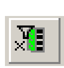
Image: Protocol Interfaces—FIP



The fields and controls shown in these views are described in *Table: **Protocol Interfaces** tab*. You may manually edit any of the available entries in the view by placing the cursor over the value field or table cell and pressing the **F2** key.

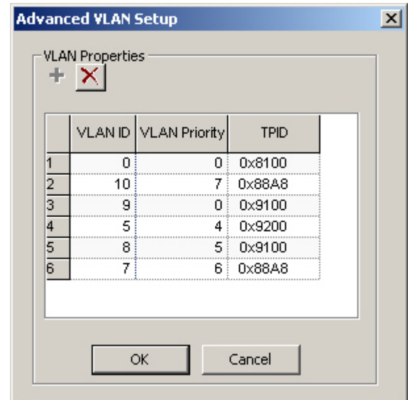
Table: **Protocol Interfaces** tab

View/Section	Field/Control	Description
Protocol Interfaces - Header		Select this button to add a protocol interface to the selected port in the Interface view.

View/Section	Field/Control	Description
		NOTE The number of protocol interfaces that can be added depends on the amount of memory available.
		Select this button to open the Protocol Interfaces wizard dialog box for configuring one or more protocol interfaces. Protocol Interface Wizard for additional information.
		Select this button to delete the selected interface entry(ies) from the table.
		Select this button to add an IPv4 Address to a Selected Interface.
		Select this button to delete the IPv4 Address from a Selected Interface.
		Select this button to add an IPv6 Address to a Selected Interface.
		Select this button to delete the selected IPv6 Address(es) from a Selected Interface.
		For Ethernet type ports only. Select this button to transmit an ARP request for the selected entry(ies).
		Filter Selected Ports. Select this button to open the **Filter Port** dialog box. This dialog box allows to specify which of the available ports appears in the table. Then the Port Description column will be automatically relabeled as 'Port Description (** Filtered **). Filter Ports dialog box for additional information on Port Filtering.
		Remove Port Filter. Select this button to disable the Port

View/Section	Field/Control	Description
		Filter feature, and all available ports appear in the table.
		Add DHCPv4 TLV. Add a DHCPv4 TLV entry to the table.
		Remove DHCPv4 TLV. Delete the selected DHCPv4 TLV entry (ies) from the table.
		Add DHCPv6 TLV. Add a DHCPv6 TLV entry to the table.
		Remove DHCPv6 TLV. Delete the selected DHCPv6 TLV entry (ies) from the table.
Fields for all Protocol Interface Views	Port Description	The identifier for the port including card and port numbers, and the port type.
	Port Link	The color of this icon indicates the state of the link: • **Green**—Link is Up. • **Red**—Link is Down. • **Yellow**—Link is in loopback mode. • **Gray**—Link is unavailable because it is busy or it is an unsupported link type.
	Interface Description	When an interface is added to the port in this window, the new Interface description consists of three items: • The interface number on this port. • The card number / port number. • Protocol Interface. (You may manually edit the Interface Description.)
Interface View	Enable	Select this box to enable the selected protocol interface.
	IPv4 Address	When an interface is selected, an IPv4 address may be added to that interface,

View/Section	Field/Control	Description
		using the *Add* button, or 'Add' from the Interfaces pop-up menu. Adding the IPv4 Address also automatically adds an IPv4 Mask Width and a Gateway address to the interface, using the default values.
	IPv4 Mask Width	The length of the IPv4 network mask to be used with the IPv4 address, in bits. The default IPv4 mask width is 24 bits.
	Gateway	The IPv4 address of the 'Gateway' to the network, typically an interface on the DUT.
	IPv6 Address	When an interface is selected, an IPv6 address may be added to that interface, using the *Add* button or 'Add' from the Interfaces pop-up menu. Adding the IPv6 Address also automatically adds an IPv6 Mask Width to the interface, using the default values. Multiple IPv6 addresses may be added to each interface.
	IPv6 Mask Width	The number of bits for the IPv6 network mask to be used with the IPv6 address, starting with the most significant bit of the address (at the left). These bits (n bits) comprise the network part of the address. The remaining bits in the address (128 minus n) comprise the host part of the address. The default IPv6 Mask width is 64 bits.
	IPv6 Gateway	(Optional) There can be one gateway per IPv6 interface.
VLAN View	VLAN Enable	(For IPv4 only) If selected, enables the VLAN option on this port, with one VLAN ID per interface. Double-click this field or any of the following VLAN fields to open the Advanced VLAN Setup dialog box, in which these values can be configured.

View/Section	Field/Control	Description
		
	VLAN Count	The number of VLANs (up to 6)
	VLAN ID	(For IPv4 only) If the VLAN option is enabled for the current interface, a VLAN ID may be added to the packet, to identify the VLAN that the packet belongs to.
	VLAN Priority(Outer, ..., Inner)	The user priority of the VLAN tag: a value from 0 through 7. The use and interpretation of this field is defined in ISO/IEC 15802-3.
	TPID (Outer, ..., Inner)	Tag Protocol ID: Ether types identify the protocol that follows the VLAN header. Select from available hex options:0x8100, 0x88A8, 0x9100, 0x9200
MAC View	MAC Address	For non-POS ports/interfaces only. When a New interface is added to the port, a MAC (Layer 2/Ethernet) address is automatically assigned to that interface.
	EUI-64 Id	This is the 64-bit IEEE Modified EUI Id value for the Interface Identifier portion of the IPv6 address. For **Ethernet** modules, this field is not editable. The value is automatically calculated, based on the 48-bit MAC address. For more information on how this value is calculated, refer to the IPv6 Interface Identifiers (IIDs) section in the 'Theory of Operation: General' chapter

View/Section	Field/Control	Description
		of the *Ixia Platform Reference Manual*. For OC48 and OC192 POS modules, you can edit the value.
IPv4 View	IPv4 Address	When an interface is selected, exactly one IPv4 address may be added to that interface, using the *Add* button, or 'Add' option in the Interfaces pop-up menu. Adding the IPv4 Address also automatically adds an IPv4 Mask Width and a Gateway address to the interface, using the default values.
	IPv4 Mask Width	The length of the IPv4 network mask to be used with the IPv4 address, in bits. The default IPv4 mask width is 24 bits.
	Gateway	The IPv4 address of the 'Gateway' to the network, typically an interface on the DUT.
	Auto Arp	If selected and then MAC interface is enabled, the Learned IP Addresses and Learned MAC Addresses are automatically shown in the ARP Table.
DHCPv4 View	DHCP Enable	(Applies only to Ethernet ports and to ATM ports using Bridged Ethernet encapsulation.) NOTE You will not be able to select DHCPv4-enabled interfaces for use with protocol emulations, with the exception of IGMP. If selected, the IPv4 DHCP client feature will be enabled. DHCP negotiation will be started and an IPv4 address learned from the DHCP server will be assigned automatically to the protocol interface. When this feature is enabled, the fields in the IPv4 view will be dimmed and unavailable for configuration by you. If an IPv4 address has already been assigned to the port, a warning message

View/Section	Field/Control	Description
		will open, requiring a choice by you to continue with DHCP address assignment to replace the existing IPv4 address, or to keep the existing address.
	DHCP (DHCPv6) Maximum Request Rate	(For rate control) The user-specified maximum number of Request messages that can be sent per second from the client to the server, requesting an IPv4 address. A value of zero (0) indicates that there will be no rate control, that is, requests will be sent as fast as possible.
	DHCP (DHCPv6) Maximum Outstanding	The maximum number of DHCP requests that can be pending, waiting replies from the server. If this number is reached, no further requests can be sent until an acknowledgment is received for a pending request.
	DHCP Client ID	(string) You may optionally assign an identifier for the Client. This value must be unique on the subnet where the DHCP Client is located. If this value is *not* configured by you, the MAC address of the Protocol Interface will automatically be used as the Client ID.
	DHCP Server ID	(4-octet IPv4 address) If this value is configured by you, the DHCP client state machine will perform negotiations only with this specified DHCP server. This value is used to identify the DHCP Server and as a destination address from the client.
	DHCP Vendor ID	(string) The optional, user-assigned Vendor ID (vendor class identifier).
	DHCP Renew Timer	(in seconds) The user-specified value and the lease timer (from the DHCP Server) are

View/Section	Field/Control	Description
		compared. The lowest value is used as the release/renew timer. After this time period has elapsed, the address will be renewed. Maximum is 4,294,967,295 (decimal) = 0xFFFFFFFF (hex). This value equals 'infinity,' and indicates that the IP address allocation is 'permanent.'
	Relay Agent Address	Set by the server, to be used in optional cross-gateway starting.
(DHCP TLVs)		DHCP TLVs (tuples) for custom DHCP options. Additional TLV entries may be added by pressing the  button.
	DHCP Type	(integer) The identifier or 'tag' for this DHCP option.
	DHCP Value	The DHCP option value field may contain data for configuration information such as IPv4 addresses, time server information, and so on.

View/Section	Field/Control	Description
IPv6 View	NOTE IPv6 has a maximum transmission unit (MTU) minimum of 1280. When creating IPv6 protocol interfaces for POS ports, it is important that the desired negotiated port Transmit MRU value is 1280 bytes or greater. If this is not done, protocol interfaces cannot be associated with the port.	
	IPv6 Address	When an interface is selected, an IPv6 address may be added to that interface, using the *Add* button or the 'Add' option from the Interfaces pop-up menu. Adding the IPv6 Address also automatically adds an IPv6 Mask Width to the interface, using the default values. Multiple IPv6 addresses may be added to each interface.
	IPv6 Mask Width	The number of bits for the IPv6 network 'mask' to be used with the IPv6 address, starting with the most significant bit of the address (at the left). These bits (n bits) comprise the network part of the address. The remaining bits in the address (128 minus n) comprise the host part of the address. The default IPv6 Mask width is 64 bits.
	IPv6 Gateway	(Optional) There can be one gateway per IPv6 interface.

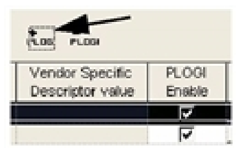
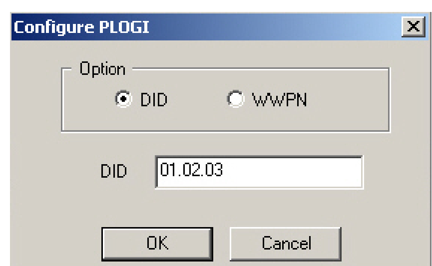
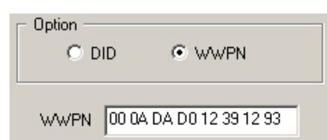
View/Section	Field/Control	Description
	Auto Neighbor Discovery	If selected and then MAC interface is enabled, the Discovered Neighbors parameters are automatically shown.
DHCPv6 View	DHCPv6 Enable	(Applies only to Ethernet ports and to ATM ports using Bridged Ethernet encapsulation.) NOTE You will not be able to select DHCPv6-enabled interfaces for use with protocol emulations. If selected, the IPv6 DHCP client feature will be enabled. DHCPv6 negotiation will be started and an IPv6 address learned from the DHCPv6 server will be assigned automatically to the protocol interface. When this feature is enabled, the fields in the IPv6 view will be dimmed and unavailable for configuration by you. If an IPv6 address has already been assigned to the port, a warning message will open, requiring a choice by you to continue with DHCPv6 address assignment to replace the existing IPv6 address, or to keep the existing address.
	DHCPv6 Maximum Request Rate	(For rate control) The user-specified maximum number of Request messages that can be sent per second from the client to the server, requesting an IPv6 address. A value of zero (0) indicates that there will be no rate control, that is, requests will be sent as fast as possible.
	DHCPv6 IA Id	(string) The unique identifier value for the Identity Association.
	DHCPv6 IA Type	The Identity Association type. Choose one of: • Temporary (IA_TA)—A group of temporary IPv6 addresses identified by a unique Identity Association Id (IAID)—Assigned by

View/Section	Field/Control	Description
		the DHCP server to the client. Each IA_TA may be associated with only one interface. (The DHCPv6 server sends complete IPv6 addresses to the client.) • Permanent (IA_NA)—A group of non-temporary (permanent) IPv6 addresses identified by a unique Identity Association Id (IAID) - assigned by the DHCP server to the client. Each IA_NA may be associated with only one interface. (The DHCPv6 server sends complete IPv6 addresses to the client.) • Prefix Delegation (IA_PD)—Collection of prefixes. The delegating router (server) assigns the prefix(es) to the requesting router, instead of individual, complete addresses. For example, prefixes of length /64. The requesting router can then assign 128-bit address(es) or subnets to its interfaces. Currently, each IA_PD may be associated with one interface. NOTE Address assignment may also be used by the requesting router—in addition to prefix delegation.
	DHCPv6 Renew Time	(In seconds) The amount of time that the DHCPv6 Client will wait before sending a Renew message to the server. The Renew message is sent by the client to request an extension of the lifetime for the IPv6 address that was assigned by the server.
	Relay Destination	Set by the server, to be used in optional cross-gateway starting.
(DHCPv6 TLVs)		DHCPv6 TLVs (tuples) for custom

View/Section	Field/Control	Description
		DHCPv6 options. Additional TLV entries may be added by pressing the  button.
	DHCPv6 Tlv Type	(decimal) The identifier for this DHCPv6 option.
	DHCPv6 Tlv Value	(hex) The DHCPv6 option value field may contain data for configuration information such as time server information, and so forth.
VLAN View	VLAN Enable	If selected, enables the VLAN option on this port, with one VLAN ID per interface.
	VLAN ID	If the VLAN option is enabled for the current interface, a VLAN ID may be added to the packet, to identify the VLAN to which the packet belongs.
	VLAN Priority	The user priority of the VLAN tag: a value from 0 through 7. The use and interpretation of this field is defined in ISO/IEC 15802-3.
ATM View (applies to ATM ports only)	ATM Encapsula-tion	The type of RFC 2684 ATM multiplexing encapsulation (bridging or routing) protocol to be used. Choose one of: • VC Mux IPv4 Routed • VC Mux IPv6 Routed • VC Mux Bridged Ethernet/802.3 (FCS)—(the default) • VC Mux Bridged Ethernet/802.3 (no FCS) • LLC Routed AAL5 Snap • LLC Bridged Ethernet (FCS) • LLC Bridged Ethernet (no FCS)

View/Section	Field/Control	Description
		NOTE See the information below regarding the general types of ATM encapsulation. • **VC Mux**—VC MUX Routed Protocol. For ATM Virtual Connection (VC) Multiplexing. Each ATM VC carries routed PDUs for only one protocol. Multiple VCs are required for multiple protocols. Helps to reduce fragmentation overhead. • **LLC Snap**—LLC/SNAP Routed Protocol. For ATM LLC Encapsulation. Each ATM VC carries routed PDUs for multiple protocols. Helps to reduce the number of separate VCs required if multiple protocols are used.
	ATM VPI	Virtual Path Identifier (VPI) for the VC over which information is being transmitted. The minimum value = 0. See the *Ixia Platform Reference Manual* for additional information about ATM VPI/VCI pairs.
	ATM VCI	Virtual Circuit/Channel Identifier (VCI) for the VC over which information is being transmitted. The minimum value = 32. (Values less than 32 are reserved.) See the *Ixia Platform Reference Manual* for additional information about ATM VPI/VCI pairs.
FC/FCoE View	FLOGI Enable	If selected, enables Fabric login (FLOGI). The FLOGI frame provides the means by which an Nx_Port requests Login with the Fabric.
	SCR Enable	If selected, enables State Change Registration. SCR requests the Fabric Controller or Nx_Port to add the Nx_Port

View/Section	Field/Control	Description
		that is sending the SCR Request to the list of Nx_Ports.
	SCR Options	If *SCR Enable* check box is enabled, the field for SCR Options become available. The registration function options for SCR are as follows: • Fabric Detected: Register to receive all Registered State Change Notification (RSCN) Requests issued by the Fabric Controller for events detected by the Fabric. • Nx Port Detected: Register to receive all RSCN Requests issued for events detected by the affected Nx_Port. • Full Registration: Register to receive all RSCN Requests issued. The RSCN Request returns all affected N_Port_ID pages.
	NS Registration	If selected, enables Name Server Registration for this port.
	NS Registration Options	If *NS Registration* check box is selected, the *NS Registration Options* field becomes active and the *Edit* button is available. Select *Edit* to open the *Name Server Registration Configuration* dialog box to configure NS Registration options. Refer Name Server Registration for more information.
	Name Server Query Enable	If selected, enables Name Server Query parameters for this Fibre Channel Name Server.
	Name Server Query parameters	If *Name Server Query Enable* check box is selected, the *Name Server Query parameters* field becomes active and the *Edit* button is available. Select *Edit* button to open the *FC Name Server Query* dialog box to configure FC name server options. Refer FC Name Server Query for more

View/Section	Field/Control	Description
		information.
	Automatic PLOGI	If selected, automatically enables PLOGI to all the ports that are advertised by the fabric, or to PLOGI to a subset of the available ports that belong to a specified domain.
	PLOGI Enable	Enables PLOGI. The PLOGI transfers Service Parameters from the initiating Nx_Port to the FC Port associated with the Destination Identifier. The PLOGI frame provides the means by which an Nx_Port requests Login with another Nx_Port before other Data frame transfers. If +PLOGI is activated (in the toolbar, as shown in the image)  enables Port login to specified Destination ID.
	PLOGI Destination	The PLOGI Destination Identifier. When +PLOGI is activated, a dialog box opens for configuring the Port login.  
	PRLI Enable	If selected, enables the Process Login parameters used by this port. The Process Login (PRLI) ELS request is

View/Section	Field/Control	Description
		used to establish the operating environment between a group of related processes at the originating Nx_Port and a group of related processes at the responding Nx_Port. If enabled, this option causes the state machine to attempt a process login.
	Number of Retries	Number of retries before being marked as *Failure*.
	Request Rate	Maximum rate (packets/second). This value is configured per port. The port CPU state machine uses this value to determine the rate at which it should send out the control plane packets. This option is not configurable per interface, and all the interfaces on the port uses this configured value.
	Retry Interval	The interval between retries, when a packet is sent and no response received. The default value is 2000 (milliseconds).
	Source Port WWN	The Source Port Worldwide Name is a Name_Identifier that is unique worldwide. It is represented by a 64-bit value.
	Source Node WWN	The Source Node Worldwide Name is a Name_Identifier that is unique worldwide. It is represented by a 64-bit value.
	Source OUI	The three bytes Source Organization Unique Identifier.
	Buffer to Buffer Rx Size	The size, in bytes, of the buffer-to-buffer capacity. It is the maximum buffer-to-buffer Receive_Data_Field specified by the Fabric.
PTP View	PTP Enable	Enables PTP
	PTP Edit	Select **Edit** button to open PTP Clock Configuration dialog box.
	Clock ID	(See *Table: PTP Clock Configuration* for

View/Section	Field/Control	Description
		definitions.)
	Port Number	(See *Table: PTP Clock Configuration* for definitions.)
	Clock Class	(See *Table: PTP Clock Configuration* for definitions.)
	Clock Accuracy	(See *Table: PTP Clock Configuration* for definitions.)
	Priority1	(See *Table: PTP Clock Configuration* for definitions.)
	Priority2	(See *Table: PTP Clock Configuration* for definitions.)
	Domain Number	(See *Table: PTP Clock Configuration* for definitions.)
	Announce Interval	(See *Table: PTP Clock Configuration* for definitions.)
	Sync Interval	(See *Table: PTP Clock Configuration* for definitions.)
	Delay Request Interval	(See *Table: PTP Clock Configuration* for definitions.)
	Announce Receipt Timeout	(See Announce Receipt Timeout in *Table: PTP Clock Configuration* for definitions.)
	Delay Mechanism	(See *Table: PTP Clock Configuration* for definitions.)
	Master Slave Flag	(See *Table: PTP Clock Configuration* for definitions.)
	Start Offset	(See *Table: PTP Clock Configuration* for definitions.)
	% Bad Timestamp	(See *Table: PTP Clock Configuration* for definitions.)
	Timestamp Error	(See *Table: PTP Clock Configuration* for definitions.)
	% Bad CRC	(See *Table: PTP Clock Configuration* for definitions.)

View/Section	Field/Control	Description
	% Drop Follow-up Messages	(See *Table: PTP Clock Configuration* for definitions.)
	% Delay Resp Messages	(See *Table: PTP Clock Configuration* for definitions.)
DCBX / LLDP View	LLDP Enable	Enables LLDP Tx and Rx NOTE Since DCBX is an acknowledged protocol which uses LLDP, for the protocol to operate correctly, both LLDP Rx and Tx are enabled on the interface on which DCBX runs.
	Fast Transmit	Enables Fast Transmit. The interval for the LLDP transmission time to refresh the timer (Tx Interval) is set to 1 second for the first five transmissions after LLDP initialization and then reset to the administratively configured value.
	Tx Delay	Minimum delay between successive transmitted LLDP frames. Set to 2 seconds as a DCBX default.
	Chassis Id	MAC address of the chassis.
	Port Id Options	Select **Edit** to configure. DCBX Port Id.
	Hold Time	Tx Hold is the multiplier on Tx Interval that determines the actual TTL that is sent in the LLDP message. Hold Time x Tx Interval = TTL.
	Tx Interval	If Fast Transmit is enabled, the interval for the LLDP transmission time to refresh the timer (msgTxInterval) is set to 1 second for the first five transmissions after LLDP initialization and then reset to the administratively configured value. Hold Time x Tx Interval = TTL. Default = 30.

View/Section	Field/Control	Description
	DCBX Enable	Enables DCBX.
	DCBX OUI	The OUI used for the DCBX TLV is 0x001B21. The default is the Intel OUI, but can be changed to any 3-byte value.
	DCBX SubType	Select one of two DCBX types, either Intel 1.0 or IEEE 1.01. Based on the selection, the TLV differs.
	DCBX Control TLV Max Version	Set to 255. Highest DCBX protocol version supported by the system. Version numbers range from 0 to 255.
	DCBX Feature Type	Select the TLV+ icon (above) to add a TLV, and then the DCBX Feature Type becomes active: For SubType 1 (Intel) the first Feature Type entry is 2 Priority Group, next is 3-PFC, then 4-Custom (BCN), then 5-FCoE, then 6-Logical Link, then customizable 7, 8, and so on. The first 5 types are the 'known' TLVs. For SubType 2 IEEE, the first is 2-Priority Group, then 3-PDF, then 4-FCoE, then customizable 5,6, and so on. The first 3 types are the 'known' TLVs.
	DCBX Feature Value	For each DCBX Feature Type, select **Edit** to configure values. See *Table: DCBX Feature Values*.
FIP View	FIP Version	The version of FCoE Initialization Protocol (FIP) used.
	FIP enable	If selected, enables FIP. If enabled, the interface uses FIP for its initialization. Otherwise, it uses Cisco adhoc standard.
	Max FCoE size	Enter the maximum FCoE size (default - 2,158).
	Addressing Mode	Specifies the addressing mode to be used by the n-port. The options in the list are as follows: • Fabric Provided (default)

View/Section	Field/Control	Description
		• Server Provided • Both
	VLAN Discovery Enable	If selected, VLAN Discovery is performed.
	Untagged VLAN Discovery	If *VLAN Enable* is selected, this field becomes available. It enables untagged FIP VLAN discovery.
	VN_Port Keep Alive Enable	If enabled, VN_Port sends periodic keep alives.
	ENode Keep alive	If enabled, ENode sends periodic keep alives.
	Vendor ID	This value is used in the vendor specific descriptor.
	Vendor Specific Descriptor type	A user-specified entry.
	Vendor Specific Descriptor value	A user-specified entry.
	Collect FCF-MAC	If selected, sends collect FCF MAC address.
	Collect Time	The collect time for FCF MAC address. The default value is 1000 milliseconds.
	Propose MAC in FPMA mode	If selected, sends proposal for MAC address in FPMA mode.
	Include Name Id in VLAN Discovery	If selected, includes Name Identifier in VLAN Discovery tag.
	Reset FIP Discovery	If selected, resets FIP Discovery tag.
	Reset FIP Discovery Retries	If set, retries FIP Discovery for the selected number of times.

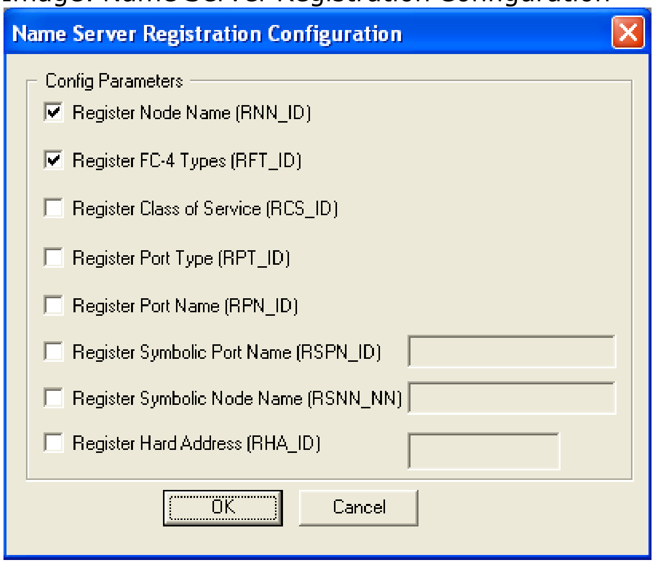
Name Server Registration

The Name Server Registration Configuration option enables to set up the configurable parameters for the name server registration. Once configured, it sends name server query to the Fibre Channel Name Server.

To access the *Name Server Registration Configuration* dialog box, select the *NS Registration* check box in FC/FCoE view. The *NS Registration Options* field becomes active and the *Edit* button is available. Select *Edit* to open the *Name Server Registration Configuration* dialog box to configure NS Registration options.

The *Name Server Registration Configuration* dialog box is shown in *Image: Name Server Registration Configuration*.

Image: Name Server Registration Configuration



The options available in this dialog box are described in *Table: Name Server Registration Configuration*.

Table: Name Server Registration Configuration

Options	Description
Register Node Name (RNN_ID)	The RNN_ID Name Server request is used to associate a Node Name with a given Port Identifier.
Register FC-4 Types (RFT_ID)	The RFT_ID Name Server request is used to record the FC-4 TYPEs that are supported by a given Port Identifier.
Register Class of Service (RCS_ID)	The RCS_ID Name Server request is used to record the Classes of Service that are supported by a given Port Identifier.
Register Port Type (RPT_ID)	The RPT_ID Name Server request is used to record the Port Type that is supported by a given Port Identifier.
Register Port Name (RPN_ID)	The RPN_ID Name Server request is used to record the Port Name that is supported by a given Port Identifier.
Register Symbolic Port Name (RSPN_ID)	The RSPN_ID Name Server request is used to associate a Symbolic Port Name with a given Port Identifier.
Register Symbolic Node Name (RSNN_NN)	The RSNN_NN Name Server request is used to associate a Symbolic Node Name with a given Node Name.

Options	Description
Register Hard Address (RHA_ID)	The RHA_ID Name Server request is used to associate a Hard Address with a given Port Identifier.

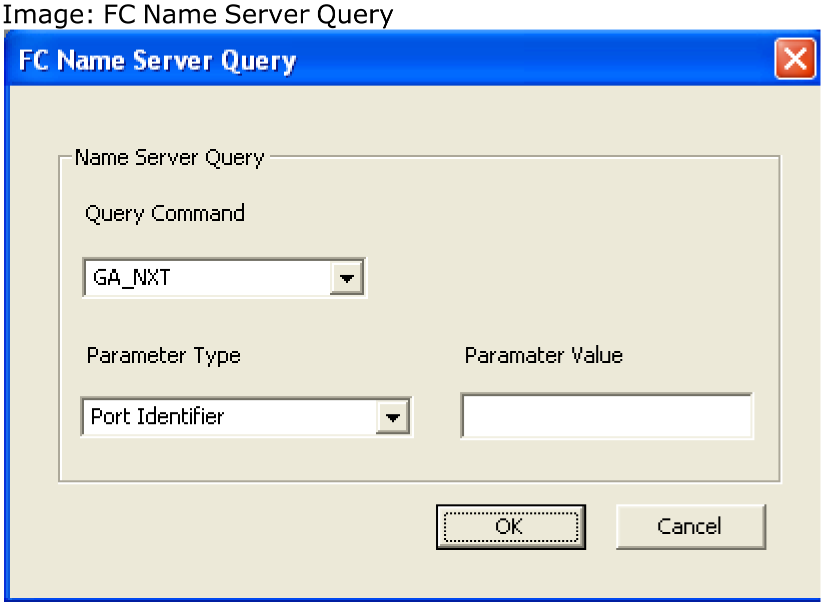
FC Name Server Query

The FC Name Server Query sends name server queries to the Fibre Channel module.

To access the *FC Name Server Query* dialog box, select the *Name Server Query Enable* check box. The *Name Server Query parameters* field becomes active and the *Edit* button is available. Select *Edit* button to open the *FC Name Server Query* dialog box to configure FC name server options.

The *Name Server Query* dialog box is shown in *Image: FC Name Server Query*.

Image: FC Name Server Query



The fields and options in this dialog box are described in *Table: FC Name Server Query*.

Table: FC Name Server Query

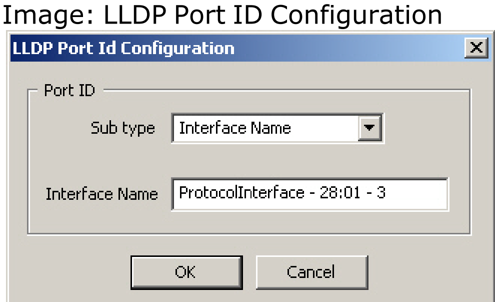
Section	Field/Options	Description
Query Command	GA_NXT	The GA_NXT is used by a requestor to obtain Name Server objects associated with a specific Port.
	GID_A	When the Name Server receives a GID_A request, it returns identifiers for the specified scope.
	GID_PN	When the Name Server receives a GID_PN request, it returns the Port Identifier associated with the specified Port Name.
	GID_PT	When the Name Server receives a GID_PT request, it returns all Port Identifiers having registered support for the specified Port Type. If the specified Port Type is equal to ‘Nx_Port’, then the

Section	Field/Options	Description
		Name Server returns all Port Identifiers that have registered Port Types with an unsigned value of less than 80h.
	GNN_ID	When the Name Server receives a GNN_ID request, it returns the registered Node Name object for the specified Port Identifier.
	GPN_ID	When the Name Server receives a GPN_ID request, it returns the registered Port Name object for the specified Port Identifier.
Parameter Type		The parameter type depends on the Query Command code. The types in the list are as follows: • Port Identifier • None • Port Name • Port Type
Parameter Value		The value depending on the parameter type.

DCBX Port Id

Select **Edit** to configure.

Image: LLDP Port ID Configuration

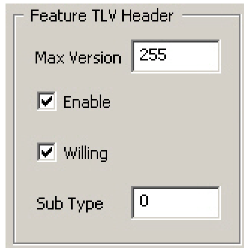


Sub type: select MAC Address or Interface Name. The second field is editable, although default values will appear at first.

DCBX Feature Value

For each DCBS Subtype and Feature Type, there is a configuration dialog box that allows setting the values.

Table: DCBX Feature Values

DCBX Subtype	DCBX Feature Type	DCBX Feature Value
Both	All	All the DCBX Feature Value configuration dialog boxes have these common elements.  **Max Version** - 255, in all cases**Enable** - selected, to enable the TLV**Willing** - indicates whether this feature accepts its configuration from the peer or not. **Subtype** - For Logical Link, 0 = FCoE, 1 = LAN. For negative testing or other purposes, any value is OK. Default = 0.
1 - Intel 1.0	2 - Priority Group	DCBX Priority Group Configuration, Intel 1.0.
	3 - PFC	DCBX PFC Configuration, Intel 1.0.
	4 - Custom (BCN)	(BCN is not yet implemented, as of IxOS 5.50)
	5 - FCoE	DCBX FCoE Configuration, Intel 1.0.
	6 - Logical Link	DCBX Logical Link Configuration, Intel 1.0.
	7, 8, and so on (customizable)	DCBX Custom Configuration, Intel 1.0 or IEEE 1.01.
2 - IEEE 1.01	2 - Priority Group	DCBX Priority Group Configuration, IEEE 1.01
	3 - PFC	DCBX PFC Configuration, IEEE 1.01
	4 - FCoE	DCBX FCoE Configuration, IEEE 1.01.
	5, 6 (customizable)	DCBX Custom Configuration, Intel 1.0 or IEEE 1.01.

DCBX Priority Group Configuration, Intel 1.0

For DCBX Subtype *Intel 1.0*, Feature Type *2 - Priority Group*, the following configuration dialog box opens when **Edit** is selected.

(For DCBX Subtype *IEEE 1.01*, DCBX Priority Group Configuration, IEEE 1.01.)

Image: DCBX Priority Group Configuration, Intel 1.0

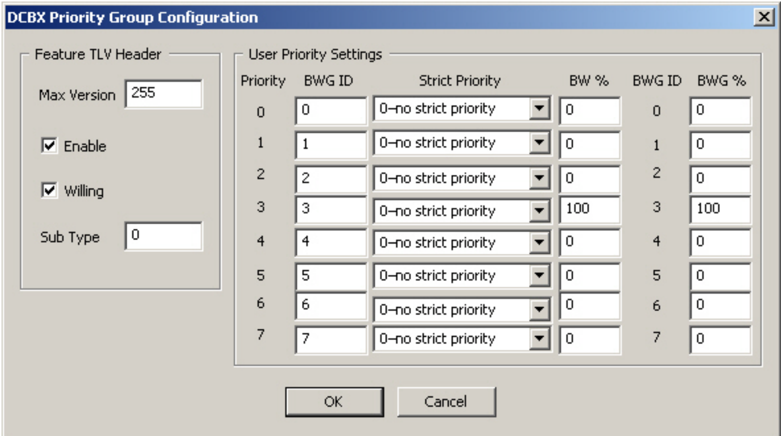


Table: DCBX Priority Group Configuration, Intel

Field	Description
Priority	User priority
BWG ID	Queue bandwidth group
Strict Priority	Strict priority settings: 0 - no strict priority 1 - Group Strict Priority (GSP) 2 - Link Strict Priority (LSP)
BW%	Percentage of BWG bandwidth
BWG ID	BWG to which the priority belongs
BWG%	Percentage of link bandwidth

DCBX PFC Configuration, Intel 1.0

For DCBX Subtype *Intel 1.0*, Feature Type *3 - PFC*, the following configuration dialog box opens when **Edit** is selected.

(For DCBX Subtype *IEEE 1.01*, DCBX PFC Configuration, IEEE 1.01.)

Image: DCBX PFC Configuration, Intel

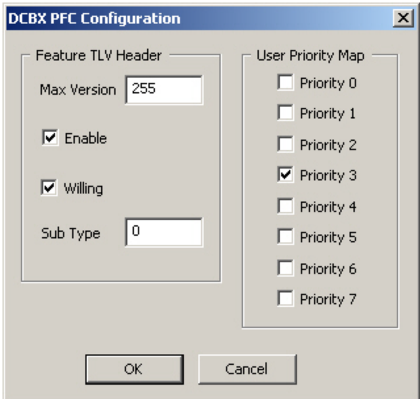


Table: DCBX PFC Configuration, Intel

Field	Description
User Priority Map	For this TLV, select a priority.

DCBX FCoE Configuration, Intel 1.0

For DCBX Subtype *Intel 1.0*, Feature Type *5 - FCoE*, the following configuration dialog box opens when **Edit** is selected.

(For DCBX Subtype *IEEE 1.01*, DCBX FCoE Configuration, IEEE 1.01.)

Image: DCBX FCoE Configuration

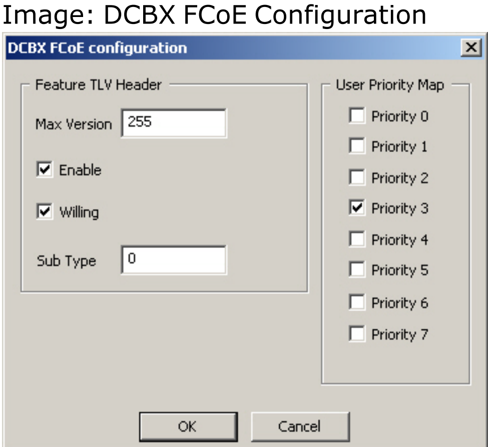


Table: DCBX FCoE Configuration, Intel

Field	Description
User Priority Map	For this TLV, select a priority (that is associated with FCoE traffic).

DCBX Logical Link Configuration, Intel 1.0

For DCBX Subtype *Intel 1.0*, Feature Type *6 - Logical Link*, the following configuration dialog box opens when **Edit** is selected.

Image: DCBX Logical Link Configuration

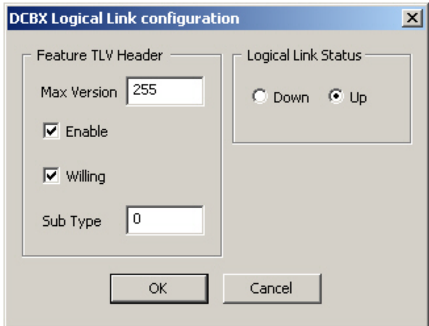


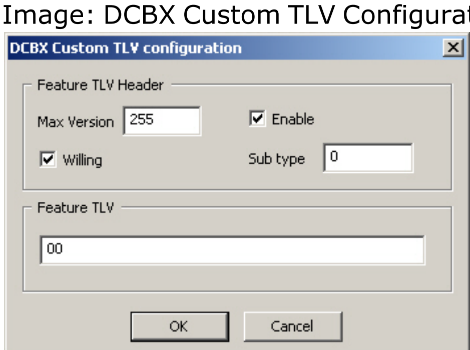
Table: DCBX Logical Link Configuration, Intel

Field	Description
Logical Link Status	Up or Down Signifies whether the Logical Link Status of this type of network (FCoE or LAN) is up or not.

DCBX Custom Configuration, Intel 1.0 or IEEE 1.01

For TLVs added after the known types, under either DCBX Subtype, this customization dialog box will appear.

Image: DCBX Custom TLV Configuration



Enter the 16-bit header field definition into the Feature TLV field. The elements of the header field are described in *Table: Feature TLV Header*.

Table: Feature TLV Header

Position	Type	Description
Type (of TLV)	Integer	Type code of the DCB Feature. Following is a list of defined types: 1 - PROTOCOL Control (not a feature) 2 - Priority Groups 3 - Priority Flow Control 4 - BCN 5 - Application 6 - Logical Link Down

Position	Type	Description
Length	Integer	Length of the DCB Feature sub-TLV payload (not including the Type and Length fields).
Oper Version	Integer0-255	Operating version of the feature. The system adjusts to operate at the highest version supported by both link partners.
Max Version	Integer0-255	Highest feature version supported by the system.
Enable	Boolean	Locally administered parameter that indicates whether the DCB feature is enabled or not.
Willing	Boolean	Locally administered parameter that indicates whether this feature accepts its configuration from the peer or not.
Error	Boolean	Indicates that an error has occurred during the configuration exchange with the peer.
Subtype	Integer	For Logical Link, 0 = FCoE, 1 = LAN. For negative testing or other purposes, any value is OK. Default = 0.

DCBX Priority Group Configuration, IEEE 1.01

For DCBX Subtype *IEEE 1.01*, Feature Type *2 - Priority Group*, the following configuration dialog box opens when **Edit** is selected.

Image: DCBX Priority Group Configuration, IEEE 1.01

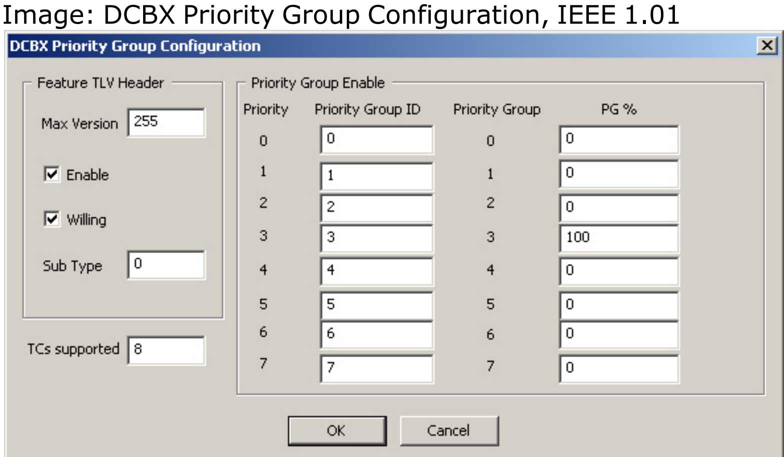


Table: DCBX Priority Group Configuration, IEEE

Field	Description
Priority	User priority
Priority Group ID	PG to which the priority belongs

Field	Description
Priority Group	Queue bandwidth group
PG%	Percentage of link bandwidth
TCs supported	Number of Traffic Classes supported by device.

DCBX PFC Configuration, IEEE 1.01

For DCBX Subtype *IEEE 1.01*, Feature Type *3 - PFC*, the following configuration dialog box opens when **Edit** is selected.

Image: DCBX PFC Configuration, IEEE 1.01

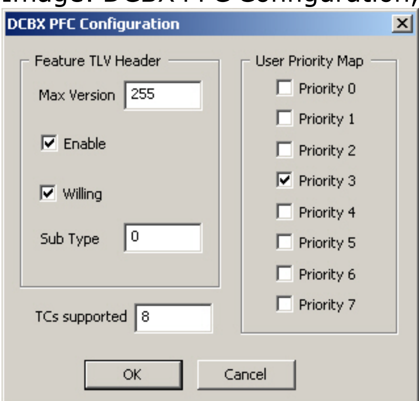


Table: DCBX PFC Configuration, IEEE

Field	Description
User Priority Map	For this TLV, select a priority.
TCs supported	Number of Traffic Classes that can simultaneously support PFC.

DCBX FCoE Configuration, IEEE 1.01

For DCBX Subtype *IEEE 1.01*, Feature Type *4 - FCoE*, the following configuration dialog box opens when **Edit** is selected.

Image: DCBX FCoE Configuration

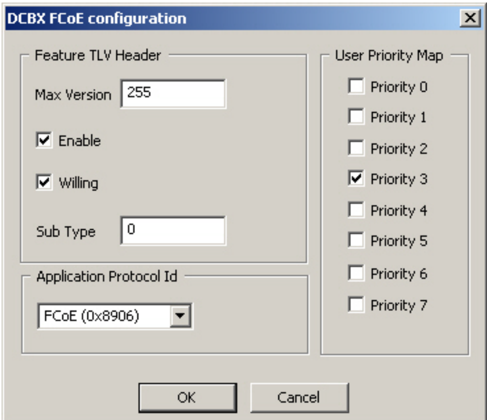
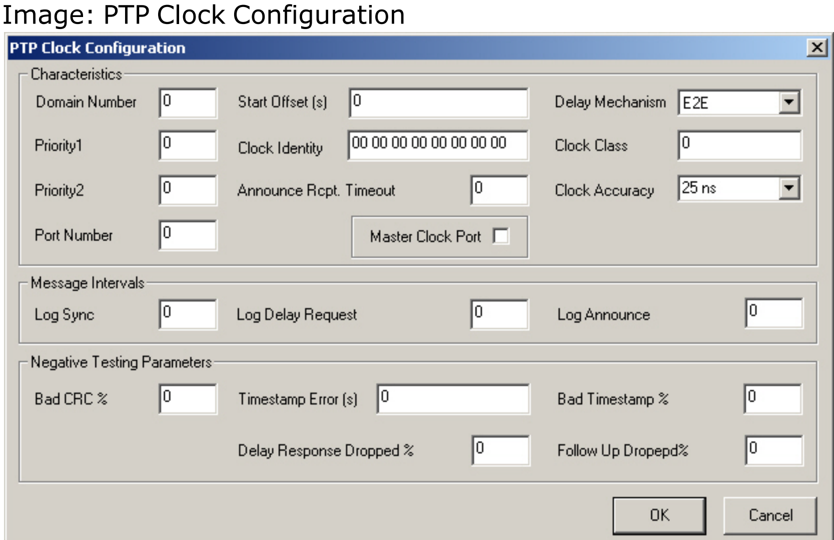


Table: DCBX FCoE Configuration, IEEE

Field	Description
User Priority Map	For this TLV, select a priority (that is associated with FCoE traffic).
Application Protocol Id	Identifies protocol supported by DCB node. Select:FCoE (0x8906)FIP (0x8914)Other = any 2-byte number (in Hex)

PTP Clock Configuration

Image: PTP Clock Configuration



The field definitions for this screen appear in *Table: PTP Clock Configuration*, below.

Table: PTP Clock Configuration

Area	Field	Description
Characteristics	Domain Number	The domain is identified by an integer in the range of 0 to 255.

Area	Field	Description
	Priority 1	A user configurable designation that a clock belongs to an ordered set of clocks from which a master is selected.
	Priority 2	A user configurable designation that provides finer grained ordering among otherwise equivalent clocks.
	Port Number	A specific PTP port on a PTP node
	Start Offset (s)	Defines the clock offset in nanoseconds. Master sends PTP messages with Start Offset added to the clock.
	Clock Identity	Identifies a clock
	Announce Receipt Timeout	Number of *announceInterval* that must pass without receipt of an Announce message before the Announce Receipt Timeout event occurs The value range of this field depends on the value of Log Announce interval (below).
	Delay Mechanism	Either (1) ‘end-to-end’ or (254) ‘disabled’
	Clock Class	Defines a clock’s TAI traceability. The clockClass attribute of an ordinary or boundary clock denotes the traceability of the time or frequency distributed by the grandmaster clock.
	Clock Accuracy	Defines the accuracy of a clock. See *Table: Clock Accuracy*.
	Master Clock Port	If selected, configures the port in master mode.
Message Intervals	Log Sync	The mean time interval between successive Sync messagesRange -5 to 26 NOTE Instead of Message Interval values, the logarithm to base 2 of the Message Interval values are specified. So, for instance, ‘Log Sync’ is the logarithm to base 2 of the Sync Interval. Range of -5 to 26 would translate to 2^(-5) to 2^26 ---> 1/32 to 64M.
	Log Delay Request	The minimum permitted mean time interval between successive Delay_Req messages, sent by a to a specific port on the master. Range -5 to 22 See Note under Log Sync.

Area	Field	Description
	Log Announce	Mean time interval between successive Announce messagesRange -5 to 26 See Note under Log Sync.
Negative Testing Parameters	Bad CRC %	Percent of follow-up messages sent with bad CRC.
	Timestamp Errors	The time error between a and a master ordinary or boundary clock.
	Bad Timestamp %	Percent of follow-up messages sent with bad timestamp.
	Delay Response Dropped %	Defines how many delay response messages to be dropped. Drop delay response messages exclicked as percentage of received delay request messages. Normally, delay response is sent by the master corresponding to each delay request massage received. For negative testing, you can configure Ixia port to drop the delay response message to see how the DUT behaves.
	Follow-up Dropped %	Defines how many follow-up messages to be dropped. Drop follow-up messages exclicked as percent of sync messages. Normally, a follow-up message is sent out corresponding to each sync message. For negative testing, you can configure Ixia port to drop the follow-up message to see how the DUT behaves.

Table: Clock Accuracy

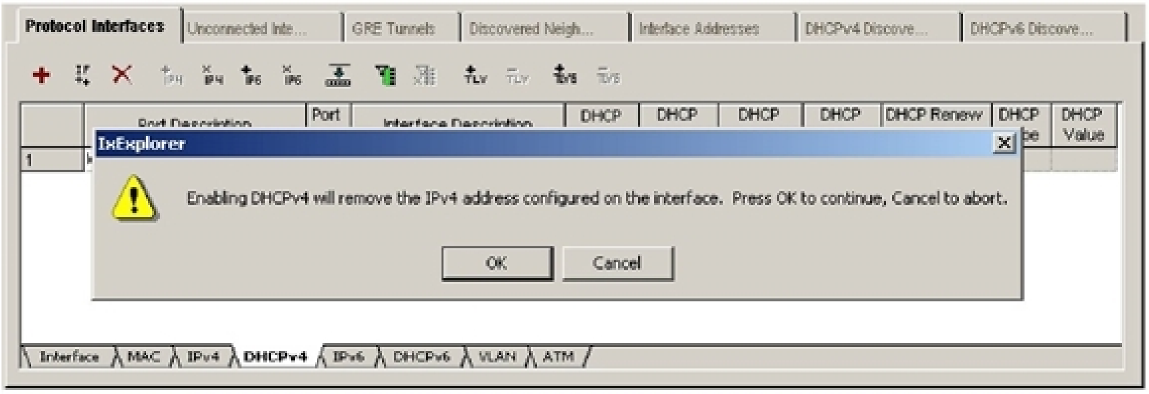
Value	Usage
32	accuracy 25 nanoseconds
33	accuracy 100 ns
34	accuracy 250 ns
35	accuracy 1 microsecond
36	accuracy 2.5 microseconds
37	accuracy 10 microseconds
38	accuracy 25 microseconds
39	accuracy 100 microseconds

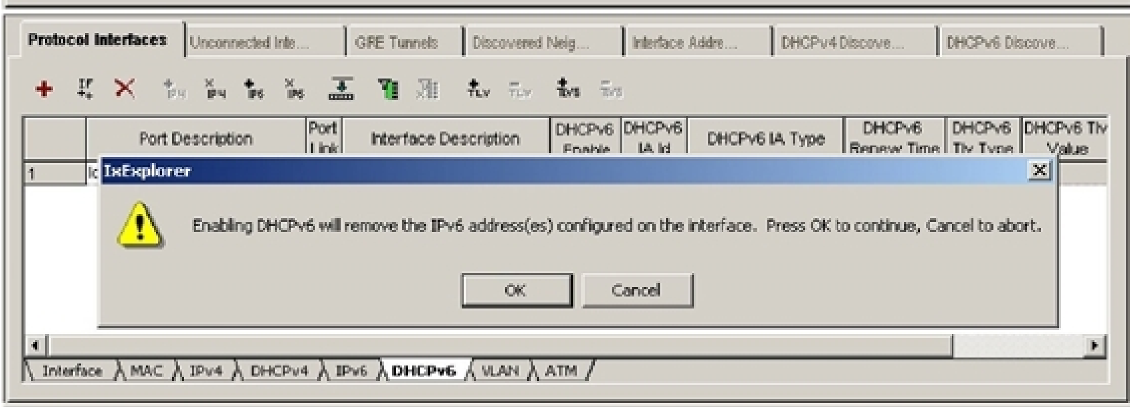
Value	Usage
40	accuracy 250 microseconds
41	accuracy 1 millisecond
42	accuracy 2.5 milliseconds
43	accuracy 10 milliseconds
44	accuracy 25 milliseconds
45	accuracy 100 milliseconds
46	accuracy 250 milliseconds
47	accuracy 1 second
48	accuracy 10 seconds
49	accuracy greater than 10 seconds
254	accuracy unknown

Adding DHCP Addresses

If an IPv4 or IPv6 address has already been assigned to an Ethernet port or an ATM port using Bridged Ethernet encapsulation, selecting the 'DHCPv4 Enable' or 'DHCPv6 Enable' check box, respectively, will open the appropriate warning message box shown in *Image: DHCPv4 and DHCPv6 Messages*. Select the *OK* button to delete the existing address and use DHCPv4 or DHCPv6 for address assignment, or select the *Cancel* button to close the message box and use the previously assigned IPv4 or IPv6 address.

Image: DHCPv4 and DHCPv6 Messages



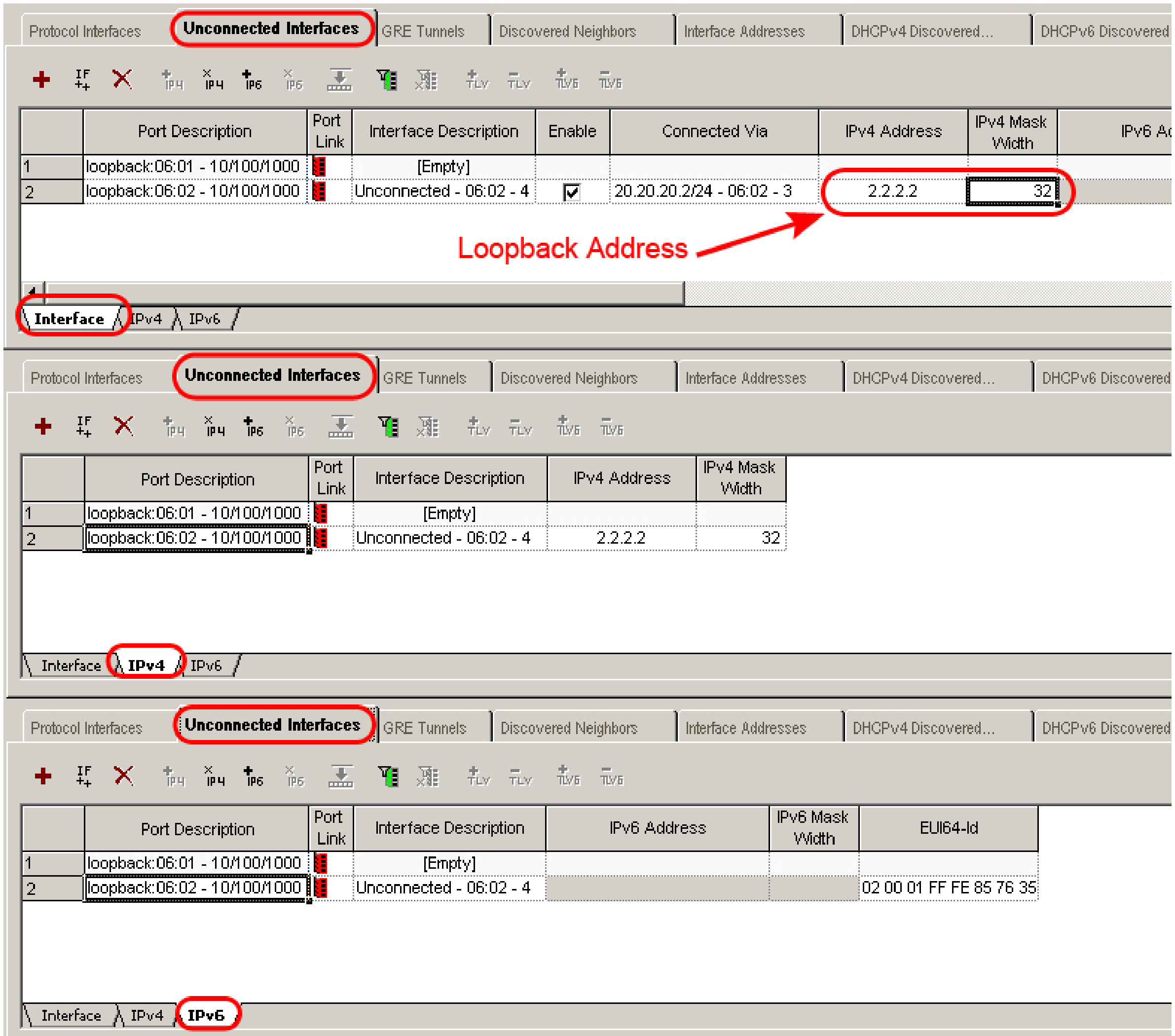


Unconnected Interfaces

The Unconnected Interfaces tab of the Protocol Interfaces window is shown in *Image: **Unconnected Interfaces** Tab*. This window is provided so you can create virtual, 'unconnected' interfaces that are not connected by any links to the SUT or to other Ixia ports. The unconnected interfaces can be set up to link the Ixia-emulated router to virtual networks 'behind' the router, such as emulated OSPF network ranges.

Also, when L2 VPNs or L3 VPNs are being set up, the loopback IP addresses that identify the tunnel endpoints on the Ixia-emulated routers are created using unconnected interfaces—automatically, if the configuration and/or protocol interface wizards are used, or manually in the individual protocol windows.

Image: **Unconnected Interfaces** Tab



The fields in the Unconnected Interfaces tab are described in *Table: **Unconnected Interfaces** Tab*.

Table: **Unconnected Interfaces** Tab

View	Field	Description
Interfaces	Port Description	The identification of the port, including the card number, port number, and type of port.
	Port Link	The status of the physical link for the Ixia port.
	Interface Description	A description for this unconnected protocol interface. The format will vary, depending on whether it is a loopback address configured for the Ixia port, or it is a virtual connection to a network range 'behind' the Ixia-emulated router. For example, interface description format when created with MVPN wizard: 'Un-2.2.2.2/32 - 10:02 - 4'

View	Field	Description
		(Un-Address/Mask - Card No.:Port No. - Protocol Interface number for this port)
	Enable	If selected, this unconnected interface is enabled.
	Connected Via	The name of a specified 'connected' protocol interface on the link that is directly connected to the DUT.
	IPv4 Address	The 32-bit IPv4 address assigned to this unconnected interface.
	IPv4 Mask Width	The number of bits in the mask used with the IPv4 address. The default is 24 bits.
	IPv6 Address	The 128-bit IPv6 address assigned to this unconnected interface.
	IPv6 Mask Width	The number of bits in the mask used with the IPv6 address. The default is 64 bits.
	EUI-64 Id	This is the 64-bit IEEE Modified EUI Id value for the Interface Identifier portion of the IPv6 address. For **Ethernet** modules, this field is not editable by you. The value is automatically calculated, based on the 48-bit MAC address. For more information on how this value is calculated, refer to the IPv6 Interface Identifiers (IIDs) section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*. For OC48 and OC192 POS modules, you can edit the value.
IPv4	Interface Description	A user-defined description for this unconnected interface.
	IPv4 Address	The 32-bit IPv4 address assigned to this unconnected interface.
	IPv4 Mask Width	The number of bits in the mask used with the IPv4 address. The default is 24 bits.
IPv6	Interface Description	A user-defined description for this unconnected interface.
	IPv6 Address	The 128-bit IPv6 address assigned to this unconnected interface.
	IPv6 Mask Width	The number of bits in the mask used with the IPv6 address. The default is 64 bits.
	EUI-64 Id	This is the 64-bit IEEE Modified EUI Id value for the Interface Identifier portion of the IPv6 address. For **Ethernet** modules, this field is not editable by you. The value is automatically calculated, based on the 48-bit MAC address. For more information on how this value is calculated, refer to the IPv6 Interface Identifiers (IIDs) section in the 'Theory of Operation:

View	Field	Description
		General' chapter of the *Ixia Platform Reference Manual*. For OC48 and OC192 POS modules, you can edit the value.

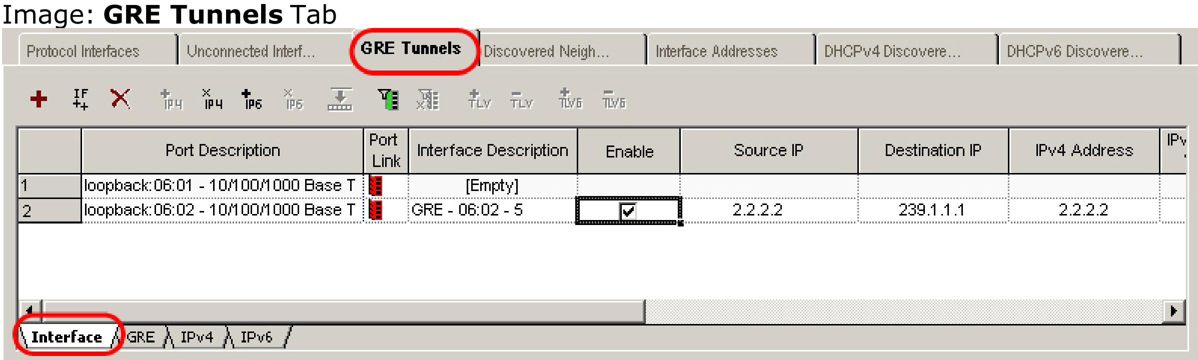
GRE Tunnels

NOTE The **GRE Tunnels** tab is available ONLY for modules that support GRE over IP. Refer to the *Ixia Platform Reference Manual* for information on modules that support this feature.

The Generic Routing Encapsulation (GRE) Tunnels tab is shown in *Image: **GRE Tunnels** Tab* and *Image: **GRE Tunnels** Tab (Continued)*. This window allows to set up GRE tunnels from the Ixia port to the DUT port. The GRE protocol can be used to encapsulate packets of many different protocol types and tunnel them across a network of a different protocol type. This basic encapsulation method indicates the Ethertype of the payload packet, and depends on a delivery header with both Layer 2 and Layer 3 information to forward the packet across the network. For additional information on GRE, refer to the *Ixia Platform Reference Manual*.

NOTE Creating multiple GRE tunnels that have the same Source IP address and same Destination IP address is an illegal configuration.Each GRE tunnel must have a **unique** combination of:Source IP, andDestination IP, andIn-key.

Image: **GRE Tunnels** Tab



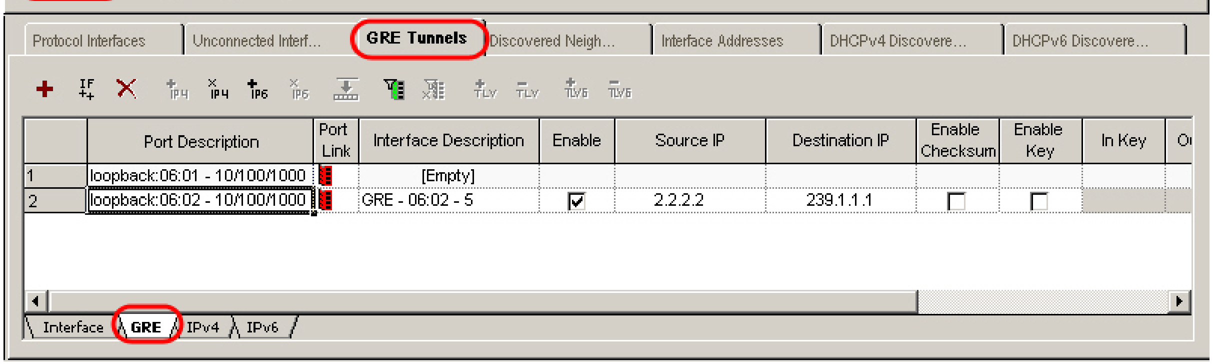
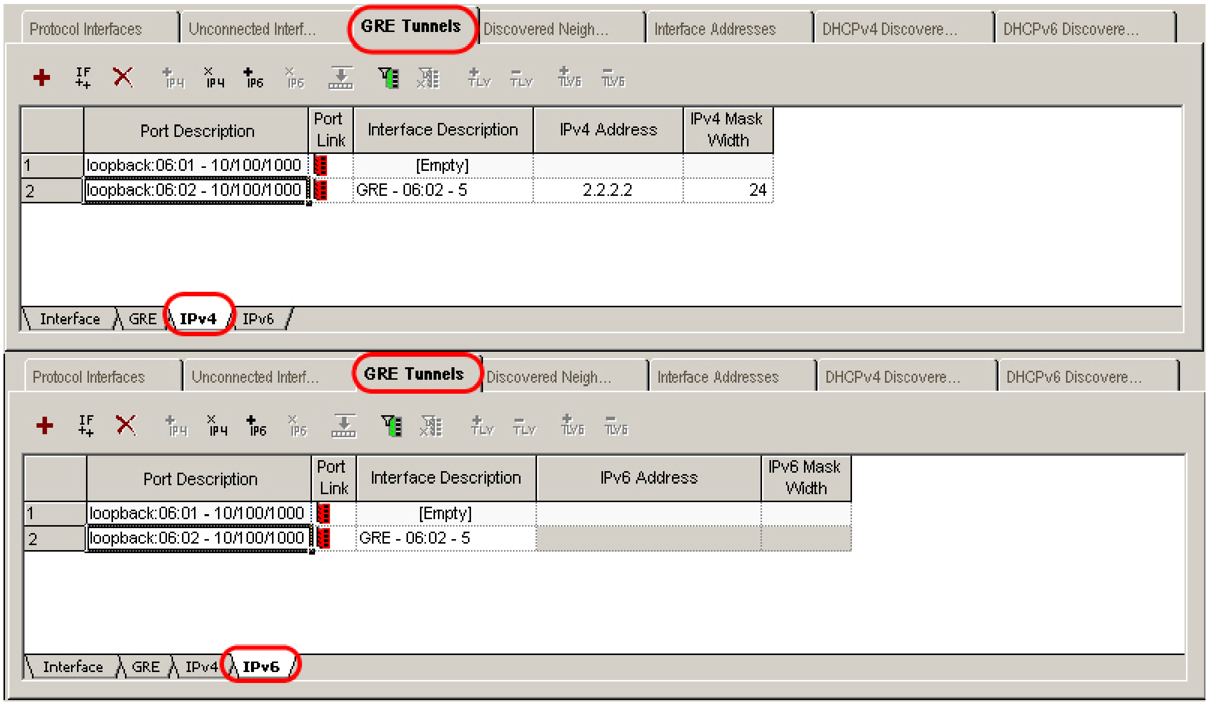


Image: **GRE Tunnels** Tab (Continued)



The fields in the **GRE Tunnels** tab are described in *Table: **GRE Tunnels** Tab*.

Table: **GRE Tunnels** Tab

View	Field	Description
Interface	Port Description	The identifier for the port including card and port numbers, and the port type.
	Port Link	The color of this icon indicates the state of the link: • **Green**—Link is Up. • **Red**—Link is Down. • **Yellow**—Link is in loopback mode. • **Gray**—Link is unavailable because it is busy or it is an unsupported link type.
	Interface Description	A description for this GRE Tunnel Interface.
	Source IP	Part of the GRE Delivery Header: The IP address of the connected interface associated with the source of this GRE tunnel.
	Destination IP	Part of the GRE Delivery Header: The IP address of the Destination router at the remote end of the GRE tunnel.

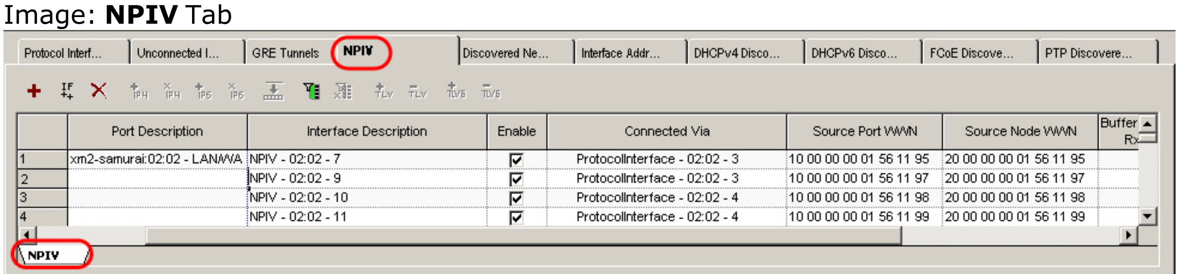
View	Field	Description
	IPv4 Address	The 32-bit IPv4 address assigned to this unconnected interface.
	IPv4 Mask Width	The number of bits in the mask used with the IPv4 address. The default is 24 bits.
	IPv6 Address	The 128-bit IPv6 address assigned to this unconnected interface.
	IPv6 Mask Width	The number of bits in the mask used with the IPv6 address. The default is 64 bits.
	Enable Checksum	If selected, enables the use of the optional GRE Checksum.
	Enable Key	If selected, the optional authentication key feature will be added to the GRE header, per RFC 2890.
	In Key	This is the user-assigned GRE header authentication key value that the receiving router will check for to validate GRE packets being sent through the tunnel. All packets sent through a specific tunnel should contain the same key value (one key per GRE tunnel). In most cases, the In Key and Out Key will be the same.
	Out Key	This is the user-assigned GRE header authentication key value that will be included in the GRE packets being sent through the tunnel. All packets sent through a specific tunnel should contain the same key value (one key per GRE tunnel). In most cases, the In Key and Out Key will be the same.
GRE	Enable	If selected, this emulated GRE tunnel interface is enabled.
	Source IP	Part of the GRE Delivery Header: The IP address of the interface associated with the source of this GRE tunnel.
	Destination IP	Part of the GRE Delivery Header: The IP address of the Destination router.
	Enable Checksum	If selected, enables the use of the optional GRE Checksum.
	Enable Key	If selected, enables the use of the optional GRE header Key field.
	In Key	This is the user-assigned GRE header authentication key value that the receiving router will check for to validate GRE packets being sent through the tunnel. All packets sent through a specific tunnel should contain the same

View	Field	Description
		key value (one key per GRE tunnel). In most cases, the In Key and Out Key will be the same.
	Out Key	This is the user-assigned GRE header authentication key value that will be included in the GRE packets being sent through the tunnel. All packets sent through a specific tunnel should contain the same key value (one key per GRE tunnel). In most cases, the In Key and Out Key will be the same.
IPv4	Interface Description	A user-defined description for this unconnected interface.
	IPv4 Address	The 32-bit IPv4 address assigned to this unconnected interface.
	IPv4 Mask Width	The number of bits in the mask used with the IPv4 address. The default is 24 bits.
IPv6	Interface Description	A user-defined description for this unconnected interface.
	IPv6 Address	The 128-bit IPv6 address assigned to this unconnected interface.
	IPv6 Mask Width	The number of bits in the mask used with the IPv6 address. The default is 64 bits.

NPIV Protocol Interface

The **NPIV** tab is used to configure N_Port_ID Virtualization (NPIV), which provides a Fibre Channel facility for assigning multiple N_Port_IDs to a single N_Port, thereby allowing multiple distinguishable entities.

Image: **NPIV** Tab



The fields and controls shown in the **NPIV** tab are described in *Table: **Discovered Neighbors** Tab*.

Table: **NPIV** Tab

Field/Control	Description
Interface Description	A description for this NPIV Interface.

Field/Control	Description
Enable	Enables the NPIV interface
Connected Via	Specifies the FCoE interface that has to be used
Source Port WWN	Source port Worldwide Name - a Name_identifier that is worldwide unique, represented by a 64-bit value
Source Node WWN	Source node Worldwide Name - a Name_identifier that is worldwide unique, represented by a 64-bit value
Buffer to Buffer Rx Size	Maximum buffer-to-buffer Receive_Data_Field specified by the Fabric
SCR Enable	If enabled, the ENode will register for any changes with the Fabric by sending a State Change Registration packet.
NS Enable	Enables registration to Name Server
PLOGI Enable	Enables Port login to specified Destination ID
PLOGI Destination	Destination Identifier

NPIV interfaces can be configured using the Protocol Interface Wizard.

Discovered Neighbors

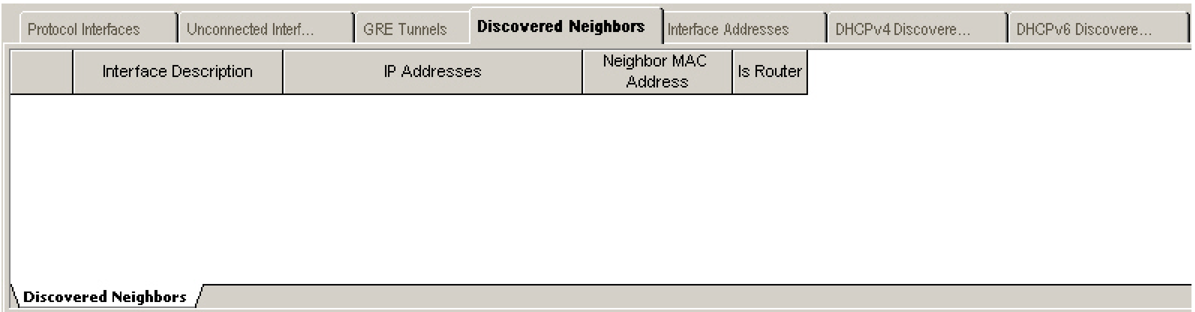
Learned IPV4 and IPv6 information for Discovered Neighbors appears in the window shown in *Image: **Discovered Neighbors** Tab*. This tab contains a list of discovered IPv4 and IPv6 neighbors, including a MAC address (for Ethernet) and a list of interfaces for each neighbor. This list has one entry for each neighbor on attached links. For IPv6, it contains information received in an Advertisement Message.

An IPv4 node discovers its neighbor on an Ethernet link by sending an ARP request, which returns a MAC address for that neighbor.

When a protocol interface is created or enabled on an IPv6 node, or when the first IPv6 address is added, a Router Solicitation is sent from that interface. If the DUT responds to the Router Solicitation by sending a Router Advertisement, the DUT is ‘discovered’ (learned). A Neighbor Solicitation is also sent from the interface for Duplicate Address Detection (DAD), to confirm that no other node on the link has the same address.

Subsequently, when an upper layer (routing) protocol configured for the interface needs to find the MAC address for a link local address learned through other means, the discovery process is handled by sending Neighbor Solicitations and receiving Neighbor Advertisements.

Image: **Discovered Neighbors** Tab



The fields and controls shown in the Discovered Neighbors tab are described in *Table: **Discovered Neighbors** Tab*.

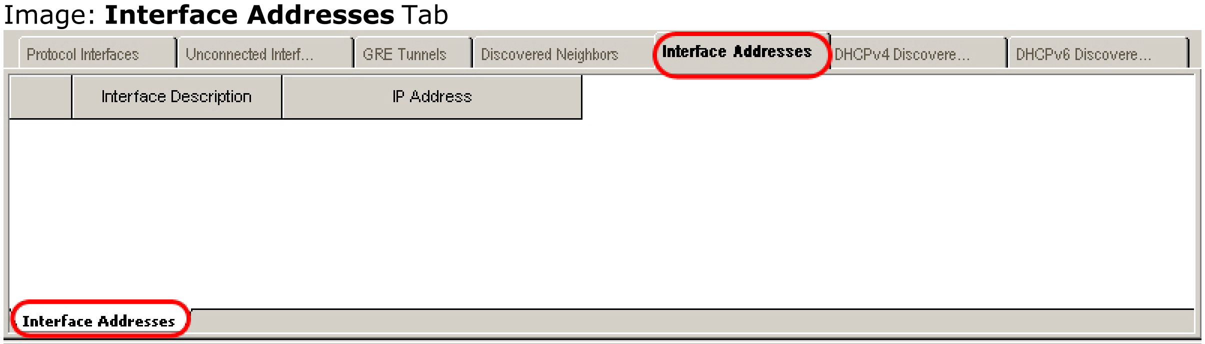
Table: **Discovered Neighbors** Tab

Field/Control	Description
Interface Description	The description of the interface which has learned the neighbor.
IP Addresses	The IP addresses for the discovered interface.
Neighbor MAC Address	The link layer (Layer 2) MAC address of the discovered interface on a neighbor.
IsRouter	For IPv6, the status of the router flag (R-bit) in the Neighbor Advertisement Message. If the bit is set, it Informs the local IPv6 node that the sender is a router.

Interface Addresses

The Interface Addresses tab in the Protocol Interfaces window is shown in *Image: **Interface Addresses** Tab*. This tab contains a list of IP addresses learned for each of the Protocol Interfaces.

Image: **Interface Addresses** Tab



The fields and controls shown in the Interface Addresses tab are described in *Table: Interface Addresses Tabs*.

Table: Interface Addresses Tabs

Field/Control	Description
Interface Description	The description of the interface which has learned the address.
IP Address	A learned IP address for this interface.

DHCPv4 Discovered Information

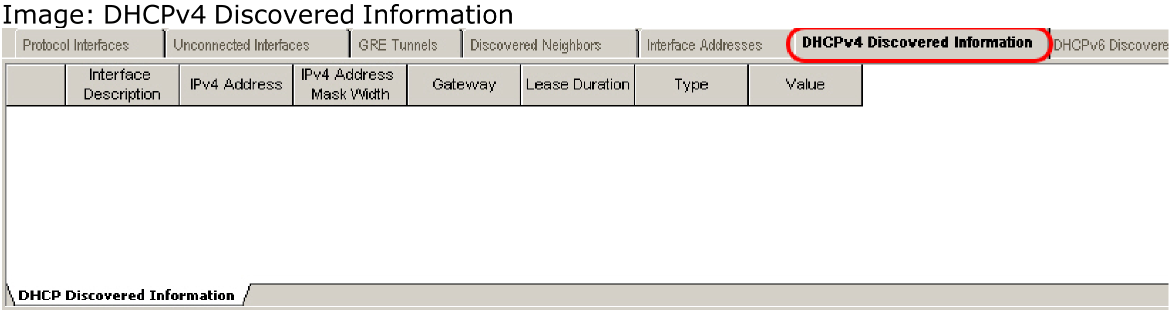
The Dynamic Host Configuration Protocol (DHCP) Discovered Information, based on RFC 2131, is supported in the Protocol Interfaces window, as shown in *Image: DHCPv4 Discovered Information*. When the protocol interface is set for DHCP and enabled, DHCP negotiations will be started. Configuration parameters, such as IPv4 network addresses, masks, and associated Gateway addresses learned from the DHCP server will be viewable in this read-only window.

NOTE You will not be able to select DHCPv4-enabled interfaces for use with protocol emulations, with the exception of IGMP.

DHCP is applicable only to Ethernet ports and to ATM ports using Bridged Ethernet encapsulation.

NOTE When DHCP is enabled on a Protocol Interface, you will not be able to enter the IPv4 address, mask, or gateway address, as these values will be automatically assigned.

Image: DHCPv4 Discovered Information



The fields and controls shown in this tab are described in *Table: DHCPv* ***Discovered Information*** *Tab*.

Table: DHCPv4 **Discovered Information** Tab

	Field/Control	Description
	Interface Description	The Interface Description for the Ixia protocol interface that is negotiating with the DHCP Server.
	IPv4 Address	A learned/allocated IPv4 address for this interface.
	IPv4 Address Mask Width	A learned/allocated IPv4 address prefix length (mask) for this interface.
	Gateway	A learned/allocated IPv4 Gateway address for this interface.
	Lease Duration	(in seconds) The lease timer value specified from the DHCP Server.

	Field/Control	Description
(DHCP Options)		Options advertised by the DHCP Server, presented as a list of Type/Length/Value tuples (TLVs).
	Type	(integer) The identifier or 'tag' for this DHCP option.
	Value	The DHCP option value field may contain data for configuration information such as time server information, and so forth.

DHCPv6 Discovered Information

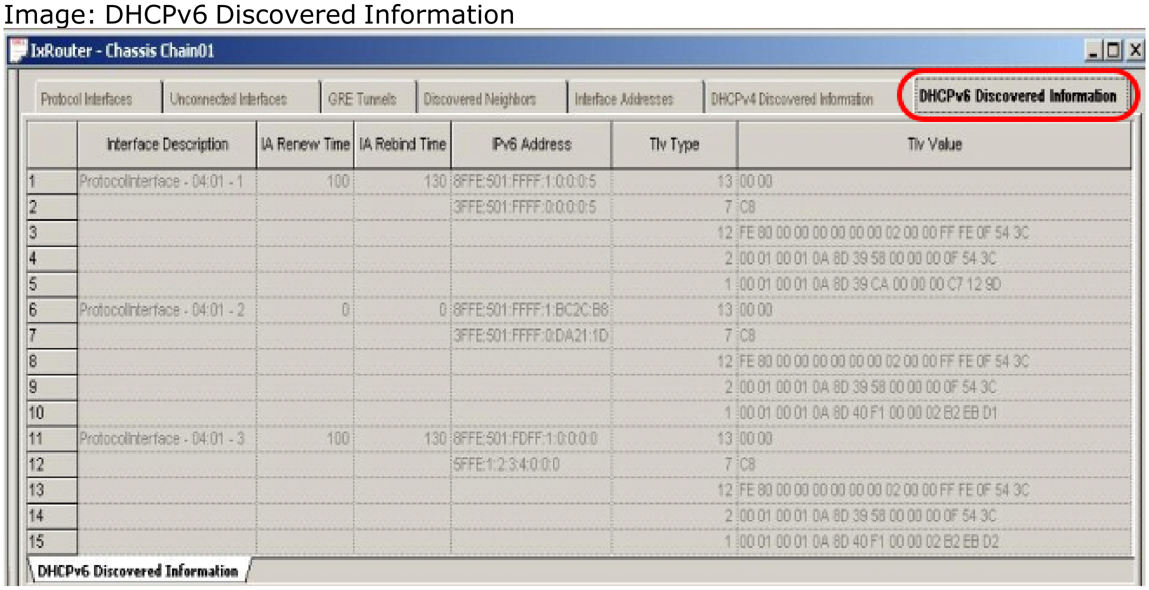
The Dynamic Host Configuration Protocol Version 6 (DHCPv6) Discovered Information, based on RFC 3315, is supported in the Protocol Interfaces window, as shown in *Image: DHCPv6 Discovered Information*. When the protocol interface is set for DHCPv6 and enabled, DHCPv6 negotiations will be started. Configuration parameters, such as IPv6 network addresses learned from the DHCPv6 server will be viewable in this read-only window.

NOTE You will not be able to select DHCPv6-enabled interfaces for use with protocol emulations.

DHCP is applicable only to Ethernet ports and to ATM ports using Bridged Ethernet encapsulation.

NOTE When DHCPv6 is enabled on a Protocol Interface, you will not be able to enter the IPv6 addresses, as these values will be automatically assigned.

Image: DHCPv6 Discovered Information



The fields and controls shown in this tab are described in *Table: DHCPv4* ***Discovered Information*** *Tab*.

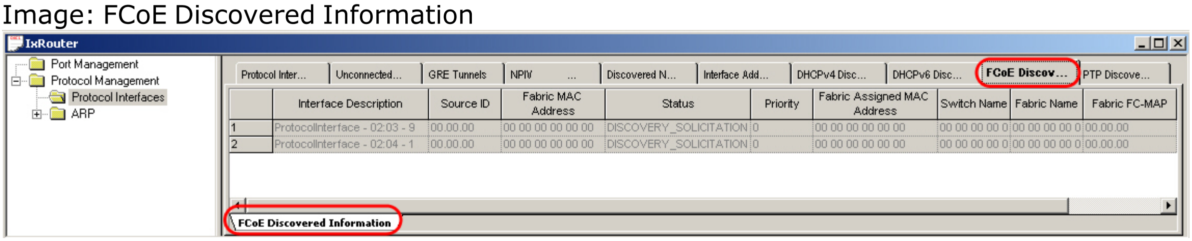
Table: DHCPv6 **Discovered Information** Tab

Field/Control	Description
Interface Description	The Interface Description for the Ixia protocol interface that is negotiating with the DHCPv6 Server.
IA Renew Time	(in seconds) The renew timer value specified by the DHCPv6 Server.
IA Rebind Time	(in seconds) The rebind timer value specified by the DHCPv6 Server.
IPv6 Address	A learned/allocated IPv6 address for this interface.
(DHCPv6 Options)	Options advertised by the DHCPv6 Server, presented as a list of Type/Length/Value tuples (TLVs).
Tlv Type	(integer) The identifier or 'tag' for this DHCPv6 option.
Tlv Value	The DHCPv6 option value field may contain data for configuration parameter information.

FCoE Discovered Information

The FCOE Discovered Information tab lists the obtained source FCID and status for each FCoE/NPIV interface.

Image: FCoE Discovered Information



The read-only fields shown in this tab are described in *Table: DHCPv6* ***Discovered Information*** *Tab*.

Table: FCoE **Discovered Information** Tab

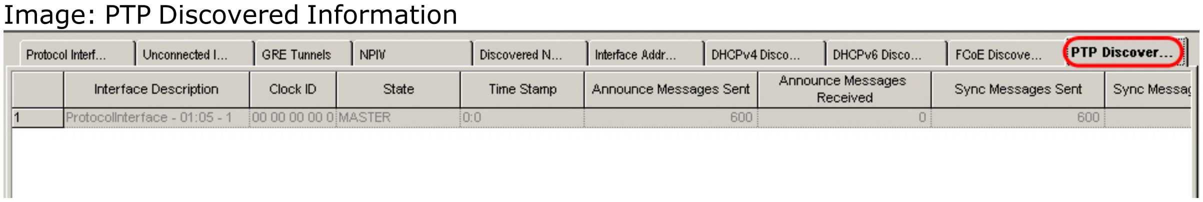
Field	Description
Interface Description	The Interface Description for the Ixia protocol interface that is negotiating with the FCoE Server.
Source ID	Source ID assigned by the Fabric
Fabric MAC Address	MAC address of the Fabric
Status	Textual description of the status of the interface

Field	Description
Priority	(Only if FIP is enabled) The priority of the Fabric we are logged into.
Fabric Assigned MAC Address	(Only if FIP is enabled) The MAC address assigned by the Fabric.
Switch Name	(Only if FIP is enabled) The switch name obtained from the Discovery Advertisement.
Fabric Name	(Only if FIP is enabled) The Fabric name obtained from the Discovery Advertisement.
Fabric FC-MAP	(Only if FIP is enabled) Obtained from the Discovery Advertisement.
Discovered VLAN ID	The list of IDs discovered from the VLAN Discovery notification

PTP Discovered Information

PTP ports discover other ports within a communication path through the receipt of multicast Announce messages.

Image: PTP Discovered Information



The fields and controls shown in this tab are described in *Table: DHCPv6* ***Discovered Information*** *Tab*.

Table: PTP **Discovered Information** Tab

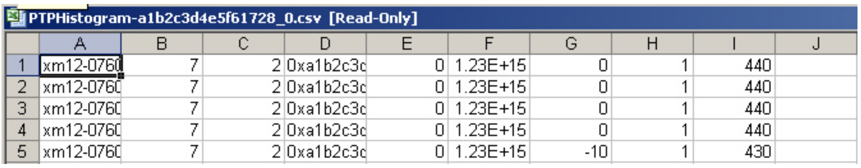
Field/Control	Description
Interface Description	The Interface Description for the Ixia protocol interface that is negotiating with the PTP Server.
Clock ID	
State	Defines the state of the clock: master or , unknown or uncalibrated
Time Stamp	Timestamp of statistics.
Announce Messages Sent	Number of announce messages sent by the interface.
Announce Messages Received	Number of announce messages received by the interface.
Sync Messages	Number of sync messages sent by the interface.

Field/Control	Description
Sent	
Sync Messages Received	Number of sync messages received by the interface.
Follow-up Messages Sent	Number of follow-up messages sent by the interface.
Follow-up Messages Received	Number of follow-up messages received by the interface.
Delay Request Messages Sent	Number of delay request messages sent by the interface.
Delay Request Messages Received	Number of delay request messages received by the interface.
Delay Response Messages Sent	Number of delay response messages sent by the interface.
Delay Response Messages Received	Number of delay response messages received by the interface.
Clock Offset	The offset of the clock in nanoseconds with reference to its master, as calculated by the per 1588 protocol. It is a measure of time transfer.
Time Slope	The ratio of the clock frequency to its master clock frequency. It is a measure of frequency transfer.
Mean Path Delay	The mean propagation time between master and clock.
Record Histogram Data	Select Start to start (or resume) recording. Select Stop to stop recording. Selecting Stop does not clear the accumulated data.
Clear Histogram Data	Select Clear to clear the accumulated data.
Save Histogram Data to Disk	Select Save to save all accumulated data. A typical Save As dialog box will appear. **Note**: To avoid overwriting previously saved data, modify the suggested filename.

Saved PTP Discovered Info Data

When PTP histogram data is saved to disk, a comma-separated-values (.csv) file is created. The .csv file can be opened as-is, or can be opened in MS Excel, as shown in the following example (*Image: PTP Discovered Information*).

Image: PTP Discovered Information


PTPHistogram-a1b2c3d4e5f61728_0.csv [Read-Only]

	A	B	C	D	E	F	G	H	I	J
1	xm12-0760	7	2	0xa1b2c3c	0	1.23E+15	0	1	440	
2	xm12-0760	7	2	0xa1b2c3c	0	1.23E+15	0	1	440	
3	xm12-0760	7	2	0xa1b2c3c	0	1.23E+15	0	1	440	
4	xm12-0760	7	2	0xa1b2c3c	0	1.23E+15	0	1	440	
5	xm12-0760	7	2	0xa1b2c3c	0	1.23E+15	-10	1	430	

The columns in the spreadsheet contain the types of information described in *Table: PTP Discovered Information Saved Data*.

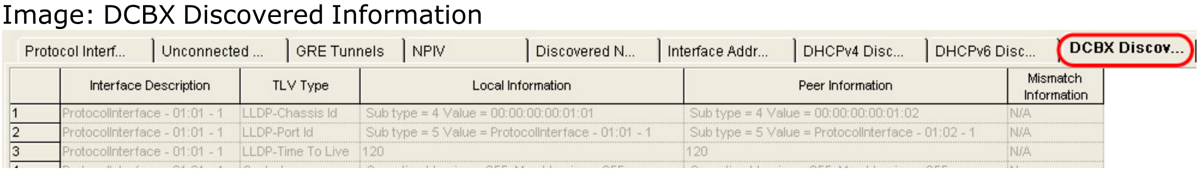
Table: PTP Discovered Information Saved Data

Column	Description
A	Chassis name
B	Card number
C	Port number
D	PTP Clock ID
E	PTP Port Identity
F	PTP Time Stamp
G	PTP Clock Offset from master
H	Time Slope
I	Mean Path Delay

DCBX Discovered Information

The Data Center Bridging (DCB) Capability Exchange Protocol (DCBX) Discovered Information is supported in the Protocol Interfaces window, as shown in *Image: DCBX Discovered Information*. When the protocol interface is set for DCBX and enabled, DCBX negotiations will be started. Configuration information learned from peers will be viewable in this read-only window.

Image: DCBX Discovered Information



The fields and controls shown in this tab are described in *Table: DHCPv6* ***Discovered Information*** *Tab*.

Table: DCBX **Discovered Information** Tab

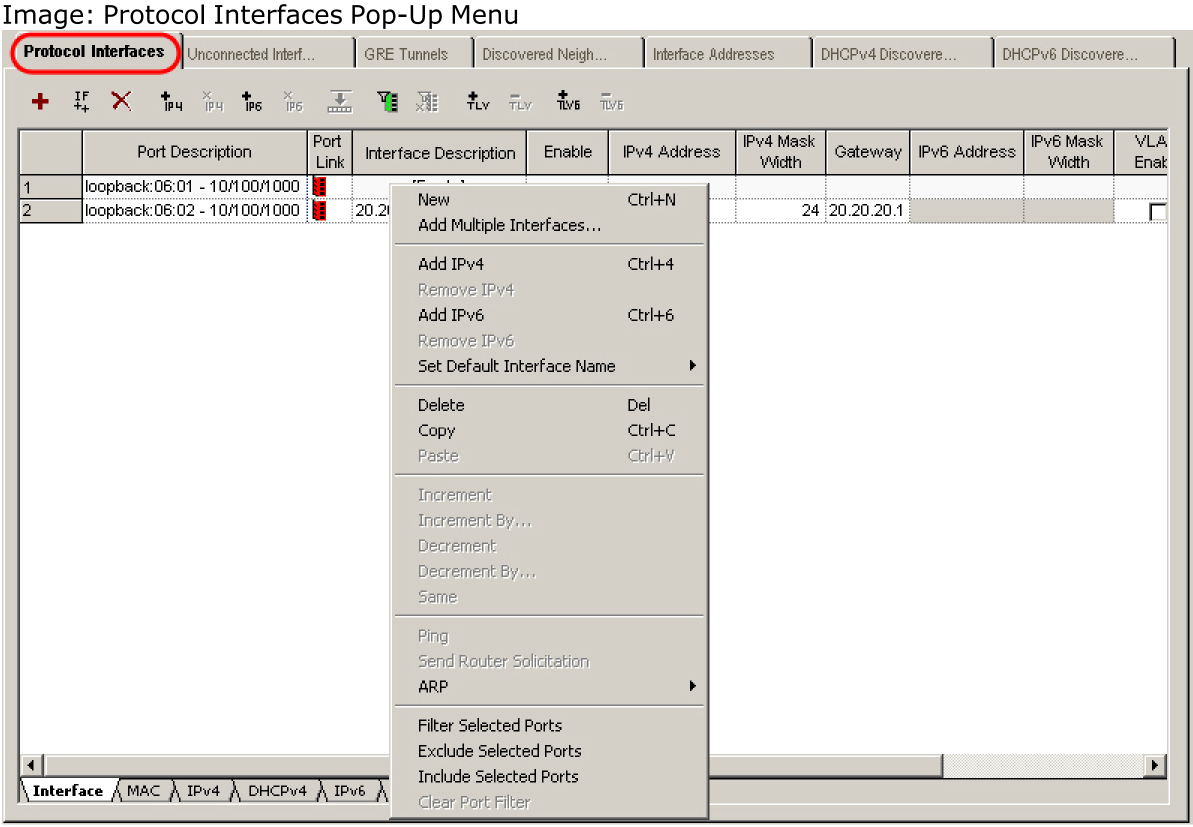
Field/Control	Description
Interface Description	The Interface Description for the Ixia protocol interface

Field/Control	Description
TLV Type	The name of the TLV (example: LLDP Chassis ID)
Local Information	The operating information of all TLVs on the local port
Peer Information	The peer TLV information
Mismatch Information	Indicates any mismatch in the TLVs . This applies only for DCBX TLVs and the algorithm to determine mismatches is different for each TLV.

Protocol Interfaces Pop-Up Menu

There is a pop-up menu that appears by selecting a row in any of the Protocol Interface views. The available menu options differ depending on the view selected. The pop-up menu for the Protocol Interfaces window is shown in *Image: Protocol Interfaces Pop-Up Menu*.

Image: Protocol Interfaces Pop-Up Menu



The options available in this menu depend on the type of view that currently appears. All of the possible options are described in *Table: Interfaces—Pop-Up Menu*.

Table: Interfaces—Pop-Up Menu

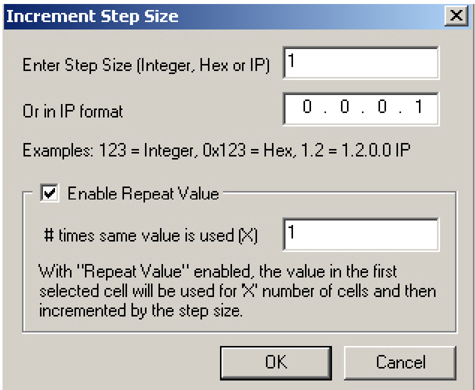
Menu Options	Description
New	Add one protocol interface to the selected port.
Add Multiple Interfaces...	Shows the Protocol Interfaces wizard. Protocol Interface Wizard for additional information.
Add IPv4	Add one IPv4 address entry to the selected interface. A maximum of one IPv4 address entry may be added to each interface.
Remove IPv4	Remove an IPv4 address from the selected interface.
Add IPv6	Add one IPv6 address entry to the selected interface. Multiple IPv6 addresses may be added to one interface.
Remove IPv6	Removes one or more IPv6 addresses from the selected interface.
Set Default Interface Name	Automatically renames the protocol interface with the IP addresses, to create unique names for the interfaces.
Delete	Permanently removes one or more selected interface(s) from the view.
Copy	Copy is used with the Paste operation. Selected fields for an interface may be copied and pasted into the fields for a different interface.
Paste	Paste is used with the Copy operation. Selected fields for an interface may be copied and pasted into the fields for a different interface.
Increment	For use with multiple, consecutive, and numerical items in a column. When the items are selected, and 'Increment' is chosen, all of the items will be numbered in increasing order—starting with the value for the topmost item in the column. The value for each consecutive selected item in the column will be one greater than the previous item.
Increment By...	For use with multiple, consecutive, numerical items in a column. When the items are selected, and 'Increment By...' is chosen, all of the items will be numbered in increasing order—starting with the value for the topmost item in the column. The value for each consecutive selected item in the column will be increased by the amount specified in the 'Increment Step Size' dialog box. Increment Step Size dialog box for additional information.
Decrement	For use with multiple, consecutive, numerical items in a column. When the items are selected, and 'Decrement' is chosen, all of the items will be assigned values in decreasing order—starting with the value for the topmost item in the column. The value for each consecutive selected item in the column will be one less than the previous item.

Menu Options	Description
Decrement By...	For use with multiple, consecutive numerical items in a column. When the items are selected, and 'Decrement By...' is chosen, all of the items will be assigned values in decreasing order—starting with the value for the topmost item in the column. The value for each consecutive selected item in the column will be decreased by the amount specified in the 'Increment Step Size' dialog box. Increment Step Size dialog box for additional information.
Same	For use with multiple, consecutive numerical items in a column. When the items are selected, and 'Same' is chosen, all of the items will be assigned the same value—the value for the topmost item in the column.
Ping	(for Ethernet type modules only) Shows the Ping dialog box for the Interface views.
Send Router Solicitation	Sends a Router Solicitation Message for IPv6 Neighbor Discovery (RFC 2461). After an IPv6 interface is enabled on a host, an ICMPv6 Router Solicitation packet is sent by the host to request that routers **immediately** send Router Advertisements containing link-layer addresses in reply. This request temporarily overrides the timed cycle for sending Router Advertisements.
ARP	Shows a sub-pop-up list for the types of ARP operations. Choose one of: • Send ARP for selected • Refresh ARP for selected • Clear ARP for selected
Filter Selected Ports	Use the Filter Ports feature.
Exclude Selected Ports	Ports in the 'Include' list in the Port Filter dialog box are disabled and removed from the list of ports in the Protocol Interfaces window.
Include Selected Ports	Ports in the 'Include' list in the Port Filter dialog box are enabled and appear in the list of ports in the Protocol Interfaces window.
Clear Port Filter	Clears the Port Filter feature—all owned ports appear in the table of the Protocol Interface window.

Increment Step Size dialog box

When the 'Increment By' or 'Decrement By' options are selected, the Increment Step Size dialog box opens so you can define an increment/decrement step other than '1' (the default setting). This dialog box applies ONLY for incrementing or decrementing selected, contiguous values in a column. The Increment Step Size dialog box is shown in *Image: Increment Step Size dialog box*.

Image: Increment Step Size dialog box



The fields and controls in this dialog box are described in *Table: Increment Step Size dialog box*.

Table: Increment Step Size dialog box

Field/Control	Description
Enter Step Size (Integer, Hex or IP)	Enter an integer, a hex value, or an 'IP' value that will be used as the increment step value. Entry examples: • 123 = Integer • 0x123 = Hex • 1.2 = 1.2.0.0 IP
Or in IP format	Enter a 4-octet IP address that will be used as the increment step value.
Enable Repeat Value	With 'Repeat Value' enabled, the value in the first selected cell will be used for 'X' number of cells and then incremented by the increment step size.
# times same value is used (X) (Repeat Value)	Enter the number of times that a value will be used before this value will be incremented by the amount of the 'Step Size'. For example: If the initial value is 10.0.0.1, the Step Size is '0.0.0.1,' and the Repeat Value is '2': • 10.10.10.1 • 10.10.10.1 • 10.10.10.2 • 10.10.10.2 • 10.10.10.3 • 10.10.10.3

Protocol Interface Wizard

The Protocol Interface Wizard is described in the following sections:

- [Accessing the Protocol Interface Wizard](#)
- [Protocol Interface Wizard Types](#)
    - [Protocol Interface Wizard–Connected Interfaces](#)
    - [Protocol Interface Wizard–Unconnected Interfaces](#)
    - [Protocol Interface Wizard—GRE Tunnels](#)
    - [Protocol Interface Wizard–FCoE and NPIV](#)

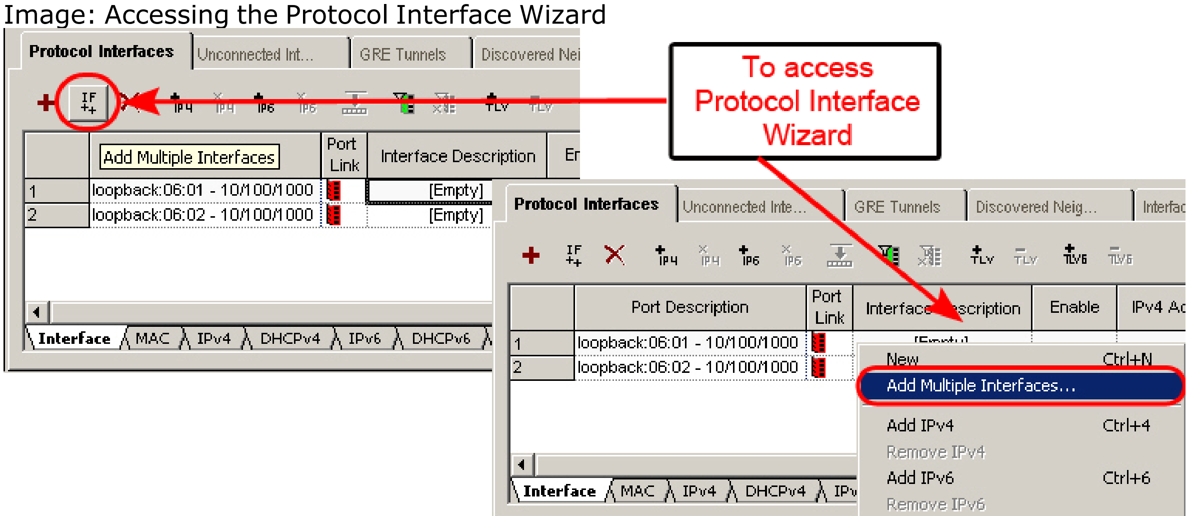
NOTE The GRE Tunnels wizard is available ONLY for modules that support GRE over IP.

Refer to the *Ixia Platform Reference Manual* for information on modules that support this feature.

Accessing the Protocol Interface Wizard

The Protocol Interface wizard can be accessed using the methods shown in *Image: Accessing the Protocol Interface Wizard*. Information on the use of this wizard is found in [Protocol Interface Wizard Types](#).

Image: Accessing the Protocol Interface Wizard



Protocol Interface Wizard Types

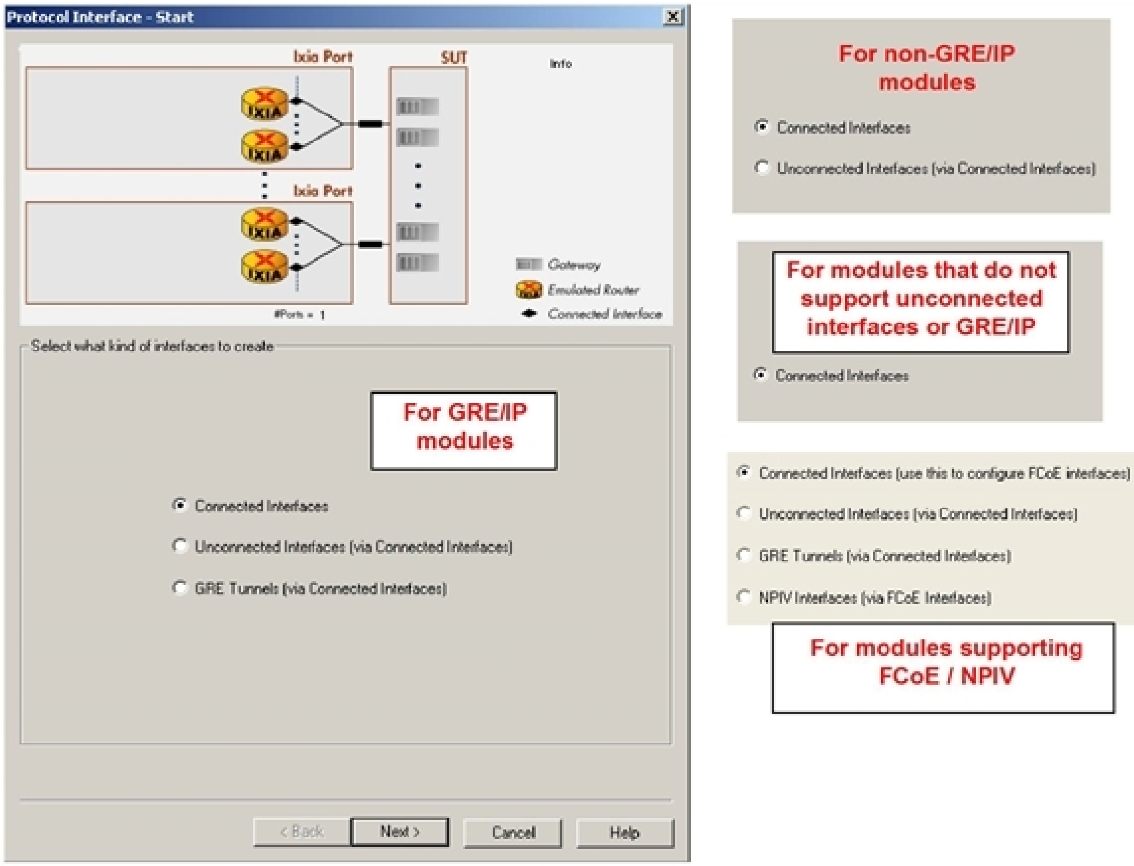
The Protocol Interface Wizard is shown in *Image: Protocol Interface Wizard—Start dialog box (for Connected Interfaces)*. It allows to configure three different types of protocol interfaces, with customized dialog boxes and diagrams for each type, as described in the following sections:

- [Protocol Interface Wizard–Connected Interfaces](#)
- [Protocol Interface Wizard–Unconnected Interfaces](#)
- [Protocol Interface Wizard—GRE Tunnels](#)
- [Protocol Interface Wizard–FCoE and NPIV](#)

NOTE The GRE Tunnels wizard is available ONLY for modules that support GRE over IP.

Refer to the *Ixia Platform Reference Manual* for information on modules that support this feature.

Image: Protocol Interface Wizard



Protocol Interface Wizard–Connected Interfaces

The GUI screens in the Protocol Interface Wizard for Connected Interfaces, and their use, are described in the following sections:

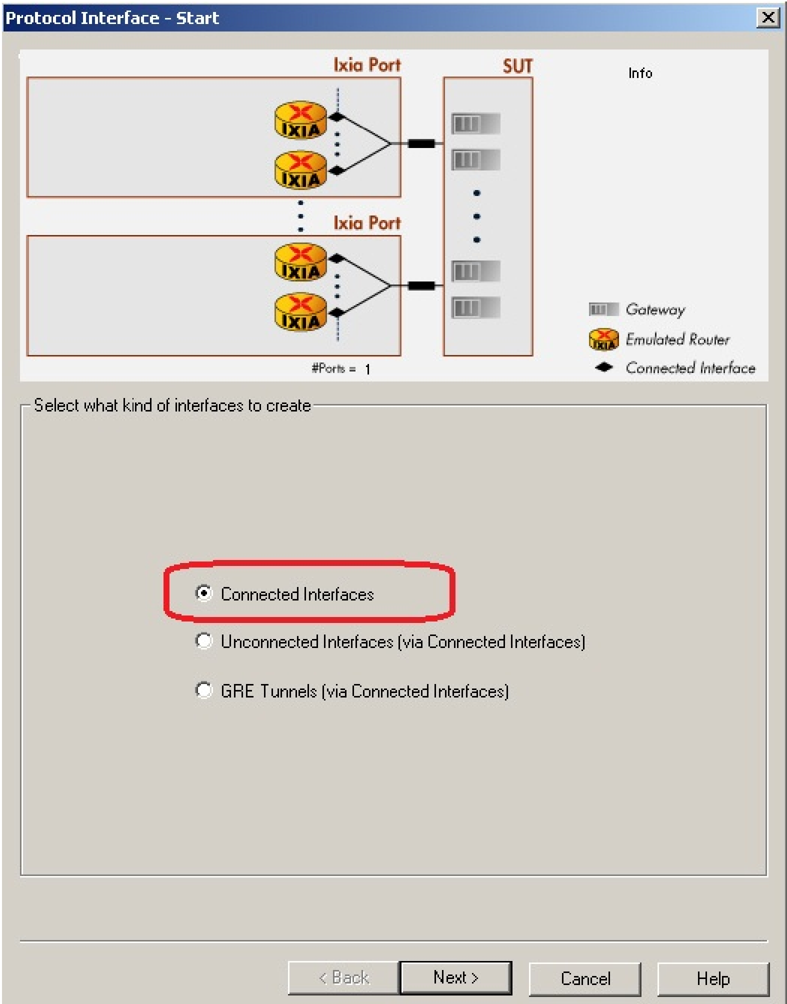
- Protocol Interface Wizard—Start dialog box (for Connected Interfaces)
- Protocol Interface Wizard—Connected Interfaces dialog box (for Connected Interfaces)
- Protocol Interface Wizard—ATM dialog box (for Connected Interfaces)
- Protocol Interface Wizard—Finish dialog box (for Connected Interfaces)

NOTE Protocol interfaces should not be created in the same subnet as the IxRemoteIP (the IxRemoteIP subnet default is 10.0.0.0). Creating protocol interfaces in this subnet will cause problems and odd behavior.Chassis Properties—IxRemoteIp for more information on the IxRemoteIP, and how to change the default subnet.

Protocol Interface Wizard—Start dialog box (for Connected Interfaces)

The Protocol Interface Wizard—Start dialog box, with 'Connected Interfaces' selected, is shown in *Image: Protocol Interface Wizard—Start dialog box (for Connected Interfaces)*. Connected Interfaces are created on directly-connected links between the Ixia port and a DUT port.

Image: Protocol Interface Wizard—Start dialog box (for Connected Interfaces)



The fields and controls in this dialog box are described in *Table: Start dialog box (for Connected Interfaces)*.

Table: Start dialog box (for Connected Interfaces)

Section	Field/Control	Description
Select what kind of interfaces to create	Connected Interfaces	Select this option to create one or more 'Connected Interfaces'—Ixia-emulated protocol interfaces that are on the directly-connected physical link between an Ixia port and a DUT/SUT port.
	Unconnected Interfaces (via Connected Interfaces)	Select this option to create one or more 'Unconnected Interfaces'—Ixia-emulated protocol interfaces that are NOT on the directly-connected physical link between an Ixia port and a DUT/SUT port. The Unconnected Interfaces are 'virtual interfaces' that connect to 'virtual routers'—to create a virtual topology 'behind' the Ixia-emulated router.

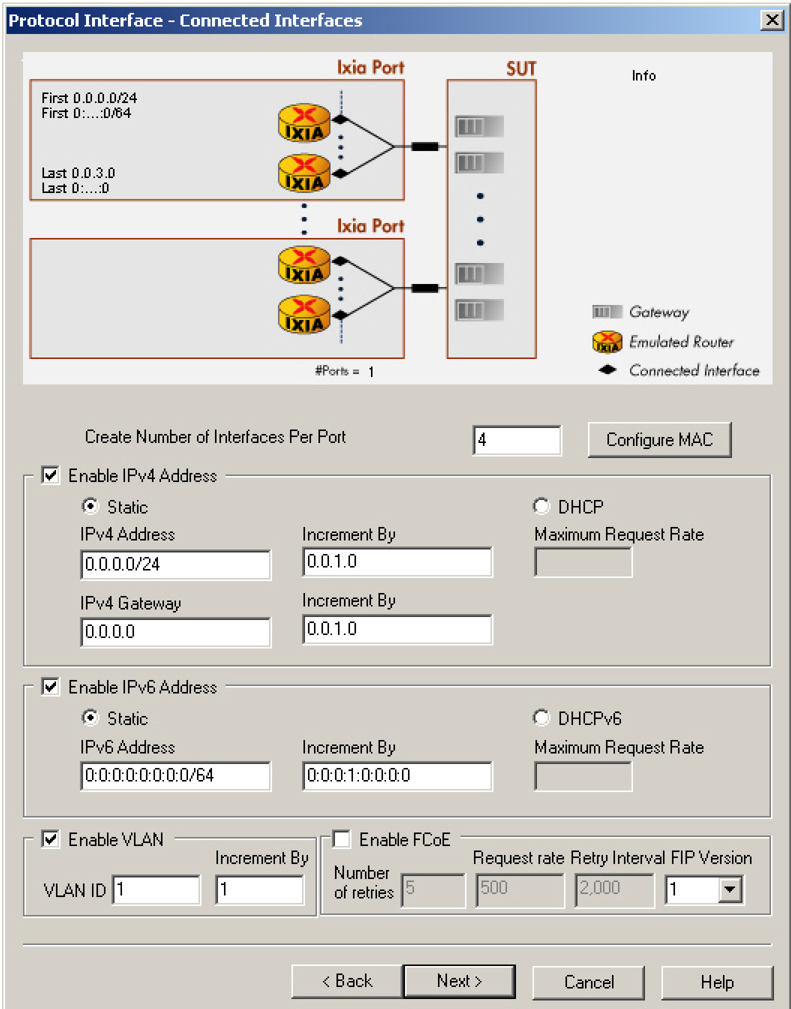
Section	Field/Control	Description
		For the virtual routers 'behind' the Ixia-emulated router to 'communicate' with the DUT/SUT, each Unconnected Interface must be associated with a Connected Interface.
	GRE Tunnels (via Connected Interfaces)	Select this option to create one or more Ixia-emulated 'GRE Tunnels.' Each GRE tunnel is emulated over the directly-connected physical link between an Ixia port and a DUT/SUT port and beyond (to the GRE tunnel destination end point). Each GRE Tunnel must be associated with a Connected Interface—to be used as the Source IP address, for the local end of the tunnel.

Protocol Interface Wizard—Connected Interfaces dialog box (for Connected Interfaces)

The dialog box for creating connected interfaces is shown in *Image: Connected Interfaces dialog box (for Connected Interfaces)*. This dialog box can be used to streamline the process of configuring multiple connected (connected to the DUT/SUT) interfaces on one or more Ixia ports. The diagram at the top of the dialog box shows the configuration values that you are entering into the fields in the dialog box.

NOTE You will not be able to select DHCPv4-enabled interfaces for use with protocol emulations, with the exception of IGMP.You will not be able to select DHCPv6-enabled interfaces for use with protocol emulations.DHCP is applicable only to Ethernet ports and to ATM ports using Bridged Ethernet encapsulation.

Image: Connected Interfaces dialog box (for Connected Interfaces)



The fields and controls in this dialog box are described in *Table: Connected Interfaces dialog box (for Connected Interfaces)*.

Table: Connected Interfaces dialog box (for Connected Interfaces)

Section	Field/Control	Description
Header	Create number of interfaces per port	Enter the number of interfaces to be added to the current port. The default is 1 interface. NOTE The number of protocol interfaces that can be added depends on the amount of memory available.
Enable IPv4 Address	Enable IPv4 Address	If selected, one or more IPv4 interface address(es) can be configured for this port.
(Address assignment mode)	Static	(Default) If selected, you may manually configure IPv4 addresses for this protocol interface.

Section	Field/Control	Description
(Address Assignment mode)	DHCP	Available for Ethernet ports and ATM ports in Bridged Ethernet mode only. If selected, the IPv4 address configuration fields will be dimmed and unavailable for configuration. IPv4 addresses and additional network configuration information will be allotted to this protocol interface through the DHCPv4 protocol. NOTE This option is available for connected interfaces only (interfaces directly connected to a DUT).
	Maximum Request Rate	The maximum number of request messages that will be sent by this interface.
	IPv4 Address	A 32-bit IPv4 Address (with mask) for this particular interface.
	Increment IPv4 By	A 32-bit value to be applied to the IPv4 Gateway address as an increment step for creating a range of consecutive IPv4 addresses, starting with the least significant bit of the IPv4 address.
	IPv4 Gateway	A 32-bit IPv4 Address for the network gateway (typically the DUT) connected to this particular interface.
	Increment GW By	A 32-bit value to be applied to the IPv4 Gateway address as an increment step for creating a range of consecutive IPv4 addresses, starting with the least significant bit of the IPv4 address.
Enable IPv6 Address	Enable IPv6 Address	If selected, one or more IPv6 interface address(es) can be configured for this port.
(Address assignment mode)	Static	(Default) If selected, you may manually configure IPv6 addresses for this protocol interface.
(Address Assignment mode)	DHCPv6	Available for Ethernet ports and ATM ports in Bridged Ethernet mode only. If selected, the IPv6 address configuration fields will be dimmed and unavailable for configuration. IPv4 addresses and additional network configuration information will be allotted to this protocol interface through the DHCPv6 protocol. NOTE This option is available for connected interfaces only (interfaces directly connected to a DUT).

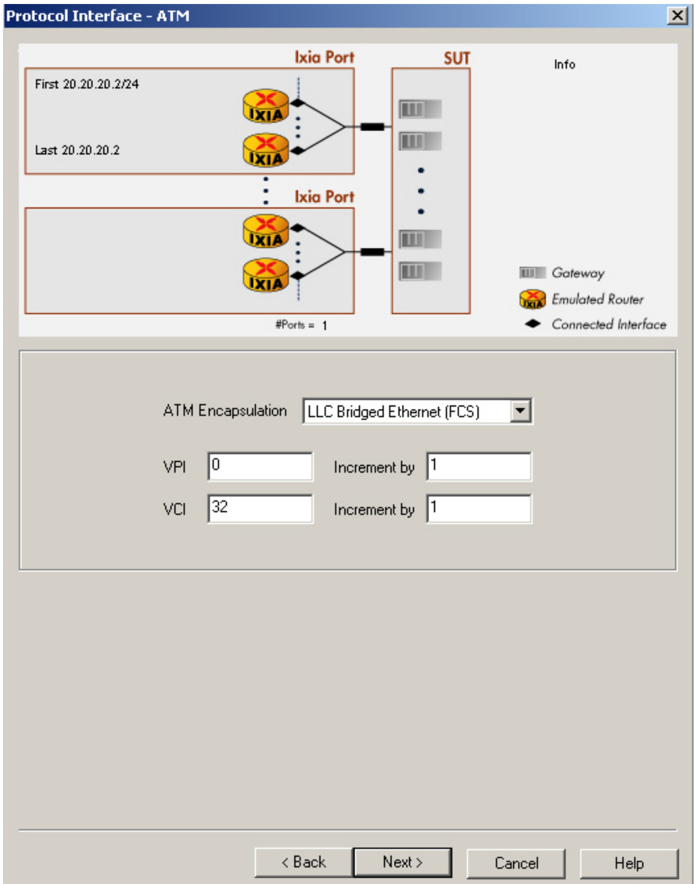
Section	Field/Control	Description
	Maximum Request Rate	The maximum number of request messages that will be sent by this interface.
	IPv6 Address	A 128-bit IPv6 Address (with mask) for this particular interface.
	Increment IPv6 By	A 128-bit value to be used with the IPv6 address as an increment step for creating a range of consecutive IPv6 addresses, starting with the least significant bit of the host part of the IPv6 address.
Enable VLAN		If selected, a VLAN can be assigned for each of the interfaces being created in this dialog box.
	VLAN ID	(integer) The identifier value for the VLAN.
	Increment By	(integer) The value of the increment step to be used in creating the range of VLAN IDs for the interfaces created in this dialog box.
Enable FCoE		If selected, FCoE will be enabled for each of the interfaces being created in this dialog box.
	Number of retries	FCoE number of retries before being marked as Failure. (default = 5)
	Request rate	FCoE maximum rate (packets/second). (default = 500)
	Retry Interval	Interval between retries, when a packet is sent and no response received. Enter a value. Default = 2000 (milliseconds).
	FIP Version	0, 1, or Auto (default = 1). Auto = it will detect the version.

Protocol Interface Wizard—ATM dialog box (for Connected Interfaces)

NOTE This dialog box is available for ATM ports **ONLY**.

For ATM ports there is an additional dialog box in the Protocol Interface Wizard, as shown in *Image: ATM dialog box (for Connected Interfaces)*. This dialog box can be used to streamline the process of configuring one or more 'connected' (connected to the SUT) interfaces on one or more Ixia ATM ports. The diagram at the top of the dialog box shows the configuration values that you are entering into the fields in the dialog box.

Image: ATM dialog box (for Connected Interfaces)



The fields and controls in this dialog box are described in *Table: ATM dialog box (for Connected Interfaces)*.

Table: ATM dialog box (for Connected Interfaces)

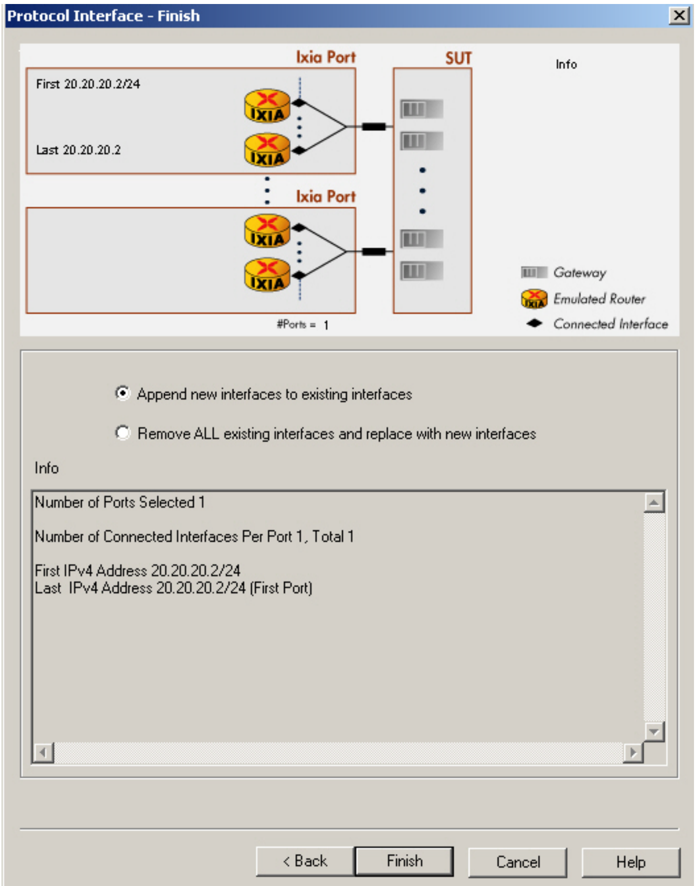
Field/Control	Description
ATM Encapsulation	The type of RFC 2684 ATM multiplexing encapsulation (routing) protocol to be used. Choose one of: • VC Mux IPv4 Routed • VC Mux IPv6 Routed • VC Mux Bridged Ethernet/802.3 (FCS) • VC Mux Bridged Ethernet/802.3 (no FCS) • LLC Routed AAL5 SNAP • LLC Bridged Ethernet (FCS) - (the Default) • LLC Bridged Ethernet (no FCS) NOTE See the information below regarding the two general types of ATM encapsulation. • **VC Mux**—VC MUX Protocols. For ATM Virtual Connection (VC)

Field/Control	Description
	Multiplexing ('Muxing') encapsulation. Each ATM VC carries routed PDUs for only one protocol. Multiple VCs are required for multiple protocols. Helps to reduce fragmentation overhead. • **LLC**—LLC Protocols. For ATM Logical Link Control (LLC) encapsulation. Each ATM VC carries routed PDUs for multiple types of protocols. Helps to reduce the number of separate VCs required when multiple protocols are used.
VPI	Virtual Path Identifier (VPI) for the ATM VC over which information is being transmitted. The valid minimum = 0.
Increment by	The increment step to add for creating each **additional** VPI.
VCI	Virtual Circuit/Connection Identifier (VCI) for the ATM VC over which information is being transmitted. The valid minimum = 32. (Values less than 32 are reserved.)
Increment by	The increment step to add for creating each **additional** VCI.

Protocol Interface Wizard—Finish dialog box (for Connected Interfaces)

The dialog box for completing the configuration process for connected protocol interfaces is shown in *Image: Finish dialog box (for Connected Interfaces)*. This dialog box shows the configuration information in the 'Info' window, and allows to choose the way that interfaces will be applied to the ports. The diagram at the top of the dialog box shows the configuration values that you have entered into the fields of the previous dialog box.

Image: Finish dialog box (for Connected Interfaces)



The fields and controls in this dialog box are described in *Table: Finish dialog box (for Connected Interfaces)*.

Table: Finish dialog box (for Connected Interfaces)

Section	Field/Control	Description
Header	Append new interfaces to existing interfaces	Choose this option to add the newly created protocol interfaces to the list of existing protocol interfaces (in the Protocol Interface window).
	Remove ALL existing interfaces and replace with new interfaces	Choose this option if you want to delete the list of existing protocol interfaces (in the Protocol Interface window) and replace it with a list of the newly created protocol interfaces.
Info		This section of the dialog box contains the current information regarding the newly created protocol interfaces, including: • Number of Ports selected • Number of Connected Interfaces for each port, and total number of Connected Interfaces • First and Last IPv4 Addresses of the range of IPv4 Addresses—for each port (if configured for IPv4)

Section	Field/Control	Description
		• First and Last IPv6 Addresses of the range of IPv6 Addresses—for each port (if configured for IPv6)

Protocol Interface Wizard–Unconnected Interfaces

The GUI screens in the Protocol Interface Wizard for Unconnected Interfaces, and their use, are described in the following sections:

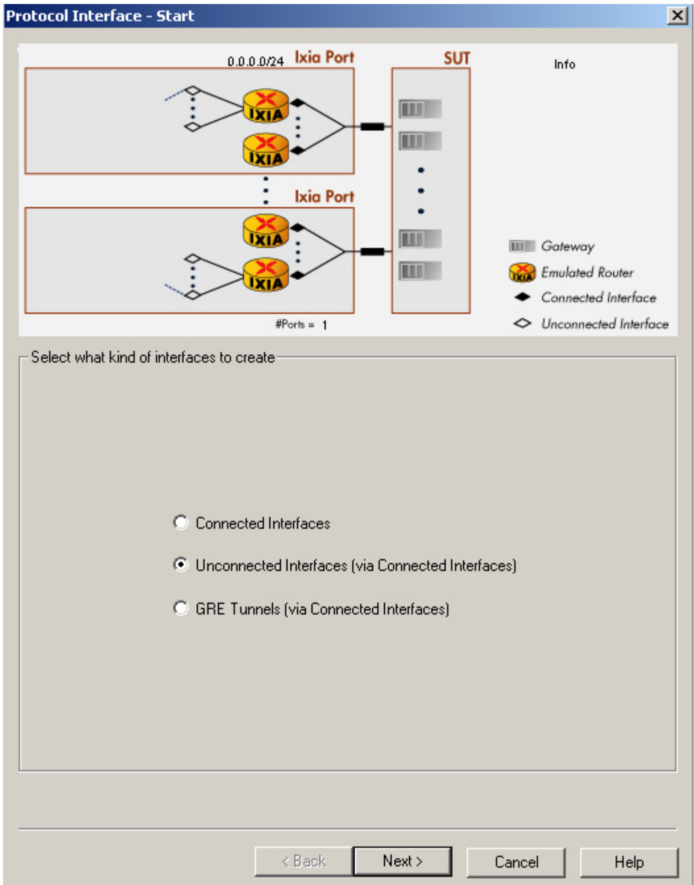
- Protocol Interface Wizard—Start dialog box (for Unconnected Interfaces)
- Protocol Interface Wizard—Connected Interface dialog box (for Unconnected Interfaces)
- Protocol Interface Wizard—Unconnected Interface dialog box
- Protocol Interface Wizard—ATM dialog box (for Unconnected Interfaces)
- Protocol Interface Wizard—Finish dialog box (for Unconnected Interfaces)

NOTE Protocol interfaces should not be created in the same subnet as the IxRemoteIP (the IxRemoteIP subnet default is 10.0.0.0). Creating protocol interfaces in this subnet will cause problems and odd behavior.Chassis Properties—IxRemoteIp for more information on the IxRemoteIP, and how to change the default subnet.

Protocol Interface Wizard—Start dialog box (for Unconnected Interfaces)

The Protocol Interface Wizard—Start dialog box, with 'Unconnected Interfaces' selected, is shown in *Image: Start dialog box (Unconnected Interfaces)*. Unconnected Interfaces can be created as Loopback addresses for Ixia-emulated routers, or as virtual interfaces connecting to a virtual topology 'behind' the Ixia-emulated routers.

Image: Start dialog box (Unconnected Interfaces)



The fields and controls in this dialog box are described in *Table: Start dialog box (for Connected Interfaces)*.

Table: Start dialog box (for Connected Interfaces)

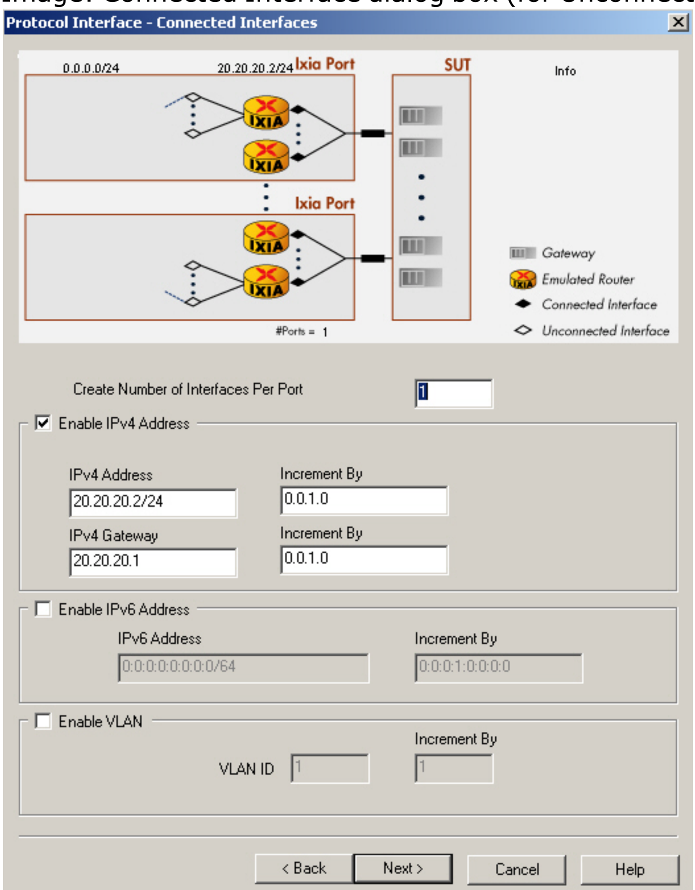
Section	Field/Control	Description
Select what kind of interfaces to create	Connected Interfaces	See *Table: Start dialog box (for Connected Interfaces)*.
	Unconnected Interfaces (via Connected Interfaces)	Select this option to create one or more 'Unconnected Interfaces'— Ixia-emulated protocol interfaces that are NOT on the directly-connected physical link between an Ixia port and a DUT/SUT port. The Unconnected Interfaces are 'virtual interfaces' that connect to 'virtual routers'—to create a virtual topology 'behind' the Ixia-emulated router. For the virtual routers 'behind' the Ixia-emulated router to 'communicate' with the DUT/SUT, each Unconnected Interface must be associated with a Connected Interface.

Section	Field/Control	Description
	GRE Tunnels (via Connected Interfaces)	See *Table: Start dialog box (for Connected Interfaces)*.

Protocol Interface Wizard—Connected Interface dialog box (for Unconnected Interfaces)

The Protocol Interface Wizard—Connected Interface dialog box for Unconnected Interfaces is shown in *Image: Connected Interface dialog box (for Unconnected Interfaces)*. The *Enable IPv4 Address* check box or *Enable IPv6 Address* check box must be selected, or the *Next* button will not be active and configuration cannot continue.

Image: Connected Interface dialog box (for Unconnected Interfaces)



The fields and controls in this dialog box are described in *Table: Connected Interfaces dialog box (for Unconnected Interfaces)*.

Table: Connected Interfaces dialog box (for Unconnected Interfaces)

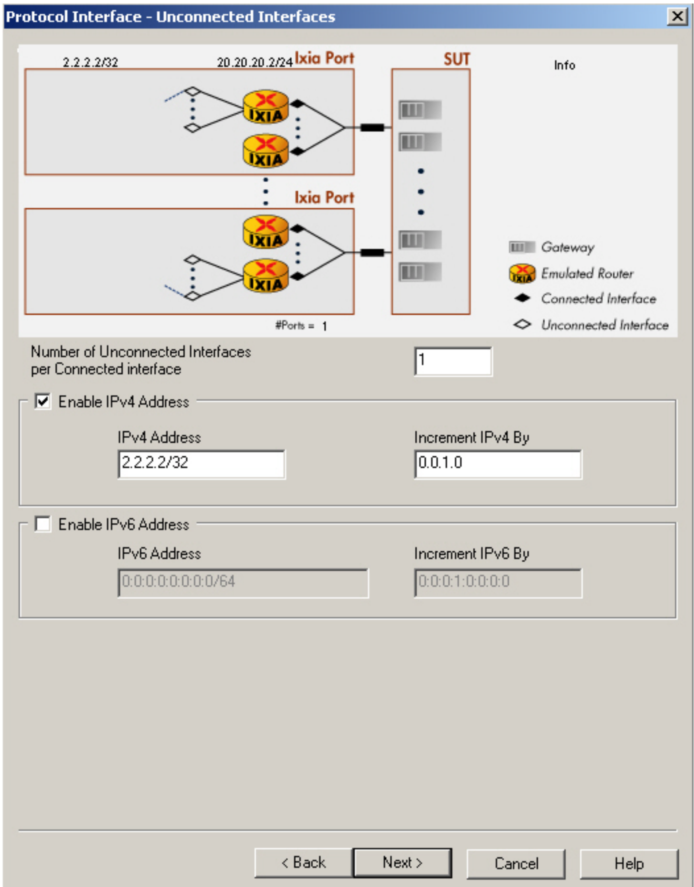
Section	Field/Control	Description
Header	Create number of interfaces per port	Enter the number of **connected** interfaces to be added to the current port. The default is 1 interface.

Section	Field/Control	Description
		NOTE The number of protocol interfaces that can be added depends on the amount of memory available.
Enable IPv4 Address	Enable IPv4 Address	If selected, one or more IPv4 interface address(es) can be configured for this port.
	IPv4 Address	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
	Increment IPv4 By	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
	IPv4 Gateway	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
	Increment GW By	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
Enable IPv6 Address	Enable IPv6 Address	If selected, one or more IPv6 interface address(es) can be configured for this port.
	IPv6 Address	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
	Increment IPv6 By	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
Enable VLAN	Enable VLAN	If selected, a VLAN can be assigned for each of the interfaces being created in this dialog box.
	VLAN ID	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
	Increment By	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.

Protocol Interface Wizard—Unconnected Interface dialog box

The Protocol Interface Wizard—Unconnected Interface dialog box is shown in *Image: Unconnected Interface dialog box*.

Image: Unconnected Interface dialog box



The fields and controls in this dialog box are described in *Table: Unconnected Interface dialog box*.

Table: Unconnected Interface dialog box

Section	Field/Control	Description
Header	Number of Unconnected Interfaces per Connected Interface	Enter the number of **Unconnected** interfaces to be created for each connected interface. The default is 1 unconnected interface. NOTE The number of protocol interfaces that can be added depends on the amount of memory available.
Enable IPv4 Address	Enable IPv4 Address	If selected, one or more IPv4 interface address(es) can be configured for this port.
	IPv4 Address	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
	Increment IPv4 By	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.

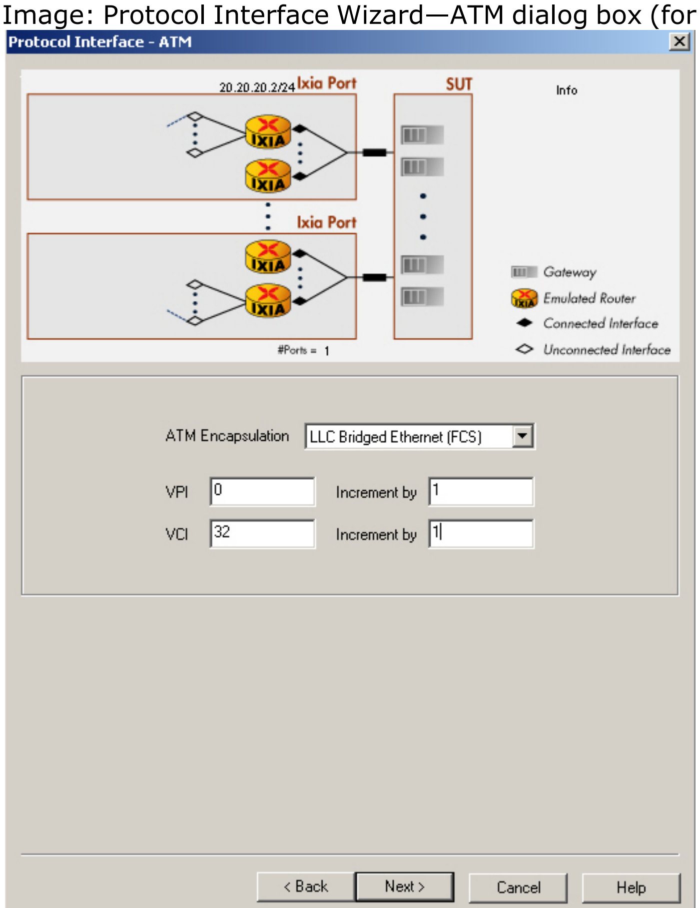
Section	Field/Control	Description
Enable IPv6 Address	Enable IPv6 Address	If selected, one or more IPv6 interface address(es) can be configured for this port.
	IPv6 Address	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
	Increment IPv6 By	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.

Protocol Interface Wizard—ATM dialog box (for Unconnected Interfaces)

NOTE This dialog box is available for ATM ports **ONLY**.

For ATM ports there is an additional dialog box in the Protocol Interface Wizard for unconnected interfaces, as shown in *Image: Protocol Interface Wizard—ATM dialog box (for Unconnected Interfaces)*. This dialog box can be used to streamline the process of configuring one or more Unconnected Interfaces (through Connected Interfaces) on one or more Ixia ATM ports. The diagram at the top of the dialog box shows the configuration values that you are entering into the fields in the dialog box.

Image: Protocol Interface Wizard—ATM dialog box (for Unconnected Interfaces)



The fields and controls in this dialog box are described in *Table: Protocol Interface Wizard—ATM dialog box (for Unconnected Interfaces)*.

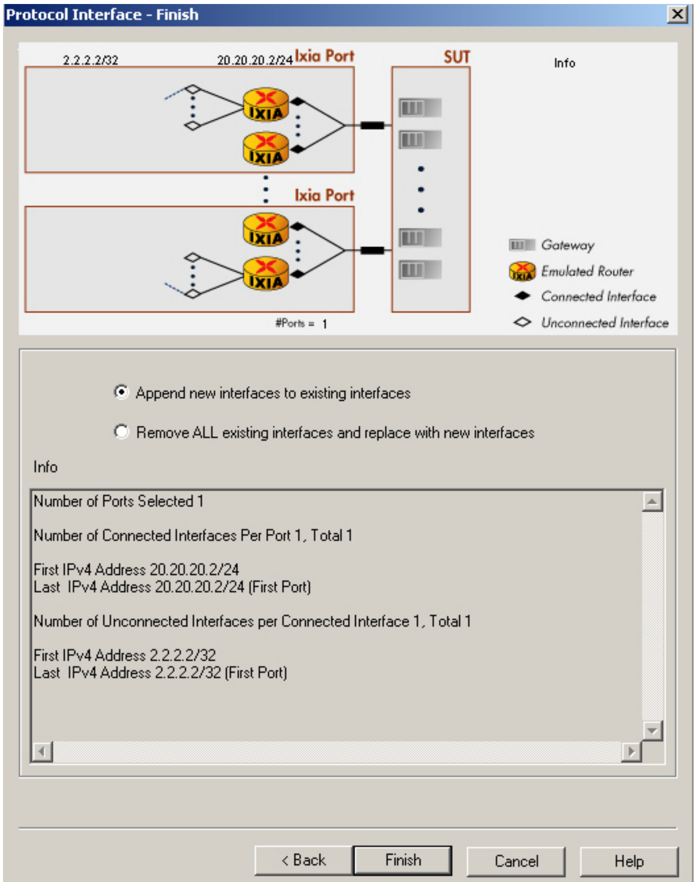
Table: Protocol Interface Wizard—ATM dialog box (for Unconnected Interfaces)

Field/Control	Description
ATM Encapsulation	The type of RFC 2684 ATM multiplexing encapsulation (routing) protocol to be used. See *Table: ATM dialog box (for Connected Interfaces)*.
VPI	See *Table: ATM dialog box (for Connected Interfaces)*.
Increment by	See *Table: ATM dialog box (for Connected Interfaces)*.
VCI	See *Table: ATM dialog box (for Connected Interfaces)*.
Increment by	See *Table: ATM dialog box (for Connected Interfaces)*.

Protocol Interface Wizard—Finish dialog box (for Unconnected Interfaces)

The dialog box for completing the configuration process for unconnected protocol interfaces is shown in *Image: Finish dialog box (for Unconnected Interfaces)*. This dialog box shows the configuration information in the 'Info' window, and allows to choose the way that interfaces will be applied to the ports. The diagram at the top of the dialog box shows the configuration values that you have entered into the fields of the previous dialog box.

Image: Finish dialog box (for Unconnected Interfaces)



The fields and controls in this dialog box are described in *Table: Finish dialog box (for Unconnected Interfaces)*.

Table: Finish dialog box (for Unconnected Interfaces)

Section	Field/Control	Description
Header	Append New Interfaces to existing interfaces	See *Table: Finish dialog box (for Connected Interfaces)*.
	Remove ALL existing Interfaces and replace with new interfaces	See *Table: Finish dialog box (for Connected Interfaces)*.
Info		This section of the dialog box contains the current information regarding the newly created protocol interfaces, including: • Number of Ports Selected (Total) • Number of Connected Interfaces Per Port, and the Total number of connected interfaces • First and Last IPv4 Addresses of the range of IPv4 Addresses for connected interfaces—for each port (if configured for IPv4).

Section	Field/Control	Description
		• First and Last IPv6 Addresses of the range of IPv6 Addresses for connected interfaces—for each port (if configured for IPv6). • Number of Unconnected Interfaces per Connected Interface, and the Total number of unconnected interfaces. • First and Last IPv4 Addresses of the range of IPv4 Addresses for unconnected interfaces—for each port (if configured for IPv4). • First and Last IPv6 Addresses of the range of IPv6 Addresses for unconnected interfaces—for each port (if configured for IPv6).

Protocol Interface Wizard—GRE Tunnels

NOTE The GRE Tunnels wizard is available ONLY for modules that support GRE over IP.Refer to the *Ixia Platform Reference Manual* for information on modules that support this feature.

The GUI screens in the Protocol Interface Wizard for GRE Tunnels, and their use, are described in the following sections:

- Protocol Interface Wizard—Start dialog box (for GRE Tunnels)
- Protocol Interface Wizard—Connected Interfaces dialog box (for GRE Tunnels)
- Protocol Interface Wizard—GRE Tunnels dialog box
- Protocol Interface Wizard—Finish dialog box (for GRE Tunnels)

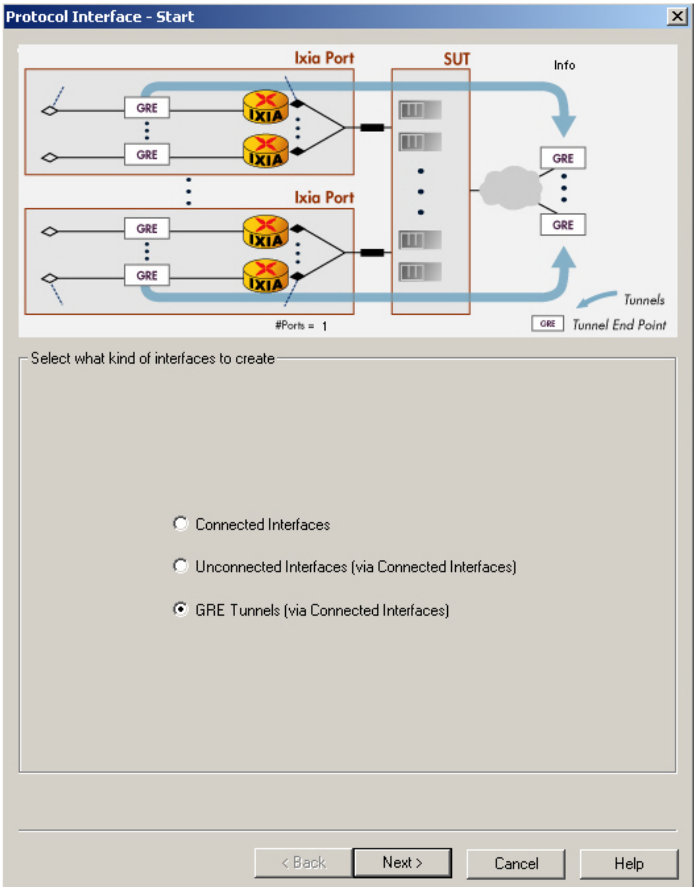
NOTE Protocol interfaces should not be created in the same subnet as the IxRemoteIP (the IxRemoteIP subnet default is 10.0.0.0). Creating protocol interfaces in this subnet will cause problems and odd behavior.

Chassis Properties—IxRemoteIp for more information on the IxRemoteIP, and how to change the default subnet.

Protocol Interface Wizard—Start dialog box (for GRE Tunnels)

The Protocol Interface Wizard—Start dialog box, with 'GRE Tunnels' selected, is shown in *Image: Start dialog box (for GRE Tunnels)*.

Image: Start dialog box (for GRE Tunnels)



The fields and controls in this dialog box are described in *Table: Protocol Interface Wizard—Start dialog box (for GRE Tunnels)*.

Table: Protocol Interface Wizard—Start dialog box (for GRE Tunnels)

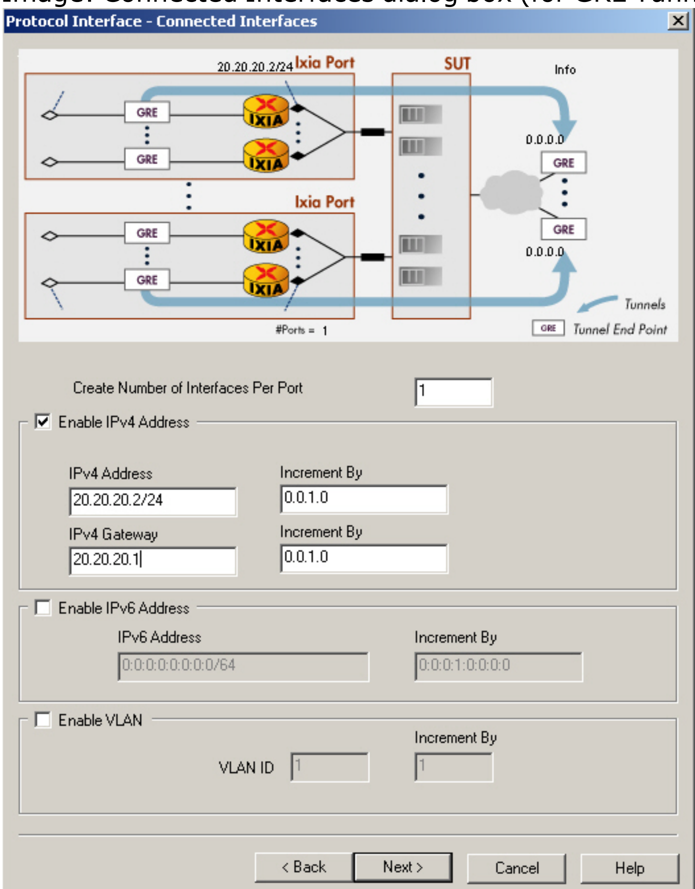
Section	Field/Control	Description
Select what kind of interfaces to create	Connected Interfaces	See *Table: Start dialog box (for Connected Interfaces)*.
	Unconnected Interfaces (via Connected Interfaces)	See *Table: Start dialog box (for Connected Interfaces)*.
	GRE Tunnels (via Connected Interfaces)	Select this option to create one or more Ixia-emulated 'GRE Tunnels.' Each GRE tunnel is emulated over the directly-connected physical link between an Ixia port and a DUT/SUT port and beyond (to the GRE tunnel destination end point). Each GRE Tunnel must be associated with a Connected Interface—to be used as the Source IP address, for the local end

Section	Field/Control	Description
		of the tunnel.

Protocol Interface Wizard—Connected Interfaces dialog box (for GRE Tunnels)

The Protocol Interface Wizard—Connected Interfaces dialog box for GRE Tunnels is shown in *Image: Connected Interfaces dialog box (for GRE Tunnels)*.

Image: Connected Interfaces dialog box (for GRE Tunnels)



The fields and controls in this dialog box are described in *Table: Connected Interfaces dialog box (for GRE Tunnels)*.

Table: Connected Interfaces dialog box (for GRE Tunnels)

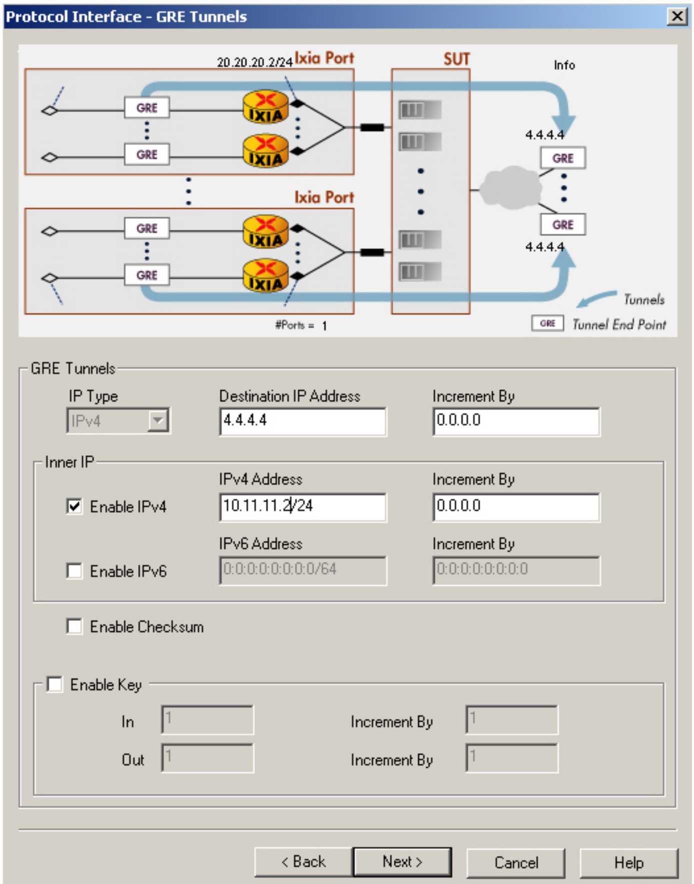
Section	Field/Control	Description
Header	Create number of interfaces per port	Enter the number of **connected** interfaces to be added to the current port. The default is 1 interface.

Section	Field/Control	Description
		NOTE The number of protocol interfaces that can be added depends on the amount of memory available.
Enable IPv4 Address	Enable IPv4 Address	If selected, one or more IPv4 interface address(es) can be configured for this port.
	IPv4 Address	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
	Increment IPv4 By	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
	IPv4 Gateway	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
	Increment GW By	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
Enable IPv6 Address	Enable IPv6 Address	If selected, one or more IPv6 interface address(es) can be configured for this port.
	IPv6 Address	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
	Increment IPv6 By	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
Enable VLAN	Enable VLAN	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
	VLAN ID	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
	Increment By	See *Table: Connected Interfaces dialog box (for Connected Interfaces)*.

Protocol Interface Wizard—GRE Tunnels dialog box

The Protocol Interface Wizard—GRE Tunnels dialog box is shown in *Image: GRE Tunnels dialog box*.

Image: GRE Tunnels dialog box



The fields and controls in this dialog box are described in *Table: GRE Tunnels dialog box*.

Table: GRE Tunnels dialog box

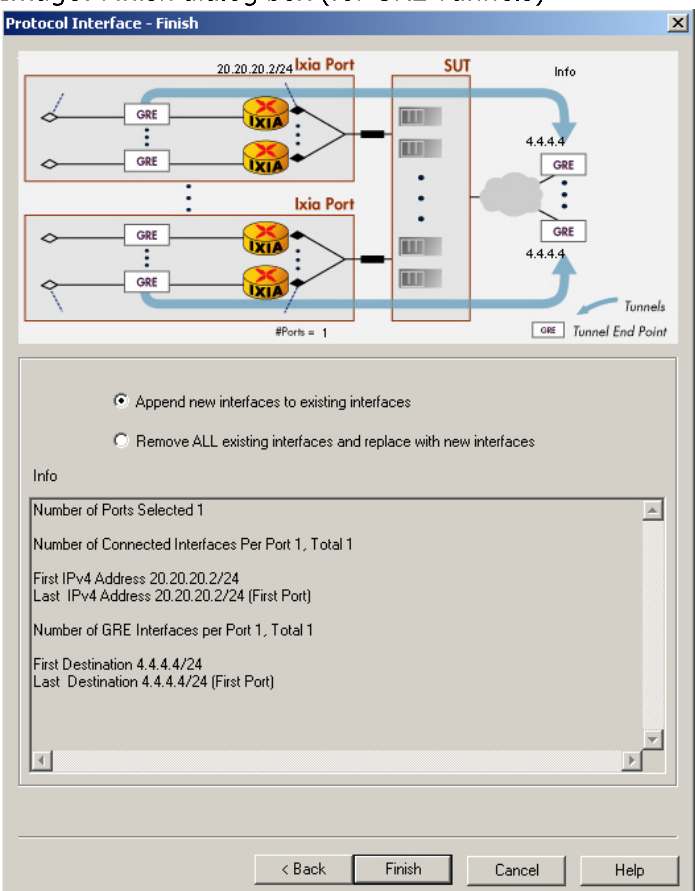
Section	Field/Control	Description
GRE Tunnels	IP Type	The type of IP address used in the Delivery Header of the GRE-encapsulated packet. Choose one of: • IPv4 • IPv6
	Destination IP Address	The IP address of the first GRE tunnel destination—part of the GRE Delivery Header.
	Increment By	If more than one Destination IP Address will be used, this is the amount that will be added to create each additional destination address.
Inner IP		The following fields are used to configure the destination IP (IP DA) addresses for the GRE-encapsulated payload IP packet.
	Enable IPv4	If selected, the payload IP packet will be assigned an IPv4 destination address.

Section	Field/Control	Description
	IPv4 Address	The IPv4 destination address for the first payload IP packet.
	Increment By	If more than one payload IPv4 address will be used, then this is the value that will be added to create each additional destination address.
	Enable IPv6	If selected, the payload IP packet will be assigned an IPv6 destination address.
	IPv6 Address	The IPv6 destination address for the first payload IP packet.
	Increment By	If more than one payload IPv6 address will be used, this is the value that will be added to create each additional destination address.
(GRE Header Fields)		The following fields are used to configure the optional information for the GRE header.
Enable Checksum		If selected, the optional Checksum will be added to the GRE header, per RFC 2890.
Enable Key		If selected, the optional authentication key feature will be added to the GRE header, per RFC 2890.
	In	A user-assigned integer value for the optional GRE header authentication key that will be expected in packets received through the first GRE tunnel that is created. This is the value that the receiving router will be expecting in the GRE packets being received through the tunnel. All packets arriving through a specific tunnel should contain the same key value (one key per GRE tunnel).
	Increment By	If more than one GRE tunnel will be used, this is the amount that will be added to create each additional authentication key value to look for in received GRE packets (one key per GRE tunnel).
	Out	A user-assigned integer value for the optional GRE header authentication key to be placed in packets for the first GRE tunnel that is created. This is the value that the sending router will be placed in the GRE packets being sent through the tunnel. All packets sent through a specific tunnel should contain the same key value (one key per GRE tunnel).
	Increment By	If more than one GRE tunnel will be used, this is the amount that will be added to create each additional authentication key value to be sent in the GRE packets (one key per GRE tunnel).

Protocol Interface Wizard—Finish dialog box (for GRE Tunnels)

The dialog box for completing the configuration process for GRE Tunnel protocol interfaces is shown in *Image: Finish dialog box (for GRE Tunnels)*. This dialog box shows the configuration information in the 'Info' window, and allows to choose the way that interfaces will be applied to the ports. The diagram at the top of the dialog box shows the configuration values that you have entered into the fields of the previous dialog box.

Image: Finish dialog box (for GRE Tunnels)



The fields and controls in this dialog box are described in *Table: Finish dialog box (for GRE Tunnels)*.

Table: Finish dialog box (for GRE Tunnels)

Section	Field/Control	Description
Header	Append New Interfaces to existing interfaces	See *Table: Finish dialog box (for Connected Interfaces)*.
	Remove ALL existing Interfaces and replace with new interfaces	See *Table: Finish dialog box (for Connected Interfaces)*.
Info		This section of the dialog box contains the current information regarding the newly created protocol

Section	Field/Control	Description
		interfaces, including: • Number of Ports Selected (Total) • Number of Connected Interfaces Per Port, and the Total number of connected interfaces • First and Last IPv4 Addresses of the range of IPv4 Addresses for connected interfaces—for each port (if configured for IPv4) • First and Last IPv6 Addresses of the range of IPv6 Addresses for connected interfaces—for each port (if configured for IPv6) • Number of GRE Interfaces per Connected Interface, and the Total number of GRE Tunnels • First and Last IPv4 Addresses of the range of IPv4 Addresses for GRE Tunnel Destinations—for each port (if configured for IPv4) • First and Last IPv6 Addresses of the range of IPv6 Addresses for GRE Tunnel Destinations—for each port (if configured for IPv6)

Protocol Interface Wizard–FCoE and NPIV

NOTE The FCoE / NPIV wizard is available ONLY for modules that support Fibre Channel over Ethernet. Refer to the *Ixia Platform Reference Manual* for information on modules that support this feature.

The GUI screens in the Protocol Interface Wizard for NPIV through FCoE, and their use, are described in the following sections:

- Protocol Interface Wizard–Start dialog box (for FCoE and NPIV)
- Protocol Interface Wizard–Connected Interfaces dialog box (for FCoE/NPIV)
- Protocol Interface Wizard–FCoE dialog box
- Protocol Interface Wizard—FIP Configuration
- Protocol Interface Wizard–NPIV dialog box
- Protocol Interface Wizard–Finish dialog box (for FCoE/NPIV)

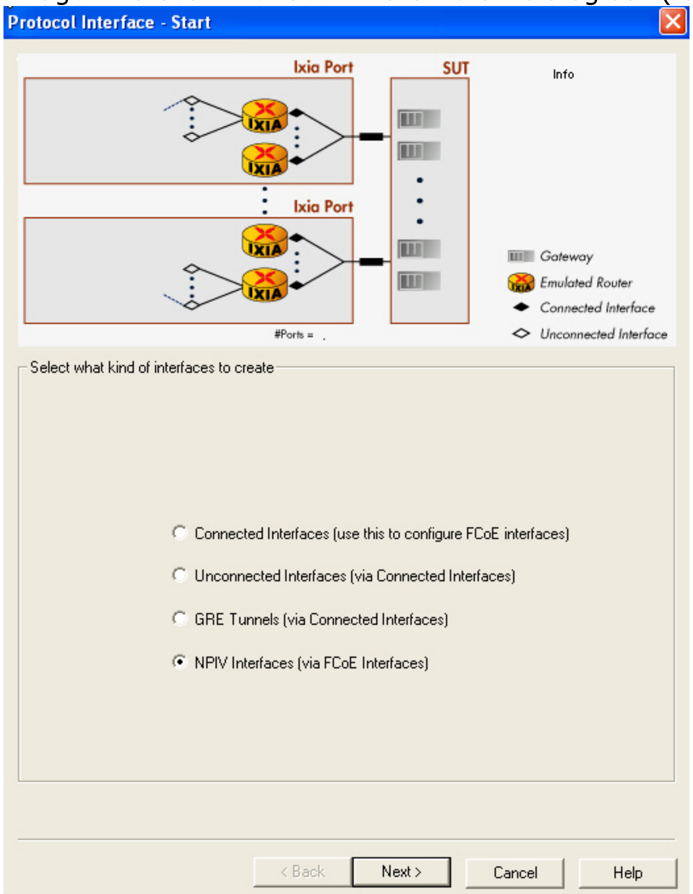
NOTE Protocol interfaces should not be created in the same subnet as the IxRemoteIP (the IxRemoteIP subnet default is 10.0.0.0). Creating protocol interfaces in this subnet will cause problems and odd behavior.

Chassis Properties—IxRemoteIp for more information on the IxRemoteIP, and how to change the default subnet.

Protocol Interface Wizard–Start dialog box (for FCoE and NPIV)

The Protocol Interface Wizard - Start dialog box is shown in *Image: Protocol Interface Wizard—Start dialog box (for FCoE / NPIV)*.

Image: Protocol Interface Wizard—Start dialog box (for FCoE / NPIV)



The fields and controls in this dialog box are described in *Table: Protocol Interface Wizard—Start dialog box (for GRE Tunnels)*.

Table: Start dialog box (for NPIV/FCoE)

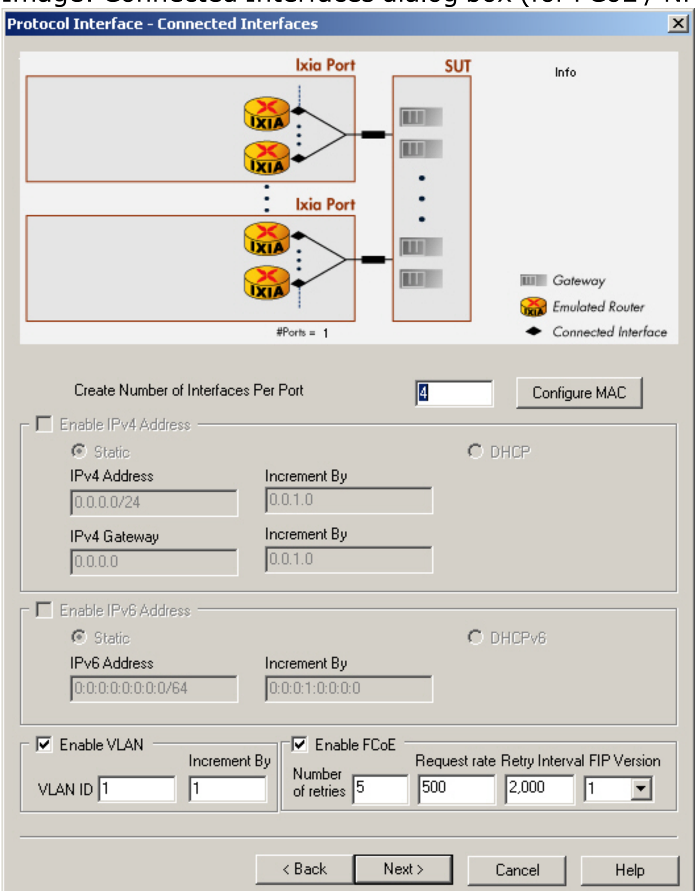
Section	Field/Control	Description
Select what kind of interfaces to create	Connected Interfaces	Select this option to create one or more FCoE 'Connected Interfaces'— Ixia-emulated protocol interfaces that are on the directly-connected physical link between an Ixia port and a DUT/SUT port.
	Unconnected Interfaces (via Connected Interfaces)	See *Table: Start dialog box (for Connected Interfaces)*.
	GRE Tunnels (via Connected Interfaces)	See *Table: Start dialog box (for Connected Interfaces)*.
	NPIV Interfaces (via FCoE	Select this option to create one or more NPIV interfaces on each of one or more FCoE interfaces.

Section	Field/Control	Description
	Interfaces)	

Protocol Interface Wizard–Connected Interfaces dialog box (for FCoE/NPIV)

The Protocol Interface Wizard - Connected Interfaces dialog box for FCoE or NPIV interfaces (through FCoE) is shown in *Image: Connected Interfaces dialog box (for FCoE / NPIV)*.

Image: Connected Interfaces dialog box (for FCoE / NPIV)



The fields and controls in this dialog box are described in *Table: Connected Interfaces dialog box (for NPIV/FCoE)*.

Table: Connected Interfaces dialog box (for NPIV/FCoE)

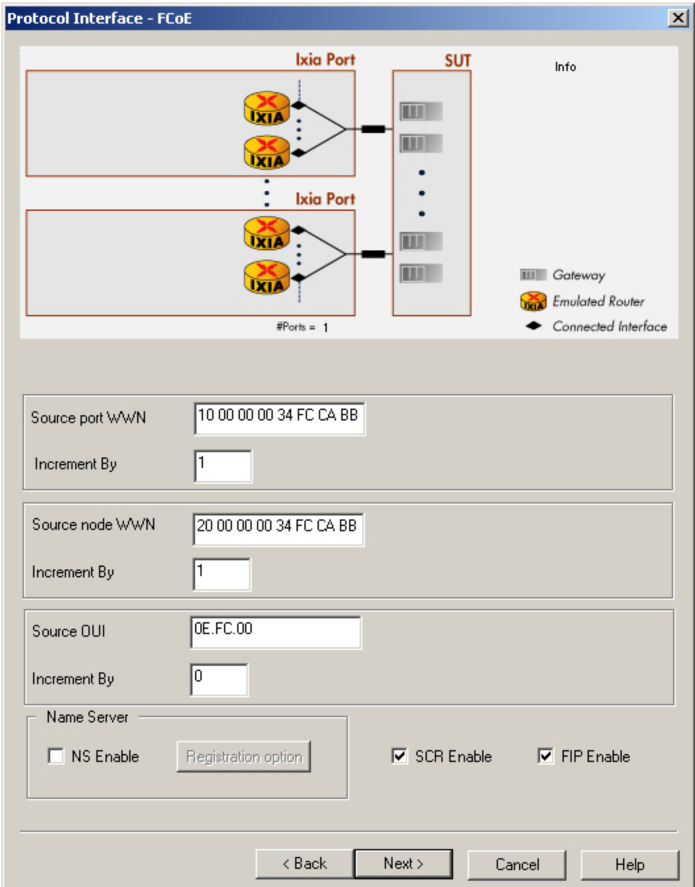
Section	Field/Control	Description
Header	Create number of interfaces per port	Enter the number of **NPIV** interfaces to be added to the current port. The default is 1 interface.

Section	Field/Control	Description
		NOTE The number of protocol interfaces that can be added depends on the amount of memory available.
Enable IPv4 Address	IPv4 AddressIncrement IPv4 ByIPv4 GatewayIncrement GW By	Grayed-out (not available). For definition, see *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
Enable IPv6 Address	IPv6 AddressIncrement IPv6 By	Grayed-out (not available). For definition, see *Table: Connected Interfaces dialog box (for Connected Interfaces)*.
Enable VLAN		If selected, a VLAN can be assigned for each of the interfaces being created in this dialog box.
	VLAN ID	(integer) The identifier value for the VLAN.
	Increment By	(integer) The value of the increment step to be used in creating the range of VLAN IDs for the interfaces created in this dialog box.
Enable FCoE		If selected, FCoE will be enabled for each of the interfaces being created in this dialog box.
	Number of Retries	FCoE number of retries before being marked as Failure. (default = 5)
	Request Rate	FCoE maximum rate (packets/second). (default = 500)
	Retry Interval	Interval between retries, when a packet is sent and no response received. Enter a value. Default = 2000 (milliseconds).
	FIP Version	0, 1, or Auto (default = 1). Auto = it will detect the version.

Protocol Interface Wizard–FCoE dialog box

The Protocol Interface Wizard - FCoE dialog box is shown in *Image: FCoE dialog box*.

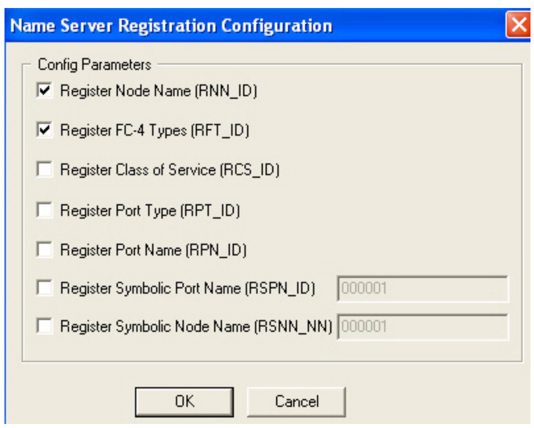
Image: FCoE dialog box



The fields and controls in this dialog box are described in *Table: FCoE dialog box*.

Table: FCoE dialog box

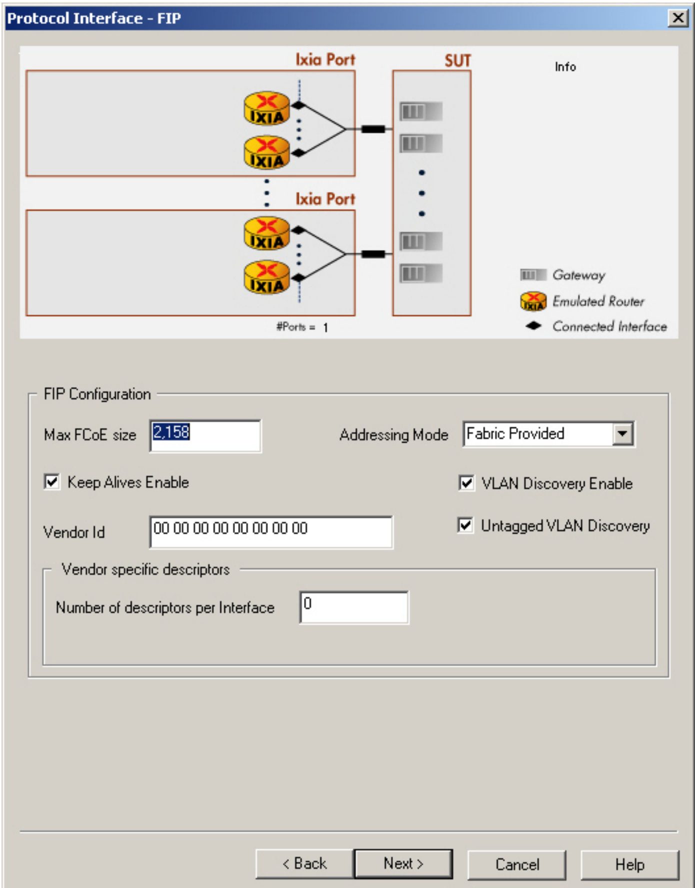
Section	Field/Control	Description
Source port WWN	Source port WWN	Source port Worldwide Name - a Name_identifier that is worldwide unique, represented by a 64-bit value
	Increment By	If more than one Source port WWN will be used, this is the amount that will be added to create each additional value to be sent in the FCoE packets.
Source node WWN	Source node WWN	Source node Worldwide Name - a Name_identifier that is worldwide unique, represented by a 64-bit value
	Increment By	If more than one Source node WWN will be used, this is the amount that will be added to create each additional value to be sent in the FCoE packets.

Section	Field/Control	Description
Source OUI	Source OUI	Use to configure the source Organization Unique Identifier. (*default = 0e.fc.00*)
	Increment By	If more than one Source OUI will be used, this is the amount that will be added to create each additional value to be sent in the FCoE packets. (*default = 0*)
Name Server	NS Enable	Enables registration to Name Server
	Registration option	Select to open NS Registration Configuration page (shown here).
		
SCR Enable		If enabled, the ENode will register for any changes with the Fabric by sending a State Change Registration packet.
FIP Enable		Enables FIP (FCoE Initialization Protocol) If enabled, the interface will use FIP for its initialization. Otherwise, it will use Cisco adhoc standard.

Protocol Interface Wizard—FIP Configuration

If FIP is enabled in the FCoE dialog box, the FIP dialog box will appear next. The Protocol Interface Wizard - FIP dialog box is shown in *Image: FIP dialog box*.

Image: FIP dialog box



The fields and controls in this dialog box are described in *Table: FIP dialog box*.

Table: FIP dialog box

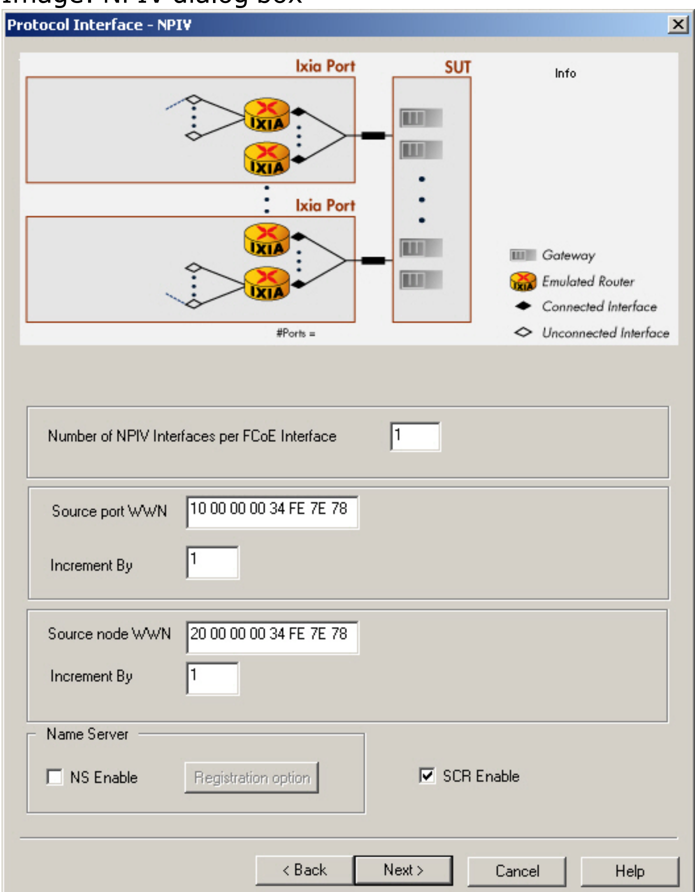
Section	Field/Control	Description
FIP Configuration	Max FCoE size	Enter the maximum FCoE size (default - 2,158)
	Addressing Mode	Specifies the addressing mode to be used by the FLOGI requests. Select from pulldown:Fabric ProvidedServer ProvidedBoth
	Keep Alives Enable	If enabled, ENode will send periodic keep alives.
	VLAN Discovery Enable	If selected, specifies that VLAN Discovery is to be performed.
	Untagged VLAN Discovery	If VLAN Enable is selected, this check box becomes accessible (and is selected by default). Enables untagged FIP VLAN discovery. If this option is cleared, the VLAN discovery packet is tagged with whatever VLAN the user configures.

Section	Field/Control	Description
	Vendor ID	This value is used in the vendor specific descriptor (default = all zeroes)
Vendor specific descriptors	Number of descriptors per interface	When enabled, this number of descriptors will be part of every FIP message.

Protocol Interface Wizard–NPIV dialog box

The Protocol Interface Wizard - NPIV dialog box is shown in *Image: NPIV dialog box*.

Image: NPIV dialog box



The fields and controls in this dialog box are described in *Table: NPIV dialog box*.

Table: NPIV dialog box

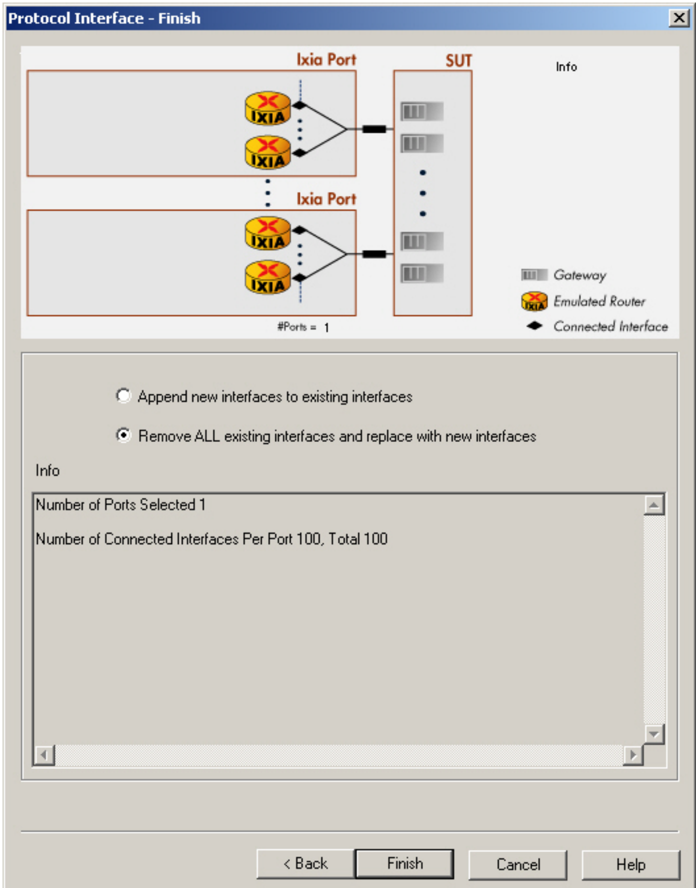
Section	Field/Control	Description
Number of NPIV Interfaces per FCoE Interface		Number of NPIV interfaces to be created per FCoE interface. Max. 256.

Section	Field/Control	Description
Source port WWN	Source port WWN	Source port Worldwide Name - a Name_identifier that is worldwide unique, represented by a 64-bit value
	Increment By	If more than one Source port WWN will be used, this is the amount that will be added to create each additional value to be sent in the NPIV packets.
Source node WWN	Source node WWN	Source node Worldwide Name - a Name_identifier that is worldwide unique, represented by a 64-bit value
	Increment By	If more than one Source node WWN will be used, this is the amount that will be added to create each additional value to be sent in the NPIV packets.
NS Enable		Enables registration to Name Server
	Registration option	Select to open NS Registration Configuration page (shown in *Table: FCoE dialog box*).
SCR Enable		If enabled, the ENode will register for any changes with the Fabric by sending a State Change Registration packet.

Protocol Interface Wizard–Finish dialog box (for FCoE/NPIV)

The dialog box for completing the configuration process for NPIV/FCoE protocol interfaces is shown in *Image: Protocol Interface Wizard—Finish dialog box (for FCoE/NPIV)*. This dialog box shows the configuration information in the 'Info' window, and allows to choose the way that interfaces will be applied to the ports. The diagram at the top of the dialog box shows the configuration values that you have entered into the fields of the previous dialog box.

Image: Protocol Interface Wizard—Finish dialog box (for FCoE/NPIV)



The fields and controls in this dialog box are described in *Table: Finish dialog box (for NPIV/FCoE)*.

Table: Finish dialog box (for NPIV/FCoE)

Section	Field/Control	Description
Header	Append New Interfaces to existing interfaces	See *Table: Finish dialog box (for Connected Interfaces)*.
	Remove ALL existing Interfaces and replace with new interfaces	See *Table: Finish dialog box (for Connected Interfaces)*.
Info		This section of the dialog box contains the current information regarding the newly created protocol interfaces, including: • Number of Ports Selected (Total) • Number of Connected Interfaces Per Port, and the Total number of connected interfaces

CHAPTER 11

Address Resolution Protocol (ARP)

The Address Resolution Protocol (ARP) window controls the manner in which ARP requests are sent from the port. This option is only available on Ethernet-based cards. The resulting responses from ARP requests are held in the ARP Table, which is used to set MAC addresses for transmitted data. ARP'ing the Device Under Test (DUT) allows tests and generated frames to be configured with a specific IP address, which at run time is associated with the MAC address of that particular DUT.

This chapter includes information on the use of the ARP window and the IP window, in the following sections:

- ARP Window
- IP Window

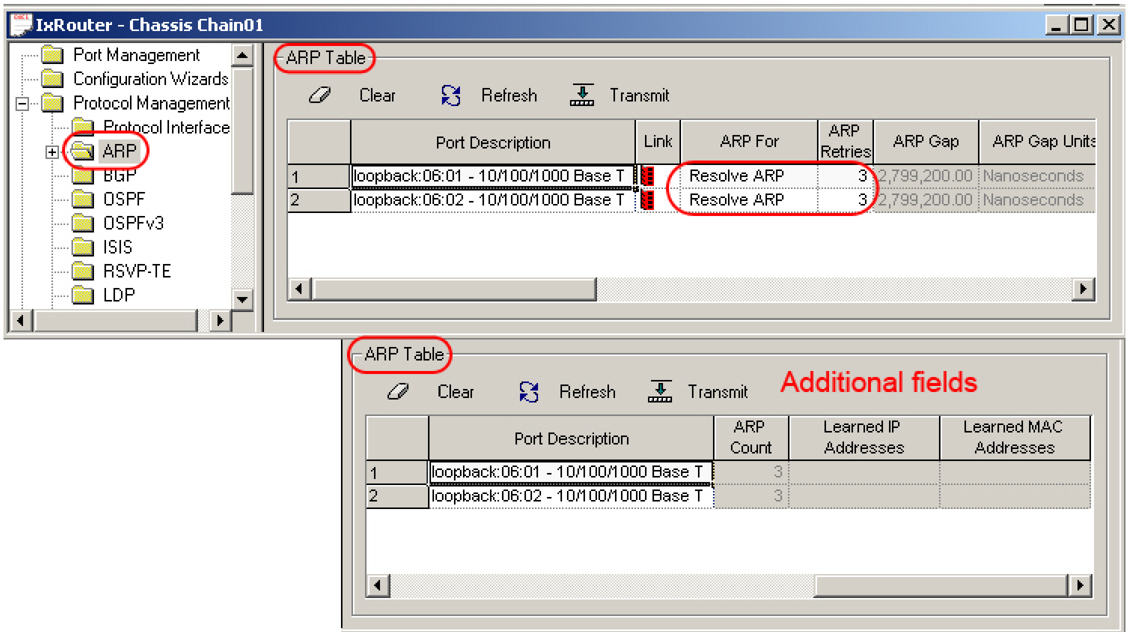
ARP Window

NOTE For information on the IP Window, go to IP Window.

ARP requests are generated from this window, from the main IxExplorer window, or when a Destination Address type of 'ARP Table' is used in the Frame Data dialog box. Entries in the ARP table are not aged; they are always considered valid. The ARP window is shown in *Image: ARP Window*.

NOTE On per-port Linux CPU-based cards with the ARP mode set to 'Resolve ARP' (only), the 'Send ARP' command from a client will result in the transmission of an ARP request ONLY if the ARP table does not have an updated entry.

Image: ARP Window



The ARP table holds the local addresses used, as well as the learned addresses from the Gateway/DUT port on the link. The learned entries are automatically added to the table following discovery. The fields and controls in this window are shown in *Table: ARP Window*.

Table: ARP Window

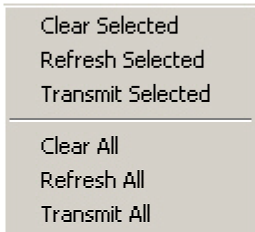
Field/Control	Description
Clear	Select this button to clear the learned information for the selected ARP entries.
Refresh	Select this button to refresh the selected ARP entries with values from the Ixia server software,without sending any new ARP requests.
Transmit	Select this button to transmit ARP requests for the selected entries.
Port Description	The name/number of the local port and the port type.
Link	The color of this icon indicates the state of the link for this port: • **Green**—Link is up. • **Red**—Link is down. • **Yellow**—Link is in loopback mode. • **Gray**—Link is unavailable because it is busy or it is an unsupported link type.
ARP For:	Transmit ARP request for one of the following: • **Resolve ARP**—(get MAC address) a single ARP request is sent to each Gateway IP address, using the first IP address found in the IP table entry for the port as the source address. The result of the ARP

Field/Control	Description
	request is saved in the ARP table. • **Learn ARP**—(for learning) sends ARP requests using all of the addresses found in the IP Address Table for this port as source addresses. The Ixia hardware does not listen for or record the responses. This is used to allow switches to learn the addresses of the Ixia-simulated devices that they will be seeing during the test. • **Both (Resolve + Learn)**—performs both of the operations (Resolve/get MAC Address + Learning).
ARP Retries	(Used for Resolve and Resolve + Learn requests) When transmitted ARP requests do not yield a result, this is the number of retries to execute before giving up. Used only with the 'First' and 'Both' options.
ARP Gap	(Used for Learn and Resolve + Learn requests) (Used **with** the ARP Gap Unit) A value that is the length of the gap inserted between the ARP packets when ARP Requests are sent for multiple addresses.
ARP Gap Units: • Nanoseconds • Microseconds • Milliseconds • Seconds • Clock Ticks	(Used **with** the ARP Gap value) The gap units available are: • Nanoseconds • Microseconds • Milliseconds • Seconds • Clock ticks—this is dependent on the load module used. It is the minimum packet gap found in *Ixia Platform Reference Manual*.
ARP Count	(Used for Learn and Resolve + Learn requests) Each ARP request is repeated this number of times, with gaps between the requests.
Learned IP Addresses	For each row entry, the IP address learned from the Gateway/DUT port on the link.
Learned MAC Addresses	For each row entry, the MAC address learned from the Gateway/DUT port on the link.

ARP Options Pop-Up Menu

The ARP options pop-up menu is shown in *Image: ARP Options Pop-Up Menu*.

Image: ARP Options Pop-Up Menu



The options in this menu are described in *Table: ARP Options Pop-Up Menu*.

Table: ARP Options Pop-Up Menu

Menu Options	**Description**
Clear Selected	Clear the learned information for the selected entries.
Refresh Selected	Refresh the learned information for the selected entries with values from the Ixia server software,without sending any new ARP requests.
Transmit Selected	Transmit ARP requests for the selected entries.
Clear All	Clear the learned information for ALL entries.
Refresh All	Refresh the learned information for ALL entries with values from the Ixia server software, without sending any new ARP requests.
Transmit All	Transmit ARP requests for ALL entries.

IP Window

The IP Table window allows IPv4 addresses to be assigned on a per-port basis. This window differs from the Protocol Interfaces window since the IP Table allows to create a very large range of IPv4 addresses, while the Protocol Interface table allows only one IPv4 address per interface. But, the IP Table addresses do not support routing protocol configuration in IxExplorer. This table is used if you want ARP and PING responses, or ARP learning frames, for a very large range of addresses.

In most cases, you should be using the Protocol Interfaces window. See Protocol Interfaces for additional information.

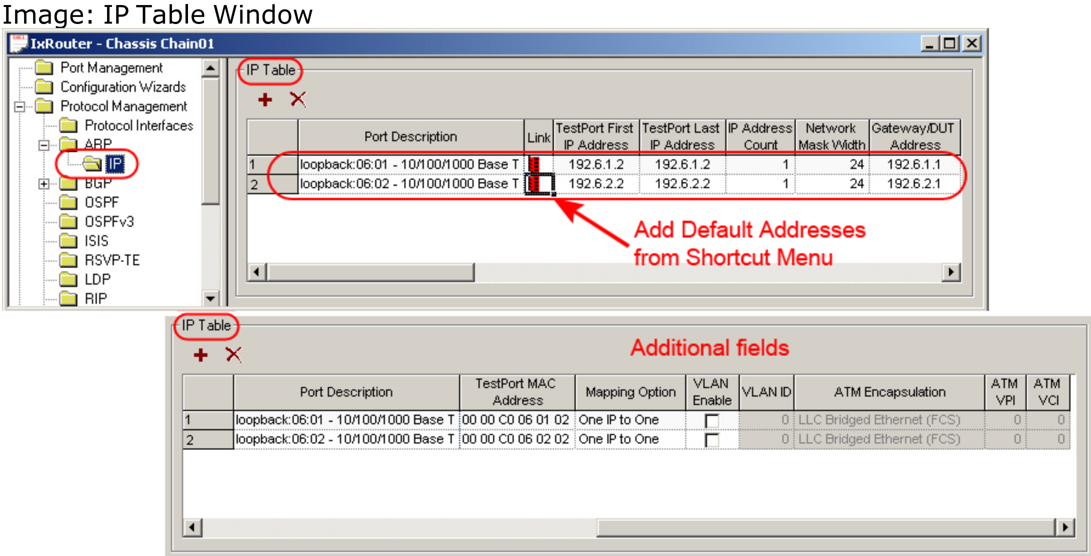
The correspondence between source IP addresses and MAC addresses (for Ethernet ports only) can be specified, and the Gateway IP address is also specified here. The IP Table for POS cards is similar except for the omission of the Mapping Option and MAC Address columns. IP addresses may be exclicked as individual addresses or as a range of addresses.

All ARP requests (for Ethernet) are sent to the Gateway address. In most cases, the default Gateway Address is the address of the DUT. When a gateway separates the Ixia port from the DUT, the IP address of that gateway is used as the default.

The IP Table window, shown in *Image: IP Table Window*, consists of a header and a grid with fields that control IP to MAC address and Gateway correspondence information. In this example, three IPv4 addresses have been added to the first port and are shown with the automatically-generated default addresses. (See [IP Table–Default IP Addressing Method] for additional information.)

NOTE	Port identifiers appear in the Protocol Window using the following format:*Chassis Name: Card Number: Port Number***Example**: *Your Chassis:01:01*

Image: IP Table Window



The fields and controls for the IP Table window are described in *Table: IP Table Window*. For information on the context menu, See [IP Table context menu]. The values in the fields may be added or edited manually. Select 'F2' to insert the cursor in the field.

Table: IP Table Window

Field/Control	**Description**
	Select this button to add an IPv4 address to the IP table for the selected port.
	Select this button to delete selected IP address(es) from the IP table for the selected port.
Port Description	The name/number of the port, and port type.
Link	The color of this icon indicates the state of the link for this port: • **Green**—Link is up. • **Red**—Link is down. • **Yellow**—Link is in loopback mode. • **Gray**—Link is unavailable because it is busy or it is an unsupported link type.
TestPort First IP	Sets the starting IP address of an IP address range for the Ixia Test Port.

Field/Control	Description
Address	IP Table–Default IP Addressing Method for information on default addresses.
TestPort Last IP Address	Sets the last IP address of an IP address range for the Test Port.
IP Address Count	Sets the number of addresses to be created for this IP address range for the Test Port.
Network Mask Width	The number of digits in the network mask, to be used to create a range of network addresses.
Gateway/DUT Address	The gateway address for the current entry. If multiple DUTs are to be tested, this should be set to the IP address of the DUT that corresponds to this address range. The default Gateway IP Address. *Gateway/DUT Address for additional information.*
TestPort MAC Address	(For Ethernet only) Sets the MAC address associated with the Ixia port IP address(es). IP Table—Default MAC Addressing for additional information.
Mapping Option	Choose one of the following mapping options: • **One IP to One MAC**—Sets up a one-to-one mapping of IP addresses to MAC addresses. For each of the IP addresses configured for the port, a different MAC address will be created. The rightmost octet in the initial MAC address will be incremented by '1' for each additional MAC address. • **Many IPs to One MAC**—For each of the IP addresses in this range of IP addresses, the same MAC address will be used. MAC Mapping for additional information.
VLAN Enable	If selected, enables the use of VLANs.
VLAN ID	
ATM Encapsulation	The type of RFC 2684 ATM multiplexing encapsulation (routing) protocol to be used. Each of these ATM encapsulation modes is described in the *Ixia Platform Reference Guide*. Choose one of: • VC Mux IPv4 Routed • VC Mux IPv6 Routed • VC Mux Bridged Ethernet/802.3 (FCS) • VC Mux Bridged Ethernet/802.3 (no FCS) • LLC Routed AAL5 Snap • LLC Bridged Ethernet (FCS) • LLC Bridged Ethernet (no FCS)

Field/Control	Description
	NOTE See the information below regarding the general types of ATM encapsulation. • **VC Mux**—VC MUX Routed Protocol. For ATM Virtual Connection (VC) Multiplexing. Each ATM VC carries routed PDUs for only one protocol. Multiple VCs are required for multiple protocols. Helps to reduce fragmentation overhead. • **LLC Snap**— LLC/SNAP Routed Protocol. For ATM LLC Encapsulation. Each ATM VC carries routed PDUs for multiple protocols. Helps to reduce the number of separate VCs required if multiple protocols are used.
ATM VPI	Virtual Path Identifier (VPI) for the VC over which information is being transmitted.
ATM VCI	Virtual Circuit/Channel Identifier (VCI) for the VC over which information is being transmitted.

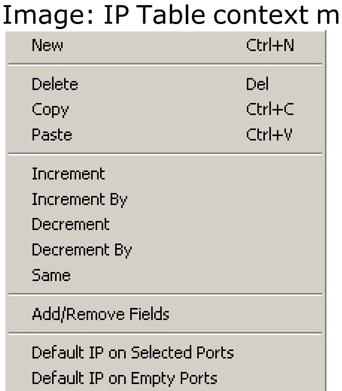
Gateway/DUT Address

Unless otherwise specified for a specific range of addresses, all ARP requests are sent to the Default Gateway IP address. In most cases, the Default Gateway Address is the address of the DUT. Where a gateway separates the Ixia port from the DUT, this should be set to the IP address of the gateway.

IP Table context menu

Open the IP table context menu as shown in *Image: IP Table context menu*.

Image: IP Table context menu



The options in this menu are described in *Table: IP Table context menu*.

Table: IP Table context menu

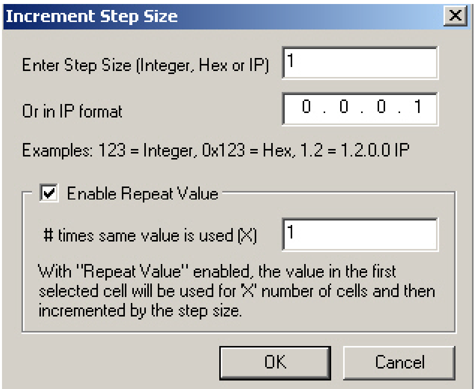
Menu Options	Description
New	Select a port listed in the IP Table, and select 'New' to add an IPv4 address set (one row entry) to the port.

Menu Options	Description
Delete	Select an address set (one row entry) for a port listed in the IP Table, and then select **Delete** to delete that row entry.
Copy	Select a row entry, and then select **Copy** to copy the addressing information in that row to a row entry for another port. (Use with the Paste option.)
Paste	Select a row entry, and then select **Paste** to paste the copied addressing information to the selected row entry. (Use with the Copy option.)
Increment	For use when multiple, contiguous row entries in a column are selected. The top selected entry will be used as the base value. Each additional entry will be increased in value by 1 (hex, integer, or as an IP value, depending on the type).
Increment By	For use when multiple, contiguous row entries in a column are selected. Shows the IP address Step Size dialog box for creating customized incrementing values in the column. Increment Step Size dialog box for additional information.
Decrement	For use when multiple, contiguous row entries in a column are selected. The top selected entry will be used as the base value. Each additional entry will decreased in value by 1 (hex, integer, or as an IP value, depending on the type).
Decrement By	For use when multiple, contiguous row entries in the column are selected. Shows the IP address Step Size dialog box for creating customized decrementing values in the column. Increment Step Size dialog box for additional information.
Same	For use when multiple row entries are selected. Forces all of the selected address fields to be identical, with all values matching those in the uppermost row entry.
Add/Remove Fields	Opens the Add/Remove Fields dialog box, so the selection of fields/column headings that appear in a view can be customized.
Default IP on Selected Ports	Applies the default IP addressing method to the selected ports. IP Table–Default IP Addressing Method for additional information.
Default IP on Empty Ports	Applies the default IP addressing method to all of the ports which do not yet have IP addresses assigned. IP Table–Default IP Addressing Method for additional information.

Increment Step Size dialog box

When the 'Increment By' or 'Decrement By' options are selected, the Increment Step Size dialog box opens so you can define an increment/decrement step other than '1' (the default setting). This dialog box applies only for incrementing or decrementing selected, contiguous values in a column. The Increment Step Size box is shown in *Image: Increment Step Size dialog box*.

Image: Increment Step Size dialog box



The fields and controls in this dialog box are described in *Table: Increment Step Size dialog box*.

Table: Increment Step Size dialog box

Field/Control	**Description**
Enter Step Size (Integer, Hex or IP)	Enter an integer, a hex value, or an 'IP' value that will be used as the step value. Entry examples: • 123 = Integer • 0x123 = Hex • 1.2 = 1.2.0.0 IP (a decimal value that will be translated into a 4-octet IP address)
Or in IP format	Enter a 4-octet IP address that will be used as the step value.
Enable Repeat Value	With 'Repeat Value' enabled, the value in the first selected cell will be used for 'X' number of cells, and then incremented by the step size.
# times same value is used (X) (Repeat Value)	Enter the number of times that a value will be used before this value will be incremented by the amount of the 'Step Size'. For example—If the initial value is 10.0.0.1, the Step Size is '0.0.0.1', and the Repeat Value is '2': • 10.10.10.1 • 10.10.10.1 • 10.10.10.2 • 10.10.10.2 • 10.10.10.3 • 10.10.10.3

IP Table–Default IP Addressing Method

To assist in speeding up the address configuration process for large numbers of ports in the IP table, a default addressing scheme is available for use. The two types of addressing are:

- IP Table—Default IPv4 Addressing
- IP Table—Default MAC Addressing

IP Table—Default IPv4 Addressing

The default IPv4 addresses consist of a network address (first 3 bytes) plus the one-byte host portion of the address, and are based on the following rules:

- The first byte is 192 (hex value = C0).
- The second byte is based on the number of the card slot in the chassis where the port is located. For example: If the load module is located in Slot 2, then the first 2 bytes of the IP address will be: 192.2.
- The third byte is based on the number of the port in the card. For example: If the port is the first port or only port on the card, the first 3 bytes of the IP address will be: 192.2.1.
- For the fourth byte (the host portion of the address) the IP address for the DUT/Gateway port on the link is assigned the first available host address on the subnet for that link, so its address would be: 192.2.1.1.
- The IP address for the Ixia port on that link is assigned the second available host address on the subnet for that link, so its address would be: 192.2.1.2.

IP Table—Default MAC Addressing

The default Test Port MAC addresses are automatically assigned according to the following rules:

- First 2 octets are zeros (00 00).
- Third octet is C0 (decimal value = 192).
- The last 3 bytes of the MAC address copy the values last 3 bytes of the IP address, but exclicked in hexadecimal notation.

See also MAC Mapping.

MAC Mapping

There are two types of mapping MAC addresses to IP addresses:

- One IP to One MAC Mapping
- Many IPs to One MAC Mapping

One IP to One MAC Mapping

- One MAC Address is created for each IP address in the range, according to the formatting described above.
- The last byte of the MAC Address is incremented by '1' for each additional address.
- The number of MAC Addresses is determined by the value in the IP Address Count column.
- Example (For Port 04:01, IP Address Count = 3):

TestPort IP Address	TestPort MAC Address
192.4.1.2	00 00 C0 04 01 02
192.4.1.3	00 00 C0 04 01 03
192.4.1.4	00 00 C0 04 01 04

Many IPs to One MAC Mapping

- The same MAC Address is used for every IP address in the range.
- Example (For Port 04:01, IP Address Count = 3):

TestPort IP Address	TestPort MAC Address
192.4.1.2	00 00 C0 04 01 02
192.4.1.3	00 00 C0 04 01 02
192.4.1.4	00 00 C0 04 01 02

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CHAPTER 12

ICMP/PINGv4

ICMP is the Internet Control Message Protocol. The Packet InterNet Groper (PING) utility, based on ICMP, is used to test for connectivity. PING messages are ICMP messages of type *Echo Request.* Responses are ICMP message of type *Echo Response*. This chapter describes the use of the PING utility in the IxExplorer and IxRouter GUI.

ICMP/PING Overview

PINGs can be sent for both IPv4 and IPv6 addresses:

- **For IPv4**—The PING messages are IPv4 ICMP messages of type *Echo Request.* PingResponses are IPv4 ICMP message of type *Echo Response*.
- **For IPv6**—The PING protocol is available for modules which support IPv6, using ICMPv6.

!!! 'PING' REQUIRES AN ENABLED PROTOCOL INTERFACE!!!!

1)Add an interface to the port.

2)Add an IPv4 and/or IPv6 address to the interface.

3)Enable the interface.

The PING message is sent from the PING dialog (Ping dialog box) which can be accessed in two locations:

- **Protocol Interfaces Window**—From the pop-up menu in the Protocol Interfaces table. PING from Protocol Interfaces Window.
- **Network Resources Window**—From the port level pop-up menu. The 'Send Ping...' option is available in this menu IF a protocol interface has been created and enabled for that port. PING from Network Resources Window.

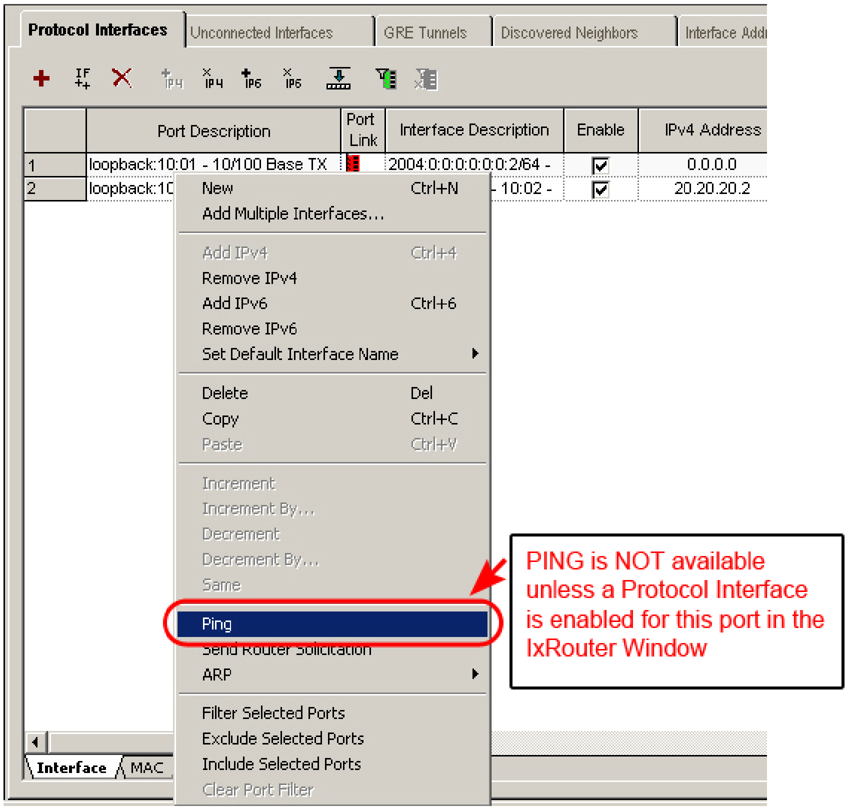
When a PING is sent to an IPv4 address, the check boxes for 'Enable PING for IPv4' and 'Enable ARP' will be enabled automatically in the Protocol Management window. To disable the PING function:

- **For IPv4**—Clear the check box for 'Enable PING for IPv4,' or disable the protocol interface.
- **For IPv6**—Disable the protocol interface.

PING from Protocol Interfaces Window

The Protocol Interfaces Window is shown in *Image: Protocol Interfaces Window—Ping Option*. The context menu for a port is shown, with the **Ping** option available.

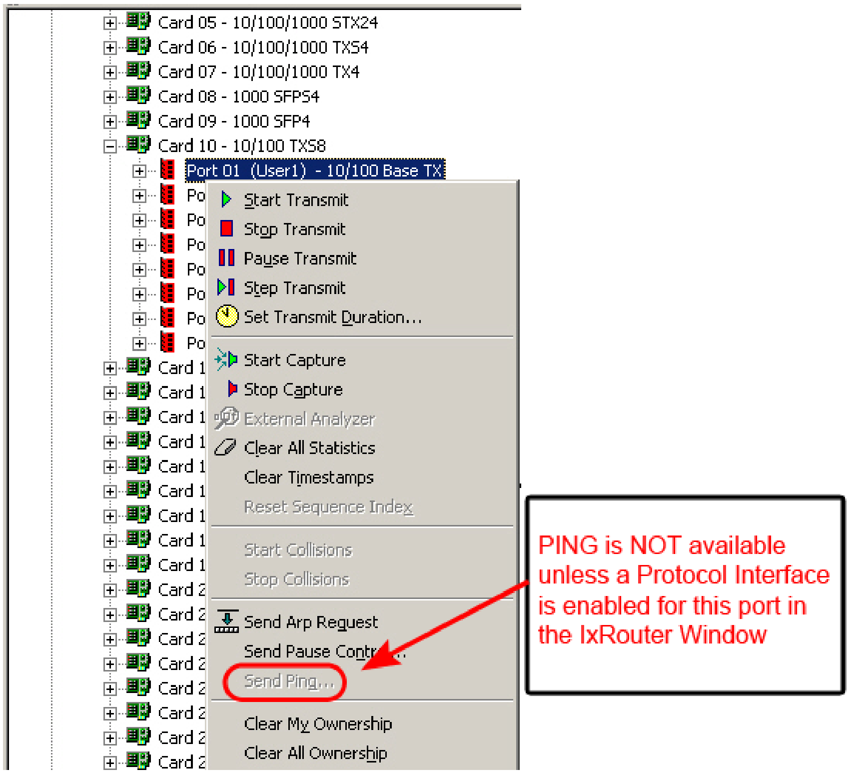
Image: Protocol Interfaces Window—Ping Option



PING from Network Resources Window

The 'Send Ping...' option in the Network Resources window port pop-up menu is shown in *Image: Network Resources Window—Send Ping*.

Image: Network Resources Window—Send Ping



Ping dialog box

The Ping dialog, which can be accessed from the Protocol Interfaces window, or from the Network Resources port level, is shown in *Image: Ping dialog box for IPv4 and IPv6*.

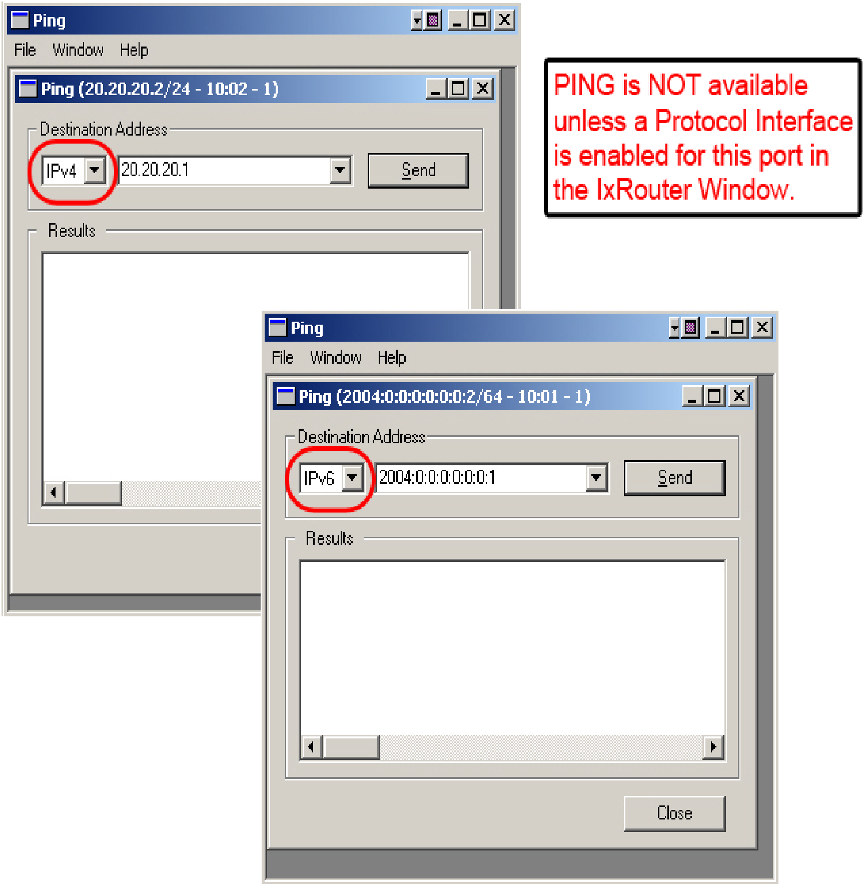
MANDATORY for Using PING:

1) In the Protocol Interfaces Window, a named Protocol Interface**MUST**first be added to the port.

2) An IPv4 and/or IPv6 address **MUST** be assigned to that interface.

3) The named interface **MUST**be enabled.

Image: Ping dialog box for IPv4 and IPv6



The fields and controls in this dialog are described in *Table: Ping dialog box for IPv4 and IPv6*.

Table: Ping dialog box for IPv4 and IPv6

Section	Field/Control	Description
Protocol Interface	(Named Protocol Interfaces)	Select from the dropdown list of named, **enabled**, interfaces for the port.
Destination Address	(IP Version) Choose one of: • IPv4 • IPv6	The options that appear in this list depend on the type of IP addresses that have been added to the interface. **IPv4 (only)**—For an interface that has an IPv4 address only. **IPv6 (only)**—For an interface that has an IPv6 address only. (Also available for each of multiple IPv6 addresses assigned to the interface.) **IPv4 and IPv6**—For an interface that has both IPv4 and IPv6 addresses.
	(Address)	Shows the IPv4 or IPv6 address to which the Ping message will be sent. For a 32-bit IPv4 address, the format will be: x.x.x.x

Section	Field/Control	Description
		For a 128-bit IPv6 address, the format will be: x:x:x:x:x:x:x:x (or any of the other standard IPv6 address formats)
	Send	Select the *Send* button after the IP version and Destination address have been set.
Results		The status and results of the Ping appears in the Results window.

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CHAPTER 13

Filter Properties

The Filters selection for a port allows for a number of settings related to capturing, filtering, and statistics. There are three tabs for the Filters, Statistics, Receive Mode dialog box, described in the following sections:

Filter Properties Tab	Controls the settings for the capture trigger and filter as well as the setting of the user defined-statistics.
Statistics Tab	Controls the selection of alternative statistics to be shown.
Receive Mode Tab	Controls the options related to data capture and latency operations.

Filter Properties Tab

The **Filter Properties** tab sets trigger and filter parameters that are used in three different areas within the Ixia system:

User Defined Statistics	Sets up the conditions for the accumulation of up to four user-definable statistics.
Capture Trigger and Capture Filter	Sets up the conditions under which a port will start capturing data, and a filter for the data it will retain in its capture buffer.

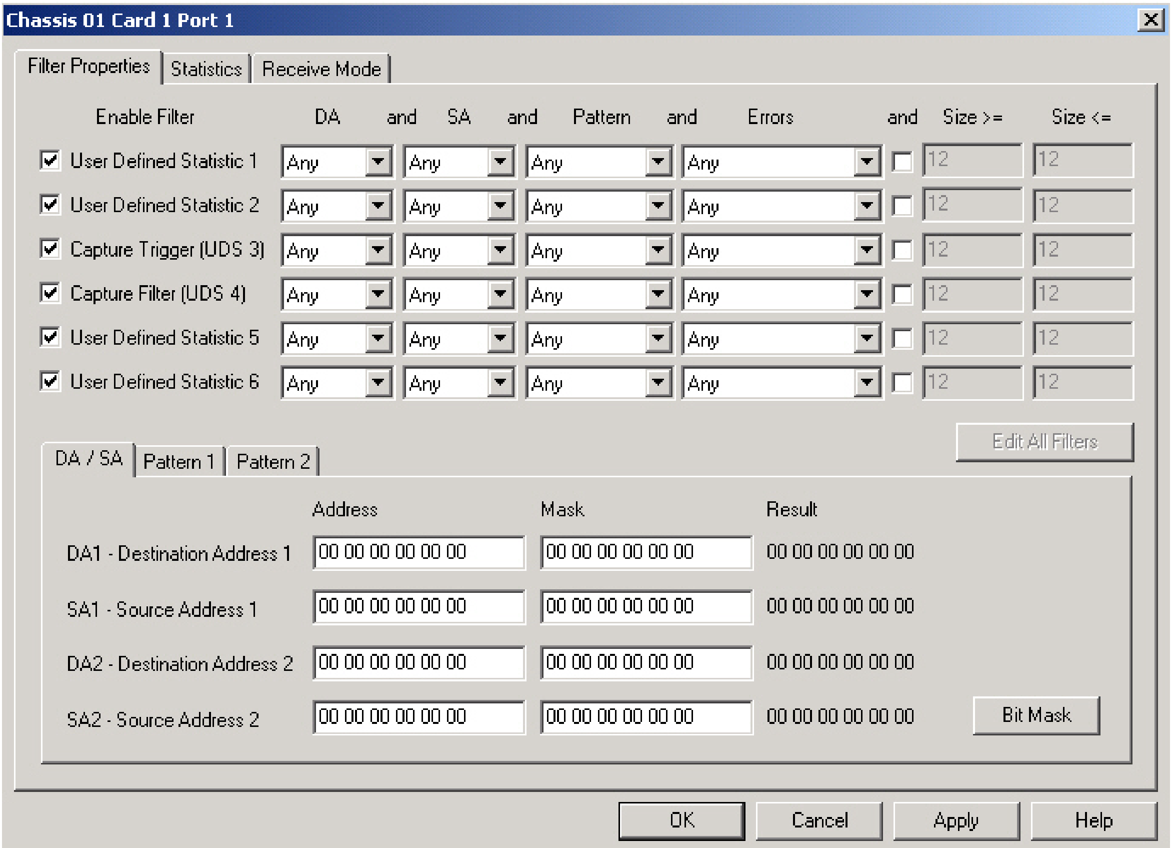
The parameters used to construct these values are based on:

- Masked MAC DA/SA addresses. MAC DA/SA addresses are not applicable to Packet over SONET modules.
- Type of packet or masked data patterns within the packet.
- Any error condition, including a good packet.
- The size of the received packet.

The **Filter Properties** tab for a 10/100 module—with the optional User-Defined Statistics 5 & 6 enabled—is shown in *Image: Filter Properties—Overview*. The dialog boxes for Packet over SONET modules do not show the DA and SA columns. The dialog boxes for OC-48 channelized port mode show the Circuit column.

NOTE In case the user changes any parameters under Filter Properties or Receive mode, the traffic related to capture will not stop and the latency will also not be affected.

Image: Filter Properties—Overview



The upper part of the dialog box contains rows for the following major elements:

User Defined Statistics	Set the conditions that will cause the four user defined statistics to accumulate data.
Capture Trigger	Set the conditions under which capture will commence.
Capture Filter	Set the filtering conditions for captured data.

The lower part of the tab has property sheets that allow the parameters used in defining the elements above to be set:

DA/SA Values	Allows masked values for Destination and Source MAC addresses to be set for Ethernet modules.
Pattern Match Tabs	Allows either a type of packet or masked data patterns to be defined.
VCAT Circuit Filter Properties	For OC-48 channelized port mode (only). Allows filtering on circuit.

Capture Trigger

The Capture Trigger settings control the conditions that cause a port to start capturing data after a 'Start Capture' command has been given. The elements of the **Filter Properties** tab related to Capture Triggers are shown in 1. *Table: Capture Trigger Condition Fields*.

Image: Filter Properties—Capture Trigger

For the Capture Trigger to take effect, the box must be selected (enabled), and all of the visible basic categories (DA, SA, Pattern, Errors, and the optional Size Range, if enabled) must be matched for the same packet at the same time. The *DA* and *SA* fields are not shown for Packet over SONET modules.

By default, the Capture Trigger is enabled for every port with the 'Any' condition set for all of the fields and with no size requirements. This will result in immediate data capture after a 'Start Capture' command has been given.

The fields and controls are described in Table: Capture Trigger Condition Fields.

Table: Capture Trigger Condition Fields

Field/Control	Choice	Description
check box		This box must be selected to activate the row and enable the remaining fields. If this box is cleared, the port will not capture any data.
DA	Any	Any destination address is matched.
	DA1/DA2	The (possibly masked) value for Destination Address 1 or 2 is matched. DA/SA Values
	Not DA1/DA2	Anything but the (possibly masked) value for Destination Address 1 or 2 is matched. DA/SA Values.
SA	Any	Any source address is matched.
	SA1/SA2	The (possibly masked) value for Source Address 1 or 2 is matched. DA/SA Values
	Not SA1/SA2	Anything but the (possibly masked) value for Source Address 1 or 2 is matched. DA/SA Values
Pattern	Any	Any data pattern is matched.
	Pattern 1/2	The (possibly masked) data pattern for Data Pattern 1 or 2 is matched. Pattern Match Tabs
	Not Pattern 1/2	Anything but the (possibly masked) data pattern for Data Pattern 1 or 2 is matched. Pattern Match Tabs

Field/Control	Choice	Description
	Pattern 1& 2	The (possibly masked) values for both Patterns 1 and 2, are matched.
Error		*Table: Error Condition Filters.* This contains a description of the error conditions available, depending on type of module.
and	Check or Unselected	Enable this box if the condition should depend on the size range of the received packet.
Size >=	Decimal number	The minimum packet size to match.
Size <=	Decimal number	The maximum packet size to match.

Error Condition Filters

Several error condition filters are available depending on the module as listed in .

Table: Error Condition Filters

Error Filter	Description
Any	Any good or bad packet.
Good Packet	A good packet is matched.
Bad CRC	A packet with a bad CRC.
Bad Packet	A frame with one or more of the following defects: • Bad CRC • Alignment Error - Ethernet only • Dribble Error - Ethernet only • Fragment - Ethernet only • Undersize - Ethernet only, less than 64 • Oversize - Ethernet only, if frame greater than 1588 (non-VLAN), or greater than 1522 (VLAN)
IPv4/TCP/UDP Checksum Error	Any IPv4, TCP, or UDP checksum error.
Alignment	A packet with an extra nibble, with bad CRC.
Dribble	A packet with an extra nibble, but with good CRC.
Bad CRC/Alignment/Dribble	Any packet with this combination of errors.

Error Filter	Description
Line Error	A packet received with symbol errors with either a good or bad CRC.
Line Error & Bad CRC	A packet received with symbol errors and with a bad CRC.
Line Error & Good CRC	A packet received with symbol errors and with a good CRC.
Data Integrity Error	A packet received with a data integrity error. The *Data Integrity* check box must first be selected in the **Receive Mode** tab for this selection to become available. Data Integrity for additional information.
Any Sequence Error	A packet received with any type of sequence error: Small, Big, or Reverse error. The *Advanced Sequence Checking* option must first be enabled in the ***Receive Mode*** tab for this selection to become available. Advanced Sequence Checking for additional information.
Small Sequence Error	A packet received with a small sequence error—which is when the current sequence number minus the previous sequence number is less than or equal to the error threshold (set by software) and not negative, **OR** when the current sequence number is equal to the previous sequence number. The *Advanced Sequence Checking* option must first be enabled in the **Receive Mode** tab for this selection to become available. Advanced Sequence Checking for additional information.
Big Sequence Error	A packet received with a big sequence error—which is when the current sequence number minus the previous sequence number is greater than the error threshold (set by software) and not negative. The *Advanced Sequence Checking* option must first be enabled in the **Receive Mode** tab for this selection to become available. Advanced Sequence Checking for additional information.
Reverse Sequence Error	When the current sequence number is less than the previous sequence number. *Table: Advanced Sequence Checking Error Conditions* for a full definition of Reverse Sequence Error. Advanced Sequence Checking option must first be enabled in the **Receive Mode** tab for this selection to become available.
For Cisco CDL only	
CDL Error	A packet received with a CDL checksum error.
For GFP only	

Error Filter	Description
GFP Error	A packet received with a GFP checksum error.
For FCoE only	
Invalid FCoE Frame	A packet received with an invalid FCoE frame.

Capture Filter

The Capture Filter settings control which data is captured after a Start Capture command has been given and after the Capture Trigger has been satisfied. The *DA* and *SA* fields are not shown for Packet over SONET (POS) modules. The *Error* fields are not shown for USB ports. The elements of the **Filter Properties** tab related to capture filter are shown in *Image: Filter Properties—Capture Filter*.

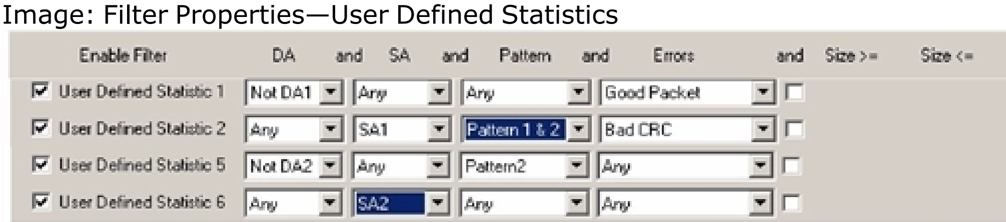
Image: Filter Properties—Capture Filter

For the Capture Filter to take effect, the check box must be selected and all of the basic categories (DA, SA, Pattern, Error and optional Size Ranges) matched for the same packet at the same time. By default, the Capture Filter is enabled for every port with *Any* conditions for all of the fields and with no size requirements. This will result in complete data capture after a *Start Capture* command has been given and the Capture Trigger function has taken effect, following receipt of the first packet. The fields and their usage are described in *Table: Capture Trigger Condition Fields*.

User Defined Statistics

The User Defined Statistics 1/2/5/6 fields are used to define conditions that cause the four user-defined statistics to accumulate. These images appear in the Statistic View. The elements of the **Filter Properties** tab related to the user defined statistics are shown in *Image: Filter Properties—User Defined Statistics.*

Image: Filter Properties—User Defined Statistics



For a User Defined Statistic to be counted, the check box must be selected and all of the basic categories (DA, SA, Pattern, Error, and optional Size Range) will be matched for the packet simultaneously.

In most cases, the filtering for UDS 1 is monitored, and packets received on the port that satisfy the conditions of that UDS cause a pulse signal to be generated on the corresponding Trigger Out pin located in the load module faceplate. The Trig LED on the face plate follows the state of the Trigger Out pin. It appears green when the pulse signal is being sent to the pin. Refer to the *Ixia Platform Reference Manual* for information about the functions of the individual load modules.

The fields and their usage are shown in *Image: Filter Properties—Overview*.

NOTE

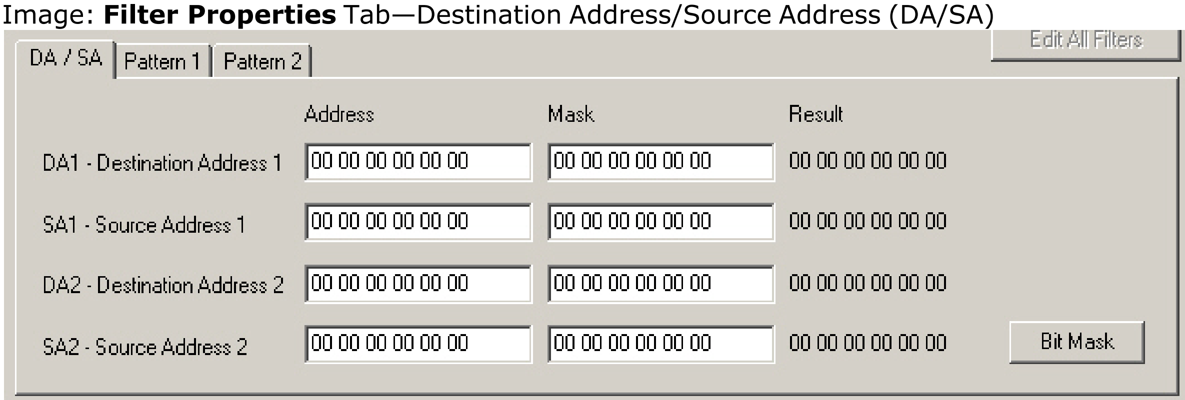
To get the rate count for a User Defined Statistic (UDS) into a StatisticView created to show multiple ports, do the following: Create a statistic view. The UDS rate will not be shown. You will have to add additional statistics to the view. Tile the main IxExplorer view and the statistic view so you can see them together. In IxExplorer, select the statistic that you want to see the rate for by selecting the name field. Then select the selected statistics and hold it down as you drag the stat to the statistics view. Select the mouse and hold it down to drag the stat to the statistics view to add the rate of the stat to the statistics view.

DA/SA Values

(For Ethernet modules) The DA/SA property sheet allows the specification of two Destination MAC Addresses and two Source MAC Addresses which may be used in any combination of Capture Trigger, Capture Filter, User Defined Statistics, and DA/SA Values settings. This property sheet does not appear for Packet over SONET modules. The DA/SA property sheet is shown in *Image: **Filter Properties** Tab—Destination Address/Source Address (DA/SA)*

The DA1 value and mask may be used to filter for packets to retransmit when the port is set to Echo Mode. Echo for additional information.

Image: **Filter Properties** Tab—Destination Address/Source Address (DA/SA)



These four rows define values for two Destination Addresses (DA1 and DA2) and two Source Addresses (SA1 and SA2). Each of the four values is formatted as a 48-bit MAC address in hex notation. The fields for each row are described in *Table: DA/SA Fields*.

Table: DA/SA Fields

Field	Description
Address	The hex value for the MAC address to be matched on incoming packets.
Mask	The hex mask value to be applied to the address. Each '0' bit in the mask indicates that the corresponding incoming port data and DA/SA address bit are compared. Each '1' bit in the mask indicates that no comparison should be made.
Result	The result of applying the mask against the address. The possible values are shown below.

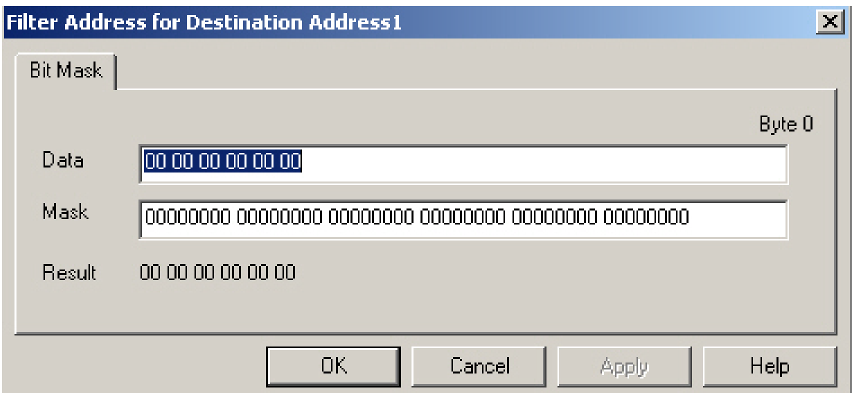
The possible values that appear in the Results column are shown in *Table: Result Values*.

Table: Result Values

Mask Value	Description
0 through F	The corresponding four bits of the MAC address are matched against this value.
X	The corresponding four bits of the MAC address are ignored during matching.
?	This indicates that the mask nibble value is a combination of '0's', '1's', and 'X' bit values. The *Bit Mask* dialog box must be used to view and edit this value.

When the *Bit Mask* button is used, the *Bit Mask* dialog box presents the values for the currently selected DA or SA row, as shown in *Image: Filter Properties—Bit Mask for DA/SA*.

Image: Filter Properties—Bit Mask for DA/SA



The fields in this dialog box are described in *Table: Bit Mask dialog box*.

Table: Bit Mask dialog box

Field	Description
Data	The hexadecimal data value (MAC address) to be masked. Its value may be set using any hexadecimal character (0 through 9, a through f, and A through F). Characters entered as lowercase appear in uppercase, by default. Each character corresponds to a 4-bit nibble, and two nibbles make up a byte/octet. Spacing between bytes is provided automatically.
Mask	The bit mask consists of 8 bits per byte of the data value. Each bit can be set to '0' or '1.' Spacing between each group of 8 bits (= one byte) is provided automatically. Each '0' in the mask lets the corresponding bit in the data field be used for matching. Each '1' in the mask causes the corresponding data bit to be ignored.
Result	(Read-only) See the Result Values in *Table: Result Values* for information on the masked results that appear in this field.

Pattern Match Tabs

The *Pattern Match* sub-tabs of the **Filter Properties** tab allow for the specification of two data patterns to be matched against the contents of incoming packets for the purpose of filtering packets. Each pattern may be up to 16 bytes in length. The *Pattern Match* sub-tabs for Patterns 1 & 2 is shown in *Image: Filter Properties - Patterns 1 and 2 (shown for Gigabit module).*

NOTE For information on the ATM Pattern 3 sub-tabs, ATM Filter Properties. For information on the GFP Pattern 3,GFP Filter Properties. For information on the VCAT Circuit, VCAT Circuit Filter Properties.

Image: Filter Properties - Patterns 1 and 2 (shown for Gigabit module)

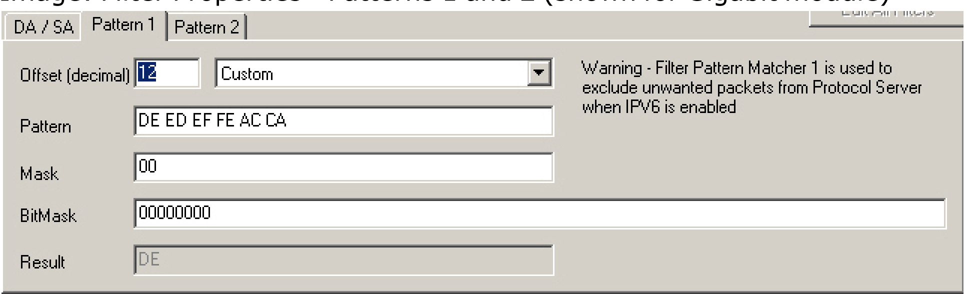
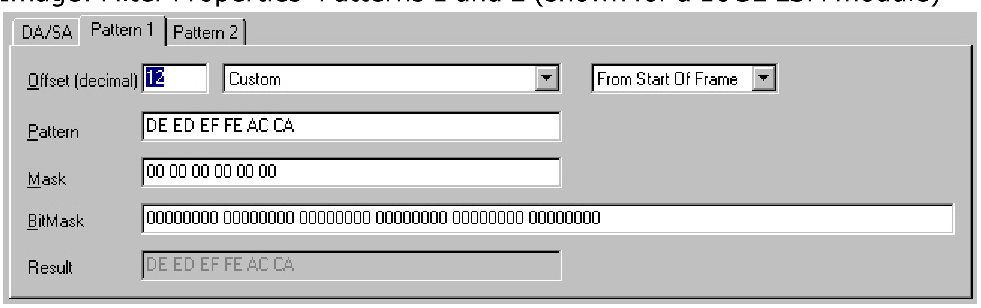


Image: Filter Properties–Patterns 1 and 2 (shown for a 10GE LSM module)



The fields and controls in this sub-tab are described in *Table: Filter Properties—Patterns 1 and 2*.

Table: Filter Properties—Patterns 1 and 2

Field/Control	Description
Offset (decimal)	(in bytes) The offset from the beginning of the packet.
(Pattern Selection List)	Refer to *Table: Pattern Match Choices—Ethernet-Type Modules* for a list of all the available types of patterns.
Pattern	(in hex) The value of the pattern
Mask	(in hex) The mask value to be applied against the pattern.
Bit Mask	The bit mask value to be applied against the pattern. Each *0* bit in the mask indicates that the corresponding are compared. Each *1* bit in the mask indicates that no comparison should be made for that bit.

Field/Control	Description
Result	The result of applying the mask against the pattern.
Flexible Offset	A pull-down menu that allows to specify where the data pattern (including the offset) should start. Options are: • From Start of Frame • From Start of IP • From Start of Protocol
(Warning)	Filter Pattern Matcher 1 is may be used to exclude unwanted packets from IxNetwork when IPv6 is enabled. For more information on adding IPv6 addresses to Protocol Interfaces, see the *IxNetwork User Guide*.

The basic choices available in the dropdown list for Ethernet-type modules are shown in *Table: Pattern Match Choices—Ethernet-Type Modules*.

The number and types of fields in the sub-tab change, based on the choice of pattern.

Table: Pattern Match Choices—Ethernet-Type Modules

Pattern Type	Configurable Fields	Description
IP/Ethernet II	None	Match any packet that is an IP packet formatted according to Ethernet II conventions.
IP SA/Ethernet II	IP SA SubmaskBit Mask	Match a specific IP source address, under a mask for Ethernet II packets.
IP DA/Ethernet II	IP DA SubmaskBit Mask	Match a specific IP destination address, under a mask for Ethernet II packets.
IP DA, SA/Ethernet II	IP SA SubmaskBit Mask	Match a specific IP source and destination addresses, under masks for Ethernet II packets.
TCP Source Port/Ethernet II	Pattern	Match a specific TCP source port for Ethernet II IP packets. Two bytes should be specified.
TCP Dest Port/Ethernet II	Pattern	Match a specific TCP destination port for Ethernet II IP packets. Two bytes should be specified.
UDP Source Port/Ethernet II	Pattern	Match a specific UDP source port for Ethernet II IP packets. Two bytes should be specified.
UDP Dest Port/Ethernet II	Pattern	Match a specific UDP destination port for Ethernet II IP packets. Two bytes should be specified.
IP/Ethernet SNAP	None	Match any packet that is an IP packet formatted according to Ethernet SNAP conventions.

Pattern Type	Configurable Fields	Description
IP SA/Ethernet SNAP	IP SA SubmaskBit Mask	Match a specific IP source address, under a mask for Ethernet SNAP packets.
IP DA/Ethernet SNAP	IP SA SubmaskBit Mask	Match a specific IP destination address, under a mask for Ethernet SNAP packets.
IP SA, DA/Ethernet SNAP	IP SA SubmaskBit Mask	Match a specific IP source and destination addresses, under masks for Ethernet SNAP packets.
TCP Source Port/Ethernet SNAP	Pattern	Match a specific TCP source port for Ethernet SNAP IP packets. Two bytes should be specified.
TCP Dest Port/Ethernet SNAP	Pattern	Match a specific TCP destination port for Ethernet SNAP IP packets. Two bytes should be specified.
UDP Source Port/Ethernet SNAP	Pattern	Match a specific UDP source port for Ethernet SNAP IP packets. Two bytes should be specified.
UDP Dest Port/Ethernet SNAP	Pattern	Match a specific UDP destination port for Ethernet SNAP IP packets. Two bytes should be specified.
VLAN	None	Match any packet that is a recognizable VLAN packet.
IPv6 SA/Ethernet II	IPv6 AddressBitMask	Match the IPv6 Source Address for an Ethernet II packet.
IPv6 DA/Ethernet II	IPv6 AddressBitMask	Match the IPv6 Destination Address for an Ethernet II packet.
IPv6 SA/8023Snap	IPv6 AddressBitMask	Match the IPv6 Source Address for an 802.3 SNAP packet.
IPv6 DA/8023Snap	IPv6 AddressBitMask	Match the IPv6 Destination Address for an 802.3 SNAP packet.
IPv6 TCP Source Port Ethernet II	Pattern	Match the IPv6 TCP source port number for an Ethernet II packet.
IPv6 TCP Dest Port Ethernet II	Pattern	Match the IPv6 TCP destination port number for an Ethernet II packet.
IPv6 UDP Source Port Ethernet II	Pattern	Match the IPv6 UDP source port number for an Ethernet II packet.
IPv6 UDP Dest	Pattern	Match the IPv6 UDP destination port number for an

Pattern Type	Configurable Fields	Description
Port Ethernet II		Ethernet II packet.
IPv6 TCP Source Port 8023 SNAP	Pattern	Match the IPv6 TCP source port number for an 802.3 SNAP packet.
IPv6 TCP Dest Port 8023 SNAP	Pattern	Match the IPv6 TCP destination port number for an 802.3 SNAP packet.
IPv6 UDP Source Port 8023 SNAP	Pattern	Match the IPv6 UDP source port number for an 802.3 SNAP packet.
IPv6 UDP Dest Port 8023 SNAP	Pattern	Match the IPv6 UDP destination port number for an 802.3 SNAP packet.
IPv6 IP TCP Source Port Ethernet II	Pattern	Match the TCP source port number for an IPv4 over IPv6 or IPv6 over IPv4 packet in an Ethernet II frame.
IPv6 IP TCP Dest Port Ethernet II	Pattern	Match the TCP destination port number for an IPv4 over IPv6 or IPv6 over IPv4 packet in an Ethernet II frame.
IPv6 IP UDP Source Port Ethernet II	Pattern	Match the UDP source port number for an IPv4 over IPv6 or IPv6 over IPv4 packet in an Ethernet II frame.
IPv6 IP UDP Dest Port Ethernet II	Pattern	Match the UDP destination port number for an IPv4 over IPv6 or IPv6 over IPv4 packet in an Ethernet II frame.
IPv6 IP TCP Source Port 8023 Snap	Pattern	Match the TCP source port number for an IPv4 over IPv6 or IPv6 over IPv4 packet in an 802.3 SNAP frame.
IPv6 IP TCP Dest Port 8023 Snap	Pattern	Match the TCP destination port number for an IPv4 over IPv6 or IPv6 over IPv4 packet in an 802.3 SNAP frame.
IPv6 IP UDP Source Port 8023 Snap	Pattern	Match the UDP source port number for an IPv4 over IPv6 or IPv6 over IPv4 packet in an 802.3 SNAP frame.
IPv6 IP UDP Dest Port 8023 Snap	Pattern	Match the UDP destination port number for an IPv4 over IPv6 or IPv6 over IPv4 packet in an 802.3 SNAP frame.
IP/IPv6 IP SA/Ethernet II	IP SASubmaskBitMask	Match the IPv4 source address in an IPv4 packet encapsulated in an IPv6 packet in an Ethernet II frame.

Pattern Type	Configurable Fields	Description
IP/IPv6 IP DA/Ethernet II	IP SASubmaskBitMask	Match the IPv4 destination address in an IPv4 packet encapsulated in an IPv6 packet in an Ethernet II frame.
IP/IPv6 IP SA/8023Snap	IP SASubmaskBitMask	Match the IPv4 source address in an IPv4 packet encapsulated in an IPv6 packet in an 802.3 SNAP frame.
IP/IPv6 IP DA/8023Snap	IP SASubmaskBitMask	Match the IPv4 destination address in an IPv4 packet encapsulated in an IPv6 packet in an 802.3 SNAP frame.
IPv6/IP IPv6 SA/Ethernet II	IPv6 AddressBitMask	Match the IPv6 source address in an IPv6 packet encapsulated in an IPv4 packet in an Ethernet II frame.
IPv6/IP IPv6 DA/Ethernet II	IPv6 AddressBitMask	Match the IPv6 destination address in an IPv6 packet encapsulated in an IPv4 packet in an Ethernet II frame.
IPv6/IP IPv6 SA/8023Snap	IPv6 AddressBitMask	Match the IPv6 source address in an IPv6 packet encapsulated in an IPv4 packet in an 802.3 SNAP frame.
IPv6/IP IPv6 DA/8023Snap	IPv6 AddressBitMask	Match the IPv6 destination address in an IPv6 packet encapsulated in an IPv4 packet in an 802.3 SNAP frame.
Custom	OffsetPatternMask	Match particular data items within a packet. The remaining fields in the sub-tab are used to specify how the match occurs.

The basic choices available for POS modules are shown in *Table: Pattern Match Choices—POS modules*. The options for IP/PPP, IP/Cisco HDLC, SRP, or RPR appear only if a POS packet with a header of that type is being configured. POS packets with headers of types other than those mentioned here, can be matched only for the choices from IP/SA onward.

Pattern Match Choices—POS modules

Pattern Type	Description
IP/PPP	(For use with PPP only) Match any packet that is an IP packet formatted according to PPP conventions.
IP/Cisco HDLC	(For use with IP/HDLC only) Match any packet that is an IP packet formatted according to Cisco HDLC conventions.
For SRP only:	

Pattern Type	Description
SRP Mode Reserved (000, 001, 010)	Match any SRP-formatted packet that has this mode set in the SRP generic header.
SRP Mode ATM Cell (011)	Match any SRP-formatted packet that has this mode set in the SRP generic header. The binary value 011 indicates an SRP/ATM cell.
SRP Mode Control Message Pass to Host (100)	Match any SRP-formatted packet that has this mode set in the SRP generic header.
SRP Mode Control Message Buffer For Host (101)	Match any SRP-formatted packet that has this mode set in the SRP generic header.
SRP Mode Usage Message (110)	Match any SRP-formatted packet that has this mode set in the SRP generic header.
SRP Mode Packet Data (111)	Match any SRP-formatted packet that has this mode set in the SRP generic header.
SRP Mode All Control Messages (10x)	Match any SRP-formatted packet that has this mode set in the SRP generic header, where 'x' can be a '0' or '1.' The binary value 10x indicates a control message.
SRP Mode Usage Message Or Packet Data (11x)	Match any SRP-formatted packet that has this mode set in the SRP generic header, where 'x' can be a '0' or '1.' The binary value 11x indicates a Usage Message or Packet Data.
SRP Mode Control Usage Or Packet Data (1xx)	Match any SRP-formatted packet that has this mode set in the SRP generic header where 'x' can be a '0' or '1.' The binary value 1xx indicates a Control or Usage message.
SRP Inner Ring (1)	Match any SRP-formatted packet that has the ring identifier set to inner ring (1).
SRP Outer Ring (0)	Match any SRP-formatted packet that has the ring identifier set to outer ring (0).
SRP Priority 0-7 (000-111)	Match any SRP-formatted packet according to this user-assigned priority.
SRP Parity Bit	Match any SRP-formatted packet that has odd parity.

Pattern Type	Description
Odd (xx1)	
SRP Parity Bit Even (xx0)	Match any SRP-formatted packet that has even parity.
SRP Discovery Frame	Match any SRP Discovery Frame. See **Note** below.
SRP IPS Frame	Match any SRP IPS Frame. See **Note** below.
RPR only	
RPR Ringlet 0	Match any RPR packet which specifies Ringlet 0. (Originally transmitted on Ringlet 0 by the Source.)
RPR Ringlet 1	Match any RPR packet which specifies Ringlet 1. (Originally transmitted on Ringlet 1 by the Source.)
RPR Fairness Eligibility 0	Match any RPR packet which specifies Fairness Eligibility 0. (0 = Not eligible for Fairness algorithm.)
RPR Fairness Eligibility 1	Match any RPR packet which specifies Fairness Eligibility 1. (1 = Eligible for Fairness algorithm.)
RPR Reserved Packet	Match any RPR packet with Packet Type = 00 (Reserved).
RPR Control Packet	Match any RPR Control Packet (Control message). (Packet Type = 01)
RPR Fairness Packet	Match any RPR Fairness Packet (RPR Fairness Control Message/FCM). (Packet Type = 10)
RPR Data Packet	Match any RPR Data Packet. (Packet Type = 11)
RPR Service Class C	Match any RPR packet which specifies service Class C. Class C is the lowest level of MAC service 'best-effort' traffic that is subject to the RPR fairness algorithm.
RPR Service Class B	Match any RPR packet which specifies MAC service Class B. ClassB actually has two types of service: 1) some traffic is allocated, with guaranteed data rate and bounded delay and jitter, not subject to the RPR fairness algorithm. 2) remainder is best-effort traffic and subject to the RPR fairness algorithm.
RPR Service Class A1	Match any RPR packet which specifies service Class A1. ClassA service has an allocated, guaranteed data rate, with bounded (low) end-to-end delay and jitter. The RPR fairness algorithm does not apply to allocated bandwidth. The MAC subclassA1 is for **reclaimable** bandwidth.

Pattern Type	Description
RPR Service Class A0	Match any RPR packet which specifies service Class A0. ClassA service has an allocated, guaranteed data rate, with bounded (low) end-to-end delay and jitter. The RPR fairness algorithm does not apply to allocated bandwidth. The MAC subclassA0 is for **reserved** bandwidth.
RPR Wrap Eligibility 0	Match any RPR packet which specifies Wrap Eligibility 0. (0 = Steerable only)
RPR Wrap Eligibility 1	Match any RPR packet which specifies Wrap Eligibility 1. (1 = Wrap Eligible)
RPR Reserved Bit 0	Match any RPR packet which specifies Reserved Bit 0. (Parity Bit = 0 is reserved for future use, applies to data frames and control frames. Parity Bit = 1 for fairness and idle frames.)
RPR Reserved Bit 0	Match any RPR packet which specifies Reserved Bit 0. (Parity Bit = 0 is reserved for future use, applies to data frames and control frames. Parity Bit = 1 for fairness and idle frames.)
For GFP only	
Data Fcs Null Extension Ethernet	Match for GFP Payload type emulating Data information, with a Frame Check Sequence, with no extension indicated, using Ethernet.
Data NoFcs Null Extension Ethernet	Match for GFP Payload type emulating Data information, with no Frame Check Sequence, with no extension indicated, using Ethernet.
Data Fcs Linear Extension Ethernet	Match for GFP Payload type emulating Data information, with a Frame Check Sequence, with Linear extension indicated, using Ethernet.
Data NoFcs Linear Extension Ethernet	Match for GFP Payload type emulating Data information, with no Frame Check Sequence, with Linear extension indicated, using Ethernet.
Data Fcs Null Extension PPP	Match for GFP Payload type emulating Data information, with a Frame Check Sequence, with no extension indicated, using Point-to-Point Protocol.
Data NoFcs Null Extension PPP	Match for GFP Payload type emulating Data information, with no Frame Check Sequence, with no extension indicated, using Point-to-Point Protocol.
Data Fcs Linear Extension PPP	Match for GFP Payload type emulating Data information, with a Frame Check Sequence, with Linear extension indicated, using Point-to-Point Protocol.
Data NoFcs Linear	Match for GFP Payload type emulating Data information, with no Frame Check Sequence, with Linear extension indicated, using Point-to-Point Protocol.

Pattern Type	Description
Extension PPP	
Mgmt Fcs Null Extension Ethernet	Match for GFP Payload type emulating Management information, with a Frame Check Sequence, with no extension indicated, using Ethernet.
Mgmt NoFcs Null Extension Ethernet	Match for GFP Payload type emulating Management information, with no Frame Check Sequence, with no extension indicated, using Ethernet.
Mgmt Fcs Linear Extension Ethernet	Match for GFP Payload type emulating Management information, with a Frame Check Sequence, with Linear extension indicated, using Ethernet.
Mgmt NoFcs Linear Extension Ethernet	Match for GFP Payload type emulating Management information, with no Frame Check Sequence, with Linear extension indicated, using Ethernet.
Mgmt Fcs Null Extension PPP	Match for GFP Payload type emulating Management information, with a Frame Check Sequence, with no extension indicated, using Point-to-Point Protocol.
Mgmt NoFcs Null Extension PPP	Match for GFP Payload type emulating Management information, with no Frame Check Sequence, with no extension indicated, using Point-to-Point Protocol.
Mgmt Fcs Linear Extension PPP	Match for GFP Payload type emulating Management information, with a Frame Check Sequence, with Linear extension indicated, using Point-to-Point Protocol.
Mgmt NoFcs Linear Extension PPP	Match for GFP Payload type emulating Management information, with no Frame Check Sequence, with Linear extension indicated, using Point-to-Point Protocol.
General	
IP SA	Match a specific IP source address.
IP DA	Match a specific IP destination address.
IP DA, SA	Match specific IP source and destination addresses.
TCP Source Port/IP	Match a specific TCP source port for IP packets. Two bytes should be specified.
TCP Dest Port/IP	Match a specific TCP destination port for IP packets. Two bytes should be specified.
UDP Source Port/IP	Match a specific UDP source port for IP packets. Two bytes should be specified.

Pattern Type	Description
UDP Dest Port/IP	Match a specific UDP destination port for IP packets. Two bytes should be specified.
IPv6 SA/Pos	Match the IPv6 Source Address for a POS frame.
IPv6 DA/Pos	Match the IPv6 Destination Address for a POS frame.
IPv6 TCP Source Port	Match the IPv6 TCP source port number for a POS frame.
IPv6 TCP Dest Port	Match the IPv6 TCP destination port number for a POS frame.
IPv6 UDP Source Port	Match the IPv6 UDP source port number for a POS frame.
IPv6 UDP Dest Port	Match the IPv6 UDP destination port number for a POS frame.
IPv6 IP TCP Source Port	Match the TCP source port for an IPv4 over IPv6 or IPv6 over IPv4 packet in a POS frame.
IPv6 IP TCP Dest Port	Match the TCP destination port for an IPv4 over IPv6 or IPv6 over IPv4 packet in a POS frame.
IPv6 IP UDP Source Port	Match the UDP source port for an IPv4 over IPv6 or IPv6 over IPv4 packet in a POS frame.
IPv6 IP UDP Dest Port	Match the UDP destination port for an IPv4 over IPv6 or IPv6 over IPv4 packet in a POS frame.
IP/IPv6 IP SA/Pos	Match the IPv4 Source Address in an IPv4 packet encapsulated in an IPv6 packet in a POS frame.
IP/IPv6 IP DA/Pos	Match the IPv4 Destination Address in an IPv4 packet encapsulated in an IPv6 packet in a POS frame.
IPv6/IP IPv6 SA/Pos	Match the IPv6 Source Address in an IPv6 packet encapsulated in an IPv4 packet in a POS frame.
IPv6/IP IPv6 DA/Pos	Match the IPv6 Destination Address in an IPv6 packet encapsulated in an IPv4 packet in a POS frame.
Custom	Match particular data items within a packet. The remaining fields in the sub-tab are used to specify how the match occurs.

NOTE

To match an SRP IPS or a Topology Discovery Frame, set Pattern 1 = Control and Pattern 2 to IPS/Discovery. Pattern 1 filters MODE bits, and Pattern 2 checks for Protocol type.

The additional fields for each of the data patterns are shown in *Table: Pattern Match Fields*.

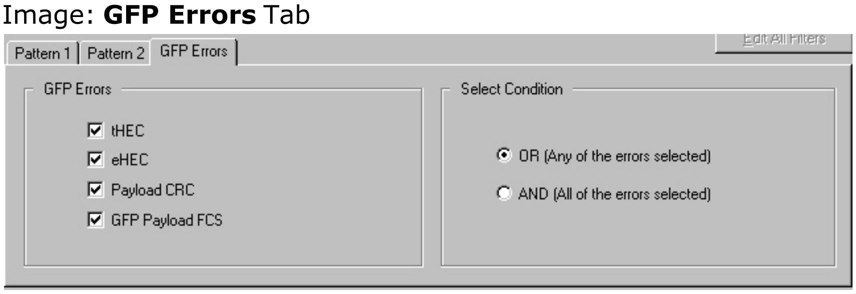
Table: Pattern Match Fields

Field	Description
Offset	The offset within the packet. Any value within the maximum packet length size may be specified. An offset from 0 through 11 may intentionally be used to overlap the DA/SA fields.
Pattern	Up to 16 bytes of data may be exclicked in hexadecimal. The data value that is being masked is shown in this field. Its value may be set using any hexadecimal character (0 through 9, a through f and A through F); lowercase characters appear in uppercase. Each character corresponds to a 4-bit nibble; spacing between bytes is automatically provided.
Mask	The mask value to be applied against the incoming data and pattern exclicked in hex. Each *0* bit in the mask indicates that the corresponding incoming port data and pattern are compared. Each *1* bit in the mask indicates that no comparison should be made.
Bit Mask	The mask value to be applied against the incoming data and pattern exclicked in bits. Each permitted byte of the mask consists of 8 characters, each character corresponding to one bit. Values of *0* or *1* are permitted. Spacing between each byte is automatically provided. The first 8 bits of mask operate on the first byte (2 nibbles) of the data value. Each *0* in the mask causes the corresponding bit in the data field to be used for matching; each *1* in the mask causes the bit to be ignored.
Result	The value resulting from the masking process.

GFP Filter Properties

On OC-48c load modules that employ GFP, it is possible to use GFP parameters as a matching pattern. When GFP is selected, a *GFP Errors* sub-tab appears, as shown in *Image: **GFP Errors** Tab*.

Image: **GFP Errors** Tab



The options in this sub-tab are described in *Table: **GFP Errors** Tab Usage*.

Table: **GFP Errors** Tab Usage

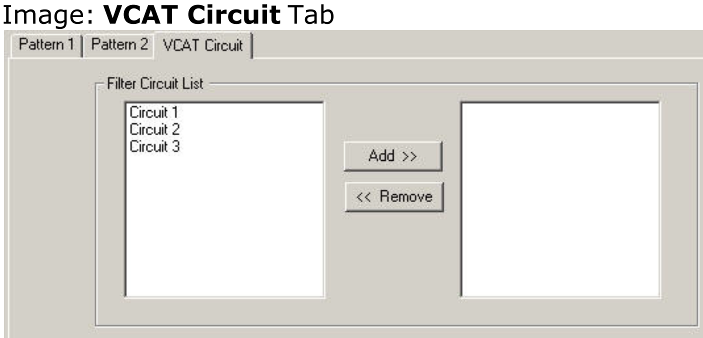
Field	Usage
tHEC	A packet received with a bad Type Header Error Check, which means the CRC-16 error control code will not match the expected code.
eHEC	A packet received with a bad Extension Header Error Check, which means the CRC-16 error control code will not match the expected code.

Field	Usage
Payload CRC	A packet received with a bad Cyclical Redundancy Check sequence, which means the CRC-32 sequence does not match the expected sequence.
GFP Payload FCS	A packet received with a bad Payload Frame Check Sequence.
OR	Selecting this option button means that any of the selected errors can be used as a match.
AND	Selecting this option button means that all of the selected errors must be used as a match.

VCAT Circuit Filter Properties

On OC-48c load modules that employ channelization, it is possible to use VCAT parameters as a matching pattern. A *VCAT Circuit* sub-tab appears, as shown in *Image:* ***VCAT Circuit*** *Tab*.

Image: **VCAT Circuit** Tab

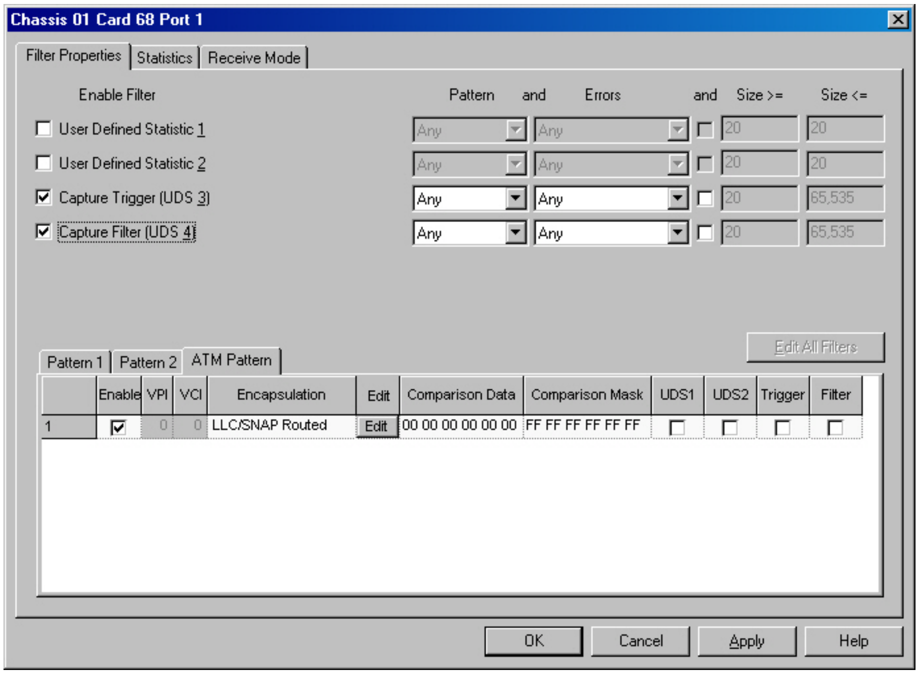


Use the Add >> and Remove << buttons to add or remove circuits to the list of filter patterns. For informaton about VCAT channelized port mode.

ATM Filter Properties

The **Filter Properties** tab provides the *ATM Pattern* sub-tab specific to ATM, as shown in *Image: ATM Filter Properties—Pattern 3*. This dialog box is activated by selecting *ATM Pattern Matching* in the **ATM** tab of the *Port Properties* dialog box.

Image: ATM Filter Properties—Pattern 3



This sub-tab allows to configure various filtering patterns to be matched against incoming ATM traffic on the port. The filtering is done at the ATM AAL5 level and includes the 5-byte ATM cell header. The UDF, filter, and trigger options change depending upon what selections are made on the **Receive Mode** tab. Table shows what UDF, trigger, and filter options are available for each Receive Mode selection.

Table: Enable Filter Options

Receive Mode	Available UDF, Trigger, and Filter Options
Capture Mode	UDS 1, Capture Trigger (UDS 3), Capture Filter (UDS 4)
Packet Groups	UDS 1
Sequence Checking (with Capture Mode)	UDS 1, Capture Trigger (UDS 3), Capture Filter (UDS 4)
Sequence Checking (Packet Groups)	UDS 1
Data Integrity	UDS 1, UDS 2, Capture Trigger (UDS 3), Capture Filter (UDS 4)

For more information on the **Receive Mode** tab, **Receive Mode** Tab.

The fields and controls in this sub-tab are described in *Table: ATM Filter Properties—Pattern 3*. (Note that if Packet Group mode is selected in the **Receive Mode** tab, the *Pattern 2* sub-tab will not be available.)

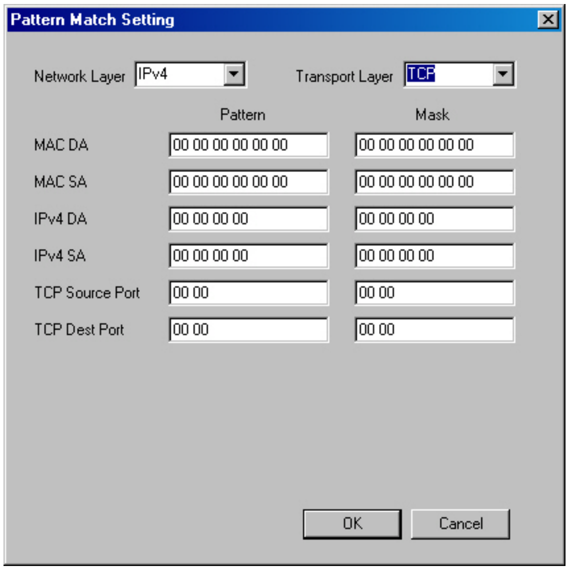
Table: ATM Filter Properties—Pattern 3

Field/Control	Description
Enable	If this option is selected, Pattern 3 can be configured for use in filter pattern matching.
VPI	(Read-only) Virtual Path Identifier. You can set this value when registering the VPI/VCI in the VPI/VCI Statistic View—when a VPI/VCI is added to the *Receive Stats* list.
VCI	(Read-only) Virtual Circuit/Connection Identifier. You can set this value when registering the VPI/VCI in the VPI/VCI Statistic View—when a VPI/VCI is added to the *Receive Stats* list.
Encapsulation	Select the encapsulation type for the ATM filter, from a pull-down list of types. Select from the following list: • LLC SNAP Routed Protocol • LLC Bridged Ethernet/802.3 • LLC Bridged Ethernet/802.3 no FCS • LLC Encapsulated PPP • VC Multiplexed PPP • VC MUX Routed Protocol • VC MUX Bridged Ethernet • VC MUX Bridged Ethernet with No FCS
Edit	Selecting this button opens the *Pattern Match Settings* dialog box, which allows to edit layer 3 and layer 4 filter matching information (in Hex). This dialog box is discussed in ATM Pattern Match Settings dialog box.
Comparison Data	(in Hex) The data pattern to be used for pattern matching on this VC. This is only user-editable when the 'Custom' encapsulation type is selected.
Comparison Data Mask	(in Hex) The Mask to be used with the Comparison Data pattern on this VC. This is only user-editable when the 'Custom' encapsulation type is selected.
UDS1	If selected, this pattern will be used as User-Defined Statistic 1 for this VC.
UDS2	If selected, this pattern will be used as User-Defined Statistic 2 for this VC.
Trigger	If selected, this pattern will be used as the Capture Trigger (UDS3) for this VC.
Filter	If selected, this pattern will be used as the Capture Filter (UDS4) for this VC.

ATM Pattern Match Settings dialog box

The ATM *Pattern Match Settings* dialog box allows to specify a Layer 3/Layer 4 data pattern and mask that can be used for trigger or filter cases. The *Pattern Match Settings* dialog box is shown in *Image: Pattern Match Settings (bridged protocol using IPv4 and TCP)*.

Image: Pattern Match Settings (bridged protocol using IPv4 and TCP)



The options shown in this dialog box are described in *Table: Pattern Match Settings Configuration*. The configurable fields change depending upon the settings selected.

Table: Pattern Match Settings Configuration

Field	**Usage**
Network Layer	Select a Layer 3 protocol from the options in the pull-down list: • None • IPv4 • IPv6 Once a protocol is selected, you can specify a pattern for the Source and Destination Address.
Transport Layer	Select a Layer 4 protocol from the options in the pull-down list: • None • TCP • UDP Once a protocol (or protocols) are selected, you can specify a pattern for the Source and Destination Port.
MAC DA	(In Hex) Specify a pattern and mask match for the MAC Destination Address. NOTE This field only appear if a a bridged encapsulation option is option is selected. ATM Filter Properties for information.
MAC SA	(In Hex) Specify a pattern and mask match for the MAC Source Address. NOTE This field only appear if a a bridged encapsulation option is option is selected. ATM Filter Properties for information.
IP4/IPv6	(In Hex) Specify a pattern and mask match for the IPv4 or IPv6 Destination Address.

Field	Usage
DA Pattern and Mask	The name of this field changes to reflect the protocol or protocols selected from the **Network Layer** pull down list. NOTE Only IPv4 DA/SA has mask. IPv6 DA/SA does not have mask.
IP4/IPv6 SA Pattern and Mask	(In Hex) Specify a pattern and mask match for the IPv4 or IPv6 Source Address. The name of this field changes to reflect the protocol or protocols selected from the **Network Layer** pull down list. NOTE Only IPv4 DA/SA has mask. IPv6 DA/SA does not have mask.
TCP/UDP Source Port Pattern	(In Hex) Specify a pattern match for the TCP or UDP Source Port. The name of this field changes to reflect the protocol or protocols selected from the **Transport Layer** pull down list. A Layer 3 protocol must be selected to make these fields active.
TCP/UDP Dest Port Pattern	(In Hex) Specify a pattern match for the TCP or UDP Destination Port. The name of this field changes to reflect the protocol or protocols selected from the **Transport Layer** pull down list. A Layer 3 protocol must be selected to make these fields active.

Stream Extraction Module Filter Properties

The Stream Extraction module allows for capturing and filtering many types of stream data from Ethernet/IP traffic (video, voice, e-mail, web, and so on) from ports 2→3 and 3←2. AFM hardware supports two sets of eight filters. There are eight tabs each on two pages for configuring the filters. A logic control setup is present to configure logic combinations of these filters. Each filter works independently from others. The filters are described in the following paragraphs. The Logic Control setup is described in Logic Control.

Filter Offset is set to a default value by selecting a filter type, but you can change it manually, in some cases. A pattern can be used to match any data at any offset. For example, Filter 1 can be used to match data 0xABCD at offset 32 while Filter 2 is used to match MAC DA data at offset 0.

The elements that combine to configure a filter vary with the type of filter.

- Custom, IP Version, or L4 Protocol: Custom, IP Version, or L4 Protocol Filter Type.
- MAC DA or MAC SA: MAC DA or SA Filter Type.
- DA/IPv4 or SA/IPv4: DA/IPv4 or SA/IPv4 Filter Type.
- DA/IPv6 or SA/IPv6: DA/IPv6 or SA/IPv6 Filter Type.
- Dest Port or Source Port /TCP or UDP /IPv4 or v6: Port Filter Type.

Modifiers are enabled when at least one filter is enabled. A Modifier will have its own offset GUI input. The three Modifiers (Destination MAC Address, IPv4 Destination IP Address, and UDP Destination Address) are described in Address Modifiers.

Image: AFM Module Filter Properties (Custom Filter Type) shows the Port 2->3 filter properties page for the Stream Extraction module with filter type *Custom* selected.

Image: AFM Module Filter Properties (Custom Filter Type)

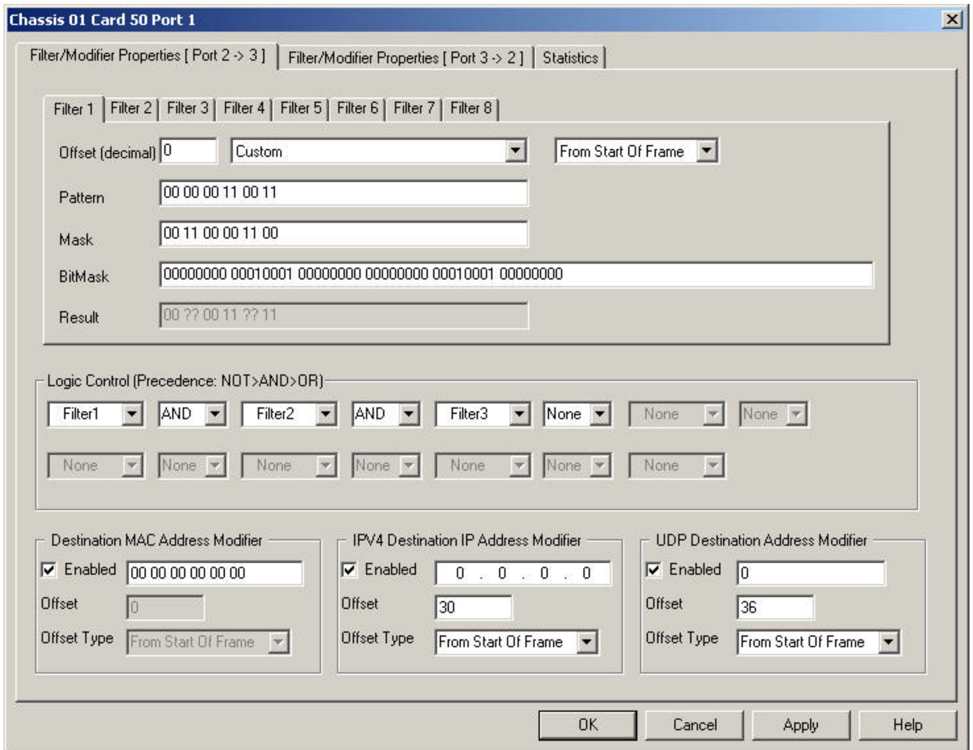


Table: AFM Module Configuration Options (Overview) gives an overview of configuration options of the AFM module **Filter Properties** page (using filter type *Custom)*.

Table: AFM Module Configuration Options (Overview)

Section	Field/Control	Description
Filter (1 to 8)	Offset (decimal)	The length of the offset, in bytes. The default setting is determined by the selected Filter type, but in some cases can be edited.
	(Filter type)	List of filter types: • MAC DA • MAC SA • IP Version • DA / IPV4 • SA / IPV4 • DA / IPV6 • SA / IPV6 • L4 Protocol Type • Dest Port / TCP / IPV4 • Source Port / TCP / IPV4 • Dest Port / TCP / IPV6 • Source Port / TCP / IPV6

Section	Field/Control	Description
		• Dest Port / UDP / IpV4 • Source Port / UDP / IPV4 • Dest Port / UDP / IpV6 • Source Port / UDP / IPV6 • Custom Each type gives a default **Offset** based on its description. NOTE 'DA / IPV4' only sets the filter for 'DA', another filter must be set to filter 'IPV4' packets. The same rule applies to all these combo filter types such as ' SA/IPV6' or 'Dest Port / TCP / IPV4'
	(Offset mode)	From start of frame, or From start of IP The 'start of IP' is based on a default format of IP packet.
	Pattern	The data to be compared by the filters. The length of pattern is pre-defined by filter types. MAC DA and MAC SA have 6-byte pattern, 'DA/IPV4' has 4-byte pattern, 'Custom' has maximum 16 byte pattern. Pattern data are in Hex format.
	Mask	Default = 00 (0 to 16 bytes) Hex format.
	Bitmask	Default = 00000000 binary format. Auto-generated from the **Mask**
	Result	Auto-generated from **Pattern** + **Mask**
Logic Control		*Logic Control.*
Destination MAC Address Modifier		Address Modifiers
IPv4 Destination IP Address Modifier		Address Modifiers
UDP Destination Address Modifier		Address Modifiers

Custom, IP Version, or L4 Protocol Filter Type

Image: AFM Module Filter Properties (Custom, IP Version, or L4 Protocol Type) shows the filter properties page for filter types Custom, IP Version, and L4 Protocol.

Image: AFM Module Filter Properties (Custom, IP Version, or L4 Protocol Type)

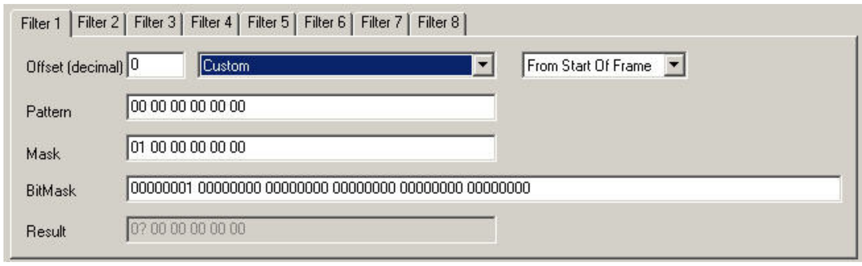


Table: AFM Module Filter Properties (Custom, IP Version, or L4 ProtocolType) provides definitions for the fields to configure the Custom, IP Version, or L4 Protocol filter type..

Table: AFM Module Filter Properties (Custom, IP Version, or L4 Protocol Type)

Section	Field/Control	Description
Filter (1 to 8)	Offset (decimal)	The length of the offset, in bytes. The default setting is determined by the selected Filter type, but can be edited. • Custom, default = 0 • IP Version, default = 14 • L4 Protocol, default = 23
	(Filter type)	Custom or IP Version or L4 Protocol
	(Offset mode)	Two options: • From start of frame • From start of IP The 'start of IP' is based on a default format of IP packet.
	Pattern	The data to be compared by the filters. The length of pattern is pre-defined by filter types. 'Custom' has maximum 16 byte pattern.
	Mask	Default = 00 (0 to 16 bytes)
	Bitmask	Default = 00000000 Auto-generated from the **Mask**
	Result	Auto-generated from **Pattern** + **Mask**

MAC DA or SA Filter Type

Image: AFM Module Filter Properties (MAC DA /SA Type) shows the filter properties page for filter types MAC DA and MAC SA.

Image: AFM Module Filter Properties (MAC DA /SA Type)

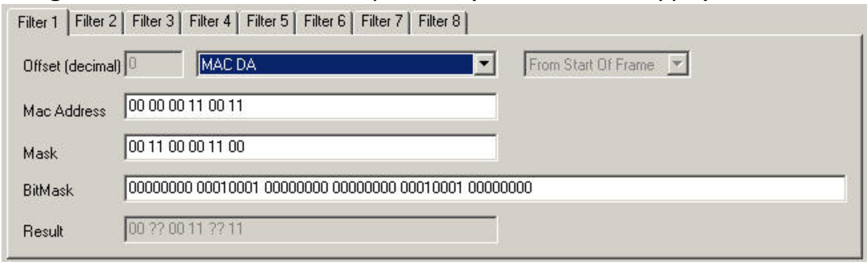


Table: AFM Module Filter Properties (MAC DA/SA Filter Type) provides definitions for the fields to configure the MAC DA or MAC SA filter type..

Table: AFM Module Filter Properties (MAC DA/SA Filter Type)

Section	Field/Control	Description
Filter (1 to 8)	Offset (decimal)	The length of the offset, in bytes. The default setting is determined by the selected Filter type. MAC DA default = 0 MAC SA default = 6
	(Filter type)	MAC DA or MAC SA
	(Offset mode)	*Read-only, fixed*. From start of frame
	MAC Address	The data to be compared by the filters. The length is pre-defined by filter types. MAC DA and MAC SA have 6-byte length.
	Mask	Default = 00 (0 to 16 bytes)
	Bitmask	Default = 00000000 Auto-generated from the **Mask**
	Result	Auto-generated from **MAC Address** + **Mask**

DA/IPv4 or SA/IPv4 Filter Type

Image: AFM Module Filter Properties (DA/IPv4 or SA/IPv4 Type) shows the filter properties page for filter types DA/IPv4 or SA/IPv4.

Image: AFM Module Filter Properties (DA/IPv4 or SA/IPv4 Type)

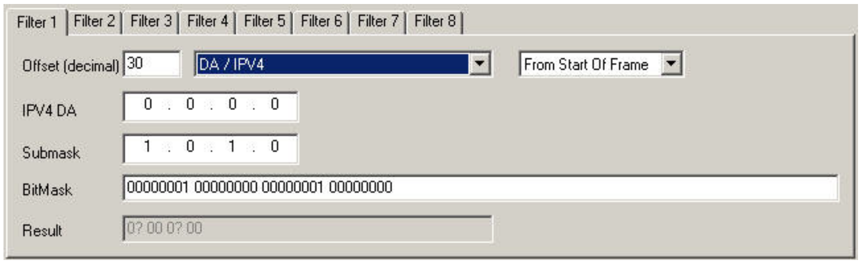


Table: AFM Module Filter Properties (DA/IPv4 or SA/IPv4 Filter Type) provides definitions for the fields to configure the DA/IPv4 or SA/IPv4 filter type..

Table: AFM Module Filter Properties (DA/IPv4 or SA/IPv4 Filter Type)

Section	Field/Control	Description
Filter (1 to 8)	Offset (decimal)	The length of the offset, in bytes. The default setting is determined by the selected Filter type. DA/IPv4 default = 30 SA/IPv4 default = 26
	(Filter type)	DA/IPv4 or SA/IPv4
	(Offset mode)	From start of frame (default) or From start of IP
	IPv4 DA or IPv4 SA	The data to be compared by the filters. The length is pre-defined by filter types. 'DA/IPv4' and 'SA/IPv4' have 4-byte pattern 0.0.0.0 in IP address format.
	Submask	Default =0.0.0.0 in IP address format.
	Bitmask	Auto-generated from the **Mask**
	Result	Auto-generated from **IPv4 DA or IPv4 SA** + **Mask**

DA/IPv6 or SA/IPv6 Filter Type

Image: AFM Module Filter Properties (DA/IPv6 or SA/IPv6 Type) shows the filter properties page for filter types DA/IPv6 or SA/IPv6.

Image: AFM Module Filter Properties (DA/IPv6 or SA/IPv6 Type)

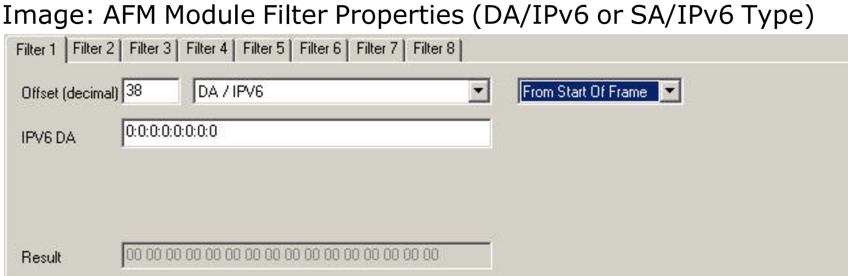


Table: AFM Module Filter Properties (DA/IPv6 or SA/IPv6 Filter Type) provides definitions for the fields to configure the DA/IPv6 or SA/IPv6 filter type..

Table: AFM Module Filter Properties (DA/IPv6 or SA/IPv6 Filter Type)

Section	Field/Control	Description
Filter (1 to 8)	Offset (decimal)	The length of the offset, in bytes. The default setting is determined by the selected Filter type. DA/IPv6 default = 38 SA/IPv6 default = 22
	(Filter type)	DA/IPv6 or SA/IPv6
	(Offset mode)	From start of frame (default) or From start of IP
	IPv6 DA or IPv6 SA	The data to be compared by the filters. The length is pre-defined by filter types. ‘DA/IPv6’ and ‘SA/IPv6’ have 8-byte pattern 0.0.0.0.0.0.0.0
	Result	Auto-generated from **IPv6 DA or IPv6 SA**

Port Filter Type

The following filter types share the same basic filter configuration elements:

- Dest Port / TCP / IPv4
- Source Port / TCP / IPv4
- Dest Port / TCP / IPv6
- Source Port / TCP / IPv6
- Dest Port / UDP / IPv4
- Source Port / UDP / IPv4
- Dest Port / UDP / IPv6
- Source Port / UDP / IPv6

Image: AFM Module Filter Properties (Port Type) shows the filter properties page for the filter types listed above.

Image: AFM Module Filter Properties (Port Type)

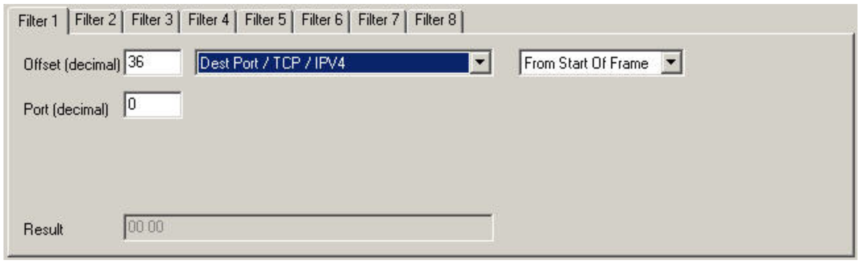


Table: AFM Module Filter Properties (Port Filter Type) provides definitions for the fields to configure the Port filter type..

Table: AFM Module Filter Properties (Port Filter Type)

Section	Field/Control	Description
Filter (1 to 8)	Offset (decimal)	The length of the offset, in bytes. The default setting is determined by the selected Filter type. Dest Port / TCP / IPv4 default = 36 Source Port / TCP / IPv4 default = 34 Dest Port / TCP / IPv6 default = 56 Source Port / TCP / IPv6 default = 54 Dest Port / UDP / IPv4 default = 36 Source Port / UDP / IPv4 default = 34 Dest Port / UDP / IPv6 default = 56 Source Port / UDP / IPv6 default = 54
	(Filter type)	One of these: • Dest Port / TCP / IPv4 • Source Port / TCP / IPv4 • Dest Port / TCP / IPv6 • Source Port / TCP / IPv6 • Dest Port / UDP / IPv4 • Source Port / UDP / IPv4 • Dest Port / UDP / IPv6 • Source Port / UDP / IPv6
	(Offset mode)	From start of frame (default) or From start of IP
	Port (decimal)	default = 0 (range = 0 to 65535)
	Result	Auto-generated from Filter type and Port

Logic Control

Image: AFM Module Filter Properties (Logic Control) shows the Logic Control section of the filter properties page.

NOTE Be careful to set the correct equation based the pre-defined precedence. NOT has precedence over AND, which has precedence over OR (NOT>AND>OR). All equations must end in NONE.

Image: AFM Module Filter Properties (Logic Control)

Table: AFM Module Filter Properties Logic Control provides definitions for the fields to configure the Logic Control.

Table: AFM Module Filter Properties Logic Control

Section	**Field/Control**	**Description**
Logic Control		Precedence: NOT>AND>OR Use the sequence of lists to construct the logic sequence. Example: F1 AND F2 OR F3 AND !F4 ‘!Filter‘ = NOT Filter
	(First list)	Select a filter (1 through 8) or !Filter (NOT Filter)
	(Next list)	Select AND, OR, or None ‘None’ is used to end the logic sequence.
	(Next list)	Select the next filter or (!Filter) in the logic sequence.

Address Modifiers

All three modifiers will be forced disabled if there is no filter enabled, which means no traffic can pass filters. Any modifier can be enabled if there is at least one filter enabled. When enabling an IPv4 or UDP Destination modifier, set the modifier’s offset and offset type.

NOTE The IPV4 DA modifier can be used to modify any packet at any offset, depending on user’s setting.

Image: AFM Module Filter Properties (Address Modifiers shows the Address Modifiers section of the filter properties page.

Image: AFM Module Filter Properties (Address Modifiers

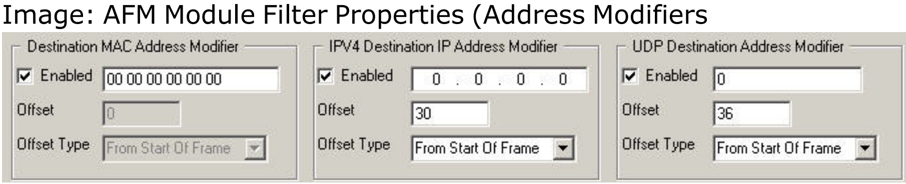


Table: AFM Module Filter Properties (Address Modifiers) provides definitions for the fields to configure the Address Modifiers..

Table: AFM Module Filter Properties (Address Modifiers)

Section	Field/Control	Description
Destination MAC Address Modifier	Enabled	Selecting this check box enables the AFM to modify the Destination MAC Address of the packet. AFM Packet Modification Feature. NOTE To enable this modifier, any one of the the filters must be enabled (MAC address, IP address, or TCP/UDP).
	Modifier	Enter the new address that will replace the original contents of the Destination MAC address field.
	Offset	Default = 0. The length of the offset, in bytes
	Offset Type	From start of frame (default)
IPv4 Destination IP Address Modifier	Enabled	Selecting this check box enables the AFM to modify the IPv4 Destination IP Address of the packet. AFM Packet Modification Feature NOTE To enable this modifier any one of the filters must be enabled (MAC address, IP address, or TCP/UDP).
	Modifier	Enter the new address that will replace the original contents of the IPv4 Destination IP address field.
	Offset	Default = 30. The length of the offset, in bytes.
	Offset Type	From start of frame From start of IP
UDP Destination Address Modifier	Enabled	Selecting this check box enables the AFM to modify the UDP Destination Address of the packet. AFM Packet Modification Feature. NOTE To enable this modifier any one of the filters must be enabled (MAC address, IP address, or TCP/UDP).
	Modifier	Enter the new address that will replace the original contents of the UDP Destination address field.
	Offset	Default = 36. The length of the offset, in bytes
	Offset Type	From start of frame From start of IP

AFM Packet Modification Feature

The packet modification feature for AFM1000SP-01 enables external monitoring of unicast UDP video streams by replacing, in real time, UDP Video Client addresses in a monitored flow with the addresses of a monitoring device. The packet modification performed by AFM will allow the video monitor to view many different streams, without ever having to change its addresses.

Statistics Tab

The **Statistics** tab allows the selection of which sets of statistics appear for the port. The selections available depend on the type of module. For example:

- The **Statistics** tab for a 10/100/1000 STXS4 (CPU per port) module is shown in *Image: **Statistics** Tab (for 10/100/1000 STXS4 module)*
- The ***Statistics*** tab for a 10GE LSM module is shown in *Image: **Statistics** Tab (for 10GE LSM module)*
- The **Statistics** tab for an ALM1000T8 module is shown in *Image: **Statistics** Tab (for ALM1000T8 module)*.
- The **Statistics** tab for an Lava module is shown in *Image: **Statistics** Tab (for Lava module)*.
- The **Statistics** tab for an QSFP-DD module is shown in *Image: **Statistics** Tab (for QSFP-DD module)*.
- The ***Statistics*** tab for a CFP8 module is shown in *Image: **Statistics** Tab (for CFP8 module)*.

Image: **Statistics** Tab (for 10/100/1000 STXS4 module)

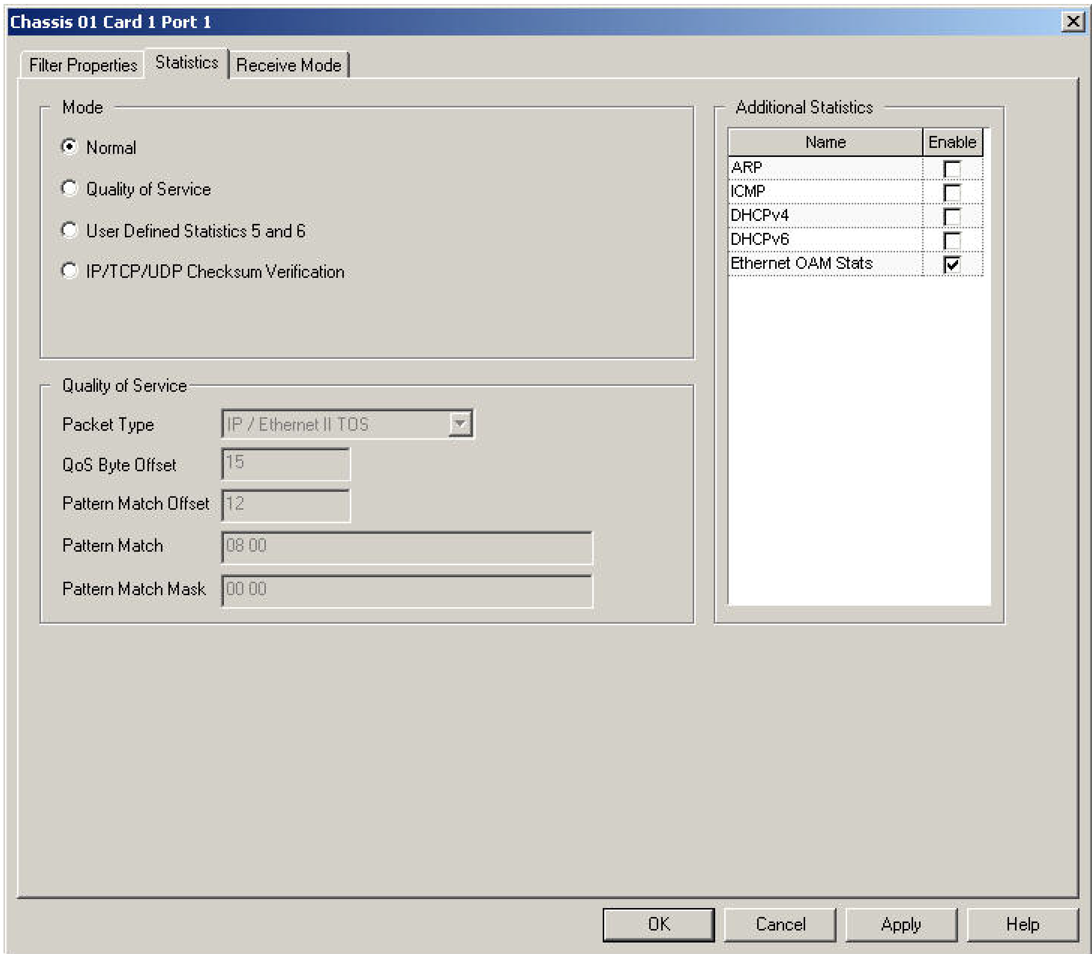


Image: **Statistics** Tab (for 10GE LSM module)

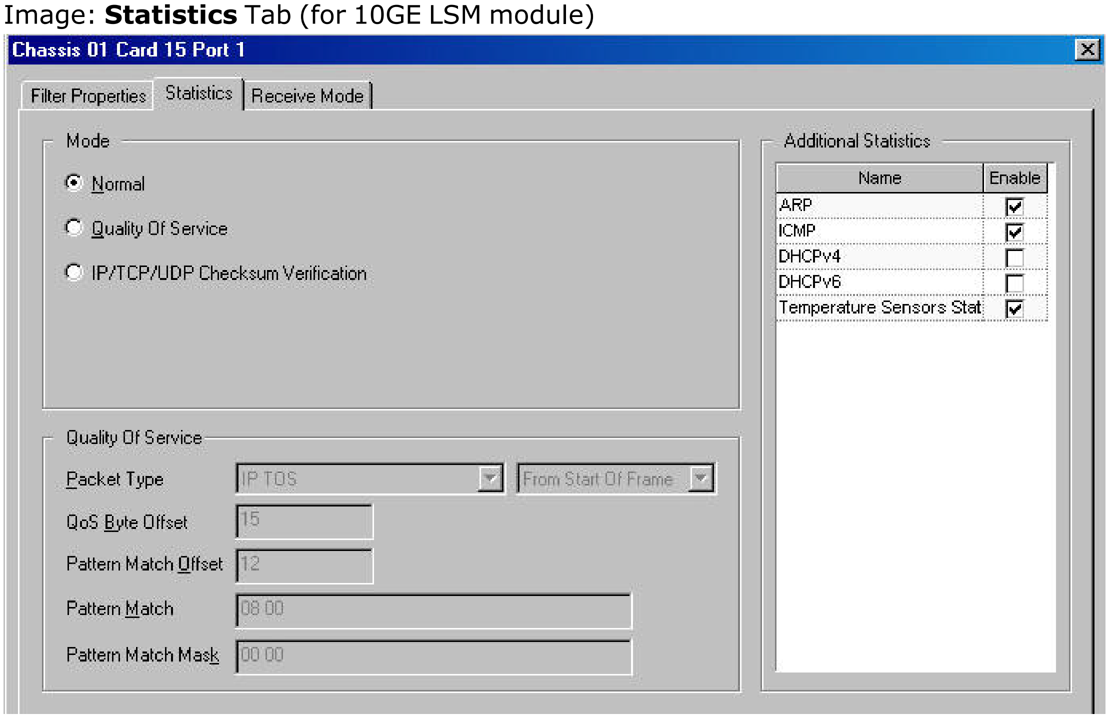


Image: **Statistics** Tab (for ALM1000T8 module)

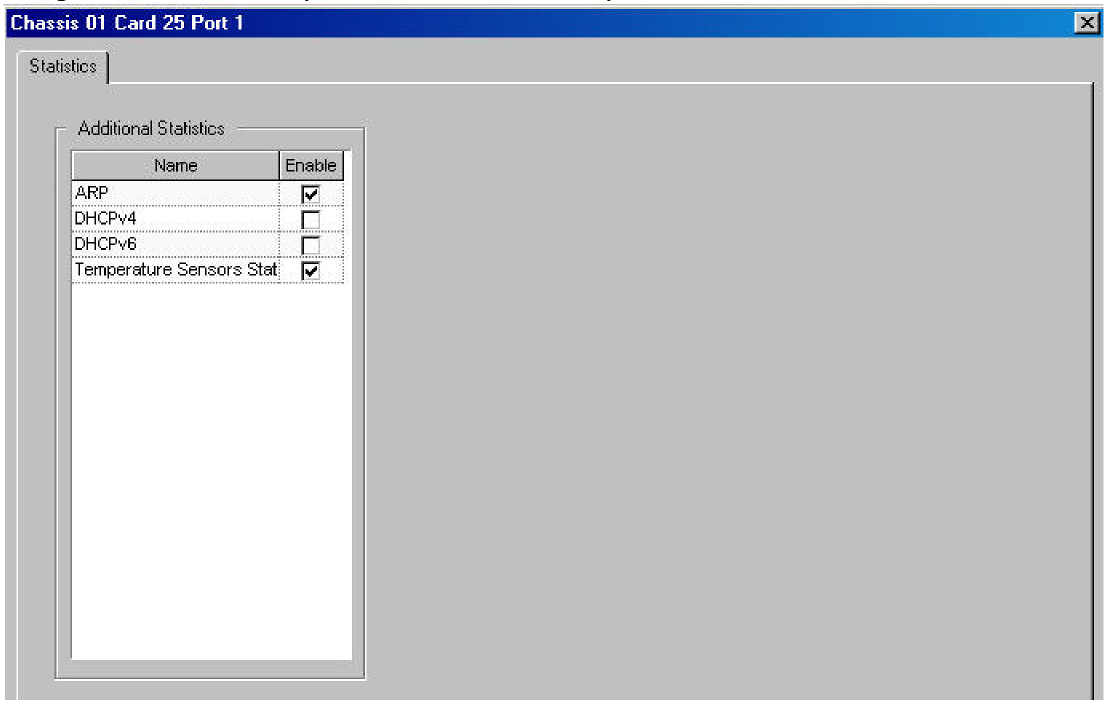


Image: **Statistics** Tab (for Lava module)

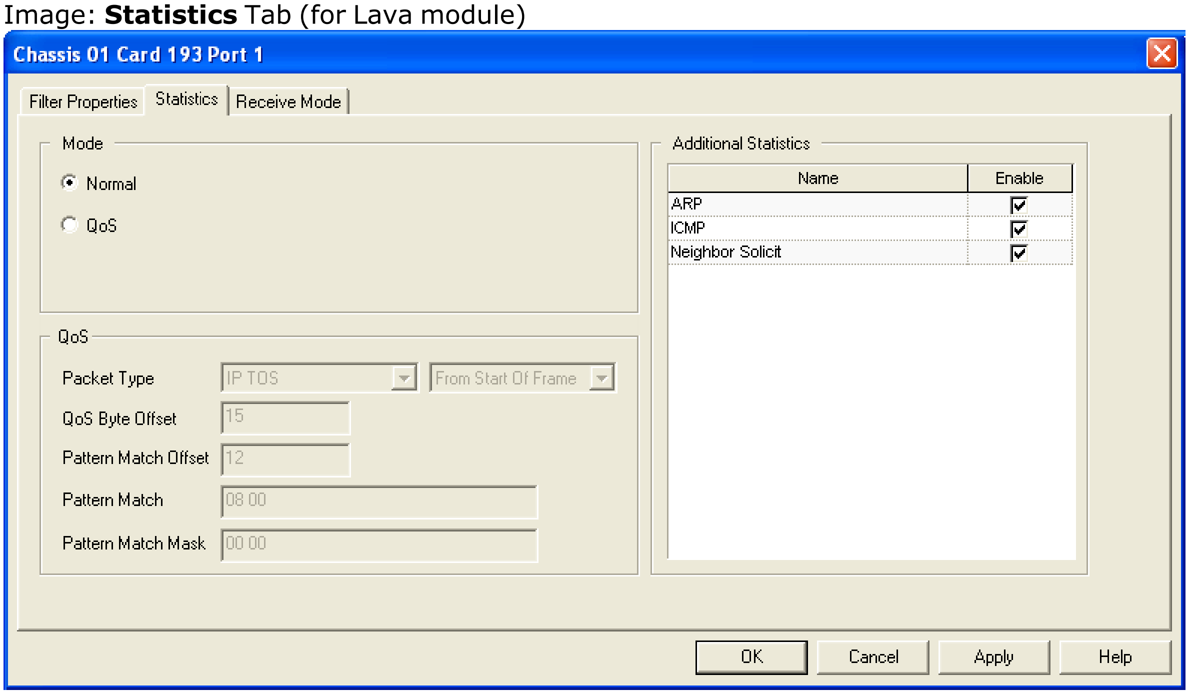


Image: **Statistics** Tab (for QSFP-DD module)

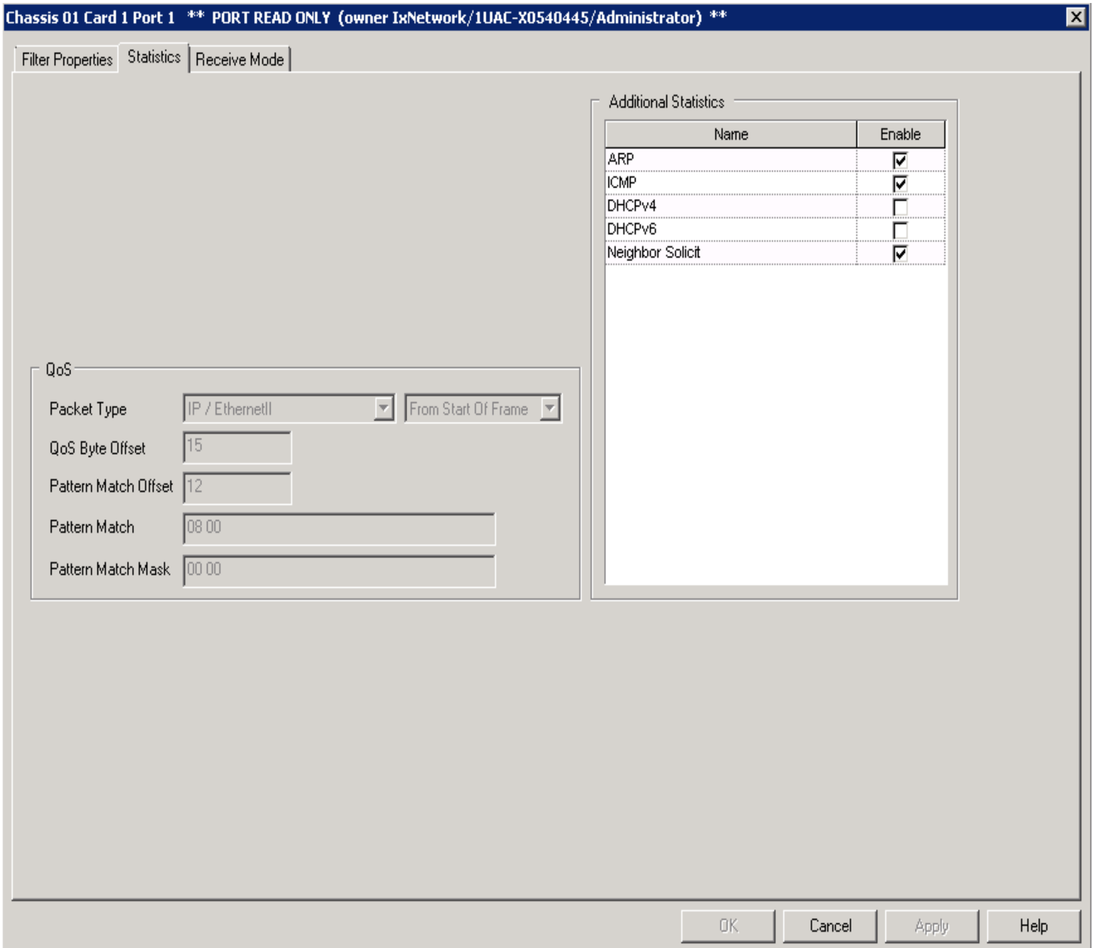
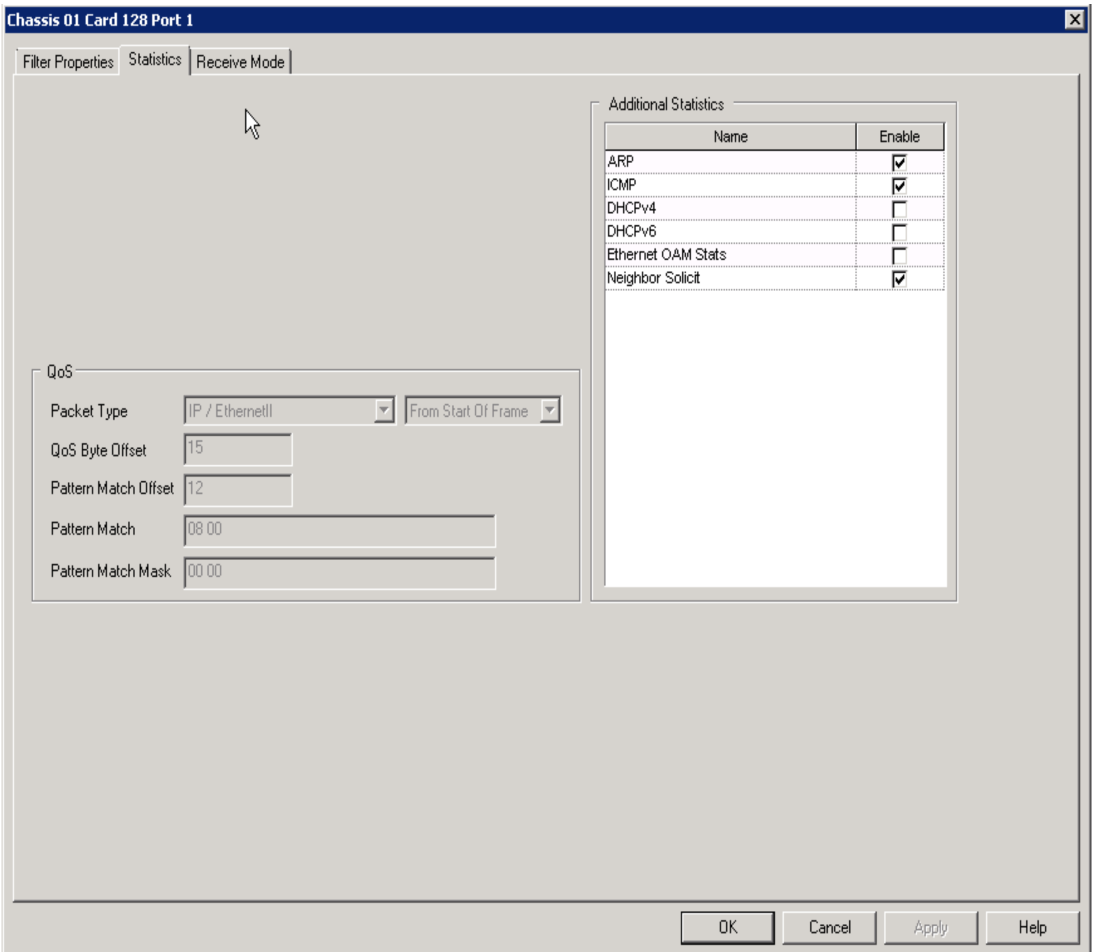


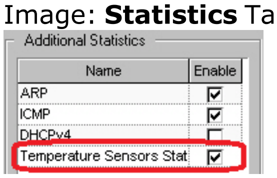
Image: **Statistics** Tab (for CFP8 module)



Temperature Sensor Statistics

The **Statistics** tab for OC-192, 10 GE (including LSM and MSM), 2.5G MSM POS, and ALM1000T8 modules includes an additional *Temperature Sensor Stats* check box, as shown in *Image: **Statistics** Tab—Temperature Sensor Stats*. This option is enabled by default, so these statistics also appear in Statistic View for the 10GE XAUI/BERT or 10GE XENPAK/BERT modules when set to BERT mode (which makes this **Statistics** tab unavailable).

Image: **Statistics** Tab—Temperature Sensor Stats



USB Extended Statistics

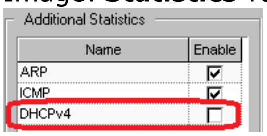
The **Statistics** tab for USB modules includes an additional *USB Extended Stats* check box, as shown in *Image: **Statistics** Tab—USB Differences*.

Image: **Statistics** Tab—USB Differences

DHCPv4 Statistics

All TXS, 10GE (including LSM and MSM), and ATM POS modules have optional DHCPv4 statistics available in the **Statistics** tab, as shown in *Image: **Statistics** Tab—DHCPv4 Stats*.

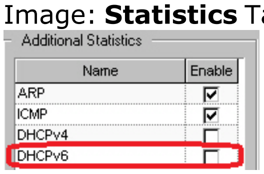
Image: **Statistics** Tab—DHCPv4 Stats



DHCPv6 Statistics

All TXS, 10GE LSM, and ATM POS modules have optional DHCPv6 statistics available in the **Statistics** tab, as shown in *Image: **Statistics** Tab—DHCPv6 Stats*.

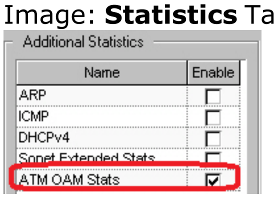
Image: **Statistics** Tab—DHCPv6 Stats



ATM OAM Statistics

The ATM POS module has optional ATM OAM statistics available in the **Statistics** tab, as shown in *Image: **Statistics** Tab—ATM OAM Stats*.

Image: **Statistics** Tab—ATM OAM Stats

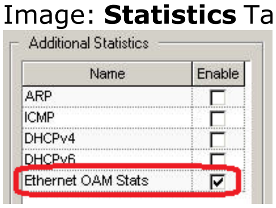


Ethernet OAM Statistics

The following Ethernet load modules have optional OAM statistics available in the **Statistics** tab, as shown in *Image: **Statistics** Tab—Ethernet OAM Stats*.

10/100/1000 (S)TX(S)2, 4, 241000 SFP(S)410/100/1000 XMS(R)1210/100/1000 LSM XMV(R)4, 1610/100/1000 ASM XMV1210GE LSM (XM3, XMR3, XL6) in LAN mode10G MSM in LAN mode

Image: **Statistics** Tab—Ethernet OAM Stats



Statistics Tab Fields

The fields and controls in the **Statistics** tab are described in *Table: **Statistics** Tab Options*.

Table: **Statistics** Tab Options

Section	Field/Control	Description
Mode		A set of mutually exclusive choices related to which statistics to accumulate and show.
	Normal	A 'normal' set of statistics.
	Quality of Service (QoS)	Quality of Service statistics appear at the expense of all the User Defined Statistics, Capture Trigger and Filter and several 'normal' statistics.
	User Defined Statistics 5 and 6	UDS 5 and 6 appear at the expense of Quality of Service statistics and several 'normal' statistics (this limitation is not true for LSM and MSM modules).
	IP/UDP/TCP Checksum Verification	IP, UDP, and TCP checksums appear at the expense of assorted other statistics.
	Data Integrity	Sequence and data integrity errorsare selected at the expense of assorted other statistics. Refer to the Sequence Checking Operation and Data Integrity Checking Operation sections in the 'Theory of Operation: Chapter' of the *Ixia Platform Reference Manual* for more information.
Additional Stats	Protocol Server Stats	Statistics related to Protocol Server Transmit and Receive appear.
	ARP Stats	Statistics related to sending and receiving ARP requests and replies appear.
	ICMP Stats	Statistics related to sending and receiving PING requests and replies appear.
	Neighbor Solicit	
	BGP Stats	Statistics related to configuration and establishment of BGP sessions appear (only seen if IxRouter is installed).
	OSPF Stats	Statistics related to configuration and establishment of OSPF (v2) sessions appear (only seen if IxRouter is installed).
	OSPFv3 Stats	Statistics related to configuration and establishment of OSPFv3 sessions appear (only seen if IxRouter is installed).
	ISIS Stats	Statistics related to configuration and establishment of ISIS sessions appear (only seen if IxRouter is installed).

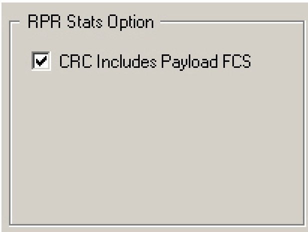
Section	Field/Control	Description
	RSVP-TE Stats	Statistics related to configuration and establishment of RSVP-TE sessions appear (only seen if IxRouter is installed).
	LDP Stats	Statistics related to the configuration and establishment of LDP sessions appear (only seen if IxRouter is installed).
	PIM-SM Stats	Statistics related to the configuration and establishment of PIM-SM sessions appear (only seen if IxRouter is installed).
	ATM OAM Stats	Statistics related to the use of ATM OAM cells.
	DHCPv4 Stats	Statistics related to the use of DHCPv4 with protocol interfaces.
	DHCPv6 Stats	Statistics related to the use of DHCPv4 with protocol interfaces.
	IGMP Stats	Statistics related to the configuration and establishment of protocol server IGMP sessions appear.
	SONET Extended Stats	(POS cards only) Statistics related specifically to Packet over SONET appear.
	Temperature Sensor Stats	Statistics related specifically to temperature readings on high-powered cards appear.
	USB Extended Stats	(USB/Ethernet ports in USB mode only) Statistics related specifically to USB appear.
	RPR Stats	RPR Statistics Option (below).
	Ethernet OAM Stats	Statistics related specifically to Ethernet OAM appear.
Quality of Service Statistics		Settings related to the view of Quality of Service statistics. These are described in *Table: Quality of Service*.

The particular statistics shown for each of the choices is detailed in the 'Available Statistics' appendix of the *Ixia Platform Reference Manual*.

RPR Statistics Option

When Resilient Packet Ring (RPR) is selected for the SONET header, the **Statistics** tab shows an area with an option for enabling RPR Statistics, as shown in *Image: Enable RPR Statistics*. The check box specifically notes that the RPR frame CRC calculation will include the FCS field of the encapsulated packet in the payload of the RPR frame.

Image: Enable RPR Statistics

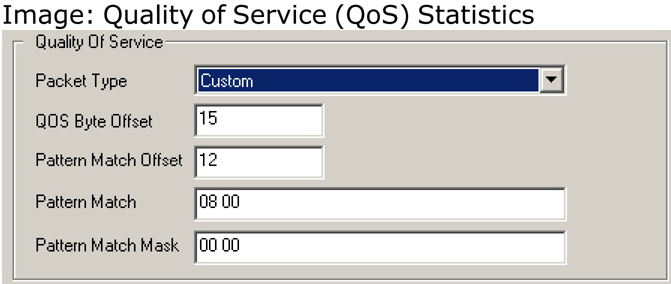


The particular statistics shown for RPR are detailed in 'Available Statistics' appendix of the *Ixia Platform Reference Manual*.

Quality of Service Statistics

The Quality of Service (QoS) fields within the **Statistics** tab are shown in . The **Packet Type** and other parameters in the tab differ, depending on the type of load module.

Image: Quality of Service (QoS) Statistics



The fields and controls in this tab are described in *Table: Quality of Service.*

Table: Quality of Service

Field/Control	Description
Packet Type (for non-POS modules, except 10 Gigabit modules)	The type of packet is specified. The choices for non-POS modules are: • IP/Ethernet II TOS • IP/IEEE 802.3 SNAP TOS • VLAN User Priority These choices automatically set the values of the remaining tab items to the correct settings for those types of protocols. The final setting is: • Custom This allows for the complete specification of the location of QoS information in a packet. Selecting Custom makes the other fields active, so values can be entered.
Packet Type (for some POS modules)	The choices for POS modules are: • IP/PPP • IP/CISCO HDLC These choices automatically set the values of the remaining tab

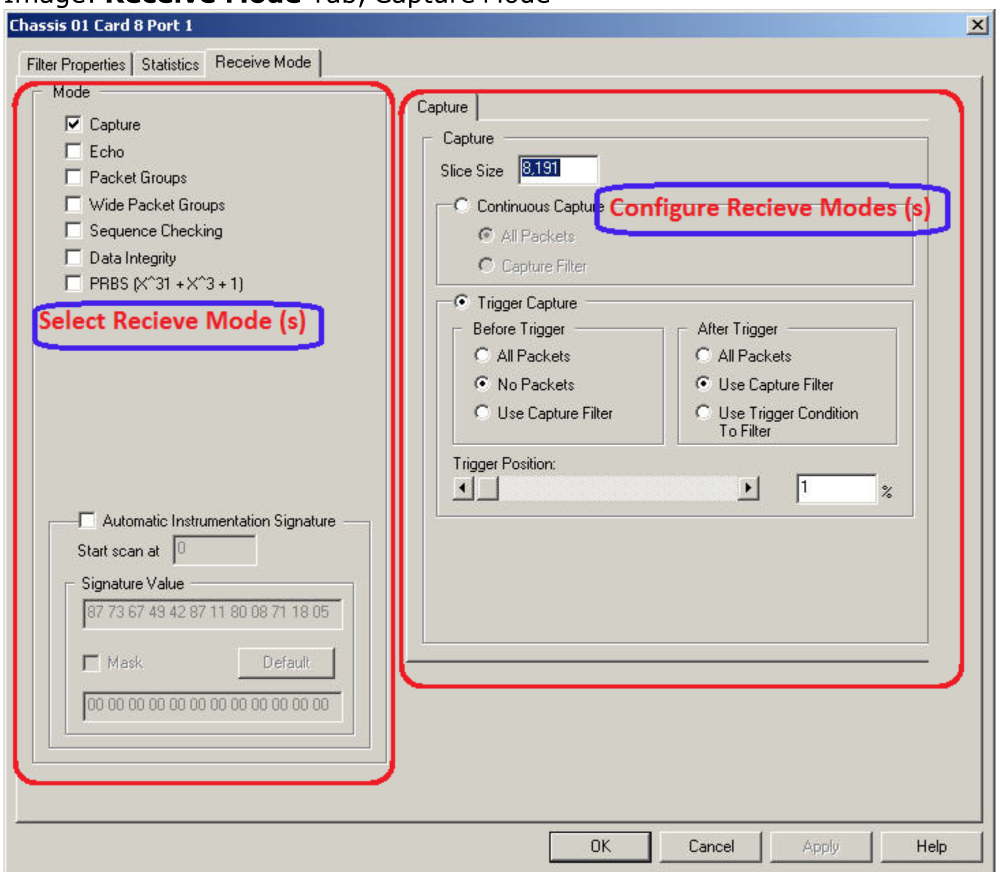
<table>
<tr><th>Field/Control</th><th>Description</th></tr>
<tr><td>NOTE QoS is not available for OC-192c POS.</td><td>items to the correct settings for those types of protocols. The final setting is:
• Custom
This allows for the complete specification of the location of QoS information in a packet. Selecting Custom makes the other fields active, so values can be entered.</td></tr>
<tr><td>Packet Type (for 10 Gigabit modules)</td><td>The choices for 10 Gigabit modules are:
• IP TOS—for IP Type of Service (TOS). (Settings for the 8-bit TOS field in the IP packet header.)
• VLAN User Priority
These choices automatically set the values of the remaining tab items to the correct settings for those types of protocols. The final setting is:
• Custom
This allows for the complete specification of the location of QoS information in a packet. Selecting Custom makes the other fields active, so values can be entered.</td></tr>
<tr><td>Packet Type (for ATM modules)</td><td>The choices for ATM modules are:
• IP/ATM
This choice automatically sets the values of the remaining tab items to the correct settings for those types of protocols.
• Custom
This allows for the complete specification of the location of QoS information in a packet. Selecting Custom makes the other fields active, so values can be entered.</td></tr>
<tr><td>QOS Byte Offset</td><td>The byte offset from the beginning of the packet for the byte which contains the QoS level for the packet.</td></tr>
<tr><td>Pattern Match Offset</td><td>The byte offset from the beginning of the packet for the byte(s) that contains a value to be matched. If the pattern is matched, then the packet is deemed to contain a QoS level.</td></tr>
<tr><td>Pattern Match</td><td>The value to be matched for at the Pattern Match Offset, subject to the Pattern Match Mask.</td></tr>
<tr><td>Pattern Match Mask</td><td>The mask to be applied to the pattern match. ‘1’ values indicate that the corresponding bit is not to be matched.</td></tr>
</table>

Receive Mode Tab

The **Receive Mode** tab controls the port's receive mode configuration. The format of the dialog box changes based on the receive mode(s) selected.

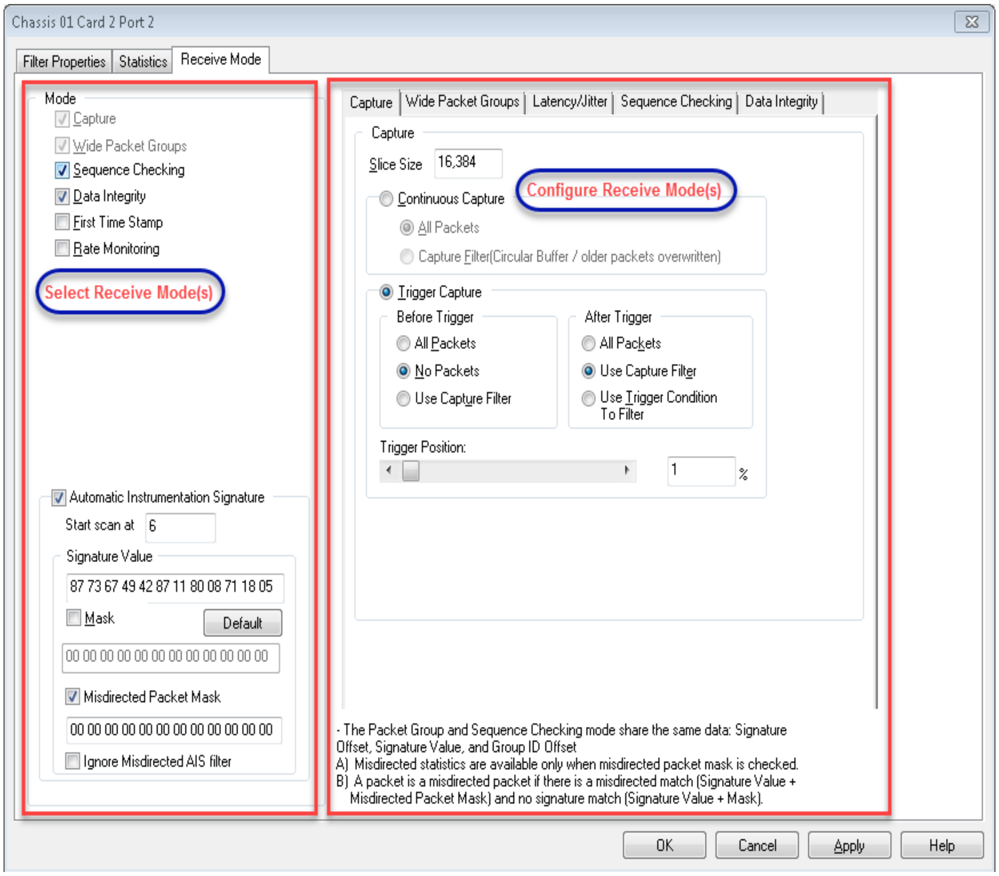
An example of the **Receive Mode** tab is shown for a port on the 1000 SFPS4 load module in *Image: **Receive Mode** Tab, Capture Mode.*

Image: **Receive Mode** Tab, Capture Mode



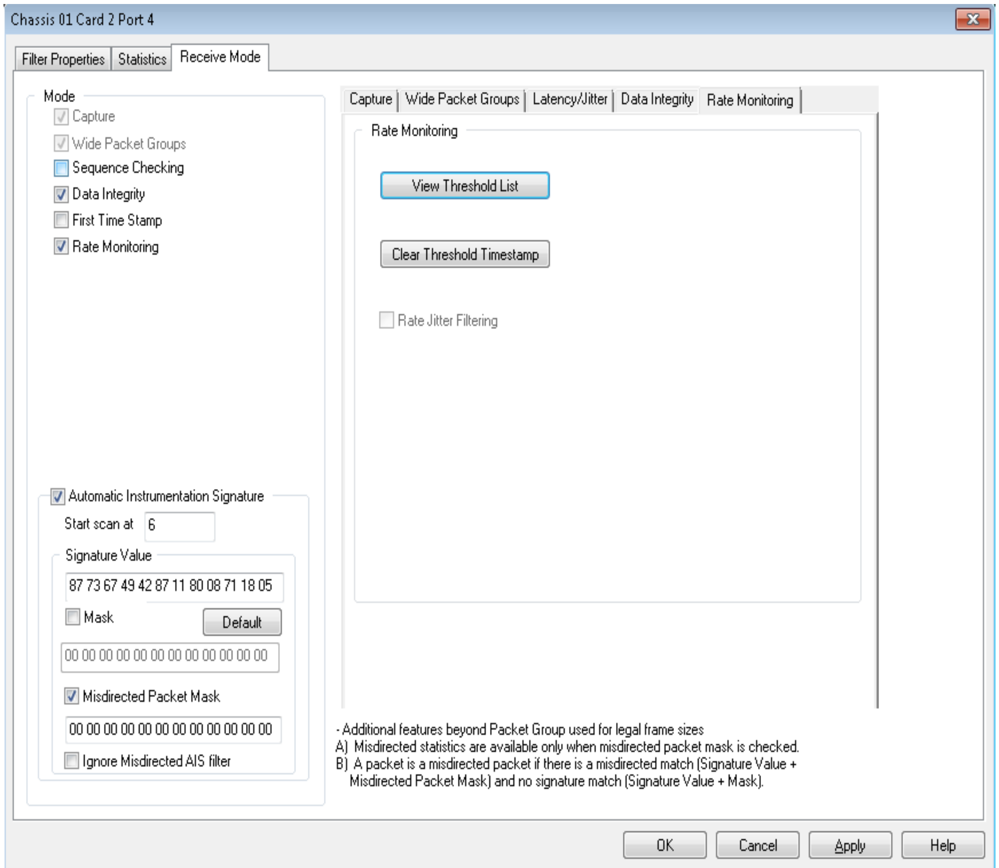
An example of the **Receive Mode** tab is shown for a port on the QSFP-DD load module in *Image: **Receive Mode** Tab for QSFP-DD load module.* The **Receive Mode** tab for the CFP8 load module has similar properties.

Image: **Receive Mode** Tab for QSFP-DD and CFP load module



An additional tab **Rate Monitoring** is available if you select the **Rate Monitoring** check box. In this case the **Sequence Checking** tab does not appear as shown below:

Image: **Rate Monitoring** Tab for QSFP-DD load module



NOTE The Apply changes to all Ports for this chassis check box causes the settings on the **Receive Mode** tab to be copied to all ports on the current chassis, where applicable.

As shown in *Image: **Receive Mode** Tab, Capture Mode*, receive mode configuration consists of two main tasks:

- **STEP 1**—Select Receive Mode(s)
- **STEP 2**—Configure Receive Mode(s)

Select Receive Mode(s)

The subset of receive mode types that appear in the **Receive Modes** tab is based on the type of port in use. The various types of Receive Modes are listed below:

- Capture Mode
- Echo
- Packet Groups
- Wide Packet Groups
- Sequence Checking
- Latency/Jitter
- Data Integrity
- PRBS Mode

- Round Trip TCP Flows
- First Time Stamp
- ISL Encapsulation
- DCC
- Automatic Instrumentation Signature
- Rate Monitoring
- Per PGID Checksum Error Stats

Refer to the *Ixia Platform Reference Manual* for additional information on card/port capabilities. The receive modes are described in *Table: Receive Modes*.

Table: Receive Modes

Mode	Description
Capture	If selected, the port is set to Capture Mode, in which the buffer memory is used to hold recorded data. For some modules the following options are available on the right side of the screen. • Continuous capture • Trigger Capture Capture Mode for additional information.
Packet Groups	If selected, the port is set to Packet Group/Latency/Jitter mode, in which packets are matched according to a signature and then classified in buckets according to Packet Group IDs. Packet Groups for additional information.
Sequence Checking	If selected, the port is set to Sequence Checking mode, in which the proper sequencing of packets is selected. Packets are matched according to a signature and then an embedded sequence number is used. For some modules the following options are available on the right side of the screen. • Standard sequence checking • Advanced threshold sequence checking Sequence Checking for additional information.
Data Integrity	If selected, the port is set to Data Integrity mode, where a signature must be matched and a CRC is selected. Data Integrity can only be used with Wide Packet Groups on a limited number of load modules (that is, OC-192c load modules). Data Integrity for additional information.
Wide Packet Groups	If selected, the port is set to Wide Packet Group mode, in which packets are matched according to a signature, and then classified in bins (buckets) according to Packet Group IDs.

<table>
<tr><th>Mode</th><th>Description</th></tr>
<tr><td></td><td>
Novus 100GE/50GE/40GE/25GE/10GE supports dual PGID stat mode.
For 100GE/40GE the available stats are:
8k stat
32K stat
For 25GE/10GE the available stats are:
4k stat
8k stat
For 50GE the available stats are:
8k stat
16k stat
Dual PGID is supported in QSFP-DD 100GE/50GE. QSFP-DD speed modes have the following PGID support.
Maximum PGID with or without SQ Checking (No Tx/Rx Sync):
400GE/200GE: 32K
100GE: 32k Min / 8k Full
50GE: 16k Min / 8k Full
Maximum PGID with or without SQ Checking (With Tx/Rx Sync):
400GE/200GE: 32K
100GE: 32k Min / 4k Full
50GE: 16k Min / 4k Full
NOVUS25/10GE8SFP28+100G+50G supports dual PGID stat mode.
For 10GE/25GE/50GE/100GE the available stats are:
8k stat
32K stat
CFP8-400GE has the following PGID support.
Maximum PGID with or without SQ Checking (No Tx/Rx Sync): 32K
Maximum PGID with or without SQ Checking (With Tx/Rx Sync): 32K
S400-16P-QDD has the following PGID support.
400G: 32K full
200G: 32K full
100G: 32K min / 8K full
50G: 16K min / 8K full
40G: 16K min / 8K full
25G: 16K min / 8K full
10G: 16K min / 8K full
</td></tr>
</table>

Mode	Description
	In the **Novus** 25GE/10GE module, if **4k stat** is selected in the Wide **Packet Group** tab and in the **Novus** 50GE module, if **8k stat** is selected in the Wide **Packet Group** tab, the **Switched-Path Duplicate/Gap Checking** and Advance Sequence Tracking options are available. In the **NOVUS25/10GE8SFP28** module, if **8k stat** is selected in the Wide **Packet Group** tab the **Switched-Path Duplicate/Gap Checking** and Advance Sequence Tracking options are available. In the **Novus** 50GE module, if **16k stat** is selected in the Wide **Packet Group** tab, the **Switched-Path Duplicate/Gap Checking** and Advance Sequence Tracking options are disabled. In the **QSFP-DD** 100GE/500GE module, if the **4k stat** is selected in the Wide **Packet Group tab**, the **Switched-Path Duplicate/Gap Checking** and Advance Sequence Tracking options are available. See Wide Packet Groups for additional information. NOTE When Rate Monitoring mode is selected, Wide Packet Groups is also automatically selected.
Round Trip TCP Flows	If selected, the port is set to Round Trip TCP Flows. Round Trip TCP Flows for additional information.
First Time Stamp	If selected, it reflects a port setting made in the IxAutomate (previously IxScriptmate) program. It may be disabled here. First Time Stamp for additional information.
ISL Encapsulation	If selected, the port is set for checking ISL encapsulation on the received packets. ISL Encapsulation for additional information.
Echo	Before selecting the *Echo* check box in the ***Receive Mode*** tab, read the following warning: The following warning message is issued when Echo is selected in the **Transmit Modes** or **Receive Mode** tabs: `‘Setting this mode on a live network may cause severe problems. All ethernet frames with a DA which matches the Receive Filter DA1 will be ‘echoed’ back onto the network. Setting this mode will IMMEDIATELY start echoing packets. Are you sure you want to set Echo Mode? Yes or No’` If selected, the receiving port is set for Echo mode. (Available on SFPS4, 10/100/1000 TXS4, Gigabit, GBIC, and Copper 10/100/1000 modules running Gigabit mode). Echo for additional information.
DCC	The SONET Data Communications Channel (DCC) option allows capture of DCC packets transmitted in DCC Packet Streams or DCC Advanced Streams.

<table>
<tr><th>Mode</th><th>Description</th></tr>
<tr><td></td><td>NOTE In the case of two simultaneous channels being transmitted, where both DCC Packet flows and normal SPE packet streams are being transmitted, the user must choose between normal Capture (for the SPE packet streams) or DCC capture (for the flow packets in the DCC channel). DCC for additional information.</td></tr>
<tr><td>PRBS</td><td>In PRBS mode, both Wide Packet Groups and Sequence Checking are automatically enabled. In PRBS mode, all latency-related statistics are removed and the following per-PGID statistics are added:
• PRBS Bits Received
• PRBS Errored Bits
• PRBS BER
PRBS Mode.</td></tr>
<tr><td>Rate Monitoring</td><td>In Rate Monitoring mode, the Rate Monitoring tab will appear. This tab contains two buttons: View Threshold List and Clear Threshold Timestamp.
NOTE When this mode is selected, Wide Packet Groups is also automatically selected, and Sequence Checking is automatically deselected. Also, the latency mode Inter-Arrival Time is automatically selected (and other latency modes are grayed out).</td></tr>
<tr><td>Per PGID Checksum Error Stats</td><td>In Per PGID Checksum Error Stats mode, per-flow checksum error statistics will be provided for Tcp\Udp and IPV4 checksum errors.
NOTE When this mode is selected, Wide Packet Groups is also automatically selected.</td></tr>
</table>

Configure Receive Mode(s)

Detailed explanations of the receive mode configuration for the different types of receive modes are provided in the following sections.

Capture Mode

If *Capture* is selected, the port is set to Capture Mode in which the buffer memory is used to hold received data. There are three main types of Capture mode:

- Capture Slice ONLY
- Small Packet Capture
- Continuous and Triggered Capture

Capture Slice ONLY

When the *Capture Mode* check box is chosen for 10/100 and Gigabit modules, the right-hand side of the dialog box is as pictured in *Image: Capture Mode (shown for 10/100)—Capture Slice* **only**, with the Capture sub-tab.

Image: Capture Mode (shown for 10/100)—Capture Slice **only**

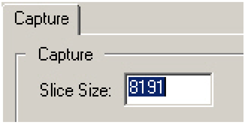
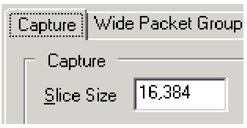


Image: Capture Mode (shown for QSFP-DD and CFP8)—Capture Slice **only**



NOTE The **Capture** tab for CFP8 and QSFP-DD load modulehas similar properties.

The control available in this sub-tab is described in *Table: Capture Mode—Capture Slice* only.

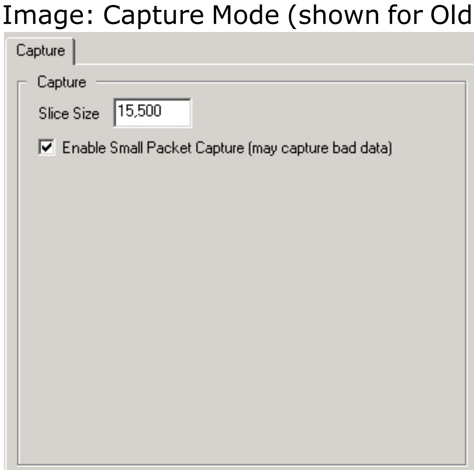
Table: Capture Mode—Capture Slice **only**

Field	Description
Slice Size	(in bytes) The amount of each packet to be saved in the memory buffer.

Small Packet Capture

The *Capture Mode* sub-tab for older OC-12c/OC-3c POS modules allows the selection of the Small Packet capture option, as shown in *Image: Capture Mode (shown for Older OC-12c/OC-3c POS)*. When this option is selected, frames smaller than the 'legal' minimum size can be captured. As noted in the **Receive Mode** tab shown in *Image: Capture Mode (shown for Older OC-12c/OC-3c POS)*, this may result in the capture of bad data.

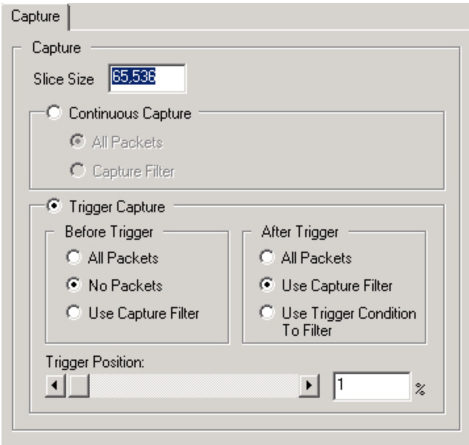
Image: Capture Mode (shown for Older OC-12c/OC-3c POS)



Continuous and Triggered Capture

The *Capture Mode* sub-tab for a number of other modules, such as the ATM/POS 622 module, includes advanced capture options, as shown in *Image: Capture Mode Options—Continuous and Triggered Capture*.

Image: Capture Mode Options—Continuous and Triggered Capture



The fields and controls in this sub-tab are described in *Table: Capture Mode Options* .

Table: Capture Mode Options

Section	Field/Control	Sub-Field/Control	Description
Slice Size			The amount of each packet to be saved in the memory buffer.
Continuous Capture			Select this option button to enable the Continuous Capture option.
	All Packets		Select this option button for continuous capture of all received packets.
	Capture Filter		Select for continuous capture of received packets which match the filter conditions applied.
Trigger Capture			Select this option button to enable the Trigger Capture option. Before the Capture Trigger being activated, all received packets are retained in the capture buffer.
	Before Trigger	All Packets	Before the Capture Trigger being activated, **all** received packets are retained in the capture buffer.
		No Packets	Before the Capture Trigger being activated, **no** received packets are retained in the capture buffer.
		Use Capture Filter	Before the Capture Trigger being activated, applies the Capture Filter conditions to all received packets to select which packets

Section	Field/Control	Sub-Field/Control	Description
			will be retained in the capture buffer.
	After Trigger	All Packets	After the Capture Trigger is activated, all received packets are retained in the capture buffer.
		Use Capture Filter	After the Capture Trigger is activated, applies the Capture Filter conditions to all received packets to select which packets will be retained in the capture buffer.
		Use Trigger Condition to Filter	After the Capture Trigger is activated, applies the trigger conditions to all received packets to select which packets will be retained in the capture buffer.
	Trigger Position	Slider and Percentage (%) field	Used to set the position (% transmitted) in the data stream where the Capture Trigger will be first applied to incoming packets.

NOTE When Continuous Capture is enabled, the Capture Trigger and Capture Trigger statistics do not appear. Capture Trigger for more information on the Capture Trigger.

Packet Groups

Packet Groups are created for use with Latency/Jitter testing. When Packet Groups mode is chosen, the right-hand side of the window shows the both the Packet Groups sub-tab and the related Latency/Jitter sub-tab, as shown in *Image: Packet Groups/Latency (shown for 10/100 module)*. (Note that when *Packet Groups* check box is selected for many modules, the regular Capture Mode - Capture Slice mode is unavailable.)

The *Packet Groups* and Latency/Jitter sub-tabs differ depending on the load module. The sub-tabs for Packet Groups and Latency/Jitter for the varying load modules are described in the following sections:

- 10/100/1000, 10GE Ethernet, and POS modules
- OC-48c Packet Groups/Latency dialog boxes
- Wide Packet Group Inter-Arrival Jitter

Wide Packet Groups are also available, and are described in Wide Packet Groups

Table: Number of PGIDs per Load Module and Feature Use shows the maximum number of Packet Groups a port can process (by load module) for:

- Latency View
- Latency and Sequence View
- Sequence View

The maximum number of PGIDs supported on a port will vary depending on whether packet groups/wide packet groups, sequence checking, or both modes are enabled. Modifying packet group parameters may reduce the maximum number of PGIDs the port supports.

Table: Number of PGIDs per Load Module and Feature Use

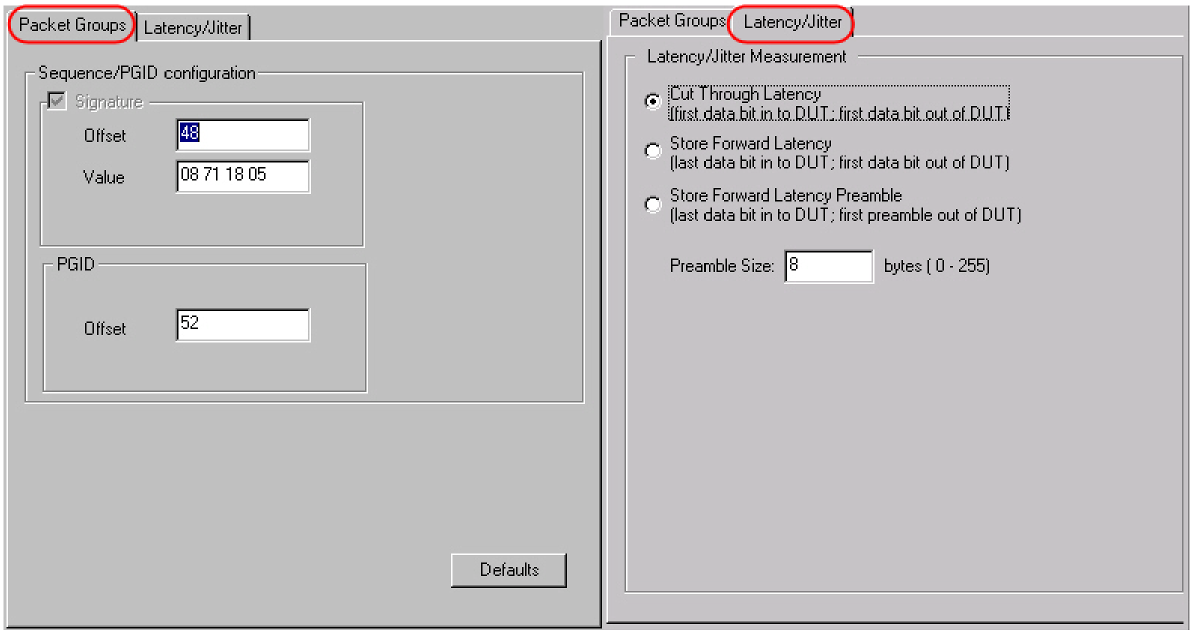
Load Module	Packet Groups	Wide Packet Groups	Wide Packet Groups (Wide Bin Mode)	Packet Groups with Sequence Checking	Wide Packet Groups with SequenceChecking	Wide Packet Groupswith Sequence Checking (Wide Bin Mode)	Sequence Checking
(S)TX (S)4/2/1TX S8	65536	65536	131072	128	65536	131072	128
Legacy Ethernet (Gigabit, LM1000T, LM100TX)	57344	N/A	N/A	N/A	N/A	N/A	
LSM 10GE	N/A	65536	2097152	N/A	65536	524288	65536
MSM2.5G POS	N/A	65536	2097152	N/A	65536	524288	65536
MSM10G LAN/WAN	N/A	65536	2097152	N/A	65536	524288	65536
	N/A	65536	2097152	N/A	65536	524288	65536
LM622 ATM	65536	65536	131072	128	65536	131072	128
LM622 POS	65536	65536	131072	128	65536	131072	128
LM10G LAN/WAN	65536	65536	131072	8192	8192	8192	8192
OC192 POS/LM10G POS	1024	65536	131072	1024	8192	8192	1024
OC3/12 POS	57344	N/A	N/A	N/A	N/A	N/A	N/A
OC48 POS	65536	N/A	N/A	512	N/A	N/A	512

For OC-192c POS legacy modules (in packet group mode) When performing latency/jitter measurements, the following restrictions apply: 1,024 or fewer packet group IDs should be used if different frame sizes are used at full line rate. More than 1,024 packet group IDs may be used at line rate and varying frame sizes, so long as the frame sizes are between 256 and 1,024 bytes. When performing sequence checking, no more than 1,024 packet group IDs should be used.

10/100/1000, 10GE Ethernet, and POS modules

Image: Packet Groups/Latency (shown for 10/100 module) shows the *Packet Groups* and Latency/Jitter sub-tabs for 10/100, Gigabit Ethernet, and POS (including ATM/POS 622) modules.

Image: Packet Groups/Latency (shown for 10/100 module)



The fields and controls for these sub-tabs are described in *Table: Packet Groups/Latency Configuration*.

Table: Packet Groups/Latency Configuration

Dialog box	Field/Control	Description
Packet Group	Signature Offset	(in bytes) The offset within the packet where the 4-byte signature will be found.
	Signature Value	The actual 4-byte value matched against for a signature.
	Group ID Offset	(in bytes) The offset within the packet where the 2-byte packet group ID will be found.
	Defaults	Resets the signature offset, value, and group ID offset to default values.
Latency Measurement	Cut Through Latency (first data bit in to	First data bit in to first data bit out. If selected, the time interval between the first data bit out of

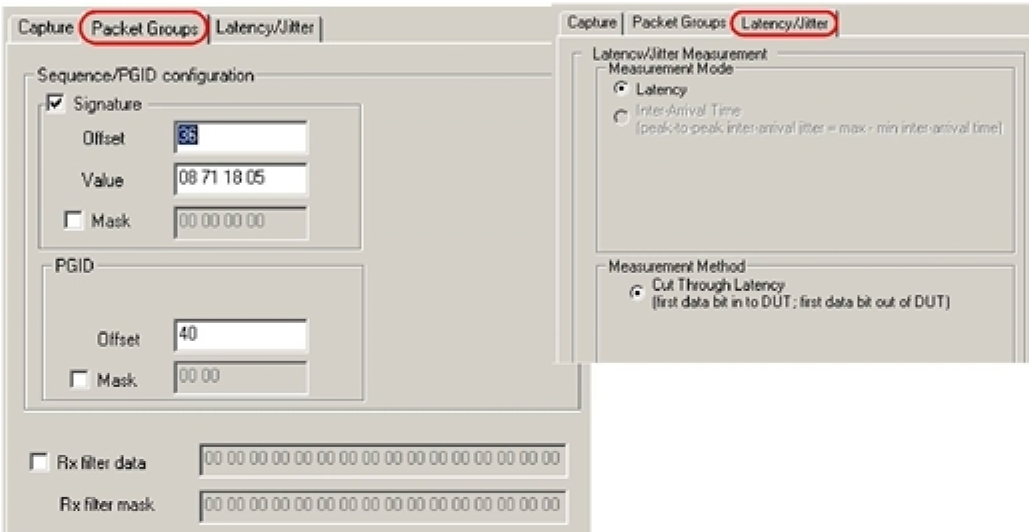
Dialog box	Field/Control	Description
	DUT; first data bit out of DUT)	the Ixia transmit port and the first data bit received by the Ixia receive port is measured.
	Store Forward Latency (last data bit in to DUT; first data bit out of DUT)	(Not available for some modules.) Last data bit out to first data bit in. If selected, the time interval between the last data bit out of the Ixia transmit port and the first data bit received by the Ixia receive port is measured. This option is available on 10/100/1000 and 10GE modules when using Wide Packet Groups, as described in Wide Packet Groups. NOTE Store and Forward latency mode is intended to test Store and Forward switching devices, which receive the entire packet before transmitting it to its destination. If Store and Forward latency is used in loopback, back-to-back or without a Store and Forward switch, then either a zero latency or very high latency will be reported.
	Store and Forward Preamble	(Not available for some modules.) If selected, the time interval between the last data bit out of the Ixia transmit port and the first preamble data bit received by the Ixia receive port is measured
	Inter-Arrival Time (peak-to-peak inter-arrival jitter = max - min inter-arrival time)	(Not available for some modules, only available when using Wide Packet Groups. Wide Packet Groups and Wide Packet Group Inter-Arrival Jitter for more information.) If selected the time interval between packets in the same PGID is measured.
	Preamble Size	(in bytes) When Store and Forward Preamble is selected, this is the expected size of the preamble. (Shows the value of the Preamble Size set in the **Frame Data** tab of the *Stream Properties* dialog box.) Valid range is 0 to 255 bytes.

OC-48c Packet Groups/Latency dialog boxes

The **Packet Groups** and **Latency/Jitter** tabs for the OC-48c POS load module ports have some special Receive Mode options available—*Image: OC-48c POS Packet Groups and Latency/Jitter*.

A user-defined 128-bit data pattern filter can be inserted at the start of the frame, which can filter addresses in the frame header. This filter, as well as the Signature and Group ID, may be masked. (These additional options support the IxProfile feature.)

Image: OC-48c POS Packet Groups and Latency/Jitter



The fields and controls in these sub-tabs are described in *Table: Packet Group/Latency*.

Table: Packet Group/Latency

Dialog box	**Field/Control**	**Description**
Packet Groups Sequence/PGID Configuration	Signature (check box)	When this check box is cleared, the signature fields are disabled (dimmed). This allows all packets to be measured for real-time latency, not just those which contain a specified signature.
	Signature Offset	The offset within the packet where the 4-byte signature will be found.
	Signature Value	The actual 4-byte value matched against for a signature.
	Signature Mask (check box)	When selected, the bit mask used for masking the value in the *Signature* field.
	PGID Offset	The offset within the packet where the 2-byte packet group ID will be found.
	PGID Mask (check box)	When selected, the bit mask used for masking the value in the *Packet Group ID* (PGID) field.
	Rx Filter Data (check box)	When selected, the 128-bit field for filtering packets on the receive side. The Offset for this field is fixed at 0, the beginning of the packet.
	Rx Filter Mask	128-bit mask to be used with the filter data field.
	Defaults	The button resets the signature offset, value and group ID offset to default values, and disables the *Signature Mask*, *Group ID Mask*, the *Rx Filter Data* and *Mask* fields, and leaves *Ignore Signature* check box empty.

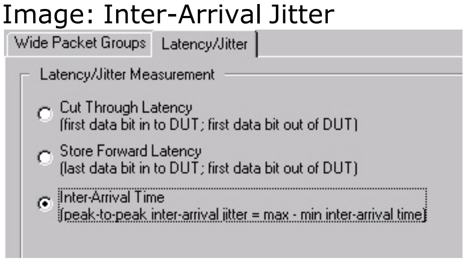
Dialog box	Field/Control	Description
Latency/Jitter Measurement Measurement Mode	Latency	Automatically selected when Packet Groups is selected Receive mode.
Latency Measurement Method	Cut Through	Automatically selected when Packet Groups is selected Receive mode. The time interval between the first data bit in to DUT and the first data bit out of DUT.

Wide Packet Group Inter-Arrival Jitter

Some modules have another Latency option when using Wide Packet Groups (Wide Packet Groups for more information on Wide Packet Groups), called Inter-Arrival Jitter. It measures the time between arrival of packets in the same PGID.

The Inter-Arrival Jitter option is shown in *Image: Inter-Arrival Jitter*.

Image: Inter-Arrival Jitter



This option is only available when using Wide Packet Groups. For more information on Inter-Arrival Jitter, refer to the Latency/Jitter Measurements section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.

Sequence Checking

There are three types of Sequence Checking—Standard, Advanced with Threshold Error, and Advanced Sequence Tracking. Availability of the options depends on the type of load module. Refer to the *Ixia Platform Reference Manual* for additional information.

- Advanced Sequence Checking (for TXS Ethernet, 10 GE, OC-192c, OC-48c, POS 622 (OC-12c/OC-3c POS) load modules)
- Standard Sequence Checking (for Copper 10/100/100, older OC-12c/OC-3c modules)
- Advanced Sequence Tracking (for LSM XMVDC16, ASM XMV 10/100/1000, LSM XM 10/100/1000, FCM GXM, Xcellon-Flex-AP-10GE, and Xcellon-Flex-AP-Combo-10GE load modules)

For OC-192c POS legacy modules (in packet group mode)—When performing latency measurements, the following restrictions apply: 1024 or fewer packet group IDs should be used if different frame sizes are used at full line rate. More than 1024 packet group IDs may be used at line rate and varying frame sizes, so long as the frame sizes are between 256 and 1024 bytes. When performing sequence checking, no more than 1024 packet group IDs should be used.

Advanced Sequence Checking

Advanced Sequence Checking with Error Threshold is available for some modules. The Sequence Checking sub-tab for Advanced Sequence Checking changes depending on whether Packet Groups or Wide Packet Groups is used.

The sub-tabs for Advanced Sequence Checking are shown in *Image: Advanced Sequence Checking for Packet Groups* and image.

Image: Advanced Sequence Checking for Packet Groups

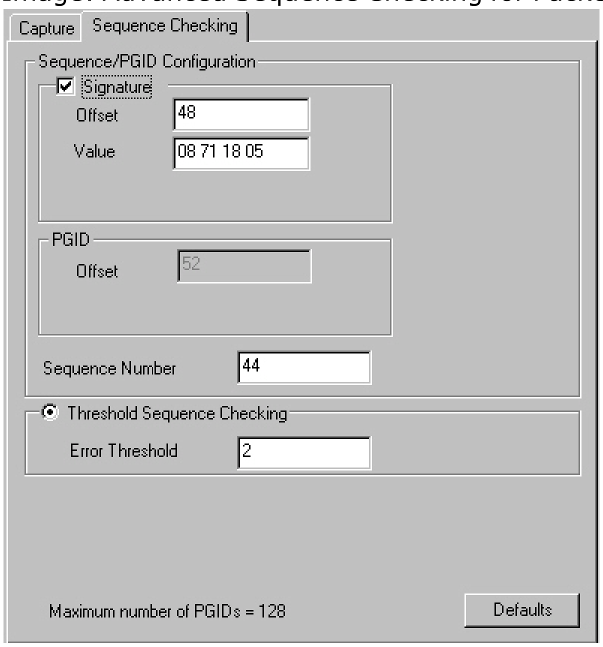
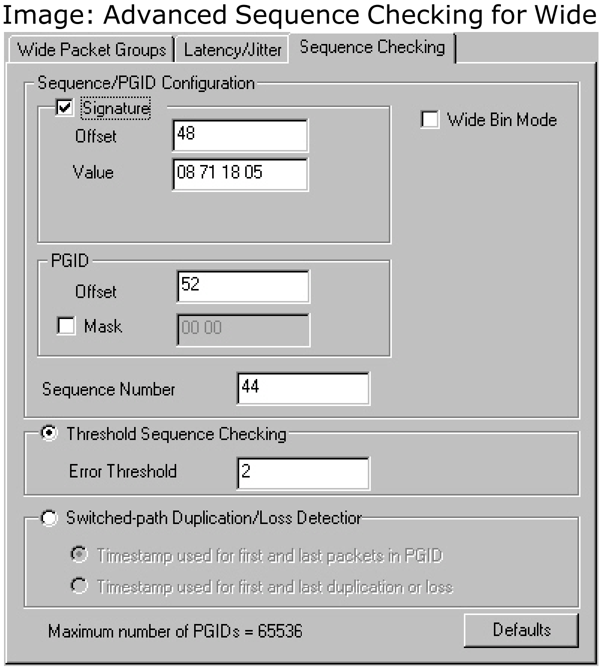


Image: Advanced Sequence Checking for Wide Packet Groups



The fields and controls in this sub-tab are described in *Table: Advanced Sequence Checking*.

Table: Advanced Sequence Checking

Section	Field/Control	Description
Signature		If not selected, the *Signature Offset* and *Signature Value* fields will be disabled (dimmed). This allows ALL packets to be measured for real-time latency, not just those which contain a specified signature.
	Signature Offset	The offset within the packet where the 4-byte signature will be found.
	Signature Value	The actual 4-byte value matched against for a signature.
PGID	Offset	The offset within the packet where the packet group ID (PGID) will be found. NOTE The maximum number of PGIDs for Advanced Sequence Checking is 256 (one-byte field).
	Mask	If selected, the packet Group ID will be masked. If the mask bit = 0, the corresponding bit in the PGID will be used. If the mask bit = 1, the corresponding bit in the PGID will be masked with a '0'.
Wide Bin Mode		(Not available on all modules.) If selected, the 128K Bin mode will be used, where up to 128K PGID bins (time buckets) can used for grouping PGIDs. The maximum length of the Group ID will be increased from 16 to 17 bits. • In the Novus 100GE/40GE module and **QSFP-DD** 50GE module, if you select **8k Stat** the maximum number of PGID is 8192 and if you select **32k Stat** the maximum number of PGID is 32768. • In the Novus 25GE/10GE module, if you select **4k Stat** the maximum number of PGID is 4096 and if you select **8k Stat** the maximum number of PGID is 8192. • In the **QSFP-DD** 100GE module, if you select **8k Stat** the maximum number of PGID is 8192 and if you select **16k Stat** the maximum number of PGID is 16384.
Sequence Number Offset		The offset within the packet where the 4-byte sequence number will be found.
Threshold Sequence Checking	Error Threshold	The user-configurable threshold value used to determine error levels for out-of-sequence, received packets.

Section	Field/Control	Description
		This option and *Switched-path Duplicate/Gap Checking* are mutually exclusive.
Switched-Path Duplicate/Gap Checking	Record First/Last Packet Arrival Time	Store the timestamp of the first and last packet received for each PGID (and each latency bin). This option and *Error Threshold* are mutually exclusive. Refer to the Switched Path Duplicate/Gap Checking Mode section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual* for more information.
	Record First/Last Switched-Path Events Time.	Store the first and last timestamp when an error occurs for each PGID (and each latency bin). This option and *Error Threshold* are mutually exclusive.
	Defaults	Resets the signature offset, value and group ID offset to default values.

This sub-tab provides an additional Sequence Checking option, *Sequence Error Threshold*. When the sequence numbers show that the packets are being received in the correct order, it is a 'no error' condition. When the packets are received out of sequence or if packets are missing, sequence errors occur. These errors can be used as a trigger condition for capture, based on a user-configurable threshold value.

There are four sets of error statistic counters per Group ID: Small Errors, Big Errors, Reverse Errors, and Total Errors. These errors are listed in the Packet Group Statistic View for the port. Packet Group Stats/Sequence Checking Data View for additional information. The definitions of the possible error conditions are listed in *Table: Advanced Sequence Checking Error Conditions*.

Table: Advanced Sequence Checking Error Conditions

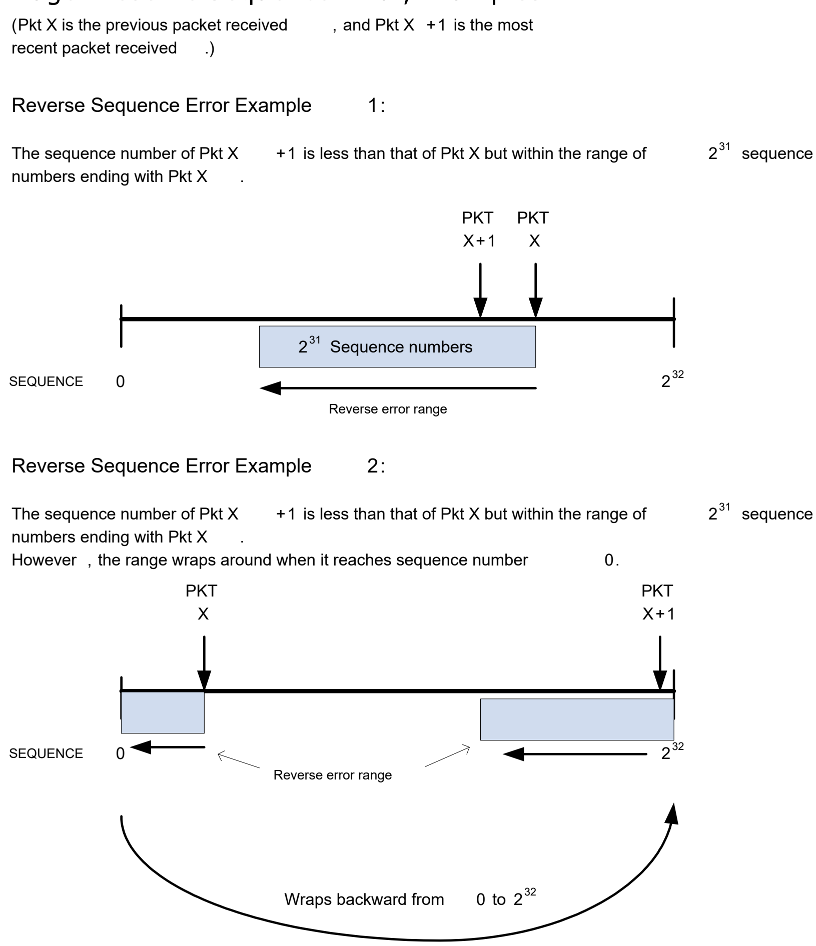
Error	Description
No Error	When the current sequence number is **one** greater than the previous sequence number.
Small Errors	When the current sequence number minus the previous sequence number is less than or equal to the error threshold (set by software) and not negative.
Big Errors	When the current sequence number minus the previous sequence number is greater than the error threshold (set by software) and not negative.
Reverse Errors	A packet received with a reverse sequence error — which is when the current sequence number is less than the previous sequence number, but is still within the 'sliding window' range of sequence numbers. (Examples of Reverse Sequence Error following this table.)

Error	Description
	NOTE The sequence counter can roll over without error — going from sequence number 0x FF FF FF FF to 0 is OK... this is a normal roll-over. Going from 0 to 0x FF FF FF FF (rollback) is not OK. It is a reverse error.
Total Errors	The sum of all the errors: small, big, and reverse Sequence Checking errors.

Examples of Reverse Sequence Error

The total range of sequence numbers is 4 bytes, or 2^{32} (4,294,967,296). The 'sliding window' is the set of sequence numbers equal to one-half the total 4 byte range (2^{31} or 2,147,483,648), ending with the sequence number of the previous packet. Each time the current sequence number increments, the 'sliding window' moves incrementally. For example, the total range is 4,294,967,296 numbers, and if the current sequence number received is 3,800,000,000 then the 'sliding window' would have started with sequence number 1,652,516,352 (3,800,000,000 minus 1/2 of the total range). When the current sequence number is less than the value of the previous packet's sequence number, but lies within the 'sliding window' range of numbers, it is a Reverse Sequence Error.

Image: Reserve Sequence Error, Examples



Standard Sequence Checking

When standard Sequence Checking Mode is chosen, the right-hand side of the **Receive Mode** tab is shown in *Image: Sequence Checking Mode (shown for a Gigabit module)*, with the Sequence Checking sub-tab.

Image: Sequence Checking Mode (shown for a Gigabit module)

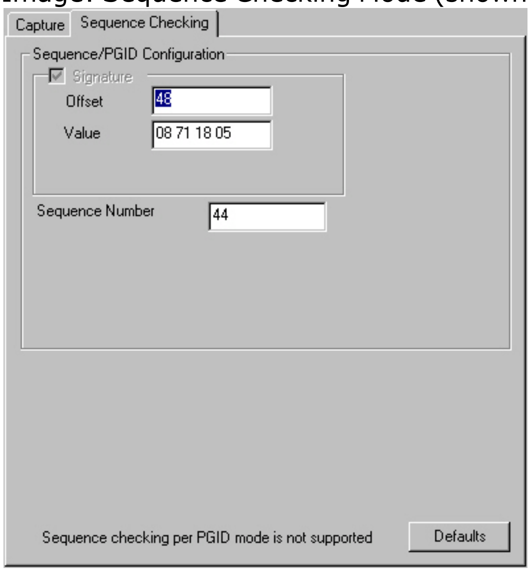
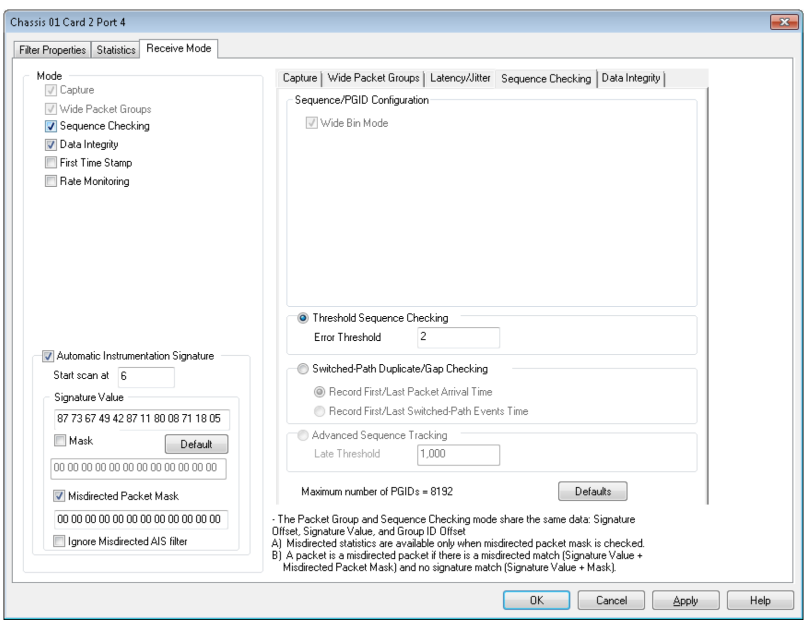


Image: Sequence Checking Mode (shown for QSFP-DD and CFP8 modules)



NOTE **The Sequence Checking** tab for CFP8 and QSFP-DD load module has similar properties.

Sequence checking is used to verify that packets are received in the correct order. Refer to the Sequence Checking Operation section in the 'Theory of Operation: General' chapter in the *Ixia*

Platform Reference Manual for additional information. The fields and controls in this sub-tab are described in *Table: Sequence Checking Configuration*.

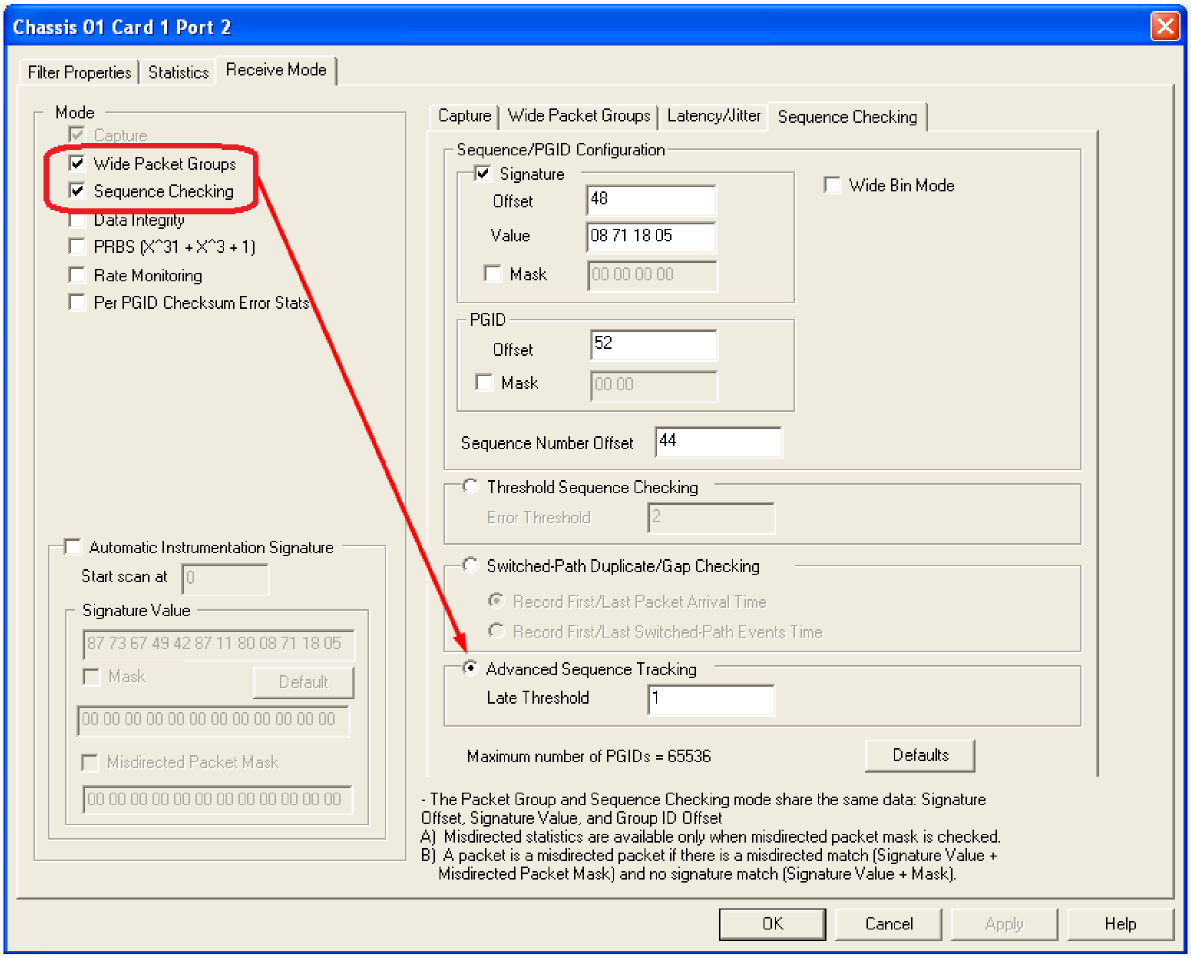
Table: Sequence Checking Configuration

Section	Field/Control	Description
Sequence/PGID Configuration	Signature Offset	The offset within the packet where the 4-byte signature will be found.
	Signature Value	The actual 4-byte value matched against for a signature.
	Group ID Offset	The offset within the packet where the 2-byte packet group ID will be found.
	Sequence Number Offset	The offset within the packet where the 4-byte sequence number will be found.
	Defaults	Resets the signature offset, value and group ID offset to default values.

Advanced Sequence Tracking

When **Wide Packet Groups** and **Sequence Checking** check boxes are selected in the **Receive Mode** port, the **Advanced Sequence Tracking** option is made available in the **Sequence Checking** tab. This mode allows to track a frame by five new statistics.

Image: Sequence Tracking Mode (shown for a LSM XMVDC16 module)



The fields and controls are described in the following table.

Table: Advanced Sequence Tracking Configuration

Section	Field/Control	Description
Advanced Sequence Tracking	Late Threshold	A fixed value that sets a threshold to track the expected sequence value. The Late Threshold value is subtracted from the expected sequence number when the received sequence numbers are less than the late threshold value. Default value is 1. Maximum value is 65535. NOTE For information on the additional statistic options to track a frame, *Wide Packet Groups/Sequence Checking—Advanced Sequence Tracking.*

Supported Load Modules

Advanced Sequence Tracking support is available for the load modules. The names of the load modules along with the sequence tracking statistics are provided in the following table.

Image: Advanced Sequence Tracking Statistics

Counter	Normal Mode	Sequence Tracking Mode
10/100/1000 LSM XMVDC16		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
10/100/1000 LSM XMVDC12		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
10/100/1000 LSM XMVDC8		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
10/100/1000 LSM XMVDC4		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits

Counter	Normal Mode	Sequence Tracking Mode
10/100/1000 LSM XMVAE16		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
Xcellon-Ultra XP		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
Xcellon-Ultra NP		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
FlexAP1040SQ		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
FlexAP10G16S		
	Small Error, 32 bits	In Order Packets, 32 bits

Counter	Normal Mode	Sequence Tracking Mode
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
NGY-NP8		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
XM100GE4CXP		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
XM100GE4CXP + FAN		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
XM40GE12QSFP + FAN		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits

Counter	Normal Mode	Sequence Tracking Mode
		Late Packets, 32 bits
		Lost Packets, 32 bits
XM10/40GE12QSFP + FAN		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
XM10/40GE06QSFP + FAN		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
XM100GE4CFP4		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
XM100GE4QSFP28		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits

Counter	Normal Mode	Sequence Tracking Mode
XM100GE4CFP4 + ENH		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
XM100GE4QSFP28 + ENH		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
XMR10GE32SFP + FAN		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
XMR10GE16SFP + FAN		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
XMR10GE32SFP + FAN + 40G		
	Small Error, 32 bits	In Order Packets, 32 bits

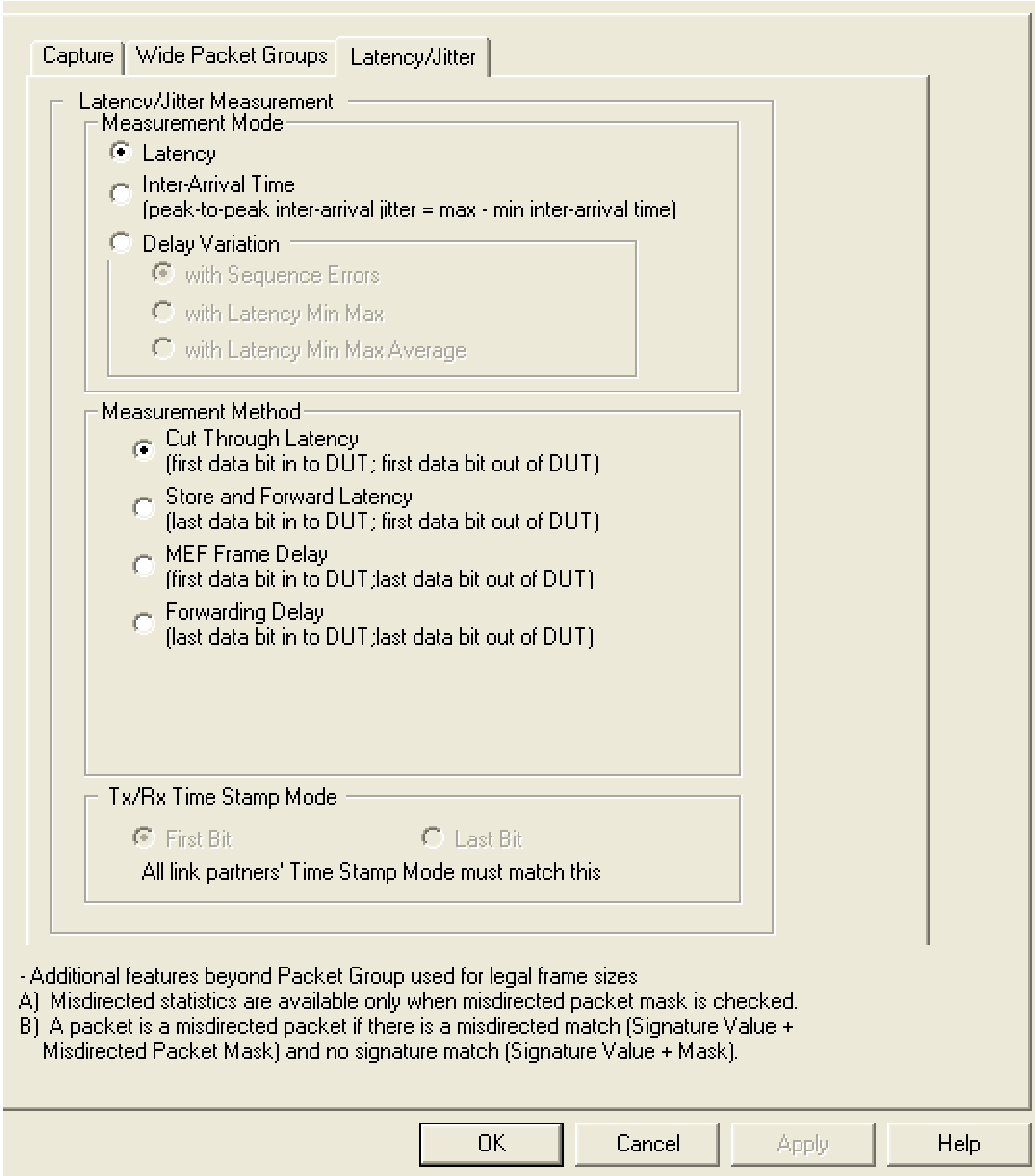
Counter	**Normal Mode**	**Sequence Tracking Mode**
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
XMR10GE16SFP + FAN + 40G		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
XMR40GE12QSFP+		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
XMR40GE6QSFP+		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits
XM10/40GE12QSFP + FAN +10G		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits

Counter	Normal Mode	Sequence Tracking Mode
		Late Packets, 32 bits
		Lost Packets, 32 bits
XM10/40GE06QSFP + FAN +10G		
	Small Error, 32 bits	In Order Packets, 32 bits
	Big Error, 32 bits	Reordered Packets, 32 bits
	Reverse Error, 32 bits	Duplicate Packets, 32 bits
		Late Packets, 32 bits
		Lost Packets, 32 bits

Latency/Jitter

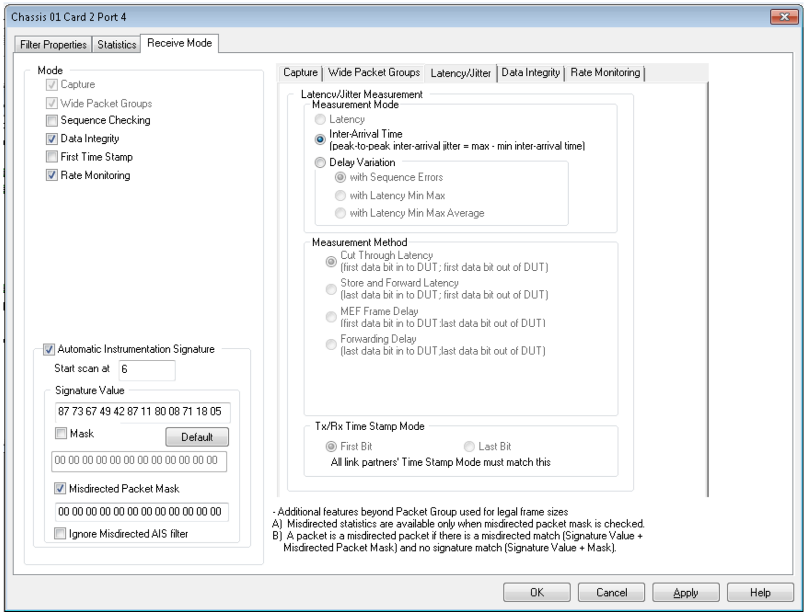
When the Latency/Jitter mode for Lava is chosen, the right-hand side of the **Receive Mode** tab is as pictured in *Image: Latency/Jitter (for Lava)*, with the **Data Integrity** sub-tab.

Image: Latency/Jitter (for Lava)



The **Latency/Jitter** tab for QSFP-DD and CFP8 load module is shown in the following image:

Image: Latency/Jitter (for QSFP-DD) and CFP8



NOTE The **latency/Jitter** tab for the CFP8 and QSFP-DD has similar properties.

The fields and controls in the Latency/Jitter sub-tab are described in *Table:Latency/Jitter Configuration*.

Table:Latency/Jitter Configuration

Section	Field/Control	Description
Measurement Mode	Latency	
	Inter-Arrival Time	
	Delay Variation	
Measurement Method	Cut Through Latency (first data bit in to DUT; first data bit out of DUT)	First data bit in to first data bit out. If selected, the interval between the first data bit out of the Ixia transmit port and the first data bit received by the Ixia receive port is measured.
	Store and Forward latency (last data bit in to DUT; first data bit out of DUT)	Last data bit out to first data bit in. If selected, the interval between the last data bit out of the Ixia transmit port and the first data bit received by the Ixia receive port is measured.

Section	Field/Control	Description
		NOTE Store and Forward latency mode is intended to test Store and Forward switching devices, which receive the entire packet before transmitting it to its destination. If Store and Forward latency is used in loopback, back-to-back or without a Store and Forward switch, then either a zero latency or very high latency will be reported.
	MEF Frame Delay	
	Forwarding Delay	
Tx/Rx Time Stamp Mode	First Bit	
	Last Bit	

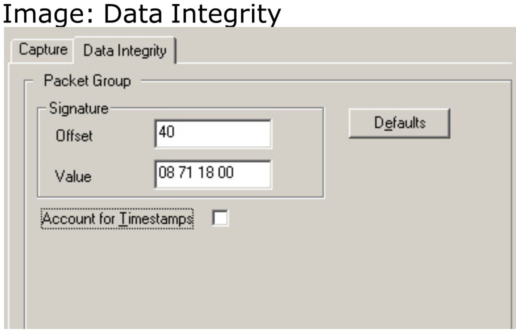
Data Integrity

If selected, the port is set to Data integrity mode, in which packets are matched according to a signature, and then an embedded CRC-16 checksum is selected against the data.

NOTE Only a limited number of load modules support the use of Data Integrity and Wide Packet Mode simultaneously (that is, OC-192c load modules).

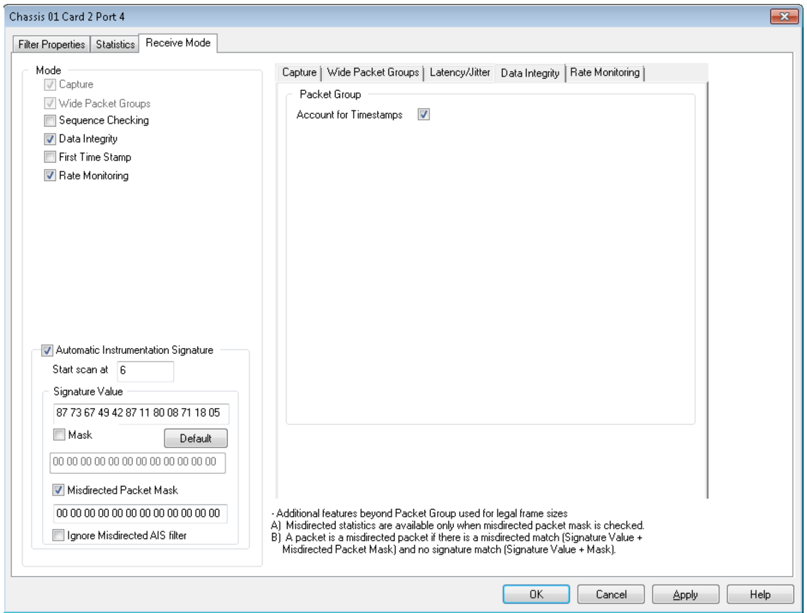
When the Data Integrity mode is chosen, the right-hand side of the **Receive Mode** tab is as pictured in *Image: Data Integrity*, with the **Data Integrity** sub-tab.

Image: Data Integrity



The **Data Integrity** tab for QSFP-DD and CFP8 is shown in the following image:

Image: Data Integrity for QSFP-DD and CFP8



NOTE The **Data Integrity** tab for the CFP8 and QSFP-DD load module has similar properties.

The fields and controls in the **Data Integrity** sub-tab are described in *Table: Data Integrity Configuration*.

Table: Data Integrity Configuration

Section	Field/Control	Description
Packet Group	Signature Offset	The offset from the beginning of the packet to the start of the data integrity signature value field.
	Signature Value	The 4-byte value to use as a signature value. Any value may be chosen, but it should be something that is unlikely to appear in 'normal' data, so it is easily recognized when viewing the captured data.
	Defaults	Restores the Data Integrity default settings.
	Account for Timestamps	When selected, the port does not look at the last two bytes of the payload for the data integrity checksum. Instead it looks for the checksum six bytes before the end of the payload to allow for the 48-bit timestamp at the end of the payload. NOTE For floating timestamps, the length of the timestamp is 4 bytes (32-bit) and it will be part of the Auto Instrumentation header, not at the end of the payload. **Auto Instrumentation** Tab for Ethernet Modules.

PRBS Mode

When the Receive Mode is set to Pseudo Random Binary Sequence (PRBS) mode, both Wide Packet Groups and Sequence Checking are automatically enabled. In PRBS mode, all latency-related statistics are removed and the following per-PGID statistics are added:

- PRBS Bits Received
- PRBS Errored Bits
- PRBS BER

For detailed information, see PRBS Mode.

Wide Packet Groups

The *Wide Packet Groups* sub-tab for modules is shown in *Image: Wide Packet Groups—10/100/1000 Ethernet/ATM Modules*, and *Image: Wide Packet Groups—10GE Modules for 10GE modules*. When Wide Packet Groups mode is enabled, Instantaneous Latency, Sequence Checking, and First and Last Timestamps, and Data Integrity are available, but not Latency over Time. A frame less than 64 bytes long is invalid in this mode.

NOTE	Only a limited number of load modules support the use of Wide Packet Mode and Data Integrity simultaneously (that is, OC-192c load modules).

Certain modules have an additional *Inter-Arrival Jitter* option available on the *Latency/Jitter* sub-tab when using Wide Packet Groups. See Wide Packet Group Inter-Arrival Jitter for more information.

When the Wide Packet Groups feature is enabled, the Latency View for this port is modified to show the First Timestamp and Last Timestamp. See Wide Packet Groups for additional information on Wide Packet Groups implementation in the Latency View for the port.

The use of the PGID Mask is shown in *Image: Wide Packet Groups—Group ID Mask*. Note that in this example, 17 bits are used for the Wide Packet Group Mask. However, not all modules are limited to only 17 bits.

Image: Wide Packet Groups—Group ID Mask

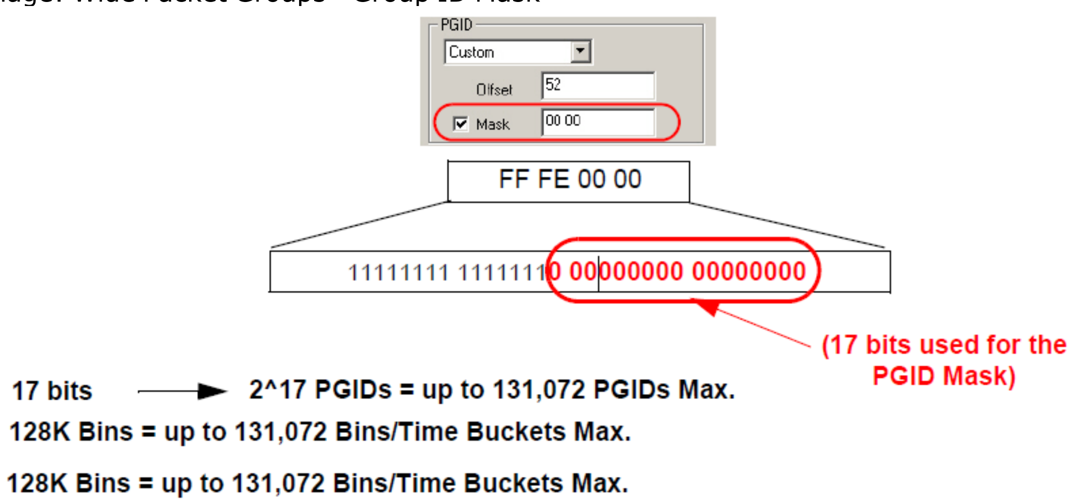


Image: Wide Packet Groups—10/100/1000 Ethernet/ATM Modules

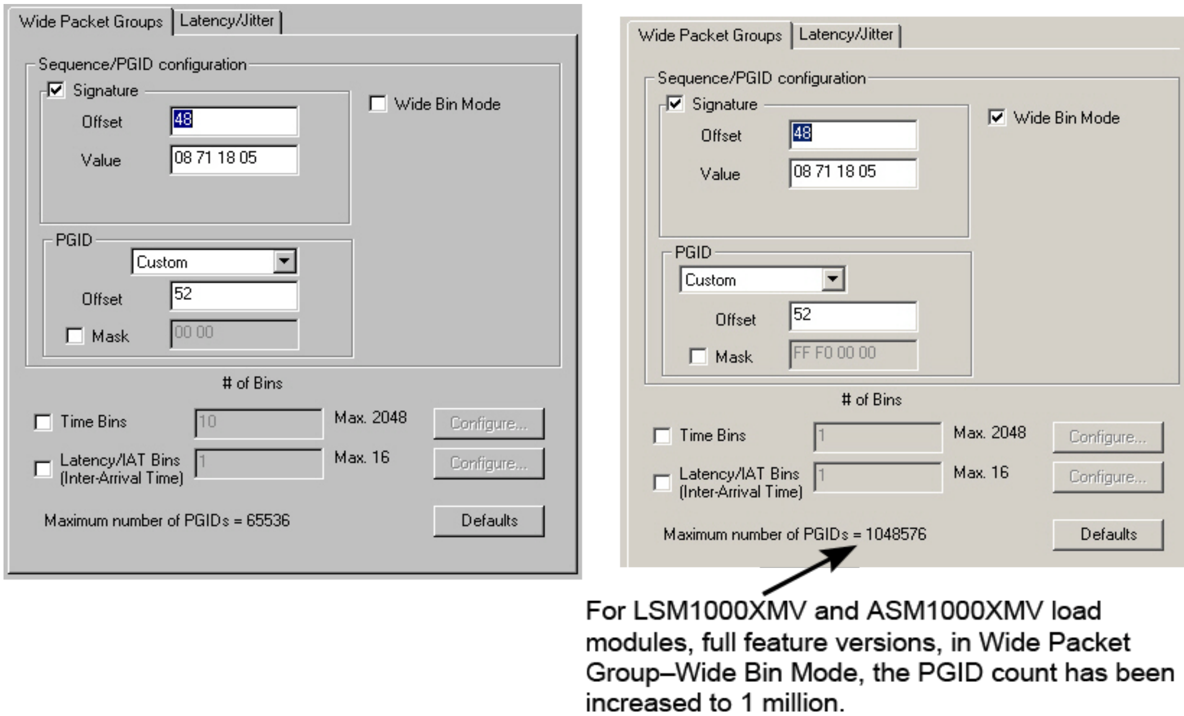


Image: Wide Packet Groups—10GE Modules

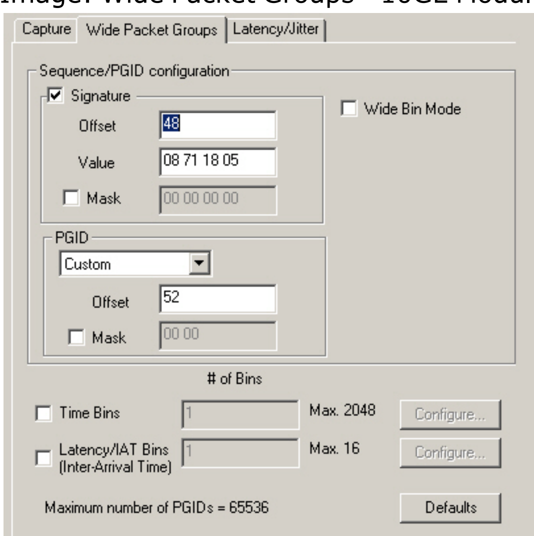
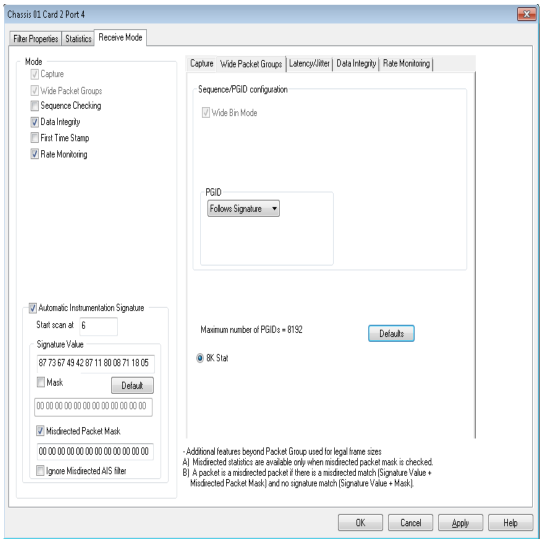


Image: Wide Packet Groups—QSFP-DD and CFP8 Modules



NOTE The Wide Packet Groups tab for the CFP8 and QSFP-DD load module has similar properties.

The fields and controls in the *Wide Packet Groups* sub-tab are described in *Table: Wide Packet Groups Configuration*.

Table: Wide Packet Groups Configuration

Section	Field/Control	Description
Sequence/PGID Configuration Signature	Signature (check box)	If cleared, the *Signature Offset* and *Signature Value* fields will be disabled (dimmed). This allows ALL packets to be measured for real-time latency, not just those which contain a specified signature.
	Signature Offset	(in bytes) The offset from the beginning of the packet to the start of the data integrity signature value field.
	Signature Value	The 4-byte value to use as a signature value. Any value may be chosen, but it should be something that is unlikely to appear in 'normal' data, so it is easily recognized when viewing the captured data.
	Signature Mask (check box)	When selected, the bit mask used for masking the value in the *Signature* field.
PGID	(pull-down menu)	Select a PGID mode: • Custom • DSCP • IPv6 Traffic Class • MPLS Exp • Split If any option besides *Custom* is selected, the configurable

Section	Field/Control	Description
		fields are dimmed (they are pre-set to the selected protocol option). If **Split** is selected, then a **Config** button appears that allows to configure the split PGID. Split PGIDs for more information. NOTE If one of the preset options is selected, it assumes that there is no header information (such as MPLS, GRE, VLAN, and so forth) on the received packet. It looks for the PGID at the preset offset. If such headers are used in the received packet, the PGID offset must be manually adjusted to the correct setting using the *Custom* option.
	Offset	(in bytes) The offset, from the beginning of the packet, where the packet Group ID will be found.
	Mask	If selected, the packet Group ID will be masked. If the mask bit = 0, the corresponding bit in the PGID will be used. If the mask bit = 1, the corresponding bit in the PGID will be masked with a '0.'
Wide Bin Mode	(check box)	(Not available on all modules.) If selected, the 128K Bin mode will be used, where up to 128K PGID bins (time buckets) can used for grouping PGIDs. The maximum length of the Group ID will be increased from 16 to 17 bits. This 17 bit maximum does not apply for the LSM and MSM family of modules.
Time Bins	(check box)	(Not available on all modules.) Selecting this check box activates the Time Bins feature, which can be configured by selecting the *Configure* button. Time Bins are discussed in Wide Packet Mode Latency/IAT Bins. The field to the right of this check box allows to set the number of Time Bins to create.
Latency/IAT Bins (Inter-Arrival Time)	(check box)	(Not available on all modules.) Selecting this check box activates the Latency/IAT feature, which can be configured by selecting the *Configure* button. are discussed in *Wide Packet ModeLatency/IAT Bins on. The field to the* right of this check box allows to set the number of Latency/IAT Bins to create.
Defaults		Restores the default settings for this sub-tab.

Wide Packet Mode Latency/IAT Bins

All 10/100/1000, 10 Gigabit Ethernet, and ATM load modules have an added Latency/IAT Bin feature. This allows for greater granularity in collecting latency statistics. Latency/IAT Bin controls set the granularity of the latency or Inter-Arrival Time (IAT) to be monitored (called Latency/IAT Bins).

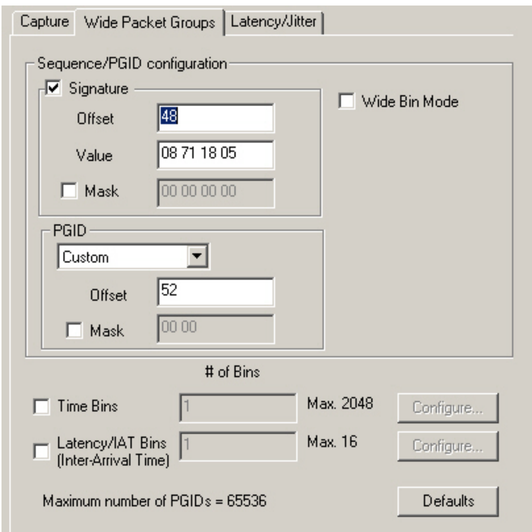
Additionally, the 10/100/1000 Ethernet, LSM, MSM, and LM622 ATM/POS modules have a Time Bin feature, which sets the number of time buckets (bins) and the durations of the buckets.

You can set up to 2048 Time Bins and up to 16 Latency/IAT Bins.

NOTE For a complete explanation of Time Bins, see the Time Buckets explanation in Latency Type Tab. The differences between Time Bins and Time Buckets are noted there.

Image: Wide Packet Groups—10GE Modules shows the added Latency/IAT Bin controls for 10/100/1000 and 10 Gigabit Ethernet load modules.

Image: Wide Packet Groups—10GE Modules



Over the set number of Time Bins configured, Latency ranges are specified and grouped into Latency/IAT Bins. All latency times recorded are separated into the Bin range in which the time falls.

Most of the controls on the *Wide Packet Groups* sub-tab are described in *Table: Wide Packet Groups Configuration*. The added Latency/IAT Bin configuration options are described in *Table :Latency Bin Configuration Controls below*.

Table: Latency Bin Configuration Controls

Field/Control	Description
Time Bins	Set the number of Time Bins for the latency test. The maximum number is 2048. The higher the number of Time Bins, the lower the number of Packet Group Identifications (PGIDs) that can be assigned to a single Time Bin.
Latency/IAT Bins	Set the number of latency bins for the latency test. The maximum number is 16.

Field/Control	Description
Configure (Time Bins)	Opens the *Time Bins* dialog box, which allows the configuration of time bins, as described in Time Bins Configuration.
Configure (Latency/IAT Bins)	Opens the *Latency Bins* dialog box, which allows the configuration of latency bins, as described in Latency/IAT Bins Configuration.

For information on running a latency test using the Latency/IAT Bins, see Packet Group Statistic View.

Time Bins Configuration

Time Bins are used as time divisions in a latency test. Time Bins are given specific time values, each of which are added together to make up the entire test time. Each Time Bin can be assigned a set number of Packet Group identification (PGID) numbers, depending on the number of Time Bins. The greater the number of Time Bins, the less PGIDs can be assigned per Time Bin.

Time bins are available on all 10/100/1000 Ethernet, LSM, MSM, and LM622 ATM/POS modules.

NOTE For more detailed information on Time Bins, see Latency/IAT Bins Configuration . Time Bins are identical to Time Buckets in function.

The *Time Bins* dialog box is shown in *Image: Time Bins dialog box*.

Image: Time Bins dialog box

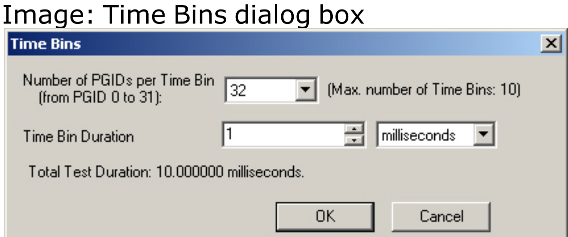


Table: Time Bin Configuration defines the Time Bin configuration controls.

Table: Time Bin Configuration

Field/Control	Usage
Number of PGIDs per Time Bin	Select the number of PGID's to be processed per time bin from the list.
Max. Number of Time Bin	The total number of time buckets to be used. (The maximum number of Time Bins available is indicated as a comment that appears next to the *Number of PGIDs per Time Bucket* field.)
Time Bin Duration	The time duration of each time bin. Units of time available are: • microseconds • milliseconds • seconds

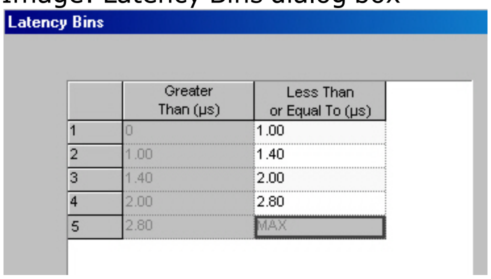
Field/Control	Usage
	• minutes • hours

Latency/IAT Bins Configuration

Latency/IAT Bins allow for a more granular look at latency times in a test. Each bin is assigned a latency range in microseconds (for example, greater than 0 to less than or equal to 1). Each latency time recorded is put into a bin based on whether or not it falls into that bin's range.

The *Latency Bins* dialog box is shown in *Image: Latency Bins dialog box*.

Image: Latency Bins dialog box



For example, using *Image: Latency Bins dialog box* above, a latency time of 1.5 microseconds would be classified into Bin 3, and a latency time of 2.2 microseconds would be classified into Bin 4.

The controls in the *Latency Bins* dialog box are described in *Table: Latency Bin Configuration*.

Table: Latency Bin Configuration

Field/Control	Usage
Greater Than (us)	The lower limit of the Latency/IAT Bin, in microseconds. The latency value must be greater than this number to be included in this Latency/IAT Bin. The Latency/IAT Bin number is shown on the far left.
Less Than or Equal To (us)	The upper limit of the Latency/IAT Bin, in microseconds. The latency value must be less than or equal to this number to be included in this Latency Bin. The Latency/IAT Bin number is shown on the far left. This number can be changed by selecting the field and manually typing in a new value. The new value automatically becomes the Greater Than limit for the next Latency/IAT Bin.

Split PGIDs

Splitting the PGID allows the 32-bit PGID field (used to identify and group packets) to be generated from a concatenation of three separate PGID fields. Instead of having one PGID offset value with one mask, you are allowed to enter up to three separate PGID offsets and masks.

This feature is accessed in the Wide Packet Group mode of the **Receive Mode** tab.*Image: Split PGID Configuration* shows the **New Split PGID Configuration** dialog box.

Image: Split PGID Configuration

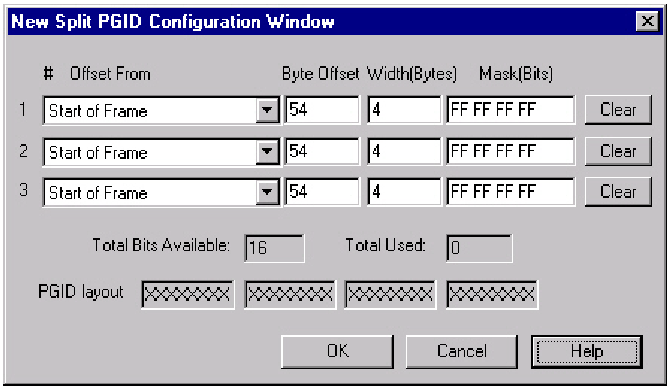


Table: Split PGID Configuration describes the configuration options of the **New Split PGID Configuration** dialog box.

Table: Split PGID Configuration

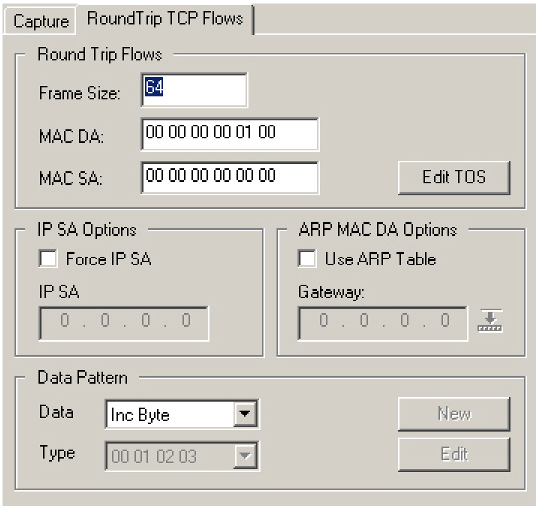
Field/Control	Description
# Offset From	Where in the packet to start the offset for the PGID split section.
Byte Offset	The offset, in bytes, from the starting point set in **# Offset From**.
Width (Bytes)	The number of bytes in the PGID split section.
Mask (Bits)	The PGID mask bits.
Clear	Sets the values of the PGID split section back to their defaults.
Total Bits Available	Remaining bits available for use in the configured split PGID. This number decreases as each split segment is configured.
Total Used	The number of bits used.
PGID Layout	The current configuration of the PGID.

Round Trip TCP Flows

If selected, a port is configured to reflect a received packet with modifications. Only cards supporting 10 or 100 Mbps can be configured for this option. Refer to the Round Trip TCP Flows section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual* for more information.

When Round Trip TCP Flows (RTF) mode is chosen, the right-hand side of the **Receive Mode** tab is as pictured in , with the *Round Trip TCP Flows* sub-tab.

Image: Round Trip TCP Flows



The fields and controls in the *Round Trip TCP Flows* sub-tab are described in *Table: Round Trip TCP Configuration*.

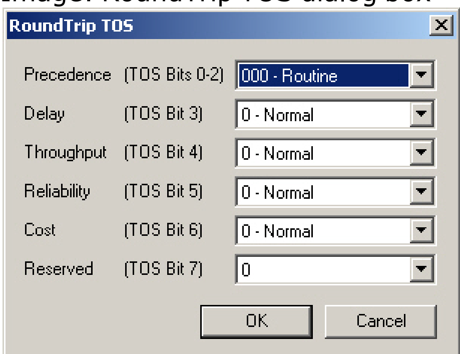
Table: Round Trip TCP Configuration

Section	Field/Control	Description
Round Trip Flows	Frame Size	The frame size for outbound reflected packets.
	MAC DA	The destination MAC address used for outbound reflected packets.
	MAC SA	The source MAC address used for outbound reflected packets. This may be overridden through the settings in the *ARP MAC DA Options* category.
	Edit TOS	By checking this box, the *RoundTrip TOS* dialog box appears. This controls the TOS byte used for reflected packets.
IP SA Options	Force IP SA	By checking this box, the IP address within the packet may be forced for outbound reflected packets.
	IP SA	If the *Force IP SA* box is selected, this address is used in the outbound packet contents.
ARP MAC DA Options	Use ARP Table	Instead of using the constant value in the *MAC DA* field above, a value looked up in the ARP table may be used. Check this box to enable this feature.
	Gateway	The gateway IP address is ARP'd to set the MAC DA.
Data Pattern		Allows for the specification of the background data pattern. The selections and usage is identical to the **Frame Data** tab. Refer to Data Pattern Box.

RoundTrip TOS dialog box

When the *Edit TOS* button is selected, the *RoundTrip TOS* dialog box appears, as shown in *Image: RoundTrip TOS dialog box*.

Image: RoundTrip TOS dialog box



The fields and controls in this dialog box, based on the Type of Service (TOS) bits in the IP header, are described in *Table: Round Trip TOS dialog box fields*.

Table: Round Trip TOS dialog box fields

Field/Control	Description
Precedence (TOS Bits 0-2)	Choose one of: • 000 - Routine • 001 - Priority • 010 - Immediate • 011 - Flash • 100 - Flash Override • 101 - CRITIC/ECP • 110 - Internet Control • 111 - Network Control
Delay (TOS Bit 3)	Choose one of: • 0 - Normal • 1 - Low
Throughput (TOS Bit 4)	Choose one of: • 0 - Normal • 1 - High

Field/Control	Description
Reliability (TOS Bit 5)	Choose one of: • 0 - Normal • 1 - High
Cost (TOS Bit 6)	Choose one of: • 0 - Normal • 1 - Low
Reserved (TOS Bit 7)	Choose one of: • 0 • 1

First Time Stamp

First Time Stamp is a timing option which is not used in this release of IxExplorer. It is provided in Ixia's IxAutomate (previously IxScriptmate) application. If the box is selected, it reflects a setting which was made in IxAutomate, and this option can be disabled by selecting the *First Time Stamp* check box in the **Receive Modes** tab.

This option is available on TX8 and TXS8 10/100 Ethernet Modules.

ISL Encapsulation

By enabling the ISL Encapsulation option, the receiving port is set to receive packets which are in the proprietary Cisco ISL encapsulation mode.

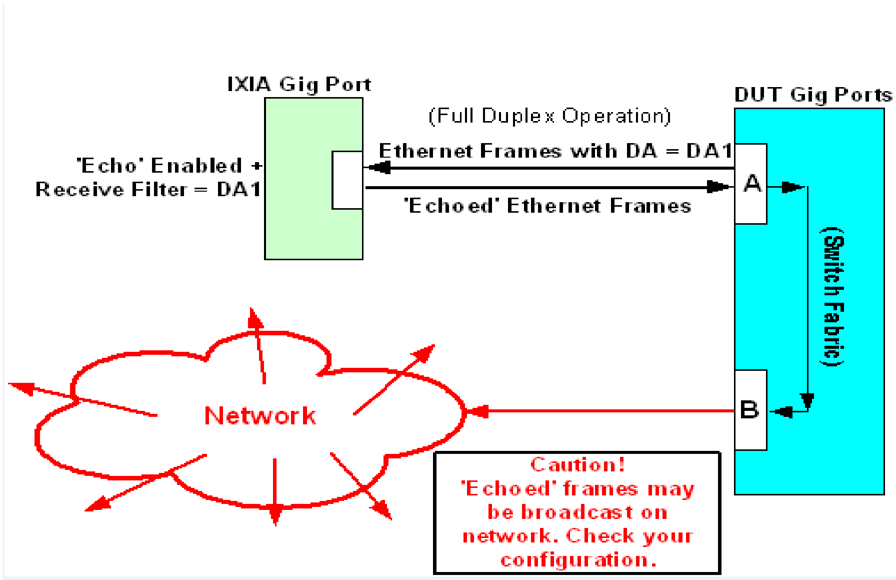
Echo

Before selecting the *Echo* check box in the **Receive Mode** tab for a gigabit module, read the following warning.

The following warning message is issued when Echo is selected in the Transmit Modes or **Receive Mode** tab: 'Setting this mode on a live network may cause severe problems. All ethernet frames with a DA which matches the Receive Filter DA1 will be 'echoed' back onto the network. Setting this mode will IMMEDIATELY start echoing packets. Are you sure you want to set Echo Mode? Yes or No.'

The gigabit TXS modules (10/100/1000 TXS4 and TX4, 1000 SFPS4 and SFP4, and 10/100/1000 STXS24 and STX24), Gigabit, GBIC, and Copper 10/100/1000 (running in Gigabit mode) load modules offer an additional feature—Layer 2 Echo. This feature operates in conjunction with gigabit rates in full duplex mode, for testing Ethernet loopback mode at up to wire speed. A diagram for the Echo feature is shown in *Image: Gig Echo Diagram*.

Image: Gig Echo Diagram



The transmitting side (the DUT) sends simple Ethernet frames. The minimum valid length of an incoming frame is 16 bytes, which includes the MAC DA, MAC SA, and CRC. A preamble of at least 8 bytes must precede the incoming Ethernet frame. The minimum length of a valid incoming frame is 16 bytes (for DA + SA + CRC).

When the frames are received, the MAC DA and MAC SA will be swapped, a standard 8-byte preamble will be inserted for each echoed frame (no matter how long the preamble is on the received frame), and the CRC will be recalculated before the frame is echoed (retransmitted) back. If an incoming frame has a bad CRC, the frame will be retransmitted with a bad CRC. To control the amount of traffic echoed back onto the network, the receiving port will echo ONLY received frames which match a specified DA1 (Destination Address) set to act as a receive filter. DA/SA Values for additional information.

The Echo feature will support VLAN-encapsulated Ethernet or SNAP Ethernet frames. Transmit Modes for Gigabit Modules for additional information on setting the Transmit Mode to Echo for retransmitting the filtered packets.

DCC

Data Communications Channel (DCC) network management uses the embedded SONET/SDH Operation and Maintenance (OAM&P) channel to manage SONET/SDH networks and devices. The OAM&P channels carry management commands and information, plus alarms, over the OH bytes of the SONET frame. The bytes that make up the DCC channel are:

- For the Section-level DCC (192 Kbps)—D1 to D3 bytes in the Section overhead.
- For the Line-level DCC (576 Kbps)—D4 to D12 bytes in the Line overhead.

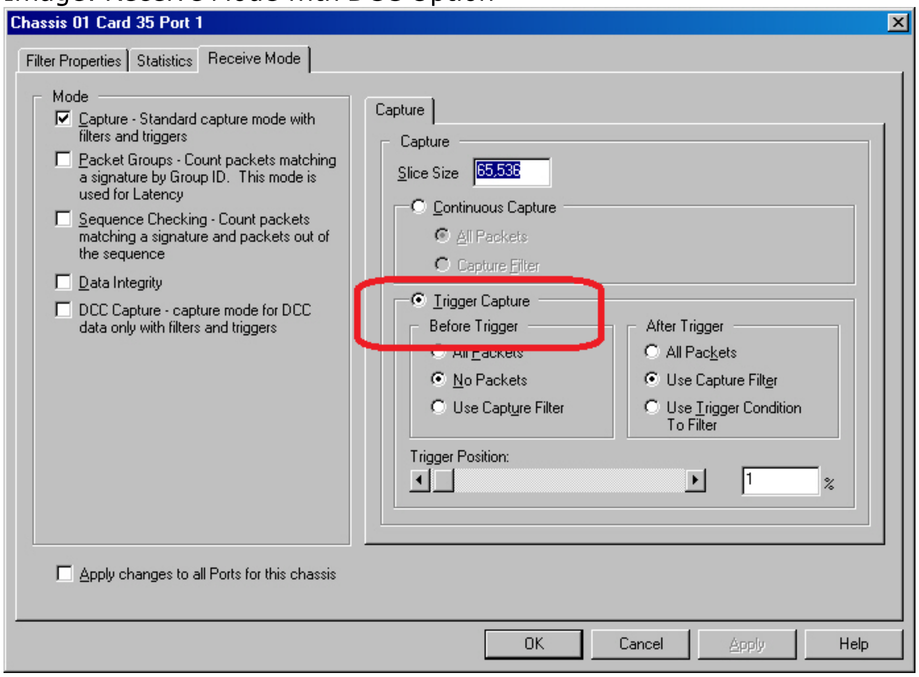
This feature provides access from a remote management workstation to network devices for uses such as:

- Collection of network management information, including alarms
- Remote configuration
- Remote troubleshooting

When control messages are sent from a workstation to a network device through an Ethernet link, it is called 'out-of-band.' When the control messages are sent through the overhead bytes of the SONET frames, it is called 'in-band.'

The **Receive Mode** tab for an OC-192c POS module, with the optional DCC feature, is shown in *Image: Receive Mode with DCC Option*.

Image: Receive Mode with DCC Option



If the Transmit Mode for the OC-192c POS port has been set to DCC Packet Streams or DCC Advanced Streams, enable the DCC option for capture of the DCC packets.

NOTE For protocols to work in DCC packet streams, this box MUST be selected. No protocols are supported in DCC flow modes.

If the Transmit Mode has been set to one of the dual-modes, transmitting DCC Packet Flows in addition to normal packet streams in the SPE payload, the packets in only one of the types of streams can be captured upon receipt. If the DCC receive mode is enabled, the normal (SPE) packets will not be captured. If the DCC receive mode is disabled, only the normal packets will be captured.

When the DCC receive mode is enabled, five DCC statistics appears in the Statistic View. See the 'Available Statistics' appendix of the *Ixia Platform Reference Manual*. for additional information.

Automatic Instrumentation Signature

The *Automatic Instrumentation Signature* option of the **Receive Mode** tab allows the receive port to look for a signature at a variable offset from the start of frames. The instrumentation block supports Sequence Checking, Latency, Data Integrity functionality, with signature and Packet Group ID (when *Automatic Instrumentation Signature* is enabled, these receive port options are enabled as well, unless manually disabled).

NOTE For QSFP-DD and CFP8 load modules the Automatic Instrumentation Signature check box is selected by default and cannot be cleared.

For more information on Automatic Instrumentation Signature, Instrumentation Box, and see the chapter titled 'Theory of Operation: General' in the *Ixia Platform Reference Manual*.

Image: Automatic Instrumentation Signature Sub-Tab shows the *Automatic Instrumentation Signature* sub-tab.

Image: Automatic Instrumentation Signature Sub-Tab

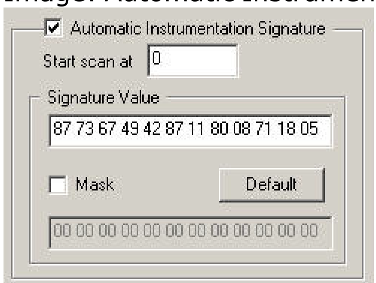


Image: Automatic Instrumentation Signature Sub-Tab for CFP8 400GE, QSFP-DD

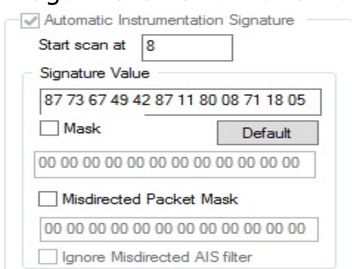
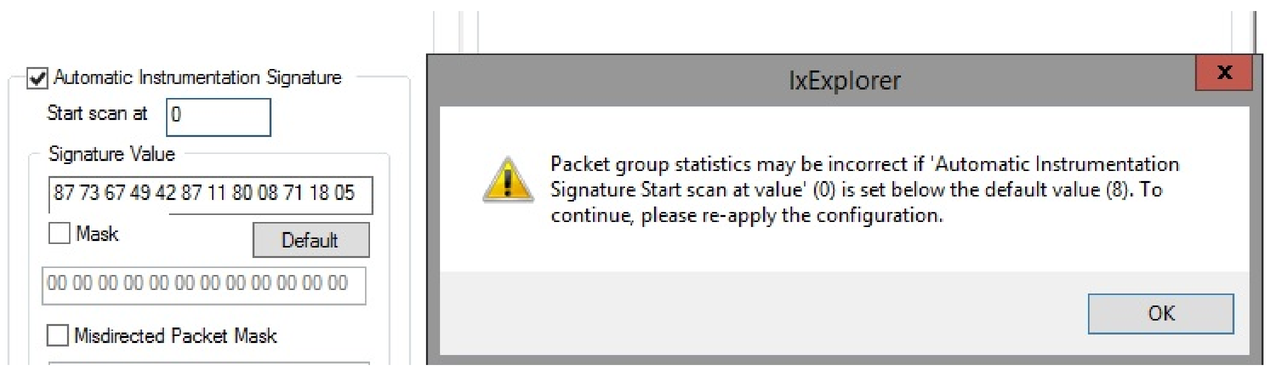


Image: Automatic Instrumentation Signature Sub-Tab Warning shows the dialog box seen when setting the Start scan at offset to values less than the default one.

Image: Automatic Instrumentation Signature Sub-Tab Warning



For more information on the prescribed default and minimum values, refer to the *Table: Automatic Instrumentation Signature Configuration* given below. This table explains the configuration options of the *Automatic Instrumentation Signature* sub-tab.

Table: Automatic Instrumentation Signature Configuration

Field/Control	Description
Start scan at	Indicates where to look in the packet for the instrumentation signature.

Field/Control	Description
	NOTE • For QSFP-DD 400G and 200G speed modes, default value is 8 and minimum value is 0. • For QSFP-DD 100G and 50G speed modes, default value is 6 and minimum value is 0. • For Novus QSFP28 100G and 40G speed modes, default value is 6 and minimum value is 0. • For Novus QSFP28 25G, 50G and 10G speed modes, default value is 0 and minimum value is 0. • For remaining load modules, both default and minimum values are 0.
Signature Value	The data signature that is being matched (12 bytes).
Mask (check box and data field)	The data signature mask.
Default	Select this button to reset the defaults.
Misdirected Packet Mask	Select this check box to make the misdirected packet statistics available.This is used to compare the signature value to a valid port ID to identify a misdirected packet.A packet is a misdirected packet if there is a misdirected match (Signature Value + Misdirected Packet Mask) and no signature match (Signature Value + Mask).
Ignore Misdirected AIS filter	This check box is available only when the **Misdirected Packet Mask** check box is selected.The Ignore Misdirected Packet statistics are available only when this check box is selected. Selecting the check box enables us to filter out misdirected packets and not forward them to the PCPU only when the LSB of the Tx Signature of the misdirected packet is 1.

Misdirected Packet Detection

All ports use the same signature to trigger the decision to analyze the packet for PGID information. For some load modules, the signature decision has been modified by using a subset of the signature to make the processing decision. If the packet should be processed, the remainder of the signature will be used to determine whether this packet is misdirectied and to increment a counter accordingly, or to proceed with PGID processing. Each Rx port has a separate counter for *Misdirected Packets Received*. See Appendix B *Available Statistics*, in the *Ixia Platform Reference Manual* for information about statistics for all load modules.

The following Ixia load modules can detect misdirected packets:

- LSM10GXM8 (all NGY family)
- LSM1000XMVx16
- ASM1000XMV12

The Automatic Instrumentation Signature block on the **Receive Mode** tab has added fields, as shown in Image: Automatic Instrumentation Signature, Misdirected Packets.

Image: Automatic Instrumentation Signature, Misdirected Packets

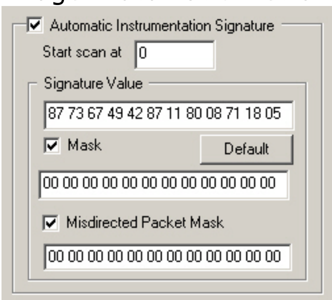


Table: Automatic Instrumentation Signature Configuration, Misdirected Packet explains the configuration options of the *Automatic Instrumentation Signature* sub-tab including the misdirected packet detection.

Table: Automatic Instrumentation Signature Configuration, Misdirected Packet

Field/Control	Description
Start scan at	Where to look in the packet for the instrumentation signature.
Signature Value	The data signature that is being matched (12 bytes).
Mask (check box and data field)	The data signature mask. Used to determine whether the packet is valid for PGID processing.
Defaults	Selecting this button resets the defaults.
Misdirected Packet Mask	check box and data field. Misdirected packet statistics are available only when this is selected. Used to compare the signature value to a valid port ID to identify a misdirected packet. A packet is a misdirected packet if there is a misdirected match (Signature Value + Misdirected Packet Mask) and no signature match (Signature Value + Mask).

Rate Monitoring

The Rate Monitoring *Receive Mode* enables testing convergence times and service interruption from the Ixia load modules.

Rate Monitoring mode is available in the following load modules:

- LSM10GXM family (NGY)
- LSM1000XMV family
- ASM1000XMV12X
- QSFP-DD-400GE+200G+100G+50G
- CFP8-400GE

When Rate Monitoring mode is selected, Wide Packet Groups is also automatically selected and Sequence Checking is automatically deselected. In Rate Monitoring mode, the only available Latency mode is Inter-Arrival Time.

The **Rate Monitoring** tab (*Image: Rate Monitoring Receive Mode*) contains two buttons:

- **View Threshold List**: shows the Threshold Value List, a list of the threshold values with their PGID ranges
- **Clear Threshold Timestamp**: sends a message to the Server to clear threshold timestamps.

It also contains a grayed-out check box **Rate Jitter Filtering**. This check box indicates whether Jitter Filtering has been enabled. It is not enabled using IxExplorer; rather it is enabled using the IxTclHal interface (see *packetGroupThresholdList* command, *enableJitterFilter* option). If enabled, then the Threshold Value List view will be altered. The Threshold value will be shown in packets, and an additional column labeled Filter Window (ns) is added, which appears in nanoseconds.

Two new statistics 'Below Threshold Timestamp' and 'Above Threshold Timestamp' are available when in Rate Monitoring mode. Rate Monitoring Mode.

Image: Rate Monitoring Receive Mode

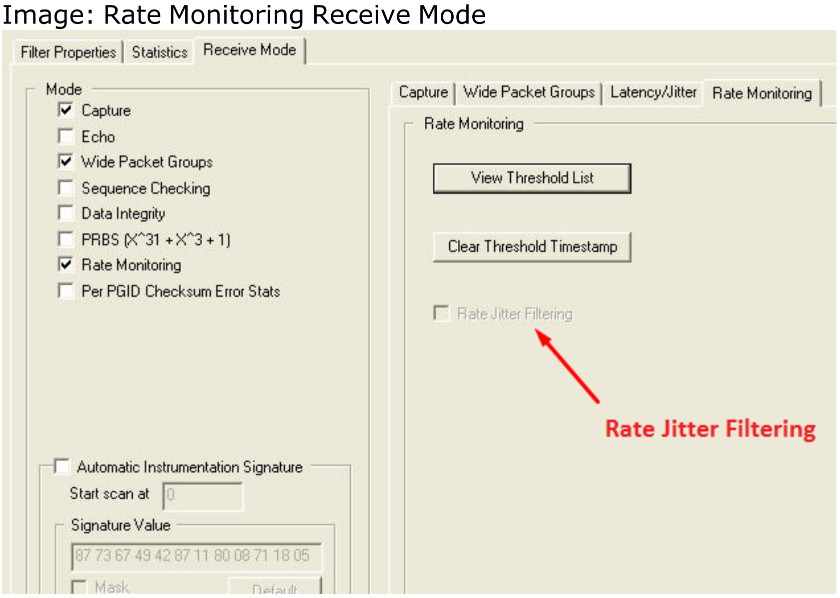


Table: Rate Monitoring Receive Mode

Field/Control	Description
View Threshold List	Shows a list of the threshold values with their PGID ranges
Clear Threshold Timestamp	Sends a message to the Server to clear threshold timestamps
Rate Jitter Filtering	(read-only) If enabled (using IxTclHal), the Threshold Value List will show Threshold in packets and Filter Window in nanoseconds.

Threshold Value List

Select the**View Threshold List** button to show the Threshold Value List.

Image: Threshold Value List

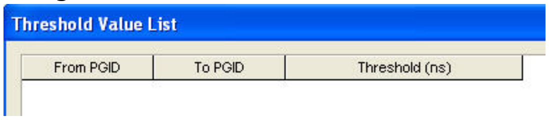


Table: Threshold Value List

Field/Control	Description
From PGID	the sequence number of the PGID at the start of the range.
To PGID	the sequence number of the PGID at the end of the range.
Threshold	if Rate Jitter Filtering is OFF, this number (in nanoseconds) is the threshold for the Inter-Arrival Time (latency) of a PGID or a range of PGIDs. If Rate Jitter Filtering is ON, its units become packets instead of nanoseconds.
Filter Window	(Only present if Rate Jitter Filtering is ON.) Specifies the filter window, in nanoseconds.

Per PGID Checksum Error Stats

The Per PGID Checksum Error Stats *Receive Mode* enables collection of per-flow checksum error statistics.

This mode is available in the following load modules:

- LSM10GXM family (NGY)
- LSM1000XMV family
- ASM1000XMV12X

If enabled, the following statistics will be included (in Packet Group Statistic View):

- IPv4 Checksum Errors
- UDP Checksum Errors
- TCP Checksum Errors

Delay Variation Measurement Mode

This mode in Receive properties enables the system to measure delay variation between consecutive frames that are not out of sequence. This measurement is sometimes called 'jitter' but since 'jitter' is used in this system to refer to inter-arrival time, the term 'delay variation' is used here to avoid confusion.

The following load modules support this mode:

- NGY LSM10GXM2/4/8 (all versions)
- LSM1000XMV4/8/12/16 (all versions)

- ASM1000XMV12X
- HSE40GETSP1 and HSE100GETSP1

Following Load modules have the support for High Time Stamp Resolution:

- NGY
- K2
- MK and
- Everest 40G

Image: INGY Module, Delay Variation Mode shows the Receive Mode page of an NGY standard 8-port module, with Wide Packet Group selected and the **Latency/Jitter** tab shown.

Image: INGY Module, Delay Variation Mode

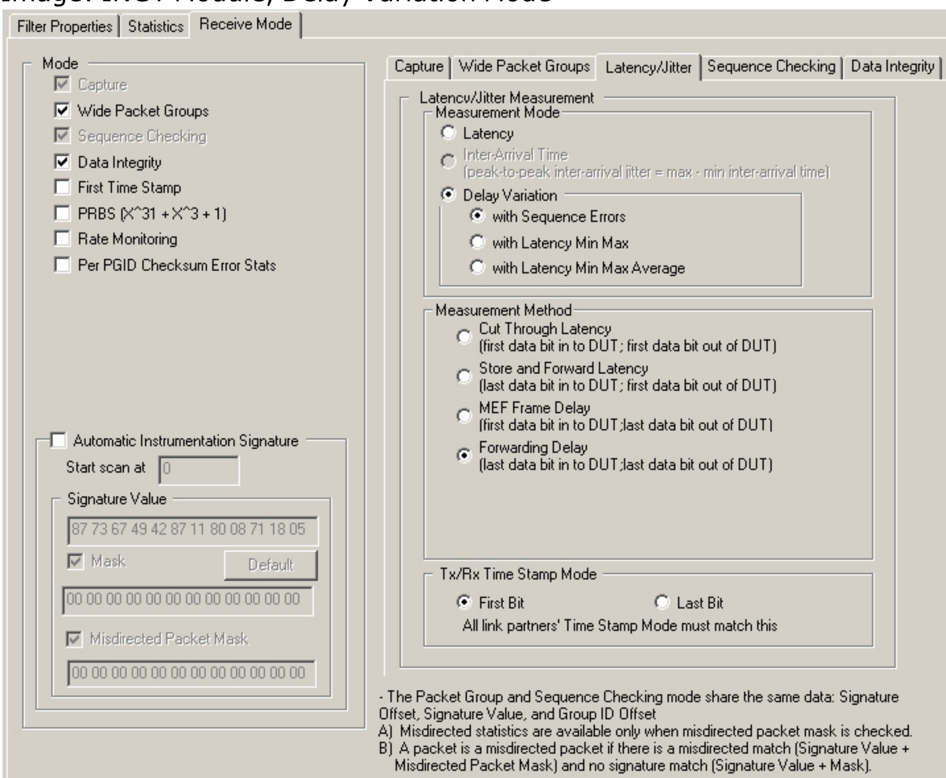


Table: Delay Variation Definitions provides definitions of terms for the delay variation mode.

The first configuration choice is what to measure (Measurement Mode). These options are available on the **Latency/Jitter** tab:

- Latency
- Inter-Arrival Time
- Delay Variation (select one of three types)
  - with Sequence Errors
  - with Latency Min/Max
  - with Latency Average

The delay measurement method defines which bit of the packet is used for time measurement. These delay measurement methods are defined:

- Cut through - (FIFO) first bit of transmit packet to first bit of receive packet
- Store forward - (LIFO) last bit of transmit packet to first bit of receive packet
- MEF - (FILO) first bit of transmit packet to last bit of receive packet
- Forwarding Delay - (LILO) last bit of transmit packet to last bit of receive packet.

Table: Delay Variation Definitions

Term	Description
Delay	the mathematical subtraction of the transmit time of a packet from the arrival time of the same packet.
Delay variation (DV)	the difference between the delays of two consecutive frames in a flow.
Min DV	The smallest of all delay variations measured for a specific flow from the start of statistic collection.
Max DV	The largest of all delay variations measured for a specific flow from the start of statistic collection.
Max-Min DV	The mathematical subtraction of Min DV from Max DV.
Average DV (ADV)	Boxcar average value of all the valid delay variations from the start of statistic collection. This is calculated by dividing the total sum of all DV by the number of received frames.
Short Term ADV	Boxcar average value of all the valid delay variations from the last time this value was read.

The Packete Group Statistic View shows the stats for Delay Variation, Delay Variation Measurement Mode.

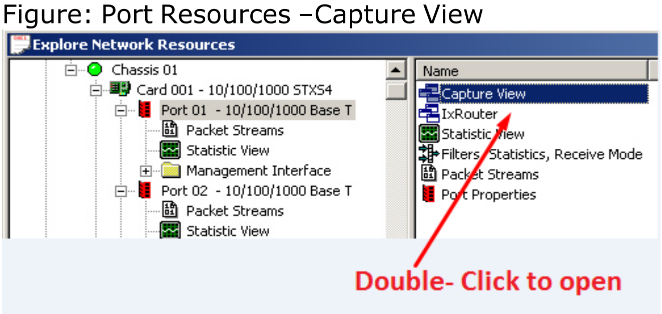
CHAPTER 14

Capture View

Capture View Window

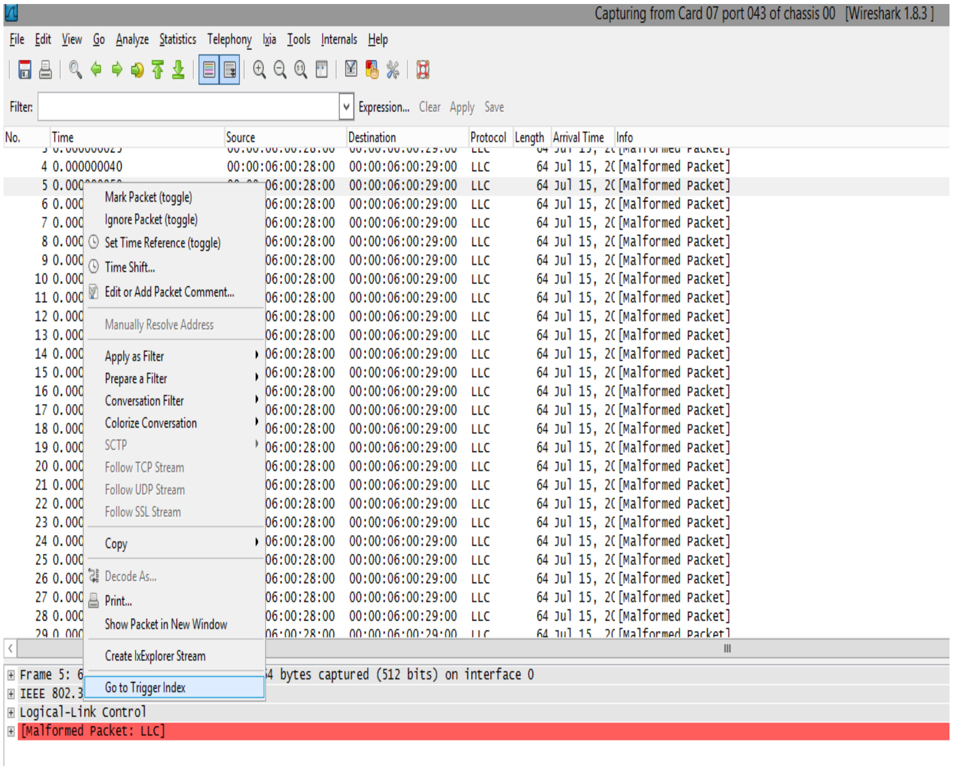
Capture View enables captured data to be viewed. Capture View is selectable from the Resource Details view when a port has been selected, as shown in *Figure: Port Resources Capture View*.

Figure: Port Resources –Capture View



The Capture Trigger and Capture Filter (as described in Capture Trigger and Capture Filter) for that port determine which packets are 'allowed' into the Capture View. The slice size of the port (see Configure Receive Mode(s)) sets the number of bytes captured and decoded for each packet. If the slice size is less than the packet length, not all of the packet will be available for review, analysis, and conversion. The timestamp, frame length, and status values for the packet are not affected by the slice size, however.

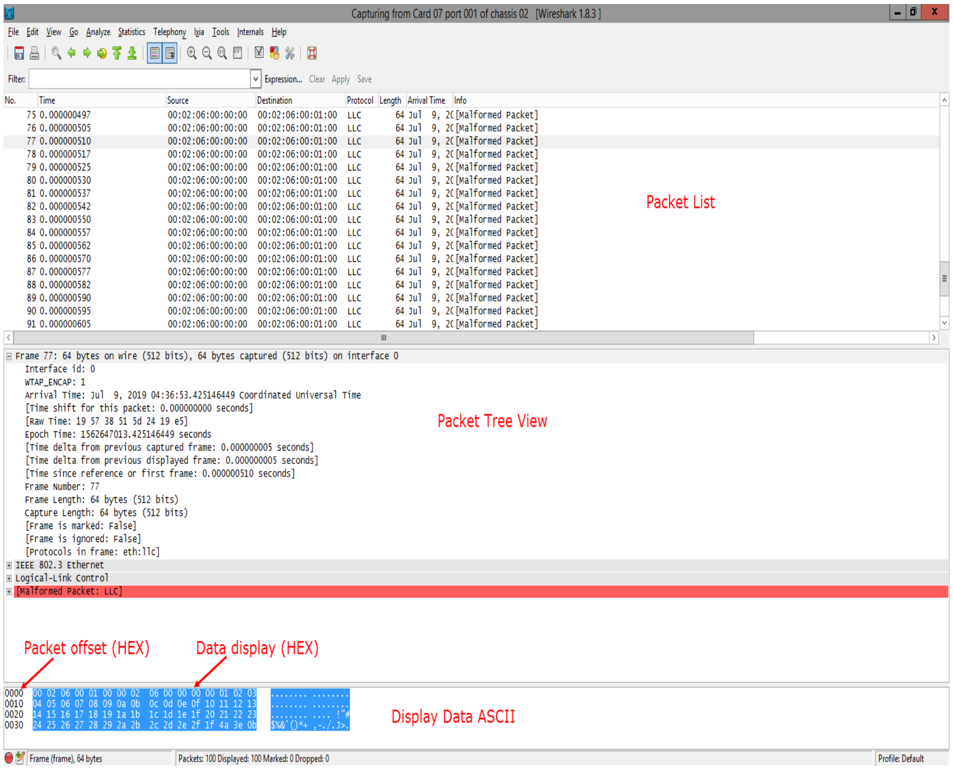
Figure: Go to Trigger Index



Refer to the *Port Data Capture Capabilities* section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual* for additional information on captured data.

The *Capture View* window has two variations, one for standard capture view and one for PRBS capture mode. The standard variation is shown in *Figure: Capture View Window–Standard Version*. The PRBS capture mode is shown in *Figure: Capture View dialog box–PRBS Version*.

Figure: Capture View Window–Standard Version



The standard *Capture View* window is split into panels, from top to bottom. These are described in *Table: Capture View dialog box Windows*.

Table: Capture View dialog box Windows

Window	Contents
Packet List (upper)	Packet List: A list that contains columns for a packet number, packet length, the destination address, the source address, timestamp data, and the error status of the frame. These fields are described in *Table: Capture View– Packet List Fields*.
Packet Tree View (lower)	Packet Tree View, expandable to show the parameters of the selected packet..
Hex and ASCII Data	Hexadecimal and ASCII byte view of the contents of the selected packet

Packet List

The top portion of the *Capture View* contains a summary view of each frame captured. The fields shown in this view are described in *Table: Capture View– Packet List Fields*.

Table: Capture View– Packet List Fields

Heading	Contents
Packet No.	The sequential frame number captured. Depending on the Capture Filter

Heading	Contents
	settings, these may not be sequentially received packets.
Packet Length	The length of the packet, in bytes. Ethernet II packets use this for the *Type* field, while 802.3 SNAP packets use this for the Length field.
Source MAC	The Source MAC Address, exclicked in hexadecimal.
Dest MAC	The Destination MAC Address, exclicked in hexadecimal.
Source IP	The Source IP that is configured for traffic in transmit side.
Dest IP	The Destination IP that is configured for traffic in receive side.
Protocol	The protocol that is configured on the transmit side.
Status	The status of the received packet. The possible status conditions are shown in *Table: Capture View Status* (below).
Time Stamp - from last clear	Time stamp shows amount of time since last *clear* (when counter was reset to zero)
Time Stamp - relative to previous	Time stamp relative to the preceding packet (preceding row).
Time Stamp - relative to first	Time stamp relative to the first packet (first row).

The possible status conditions vary with module type. *Table: Capture View Status* describes the types of errors.

Table: Capture View Status

Error	Description
Any	Any good or bad packet.
Good Packet	A good packet is matched.
Bad CRC	A packet with a bad CRC.
Bad Packet	A frame with one or more of the following defects: • Bad CRC • Alignment Error–Ethernet only • Dribble Error–Ethernet only • Fragment–Ethernet only • Undersize–Ethernet only, less than 64 • Oversize–Ethernet only, if frame greater than 1588 (non-VLAN),

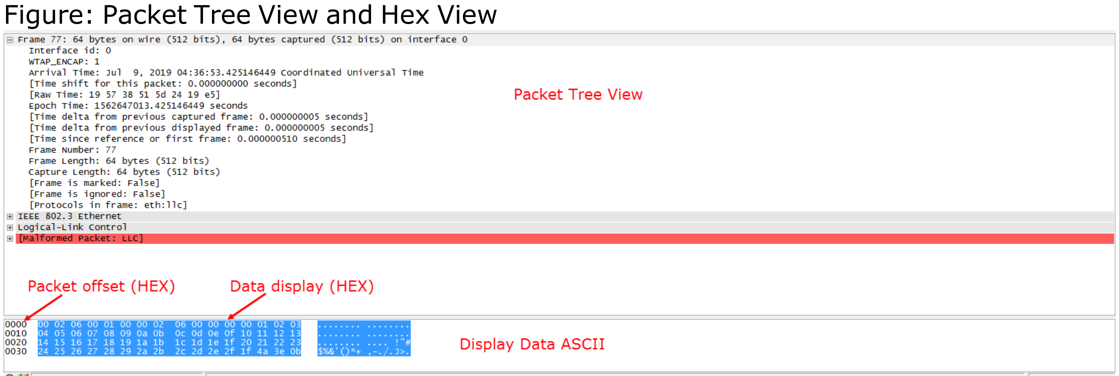
Error	Description
	or greater than 1522 (VLAN)
Alignment	A packet with an extra nibble, with bad CRC.
Dribble	A packet with an extra nibble, but with good CRC.
Bad CRC/Alignment/Dribble	Combination of: Bad CRC, Alignment, and Dribble errors.
Line Error	A packet received with symbol errors with either a good or bad CRC.
Line Error & Bad CRC	A packet received with symbol errors with a bad CRC.
Line Error & Good CRC	A packet received with symbol errors with a good CRC.
Core Header	**(GFP ONLY)** A GFP packet received with Core Header information.
Type Header	**(GFP ONLY)** A GFP packet received with Type Header information.

You can advance between all of the captured frames using various keys and the icons at the top of the screen that simulate tape transport controls. For information on controls in the analyzer screen, see *Wireshark User Guide*.

Packet Tree View and Hex View

The lower half of the standard *Capture View* dialog box shows the entire contents of the selected packet. The tree view summarizes the breakdown of the selected packet into its components. Then in the lower panel (shown in 3 parts horizontally) the left-hand column is the packet offset, exclicked in hexadecimal. This is followed by 16 bytes of data shown, all in hexadecimal. Finally, the right-hand column contains a view of the data in ASCII, if the byte can appear as such; otherwise the byte appears as a dot (.).

Figure: Packet Tree View and Hex View



The view options are:

- Horizontally split packet tree and hex viewer (shown above)
- Vertically split packet tree and hex viewer
- Application data as ASCII

- Packet array
- Protocols arrays
- Packet tree view

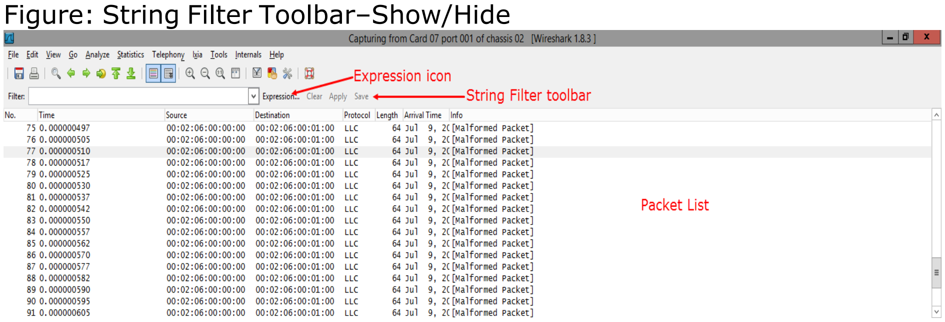
Filtering Captured Data

The Capture View of data shown can be filtered to show only specified types of packets, using the string filter feature.

As mentioned previously, the Capture Trigger and Capture Filter (as described in Capture Trigger and Capture Filter) for the selected port determine which packets are selected for appearing in Capture View. The slice size of the port (Configure Receive Mode(s)) sets the number of bytes captured and decoded for each packet. But the data that has been captured can be filtered further, to show only particular types of packets.

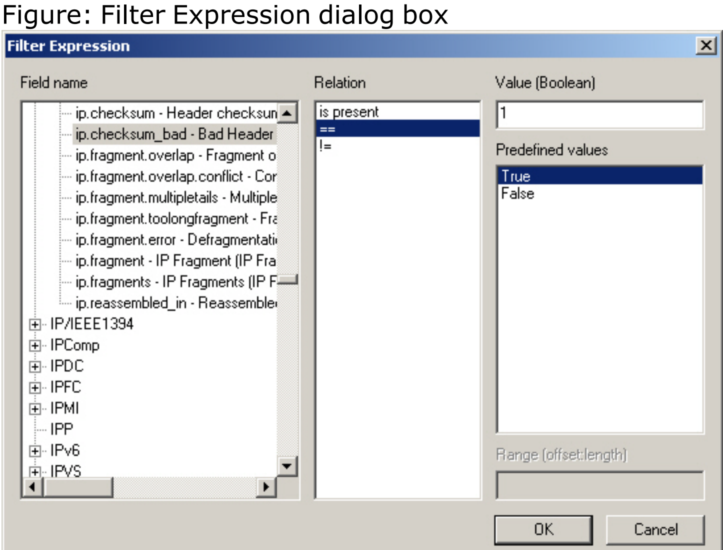
Select the the *Show or hide string filter* icon in the toolbar of the Capture View window to show the string filter toolbar (*Figure: String Filter Toolbar–Show/Hide*). This icon is a toggle, so selecting it again will hide the toolbar.

Figure: String Filter Toolbar–Show/Hide



Filtering of the Capture View data is performed by configuring an expression (string) that functions as the qualifying characteristic. Select the **Expression** icon in the string filter toolbar, shown above (*Figure: String Filter Toolbar–Show/Hide*). The **Filter Expression** dialog box will appear.

Figure: Filter Expression dialog box

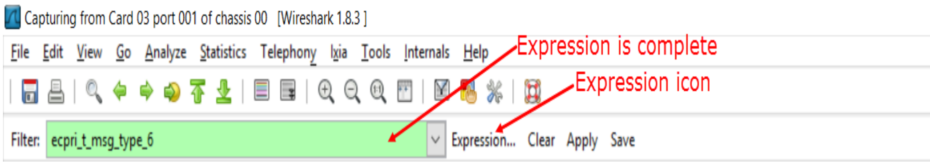


1. To build the filter expression, scroll down in left column (**Field name**) to locate and select the field you wish to focus on. Select the + to expand the listing under each heading. In the example above, ip.checksum_bad (under the expanded IP entry) has been selected.
2. In the center column (Relation) choose the relational operator for the expression. The choices are 'is present', (==) 'equal to' and (!=) 'not equal to'. In the example above, 'equal to' is selected.
3. In the right column (**Values** and **Predefined values**) column, select the value portion of the expression. In the example above, two values (True, False) are available and 'True' has been selected. In the Value (Boolean) field, the number 1 appeared when 'True' was selected. For other expressions, you may need to simply type an entry into the Value field..

   NOTE Depending on the Field name selected, the Relation operator list and the two Value fields will be different.

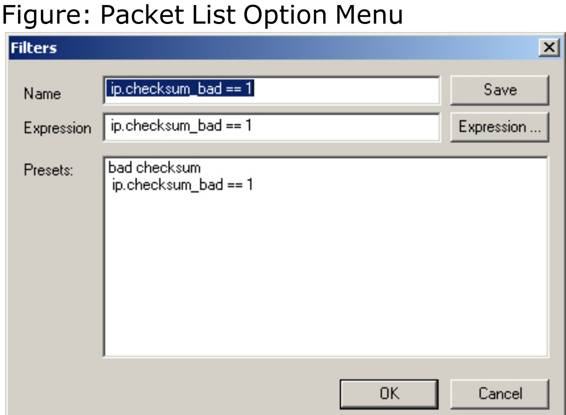
4. When all three parts of the expression are complete (two parts, if 'is present' is the relational operator), select **OK**. The expression will appear in the **Filter** field of the string filter toolbar (*Figure: String Filter Toolbar–Expression Complete*).

   Figure: String Filter Toolbar–Expression Complete

5. (Optional) If you want to save this string filter for use in the future, select the Filters icon (*Figure: Packet List Option Menu*). The Filters dialog box will appear, offering the ability to save the string filter just configured.

   Figure: Packet List Option Menu

6. (Optional) Enter a name or accept the default name for this string filter (which is the same as the field name in the expression). Then select **OK**.

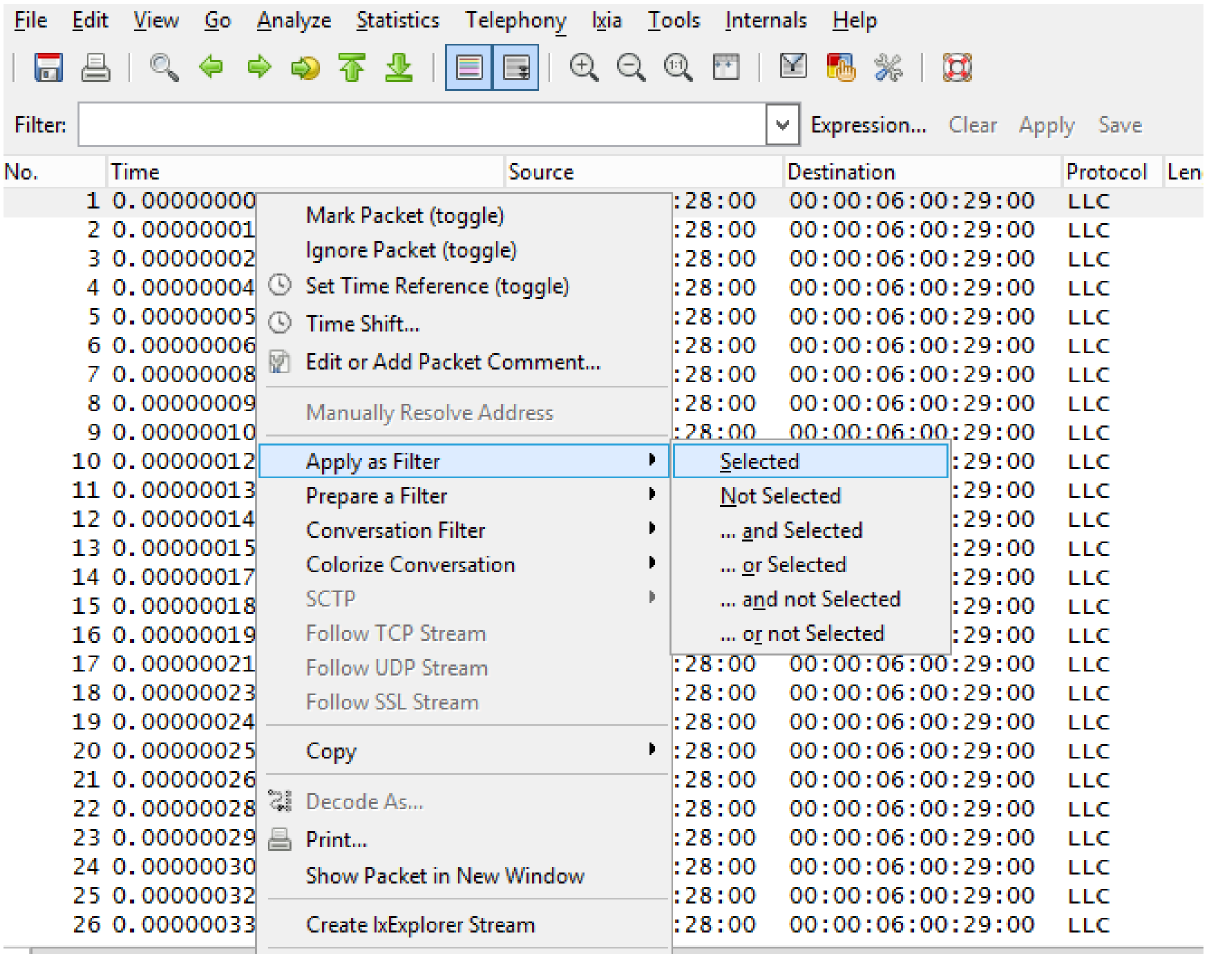
   In the future, you can select the **Filters** icon to open the list of saved strings, then select one and select **OK** to load it into the Capture View Filter field.

7. Finally, select the green 'start' arrow (*Figure: Packet List Option Menu*) to activate the string filter. The list of captures that appear, will change according to the filter you have selected.

Capture View Option Menu

Select any packet within the Packet List (upper panel) and select an option from this menu.

Figure: Packet List Option Menu

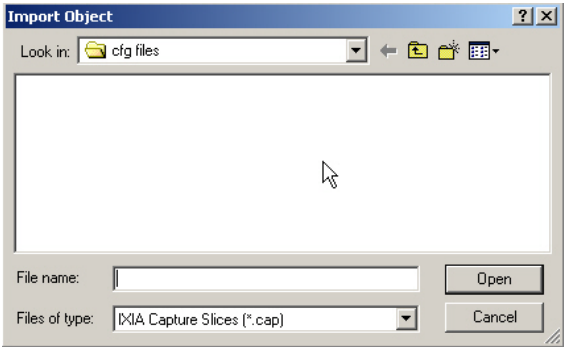


- Apply as filter–choose to filter on one of available values in the selected column (*Figure: Packet List Option Menu* shows Packet Length column is selected)
- Clear All Filters–undo filtering, restore unfiltered listing
- Import–imports captured data from a file; opens Import Object dialog box (Capture File Import)
- Export–exports captured data to a file; opens Capture Export dialog box (Capture File Export)

Capture File Import

Captured data may be imported into the capture buffer. From there it may be converted to streams as desired. The *Import Object* dialog box shows saved data files and is shown in *Figure: Import Object dialog box*.

Figure: Import Object dialog box



- While viewing a capture, if Wireshark is not associated with IxExplorer, follow the instructions to install Wireshark when prompted.
- If you start a new capture, it will clear the FPGA capture buffer.
- Multiple captures at a time per port is not supported.

Two file formats are acceptable for import:

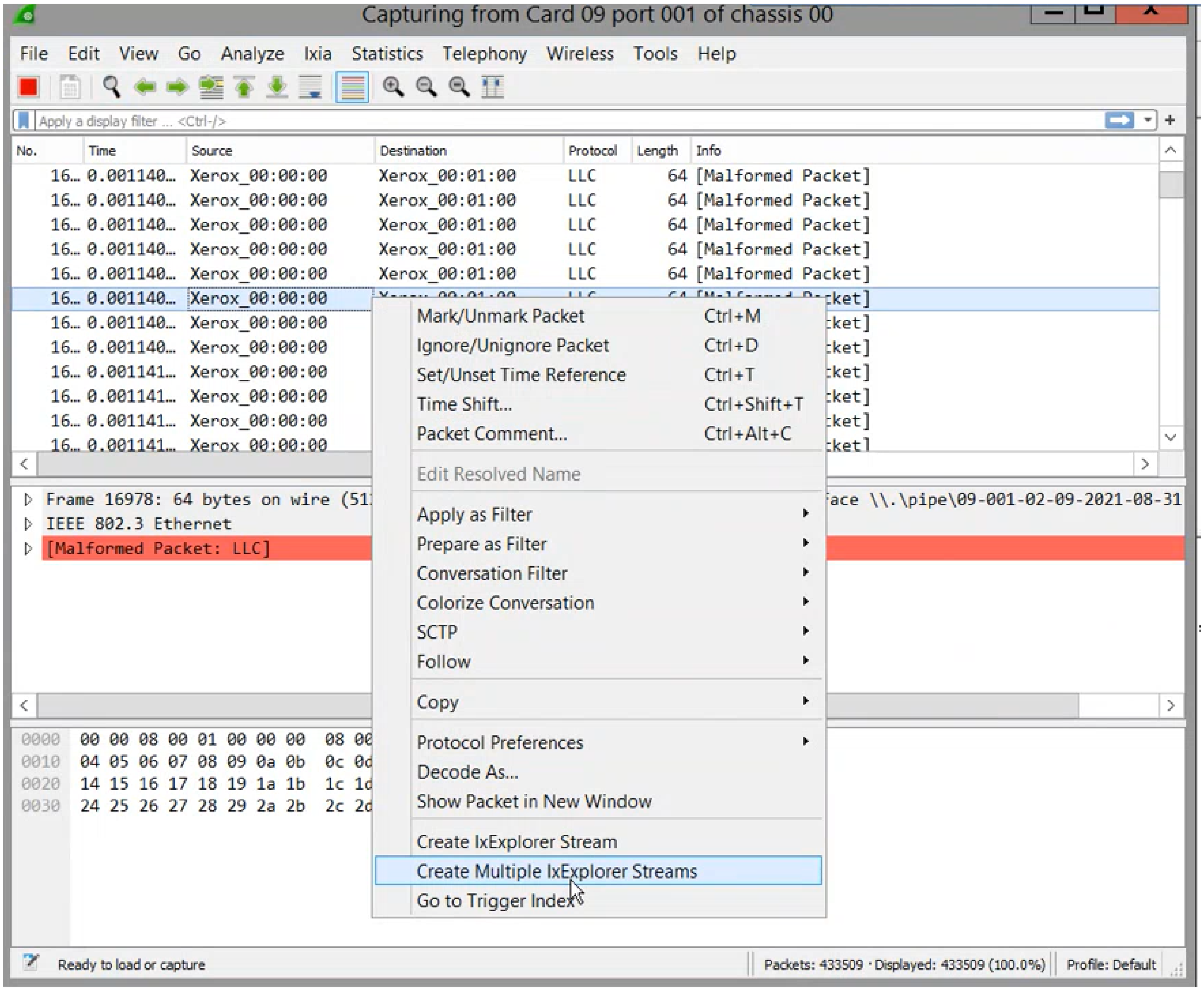
- Ixia capture slice (*.pcap*)—a binary format created with IxExplorer File Export.
- Sniffer encoding (*.enc*)
  - Network General Sniffer Format enc file version 4.x (*.enc*)
  - Network General Sniffer Format enc file version 1.6 (*.enc*)

NOTE Support for new .cap file is not available. Support for existing .cap file is available.

This dialog box allows the selection of existing files. The *Files of Types* field only provides for *.cap* and *.enc* file types. Imported data replaces the port's capture buffer.

- Ixia capture slice .cap file will convert to .pcap format and IxExplorer will launch Wireshark to open the pcap file.
- For all the other formats, IxExplorer will launch Wireshark.

NOTE IxExplorer does not allow to import .cap file that is saved from Wireshark. IxExplorer only supports Ixia .cap file format. The .cap file imported from Wireshark uses a different format. If you want to import the .pcap file from Wireshark, first save it as a Sniffer .enc file and then import it to IxExplorer.The Sniffer encoding file format is compatible with Wireshark. When you import a .enc file, the CRC frame check sequence is preserved and no additional bytes are created.



When you select a packet for analyzing, it opens in Wireshark window. If IxExplorer is associated with Wireshark, it shows **Ixia** tab .

To add stream to packets, do the following:

- Select **Ixia** > **Create IxExplorer Stream** to convert the packets to stream.
- Select **Create Multiple IxExplorer Streams** to create multiple steams for each packet.
  1. In the **Create Multiple IxExplorer Stream** dialog box, specify the number of streams to create.

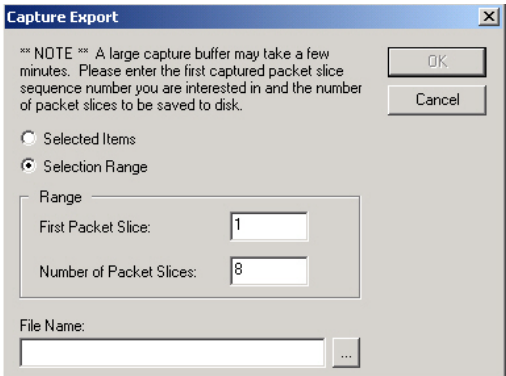
     NOTE You can insert maximum 512 streams.

  2. Select **OK**.

Capture File Export

Data that appears from the Capture View Frame, can be saved to files, as shown in *Figure: Capture Export dialog box*.

Figure: Capture Export dialog box



Each slice starts at the beginning of a packet and contains all or part of that one packet only. Different types of encodings for the export file are available, Export Object dialog box for additional information.

- IxExplorer supports .pcap and .enc formats only. IxExplorer does not support .cap.
- You can export files only if IxExplorer has no Wireshark associated.

If large amounts of captured data are being exported, a status bar appears showing time remaining until completion.

The fields and controls in this dialog box are described in *Table: Capture Export dialog box*.

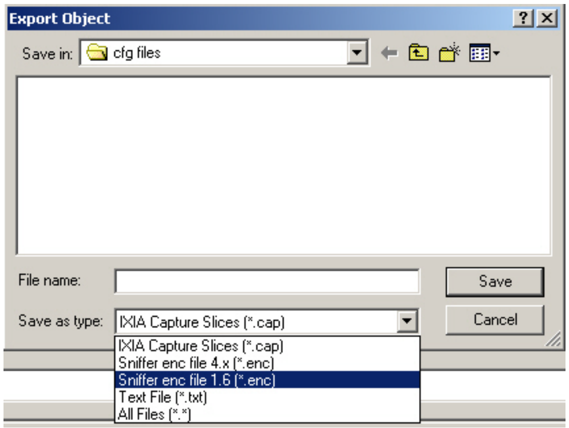
Table: Capture Export dialog box

Field/Control	Description
Selected Items	Highlights selected data in *Capture View* dialog box and saves it to a file.
Selected Range	Enables fields in the *Range* box for data entry, which can then be saved in the selected range to a file.
Range - First Packet Slice	The sequence number of the first packet slice to save.
Range - Number of Packet Slices	The number of packet slices to be saved.
File Name	The name of the file to save to. Export Object dialog box for additional information on file formats.
...	Invokes a standard windows file dialog box that allows directory navigation and file choice, as described in Export Object dialog box.
OK	Causes the data to be saved.
Cancel	Exits the dialog box.

Export Object dialog box

The *Export Object* dialog box is shown in *Figure: Export Object dialog box*.

Figure: Export Object dialog box

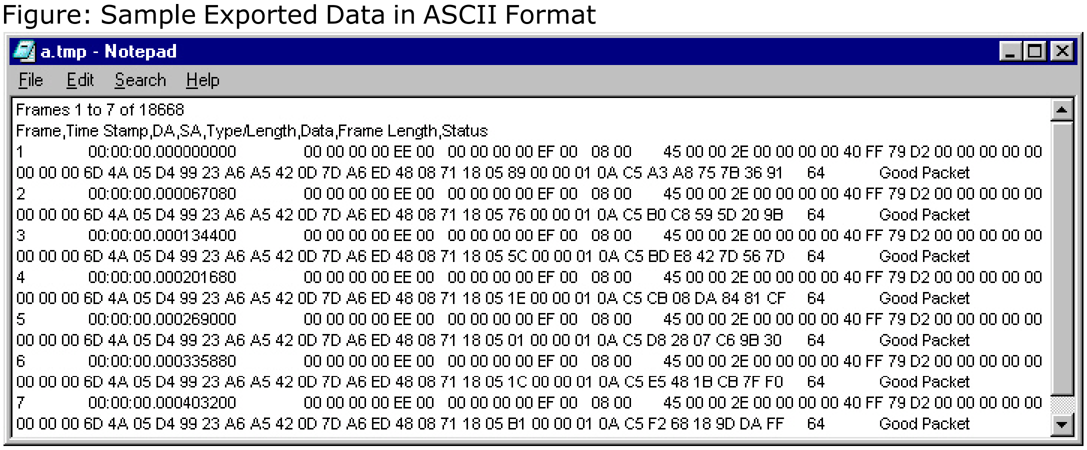


The types of captured data files that can be saved are:

- IXIA Capture Slices (*.cap*)—a binary format for use with IxExplorer File Import.
- Sniffer encoding (*.enc*):
  - Network General Sniffer Format enc file version 4.x (*.enc*)
  - Network General Sniffer Format enc file version 1.6 (*.enc*)
- Text File (*.txt*)—an ASCII text file suitable for import into a database. A sample of the ASCII file (*.txt*) format is shown in *Figure: ample Exported Data in ASCII Format*.

NOTE When a file is exported to .enc format, the CRC frame check sequence is preserved.

Figure: Sample Exported Data in ASCII Format



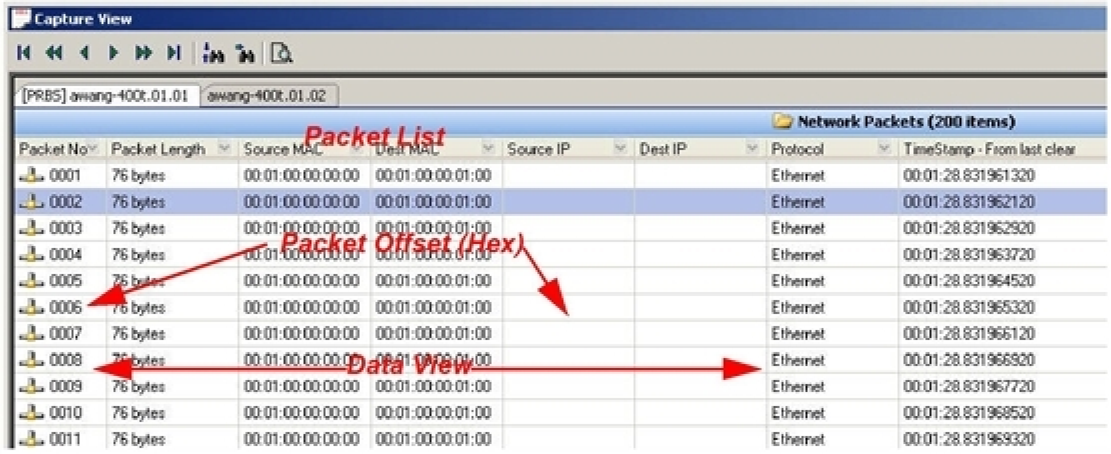

```
Frames 1 to 7 of 18668
Frame,Time Stamp,DA,SA,Type/Length,Data,Frame Length,Status
1    00:00:00.000000000    00 00 00 00 EE 00   00 00 00 00 EF 00   08 00    45 00 00 2E 00 00 00 00 40 FF 79 D2 00 00 00 00 00
00 00 00 6D 4A 05 D4 99 23 A6 A5 42 0D 7D A6 ED 48 08 71 18 05 89 00 00 01 0A C5 A3 A8 75 7B 36 91    64    Good Packet
2    00:00:00.000067080    00 00 00 00 EE 00   00 00 00 00 EF 00   08 00    45 00 00 2E 00 00 00 00 40 FF 79 D2 00 00 00 00 00
00 00 00 6D 4A 05 D4 99 23 A6 A5 42 0D 7D A6 ED 48 08 71 18 05 76 00 00 01 0A C5 B0 C8 59 5D 20 9B    64    Good Packet
3    00:00:00.000134400    00 00 00 00 EE 00   00 00 00 00 EF 00   08 00    45 00 00 2E 00 00 00 00 40 FF 79 D2 00 00 00 00 00
00 00 00 6D 4A 05 D4 99 23 A6 A5 42 0D 7D A6 ED 48 08 71 18 05 5C 00 00 01 0A C5 BD E8 42 7D 56 7D    64    Good Packet
4    00:00:00.000201680    00 00 00 00 EE 00   00 00 00 00 EF 00   08 00    45 00 00 2E 00 00 00 00 40 FF 79 D2 00 00 00 00 00
00 00 00 6D 4A 05 D4 99 23 A6 A5 42 0D 7D A6 ED 48 08 71 18 05 1E 00 00 01 0A C5 CB 08 DA 84 81 CF    64    Good Packet
5    00:00:00.000269000    00 00 00 00 EE 00   00 00 00 00 EF 00   08 00    45 00 00 2E 00 00 00 00 40 FF 79 D2 00 00 00 00 00
00 00 00 6D 4A 05 D4 99 23 A6 A5 42 0D 7D A6 ED 48 08 71 18 05 01 00 00 01 0A C5 D8 28 07 C6 9B 30    64    Good Packet
6    00:00:00.000335880    00 00 00 00 EE 00   00 00 00 00 EF 00   08 00    45 00 00 2E 00 00 00 00 40 FF 79 D2 00 00 00 00 00
00 00 00 6D 4A 05 D4 99 23 A6 A5 42 0D 7D A6 ED 48 08 71 18 05 1C 00 00 01 0A C5 E5 48 1B CB 7F F0    64    Good Packet
7    00:00:00.000403200    00 00 00 00 EE 00   00 00 00 00 EF 00   08 00    45 00 00 2E 00 00 00 00 40 FF 79 D2 00 00 00 00 00
00 00 00 6D 4A 05 D4 99 23 A6 A5 42 0D 7D A6 ED 48 08 71 18 05 B1 00 00 01 0A C5 F2 68 18 9D DA FF    64    Good Packet
```

The saved data file contains the same information as the top window of the *Capture View* dialog box, as shown in *Figure: Capture View Window–Standard Version*. This list has columns for a frame index number, a timestamp, the destination address, the source address, the type/length, the packet data, the frame length, and the error status of the frame.

PRBS Mode Capture

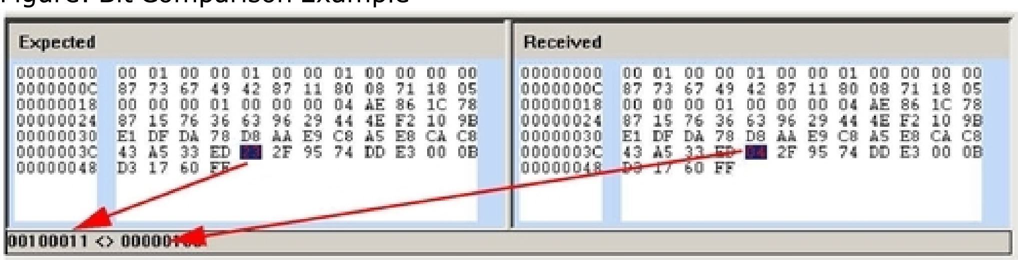
When PRBS mode is selected for transmit and receive, the capture view dialog box has the configuration shown in *Figure: Capture View dialog box–PRBS Version*. There is no Packet Tree view (as in the standard variation). In this example, a TXS4 card has been configured in a loopback fashion to transmit and receive packet streams in PRBS mode.

Figure: Capture View dialog box–PRBS Version



In the data view (lower) panel, the Expected packet configuration appears on the left, and the Received packet on the right. This enables bit comparison between the two. Differences are highlighted in red. Select any byte in the data view, and a bit comparison will be revealed on the bottom frame.

Figure: Bit Comparison Example



NOTE PRBS support is not provided in Capture analyzer.

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CHAPTER 15

Statistic View

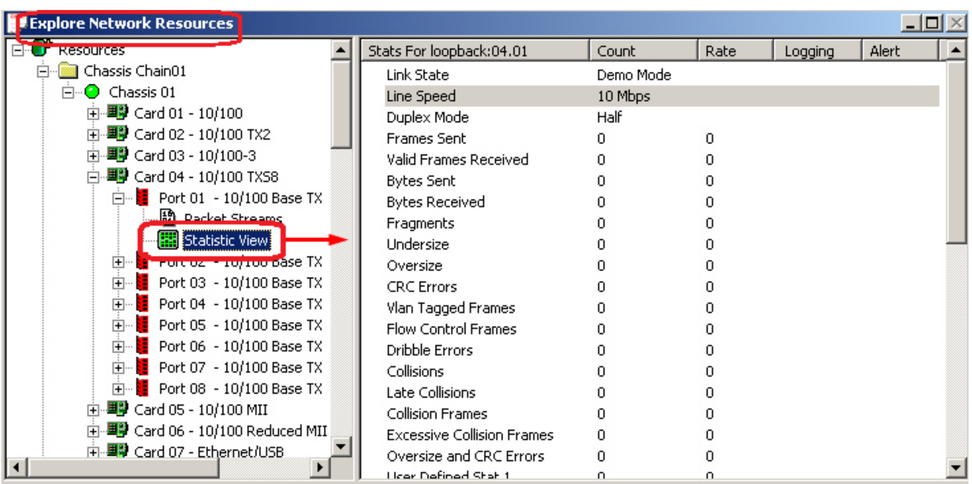
The Statistic View feature of Ixia IxExplorer allows to view all or a subset of the statistics available for ports. Statistics for multiple ports can appear side-by-side for greater insight into overall traffic patterns, and single stream statistics can be viewed, as shown in the following section:

- Statistic View—Port for single port statistics (in the **Explore Network Resources** window).
- Statistic View—Custom Views for creating Statistic Views for multiple ports.
- Stream Statistic Views for creating Stream Statistic Views for one or more ports.

IxExplorer has the ability to centrally log statistics from any port and to signal alert conditions when a particular statistic goes out of a specified, valid range. Refer to the Statistics Logging and Alerts section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual* for additional information.

Statistic View—Port

To view the statistics for a single port in the **Explore Network Resources** window, select **Statistic View** under the port on the tree. The following image is one sample set of statistics shown for a port on a 10/100 TXS8 load module.



The counters that appear in the statistics windows for each type of load module are the ones that are applicable to the load module type. The **Rate** column shows the count rate values for each counter in increments per second. The **Logging** and **Alert** columns show information if Logging and Alerts are enabled on the chassis and configured for the statistics. See Statistics Logging and Alerts for additional information.

See the 'Available Statistics' appendix of the *Ixia Platform Reference Manual* for a description of the statistics which are counted for each card type.

NOTE Derived Statistics Some statistics are derived from calculations based on other statistics. For example, 'Bits Sent' is derived from the 'Bytes Sent' statistic. To clear a derived statistic, the statistic on which it is based must also be cleared.

NGY Fault Handling

IEEE Requirements

IEEE 802.3ae, section 46.3.4 defines how a Reconciliation Sublayer (RS) shall respond to Local and Remote Faults. Response to a Local Fault is to immediately cease sending traffic on the transmit data path (even if doing so truncates a frame) and to send continual Remote Faults. Response to a Remote Fault is to stop sending MAC data (completing any frame that is being transmitted) and to send continual idles.

NGY Operation

NGY load modules have a single statistic for Faults called Link Fault State. This statistic is real-time and indicates the current state of the port's Reconciliation Sublayer (RS) state machine. The possible stat values are the following:

- No Fault
- Local Fault
- Remote Fault

Features that force deviation from IEEE spec

NOTE In general, if an NGY port appears to be transmitting according to the Frames Sent statistic, be aware that Link Fault State may override this.

Tx Ignores Rx Link Faults

This feature is enabled through the **Link Fault Signaling** tab of **Port Properties**. When the feature is enabled, the Fault statistic will continue to indicate the RS state of the port; however, the transmit-side response will behave as if no fault was received. That is to say, Remote Faults will not be sent as a response to Local Fault and Idles will not be forced as a response to Remote Fault, even though Link Fault State indicates the board is in a Fault state.

Transmit Ignores Link Status

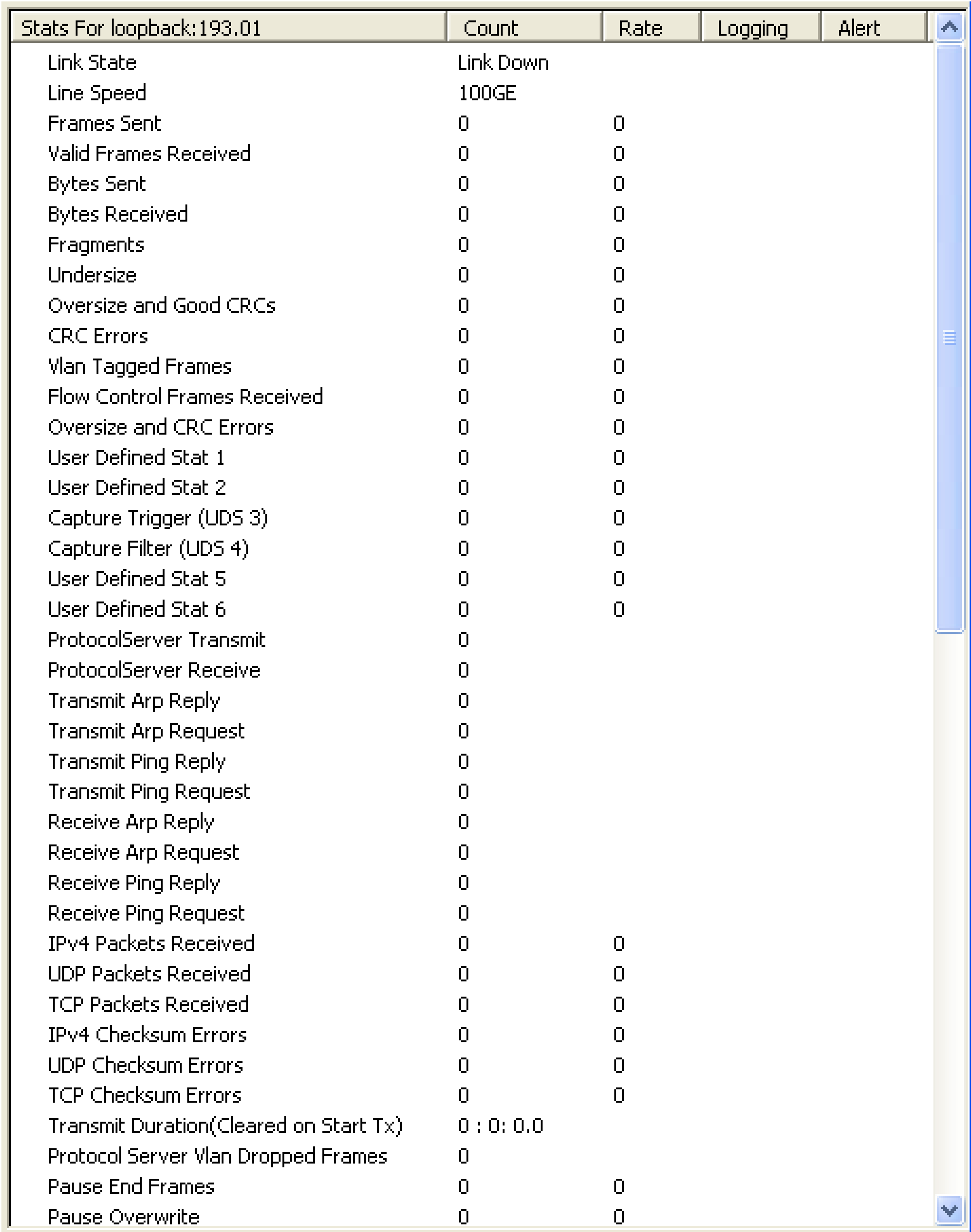
This feature is enabled through the **Transmit Modes** tab of **Port Properties**. When the feature is enabled, a port will be permitted to transmit under conditions that would normally inhibit transmit. For instance, a port that has no link and is not in diagnostic loopback will appear in IxExplorer as red color, and will normally not be permitted to transmit. Enabling this feature will allow transmit. When the feature is enabled, the statistic called Link State will indicate 'Ignore Link.'

Note that if the port is in Fault, enabling this feature and forcing transmit may result in misleading results. The port shown in the following stat view is ignoring link (see Link State statistic), is in Remote Fault (see Link Fault State statistic), yet appears to be transmitting (see Frames Sent Rate statistic). The reality is that no frames are actually leaving the port because the port is in Remote

Fault. This is because the block that maintains the transmit statistics is located before the block that forces idles as a response to Remote Fault.

	A	B
1	Name	loopback:02.01
2	Link State	Ignore Link
3	Line Speed	10GE LAN
4	Frames Sent	164,624,279
5	Frames Sent Rate	14,880,954
6	Valid Frames Received	0
7	Valid Frames Received Rate	0
8	Bytes Sent	10,535,953,80
9	Bytes Sent Rate	952,380,945
10	Bytes Received	0
11	Bytes Received Rate	0
12	Fragments	0
13	Undersize	0
14	Oversize	0
15	CRC Errors	0
16	Link Fault State	Remote Fault
17	Scheduled Transmit Duration	0 : 0: 0.0
18	Bytes Sent / Transmit Duration	21,740,528
19	Bits Sent	84,287,630,43
20	Bits Sent Rate	7,619,047,560
21	Bits Received	0
22	Bits Received Rate	0
23	Central Chip Temperature(C)	45
24	Port Chip Temperature(C)	45
25	Port CPU Status	Ready
26	Port CPU DoD Status	Ready

Lava Statistics View



Stats For loopback:193.01	Count	Rate	Logging	Alert
Link State	Link Down			
Line Speed	100GE			
Frames Sent	0	0		
Valid Frames Received	0	0		
Bytes Sent	0	0		
Bytes Received	0	0		
Fragments	0	0		
Undersize	0	0		
Oversize and Good CRCs	0	0		
CRC Errors	0	0		
Vlan Tagged Frames	0	0		
Flow Control Frames Received	0	0		
Oversize and CRC Errors	0	0		
User Defined Stat 1	0	0		
User Defined Stat 2	0	0		
Capture Trigger (UDS 3)	0	0		
Capture Filter (UDS 4)	0	0		
User Defined Stat 5	0	0		
User Defined Stat 6	0	0		
ProtocolServer Transmit	0			
ProtocolServer Receive	0			
Transmit Arp Reply	0			
Transmit Arp Request	0			
Transmit Ping Reply	0			
Transmit Ping Request	0			
Receive Arp Reply	0			
Receive Arp Request	0			
Receive Ping Reply	0			
Receive Ping Request	0			
IPv4 Packets Received	0	0		
UDP Packets Received	0	0		
TCP Packets Received	0	0		
IPv4 Checksum Errors	0	0		
UDP Checksum Errors	0	0		
TCP Checksum Errors	0	0		
Transmit Duration(Cleared on Start Tx)	0 : 0: 0.0			
Protocol Server Vlan Dropped Frames	0			
Pause End Frames	0	0		
Pause Overwrite	0	0		

Stats For loopback:193.01	Count	Rate	Logging	Alert
Scheduled Frames Sent	0	0		
Asynchronous Frames Sent	0	0		
Port CPU Frames Sent	0	0		
Link Fault State	No Fault			
Local Faults	0			
Remote Faults	0			
Scheduled Transmit Duration	0 : 0: 0.0			
Bytes Sent / Transmit Duration	0			
Bits Sent	0	0		
Bits Received	0	0		
Port CPU Status	Not Present			
Port CPU DoD Status	Not Ready			
Frames Received with Coding Errors	0	0		
Frames Received with /E/ error Character	0	0		
TxSchedulerOverlay Fpga Temperature(C)	0			
TxFmx Fpga Temperature(C)	0			
Capture1 Fpga Temperature(C)	0			
Latency1 Fpga Temperature(C)	0			
Pcpu Fpga Temperature(C)	0			
PCS Sync Errors	0	0		
PCS Illegal Codes	0	0		
PCS Remote Faults	0	0		
PCS Local Faults	0	0		
PCS Illegal Ordered Set	0	0		
PCS Illegal Idle	0	0		
PCS Illegal SOF	0	0		
PCS Out Of Order SOF	0	0		
PCS Out Of Order EOF	0	0		
PCS Out Of Order Data	0	0		
PCS Out Of Order Ordered Set	0	0		
PHY Chip Temperature(C)	0			
Transmit Neighbor Solicitations	0			
Transmit Neighbor Advertisements	0			
Receive Neighbor Solicitations	0			
Receive Neighbor Advertisements	0			

QSFP-DD and CFP8 Statistics View

Stats For loopback:127.01	Count	Rate	Logging	Alert
Link State	Link Down			
Line Speed	400GE			
Frames Sent	0	0		
Valid Frames Received	0	0		
Bytes Sent	0	0		
Bytes Received	0	0		
Fragments	0	0		
Undersize	0	0		
Oversize and Good CRCs	0	0		
CRC Errors	0	0		
Vlan Tagged Frames	0	0		
Flow Control Frames Received	0	0		
Oversize and CRC Errors	0	0		
User Defined Stat 1	0	0		
User Defined Stat 2	0	0		
Capture Trigger (UDS 3)	0	0		
Capture Filter (UDS 4)	0	0		
User Defined Stat 5	0	0		
User Defined Stat 6	0	0		
ProtocolServer Transmit	0			
ProtocolServer Receive	0			
Transmit Arp Reply	0			
Transmit Arp Request	0			
Transmit Ping Reply	0			
Transmit Ping Request	0			
Receive Arp Reply	0			
Receive Arp Request	0			
Receive Ping Reply	0			
Receive Ping Request	0			
Data Integrity Frames	0	0		
Data Integrity Errors	0	0		
Transmit Duration(Cleared on Start Tx)	69020740 :...			
Sequence Frames	0	0		
Sequence Errors	0	0		
Pause End Frames	0	0		
Pause Overwrite	0	0		
Scheduled Frames Sent	0	0		
Asynchronous Frames Sent	0	0		
Port CPU Frames Sent	0	0		
Link Fault State	Remote Fault			
Local Faults	0			

Stats For loopback:127.01	Count	Rate	Logging	Alert
Remote Faults	0			
Scheduled Transmit Duration	0 : 0: 0.0			
Bytes Sent / Transmit Duration	0			
Bits Sent	0	0		
Bits Received	0	0		
Central Chip Temperature(C)	0			
Port Chip Temperature(C)	0			
Port CPU Status	Not Present			
Port CPU DoD Status	Not Ready			
Misdirected Packets Received	0	0		
Pcpu Fpga Temperature(C)	0			
PCS Sync Errors	0	0		
PCS Illegal Codes	0	0		
PCS Remote Faults	0	0		
PCS Local Faults	0	0		
PCS Illegal Ordered Set	0	0		
PCS Illegal Idle	0	0		
PCS Illegal SOF	0	0		
PCS Out Of Order SOF	0	0		
PCS Out Of Order EOF	0	0		
PCS Out Of Order Data	0	0		
PCS Out Of Order Ordered Set	0	0		
PHY Chip Temperature(C)	0			
Transmit Neighbor Solicitations	0			
Transmit Neighbor Advertisements	0			
Receive Neighbor Solicitations	0			
Receive Neighbor Advertisements	0			
FEC Total Bit Errors	0	0		
FEC Max Corrected Symbols	0			
FEC Corrected Codewords	0	0		
FEC Total Codewords	0	0		
FEC Frame Loss Ratio	0.00e+000			
pre FEC Bit Error Rate	0.00e+000			
FEC Codeword with 0 error	0	0		
FEC Codeword with 1 error	0	0		
FEC Codeword with 2 errors	0	0		
FEC Codeword with 3 errors	0	0		
FEC Codeword with 4 errors	0	0		
FEC Codeword with 5 errors	0	0		
FEC Codeword with 6 errors	0	0		
FEC Codeword with 7 errors	0	0		
FEC Codeword with 8 errors	0	0		
FEC Codeword with 9 errors	0	0		
FEC Codeword with 10 errors	0	0		
FEC Codeword with 11 errors	0	0		
FEC Codeword with 12 errors	0	0		
FEC Codeword with 13 errors	0	0		
FEC Codeword with 14 errors	0	0		
FEC Codeword with 15 errors	0	0		
FEC Uncorrectable Codewords	0	0		

NOTE The Statistics view for all speed modes of QSFP-DD 400GE and CFP8 400GE is similar. The Line Speed will vary according to the speed mode of the load module.

T400 QDD and T400 OSFP Statistics View

Stats For loopback:145.001	Count	Rate	Logging	Alert
Link State	Link ...			
Line Speed	400GE			
Frames Sent	0	0		
Valid Frames Received	0	0		
Bytes Sent	0	0		
Bytes Received	0	0		
Fragments	0	0		
Undersize	0	0		
Oversize and Good CRCs	0	0		
CRC Errors	0	0		
Vlan Tagged Frames	0	0		
Flow Control Frames Received	0	0		
Oversize and CRC Errors	0	0		
User Defined Stat 1	0	0		
User Defined Stat 2	0	0		
Capture Trigger (UDS 3)	0	0		
Capture Filter (UDS 4)	0	0		
User Defined Stat 5	0	0		
User Defined Stat 6	0	0		
ProtocolServer Transmit	0			
ProtocolServer Receive	0			
Transmit Arp Reply	0			
Transmit Arp Request	0			
Transmit Ping Reply	0			
Transmit Ping Request	0			
Receive Arp Reply	0			
Receive Arp Request	0			
Receive Ping Reply	0			
Receive Ping Request	0			

Stats For loopback:145.001	Count	Rate	Logging	Alert
Data Integrity Frames	0	0		
Data Integrity Errors	0	0		
Transmit Duration(Cleared on Start Tx)	0 : 0: ...			
Sequence Frames	0	0		
Sequence Errors	0	0		
Pause End Frames	0	0		
Pause Overwrite	0	0		
Scheduled Frames Sent	0	0		
Asynchronous Frames Sent	0	0		
Port CPU Frames Sent	0	0		
Link Fault State	No F...			
Local Faults	0			
Remote Faults	0			
Scheduled Transmit Duration	0 : 0: ...			
Bytes Sent / Transmit Duration	0			
Bits Sent	0	0		
Bits Received	0	0		
Central Chip Temperature(C)	0			
Port CPU Status	Not ...			
Port CPU DoD Status	Not ...			
Pcpu Fpga Temperature(C)	0			
PCS Sync Errors	0	0		
PCS Illegal Codes	0	0		
PCS Remote Faults	0	0		
PCS Local Faults	0	0		
PCS Illegal Ordered Set	0	0		
PCS Illegal Idle	0	0		
PCS Illegal SOF	0	0		

Stats For loopback:145.001	Count	Rate	Logging	Alert
PCS Out Of Order SOF	0	0		
PCS Out Of Order EOF	0	0		
PCS Out Of Order Data	0	0		
PCS Out Of Order Ordered Set	0	0		
Transmit Neighbor Solicitations	0			
Transmit Neighbor Advertisements	0			
Receive Neighbor Solicitations	0			
Receive Neighbor Advertisements	0			
Tx Fpga Temperature(C)	0	0		
Rx Fpga Temperature(C)	0	0		
FEC Total Bit Errors	0	0		
FEC Max Symbol Errors	0			
FEC Corrected Codewords	0	0		
FEC Total Codewords	0	0		
FEC Frame Loss Ratio	0.00e...			
pre FEC Bit Error Rate	0.00e...			
FEC Codewords with 0 errors	0	0		
FEC Codewords with 1 error	0	0		
FEC Codewords with 2 errors	0	0		
FEC Codewords with 3 errors	0	0		
FEC Codewords with 4 errors	0	0		
FEC Codewords with 5 errors	0	0		
FEC Codewords with 6 errors	0	0		
FEC Codewords with 7 errors	0	0		
FEC Codewords with 8 errors	0	0		
FEC Codewords with 9 errors	0	0		
FEC Codewords with 10 errors	0	0		
FEC Codewords with 11 errors	0	0		
FEC Codewords with 12 errors	0	0		
FEC Codewords with 13 errors	0	0		
FEC Codewords with 14 errors	0	0		
FEC Codewords with 15 errors	0	0		
FEC Uncorrectable Codewords	0	0		
FEC Transcoding Uncorrectable Events	0	0		
L1 Bits Sent	0	0		
L1 Bits Received	0	0		
L1 Line Rate Transmit (%)	0.0000			
L1 Line Rate Receive (%)	0.0000			
Transmit Arp Gratuitous	0	0		
Transmit Arp Reverse	0	0		
Transceiver Temperature (C)	N/A			
Transceiver Interrupt Asserted	No			
PGID Overflow	0	0		

NOTE The Statistics view for all speed modes of T400 QDD and T400 OSFP are similar. The details of the statistics are explained in Appendix B section of the *Platform Reference Guide*.

HSE 100GE Load Module Statistics

The statistics support for HSE 100GE load module has been added with new statistic fields per port and per PCS Lane. The new statistics are mentioned in the following table:

Statistics Per Port	Statistics Per PCS Lane
Link Fault State	Physical and PCS lane address assignments
PCS Sync Errors	Sync header lock
PCS Illegal Codes	PCS lane marker lock
PCS Remote Faults	PCS lane marker map
PCS Local Faults	Relative lane skew
PCS Illegal Ordered Set	Synch header error count
PCS Illegal Idle	PCS lane marker error count
PCS Illegal SOF	BIP-8 Error Count
PCS Out Of Order SOF	Lost synch header lock
PCS Out Of Order EOF	Lost PCS lane marker lock
PCS Out Of Order Data	
PCS Out Of Order Ordered Set	

Background for 100GbE PCS 64B/66B Encoding

100GbE PCS uses an encoding called 64B/66B for sending data over the wire. Go here for more information on 64B/66B encoding.

- In this encoding, everything is sent in 66-bit blocks. The first two bits (sync bits) indicate whether the remaining 64 bits contain packet data or control information.
- If it is a control block, then there are 8 bits that indicate the type of control (e.g. start-of-frame (SOF), end-of-frame (EOF), idle, link fault); the remaining 56 bits are additional control data for that type.
- If it is an IDLE control block, then the remaining 56 bits are expected to have a specific value (all 0's).
- If it is a SOF control block, then the remaining 56 bits are the preamble data, which has a standard value of 0x55_55_55_55_55_55_D5.
- If it is an Ordered Set control block, then the remaining 56 bits can have two possible values that correspond to either Remote Fault or Local Fault.

- All packets should be properly framed, beginning with a SOF control block, then blocks of packet data, then an EOF control block.

Port statistics	Descriptions
PCS Sync Errors	Count of Sync header violations detected by the port's PCS layer. This occurs when the two sync bits of the 66-bit encoded blocks do not have a valid value of “01” or “10” to indicate data or control.
PCS Illegal Codes	Count of illegal PCS control codes found by the port's PCS layer. This occurs when a 66-bit encoded control block is received, but the 8-bit type field does not have a legal value as defined in the IEEE spec.
PCS Remote Faults	Count of the number Remote Fault ordered sets detected by the port's PCS layer.
PCS Local Faults	Count of the number Local Fault ordered sets detected by the port's PCS layer.
PCS Illegal Ordered Set	Count of the number of malformed ordered sets. This occurs when the received 66-bit encoded control block has an 8-bit type Ordered Set, but the remaining 56 bits do not have legal values of remote or local fault.
PCS Illegal Idle	Count of the number of malformed Idle control codes. This occurs when the received 66-bit encoded control block has an 8-bit type IDLE, but the remaining 56 bits do not have the standard legal value of all 0’s.
PCS Illegal SOF	Count of the number of malformed Start-of-Frame control codes. This occurs when the received 66-bit encoded control block has an 8-bit type SOF, but the remaining 56 bits do not have the standard preamble value.
PCS Out Of Order SOF	Count of the number of unexpected Start-of-Frame control codes during the expected payload data sequence. This happens when an SOF control block is received while in the middle of a packet (i.e. got SOF, data blocks, and then another SOF without EOF to terminate the previous packet).
PCS Out Of Order EOF	Count of the number of End-of-Frame control codes found between frames. This happens when an EOF control block is received while not in a packet (i.e. receiving idles and then got an EOF without an SOF first to start the packet).
PCS Out Of Order Data	Count of the number of Data words found between frames. This happens when a data block is received while not in a packet (i.e. receiving idles and then got a data block without an SOF first to start the packet).
PCS Out Of Order Ordered Set	Count of the number of ordered sets found during a frame.

Per PCS Lane	Descriptions
Physical and PCS	Physical PCS lane number from or to the connector/attachment unit

Per PCS Lane	Descriptions
lane address assignments	interface.
Sync header lock	Real time indicator of whether a PCS lane currently has Sync header lock (green) or not (red).
PCS lane marker lock	Real time indicator of whether a PCS lane is currently locked (green) or not (red).
PCS lane marker map	Logical mapping of the PCS lane based on the extracted alignment marker information.
Relative lane skew	Relative skew of the current PCS lane vs. the earliest PCS lane that achieved lock based on the alignment marker information extracted from of all PCS lanes in the port.
Synch header error count	Number of Sync header errors found in the PCS lane.
PCS lane marker error count	Number of alignment marker errors found in the PCS lane.
BIP-8 Error Count	Number of BIP-8 (bit interleaved parity) errors found in the PCS lane.
Lost synch header lock	Sticky flag that indicates whether a PCS lane has lost header synchronization since the last clear.
Lost PCS lane marker lock	Sticky flag that indicates whether a PCS lane has lost lock since the last clear.

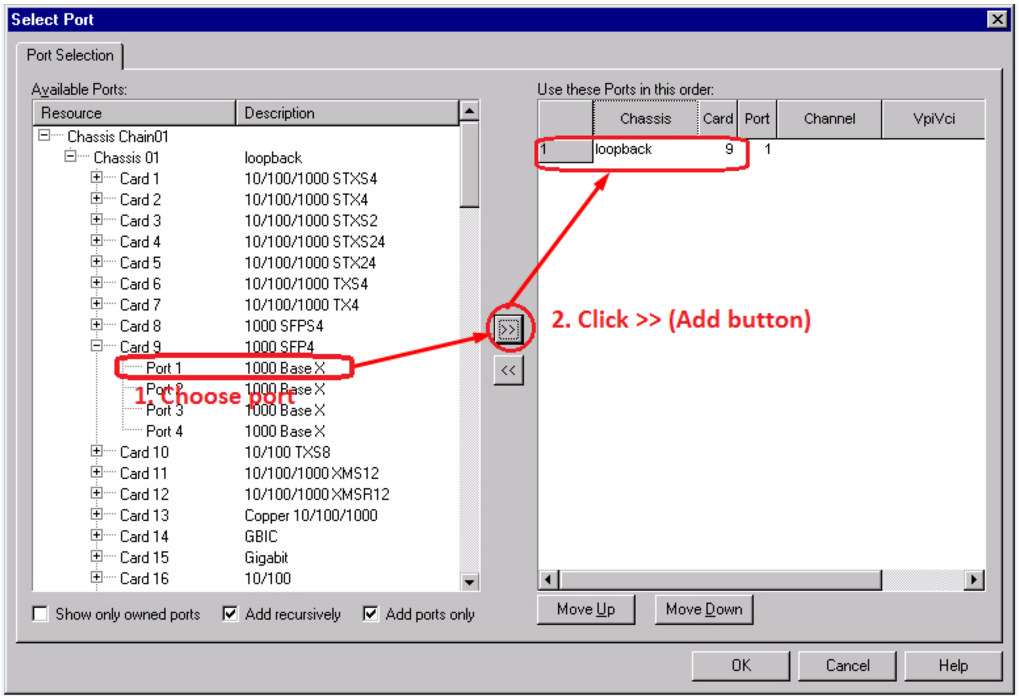
Statistic View—Custom Views

Use the Statistic View, accessed in the lower part of the Resources tree list, to show multiple ports' statistics side-by-side.

Selecting Ports for the Statistic View

To create a Statistic View for one or more ports, highlight *Statistic View* near the bottom of the Explore Network Resources list, select *New*. The *Select Port* dialog box opens, allowing to select ports for viewing statistics in a side-by-side view, as shown in *Image: Select Port dialog box*.

Image: Select Port dialog box



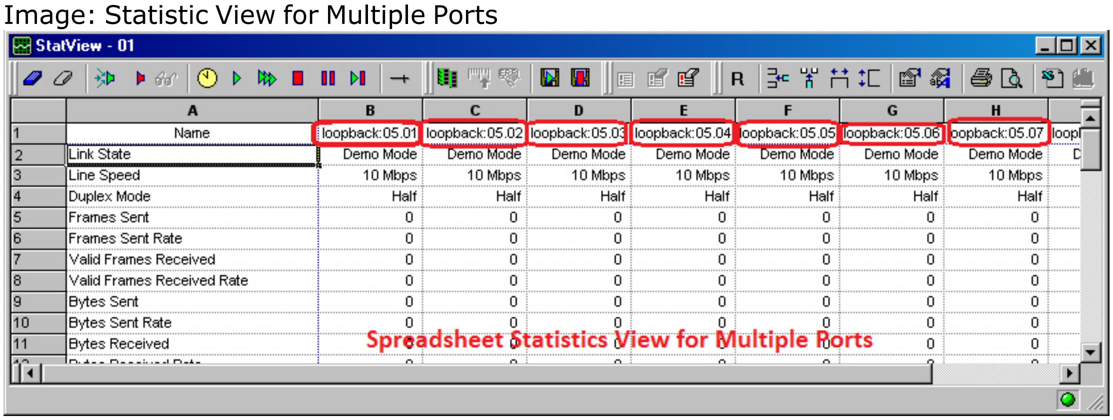
On the left side of the window, highlight the desired ports using either the shift-select or control-select methods, and then select the >> (Add) button to place them in a list on the right side of the window. Then select *OK*, and the statistics window will appear.

The *Add recursively* check box enables the capability for adding groups of ports at one time. Enable the *Add recursively* check box. Then select/highlight a higher level item in the list: Card (load module), Chassis, or Chassis Chain. Select the >> (Add) button, and all of the ports listed under that higher level item will be added to the list of active ports in the right pane.

NOTE For a description of the Select Port dialog box, Select Port dialog box.

The *Statistic View* dialog box is shown in *Image: Statistic View for Multiple Ports*.

Image: Statistic View for Multiple Ports

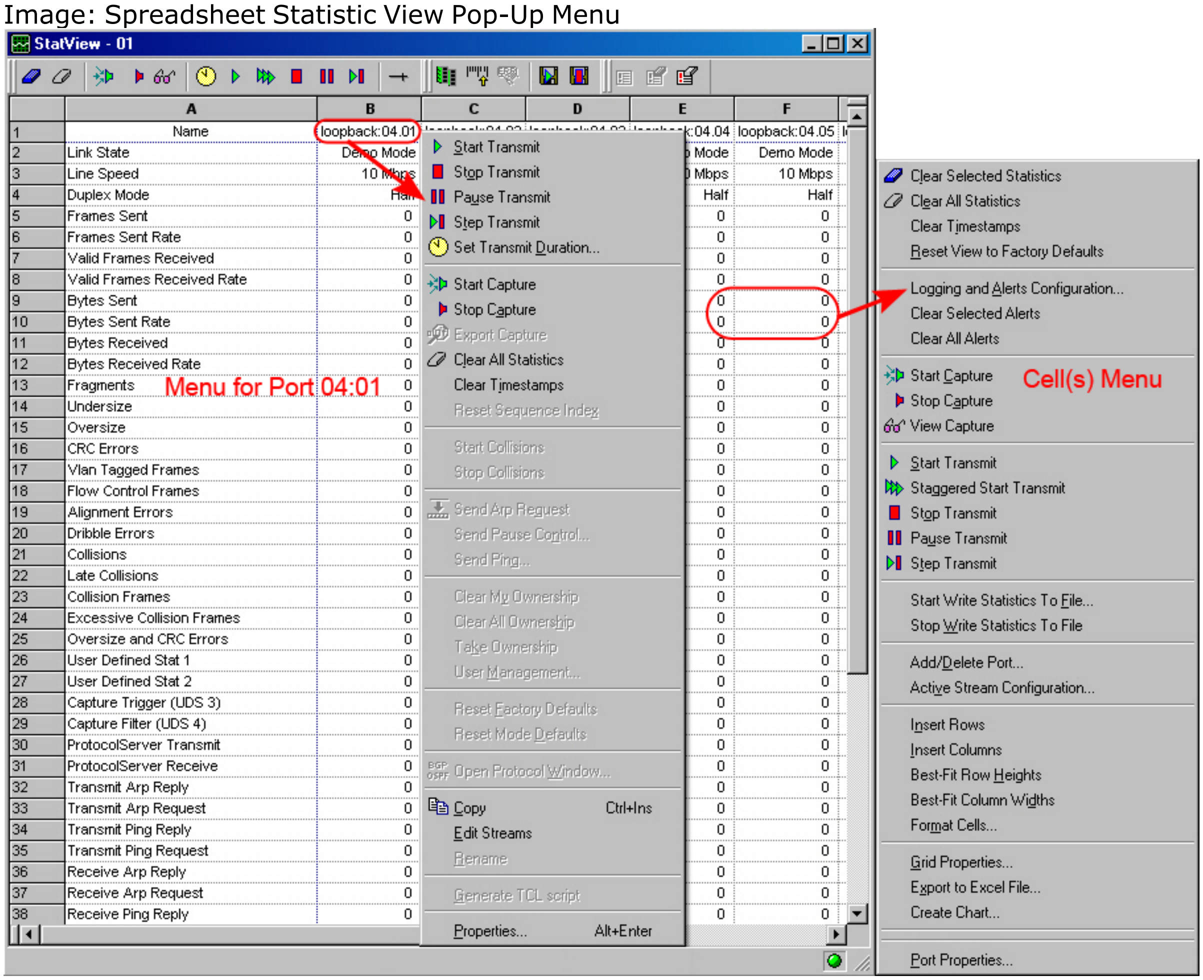


It is possible to include a counter that does not exist in this view by default. From a statistics window that contains the desired counter, users can drag-and-drop the counter into the multiple ports *Statistic View* dialog box using the left button on the mouse. The order of the list of counters in the window can be rearranged using the same drag-and-drop method. Full control over transmit and capture operations, as well as operations related to statistics and their views are available from the Statistic View toolbar.

By selecting any of the column titles, additional operations may be invoked. *Image: Spreadsheet Statistic View Pop-Up Menu* shows an example of the pop-up menu that it presented when a column header is selected.

NOTE The tx and rx stats that appear in Statistic View are continuously synching as IxServer polls the ports that are communicating with each other. However, if the link between two ports is down, the Statistic View will not be updated, and so the tx and rx stats in the Statistic View will not match. It may appear that more frames are received than are transmitted, or vice-versa. This behavior applies only to the following load modules: Copper 10/100/100 (LM1000T-5) GBIC (LM1000GBIC) Gigabit (LM1000SX) 10/100 (LM100TX)

Image: Spreadsheet Statistic View Pop-Up Menu

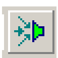
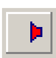
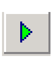
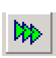
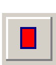
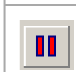
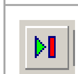
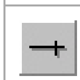
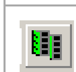


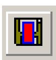
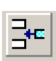
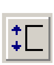
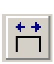
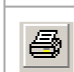
The operations available on the Column pop-up menu are a subset of the commands available from the Explore Resources port pop-up menu (Ports). *Selection of the Edit Streams item invokes the* Frame Data Tab *for the first stream for the port (**Frame Data** Tab for additional information).*

Spreadsheet Statistic View Toolbar

The icons/options in the spreadsheet type Statistic View toolbar are described in *Table: Statistic View—Spreadsheet Type Toolbar Options.*

Table: Statistic View—Spreadsheet Type Toolbar Options

Toolbar Icon	Pop-Up Menu Option	Operation
	Clear Selected Statistics	Resets the selected statistics for the port(s) back to all 0's.
	Clear All Statistics	Resets the statistics for all ports back to all 0's.
	Start Capture	Starts the capture operation on the selected port(s).
	Stop Capture	Stops the capture operation on the selected port(s).
	Capture View	Shows the *Capture View* dialog box. Capture View for additional information.
	Set Transmit Duration	Shows the *Set Transmit Duration* dialog box which allows to control the length of the stream transmission. Set Transmit Duration for additional information.
	Start Transmit	Starts the transmit operation on the selected port(s).
	Start Staggered Transmit	Starts the transmit operation on the selected ports. A delay is inserted between one port's start transmission and the next.
	Stop Transmit	Stops the transmit operation on the selected port(s).
	Pause Transmit	Pauses the transmit operation on the selected port(s).
	Single Step Stream	Sends a single packet on each of the selected ports.
	Global Rate Slide Bar	Sets the line rate for ports in the Statistic View. Global Line Rate Configuration.
	Add/Delete Ports	Opens the *Select Port* dialog box, where one or more ports can be added to or deleted from the Statistic View. Selecting Ports for the Statistic View.

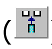
Toolbar Icon	Pop-Up Menu Option	Operation
	Active Stream Configuration	Opens the *Active Streams* dialog box, which allows frame size and inter-packet gap to be varied over a set of ports. Active Stream Configuration.
	Insert Single BERT Error	(Available only for BERT mode) Inserts a single Bert error into the data stream.
	Start Write Statistics to File	Starts logging of statistics to a file. Start Write Statistics to File.
	Stop Write Statistics to File	Stops logging of statistics to a file. Stop Write Statistics to File.
	Logging and Alerts Configuration	Shows the *Logging and Alerts* dialog box. Statistics Logging and Alerts for additional information.
	Clear Selected Alerts	Clears the alerts in highlighted cells of the Statistic View.
	Clear All Alerts	Clears the alerts in all cells of the Statistic View.
	Reset View to Defaults	Resets the view to the factory-default settings.
	Insert Rows	Inserts a row below the currently selected row.
	Insert Columns	Inserts a column to the right of the currently selected cell or column. This option may be used for setting up a blank area in which an Excel-style formula may be entered. Grid Properties—Display Settings.
	Best-Fit Row Heights	For all of the selected rows, adjusts the height of the row so as to just fit the contents of all of the columns.
	Best-Fit Column Width	For all of the selected columns, adjusts the width of the columns so as to just fit the contents of all of the rows.
	Grid Properties	Controls the grid properties of spreadshseet. Refer to Grid Properties—Display Settings.
	Format Cells	Controls the formatting of the text within cells. Refer to Cells Format dialog box.
	Print	Shows a print dialog box, so the Statistic View grid can be printed (does not include the toolbar).

Toolbar Icon	Pop-Up Menu Option	Operation
	Print Preview	Shows the a preview of the Statistic View grid as it will appear in a printed format.
	Export to Excel File	Allows part or all of the spreadsheet to exported to an Excel compatible spreadsheet file. Refer to Spreadsheet—Export to Excel File dialog box.
	Create Chart	Creates a chart from selected areas of the spreadsheet. Refer to Using Chart View.

Statistic View Operations

Excel Spreadsheet Capabilities

The spreadsheet view follows most of the behavior characteristics of an Excel spreadsheet.

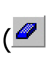
Formulas for manipulating received statistical data may be created in the spreadsheet-style Statistic View. Add a new (empty) column to the right of the existing columns that contain port data. Select/highlight the last column on the right, and then select the *Insert Column* icon () on the toolbar. Select a convenient cell in the new column, and enter the equal sign '=' to indicate the start of a formula. Use the standard Excel techniques for performing mathematical operations on the numerical contents of various cells in the spreadsheet. Each cell is indicated by a combination of the column letter and row number, such as 'B9.'

Statistics Logging and Alerts

If visual alerts (see the Statistics Logging and Alerts section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*) are configured and enabled, the cell containing the statistic shows a color to indicate the alert status of that statistic for the port. The color coding is described below:

- **Clear** (background color of spreadsheet)—no alert has been configured.
- **Green**—an alert has been configured, but no alert is active.
- **Red**—an alert is active, which indicates that an out-of-range condition exists.
- **Yellow**—an alert was active, but the condition is now within range, and a user acknowledgment is pending. This serves as an alert history indicator. If the user then clears the statistic, by using the *Clear Selected Statistics* or *Clear All Statistics* icons ( and ) or menu options, the color will turn green.

An example follows for a link state statistic that has been previously configured to use Logging and Alerts:

- A link is down due to a physical disconnect (connector is pulled out of port interface)—statistic turns red.
- The interface is reconnected—statistic turns yellow.
- Select the stat and then select the *Clear Selected Statistics* or *Clear All Statistics* icons ( and ) in the toolbar—statistic turns green.

These are the default colors. The alert status colors may be modified in the *Tools* > *Options* > *Alerts* dialog box. Refer to Chassis Properties—Logging and Alerts.

Statistic View Options

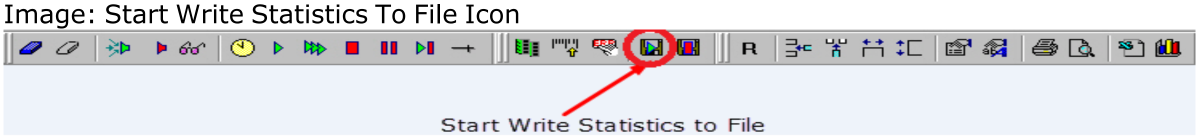
Some of the options available for Statistic Views are described in more detail in the following sections:

- Start Write Statistics to File
- Stop Write Statistics to File
- Active Stream Configuration
- Global Line Rate Configuration
- Grid Properties—Display Settings
- Cells Format dialog box
- Spreadsheet—Export to Excel File dialog box
- Chart View dialog box

Start Write Statistics to File

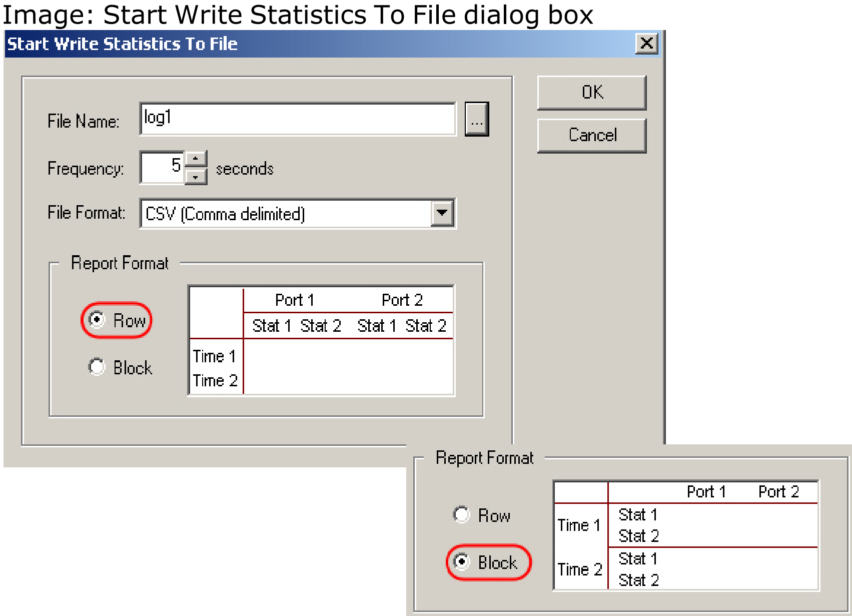
In addition to showing statistics on the screen, IxExplorer is able to write statistics to a disk file. The Start Write Statistics To File mode is entered by selecting the *Start Write Statistics to File* icon ()on the Statistic View tool bar, as shown in *Image: Start Write Statistics To File Icon*.

Image: Start Write Statistics To File Icon



The *Start Write Statistics to File* dialog box allows a number of formatting parameters to be set, as shown in .

Image: Start Write Statistics To File dialog box



The fields in this dialog box and their usage are described in *Table: Start Write Statistics To File dialog box*.

Table: Start Write Statistics To File dialog box

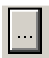
Field	Usage
File Name	The name of the file on the disk to write to.
	This button provides access to a standard Windows *Save As* dialog box, as shown in *Image: Save As dialog box*. If no directory is provided in the file name, the directory into which IxExplorer was loaded will be used (`c:\Program Files\Ixia` by default).
Frequency	(in seconds) Specifies how often statistics are written to the file.
File Format	Determines how each line of output appears. The choices are: • **CSV** (Comma delimited)—all items are separated by a single comma. • **Formatted text** (Space Delimited)—columns are lined up by the insertion of spaces. • **Text** (Tab Delimited)—all items are separated by a single tab character.
Report Format	The output may be formatted in one of two methods: • **Row**—the output is formatted as shown in *Image: Sample Output for Row Format Output with Formatted Text*. • **Block**—the output is formatted as pictured below *Image: Sample Output for Block Format Output with Formatted Text*.

Image: Save As dialog box

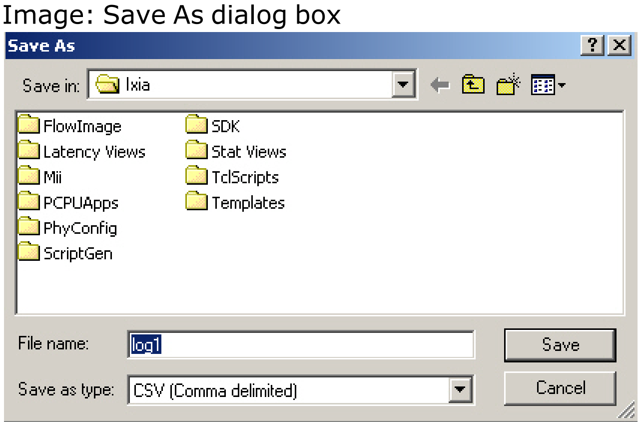


Image: Sample Output for Row Format Output with Formatted Text

```
                    "127.0.0.1:01.01"
                    "Link State"  "Line Speed"  "Duplex Mode" "Frames Sent" "Frames Sent Rate"

01-25-1999    20:53:52     "Down" "1000" "Full" "0"    "0"    "0"    "0"    "0"    "0"
01-25-1999    20:53:57     "Down" "1000" "Full" "0"    "0"    "0"    "0"    "0"    "0"
01-25-1999    20:54:03     "Down" "1000" "Full" "0"    "0"    "0"    "0"    "0"    "0"
01-25-1999    20:54:08     "Down" "1000" "Full" "0"    "0"    "0"    "0"    "0"    "0"
```

Image: Sample Output for Block Format Output with Formatted Text

```
                    "127.0.0.1:01.01"    "127.0.0.1:01.02"    "127.0.0.1:02.01"    "127.0.0.1:02.02"

01-25-1999    21:26:28      "Link State"  "Down" "Down" "Down" "Down"
              "Line Speed"  "1000" "1000" "1000" "1000"
              "Duplex Mode" "Full" "Full" "Full" "Full"
              "Frames Sent" "0"    "0"    "0"    "0"
              "Frames Sent Rate"   "0"    "0"    "0"    "0"
              "Valid Frames Received"     "0"    "0"    "0"    "0"
              "Valid Frames Received Rate"       "0"    "0"    "0"    "0"
              "Bytes Sent"  "0"    "0"    "0"    "0"

01-25-1999    21:26:33      "Link State"  "Down" "Down" "Down" "Down"
              "Line Speed"  "1000" "1000" "1000" "1000"
              "Duplex Mode" "Full" "Full" "Full" "Full"
              "Frames Sent" "0"    "0"    "0"    "0"
              "Frames Sent Rate"   "0"    "0"    "0"    "0"
              "Valid Frames Received"     "0"    "0"    "0"    "0"
              "Valid Frames Received Rate"       "0"    "0"    "0"    "0"
              "Bytes Sent"  "0"    "0"    "0"    "0"
```

Stop Write Statistics to File

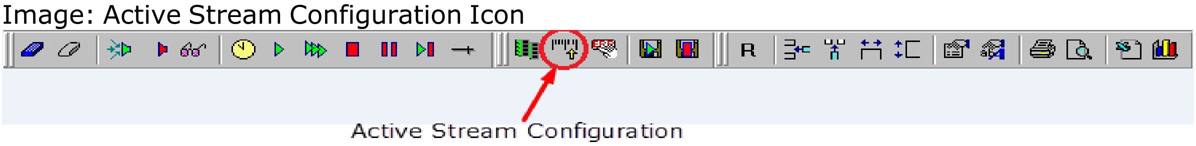
Output to statistics write files may only be stopped when IxExplorer is terminated or the *Stop Write To File* icon ()is selected from the Statistic View toolbar, as shown in *Image: Stop Write Statistics To File Icon*.

Image: Stop Write Statistics To File Icon

Active Stream Configuration

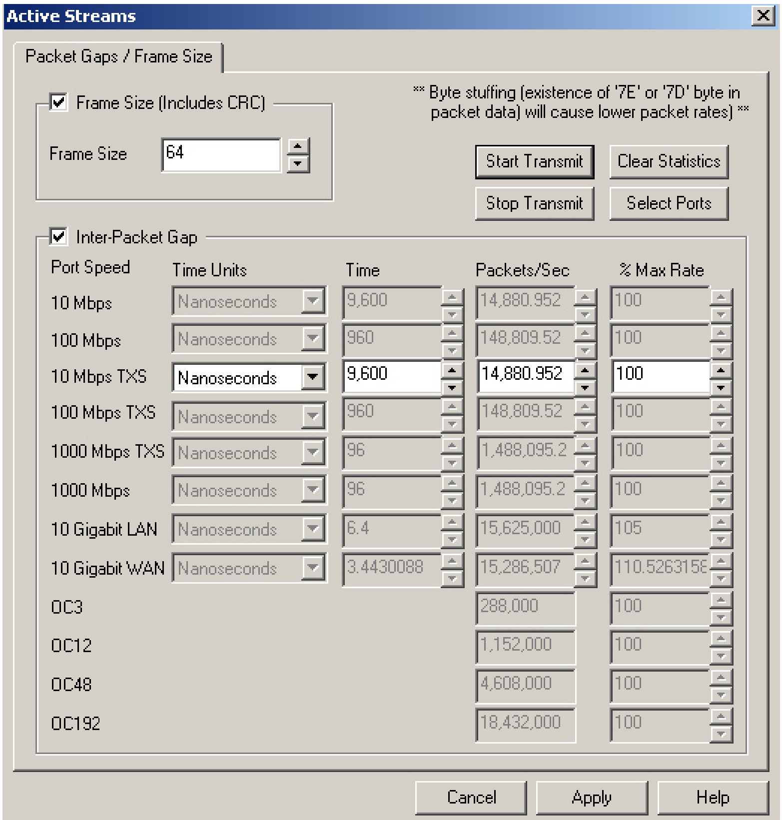
The *Active Stream Configuration* option of the multiple Statistic Views is a unique feature that allows threshold testing by varying frame size and inter-packet gap across a range of ports, while monitoring a set of statistics. During the operation of active streams, the first stream for the applicable ports is set to contiguous packet mode, and then reset after the adjustments are completed.

Image: Active Stream Configuration Icon



When the *Active Stream Configuration* icon () is selected, the *Active Streams* dialog box appears, as shown in *Image: Active Streams dialog box*.

Image: Active Streams dialog box



When editing the Frame Size, Time, Packets/Sec, and % Max Rate fields directly it is not necessary to select the Apply button (the Apply button is grayed out). The changes take effect immediately.

The fields and controls in this dialog box are described in *Table: Active Streams dialog box*.

Table: Active Streams dialog box

Control	Usage
Start Transmit	Starts the transmit process, using the other settings that override frame size and inter-packet gap for the selected ports. If the transmit sequence on the selected ports is infinite, there is no need to stop and start the transmit operation.
Stop Transmit	Stops the transmit process on the selected ports.
Clear Statistics	Clears the statistics on the selected ports.
Select Ports	Presents a dialog box identical to the one used to select the members of the statistics group. The selections in this list are the only ones that will be subject to the changes made in Active mode.
Frame Size (Includes CRC)	If the check box is selected, this box allows the frame size of transmitted packets to be set in a range from the minimum to maximum compatible with the ports and frames being applied. The number may be typed directly into the box or

Control	Usage
	incremented/decremented with the up/down arrows. The *Apply* button must be selected before any change goes into effect.
Inter-Packet Gap	If the check box is selected, this box allows the inter-packet gap for the selected ports/line rates to be varied. Separate controls are available for ports that are operating at different speeds. Time units available are: • Nanoseconds • Microseconds • Milliseconds • Seconds The gap may be modified in any of three ways: • Time—the number of time units (N/A to POS modules). • Packets/Sec—the number of packets per second. The gap will be adjusted so as to allow the required number of packets to be sent. • % Max Rate—as a percentage of the maximum rate obtainable. The *Apply* button must be selected before any change goes into effect.
Apply	The *Apply* button must be selected before any change goes into effect.

Global Line Rate Configuration

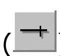
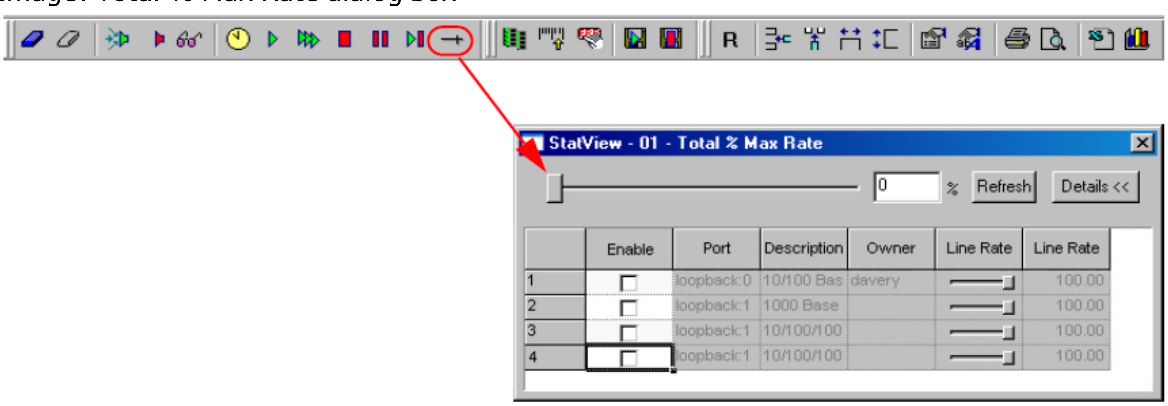
The *Global Line Rate* icon () allows to change the line rate for ports in the Statistic View. The slide bar will change the total percentage of the maximum line for each port indicated port. Selecting this icon opens the *Total % of Max Rate* dialog box. *Image: Total % Max Rate dialog box* shows the *Total % Max Rate* dialog box.

Image: Total % Max Rate dialog box



The *Table: Total % Max Rate Fields* describes the fields on the *Total % Max Rate* dialog box.

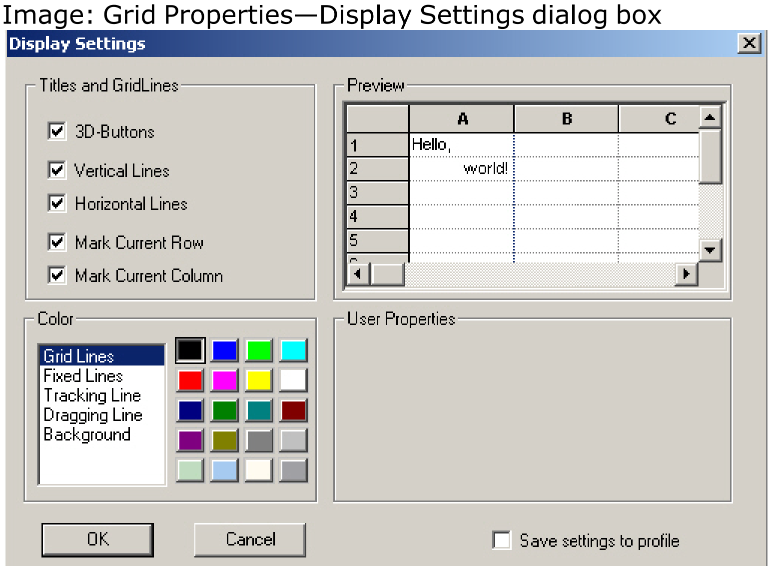
Table: Total % Max Rate Fields

Field	Usage
Slide Bar	Adjusts the percentage of the maximum line rate for all ports selected in the list. When this bar is moved, the percentage number to the right is changed.
Percentage	Shows the percentage number for the line rate usage for all selected ports. When this number is changed, the Slide Bar moves.
Details	Selecting this button shows or hides the fields listed for individual Latency Views.
Enable	This check box enables the use of the line rate slide bar and other configurable port options.
Port	Specifies the port number by chassis, card slot, and port.
Description	Describes the port type (that is, 10/100 base TX).
Owner	Shows the port owner (if applicable).
Line Rate	A slider bar for adjusting the percentage of the max line rate for a particular Statistic View. When this is moved, the percentage number to the right changes.
Line Rate	A percentage number used for adjusting the max line rate for the Statistic View. When this change, the slider bar to the left moves.

Grid Properties—Display Settings

The grid properties are defined in the *Image: Grid Properties—Display Settings dialog box*.

Image: Grid Properties—Display Settings dialog box



The fields in the dialog box are described in *Table: Grid Properties—Display Settings dialog box*.

Table: Grid Properties—Display Settings dialog box

Field	Sub-Field	Usage
Titles and Gridlines	3D-Buttons	Provides shading for the column and row labels making them appear as buttons.
	Vertical Lines	Draws vertical lines between columns.
	Horizontal Lines	Draws horizontal lines between rows.
	Mark Current Row	Causes the current row's label to appear unavailable.
	Mark Current Column	Causes the current column's label to appear unavailable.
Color	Grid Lines	Sets the default color for all grid lines.
	Fixed Lines	Sets the color for the line separating the heading rows and the body of the chart.
	Tracking Line	Sets the color for the line separating the heading rows and the body of the chart, when the area is highlighted.
	Dragging Line	The color of the line used to indicate the new position of a relocated column or row.
	Background	Sets the color for the part of the spreadsheet window that has no data grid.
Preview		Shows a preview of the selections you make.

Cells Format dialog box

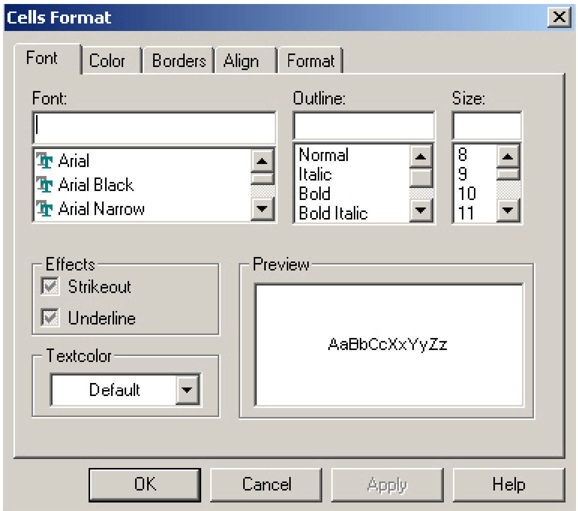
The *Cells Format* dialog box consists of five tabs for configuring custom grid formats for the Statistic View, as described in the following sections:

- Font Tab
- Color Tab
- Borders Tab
- Align Tab
- Format Tab

Font Tab

The **Font** tab controls the fonts used within cells and is shown in *Image: Statistic View—Cells Format, **Font** Tab*.

Image: Statistic View—Cells Format, **Font** Tab



Where a field is blank, or the check box is dimmed (as in the *Strikeout* and *Underline* attributes in the image above), then the spreadsheet default is applied. The fields in this dialog box are described in *Table: Statistic View—Cells Format,* ***Font*** *Tab Fields*.

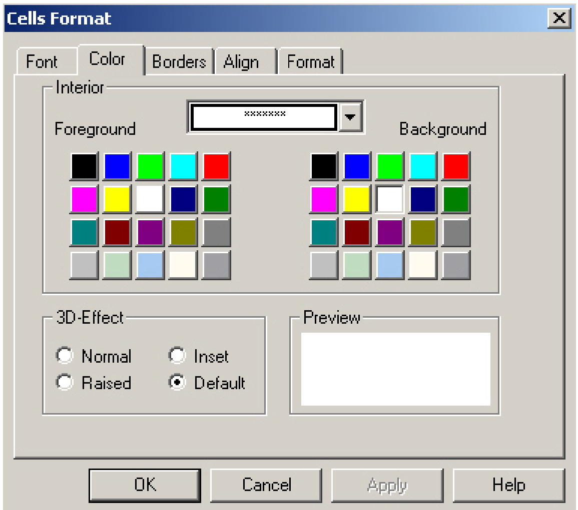
Table: Statistic View—Cells Format, **Font** Tab Fields

Field	Usage
Font	Selects the font to be used in the selected cells. Selects from the system installed fonts.
Outline	Selects the representation of the font: normal, italic, bold, bold-italic, not bold, and not italic.
Size	Selects the font size to be used in the selected cells. A font size may be selected from the list, or typed directly into the box.
Effects	Selects strikeout and or underline for the selected cells.
Textcolor	Selects the color for text in the selected cells.
Preview	Previews the results of the selections.

Color Tab

The **Color** tab is used to set the color used within cells and is shown in *Image: Statistic View—Cells Format,* ***Color*** *Tab*.

Image: Statistic View—Cells Format, **Color** Tab



The fields in the tab are described in *Table: Statistic View—Cells Format, **Color** Tab Fields*.

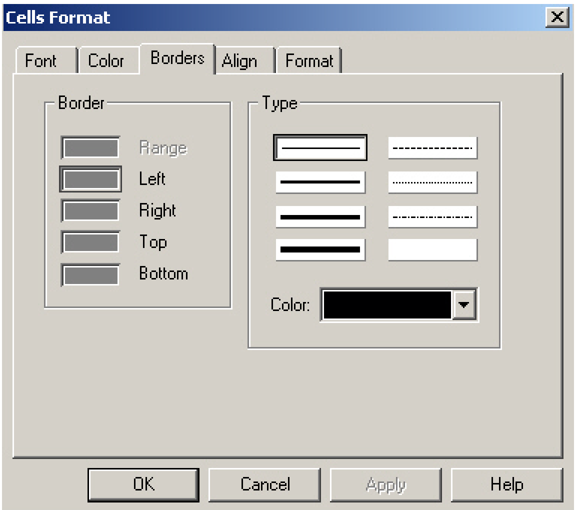
Table: Statistic View—Cells Format, **Color** Tab Fields

Field	Usage
Top Drop Down Box	Selects a black and white background pattern, rather than a combination of colors. The initial selection of '******' indicates use of the spreadsheet default.
Foreground	Selects the foreground color used to show text. Selection of either a foreground or background color overrides any black and white selection.
Background	Selects the background color used in the selected cells. Selection of either a foreground or background color overrides any black and white selection.
3D-Effect	Selects the view effect of the selected cells. The choices are: • Normal—a flat view. • Raised—the cells appear raised up. • Inset—the cells appear unavailable. • Default—the spreadsheet default is used.
Preview	Previews the results of the selections.

Borders Tab

The **Borders** tab, used to place border lines around cells, is shown in *Image: Statistic View—Cells Format, **Borders** Tab*.

Image: Statistic View—Cells Format, **Borders** Tab



The fields in this tab are described in *Table: Statistic View—Cells Format, **Borders** Tab Fields*.

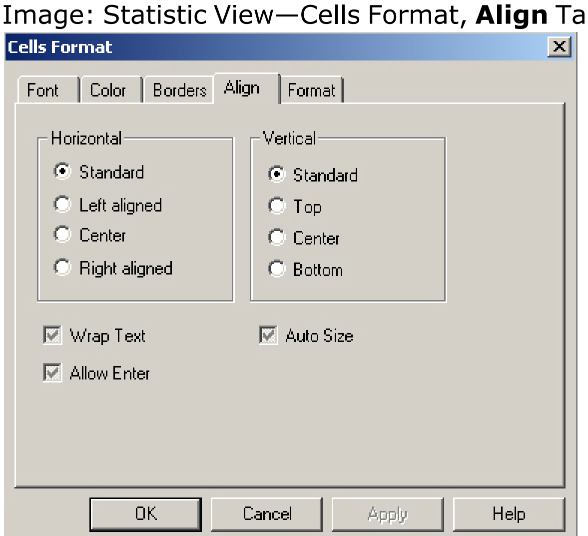
Table: Statistic View—Cells Format, **Borders** Tab Fields

Field	Usage
Border	Select which side or sides of the cells to place border lines along. Any combination of left, right, top, and bottom.
Type	Select the type of border line to apply. The left column offers different line widths, and the right column offers different line styles.
Color	Select the line color from the list.

Align Tab

The **Align** tab, used to set the alignment of the text within the cells, is shown *Image: Statistic View—Cells Format, **Align** Tab*.

Image: Statistic View—Cells Format, **Align** Tab



Where a check box is dimmed in the tab, the spreadsheet default is applied. The fields in this tab are described in *Table: Statistic View—Cells Format, **Align** Tab Fields*.

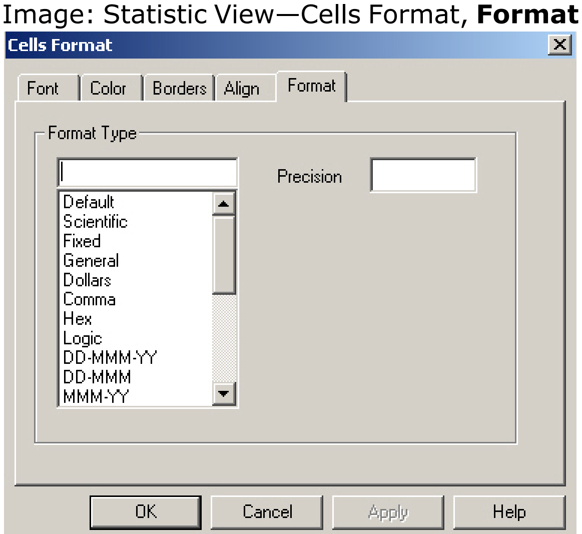
Table: Statistic View—Cells Format, **Align** Tab Fields

Field	Usage
Horizontal	Select the horizontal alignment of text in the selected cells. One of standard (spreadsheet default), left alignment, centered, or right aligned.
Vertical	Select the vertical alignment of text in the selected cells.
Wrap Text	If selected and not dimmed, wraps text that exceeds the cell's width onto a new line within the cell.
AutoSize	If selected and not dimmed, the column width expands to hold the entered text.
Allow Enter	If selected and not dimmed, the *Enter* key causes a new line to be started in the cell.

Format Tab

The **Format** tab, used to define the format of data in the cells, is shown in .

Image: Statistic View—Cells Format, **Format** Tab



The fields in the tab are described in *Table: Statistic View—Cells Format, **Format** Tab*.

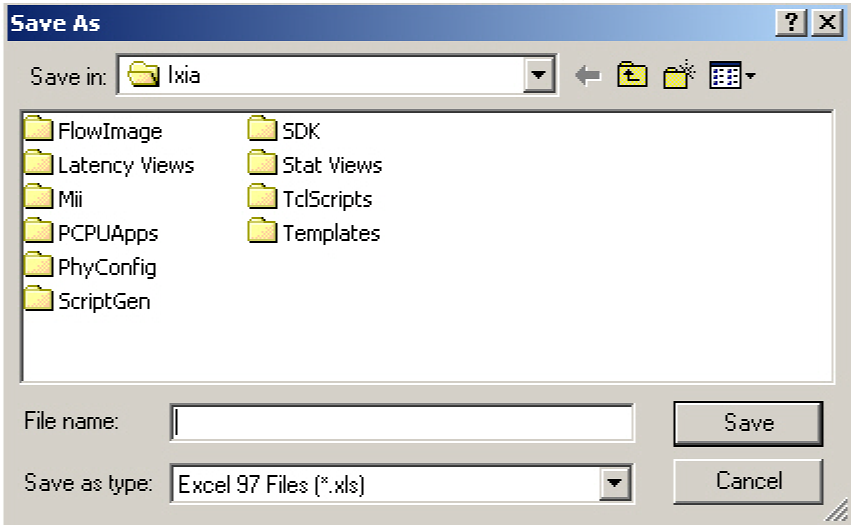
Table: Statistic View—Cells Format, **Format** Tab

Field	Usage
Format Type	Select one of the standard numeric formats.
Precision	The precision/scientific notation used for the numeric format (for example, hex = 0x0).

Spreadsheet—Export to Excel File dialog box

The export to Excel file *Save As* dialog box is shown *Image: Statistic View—Export to Excel dialog box*.

Image: Statistic View—Export to Excel dialog box



The standard file *Save As* dialog box allows the selection/specification of a file name for the saved file, which is stored in Excel format.

Using Chart View

The charting process may be performed either on the instantaneous, real-time statistics data or on static data obtained when testing has stopped. The process of charting starts with the selection of one or more ranges of data on the spreadsheet.

For example, in the following fictitious spreadsheet with the indicated selection (shown in *Image: Logging and Alerts dialog box–Single Stat*), the vertical bar chart corresponding to the selection follows in *Image: Statistic View—Sample Chart*.

Image: Statistic View—Chart Data Selection

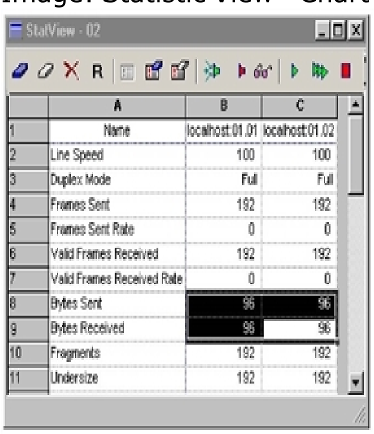
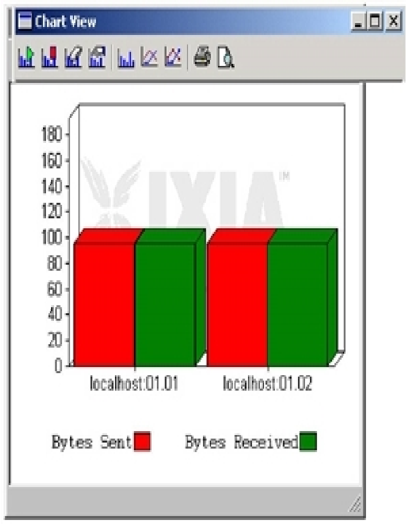


Chart View dialog box

Select the *Create Chart* icon ( ) in the Statistic View spreadsheet toolbar to open the *Chart View* dialog box. An example is shown in *Image: Statistic View—Sample Chart*.

Image: Statistic View—Sample Chart



The format of the chart may be changed through the use of the *Chart Properties* icon ( )at the top of the *Chart View* dialog box, as shown in *Image: Statistic View—Chart Toolbar*. See the [Chart Properties] window for configuration specifics.

Image: Statistic View—Chart Toolbar

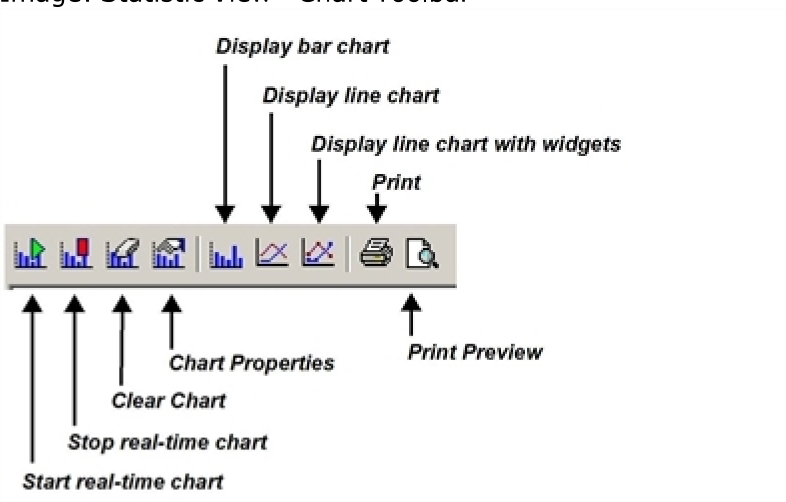
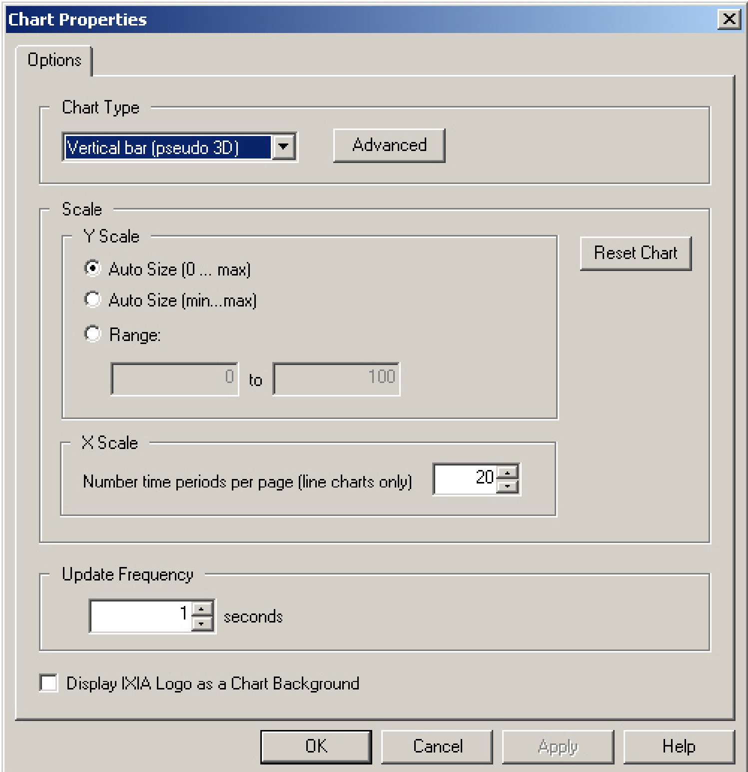


Chart Properties

The *Chart Properties* icon ( ) provides dialog boxes that allows for scale specification and chart type selection, as shown in .

Image: Statistic View—Chart Properties dialog box



The fields on this dialog box are described in *Table: Statistic View—Chart Properties dialog box fields*.

Table: Statistic View—Chart Properties dialog box fields

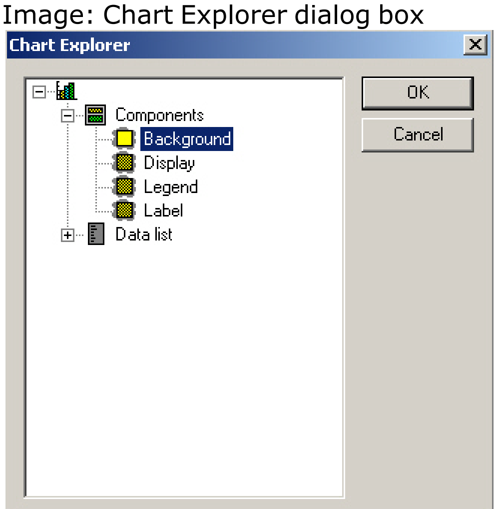
Boxed Area	Field	Usage
Chart Type	List	Lists the different types of charts that are available. The choices available and illustrations are available in the discussion of charting. Chart View dialog box.
	Advanced...	This button makes available a series of dialog boxes that present each component of the chart in a form that may be individually customized in any way through the Chart Explorer window, as described in Chart Explorer dialog box.
Scale - Y Scale	Auto Size (0 ... max)	Allows the chart to automatically scale in size.
	Auto Size (min...max)	Allows the chart to automatically scale in size.
	Range	Allows the vertical scale to be set explicitly.
	From	Low vertical scale value.
	To	High vertical scale value.
X Scale	Number of	Select the number of time periods which will appear in the line

Boxed Area	Field	Usage
	time periods per page (line charts only)	chart along the x-axis.
Reset Chart		Resets the chart to its default configuration.
Update Frequency		Select the time interval between updates of the data shown in the chart.
Show IXIA logo as a Chart Background		If selected, the IXIA logo will appear as a background in the chart.

Chart Explorer dialog box

The *Chart Explorer* dialog box appears when the *Advanced...* button is selected, and is shown in *Image: Chart Explorer dialog box*.

Image: Chart Explorer dialog box



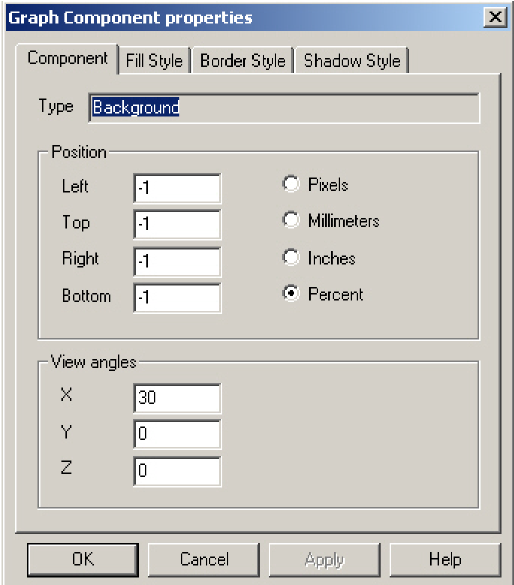
The components listed in this window allow to access many standard graphics properties for configuring the Chart View. The following dialog boxes appear by double-clicking the appropriate item in the list:

- Background dialog box
- Display dialog box
- Legend dialog box
- Label dialog box

Background dialog box

The *Background* dialog box provides with four tabs that allow customization of the graphic backgrounds for the charts, as shown in *Image: Chart Explorer—Background dialog box*.

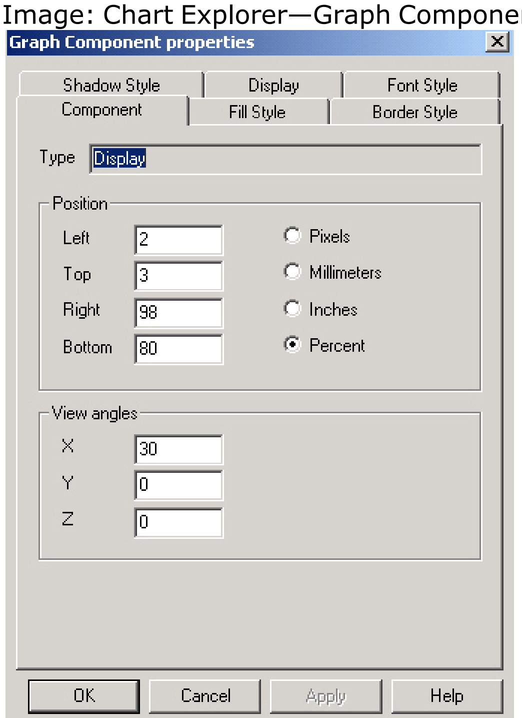
Image: Chart Explorer—Background dialog box



Display dialog box

The *Display* option provides with six tabs which allow customization of the view properties for the charts, as shown in *Image: Chart Explorer—Graph Components–Display*.

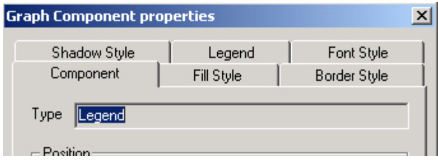
Image: Chart Explorer—Graph Components–Display



Legend dialog box

The *Legend* option provides with six tabs which allow customization of the legends for the charts, as shown in *Image: Chart Explorer—Graph Components–Legend*.

Image: Chart Explorer—Graph Components–Legend



Label dialog box

The *Label* option provides with six tabs which allow customization of the labels to be used in the charts, as shown in *Image: Chart Explorer—Graph Components–Label*.

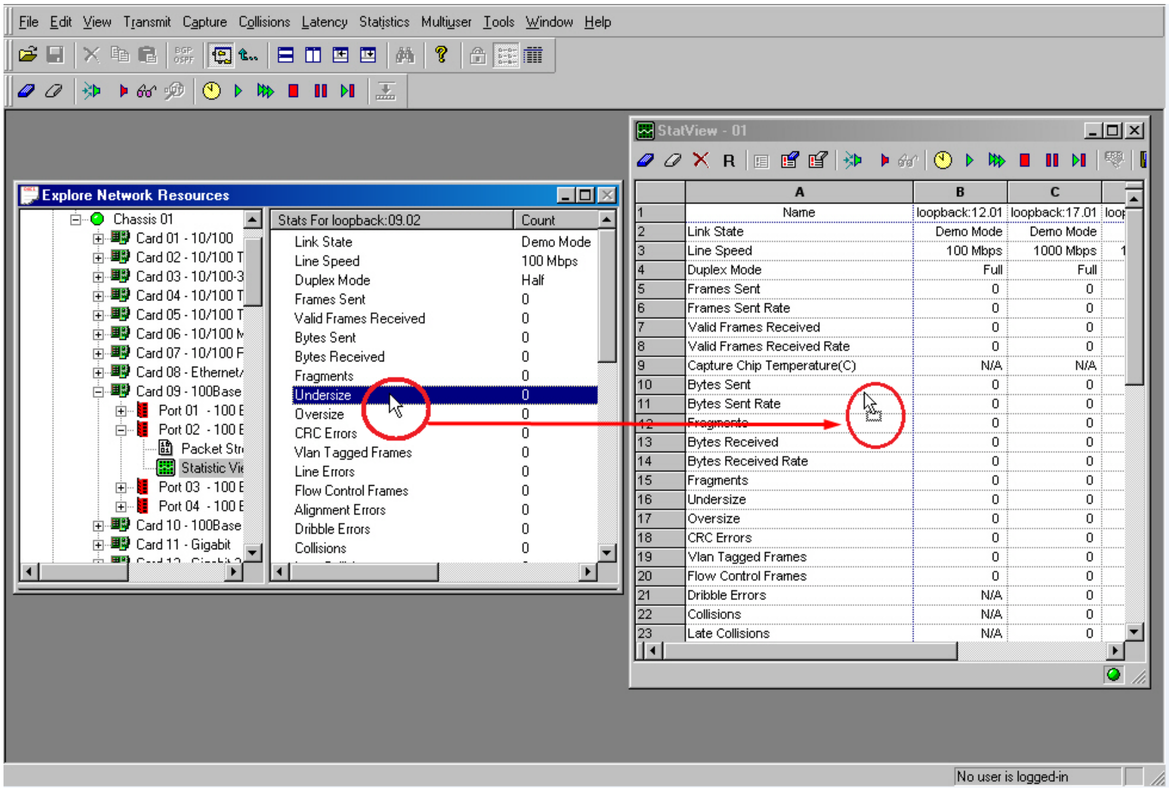
Image: Chart Explorer—Graph Components–Label

Adding Fields and Ports to Custom Views by 'Drag and Drop'

Fields and their related ports can be dragged from a Port Statistic View and dynamically added to an existing Custom Statistic View. The steps to accomplish this are:

1. Create a Custom Statistic View as described in Statistic View—Custom Views above. Leave the view open in the IxExplorer window.
2. Open a Port Statistic View as described in Statistic View—Port above.
3. Select a field (or fields) in the Port Statistic View, and drag it (or them) to the Custom Statistic View. *Image: Dragging and Dropping Statistic from Port to Custom View* demonstrates this action.

Image: Dragging and Dropping Statistic from Port to Custom View



The selected fields appears in the Custom View. If the port from which the fields were dragged was not originally a member of the Custom View, this action adds the port to the custom view.

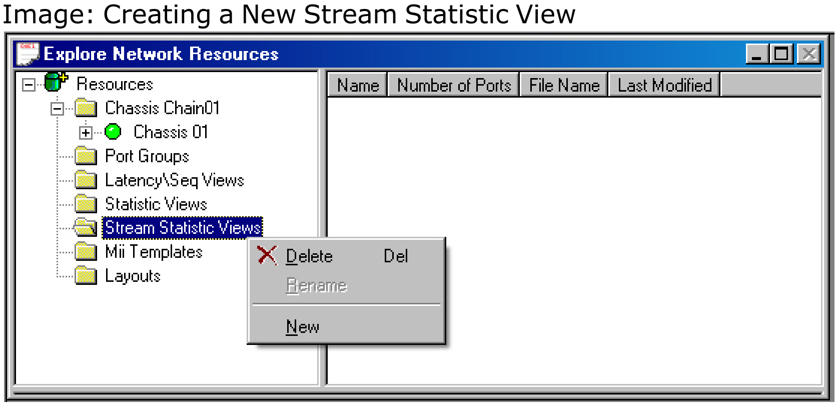
To remove the newly added fields, delete the port from the custom view, as described in Statistic View—Custom Views above.

Stream Statistic Views

Stream Statistic Views allow to see statistics for specified streams on all TXS/SFP port module types. To view the statistics for a single stream in the Explore Network Resources window, select *Stream Statistic View* folder in the Resources view.

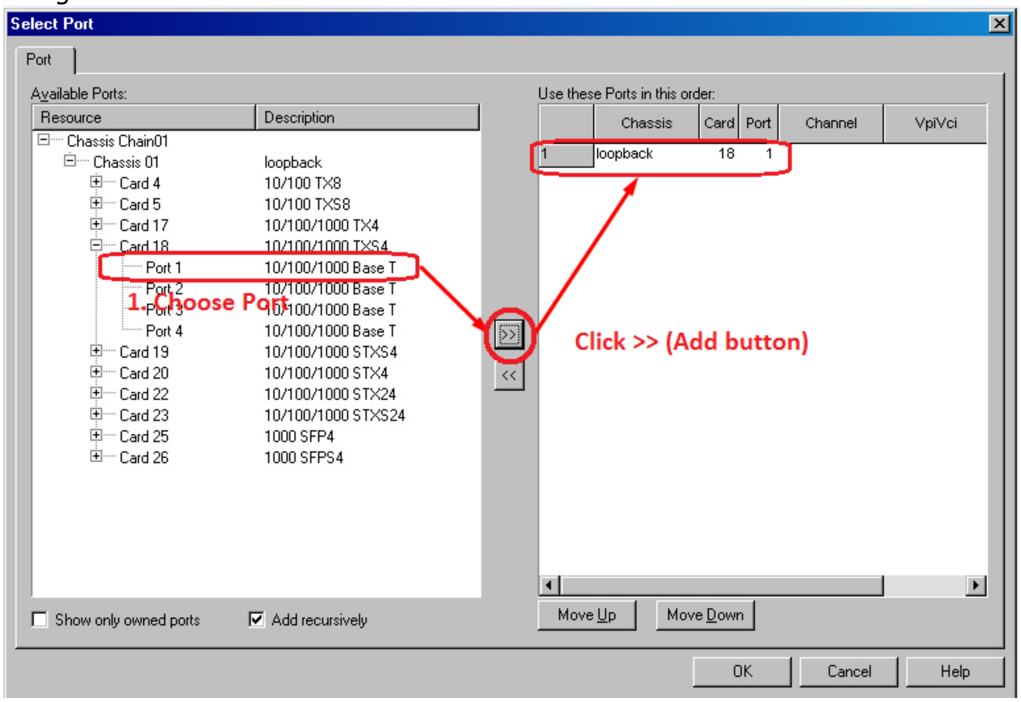
Image: Creating a New Stream Statistic View shows the Stream Statistic View context menu.

Image: Creating a New Stream Statistic View



Selecting the **New** option opens the *Select Port* dialog box. The *Select Port* dialog box is shown in *Image: Port Selection Menu*.

Image: Port Selection Menu

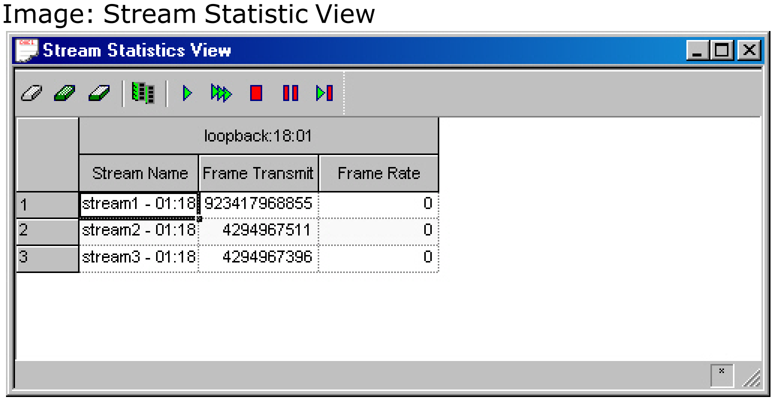


To select streams to show statistics, select a port or ports in the left pane and then the >> button (to Add). Once all ports that have streams to track have been added to the list, select **OK**.

NOTE	For a description of the Select Port dialog box, Select Port dialog box.

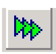
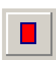
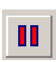
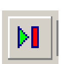
The *Stream Statistic View* dialog box shows the per stream statistics. The *Stream Statistic View* dialog box is shown in *Image: Stream Statistic View*.

Image: Stream Statistic View



Each port is shown with its configured streams. The controls on this dialog box are explained in *Table: Stream Statistic View Operation*.

Table: Stream Statistic View Operation

Icon	Field/Control	Usage
	Clear All Statistics	Resets all statistics back to all 0’s.
	Clear Stream Statistics	Resets the selected stream statistics for back to all 0’s. At least one stream must be highlighted for this icon to be active.
	Clear All Stream Statistics	Resets the statistics for all streams back to all 0’s.
	Add/Delete Ports	Opens the *Select Port* dialog box, where one or more ports can be added to or deleted from the Statistic View. Selecting Ports for the Statistic View.
	Start Transmit	Starts the transmit operation on the selected stream(s).
	Start Staggered Transmit	Starts the transmit operation on the selected streams. A delay is inserted between one port’s start transmission and the next.
	Stop Transmit	Stops the transmit operation on the selected stream(s).
	Pause Transmit	Pauses the transmit operation on the selected stream(s).
	Single Step Stream	Sends a single packet on each of the selected streams.
	Stream Name	The name of the stream on the selected port.
	Frame Transmit	The total number of frames transmitted on the port through the selected stream.
	Frame Rate	The frame rate of the stream.

Statistics Logging and Alerts

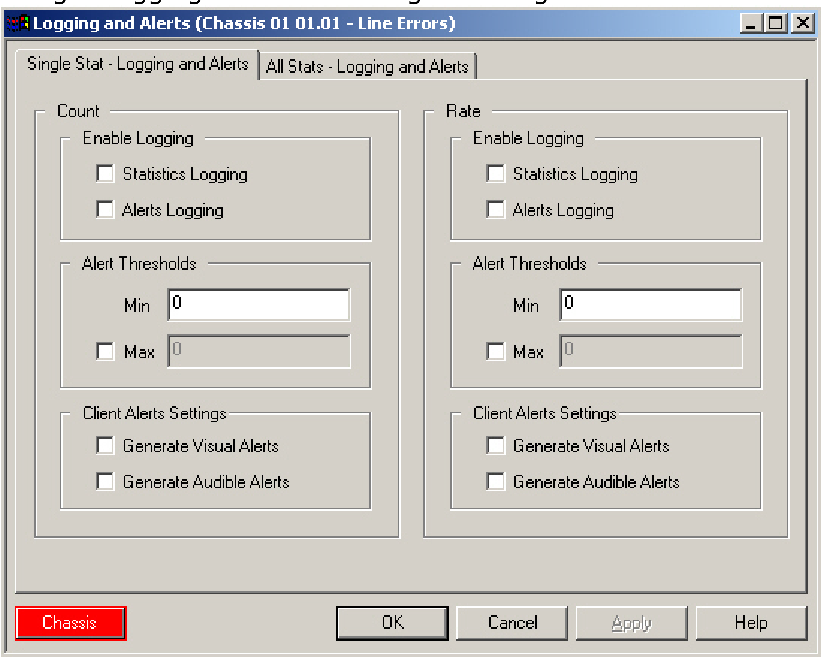
Statistics Logging and Alerts only operates in conjunction with the spreadsheet view of statistics. The spreadsheet view is configured in the *Tools* > *Options* > ***Statistics View*** tab; refer to Statistic Views *. Statistics Logging and Alerts may be configured through the Logging and Alerts dialog box, which is accessed by selecting the Logging and Alerts Configuration icon (**), or by selecting a cell and then selecting Logging and Alerts Configuration. The Logging and Alerts dialog box is shown in Image: Logging and Alerts dialog box–Single Stat. There are two tabs on the dialog box:*

- Single Stat–Logging and Alerts—allows configuration of logging and/or alerts for a related pair of statistics.
- All Statistics– Logging and Alerts—allows configuration of logging and alerts for multiple statistics.

Single Stat–Logging and Alerts

For specifying logging and alerts for a single statistic, select the **Single Stat - Logging and Alerts** tab, which is shown in *Image: Logging and Alerts dialog box–Single Stat*.

Image: Logging and Alerts dialog box–Single Stat



This tab allows configuration of logging and/or alerts for a related pair of statistics. The first is a raw count of events and the other is the rate per second of the count. Regardless of which is selected, both may be configured at the same time. For example, if either the *Frames Sent* or *Frames Sent Rate* is selected in the spreadsheet with the right mouse button, then the same dialog box will be presented, which will allow alerts for both statistics to be configured. The fields and controls in this dialog box are described in *Table: Logging and Alerts dialog box–Single Stat Fields*.

Table: Logging and Alerts dialog box–Single Stat Fields

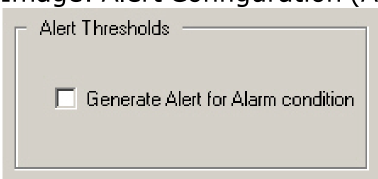
Area	Field	Usage
Count		The left side of the dialog box configures the count form of the statistic.
Enable Logging	Statistics Logging	If selected, statistics logging is enabled for the selected count statistic.
	Alert Logging	If selected, alert logging is enabled for the selected count statistic.
Alert Thresholds	Min	If alert logging or either client alert is enabled, this value specifies the low alert threshold. Measured values below this value will generate logs and/or alerts.
	Max	If alert logging or either client alert is enabled and the check box is

Area	Field	Usage
		selected, then this value specifies the upper alert threshold. Measured values above this value will generate logs and/or alerts.
	(Alternate to Min/Max)) Generate Alert for Alarm Condition	When the alert is configured for a condition which cannot be defined by numerical threshold values, a single check box is provided for enabling an alert for alarm condition applicable to that parameter.
Client Alerts Settings	Generate Visual Alerts	If selected, enables visual alerts on the client station for configured parameters. These would be made visible in the Statistic View spreadsheet with a red, green, or yellow background in the cell for that statistic on the affected port.
	Generate Audible Alerts	If selected, enables audible alerts on the client station for configured parameters. These alerts would be in the form of a beeping noise from the PC speakers. The Statistic View spreadsheet window must be open for these to take effect.
Rate		The right side of the dialog box configures the rate form of the statistic.
Enable Logging	Statistics Logging	If selected, statistics logging is enabled for the selected rate statistic.
	Alert Logging	If selected, alert logging is enabled on the chassis for the selected rate statistic.
Alert Thresholds	Min	If alert logging or either client alert is enabled, this value specifies the low alert threshold. Measured values below this value will generate logs and/or alerts.
	Max	If alert logging or either client alert is enabled and the check box is selected, then this value specifies the upper alert threshold. Measured values above this value will generate logs and/or alerts.
Client Alerts Settings	Generate Visual Alerts	If selected, enables visual alerts on the client station for configured parameters. These would be made visible in the Statistic View spreadsheet with a red, green, or yellow background in the cell for that parameter on the affected port.
	Generate Audible Alerts	If selected, enables audible alerts on the client station for configured parameters. These alerts would be in the form of a beeping noise from the PC speakers. The Statistic View spreadsheet window must be open for these to take effect.
Chassis	Chassis	This button invokes the **Logging and Alerts** tab of the *Chassis*

Area	Field	Usage
	Button	*Properties* dialog box which allows logging and alerts to be configured for the chassis as a whole. Refer to Chassis Properties—Logging and Alerts.

For state conditions, where an allowable range with threshold values is not applicable, the **Alert Thresholds** section is shown in *Image: Alert Configuration (Alternate view)*.

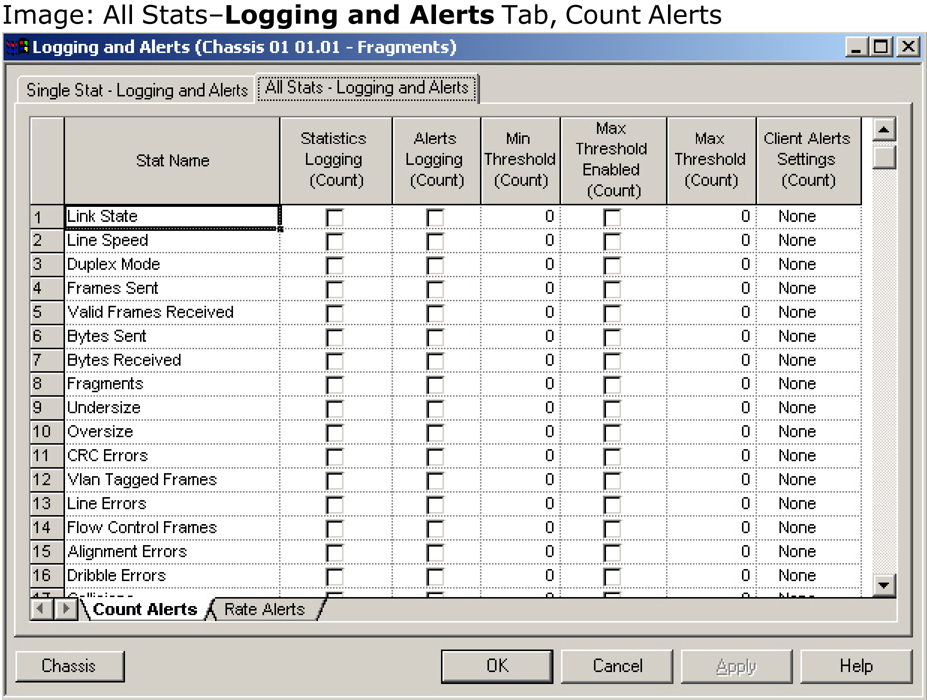
Image: Alert Configuration (Alternate view)



All Statistics– Logging and Alerts

For specifying logging and alerts for multiple statistics, select the *All Stats–**Logging and Alerts*** tab, which is shown in *Image: All Stats–**Logging and Alerts** Tab, Count Alerts*.

Image: All Stats–**Logging and Alerts** Tab, Count Alerts



The *All Stats–**Logging and Alerts*** tab has two sub-tabs along the bottom edge: *Count Alerts* and *Rate Alerts*. The columns allow to configure statistics logging and/or alerts for all of the statistics for the port. The screen can be scrolled left-to-right to access all of the columns. The columns are selectable; selecting a column heading shows a pop-up menu with options for modifying the column properties.

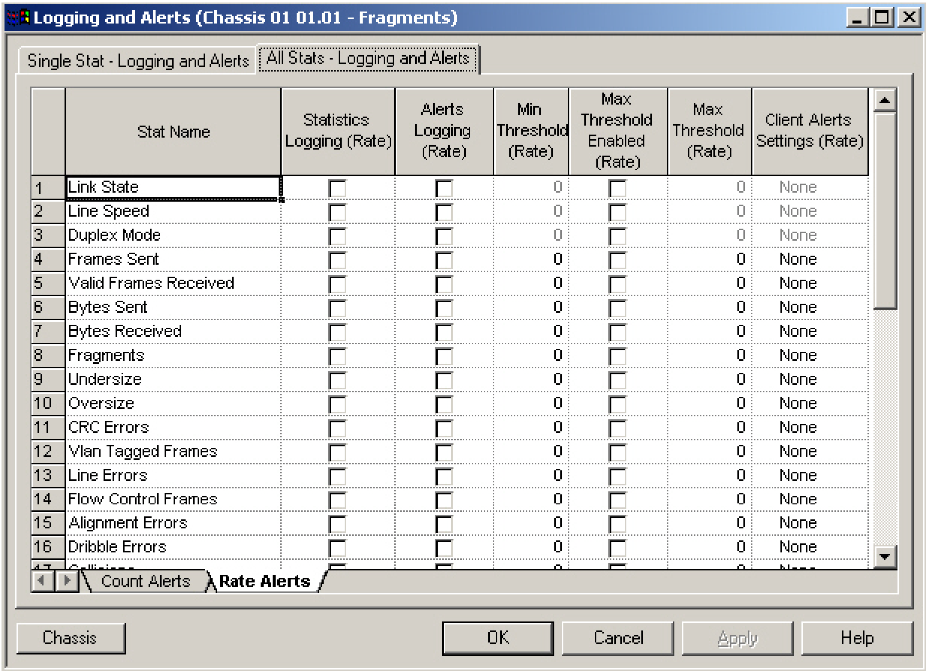
Columns and controls for the *Count Alerts* sub-tab are described in *Table: All Stats–**Logging and Alerts** Tab, Count Alerts*.

Table: All Stats–**Logging and Alerts** Tab, Count Alerts

Field	Usage
Stat Name	The name of the statistic which is being monitored for this port.
Statistics Logging (Count)	If selected, statistics logging is enabled for the statistic for this port.
Alerts Logging (Count)	If selected, alert logging is enabled for the statistic for this port.
Min Threshold (Count)	If alert logging or either client alert is enabled, this value specifies the lower alert threshold. Measured values below this value will generate logs and/or alerts.
Max Threshold Enabled (Count)	If alert logging or either client alert is enabled and the check box is selected, then the corresponding Maximum Threshold value in the next column specifies the upper threshold value. Measured values above this value will generate logs and/or alerts.
Max Threshold (Count)	If alert logging or either client alert is enabled and the Maximum Threshold (Enabled) check box is selected, then this value specifies the upper alert threshold. Measured values above this value will generate logs and/or alerts.
Client Alerts Settings (Count)	Selects the type of Alerts settings to be enabled. Select the cell in this column to open the alert setting list. Select one of: • **None**—Indicates that no client alerts are enabled for this statistic for this port. • **Audio**—Enables audible alerts on the client station for configured statistics in the form of a beeping noise from the PC speakers. The Statistic View spreadsheet window must be open for these to take effect. • **Visual**—Enables visual alerts on the client station for configured statistics. These would be made visible in the Statistic View spreadsheet with a red, green, or yellow background in the cell for that statistic on the affected port. • **Audio + Visual**—Enables both visual and audible alerts (as described above) for this statistic for this port.

Logging and Alerts for multiple statistics can be also configured for rates by using the *Rate Alerts* sub-tab as shown *Image: All Stats–**Logging and Alerts** Tab, Rate Alerts* .

Image: All Stats–**Logging and Alerts** Tab, Rate Alerts

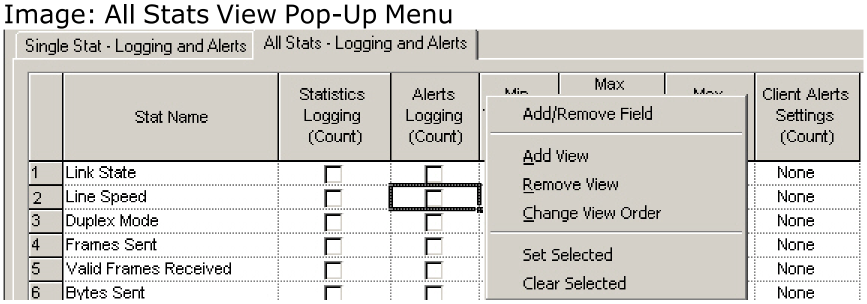


This spreadsheet uses the same set of columns as the *Count Alerts* sub-tab, but applies to rate-based alerts. *Table: All Stats–**Logging and Alerts** Tab, Count Alerts* for an explanation of the fields and columns.

Logging and Alerts dialog box–All Stats–Configuring Views

The **All Stats** tab in the *Logging and Alerts* dialog box can be configured to suit varied needs. Select a column heading on the *Count Alerts* or *Rate Alerts* sub-tab (which are the default views), to open the pop-up menu shown *Image: All Stats View Pop-Up Menu*.

Image: All Stats View Pop-Up Menu



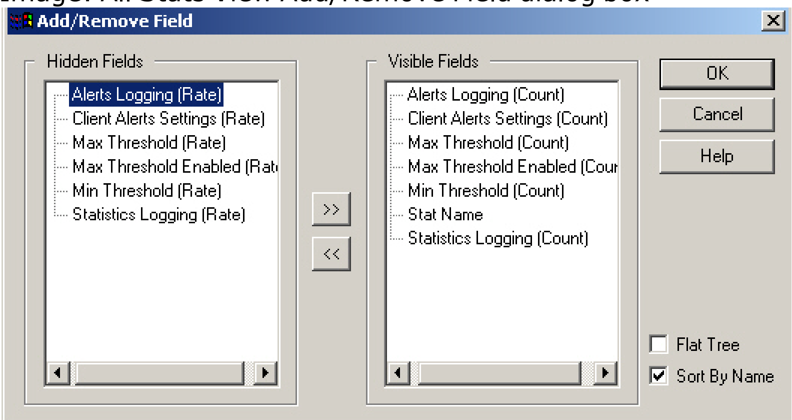
The pop-up menu allows to select the following options.

- Add/Remove Field Option
- Add View Option
- *Remove View*—deletes the currently shown view sub-tab from the **All Stats** tab.
- Change View Order Option
- *Set Selected*—you can enable all of the highlighted parameters at one time.
- *Clear Selected*—you can disable all of the highlighted parameters at one time.

Add/Remove Field Option

To add or remove a field (column), select the column, and then select *Add/Remove Field*, and the dialog box shown in *Image: All Stats View Add/Remove Field dialog box* will be presented.

Image: All Stats View Add/Remove Field dialog box

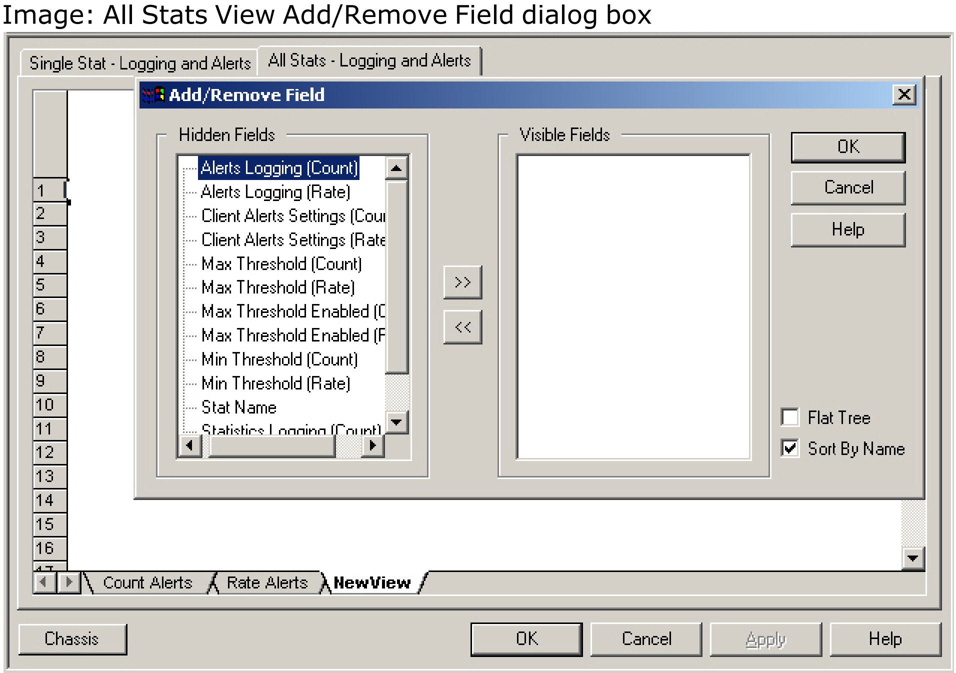


Highlight field names in the *Hidden Fields* list in the left pane, and select the >> button to move them to the *Visible Fields* list in the right pane. To remove fields from the view, highlight and move the field names to the left pane using the << button.

Add View Option

To add another view (a sub-tab, such as the *Count Alerts* or *Rate Alerts*) containing only specific columns, select an existing sub-tab and select *Add View* in the pop-up menu, and the dialog box shown in will appear.

Image: All Stats View Add/Remove Field dialog box

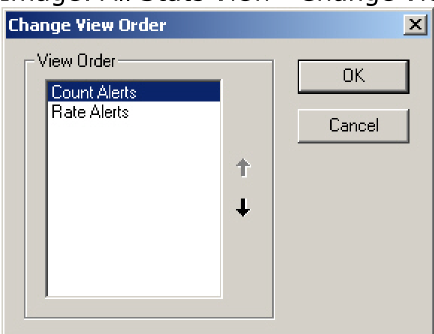


Select the fields/columns to be shown in the new view, using the same method used with the *Add/Remove Field* dialog box described above. Enter a name for the new view in the tab at the bottom of the view window.

Change View Order Option

Select the *Change View Order* option on the pop-up menu to open the *Change View Order* dialog box as shown in . This dialog box is used to change the order of the tab labels shown at the bottom edge of the **All Stats** tab.

Image: All Stats View—Change View Order



Use the arrow buttons to move a selected view feature up or down.

NOTE: This section describes the function of the Logging and Statistics Change View dialog box. There is a similar dialog box found for the Stream Grid in the main IxExplorer window. It functions in the same manner.Customizing the Stream Edit Window for more information about the Stream Grid.

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CHAPTER 16

Packet Group Statistic View

The Packet Group Statistic View allows the latency data (including Inter-Arrival Time) to be collected from one or more ports that are configured to receive packet groups. Packets representing different types of traffic profiles can be associated with packet group identifiers (PGIDs). The receiving port measures the minimum, maximum, and average latency in real time for each packet belonging to different groups. Measurable latencies include Instantaneous Latency, where each packet is associated with one group ID only, and Latency Over Time, where multiple PGIDs can be placed in ‘time buckets’ with fixed durations.

Data may be viewed as a spreadsheet and/or charted. For certain modules, data related to sequence checking error thresholds may also be monitored in this view.

To view latency/sequence checking data for one or more ports side-by-side, select *Packet Group Statistic Views* (under *Global Views*) in the tree and select *New*, or choose a previously defined view in the detail pane. Selecting *New* will open a window where one or more ports may be selected to view the data in a side-by-side view. Latency data is shown in the form of a spreadsheet labeled *Packet Group Statistic View*. Some modules also support *Latency over Time* and *Inter-Arrival Time*. Latency Reports appear as additional, named spreadsheets in the same view.

NOTE There may be a minimum frame size necessary to support latency measurements on particular load modules. Refer to the appropriate chapter in the Reference Manual for limits.

For more information on Latency, Sequence Checking, and Inter-Arrival Time, see the following sections in the ‘Theory of Operation: General’ chapter in the *Ixia Platform Reference Manual*:

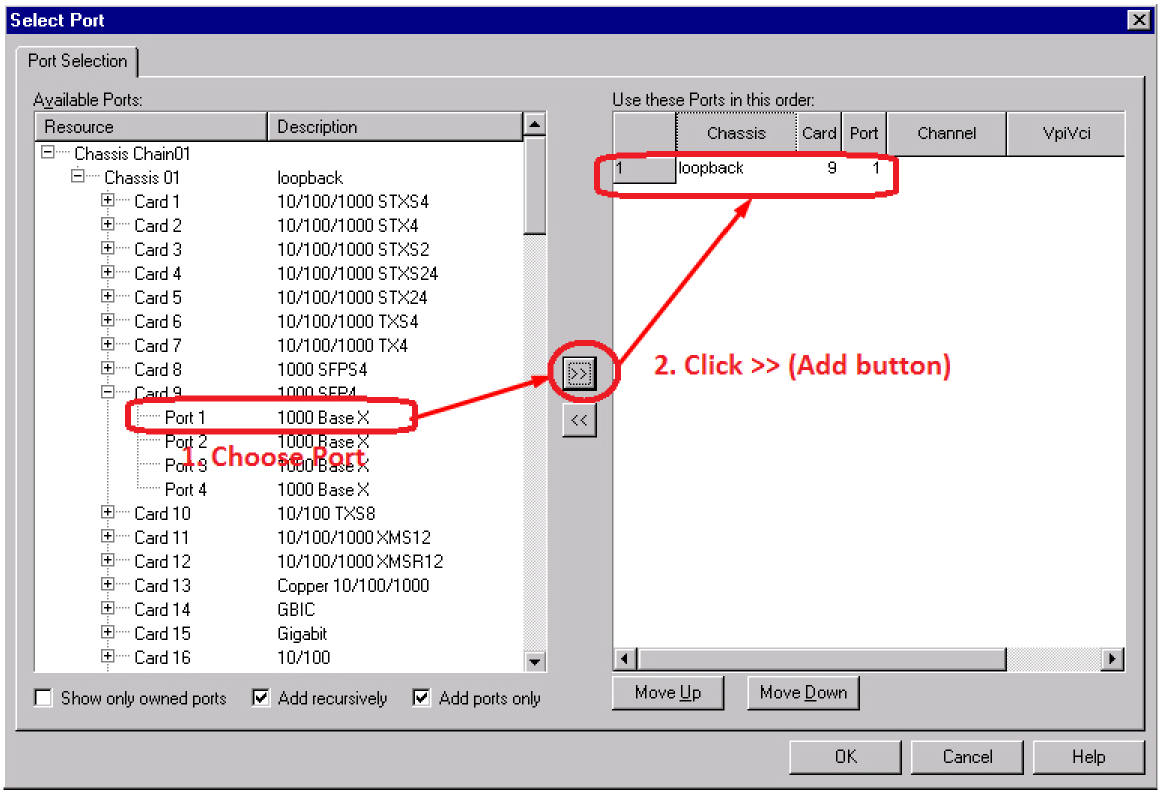
- Packet Group Operation
- Latency/Jitter Measurements
- Sequence Checking Operation

Port Selection

The Packet Group Statistic Views *Select Port* dialog box for selecting new or additional ports is shown in *Image: Packet Group Statistic Views—Select Port*.

NOTE For a description of the Select Port dialog box,Select Port dialog box.

Image: Packet Group Statistic Views—Select Port



On the left side of the window, highlight the desired ports using either the shift-select or control-select methods, and then select the *Add* button to place them in a list on the right side of the window. After selections are complete, select *OK*, and the *Packet Group Statistic View* spreadsheet will appear.

Any port may be selected, but latency measurements will not occur unless several things are set up correctly (see the Port Data Capture Capabilities section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual* for a full description of packet group and latency operation). Configuration requirements are described below:

NOTE Type-3 cards may not be used to transmit packet group data.

- The Receive Mode on the ports in the latency group must be set for Packet Groups or Wide Packet Groups. Receive Mode Tab for the setting of latency groups and associated parameters.
- The transmitting port or ports must be configured to generate packet group data in the manner that the selected receive ports expect. Instrumentation Box for setting up Packet Group mode on transmitting ports.
- When ports support sequence checking with threshold error, a combination Latency/sequence Checking View may be set up. The ports must also have sequence checking enabled for receive modes. Advanced Sequence Checking for further information.

Packet Group Stats/Sequence Checking Data View

The Packet Group Statistics View has different modes which are described in the following sections:

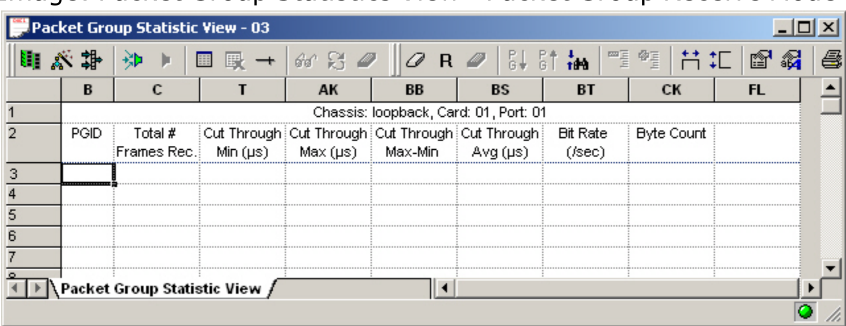
- [Packet Groups View]
- [Wide Packet Groups]
- [Packet Group/Sequence Checking View]
- [Switched-Path Duplicate/Gap Checking]
- [Inter-Arrival Time]
- [PRBS Mode]

Packet Groups View

A Packet Groups view for a group with a single member (a Gigabit port) is shown in *Image: Packet Group Statistics View—Packet Group Receive Mode*. This view is set up for latency measurements only, without the sequence checking option.

For OC-192c POS legacy modules (in packet group mode)— When performing latency measurements, the following restrictions apply: 1024 or fewer packet group IDs **should** be used if different frame sizes are used at full line rate. More than 1024 packet group IDs **may** be used at line rate and varying frame sizes, so long as the frame sizes are between 256 and 1024 bytes.

Image: Packet Group Statistics View—Packet Group Receive Mode



Each port in the packet group appears in a set of columns, with a blank column between ports. The first row of the view specifies the port. The second row has the column headings for the latency parameters. *Refer to Image: Packet Group Statistic Views—Select Port* for explanations of these headings.

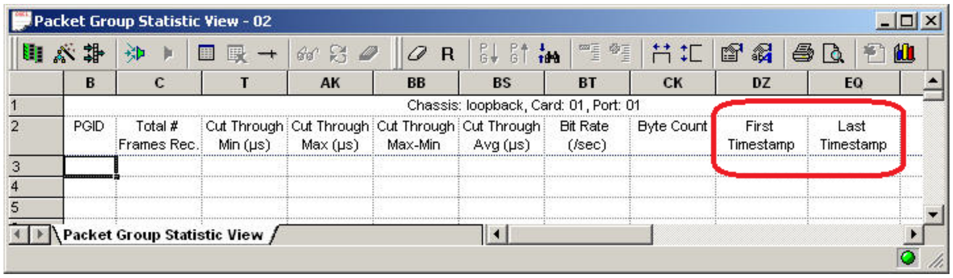
NOTE	When Wide Packet Groups are used, two extra columns for First and Last Timestamp are included. See Wide Packet Groups.

The rest of the rows contain latency data. For instantaneous latency, some rows may be appear to be empty, but this is due to the lack of received data with the Packet Group ID that corresponds to that row.

Wide Packet Groups

If the *Wide Packet Groups* check box is selected in the **Receive Mode** tab, the Packet Group Statistics View for the port will contain two additional columns, for First Timestamp and Last Timestamp, as shown in *Image: Wide Packet Groups—First and Last Timestamps*.

Image: Wide Packet Groups—First and Last Timestamps



The column headings in this view are described in *Table: Wide Packet Groups Statistics View* .

Table: Wide Packet Groups Statistics View

Column Heading	Description
PGID	The Packet Group ID (PGID) is used as a row ID for latency data concerning packets that contain this PGID.
Total # Frames Rec.	The number of packets received with this specific PGID, since the last reset of the data.
Cut Through Min (us)	The minimum delay seen on packets with this specific PGID, measured in microseconds.
Cut Through Max (us)	The maximum delay seen on packets with this specific PGID, measured in microseconds.
Cut Through Max-Min	Maximum delay minus minimum delay.
Cut Through Avg (us)	The average delay seen on packets with this specific PGID, measured in microseconds.
Bit Rate (bit/sec)	The instantaneous bit rate seen on the port, measured in bits per second.
Byte Count	The total number of bytes seen on the port.
First Timestamp	The received timestamp for the first incoming packet. The 6-byte timestamp value for the first packet received with this particular PGID. This value is exclicked, in hex, as multiples of the basic system clock (20 ns intervals).
Last Timestamp	The received timestamp for the last incoming packet. The 6-byte timestamp value for the last packet received with this particular PGID. This value is exclicked, in hex, as multiples of the basic system clock (20 ns intervals).
Standard Deviation	Only available if latency bin is enabled for wide packet group mode. Shows the standard deviation in the latency for the bin.

Delay Variation Measurement Mode

This mode in Receive properties, Wide Packet Groups, Latency/Jitter configuration enables the system to measure delay variation between consecutive frames that are not out of sequence. For details, Delay Variation Measurement Mode.

In addition to the statistics for Wide Packet Groups (above,*Table: Wide Packet Groups Statistics View*), the following are specific to the Delay Variation measurement.

Table: Delay Variation Measurement Statistics

Column Heading	Description
DV Min (us)	The smallest of all delay variations measured for a specific flow from the start of statistic collection
DV Max (us)	The largest of all delay variations measured for a specific flow from the start of statistic collection
DV Max - Min (us)	The mathematical subtraction of Min DV from Max DV
DV Avg (us)	Boxcar average value of all the valid delay variations from the start of statistic collection. This is calculated by dividing the total sum of all DV by the number of received frames.
DV Short Term Avg	Boxcar average value of all the valid delay variations from the last time this value was read.

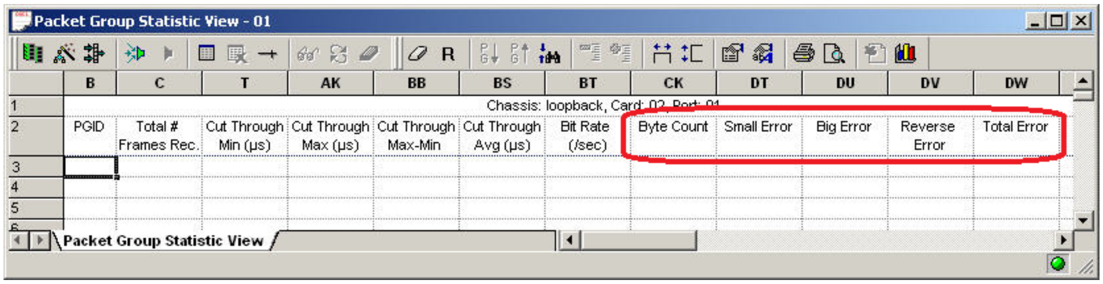
Packet Group/Sequence Checking View

The headings for the Packet Group/Sequence Checking View are shown in *Image: Packet Group/Sequence Checking View*. The sequence checking information is based on error conditions related to a threshold value defined in the sequence checking dialog box for the port’s receive mode. **No** error condition exists when the current sequence number is **one** greater than the previous sequence number. The error conditions are described in *Table: Packet Group/Sequence Checking View*

For more information on Sequence Checking using threshold values, Advanced Sequence Checking.

For OC-192c POS legacy modules (in packet group mode).When performing latency measurements, the following restrictions apply:1,024 or fewer packet group IDs should be used if different frame sizes are used at full line rate.More than 1,024 packet group IDs may be used at line rate and varying frame sizes, so long as the frame sizes are between 256 and 1,024 bytes.When performing sequence checking, no more than 1,024 packet group IDs should be used.

Image: Packet Group/Sequence Checking View



The possible options that appear as column headings in the spreadsheet are described in *Table: Packet Group/Sequence Checking View*.

Table: Packet Group/Sequence Checking View

Column Heading	Description
PGID	The Packet Group ID (PGID) is used as a row ID for latency data concerning packets that contain this PGID.
Total # Frames Rec.	The number of packets received with this specific PGID, since the last reset of the data.
Cut Through Min (us)	The minimum delay seen on packets with this specific PGID, measured in microseconds.
Cut Through Max (us)	The maximum delay seen on packets with this specific PGID, measured in microseconds.
Cut Through Max-Min	Maximum delay minus minimum delay.
Cut Through Avg (us)	The average delay seen on packets with this specific PGID, measured in microseconds.
Bit Rate (bit/sec)	The instantaneous bit rate seen on the port, measured in bits per second.
Byte Count	The total number of bytes seen on the port.
No Error	When the current sequence number is **one** greater than the previous sequence number. Refer to Advanced Sequence Checking.
Small Error	A 'Small Error' is counted when the current sequence number minus the previous sequence number is less than or equal to the error threshold (set by software) and not negative. Refer to Advanced Sequence Checking.

Column Heading	Description
Big Error	A 'Big Error' is counted when the current sequence number minus the previous sequence number is greater than the error threshold. Refer to Advanced Sequence Checking.
Reverse Error	A 'Reverse Error' is counted when the current sequence number is less than the previous sequence number. Refer to Advanced Sequence Checking.
Total Error	The 'Total Error' is the sum of all of the sequence checking errors, including: small, bit, and reverse. Refer to Advanced Sequence Checking.

The process of collecting latency data starts with deciding whether to perform a single set of measurements or handling multiple time slices.

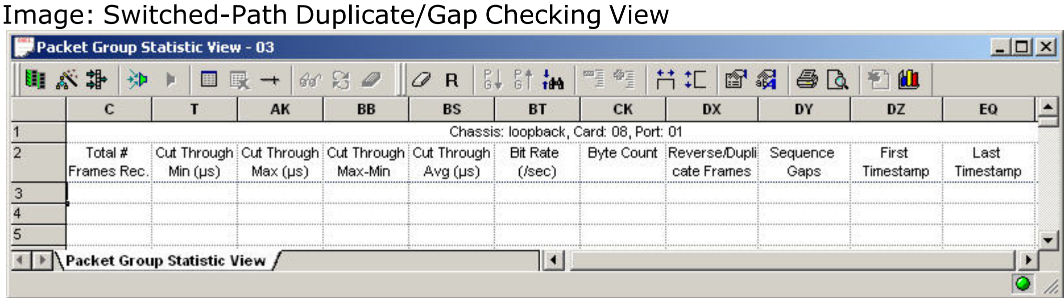
Switched-Path Duplicate/Gap Checking

If the port's **Receive Mode** tab is set up with these two conditions:

- the *Wide Packet Groups* check box is selected and
- the *Switched-Path Duplicate/Gap Checking* option button is selected in the **Sequence Checking** tab,

then the Packet Group Statistic View for the port will contain two additional columns, for *Reverse/Duplicate Frames* and *Sequence Gaps*, as shown in the following image.

Image: Switched-Path Duplicate/Gap Checking View



The extra options that appear as column headings in the spreadsheet are described in *Table: Switched-Path Duplicate/Gap Checking*.

Table: Switched-Path Duplicate/Gap Checking

Column Heading	Description
Reverse/Duplicate Frames	The number of reversed or duplicate frames that arrive on the port. This is used in test switched-path operations. A duplicate frame is a frame that arrives more than once with the same sequence ID, and a reverse frame is counted when the current sequence number is less than the previous sequence number. In most situations, these numbers should be the same.
Sequence Gaps	Records the number of gaps in a sequence, that is, if packets 1, 2, 3, 5 arrive there would be a count of 1 gap.

The remaining columns are explained in *Table: Wide Packet Groups Statistics View*.

Refer to the Switched-Path Duplicate/Gap Checking Mode section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual* for more information.

Wide Packet Groups/Sequence Checking—Advanced Sequence Tracking

If the port's **Receive Mode** tab is set up with these three conditions:

- the **Wide Packet Groups** check box is enabled,
- the **Sequence Checking** check box is enabled, and
- the **Late Threshold** value is added in the **Advanced Sequence Tracking** option,

then, five additional statictics appear in the **Packet Group Statistic View** tab. Configuring Advanced Sequence Tracking of Frame for more information.

NOTE Advanced Sequence Tracking options are available in the following load modules: LSM XMVDC16 ASM XMV 10/100/1000 LSM XM 10/100/1000 FCM GXM.

Configuring Advanced Sequence Tracking of Frame

The following steps help to configure the parameters in the IxExplorer application, using relevant load modules, to set advanced sequence tracking options to a frame of data.

To configure Advanced Sequence Tracking, do the following:

1. Select the port that is in transmit mode in the left pane, and then double-click **Packet Streams** in the right pane.

   The **Frame/Stream Data** tab appears.

2. Double-click any value in one of the rows of the **Frame/Stream Data** table.

   The Stream Properties dialog box appears.

3. In the **Frame Data** tab, select the **Packet Groups** and the **Sequence Checking** check boxes under **Instrumentation Offsets** pane. Note that selecting the **Packet Groups** check box automatically selects the **Time Stamp** check box as well.
4. Select **Ok**.
5. Select the port that is in receive mode in the left pane, and then double-click **Filters, Statistics, Receive Mode** in the right pane.

   The Chassis dialog box appears.

6. Select the **Receive Mode** tab.
7. Select the **Wide Packet Groups** and the **Sequence Checking** check boxes under the **Mode** pane.
8. In the **Sequence Checking** tab, select **Advanced Sequence Tracking**.

   The Late Threshold box is made available.

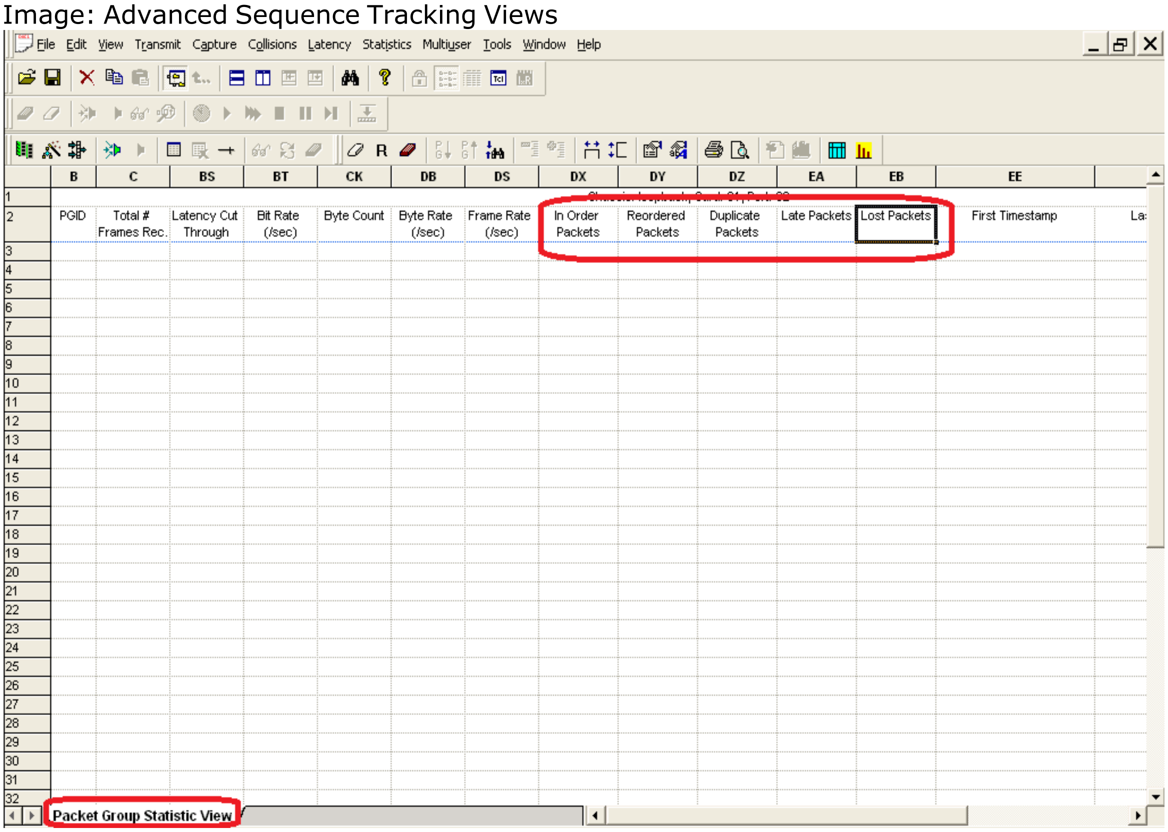
9. In the **Late Threshold** box**,** type a value in the range of 1 to 19,555.
10. Select **Apply,** and then select **OK** to go back to the **Explore Network Resources** window.
11. In the left pane, scroll to locate the **Global Views** folder, and then double-click the folder to expand it.

    The subfolders under the Global Views folder appears.
12. Select the **Packet Group Statistic Views** folder to open a context menu.
13. Select **New**.

    The Select Port dialog box appears.
14. Select the port that you have configured in receive mode in the preceeding steps, and then select >> to add the port to the right pane.
15. Select **OK**.

The **Packet Group Statistic View** window appears where you can view the advanced sequence tracking options.

Image: Advanced Sequence Tracking Views



The additional advanced sequence tracking options for a frame are described in the following table.

Table: Advanced Sequence Tracking Views Option

Field	Description
In Order	Count of received packets that contain sequence numbers equal to or greater than

Field	Description
Packets	expected. The expected value is set to one greater than the largest sequence number received. When packets are in order, the frames are received when expected. The **In Order** count is derived by software in the following manner: • Lost = Received Frames - Duplicate - Reordered - Late
Reordered Packets	Count of received packets that contain sequence numbers that are less than expected, but were not counted as Duplicate, and are greater than or equal to the Late Threshold value.
Duplicate Packets	Count of packets that were determined to be duplicates. A received test packet is a duplicate if its value falls within the current sequence run. (A sequence run is a series of sequence numbers from the received test packets that is equal to or less than expected. The sequence run ends when the received sequence number is greater than expected, creating a gap in the series, and a new sequence run is initiated). The sequence run contains all of the sequence numbers from the start of the series up to one less than the expected value. Consequently, a received sequence number that falls within the current series must be a duplicate. Received sequence numbers are not checked against previous sequence runs. Therefore, undetected duplicate packets are counted as **Reordered** or **Late**.
Late Packets	Count of received packets that contain sequence numbers that are less than expected, were not counted Duplicate, and are less than the Late Threshold value. Received sequence numbers that are less than expected are due to packets that arrived later than the adjacent packets of the transmitted packet sequence. The threshold may be adjusted to allow these packets to be classified as Reordered (if they arrive before the Late Threshold) or Late (if they arrive after the Late Threshold).
Lost Packets	Frames that were counted as Unknown, but later arrive (and counted as Reordered or Late) are referred to as **Lost**. The **Lost** count can be derived by software in the following manner: • Lost = Unknown - Reordered - Late NOTE It is possible that this equation results in a negative number, which the software treats as 0.

Inter-Arrival Time

If the port's **Receive Mode** tab is set up with these conditions:

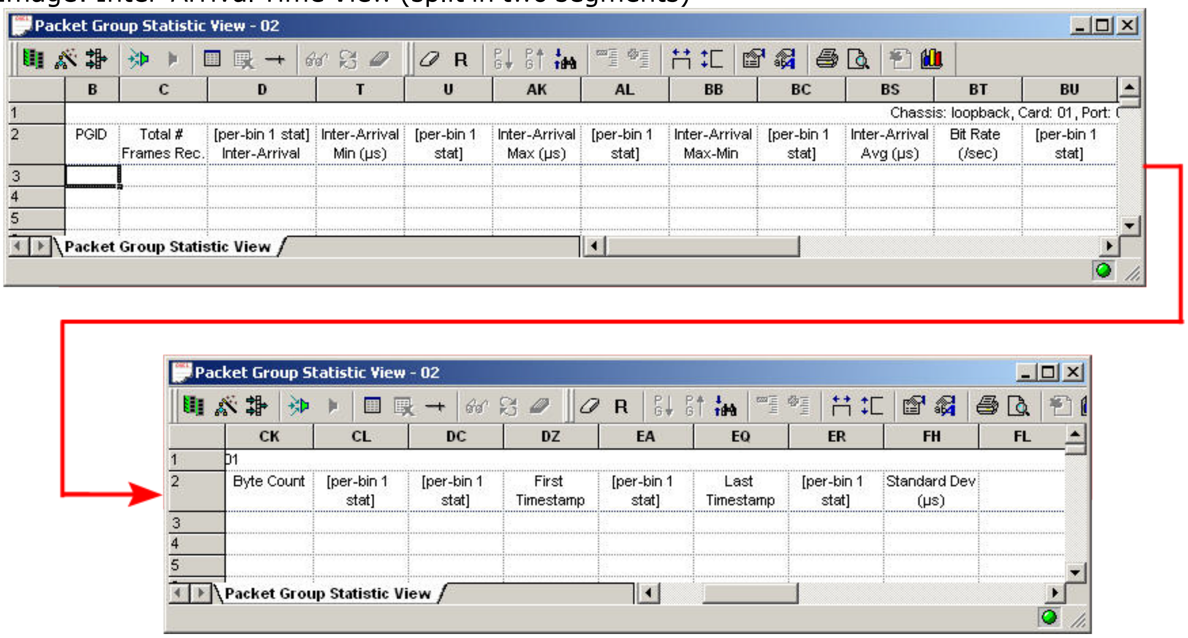
- the *Latency/IAT Bins (Inter-Arrival Time)* check box is enabled in the **Wide Packet Groups** tab, and
- the *Inter-Arrival Time* check box is selected in the ***Latency/Jitter*** *tab*,

  or
- the *Rate Monitoring* mode is selected (which automatically selects Inter-Arrival Time latency),

then the Inter-Arrival Time view appears when creating a Packet Group Statistic View. This view is shown in .

For more information on Inter-Arrival Time, see the *Ixia Platform Reference Manual*.

Image: Inter-Arrival Time View (split in two segments)



The headings for the columns of data collected in the Inter-Arrival Time view are described in *Table: Inter-Arrival View Columns*

Table: Inter-Arrival View Columns

Field	Description
PGID	The Packet Group ID (PGID) is used as a row ID for inter-arrival time data concerning packets that contain this PGID.
Total # of Frames Rec	The total number of frames received for this PGID.
(per-bin 1 stat) Inter-Arrival	For each listed column statistic, a corresponding bin column is listed for each configured inter-arrival time bin. For information on inter-arrival Time Bins Configuration, see Latency/IAT Bins Configuration.
Inter-Arrival Min (us)	The smallest packet-to-packet gap in microseconds.
Inter-Arrival Max (us)	The largest packet-to-packet gap in microseconds.
Inter-Arrival Max-Min	The difference between the inter-arrival maximum and minimum values. This measurement is peak to peak inter-arrival time.
Inter-Arrival	The sum of all the packet to packet gaps, divided by the total number of packets.

Field	Description
Avg (us)	
Bit Rate (/sec)	The instantaneous bit rate seen on the port, measured in bits per second.
Byte Count	The total number of bytes seen on the port.
First Timestamp	(in 'raw' format) The 6-byte timestamp value in the first packet received with this particular PGID. This value is exclicked, in hex, as multiples of the basic system clock (20 ns intervals).
Last Timestamp	(in 'raw' format) The 6-byte timestamp value in the last packet received with this particular PGID. This value is exclicked, in hex, as multiples of the basic system clock (20 ns intervals).
Standard Deviation (us)	The standard deviation between expected packet gap and actual packet gaps.

PRBS Mode

Pseudo Random Binary Sequence (PRBS) checking mode is available in the following load modules:

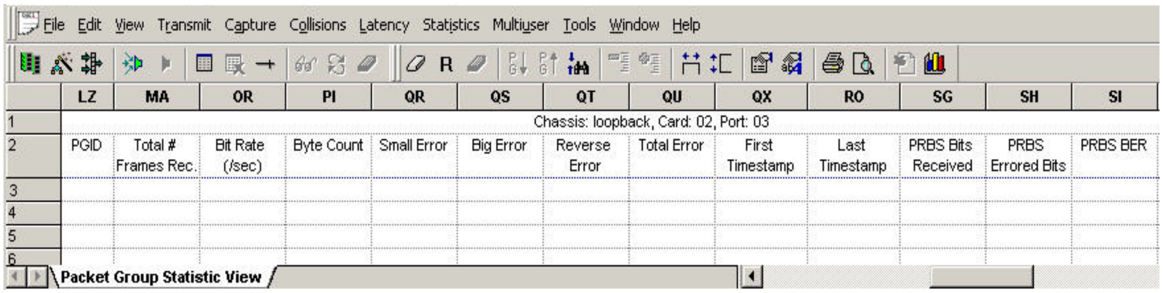
- LM1000STXS4 family
- LM1000TXS4 family
- LM1000SFPS4 family
- OLM1000STXS24 family
- LSM1000XMS12 family
- LSM1000XMV family (not in Data Center Mode)
- ASM1000XMV12
- NGY LSM10GXM family (not in Data Center Mode)

When the port is in PRBS mode, all latency-related statistics are removed and the following per-PGID statistics are added:

- PRBS Bits Received
- PRBS Errored Bits
- PRBS BER

The PRBS view is shown in *Image: PRBS View*.

Image: PRBS View



The headings for the columns of data collected in the PRBS view are described in *Table: PRBS View Columns*.

Table: PRBS View Columns

Field	Description
PRBS Bits Received	The number of bits in PRBS payload
PRBS Errored Bits	The number of bits in PRBS payload that are corrupted (that is, ‘in error’)
PRBS BER	The ratio of PRBS Errored Bits to PRBS Bits Received

Table: Packet Format in PRBS Mode shows the packet format when enabled in PRBS mode.

Table: Packet Format in PRBS Mode

Mode : PRBS	Signature 12 bytes	**PGID** 4 bytes	**Sequence #** 4 bytes	**PRBS Lock Pattern** 4 bytes	Header CRC 4 bytes	N-Byte PRBS payload	Reserved	TS 4 bytes	FCS 4 bytes

Rate Monitoring Mode

Rate Monitoring mode is available in the following load modules:

- LSM10GXM family (NGY)
- LSM1000XMV family
- ASM1000XMV12X

The stats for Inter-Arrival Time latency mode will be available when the Receive Mode is set to *Rate Monitoring* mode, as well at the two stats listed below.

The headings for the columns of data collected in the Rate Monitoring view are described in *Table: Rate Monitoring Columns*.

Table: Rate Monitoring Columns

Field	Description
Below Threshold Timestamp	Below threshold timestamp is the time at which the Inter-Arrival Time crossed below the programmed IAT threshold value for the last time. The last time the IAT was greater than the threshold value. The value appears in nanoseconds.

Field	Description
Above Threshold Timestamp	The Above threshold timestamp is the time at which the Inter-Arrival Time crossed above the programmed IAT threshold value for the first time. The first time the IAT was less than the threshold value. The value appears in nanoseconds.

Per PGID Checksum Error Stats Mode

In Per PGID Checksum Error Stats mode, per-flow checksum error statistics will be provided for Tcp\Udp and IPV4 checksum errors.

This mode is available in the following load modules:

- LSM10GXM family (NGY)
- LSM1000XMV family
- ASM1000XMV12X

When the port is in this mode, the following per-PGID statistics are added:

- IPv4 Checksum Errors
- UDP Checksum Errors
- TCP Checksum Errors

Latency/Jitter Options

The Packet Group Statistics View toolbar (*Image: Packet Group Statistics View Toolbar*) contains the *Options* icon ( ). Selecting the *Options* icon shows the *Latency Options* dialog box, which presents the latency options available, depending on the capability of the load module. These options tabs are described in the following sections:

- Latency Type Tab—available for modules that support latency over time (which requires support for sequence checking receive mode). It allows to choose between instantaneous latency (the default) and latency over time.
- Latency Statistics Tab—controls the manner in which the received data rate appears.
- Latency Update Interval Tab—available for all modules that support latency testing.

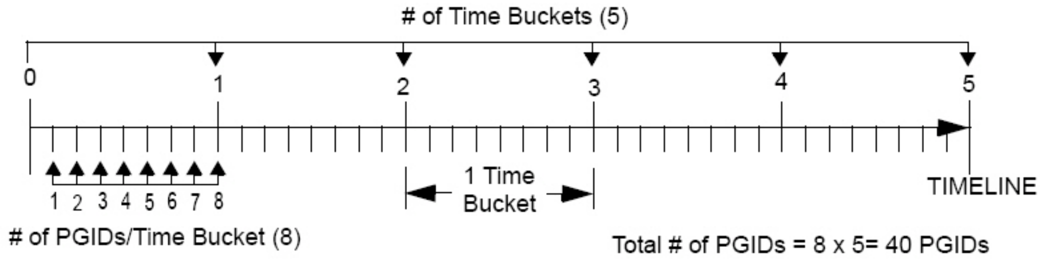
Latency Type Tab

For those load modules that support Latency testing and Sequence Checking, there are two types of Real-Time Latency measurement available:

- **Instantaneous** (default)—Latency measured for all received data (continuous). Up to 57,344 packet group IDs (PGIDs) may be used.
- **Latency Over Time**—Latency measured for a number of time intervals of equal length, called 'time buckets' or 'time bins.' The example diagram in *Image: Multiple Latency Time Measurements—Example* demonstrates the relationship between the time buckets/bins and PGIDs.

NOTE For the remainder of this chapter, 'Time Bucket' and 'Time Bin' are interchangeable terms.

Image: Multiple Latency Time Measurements—Example



The timeline is equally divided into a *# of Time Buckets,* each of which is ONE *Time Bucket Duration* in length. A time bucket duration can range anywhere from nanoseconds to hours, depending on the user configuration.

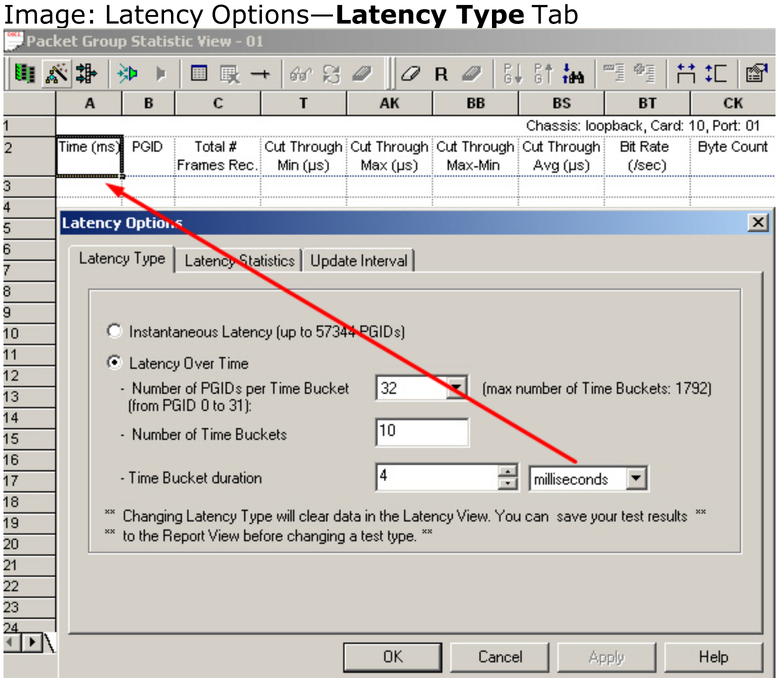
The maximum number of time buckets that can be handled is determined by the number of PGIDs in each bucket. The product of the number of time buckets and the number of PGIDs must be no more than 57,344 (131072 for Time Bins). The number (count) of PGIDs starts at 1 and increments by powers of 2—that is, 2, 4, ..., up to 8,192, and then jumps to 57,344 (Time Bins continue exponentially up to 131,072).

NOTE The actual PGID numbers start at 0, and increase up to a maximum of 57,343 (131072 for Time Bins).

When the time bucket duration is set, the *Time (units)* column appears in the spreadsheet.

The **Latency Type** tab in the *Latency Options* dialog box is shown in *Image: Latency Options—**Latency Type** Tab*.

Image: Latency Options—**Latency Type** Tab



The two options available are described in *Table: Latency Options—**Latency Type** Tab*.

NOTE Changing the latency type will clear data in the Latency View. Test results are saved by creating a Latency report before changing a test type.

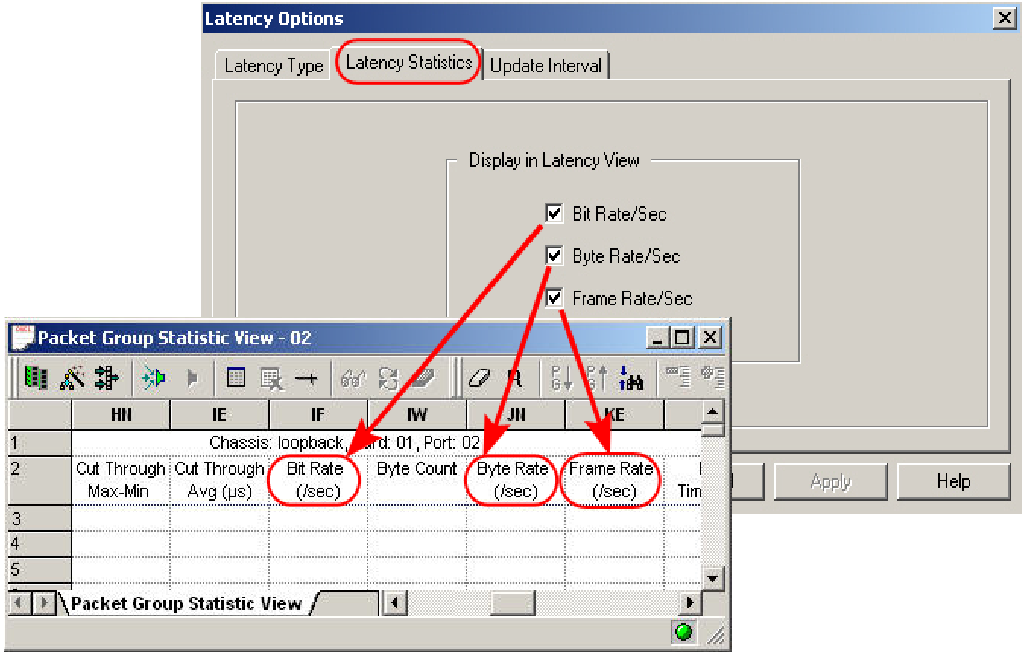
Table: Latency Options—**Latency Type** Tab

Option	Field/Control	Description
Instantaneous Latency (default)		All of the measurements over time are stored in a single set of values.
Latency Over Time (available for modules which have sequence checking enabled)		Multiple measurements are made for a specified number of PGID's.
	Number of PGIDs per Time Bucket.	Select the number of PGID's to be processed per time bucket–from the dropdown list.
	Number of Time Buckets	The total number of time buckets to be used. (The maximum number of Time Buckets available is indicated as a comment that appears next to the *number of PGIDs per Time Bucket* field.)
	Time Bucket Duration	The time duration of each time bucket. When this field is active, the Time (*units*) column appears in the spreadsheet. Units of time available are: • nanoseconds • microseconds • milliseconds • seconds • minutes • hours

Latency Statistics Tab

The **Latency Statistics** tab of the *Latency Options* dialog box controls the manner in which the received data rate appears, and is shown in *Image: Latency Options—**Latency Statistics** Tab*. A view of the received data rate is **optional**. Any number of the data rate views can be added to the Packet Group Statistics View.

Image: Latency Options—**Latency Statistics** Tab



The controls in this tab are described in *Table: Latency Options—**Latency Statistics** Tab.*

Table: Latency Options—**Latency Statistics** Tab

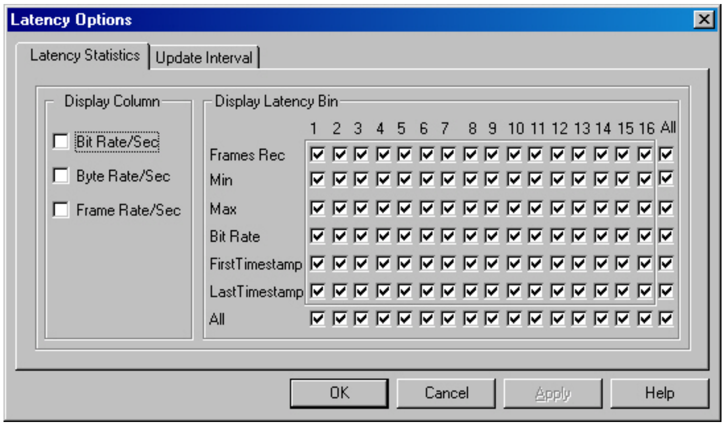
Section	Field/Control	Description
Display in Latency View	Bit Rate/Sec	When selected, the Packet Group Statistics View dialog box will contain a column for showing the received data rate in bits per second.
	Byte Rate/Sec	When selected, the Packet Group Statistics View dialog box will contain a column for showing the received data rate in bytes per second.
	Frame Rate/Sec	When selected, the Packet Group Statistics View dialog box will contain a column for showing the received data rate in frames per second.

10/100/1000 and 10 Gigabit Ethernet load modules have a different **Latency Statistics** tab that incorporates statistics for the Latency Bin feature, and is described in Latency Statistics with Latency Bins.

Latency Statistics with Latency Bins

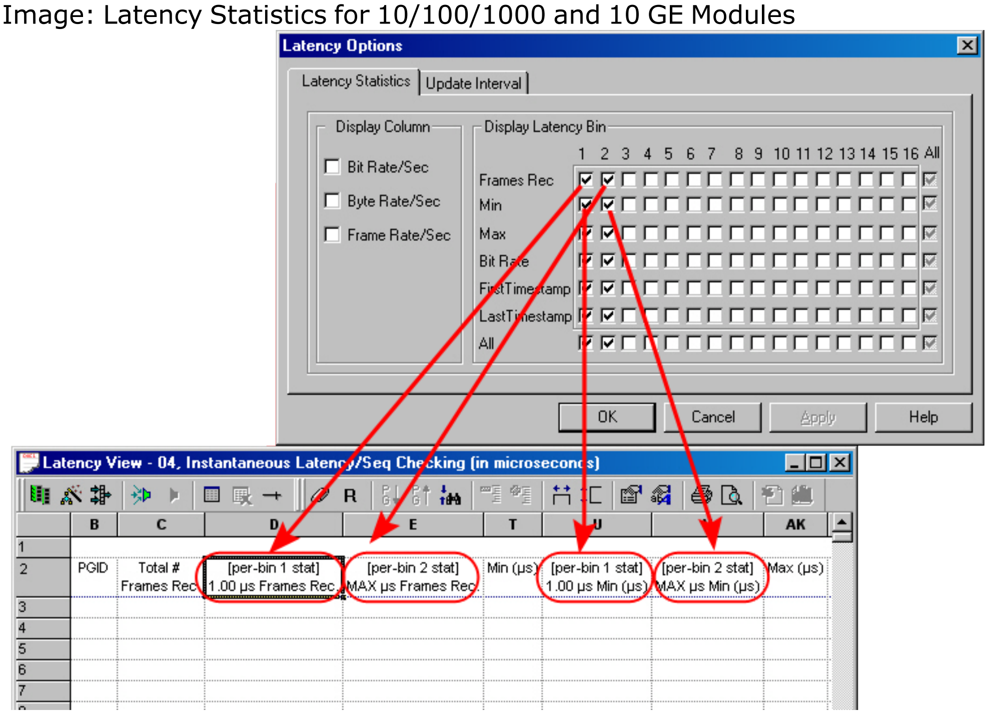
For 10/100/1000 and 10 Gigabit Ethernet modules, the ***Latency Statistics*** tab has additional options for the Latency Bin feature. The options for Latency Bin features on the **Latency Statistics** tab page are shown in *Image: Latency Statistics for 10/100/1000 and 10 GE Modules*.

Image: Latency Statistics for 10/100/1000 and 10 GE Modules



The statistics appear in the Packet Group Statistics View dialog box under the port being used. Each latency bin (from 1 to 16) receives its own column for each listed statistic, as shown in *Image: Latency Statistics for 10/100/1000 and 10 GE Modules*.

Image: Latency Statistics for 10/100/1000 and 10 GE Modules



The check boxes shown in the **Display Column** are described in *Table: Latency Options—**Latency Statistics** Tab*. The Latency Bin options in the **Display Latency Bin** section are described in *Table: Latency Bin Statistics*.

Table: Latency Bin Statistics

Section	Field/Control	Description
Display Latency Bin	Frames Rec	Selecting this check box shows the total number of frames received during the latency test in the Packet Group Statistics View.

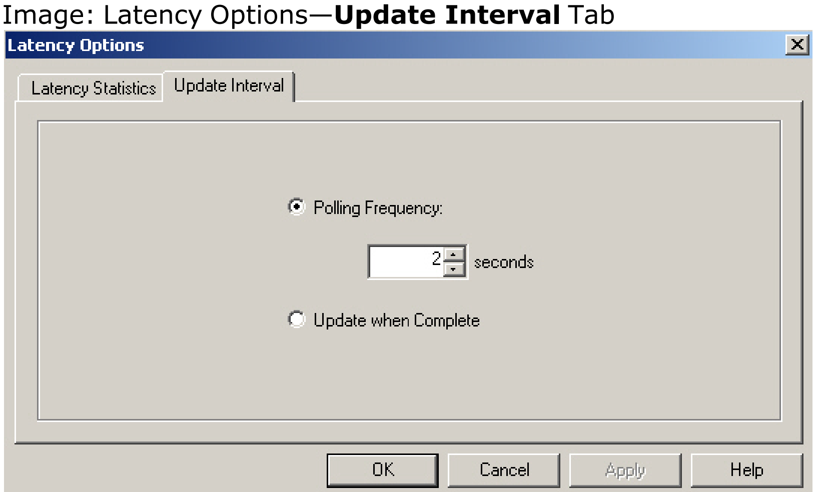
Section	Field/Control	Description
	Min	Selecting this check box shows the minimum latency value received during the latency test in the Packet Group Statistics View, measured in microseconds.
	Max	Selecting this check box shows the maximum latency value received during the latency test in the Packet Group Statistics View, measured in microseconds.
	Bit Rate	Selecting this check box shows the bit rate of the latency test during the latency test in the Packet Group Statistics View.
	First Timestamp	Selecting this check box shows the first timestamp received during the latency test in the Packet Group Statistics View.
	Last Timestamp	Selecting this check box shows the last timestamp received during the latency test in the Packet Group Statistics View.
	All (vertical)	Selecting this check box activates all of the fields for a specified Latency Bin.
	All (horizontal)	Selecting this check box activates the selected statistic for all ports.

The default is for all statistics for all Latency Bins to be shown. Statistics will only appear for the number of Latency Bins that have been specified in Wide Packet Mode Latency/IAT Bins.

Latency Update Interval Tab

The Latency **Update Interval** tab in the *Latency Options* dialog box controls the type and timing of screen updates, and is shown in *Image: Latency Options—**Update Interval** Tab*.

Image: Latency Options—**Update Interval** Tab



The fields and controls in this tab are described in *Table: Latency Options—**Update Interval** Tab*.

Table: Latency Options—**Update Interval** Tab

Field/Control	Description
Polling Frequency	When selected, the data in the Packet Group Statistics View dialog box will be updated at the frequency selected in the *Polling Frequency* field, in seconds.
Update when Complete	When selected, the Packet Group Statistics View dialog box data will not appear until the latency measurements are complete.

The update interval selected will affect the update of the Packet Group Statistics View dialog box while the view is scrolled. A large update interval may cause scrolled screens to appear to have no data until the next update occurs.

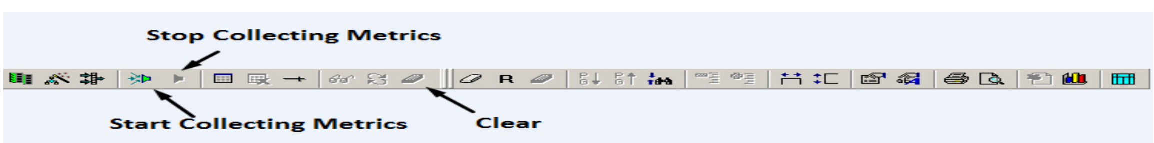
Start/Stop Latency

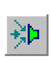
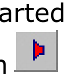
The process of collecting latency data is performed through the use of the Packet Group Statistics View toolbar, shown in *Image: Packet Group Statistics View Toolbar*.

NOTE

Clear Timestamps on Transmit and Receive ports together **BEFORE** starting Latency measurements. Some methods for clearing timestamps on multiple ports simultaneously are listed below: Create a Port Group for all of the transmit and receive ports to be used in the Latency measurement. Select the Port Group name in the details list, and select Clear Timestamps. If all of the Transmit and Receive ports are on a single card, and no other ports on that card are being used for other purposes, highlight the card in the Network Resources list, and go to the main menu bar. Select Transmit or Capture and select Clear Timestamps from the dropdown menu. Create a Statistic View for all of the transmit and receive ports to be used in the Latency Measurement. In the Statistic View, highlight ALL of the port names in the column headers. Select the highlighted port names, and then select **Clear Timestamps** from the pop-up menu.

Image: Packet Group Statistics View Toolbar



The *Start Collecting Metrics* icon  should be used before any transmit is started on ports feeding the ports in the Packet Group Statistics View. The *Stop Collecting Metrics* icon  should be used after all latency data has been received. A number of other commands are not available while latency data is being collected. The *Clear* icon  may be used to erase collected data in preparation for a new run.

The spreadsheet contents are updated during the latency data collection process, as dictated by the **Update Interval** tab of the *Latency Options* dialog box.

Packet Group Statistics View Toolbar

The set of operations available in the Packet Group Statistics View, either from the main menu bar or from the latency toolbar are shown in *Table: Packet Group Statistics View Operations*.

Table: Packet Group Statistics View Operations

Operation	Toolbar Icon	Description
Add/Delete Ports		Opens a dialog box allowing ports to be added and/or removed to the latency group. Port Selection.
Latency Options		Opens the *Latency Option* dialog box which allows the latency measurement type to be adjusted. See Latency/Jitter Options.
Port Receive Mode		Opens the **Receive Mode** tab for the current port. See Receive Mode Tab.
Start Collecting Metrics		Starts the latency operation. See Start/Stop Latency Clear Timestamps for all ports before starting a Latency test.
Stop Collecting Metrics		Stops the latency operation. See Start/Stop Latency
Clear		Clears collected latency data. See Start/Stop Latency
Reset View to Defaults		Resets all of the Packet Group Statistics View options to their defaults.
Create Latency Report		Creates a latency report in the form of an additional spreadsheet which is a snapshot of the current data. See Latency Reports.
Delete Latency Report		Deletes the current latency report. See Latency Reports.
Global Line Rate		Sets the total percentage of the maximum port rate. See Total % Max Rate.
View PRBS Capture		View the captured PRBS packets and show the errored bits.
Refresh PRBS Capture		Refresh capture buffer with captured packets from Start capture until latest ones.
Clear PRBS Capture		Clear current PRBS capture buffer.

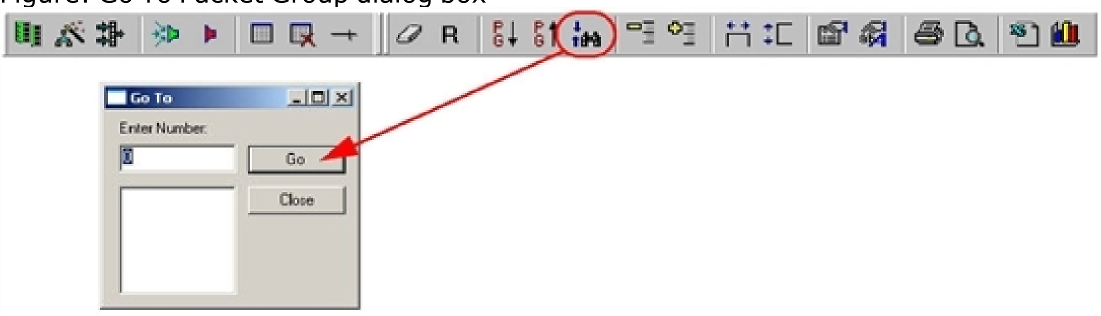
Operation	**Toolbar Icon**	**Description**
Clear Selected PGID Stats		Clear selected PGID stats NOTE (Not supported in Packet Group mode.)
Next Packet Group		Moves the cursor to the first row of the next packet group in the view. See note below.
Previous Packet Group		Moves the cursor to the first row of the previous packet group in the view. See note below.
Go To Packet Group		Opens the *Go To* dialog box. This dialog box allows to Move the cursor to the first row of the specified packet group. See Go to Packet Group.
Hide Empty Rows		During latency measurements, blank rows may will appear for empty packet group ids. This selection causes those rows to be omitted from the view. See Latency Reports.
Show Empty Rows		This selection reverses the previous selection. See Latency Reports.
Best-Fit Column Widths		For the selected column(s), the width of the column is adjusted to just fit the widest data in that column(s).
Best-Fit Row Height		For the selected row(s), the height of the row is adjusted to just fit the tallest data in the row(s).
Grid Properties		Opens a dialog box that allows the adjustment of the visible grid. See Grid Properties—View Settings.
Format Cells		Sets the formatting for the view in the selected cells. See Cells Format dialog box.
Print		Prints the contents of the current spreadsheet —either live data or a latency report.
Print Preview		Allows the printout of the contents of the current spreadsheet—either live data or a latency report—to be previewed before printout.
Export Data to Excel File		Exports the current data to a file in Excel spreadsheet form. A standard file save dialog box allows the naming and placement of the output file.
Create Chart		Opens a dialog box that allows the creation of a chart in a number of formats. See Using Chart View.
Latency View Options		Opens a dialog box that allows changing the latency view to list the ports vertically. See Latency View Options.

NOTE When there is a large number of PGIDs listed in the Packet Group Statistics View/Latency report, it may be necessary to use the vertical scroll bar to move up and down in the list of PGIDs. Also, for instantaneous latency, the PGIDs may not be continuous, and some rows may appear to be empty, but this is due to the lack of received data with the packet group ID that corresponds to that row. Additional data may be present for larger PGID numbers.

Go to Packet Group

The *Go to Packet Group* icon  allows to advance the cursor to a specified Packet Group in the Packet Group Statistics View grid. Selecting this icon opens the *Go To* dialog box, as shown in *Figure: Go To Packet Group dialog box*.

Figure: Go To Packet Group dialog box



Enter the packet group number in the field shown and select the *Go* button. The cursor in the Packet Group Statistics View grid moves to the first instance of the Packet Group.

The number searched on is saved in the window below the *Enter Number* field. It can be reselected for another search at a later time. Once the *Go To* dialog box is close, all entries are cleared.

Clear Selected PGID Stats

The Clear Selected PGID Stats icon allows to clear statistics of selected rows in Packet Group Statistics View while latency is running. To use the feature, highlight any combination of PGID rows and select the icon. The stats are cleared on those highlighted rows.

NOTE Currently this feature is only supported by these load modules: LM1000(S)TX (S)4/24 LSM1000XMS(R)12 LSM1000XMV(R)16 ASM1000XMV12X LSM10G1-01, LSM10GL1-01, and LSM10GXL6-01 MSM2.5G and MSM10G 10/100/1000 STXS4 10/100/1000 STX4 10/100/1000 STXS2 10/100/1000 STXS24 10/100/1000 STX24 10/100/1000 TXS4 10/100/1000 TX4 1000 SFPS4 1000 SFP4 10/100/1000 XMS12 10/100/1000 XMSR12 10/100/1000 XMSP12 10/100/1000 LSM XMV16 10/100/1000 LSM XMVR16 10/100/1000 LSM XMVDC16 10/100/1000 LSM XMVDC12 10/100/1000 LSM XMVDC8 10/100/1000 LSM XMVDC4 10/100/1000 LSM XMVDC4 10/100/1000 ASM XMV12X 10GE LSM XM8 10GE LSM XM8XP 10GE LSM XM8S 10GE LSM XMR8S 10GE LSM XM8 10GBASE-T 10GE LSM XMR8 10GBASE-T 10GE LSM XM8 10GBASE-T 10GE LSM XMR8 10GBASE-T NGY-NP8 10GE LSM 10GE LSM XM3 10GE LSM XMR3 10GE LSM XL6 10G MSM 2.5G MSM 100GE/BERT LSM XMV1 40GE/BERT LSM XMV1

In S400GD-16P-QDD+FAN+NRZ load module, if you highlight a cell and then select **Clear Selected PGID Stats** button, IxExplorer clears the stats of that particular PGID on that port only. All the other PGID stats remain unchanged. If you highlight a row and then select Clear Selected PGID Stats option, IxExplorer clears the stats of that particular PGID on all ports.

Total % Max Rate

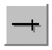
The *Global Line Rate* icon  allows to change the line rate for ports in the Packet Group Statistics View. The slide bar will change the total percentage of the maximum line for each port indicated port. Selecting this icon opens the *Packet Group Statistic View—Total % of Max Rate* dialog box.

Figure: Total % Max Rate dialog box

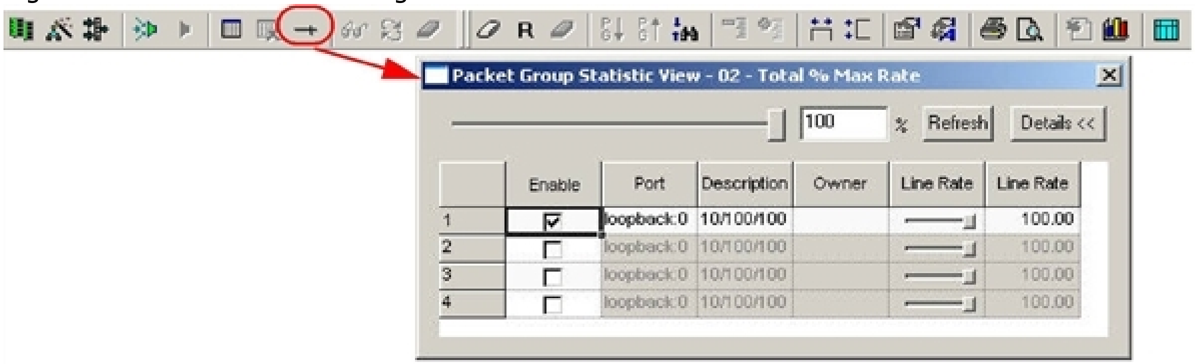


Table: Total % Max Rate dialog box describes the fields on the *Packet Group Statistic View—Total % of Max Rate* dialog box.

Table: Total % Max Rate dialog box

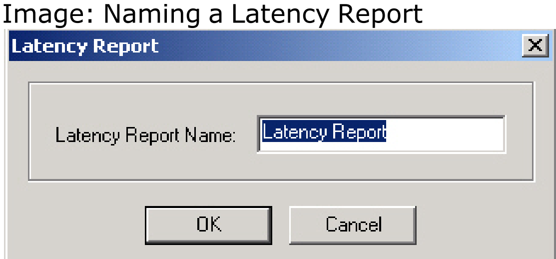
Field	Usage
Slide Bar	Adjusts the percentage of the maximum line rate for the entire list of Packet Group Statistics Views. When this bar is moved the percentage number to the right is changed.
Percentage	Shows the percentage number for the line rate usage. When this number is changed, the Slide Bar moves.
Details	Selecting this button shows or hides the fields listed for individual Packet Group Statistics Views.
Enable	This check box enables the use of the line rate slide bar.
Port	Specifies the port number by chassis, card slot, and port.
Description	Describes the port type (that is, 10/100 base TX).
Owner	Shows the port owner (if applicable).
Line Rate	A slider bar for adjusting the percentage of the max line rate for a particular Packet

Field	Usage
	Group Statistics View. When this is moved, the percentage number to the right changes.
Line Rate	A percentage number used for adjusting the max line rate for the Packet Group Statistics View. When this change, the slider bar to the left moves.

Latency Reports

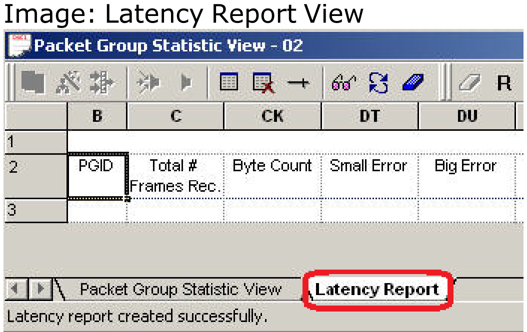
A Latency Report is a copy of the Instantaneous Latency data, that appears as an additional tabbed view in the spreadsheet. We recommend creating a Latency Report, as soon as the Latency test setup is completed, for saving the collected data. When the *Create Report* icon  is selected, the *Latency Report* dialog box appears which allows the specification of the report name, as shown in *Image: Naming a Latency Report*.

Image: Naming a Latency Report



The named Latency Report appears by selecting the named tab at the bottom of the *Packet Group Statistics View* dialog box, as shown in *Image: Latency Report View*.

Image: Latency Report View



Note that the port operation icons cannot be accessed from a latency report. While viewing a latency report, the *Hide Empty Rows* and *Show Empty Rows* icons  and  are active in the toolbar, and these commands may be used to hide empty rows in the spreadsheet or show them again. These rows are due to the lack of data with the Packet Group ID that corresponds to that row.

The *Export Data to Excel File* icon  can be used to save a copy of the latency report to disk in Excel spreadsheet format. A dialog box allows the naming and placement of the Excel file.

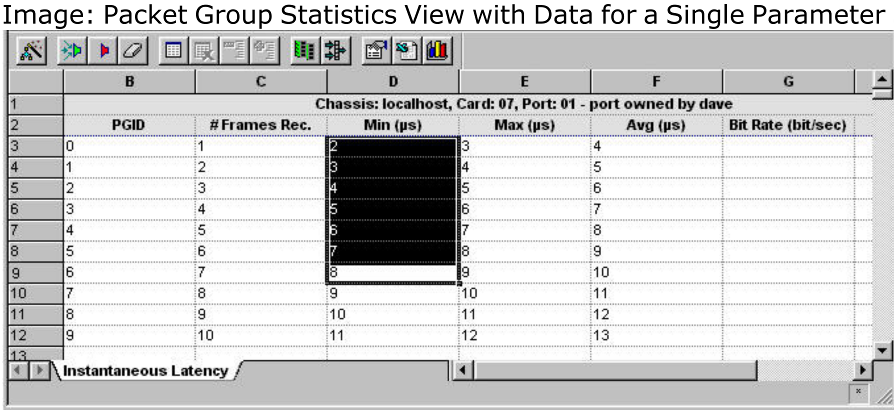
NOTE The Export Data to Excel File icon is only active and usable after an Ixia latency report has been created and you select the **Latency Report** tab. Excel also does not allow to export more than 21 ports of information at one time; attempting this causes Excel to crash.

Using Chart View

The charting process may be performed either on the Packet Group Statistics View data or on data in a latency report. Charts may be used to follow 'live' data, or to analyze data after data collection has been stopped. The process of charting starts with the selection of one or more ranges of data on the spreadsheet.

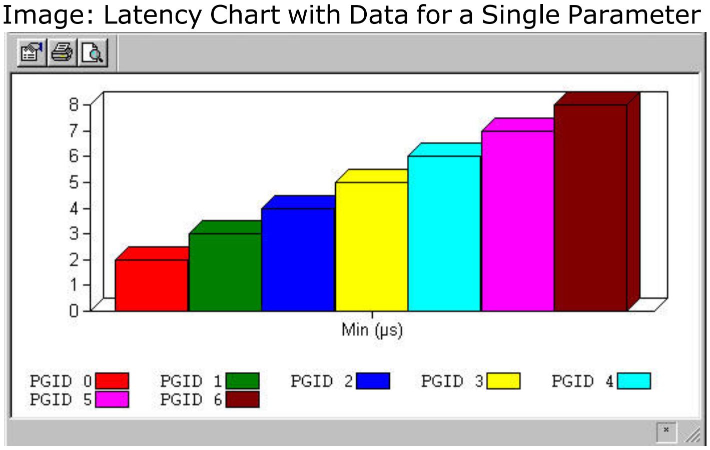
An example of this process is shown for the following fictitious spreadsheet example shown in *Image: Packet Group Statistics View with Data for a Single Parameter Selected*, with the indicated data selected. The chart corresponding to the selected data is shown in *Image: Latency Chart with Data for a Single Parameter*.

Image: Packet Group Statistics View with Data for a Single Parameter Selected



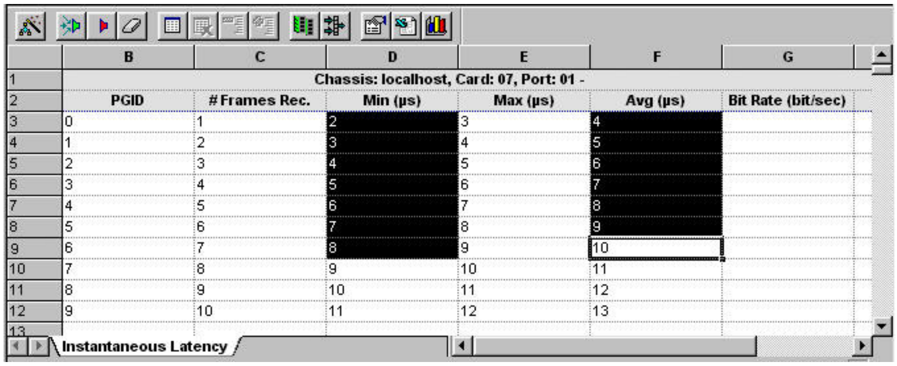
	B	C	D	E	F	G
1	Chassis: localhost, Card: 07, Port: 01 - port owned by dave					
2	PGID	# Frames Rec.	Min (µs)	Max (µs)	Avg (µs)	Bit Rate (bit/sec)
3	0	1	2	3	4	
4	1	2	3	4	5	
5	2	3	4	5	6	
6	3	4	5	6	7	
7	4	5	6	7	8	
8	5	6	7	8	9	
9	6	7	8	9	10	
10	7	8	9	10	11	
11	8	9	10	11	12	
12	9	10	11	12	13	

Image: Latency Chart with Data for a Single Parameter



Multiple selections of data can be made within one spreadsheet, as shown in *Image: Packet Group Statistics View with Multiple (2) Parameters Selected*.

Image: Packet Group Statistics View with Multiple (2) Parameters Selected

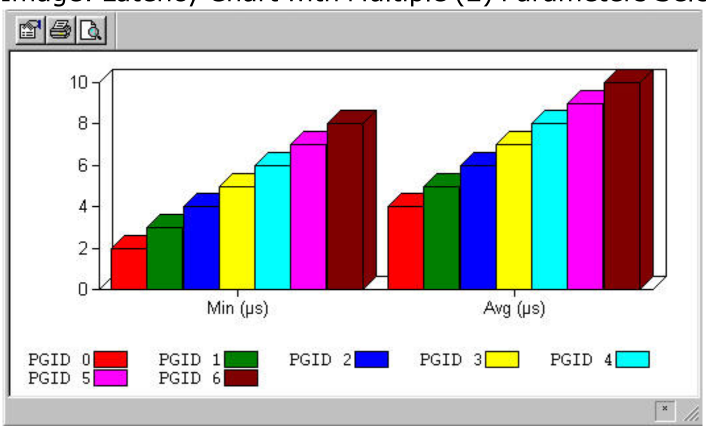


	B	C	D	E	F	G
1	Chassis: localhost, Card: 07, Port: 01 -					
2	PGID	# Frames Rec.	Min (µs)	Max (µs)	Avg (µs)	Bit Rate (bit/sec)
3	0	1	2	3	4	
4	1	2	3	4	5	
5	2	3	4	5	6	
6	3	4	5	6	7	
7	4	5	6	7	8	
8	5	6	7	8	9	
9	6	7	8	9	10	
10	7	8	9	10	11	
11	8	9	10	11	12	
12	9	10	11	12	13	
13						

Instantaneous Latency

The corresponding view is shown in *Image: Latency Chart with Multiple (2) Parameters Selected*.

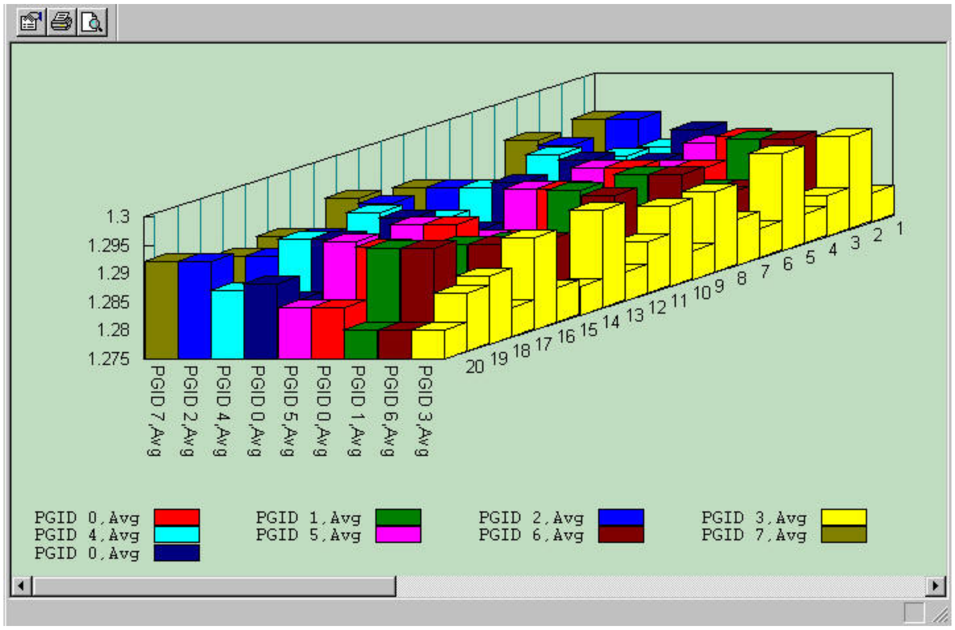
Image: Latency Chart with Multiple (2) Parameters Selected



The contents of an active chart may be changed by making a new selection of data in the spreadsheet, and then either selecting the *Chart* icon or dragging and dropping the selection into the chart. Ensure to grab the selection at its edge.

Charts can be made during latency over time measurements as well. Included in *Image: Latency over Time 3d 'Manhattan' Chart* is a 3D 'Manhattan' chart of the average latency over time for a number of packet groups.

Image: Latency over Time 3d 'Manhattan' Chart



The format of the chart may be changed through the use of the *Chart Properties* icon  in the toolbar at the top of the Chart View window, as shown in *Image: Chart View Toolbar*.

Image: Chart View Toolbar

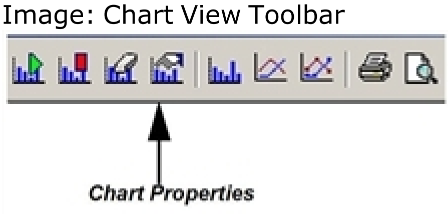


Chart Properties

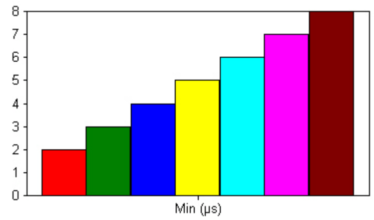
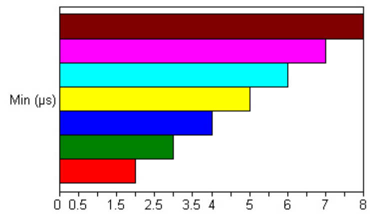
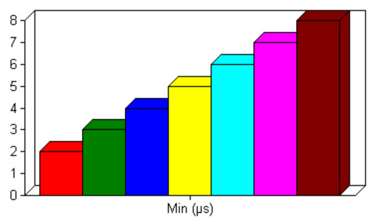
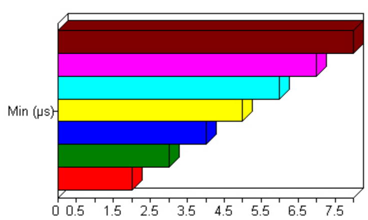
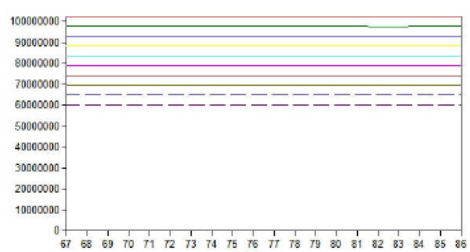
The *Chart Properties* icon  shows dialog boxes that allows for scale specification and chart type selection.

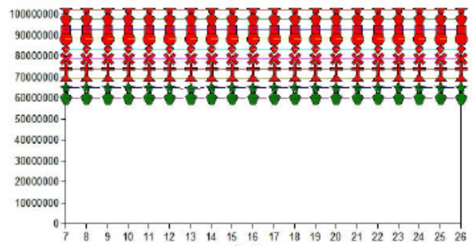
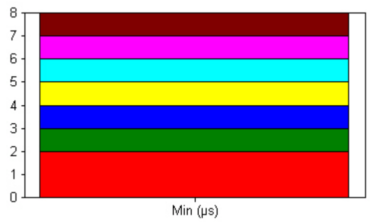
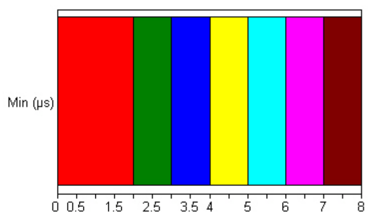
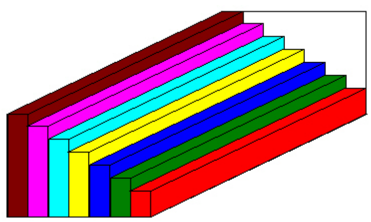
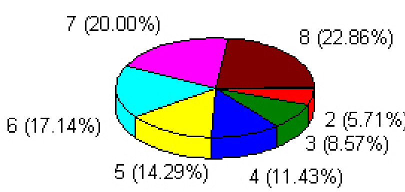
Chart Properties (in Statistic View) for additional information.

Chart Types

Within the *Chart Properties* dialog box, the type of chart can be selected from the *Chart Type* list. Examples of Latency charts from this list are shown in *Table: Chart Types*.

Table: Chart Types

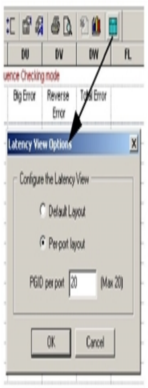
Type	Example
Vertical Bar	
Horizontal Bar	
Vertical bar (pseudo 3D)	
Horizontal bar (pseudo 3D)	
Line Plot	

Type	Example
Line Plot with Widgets	
Vertical stacked bar	
Horizontal stacked bar	
3D 'Manhattan'	
Pie Chart	

Latency View Options

When the Latency View Options icon is selected, a dialog box opens (*Image: Latency View Options dialog box*) to allow changing the latency view to list the ports vertically. You can toggle between the default layout (horizontal) and the per-port layout (vertical). You can also configure the maximum number of PGIDs to be shown (up to 20).

Image: Latency View Options dialog box



Latency View Options
Configure the Latency View
Default Layout
Per-port layout
PGID per port
(Max 20)
OK
Cancel

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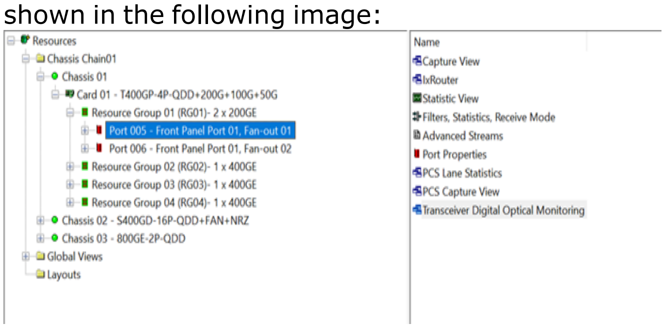
CHAPTER 17

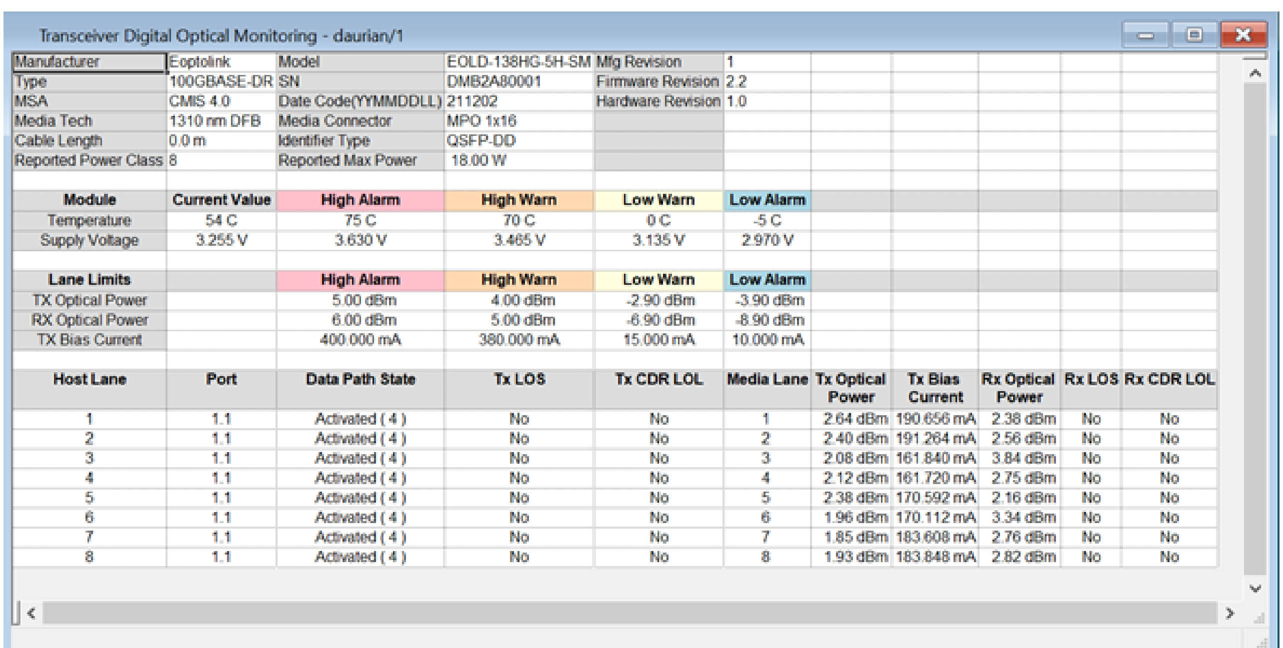
Transceiver Digital Optical Monitoring

Transceiver Digital Optical Monitoring involves collection and reporting of different transceiver digital optical monitoring parameters. This View is selectable from the Resource Details view when the T400GP-4P-QDD+200G+100G+50G card with port in 2x200G fan-out has been selected, as shown in the following image:



This feature is also supported for AresONE-S-400GE, and AresONE 800GE.

You need to double-click on **Transceiver Digital Optical Monitoring** to open the following table:



Manufacturer	Eoptolink	Model	EOLD-138HG-5H-SM	Mfg Revision	1					
Type	100GBASE-DR	SN	DMB2A80001	Firmware Revision	2.2					
MSA	CMIS 4.0	Date Code(YYMMDDLL)	211202	Hardware Revision	1.0					
Media Tech	1310 nm DFB	Media Connector	MPO 1x16							
Cable Length	0.0 m	Identifier Type	QSFP-DD							
Reported Power Class	8	Reported Max Power	18.00 W							
Module	**Current Value**	**High Alarm**	**High Warn**	**Low Warn**	**Low Alarm**					
Temperature	54 C	75 C	70 C	0 C	-5 C					
Supply Voltage	3.255 V	3.630 V	3.465 V	3.135 V	2.970 V					
Lane Limits		**High Alarm**	**High Warn**	**Low Warn**	**Low Alarm**					
TX Optical Power		5.00 dBm	4.00 dBm	-2.90 dBm	-3.90 dBm					
RX Optical Power		6.00 dBm	5.00 dBm	-6.90 dBm	-8.90 dBm					
TX Bias Current		400.000 mA	380.000 mA	15.000 mA	10.000 mA					
Host Lane	**Port**	**Data Path State**	**Tx LOS**	**Tx CDR LOL**	**Media Lane**	**Tx Optical Power**	**Tx Bias Current**	**Rx Optical Power**	**Rx LOS**	**Rx CDR LOL**
1	1.1	Activated (4)	No	No	1	2.64 dBm	190.656 mA	2.38 dBm	No	No
2	1.1	Activated (4)	No	No	2	2.40 dBm	191.264 mA	2.56 dBm	No	No
3	1.1	Activated (4)	No	No	3	2.08 dBm	161.840 mA	3.84 dBm	No	No
4	1.1	Activated (4)	No	No	4	2.12 dBm	161.720 mA	2.75 dBm	No	No
5	1.1	Activated (4)	No	No	5	2.38 dBm	170.592 mA	2.16 dBm	No	No
6	1.1	Activated (4)	No	No	6	1.96 dBm	170.112 mA	3.34 dBm	No	No
7	1.1	Activated (4)	No	No	7	1.85 dBm	183.608 mA	2.76 dBm	No	No
8	1.1	Activated (4)	No	No	8	1.93 dBm	183.848 mA	2.82 dBm	No	No

The following optical parameters are collected or queried from the transceiver:

- Vendor information
- Transceiver Type
- Hardware and Firmware revision, Date Code.
- MSA supported
- Media information, cable length
- Power class and reported Maximum power of the module.
- Current Temperature of the module and threshold limits
- Current Voltage of the module and threshold limits
- Per lane Tx and Rx Optical Power limits, Per lane Tx Bias current limits
- Per host lane Data Path State
- Per host lane Tx LOS and Tx CDR LOL
- Per media lane Tx and Rx Optical Power, Tx Bias Current
- Per media lane Rx LOS, Rx CDR LOL

The Transceiver Digital Optical Monitoring View from AresONE 800G port, as seen in the previous image, shows the temperature/voltage limits and per lane limits that are reported by the transceiver. The View defines a color code for the high/low warnings and alarms. If the real time value as shown in the table crosses any limits, the value is color coded and reported in the parenthesis next to the value. The transceiver is reporting Rx Optical power below low alarm value.

a- => Low Alarm

w- => Low Warning

w+ => High Warning

a+ => High Alarm

NOTE The information shown in the table depends on whether the transceiver supports a particular feature or information. If the transceiver has no support for some of the items in the table, the cell will display "-".

CHAPTER 18

Card Properties

Card Properties dialog box

The *Card Properties* dialog box shows a number of properties related to the port's operation (Card Properties). The view varies according to the type of card.

The complete specifications for the various types of boards can be found in the *Ixia Platform Reference Manual*. See the following chapters:

- Xcellon-Lava Load Modules
- 10/100/1000 Load Modules
- Network Processor Modules
- 40/100 Gigabit Ethernet Load Modules
- 10 Gigabit Ethernet Load Modules
- 10/100 Load Modules
- Xcellon-Flex Load Modules
- Xcellon-Multis Load Modules
- Xcellon-Multis Reduced Load Modules
- Novus QSPF28 Load Modules
- Novus QSPF28 Reduced and Mid-Scale Load Modules
- Novus 10GE/1GE/100M Ethernet Load Modules
- Novus 10GE/5GE/2.5GE/1GE/100M Load Modules
- Novus-NP and Novus-32P 10GE/1GE/100M Ethernet Load Modules
- NOVUS25/10GE8SFP28 Load Modules
- QSFP-DD-400GE/200G/100G/50G Load Modules
- CFP8 Load Modules
- T400GD-8P-QDD+200G+100G+50G
- T400GD-8P-OSFP+200G+100G+50G
- T400GP-4P-QDD+200G+100G+50G
- T400GP-2P-QDD+200G+100G+50G
- S400GD-16P-QDD+FAN+NRZ
- 800GE-4P-QDD
- 800GE-4P-QDD-C

- 800GE-4P-OSFP-C
- 800GE-8P-QDD-M+NRZ
- 800GE-8P-OSFP-M+NRZ
- 800GER-4P-QDD-OSFP-M+NRZ
- PerfectStorm Load Modules
- XMVAE Gigabit Ethernet Load Modules

Card Properties

The *Card Properties* dialog box for most load modules includes a **General** tab like that shown in the following figure.

The **General** tab forXcellon-Ultra module provides additional information—Xcellon-Ultra Module.

The Card Properties dialog box for Xcellon-Ultra NG load module and the different tab views in this dialog box features the IxN2X capability and the utility to use the load module in IxN2X mode—Xcellon-Ultra NG Module.

The **General** tab for NGY LSM10GXM 4 and 8-port modules features a Clock tab for configuring clocking—NGY LSM10GXM 2, 4 and 8-port Modules.

The **General** tab for 10/100/1000 LSM XMVDC16NG 16-port module features the IxN2X capability and the ability to use the module in N2X mode—LSM XMVDC16NG 16-port Modules.

The **General** tab for Xcellon-Multis module provides the general properties of the Multis modules—Xcellon-Multis General.

The **General** tab for Novus 10GE/1GE/100M module provides the general properties of the Novus 10GE/1GE/100M modules—Novus 10GE/1GE/100M Card Properties—General.

The **General** tab for QSFP-DD module provides the general properties of the QSFP-DD modules—QSFP-DD Card Properties—General.

The **General** tab for CFP8 module provides the general properties of the CFP8 modules—CFP8 Card Properties—General.

The **General** tab for T400GP-4P-QDD+200G+100G+50G module provides the misc properties of the T400GP-4P-QDD+200G+100G+50G modules—T400GP-4P-QDD+200G+100G+50G Card Properties—General.

The **General** tab for T400GD-8P-OSFP+200G+100G+50G module provides the misc properties of the T400GD-8P-OSFP+200G+100G+50G modules—T400GD-8P-OSFP+200G+100G+50G Card Properties—General.

The **General** tab for T400GP-4P-QDD module provides the general properties of the T400GP-4P-QDD module—T400GP-4P-QDD Card Properties—General.

The **General** tab for T400GP-2P-QDD module provides the general properties of theT400GP-2P-QDD module—T400GP-2P-QDD Card Properties—General.

The **General** tab for S400GD-16P-QDD+FAN+NRZ module provides the general properties of the S400GD-16P-QDD+FAN+NRZ module—S400GD-16P-QDD+FAN+NRZ Card Properties—General.

The **General** tab for 800GE-4P-QDD module provides the general properties of the 800GE-4P-QDD module—800GE-4P-QDD Card Properties—General.

The **General** tab for 800GE-4P-QDD-C module provides the general properties of the 800GE-4P-QDD-C module—800GE-4P-QDD-C Card Properties—General.

The **General** tab for 800GE-4P-OSFP-C module provides the general properties of the 800GE-4P-OSFP-C module—800GE-4P-OSFP-C Card Properties—General.

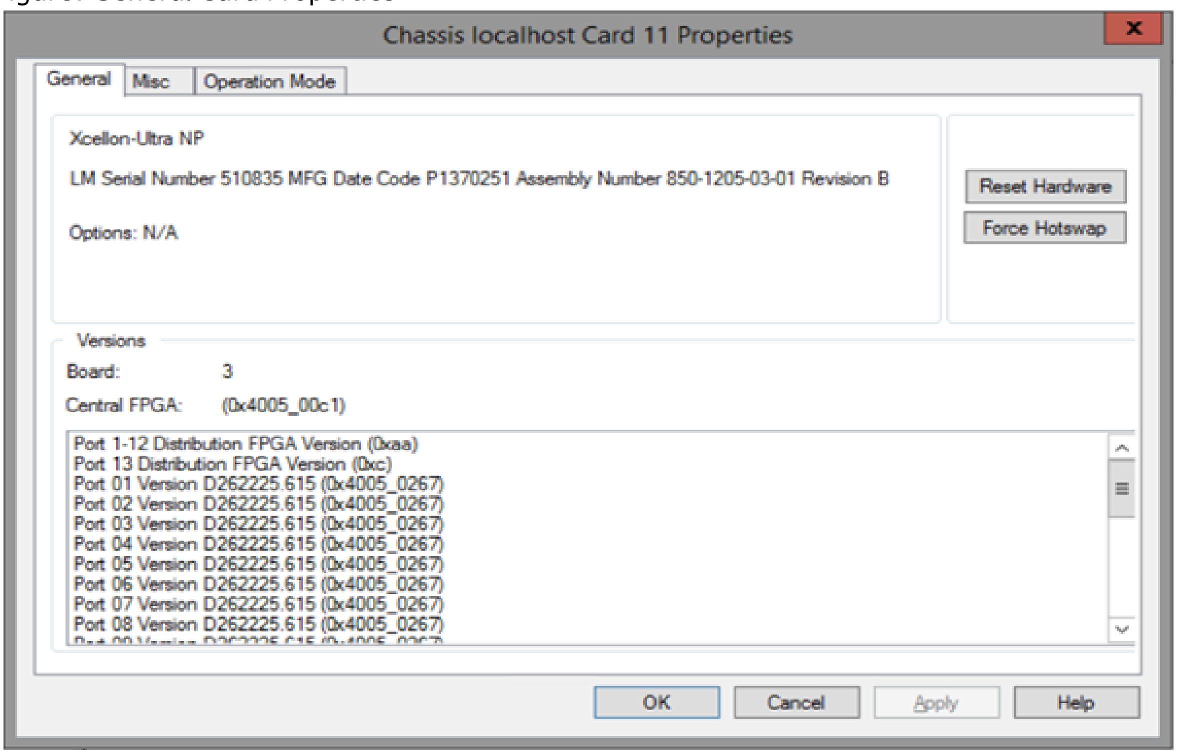
The **General** tab for 800GE-8P-QDD-M+NRZ module provides the general properties of the 800GE-8P-QDD-M+NRZ module—800GE-8P-QDD-M+NRZ Card Properties—General.

The **General** tab for 800GE-8P-OSFP-M+NRZ module provides the general properties of the 800GE-8P-OSFP-M+NRZ module—800GE-8P-OSFP-M+NRZ Card Properties—General.

The **General** tab for 800GER-4P-QDD-OSFP-M+NRZ module provides the general properties of the 800GER-4P-QDD-OSFP-M+NRZ module—800GER-4P-QDD-OSFP-M+NRZ Card Properties—General.

The **General** tab for NOVUS25/10GE8SFP28 module provides the general properties of the NOVUS25/10GE8SFP28 module— NOVUS25/10GE8SFP28 Card Properties—General.

Figure: General Card Properties



The **General** tab shows the board version, load module serial number, date of manufacture, and revision number. It also contains a button for resetting the hardware to factory defaults.

LSM1000 and LSM10GE Modules—Misc dialog box

For the LSM1000 and LSM10GE modules there is an additional Misc tab located in Card Properties dialog box, as shown in the following figure.

The **Misc** tab for Novus 10GE/1GE/100M module provides the misc properties of the Novus 10GE/1GE/100M modules—Novus 10GE/1GE/100M Card Properties—Misc.

The **Misc** tab for NOVUS25/10GE8SFP28 module provides the misc properties of the NOVUS25/10GE8SFP28 modules—NOVUS25/10GE8SFP28 Card Properties—Misc.

The **Misc** tab for QSFP-DD-400GE+200G+100G+50G module provides the misc properties of the QSFP-DD-400GE+200G+100G+50G modules—QSFP-DD-400GE+200G+100G+50G Card Properties—Misc.

The **Misc** tab for CFP8-400GE module provides the misc properties of the CFP8-400GE modules—CFP8-400GE Card Properties—Misc.

The **Misc** tab for T400GD-8P-QDD+200G+100G+50G module provides the misc properties of the T400GD-8P-QDD+200G+100G+50G modules—T400GD-8P-QDD+200G+100G+50G Card Properties—Misc.The **Misc** tab for T400GD-8P-OSFP+200G+100G+50G module provides the misc properties of the T400GD-8P-OSFP+200G+100G+50G modules—T400GD-8P-OSFP+200G+100G+50G Card Properties—Misc.

The **Misc** tab for T400GP-4P-QDD+200G+100G+50G module provides the misc properties of the T400GP-4P-QDD+200G+100G+50G modules—T400GP-4P-QDD+200G+100G+50G Card Properties—Misc.

The **Misc** tab for T400GP-4P-QDD module provides the misc properties of the T400GP-4P-QDD modules— T400GP-4P-QDD Card Properties—Misc.

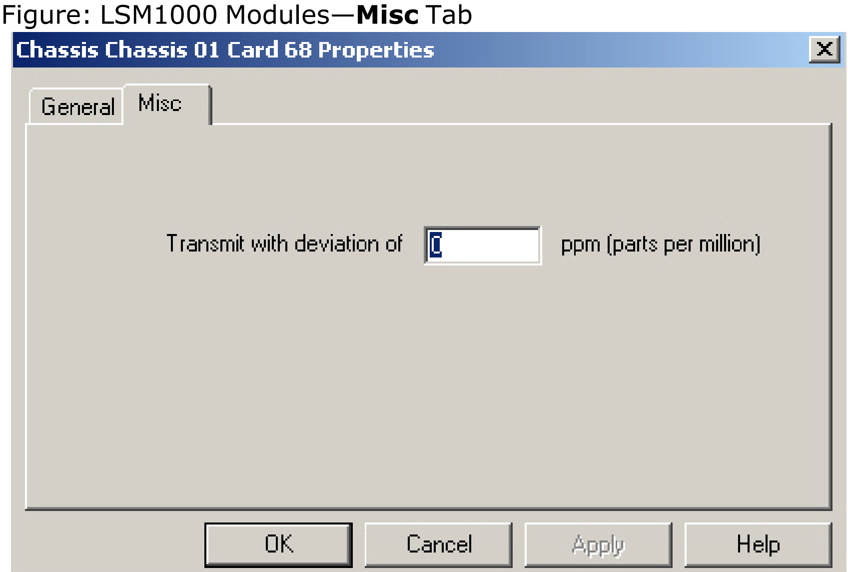
The **Misc** tab for T400GP-2P-QDD module provides the misc properties of the T400GP-2P-QDD modules— T400GP-2P-QDD Card Properties—Misc.

The **Misc** tab for S400GD-16P-QDD+FAN+NRZ module provides the misc properties of the S400GD-16P-QDD modules—S400GD-16P-QDD+FAN+NRZ Card Properties—Misc.

The **Misc** tab for 800GE-4P-QDD module provides the misc properties of the 800GE-4P-QDD modules—800GE-4P-QDD Card Properties—Misc.

The **Misc** tab for 800GE-4P-QDD-C module provides the misc properties of the 800GE-4P-QDD-C modules—800GE-4P-QDD-C Card Properties—Misc.

Figure: LSM1000 Modules—**Misc** Tab



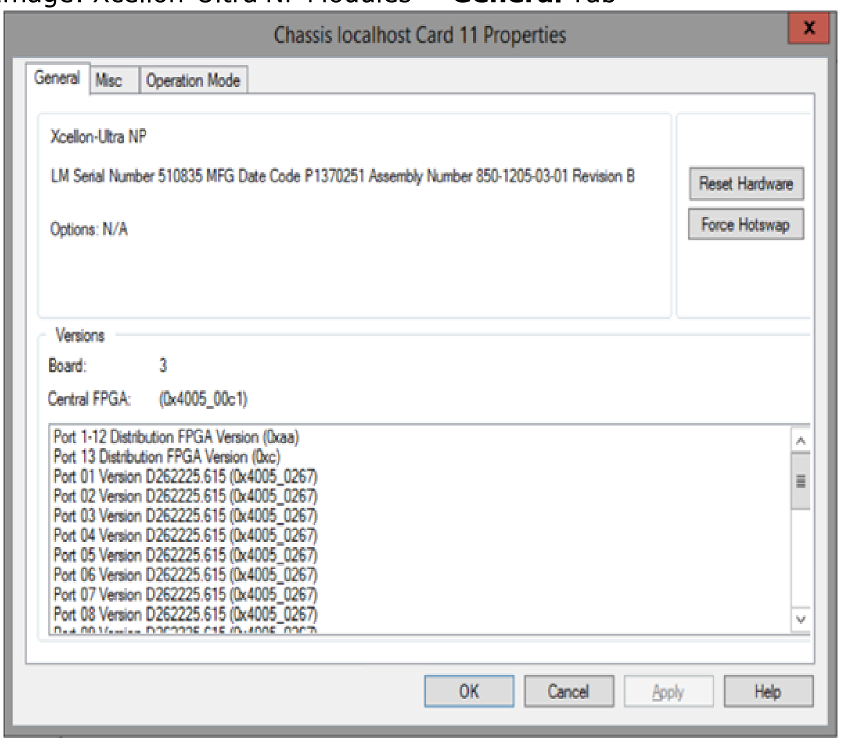
This dialog box allows to adjust the line transmit frequency for the card/module. The initial rate is controlled by the chassis chain reference clock. Then you can adjust the line transmit frequency for the card. LSM1000 cards can be adjusted by up to +/- 102 ppm–(0.0102%) above or below that initial rate—to test frequency compatibility per IEEE 802.3. LSM10GE cards can be adjusted from 0 to +/-100 ppm (- 0.01%) above or below that initial rate. All LSM1000, LSM10GE and later cards/modules are clocked on a per card basis.

Xcellon-Ultra Modules

The Xcellon-Ultra XP and NP modules Card Properties dialog box General tab is shown in the following image.

The **General** tab shows the board version and FPGA revision level for the board as well as the FPGA versions for each port on the card. It also contains a button for resetting the hardware to factory defaults. Also shown (by scrolling downward) are Power PC version, Power PC speed, and SODIMM memory size.

Image: Xcellon-Ultra NP Modules — **General** Tab



Operation Mode

The Xcellon-Ultra modules have an **Operation Mode** tab which is used to select between the three modes of operation for the module.

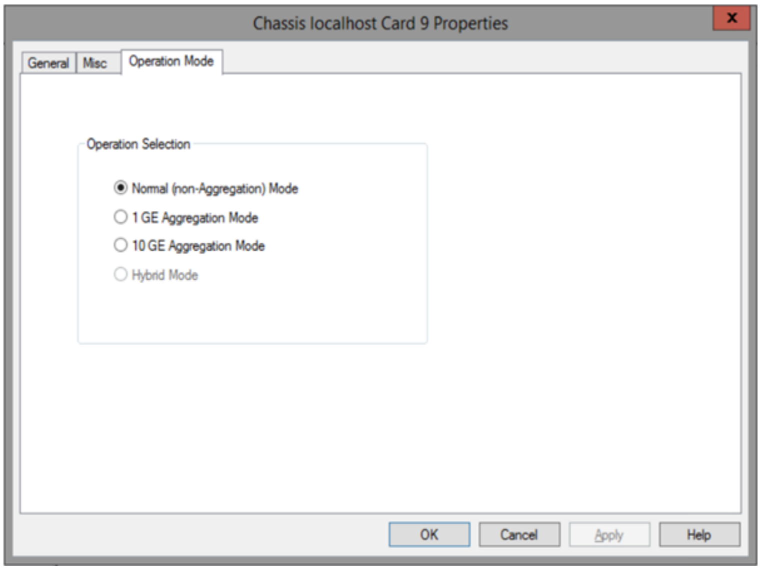
The **Operation Mode** tab is shown in the following image. The three modes are:

- Normal (non-aggregation) Mode–twelve 10/100/1000Mbps ports that provide L2-L7 functionality the same as the LSM1000XMVDC16 load module, including Stream Control, Capture and Latency features.

- 1 GE Aggregation Mode–any of the twelve PCPUs aggregated to any of 12 GE test ports through the switch fabric.
- 10 GE Aggregation Mode–twelve PCPUs aggregated to one 10GE test port through the switch fabric. The 10GE port is for application traffic only, providing no support for hardware stream engine.

NOTE The **Operation Mode** tab for Novus 10GE/1GE/100M module provides the operation mode properties of the Novus 10GE/1GE/100M modules—Novus 10GE/1GE/100M Card Properties—Operation Mode.

Image: Operation Mode Tab for Xcellon-Ultra



Misc Tab

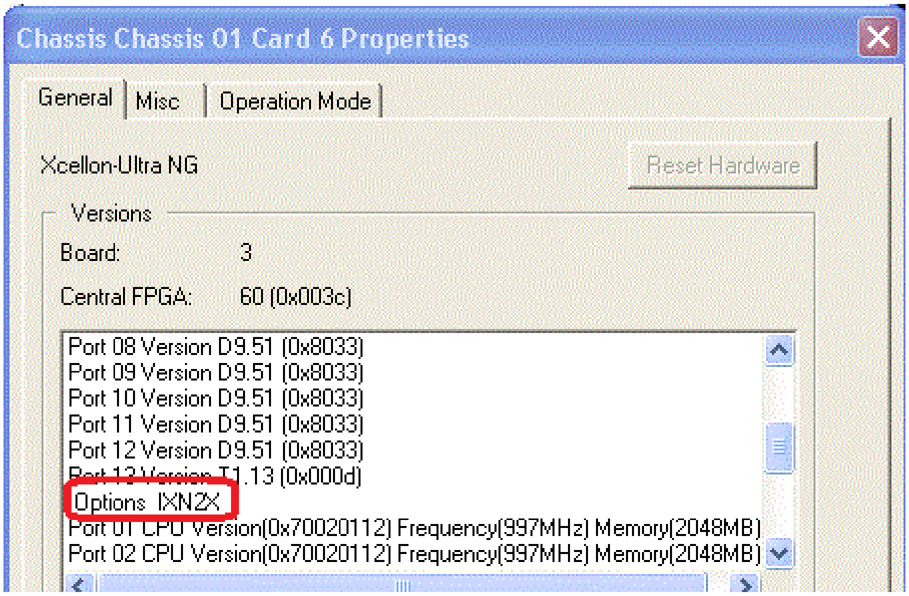
The Xcellon-Ultra modules Card Properties dialog box has the Misc tab when in normal (non-aggregated) mode.

Xcellon-Ultra NG Module

The Xcellon-Ultra NG module is the Fusion-Enabled version of the existing Ixia Xcellon-Ultra NP and XP load modules. The Xcellon-Ultra NG module is capable of running in IxN2X mode.

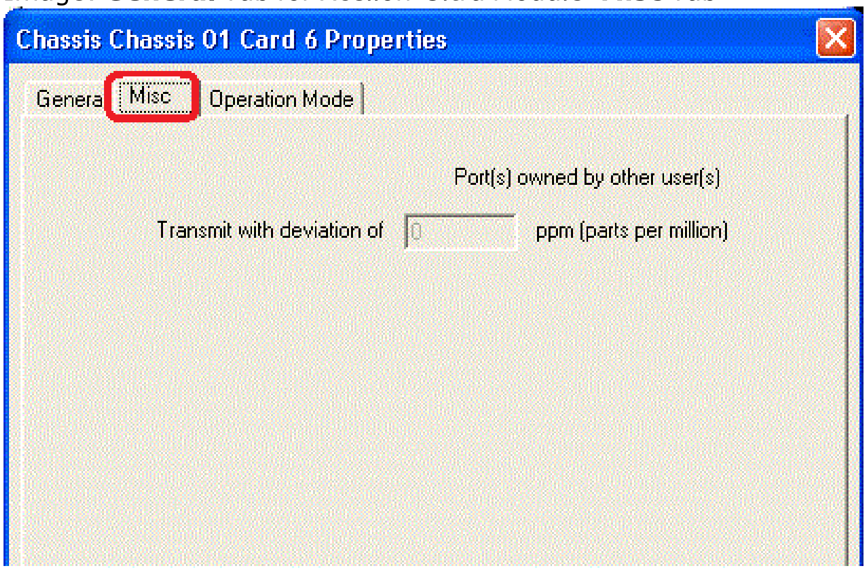
The **General** tab in **Card Properties** dialog box is shown in the following image. The IxN2X capability appears in the **General** tab.

Image: **General** Tab for Xcellon-Ultra NG Modules



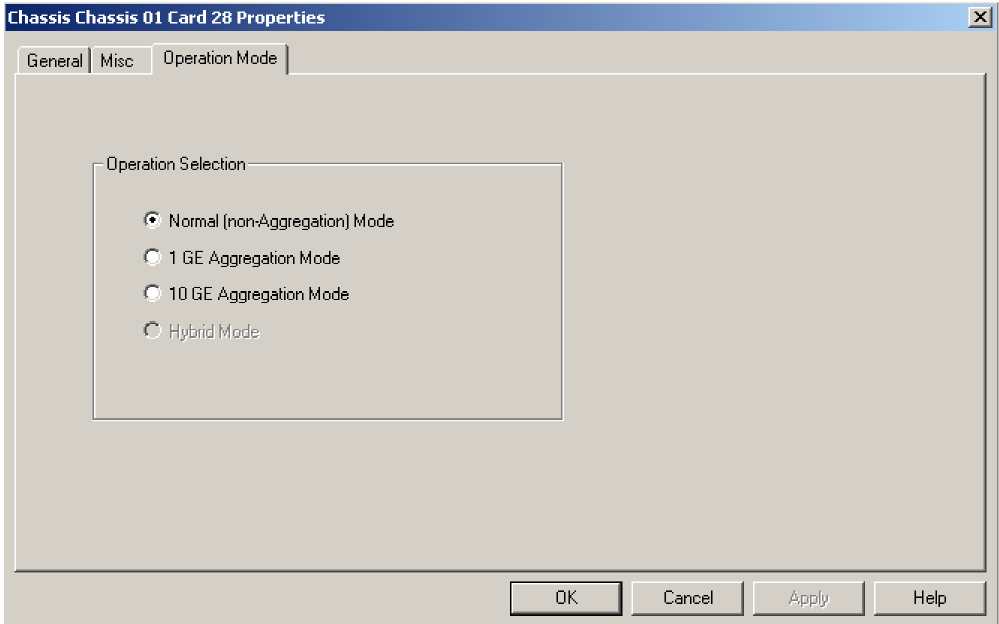
The Misc dialog box for Xcellon-Ultra NG card properties is shown in the following image.

Image: **General** Tab for Xcellon-Ultra Module–**Misc** Tab



The Operation Mode dialog box for Xcellon-Ultra NG card properties is shown in the following image.

Image: **General** Tab for Xcellon-Ultra Module–**Operation Mode** Tab



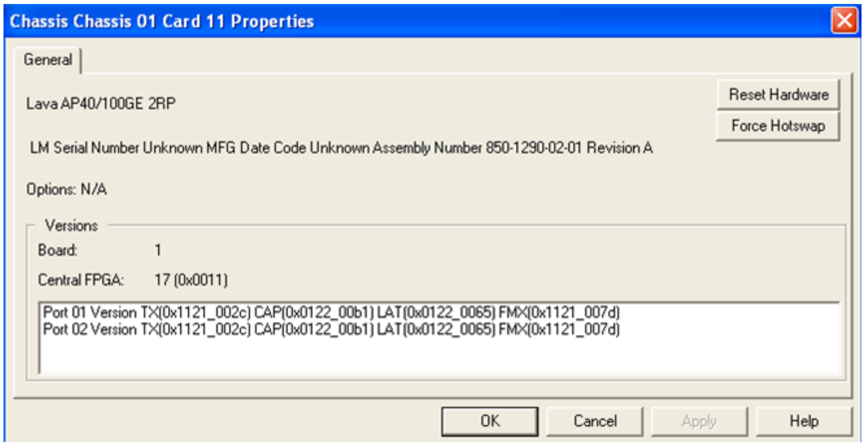
The features of partition, aggregation and multicast are mainly used by the IxLoad and IxNetwork applications. IxExplorer can show the current state of the Xcellon-Ultra card. An operation mode option named **Hybrid** Mode is added to represent the state that Xcellon-Ultra card has multiple partition groups. A radio button named **Hybrid Mode** is added in Xcellon-Ultra card **Properties** dialog box in the **Operation Mode** tab. The other options in the **Operation Mode** are Normal (non-aggregation) Mode, 1 GE Aggregation Mode, and 10 GE Aggregation Mode. In this dialog box, you can switch Xcellon-Ultra card to other modes from hybrid mode, but cannot switch it to hybrid mode from other modes. When partition groups are created through IxTclHal, the operation mode will be set to hybrid mode, and appear in IxExplorer.

Xcellon-Lava Module

The **General** tab shows the board version and FPGA revision level for the board as well as the FPGA versions for each port on the card. It contains a button for resetting the hardware to factory defaults. There is another button Force Hotswap which will emulate physical removal and insertion of the load module. This is done for diagnostic purposes. We recommend the use of this test with guidance from Ixia.

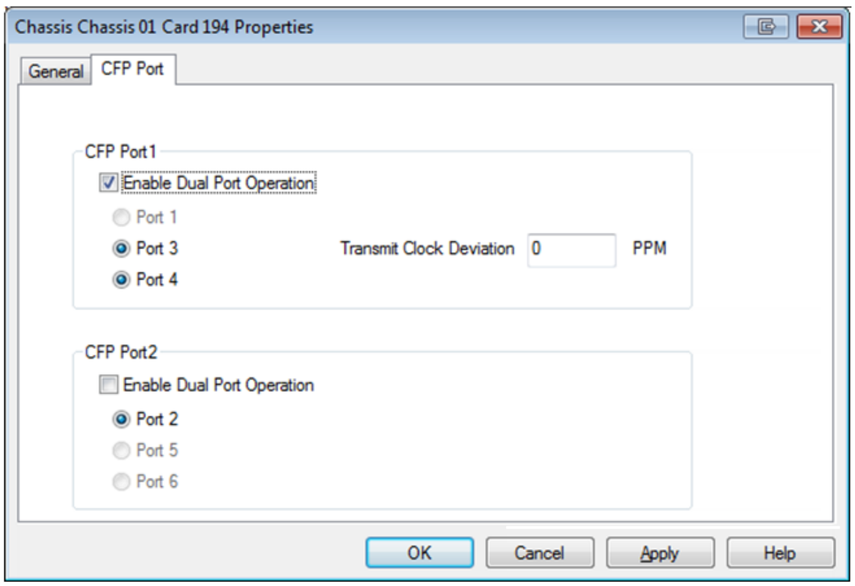
Xcellon-Lava module card properties dialog box **General** tab is shown in the following image:

Image: **General** Tab for Xcellon-Lava - **General** Tab



Xcellon-Lava module card properties dialog box **CFP Port** tab is shown in the following image:

Image: **General** Tab for Xcellon-Lava - **CFP Port** Tab



This is present in Port Properties view, and allows CFP to be placed into Single Port or Dual Port operation. CFP Mode operation is not automatic; user must select desired mode of operation. There are two types of mode:

- **Single Port Operation**: CFP provides one port of 40G or 100G. Speed is selected in a Port Property.
- **Dual Port Operation**: CFP provides two ports of 40G, when using CFP-to-QSFP+ Dual-Port Interface Adapter.

Each of the two ports can be owned independently, but if ownership is not exclusive by one user, the following operation will not be allowed by either owner:

- CFP Mode change to Single Port Operation
- Clock PPM adjustment
- Reset Hardware (under Card Properties) – not to be confused with Reboot CPU, which is not restricted

The limitations for the Dual Port Operation are as follows:

- BERT functionality not available
- Capture buffer is half the capacity of Single Port Operation
- Value List memory is half that of Single Port Operation
- TX Flow sequence memory is half that of Single Port Operation
- Sequence Checking memory is half that of Single Port Operation
- PPM adjustment is per CFP (pair of QSFP ports)
- DCE support not available at this time
- Front panel LEDs not functional

Xcellon-Multis Module

General

The **General** tab shows the board version and FPGA revision level for the board as well as the FPGA versions for each port on the card. The Reset Hardware button in this dialog box allows you to reset the hardware to factory defaults.Examples of the card properties dialog box **General** tab for the Multis CXP and QSFP load modules are shown in the following images:

Image: Xcellon-Multis CXP- **General** Tab

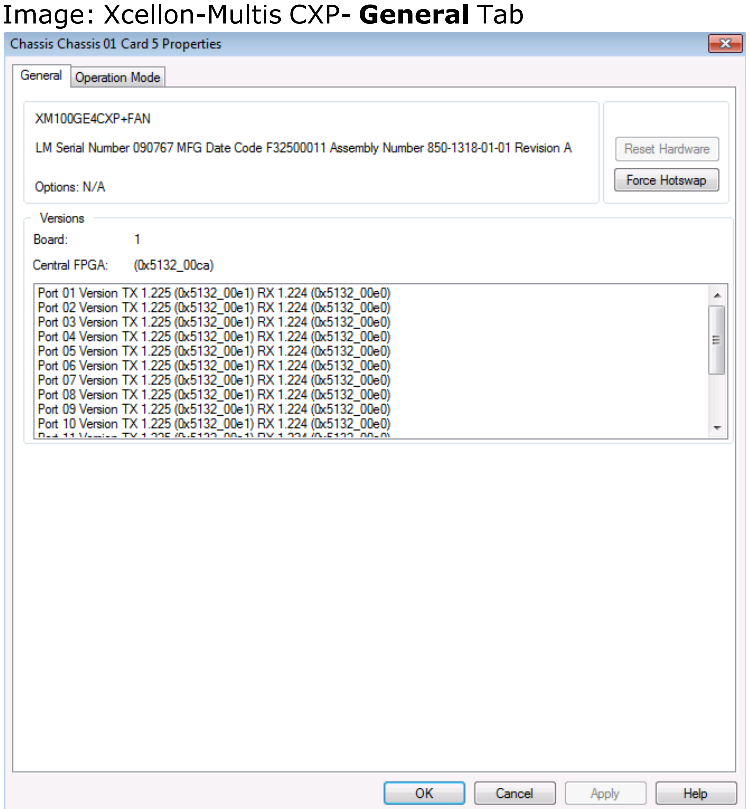
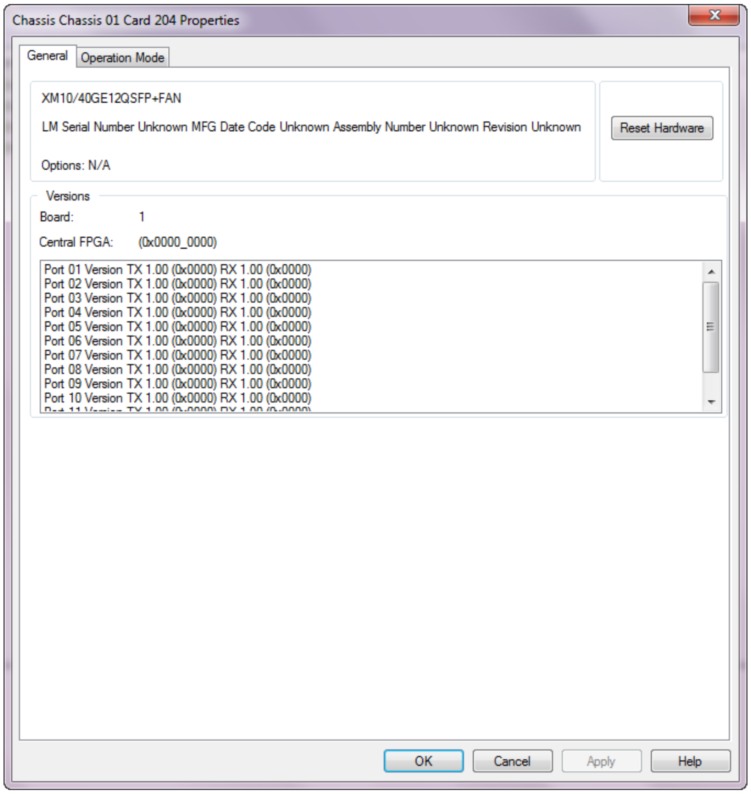


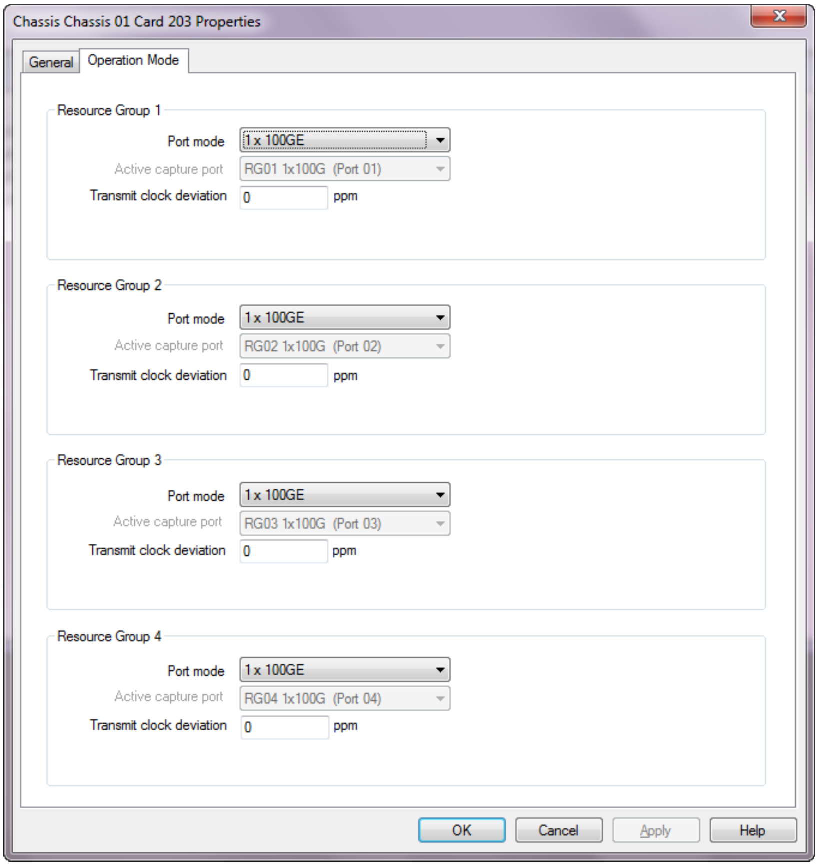
Image: Xcellon-Multis QSFP- **General** Tab



Operation Mode

The Xcellon-Multis modules have an **Operation Mode** tab which is used to select the mode of operation for the module.

The **Operation Mode** tab is shown in the following image.



The Xcellon-Multis card has four Ethernet ports with 100GE speeds. The card has a transceiver corresponding to each port. In each port, you can insert a FanOut cable which fans the output into multiple ports instead of using the original port.

You need to select the mode from the **Port mode** list for each Resource Group. Options include the following:

- 100GE Normal Mode–4 ports of 100GE speed
- 3x40GE Fan-out Mode–3 ports of 40GE speed using Fan-out cables
- 3x10GE Fan-out Mode–3 ports of 10GE speed using Fan-out cables
- 8x10GE Fan-out Mode–8 ports of 10GE speed using Fan-out cables
- 4x25GE Normal Mode–1 port of 100 GE speed converts to 4 ports of 25 GE speed within a single Resource Group using QSFP28 form factor

  2x25GE Normal Mode–A subset of the 4x25G mode, and has the same capabilities except that only 2 ports of the port group are activated. This mode is available with the 4x25G license.
- 1X50GE Normal Mode–1 ports of 50GE speed

The following Xcellon-Multis card types are supported:

- XM100GE4CXP
- XM100GE4CXP+FAN
- XM100GE4CXP+FAN+10GE
- XM10/40GE12QSFP+FAN

- XM10/40GE6QSFP+FAN
- XM100GE4CFP4+ENH
- XM100GE4QSFP28+ENH
- XM100GE4QSFP28+ENH+25G
- XM100GE4QSFP28+ENH+25G+50G
- XMR10GE16SFP+FAN
- XMR10GE32SFP+FAN

For more information on Xcellon-Multis cards, see *Ixia Platform Reference Guide*.

The **Active capture port** field shows the port in the Resource Group on which you can perform data capture.

NOTE You can perform data capture only on a single port within a Resource Group. You can activate multiple ports but if you try to capture more data on more than one, then it fails with an error message.

In the **Transmit clock Deviation** box, enter the line transmit frequency for the Multis card. The initial rate is controlled by the chassis chain reference clock. You can then adjust the line transmit frequency for the card.

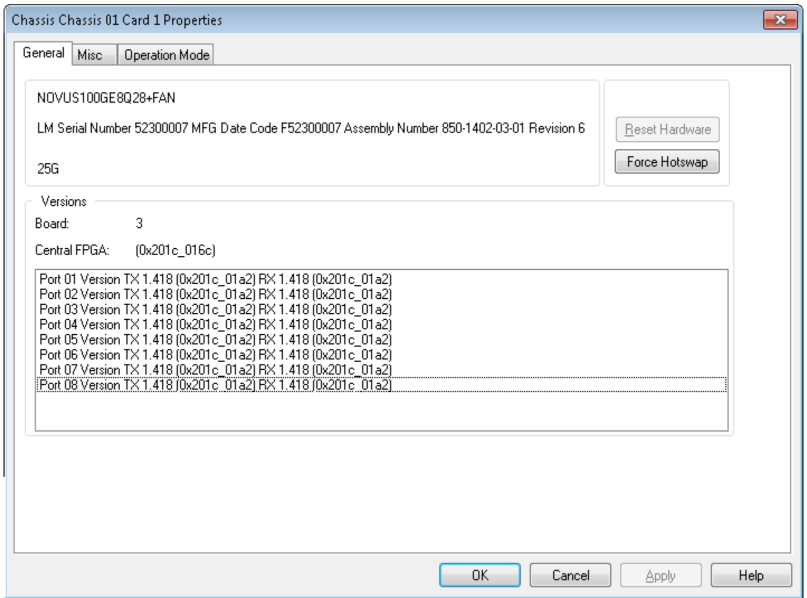
Novus Module

- The GUI for Novus, Novus-R and Novus-M QSFP28 load modules are the same. In this chapter, the port properties are explained as per the Novus load module, but the documentation is also applicable for the Novus-R and Novus- M load modules.
- For NOVUS25/10GE8SFP28 module, see NOVUS25/10GE8SFP28 Card Properties—Operation Mode
- For T400GD-8P-QDD module, see T400GD-8P-QDD Card Properties—Operation Mode.
- For T400GD-8P-OSFP module, see T400GD-8P-OSFP Card Properties—Operation Mode.

General

The **General** tab shows the board version and FPGA revision level for the board as well as the FPGA versions for each port on the card. The Reset Hardware button in this dialog box allows you to reset the hardware to factory defaults.Examples of the card properties dialog box **General** tab for the Novus load modules are shown in the following images:

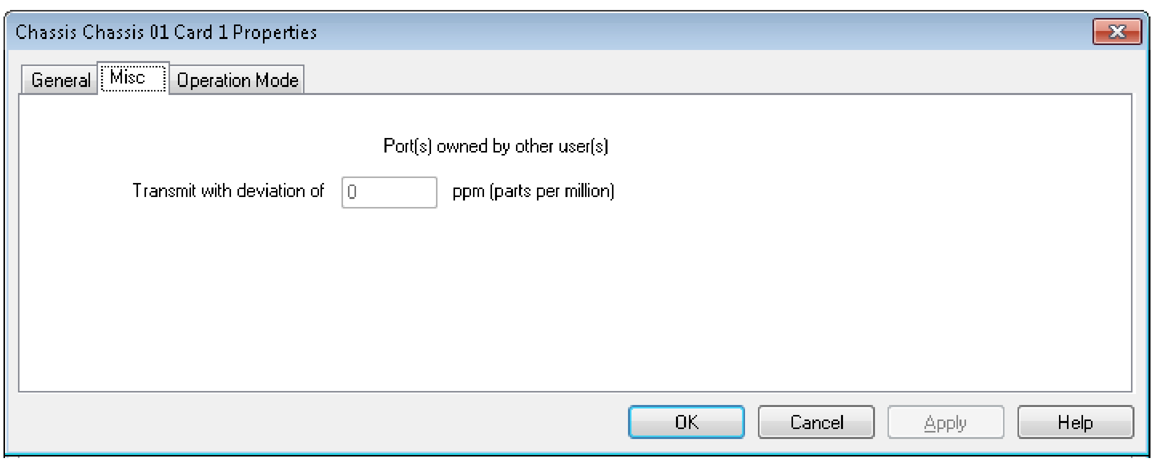
Image: Novus-**General** Tab



Misc

The Novus module Card Properties dialog box has the **Misc** tab when in normal (non-aggregated) mode. The **Misc** tab functionality is identical to that described in LSM1000 and LSM10GE Modules—Misc dialog box.

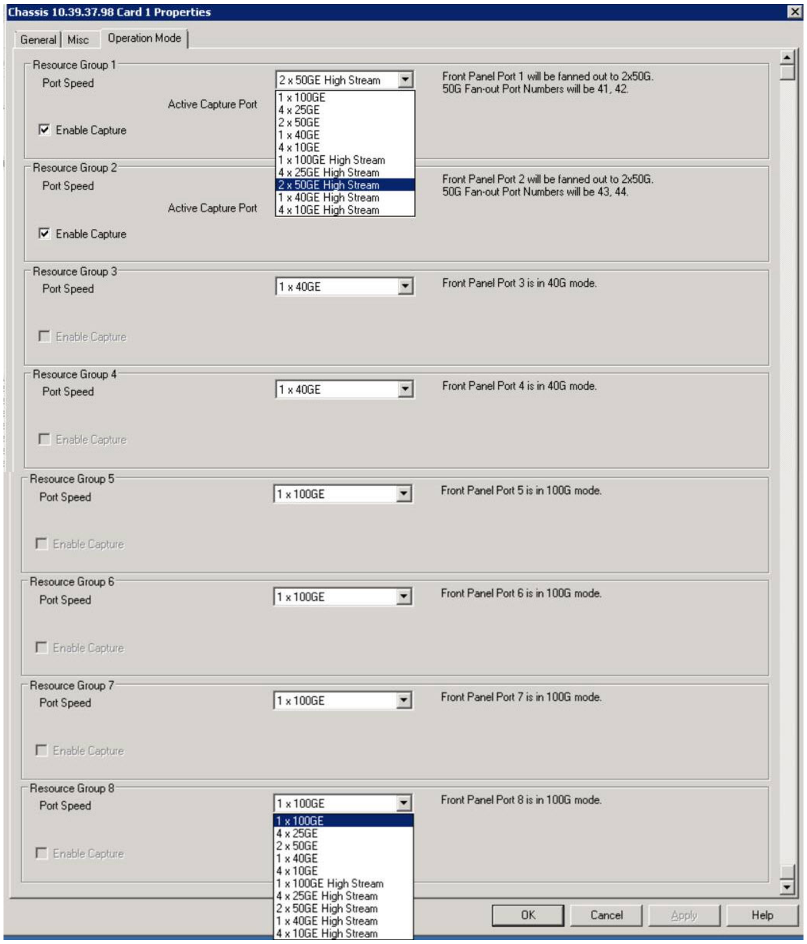
Image: Novus-**Misc** Tab



Operation Mode

The Novus modules have an **Operation Mode** tab which is used to select the mode of operation for the module.

The **Operation Mode** tab is shown in the following image:



The Novus card has eight Ethernet ports with 100GE speeds. The card has a transceiver corresponding to each port. In each port, you can insert a FanOut cable which fans the output into multiple ports instead of using the original port.

You need to select the speed from the Port speed list for each Resource Group. Options include the following:

- 1x100GE Normal Mode-8 ports of 100 GE speed
- 4x25GE Normal Mode–1 port of 100 GE speed converts to 4 ports of 25GE speed within a single Resource Group using QSFP28 form factor
- 2x50GE Normal Mode–1 port of 100 GE speed converts to 2 ports of 50GE speed within a single Resource Group using QSFP28 form factor
- 1x40GE Normal Mode–1 port of 40 GE speed
- 4X10GE Normal Mode–1 port of 100 GE speed converts to 4 ports of 10GE speed within a single Resource Group using QSFP28 form factor
- 1x100GE High Stream Mode-8 ports of 100 GE speed
- 4x25GE High Stream Mode–1 port of 100 GE speed converts to 4 ports of 25GE speed within a single Resource Group using QSFP28 form factor

- 2x50GE High Stream Mode–1 port of 100 GE speed converts to 2 ports of 50GE speed within a single Resource Group using QSFP28 form factor
- 1x40GE High Stream Mode–1 port of 40 GE speed
- 4X10GE High Stream Mode–1 port of 100 GE speed converts to 4 ports of 10GE speed within a single Resource Group using QSFP28 form factor

The following Novus card types are supported:

- NOVUS100GE8Q28+FAN+10G+25G+40G+50G
- NOVUS100GE4Q28+FAN+10G+25G+40G+50G
- NOVUS-R100GE8Q28+FAN+10G+25G+40G+50G
- NOVUS-R100GE8Q28+FAN+RU+10G+25G+40G+50G
- NOVUS-M100GE8Q28+FAN+10G+25G+40G+50G
- NOVUS-W50GE8Q28

For more information on Novus cards, see *Ixia Platform Reference Guide*.

The **Enable Capture** check box shows the port in the Resource Group on which you can perform data capture.

NOTE Default capture is supported only on two ports in a card. But, if you turn on **Capture Extended Mode**, capture will be supported on all 8 ports. This feature is available only in XGS12-SD/SDL/HSL chassis. After the feature is turned on, slots 1, 2, 11, and 12 will become inactive. To turn on this mode, refer to the IxServer Guide.

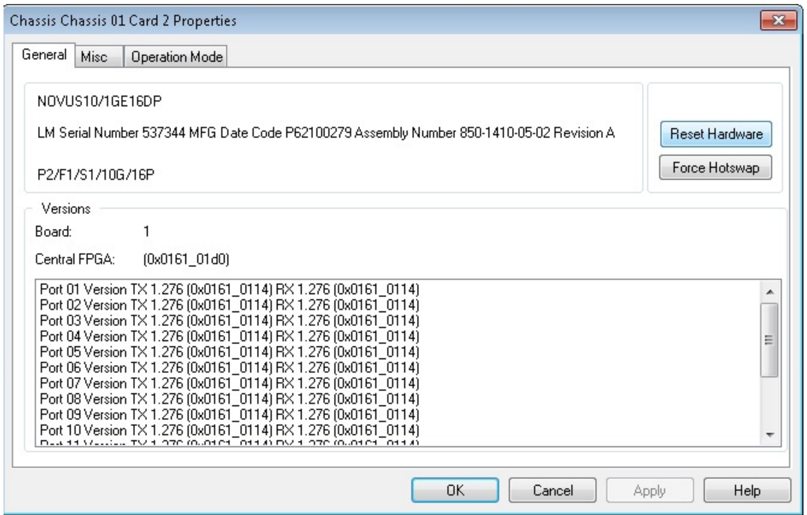
Novus 10GE/1GE/100M Module

NOTE The GUI for 10GE/1GE/100M, NOVUS-NP10/1GE16DP and NOVUS10/1GE32S load modules are the same. In this chapter, the port properties are explained as per the 10GE/1GE/100M load module, but the documentation is also applicable for the NOVUS-NP10/1GE16DP and NOVUS10/1GE32S load modules.

General

The **General** tab shows the board version and FPGA revision level for the board as well as the FPGA versions for each port on the card. The Reset Hardware button in this dialog box allows you to reset the hardware to factory defaults.Examples of the card properties dialog box **General** tab for the Novus 10/1 load modules are shown in the following images:

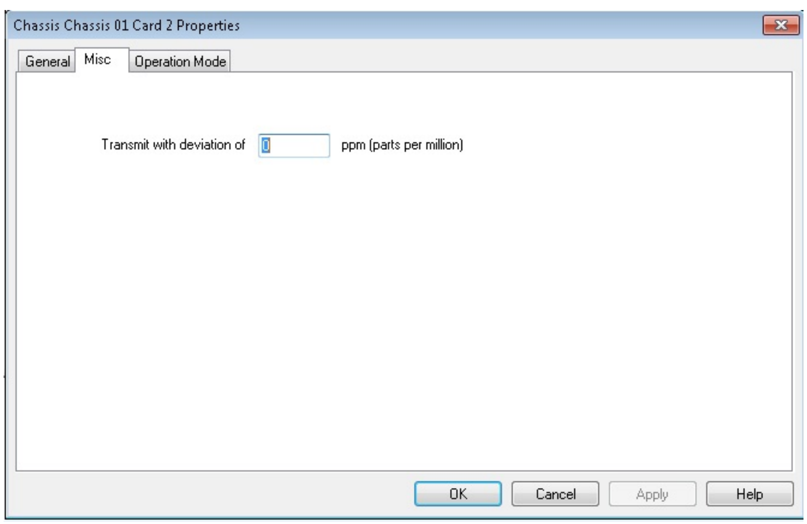
Image: Novus 10/1-**General** Tab



Misc

The Novus 10/1 module Card Properties dialog box has the **Misc** tab when in normal (non-aggregated) mode. The **Misc** tab functionality is identical to that described in LSM1000 and LSM10GE Modules—Misc dialog box.

Image: Novus-**Misc** Tab



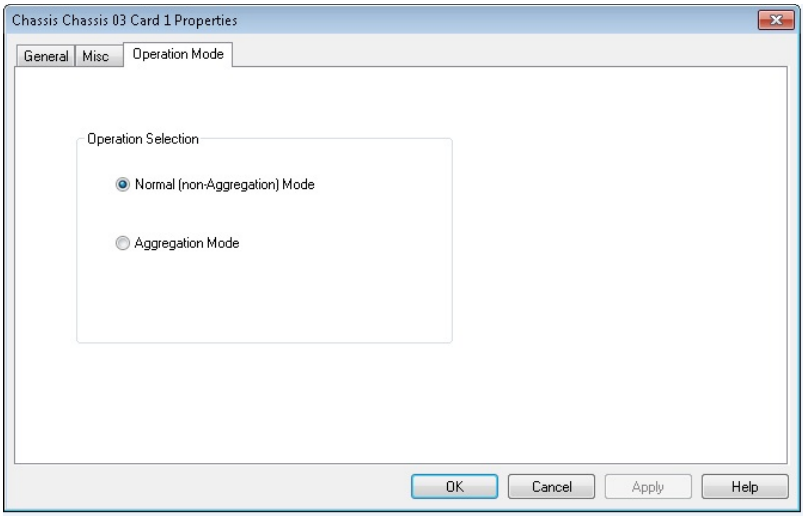
Operation Mode

The Novus 10/1 modules have an **Operation Mode** tab which is used to select between the two modes of operation for the module.

The two modes are:

- Normal (Non-Aggregation) Mode
- Aggregation Mode

The **Operation Mode** tab is shown in the following image:



The following Novus 10/1 card types are supported:

- Novus10/1GE16DP
- Novus10/1GE8DP
- Novus1GE16DP

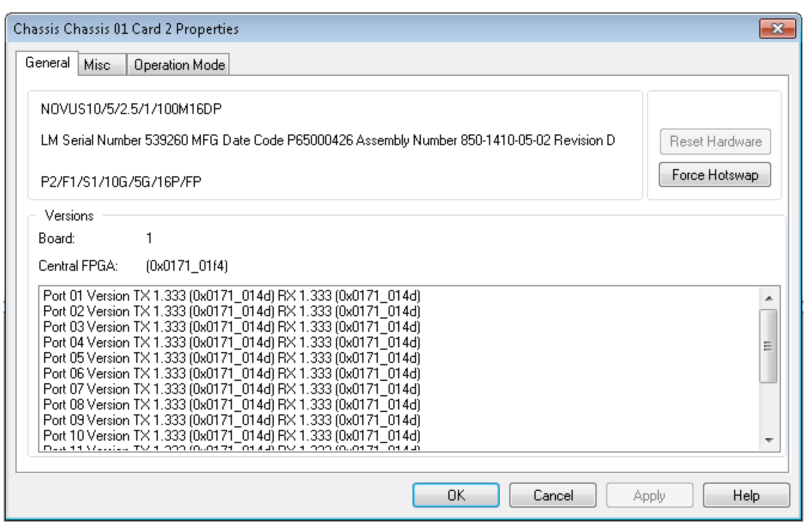
For more information on Novus 10/1 family of cards, see *Ixia Platform Reference Guide*.

Novus 10GE/5GE/2.5GE/1GE/100M Module

General

The **General** tab shows the board version and FPGA revision level for the board as well as the FPGA versions for each port on the card. The Reset Hardware button in this dialog box allows you to reset the hardware to factory defaults.Examples of the card properties dialog box **General** tab for the Novus 10/1 5-speed load modules are shown in the following images:

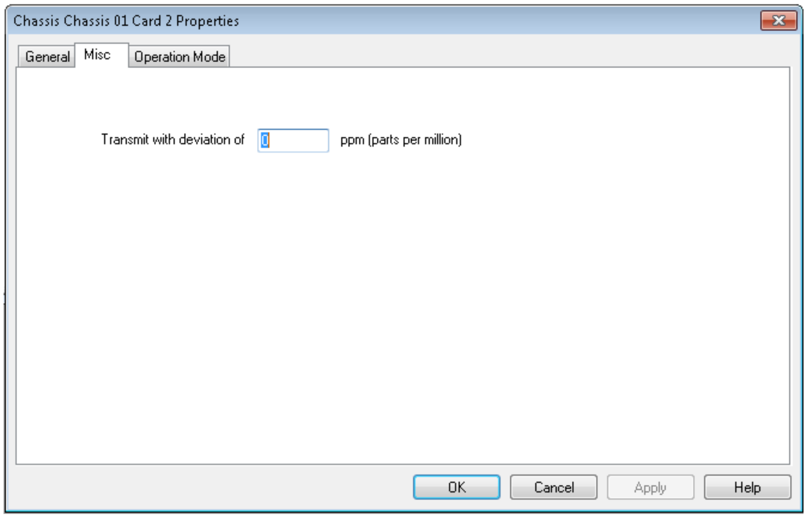
Image: Novus 10/1 5-Speed - **General** Tab



Misc

The Novus 10/1 5-speed module Card Properties dialog box has the **Misc** tab when in normal (non-aggregated) mode. The **Misc** tab functionality is identical to that described in LSM1000 and LSM10GE Modules—Misc dialog box.

Image: Novus 10/1 5-Speed - **Misc** Tab



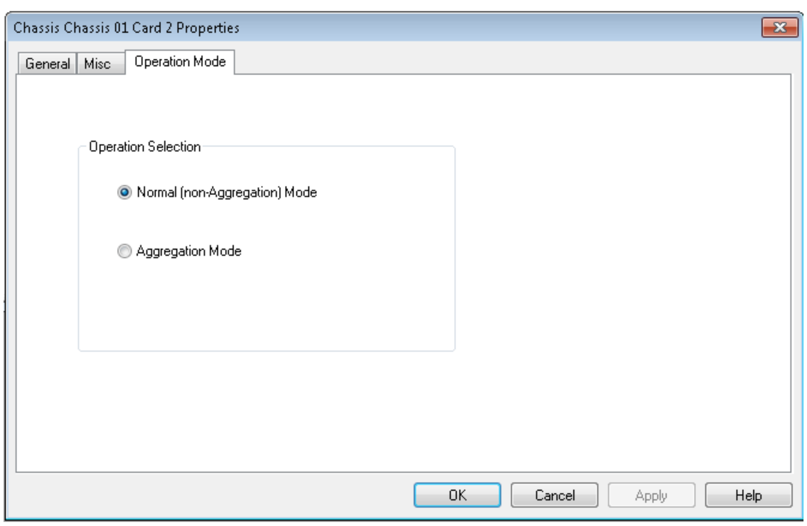
Operation Mode

The Novus 10/1 5-speed modules have an **Operation Mode** tab which is used to select between the two modes of operation for the module.

The two modes are:

- Normal (Non-Aggregation) Mode
- Aggregation Mode

The **Operation Mode** tab is shown in the following image:



The following Novus 10/1 5-speed card types are supported:

- Novus10/5/2.5/1/100M16DP
- Novus10/5/2.5/1/100M8DP
- Novus10/5/2.5/1/100M16DP-R
- Novus10/5/2.5/1/100M8DP-R

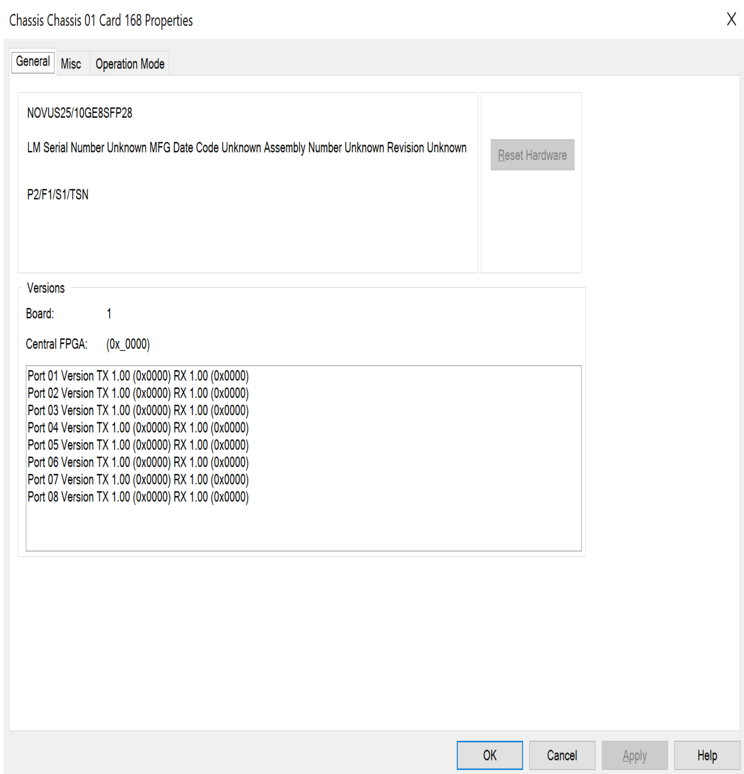
For more information on Novus 10/1 5-speed family of cards, see *Ixia Platform Reference Guide*.

NOVUS25/10GE8SPF28 Module

General

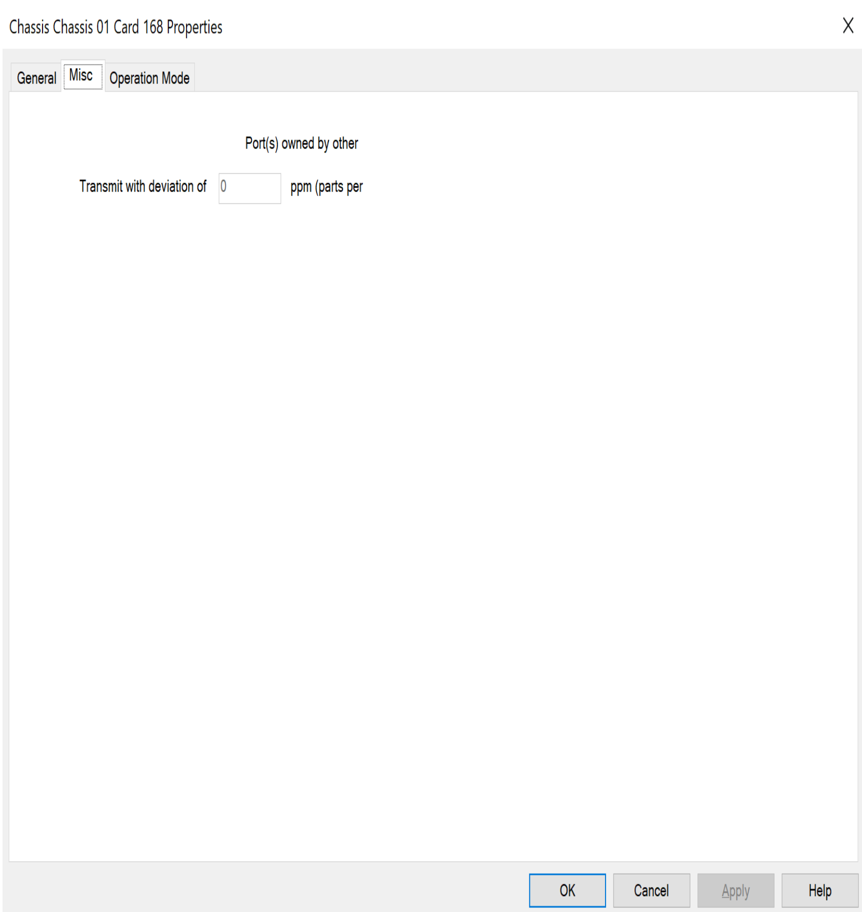
The **General** tab shows the board version and FPGA revision level for the board as well as the FPGA versions for each port on the card. The **Reset Hardware** button in this dialog box allows you to reset the hardware to factory defaults.

An example of the card properties dialog box **General** tab for the NOVUS25/10GE8SPF28 load module is shown in the following image:



Misc

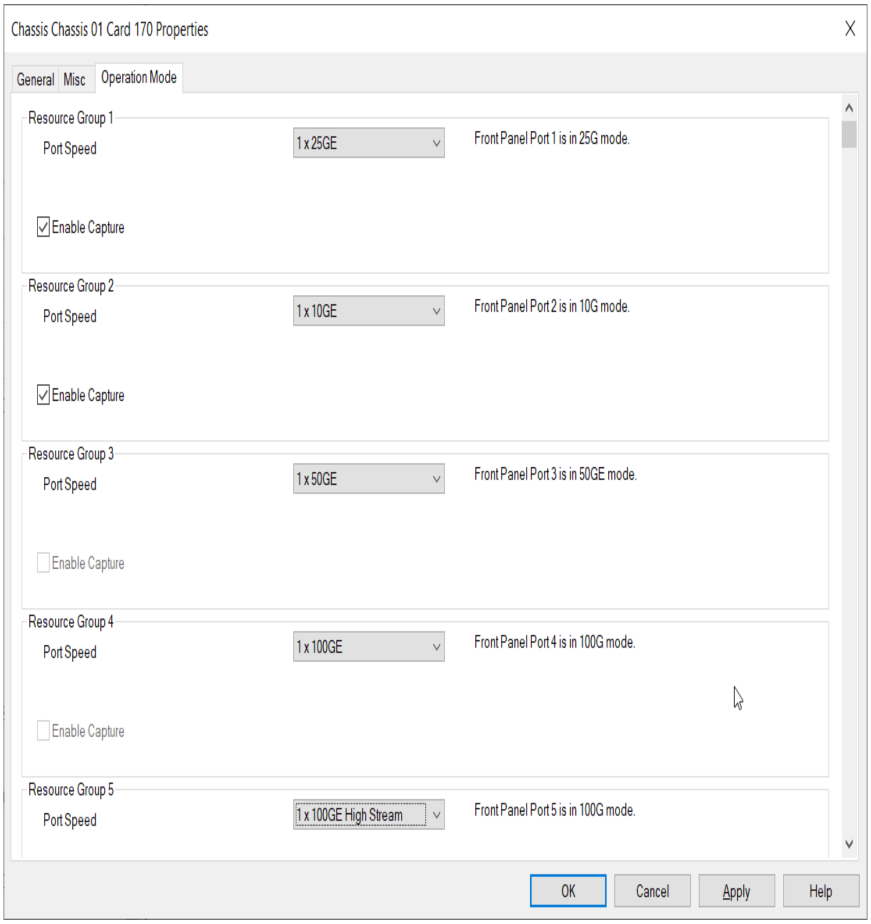
The NOVUS25/10GE8SPF28 module Card Properties dialog box has the **Misc** tab when in normal (non-aggregated) mode. The **Misc** tab functionality is identical to that described in LSM1000 and LSM10GE Modules—Misc dialog box.



Operation Mode

The **Operation Mode** tab for NOVUS25/10GE8SPF28 module is used to select the mode of operation for the module.

The **Operation Mode** dialog box for NOVUS25/10GE8SPF28 card properties is shown in the following image:



The different card level modes can be set in the **Operation Mode** dialog box.

You need to select the mode from the **Port Speed** list for each Resource Group. Options include the following:

- 1x25GE
- 1x10GE
- 1x50G
- 1x100G
- 1x100G High Stream

For more information on NOVUS25/10GE8SPF28 cards, see *Ixia Platform Reference Guide*.

The **Enable Capture** check box shows the port in the Resource Group on which you can perform data capture.

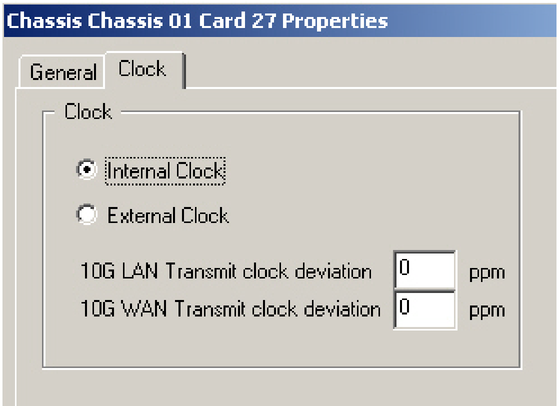
NOTE Default capture is supported only on two ports in a card. But, if you turn on **Capture Extended Mode**, capture will be supported on all 8 ports. This feature is available only in XGS12-SD/SDL/HSL chassis. After the feature is enabled, slots 1, 2, 11, and 12 will become inactive. To turn on this mode, refer to the IxServer Guide.

NGY LSM10GXM 2, 4 and 8-port Modules

The *Card Properties* dialog box of the LSM10GXM 2, 4 and 8-port modules has a **General** tab identical to that shown in the following image.

It also features a **Clock** tab, for configuring clocking, shown in the following image:

Image: **clock** Tab for LSM10GXM Modules

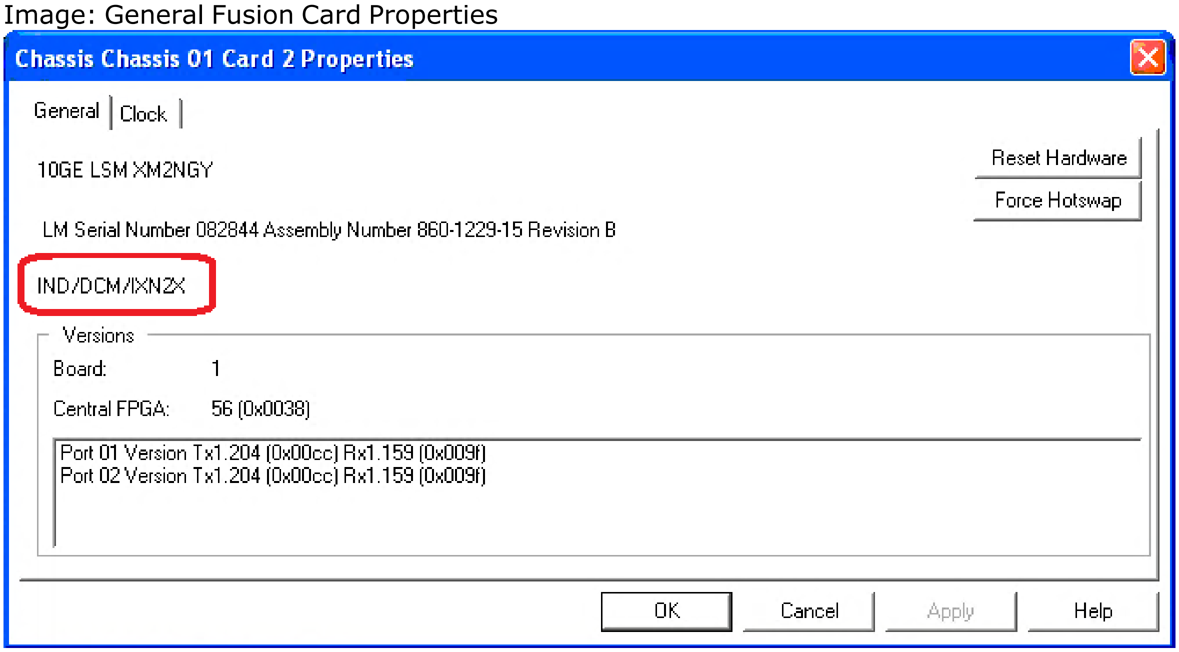


Select **Internal** clock and set the transmit clock deviation using this dialog box, or select **External** clock. Details are provided in *Table: 10GE LSM LAN/WAN **General** Tab Configuration*.

Fusion enabled NGY Modules

10GLSMXM2NG, 10GLSMXM4NG and 10GLSMXM8NG are the fusion enabled versions of the existing Ixia 10GLSMXM2XP, 10GLSMXM4XP, 10GLSMXM8XP. These modules are capable of running in IxN2X mode. The **General** Tab in Card Properties dialog box is shown in the following image. The IXN2X capability appears in the **General** tab. The remaining tabs are identical to the non-Fusion enabled load modules.

Image: General Fusion Card Properties

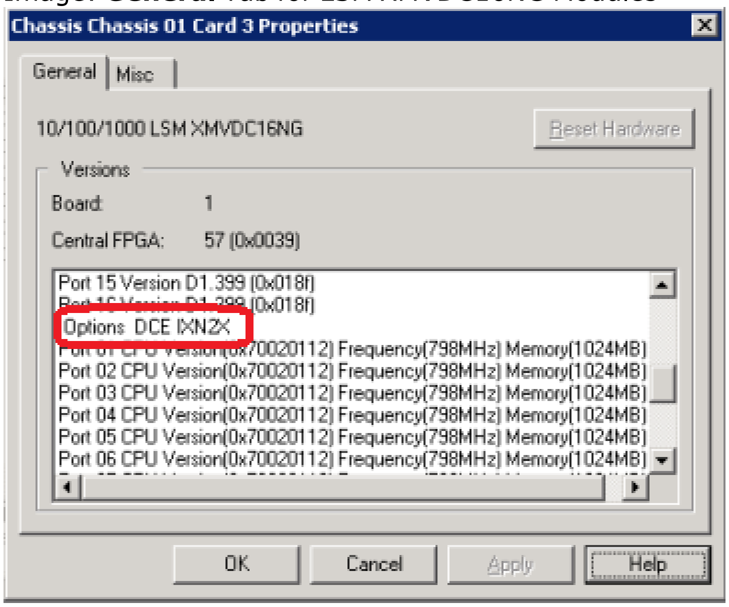


LSM XMVDC16NG 16-port Modules

The LSM XMVDC16NG module is the Fusion-Enabled version of the existing Ixia XMVDC16 module. The LSM XMVDC16NG module is capable of running in IxN2X mode.

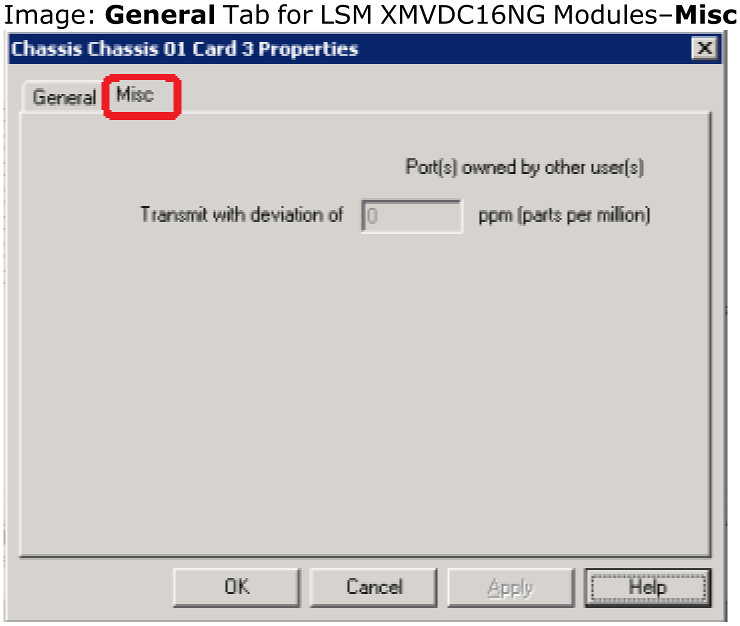
The **General** tab in **Card Properties** dialog box is shown in the following image. The IxN2X capability appears in the **General** tab.

Image: **General** Tab for LSM XMVDC16NG Modules



The Misc dialog box for LSM XMVDC16NG card properties is shown in the following image.

Image: **General** Tab for LSM XMVDC16NG Modules–**Misc** Tab



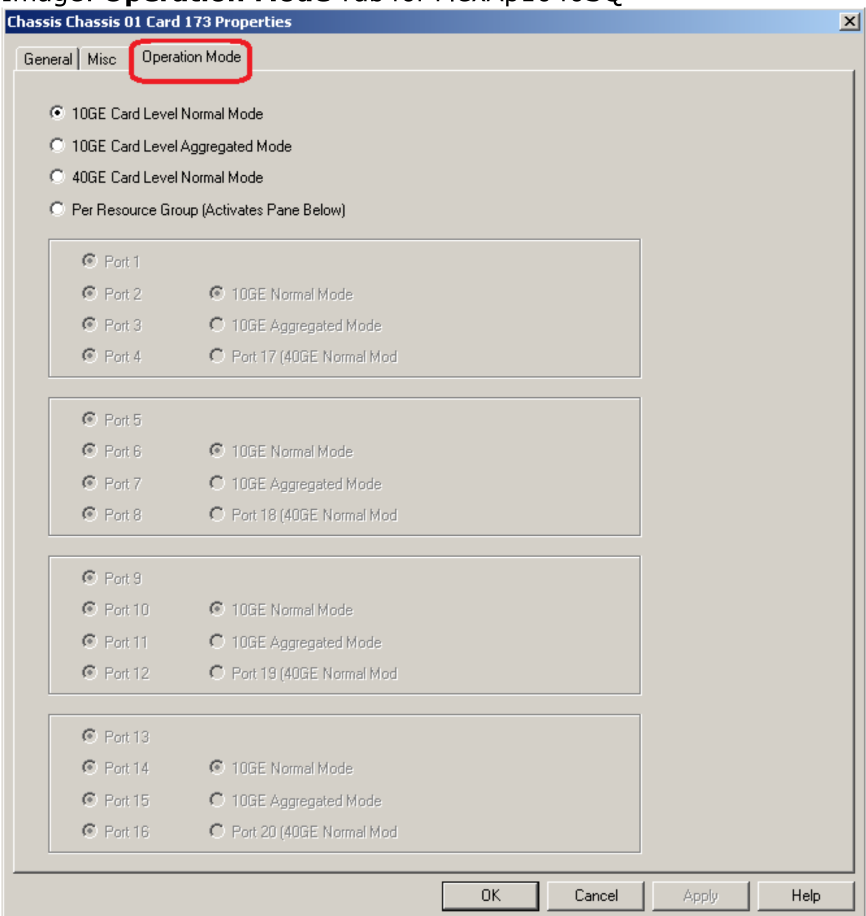
FlexAP1040SQ

The 10/40 Gigabit Ethernet Accelerated Performance is a 6-port load module with SFP+ interfaces and 4-ports of QSFP+ 40GE interfaces with full performance L2-7 support.

Operation Mode

The **Operation Mode** dialog box for FlexAP1040SQ card properties is shown in the following image:

Image: **Operation Mode** Tab for FlexAp1040SQ



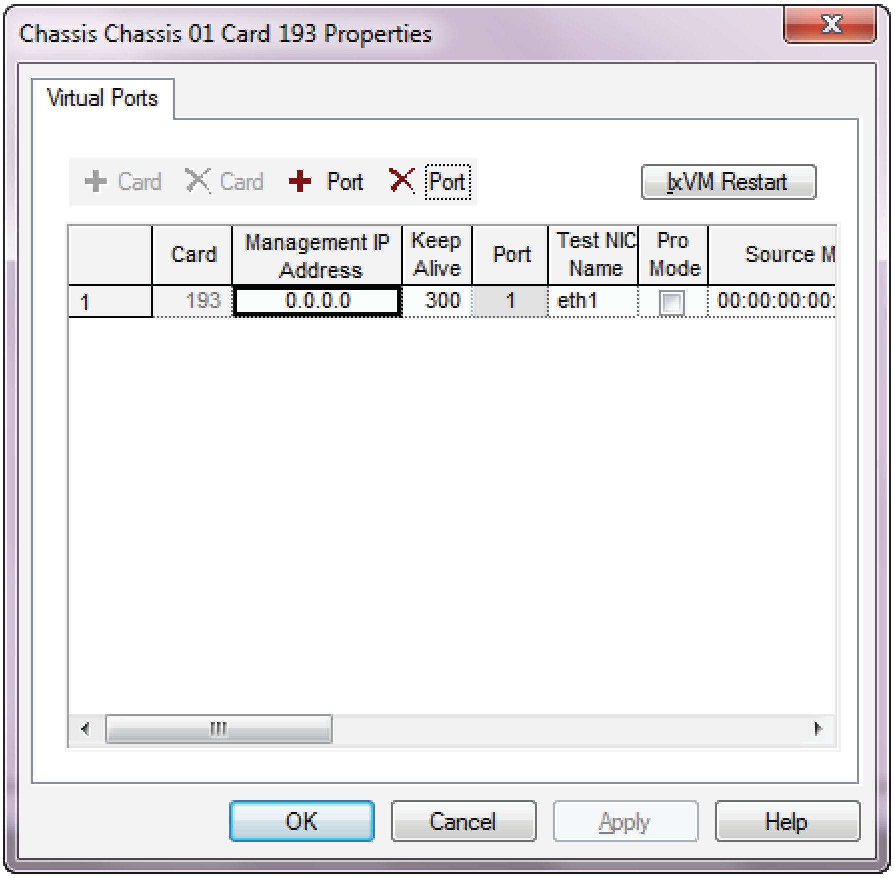
The different card level modes can be set in the **Operation Mode** dialog box.

Virtual Load Modules

The Ixia Virtual load module has the **Virtual Ports** tab in the Card Properties dialog box.

Virtual Ports Tab

The Card Properties - **Virtual Ports** tab is shown in the following image.Table 17-4. Card Properties for **Virtual Ports** Tab.



The controls for the **Virtual Ports** tab are explained in the following table.

Section	Field/Control	Description
	Card	The card number.
	Management IP Address	Management IP address of the Linux machine with the IxVM software agent installedManagement IP address of the Linux machine with the IxVM software agent installed.
	Keep Alive	The keep-alive timeout in seconds. Each IxVM card has a keep-alive mechanism between the virtual chassis and the virtual card. In case either of these two components do not send or receive a keep-alive message for a certain amount of time, then the virtual card will disconnect from the virtual chassis.
	Port	The name of the port on the IxVM card to be used for traffic generation and measurement.
	Test NIC Name	Name of the virtual interface that will be used as a traffic generator. Virtual interface must be created before adding the port.
	Pro Mode	Denotes the promiscuous or nonpromiscuous mode in which

Section	Field/Control	Description
		a virtual port is added to a virtual card.
	Source MAC	The first source MAC address to be generated for the stream.
	Link MTU	MTU value of test interface from a virtual machine. The minimum value is 1500 and the maximum value is 9000 and should be changed mainly when there are control plane frames bigger than 1500.
	Line Speed (Mbps)	Select the line speed. Options include the following: 100MBPS 1000MBPS: 1 Gb speed 10000MBPS: 10 Gb speed
+ Port		Adds a port to the virtual load module.
X Port		Removes a port from virtual the load module.
IxVM Restart		Restarts the virtual machine.

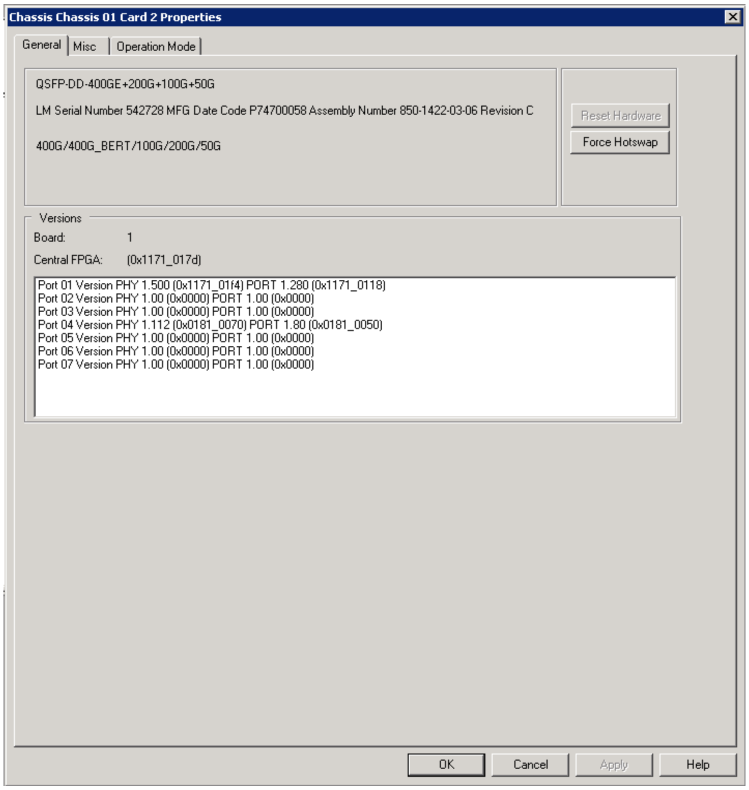
QSFP-DD Module

General

The **General** tab shows the board version and FPGA revision level for the board as well as the FPGA versions for each port on the card. The **Reset Hardware** button in this dialog box allows you to reset the hardware to factory defaults.The **Force Hotswap** button will emulate physical removal and insertion of the card. This is done for diagnostic purposes.

An example of the card properties dialog box **General** tab for the QSFP-DD load module is shown in the following image:

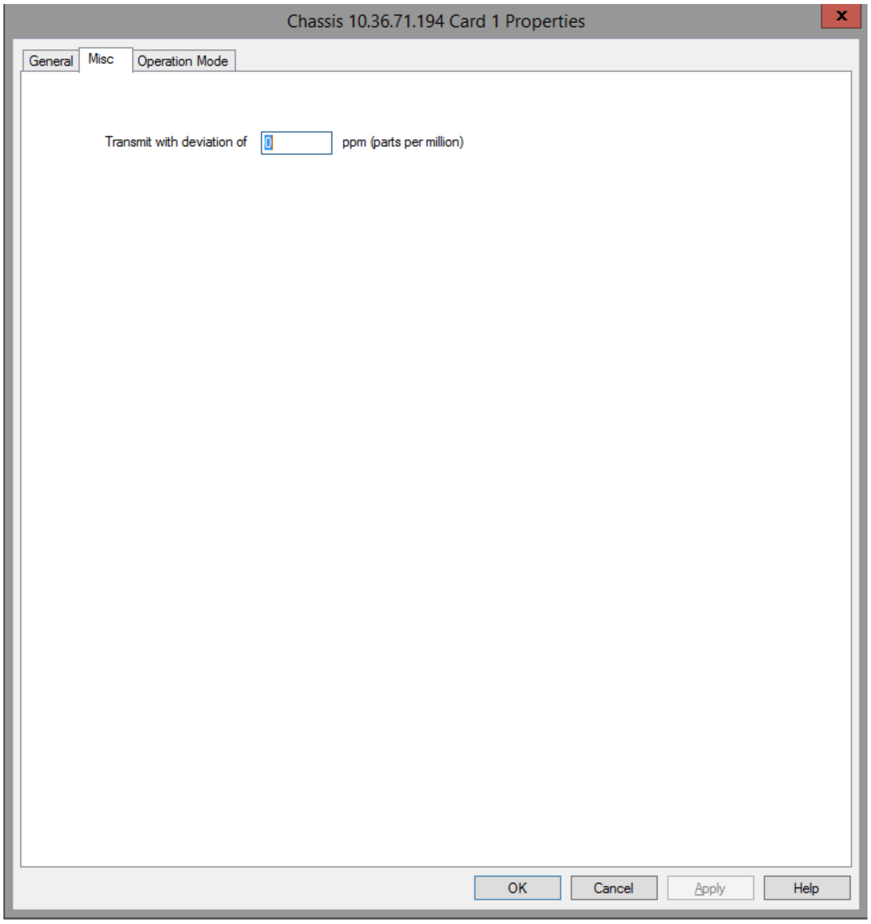
Image: QSFP-DD - General Tab



Misc

The QSFP-DD-400GE+200G+100G+50G module Card Properties dialog box has the **Misc** tab when in normal (non-aggregated) mode. The **Misc** tab functionality is identical to that described in LSM1000 and LSM10GE Modules—Misc dialog box.

Image: **Misc** Tab for QSFP-DD-400GE+200G+100G+50G

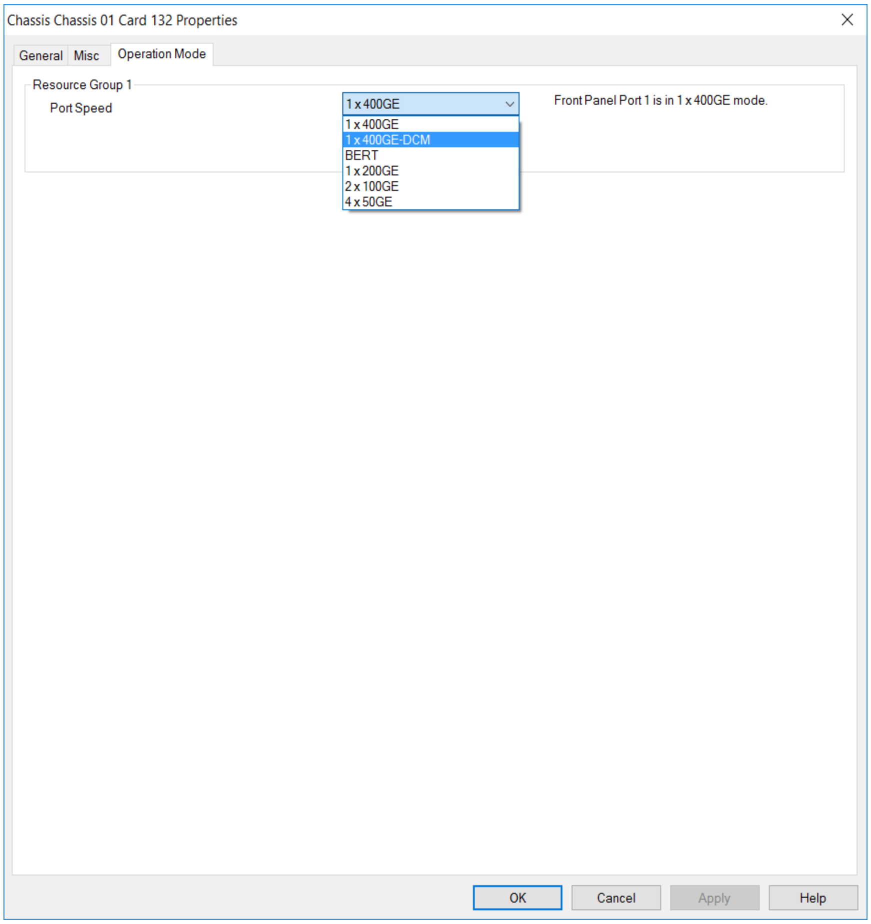


Operation Mode

The **Operation Mode** tab for **QSFP-DD** module is used to select the mode of operation for the module.

The **Operation Mode** dialog box for QSFP-DD card properties is shown in the following image:

Image: **Operation Mode** Tab for QSFP-DD



The different card level modes can be set in the **Operation Mode** dialog box.

The QSFP-DD card has five speed modes. The card has a transceiver corresponding to each port. In each port, you can insert a Fan-out cable which fans the output into multiple ports instead of using the original port.

You need to select the mode from the **Port Speed** list for each Resource Group. Options include the following:

- 1x400GE Normal Mode–1 port of 400GE speed
- 1x400GE DCM–1 port for 400GE speed using Data Center Mode
- 1x200GE Fan-out Mode–1 port of 200GE speed using Fan-out cables
- 2x100GE Fan-out Mode–2 ports of 100GE speed using Fan-out cables
- 4x50GE Fan-out Mode–4 ports of 50GE speed using Fan-out cables
- BERT Mode–Bit Error Rate Testing mode, see BERT Mode.

The following QSFP-DD card types are supported:

- QSFP-DD-400GE+200G+100G+50G
- QSFP-DD-R400GE+200G+100G+50G
- UPG-QSFP-DD-R400GE+200G+100G+50G

For more information on QSFP-DD cards, see *Ixia Platform Reference Guide*.

The **Active capture port** field shows the port in the Resource Group on which you can perform data capture.

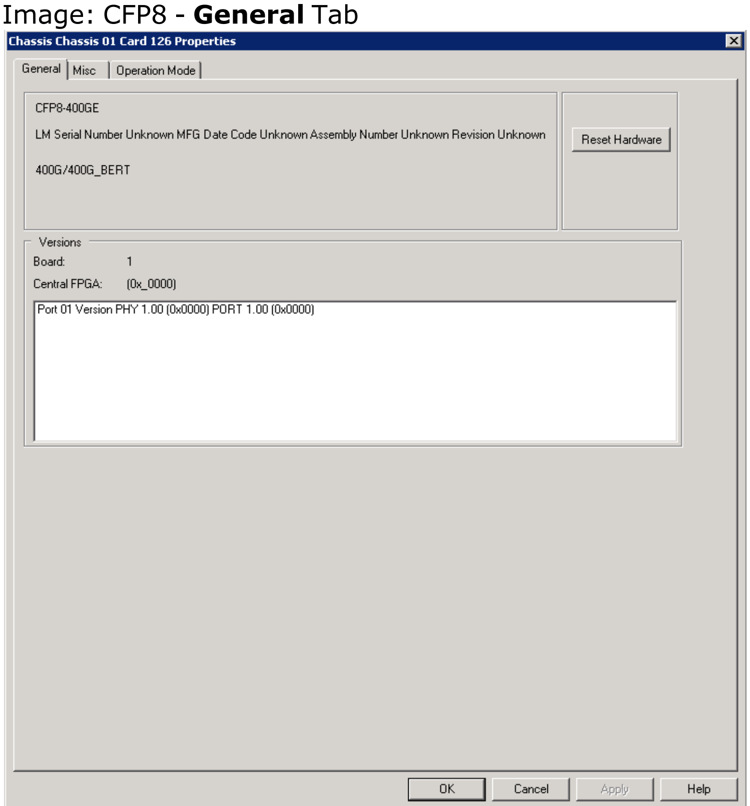
NOTE You can perform data capture only on a single port within a Resource Group. You can activate multiple ports but if you try to capture more data on more than one, then it fails with an error message.

CFP8 Module

General

The **General** tab shows the board version and FPGA revision level for the board as well as the FPGA versions for each port on the card. The Reset Hardware button in this dialog box allows you to reset the hardware to factory defaults.Examples of the card properties dialog box **General** tab for the CFP8 load module is shown in the following images:

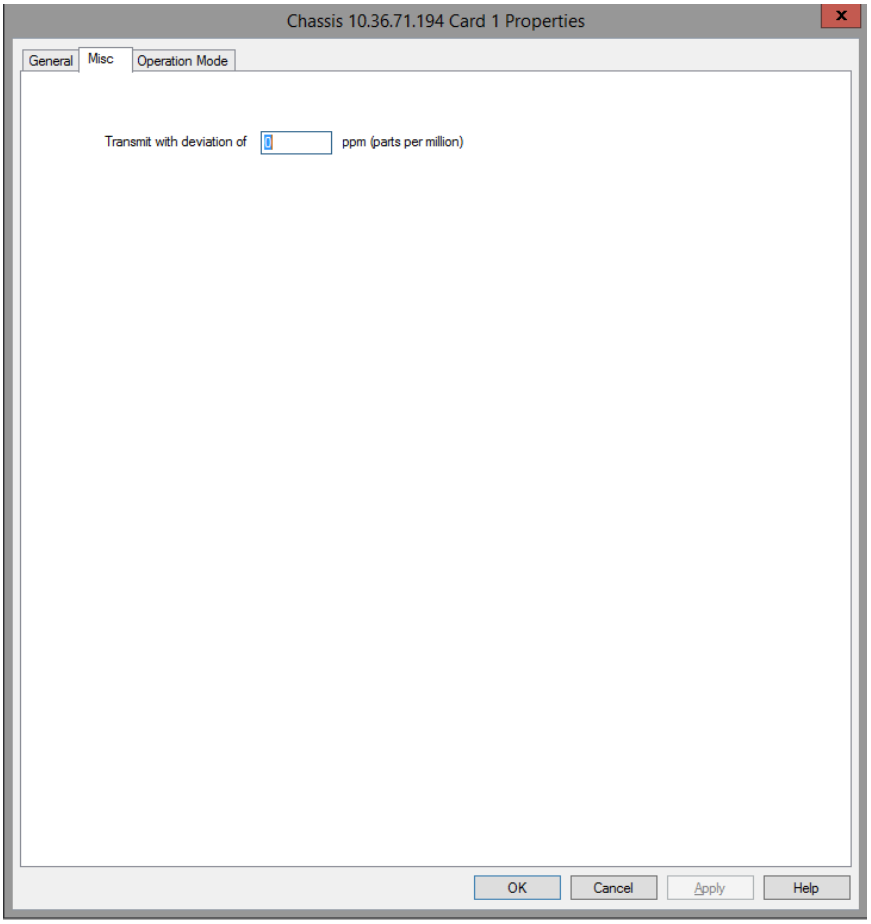
Image: CFP8 - **General** Tab



Misc

The CFP8-400GE module Card Properties dialog box has the **Misc** tab when in normal (non-aggregated) mode. The **Misc** tab functionality is identical to that described in LSM1000 and LSM10GE Modules—Misc dialog box.

Image: **Misc** Tab for CFP8-400GE

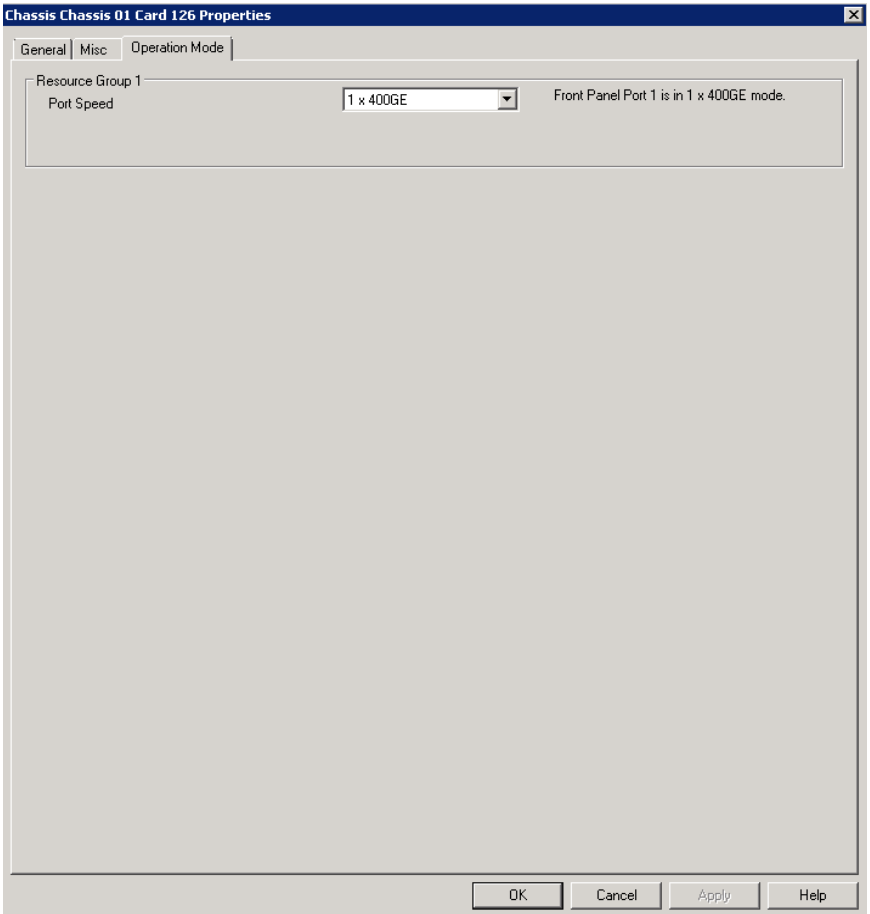


Operation Mode

The **Operation Mode** tab for **CFP8** module is used to select the mode of operation for the module.

The **Operation Mode** dialog box for CFP8 card properties is shown in the following image:

Image: **Operation Mode** Tab for CFP8



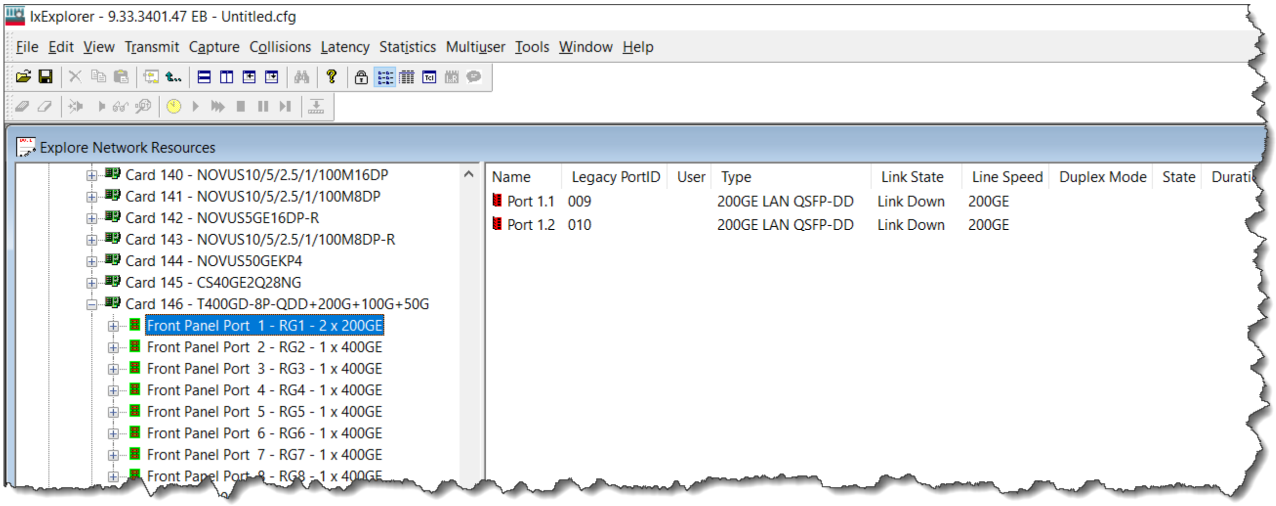
The different card level modes can be set in the **Operation Mode** dialog box.

You need to select the mode from the Port Speed list . Options include the following:

- 1x400GE Normal Mode–1 port of 400GE speed
- BERT Mode–Bit Error Rate Testing mode, see BERT Mode.

T400GD-8P-QDD Module

When you expand T400GD-8P-QDD load module, you can find the **Front Panel Port** nested below the load module. Card level is not present in T400GD-8P-QDD. When you open the card in the tree view, you can see the front panel ports listed instead of the usual ports. The ports are nested below the front panel ports. When you select a **Front Panel Port**, you can view the corresponding ports in the right pane.



Fully Qualified Port Name (FQPN)

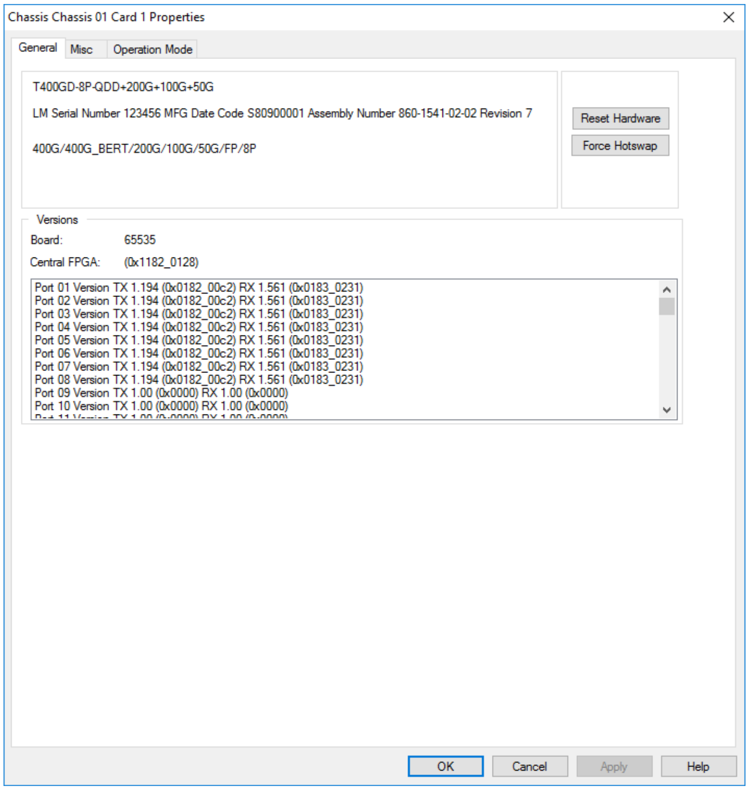
Fully Qualified Port Name (FQPN) format uniquely identifies the port. It is the concatenation of path and port ID. Port numbers of T400GD-8P-QDD load Module follows FQPN format. In the right pane you can also view the port number in FQPN format in **Name** column along with their corresponding legacy Port ID in **Legacy PortID** column. The FQPN port number indicates the front panel port ID and the fan-out ID. For example, port 1.1 indicates front panel port 1 and fan out 1. The legacy port ID for port 1.1 is 009, as shown in the above image.

See *TCL Development Guide* for more information on FQPN

General

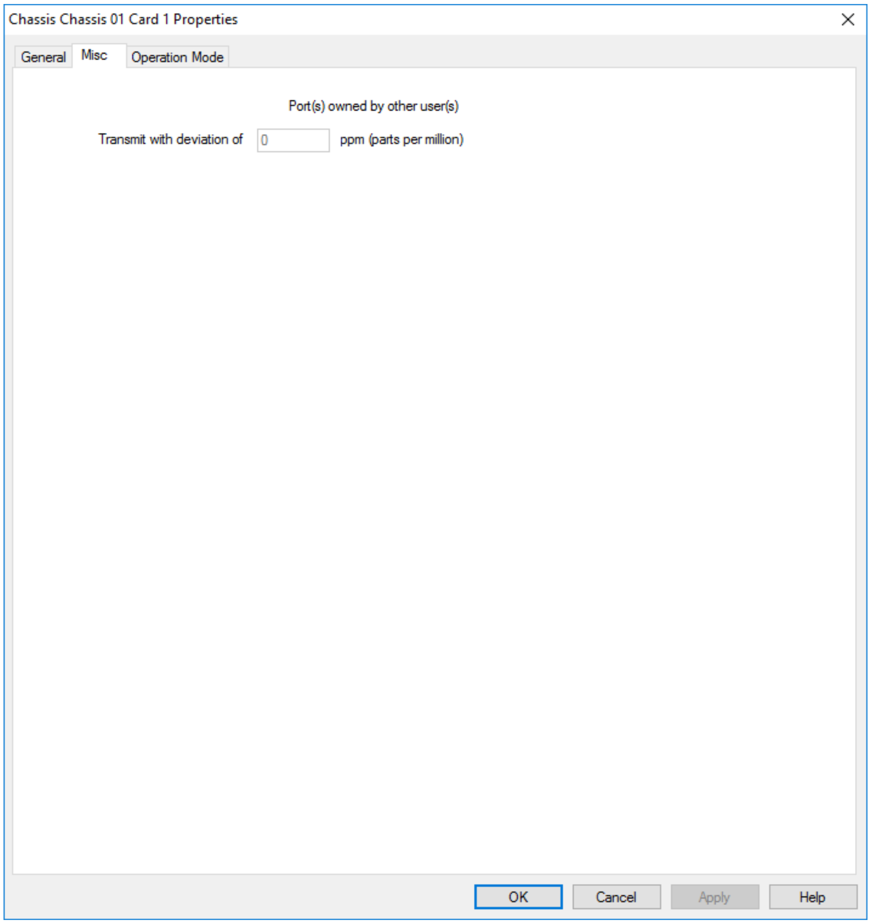
The **General** tab shows the board version and FPGA revision level for the board as well as the FPGA versions for each port on the card. The **Reset Hardware** option in this dialog box allows you to reset the hardware to factory defaults.The **Force Hotswap** option will emulate physical removal and insertion of the card. This is done for diagnostic purposes.

An example of the card properties dialog box and its corresponding **General** tab for the T400GD-8P-QDD load module is shown in the following image:



Misc

The T400GD-8P-QDD+200G+100G+50G module Card Properties dialog box shows the **Misc** tab when in normal (non-aggregated) mode. The **Misc** tab functionality is identical to that described in LSM1000 and LSM10GE Modules—Misc dialog box.

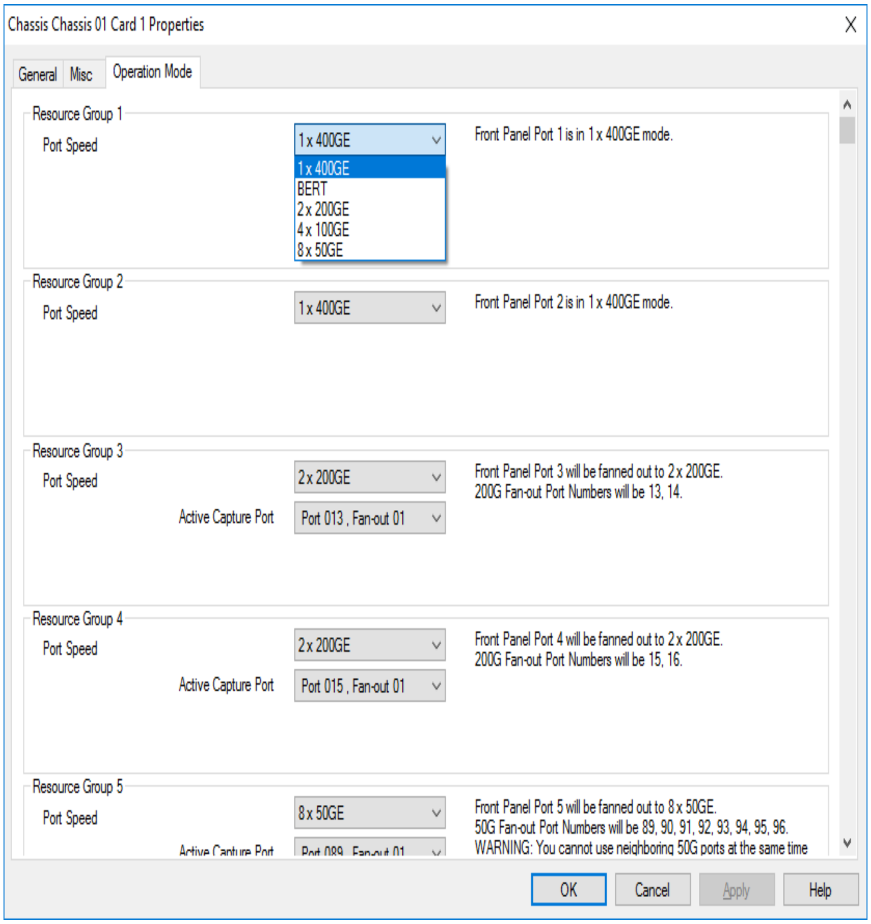


Operation Mode

The **Operation Mode** tab for **T400GD-8P-QDD** module is used to select the mode of operation for the module.

The **Operation Mode** dialog box for T400GD-8P-QDD card properties is shown in the following image:

Image: **Operation Mode** Tab for T400GD-8P-QDD



The different card level modes can be set in the **Operation Mode** dialog box.

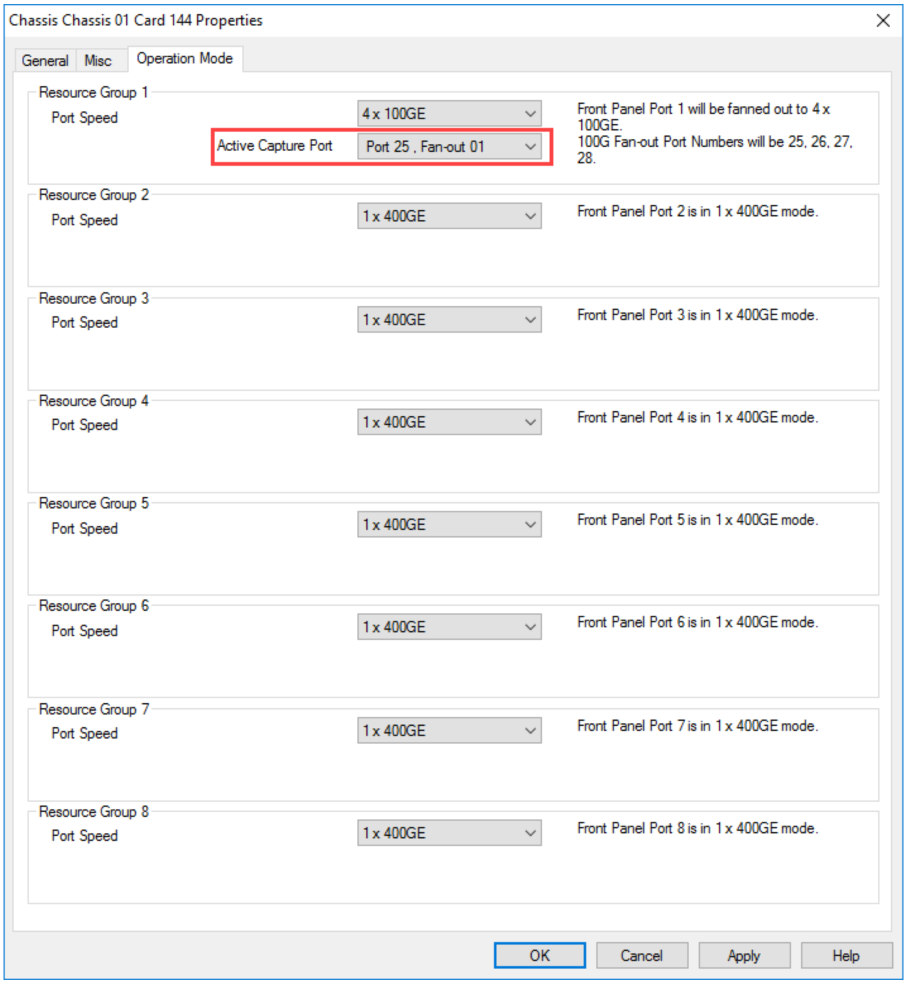
The T400GD-8P-QDD card has five speed modes. The card has a transceiver corresponding to each port. In each port, you can insert a Fan-out cable which fans the output into multiple ports instead of using the original port.

You need to select the mode from the **Port Speed** list for each Resource Group. Options include the following:

The T400GD-8P-QDD card supports the following speed modes:

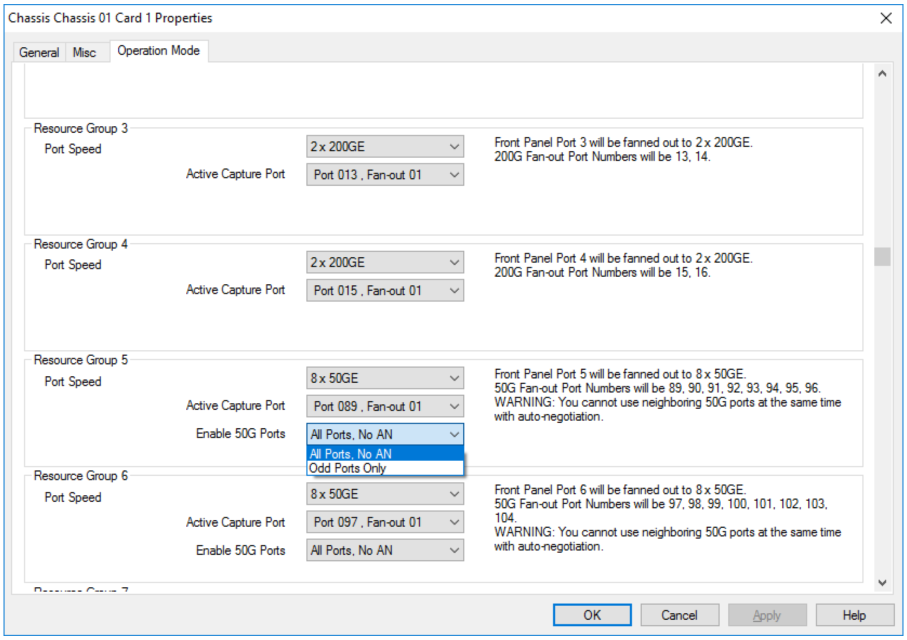
- 1x400GE Normal Mode–1 port of 400GE speed
- 2x200GE Fan-out Mode–2 ports of 200GE speed using Fan-out cables
- 4x100GE Fan-out Mode–4 ports of 100GE speed using Fan-out cables
- 8x50GE Fan-out Mode–8 ports of 50GE speed using Fan-out cables
- BERT Mode–Bit Error Rate Testing mode, see BERT Mode.

If you select any of the fan-out modes, the active capture port for that mode is shown.This is the port in the Resource Group on which you can perform data capture.



If you select 50GE fan-out mode, an additional option to enable the 50G ports is available.You can select the following options:

- All Ports, No AN - Eight 50GE ports available in a single resource group and Auto Negotiation and Link Training cannot be enabled on the ports. This is the default option.
- Odd Ports Only - Four 50GE odd-numbered ports available in a single resource group and Auto Negotiation and Link Training can be enabled on these ports.



The following T400GD-8P-QDD card types are supported:

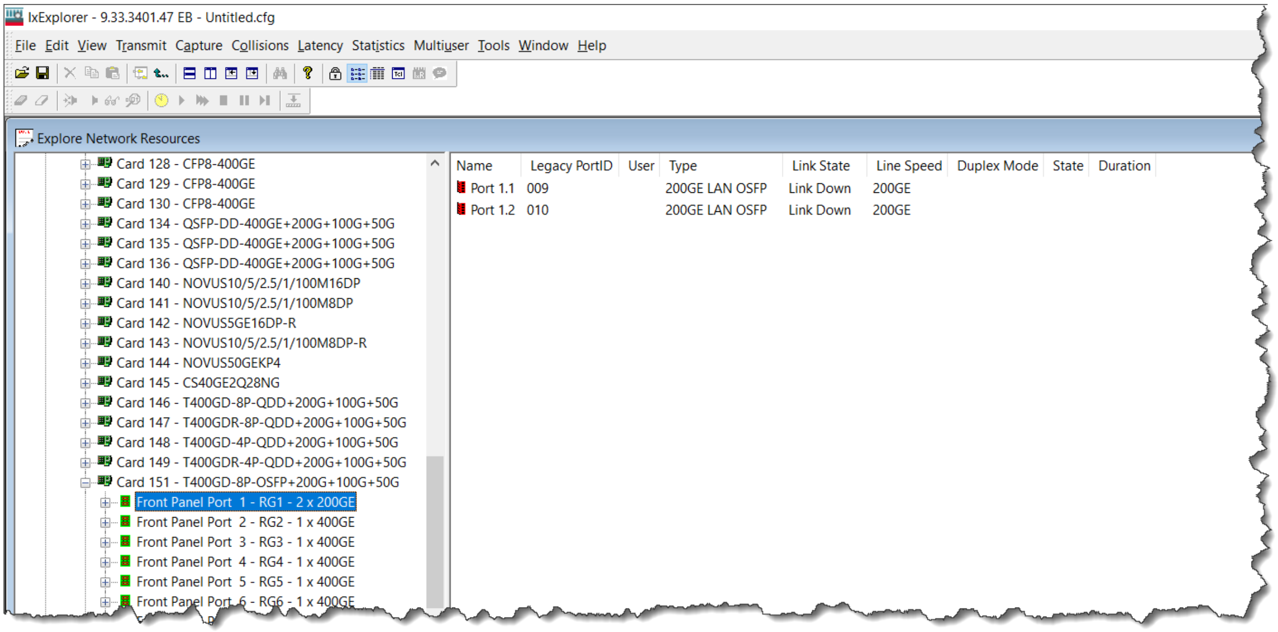
- T400GD-8P-QDD+200G+100G+50G
- T400GDR-8P-QDD+200G+100G+50G
- T400GD-4P-QDD+200G+100G+50
- T400GDR-4P-QDD+200G+100G+50G

For more information on T400GD-8P-QDD cards, see *Ixia Platform Reference Guide*.

NOTE You can perform data capture only on a single port within a Resource Group. You can activate multiple ports but if you try to capture more data on more than one, then it fails with an error message.

T400GD-8P-OSFP Module

When you expand T400GD-8P-OSFP load module, you can find the **Front Panel Port** nested below the load module. Card level is not present in T400GD-8P-OSFP. When you open the card in the tree view, you can see the front panel ports listed instead of the usual ports. The ports are nested below the front panel ports. When you select a **Front Panel Port**, you can view the corresponding ports in the right pane.



Fully Qualified Port Name (FQPN)

Fully Qualified Port Name (FQPN) format uniquely identifies the port. It is the concatenation of path and port ID. Port numbers of T400GD-8P-OSFP load Module follows FQPN format. In the right pane you can also view the port number in FQPN format in **Name** column along with their corresponding legacy Port ID in **Legacy PortID** column. The FQPN port number indicates the front panel port ID and the fan-out ID. For example, port 1.1 indicates front panel port 1 and fan out 1. The legacy port ID for port 1.1 is 009, as shown in the above image.

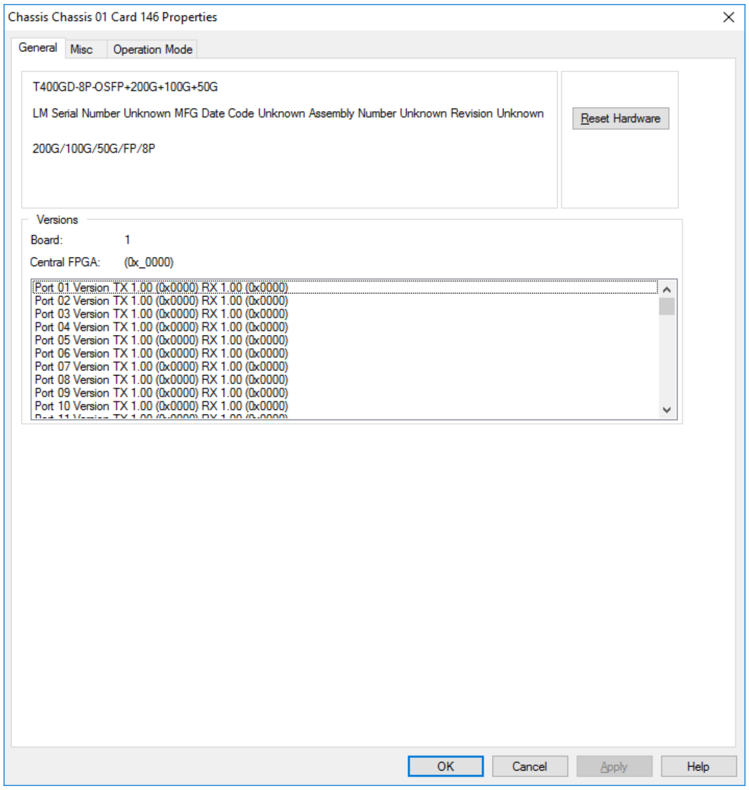
See *TCL Development Guide* for more information on FQPN

General

The **General** tab shows the board version and FPGA revision level for the board as well as the FPGA versions for each port on the card. The **Reset Hardware** button in this dialog box allows you to reset the hardware to factory defaults.The **Force Hotswap** button will emulate physical removal and insertion of the card. This is done for diagnostic purposes.

An example of the card properties dialog box **General** tab for the T400GD-8P-OSFP load module is shown in the following image:

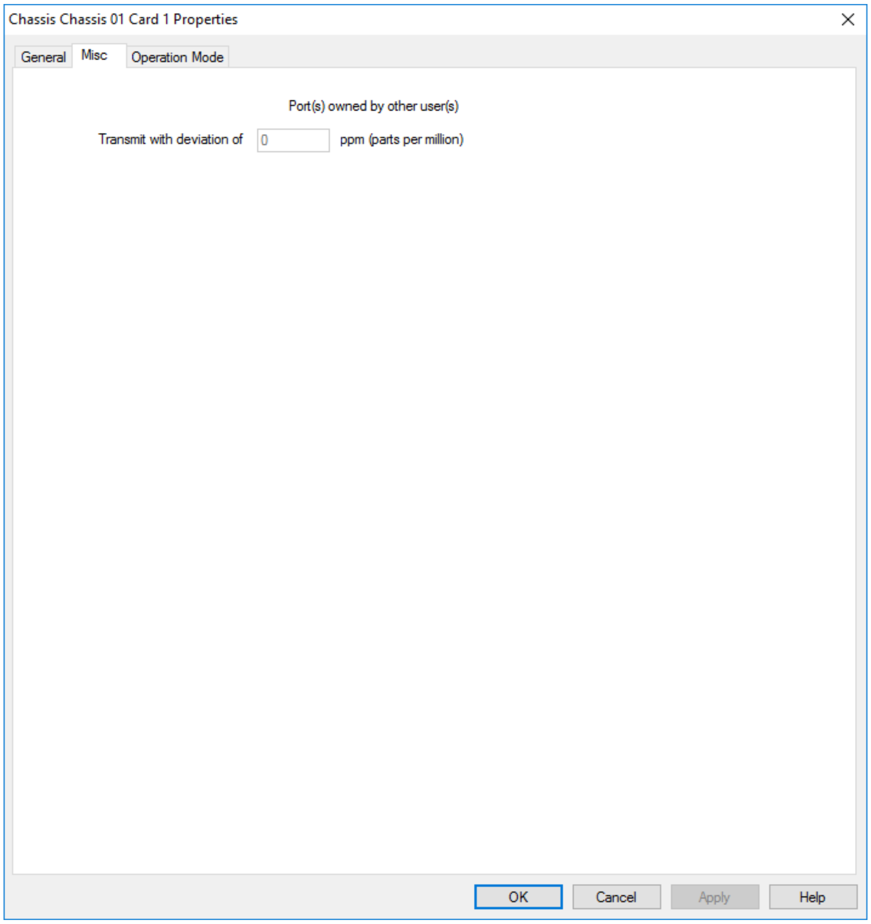
Image: T400GD-8P-OSFP - **General** Tab



Misc

The T400GD-8P-OSFP+200G+100G+50G module Card Properties dialog box has the **Misc** tab when in normal (non-aggregated) mode. The **Misc** tab functionality is identical to that described in LSM1000 and LSM10GE Modules—Misc dialog box.

Image: **Misc** Tab for T400GD-8P-OSFP

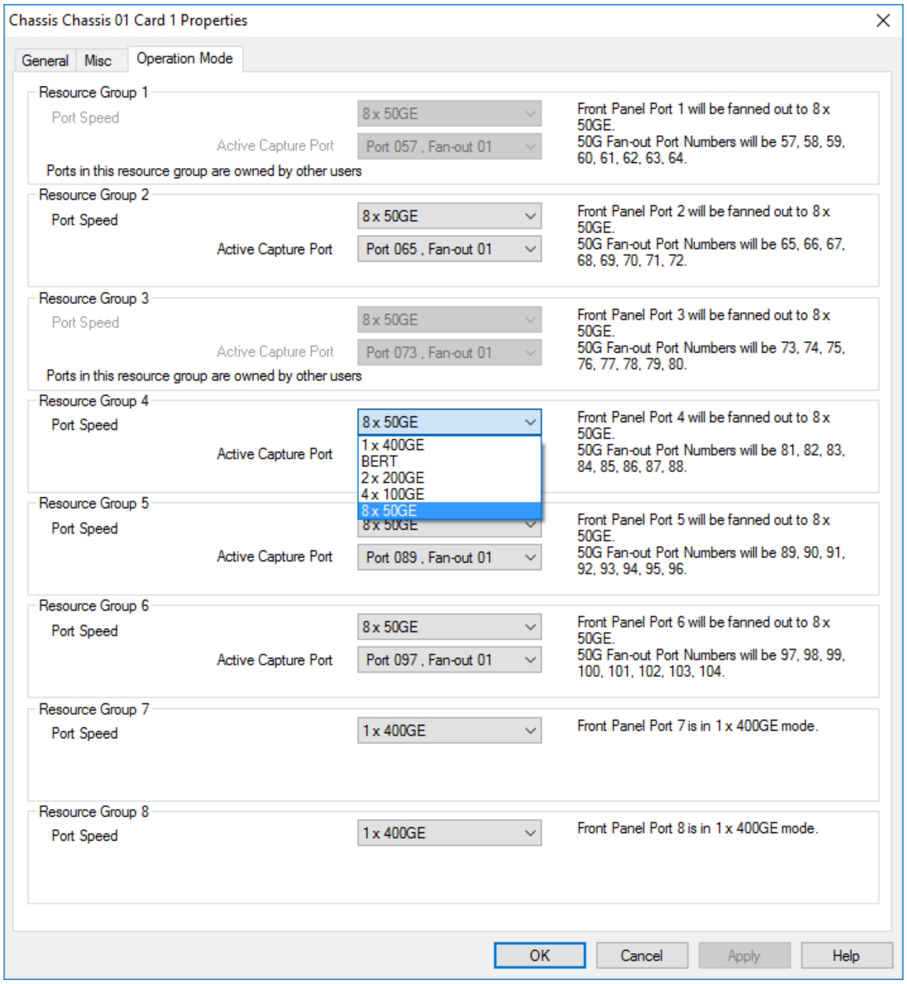


Operation Mode

The **Operation Mode** tab for **T400GD-8P-OSFP** module is used to select the mode of operation for the module.

The **Operation Mode** dialog box for T400GD-8P-OSFP card properties is shown in the following image:

Image: **Operation Mode** Tab for T400GD-8P-OSFP



The different card level modes can be set in the **Operation Mode** dialog box.

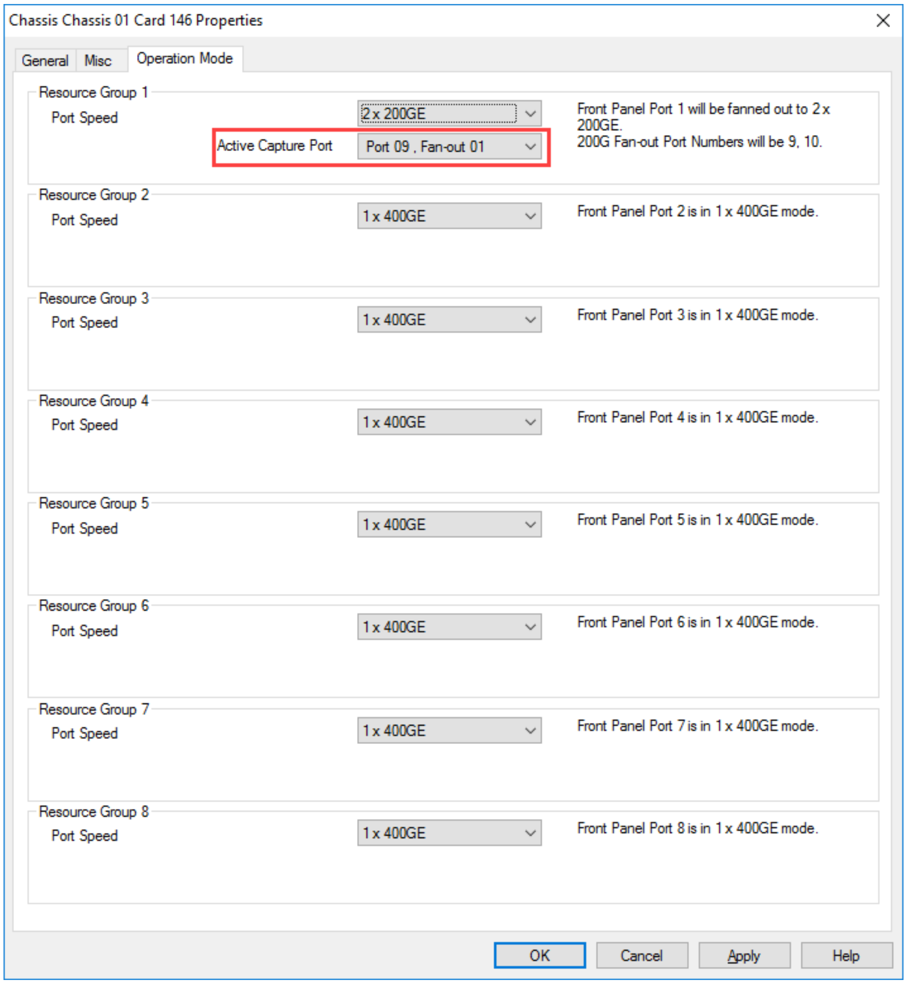
The T400GD-8P-OSFP card has five speed modes. The card has a transceiver corresponding to each port. In each port, you can insert a Fan-out cable which fans the output into multiple ports instead of using the original port.

You need to select the mode from the **Port Speed** list for each Resource Group. Options include the following:

The T400GD-8P-OSFP card supports the following speed modes:

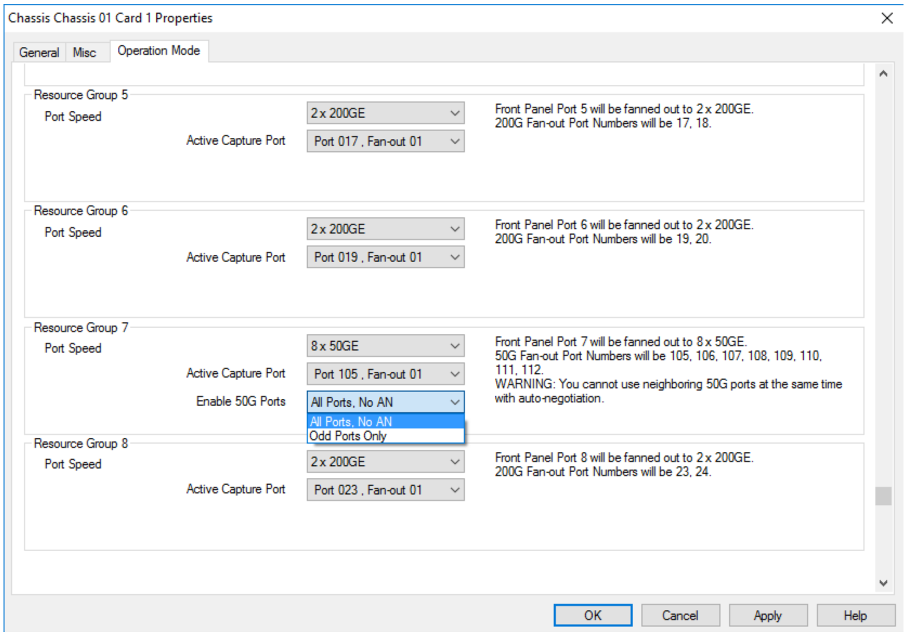
- 1x400GE Normal Mode–1 port of 400GE speed
- 2x200GE Fan-out Mode–2 ports of 200GE speed using Fan-out cables
- 4x100GE Fan-out Mode–4 ports of 100GE speed using Fan-out cables
- 8x50GE Fan-out Mode–8 ports of 50GE speed using Fan-out cables
- BERT Mode–Bit Error Rate Testing mode, see BERT Mode.

If you select any of the fan-out modes, the active capture port for that mode is shown.This is the port in the Resource Group on which you can perform data capture.



If you select 50GE fan-out mode, an additional option to enable the 50G ports is available.You can select the following options:

- All Ports, No AN - Auto Negotiation is not enabled on the ports
- Odd Ports Only - Auto Negotiation is enabled on odd-numbered ports only



The following T400GD-8P-OSFP card types are supported:

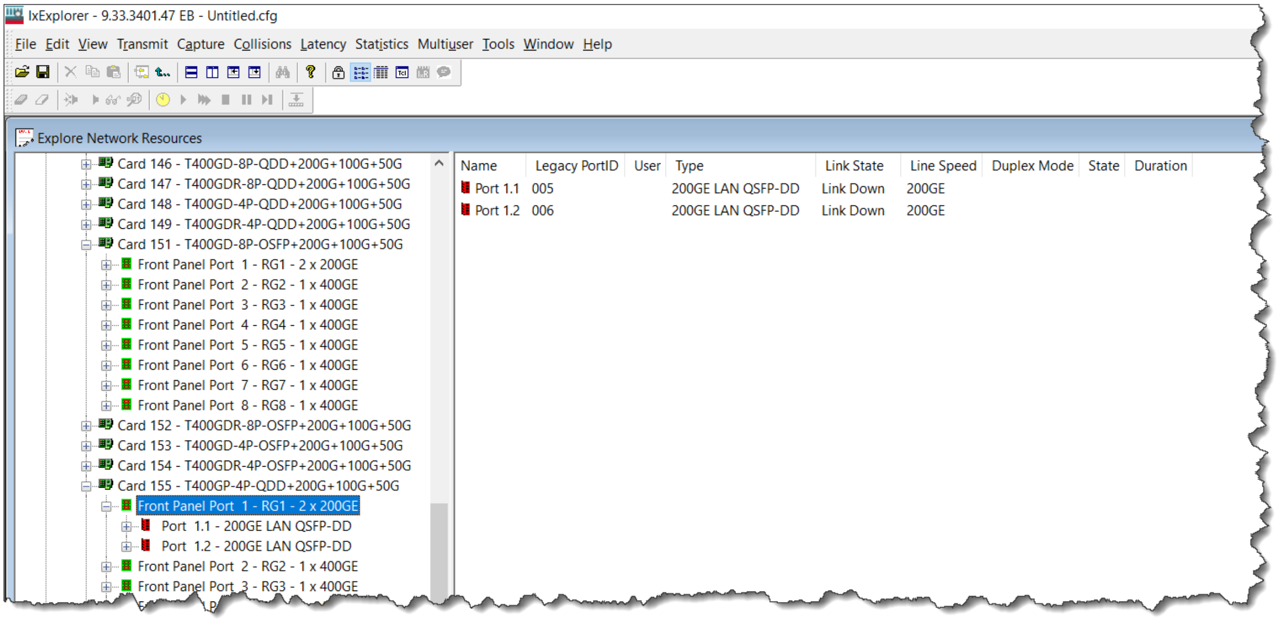
- T400GD-8P-OSFP+200G+100G+50G
- T400GDR-8P-OSFP+200G+100G+50G
- T400GD-4P-OSFP+200G+100G+50
- T400GDR-4P-OSFP+200G+100G+50G

For more information on T400GD-8P-OSFP cards, see *Ixia Platform Reference Guide*.

NOTE You can perform data capture only on a single port within a Resource Group. You can activate multiple ports but if you try to capture more data on more than one, then it fails with an error message.

T400GP-4P-QDD Module

When you expand T400GP-4P-QDD load module, you can find the **Front Panel Port** nested below the load module. Card level is not present in T400GP-4P-QDD. When you open the card in the tree view, you can see the front panel ports listed instead of the usual ports. The ports are nested below the front panel ports. When you select a **Front Panel Port**, you can view the corresponding ports in the right pane.



Fully Qualified Port Name (FQPN)

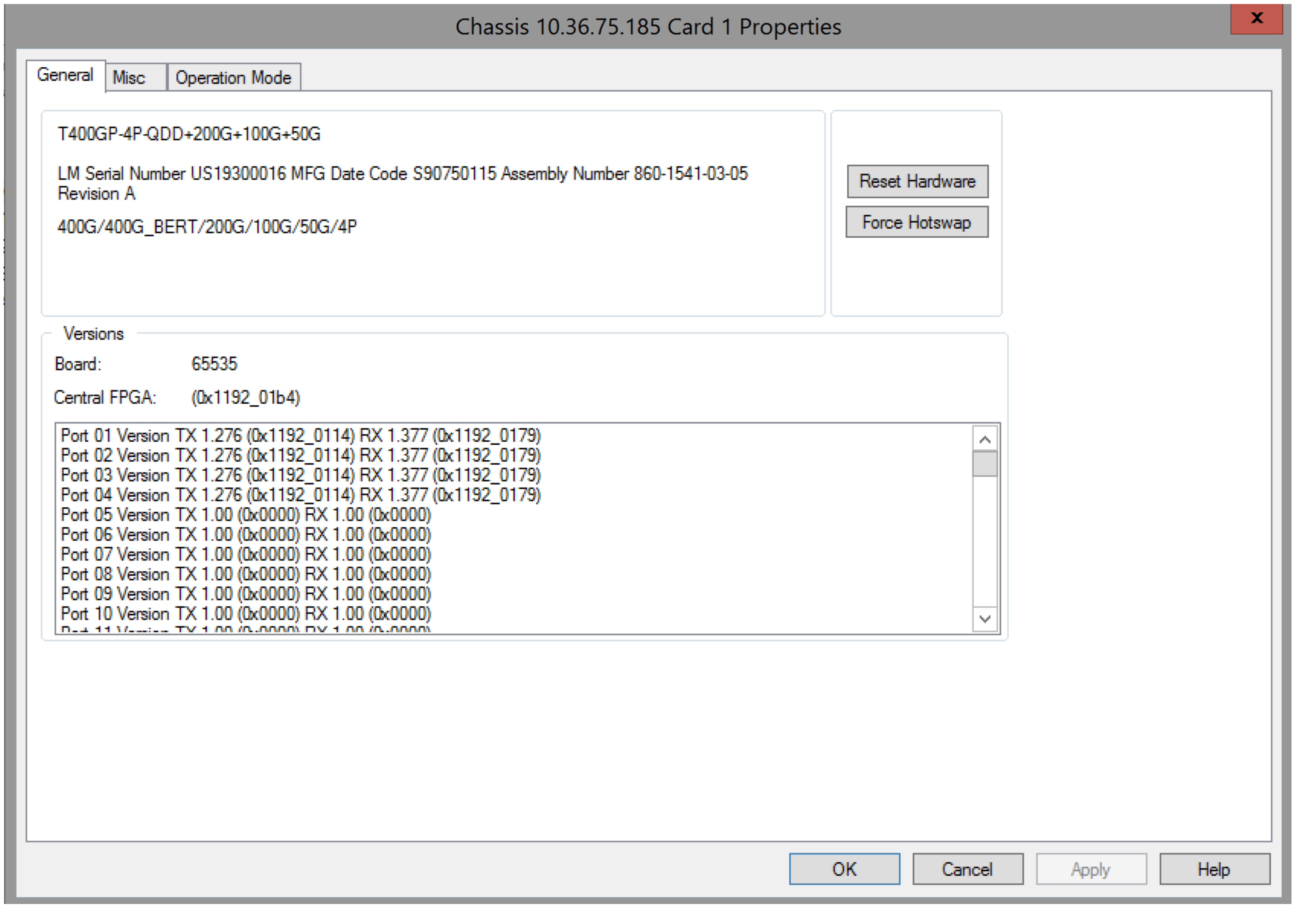
Fully Qualified Port Name (FQPN) format uniquely identifies the port. It is the concatenation of path and port ID. Port numbers of T400GP-4P-QDD load Module follows FQPN format. In the right pane you can also view the port number in FQPN format in **Name** column along with their corresponding legacy Port ID in **Legacy PortID** column. The FQPN port number indicates the front panel port ID and the fan-out ID. For example, port 1.1 indicates front panel port 1 and fan out 1. The legacy port ID for port 1.1 is 005, as shown in the above image.

See *TCL Development Guide* for more information on FQPN

General

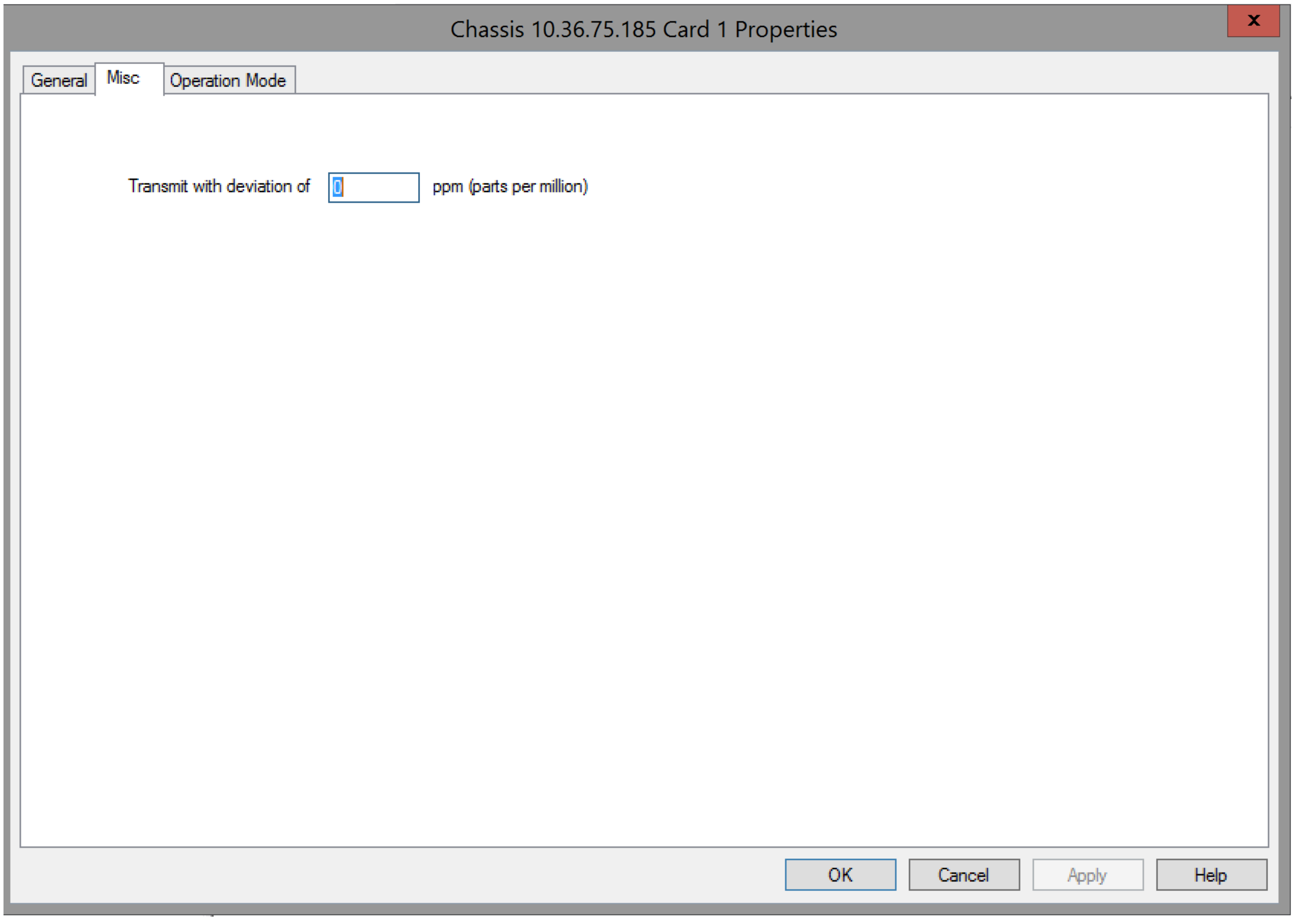
The **General** tab shows the board version and FPGA revision level for the board and the FPGA versions for each port on the card. The **Reset Hardware** option in the **Card Properties** dialog box allows you to reset the hardware to factory defaults.

An example of the card properties dialog box and its corresponding **General** tab for the T400GP-4P-QDD load module is shown in the following image:



Misc

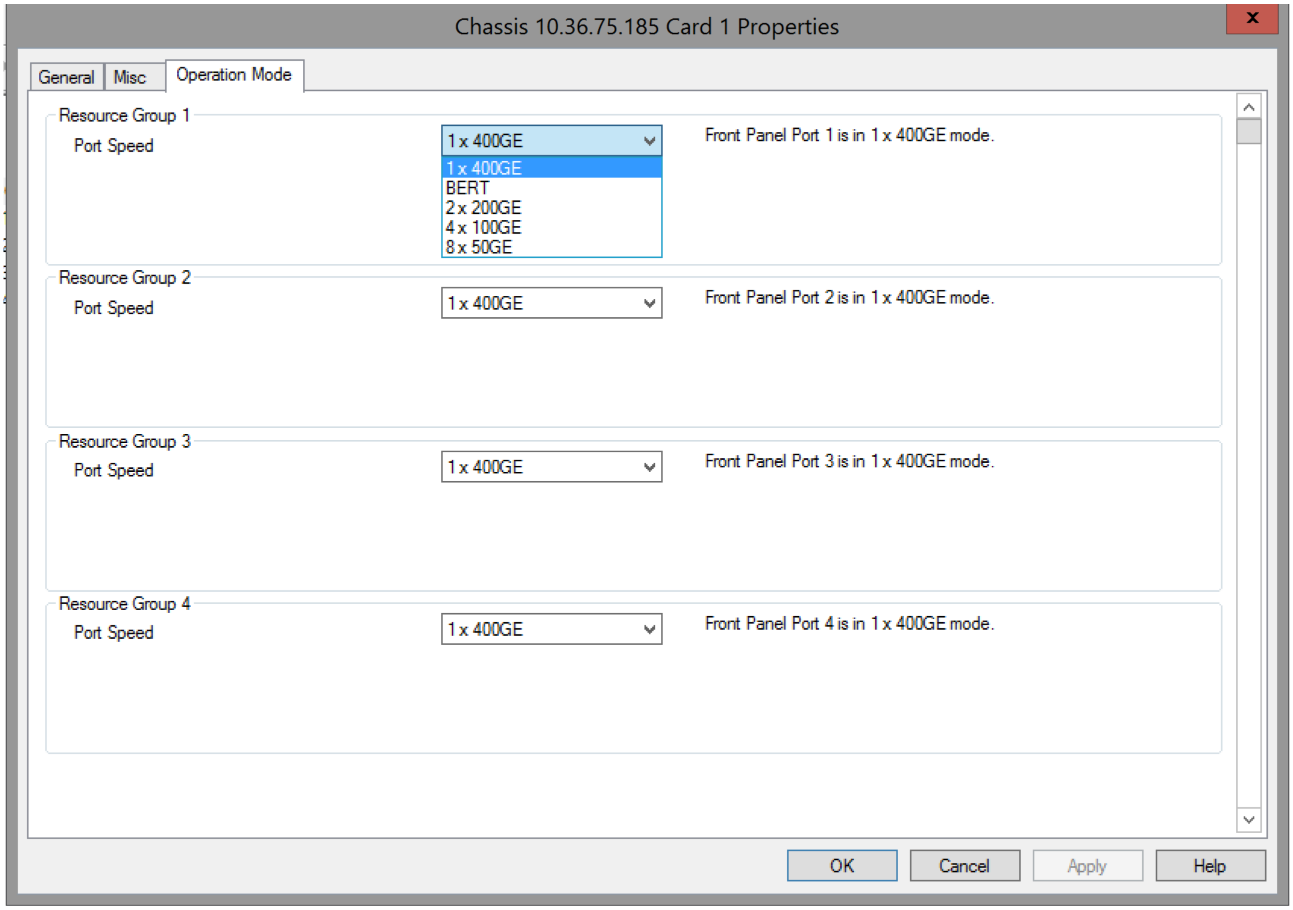
The T400GP-4P-QDD+200 G+100 G+50 G module Card Properties dialog box shows the **Misc** tab when in normal (non-aggregated) mode. The **Misc** tab functionality is identical to that described in the LSM1000 and LSM10GE Modules—Misc dialog box.



Operation Mode

The **Operation Mode** tab for **T400GP-4P-QDD** module is used to select the mode of operation for the module.

The **Operation Mode** dialog box for T400GP-4P-QDD card properties is shown in the following image:



The different card level modes can be set in the **Operation Mode** dialog box.

The T400GP-4P-QDD card has five speed modes. The card has a transceiver corresponding to each port. In each port, you can insert a Fan-out cable, which fans the output into multiple ports instead of using the original port.

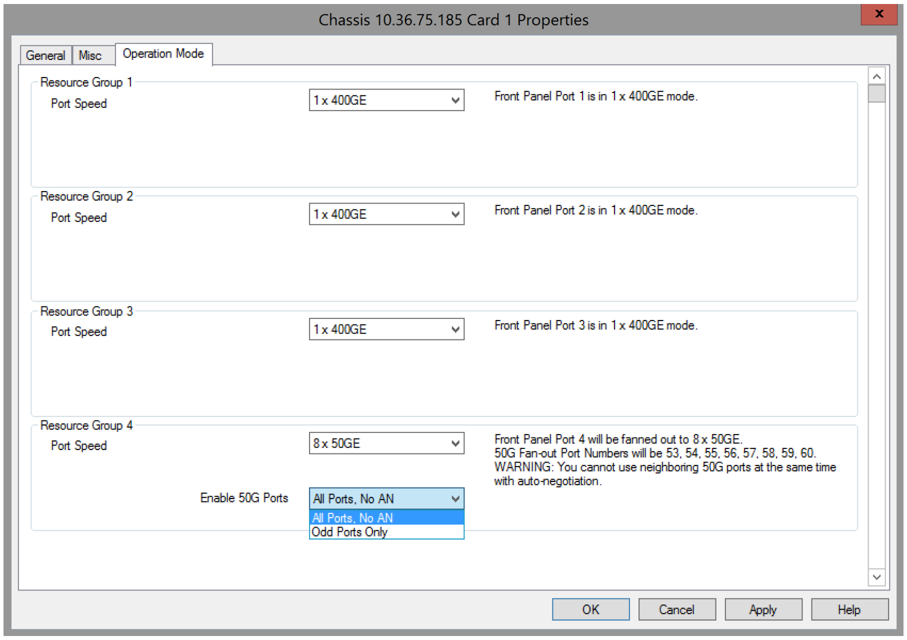
Select the mode from the **Port Speed** list for each Resource Group.

The T400GP-4P-QDD card supports the following speed modes:

- 1x400GE Normal Mode–1 port of 400 GE speed
- 2x200GE Fan-out Mode–2 ports of 200 GE speed by using Fan-out cables
- 4x100GE Fan-out Mode–4 ports of 100 GE speed by using Fan-out cables
- 8x50GE Fan-out Mode–8 ports of 50 GE speed by using Fan-out cables
- BERT Mode–Bit Error Rate Testing mode; see BERT Mode

If you select 50 GE fan-out mode, an additional option to enable the 50 G ports is available.You can select the following options:

- All Ports, No AN: Eight 50 GE ports available in a single resource group and you cannot enable Auto Negotiation and Link Training on the ports. This is the default option.
- Odd Ports Only: Four 50 GE odd-numbered ports available in a single resource group and you can enable Auto Negotiation and Link Training on these ports.



The following T400GP-4P-QDD card type is supported:

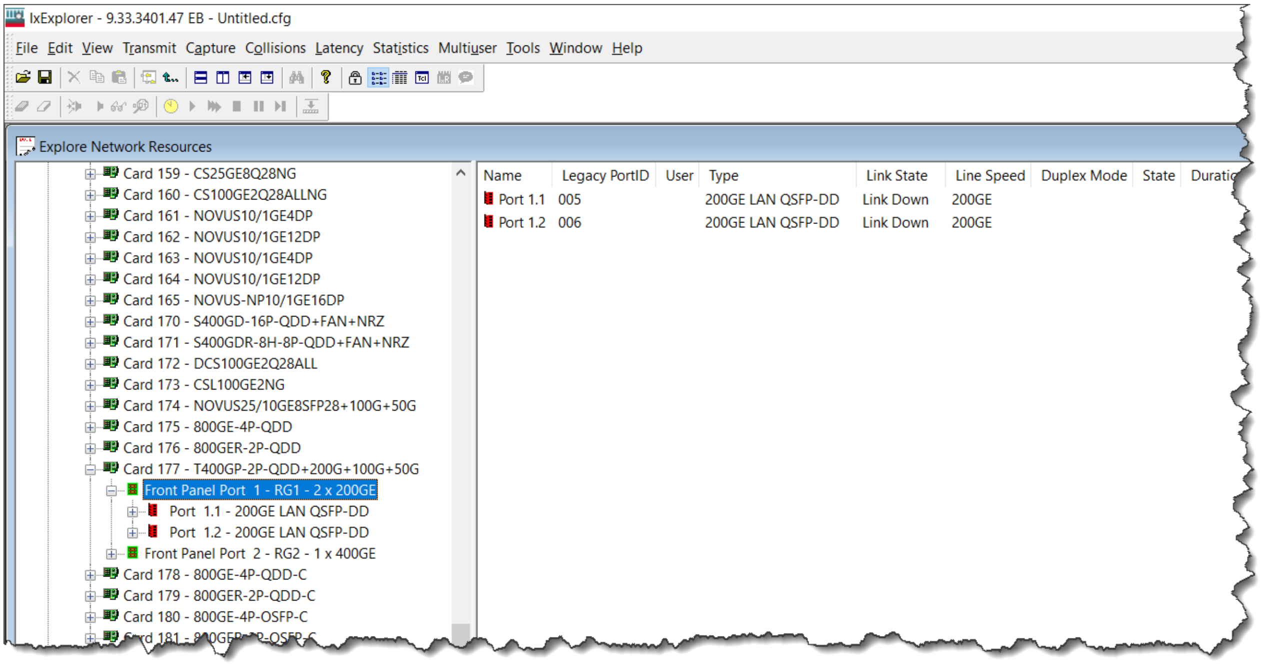
- T400GP-4P-QDD+200G+100G+50G

For more information on T400GP-4P-QDD cards, see *Ixia Platform Reference Guide*.

NOTE You can perform data capture on all ports within a Resource Group simultaneously. Therefore, **Active Capture Port** drop down for every Resource Group is not available for T400GP-4P-QDD.

T400GP-2P-QDD Module

When you expand T400GP-2P-QDD load module, you can find the **Front Panel Port** nested below the load module. Card level is not present in T400GP-2P-QDD. When you open the card in the tree view, you can see the front panel ports listed instead of the usual ports. The ports are nested below the front panel ports. When you select a **Front Panel Port**, you can view the corresponding ports in the right pane.



Fully Qualified Port Name (FQPN)

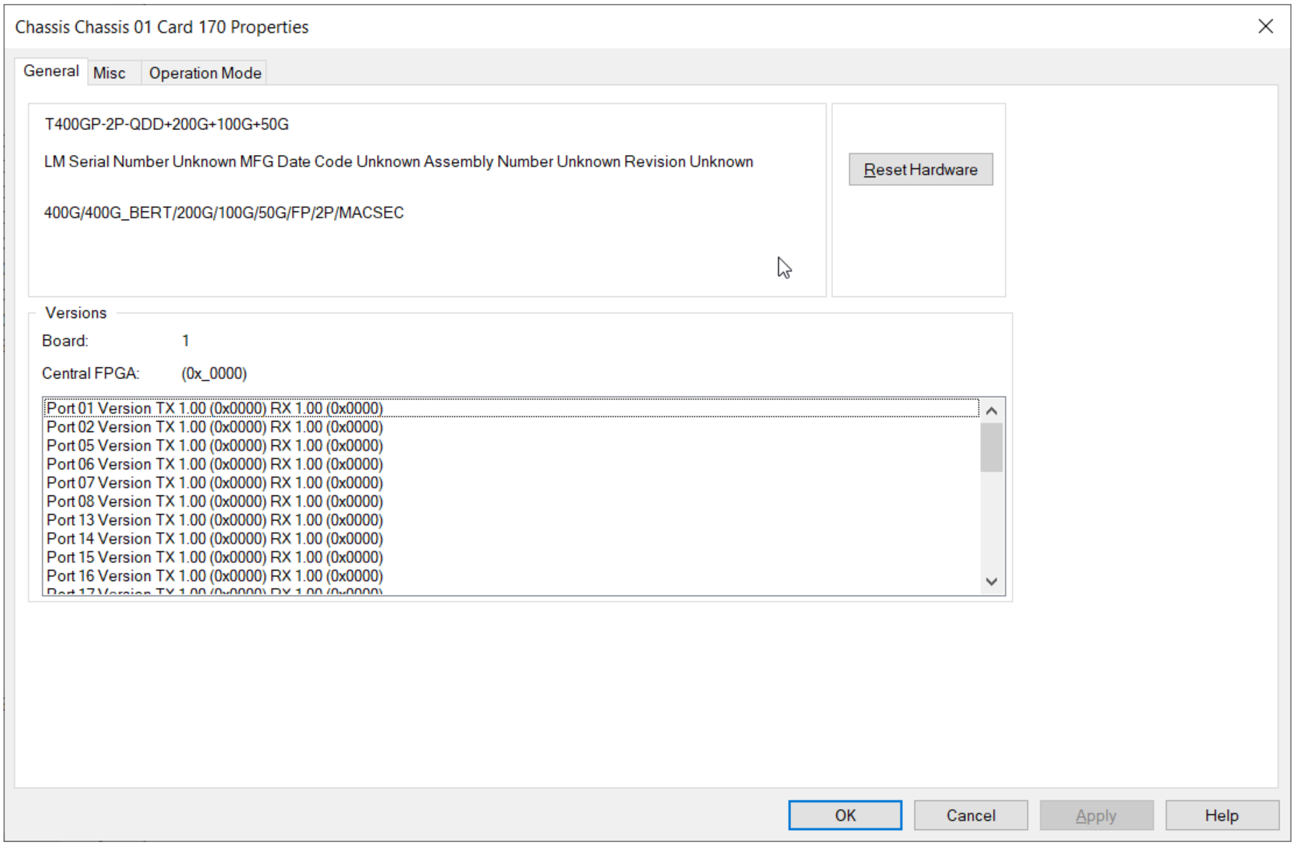
Fully Qualified Port Name (FQPN) format uniquely identifies the port. It is the concatenation of path and port ID. Port numbers of T400GP-2P-QDD load Module follows FQPN format. In the right pane you can also view the port number in FQPN format in **Name** column along with their corresponding legacy Port ID in **Legacy PortID** column. The FQPN port number indicates the front panel port ID and the fan-out ID. For example, port 1.1 indicates front panel port 1 and fan out 1. The legacy port ID for port 1.1 is 005, as shown in the above image.

See *TCL Development Guide* for more information on FQPN

General

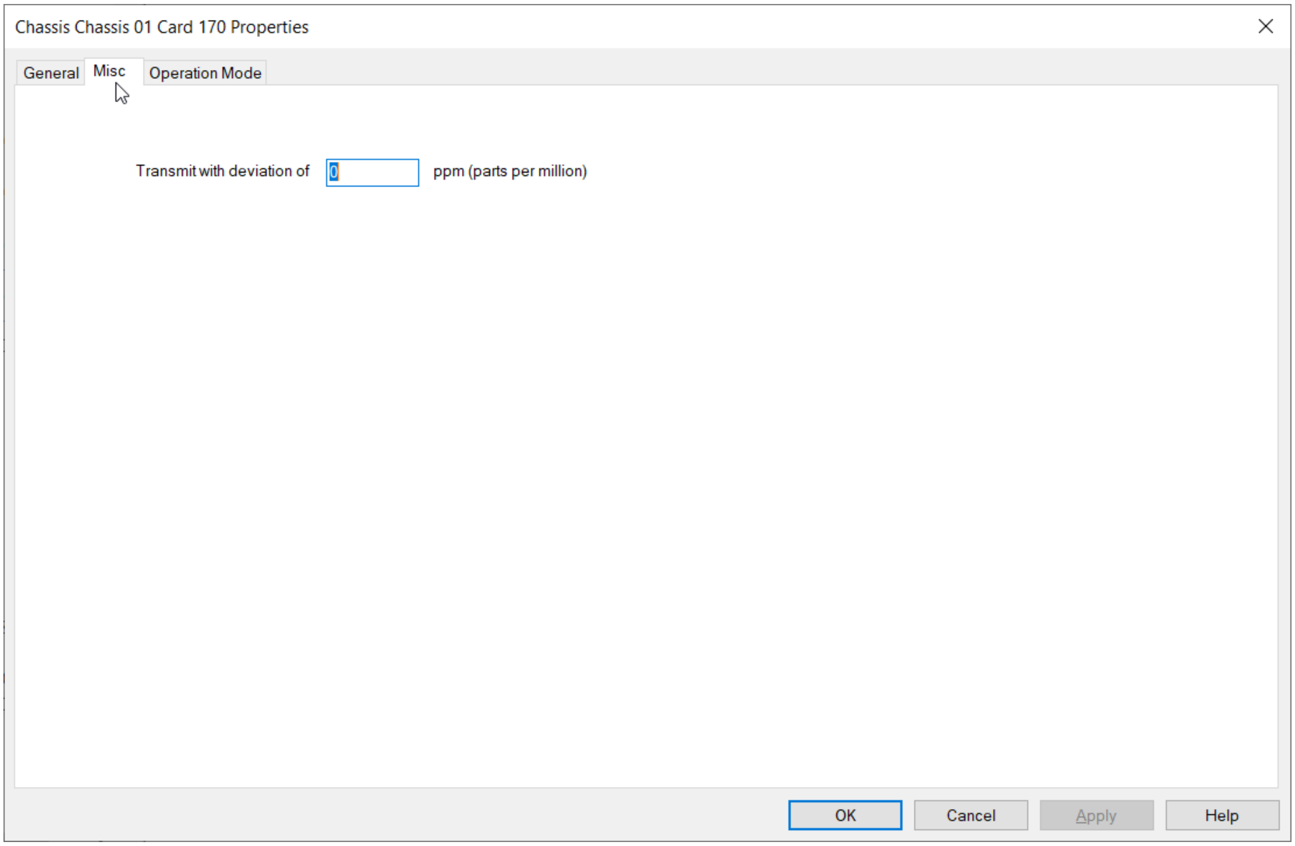
The **General** tab shows the board version and FPGA revision level for the board and the FPGA versions for each port on the card. The **Reset Hardware** option in the **Card Properties** dialog box allows you to reset the hardware to factory defaults.

An example of the card properties dialog box and its corresponding **General** tab for the T400GP-2P-QDD load module is shown in the following image:



Misc

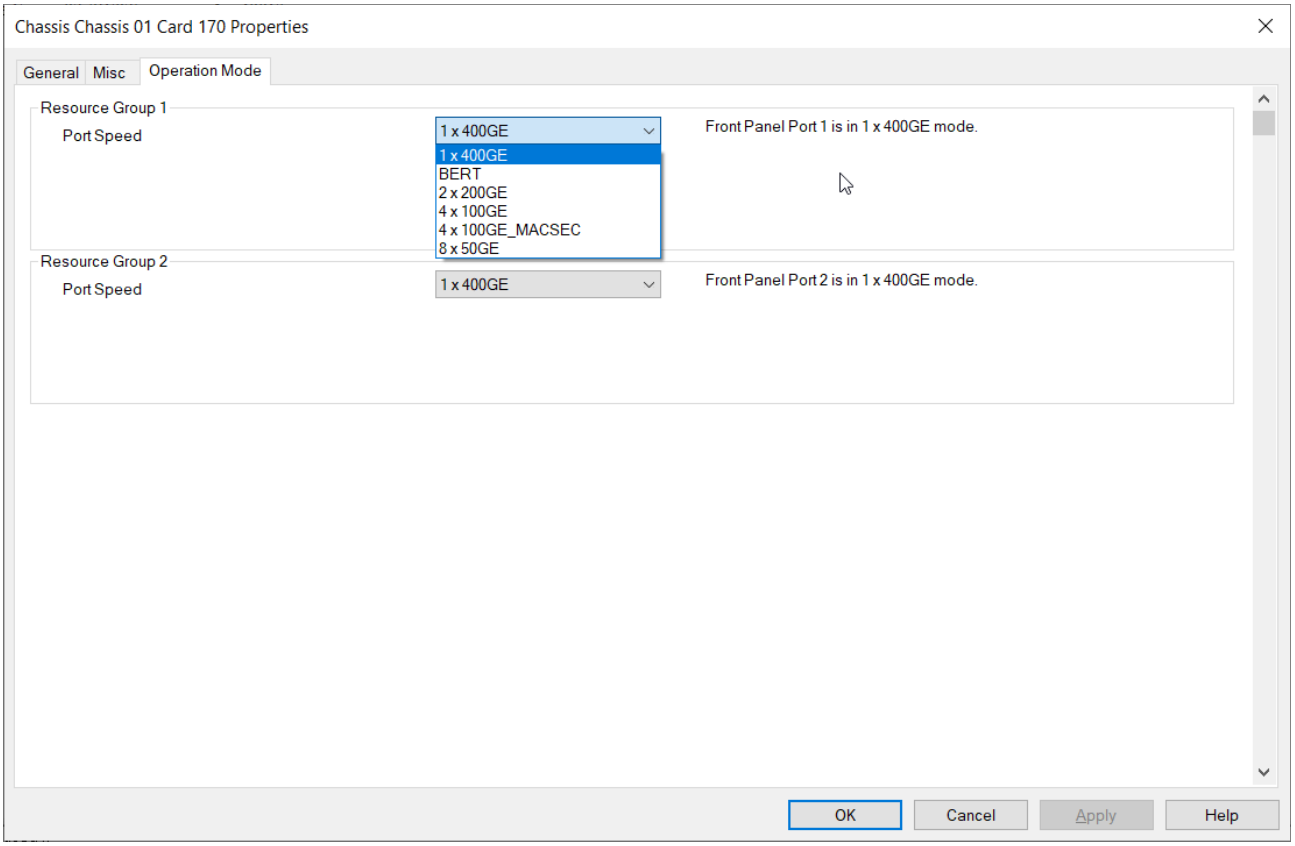
The T400GP-2P-QDD+200G+100G+50G module Card Properties dialog box shows the **Misc** tab when in normal (non-aggregated) mode. The **Misc** tab functionality is identical to that described in the LSM1000 and LSM10GE Modules—Misc dialog box.



Operation Mode

The **Operation Mode** tab for **T400GP-2P-QDD** module is used to select the mode of operation for the module.

The **Operation Mode** dialog box for T400GP-2P-QDD card properties is shown in the following image:



The different card level modes can be set in the **Operation Mode** dialog box.

The T400GP-2P-QDD card has five speed modes. The card has a transceiver corresponding to each port. In each port, you can insert a Fan-out cable, which fans the output into multiple ports instead of using the original port.

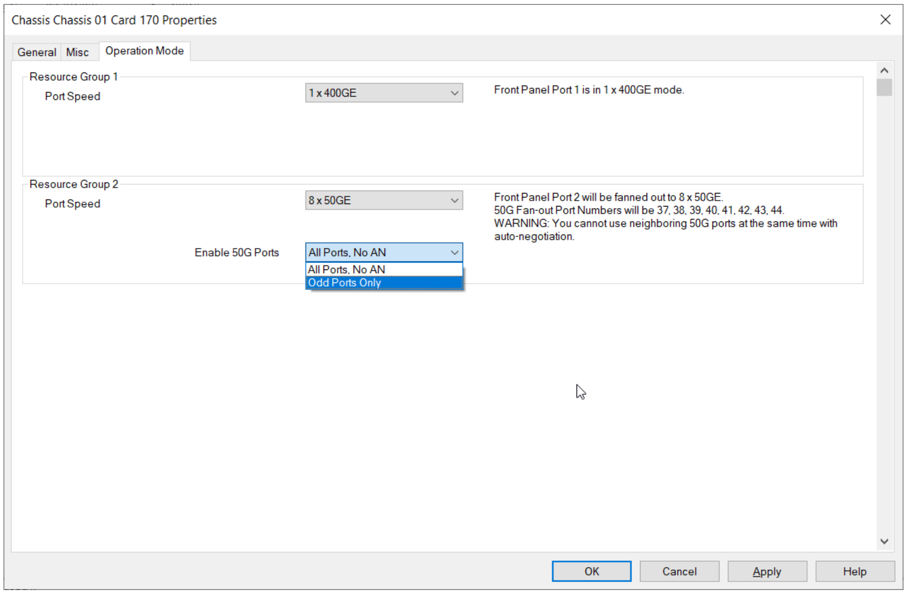
Select the mode from the **Port Speed** list for each Resource Group.

The T400GP-2P-QDD card supports the following speed modes:

- 1x400GE Normal Mode–1 port of 400 GE speed
- 2x200GE Fan-out Mode–2 ports of 200 GE speed by using Fan-out cables
- 4x100GE Fan-out Mode–4 ports of 100 GE speed by using Fan-out cables
- 8x50GE Fan-out Mode–8 ports of 50 GE speed by using Fan-out cables
- BERT Mode–Bit Error Rate Testing mode; see BERT Mode

If you select 50 GE fan-out mode, an additional option to enable the 50 G ports is available. You can select the following options:

- All Ports, No AN: Eight 50 GE ports available in a single resource group and you cannot enable Auto Negotiation and Link Training on the ports. This is the default option.
- Odd Ports Only: Four 50 GE odd-numbered ports available in a single resource group and you can enable Auto Negotiation and Link Training on these ports.



The following T400GP-2P-QDD card type is supported:

- T400GP-2P-QDD+200G+100G+50G

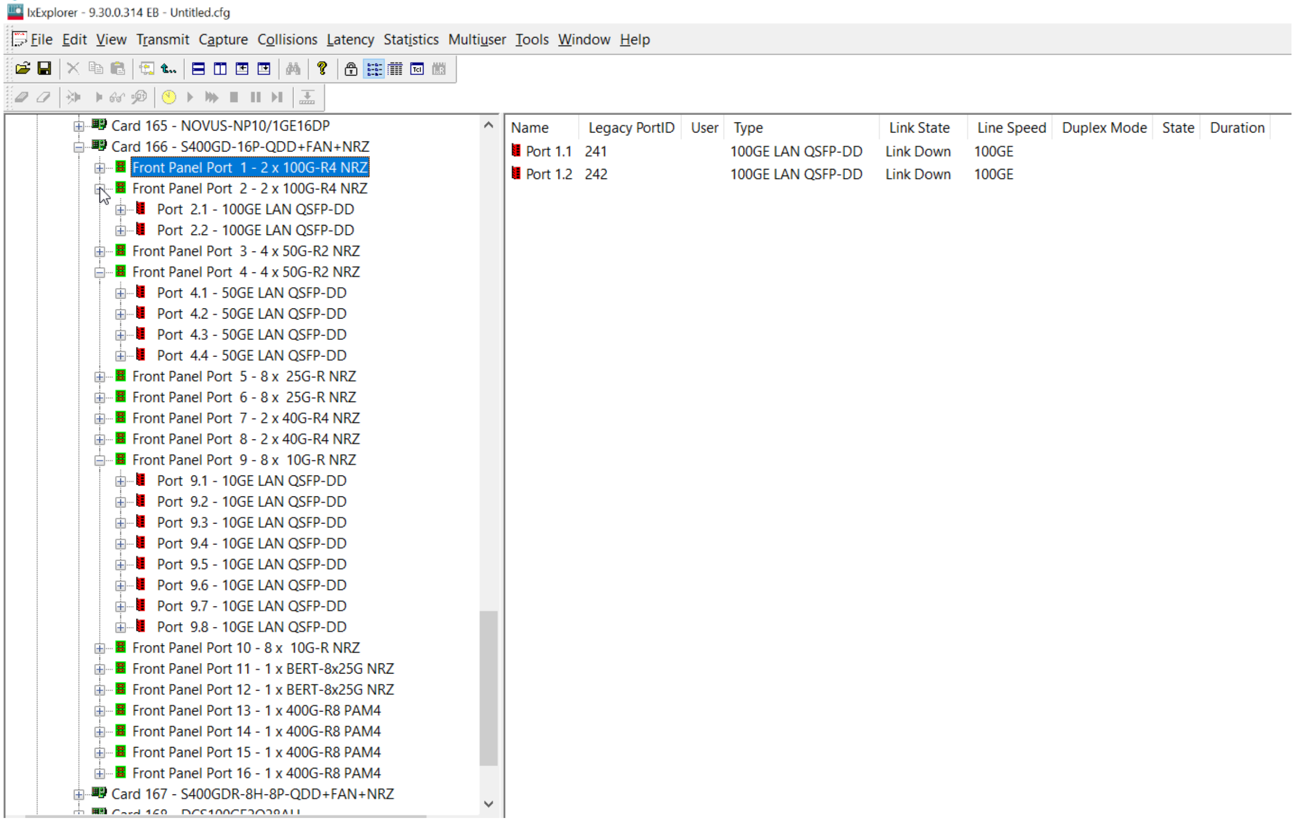
For more information on T400GP-2P-QDD cards, see *Ixia Platform Reference Guide*.

NOTE

You can perform data capture on all ports within a Resource Group simultaneously. Therefore, **Active Capture Port** drop down for every Resource Group is not available for T400GP-2P-QDD.

S400GD-16P-QDD+FAN+NRZ Load Module

When you expand S400GD-16P-QDD+FAN+NRZ load module, you can find the **Front Panel Port** nested below the load module. Card level is not present in S400GD-16P-QDD+FAN+NRZ. When you open the card in the tree view, you can see the front panel ports listed instead of the usual ports. The ports are nested below the front panel ports. When you select a **Front Panel Port**, you can view the corresponding ports in the right pane.



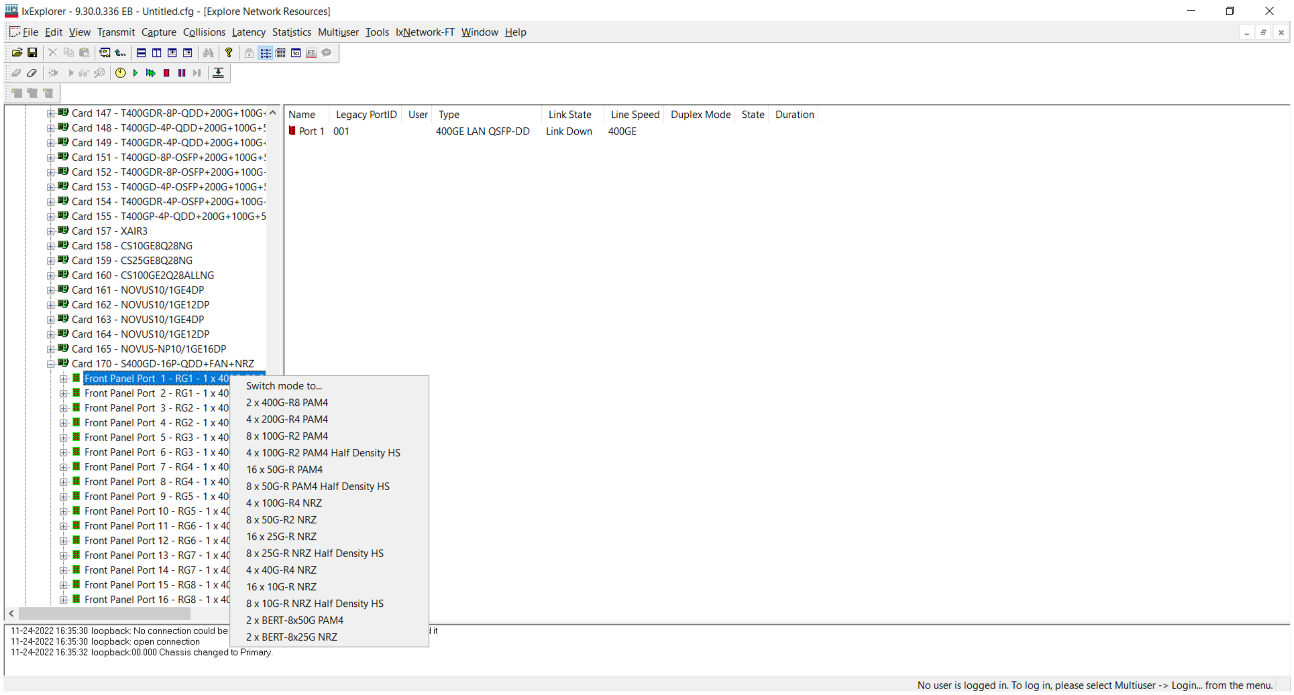
Fully Qualified Port Name (FQPN)

Fully Qualified Port Name (FQPN) format uniquely identifies the port. It is the concatenation of path and port ID. Port numbers of S400GD-16P-QDD+FAN+NRZ load module follows FQPN format. In the right pane you can also view the port number in FQPN format in **Name** column along with their corresponding legacy Port ID in **Legacy PortID** column. The FQPN port number indicates the front panel port ID and the fan-out ID. For example, port 6.1 indicates front panel port 6 and fan out 1. The legacy port ID for port 6.1 is 069, as shown in the above image.

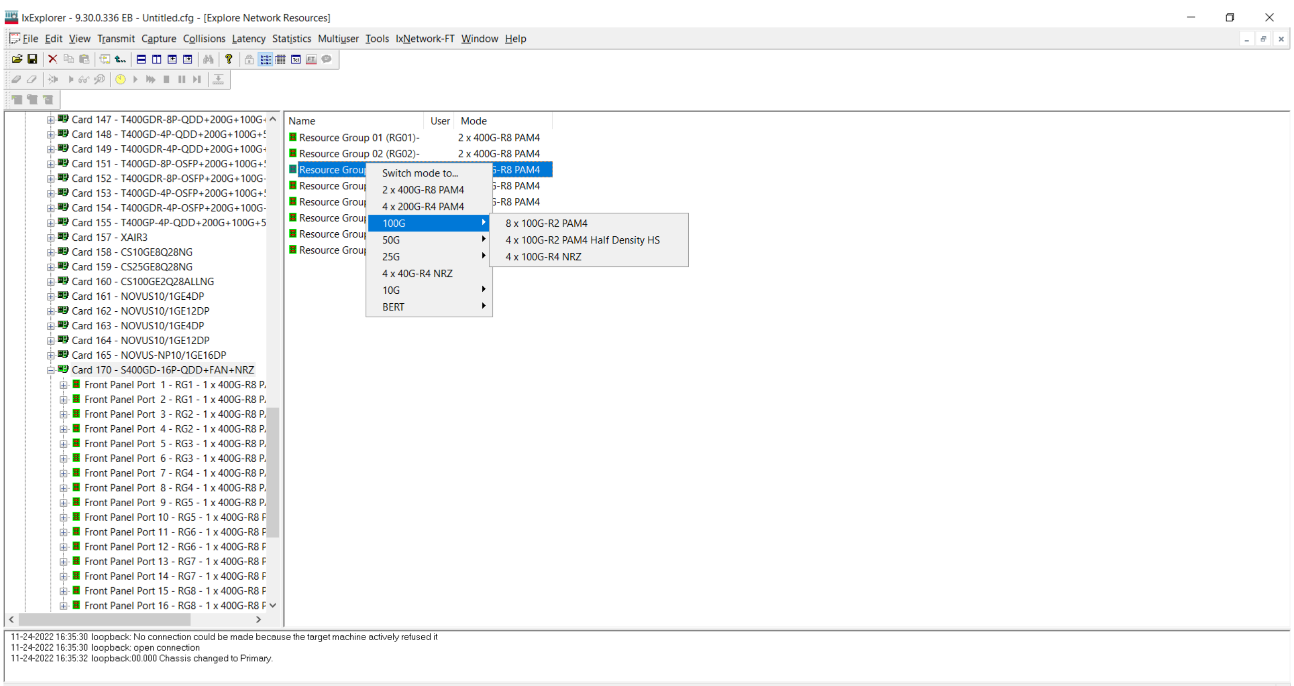
See *TCL Development Guide* for more information on FQPN.

Switch mode

You can switch modes by using the context menu of **Front Panel Port**.



Additionally, after you select the load module, eight resource groups appear in the right pane. You can switch mode by using the context menu of these resource groups as well.

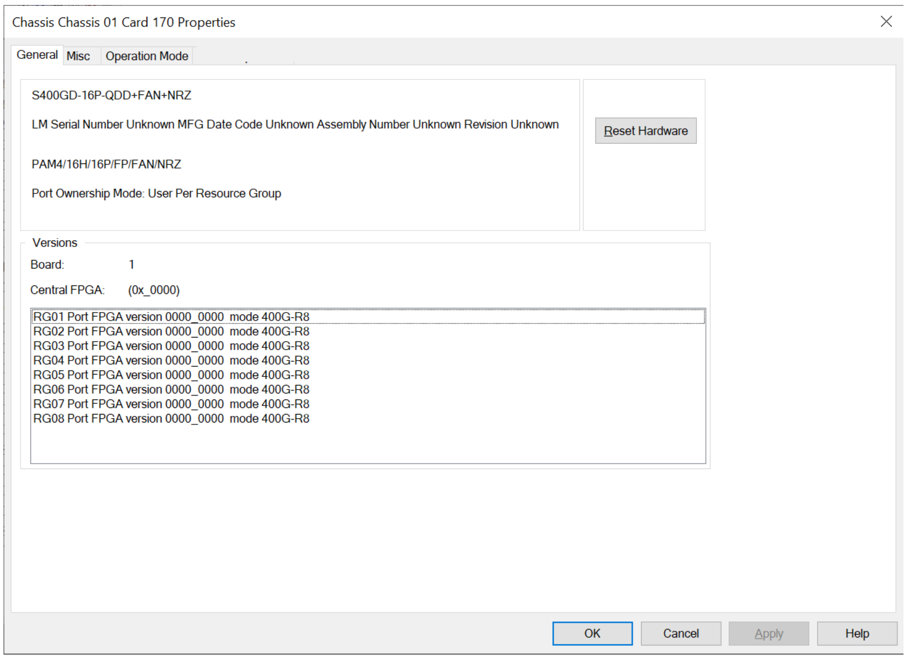


See Operation Mode for more information on resource group.

General

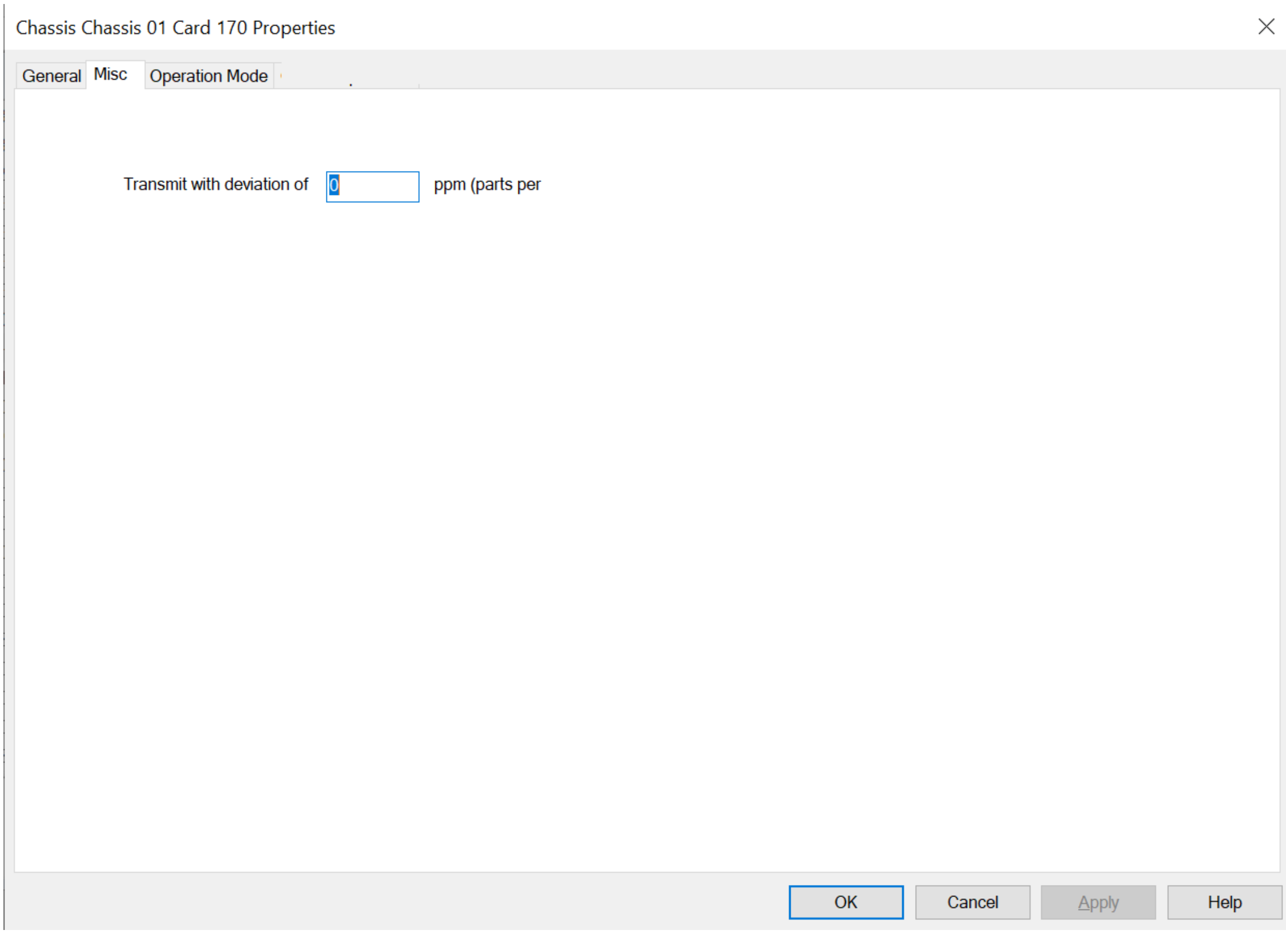
The **General** tab shows the board version and FPGA revision level for the board as well as the FPGA versions for each port on the card. The **Reset Hardware** option in this dialog box allows you to reset the hardware to factory defaults.The **Force Hotswap** option will emulate physical removal and insertion of the card. This is done for diagnostic purposes.

An example of the card properties dialog box and its corresponding **General** tab for the S400GD-16P-QDD+FAN+NRZ load module is shown in the following image:



Misc

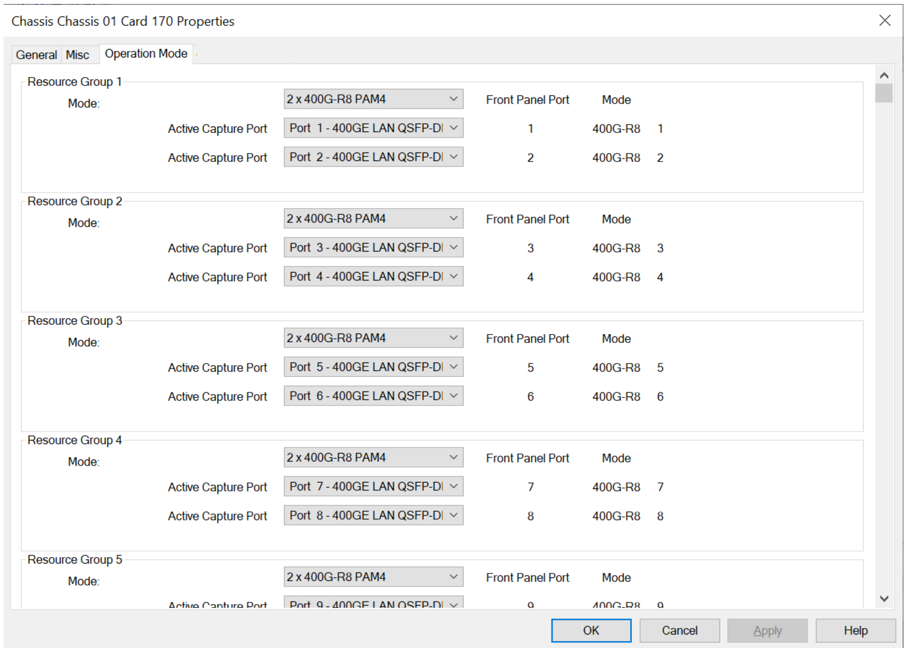
The S400GD-16P-QDD+FAN+NRZ module Card Properties dialog box shows the **Misc** tab when in normal (non-aggregated) mode. The **Misc** tab functionality is identical to that described in the LSM1000 and LSM10GE Modules—Misc dialog box.



Operation Mode

The **Operation Mode** tab for **S400GD-16P-QDD+FAN+NRZ** module is used to select the mode of operation for the module.

The **Operation Mode** dialog box for S400GD-16P-QDD+FAN+NRZ card properties is shown in the following image:



The different card level modes can be set in the **Operation Mode** dialog box.

The S400GD-16P-QDD+FAN+NRZ card has eleven speed modes. The card has a transceiver corresponding to each port. In each port, you can insert a Fan-out cable, which fans the output into multiple ports instead of using the original port.

Select the mode from the **Mode** list for each Resource Group.

The S400GD-16P-QDD+FAN+NRZ card supports the following speed modes:

- 2x400GE PAM4 normal mode–2 ports of 400 GE speed
- 4x200GE PAM4 fan-out mode–4 ports of 200 GE speed by using Fan-out cables
- 8x100GE PAM4 fan-out mode–8 ports of 100 GE speed by using Fan-out cables
- 16x50GE PAM4 fan-out full density mode–16 ports of 50 GE speed by using Fan-out cables
- 8x50G-PAM4 Half Density HS fan-out mode–8 ports for 50 GE speed by using Fan-out cables half density high stream
- 4x100GE NRZ fan-out mode–4 ports for 100 GE speed by using Fan-out cables
- 4x100G-PAM4 Half Density HS fan-out mode–4 ports for 100 GE speed by using Fan-out cables half density high stream
- 8x50GE NRZ fan-out mode–8 ports for 50 GE speed by using Fan-out cables
- 8x25G-NRZ Half Density HS fan-out mode–8 ports for 25 GE speed by using Fan-out cables half density high stream
- 16x25GE NRZ fan-out mode–16 ports 25 GE speed by using Fan-out cables
- 4x40GE NRZ fan-out mode–4 ports for 40 GE speed by using Fan-out cables
- 16x10GE NRZ fan-out mode–16 ports for 10 GE speed by using Fan-out cables
- 8x10G-NRZ Half Density HSfan-out mode–8 ports for 10 GE speed by using Fan-out cables half density high stream

- BERT Mode PAM4 –Bit Error Rate Testing mode; see BERT Mode
- BERT Mode NRZ

Following table shows the stream count in high stream mode:

Speed mode	Stream count in high stream mode
400G PAM4	256
200G PAM4	256
100G PAM4 Half Density High Stream	128
100G PAM4	32
100G NRZ	128
40G NRZ	128
50G PAM4 Half Density High Stream	64
50G PAM4	16
50G NRZ	64
25G NRZ Half Density High Stream	64
25G NRZ	16
10G NRZ Half Density High Stream	64
10G NRZ	16

One unique Resource Group (RG) consists of two native front panel QSFP-DD ports (Port 1 and 2, Port 3 and 4, so forth). All the ports (fan out ports) from same RG are always in same speed mode. The port number indicates the front panel port ID and the fan-out ID. For example, port number 1.1 indicates front panel port #1 and fan out #1.

S400GD-16P-QDD+FAN+NRZ supports the new port format. You can see the mapping of these new port formats to the legacy port IDs in the resource groups and in the right pane in the IxExplorer on selecting the front panel port.

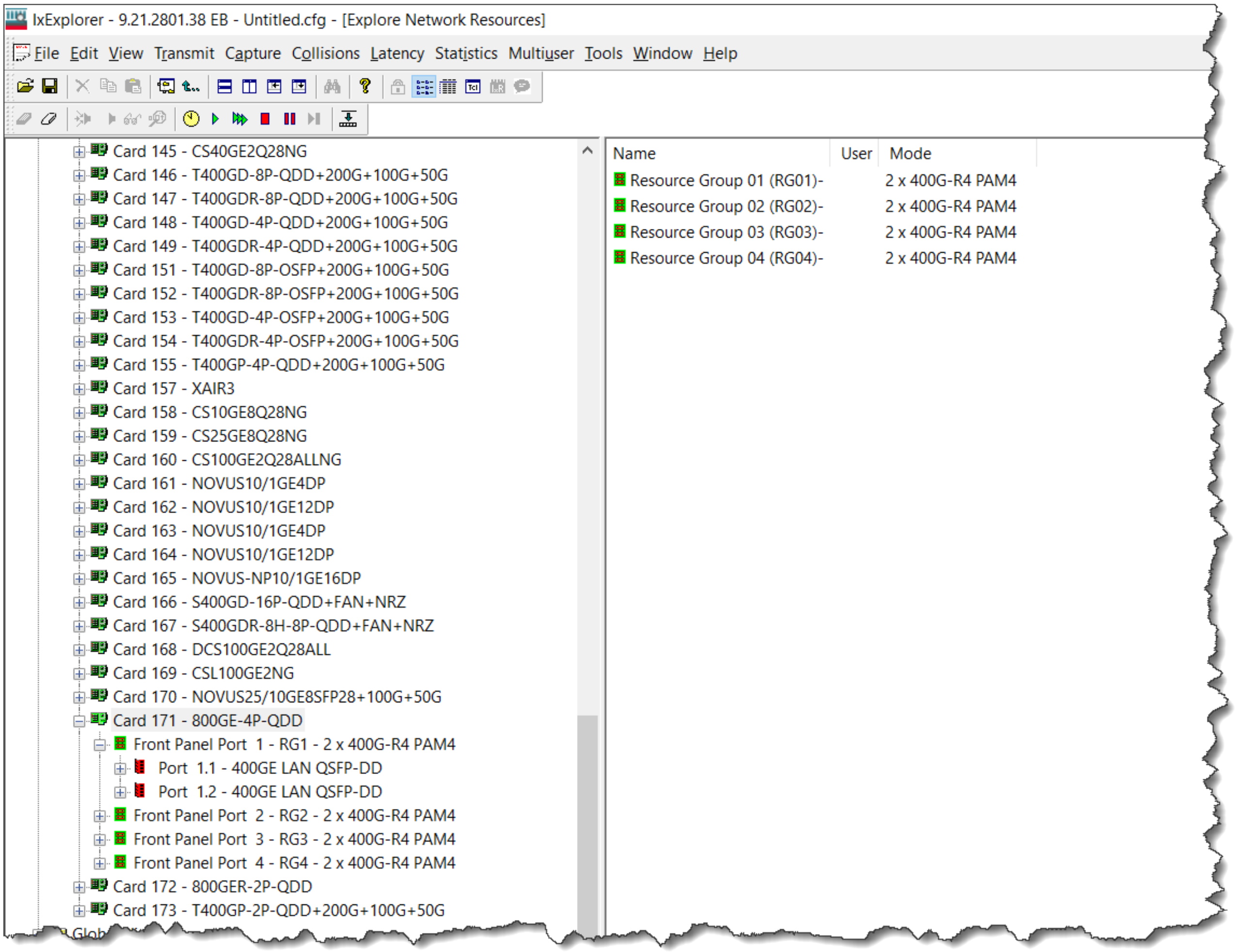
You can turn on active capture for each front panels. Each capture has 1MB capture memory, which includes both capture buffer and PIB memory.

For more information on S400GD-16P-QDD+FAN+NRZ cards, see *Ixia Platform Reference Guide*.

NOTE You can perform data capture only on two ports within a Resource Group or a single port within a Front Port Panel.

800GE-4P-QDD Load Module

When you expand 800GE-4P-QDD load module, you can find the **Front Panel Port** nested below the load module. Card level is not present in 800GE-4P-QDD. When you open the card in the tree view, you can see the front panel ports listed instead of the usual ports. The ports are nested below the front panel ports. When you select a **Front Panel Port**, you can view the corresponding ports in the right pane.



Fully Qualified Port Name (FQPN)

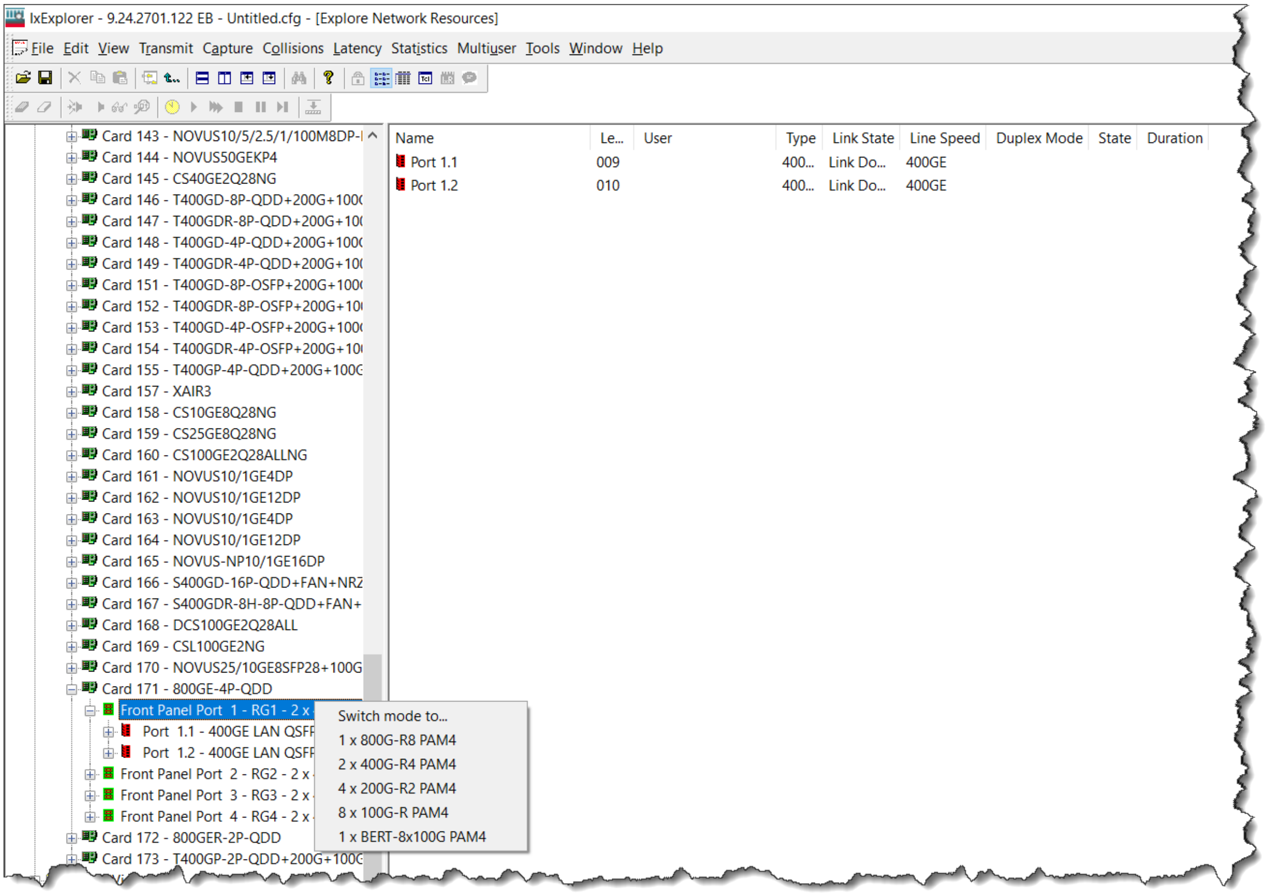
Fully Qualified Port Name (FQPN) format uniquely identifies the port. It is the concatenation of path and port ID. Port numbers of 800GE-4P-QDD load module follows FQPN format. In the right pane you can also view the port number in FQPN format in **Name** column along with their corresponding legacy Port ID in **Legacy PortID** column. The FQPN port number indicates the front panel port ID and the fan-out ID. For example, port 9.1 indicates front panel port 9 and fan out 1.

For 800GE, legacy port IDs start from 1.

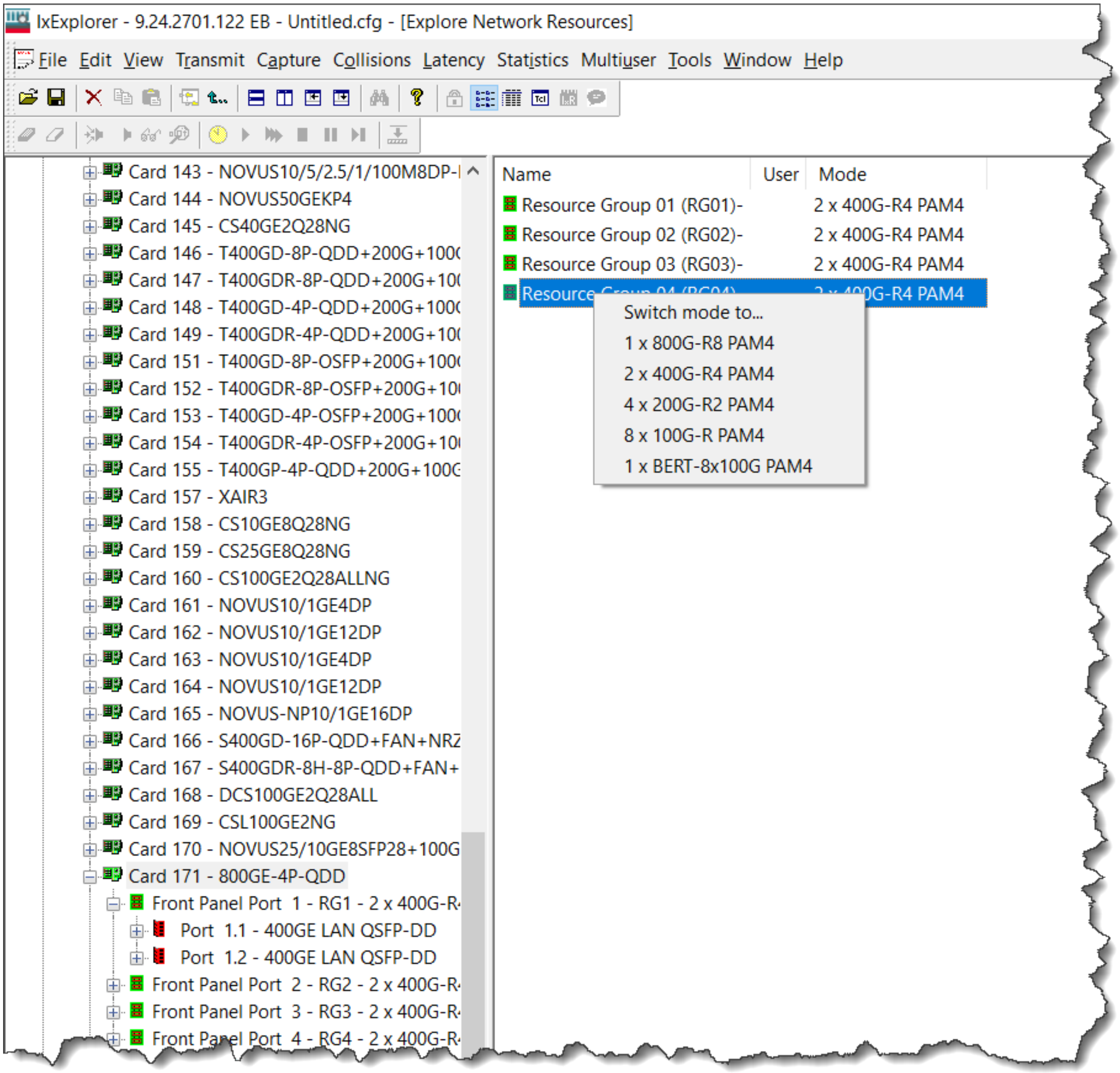
See *TCL Development Guide* for more information on FQPN.

Switch mode

You can switch modes by using the context menu of **Front Panel Port**.



Additionally, after you select the load module, resource groups appear in the right pane. You can switch mode by using the context menu of these resource groups as well.

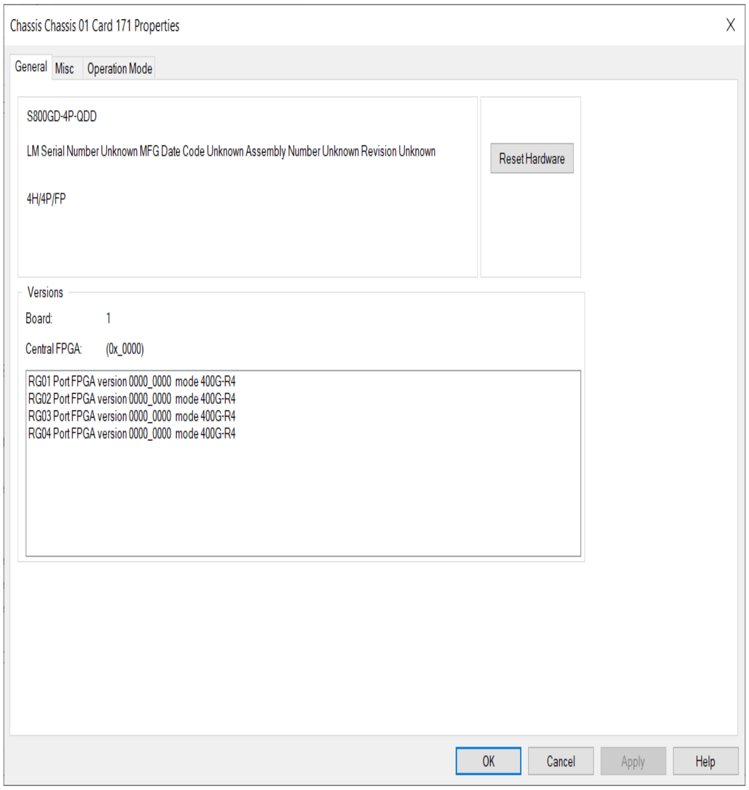


See Operation Mode for more information on resource group.

General

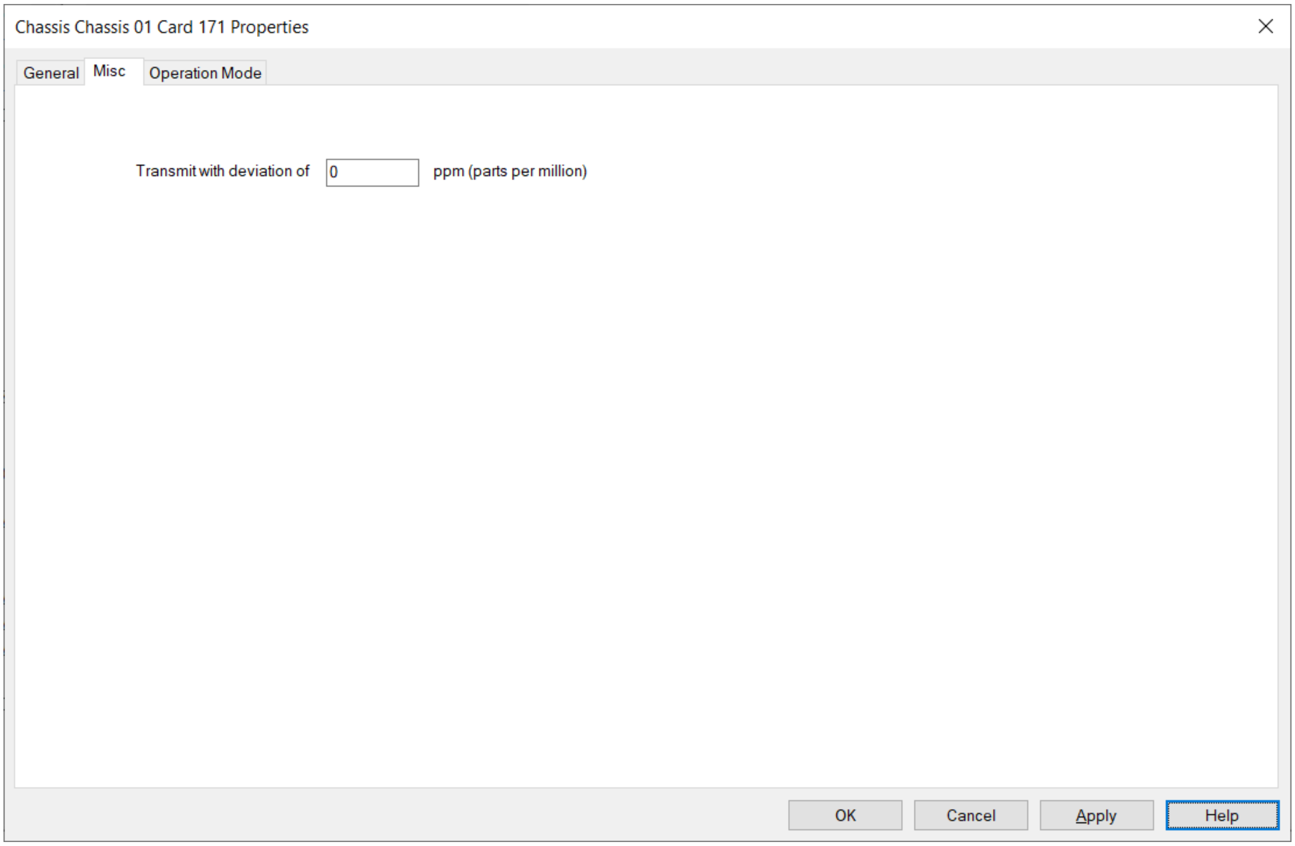
The **General** tab shows the board version and FPGA revision level for the board as well as the FPGA versions for each port on the card. The **Reset Hardware** option in this dialog box allows you to reset the hardware to factory defaults. The **Force Hotswap** option will emulate physical removal and insertion of the card. This is done for diagnostic purposes.

An example of the card properties dialog box and its corresponding **General** tab for the 800GE-4P-QDD load module is shown in the following image:



Misc

The 800GE-4P-QDD module Card Properties dialog box shows the **Misc** tab when in normal (non-aggregated) mode. The **Misc** tab functionality is identical to that described in the LSM1000 and LSM10GE Modules—Misc dialog box.

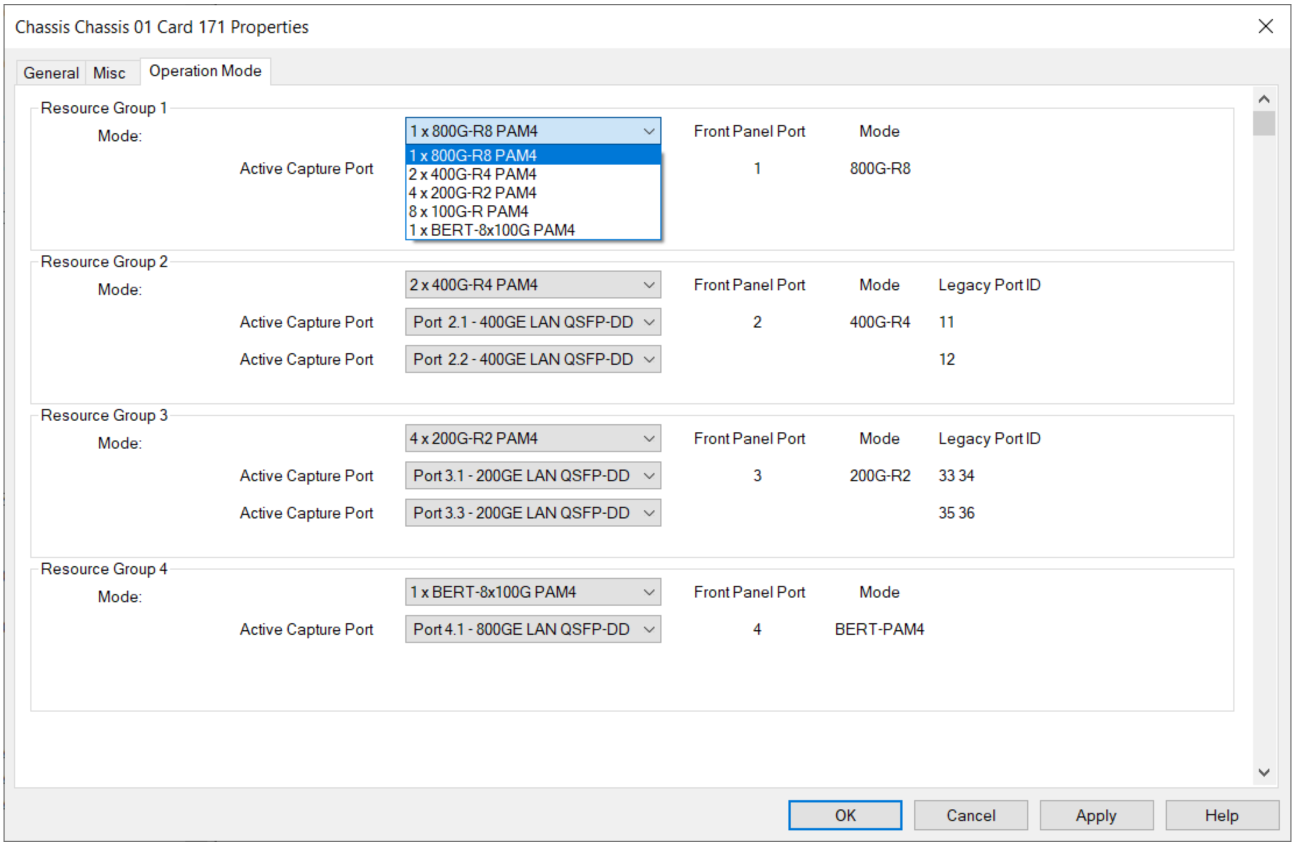


Operation Mode

The **Operation Mode** tab for **800GE-4P-QDD** module is used to select the mode of operation for the module.

For 800GE-4P-QDD-C module, see 800GE-4P-QDD-C Card Properties—Operation Mode.

The **Operation Mode** dialog box for 800GE-4P-QDD card properties is shown in the following image:



The different card level modes can be set in the **Operation Mode** dialog box.

The 800GE-4P-QDD card has five speed modes. The card has a transceiver corresponding to each port. In each port, you can insert a Fan-out cable, which fans the output into multiple ports instead of using the original port.

Select the mode from the **Mode** list for each Resource Group.

The 800GE-4P-QDD card supports the following speed modes:

- 1x800GE PAM4 normal mode–1 port of 800 GE speed
- 2x400GE PAM4 normal mode–2 ports of 400 GE speed
- 4x200GE PAM4 fan-out mode–4 ports of 200 GE speed by using Fan-out cables
- 8x100GE PAM4 fan-out mode–8 ports of 100 GE speed by using Fan-out cables
- BERT Mode PAM4 –Bit Error Rate Testing mode; see BERT Mode

One unique Resource Group (RG) consists of two native front panel QSFP-DD ports (Port 1 and 2, Port 3 and 4, so forth). All the ports (fan out ports) from same RG are always in same speed mode. The port number indicates the front panel port ID and the fan-out ID. For example, port number 1.1 indicates front panel port #1 and fan out #1.

800GE-4P-QDD supports the new port format. You can see the mapping of these new port formats to the legacy port IDs in the resource groups and in the right pane in the IxExplorer on selecting the front panel port.

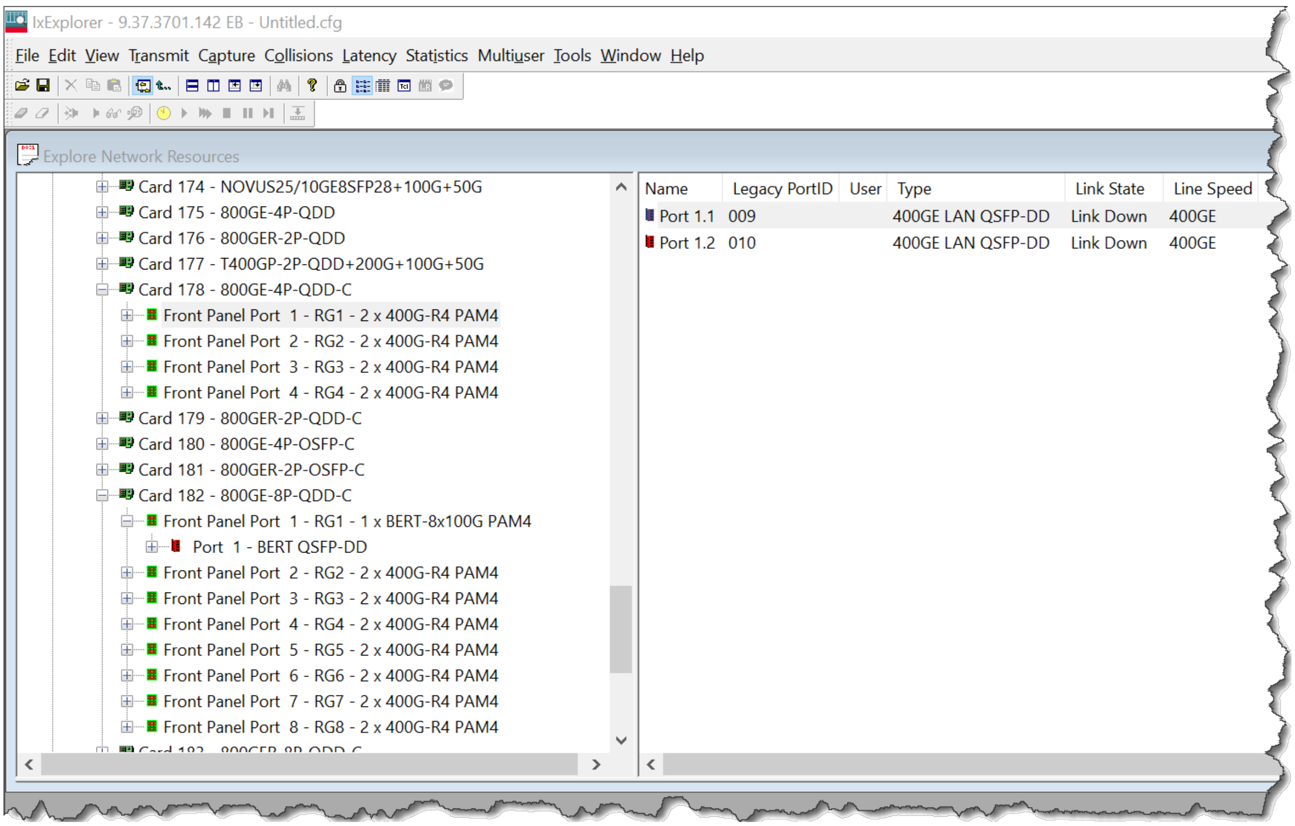
You can turn on active capture for each front panels. Each capture has 1MB capture memory, which includes both capture buffer and PIB memory.

For more information on 800GE-4P-QDD cards, see *Ixia Platform Reference Guide*.

NOTE You can perform data capture only on two ports within a Resource Group or a single port within a Front Port Panel.

800GE-4P-QDD-C Load Module

When you expand 800GE-4P-QDD-C load module, you can find the **Front Panel Port** nested below the load module. Card level is not present in 800GE-4P-QDD-C. When you open the card in the tree view, you can see the front panel ports listed instead of the usual ports. The ports are nested below the front panel ports. When you select a **Front Panel Port**, you can view the corresponding ports in the right pane.



Fully Qualified Port Name (FQPN)

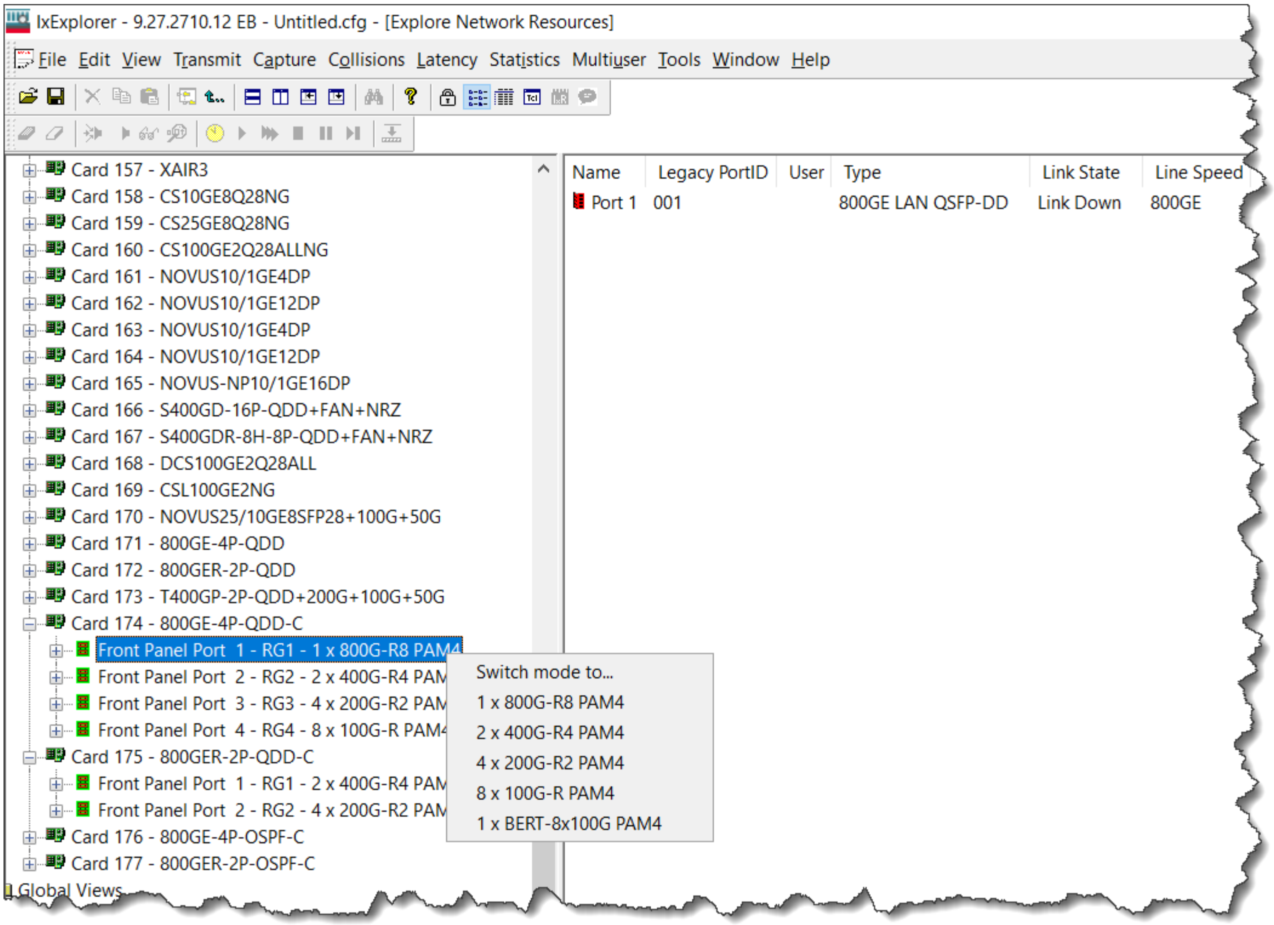
Fully Qualified Port Name (FQPN) format uniquely identifies the port. It is the concatenation of path and port ID. Port numbers of 800GE-4P-QDD-C load module follows FQPN format. In the right pane you can also view the port number in FQPN format in **Name** column along with their corresponding legacy Port ID in **Legacy PortID** column. The FQPN port number indicates the front panel port ID and the fan-out ID. For example, port 1.1 indicates front panel port 1 and fan out 1.

For 800GE, legacy port IDs start from 1.

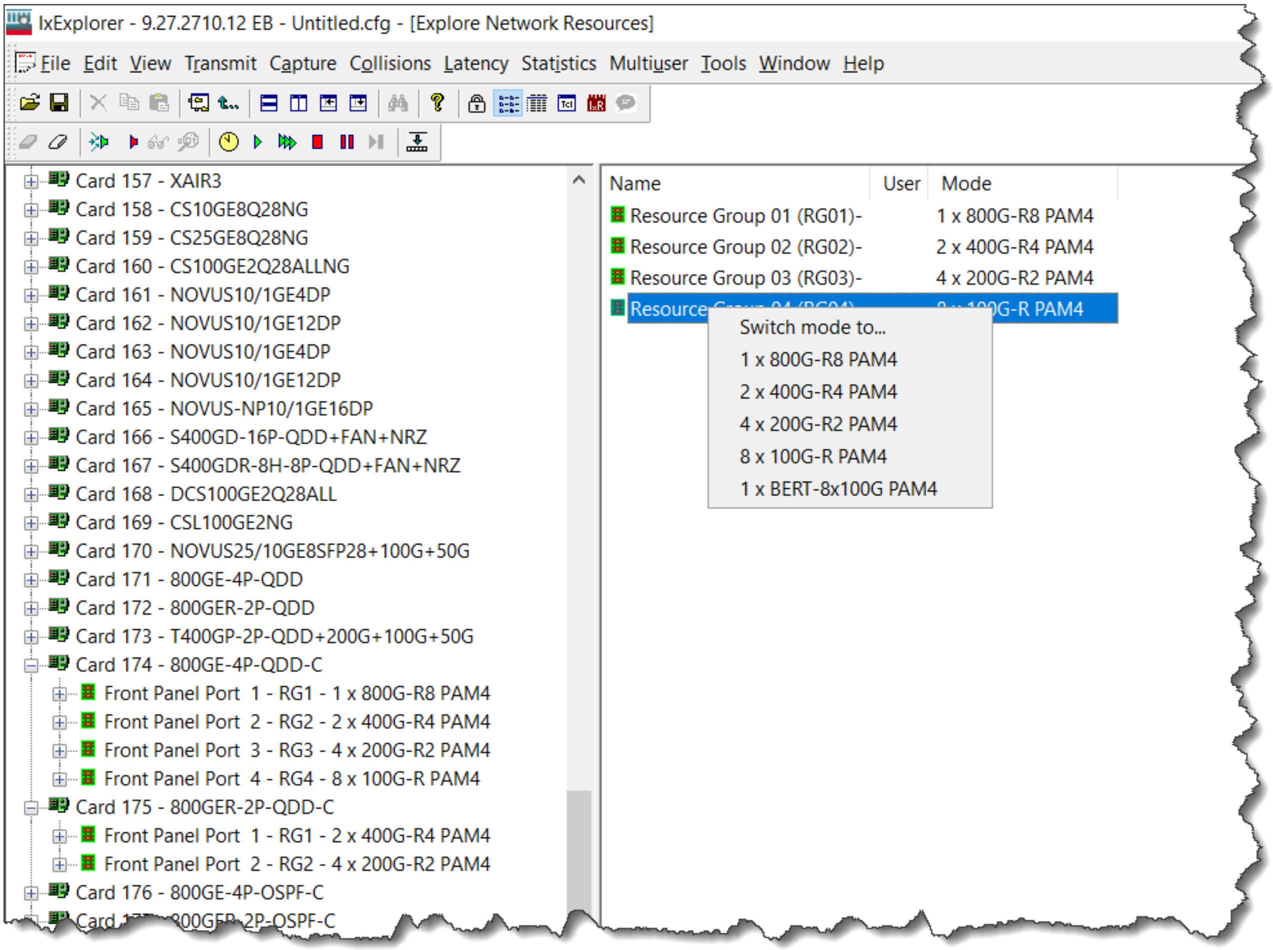
See *TCL Development Guide* for more information on FQPN.

Switch mode

You can switch modes by using the context menu of **Front Panel Port**.



Additionally, after you select the load module, resource groups appear in the right pane. You can switch mode by using the context menu of these resource groups as well.

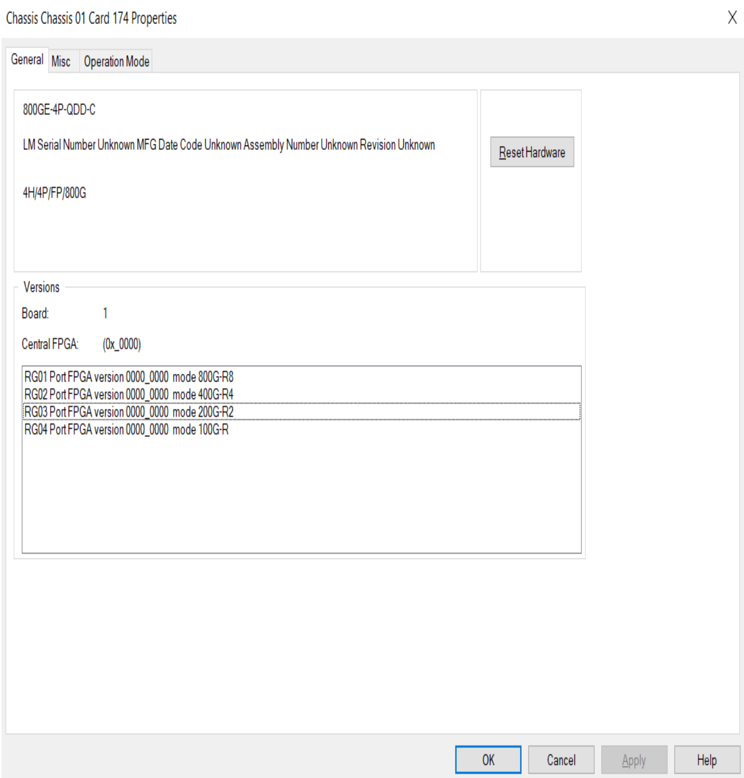


See RG Operation & PPM for more information on resource group.

General

The **General** tab shows the board version and FPGA revision level for the board as well as the FPGA versions for each port on the card. The **Reset Hardware** option in this dialog box allows you to reset the hardware to factory defaults. The **Force Hotswap** option will emulate physical removal and insertion of the card. This is done for diagnostic purposes.

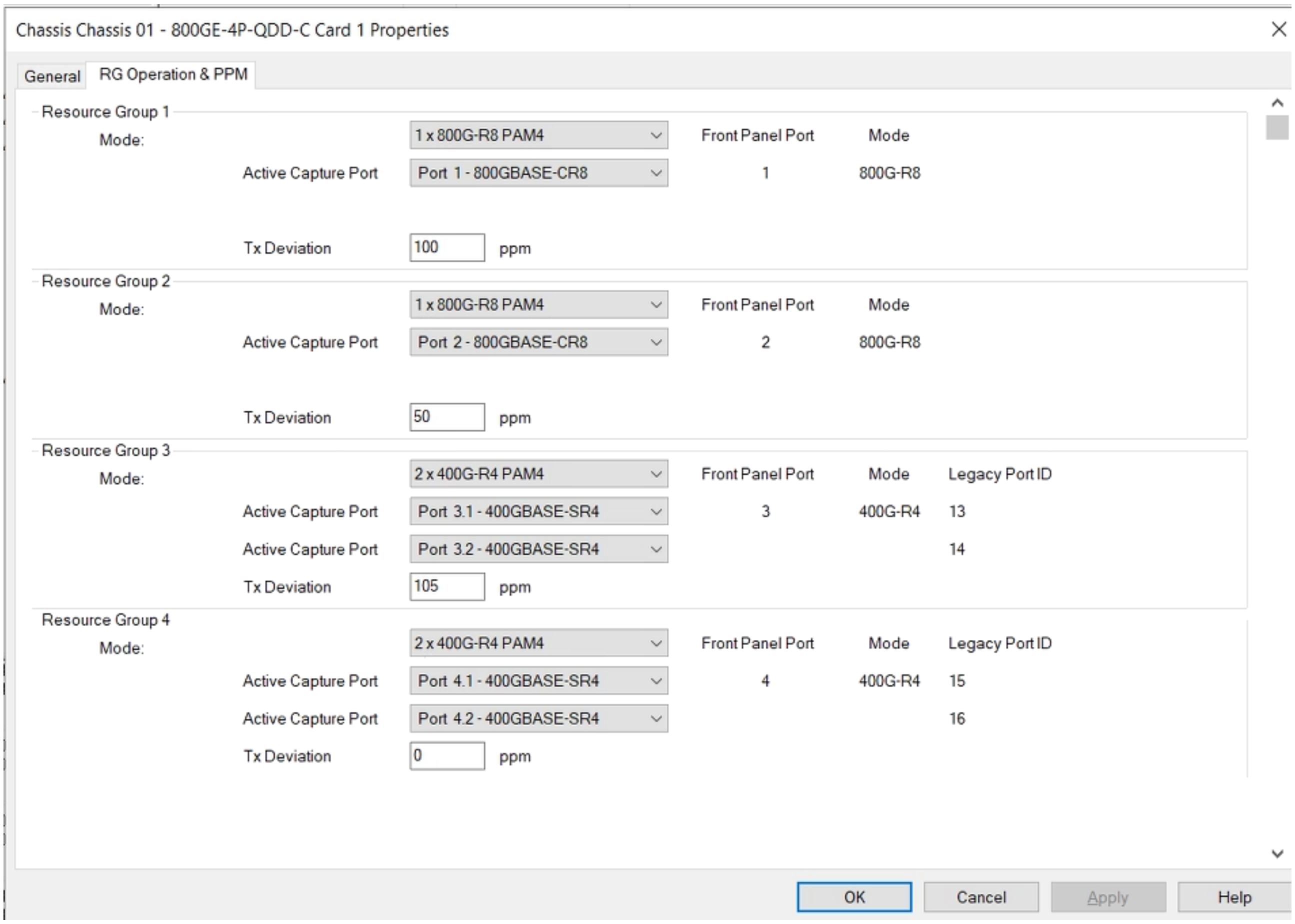
An example of the card properties dialog box and its corresponding **General** tab for the 800GE-4P-QDD-C load module is shown in the following image:



RG Operation & PPM

The **RG Operation & PPM** tab for **800GE-4P-QDD-C** module is used to select the mode of operation for the module.

The **RG Operation & PPM** dialog box for 800GE-4P-QDD-C card properties is shown in the following image:



The different card level modes can be set in the **RG Operation & PPM** dialog box.

The 800GE-4P-QDD-C card has five speed modes. The card has a transceiver corresponding to each port. In each port, you can insert a Fan-out cable, which fans the output into multiple ports instead of using the original port.

Select the mode from the **Mode** list for each Resource Group.

The 800GE-4P-QDD-C card supports the following speed modes:

- 1x800GE PAM4 normal mode–1 port of 800 GE speed
- 2x400GE PAM4 normal mode–2 ports of 400 GE speed
- 4x200GE PAM4 fan-out mode–4 ports of 200 GE speed by using Fan-out cables
- 8x100GE PAM4 fan-out mode–8 ports of 100 GE speed by using Fan-out cables
- BERT Mode PAM4 –Bit Error Rate Testing mode; see BERT Mode

One unique Resource Group (RG) consists of two native front panel QSFP-DD ports (Port 1 and 2, Port 3 and 4, so forth). All the ports (fan out ports) from same RG are always in same speed mode. The port number indicates the front panel port ID and the fan-out ID. For example, port number 1.1 indicates front panel port #1 and fan out #1.

800GE-4P-QDD-C supports the new port format. You can see the mapping of these new port formats to the legacy port IDs in the resource groups and in the right pane in the IxExplorer on selecting the front panel port.

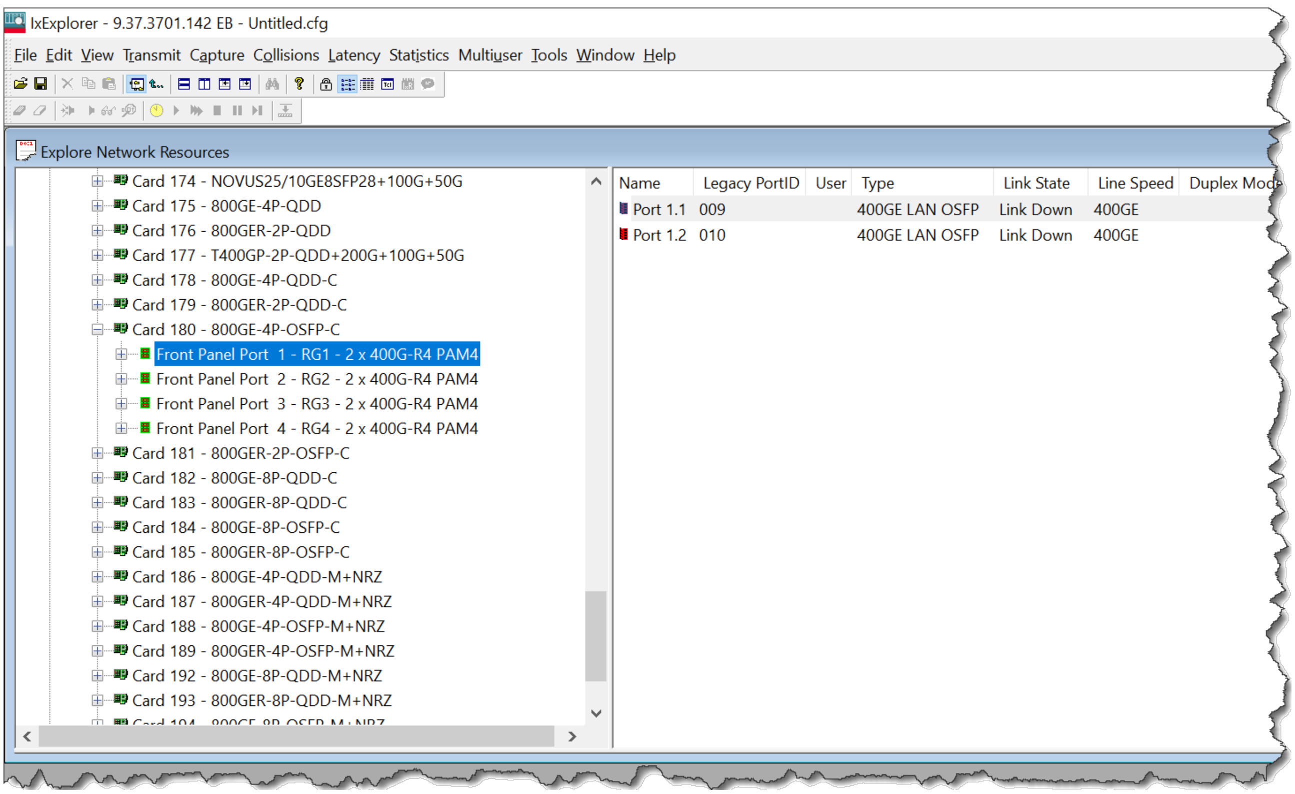
You can turn on active capture for each front panels. Each capture has 1MB capture memory, which includes both capture buffer and PIB memory.

For more information on 800GE-4P-QDD-C cards, see *Ixia Platform Reference Guide*.

NOTE You can perform data capture only on two ports within a Resource Group or a single port within a Front Port Panel.

800GE-4P-OSFP-C Load Module

When you expand 800GE-4P-OSFP-C load module, you can find the **Front Panel Port** nested below the load module. Card level is not present in 800GE-4P-OSFP-C. When you open the card in the tree view, you can see the front panel ports listed instead of the usual ports. The ports are nested below the front panel ports. When you select a **Front Panel Port**, you can view the corresponding ports in the right pane.



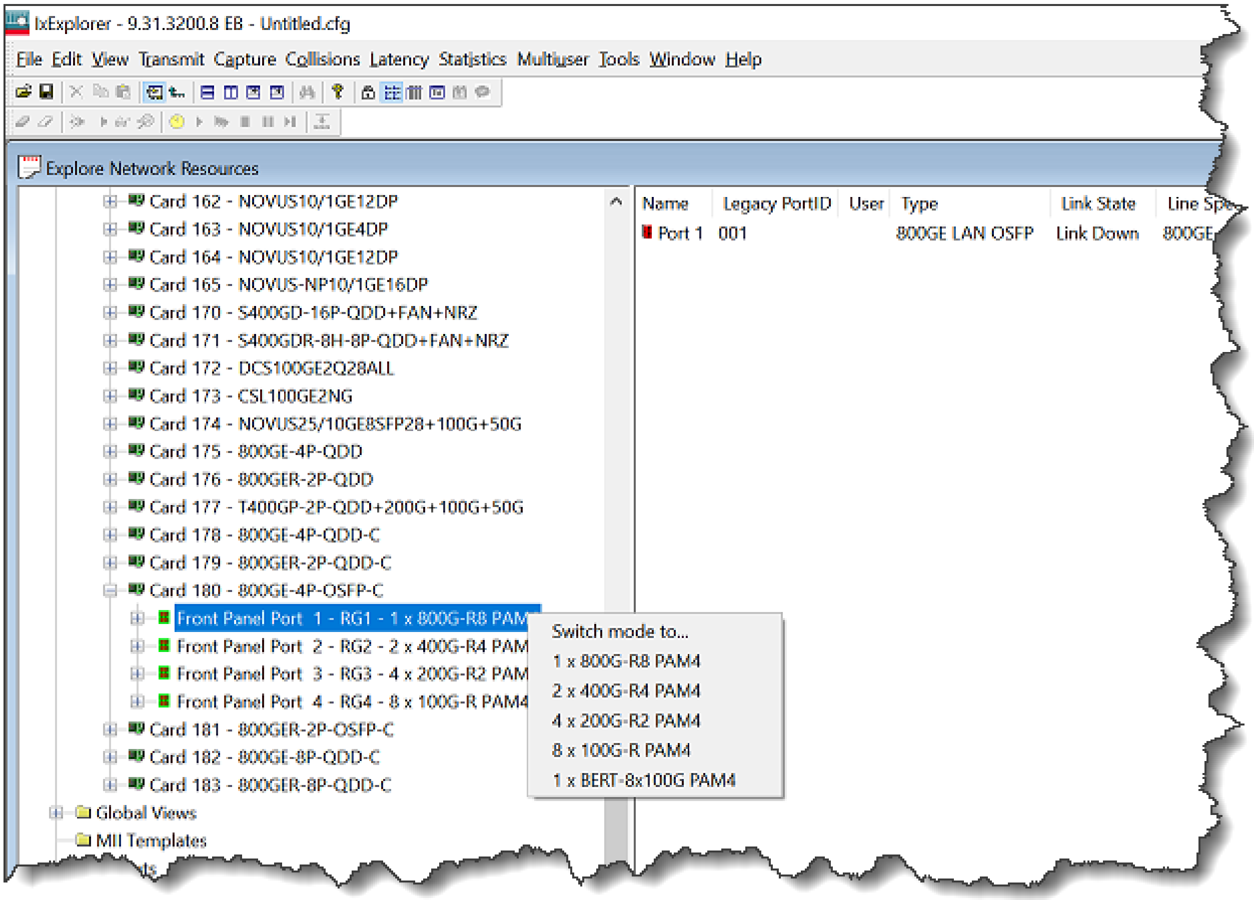
Fully Qualified Port Name (FQPN)

Fully Qualified Port Name (FQPN) format uniquely identifies the port. It is the concatenation of path and port ID. Port numbers of 800GE-4P-OSFP-C load module follows FQPN format. In the right pane you can also view the port number in FQPN format in **Name** column along with their corresponding legacy Port ID in **Legacy PortID** column. The FQPN port number indicates the front panel port ID and the fan-out ID. For example, port 1.1 indicates front panel port 1 and fan out 1.

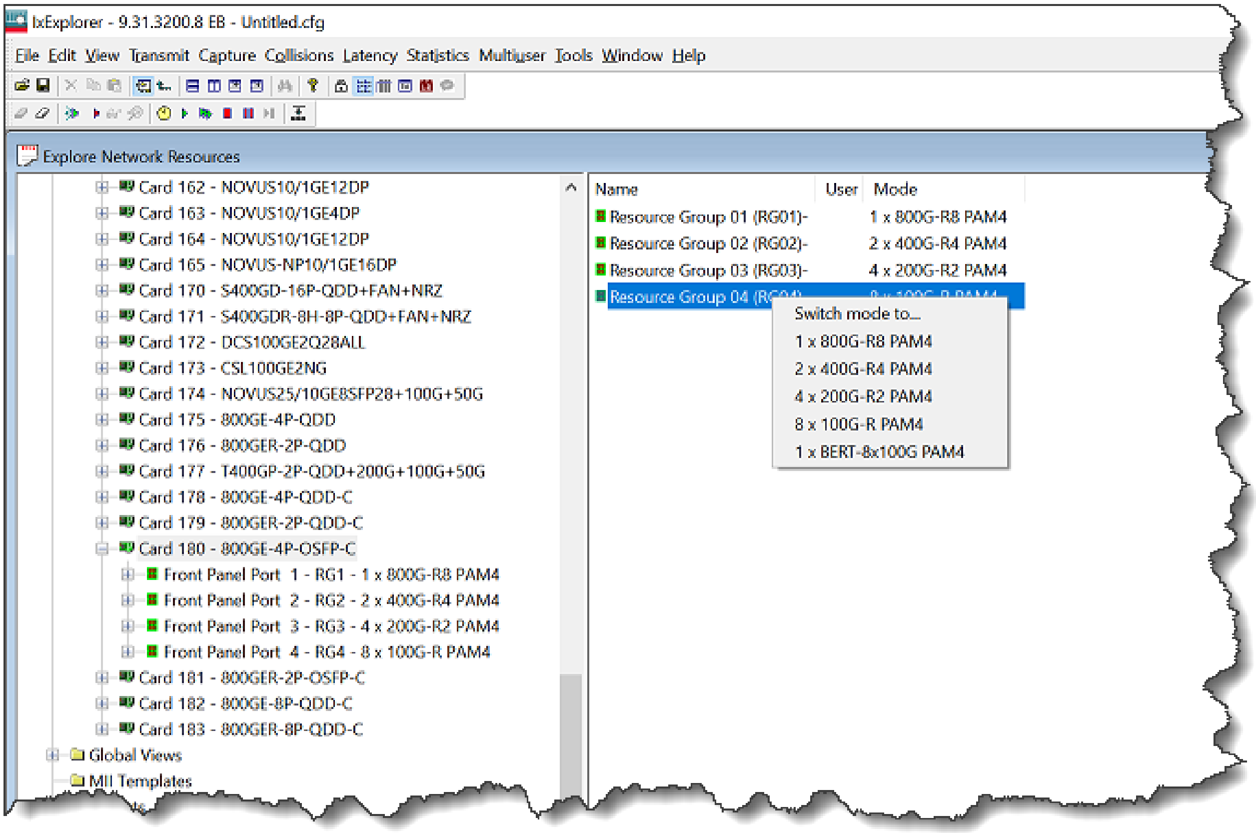
See *TCL Development Guide* for more information on FQPN.

Switch mode

You can switch modes by using the context menu of **Front Panel Port**.



Additionally, after you select the load module, resource groups appear in the right pane. You can switch mode by using the context menu of these resource groups as well.

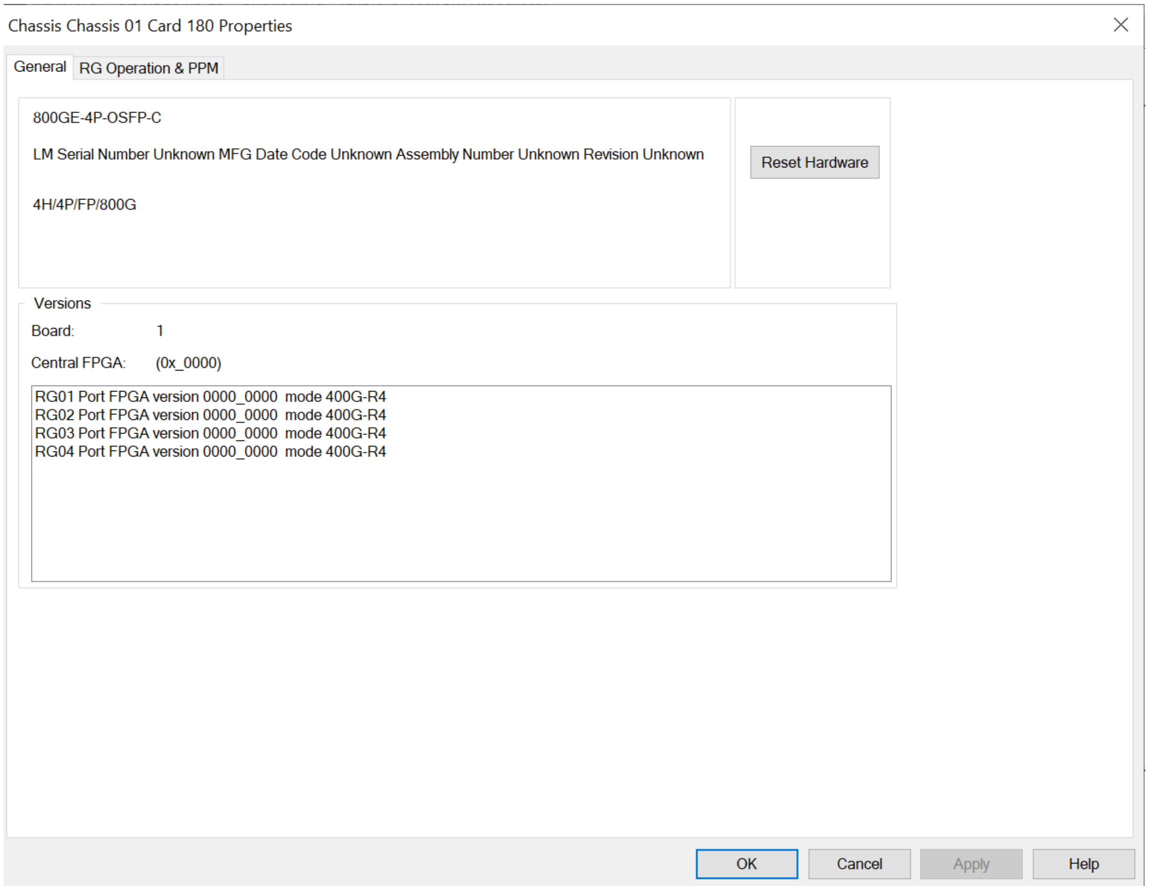


See RG Operation & PPM for more information on resource group.

General

The **General** tab shows the board version and FPGA revision level for the board as well as the FPGA versions for each port on the card. The **Reset Hardware** option in this dialog box allows you to reset the hardware to factory defaults. The **Force Hotswap** option will emulate physical removal and insertion of the card. This is done for diagnostic purposes.

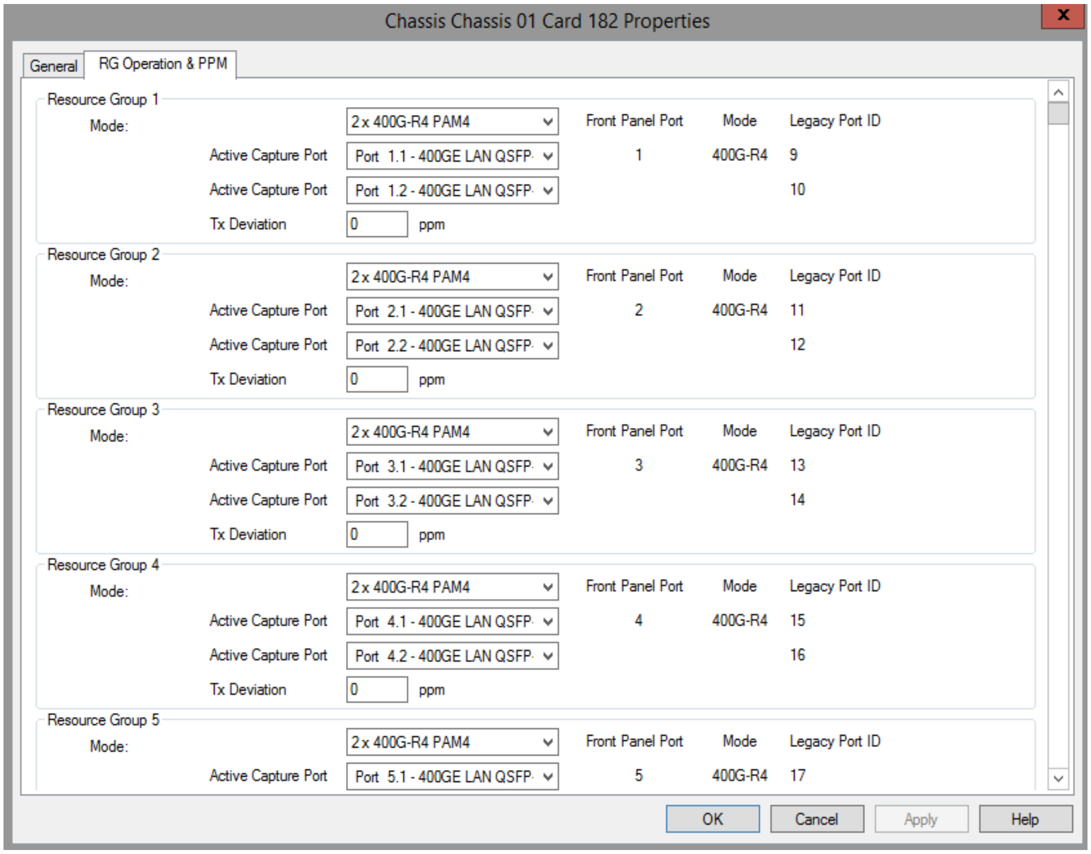
An example of the card properties dialog box and its corresponding **General** tab for the 800GE-4P-OSFP-C load module is shown in the following image:



RG Operation & PPM

The **RG Operation & PPM** tab for **800GE-4P-OSFP-C** module is used to select the mode of operation for the module.

The **RG Operation & PPM** dialog box for 800GE-4P-OSFP-C card properties is shown in the following image:



The different card level modes can be set in the **RG Operation & PPM** dialog box.

The 800GE-4P-OSFP-C card has five speed modes. The card has a transceiver corresponding to each port. In each port, you can insert a Fan-out cable, which fans the output into multiple ports instead of using the original port.

Select the mode from the **Mode** list for each Resource Group.

The 800GE-4P-OSFP-C card supports the following speed modes:

- 1x800GE PAM4 normal mode–1 port of 800 GE speed
- 2x400GE PAM4 normal mode–2 ports of 400 GE speed
- 4x200GE PAM4 fan-out mode–4 ports of 200 GE speed by using Fan-out cables
- 8x100GE PAM4 fan-out mode–8 ports of 100 GE speed by using Fan-out cables
- BERT Mode PAM4 –Bit Error Rate Testing mode; see BERT Mode

One unique Resource Group (RG) consists of two native front panel QSFP-DD ports (Port 1 and 2, Port 3 and 4, so forth). All the ports (fan out ports) from same RG are always in same speed mode. The port number indicates the front panel port ID and the fan-out ID. For example, port number 1.1 indicates front panel port #1 and fan out #1.

800GE-4P-OSFP-C supports the new port format. You can see the mapping of these new port formats to the legacy port IDs in the resource groups and in the right pane in the IxExplorer on selecting the front panel port.

You can turn on active capture for each front panels. Each capture has 1MB capture memory, which includes both capture buffer and PIB memory.

In the **Tx Deviation** box, enter the line transmit frequency for the card. The initial rate is controlled by the chassis chain reference clock. You can then adjust the line transmit frequency for the resource group. The accepted values are integers between -105 and 105 ppm.

For more information on 800GE-4P-OSFP-C cards, see *Ixia Platform Reference Guide*.

NOTE You can perform data capture only on two ports within a Resource Group or a single port within a Front Port Panel.

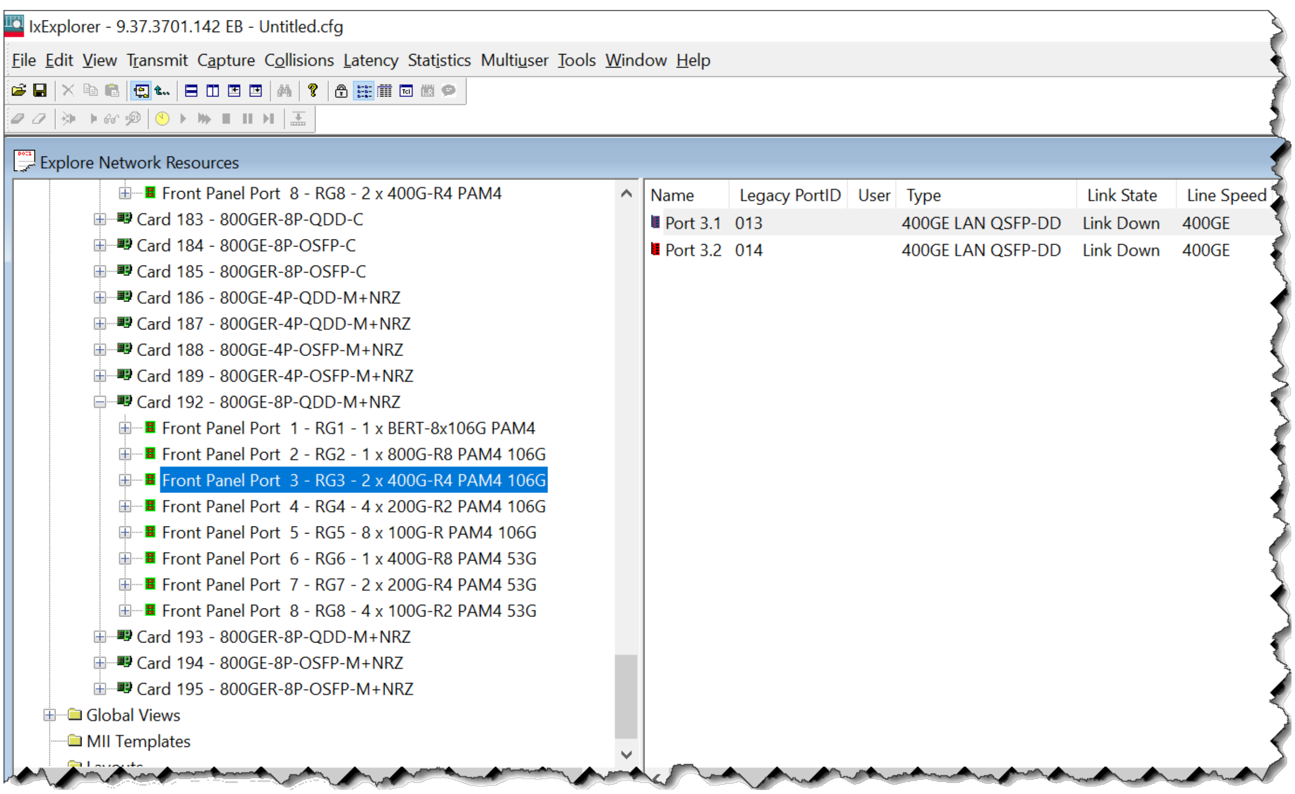
800GE-8P-QDD-M+NRZ Load Module

The following variants of 800GE QDD-M load modules are available:

- 800GE-8P-QDD-M+NRZ - Full and reduced performance
- 800GER-4P-QDD-M+NRZ - Full and reduced performance
- 800GE-2P-QDD-M+NRZ - Full and reduced performance
- 800GER-8PHW-4P-QDD-M+NRZ - Full and reduced performance

The card properties are similar for all variants of the load module.

When you expand 800GE-8P-QDD-M+NRZ load module, you can find the **Front Panel Port** nested below the load module. Card level is not present in 800GE-8P-QDD-M+NRZ. When you open the card in the tree view, you can see the front panel ports listed instead of the usual ports. The ports are nested below the front panel ports. When you select a **Front Panel Port**, you can view the corresponding ports in the right pane.



Fully Qualified Port Name (FQPN)

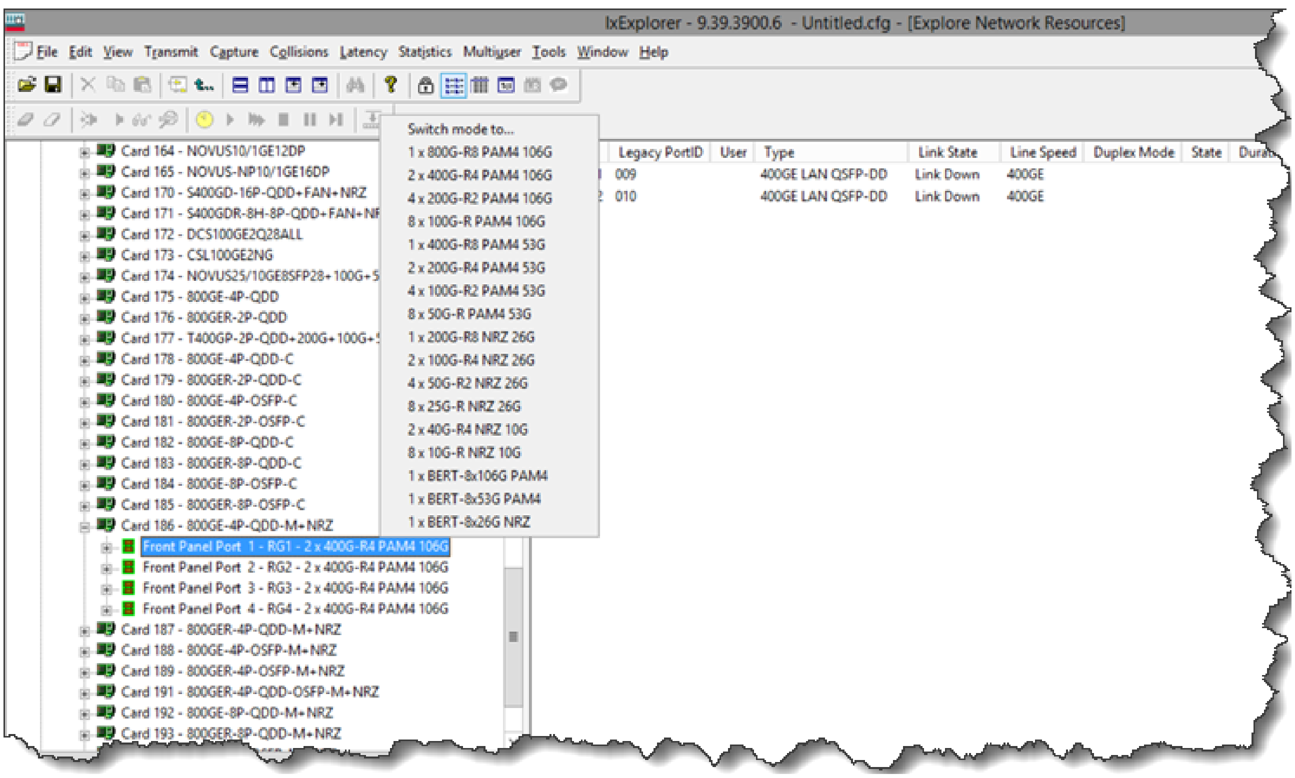
Fully Qualified Port Name (FQPN) format uniquely identifies the port. It is the concatenation of path and port ID. Port numbers of 800GE-8P-QDD-M+NRZ load module follows FQPN format. In the right pane you can also view the port number in FQPN format in **Name** column along with their corresponding legacy Port ID in **Legacy PortID** column. The FQPN port number indicates the front panel port ID and the fan-out ID. For example, port 3.1 indicates front panel port 3 and fan out 1.

For 800GE, legacy port IDs start from 1.

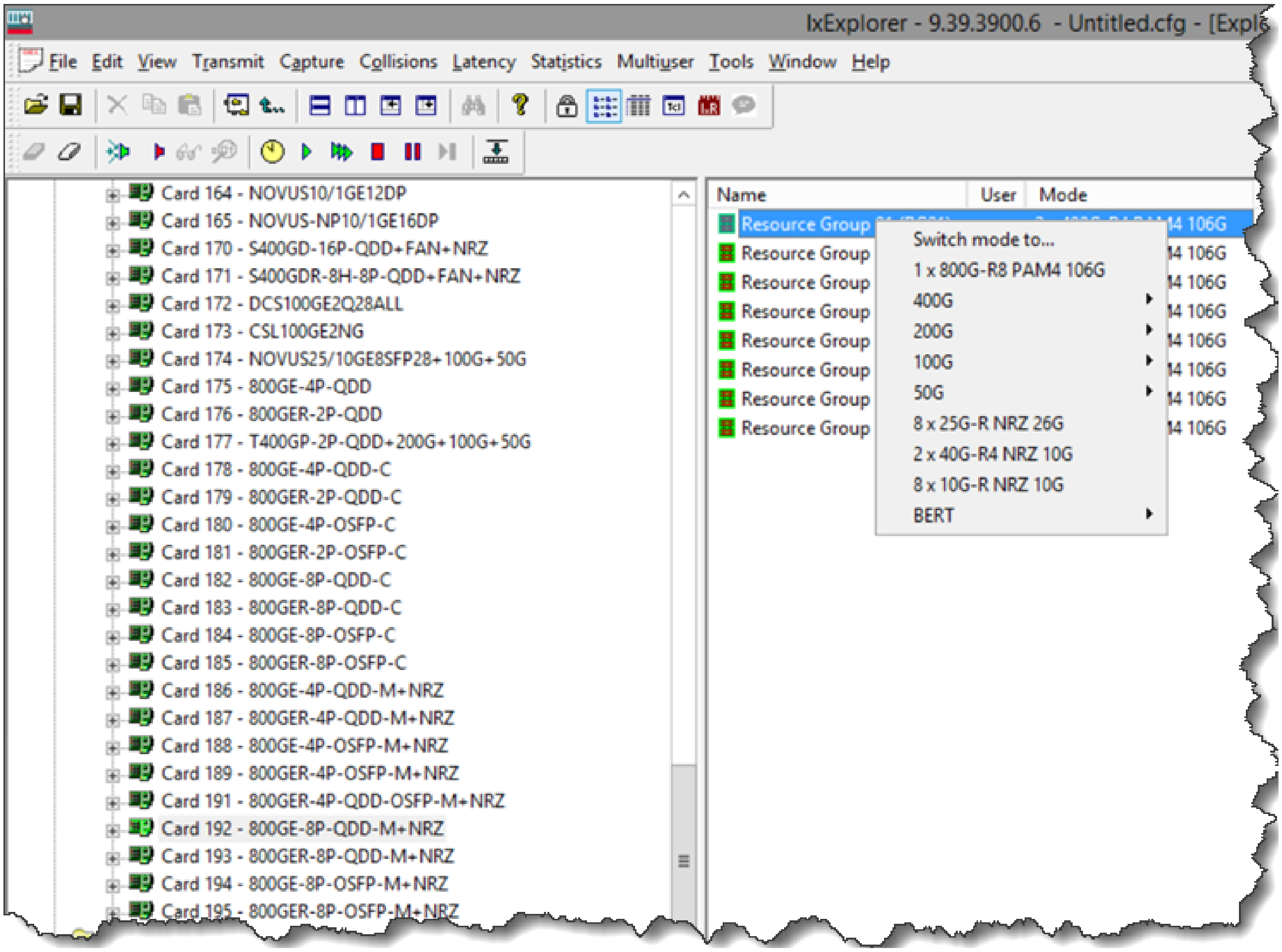
See *TCL Development Guide* for more information on FQPN.

Switch mode

You can switch modes by using the context menu of **Front Panel Port**.



Additionally, after you select the load module, resource groups appear in the right pane. You can switch mode by using the context menu of these resource groups as well.

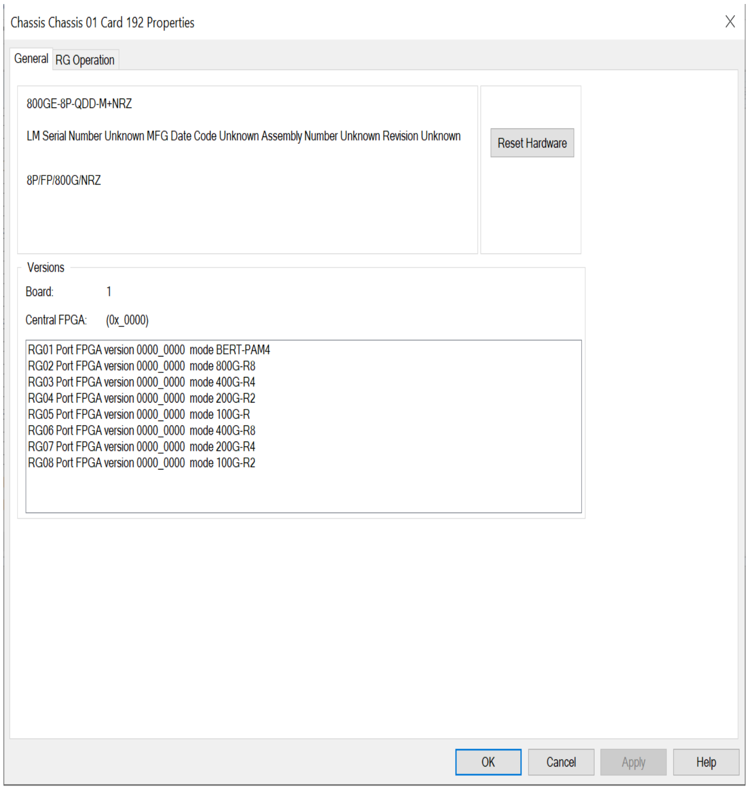


See RG Operation for more information on resource group.

General

The **General** tab shows the board version and FPGA revision level for the board as well as the FPGA versions for each port on the card. The **Reset Hardware** option in this dialog box allows you to reset the hardware to factory defaults. The **Force Hotswap** option will emulate physical removal and insertion of the card. This is done for diagnostic purposes.

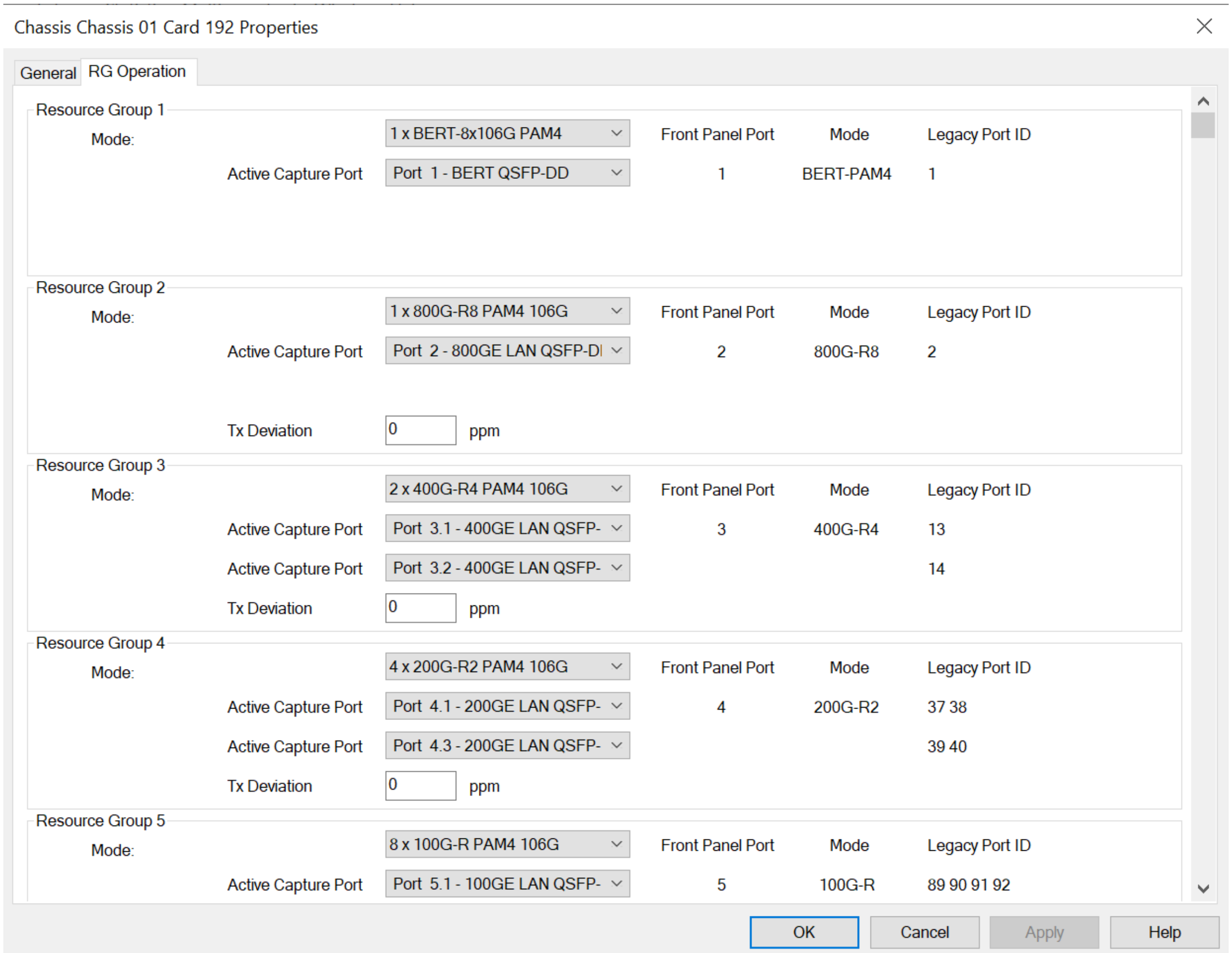
An example of the card properties dialog box and its corresponding **General** tab for the 800GE-8P-QDD-M+NRZ load module is shown in the following image:



RG Operation

The **RG Operation** tab for **800GE-8P-QDD-M+NRZ** module is used to select the mode of operation for the module.

The **RG Operation** dialog box for 800GE-8P-QDD-M+NRZ card properties is shown in the following image:



The different card level modes can be set in the **RG Operation** dialog box.

The 800GE-8P-QDD-M+NRZ card has multiple speed modes. The card has a transceiver corresponding to each port. In each port, you can insert a fan-out cable, which fans the output into multiple ports instead of using the original port.

Select the mode from the **Mode** list for each Resource Group.

The 800GE-8P-QDD-M+NRZ card supports the following speed modes:

- 1x800G-R8 PAM4 106G
- 2x400G-R4 PAM4 106G
- 4x200G-R2 PAM4 106G
- 8x100G-R PAM4 106G
- 1x400G-R8 PAM4 53G
- 2x200G-R4 PAM4 53G
- 4x100G-R2 PAM4 53G
- 8x50G-R PAM4 53G

- 1x200G-R8 NRZ 26G
- 2x100G-R4 NRZ 26G
- 4x50G-R2 NRZ 26G
- 8x25G-R NRZ 26G
- 2x40G-R4 NRZ 10G
- 8x10G-R NRZ 10G
- 1xBERT-8x106G PAM4 –Bit Error Rate Testing mode; see BERT Mode
- 1xBERT-8x53G PAM4
- 1xBERT-8x26G NRZ

One unique Resource Group (RG) consists of two native front panel QSFP-DD ports (Port 1 and 2, Port 3 and 4, so forth). All the ports (fan-out ports) from same RG are always in same speed mode. The port number indicates the front panel port ID and the fan-out ID. For example, port number 1.1 indicates front panel port #1 and fan out #1.

800GE-8P-QDD-M+NRZ supports the new port format. You can see the mapping of these new port formats to the legacy port IDs in the resource groups and in the right pane in the IxExplorer on selecting the front panel port.

You can turn on active capture for each front panels. Each capture has 1MB capture memory, which includes both capture buffer and PIB memory.

For more information on 800GE-8P-QDD-M+NRZ cards, see *IxOS Platform Reference Guide*.

NOTE You can perform data capture only on two ports within a Resource Group or a single port within a Front Port Panel.

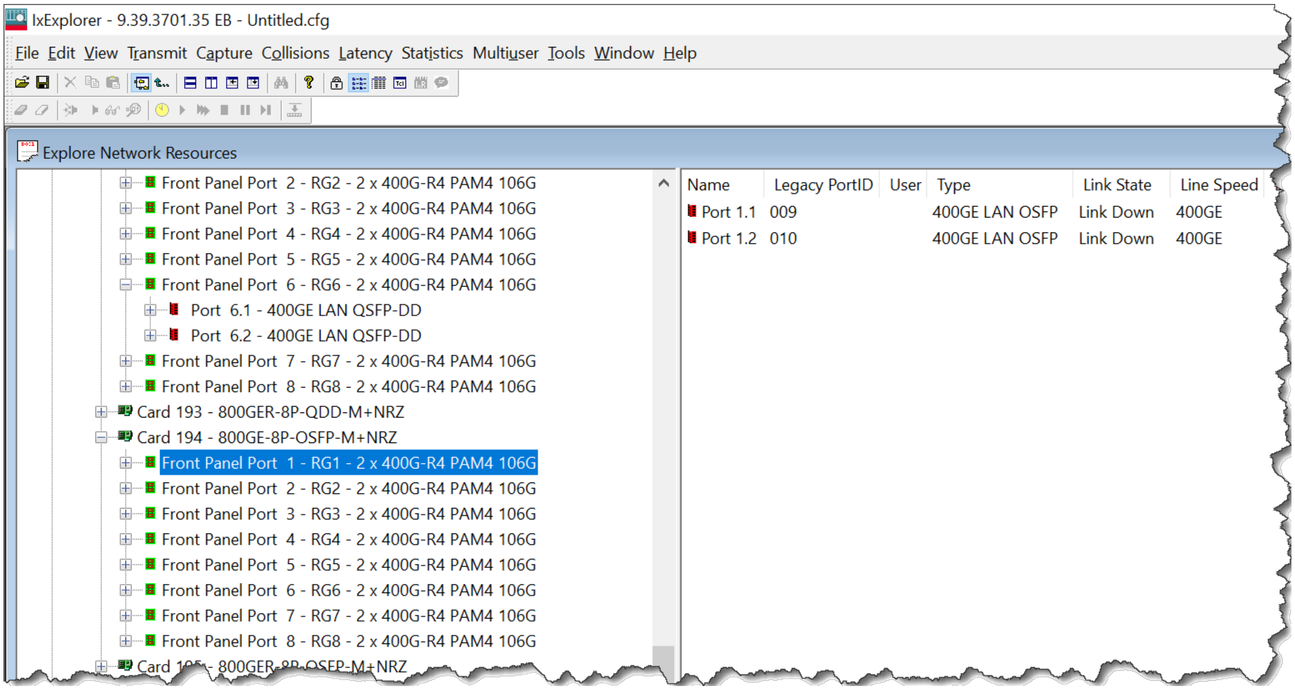
800GE-8P-OSFP-M+NRZ Load Module

The following variant of 800GE OSFP-M load module is available:

- 800GE-8P-OSFP-M+NRZ - Full and reduced performance
- 800GE-4P-OSFP-M+NRZ - Full and reduced performance
- 800GE-2P-OSFP-M+NRZ - Full and reduced performance
- 800GER-8PHW-4P-OSFP-M+NRZ - Full and reduced performance

The card properties are similar for all variants of the load module.

When you expand 800GE-8P-OSFP-M+NRZ load module, you can find the **Front Panel Port** nested below the load module. Card level is not present in 800GE-8P-OSFP-M+NRZ. When you open the card in the tree view, you can see the front panel ports listed instead of the usual ports. The ports are nested below the front panel ports. When you select a **Front Panel Port**, you can view the corresponding ports in the right pane.



Fully Qualified Port Name (FQPN)

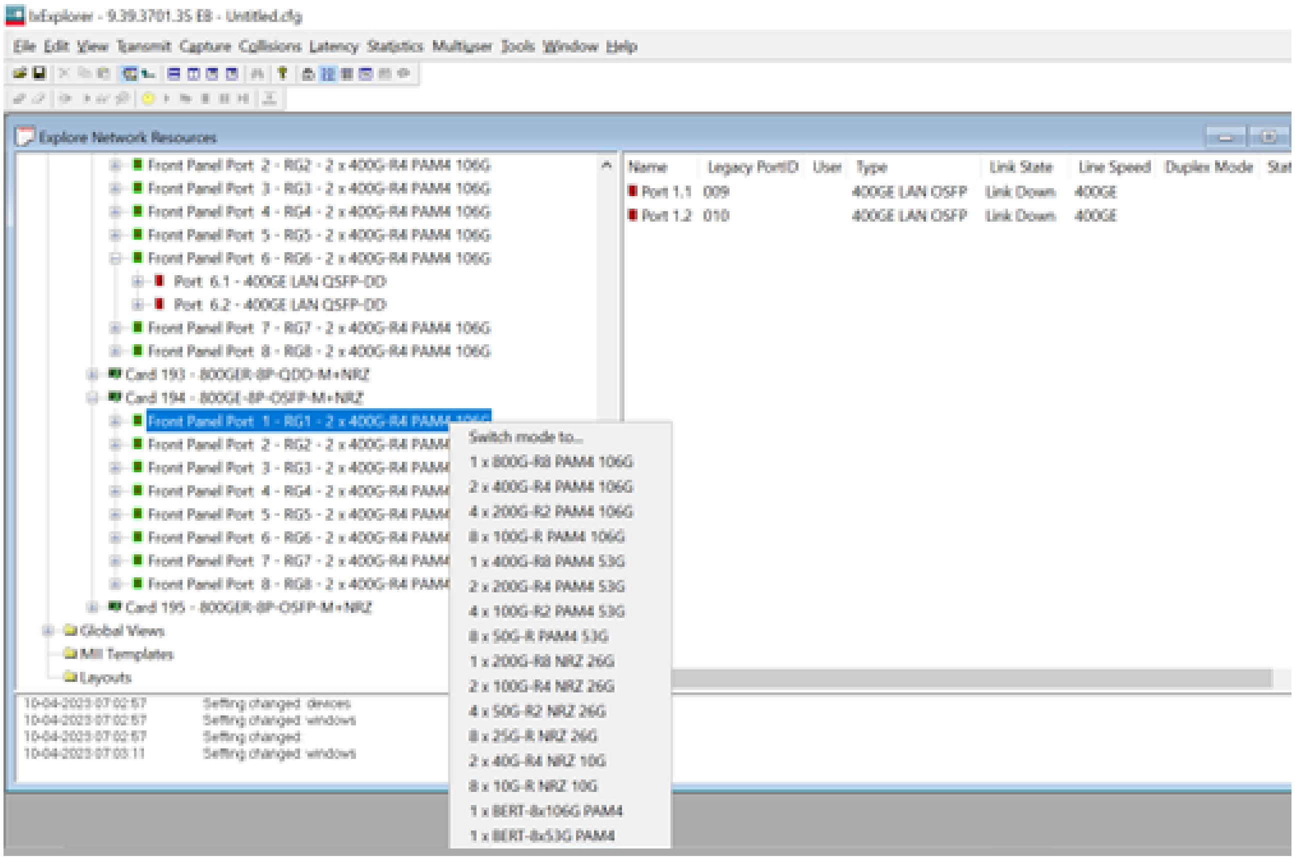
Fully Qualified Port Name (FQPN) format uniquely identifies the port. It is the concatenation of path and port ID. Port numbers of 800GE-8P-OSFP-M+NRZ load module follows FQPN format. In the right pane you can also view the port number in FQPN format in **Name** column along with their corresponding legacy Port ID in **Legacy PortID** column. The FQPN port number indicates the front panel port ID and the fan-out ID. For example, port 1.1 indicates front panel port 1 and fan out 1.

For 800GE, legacy port IDs start from 1.

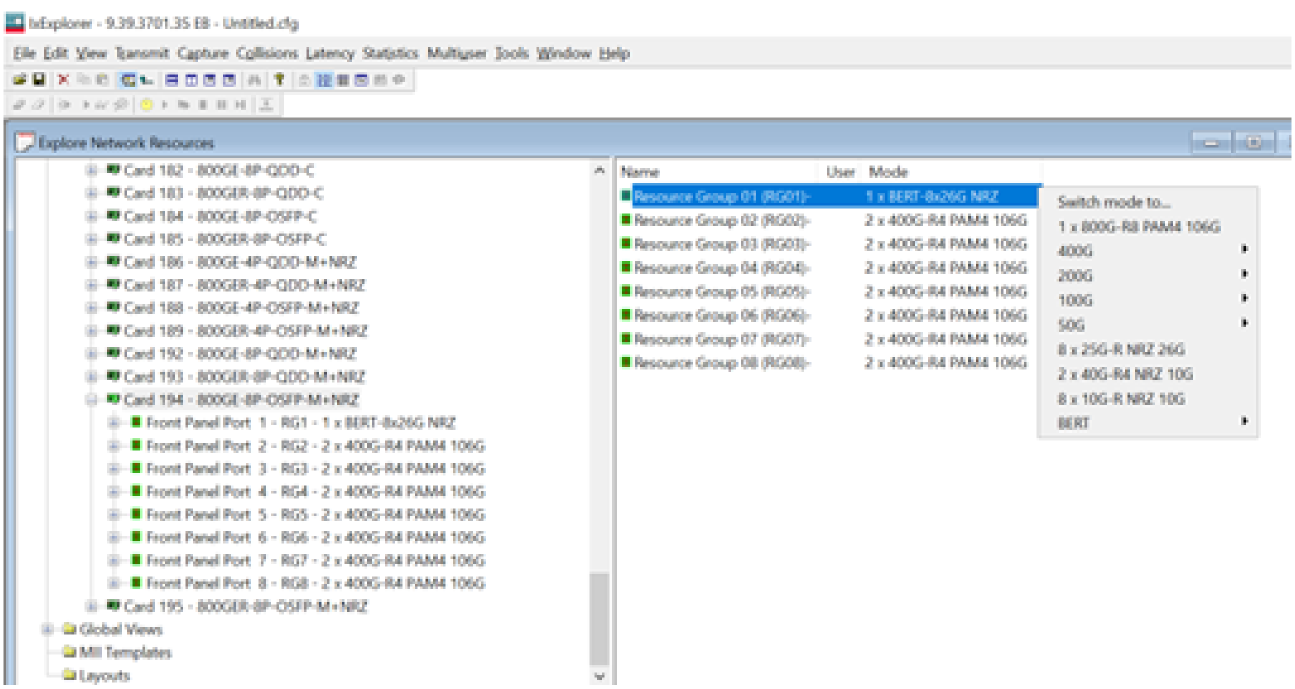
See *TCL Development Guide* for more information on FQPN.

Switch mode

You can switch modes by using the context menu of **Front Panel Port**.



Additionally, after you select the load module, resource groups appear in the right pane. You can switch mode by using the context menu of these resource groups as well.

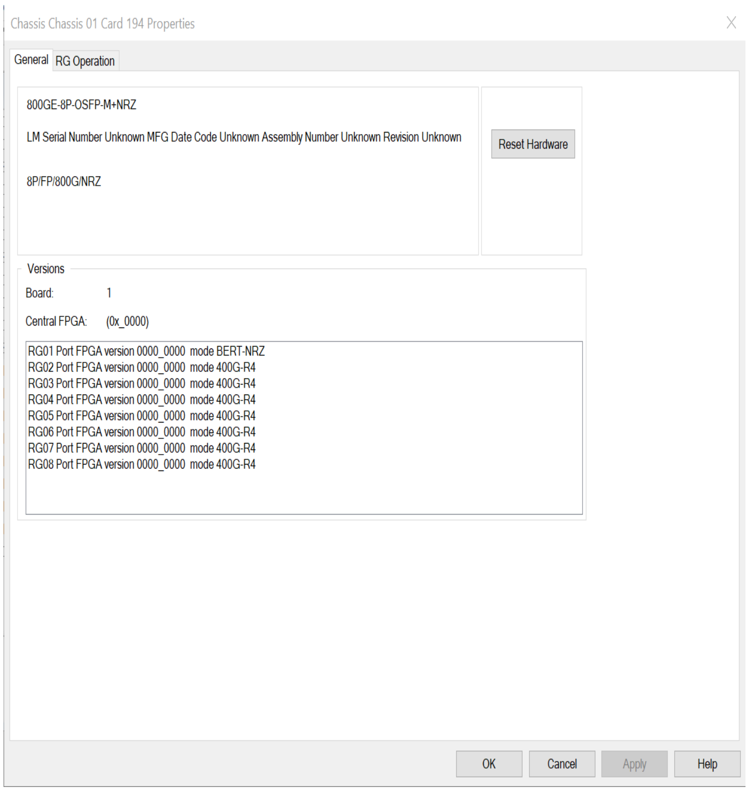


See RG Operation for more information on resource group.

General

The **General** tab shows the board version and FPGA revision level for the board as well as the FPGA versions for each port on the card. The **Reset Hardware** option in this dialog box allows you to reset the hardware to factory defaults. The **Force Hotswap** option will emulate physical removal and insertion of the card. This is done for diagnostic purposes.

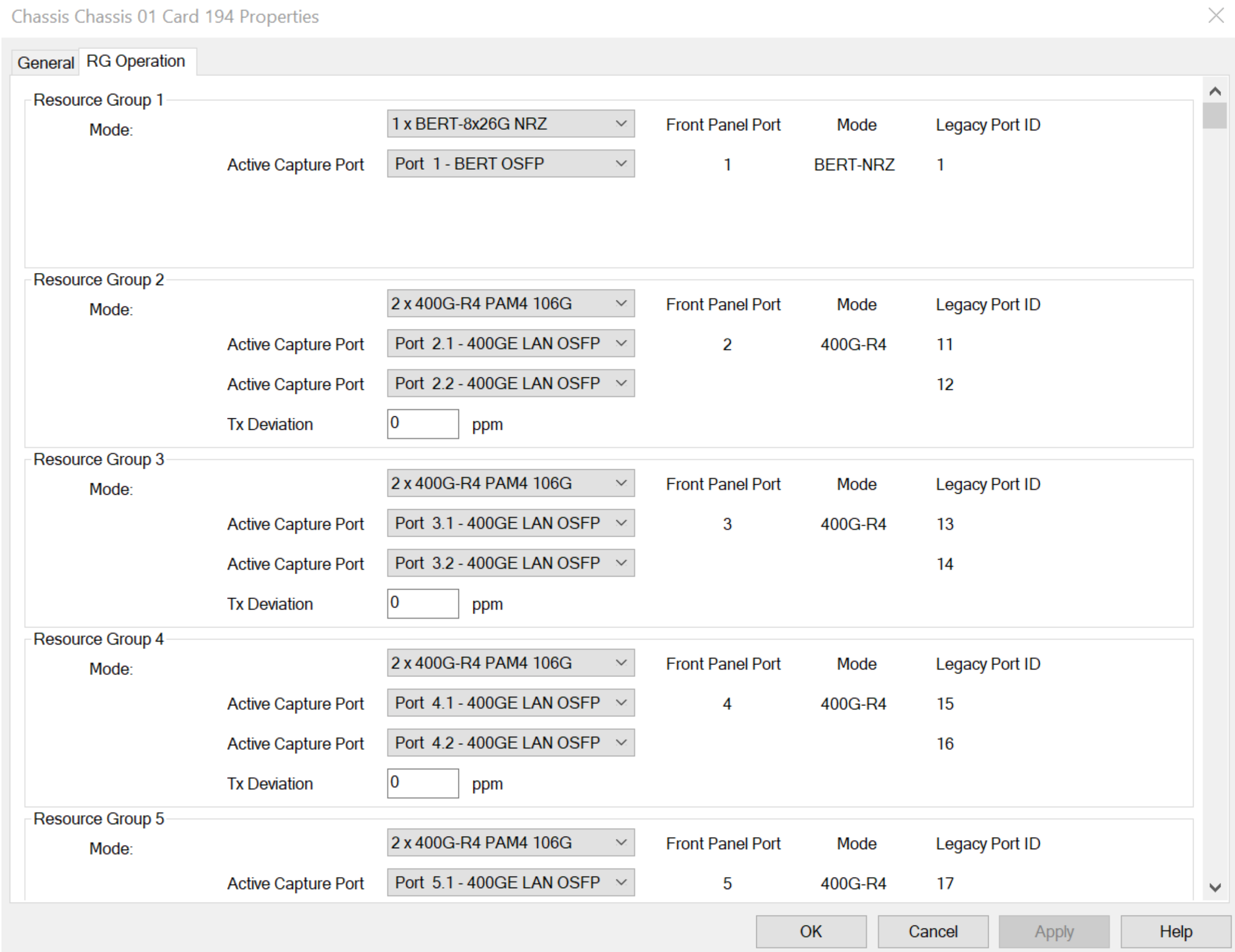
An example of the card properties dialog box and its corresponding **General** tab for the 800GE-8P-OSFP-M+NRZ load module is shown in the following image:



RG Operation

The **RG Operation** tab for **800GE-8P-OSFP-M+NRZ** module is used to select the mode of operation for the module.

The **RG Operation** dialog box for 800GE-8P-OSFP-M+NRZ card properties is shown in the following image:



The different card level modes can be set in the **RG Operation** dialog box.

The 800GE-8P-OSFP-M+NRZ card has multiple speed modes. The card has a transceiver corresponding to each port. In each port, you can insert a fan-out cable, which fans the output into multiple ports instead of using the original port.

Select the mode from the **Mode** list for each Resource Group.

The 800GE-8P-OSFP-M+NRZ card supports the following speed modes:

- 1x800G-R8 PAM4 106G
- 2x400G-R4 PAM4 106G
- 4x200G-R2 PAM4 106G
- 8x100G-R PAM4 106G
- 1x400G-R8 PAM4 53G
- 2x200G-R4 PAM4 53G
- 4x100G-R2 PAM4 53G
- 8x50G-R PAM4 53G

- 1x200G-R8 NRZ 26G
- 2x100G-R4 NRZ 26G
- 4x50G-R2 NRZ 26G
- 8x25G-R NRZ 26G
- 2x40G-R4 NRZ 10G
- 8x10G-R NRZ 10G
- 1xBERT-8x106G PAM4 –Bit Error Rate Testing mode; see BERT Mode
- 1xBERT-8x53G PAM4
- 1xBERT-8x26G NRZ

One unique Resource Group (RG) consists of two native front panel OSFP ports (Port 1 and 2, Port 3 and 4, so forth). All the ports (fan-out ports) from same RG are always in same speed mode. The port number indicates the front panel port ID and the fan-out ID. For example, port number 1.1 indicates front panel port #1 and fan out #1.

800GE-8P-OSFP-M+NRZ supports the new port format. You can see the mapping of these new port formats to the legacy port IDs in the resource groups and in the right pane in the IxExplorer on selecting the front panel port.

You can turn on active capture for each front panels. Each capture has 1MB capture memory, which includes both capture buffer and PIB memory.

For more information on 800GE-8P-OSFP-M+NRZ cards, see *IxOS Platform Reference Guide*.

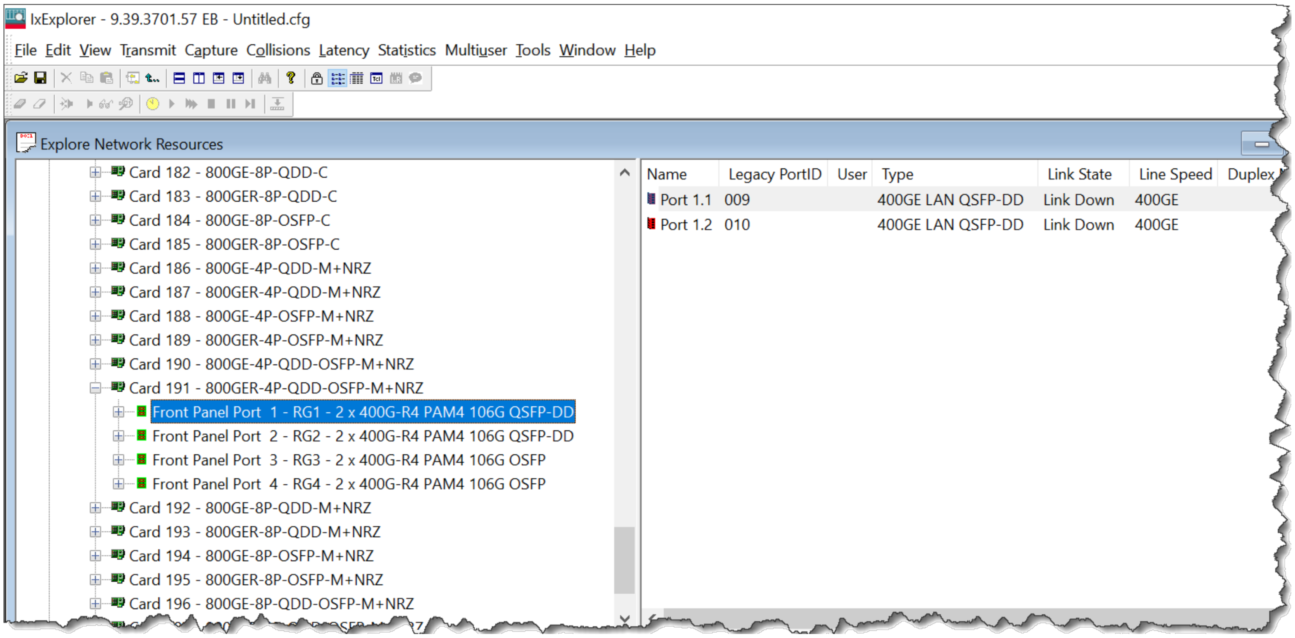
NOTE You can perform data capture only on two ports within a Resource Group or a single port within a Front Port Panel.

800GER-4P-QDD-OSFP-M+NRZ Load Module

The following variant of 800GE QDD-OSFP-M load module is available:

- 800GER-4P-QDD-OSFP-M+NRZ - Reduced performance

When you expand 800GER-4P-QDD-OSFP-M+NRZ load module, you can find the **Front Panel Port** nested below the load module. Card level is not present in 800GER-4P-QDD-OSFP-M+NRZ. When you open the card in the tree view, you can see the front panel ports listed instead of the usual ports. The ports are nested below the front panel ports. When you select a **Front Panel Port**, you can view the corresponding ports in the right pane.



Fully Qualified Port Name (FQPN)

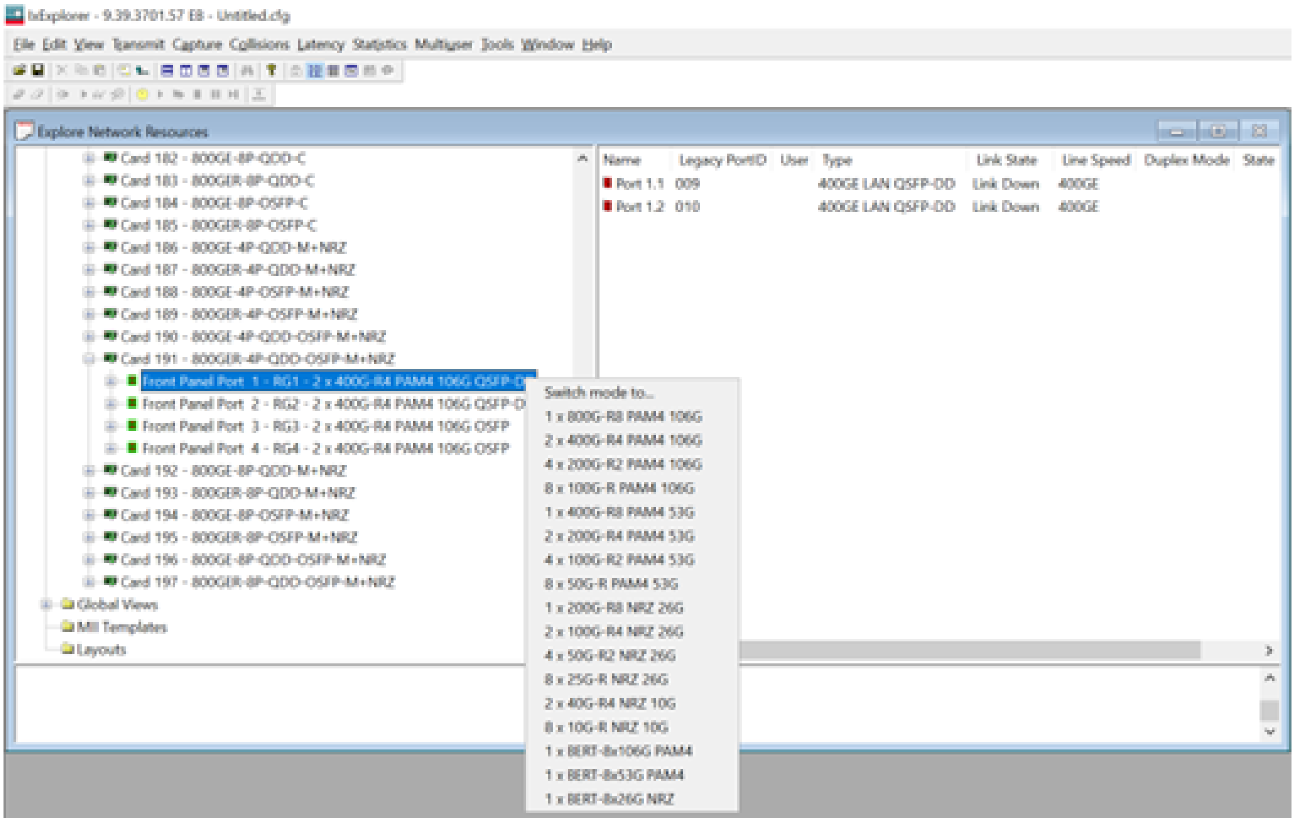
Fully Qualified Port Name (FQPN) format uniquely identifies the port. It is the concatenation of path and port ID. Port numbers of 800GER-4P-QDD-OSFP-M+NRZ load module follows FQPN format. In the right pane you can also view the port number in FQPN format in **Name** column along with their corresponding legacy Port ID in **Legacy PortID** column. The FQPN port number indicates the front panel port ID and the fan-out ID. For example, port 1.1 indicates front panel port 1 and fan out 1.

For 800GE, legacy port IDs start from 1.

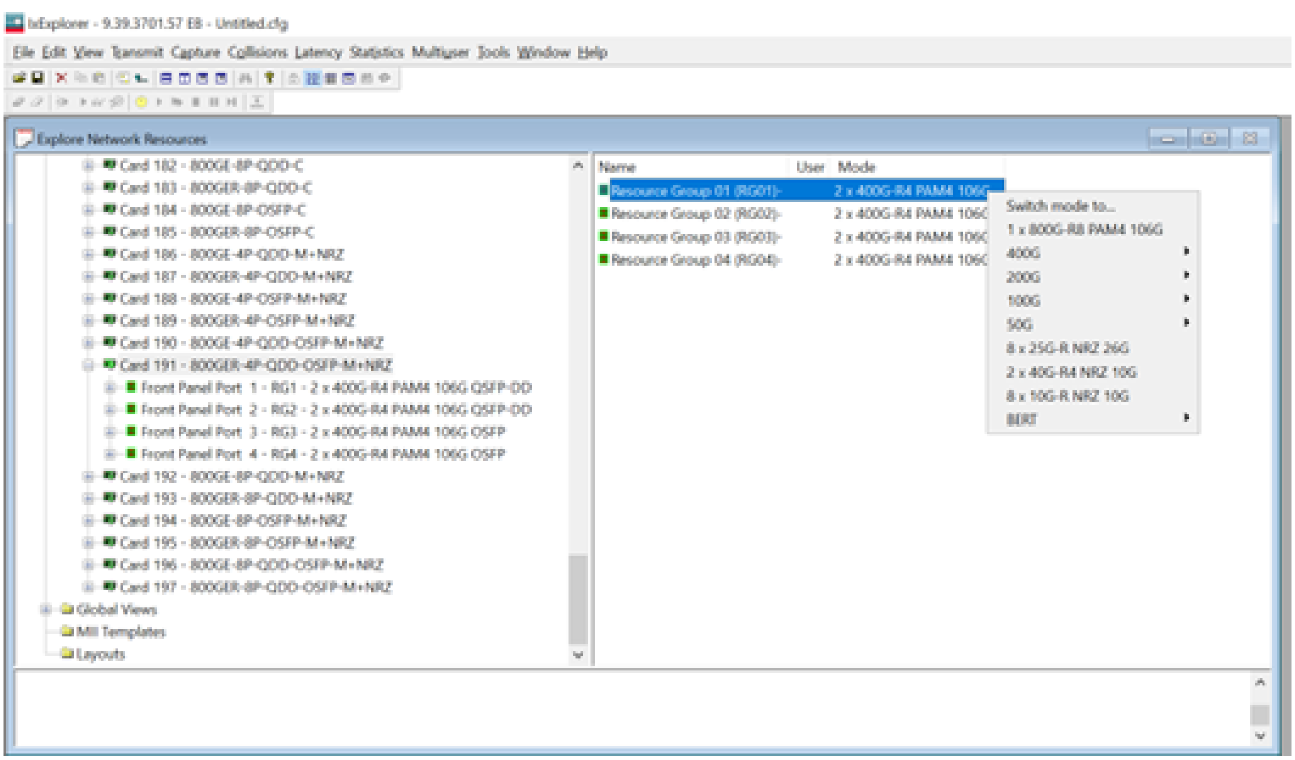
See *TCL Development Guide* for more information on FQPN.

Switch mode

You can switch modes by using the context menu of **Front Panel Port**.



Additionally, after you select the load module, resource groups appear in the right pane. You can switch mode by using the context menu of these resource groups as well.

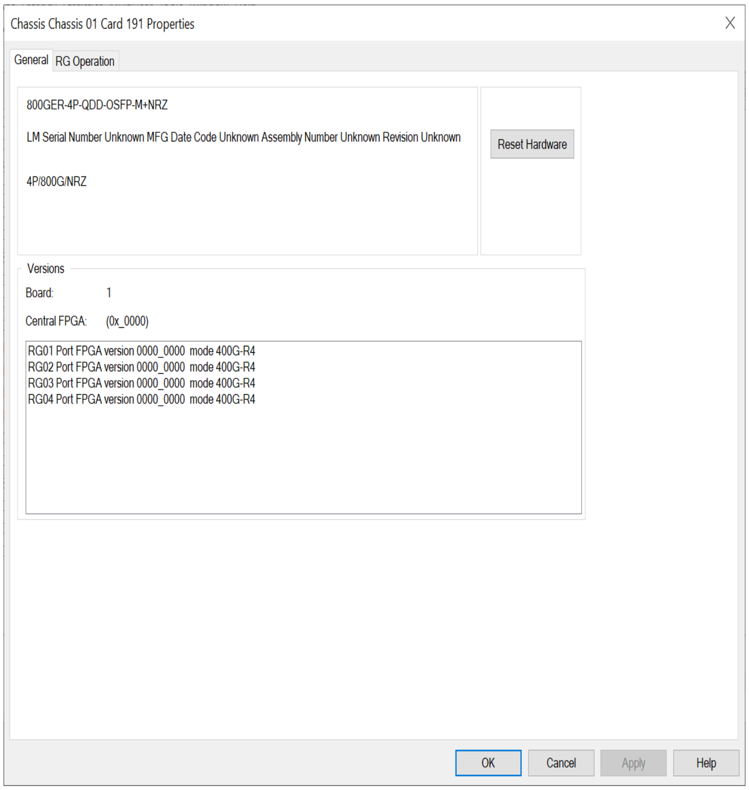


See RG Operation for more information on resource group.

General

The **General** tab shows the board version and FPGA revision level for the board as well as the FPGA versions for each port on the card. The **Reset Hardware** option in this dialog box allows you to reset the hardware to factory defaults. The **Force Hotswap** option will emulate physical removal and insertion of the card. This is done for diagnostic purposes.

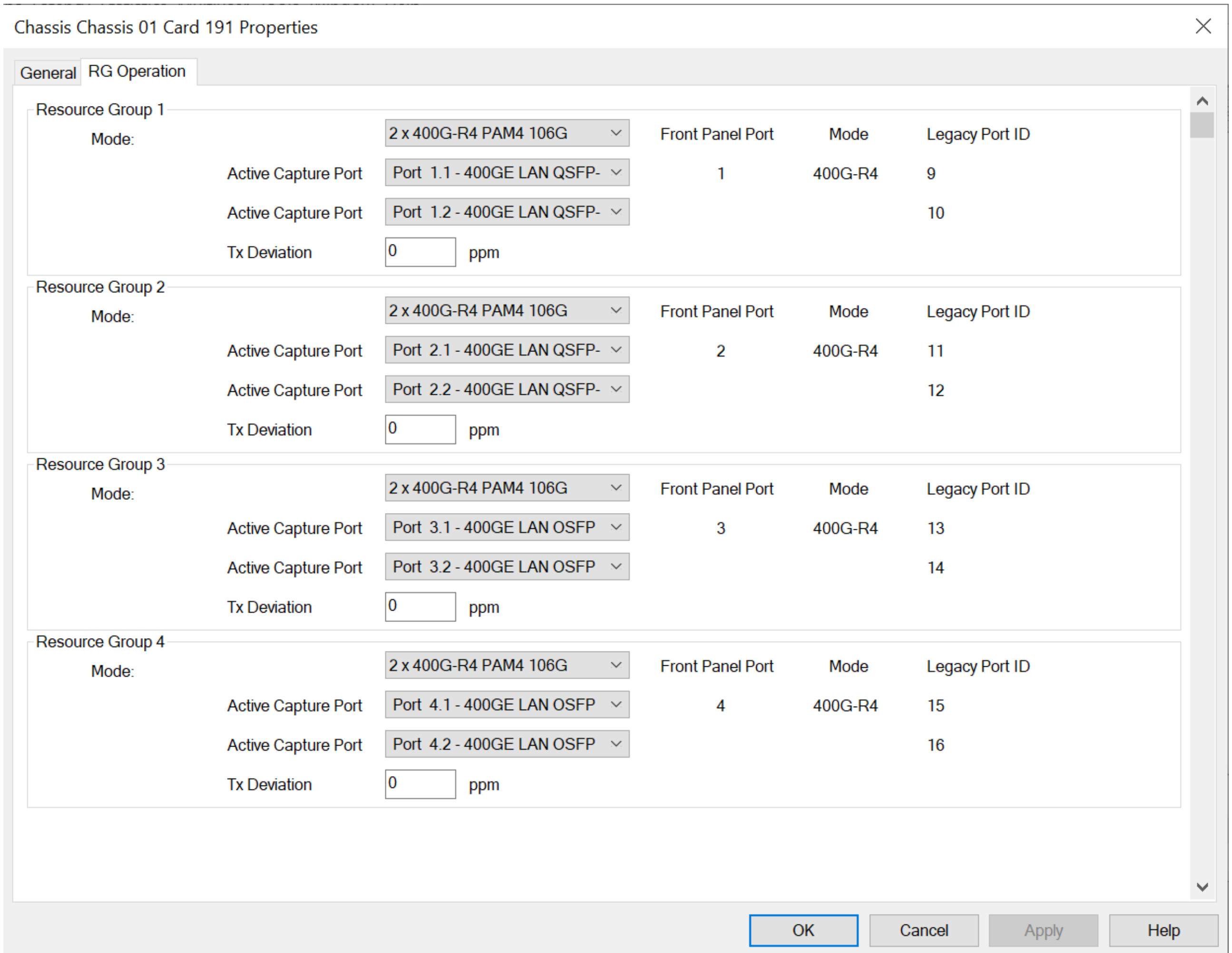
An example of the card properties dialog box and its corresponding **General** tab for the 800GER-4P-QDD-OSFP-M+NRZ load module is shown in the following image:



RG Operation

The **RG Operation** tab for **800GER-4P-QDD-OSFP-M+NRZ** module is used to select the mode of operation for the module.

The **RG Operation** dialog box for 800GER-4P-QDD-OSFP-M+NRZ card properties is shown in the following image:



The different card level modes can be set in the **RG Operation** dialog box.

The 800GER-4P-QDD-OSFP-M+NRZ card has multiple speed modes. The card has a transceiver corresponding to each port. In each port, you can insert a fan-out cable, which fans the output into multiple ports instead of using the original port.

Select the mode from the **Mode** list for each Resource Group.

The 800GER-4P-QDD-OSFP-M+NRZ card supports the following speed modes:

- 1x800G-R8 PAM4 106G
- 2x400G-R4 PAM4 106G
- 4x200G-R2 PAM4 106G
- 8x100G-R PAM4 106G
- 1x400G-R8 PAM4 53G
- 2x200G-R4 PAM4 53G
- 4x100G-R2 PAM4 53G
- 8x50G-R PAM4 53G

- 1x200G-R8 NRZ 26G
- 2x100G-R4 NRZ 26G
- 4x50G-R2 NRZ 26G
- 8x25G-R NRZ 26G
- 2x40G-R4 NRZ 10G
- 8x10G-R NRZ 10G
- 1xBERT-8x106G PAM4 –Bit Error Rate Testing mode; see BERT Mode
- 1xBERT-8x53G PAM4
- 1xBERT-8x26G NRZ

One unique Resource Group (RG) consists of two native front panel ports (Port 1 and 2, Port 3 and 4, so forth). All the ports (fan-out ports) from same RG are always in same speed mode. The port number indicates the front panel port ID and the fan-out ID. For example, port number 1.1 indicates front panel port #1 and fan out #1.

800GER-4P-QDD-OSFP-M+NRZ supports the new port format. You can see the mapping of these new port formats to the legacy port IDs in the resource groups and in the right pane in the IxExplorer on selecting the front panel port.

You can turn on active capture for each front panels. Each capture has 1MB capture memory, which includes both capture buffer and PIB memory.

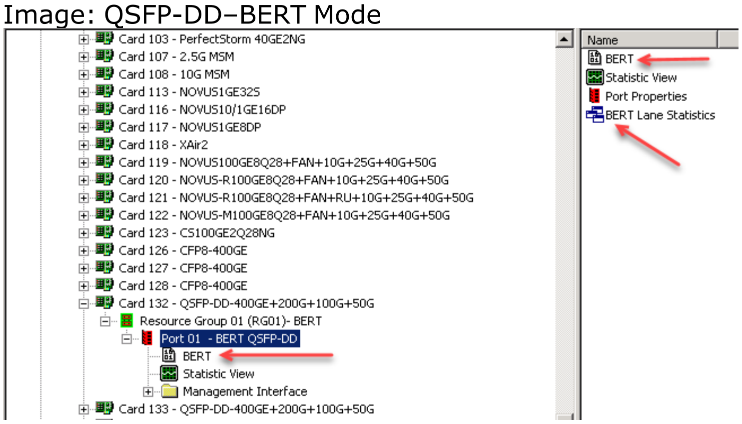
For more information on 800GER-4P-QDD-OSFP-M+NRZ cards, see *IxOS Platform Reference Guide*.

NOTE	You can perform data capture only on two ports within a Resource Group or a single port within a Front Port Panel.

BERT Mode

If BERT is the selected Operation Mode, the tree view of port resources, on the left, and the detail view on the right now feature BERT and BERT Lane Statistics entries, as shown in the following image:

Image: QSFP-DD–BERT Mode



BERT and BERT Lane Statistics entries also appear in a similar manner for the following load modules:

- CFP8-400GE
- QSFP-DD-400GE+200G+100G+50G
- T400GD-8P-QDD+200G+100G+50G
- T400GD-4P-QDD+200G+100G+50G
- T400GD-8P-OSFP+200G+100G+50G
- T400GD-4P-OSFP+200G+100G+50G
- T400GP-4P-QDD+200G+100G+50G
- T400GP-2P-QDD+200G+100G+50G
- S400GD-4H-4P-QDD+FAN+NRZ
- S400GD-8H-8P-QDD+FAN+NRZ
- S400GD-16P-QDD+FAN+NRZ
- 800GE-4P-QDD
- 800GE-8P-QDD-C
- 800GE-4P-QDD-C
- 800GE-8P-OSFP-C
- 800GE-4P-OSFP-C
- 800GE-8P-QDD-M+NRZ
- 800GE-4P-QDD-M+NRZ
- 800GE-8P-OSFP-M+NRZ
- 800GE-4P-OSFP-M+NRZ
- 800GER-4P-QDD-OSFP-M+NRZ

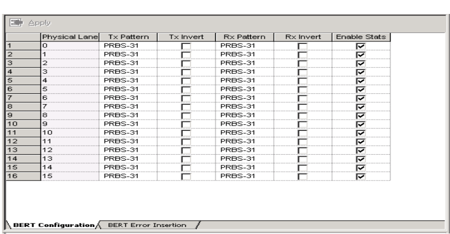
If the BERT entry is selected from either location above, a configuration grid will appear.

For more information on BERT configuration and statistics, see the following:

- BERT Configuration
- BERT Error Insertion
- BERT Lane Statistics

BERT Configuration

Image: BERT Configuration



The fields in the **BERT Configuration** tab are described in the following table:

Table: BERT Configuration

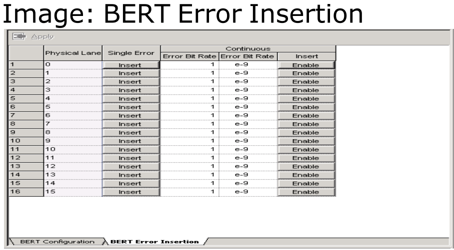
Field/Control	Description
Physical Lane	The physical lane identifier.
Tx Pattern	Select the pseudo-random data pattern to be transmitted. Choose one of: • PRBS-31 • PRBS-31Q • PRBS-13Q • PRBS-23 • PRBS-20 • PRBS-15 • PRBS-11 • PRBS-9 • PRBS-7 • Lane Detection • Alternating One Zero NOTE • Lane Detection allows the Tx Lane to be identified on the Receive side. Selecting the Lane Detection option automatically sets Rx Pattern to Auto Detect. • 800GE-4P-QDD supports only PRBS-31Q and PRBS-13Q Tx Patterns.
Tx Invert	If enabled, the selected data transmission pattern is sent inverted.
Rx Pattern	Select the pseudo-random data pattern to be received. Choose one of: • Auto Detect • PRBS-31 • PRBS-31Q • PRBS-13Q • PRBS-23 • PRBS-20 • PRBS-15 • PRBS-11 • PRBS-9 • PRBS-7 • Alternating One Zero NOTE • Selecting the Auto Detect option will automatically lock to incoming PBRS pattern. • 800GE-4P-QDD supports only PRBS-31Q and PRBS-13Q alongwith Auto Detect Rx Patterns.

Field/Control	Description
Rx Invert	If enabled, the incoming data will be matched against the inverted form of selected receive pattern.
Enable Stats	When selected, BERT Lane Statistics will be enabled.
Tx ppm	The PPM value for BERT per physical lane. This feature is available for the following load modules: • 800GE-8P-QDD-C • 800GE-4P-QDD-C • 800GE-8P-OSFP-C • 800GE-4P-OSFP-C • 800GE-8P-QDD-M+NRZ • 800GE-4P-QDD-M+NRZ • 800GE-8P-OSFP-M+NRZ • 800GE-4P-OSFP-M+NRZ • 800GER-4P-QDD-OSFP-M+NRZ

BERT Error Insertion

The BERT error insertion grid is shown in the following image:

Image: BERT Error Insertion



The fields in the **BERT Error Insertion** tab are described in the following table:

Table: BERT Error Insertion

Section	Field/Control	Description
Single Error	Insert Single Error	When selected, inserts one BERT error.
Continuous Error	Insert Errors Continuously	When selected, inserts BERT errors continuously, at the rate selected in the *Error Bit Rate* field.
	Error Bit Rate - integer	Enter the integer portion of the error bit rate value, which will be multiplied by the selected exponential value in the list. The valid range is 1 to 32.
	Error Bit Rate -	Select the exponential multiplier for the error bit rate value.

Section	Field/Control	Description
	exponent	One of: • e-2 (= 10^{-2}) • e-3 (= 10^{-3}) • e-4 (= 10^{-4}) • e-5 (= 10^{-5}) • e-6 (= 10^{-6}) • e-7 (= 10^{-7}) • e-8 (= 10^{-8}) • e-9 (= 10^{-9}) • e-10 (= 10^{-10})
	Enable	Selecting this button makes the Apply button available. You can select the Apply button to insert errors continuously.

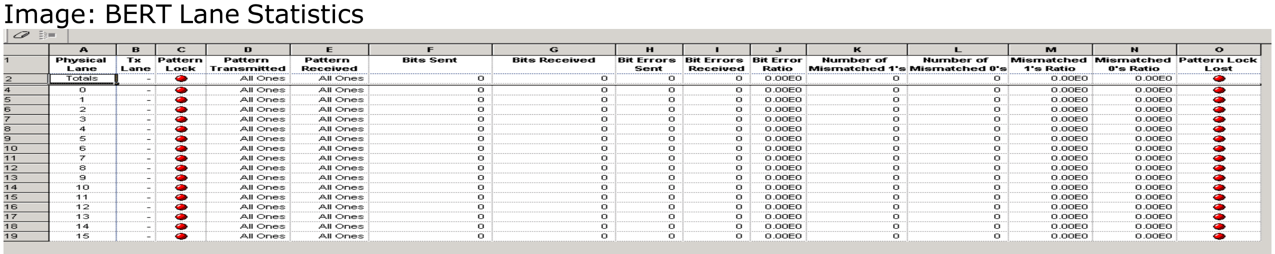
BERT Lane Statistics

If the BERT Lane Statistics entry is selected in the IxExplorer port detail window, a grid will appear as shown in the following image:

For HSE 100GE load module, FlexAP1040SQ - 40GE mode and FlexFE40QP, Lava load module Lava AP40/100GE 2P and Lava AP40/100GE 2RP load modules, you can view the following:

- Statistics for the configured PCS lanes. For more information, PCS Lane Statistics.
- PCS lane error generation. For more information, PCS Lane Error Generation.

Image: BERT Lane Statistics



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Physical Lane	Tx Lane	Pattern Lock	Pattern Transmitted	Pattern Received	Bits Sent	Bits Received	Bit Errors Sent	Bit Errors Received	Bit Error Ratio	Number of Mismatched 1's	Number of Mismatched 0's	Mismatched 1's Ratio	Mismatched 0's Ratio	Pattern Lock Lost
2	Totals	-		All Ones	All Ones	0	0	0	0	0.00E0	0	0	0.00E0	0.00E0	
4	0	-		All Ones	All Ones	0	0	0	0	0.00E0	0	0	0.00E0	0.00E0	
5	1	-		All Ones	All Ones	0	0	0	0	0.00E0	0	0	0.00E0	0.00E0	
6	2	-		All Ones	All Ones	0	0	0	0	0.00E0	0	0	0.00E0	0.00E0	
7	3	-		All Ones	All Ones	0	0	0	0	0.00E0	0	0	0.00E0	0.00E0	
8	4	-		All Ones	All Ones	0	0	0	0	0.00E0	0	0	0.00E0	0.00E0	
9	5	-		All Ones	All Ones	0	0	0	0	0.00E0	0	0	0.00E0	0.00E0	
10	6	-		All Ones	All Ones	0	0	0	0	0.00E0	0	0	0.00E0	0.00E0	
11	7	-		All Ones	All Ones	0	0	0	0	0.00E0	0	0	0.00E0	0.00E0	
12	8	-		All Ones	All Ones	0	0	0	0	0.00E0	0	0	0.00E0	0.00E0	
13	9	-		All Ones	All Ones	0	0	0	0	0.00E0	0	0	0.00E0	0.00E0	
14	10	-		All Ones	All Ones	0	0	0	0	0.00E0	0	0	0.00E0	0.00E0	
15	11	-		All Ones	All Ones	0	0	0	0	0.00E0	0	0	0.00E0	0.00E0	
16	12	-		All Ones	All Ones	0	0	0	0	0.00E0	0	0	0.00E0	0.00E0	
17	13	-		All Ones	All Ones	0	0	0	0	0.00E0	0	0	0.00E0	0.00E0	
18	14	-		All Ones	All Ones	0	0	0	0	0.00E0	0	0	0.00E0	0.00E0	
19	15	-		All Ones	All Ones	0	0	0	0	0.00E0	0	0	0.00E0	0.00E0	

The fields (columns) of statistics are described in the following table:

Table: BERT Lane Statistics

Field/Control	Description
Physical Lane	The physical lane identifier.
Tx Lane	Not applicable.
Pattern Lock	Indicates whether the receive side is locked to a particular pattern. Green indicates success; red indicates failure.

Field/Control	Description
Pattern Transmitted	The pseudo-random data pattern that was transmitted.
Pattern Received	The pseudo-random data pattern that was received.
Bits Sent	The total number of bits sent.
Bits Received	The total number of bits received.
Bit Errors Sent	The total number of bit errors sent.
Bit Errors Received	The total number of bit errors received.
Bit Error Ratio (BER)	The ratio of received errored bits compared to the total number of bits received. In the format: 0.00E0.
Number of Mismatched 1's	The number of expected ones received as zeroes.
Number of Mismatched 0's	The number of expected zeroes received as ones.
Mismatched 1's Ratio	The ratio of the number of expected ones received as zeroes to all bits. In the following format: 0.00E0.
Mismatched 0's Ratio	The ratio of the number of expected zeroes received as ones to all bits. In the following format: 0.00E0.
Pattern Lock Lost	Indicates whether the receive side is currently (Red) or has previously (Yellow) lost pattern lock.

CHAPTER 19

Port Properties — 10/100/1000 Ethernet Family

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box is a view that corresponds to the module type. The following sections describe the functions and configuration of the 10/100/1000 Ethernet family of module port properties.

Port properties for the various Ethernet family module types are described in the following sections.

- Port Properties for 10, 100, and/or 1000 Modules includes the 3 types of modules listed below):
  - Port Properties for 10, 100, and/or 1000 Modules
  - Port Properties for Ethernet Family of Modules (including TXS Layer-7)
  - Port Properties for Copper 10/100/1000 Modules
  - Port Properties for 10/100/1000 XMV Modules
- Port Properties for Gigabit and GBIC Modules
- Port Properties for Gigabit and GBIC Modules
- Port Properties for Power over Ethernet (PoE)
- ALM1000T8/CPM1000T8 Module Port Properties
- ELM1000ST2 Module Port Properties
- Port Properties for Xcellon-Ultra and ASM1000XMV12X

Port Properties for 10, 100, and/or 1000 Modules

The Ethernet modules supporting 10, 100, and/or 1000 Mbps operation often have similar port properties, and are grouped together in this section. Many of the same individual *Port Properties* dialog boxes are used for these modules. The module types included in this group are listed below:

- Port Properties for 10/100 Modules
- Port Properties for Ethernet Family of Modules
- Port Properties for Copper 10/100/1000 Modules
- Port Properties for 10/100/1000 XMV Modules

The *Port Properties* dialog box is accessed by double-clicking a port in Resources window, or by selecting a port and selecting the *Properties* menu option.

Port Properties for 10/100 Modules

The complete specifications for the 10/100 and 100 Mbps modules can be found in the *Ixia Platform Reference Manual*.

The tabbed dialog boxes in the set indicate the types of properties that may be modified for 10/100, 10/100-3, and 100 Mbps modules. The group of tabs available in each set is dependent on the type of module. The list of available tabs follows:

- **Auto Negotiation** Tab
- **Advanced MII** Tab(*MII Register* Files for additional information on MII registers.)
- **Flow Control** Tab
- **Collision Backoff Algorithm** Tab
- **Forced Collisions** Tab
- **Status** Tab
- Transmit Modes for 10/100 Modules (Not available for 100-3 modules.)

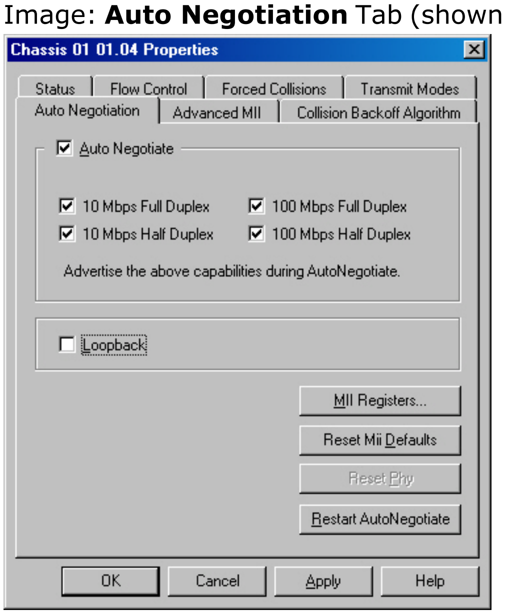
The *Port Properties* dialog box is access by double-clicking a port in Resources window, or by selecting a port and then selecting the *Properties* menu option.

Auto Negotiation Tab

The ***Auto Negotiation*** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Auto Negotiation*** tab.

Auto negotiation controls how the port communicates with other ports. The **Auto Negotiation** tab offers access to the Auto Negotiation and Loopback properties. This tab is shown in the following image:

Image: **Auto Negotiation** Tab (shown for 10/100 module)



The fields and controls in this tab are described in the following table:

Table: **Auto Negotiation** Tab

Field/Control	Description
Auto Negotiate	If selected, allows auto negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during AutoNegotiation.
10 Mbps Full Duplex	If selected, auto negotiate will advertise 10 Mbps full duplex operation.
10 Mbps Half Duplex	If selected, auto negotiate will advertise 10 Mbps half duplex operation.
100 Mbps Full Duplex	If selected, auto negotiate will advertise 100 Mbps full duplex operation.
100 Mbps Half Duplex	If selected, auto negotiate will advertise 100 Mbps half duplex operation.
Loopback	If selected, the port is set to internally loopback from transmit to receive.
MII Registers...	Allows the current MII register values to be read and written. MII Register Files for additional information on MII Registers.
Reset MII Defaults	Resets all of the port's properties back to the default settings.
Reset Phy	Does not apply to this module; it is always dimmed.
Restart AutoNegotiate	When pushed, the Auto Negotiate sequence is restarted.

The MII Control register pages for different modules vary somewhat, based on the module.

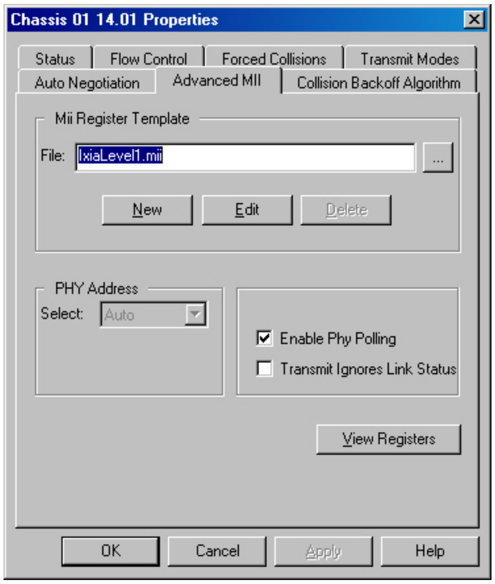
Advanced MII Tab

The **Advanced MII** tab allows for the proper association of MII register labels with the actual hardware in use (for example, a port). It is initially set to use the appropriate default template that corresponds to one of the PHYs in use on that Ixia module card. Additions or corrections can be made, and even saved under a different template name.

The **Advanced MII** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Advanced MII*** tab. The tab for a port is shown in the following image:

NOTE Note: MII Register Files for additional information on MII Registers. For Copper 10/100/1000 modules, *Advanced MII for Copper 10/100/100 Modules*.

Image: **Advanced MII** Tab (shown for 10/100 module)



The upper part of the tab, labeled *MII Register Template*, is used to control the selection and editing of an MII register template file. MII Register Template files hold the register definitions. The lower part of the dialog box allows the PHY address to be set. The fields and controls in this tab are described in the following table:

Image: **Advanced MII** Tab

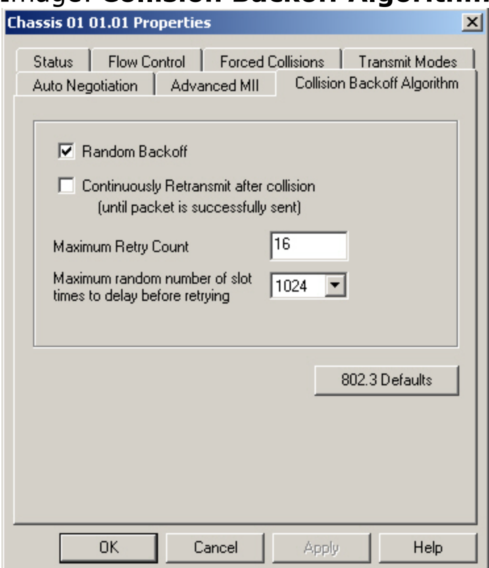
Section	Field/Control	Description
MII Register Template	File	The name of the MII register file.
	Browse	Opens up a standard Windows file browsing window in the directory `C:\Program Files\Ixia\MII`, looking for files that end in *.mii*.
	New	Allows the creation of a new MII register Template file. New/Edit MII Register Template Setup—Management Page for operational details.
	Edit	Allows the editing of the indicated file. New/Edit MII Register Template Setup—Management Page for operational details.
	Delete	Deletes the current file after a confirmation dialog box.
PHY Address	Select:	Allows the address of the PHY to be set to Auto or a constant from 0 to 31.
	Enable Phy Polling	If selected, then the PHY is continuously polled during MII setup operation.

Section	Field/Control	Description
	Transmit ignores link status	If selected, will allow transmission of packets even if the link is down.

Collision Backoff Algorithm Tab

The ***Collision Backoff Algorithm*** tab is accessed by selecting a port in Resources pane and then selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Collision Backoff Algorithm*** tab. The **Collision Backoff Algorithm** tab for 10/100 modules is shown in the following image:

Image: **Collision Backoff Algorithm** Tab (shown for 10/100 module)



Refer to the Forced Collision Operation section in the 'Theory of Operation: General' chapter of the **Ixia Platform Reference Manual** for additional information on forced collisions.

The options and controls available on the **Collision Backoff Algorithm** tab are as follows:

Table: **Collision Backoff Algorithm** Tab

Field/Control	Description
Random Backoff	When a collision occurs, wait a random amount of time before retrying the transmission. The *Maximum Retry Count* and *Maximum number of random slot times to delay before retrying* settings below govern how often and how long retries will be attempted.
Continuously Retransmit After Collision (until packet is successfully sent)	When a collision occurs, continuously retransmit the packet until the *Maximum Retry Count* is reached.
Maximum Retry	The maximum number of retries that will be attempted for each packet.

Field/Control	Description
Count	
Maximum random number of slot times to delay before retrying	Each successive retry operates by selecting a slot time over a range that doubles with each retry (2, 4, 8,..., 1024). This value controls the maximum number of slot times used.
802.3 Defaults	Restores the IEEE 802.3 standard default values for *Maximum Retry Count* (16) and *Maximum number of random slot times to delay before retrying* (1024).

The *Apply* button can be used to immediately change the port's properties without leaving the tab; the *OK* button performs the same function and exits the tab as well.

Flow Control Tab

For NGY module, NGY Port Properties–Flow Control.

For Xcellon-Flex module, Flex Port Properties—Flow Control.

For Xcellon-Multis module, Xcellon-Multis Port Properties—Flow Control.

For Novus module, Novus Port Properties—Flow Control.

For Novus 10GE/1GE/100M module, Novus 10GE/1GE/100M Port Properties—Flow Control.

For QSFP-DD module, QSFP-DD Port Properties—Flow Control.

For CFP8 module, CFP8 Port Properties—Flow Control.

For T400GD-8P-QDD module, see T400GD-8P-QDD Port Properties—Flow Control.

For T400GD-8P-OSFP module, see T400GD-8P-OSFP Port Properties—Flow Control.

For T400GP-4P-QDD module, see T400GP-4P-QDD Port Properties—Flow Control.

For T400GP-2P-QDD module, see T400GP-2P-QDD Port Properties—Flow Control.

For NOVUS25/10GE8SFP28 module, see NOVUS25/10GE8SFP28 Properties—Flow Control

For S400GD-16P-QDD+FAN+NRZ module, see S400GD-16P-QDD+FAN+NRZ Port Properties—Flow Control

For 800GE-4P-QDD module, see 800GE-4P-QDD Port Properties—Flow Control

For 800GE-4P-QDD-C module, see 800GE-4P-QDD-C Port Properties—Flow Control

For 800GE-4P-OSFP-C module, see 800GE-4P-OSFP-C Port Properties—Flow Control

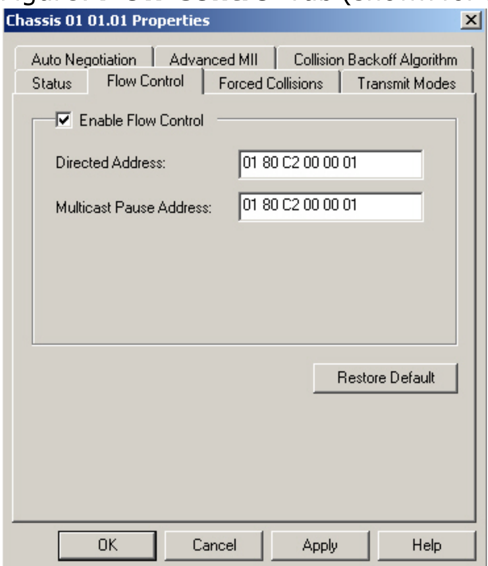
For 800GE-8P-QDD-M+NRZ module, see 800GE-8P-QDD-M+NRZ Port Properties—Flow Control

When a port is receiving data at a faster rate than it can handle from another, directly connected port, the receiving port can send a MAC control PAUSE frame to the sending port to temporarily halt transmission of frames. The PAUSE function is defined in IEEE 802.3.

NOTE For 10GE module Flow Control. For 10/100 TXS8, 1000SFPS4, and 10/100/1000 TXS4 module Flow Control, Flow Control Tab for Ethernet Modules

The ***Flow Control*** tabis accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Flow Control*** tab. The behavior of the port's link layer (MAC) flow control may be set with the ***Flow Control*** tab, shown in the following figure:

Figure: **Flow Control** Tab (shown for 10/100 module)



The options and controls available for the **Flow Control** tab are described in the following figure:

Table: **Flow Control** Tab

Field/Control	Description
Enable Flow Control	Must be selected for the port's MAC flow control mechanisms to be enabled.
Directed Address	This is the MAC address that the port will listen on for a directed pause message.
Multicast Pause Address	This is the MAC address that the port will listen on for a multicast pause message.
Restore Default	Resets both the Directed Address and Multicast Pause Address back to the default value of *01 80 C2 00 00 01.*

Forced Collisions Tab

Forced collisions can be generated on the receive side of a port on certain modules, when the port is in half-duplex mode. Forced collisions operate by generating data as information is being received. The collision takes the form of a number of 4-bit nibbles generated at a specific offset within a packet. A number of consecutive collisions are generated, followed by a non-colliding period. This combination of collisions and non-colliding periods can be repeated indefinitely, or for a specified number of repetitions. See the Port Data Capture Capabilities section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual* for a full explanation of the theory of forced collision operation.

Collisions must be separately started, before capture. See IxExplorer Operation for ways to initiate collisions.

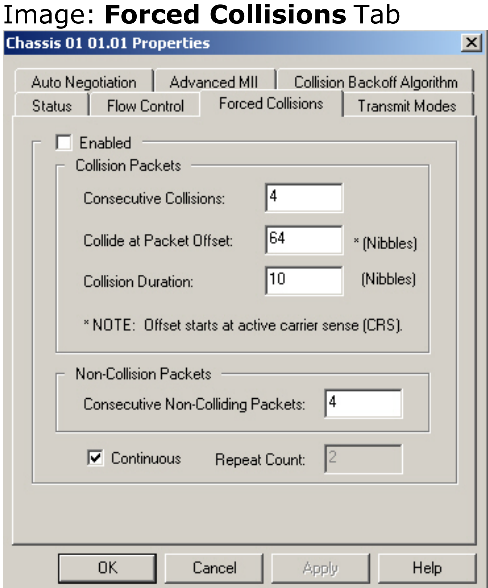
The ***Forced Collisions*** tabis accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Forced Collisions*** tab.

NOTE

The forced collision algorithm on the T-5 and 10/100 load modules does not generate a preamble and SFD as part of the collision. This may cause some PHYs not to detect the collision. This is not a problem with collisions occurring during normal operation (not initiated due to a forced collision).

The tab used to control forced collisions is shown in the following image. (Forced Collisions are not supported on 10/100 TXS8, 10/100/1000 TXS4, or 1000 SFPS4 modules.)

Image: **Forced Collisions** Tab



The options and controls available in the **Forced Collisions** tab are described in the following image:

Table: **Forced Collisions** Tab

Section	Field/Control	Description
Enabled		This box must be selected to enable the generation of forced collisions.
Collision Packets	Consecutive Collisions	The number of consecutive collisions to generate at a time. Collisions take place on the first received packet after enabled.
	Collide at Packet Offset	The offset from the beginning of packet active carrier sense (the beginning of the preamble) to the start of the collision, measured in nibbles.

Section	Field/Control	Description
	Collision Duration	The duration of each collision, measured in nibbles.
Non-Collision Packets	Consecutive Non-Colliding Packets	The number of packets that will not be modified after each time that the programmed consecutive collisions have occurred.
	Continuous	If selected, the pattern of collisions and non-collisions is repeated indefinitely.
	Repeat Count	If continuous is not selected, this value is the number of times that the pattern of collisions/non-collisions is repeated.

The *Apply* button can be used to immediately change the port's properties without leaving the tab. The *OK* button performs the same function and exits the tab as well.

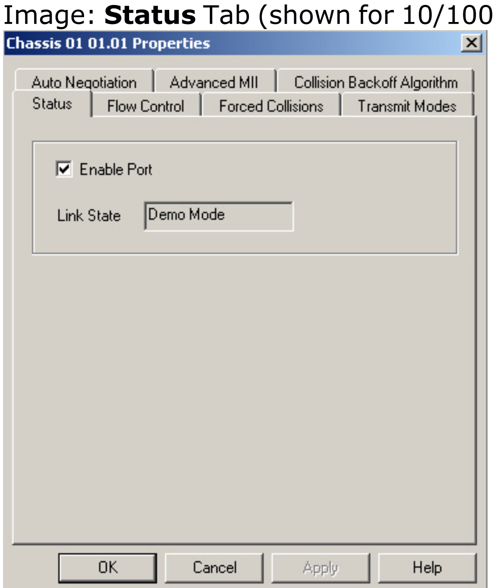
Status Tab

NOTE For VM Port **Status** tab properties, VM Port Properties—Status.

The **Status** tab shows the link state and allows the port to be disabled manually. This feature also automatically disables a port which has a hardware fault—at power up or at run time. It allows the chassis to restart without taking the time to check the status of this port. The port can also be disabled if a hardware fault occurred, or for some other purpose. The *Enable Port* check box is enabled by default.

The ***Status*** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the **Status** tab. The **Status** tab is shown in the following image. (Type-3 modules do not support this capability.)

Image: **Status** Tab (shown for 10/100)

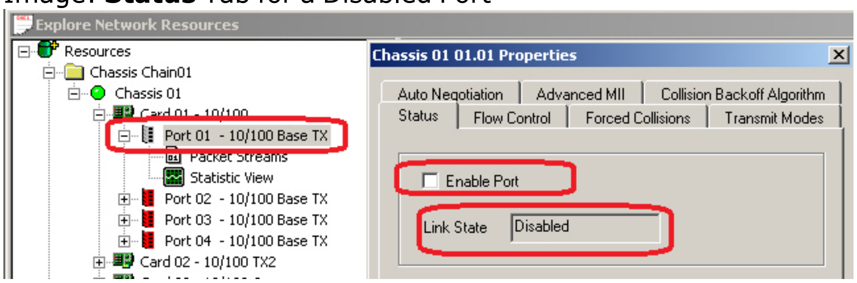


The view of the status of the link is also shown in the Statistic View for this port. The possible states are:

- Hardware Fault
- Disabled, Busy
- Link Up
- Link Down
- Loopback
- WriteMII
- Demo Mode
- empty (no status shown if the chassis is disabled)

The port can be disabled by selecting the check box to remove the checkmark and then pressing the *Apply* button. The view will then read 'Disabled,' and the port icon in the Resources tree will be changed to gray, as shown in the following image:

Image: **Status** Tab for a Disabled Port



Transmit Modes for 10/100 Modules

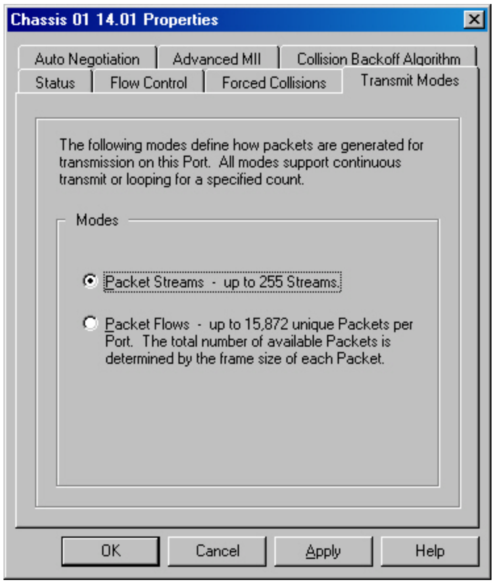
The ***Transmit Modes*** tab controls the basic transmit mode of the port. These modes define how packets are generated for transmission on the port. All modes support continuous transmit or looping for a specified count.

The ***Transmit Modes*** tab is accessed by selecting a port in Resources pane and then selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Transmit Modes*** tab. The **Transmit Modes** tab for 10/100 modules is shown in the following image:

NOTE

Transmit Modes Tab for Ethernet Modules for information on the **Transmit Modes** tab for those modules.Transmit Modes for Gigabit Modules for information on the **Transmit Modes** tab for Gigabit, GBIC, and Copper 10/100/1000 (using Gigabit) modules.

Image: **Transmit Modes** Tab (shown for 10/100 module)



The fields and controls for this tab are described in the following table:

Table: **Transmit Modes** Tab

Field/Control	Description
Packet Streams	Sets the basic operating mode for the port to packet streams. This allows the hardware to generate up to 255 streams. Or, a stream may be programmed for continuous burst or packet generation—generating a continuous, infinite stream.
Packet Flows	Sets the basic operating mode for the port to packet flows. This allows the software to generate up to 15,872 unique packets. Ultimately, the number of packets is determined by the amount of port memory available divided by the size of the packets.

The choice of the file name for image files is arbitrary, but a consistent extension should be chosen to avoid confusion. Although many ports may share the use of a single file, each port must individually specify the file name. The Port Copying operation (Port Copying Operation) will copy this information from port to port if desired. The image files are all kept in the *FlowImage* sub-directory beneath the Ixia installation directory—usually *C:\Program Files\Ixia\FlowImage*).

See the Port Transmit Capabilities section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual* for a full explanation of streams versus flows.

Port Properties for Ethernet Family of Modules

The Ethernet family of modules (10/100 TXS8, 10/100/1000 TXS4, 1000 SFPS4, 10/100/1000 ALM T8, and so forth) has per-port CPUs. The *Port Properties* dialog box for the full-featured TXS modules, as well as the versions that support Layer 2 and 3 capabilities, include the following set of tabs.

- **Auto Negotiation** Tab for Ethernet Modules
- **Advanced MII** Tab for Ethernet Modules(MII Register Files for additional information on MII registers.)
- **Status** Tab for Ethernet Modules
- **Flow Control** Tab for Ethernet Modules
- **General** Tab for Ethernet Modules
- **Transmit Modes** Tab for Ethernet Modules
- **OAM** Tab for Ethernet Modules
- **Auto Instrumentation** Tab for Ethernet Modules

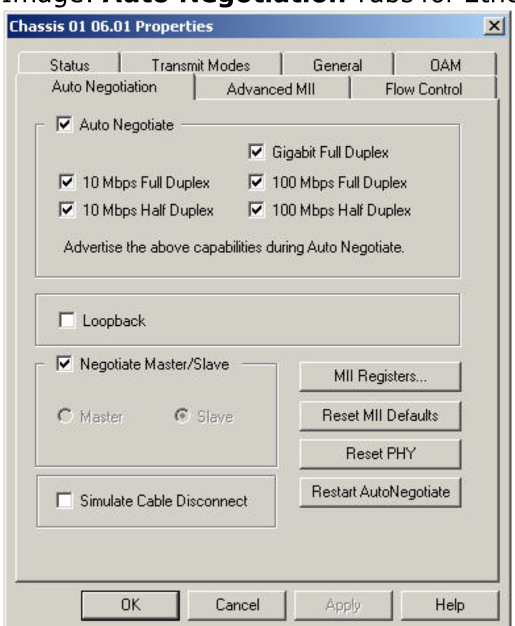
The *Port Properties dialog box* is accessed by double-clicking a port in Resources window, or by selecting a port and then selecting the *Properties* menu option.

Auto Negotiation Tab for Ethernet Modules

Auto negotiation controls how the port establishes communication with other ports. The ***Auto Negotiation*** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Auto Negotiation*** tab.

The **Auto Negotiation** tabs for the Ethernet family of modules are shown in the following image:

Image: **Auto Negotiation** Tabs for Ethernet Modules



The fields and controls in these tabs are described in the following table. The combination of fields and controls available depends on the module.

Table: Ethernet Modules—Auto Negotiation

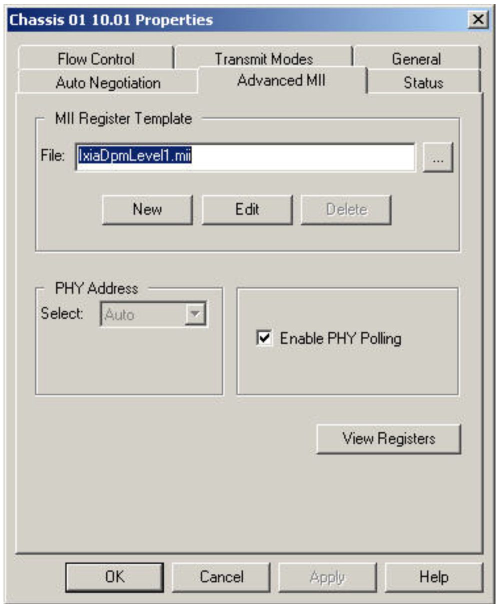
Field/Control	Description
Auto Negotiate	If selected, allows auto negotiation of speed and duplex operation based on the various choices. The capabilities which are selected are advertised

Field/Control	Description
	during AutoNegotiation.
Gigabit Full Duplex	If selected, auto negotiate will advertise Gigabit (1000 Mbps) full duplex operation.
10 Mbps Full Duplex	If selected, auto negotiate will advertise 10 Mbps full duplex operation.
10 Mbps Half Duplex	If selected, auto negotiate will advertise 10 Mbps half duplex operation.
100 Mbps Full Duplex	If selected, auto negotiate will advertise 100 Mbps full duplex operation.
100 Mbps Half Duplex	If selected, auto negotiate will advertise 100 Mbps half duplex operation.
Loopback	If selected, the port is set to internally loopback from transmit to receive.
Simulate Cable Disconnect	If this is selected, the port acts as if the cable has been disconnected. The port will neither transmit nor receive.
Negotiate Primary/Secondary	If selected, determining which port is Primary or Secondary is performed **automatically**. (Checking this box will disable the manual option for selecting Primary or Secondary).
Primary	If selected, port will be configured as Primary.
Secondary	If selected, port will be configured as Secondary.
MII Registers...	Allows the current MII register values to be read and written. MII Register Files for additional information on MII Registers.
Reset MII Defaults	When this button is selected, it resets all of the port's MII properties back to the default settings.
Restart PHY	When this button is selected, it resets the PHY associated with the port through the MII control register.

Advanced MII Tab for Ethernet Modules

The ***Advanced MII*** tab is accessed by selecting a port in Resources pane and then selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Advanced MII*** tab. The **Advanced MII** tab for the 10/100 TXS8, 10/100/1000 TXS4, 1000 SFPS4, ALM1000T8, and ELM1000ST2 modules is shown in the following image. The format for this tab is the same for all three types of modules, but the file name for the MII Register Template will be different for each one. (The tab shown in *Image:* ***Advanced MII*** *Tab* for Ethernet Modules is for the 10/100 TXS8 module.)

Image: **Advanced MII** Tab for Ethernet Modules



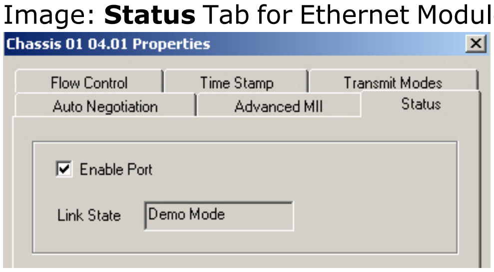
Refer to the following table for information about the fields and controls in this tab.

Status Tab for Ethernet Modules

The **Status** tab shows the link state and allows the port to be disabled manually. This feature also automatically disables a port which has a hardware fault—at power up or at run time. It allows the chassis to restart without taking the time to check the status of this port. The port can also be disabled if a hardware fault occurred, or for some other purpose. The *Enable Port* check box is enabled by default.

The ***Status*** tab is accessed by selecting a port in Resources pane and then selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Status*** tab. The **Status** tab for the 10/100 TXS8, 10/100/1000 TXS4, 1000 SFPS4, 10/100/1000 ALM T8, and 10/100/1000 ELM ST2 modules is shown in the following image. Refer to Status Tab for additional information about the use of the **Status** tab.

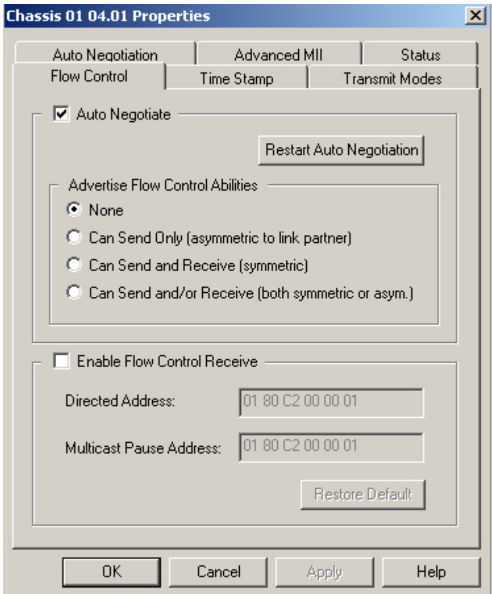
Image: **Status** Tab for Ethernet Modules



Flow Control Tab for Ethernet Modules

The ***Flow Control*** tab is accessed by selecting a port in Resources pane and then selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Flow Control*** tab. The **Flow Control** tab for the 10/100 TXS8, 10/100/1000 TXS4, 1000 SFPS4, 10/100/1000 ALM T8, and 10/100/1000 ELM ST2 modules is shown in the following image.

Image: **Flow Control** Tab for Ethernet Modules



The fields and controls in this tab are described in the following table:

Table: **Flow Control** Tab for Ethernet Modules

Section	Field/Control	Description
Auto Negotiate		Enables auto-negotiation of flow control capabilities for the port.
	Restart AutoNegotiation	If this button is selected, it causes the auto-negotiation process to start immediately.
Advertise Flow Control Abilities	None	This and the next three options indicate which set of flow control capabilities are advertised to other ports. This option advertises no capabilities. (No PAUSE, per IEEE 802.3)
	Can Send Only (asymmetric to link partner)	This option advertises only send capabilities. (Asymmetric PAUSE toward link partner, per IEEE 802.3)
	Can Send and Receive (symmetric)	This option advertises both send and receive capabilities. (Symmetric PAUSE, per IEEE 802.3)
	Can Send and/or Receive(both symmetric or asymmetric)	This option advertises all send and receive capabilities in any combination. (Both Symmetric PAUSE and Asymmetric PAUSE toward local device, per IEEE 802.3)
Force Flow Control Receive		Enables receive side flow control handling for the port.

Section	Field/Control	Description
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
	Restore Default	If this button is selected, it restores the default MAC address: 01 80 C2 00 00 01 in both *Directed* and *Multicast Pause Address* fields.

General Tab for Ethernet Modules

The **General** tab is accessed by selecting a port in Resources pane and then selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the **General** tab. The **General** tab for 10/100 TXS8, 10/100/1000 TXS4, and 1000 SFPS4 modules allows to configure the placement of the time stamp within a packet, as shown in the following image:

NOTE If Floating Timestamp is selected in the **Auto Instrumentation** tab (for modules that have it, such as XMVDC, TXS4 and SFPS4), the Time Stamp Offset options in the **General** tab will be unavailable–grayed out. This is shown in *Image: **General** Tab for TXS4 Module with Floating Timestamp*.

Image: **General** Tab for Ethernet Module

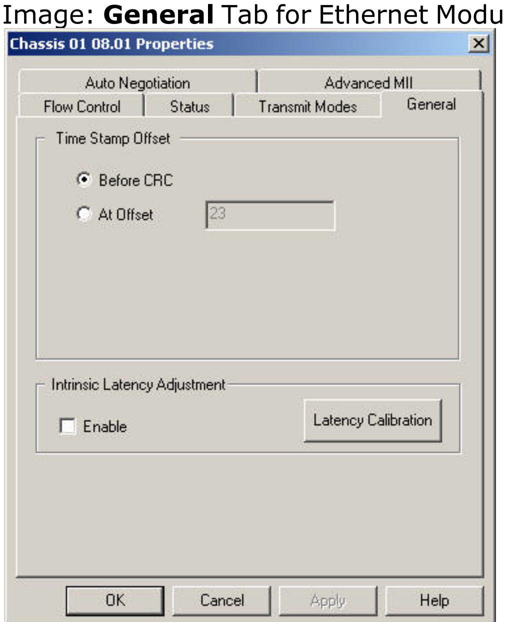


Image: **General** Tab for TXS4 Module with Floating Timestamp

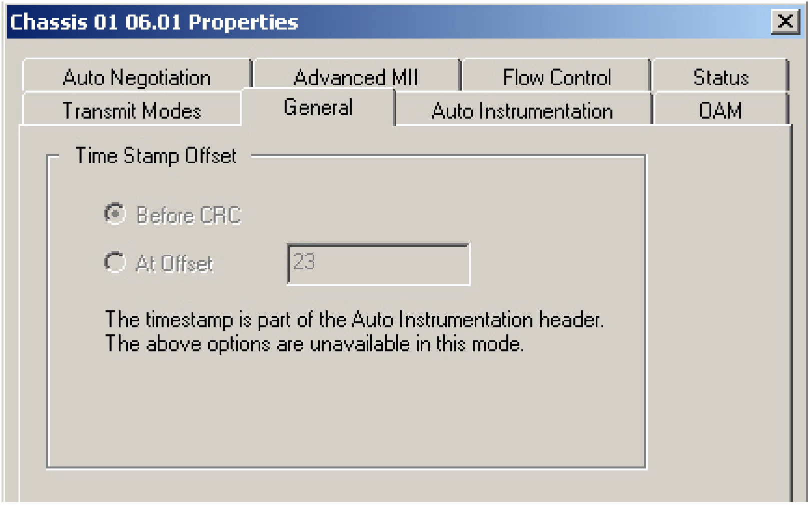
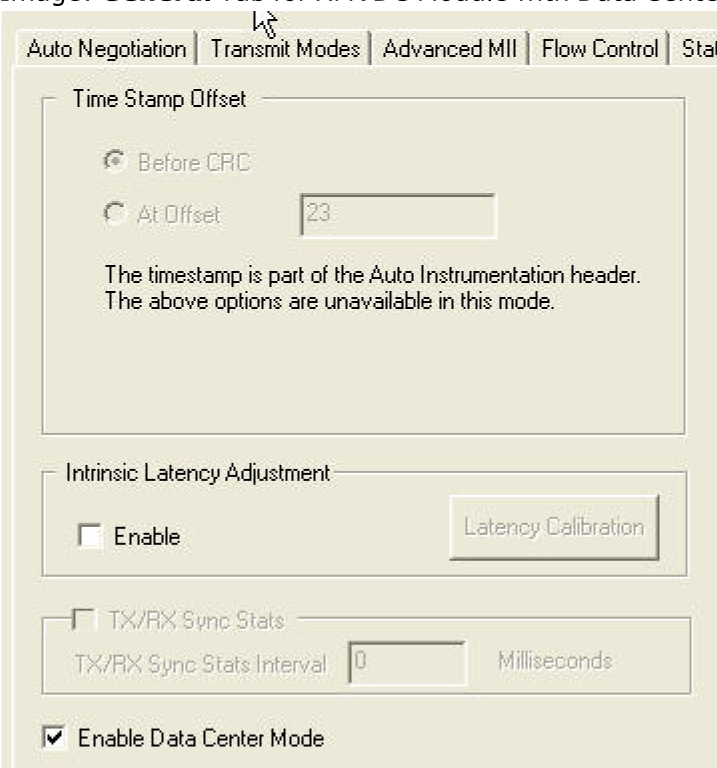


Image: **General** Tab for XMVDC Module with Data Center Mode



The text in above reads: 'The timestamp is part of the Auto Instrumentation header. The above options are unavailable in this mode.'

The fields and controls in this tab are described in the following table.

Table: **General** Tab for Ethernet Modules

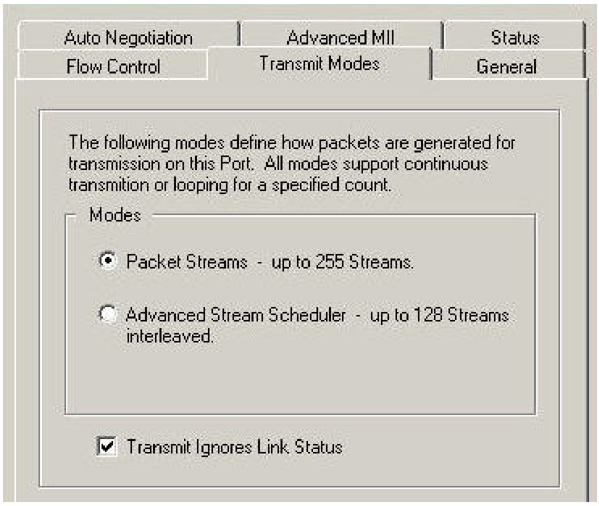
Field/Control	Description
Before CRC	(The default) When this option is selected, the Time Stamp will be inserted into the packet, immediately before the CRC field.

Field/Control	Description
At Offset	When this option is selected, the Time Stamp will be inserted into the packet, starting at the offset (in bytes) from the beginning of the packet—as specified in the user-defined field. The offset range is 23 to 12,288. A value outside of this range is automatically set to the nearest valid value (that is, 22 would default to 23, and 12,290 to 12,288). When this option is selected, the following warning appears: You are changing the default setting of the Time Stamp Offset. This may cause the receiving port to misinterpret the packets. This may also overwrite some of the packet settings.
Intrinsic Latency Adjustment	Table: 10GE LSM XENPAK/XFP **General** Tab Configuration for field definitions. For Ethernet modules, this is only available when Auto Negotiate is enabled and capability is set to Gigabit Full Duplex (only).
Enable Data Center Mode	(LSM1000 XMVDC modules) Frame Data for FCoE Support.

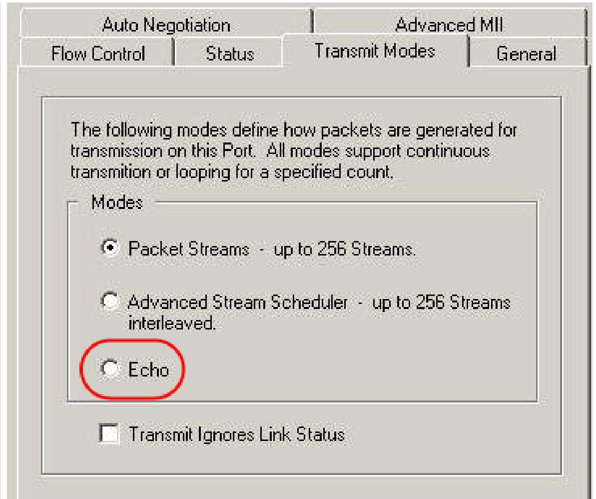
Transmit Modes Tab for Ethernet Modules

The ***Transmit Modes*** tab is accessed by selecting a port in Resources pane and then selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Transmit Modes*** tab. The **Transmit Modes** tab for different types of Ethernet modules are shown in the following image:

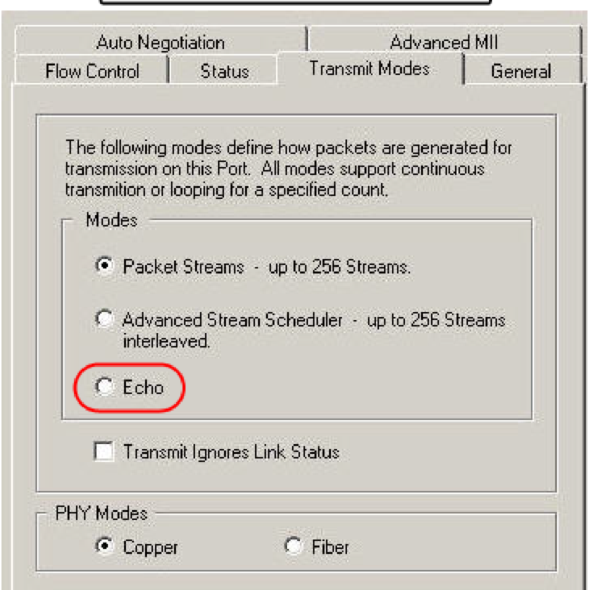
Image: **Transmit Modes** Tabs for Ethernet Modules



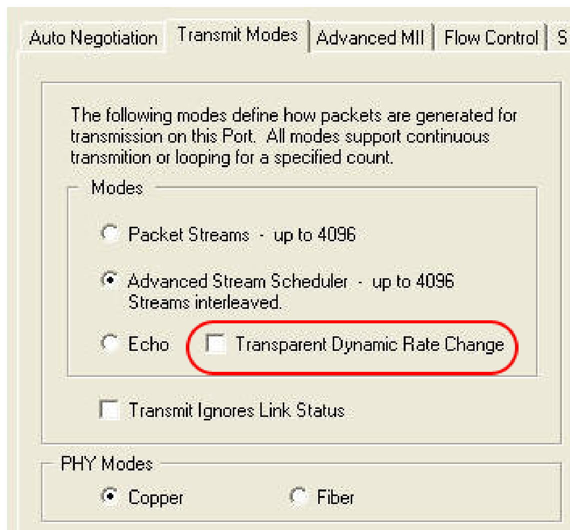
10/100 TXS8 & TX8



10/100/1000 TXS4 & TX4 & 1000 SFPS4 & SFP4



10/100/1000 STXS24 & STX24



LSM1000 XMVDC

These modules also support the Advanced Stream Scheduler feature, where a number of different streams, depending on the load module, can be interleaved for transmission from one port, to simulate the nature of Internet traffic. The selections available in this tab are described in the following table:

Table: **Transmit Modes** Tab for Ethernet Modules

Section	Field/Control	Description
Modes	Packet Streams	Sets the operating mode for the port to sequential packet streams. This allows to configure up to 255 streams. A stream may be programmed for continuous burst or packet generation— generating a continuous, infinite number of packets.

Section	Field/Control	Description
	Advanced Stream Scheduler	Up to 128 streams can be interleaved at the same time (for 10/100/1000 STXS4 family, up to 256 streams; for XMVDC family, up to 256 streams in Data Center mode, and up to 4096 streams otherwise). Each stream is assigned a percentage of the maximum rate. The streams are mixed in a pseudo-random manner so that each stream's long-term percentage of the total transmitted data is as assigned. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
	Echo **See the CAUTION below!**	(Not supported on 10/100 TXS8) Sets the basic operating mode for the port to Echo, a Layer 2 Ethernet round-trip mode. (Setting the Echo option in the **Transmit Modes** tab automatically enables the Echo option for the **Receive Mode** tab.) Echo for additional information on Echo mode. Also Echo for additional information on setting the Transmit Mode to Echo.
Transmit Ignores Link Status		If selected, will allow transmission of packets with the link down.
PHY Modes	Copper	Selected when a copper PHY connector is used (RJ-45).
	Fiber	Selected when a fiber PHY connector is used (SFP transceiver).

The following warning message is issued when Echo is selected in the **Transmit Modes** tab or **Receive Mode** tab: 'Setting this mode on a live network may cause severe problems. All Ethernet frames with a DA which matches the Receive Filter DA1 will be 'echoed' back onto the network. Setting this mode will IMMEDIATELY start echoing packets. Are you sure you want to set Echo Mode? Yes or No.'

OAM Tab for Ethernet Modules

The ***OAM*** tab is functionally identical to the one in 10GE load modules.

Auto Instrumentation Tab for Ethernet Modules

- For NGY modules, see NGY Port Properties–Auto Instrumentation
- For Flex modules, see Flex Port Properties—Auto Instrumentation
- For Xcellon-Multis module, see Xcellon-Multis Port Properties—Auto Instrumentation
- For VM module, see VM Port Properties—Auto Instrumentation
- For Novus and Novus-R module, see Novus and Novus-R Port Properties—Auto Instrumentation
- For Novus 10GE/1GE/100M module, see Novus 10GE/1GE/100M Port Properties—Auto Instrumentation.
- For DCS100GE2Q28ALL module, see DCS100GE2Q28ALL Port Properties—Auto Instrumentation

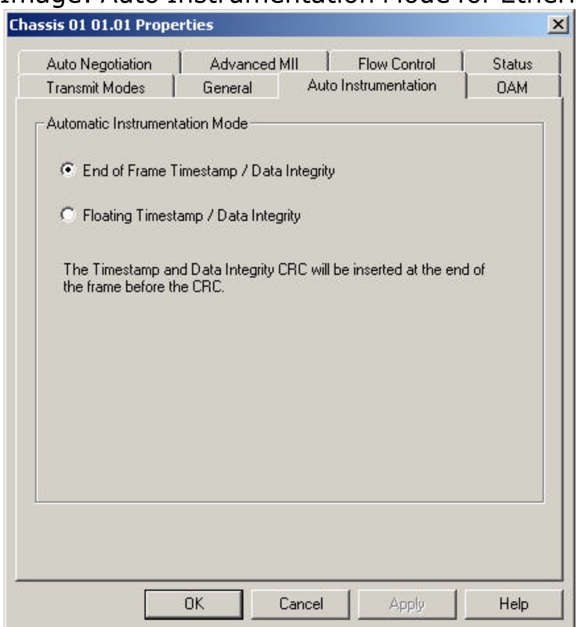
For specified load modules, the timestamp can be inserted into the Auto Instrumentation header instead of the usual locations such as before CRC or at user-specified offset. This is called *Floating Timestamp/Data Integrity*. Timestamp and Data Integrity generation will be stream-based (while the Rx analysis is port-based) if Auto Instrumentation is enabled. The Port Properties Auto **Instrumentation** tab is shown in the following image.

The **Auto Instrumentation** tab is present in the following load modules:

- LM1000STXS4 /24
- LSM1000 XMS12 /XMV16
- ASM1000XMV12X

For MACSec load modules (LSM10GMS-01).

Image: Auto Instrumentation Mode for Ethernet Modules, Configuration

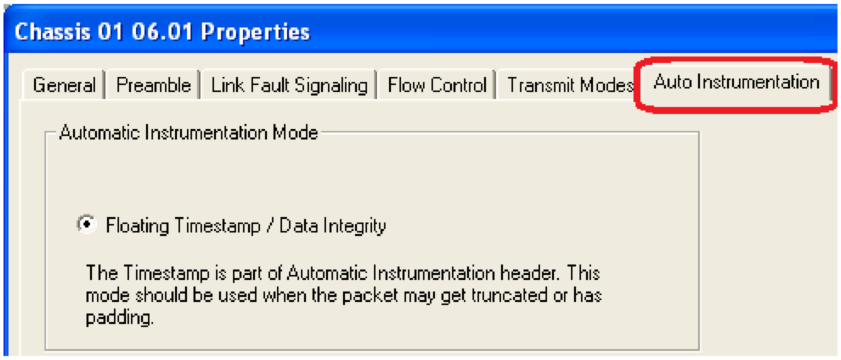


Options on this tab are described in the following table:

Table: Auto Instrumentation Configuration for Ethernet Modules

Field/Control	Description
End of Frame Timestamp / Data Integrity	Enables inserting Timestamp and Data Integrity CRC at the end of the frame before the CRC.
Floating Timestamp / Data Integrity	Enables adding timestamp as part of floating instrumentation header, and addresses similar issue in Data Integrity checking.

Image: Auto Instrumentation Mode for Ethernet Modules, Configuration



Options on this tab are described in the following table:

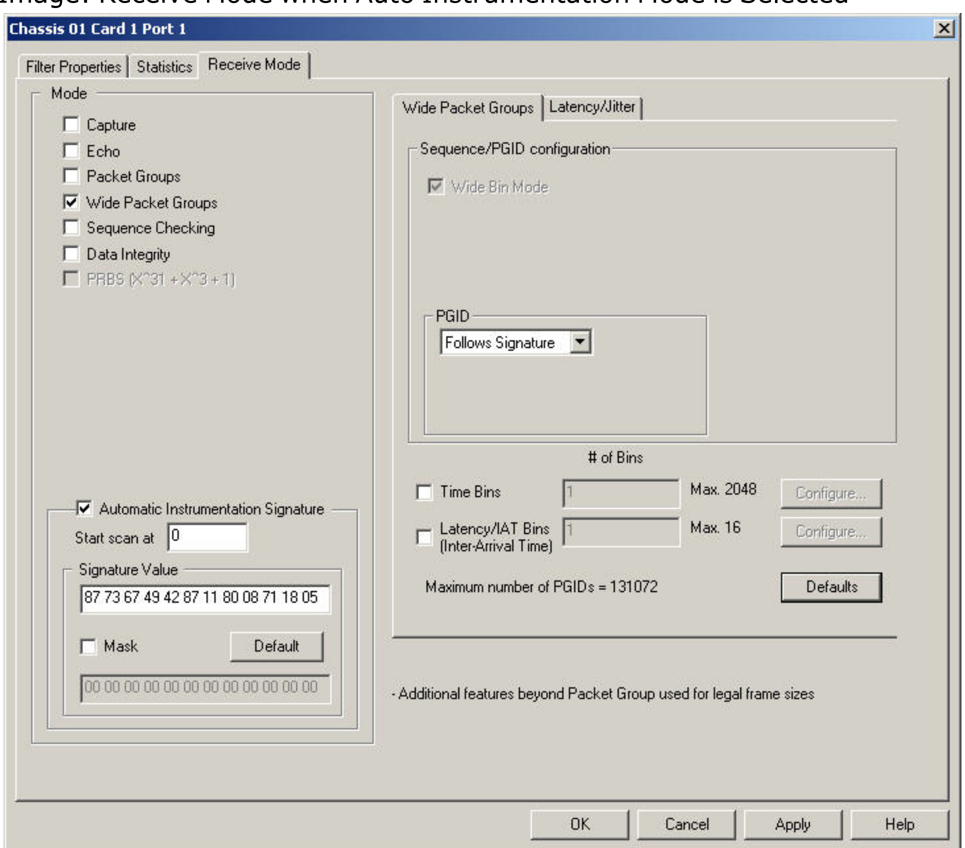
Auto Instrumentation Configuration for Ethernet Modules

Field/Control	Description
Floating Timestamp / Data Integrity	Enables adding timestamp as part of floating instrumentation header, and addresses similar issue in Data Integrity checking.

When Floating Timestamp is selected, the Time Stamp Offset options on the ***Port PropertiesGeneral*** tab are unavailable–grayed out.

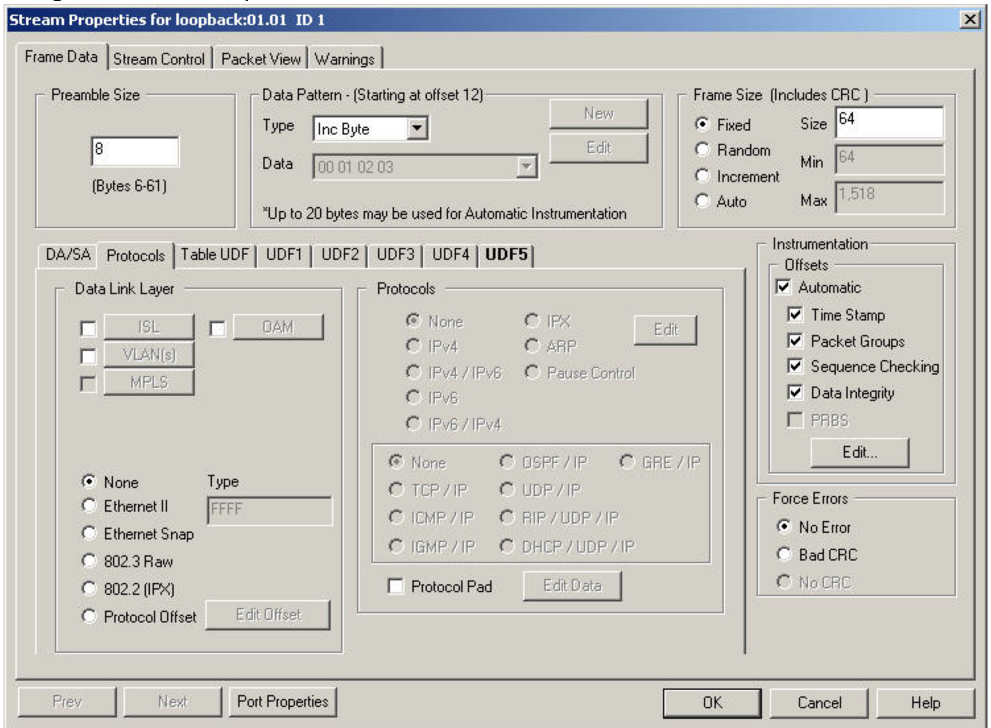
When Floating Timestamp is selected, then in the Receive Mode configuration, PRBS mode is disabled, as shown in the following image:

Image: Receive Mode when Auto Instrumentation Mode is Selected



The PRBS option in Packet Streams is also disabled, when Auto Instrumentation mode is selected, as shown in the following image:

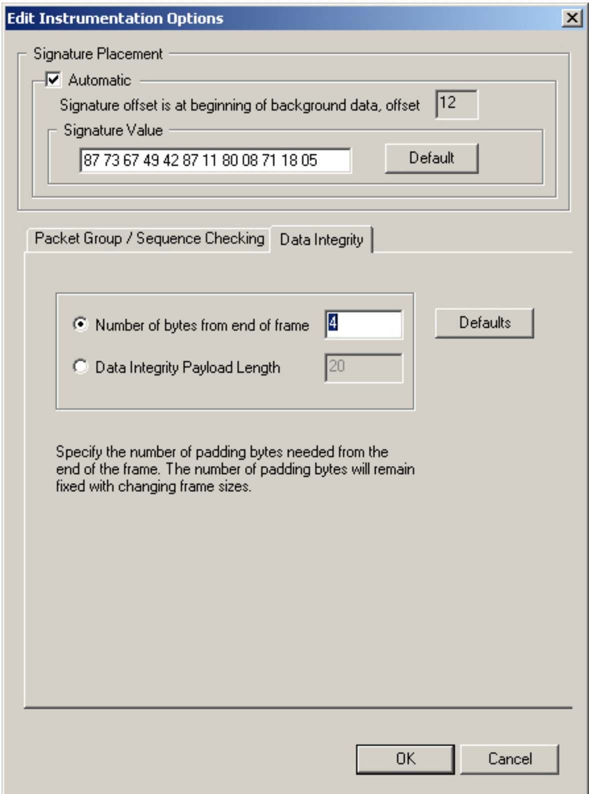
Image: Stream Properties when Auto Instrumentation Mode is Selected



If Automatic is selected (for Instrumentation), the **Edit** button becomes enabled. When **Edit** is selected, the **Edit Instrumentation Options** dialog box will display, as shown in the following image:

Edit Instrumentation Options dialog box

Image: Edit Instrumentation Options dialog box



Data Integrity Tab

In the Edit Instrumentation Options dialog box, on the **Data Integrity** tab, enter the 'Number of bytes from end of frame' or specify a 'Data Integrity Payload Length'. The options on this page are described in the following table:

Table: Edit Instrumentation Options

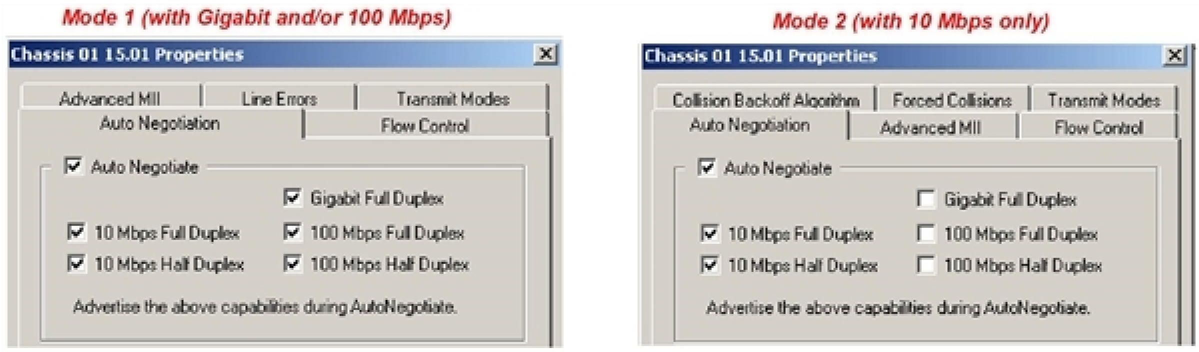
Field/Control	Description
Number of bytes from end of frame	Specify the number of padding bytes needed from the end of the frame. The number of padding bytes will remain fixed with changing frame sizes. Can be any non-negative value, depending on the packet size. (*default = 2 or 4*)
Data Integrity Payload Length	Specify the fixed data integrity payload length. This length will not change with changing frame sizes. (*default = 20*)
Defaults (button)	Resets the two fields (above) to the default values.

Port Properties for Copper 10/100/1000 Modules

The complete specification for the Copper 10/100/1000 modules can be found in the *Ixia Platform Reference Manual*.

There are two sets of configuration tabs—corresponding to the different auto-negotiate modes for the Copper 10/100/1000 module, as shown in the following image:

Image: Copper 10/100/1000 Module—Two Modes



The complete list of tabs that make up the sets for the two modes are listed below.

Mode 1: With Gigabit and/or 100 Mbps operation

- Auto Negotiation for Copper 10/100/1000 Modules
- Advanced MII for Copper 10/100/100 Modules(MII Register Files for additional information on MII registers.)
- Flow Control for Gigabit Modules
- Line Errors for Gigabit Modules
- Transmit Modes for Gigabit Modules

Mode 2: With 10 Mbps operation only

- **Auto Negotiation** Tab
- Advanced MII for Copper 10/100/100 Modules (MII Register Files for additional information on MII registers.)
- **Flow Control** Tab
- **Collision Backoff Algorithm** Tab
- **Forced Collisions** Tab
- Transmit Modes for 10/100 Modules

The *Port Properties* dialog box is accessed by double-clicking a port in Resources window, or by selecting a port and then selecting the *Properties* menu option.

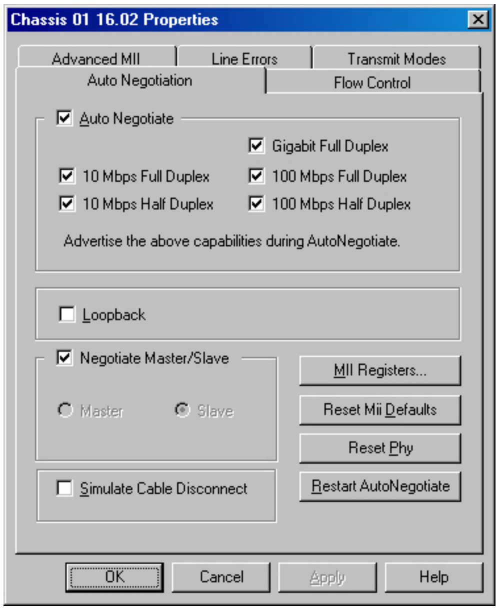
Auto Negotiation for Copper 10/100/1000 Modules

The **Auto Negotiation** tab offers access to the Auto Negotiation and Loopback properties. Auto negotiation controls how the port establishes communications with other ports.

The ***Auto Negotiation*** tab is accessed by selecting a port in Resources pane and then selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Auto Negotiation*** tab. When the module is set to operate at 100 and/or gigabit (Mode 1 in the image above), the tab appears as shown in the following image:

NOTE	If only 10 Mbps operation has been selected for this port, the **Auto Negotiation** tab will be the same one used for 10/100 modules. **Auto Negotiation** Tab for additional information.

Image: Copper 10/100/1000—Auto Negotiation



The fields and controls in this tab are described in the following table:.

Table: Copper 10/100/1000—Auto Negotiation

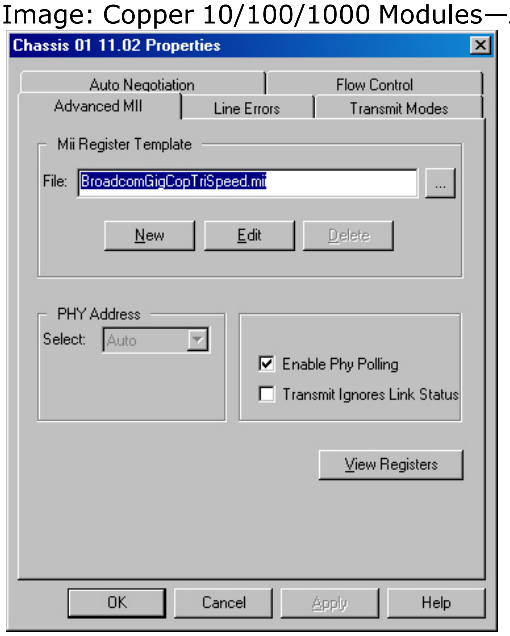
Field/Control	Description
Auto Negotiate	If selected, allows auto negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during Auto Negotiation.
Gigabit Full Duplex	If selected, auto negotiate will advertise Gigabit (1000 Mbps) full duplex operation.
10 Mbps Full Duplex	If selected, auto negotiate will advertise 10 Mbps full duplex operation.
10 Mbps Half Duplex	If selected, auto negotiate will advertise 10 Mbps half duplex operation.
100 Mbps Full Duplex	If selected, auto negotiate will advertise 100 Mbps full duplex operation.
100 Mbps Half Duplex	If selected, auto negotiate will advertise 100 Mbps half duplex operation.
Loopback	If selected, the port is set to internally loopback from transmit to receive.
Negotiate Primary/Secondary	If selected, determining which port is Primary or Secondary is performed **automatically**. (Checking this box will disable the manual option for selecting Primary or Secondary).
Primary	If selected, port will be configured as Primary.
Secondary	If selected, port will be configured as Secondary.
Simulate Cable Disconnect	If this is selected, the port acts as if the cable has been disconnected. The port will neither transmit nor receive.

Field/Control	Description
MII Registers...	Allows the current MII register values to be read and written. See MII Register Files for additional information on MII Registers.
Reset MII Defaults	Resets all of the port's MII properties back to the default settings.
Reset Phy	When pushed, resets the PHY associated with the port through the MII control register.
Restart Auto Negotiate	When pushed, the Auto Negotiate sequence is restarted.

Advanced MII for Copper 10/100/100 Modules

The ***Advanced MII*** tab is accessed by selecting a port in Resources pane and then selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Advanced MII*** tab. The ***Advanced MII*** tab allows for the proper association of MII registers to the port, as shown in the following image:

Image: Copper 10/100/1000 Modules—**Advanced MII** Tab



The upper box, labeled *MII Register Template*, is used to control the selection and editing of a register template file. Register template files hold the register definitions. The fields and controls in this box are described in the following table:.

Table: Copper 10/100/1000 Modules—**Advanced MII** Tab

Field/Control	Description
File	The name of the MII Register file.
Browse	Opens up a standard Windows file browsing window in the directory

Field/Control	Description
	C:\Program Files\Ixia\MII, looking for files that end in *.mii*.
New	Allows the creation of a new MII Register Template file. See New/Edit MII Register Template Setup—Management Page for operational details.
Edit	Allows the editing of the indicated file. See New/Edit MII Register Template Setup—Management Page for operational details.
Delete	Deletes the current file after a confirmation dialog box.

The lower part of the tab allows the PHY address to be set. The controls available in this part of the tab are described in the following image:

Table: Copper 10/100/1000—PHY Address Controls

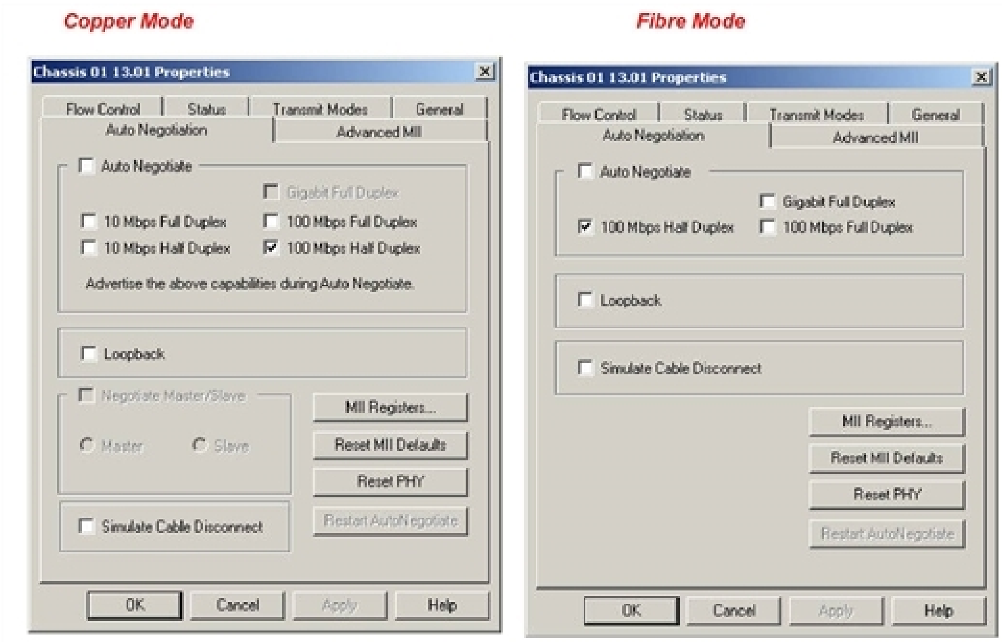
Control	Description
PHY Address	Allows the address of the PHY to be set to Auto or a constant from 0 to 31. (It is set to Auto by default, and manual configuration is disabled.)
Enable Phy Polling	If selected, then the PHY is continuously polled during MII setup operation.
Transmit Ignores Link Status	If selected, will allow transmission of packets with the link down.

Port Properties for 10/100/1000 XMV Modules

The complete specification for the 10/100/1000 XMV modules can be found in the *Ixia Platform Reference Manual*.

There are two sets of Auto Negotiation options—corresponding to the different transmit modes (copper or fibre) for the 10/100/1000 XMV module, as shown in the following image:

Image: 10/100/1000 XMV Module—Two Modes



In fibre mode, speeds 100 Mbps full duplex and 100 Mbps half duplex are available in addition to gigabit full duplex. In copper mode, 10 Mbps full and half duplex and 100 Mbps full and half duplex are available.

The port properties tabs and options for the 10/100/1000 XMV load modules are also common to other modules.

- For descriptions of the tabs and options of both sets of *Auto Negotiation* options, see in the following table.
- Advanced MII for Copper 10/100/100 Modules (MII Register Files for additional information on MII registers.)
- The **Flow Control** tab is the same as the **Flow Control** Tab for Ethernet Modules.
- The **Status** tab is the same as the **Status** Tab for Ethernet Modules
- The *Transmit Modes* is the same as that described in **Transmit Modes** Tab in Stream/Capture/Latency Mode.
- On the **General** tab, *Time Stamp Offset*, **General** Tab for Ethernet Modules.
- Also on the **General** tab, *Intrinsic Latency Adjustment*, *Table: 10GE LSM XENPAK/XFP **General** Tab Configuration for field definitions*.

Port Properties for Gigabit and GBIC Modules

The complete specification for the Gigabit type boards can be found in the *Ixia Platform Reference Manual*.

The dialog box tabs indicate the types of properties that may be modified for Gigabit modules. They include the property tabs listed below.

- Properties for Gigabit Modules
- Flow Control for Gigabit Modules

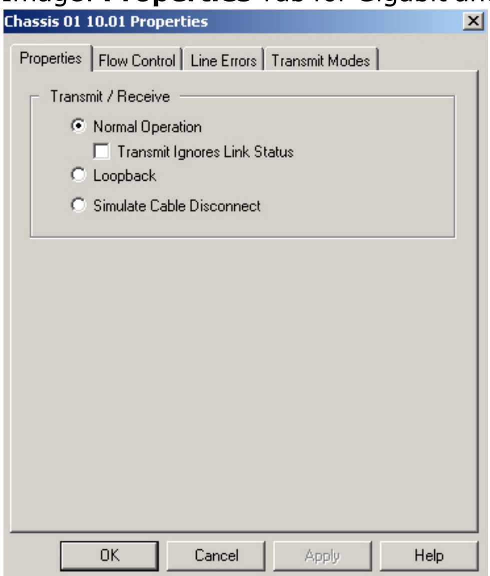
- Line Errors for Gigabit Modules
- Transmit Modes for Gigabit Modules

The *Port Properties* dialog box is accessed by double-clicking a port in Resources window, or by selecting a port and then selecting the *Properties* menu option.

Properties for Gigabit Modules

The ***Properties*** tab is accessed by selecting a port in Resources pane and then selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Properties*** tab. The general **Properties** tab common to Gigabit and GBIC modules is shown in the following image:

Image: **Properties** Tab for Gigabit and GBIC Modules



The fields and controls available in this tab are described in the following table:

Table: **Properties** Tab for Gigabit Modules

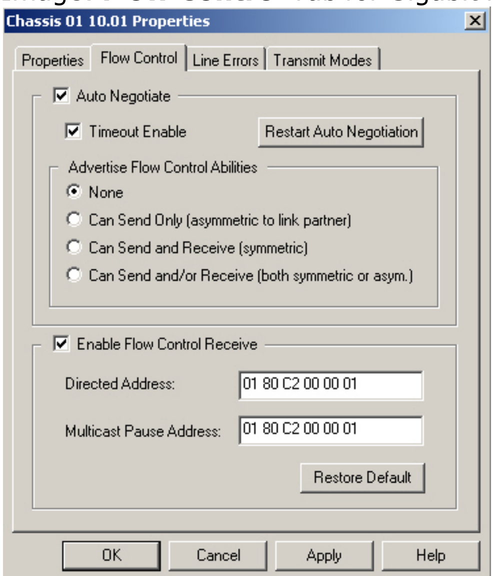
Field/Control	Description
Normal Operation	The port operates normally, as opposed to loopback mode or simulate cable disconnect mode.
Transmit Ignores Link Status	When operating in normal mode, the transmit operation will operate regardless of the link state.
Loopback	The port operates in loopback mode, as opposed to normal or simulate cable disconnect mode.
Simulate Cable Disconnect	If this is selected, the port acts as if the cable has been disconnected. The port will neither transmit nor receive.

Flow Control for Gigabit Modules

NOTE For information on Flow Control for 10/100 TXS8, 10/100/1000 TXS4, and 1000 SFPS4 modules, refer to Flow Control Tab for Ethernet Modules.

The ***Flow Control*** tab is accessed by selecting a port in Resources pane and then selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Flow Control*** tab. The **Flow Control** tab for gigabit operation is shown in the following image. It includes options for setting auto negotiation properties, as well as for flow control.

Image: **Flow Control** Tab for Gigabit Modules



The fields and controls in this tab are described in the following table.

Table: **Flow Control** Tab for Gigabit Operation

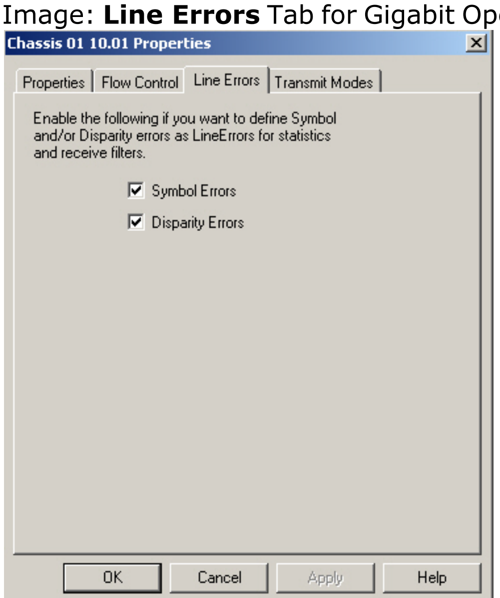
Section	Field/Control	Description
Auto Negotiate		Enables auto-negotiation of flow control capabilities for the port.
	Timeout Enable	Enables timeout during auto-negotiation.
	Restart AutoNegotiation	If this button is selected, it causes the auto-negotiation process to start immediately.
Advertise Flow Control Abilities	None	This and the next three options indicate which set of flow control capabilities are advertised to other ports. This option advertises no capabilities.
	Can Send Only (asymmetric to link partner)	This option advertises only send capabilities.

Section	Field/Control	Description
	Can Send and Receive (symmetric)	This option advertises both send and receive capabilities.
	Can Send and/or Receive(both symmetric or asymmetric)	This option advertises all send and receive capabilities in any combination.
Force Flow Control Receive		Enables receive side flow control handling for the port.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	This is the MAC address that the port will listen on for a multicast pause message.
	Restore Default	Restores the default MAC address: 01 80 C2 00 00 01 in both *Directed* and *Multicast Pause Address* fields.

Line Errors for Gigabit Modules

The ***Line Errors*** tab is accessed by selecting a port in Resources pane and then selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Line Errors*** tab. The **Line Errors** tab for gigabit operation is shown in the following image:

Image: **Line Errors** Tab for Gigabit Operation



The two check boxes control how symbol and disparity errors are considered with respect to capture and statistics operation. If a check box is selected, then that type of error will be included with Line

Errors. The Line Errors category is one of the statistics for Gigabit ports and may be used in the definition of any of the User Defined Statistics, as well as Capture triggers and filters.

Transmit Modes for Gigabit Modules

The ***Transmit Modes*** tab is accessed by selecting a port in Resources pane and then selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Transmit Modes*** tab. The **Transmit Modes** tab for Gigabit modules, including GBIC and Copper 10/100/1000 modules running at gigabit speed, is shown in the following image. (There is no **Transmit Modes** tab for Gigabit-3 modules.)

Image: Transmit Modes for ASM XMV12x

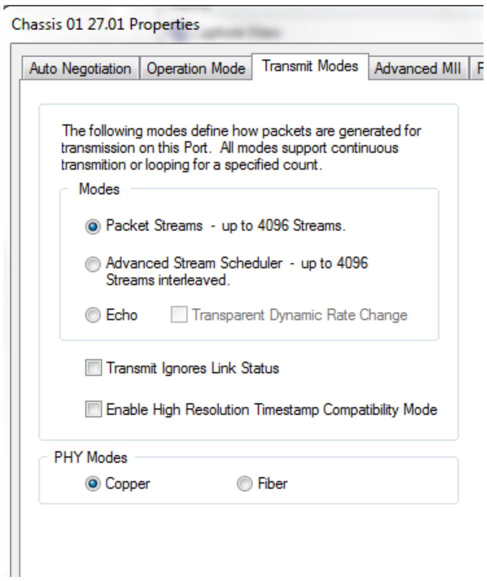


Image: Transmit Modes for LSM XMVD16

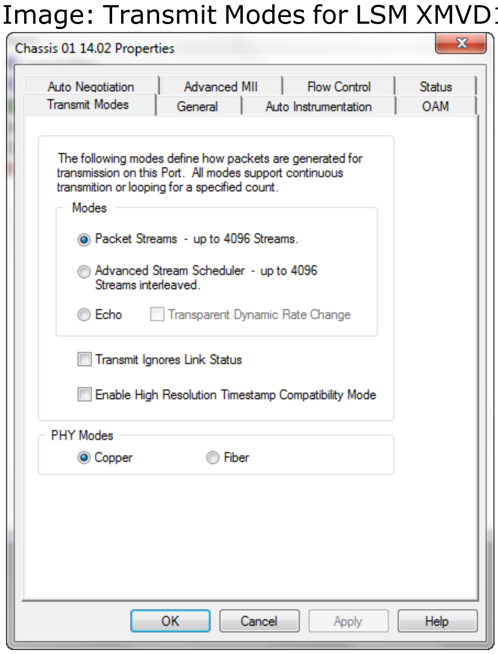


Image: Transmit Modes for LSM XMVDC12

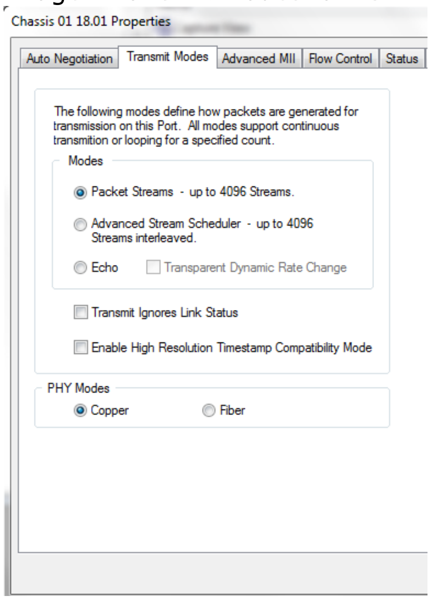
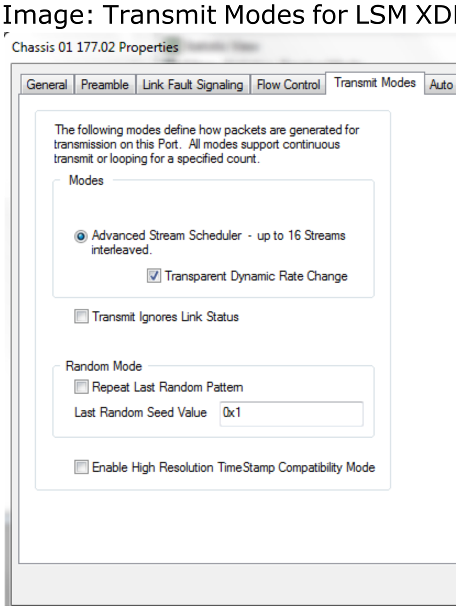


Image: Transmit Modes for LSM XDM 10GMSM



The controls in this tab are described in the following table.

Table: **Transmit Modes** Tab for Gigabit Modules

Field/Control	Description
Packet Streams	Sets the basic operating mode for the port to packet streams. This allows to configure up to 255 streams. A stream may be programmed for continuous burst or packet generation—generating a continuous, infinite number of packets.
Advanced Stream	Up to 4096 streams can be interleaved at the same time for LSM XMV16 and

Field/Control	Description
Scheduler	LSM XMVDC12, and up to 16 streams for XDM 10GMSM.Each stream is assigned a percentage of the maximum rate. The streams are mixed in a pseudo-random manner so that each stream's long-term percentage of the total transmitted data is as assigned. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Echo **See the CAUTION below!**	Sets the basic operating mode for the port to Echo, a Layer 2 Ethernet round-trip mode. (Setting the Echo option in the **Transmit Modes** tab automatically enables the Echo option for the **Receive Mode** tab.) Also Echo for additional information on Echo mode. Also Echo for additional information on setting the Transmit Mode to Echo.
Transparent Dynamic Rate Change	If selected, the dynamic rate control will allow rate change across counters, for this port.
Transmit Ignores Link Status	If selected, will allow transmission of packets with the link down.
Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream's random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the Ixia Platform Reference Guide.
Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Enable High Resolution Timestamp Compatibility Mode	Select the check box to allow the traffic to be sent and received by next gen load modules supporting high resolution timestamp without DI error.This feature is valid only in LAN and WAN mode with Packet stream and concurrent scheduler. This feature is not available in other modes like TSO/LRO, IxN2X or Offload mode.
PHY Modes - Copper	Selected when a copper PHY connector is used (RJ-45).
PHY Modes - Fiber	Selected when a fiber PHY connector is used (SFP transceiver).

The following warning message is issued when Echo is selected in the Transmit Modes or Receive Mode tabs:

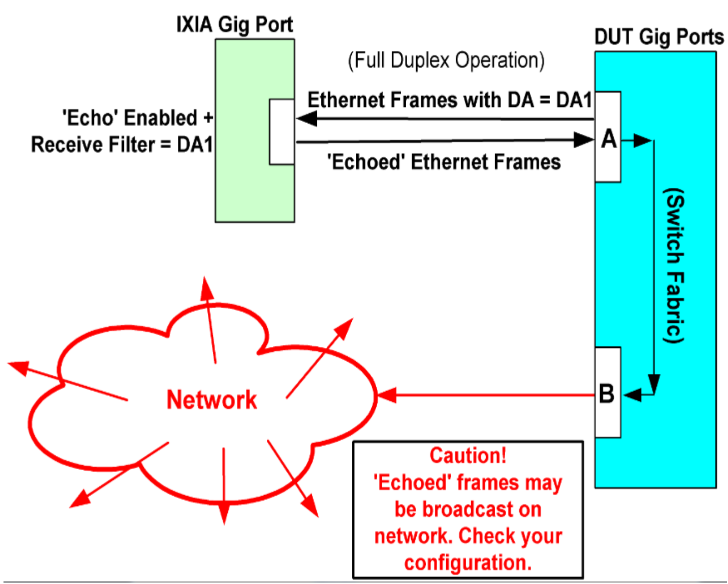
```
'Setting this mode on a live network may cause severe problems. All ethernet frames with a
DA which matches the Receive Filter DA1 will be 'echoed' back onto the network. Setting
```

```
this mode will IMMEDIATELY start echoing packets. Are you sure you want to set Echo Mode?
Yes or No.'
```

Echo

The gigabit TXS modules (10/100/1000 TXS4 and TX4, 1000 SFPS4 and SFP4, and 10/100/1000 STXS24 and STX24), Gigabit, GBIC, and Copper 10/100/1000 (running in Gigabit mode) load modules offer an additional feature–Layer 2 Echo. This feature operates in conjunction with gigabit rates in full duplex mode, for testing Ethernet loopback mode at up to wire speed. A diagram of the Echo features is shown in the following image:

Image: Gig Echo Diagram



The transmitting side (the DUT) sends one or more streams of simple Ethernet frames. Currently, the DA and DA Mask in the Stream Properties/Frame Data page is used for the Gig Echo transmit.The minimum valid length of an incoming frame is 16 bytes, which includes the MAC DA (with DA mask), MAC SA, and CRC. A preamble of at least 8 bytes must precede the incoming Ethernet frame. The minimum length of a valid incoming frame is 16 bytes (for DA + SA + CRC).

In Echo mode, when the frames are received, the MAC DA and MAC SA will be swapped, a standard 8-byte preamble will be inserted for each echoed frame (no matter how long the preamble is on the received frame), and the CRC will be recalculated before the frame is echoed back. If an incoming frame has a bad CRC, the frame will be retransmitted with a bad CRC. For Gigabit, GBIC, and Copper 10/100/1000 (running Gigabit mode), Layer 3 Capture options will not be included, but all other capture and statistics options will be available. (These capture and statistics options are not currently available for the 10/100/1000 TXS4 and 1000 SFPS4 modules.) The transmitted frames will support only the gigabit statistics. The Echo feature supports VLAN-encapsulated Ethernet or SNAP Ethernet frames.

To control the amount of traffic echoed back onto the network, the receiving port will echo ONLY received frames which matched a specified DA1 (Destination Address) set as a receive filter. DA/SA Values for additional information.

Echo for additional information on setting the Receive Mode to Echo.

Port Properties for Power over Ethernet (PoE)

The Power Over Ethernet (PoE) load module (PLM1000T4-PD) is a special purpose, 4-channel electronic load. It is intended to be used in conjunction with Ixia ethernet traffic generator/analyzer load modules to test devices that conform to IEEE std 802.3af.

There are two versions of the PoE load module: 20 Watt dissipation and 30 Watt dissipation. The two versions have slightly different controls, noted below.

For an overview of PoE, refer to the Power over Ethernet section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.

The following sections explain the use of the PoE controls:

- PoE Basic Setup
- PoE Advanced Signatures
- PoE Advanced Load Control
- PoE Voltage Threshold
- PoE Acquisition

The *Port Properties* dialog box is accessed by double-clicking a port in Resources window, or by selecting a port and then selecting the *Properties* menu option.

PoE Basic Setup

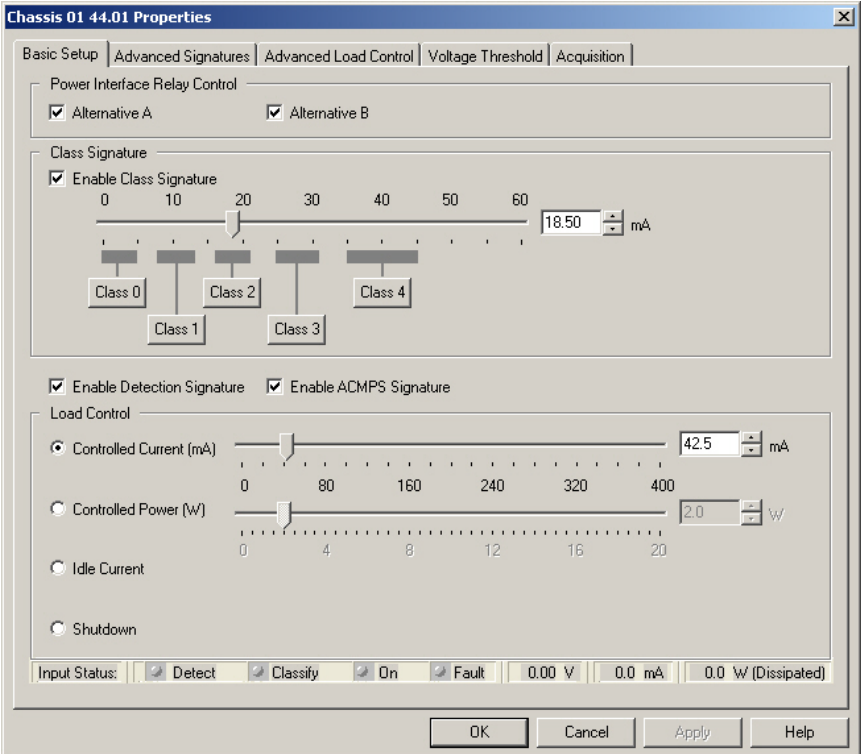
The **Basic Setup** tab allows to set the following:

- What load type will be used in the emulated Powered Device (PD) (Alternative A and/or Alternative B).
- Allows to quickly set the signatures.
- Emulate PD power requirements based on a selected class.

The selected class in this tab will determine the emulated PD characteristics when viewed by a Power Sourcing Equipment (PSE).

The **Basic Setup** tab is accessed by selecting a port in Resources pane and then selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Basic Setup*** tab. The **Basic Setup** tab is shown in the following image:

Image: **Basic Setup** Tab (20W PoE Load Module)



The controls shown in this tab are explained in the following table:

Table: Input Relays Controls

Section	Field/Control	Usage
Power Interface Relay Control		Allows the selection of the load method of the physical interface (Alternative A or Alternative B). Note that mid span PSEs only supply Alternative B power.
Class Signature		Sets the emulated class. (This function is also available in PoE Advanced Signatures.)
	Enable Class Signature	This check box enables the class signature, and allows for the detection of power requirements by class. Selecting this check box also enables the remainder of the group box.
	Slide Bar	The slide bar can be used to set the power requirements for the emulated PD. The signal value can also be set with the number field to the far right.
	Class buttons	Selecting one of these buttons sets the Current Class value to the default signaling current associated with the selected class.
Enable Detection Signature		Selecting this check box enables the nominal detection signature for the selected class. If not enabled, the emulated PD will not have a detection signature.

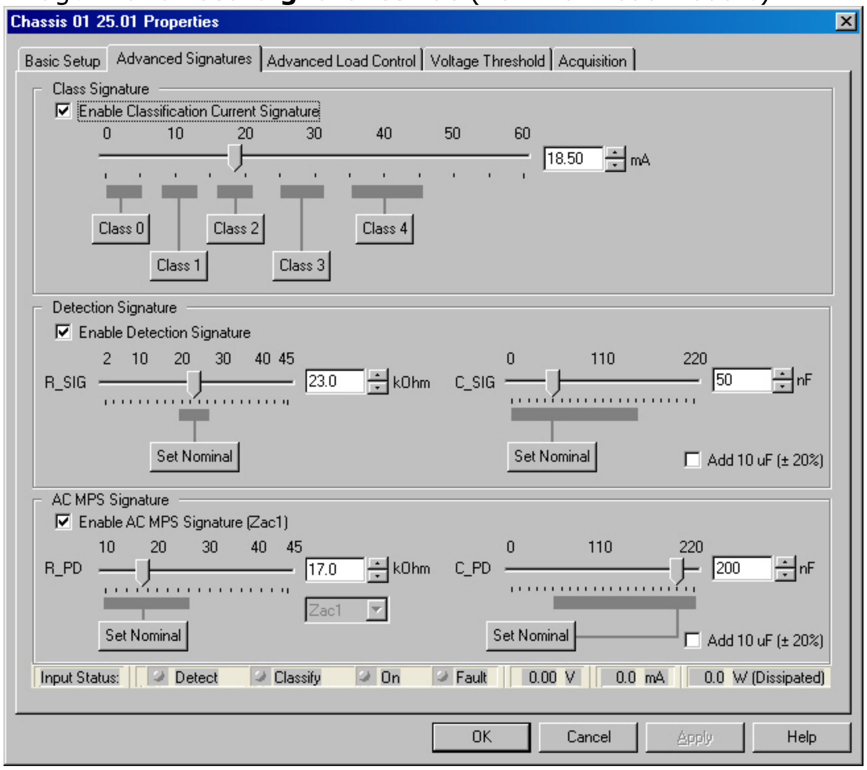
Section	Field/Control	Usage
Enable AC MPS Signature		Selecting this check box provides an Alternating Current Maintain Power Signature for the selected class. If not enabled the emulated PD will not have an AC MPS.
Load Control		Allows to set the emulated PD’s load operation mode. (This function is also available in PoE Advanced Load Control.)
	Controlled Current	Sets the emulated PD to require constant current. This slide bar sets the current requirements for the emulated PD in mAmps. The current setting can also be set by entering a number in the number field. For 20W card the max is 400 mA. For 30W card, the max is 600 mA.
	Controlled Power	Sets the PD to require constant power. This slide bar sets the power requirements for the emulated PD in watts. The power setting can also be set by entering a number in the number field.
	Standby	Sets the PD to standby mode, requiring only 10 mA of current.
	Shutdown	Sets the PD to shutdown mode.
Input Status		The bar at the bottom of the tab shows the current status of the attached PSE device. This information is visible on all PoE dialog boxes and tab pages.
	Detect	When green, shows the PSE is in the detection phase.
	Classify	When green, shows the PSE is in the classification phase.
	On	When green, shows that the PSE is supplying power to the PD.
	Fault	When red, indicates that the PSE has performed an illegal operation. The PoE disconnects under a fault condition until the PSE resets.
	Input Voltage	The voltage being sent from the connected PSE device, exclicked in volts.
	Input Current	The amperage being sent from the connected PSE device, exclicked in mAmps
	Power (Dissipated)	The power provided from the PSE device, in Watts.

PoE Advanced Signatures

The **Advanced Signatures** tab page allows for the selection and manipulation of the PD signatures. Signatures are used by the PSE to determine what the power requirements are for the PD.

The ***Advanced Signatures*** tab is accessed by selecting a port in Resources pane and then selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Advanced Signature*** tab. Following image shows the **Advanced Signatures** tab page.

Image: **Advanced Signatures** Tab (20W PoE Load Module)



The controls on the **Advanced Signatures** tab page are explained in the following table:

Table: Advanced Signatures Configuration

Section	Field/Control	Usage
Class Signature		Allows to set the emulated PD class signature.
	Enable Classification Current Signature	This check box enables the class signature, and allows for the detection of the class and power requirements. Selecting this check box also enables the load slide bar and class buttons.
	Slide Bar	The slide bar can be used to signal the power requirements for the emulated PD. The value can be manipulated using the slide bar or the number field to the far right.
	Class Buttons	Selecting one of these buttons sets the *Current Class* value to the default signaling current of the selected class.
Detection Signature		Allows to manipulate the PD detection signatures. Detection signatures signal the PSE that a PD is on line and waiting to be powered.

Section	Field/Control	Usage
	Enable Detection Signature	Enables the detection signatures for this port, and the R_SIG and C_SIG slide bars.
	R_SIG KOhm	The resistance signature, in kilo Ohms. This setting is manipulated using the slide bar or the number field to the right of the bar.
	C_SIG nF	The capacitance signature, in nano Farads. This setting is manipulated using the slide bar or the number field to right of the bar.
	Set Nominal	Pressing this button sets the detection signatures to their nominal levels. The nominal levels are shown by the black bar.
	Add 10uF	Selecting this check box adds a 10 micro Farads capacitance to the detection signature.
AC MPS Signature		Allows to manipulate the Alternating Current Maintain Power Signature.
	Enable AC MPS Signature	Enables the AC MPS signature and slide bar operation.
	R_PD KOhm	Sets the resistance for the emulated PD AC MPS signature, in kilo Ohms. This setting is manipulated using the slide bar or the number field to the far right of the bar. The range of this slide bar is dependent on the Zac setting: Zac1–10 to 45 KOhms Zac2–200 to 1200 KOhms (only on 30W PoE load modules
	C_PD nF	Sets the capacitance requirements for the emulated PD AC MPS signature, in nano Farads. This setting is manipulated using the slide bar or the number field to the far right of the bar.
	Set Nominal	Pressing this button sets the AC MPS resistance and current requirements settings to their nominal values based on the selected class.
	Zac1/Zac2 Toggle	This pull-down menu allows to select either Zac1 or Zac2 AC MPS signature. It also changes the R_PD slide bar range, noted above. Zac 1/2 is the impedance signature sent by the PD informing the PSE to maintain power (*Z* is common notation for impedance, and *AC* is alternating current). Zac1 is the impedance range for maintaining power, while Zac2 is the range for removing power. Zac2 is only available on 30W PoE load modules. In 20W PoE load modules, this control is always set to Zac1.

Section	Field/Control	Usage
	Add 10uF	Selecting this check box adds a 10 micro Farads requirement to the AC MPS signature.

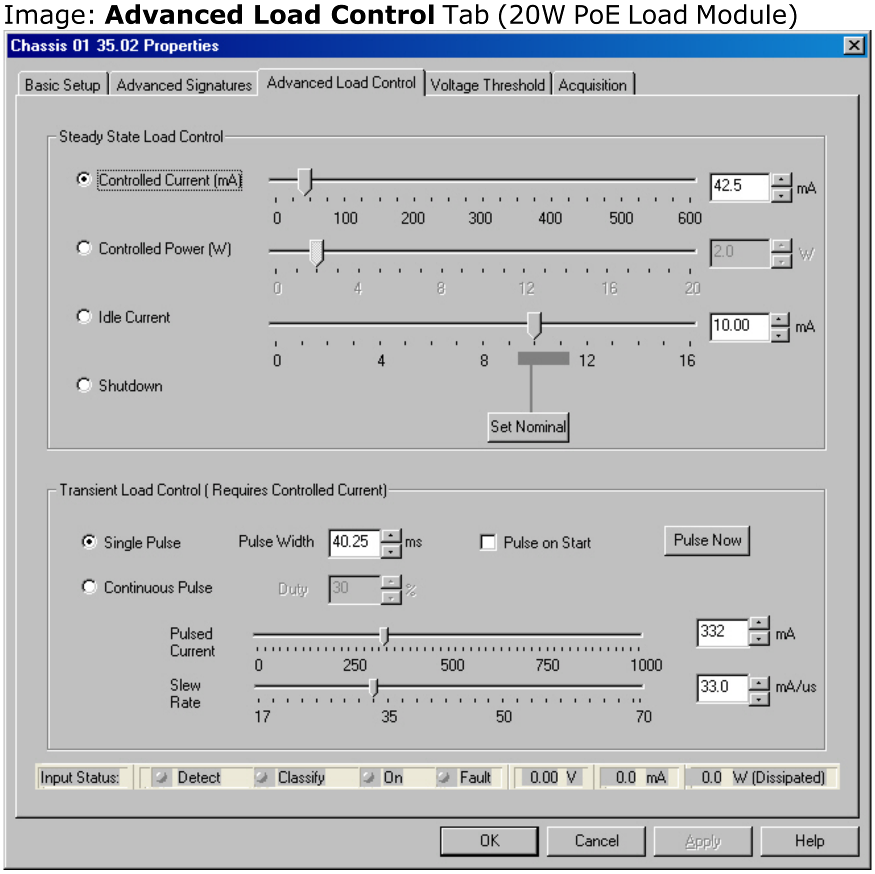
The Status settings are described in *Table: Input Relays Controls*.

PoE Advanced Load Control

Once the PSE has detected and classified the emulated PD, it should provide power to the port. The **Advanced Load Control** tab page allows to control the emulated PDs power requirements. It also allows for the insertion of power 'pulses,' which change the PD load from short periods of time.

The ***Advanced Load Control*** tab is accessed by selecting a port in Resources pane and then selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Advanced Load Control*** tab. The **Advanced Load Control** tab page is shown in the following image:

Image: **Advanced Load Control** Tab (20W PoE Load Module)



The controls on the **Advanced Load Control** tab are explained in the following table:

Table: Advanced Load Control Configuration

Section	Field/Control	Usage
Steady State		Selects the type of PD load requirements the port emulates.

Section	Field/Control	Usage
Load Control		
	Controlled Current	Sets the emulated PD to require constant current. This slide bar sets the current requirements for the emulated PD, in milli Amps. The current setting can also be manipulated by entering a number in the number field.
	Controlled Power	Sets the PD to require constant power. This slide bar sets the power requirements for the emulated PD, in Watts. The power setting can also be manipulated by entering a number in the number field. There are two ranges for this control, depending on which version of the load module being used: • 20W version–0 to 20 Watts • 30W version–0 to 30 Watts
	Standby	Sets the PD to standby mode, requiring only 10 mA of current.
	Shutdown	Sets the PD to shutdown mode.
Transient Load Parameters		Allows for the creation of Load variations from the PSE in the form of a pulse, or a repeating pulse.
	Single Pulse	Selecting this option button sets up a single pulse that conforms to the values indicated by the slide bars. The pulse is initiated when the *Pulse Now* button is selected.
	Pulse Width	Sets how long the new pulse current level lasts, in microseconds.
	Pulse on Start	Selecting this check box begins a single pulse each time the PSE starts to supply power.
	Pulse Now	Selecting this button begins the requested pulse. This button is only active after the pulse parameters have been set, and the *Apply* button selected.
	Continuos Pulse	Selecting this option button repeats the configured pulse indefinitely.
	Duty	Sets the percentage of time that the pulse current is maintained through the steady state current. For example, a setting of 30 percent means that for thirty percent of the load time, the pulse current is maintained.
	Pulse Current	Sets the pulse level, which can be less or greater than the standard current requirement of the PD (in milli Amps), and can be set through the slider or number field to the right of the

Section	Field/Control	Usage
		slide bar.
	Slew Rate	Sets how quickly the pulse level is achieved, in milli Amps per microsecond, and can be set through the slider or number field to the right of the slide bar.

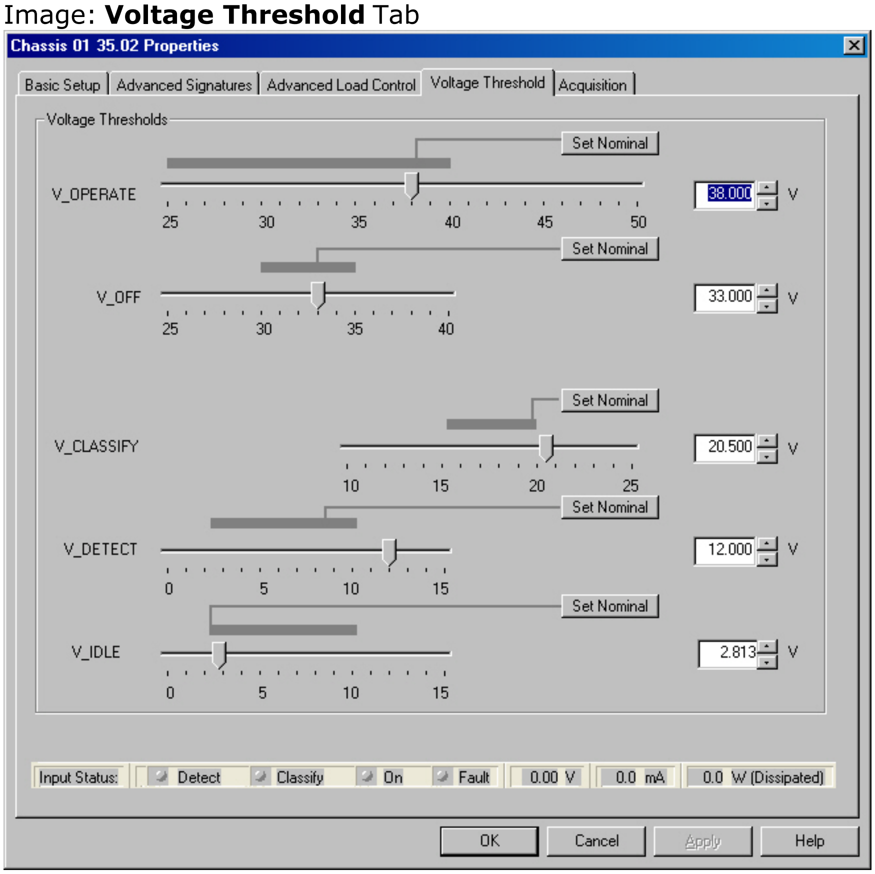
The status settings are described in *Table: Input Relays Controls*.

PoE Voltage Threshold

The voltage threshold settings allow to control the voltage necessary from the PSE for it to detect, classify, and provide power to the emulated PD. As the PSE discovers the emulated PD, the voltage increases to advance the PSE to the next phase.

The ***Voltage Threshold*** tab is accessed by selecting a port in Resources pane and then selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Voltage Threshold*** tab. The **Voltage Threshold** tab page is shown in the following image:

Image: **Voltage Threshold** Tab



The controls in this tab page are explained in the following table:

Table: Voltage Threshold Configuration

Field/Control	Usage
V_OPERATE	Sets the input threshold where the PSE load is first applied. The voltage number can be changed using the slide bar or the number field to the right.
V_OFF	Sets the input threshold below which the PSE load is removed. The voltage number can be changed using the slide bar or the number field to the right.
V_CLASSIFY	Sets the maximum voltage for the emulated PD classification stage. Between this setting and V_DETECT, the classification currents are presented to the PSE by the PD. The voltage number can be changed using the slide bar or the number field to the right.
V_DETECT	Sets the maximum voltage for emulated PD detection. Between this setting and V_IDLE, the detection signature impedances are presented to the PSE by the PD. The voltage number can be changed using the slide bar or the number field to the right.
V_IDLE	Sets the minimum detection voltage. No signatures are presented below this threshold value. The voltage number can be changed using the slide bar or the number field to the far right.
Set to Nominal	Any of these button set the selected voltage setting to its nominal position, based on IEEE 802.3af. The black bar shows the nominal range for this setting.

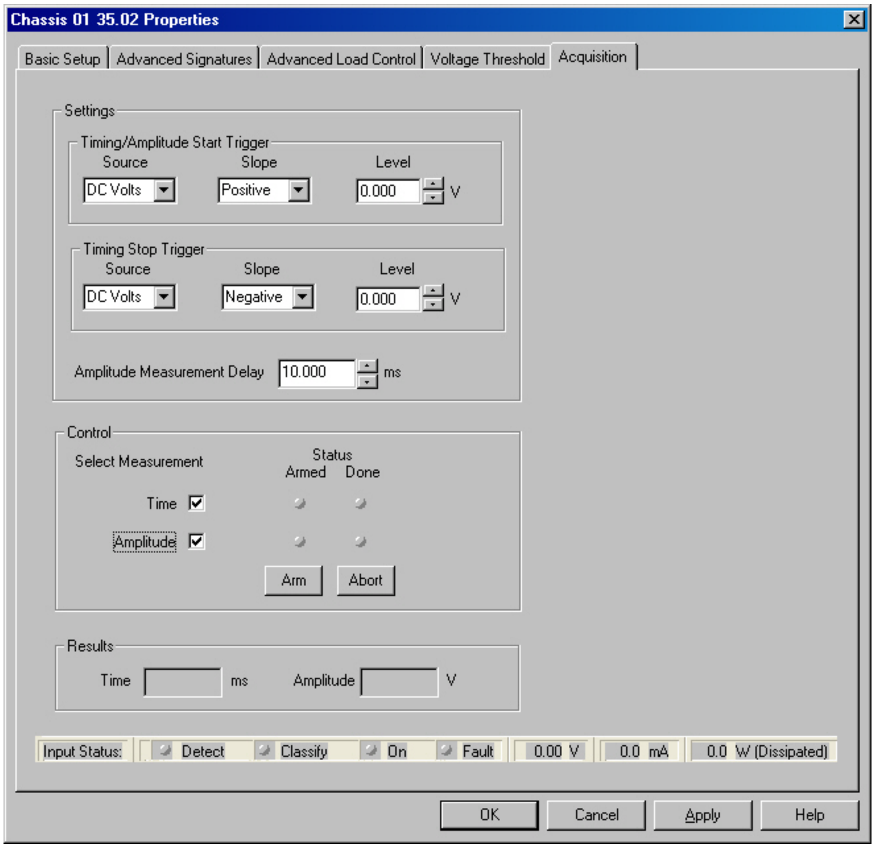
The Status settings are described in the following table:

PoE Acquisition

The **Acquisition** tab is used to set up tests that measure either the time elapsed from a Start trigger position to a Stop trigger position, and/or to measure the amplitude after a set time delay from a Start trigger.

The ***Acquisition*** tab is accessed by selecting a port in Resources pane and then selecting the *Properties* menu option, or by double-selecting a port in the Detail pane. Then select the ***Acquisition*** tab. Following image shows the PoE **Acquisition** tab.

Image: PoE **Acquisition** Tab



The controls and settings in the **Acquisition** tab are described in the following table:

Table: Acquisition Configuration

Section	Field/Control	Usage
Settings		Controls how the Start and Stop triggers are employed, as well as the Amplitude Measurement Delay.
	Start Trigger Source	Sets the Start trigger type to either DC Volts or DC Amps. The Start trigger determines when the test starts, based on the amplitude of the incoming voltage or current.
	Start Trigger Slope	Sets the Start trigger slope type, either positive or negative. A positive slope is equivalent to increasing voltage or current, while a negative slope is equivalent to decreasing voltage or current. If a trigger point is reached, but for the opposite slope setting, then the trigger is not activated.
	Start Trigger Level	Sets the amplitude of the Start trigger in either Volts or mAmps (depending on the setting in *Start Trigger Source*). When the trigger is armed, and the incoming voltage or current hits this number then the Start trigger is activated. Note that the Slope setting further qualifies this number.

Section	Field/Control	Usage
	Stop Trigger Source	Sets the Stop trigger type to either DC Volts or DC Amps. The Stop trigger determines when the test ends, based on the amplitude of the incoming voltage or current. This setting is only valid for Time tests.
	Stop Trigger Slope	Sets the Stop trigger slope type, either positive or negative. A positive slope is equivalent to increasing voltage or current, while a negative slope is equivalent to decreasing voltage or current. If a trigger point is reached, but for the opposite slope setting, then the trigger is not activated. This setting is only valid for Time tests.
	Stop Trigger Level	Sets the amplitude of the Stop trigger in either Volts or mAmps (depending on the setting in *Stop Trigger Source*). When the trigger is armed, and the incoming voltage or current hits this number then the Start trigger is activated. Note that the Slope setting further qualifies this number. This setting is only valid for Time tests.
	Amplitude Measurement Delay	Sets the length of an Amplitude test, in microseconds. When the Start trigger is activated, the value of the input signal is measured after the elapsed time. This setting is only valid for Amplitude tests.
Control		Controls the type of test, and the arming of tests.
	Select Measurement	Sets the type of test to be run, either a Time test, an Amplitude test, or both. Selecting the Time check box activates the Stop Trigger fields, while selecting the Amplitude check box activates the *Amplitude Measurement Delay* field. Both tests can be selected and run at the same time.
	Status	Shows the current status of a Time or Amplitude test. When the Arm light is green, the test is armed, and will start when the Start trigger is reached. When the Done light is green, the test has completed. Tests must be armed before they can initiate.
	Arm	Selecting this button arms a selected test. Tests are selected using the Select Measurement check boxes.
	Abort	Selecting this button disarms a selected test. Tests are selected using the Select Measurement check boxes.
Results		Shows the test results for both tests.

Section	Field/Control	Usage
	Time	For Time tests, lists the time between the Start trigger activation and Stop trigger activation. For Amplitude tests, lists the time set in the *Amplitude Measurement Delay* field.
	Amplitude	For Time tests, lists the Amplitude set in the Stop trigger point. For Amplitude tests, lists the Amplitude at the end of the Amplitude Measurement Delay.

The Status settings are described in the following table:

ALM1000T8/CPM1000T8 Module Port Properties

The ALM100T8 load module is a Layer 7-only version of Ixia TXS Ethernet modules and has 8 ports, each with an embedded CPU running the Linux operating system. It is currently designed to support two Layer 7 test applications — Ixia's Chariot and IxLoad software. It supports the PING and ARP protocols, as well as independent SDK applications.

The CPM1000T8 is identical to the ALM1000T8, only with more memory (2 Gigabytes).

For information on Ixia's IxChariot and IxLoad software, refer to the following manuals:

- IxChariot Quick Start Guide
- IxChariot User Guide
- IxLoad User Guide

The complete specifications for the ALM1000T8 and CPM1000T8 load modules can be found in the *Ixia Platform Reference Manual*.

The properties and capabilities of the ALM1000T8 and CPM1000T8 load module are described in the following sections:

- Port Properties for Ethernet Family of Modules (this chapter).
- Statistics Tab
- Statistic View
- Card Properties

Note that the ALM1000T8 and CPM1000T8 does *NOT* support the following functions:

- Frame Data Protocols support
- Filter/Receive mode support
- Time stamp support
- Transmit Modes
- Packet Streams

ELM1000ST2 Module Port Properties

Ixia's Encryption Load Module (ELM) enables high performance testing of IPSec VPN devices and networks. With its custom hardware-based security processor in conjunction with Ixia's IxVPN test suite, the ELM offers an extremely scalable solution for validating the performance of IPSec VPN gateways. The ELM emulates the functional requirements of today's VPN network with its extensive IPSec security features such as data encryption, device authentication and credential, data integrity, address hiding, and security-association (SA) key aging.

The ELM, in conjunction with Ixia's IxVPN, implements a full IPSec and IKE protocol stack. It can emulate thousands of secure gateways and clients, creating thousands of IPSec tunnels. Using multiple ports, a single Ixia test system can scale to test the largest IPSec VPN gateways and networks. Once the tunnels are set up, IxVPN measures the encryption and decryption performance of the IPSec gateway using standard RFC 2544 test methodology. This solution can also be combined with Ixia's IxChariot, enabling application emulation using real world Layer 4-7 traffic over secured networks.

For information on IxVPN, see the *IxVPN User's Guide*. For information on IxChariot, see:

- IxChariot Quick Start Guide
- IxChariot User Guide

The properties and capabilities of the ELM1000ST2 load module are described in the following sections:

- Port Properties for Ethernet Family of Modules(this chapter).
- **Statistics** Tab
- Statistic View
- Card Properties

Note that the ELM1000ST2 does *NOT* support the following functions:

- Frame Data Protocols support
- Filter/Receive/Statistics (dialog box) mode support
- Time stamp support
- Transmit Modes
- Packet Streams

Port Properties for Xcellon-Ultra and ASM1000XMV12X

The Xcellon-Ultra XP, Xcellon-Ultra NP, and ASM1000XMV12X-01 are Ethernet load modules with aggregation capability. The load module provides the following operation modes (which are set in the *Card Properties* dialog box):

- 12 ports of 10/100/1000 Mbps that operates in either normal (non-aggregated) mode or 1GE aggregation mode
- 1 port 10GE aggregation

The card operation mode is set in the *Card Properties* dialog box; Xcellon-Ultra and ASM1000XMV12X Modules.

NOTE: The complete specifications for the Xcellon-Ultra XP, NP, and ASM1000XMV12X load modules can be found in the Ixia Platform Reference Manual.

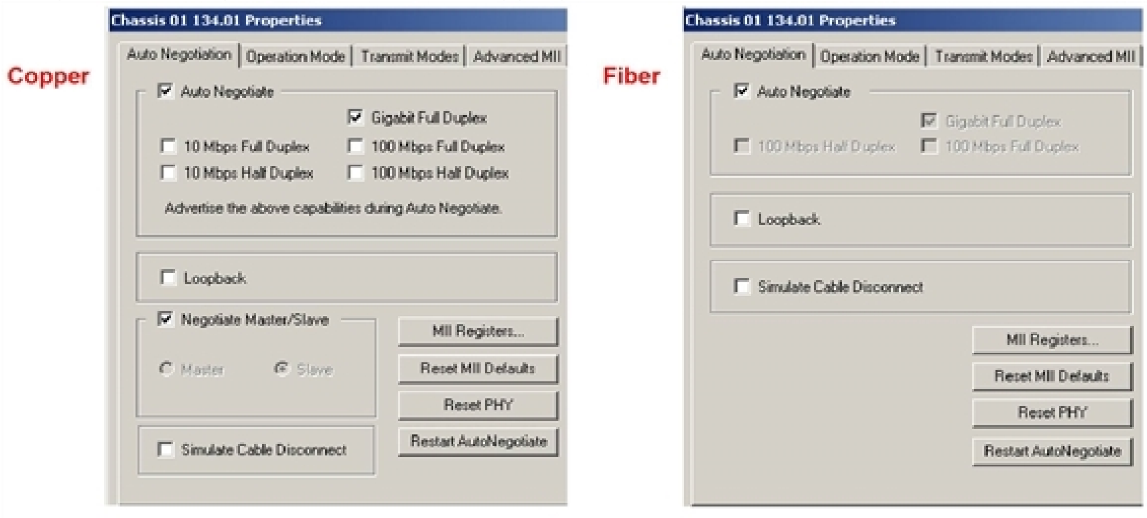
The Port Properties format will differ, depending on the operation mode of the card and the operation and transit modes of the selected port. The Transit Mode (copper or fiber) is set on the **Transit Modes** tab of the *Port Properties* dialog box.

Auto Negotiation

On the Port Properties–**Auto Negotiation** tab, these are available combinations:

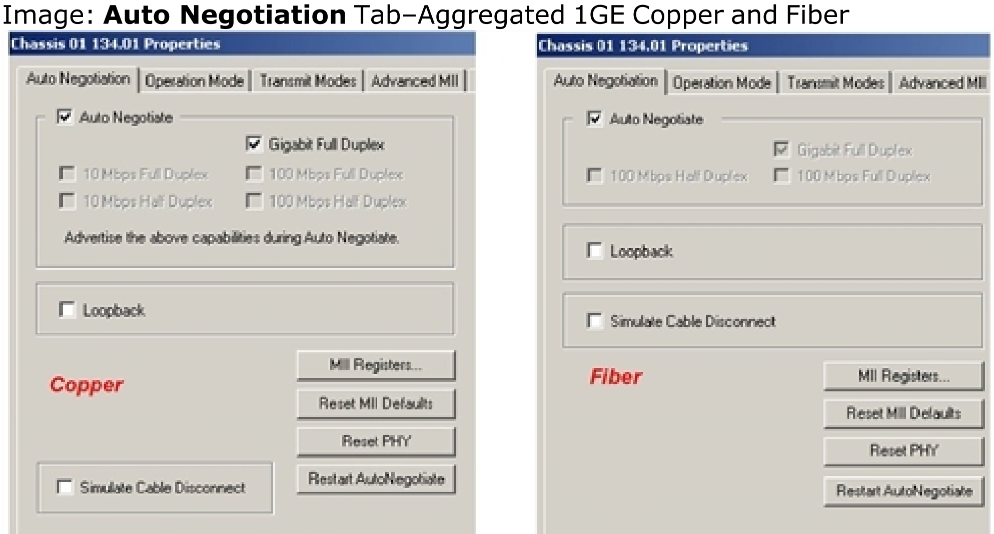
- non-aggregated copper or fiber (shown in *Image: **Auto Negotiation** Tab–Non-Aggregated Copper and Fiber*, below)
- 1GE aggregated copper or fiber (*Image: **Auto Negotiation** Tab–Aggregated 1GE Copper and Fiber*)
- 10GE aggregated copper and fiber (***Auto Negotiation** Tab–Aggregated 10GE Copper and Fiber*)

Image: **Auto Negotiation** Tab–Non-Aggregated Copper and Fiber



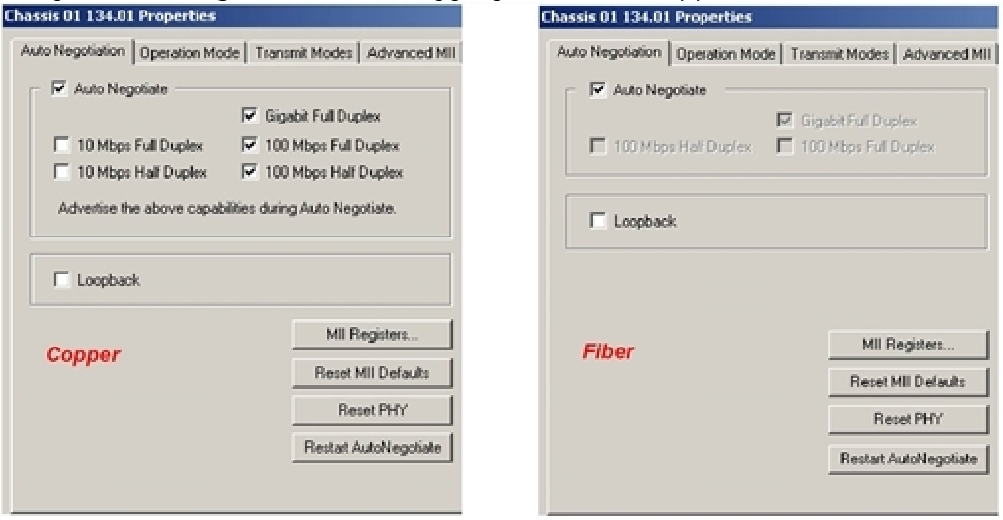
For descriptions of both sets of Auto Negotiation options, in the following image:

Image: **Auto Negotiation** Tab–Aggregated 1GE Copper and Fiber



For descriptions of both sets of Auto Negotiation options, in the following image:

Image: **Auto Negotiation** Tab–Aggregated 10GE Copper and Fiber



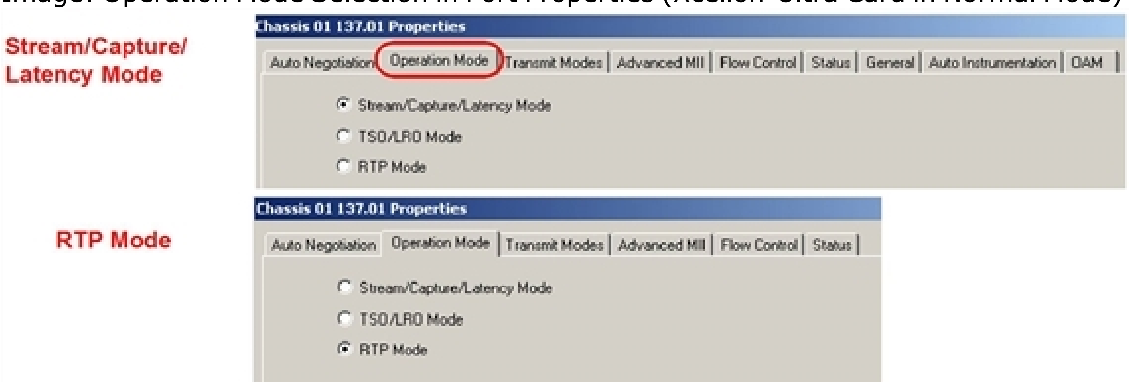
For descriptions of both sets of Auto Negotiation options, in the following table:

Non-Aggregated Port Operation Mode

With the ASM1000XMV12X-01 card in Normal (Non-Aggregated) mode, the port operation mode is (only) Stream/Capture/Latency. (This is the same when this card is in 1GbE Aggregated mode.)

For the Xcellon-Ultra XP and NP load modules, in Normal mode, the Port Operation Mode tab allows selection of Stream/Capture/Latency mode (the default) or RTP mode (Real-time Transport Protocol), or TSO/LRO (Transmit Segmentation Offload/Large Receive Offload) mode. Depending on the selection, the number and configuration of the other Port Properties tabs will vary, as shown in the following image:

Image: Operation Mode Selection in Port Properties (Xcellon-Ultra Card in Normal Mode)



Stream/Capture/Latency Mode

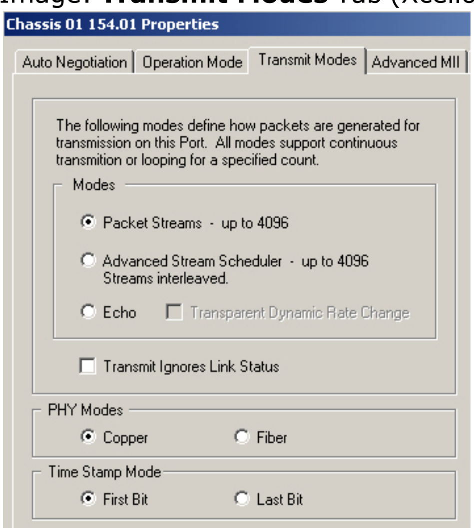
If Stream/Capture/Latency Mode (the default) is selected, then the other tabs will appear as listed below:

- *Transmit Modes*, same as that illustrated in **Transmit Modes** Tab in Stream/Capture/Latency Mode
- *Advanced MII*, practically identical to Advanced MII for Copper 10/100/100 Modules. *(See MII Register Files for additional information on MII registers.)*
- *Flow Control*, same as that described in **Flow Control** Tab for Ethernet Modules
- *Status*, same as that described in **Status** Tab for Ethernet Modules.
- On the **General** tab, *Time Stamp Offset*, same as that illustrated in **General** Tab for Ethernet Modules.
- Also on the **General** tab, *Intrinsic Latency Adjustment*,*Table: 10GE LSM XENPAK/XFP **General** Tab Configuration* for field definitions.
- *Auto Instrumentation*, same as that described in **Auto Instrumentation** Tab for Ethernet Modules.
- *OAM*, same as that illustrated in **OAM** Tab for Ethernet Modules.

Transmit Modes Tab in Stream/Capture/Latency Mode

In non-aggregated or 1GbE Aggregation mode, the **Transmit Modes** tab offers the choice of PHY Modes, copper or fiber. This **Transmit Modes** tab is also identical in the LSM1000XMV load module family.

Image: **Transmit Modes** Tab (Xcellon-Ultra) Stream/Capture/Latency Mode



The fields and controls in this tab are identified in the following table:

Table: **Transmit Modes** Tab (Xcellon-Ultra) Stream/Capture/Latency Mode

Section	Field/Control	Description
Modes	Packet Streams	Sets the basic operating mode for the port to sequential packet streams. This allows to configure up to 4096 streams. A stream may be programmed for continuous packet generation—generating a continuous, infinite number of packets.
	Advanced	Sets up the transmission of up to 4096 interleaved packet

Section	Field/Control	Description
	Stream Scheduler	streams. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
	Echo **See the CAUTION below!**	Sets the basic operating mode for the port to Echo, a Layer 2 Ethernet round-trip mode. (Setting the Echo option in the **Transmit Modes** tab automatically enables the Echo option for the **Receive Mode** tab). Echo for additional information on Echo mode. Also Echo for additional information on setting the Transmit Mode to Echo.
Transmit Ignores Link Status	(check box)	If selected, will allow transmission of packets even if the link is down.
PHY Modes	Copper	Selected when a copper PHY connector is used (RJ-45).
	Fiber	Selected when a fiber PHY connector is used (SFP transceiver).
Time Stamp Mode	First Bit	Store and Forward latency mode uses first bit time stamp mode
	Last Bit	Store and Forward latency mode uses last bit time stamp mode

The following warning message is issued when Echo is selected in the **Transmit Modes** tab or **Receive Mode** tab: 'Setting this mode on a live network may cause severe problems. All Ethernet frames with a DA which matches the Receive Filter DA1 will be 'echoed' back onto the network. Setting this mode will IMMEDIATELY start echoing packets. Are you sure you want to set Echo Mode? Yes or No.'

RTP Mode or TSO/LRO Mode

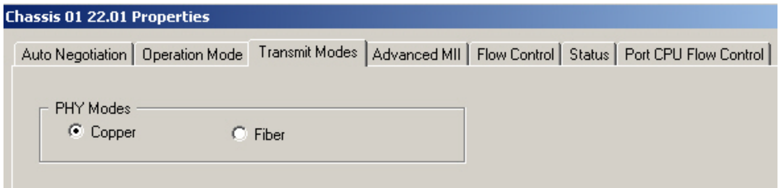
When RTP Mode is selected, IxOS downloads a different FPGA and restarts the CPU. If RTP Mode is selected, then the other Port Properties tabs will appear as listed below:

- *Transmit Modes*, select copper or fiber PHY mode. See the definitions for the PHY Modes in *Table: **Transmit Modes** Tab (Xcellon-Ultra) Stream/Capture/Latency Mode*.
- *Advanced MII*, the same as Stream/Capture/Latency Mode.
- *Flow Control*, the only option is Auto Negotiate. **Flow Control** Tab for Xcellon-Ultra Modules, below.
- *Status*, the same as Stream/Capture/Latency Mode above.

Transit Mode Tab in RTP Mode

The ***Transmit Modes*** tab for the Xcellon-Ultra modules in either RTP or TSO/LRO port operation mode is shown in the following image. *Table: **Transmit Modes** Tab (Xcellon-Ultra) Stream/Capture/Latency Mode* for definitions of PHY Modes.

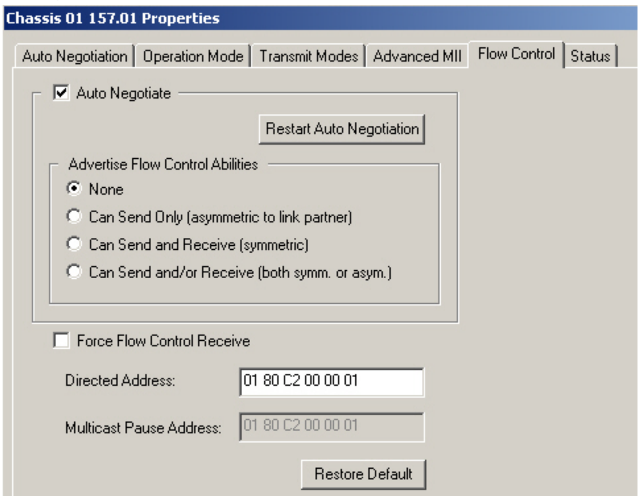
Image: **Transmit Modes** Tab in RTP or TSO/LRO Mode (Xcellon-Ultra)



Flow Control Tab for Xcellon-Ultra Modules

The **Flow Control** tab for the Xcellon-Ultra modules in either RTP or TSO/LRO port operation mode is shown in the following image:

Image: **Flow Control** Tab for Xcellon-Ultra Modules



The fields and controls in this tab are described in the following table:

Table: **Flow Control** Tab for Xcellon-Ultra Modules

Section	Field/Control	Description
Auto Negotiate		Enables auto-negotiation of flow control capabilities for the port.
	Restart AutoNegotiation	If this button is selected, it causes the auto-negotiation process to start immediately.
Advertise Flow Control Abilities	None	This and the next three options indicate which set of flow control capabilities are advertised to other ports. This option advertises no capabilities. (No PAUSE, per IEEE 802.3)
	Can Send Only (asymmetric to link partner)	This option advertises only send capabilities. (Asymmetric PAUSE toward link partner, per IEEE 802.3)
	Can Send and Receive (symmetric)	This option advertises both send and receive capabilities. (Symmetric PAUSE, per IEEE 802.3)

Section	Field/Control	Description
	Can Send and/or Receive(both symmetric or asymmetric)	This option advertises all send and receive capabilities in any combination. (Both Symmetric PAUSE and Asymmetric PAUSE toward local device, per IEEE 802.3)
Force Flow Control Receive		Enables receive side flow control handling for the port.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
	Restore Default	If this button is selected, it restores the default MAC address: 01 80 C2 00 00 01 in both *Directed* and *Multicast Pause Address* fields.

Aggregated Modes

With the ASM1000XMV12X-01 card in 1GbE Aggregated mode, the port operation mode is (only) Stream/Capture/Latency. This is the same as the Normal (non-aggregated) mode– Stream/Capture/Latency Mode.

For the Xcellon-Ultra XP and NP load modules in 1GbE Aggregated mode, the port operation mode tab allows selection of Stream/Capture/Latency mode (the default) or RTP mode, or TSO/LRO mode. This is the same as the Normal (non-aggregated) mode, which is shown in the following image.

The tabs that make up the Port Properties sets for the aggregated 1GE mode (copper and fiber) are listed below.

1GE Aggregate Mode:

- Auto Negotiation, *Image: **Auto Negotiation** Tab–Aggregated 1GE Copper and Fiber* and *Image: Auto Negotiation Tab–Aggregated 10GE Copper and Fiber*
- Operation Mode, Stream/Capture/Latency mode, RTP, or TSO/LRO mode (however, RTP mode settings are superseded when the card is in aggregated mode). There is no Operation Mode tab when the load module is in 10GbE Aggregated mode. *Image: Operation Mode Selection in Port Properties (Xcellon-Ultra Card in Normal Mode)*.
- *Transmit Modes*, select copper or fiber PHY mode*.* See the definitions for the PHY Modes in *Table: **Transmit Modes** Tab for Ethernet Modules*.
- *Advanced MII*, Advanced MII for Copper 10/100/100 Modules *(See MII Registers Files for additional information on MII registers.)*
- *Flow Control*, **Flow Control** Tab for Xcellon-Ultra Modules.
- *Status*, **Status** Tab for Ethernet Modules.
- *Port CPU Flow Control*, features a check box to enable/disable the port's flow control mechanism. Port CPU Flow Control.

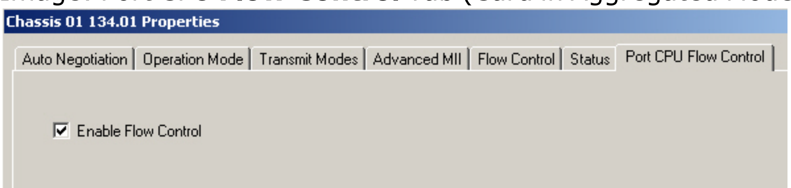
10GE Aggregate Mode:

For the ASM1000XMV12X-01 or Xcellon-Ultra XP and NP load modules in 10GbE Aggregated mode, the 12 Gigabit ports are disabled, and only port 13 *10G LAN XFP–Aggregate*–is operating. The port operation mode tab is not present. The **General** tab is used to select the type of Link and to select Simulate Cable Disconnect. The other tabs do not present configurable options, except the **Flow Control** tab, which allows enabling (or disabling) Flow Control.

Port CPU Flow Control

The Port Properties–Port CPU **Flow Control** tab is the same in all port operation modes when the card is in 1GbE Aggregate mode (shown in *Image: Port CPU **Flow Control** Tab (Card in Aggregated Mode)*). It allows enabling/disabling Flow Control.

Image: Port CPU **Flow Control** Tab (Card in Aggregated Mode)



Port/Card Ownership

You can switch the mode of operation on the Xcellon-Ultra or ASM1000XMV12X cards only if you own all ports on the card or if nobody owns any port. The behavior of taking ownership of an individual port is the same as those on other cards; that is, if nobody owns the port, ou can take ownership of the port. If you own the port, you can release ownership on the port. You can take ownership or clear ownership of a port by force.

Application software can enforce its own rules of port ownership.

Import/Export

Port files can be exported and imported even if the card is under a different mode of operation.

- When a port file (that was exported under aggregated mode) is imported back while the card is in normal mode, all the 'hidden' streams will be shown.
- When a port file (that was exported under normal mode) is imported back while the card is in aggregated mode, all the streams will be hidden and the speed will be forced to 1000FD.

CHAPTER 20

Port Properties–40/100 GE Family

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the 40/100 Gigabit Ethernet module family port properties.

Port Properties for 40/100 Gigabit Modules

The *Port Properties* dialog box is accessed by selecting a port in the Resources window, then selecting the *Properties* menu option.

The complete specification for the 40/100 Gigabit type boards can be found in the *Ixia Platform Reference Manual*.

The 40/100 Gigabit characteristics are defined in the IEEE 802.3ba standard. For more information about this standard and 100 Gigabit architecture, see the *40GE and 100GE* subsection under *Port Hardware / Types of Ports*, in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.

The following port property tabs are available for 40/100GE LAN modules:

- 40/100GE Port Properties— General
- 40/100GE Port Properties—TX Lane
- 40/100GE Port Properties–Preamble
- 40/100GE Port Properties–Link Fault Signaling
- 40/100GE Port Properties–Flow Control
- 40/100GE Port Properties–Transmit Modes

40/100GE Port Properties— General

For Xcellon-Multis module, see Xcellon-Multis Port Properties—General.

For Novus module, see Novus Port Properties—General.

For QSFP-DD module, see QSFP-DD Port Properties—General.

For CFP8 module, see CFP8 Port Properties—General.

For T400GD-8P-QDD module, see T400GD-8P-QDD Port Properties—General.

For T400GD-8P-OSFP module, see T400GD-8P-OSFP Port Properties—General.

For T400GP-4P-QDD module, see T400GP-4P-QDD Port Properties—General.

For T400GP-2P-QDD module, see T400GP-2P-QDD Port Properties—General.

For NOVUS25/10GE8SFP28 module, see NOVUS25/10GE8SFP28 Port Properties—General

For S400GD-16P-QDD+FAN+NRZ module, see S400GD-16P-QDD+FAN+NRZ Port Properties—General

For 800GE-4P-QDD module, see 800GE-4P-QDD Port Properties—General

For 800GE-4P-QDD-C module, see 800GE-4P-QDD-C Port Properties—General

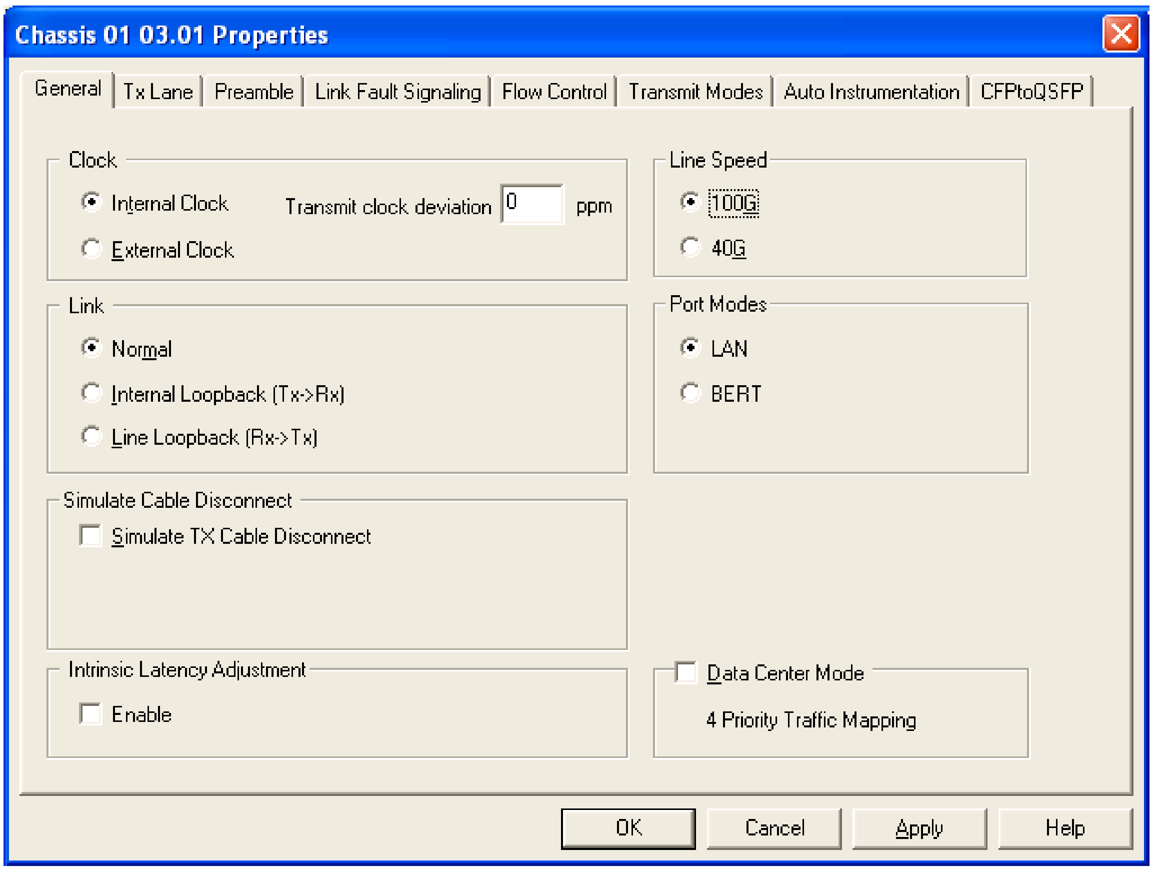
For 800GE-4P-OSFP-C module, see 800GE-4P-OSFP-C Port Properties—General

For 800GE-8P-QDD-M+NRZ module, see 800GE-8P-QDD-M+NRZ Port Properties—General

The **General** tab is accessed by selecting a port in the Resources pane, selecting the *Properties* menu options, then selecting the **General** tab.

The 40/100 GE Port Properties **General** tab is shown in the following figure:

Figure:40/100 GE–**General** Tab



The controls for the **General** tab configuration are described in the following table:

Table:40/100 GE **General** Tab Configuration

Section	Control/Field	Usage
Clock	Internal Clock	If selected, the timing for the SerDes reference clock comes

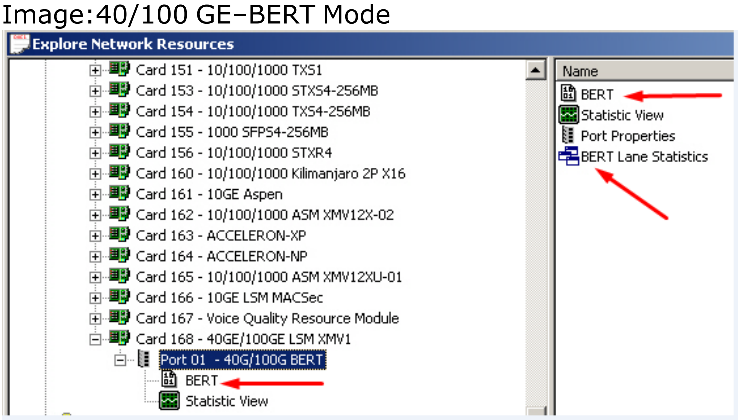
Section	Control/Field	Usage
		from an internal oscillator.
	External Clock	If selected, the timing for the SerDes reference clock comes from an external device connected to the Clock IN connector on the front panel of the module.
	Transmit Clock Deviation	Allows to adjust the line transmit frequency for the port. The initial rate is controlled by the chassis chain reference clock. Then you can adjust the line transmit frequency for the port. 40/100 GE LSM cards can be adjusted from -100 to +100 ppm from the initial rate.
Link	Normal	Normal operation
	Internal Loopback (Tx -> Rx)	Enable/disable the Internal Loopback—Transmit to Receive.
	Line Loopback (Rx -> Tx)	Enable/disable the Line Loopback—Receive to Transmit.
Simulate Tx Cable Disconnect		If this is selected, the port acts as if the cable has been disconnected on the transmit side only. Incoming packets may still be received and port may show link up, but no packets or PCS data will be transmitted.
Intrinsic Latency Adjustment	Enable	Click to enable the intrinsic latency adjustment. The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia Platform Reference Manual*.
	Latency Calibration	Click to run a Tcl script that measures intrinsic latency and stores the value in an .xml file. The button is only enabled for cards with transceivers that have not been pre-measured for intrinisic latency by Ixia. The button will be grayed-out or absent if any one of the following conditions are present: • there is no transceiver • the transceiver is CFP and a value is found for it in the list of pre-calibrated values.
Line Speed		Select 100G or 40G
Port Modes		Select LAN or BERT.

Section	Control/Field	Usage
		If BERT is selected, all the Port Properties tabs except *General* will disappear. BERT Mode.
Data Center Mode		Frame Data for FCoE Support.

BERT Mode

If BERT is the selected Port Mode, the Port Properties dialog box will have only the **General** tab. The tree view of port resources, on the left, and the detail view on the right now feature BERT and BERT Lane Statistics entries, as shown in the following image:

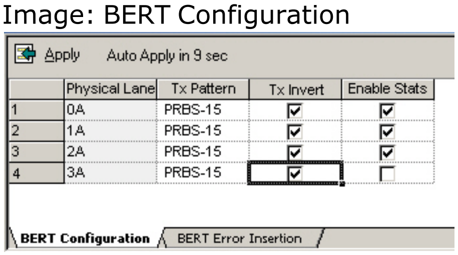
Image:40/100 GE–BERT Mode



If the BERT entry is selected from either location above, a configuration and error insertion grid will appear as shown in the following image:

BERT Configuration

Image: BERT Configuration



The fields in the **BERT Configuration** tab are described in the following table:

Table: BERT Configuration

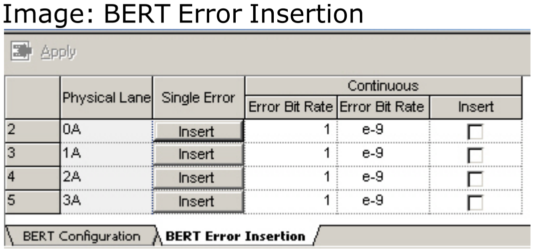
Field/Control	Description
Physical Lane	The physical lane identifier. The physical lane is paired with a corresponding PCS lane.
Tx Pattern	Select the pseudo-random data pattern to be transmitted. Choose one of:

Field/Control	Description
	• All 1's • PRBS-31 • PRBS-23 • PRBS-20 • PRBS-15 • PRBS-11 • PRBS-9 • PRBS-7
Tx Invert	If enabled, the selected data transmission pattern is sent inverted.
Enable Stats	When selected, BERT Lane Statistics will be enabled.

BERT Error Insertion

The BERT error insertion grid is shown in the following image:

Image: BERT Error Insertion



The fields in the **BERT Error Insertion** tab are described in the following table:

Table: BERT Error Insertion

Section	Field/Control	Description
	Physical Lane	The physical lane identifier. The physical lane is paired with a corresponding PCS lane.
	Single Error (Insert)	When clicked, inserts one BERT error.
Continuous	Error Bit Rate - Integer	Enter the integer portion of the error bit rate value, which will be multiplied by the selected exponential value in the list. The valid range is 1 to 32.
	Error Bit Rate - Exponent	Select the exponential multiplier for the error bit rate value. One of: • e-2 (= 10^{-2}) • e-3 (= 10^{-3})

Section	Field/Control	Description
		• e-4 (= 10^{-4}) • e-5 (= 10^{-5}) • e-6 (= 10^{-6}) • e-7 (= 10^{-7}) • e-8 (= 10^{-8}) • e-9 (= 10^{-9}) • e-10 (= 10^{-10}) • e-11 (= 10^{-11})
	Insert	check box–when selected, inserts errors continuously.

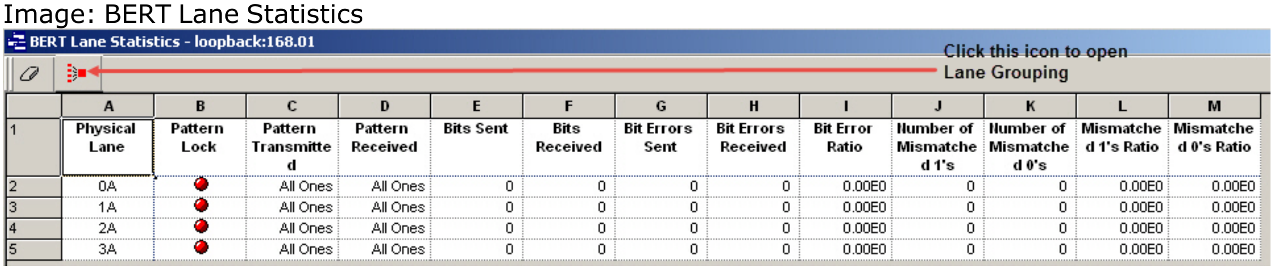
BERT Lane Statistics

If the BERT Lane Statistics entry is selected in the IxExplorer port detail window, a grid will appear as shown in the following image:

For HSE 100GE load module, FlexAP1040SQ - 40GE mode and FlexFE40QP, Lava load module Lava AP40/100GE 2P and Lava AP40/100GE 2RP load modules, you can view the following:

- Statistics for the configured PCS lanes. For more information, PCS Lane Statistics.
- PCS lane error generation. For more information, PCS Lane Error Generation.

Image: BERT Lane Statistics



The fields (columns) of statistics are described in the following table:

Table: BERT Lane Statistics

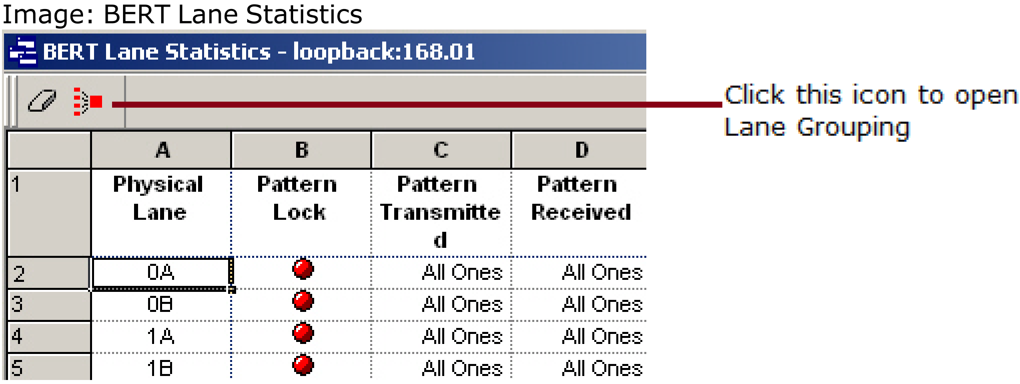
Field/Control	Description
Physical Lane	The physical lane identifier. The physical lane is paired with a corresponding PCS lane.
Pattern Lock	Indicates whether the receive side is locked to a particular pattern. Green indicates success; red indicates failure.
Pattern Transmitted	The pseudo-random data pattern that was transmitted.

Field/Control	Description
Pattern Received	The pseudo-random data pattern that was received.
Bits Sent	The total number of bits sent.
Bits Received	The total number of bits received.
Bit Errors Sent	The total number of bit errors sent.
Bit Errors Received	The total number of bit errors received.
Bit Error Ratio	(BER) the ratio of the number of errored bits compared to the total number of bits transmitted. In the following format: 0.00E0.
Number of Mismatched 1's	The number of expected ones received as zeroes.
Number of Mismatched 0's	The number of expected zeroes received as ones.
Mismatched 1's Ratio	The ratio of the number of expected ones received as zeroes to all bits. In the following format: 0.00E0.
Mismatched 0's Ratio	The ratio of the number of expected zeroes received as ones to all bits. In the following format: 0.00E0.

Lane Stats Grouping

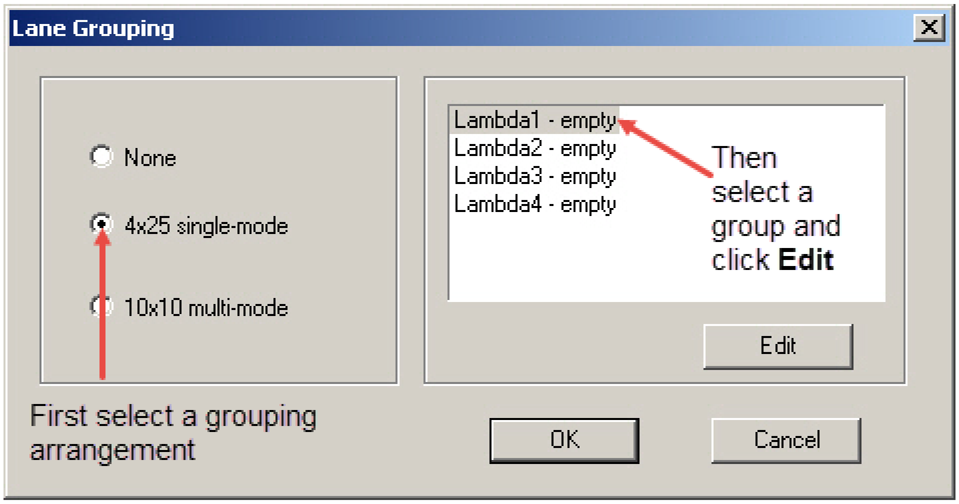
Lane stat grouping aggregates the stats from multiple lanes into a new stat. Click the icon (upper left corner) in the grid (shown in the following image) to open the Lane Grouping dialog box.

Image: BERT Lane Statistics



The Lane Grouping dialog box will open, as shown in the following image:

Image: Lane Grouping dialog box

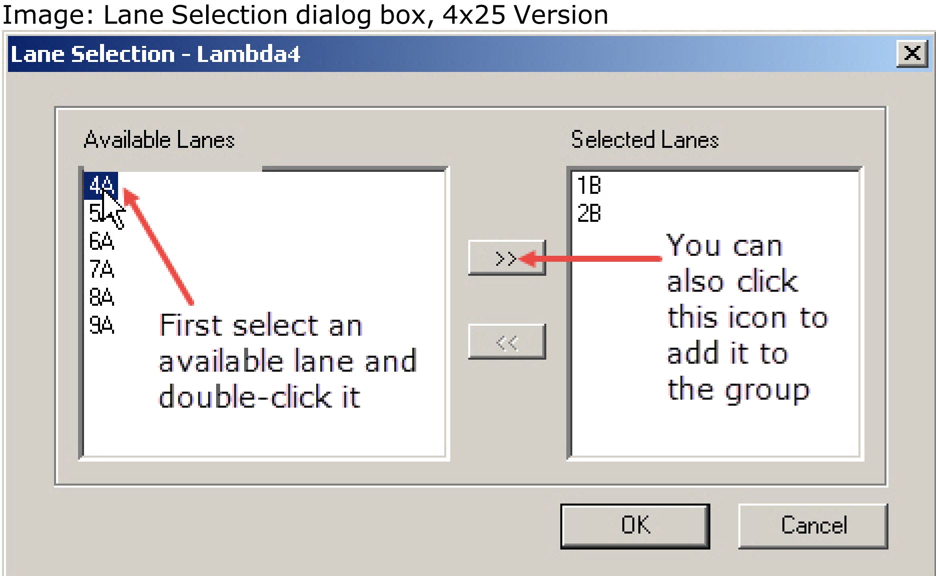


- Select a grouping approach:
  - 4x25 single-mode (4 groups of 5 lanes)-user-selectable lanes, or
  - 10x10 (10 groups of 2 lanes) multi-mode grouping-fixed configuration (0A+0B, 1A+1B, and so on).

In the example above, 4x25 has been selected. The four groups on the right are currently empty. (If 10x10 had been selected, there would be no need for the next step, since the configuration is not user-selectable.)

- Then select a group (such as Lambda1) and click **Edit**. The Lane Selection dialog box opens as shown in the following image, for configuring the selected group.

Image: Lane Selection dialog box, 4x25 Version

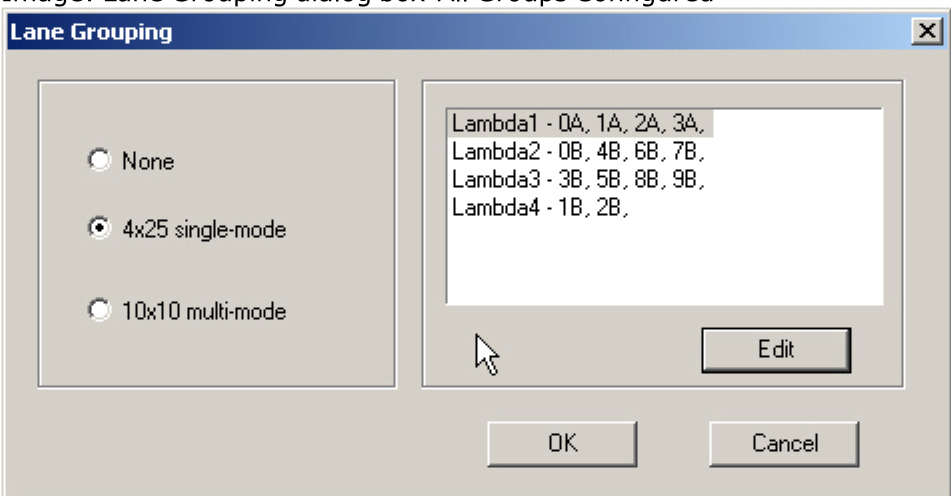


The left panel lists available lanes, and the right panel lists lanes you have selected to assign to the group (in this example, Lambda4).

- Select an available lane (or lanes) then click >> to add to the group. You can also double-click an available lane to add it to the group.
- To delete a lane from the group, select it and click <<.

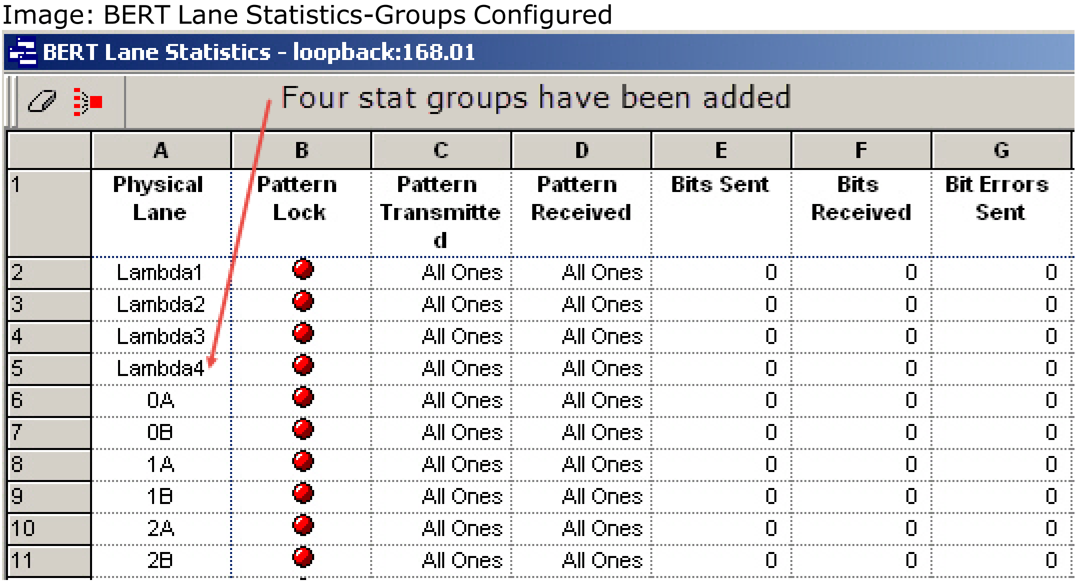
- When finished selecting lanes for the group, click **OK**. The Lane Grouping dialog box will appear again, as shown in the following image:

Image: Lane Grouping dialog box-All Groups Configured



When all groups have been configured, click **OK** to close the dialog box and save your changes. The BERT Lane Statistics grid will show your changes, as shown in the following image:

Image: BERT Lane Statistics-Groups Configured



	A	B	C	D	E	F	G
1	Physical Lane	Pattern Lock	Pattern Transmitted	Pattern Received	Bits Sent	Bits Received	Bit Errors Sent
2	Lambda1		All Ones	All Ones	0	0	0
3	Lambda2		All Ones	All Ones	0	0	0
4	Lambda3		All Ones	All Ones	0	0	0
5	Lambda4		All Ones	All Ones	0	0	0
6	0A		All Ones	All Ones	0	0	0
7	0B		All Ones	All Ones	0	0	0
8	1A		All Ones	All Ones	0	0	0
9	1B		All Ones	All Ones	0	0	0
10	2A		All Ones	All Ones	0	0	0
11	2B		All Ones	All Ones	0	0	0

40/100GE Port Properties—TX Lane

For Xcellon-Multis module, see Xcellon-Multis Port Properties—TX-Lane.

For Novus module, see Novus Port Properties—TX-Lane.

For QSFP-DD module, see QSFP-DD Port Properties—Lane Skew and Mapping.

For CFP8 module, see CFP8 Port Properties—Lane Skew and Mapping.

For T400GD-8P-QDD module, see T400GD-8P-QDD Port Properties—Lane Skew and Mapping.

For T400GD-8P-OSFP module, see T400GD-8P-OSFP Port Properties—Lane Skew and Mapping.

For T400GP-4P-QDD module, see T400GP-4P-QDD Port Properties—Lane Skew and Mapping.

For T400GP-2P-QDD module, see T400GP-2P-QDD Port Properties—Lane Skew and Mapping.

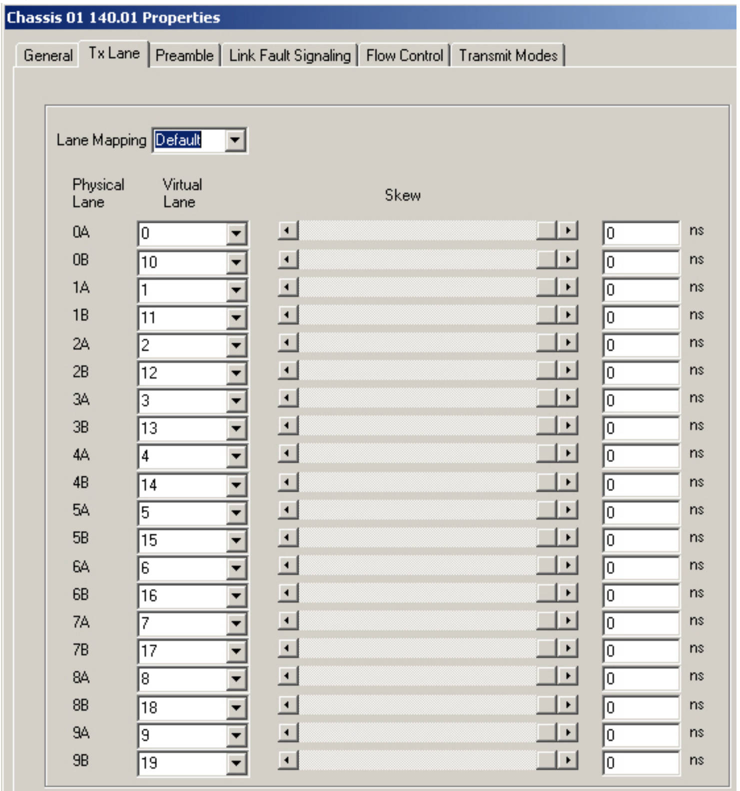
For S400GD-16P-QDD+FAN+NRZ module, see S400GD-16P-QDD+FAN+NRZ Port Properties—Lane Skew and Mapping.

The **Tx Lane** tab allows to control the PCS lane order and skew rate for each lane.

For more information on Lane Skewing, see the Lane Skew topic in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*. The Lane Skew topic is located under 'Types of Ports' / '10GE'.

The 40/100 GE Port Properties ***Tx Lane*** tab is shown in the following figure:

Figure: 40/100 GE–**Tx Lane** Tab



The controls for the ***Tx Lane*** tab configuration are described in the following table:

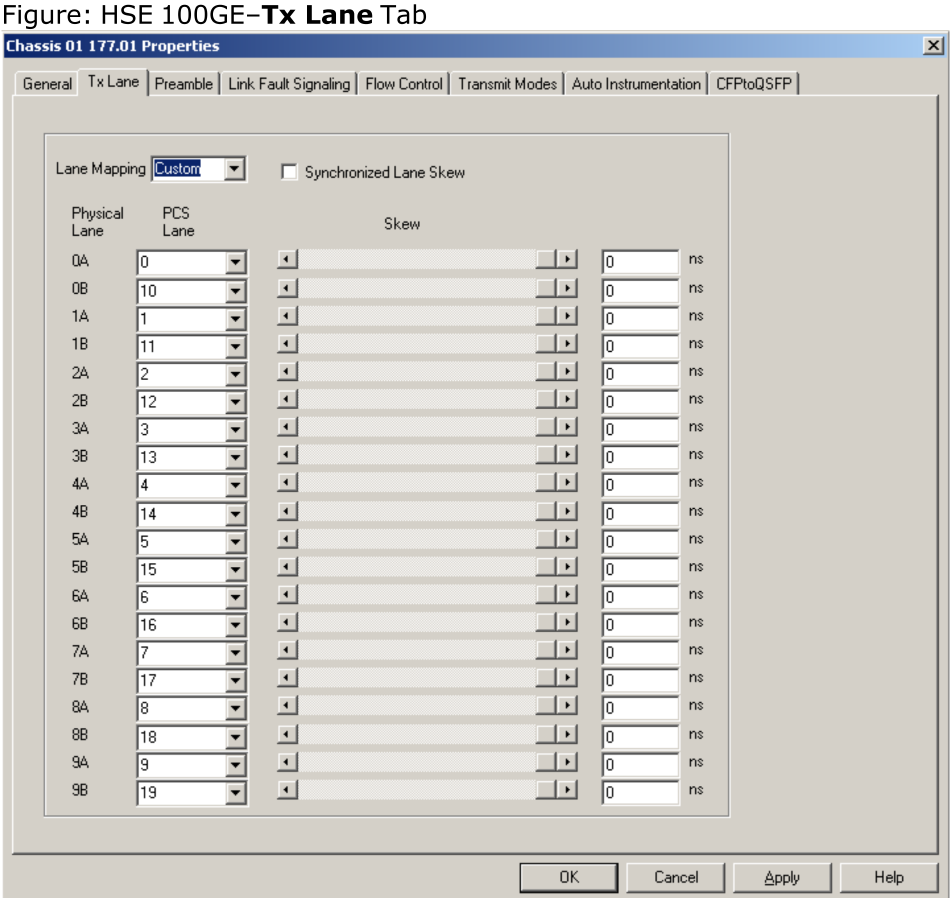
Table: **Tx Lane** Tab Configuration, 40/100 GE

Field	Description
Lane Mapping	Allows you to select a PCS lane ordering method. There are four options: • Default–the default ordering method. The default order is each physical port corresponds to 2 PCS lanes that are n and n+10, where n = physical lane number. • Increment–orders the lanes from 0 to 19, straight down the list. • Decrement–orders the lanes from 19 to 0, straight down the list.

Field	Description
	• Custom–allows to put the lanes in any order by manually entering the numbers in the fields. The starting order is the last selected mapping.
Physical Lane	The physical lane identifier. The physical lane is paired with a corresponding PCS lane.
PCS Lane	A number identifier for the PCS lane. The PCS lane is paired with a corresponding physical lane.
Skew	The skew slider is used to set a skew value for the PCS lane, in nanoseconds, on the transmit side. Lane Skew is the ability to independently delay one or more of the 20 PCS lanes. When the slider is moved, the nanoseconds field is correspondingly adjusted. You can also enter a nano second value directly into this field. When the slider is fully pushed to the right, the skew injected into the transmit stream is 0 (minimum). When the slider is pushed all the way to the left. the skew injected into the transmit stream is 3 uS (maximum).

The HSE 100GE Port Properties-TX Lane is shown in the following figure:

Figure: HSE 100GE–**Tx Lane** Tab



The controls for the ***Tx Lane*** tab configuration for HSE 100GE load module are described in the following table:

Table: **Tx Lane** Tab Configuration, HSE 100GE

Field	Description
Lane Mapping	Allows to select a PCS lane ordering method. There are five options: • Default–the default ordering method. The default order is each physical port corresponds to 2 PCS lanes that are n and n+10, where n = physical lane number. • Increment–orders the lanes from 0 to 19, straight down the list. • Decrement–orders the lanes from 19 to 0, straight down the list. • Custom–allows to put the lanes in any order by manually entering the numbers in the fields. The starting order is the last selected mapping. • Random–PCS lanes are randomly mapped.
Synchronized Lane Skew	If selected, enables to synchronize the skewing or delaying of one or more PCS lanes.
Physical Lane	The physical lane identifier. The physical lane is paired with a corresponding PCS lane.
PCS Lane	A number identifier for the PCS lane. The PCS lane is paired with a corresponding physical lane.
Skew	The skew slider is used to set a skew value for the PCS lane, in nanoseconds, on the transmit side. Lane Skew is the ability to independently delay one or more of the 20 PCS lanes. When the slider is moved, the nanoseconds field is correspondingly adjusted. You can also enter a nano second value directly into this field. When the slider is fully pushed to the right, the skew injected into the transmit stream is 0 (minimum). When the slider is pushed all the way to the left. the skew injected into the transmit stream is 3 uS (maximum).

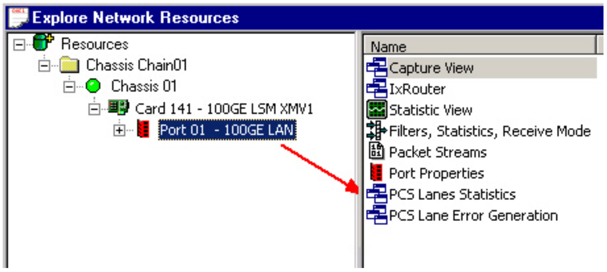
PCS Lane Statistics

The PCS Lane Statistics table allows you to view the statistics for the configured PCS lanes. It is part of the Port Properties for the module.

To open the PCS Lane Statistics table:

1. Select the HSE 100GE load module, 40 or 100GE LSM XMV1, FlexAP1040SQ - 40GE mode or FlexFE40QP, Lava Load module Lava AP40/100GE 2Pand Lava AP40/100GE 2RP module in the left pane of the IxExplorer window.
2. Expand the node, and select the Port object. In the right window pane, double-click the PCS Lane Statistics object as shown in the following figure:

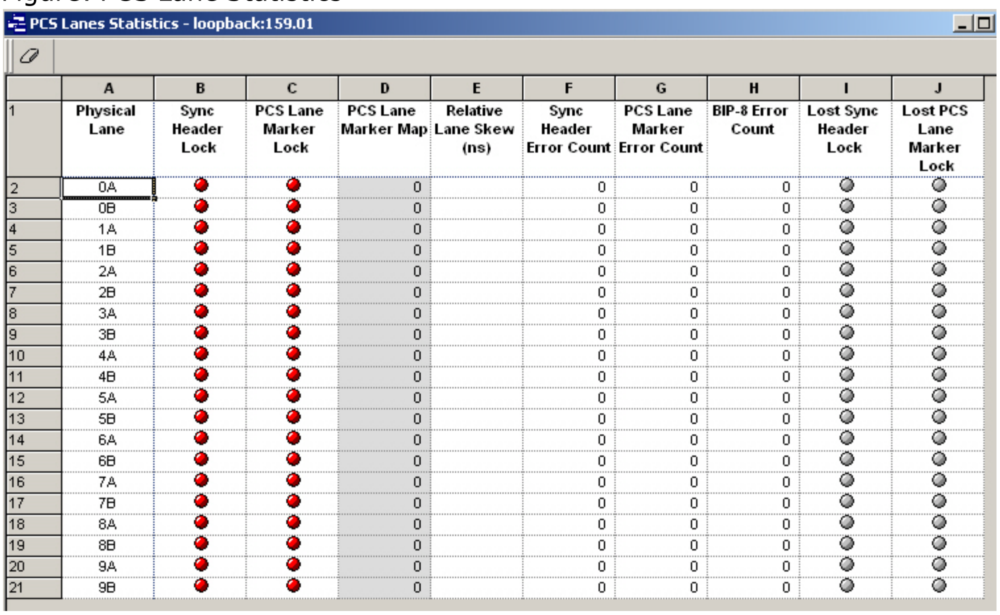
   Figure: Port and PCS Lane Statistics



3. The PCS Lane Statistics table opens. Use this table to view the PCS lane statistics for each lane. The statistics are for the **receive** side.

The PCS Lane Statistics table is shown in the following figure:

Figure: PCS Lane Statistics


PCS Lanes Statistics - loopback:159.01

	A	B	C	D	E	F	G	H	I	J
1	Physical Lane	Sync Header Lock	PCS Lane Marker Lock	PCS Lane Marker Map	Relative Lane Skew (ns)	Sync Header Error Count	PCS Lane Marker Error Count	BIP-8 Error Count	Lost Sync Header Lock	Lost PCS Lane Marker Lock
2	0A			0		0	0	0		
3	0B			0		0	0	0		
4	1A			0		0	0	0		
5	1B			0		0	0	0		
6	2A			0		0	0	0		
7	2B			0		0	0	0		
8	3A			0		0	0	0		
9	3B			0		0	0	0		
10	4A			0		0	0	0		
11	4B			0		0	0	0		
12	5A			0		0	0	0		
13	5B			0		0	0	0		
14	6A			0		0	0	0		
15	6B			0		0	0	0		
16	7A			0		0	0	0		
17	7B			0		0	0	0		
18	8A			0		0	0	0		
19	8B			0		0	0	0		
20	9A			0		0	0	0		
21	9B			0		0	0	0		

The following table explains the entries in the PCS Lane Statistics table:

Table: PCS Lane Statistics Data

Field	Description
Physical Lane	The identifier for the Receive physical lane. This is a tag / fixed label to ID each lane.
Sync Header Lock	Indicates if the received PCS lane achieved sync-bit lock. Green indicates success, red indicates failure.
PCS Lane Marker Lock	Indicates if the received PCS lane has achieved alignment marker lock. Green indicates success, red indicates failure.
PCS Lane Marker Map	The VL number identified by the alignment marker. This is only valid when VL Lock is green.
Relative Lane	Shows the actual skew in nanoseconds.

Field	Description
Skew (ns)	Skew measurements are valid only when all lanes are locked with 20 unique lane markers. The first VL markers to arrive have skew of 0. All other lane skews are relative to them.
Sync Header Error Count	The number of synchronization bit errors received.
PCS Lane Marker Error Count	The number of incorrect PCS lane markers received while in PCS lane lock state.
BIP-8 Error Count	The number of BIP-8 errors for a PCS lane. BIP-8 = Bit-Interleaved Parity with eight bit errors (BIP-8). Each bit in the BIP field is an even parity calculation over all previous selected bits of a PCS lane.
Lost Sync Header Lock	When lit, indicates the loss of sync header lock since the last statistic was read. If colored gray, there is no error. If colored red, an error has occurred.
Lost PCS Lane Marker Lock	When lit, indicates the loss of PCS lane marker lock since the last statistic was read. If colored gray, there is no error. If colored red, an error has occurred.

PCS Lane Error Generation

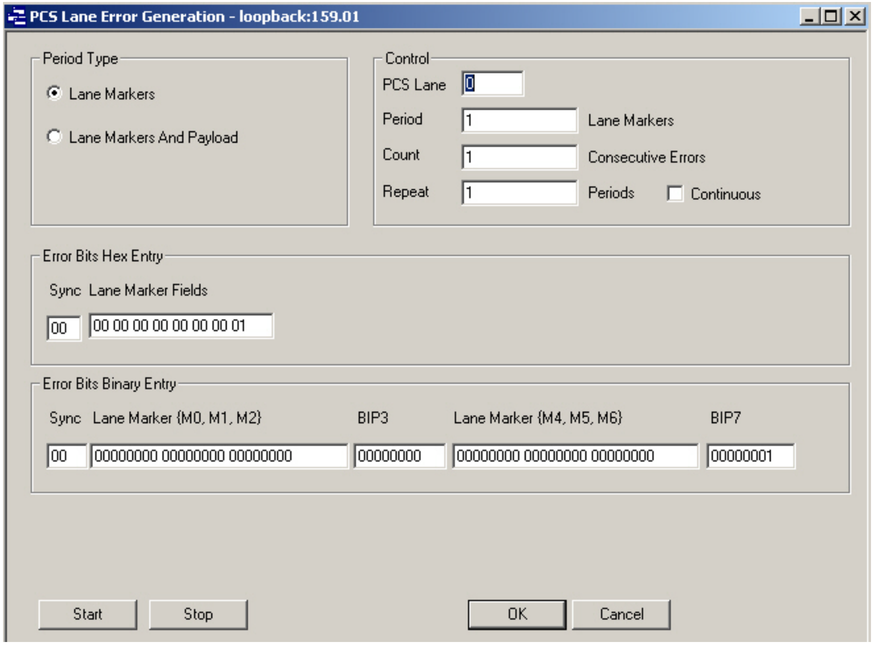
The HSE 100GE load module, Lava load module and other 40/100 GE load modules can generate errors in the BIP-8 field, or anywhere in the 40/100 GE lane markers or in the payload.

PCS Lane (virtual lane) selection is 0-19 for 100G and 0-3 for 40G.

Errors can be inserted either in only the Lane Marker fields or in both Lane Markers and Payload. The Period Type makes this choice and the Error Bits Binary Entry units change based on the selected period type, either Lane Markers or 64/66 Bit Words.

Starting and stopping errors is independent of stream transmit. Errors can be inserted when transmit is idle or active.

Image: PCS Lane Error Generation



The following table describes the fields of the **PCS Lane Error Generation** dialog box:

Table: PCS Lane Error Generation

Section	Field	Description
Period Type	Lane Markers	Insert errors only in the Lane Marker fields.
	Lane Markers and Payload	Insert errors in both Lane Markers and Payload fields.
Control	PCS Lane	Specify which lane to insert errors. 0-19 for 100G and 0-3 for 40G
	Period	(Number) Lane Markers or 64/66 Bit Words (depending on Period Type) Define the period by the number of consecutive Lane Markers or 64/66 Bit Words.
	Count	(Number) Consecutive Errors Define the number of consecutive Lane Markers or 64/66 Bit Words containing defined errors.
	Repeat	(Number) Periods Define the number of periods to repeat the error pattern.
		Continuous (check box)–if selected, the Repeat __ Periods field is disabled, and errors are inserted continuously.
Error Bits	Sync / Lane Marker Fields	Defines which bits to error, in hex format.

Section	Field	Description
Hex Entry	(or) Lane Markers and Payloads	
Error Bits Binary Entry		Defines which bits to error, in binary format. Depending on the selected Period Type, the Error Bits Binary Entry units change, either Lane Markers or 64/66 Bit Words.
	If Lane Markers is selected as Period Type	Sync Lane Marker (M0, M1, M2) BIP 3 Lane Marker (M4, M5, M6) BIP 7
	If Lane Markers and Payload is selected as Period Type	Sync Byte 0 through Byte 7

40/100GE Port Properties–Preamble

For Xcellon-Multis module, see Xcellon-Multis Port Properties—Preamble.

For Novus module, see Novus Port Properties—Preamble.

For QSFP-DD module, see QSFP-DD Port Properties—Preamble.

For CFP8 module, see CFP8 Port Properties—Preamble.

For T400GD-8P-QDD module, see T400GD-8P-QDD Port Properties—Preamble.

For T400GD-8P-OSFP module, see T400GD-8P-OSFP Port Properties—Preamble.

For T400GP-4P-QDD module, see T400GP-4P-QDD Port Properties—Preamble.

For T400GP-2P-QDD module, see T400GP-2P-QDD Port Properties—Preamble

For NOVUS25/10GE8SFP28 module, see NOVUS25/10GE8SFP28 Port Properties—Preamble

For S400GD-16P-QDD+FAN+NRZ module, see S400GD-16P-QDD+FAN+NRZ Port Properties—Preamble

For 800GE-4P-QDD module, see 800GE-4P-QDD Port Properties—Preamble

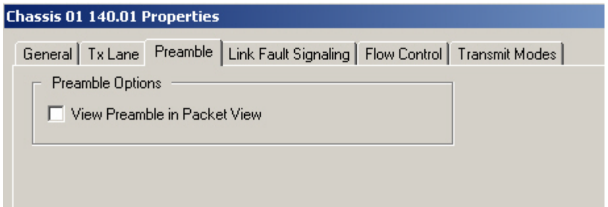
For 800GE-4P-QDD-C module, see 800GE-4P-QDD-C Port Properties—Preamble

For 800GE-4P-OSFP-C module, see 800GE-4P-OSFP-C Port Properties—Preamble

For 800GE-8P-QDD-M+NRZ module, see 800GE-8P-QDD-M+NRZ Port Properties—Preamble

The 40/100GE **Preamble** tab allows to choose to view the preamble in Packet View. The **Preamble** tab for a 100GE LSM XMV LAN module is shown in the following figure:

Figure: 100GE LSM XMV LAN Port Properties—Preamble



The fields and controls in this tab are described in the following table:

Table: 100GE LSM XMV LAN Port Properties—Preamble

Section	Choices	Description
Preamble Options	View Preamble in Packet View	When this check box is selected, the preamble data will be visible in the Packet View (transmit side) and the Capture View (receive side).

40/100GE Port Properties–Link Fault Signaling

Link Fault Signaling is a simple method to indicate certain types of faults between Ethernet stations. The Reconciliation Sublayer (RS) controls whether the MAC is allowed to transmit. In the typical scenario, the RS that had been receiving the data will receive this Local Fault status, and then send a Remote Fault status to the RS that was sending the data. Upon receipt of this Remote Fault status message, the sending RS will terminate transmission of MAC Data, sending only 'Idle' control characters until the link fault is resolved.

In the 40/100GE configuration, then you can select the option to have the transmitting RS ignore link faults from the receiving RS.

The **Link Fault Signaling** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Link Fault Signaling*** tab. The 100GE ***Link Fault Signaling*** tab is shown in the following image:

Image:40/100 GE Link Fault Signaling

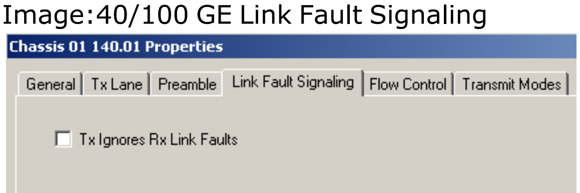


Table:40/100 GE **Link Fault Signaling** Tab

Field/Control	Description
Tx Ignores Rx Link Faults	If selected, ongoing transmission will continue even if Link Fault messages are received by the sending RS.

40/100GE Port Properties–Flow Control

When a port is receiving data at a faster rate than it can handle from another, directly connected port, the receiving port can send a MAC control PAUSE frame to the sending port to temporarily halt transmission of frames. The PAUSE function is defined in IEEE 802.3.

The ***Flow Control*** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Flow Control*** tab. The ***Flow Control*** tab is shown in the following image:

Image:40/100 GE (non Data Center mode)Port Properties—Flow Control

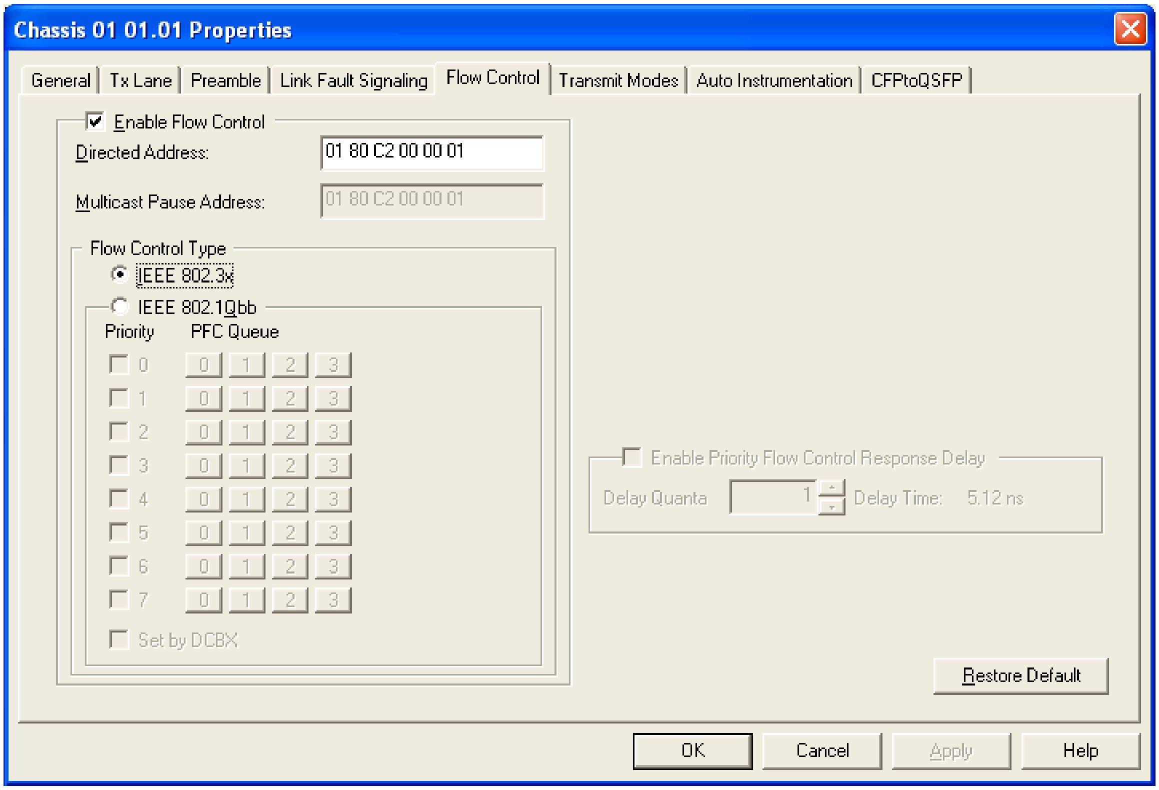
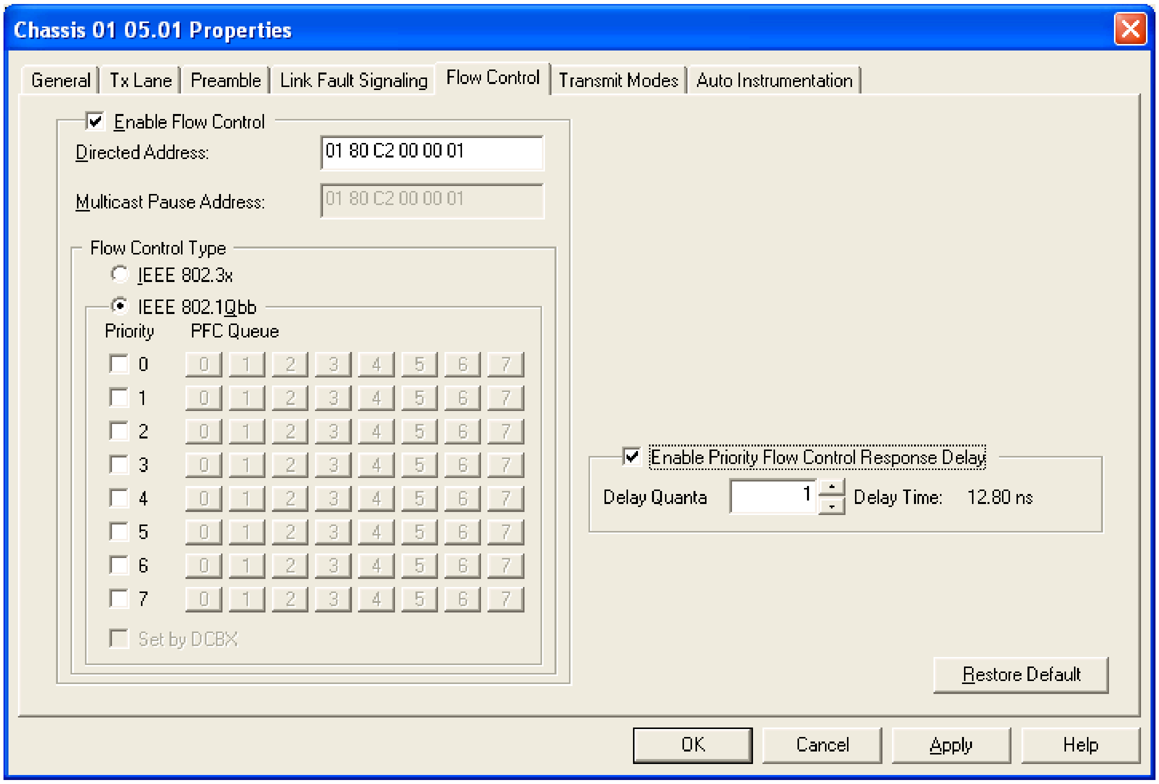


Image:40/100 GE (in Data Center mode)Port Properties—Flow Control



The fields and controls in this tab are described in the following table:

Section	Field/Control	Description
Enable Flow Control	(check box)	Enables the port's MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type	IEEE 802.3x or IEEE 802.1Qbb	Priority-based Flow Control. When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame. When not in Data Center mode, only IEEE 802.3x is available.
	Priority	Priority-based Flow Control.
	PFC Queue	Priority-based Flow Control.
Enable Priority Flow Control	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow

Section	Field/Control	Description
Response Delay		control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

40/100GE Port Properties–Transmit Modes

For Xcellon-Multis module, Xcellon-Multis Port Properties—Transmit Modes.

For Novus module, see Novus Port Properties—Transmit Modes.

For QSFP-DD module, see QSFP-DD Port Properties—Transmit Modes.

For CFP8 module, see CFP8 Port Properties—Transmit Modes.

For T400GD-8P-QDD module, see T400GD-8P-QDD Port Properties—Transmit Modes.

For T400GD-8P-OSFP module, see T400GD-8P-OSFP Port Properties—Transmit Modes.

For T400GP-4P-QDD module, see T400GP-4P-QDD Port Properties—Transmit Modes.

For T400GP-2P-QDD module, see T400GP-2P-QDD Port Properties—Transmit Modes.

For NOVUS25/10GE8SFP28 module, see NOVUS25/10GE8SFP28 Port Properties—Transmit Modes

For S400GD-16P-QDD+FAN+NRZ module, see S400GD-16P-QDD+FAN+NRZ Port Properties—Transmit Modes

For 800GE-4P-QDD module, see 800GE-4P-QDD Port Properties—Transmit Modes

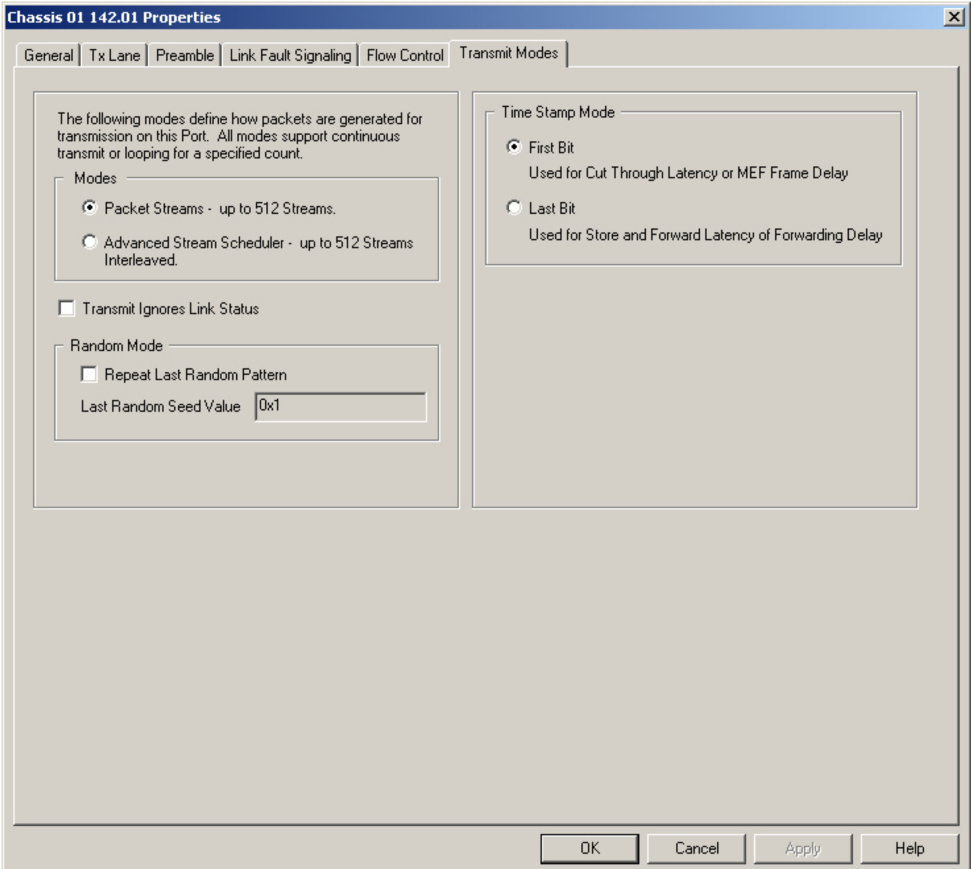
For 800GE-4P-QDD-C module, see 800GE-4P-QDD-C Port Properties—Transmit Modes

For 800GE-4P-OSFP-C module, see 800GE-4P-OSFP-C Port Properties—Transmit Modes

For 800GE-8P-QDD-M+NRZ module, see 800GE-8P-QDD-M+NRZ Port Properties—Transmit Modes

The **Transmit Modes** tab for 40/100GE LAN load modules is shown in the following figure. It is accessed by double-clicking a port in Resources window, or by selecting a port and selecting the *Properties* menu option. Then select the ***Transmit Modes*** tab.

Figure: 40/100GE LAN—Transmit Modes



The fields and controls for this tab are described in the following table:

Table: 100GE LSM XMV LAN Configuration

Section	Field/Control	Description
Modes	Packet Streams	Sets the operating mode for the port to sequential packet streams. This allows to configure up to 512 streams which become active sequentially. A stream may be programmed for continuous packet generation—generating a continuous, infinite number of packets.
	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure up to 512 streams which are concurrently active. They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
	Transmit Ignores Link Status	If selected, will allow transmission of packets even if the link is down.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the

Section	Field/Control	Description
		stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream's random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Time Stamp Mode	First Bit	(Default) When selected, used for Cut-Through Latency or MEF Frame Delay The time stamp inserted in the transmitted packet will be the time of the first bit out, for that packet.
	Last Bit	When selected, used for Store and Forward Latency of Forwarding Delay. The time stamp inserted in the transmitted packet will be the time of the last bit out, for that packet.

CHAPTER 21

Port Properties–NGY Family

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the NGY LSM10GXM module family port properties.

Port Properties for NGY Modules

The *Port Properties* dialog box is accessed by selecting a port in the Resources window, then selecting the *Properties* menu option.

The complete specification for the LSM10GXM type boards can be found in the *Ixia Platform Reference Manual*.

The following port property tabs are available for NGY modules (LSM10GXM family):

- NGY Port Properties—General
- NGY Port Properties–Operation Mode
- NGY Port Properties–Preamble
- NGY Port Properties–Link Fault Signaling
- NGY Port Properties–Flow Control
- NGY Port Properties–Transmit Modes
- NGY Port Properties–XFP
- NGY Port Properties–SFP
- NGY Port Properties–Auto Instrumentation
- NGY Port Properties–OAM
- NGY 10GBASE-T Port Properties–LASI

NGY Port Properties—General

The **General** tab is accessed by selecting a port in the Resources pane, selecting the *Properties* menu options, then selecting the **General** tab.

The NGY Port Properties **General** tab is shown in *Image: NGY—**General** tab: LAN Mode*. The 10GBASE-T version of NGY is shown in *Image: NGY–**General** Tab: 10GBASE-T Version*

NOTE For the NGY LSM10GXM load modules, the **General** tab Clock area is disabled. Clocking is configured in the Card Properties dialog box for these modules. See NGY LSM10GXM 2, 4 and 8-port Modules.

Image: NGY—**General** tab: LAN Mode

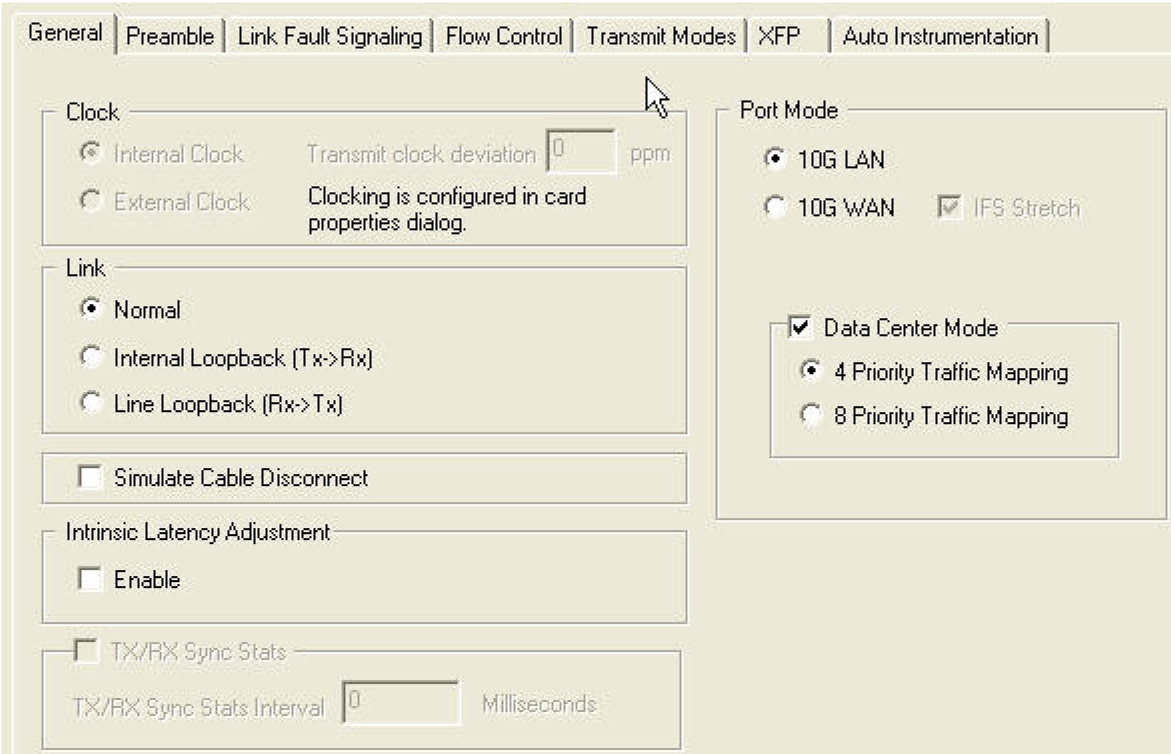


Image: NGY–**General** Tab: 10GBASE-T Version

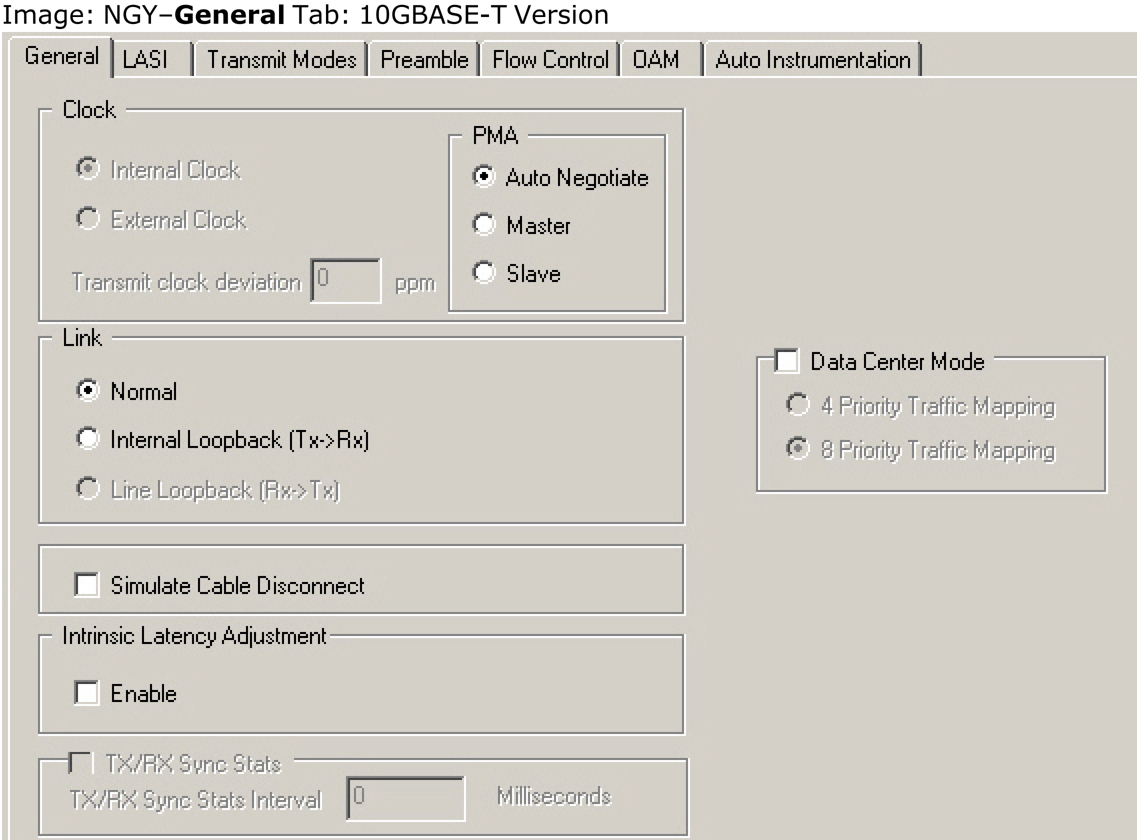
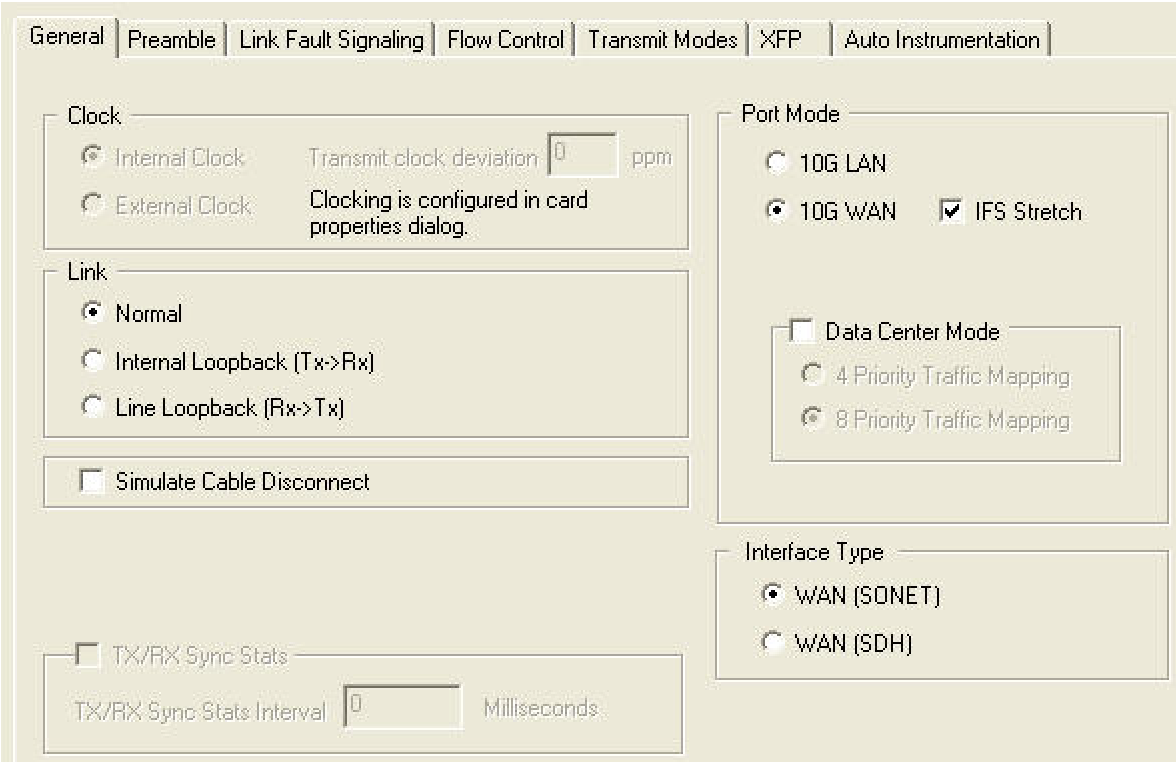


Image: NGY–**General** Tab: WAN Version



The controls for the **General** tab configuration are described in *Table: NGY **General** Tab Configuration*.

Table: NGY **General** Tab Configuration

Section	Control/Field	Usage
Clock		NOTE For the NGY LSM10GXM modules, the Clock area is disabled. Clocking is configured in the Card Properties dialog box for these modules. See NGY LSM10GXM 2, 4 and 8-port Modules.
Link	Normal	Normal operation of the card.
	Internal Loopback (Tx -> Rx)	Check this box to enable/turn on the Internal Loopback–Transmit to Receive.
	Line Loopback (Rx -> Tx)	Check this box to enable/turn on the Line Loopback–Receive to Transmit.
Port Mode	10G LAN	Sets the port to 10GE LAN mode
	10G WAN	Sets the port to 10GE WAN mode When set to WAN mode, IFS Stretch becomes selectable.

Section	Control/Field	Usage
		NOTE the **OAM** tab will not be present in Port Properties when WAN mode is selected.
	IFS Stretch	(WAN mode only) check box to enable WAN Interframe Spacing Stretch. Using this method, the frame rate is slightly lowered by adding additional IPG. In Packet Streams or Advanced Streams view with IFS Stretch mode enabled, the Line Rate will be 9,286 Mbps instead of 9,294 Mbps. And in Statistic View, the Line Speed will be characterized as 10GE WAN with IFSS. For details, see *IFS Stretch* in Chapter 18 of the *Ixia Hardware & Reference Manual*.
PMA	Auto Negotiate	(10GBASE-T Version only) If selected, determining which port is Master or Slave is performed **automatically**. (Checking this box will disable the manual option for selecting Master or Slave.
	Master	If selected, port will be configured as Master.
	Slave	If selected, port will be configured as Slave.
Data Center Mode		Frame Data for FCoE Support.
Interface Type	WAN (SONET)	WAN mode only. Selects the SONET interface type.
	WAN (SDH)	WAN mode only. Selects the SDH interface type.
Simulate Cable Disconnect		If this is selected, the port acts as if the cable has been disconnected. The port will neither transmit nor receive.
Intrinsic Latency Adjustment	Enable	LAN mode only. Select to enable the intrinsic latency adjustment. The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia Platform Reference Manual*. NOTE NGY LSM10GXM modules do not support Latency Calibration, although they do support Latency Adjustment.

NGY Port Properties–Operation Mode

For NGY-NP load modules (only), the Port **Operation Mode** tab allows selection of Stream/Capture/Latency mode (the default), TSO/LRO (Transmit Segmentation Offload/Large Receive Offload) mode, or L7 Mode as shown in *Image: Operation Mode Selection in Port Properties (NGY-NP)*. The L7 Mode is reserved for use in the IxLoad application, where it is the default setting.

Image: Operation Mode Selection in Port Properties (NGY-NP)

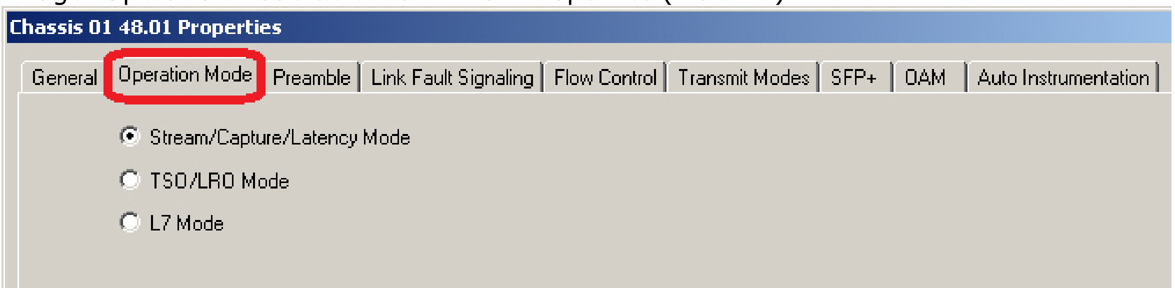
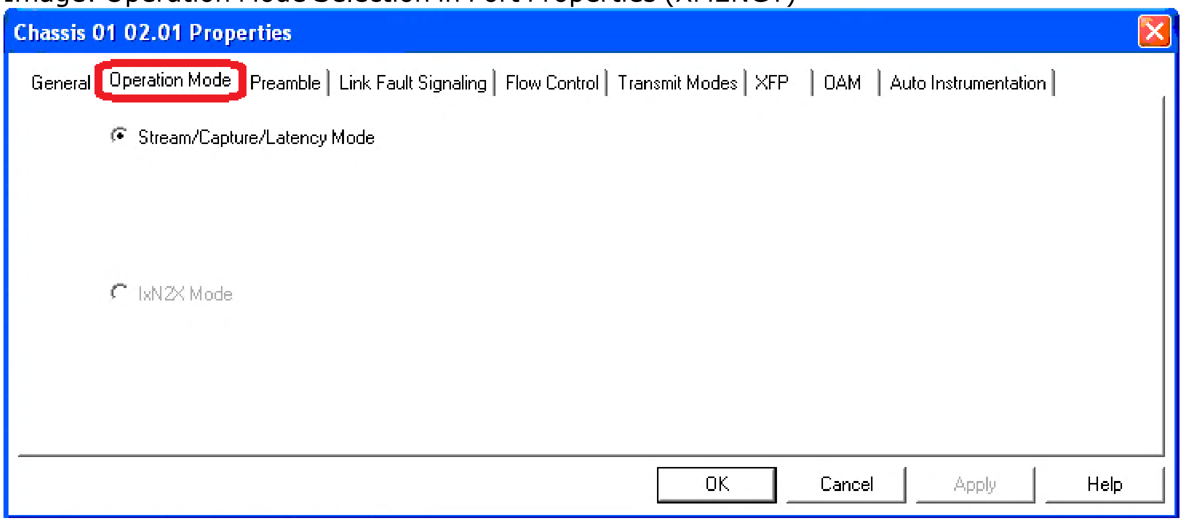


Image: Operation Mode Selection in Port Properties (XM2NGY)



NOTE

For fusion enabled NGY load modules (10GLSMXM2NG, 10GLSMXM4NG and 10GLSMXM8NG), the Port **Operation Mode** tab shows the selection of Stream/Capture/Latency mode (the default) or IxN2X Mode as shown in the above image. The IxN2X Mode is reserved for use in the IxN2X application, where it is the default setting. The current operation mode is shown for reference and cannot be changed from IxExplorer.

Stream/Capture/Latency Mode

If Stream/Capture/Latency Mode (the default) is selected, then the other Port Properties tabs will appear as listed below:

- *Transmit Modes*, same as that illustrated in NGY Port Properties–Transmit Modes
- *Flow Control*, same as that described in NGY Port Properties–Flow Control.
- **General** tab, same as that illustrated in NGY Port Properties—General.

- *Auto Instrumentation*, same as that described in NGY Port Properties–Auto Instrumentation
- *OAM*, same as that illustrated in NGY Port Properties–OAM.

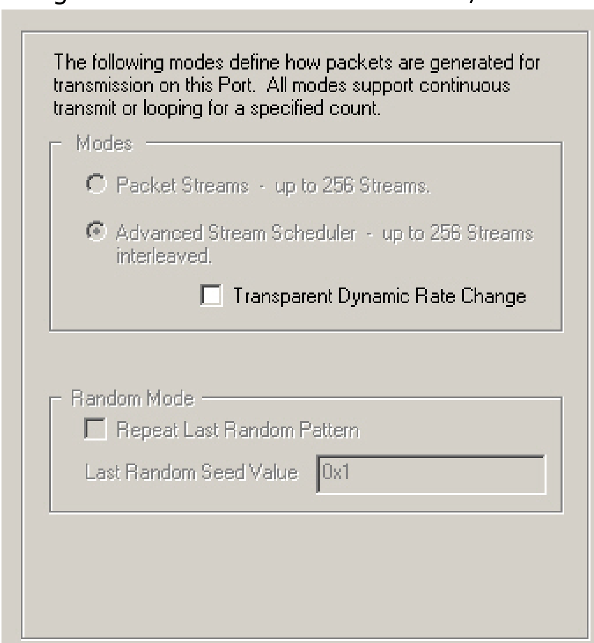
TSO/LRO Mode

When TSO/LRO Mode is selected, IxOS downloads a different FPGA and restarts the CPU. If TSO/LRO Mode is selected, then the **Transmit Modes** tab will change as shown below.

Transit Mode Tab in TSO/LRO Mode

The ***Transmit Modes*** tab for the NGY modules in TSO/LRO port operation mode is shown in *Image:* ***Transmit Modes*** *tab in TSO/LRO Mode*. The only option is *Transparent Dynamic Rate Change*.

Image: **Transmit Modes** tab in TSO/LRO Mode



L7 Mode

L7 Operation mode is intended for use only in the IxLoad application, where it is the default selection. When in L7 mode, the following changes occur on other tabs of Port Properties:

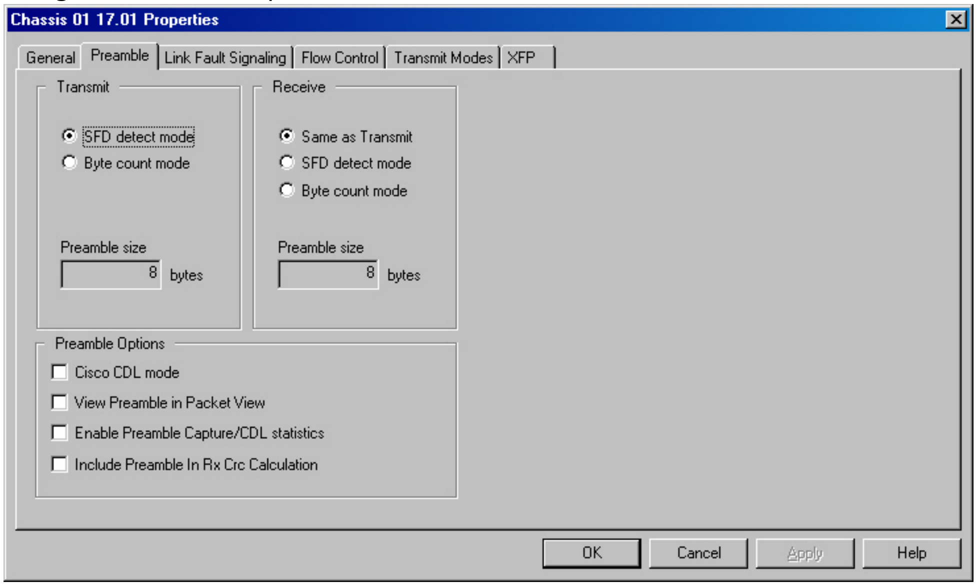
- **General** tab–there is no Port Mode 10G LAN or 10G WAN, and no Intrinsic Latency Adjustment.
- **Preamble** tab–the options Cisco CDL Mode and View Preamble in Packet View are both unavailable.
- **Transmit Modes** tab–only Packet Streams is available.

NGY Port Properties–Preamble

The NGY **Preamble** tab allows to select the method for detecting the start of a frame. The preamble precedes the frame, but is not part of the frame itself, so a method must be used to determine the first of the bytes making up the frame itself —SFD detect mode or Byte count mode. The Preamble page for a 10GE XAUI module is shown in *Image: NGY Port Properties—Preamble*.

The choice in this tab for transmitted frames is reflected in the **Frame Data** tab in the *Stream Properties* dialog box. The number of configurable bytes in the preamble depends on the start-of-frame mode.Preamble Size Box for additional information.

Image: NGY Port Properties—Preamble



The fields and controls in this tab are described in *Table: NGY Port Properties—Preamble*.

Table: NGY Port Properties—Preamble

Section	Choices	Description
Transmit	SFD detect mode	The Start of Frame Descriptor (SFD) is the last byte in the preamble (the 8th byte, in this case). This mode checks for the first occurrence of the SFD byte. The next byte is considered the start of the frame.
	Byte count mode	This mode counts the bytes of the preamble (8 bytes in this case), and considers the next byte (9th) the first byte of the frame.
	Preamble size (in bytes)	(Read-only) The length of the preamble, in bytes. This field shows the value set in the ***Frame Data*** tab in the *Stream Properties* dialog box. This value is currently fixed at 8 bytes (the default).
Receive	Same as Transmit	The Receive side will accept the same choices/entries that were made for the Transmit side.
	SFD detect mode	The Start of Frame Descriptor (SFD) is the last byte in the preamble (the 8th byte, in this case). This mode checks for the first occurrence of the SFD byte. The next byte is considered the start of the frame.
	Byte count mode	This mode counts the bytes of the preamble (8 bytes in this case) and considers the next byte (9th byte) the first byte of the frame.

Section	Choices	Description
	Preamble size (in bytes)	(Read-only) The length of the preamble, in bytes. This field shows the value set in the ***Frame Data*** tab in the *Stream Properties* dialog box. This value is currently fixed at 8 bytes (the default).
Preamble Options	Cisco CDL Mode	Enables the use of Cisco's Converged Data Link (CDL) packets, which substitutes the six preamble bytes and the SFD byte with a specific seven byte CDL header (does not apply to UNIPHY modules in 10GE LAN Mode). Selecting this disables the Transmit SFD detect mode.
	Preamble View Mode	When this check box is selected, the preamble data will be visible in the Packet View (transmit side) and the Capture View (receive side) (does not apply to UNIPHY modules in 10GE LAN Mode).
	Enable Preamble Capture/CDL Stats	When this check box is selected, the preamble is included for all packets captured through capture engine and will enable passing preamble data through Rx engine for CDL statistics to function.
	Include Preamble In Rx CRC Calculation	When this check box is selected, the CRC calculation takes into account the preamble length.

NGY Port Properties–Flow Control

When a port is receiving data at a faster rate than it can handle from another, directly connected port, the receiving port can send a MAC control PAUSE frame to the sending port to temporarily halt transmission of frames. The PAUSE function is defined in IEEE 802.3 and IEEE 802.1Qbb. Priority-based Flow Control for details.

The ***Flow Control*** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Flow Control*** tab. The ***Flow Control*** tab for NGY **not** in Data Center mode is shown in *Image: NGY (non Data Center mode) Port Properties—Flow Control*.

Image: NGY (non Data Center mode) Port Properties—Flow Control

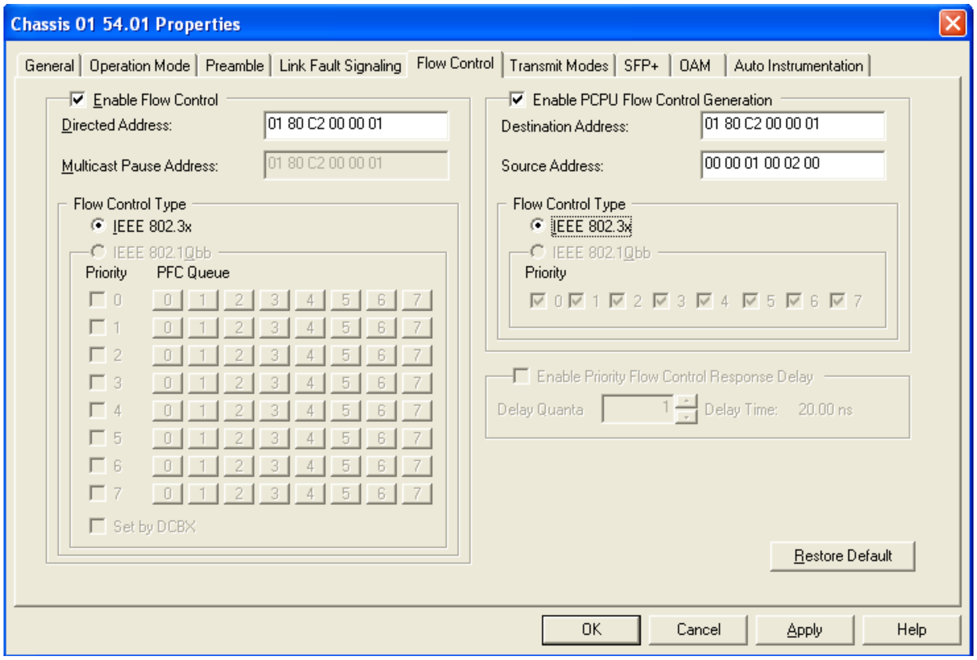
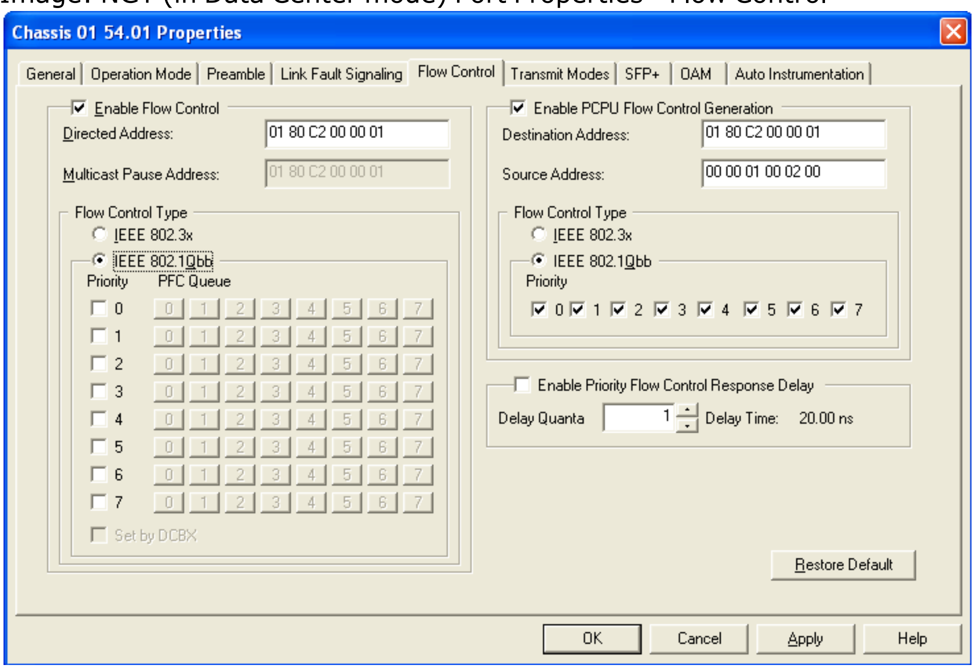


Image: NGY (in Data Center mode) Port Properties—Flow Control



The fields and controls in this tab are described in *Table: NGY–**Flow Control** tab*.

Table: NGY–**Flow Control** tab

Section	Field/Control	Description
Enable Flow Control	(check box)	Enables the port's MAC Flow control mechanisms to listen for a directed address pause message.

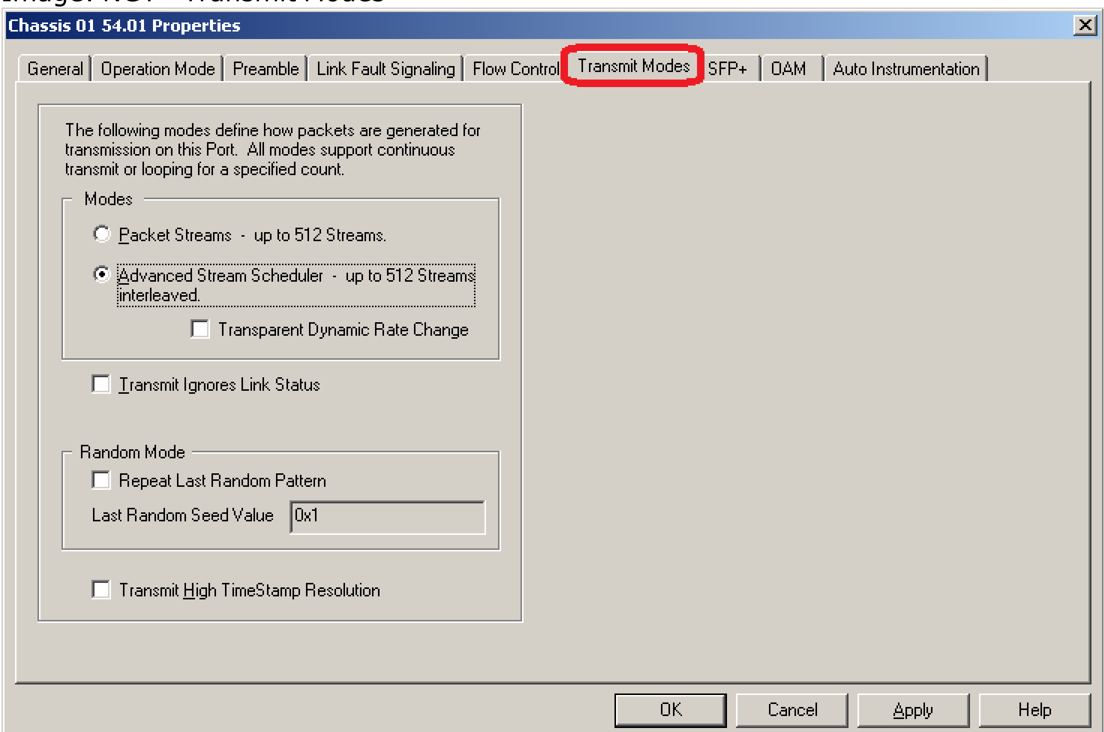
Section	Field/Control	Description
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type	IEEE 802.3x or IEEE 802.1Qbb	Priority-based Flow Control. When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame. When not in Data Center mode, only IEEE 802.3x is available.
	Priority	Priority-based Flow Control
	PFC Queue	Priority-based Flow Control
Enable PCPU Flow Control Generation	(check box)	Enables port CPU flow control generation. When the rate of incoming packets is more than the port CPU can keep up with, a pause packet will be sent to the DUT, causing it to pause transmitting for a fixed interval.
	Destination Address	The DA and SA, taken together, identify the pause packet (to the DUT).
	Source Address	See Destination Address, above.
	Flow Control Type	See Flow Control Type, above.
	Priority	In Data Center mode, when flow control type IEEE 802.1Qbb is selected, these are the channels of data that can be paused. Select to select one or more channels.
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.

Section	Field/Control	Description
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

NGY Port Properties–Transmit Modes

The **Transmit Modes** tab for NGY modules is accessed by double-clicking a port in Resources pane, or by selecting a port and selecting the *Properties* menu option. Then select the ***Transmit Modes*** tab. *Image: NGY—Transmit Modes* shows the **Transmit Modes** tab for the NGY load module in normal LAN mode (not Data Center mode).

Image: NGY—Transmit Modes



The fields and controls for the **Transmit Modes** tab are described in *Table: NGY Transmit Modes Configuration*.

Table: NGY Transmit Modes Configuration

Section	Field/Control	Description
Modes	Packet Streams	Sets the basic operating mode for the port to sequential packet streams. This allows to configure up to 256 streams. A stream may be programmed for continuous packet generation—generating a continuous, infinite number of packets. NGY LSM10GXM 4 and 8-port modules can generate up to 512 streams.
	Advanced	Sets up the transmission of up to 256 interleaved packet

Section	Field/Control	Description
	Stream Scheduler	streams. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams. NGY LSM10GXM 4 and 8-port modules can transmit up to 512 streams (up to 256 streams in Data Center mode).
	Transparent Dynamic Rate Change	If selected, the dynamic rate control will allow rate change across counters, for this port.
	Transmit Ignores Link Status	If selected, will allow transmission of packets even if the link is down.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream's random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit High TimeStamp Resolution		If selected, NGY load module will support 10ns Resolution Timestamp on selected modes.

NGY Port Properties–XFP

NGY load modules can support XFP interfaces. The XFP is a hot pluggable small footprint serial-to-serial data-agnostic multi-rate optical transceiver, intended to support Telecom (SONET OC-192 and G.709 'OTU-2') and Datacom applications (10 Gb/s Ethernet and 10 Gb/s Fibre Channel).

This tab also allows to set the carrier and laser power settings. The **XFP** tab is shown in *Image: **NGY—XFP** tab*.

Image: **NGY—XFP** tab

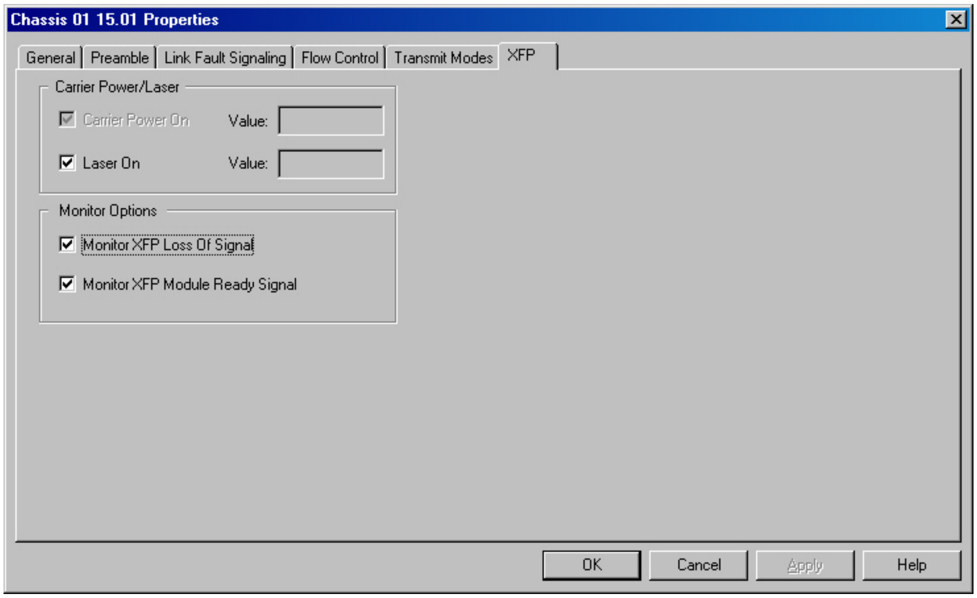


*Table: **NGY XFP** tab Page Usage* explains the configuration options of the **XFP** tab.

Table: **NGY XFP** tab Page Usage

Heading	Field	Usage
Carrier Power/Laser	Carrier Power On	Select this check box to enable the carrier power. Note that the actual reading appears in the *Value* field.
	Laser On	Select this check box to enable the laser power. Note that the actual reading appears in the *Value* field.
Monitor Options	Monitor XFP Loss of Signal	When selected, indicates the interface will conform to XFP specifications and require the absence of a Loss of Signal for transmitting and receiving.
	Monitor XFP Module Ready Signal	When selected, indicates the interface will conform to XFP specifications and require the detection of a Module Ready signal for transmitting and receiving.

NGY Port Properties–SFP

The following NGY load modules can support SFP+ interfaces.

- LSM10GXM(R)8S-01, LSM10GXM(R)4S-01, and LSM10GXM(R)2S-01–NGY full and reduced feature versions

This tab allows to set the carrier and laser power settings, the transceiver type, and the monitor options. The **SFP** tab is shown in *Image: **NGY—SFP** tab*.

Image: **NGY—SFP** tab

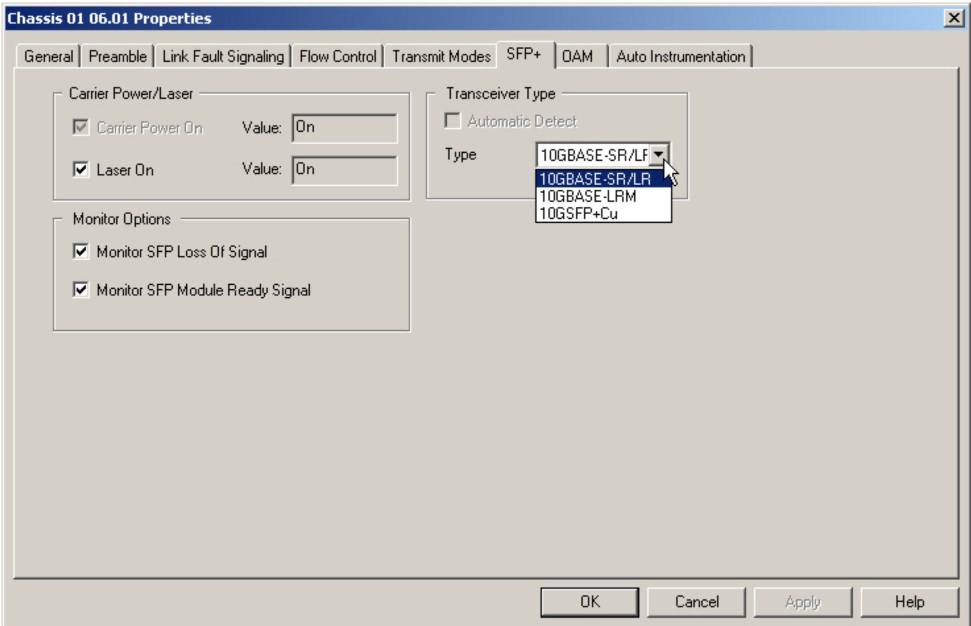


*Table: **SFP** tab Page Usage* explains the configuration options of the **SFP** tab.

Table: **SFP** tab Page Usage

Heading	Field	Usage
Carrier Power/Laser	Carrier Power On	If selected, enables the carrier power. The actual reading appears in the *Value* field.
	Laser On	Select this check box to enable the laser power. Note that the actual reading appears in the *Value* field.
Monitor Options	Monitor SFP Loss of Signal	When selected, indicates the interface will conform to SFP specifications and require the absence of a Loss of Signal for transmitting and receiving.
	Monitor SFP Module Ready Signal	When selected, indicates the interface will conform to SFP specifications and require the detection of a Module Ready signal for transmitting and receiving.

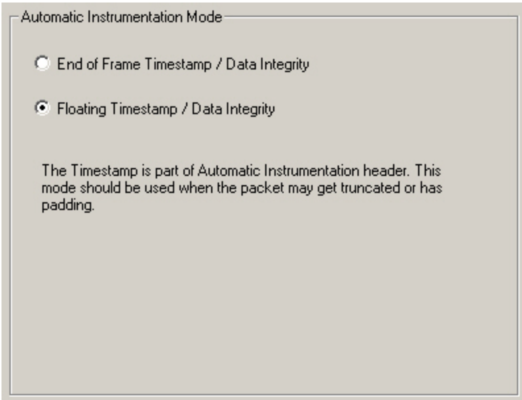
NGY Port Properties–Auto Instrumentation

For specified load modules, the timestamp can be inserted into the Auto Instrumentation header instead of the usual locations such as before CRC or at user-specified offset. This is called *Floating Timestamp/Data Integrity*. Timestamp and Data Integrity generation will be stream-based (while the Rx analysis is port-based) if Auto Instrumentation is enabled. The Port Properties **Auto Instrumentation** tab is shown in *Image: NGY Auto **Instrumentation Mode** tab*.

The **Auto Instrumentation** tab is present in the following NGY load modules:

- LSM10GXM2/4/8R and 2/4/8XP reduced and extra performance NGY

Image: NGY **Auto Instrumentation Mode** tab



Options on this tab are described in *Table: NGY Auto Instrumentation Configuration*.

Table: NGY Auto Instrumentation Configuration

Field/Control	Description
End of Frame Timestamp / Data Integrity	Inserts the Timestamp and Data Integrity CRC at the end of the frame before the CRC.
Floating Timestamp / Data Integrity	The timestamp is part of Automatic Instrumentation header. This mode should be used when the packet may get truncated or has padding.

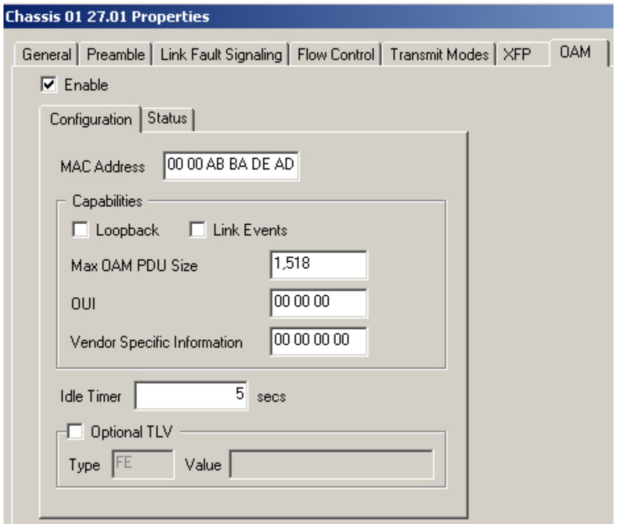
NGY Port Properties–OAM

The **OAM** tab is not present when port mode is 10G WAN.

The ***OAM*** tabis accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***OAM*** tab. The **OAM** tab for NGY load modules allows to configure local stateful OAM Data Terminating Entities (DTE) and view the status of both local and remote OAM PDUs.

The **OAM Configuration** tab is shown in .

Image: **OAM** tab for NGY, Configuration



The Operations, Administration, and Maintenance (OAM) sublayer provides mechanisms useful for monitoring link operation such as remote fault indication and remote loopback control. In general, OAM provides network operators the ability to monitor the health of the network and quickly determine the location of failing links or fault conditions.

OAM information is conveyed in Slow Protocol frames called OAM Protocol Data Units (OAM PDUs). OAM PDUs contain the appropriate control and status information used to monitor, test and troubleshoot OAM-enabled links.

The fields and controls in this tab are in *Table: **OAM Configuration** tab for NGY*.

After making configuration changes, select **Apply** to send the changes to the chassis without leaving the tab. Select **OK** to send changes and close the Properties window.

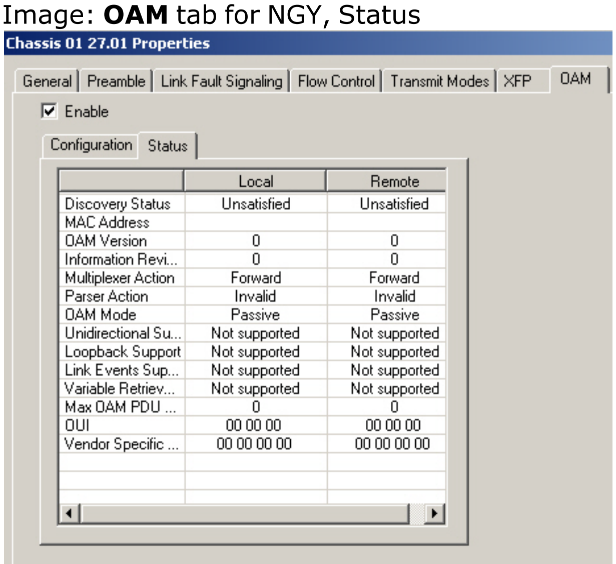
Table: **OAM Configuration** tab for NGY

Section	Field/Control	Description
	Enable	Enables and starts OAM state machine configuration
MAC Address		The individual source MAC address of the Ixia port acting as DTE (through which the OAM PDU is transmitted)
Capabilities	Loopback	Advertises OAM remote loopback capability
	Link Events	Advertises link event capability
	Max OAM PDU Size	11-bit field which represents the largest OAM PDU, in octets, supported by the DTE. This value is compared to the remote's Maximum PDU Size and the smaller of the two is used.
	OUI	24-bit 3-octet field, Organizationally Unique Identifier. Example: 00 00 00
	Vendor Specific Information	4-octet field, 32-bit identifier that may be used to differentiate a vendor's product models/versions.

Section	Field/Control	Description
Idle Timer		local_lost_link_timer Timer used to reset the Discovery state. Duration: 5 sec ± 10%.
Optional TLV	Type	This is any Information TLV that you want to send. This one-octet field indicates the nature of the data carried in this TLV-tuple. • 0x00 End of TLV marker • 0x01 Local Information • 0x02 Remote Information • 0x03-0xFD Reserved - shall not be transmitted, should be ignored on reception by OAM client • 0xFE Organization Specific Information • 0xFF Reserved - shall not be transmitted, should be ignored on reception by OAM client
	Value	This field indicates the value of the Information TLV. This field's length and contents are unspecified.

The **OAM Status** tab is shown in *Image: **OAM** tab for NGY, Status*.

Image: **OAM** tab for NGY, Status



The fields and controls in the Status tab are described in *Table: OAM Status tab*. for each category, there is both a Local and a Remote status indicator.

Table: OAM Status tab

Field/Control	Description
Discovery Status	Detects the presence of an OAM sublayer at the remote DTE
MAC Address	Defined in *Table:* ***OAM Configuration*** *tab for NGY*
OAM Version	This one-octet field indicates the version supported by the DTE. This field always contains the value 0x01.
Information Revision	This two-octet field indicates the current revision of the Information TLV. The value of this field shall start at zero and be incremented each time something in the Information TLV changes.
Multiplexer Action	Forward (0) = Device is forwarding non-OAMPDUs to the lower sublayer (local_mux_action = FWD). Discard (1) = Device is discarding non-OAMPDUs (local_mux_action = DISCARD).
Parser Action	00 = Device is forwarding non-OAMPDUs to higher sublayer (local_par_action = FWD). 01 = Device is looping back non-OAMPDUs to the lower sublayer (local_par_action = LB). 10 = Device is discarding non-OAMPDUs (local_par_action = DISCARD). 11 = Reserved. In Local Information TLVs, this value shall not be sent. If the value 11 is received, it should be ignored and not change the last received value.
OAM Mode	1 = DTE configured in Active mode. 0 = DTE configured in Passive mode.
Unidirectional Support	1 = DTE is capable of sending OAMPDUs when the receive path is non-operational. 0 = DTE is not capable of sending OAMPDUs when the receive path is non-operational.
Loopback Support	Defined in *Table:* ***OAM Configuration*** *tab for NGY*
Link Events Support	Defined in *Table:* ***OAM Configuration*** *tab for NGY*
Variable Retrieval Support	1 = DTE supports sending Variable Response OAMPDUs. 0 = DTE does not support sending Variable Response OAMPDUs.
Max OAM PDU Size	Defined in *Table:* ***OAM Configuration*** *tab for NGY*
OUI	Defined in *Table:* ***OAM Configuration*** *tab for NGY*

Field/Control	Description
Vendor Specific Information	Defined in *Table: **OAM Configuration** tab for NGY*

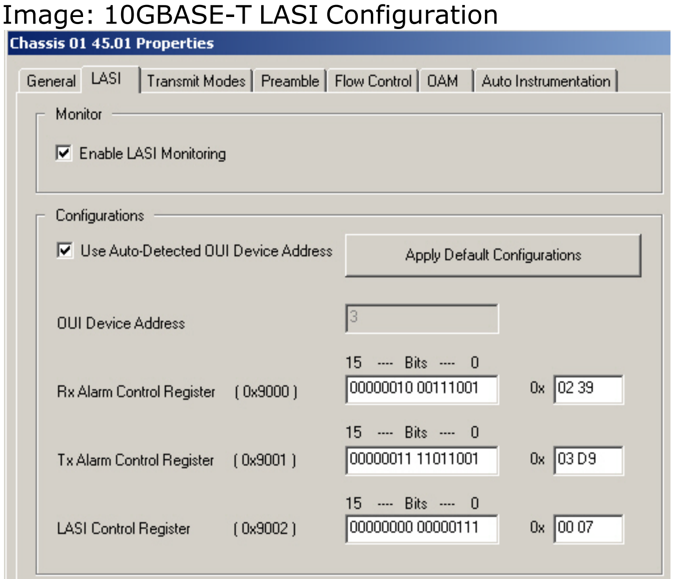
NGY 10GBASE-T Port Properties–LASI

The Link Alarm Status Interrupt (LASI) is an active-low output from the 10GBASE-T adapter that indicates a link fault condition has been asserted or has been cleared. Control registers are provided so that LASI may be programmed to assert only for specific fault conditions.

For more detailed information on LASI, see the Link Alarm Status Interrupt (LASI) section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.

The **LASI** tab page is shown in *Image: 10GBASE-T LASI Configuration*.

Image: 10GBASE-T LASI Configuration



The controls for LASI configuration are described in *Table: LASI Configuration*.

Table: LASI Configuration

Section	Control/Field	Usage
Monitor		Activates the LASI monitoring feature.
	Enable LASI Monitoring	Selecting this check box enables LASI monitoring.
Configurations		Controls LASI configuration.
	Use Auto-Detected OUI Device Address	Selecting this check box sets the OUI address to the detected address. If this is selected, then the OUI *Device Address* field is disabled.
	Apply Default	Selecting this button resets the LASI values to their default

Section	Control/Field	Usage
	Configuration	settings.
	OUI Device Address	The Organizationally Unique Identifier (OUI) device address, which signifies the device where the LASI control/status registers are located.
	Rx Alarm Control Register	Controls the register written at offset 0x9000, and indicates what type of receive path fault generates an alarm. The register can be modified using the bit field or hex field. Modifying one automatically updates the other.
	Tx Alarm Control Register	Controls the register written at offset 0x9001, and indicates what type of transmit path fault generates an alarm. The register can be modified using the bit field or hex field. Modifying one automatically updates the other.
	LASI Control Register	Controls the register written at offset 0x9002, and indicates what type of alarms are enabled. The register can be modified using the bit field or hex field. Modifying one automatically updates the other.

NGY Port Properties–SFP

The following NGY load modules can support SFP+ interfaces.

- LSM10GXM(R)8S-01, LSM10GXM(R)4S-01, and LSM10GXM(R)2S-01–NGY full and reduced feature versions

This tab allows to set the carrier and laser power settings, the transceiver type, and the monitor options. The **SFP** tab is shown in *Image: NGY—**SFP** tab*.

Image: NGY—**SFP** tab

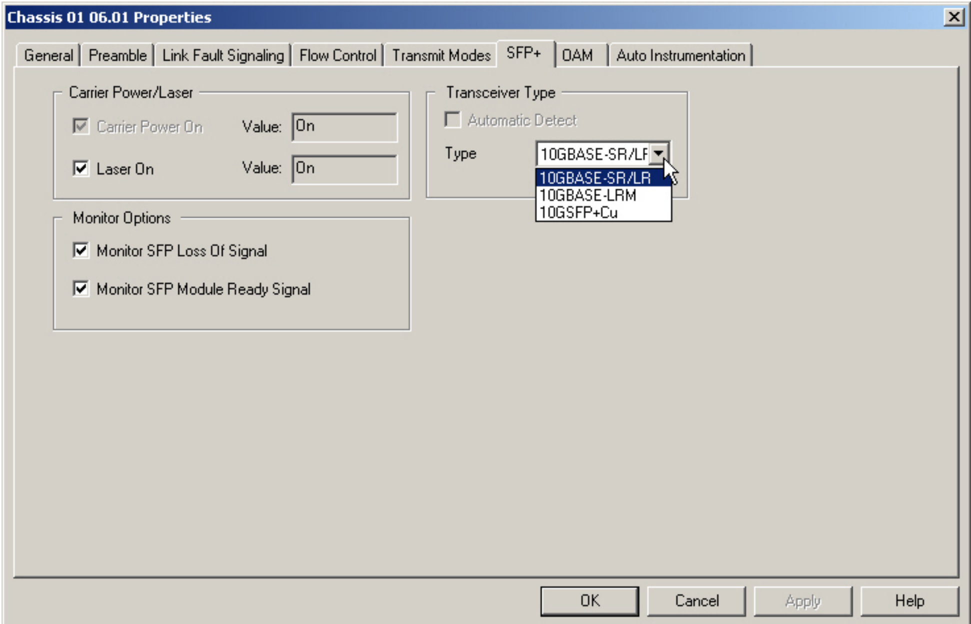


*Table: **SFP** tab Page Usage* explains the configuration options of the **SFP** tab.

Table: **SFP** tab Page Usage

Heading	Field	Usage
Carrier Power/Laser	Carrier Power On	If selected, enables the carrier power. The actual reading appears in the *Value* field.
	Laser On	Select this check box to enable the laser power. Note that the actual reading appears in the *Value* field.
Monitor Options	Monitor SFP Loss of Signal	When selected, indicates the interface will conform to SFP specifications and require the absence of a Loss of Signal for transmitting and receiving.
	Monitor SFP Module Ready Signal	When selected, indicates the interface will conform to SFP specifications and require the detection of a Module Ready signal for transmitting and receiving.

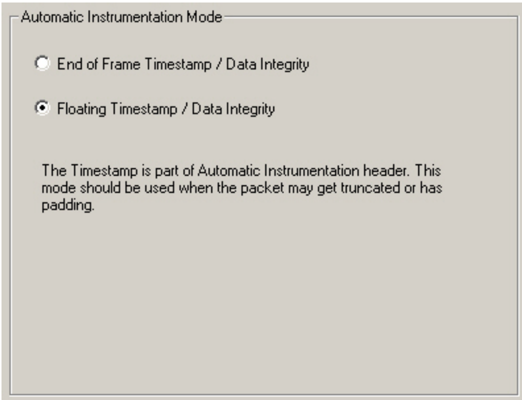
NGY Port Properties–Auto Instrumentation

For specified load modules, the timestamp can be inserted into the Auto Instrumentation header instead of the usual locations such as before CRC or at user-specified offset. This is called *Floating Timestamp/Data Integrity*. Timestamp and Data Integrity generation will be stream-based (while the Rx analysis is port-based) if Auto Instrumentation is enabled. The Port Properties **Auto Instrumentation** tab is shown in *Image: **NGY Auto Instrumentation Mode** tab*.

The **Auto Instrumentation** tab is present in the following NGY load modules:

- LSM10GXM2/4/8R and 2/4/8XP reduced and extra performance NGY

Image: **NGY Auto Instrumentation Mode** tab



Options on this tab are described in *Table: NGY Auto Instrumentation Configuration*.

Table: NGY Auto Instrumentation Configuration

Field/Control	Description
End of Frame Timestamp / Data Integrity	Inserts the Timestamp and Data Integrity CRC at the end of the frame before the CRC.
Floating Timestamp / Data Integrity	The timestamp is part of Automatic Instrumentation header. This mode should be used when the packet may get truncated or has padding.

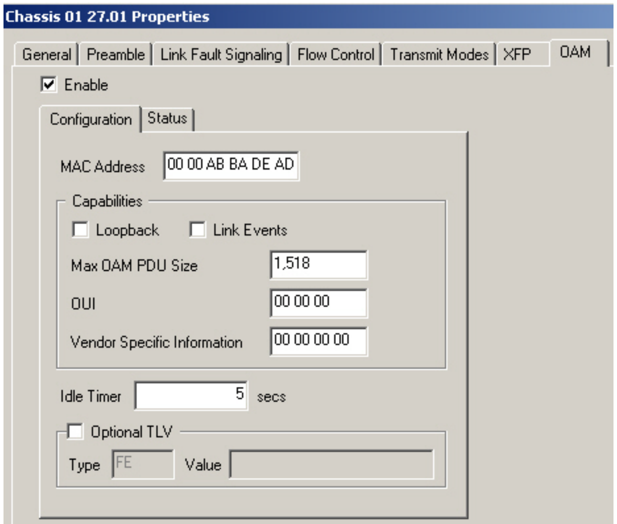
NGY Port Properties–OAM

The **OAM** tab is not present when port mode is 10G WAN.

The ***OAM*** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***OAM*** tab. The **OAM** tab for NGY load modules allows to configure local stateful OAM Data Terminating Entities (DTE) and view the status of both local and remote OAM PDUs.

The **OAM Configuration** tab is shown in .

Image: **OAM** tab for NGY, Configuration



The Operations, Administration, and Maintenance (OAM) sublayer provides mechanisms useful for monitoring link operation such as remote fault indication and remote loopback control. In general, OAM provides network operators the ability to monitor the health of the network and quickly determine the location of failing links or fault conditions.

OAM information is conveyed in Slow Protocol frames called OAM Protocol Data Units (OAM PDUs). OAM PDUs contain the appropriate control and status information used to monitor, test and troubleshoot OAM-enabled links.

The fields and controls in this tab are in *Table: **OAM Configuration** tab for NGY*.

After making configuration changes, select **Apply** to send the changes to the chassis without leaving the tab. Select **OK** to send changes and close the Properties window.

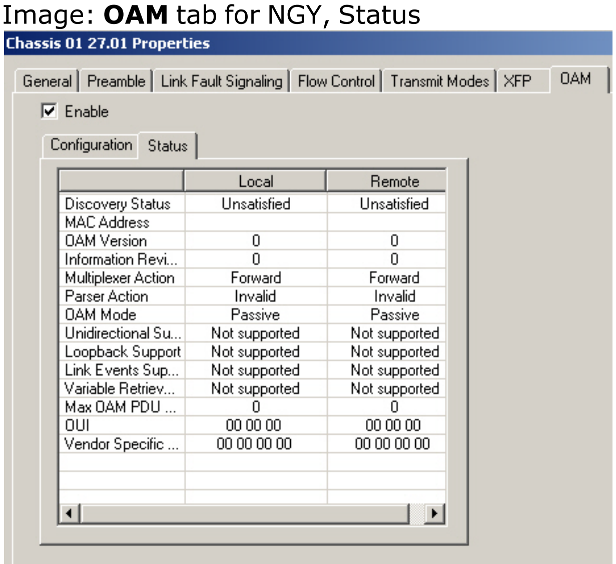
Table: **OAM Configuration** tab for NGY

Section	Field/Control	Description
	Enable	Enables and starts OAM state machine configuration
MAC Address		The individual source MAC address of the Ixia port acting as DTE (through which the OAM PDU is transmitted)
Capabilities	Loopback	Advertises OAM remote loopback capability
	Link Events	Advertises link event capability
	Max OAM PDU Size	11-bit field which represents the largest OAM PDU, in octets, supported by the DTE. This value is compared to the remote's Maximum PDU Size and the smaller of the two is used.
	OUI	24-bit 3-octet field, Organizationally Unique Identifier. Example: 00 00 00
	Vendor Specific Information	4-octet field, 32-bit identifier that may be used to differentiate a vendor's product models/versions.

Section	Field/Control	Description
Idle Timer		local_lost_link_timer Timer used to reset the Discovery state. Duration: 5 sec ± 10%.
Optional TLV	Type	This is any Information TLV that you want to send. This one-octet field indicates the nature of the data carried in this TLV-tuple. • 0x00 End of TLV marker • 0x01 Local Information • 0x02 Remote Information • 0x03-0xFD Reserved - shall not be transmitted, should be ignored on reception by OAM client • 0xFE Organization Specific Information • 0xFF Reserved - shall not be transmitted, should be ignored on reception by OAM client
	Value	This field indicates the value of the Information TLV. This field's length and contents are unspecified.

The **OAM** Status tab is shown in *Image: **OAM** tab for NGY, Status*.

Image: **OAM** tab for NGY, Status



The fields and controls in the **Status** tab are described in *Table: **OAM Status** tab*. for each category, there is both a Local and a Remote status indicator.

Table: **OAM Status** tab

Field/Control	Description
Discovery Status	Detects the presence of an OAM sublayer at the remote DTE
MAC Address	Defined in *Table: **OAM Configuration** tab for NGY*
OAM Version	This one-octet field indicates the version supported by the DTE. This field always contains the value 0x01.
Information Revision	This two-octet field indicates the current revision of the Information TLV. The value of this field shall start at zero and be incremented each time something in the Information TLV changes.
Multiplexer Action	Forward (0) = Device is forwarding non-OAMPDUs to the lower sublayer (local_mux_action = FWD). Discard (1) = Device is discarding non-OAMPDUs (local_mux_action = DISCARD).
Parser Action	00 = Device is forwarding non-OAMPDUs to higher sublayer (local_par_action = FWD). 01 = Device is looping back non-OAMPDUs to the lower sublayer (local_par_action = LB). 10 = Device is discarding non-OAMPDUs (local_par_action = DISCARD). 11 = Reserved. In Local Information TLVs, this value shall not be sent. If the value 11 is received, it should be ignored and not change the last received value.
OAM Mode	1 = DTE configured in Active mode. 0 = DTE configured in Passive mode.
Unidirectional Support	1 = DTE is capable of sending OAMPDUs when the receive path is non-operational. 0 = DTE is not capable of sending OAMPDUs when the receive path is non-operational.
Loopback Support	Defined in *Table: **OAM Configuration** tab for NGY*
Link Events Support	Defined in *Table: **OAM Configuration** tab for NGY*
Variable Retrieval Support	1 = DTE supports sending Variable Response OAMPDUs. 0 = DTE does not support sending Variable Response OAMPDUs.
Max OAM PDU Size	Defined in *Table: **OAM Configuration** tab for NGY*
OUI	Defined in *Table: **OAM Configuration** tab for NGY*

Field/Control	Description
Vendor Specific Information	Defined in *Table: **OAM Configuration** tab for NGY*

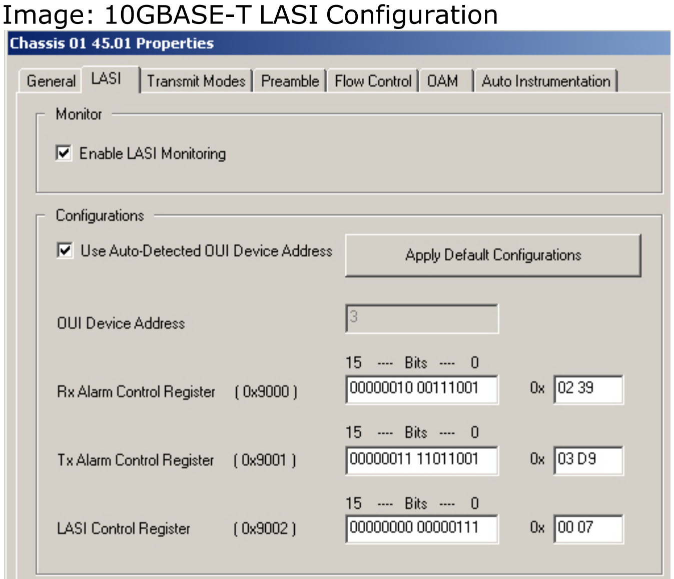
NGY 10GBASE-T Port Properties–LASI

The Link Alarm Status Interrupt (LASI) is an active-low output from the 10GBASE-T adapter that indicates a link fault condition has been asserted or has been cleared. Control registers are provided so that LASI may be programmed to assert only for specific fault conditions.

For more detailed information on LASI, see the Link Alarm Status Interrupt (LASI) section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.

The **LASI** tab page is shown in *Image: 10GBASE-T LASI Configuration*.

Image: 10GBASE-T LASI Configuration



The controls for LASI configuration are described in *Table: LASI Configuration*.

Table: LASI Configuration

Section	Control/Field	Usage
Monitor		Activates the LASI monitoring feature.
	Enable LASI Monitoring	Selecting this check box enables LASI monitoring.
Configurations		Controls LASI configuration.
	Use Auto-Detected OUI Device Address	Selecting this check box sets the OUI address to the detected address. If this is selected, then the OUI *Device Address* field is disabled.
	Apply Default	Selecting this button resets the LASI values to their default

Section	Control/Field	Usage
	Configuration	settings.
	OUI Device Address	The Organizationally Unique Identifier (OUI) device address, which signifies the device where the LASI control/status registers are located.
	Rx Alarm Control Register	Controls the register written at offset 0x9000, and indicates what type of receive path fault generates an alarm. The register can be modified using the bit field or hex field. Modifying one automatically updates the other.
	Tx Alarm Control Register	Controls the register written at offset 0x9001, and indicates what type of transmit path fault generates an alarm. The register can be modified using the bit field or hex field. Modifying one automatically updates the other.
	LASI Control Register	Controls the register written at offset 0x9002, and indicates what type of alarms are enabled. The register can be modified using the bit field or hex field. Modifying one automatically updates the other.

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CHAPTER 22

Port Properties–Xcellon-Flex Family

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the Xcellon-Flex card family. The cards belonging to this family are FlexAP10G16S and FlexFE10G16S. FlexAP10G16S is a 10 Gigabit Ethernet L2–L7 Accelerated Performance Load Module. It has a 16-port LAN, SFP+ interface. FlexFE10G16S is a 10 Gigabit Ethernet L2–L3 Full Emulation Load Module. It has a 16-port LAN, SFP+ interface.

Port Properties for Flex Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option.

The complete specification for the FlexAP10G16S and FlexFE10G16S type boards is found in the *Ixia Platform Reference Manual*.

The following port property tabs are available for Flex modules (Xcellon-Flex family):

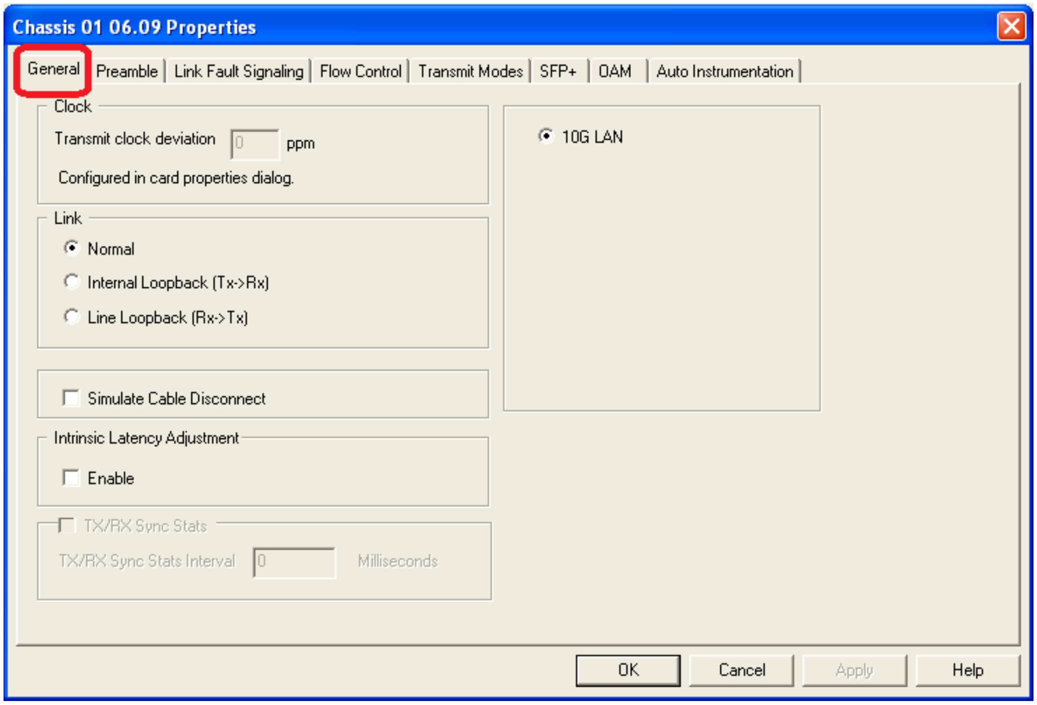
- Flex Port Properties—General
- Flex Port Properties—Preamble
- Flex Port Properties—Link Fault Signaling
- Flex Port Properties—Flow Control
- Flex Port Properties—Transmit Modes
- Flex Port Properties—SFP+
- Flex Port Properties—OAM
- Flex Port Properties—Auto Instrumentation
- Flex Port Properties—QSFP

Flex Port Properties—General

The Flex **General** tab is accessed by selecting a Flex port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, and then selecting the **General** tab.

The Flex Port Properties **General** tab is shown in the following image:

Image: Flex—**General** tab



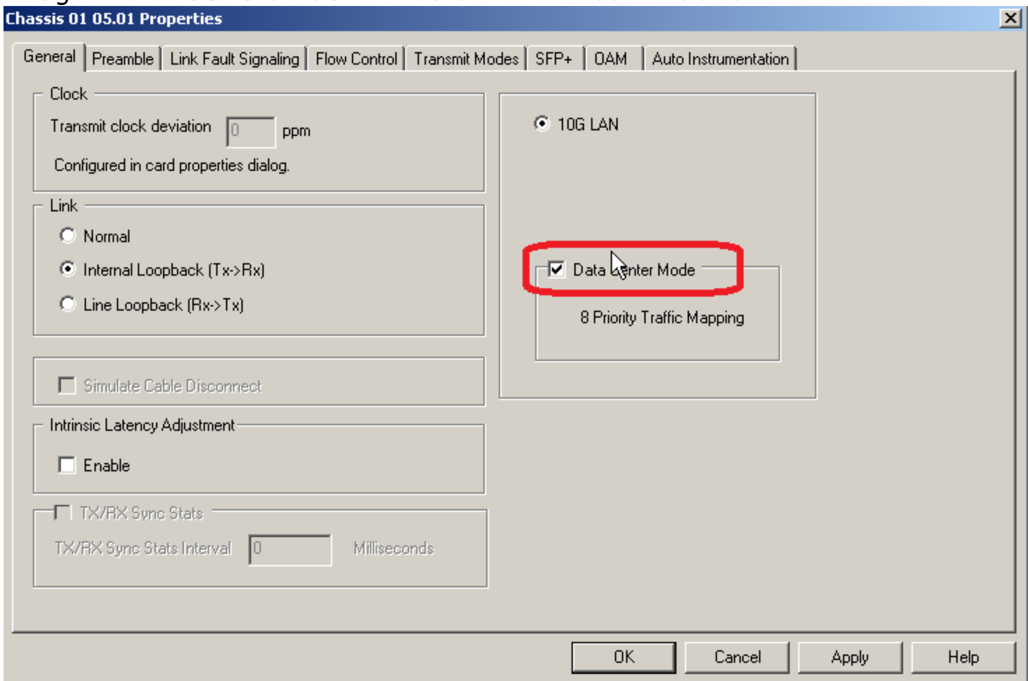
The controls for Flex **General** tab configuration are described in the following table:.

Table: General Configuration

Section	Control/Field	Usage
Clock	Transmit clock deviation	Shows the status of the transmit clock.
Link	Normal	Normal operation of the port.
	Internal Loopback (Tx->Rx)	If selected, enables the Internal Loopback-Transmit to Receive.
	Line Loopback (Rx->Tx)	If selected, enables the Line Loopback-Receive to Transmit.
Simulate Cable Disconnect		If this is selected, the port acts as if the cable has been disconnected. The port will neither transmit nor receive.
Intrinsic Latency Adjustment	Enable	If selected, enables the intrinsic latency adjustment. The **Enable** check box is disabled when no value exists in the system for the specific transceiver. It is available if a value exists (in the xml file).
TX/RX Sync Stats	TX/RX Sync Stats Interval	This field is disabled for Flex load module.

The **General** tab for Flex card with Data Center Mode enabled is shown in the following image:

Image: Flex—**General** tab with Data Center Mode Enabled



Flex Port Properties—Preamble

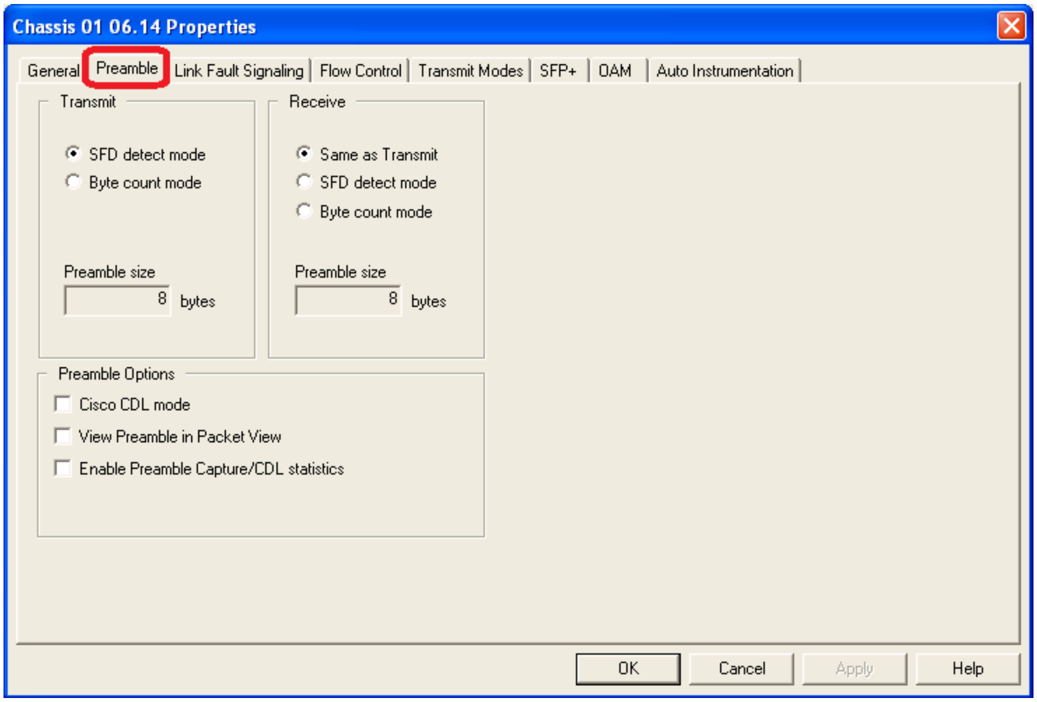
The Flex **Preamble** tab is accessed by selecting a Flex port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Preamble** tab.

The Flex Preamble tab allows to select the method for detecting the start of a frame. The preamble precedes the frame, but is not part of the frame itself, so a method must be used to determine the first of the bytes making up the frame itself -SFD detect mode or Byte count mode.

The choice in this tab for transmitted frames is reflected in the **Frame Data** tab in the **Stream Properties** dialog box. The number of configurable bytes in the preamble depends on the start-of-frame mode. Ethernet Frames for additional information.

The Flex Port Properties **Preamble** tab is shown in the following image:

Image: Flex—**Preamble** tab



The controls for Flex **Preamble** tab configuration are described in the following table:.

Table: Preamble Configuration

Section	Control/Field	Usage
Transmit	SFD detect mode	The Start of Frame Descriptor (SFD) is the last byte in the preamble (the 8th byte, in this case). This mode checks for the first occurrence of the SFD byte. The next byte is considered the start of the frame.
	Byte count mode	This mode counts the bytes of the preamble (8 bytes in this case), and considers the next byte (9th) the first byte of the frame.
	Preamble size (in bytes)	(Read-only) The length of the preamble, in bytes. This field shows the value set in the **Frame Data** tab in the **Stream Properties** dialog box. This value is currently fixed at 8 bytes (the default).
Receive	Same as Transmit	The Receive side accepts the same choices/entries that were made for the Transmit side.
	SFD detect mode	The Start of Frame Descriptor (SFD) is the last byte in the preamble (the 8th byte, in this case). This mode checks for the first occurrence of the SFD byte. The next byte is considered the start of the frame.
	Byte count mode	This mode counts the bytes of the preamble (8 bytes in this case) and considers the next byte (9th byte) the first byte of the frame.

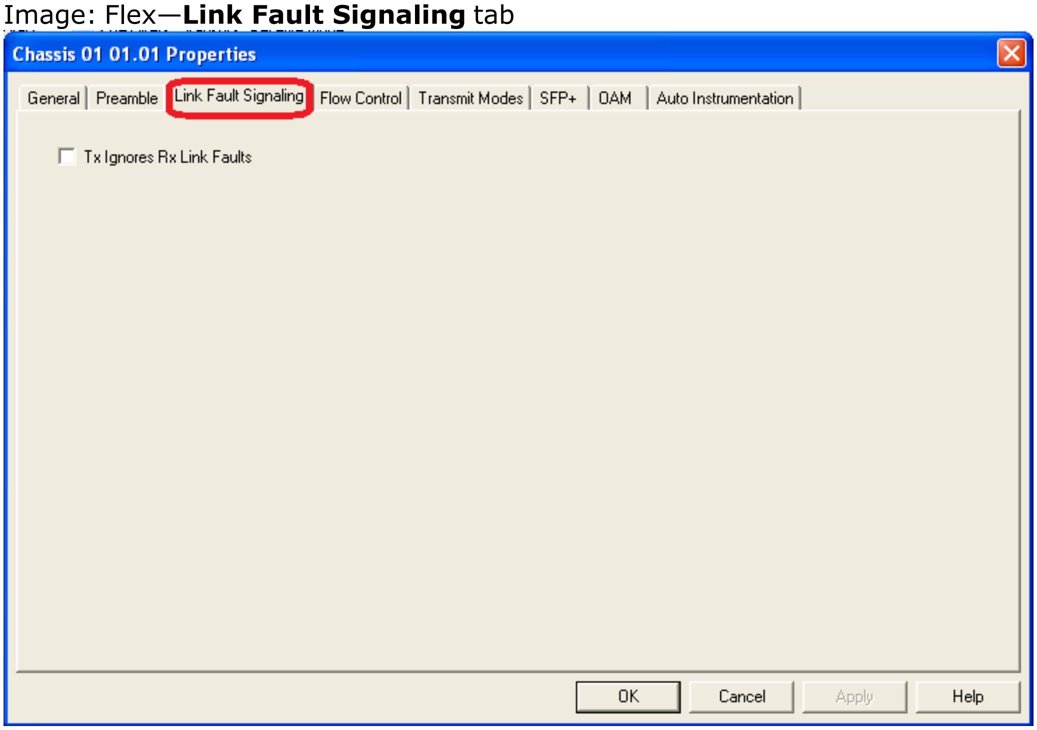
Section	Control/Field	Usage
	Preamble size (in bytes)	(Read-only) The length of the preamble, in bytes. This field shows the value set in the **Frame Data** tab in the **Stream Properties** dialog box. This value is currently fixed at 8 bytes (the default).
Preamble Options	Cisco CDL Mode	Enables the use of Cisco's Converged Data Link (CDL) packets, which substitutes the six preamble bytes and the SFD byte with a specific seven byte CDL header. Selecting this option disables the Transmit SFD detect mode.
	View Preamble in Packet View	When this check box is selected, the preamble data will be visible in the Packet View (transmit side) and the Capture View (receive side).
	Enable Preamble Capture/CDL statistics	When this check box is selected, the preamble is included for all packets captured through capture engine and will enable passing preamble data through Rx engine for CDL statistics to function.

Flex Port Properties—Link Fault Signaling

The Flex **Link Fault Signaling** tab is accessed by selecting a Flex port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Link Fault Signaling** tab.

The Flex Port Properties **Link Fault Signaling** tab for Xcellon-Flex cards other than Xcellon FlexAP10/4016SQ is shown in the following image:

Image: Flex—**Link Fault Signaling** tab



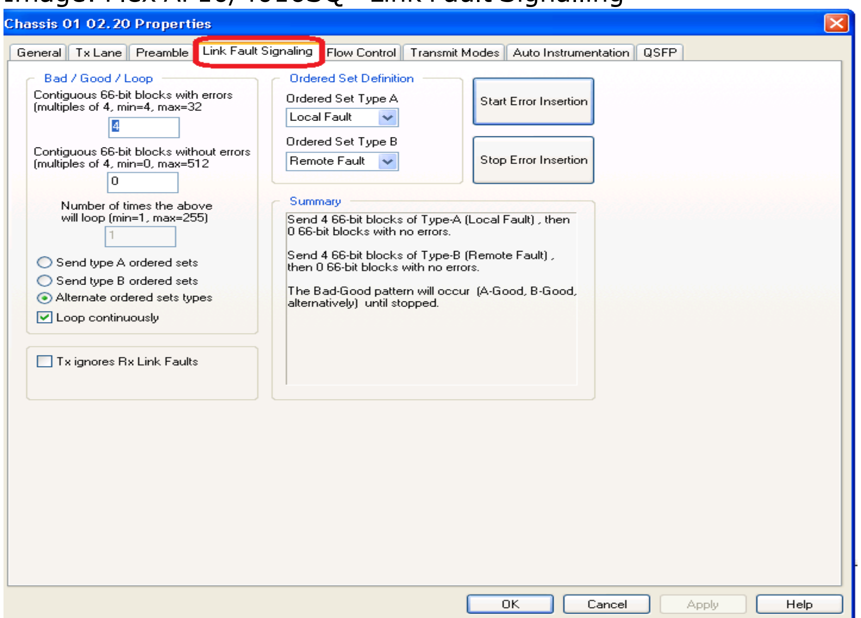
The controls for Flex **Link Fault Signaling** tab configuration are described in the following table:.

Table: Link Fault Signaling Configuration

Section	Field/Control	Description
Link Fault Signaling	Tx Ignores Rx Link Faults	If selected, ongoing transmission continues even if Link Fault messages are received by the sending RS.

The Flex Port Properties **Link Fault Signaling** tab for Xcellon FlexAP10/4016SQ is shown in the following image:

Image: Flex AP10/4016SQ—Link Fault Signalling



The controls for Flex **Link Fault Signaling** tab configuration are described in the following table:

Image: Link Fault Signaling Configuration

Section	Field/Control	Description
Bad/Good/Loop	(Bad) Contiguous 66-bit blocks with errors (multiples of 4; min = 4, max = 32)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks with errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive fault sequences allowed are minimum 4 sequences and maximum 32 sequences.
	(Good) Contiguous 66-bit blocks without errors (multiples of 4; min = 0, max = 512)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks without errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive regular data sequences allowed are minimum 0 sequences and maximum 512

Section	Field/Control	Description
		sequences.
	Number of times the above will loop (min = 1, max = 255)	Specifies the number of loops for the user defined sequence. There are two modes: • Discrete iterations: i) Minimum of 1 iterationii) Maximum of 255 iterations • Continuous loop i) User cannot specify number of iterations
	Choose one of: • Send type A ordered sets • Send type B ordered sets • Alternate ordered set types	Defines the ordered set pattern that will be sent. (The two Ordered Sets—A and B—are defined in the *Ordered Set Definition* box in this tab.) This pattern will be combined with the Good blocks/Bad blocks pattern for transmission. • Only Type A fault sequence and regular good data sequences • Only Type B fault sequence and regular good data sequences • Alternate Type A, regular good data sequences and Type B fault sequence, regular good data sequences
	Loop continuously	If selected, the loop defined by the combination of the Bad and Good blocks plus the pattern of ordered sets, will be transmitted continuously until the *Stop Error Insertion* button is selected. NOTE If fixed loop count is selected, and Send type A or Send type B is selected, one loop iteration will consist of Error-Good pattern; if the Alternate ordered set types option is selected, one loop iteration will consist of Error-Good-Error-Good pattern.
Ordered Set Definition	Ordered Set Type A	Choose one of: • Local Fault • Remote Fault
	Ordered Set Type B	Choose one of: • Local Fault • Remote Fault
Tx ignores Rx		If selected, ongoing transmission will continue even if

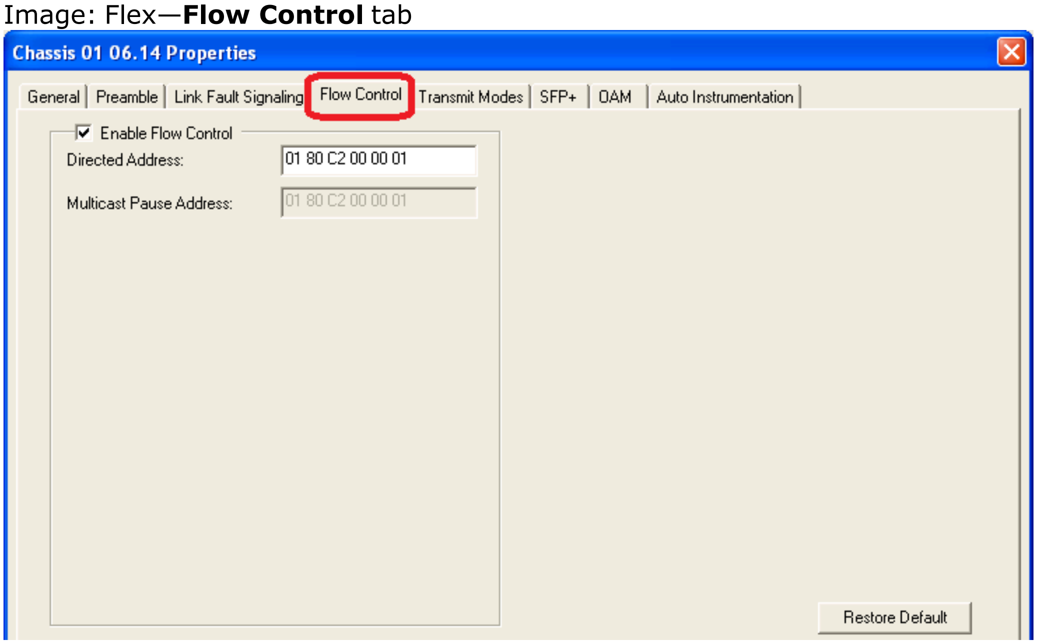
Section	Field/Control	Description
Link Faults		Link Fault messages are received by the sending RS.
Summary (Window)		(Read-only) Shows descriptions of the patterns that will be transmitted.
Start Error Insertion		Select this button to start the transmission of the configured error patterns.
Stop Error Insertion		(Available only for use with the *Loop continuously* option.) Select this button to stop the transmission of the configured error patterns.

Flex Port Properties—Flow Control

The Flex **Flow Control** tab is accessed by selecting a Flex port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

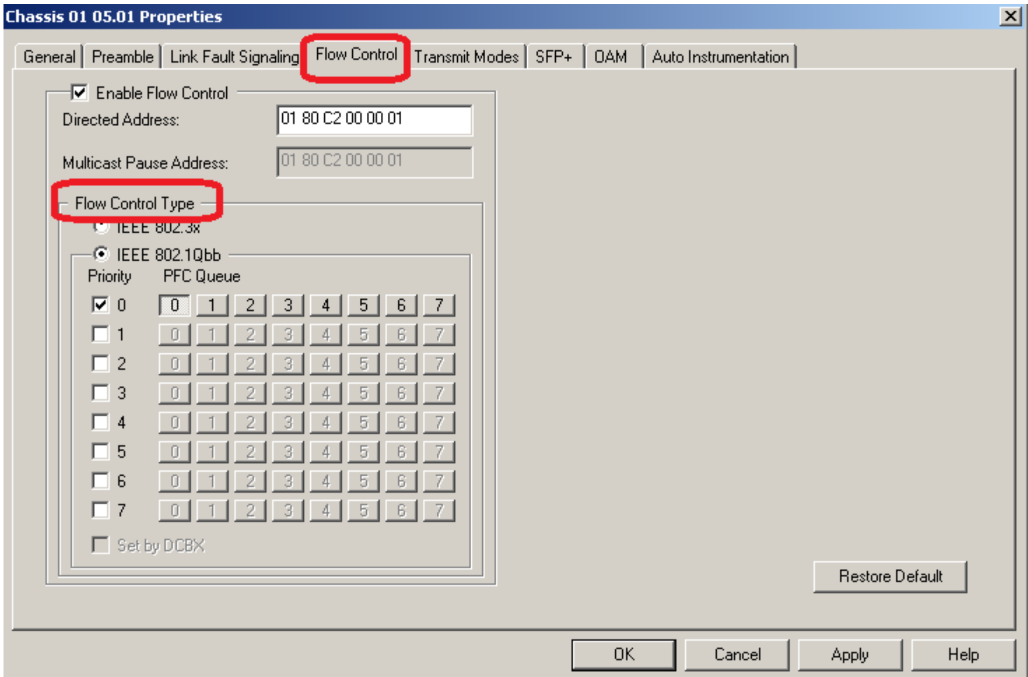
The Flex Port Properties **Flow Control** tab (non-Data Center Mode) is shown in the following image:

Image: Flex—**Flow Control** tab



The Flex Port Properties **Flow Control** tab (in Data Center Mode) is shown in the following image:

Image: Flex—**Flow Control** tab (Data Center Mode)



The controls for Flex **Flow Control** tab configuration are described in the following table:

Table: Flow Control Configuration

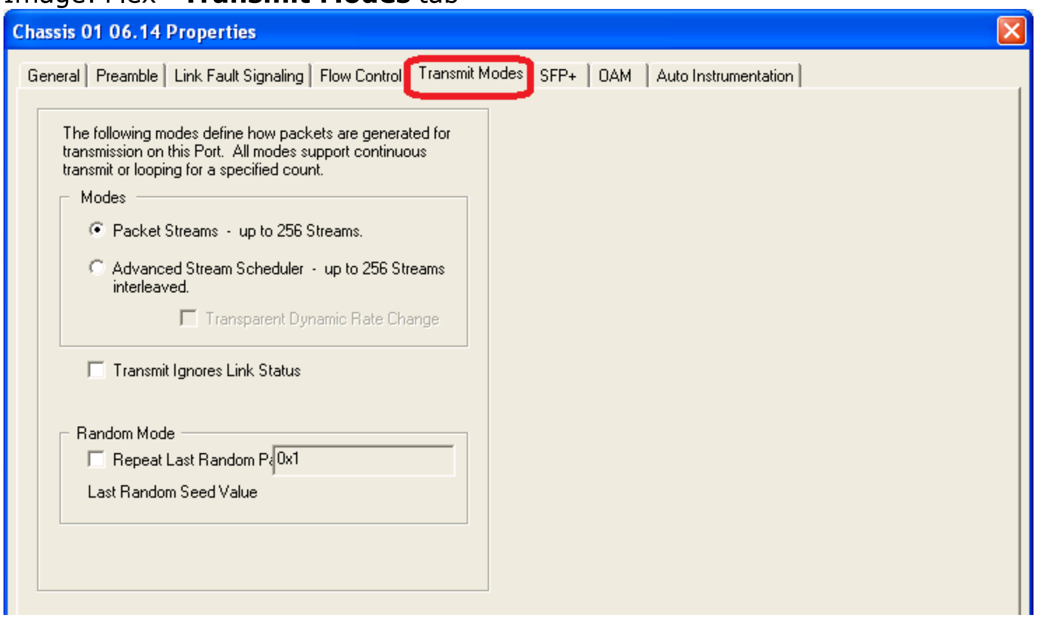
Section	Field/Control	Description
Enable Flow Control	(check box)	If selected, enables the port's MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port listens on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port listens on for a multicast pause message.
Flow Control Type	IEEE 802 3x IEEE 802.1Qbb	When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame. When not in Data Center mode, only IEEE 802.3x is available.
Priority		When flow control type IEEE 802.1Qbb is selected in Data Center mode, priority options are the channels of data that can be paused. Select one or more channels.
PFC Queue		The PFC Queue can be mapped to the priority field in the frame.

Flex Port Properties—Transmit Modes

The Flex **Transmit Modes** tab is accessed by selecting a Flex port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Transmit Modes** tab.

The Flex Port Properties **Transmit Modes** tab is shown in the following image:

Image: Flex—**Transmit Modes** tab



The controls for Flex **Transmit Modes** tab configuration are described in the following table:.

Table: Transmit Modes Configuration

Section	Control/Field	Usage
Modes	Packet Streams	Sets the basic operating mode for the port to sequential packet streams. A stream is programmed for continuous packet generation for generating a continuous, infinite number of packets.
	Advanced Stream Scheduler	Sets up the transmission of interleaved packet streams. FlexAP10G16S card supports up to 512 streams and FlexFE10G16S card supports up to 256 streams. In Data Center Mode it supports up to 256 streams. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
	Transparent Dynamic Rate Change	If selected, the dynamic rate control allows rate change across counters, for this port.
	Transmit Ignores Link Status	If selected, allows transmission of packets even if the link is down.

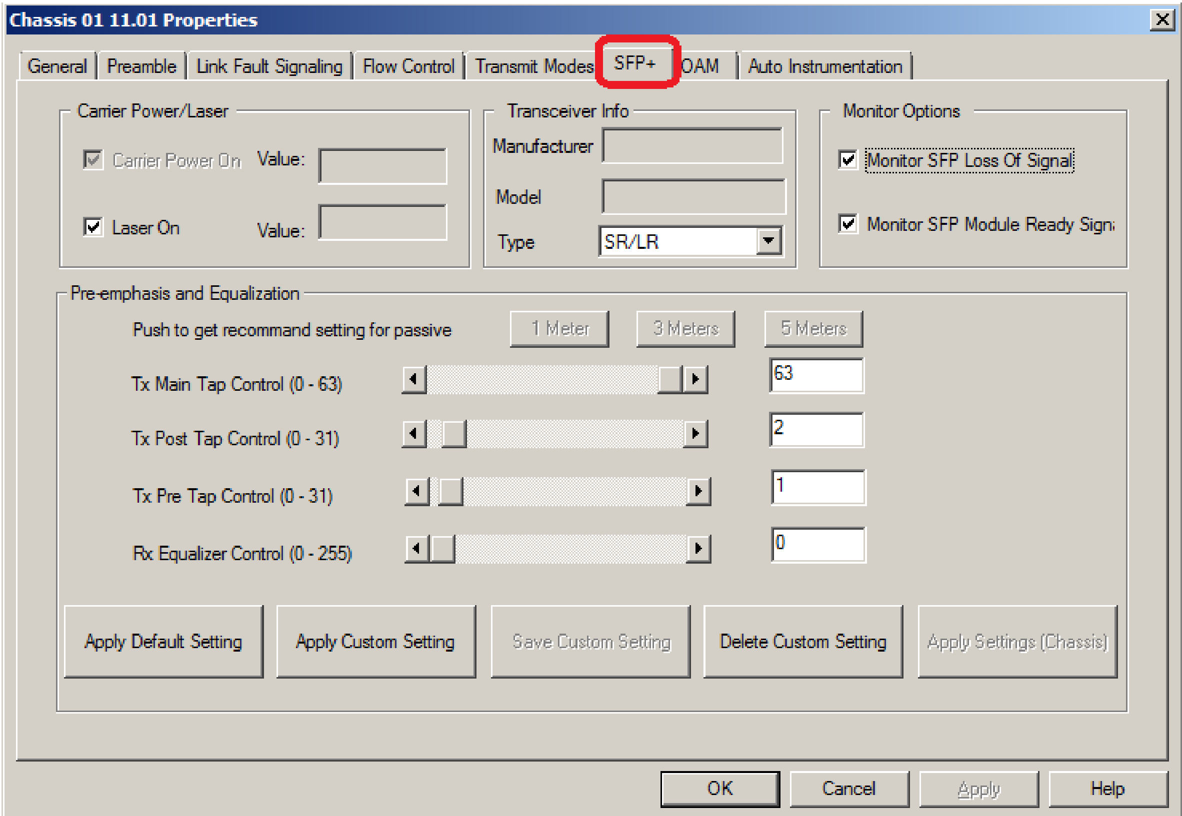
Section	Control/Field	Usage
Random Mode	Repeat Last Random Pattern	If selected, causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This is used before transmission (in which case the seed from the first packet stream is used), or immediately after a stream is sent (in which case the last stream's random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware uses to seed its random number generators. NOTE It is not a one-to-one mapping

Flex Port Properties—SFP+

The Flex **SFP+** tab is accessed from the context menu of the Flex port in the **Explore Network Resources** pane, by selecting the **Port Properties** menu option, then selecting the **SFP+** tab.

SFP+ interfaces allow to set the carrier and laser power settings, the transceiver type, and the monitor options.

The Flex Port Properties **SFP+** tab is shown in the following image.



The controls for Flex **SFP+** tab configuration are described in the following table.

Section	Control/Field	Usage
Carrier Power/Laser	Carrier Power On	If selected, enables the carrier power. The actual reading appears in the **Value** field.
	Laser On	If selected, enables the laser power. Note that the actual reading appears in the **Value** field.
Transceiver info	Manufacturer	This is the **Vendor Name** field read from the actual transceiver currently being plugged in.
	Model	This is the **Part Number** field read from the actual transceiver currently being plugged in.
	Type	Automatically detect which kind of cable is connected or plugged in. Also it can be set manually.
Monitor Options	Monitor SFP Loss of Signal	If selected, indicates the interface to conform to SFP specifications. It requires the absence of a Loss of Signal for transmitting and receiving.
	Monitor SFP Module Ready Signal	If selected, indicates the interface to conform to SFP specifications. It requires the detection of a Module Ready signal for transmitting and receiving.

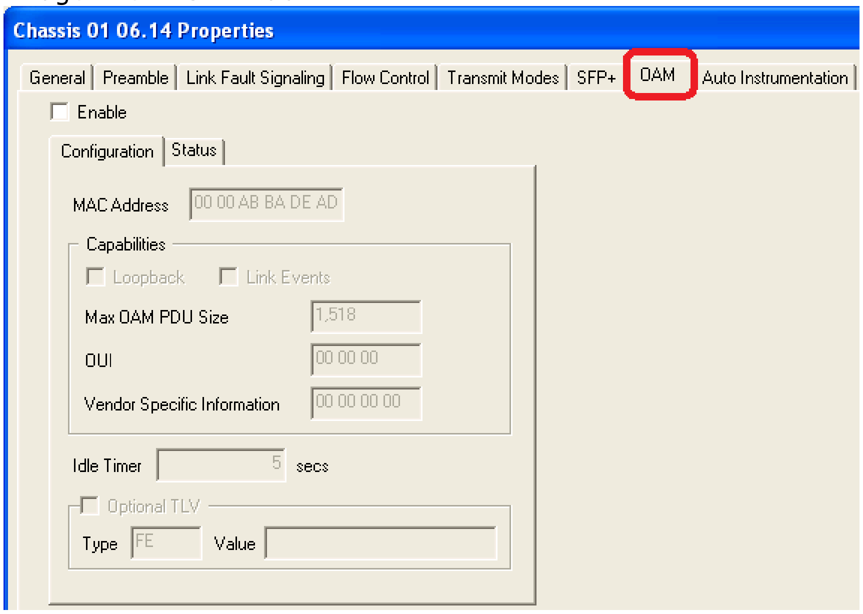
Section	Control/Field	Usage
Tranceiver Type	Automatic Detect	Automatically detect Manufacturer name and Model.
	Type	Automatically detect. Also can be set manually.
Pre-emphasis and Equalisation	Push to get recommended setting for passive	This will be disabled on Flex.
	Tx Main Tap Control (0-63)	This helps to control the Main Tap Control for Tx.
	Tx Post Tap Control (0-31)	This helps to control the Post Tap value for Tx.
	Tx Pre Tap Control (0-31)	This helps to control the Pre Tap value for Tx.
	Rx Equalizer Control (0-255)	This helps to control the Equalizer value for Rx.
	Apply Default Settings	If selected, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Settings	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users Select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	If selected, if a custom setting exists in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel that. If no custom setting exists, users will be prompted that nothing will be deleted.

Flex Port Properties—OAM

The Flex **OAM** tab is accessed by selecting a Flex port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **OAM** tab.

The Flex Port Properties **OAM** tab is shown in the following image:

Image: Flex—**OAM** tab



The Operations, Administration, and Maintenance (OAM) sublayer provides mechanisms useful for monitoring link operation such as remote fault indication and remote loopback control. In general, OAM provides network operators the ability to monitor the health of the network and quickly determine the location of failing links or fault conditions.

OAM information is conveyed in Slow Protocol frames called OAM Protocol Data Units (OAM PDUs). OAM PDUs contain the appropriate control and status information used to monitor, test and troubleshoot OAM-enabled links.

The controls for Flex **OAM** tab configuration are described in the following table:

After making configuration changes, select **Apply** to send the changes to the chassis without leaving the tab. Select **OK** to send changes and close the Properties window.

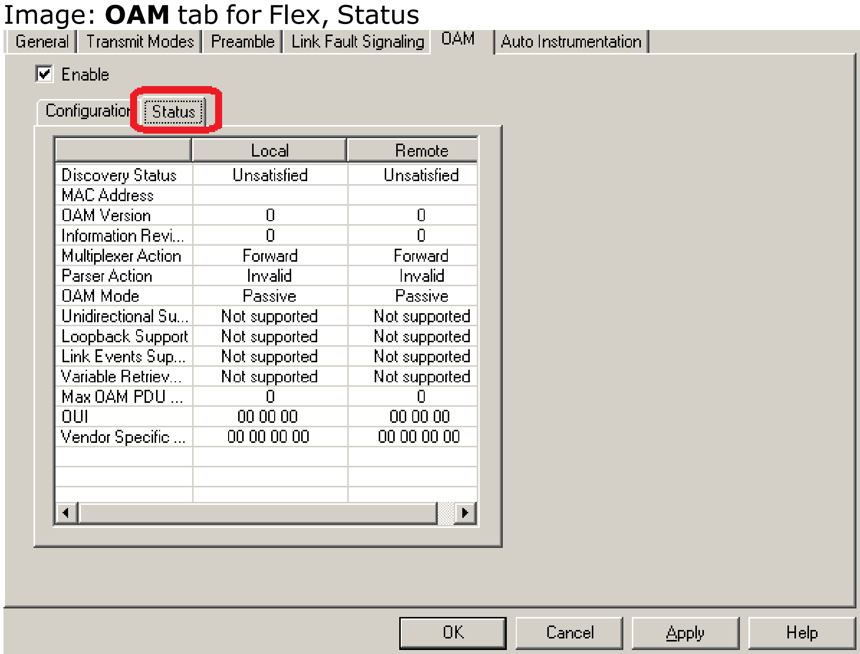
Table: OAM Configuration

Section	Field/Control	Description
	Enable	Enables and starts OAM state machine configuration.
MAC Address		The individual source MAC address of the Ixia port acting as DTE (through which the OAM PDU is transmitted).
Capabilities	Loopback	Advertises OAM remote loopback capability.
	Link Events	Advertises link event capability.
	Max OAM PDU Size	11-bit field which represents the largest OAM PDU, in octets, supported by the DTE. This value is compared to the remote's Maximum PDU Size and the smaller of the two is used.
	OUI	24-bit 3-octet field, Organizationally Unique Identifier. Example: 00 00 00.

Section	Field/Control	Description
	Vendor Specific Information	4-octet field, 32-bit identifier that may be used to differentiate a vendor's product models/versions.
Idle Timer		local_lost_link_timer Timer used to reset the Discovery state. Duration: 5 sec ± 10%.
Optional TLV	Type	This is any Information TLV that you want to send. This one-octet field indicates the nature of the data carried in this TLV-tuple. • 0x00 End of TLV marker • 0x01 Local Information • 0x02 Remote Information • 0x03-0xFD Reserved - shall not be transmitted, should be ignored on reception by OAM client • 0xFE Organization Specific Information • 0xFF Reserved - shall not be transmitted, should be ignored on reception by OAM client
	Value	This field indicates the value of the Information TLV. This field's length and contents are unspecified.

The **OAM Status** tab is shown in the following image:

Image: **OAM** tab for Flex, Status



The fields and controls in the **Status** tab are described in the following table. For each category, there is both a Local and a Remote status indicator.

Table: **OAM Status** tab

Field/Control	Description
Discovery Status	Detects the presence of an OAM sublayer at the remote DTE.
MAC Address	Defined in *Table: OAM Configuration*.
OAM Version	This one-octet field indicates the version supported by the DTE. This field always contains the value 0x01.
Information Revision	This two-octet field indicates the current revision of the Information TLV. The value of this field shall start at zero and be incremented each time something in the Information TLV changes.
Multiplexer Action	Forward (0) = Device is forwarding non-OAMPDUs to the lower sublayer (= FWD). Discard (1) = Device is discarding non-OAMPDUs (local_mux_action = DISCARD).
Parser Action	00 = Device is forwarding non-OAMPDUs to higher sublayer (local_par_action = FWD). 01 = Device is looping back non-OAMPDUs to the lower sublayer (local_par_ action = LB). 10 = Device is discarding non-OAMPDUs (local_par_action = DISCARD). 11 = Reserved. In Local Information TLVs, this value shall not be sent. If the value 11 is received, it should be ignored and not change the last received value.
OAM Mode	1 = DTE configured in Active mode. 0 = DTE configured in Passive mode.
Unidirectional Support	1 = DTE is capable of sending OAMPDUs when the receive path is non-operational. 0 = DTE is not capable of sending OAMPDUs when the receive path is non-operational.
Loopback Support	Defined in *Table: OAM Configuration*.
Link Events Support	Defined in *Table: OAM Configuration*.
Variable Retrieval Support	1 = DTE supports sending Variable Response OAMPDUs. 0 = DTE does not support sending Variable Response OAMPDUs.

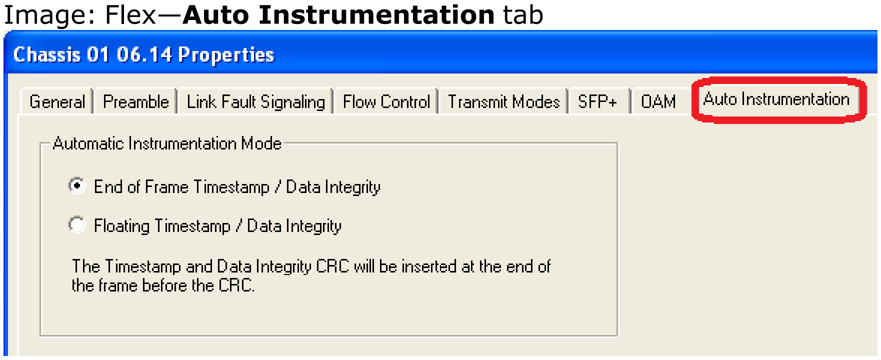
Field/Control	Description
Max OAM PDU Size	Defined in *Table: OAM Configuration*.
OUI	Defined in *Table: OAM Configuration*.
Vendor Specific Information	Defined in *Table: OAM Configuration*.

Flex Port Properties—Auto Instrumentation

The Flex **Auto Instrumentation** tab is accessed by selecting a Flex port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto Instrumentation** tab.

The Flex Port Properties **Auto Instrumentation** tab is shown in the following image:

Image: Flex—**Auto Instrumentation** tab



The options and controls in this tab are described in the following table.

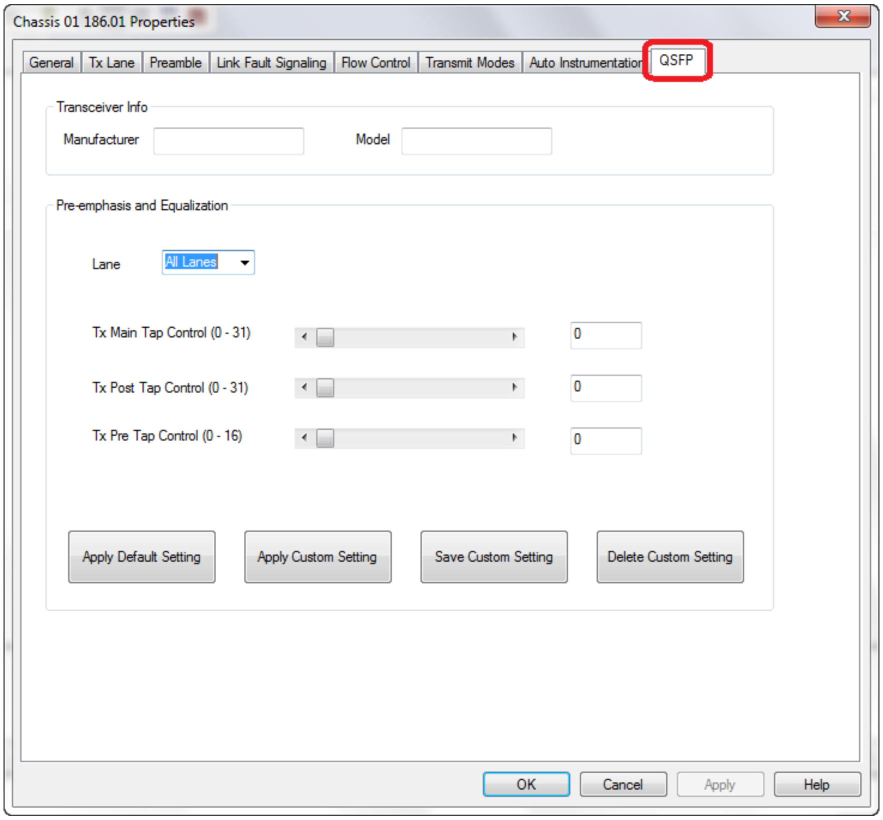
Table: Auto Instrumentation Configuration

Field/Control	Description
End of Frame Timestamp / Data Integrity	Enables inserting Timestamp and Data Integrity CRC at the end of the frame before the CRC.
Floating Timestamp / Data Integrity	Enables adding timestamp as part of floating instrumentation header, and addresses similar issue in Data Integrity checking.

Flex Port Properties—QSFP

The Flex **QSFP** tab is accessed from the context menu of the Flex port in the **Explore Network Resources** pane, by selecting the **Port Properties** menu option, then selecting the **QSFP** tab.

The Flex Port Properties **QSFP** tab is shown in the following image.



The options and controls in this tab are described in the following table.

Section	Field/Control	Description
Transceiver Info	Manufacturer	This is the **Vendor Name** field read from the actual transceiver currently being plugged in.
	Model	This is the **Part Number** field read from the actual transceiver currently being plugged in.
Pre-emphasis and Equalization		
	Lane	Specifies in which lane (from 0-3) the current settings are.
	Tx Main Tap Control (0-31)	This helps to control the Main Tap Control for Tx.
	Tx Post Tap Control (0-31)	This helps to control the Post Tap value for Tx.
	Tx Pre Tap Control (0-16)	This helps to control the Pre Tap value for Tx.
	Apply Default Setting	If selected, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual

Section	Field/Control	Description
		hardware.
	Apply Custom Setting	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Delete Custom Setting	If selected, if a custom setting exists in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel that. If no custom setting exists, users will be prompted that nothing will be deleted.

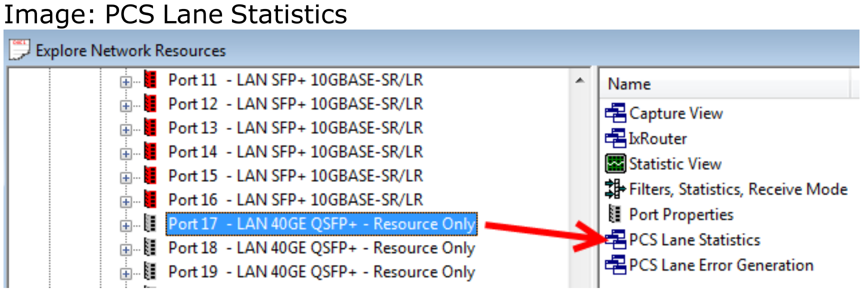
PCS Lane Statistics for Flex modules

The PCS Lane Statistics are available for FlexAP1040SQ 4GE QSFP load modules. The PCS Labe Statistics table allows you to view the statistics for the configured PCS lanes. It is part of the Port Properties for the module.

To open the PCS Lane Statistics table:

1. Select the FlexAP1040SQ Load module in the left pane of the IxExplorer window.
2. Expand the node, and select the Port object. In the right window pane, double-click the PCS Lane Statistics object as shown in the following image:

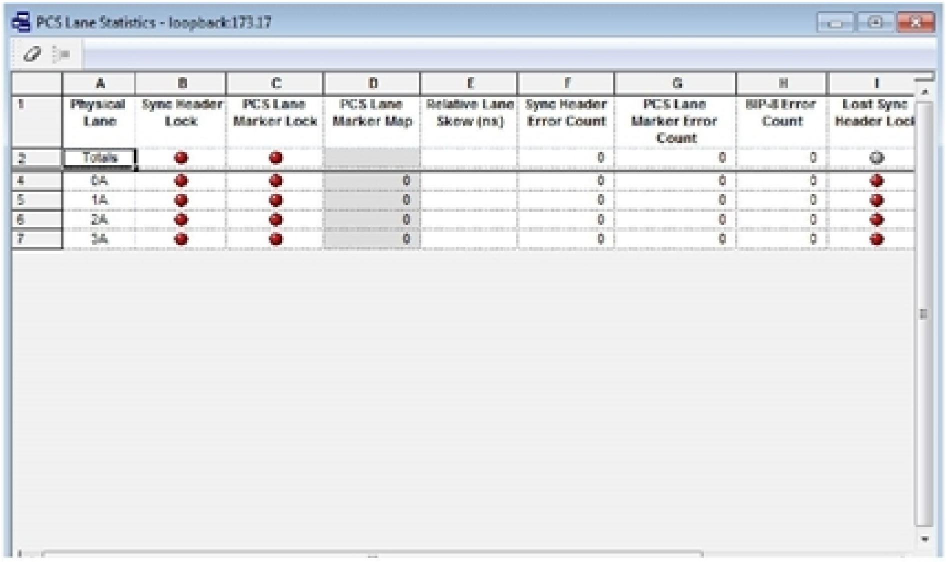
Image: PCS Lane Statistics



The PCS Lane Statistics table opens. Use this table to view the PCS lane statistics for each lane. The statistics are for the receive side.

The PCS Lane Statistics table is shown in the following image:

Image: PCS Lane Statistics table



The following table explains the entries in the PCS Lane Statistics table:

Table: PCS Lane Statistics Data

Field/Control	Description
Physical Lane	The identifier for the Receive physical lane. This is a tag /fixed label to ID each lane.
Sync Header Lock	Indicates if the received PCS lane achieved sync-bit lock. Green indicates success, red indicates failure.
PCS Lane Marker Lock	Indicates if the received PCS lane has achieved alignment marker lock.Green indicates success, red indicates failure.
PCS Lane Marker Map	The VL number identified by the alignment marker. This is only valid when VL Lock is green.
Relative Lane Skew (ns)	Shows the actual skew in nanoseconds. Skew measurements are valid only when all lanes are locked with 20 unique lane markers. The first VL markers to arrive have skew of 0. All other lane skews are relative to them.
Sync Header Error Count	The number of synchronization bit errors received.
PCS Lane Marker Error Count	The number of incorrect PCS lane markers received while in PCS lane lock state.
BIP-8 Error	The number of BIP-8 errors for a PCS lane.

Field/Control	Description
Count	BIP-8 = Bit-Interleaved Parity with eight bit errors (BIP-8). Each bit in the BIP field is an even parity calculation over all previous selected bits of a PCS lane.
Lost Sync Header Lock	When lit, indicates the loss of sync header lock since the last statistic was read. If colored gray, there is no error. If colored red, an error has occurred.
Lost PCS Lane Marker Lock	When lit, indicates the loss of PCS lane marker lock since the last statistic was read. If colored gray, there is no error.If colored red, an error has occurred.

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CHAPTER 23

Port Properties–Xcellon-Lava Load Module

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the Lava load module.

Port Properties for Lava Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option.

The complete specification for the Lava is found in the *Ixia Platform Reference Manual*.

The following port property tabs are available for Lava modules:

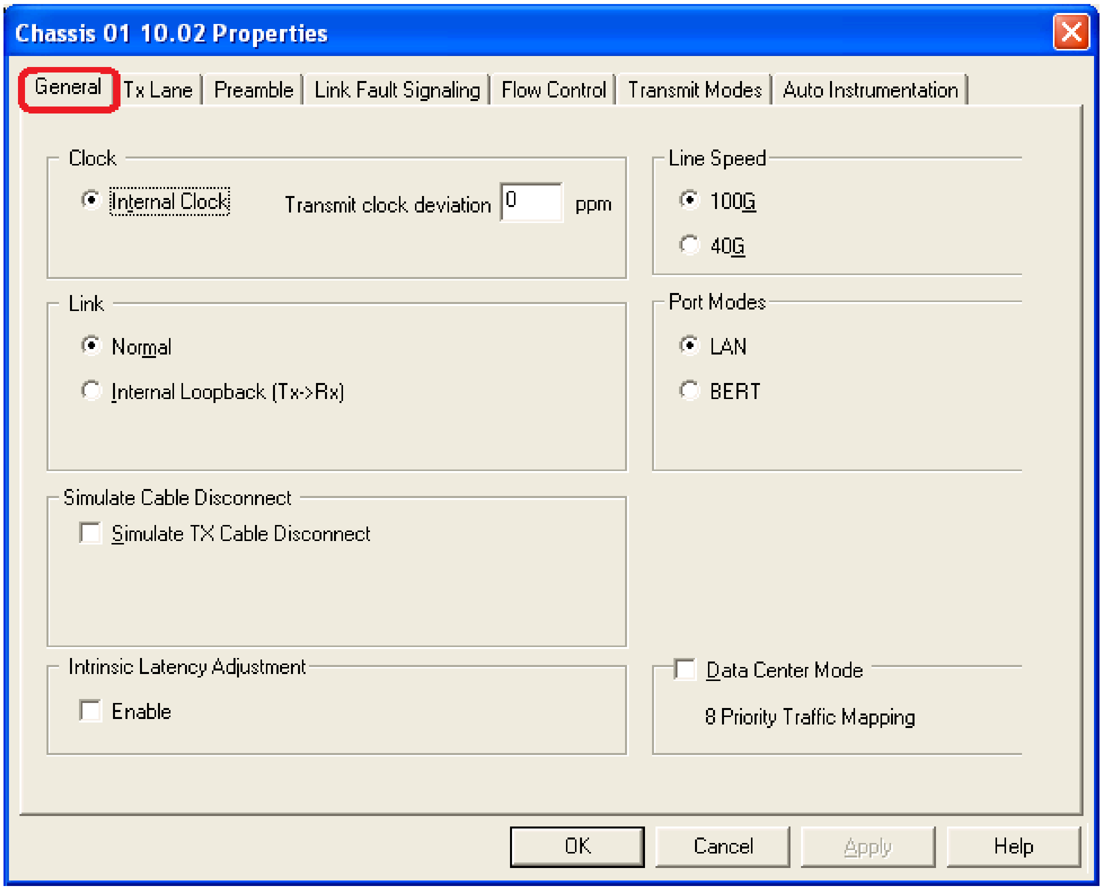
- Lava Port Properties—General
- Lava Port Properties—TX-Lane
- Lava Port Properties—Preamble
- Lava Port Properties—Link Fault Signaling
- Lava Port Properties—Flow Control
- Lava Port Properties—Transmit Modes
- Lava Port Properties—Auto Instrumentation
- Lava Port Properties—CFPtoQSFP
- Lava Port Properties—CFPtoCXP

Lava Port Properties—General

The Lava **General** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, and then selecting the **General** tab.

The Port Properties **General** tab is shown in the following image:

Image: Lava—**General** tab



The controls for **General** tab configuration are described in the following table:

Table: General Configuration

Section	Control/Field	Usage
Clock	Internal Clock	If selected, the timing for the SerDes reference clock comes from an internal oscillator.
	Transmit Clock Deviation	Allows to adjust the line transmit frequency for the port. The initial rate is controlled by the chassis chain reference clock. Then you can adjust the line transmit frequency for the port. 40/100 GE LSM cards can be adjusted from -100 to +100 ppm from the initial rate.
Link	Normal	Normal operation
	Internal Loopback (Tx -> Rx)	Internal Loopback—Transmit to Receive.
Simulate Cable Disconnect		If selected, the port acts as if the cable has been disconnected.

Section	Control/Field	Usage
Intrinsic Latency Adjustment	Enable	Select to enable the intrinsic latency adjustment. The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia Platform Reference Manual*.
Line Speed		Select 100G or 40G
Port Modes		Select LAN or BERT. If BERT is selected, all the Port Properties tabs except *General* will disappear. BERT Mode.
Data Center Mode		Frame Data for FCoE Support.

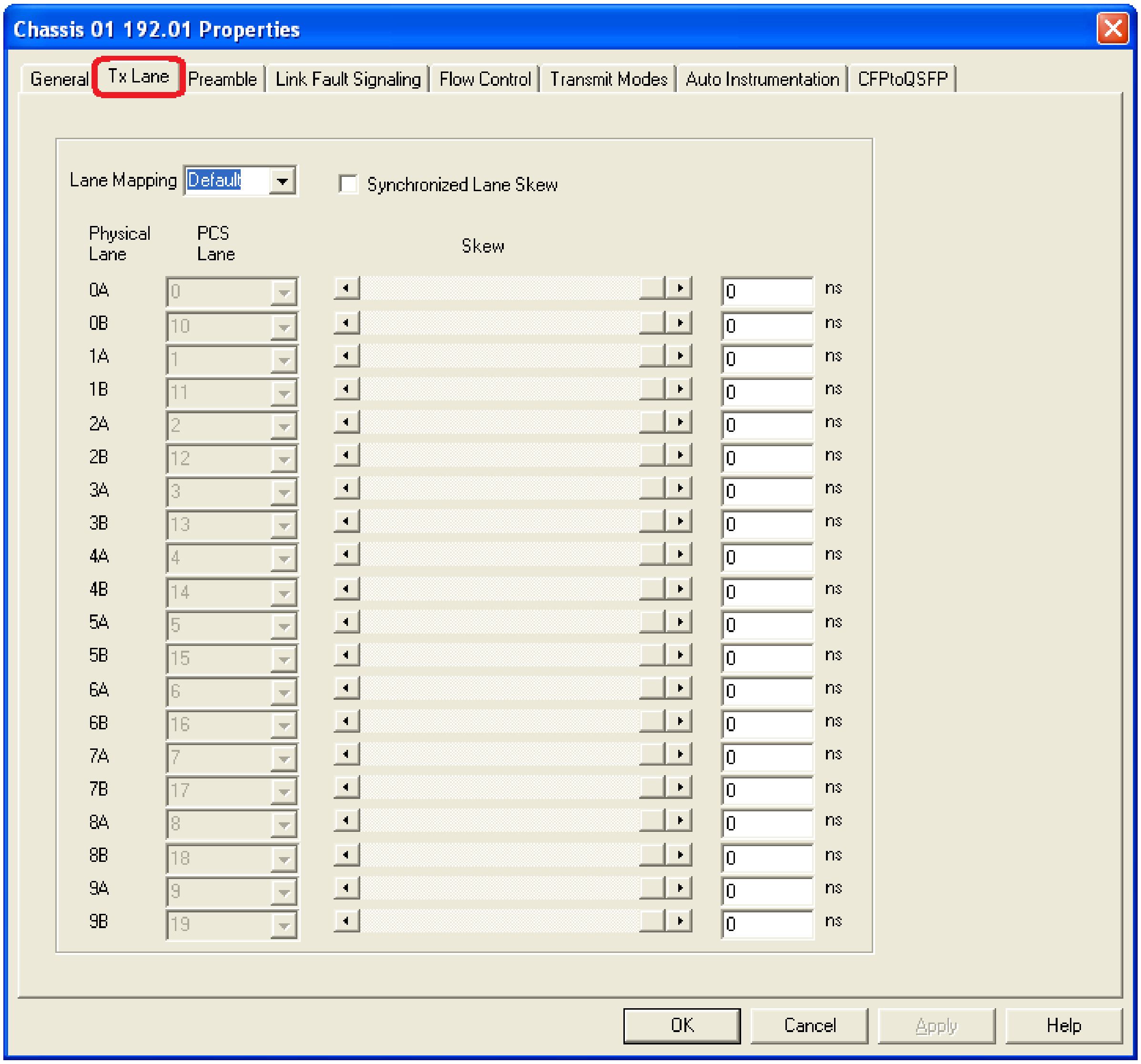
Lava Port Properties—TX-Lane

The **Tx Lane** tab allows to control the PCS lane order and skew rate for each lane.

For more information on Lane Skewing, see the Lane Skew topic in the 'Multilane Distribution Configuration' chapter of the *Ixia Platform Reference Manual*. The Lane Skew topic is located under 'Types of Ports' / '100GE'.

The Lava Port Properties ***Tx Lane*** tab is shown in the following image:

Image: Lava—**Tx Lane** tab



The controls for the ***Tx Lane*** tab configuration are described in the following table:

Table: **Tx Lane** Tab Configuration

Field	Description
Lane Mapping	Allows you to select a PCS lane ordering method. There are five options: • Default–the default ordering method. The default order is each physical port corresponds to 2 PCS lanes that are n and n+10, where n = physical lane number. • Increment–orders the lanes from 0 to 19, straight down the list. • Decrement–orders the lanes from 19 to 0, straight down the list. • Custom–allows to put the lanes in any order by manually entering the numbers in the fields. The starting order is the last selected mapping. • Random - Allows to put the lanes in any random order, values will be any

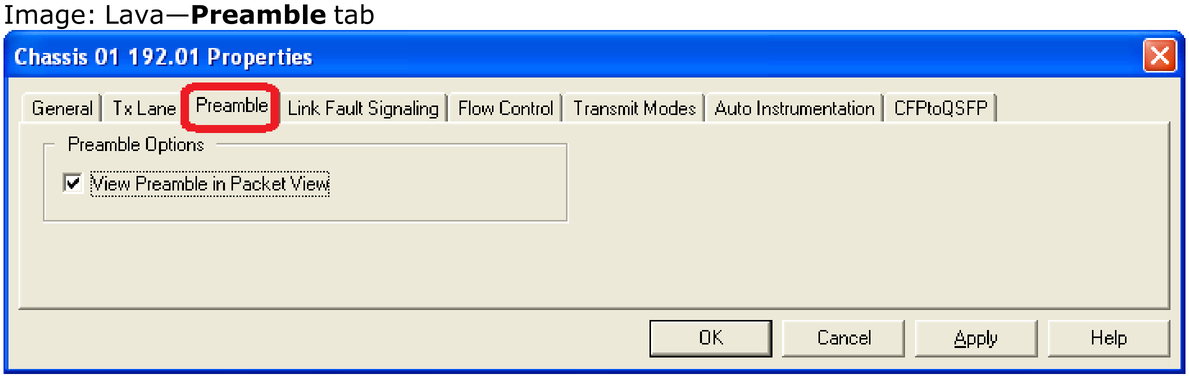
Field	Description
	value from 0 to 19.
Synchronized Lane Skew	All lanes are skewed by the same amount of skew.
Physical Lane	The physical lane identifier. The physical lane is paired with a corresponding PCS lane.
PCS Lane	A number identifier for the PCS lane. The PCS lane is paired with a corresponding physical lane.
Skew	The skew slider is used to set a skew value for the PCS lane, in nanoseconds, on the transmit side. Lane Skew is the ability to independently delay one or more of the 20 PCS lanes. When the slider is moved, the nanoseconds field is correspondingly adjusted. You can also enter a nano second value directly into this field. When the slider is fully pushed to the right, the skew injected into the transmit stream is 0 (minimum). When the slider is pushed all the way to the left. the skew injected into the transmit stream is 3 uS (maximum).

Lava Port Properties—Preamble

The preamble precedes the frame, but is not part of the frame itself.

The Lava Port Properties **Preamble** tab is shown in the following image:

Image: Lava—**Preamble** tab



The fields and controls in this tab are described in the following table:

Table: Preamble Configuration

Section	Choices	Description
Preamble Options	View Preamble in Packet View	When this check box is selected, the preamble data will be visible in the Packet View (transmit side) and the Capture View (receive side).

Lava Port Properties—Link Fault Signaling

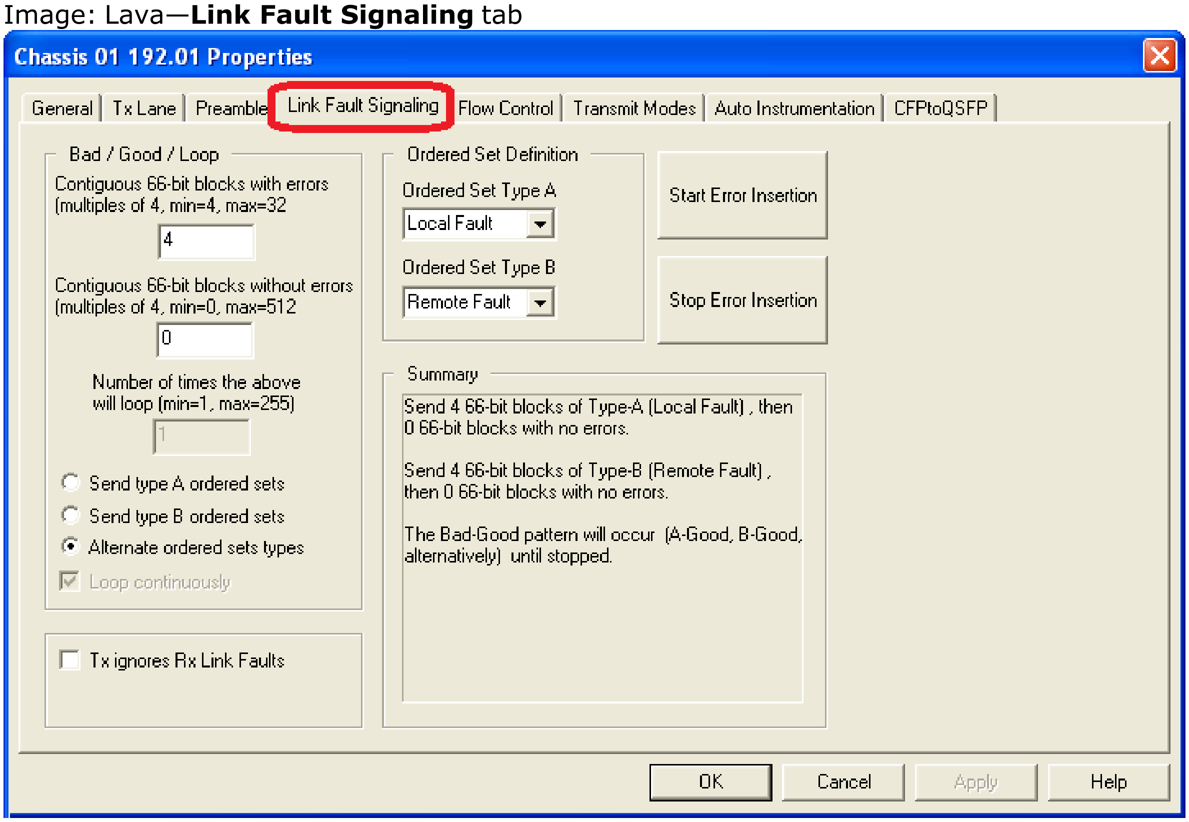
Link Fault Signaling is defined in Section 81.3.3.3 of the IEEE 802.3ba specification for 40 Gb/s and 100 Gb/s Ethernet. Link Fault Signaling is defined in Section 46 of the IEEE 802.3ae specification for 10 Gigabit Ethernet. When the feature is enabled, four statistics will be added to the list in Statistic View for the port. One is for monitoring the Link Fault State. Two provide a count of the Local Faults and Remote Faults. The last one is for indicating the state of error insertion, whether or not it is ongoing.

Link Fault Signaling for Lava originates with the PHY sending an indication of a local fault condition in the link being used as a path for MAC data. In the typical scenario, the Reconciliation Sublayer (RS) that had been receiving the data will receive this Local Fault status, and then send a Remote Fault status to the RS that was sending the data. Upon receipt of this Remote Fault status message, the sending RS will terminate transmission of MAC Data, sending only 'Idle' control characters until the link fault is resolved.

The **Link Fault Signaling** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Link Fault Signaling*** tab.

The ***Link Fault Signaling*** tab for Lava load module is shown in the following image:

Image: Lava—**Link Fault Signaling** tab



The controls for **Link Fault Signaling** tab configuration are described in the following table:

Table: Link Fault Signaling Configuration

Section	Field/Control	Description
Bad/Good/Loop	(Bad) Contiguous 66-bit blocks with errors (multiples of 4; min = 4, max = 32)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks with errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive fault sequences allowed are minimum 4 sequences and maximum 32 sequences.
	(Good) Contiguous 66-bit blocks without errors (multiples of 4; min = 4, max = 32)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks without errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive fault sequences allowed are minimum 4 sequences and maximum 32 sequences.
	Number of times the above will loop (min = 1, max = 255)	This field is available only when the *Loop continuously* check box is **NOT** selected. It is the number of times that the combination of Bad/Good and Type patterns will be repeated. After all of the 66-bit blocks have been sent, the transmission will automatically stop.
	Choose one of: • Send type A ordered sets • Send type B ordered sets • Alternate ordered set types	Defines the ordered set pattern that will be sent. (The two Ordered Sets—A and B—are defined in the **Ordered Set Definition** box in this tab.) This pattern will be combined with the Good blocks/Bad blocks pattern for transmission. • Type A only • Type B only • Alternate Type A and Type B.
	Loop continuously	If selected, the loop defined by the combination of the Bad and Good blocks plus the pattern of ordered sets, will be transmitted continuously until the *Stop Error Insertion* button is selected. NOTE If fixed loop count is selected, and Send type A or Sed type B is selected, one loop iteration will consist of Error-Good pattern; if the Alternate ordered set types option is selected, one loop iteration will consist of Error-Good-Error-Good pattern.
Ordered Set Definition	Ordered Set Type A	Choose one of: • Local Fault

Section	Field/Control	Description
		• Remote Fault
	Ordered Set Type B	Choose one of: • Local Fault • Remote Fault
Tx Ignores Rx Link Faults		If selected, ongoing transmission will continue even if Link Fault messages are received by the sending RS.
Summary (Window)		(Read-only) Shows descriptions of the patterns that will be transmitted.
Start Error Insertion		Select this button to start the transmission of the configured error patterns.
Stop Error Insertion		(Available only for use with the *Loop continuously* option.) Select this button to stop the transmission of the configured error patterns.

Lava Port Properties—Flow Control

The Lava **Flow Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

The Port Properties **Flow Control** tab is shown in the following image:

Image: Lava (non Data Center mode) **Flow Control** tab

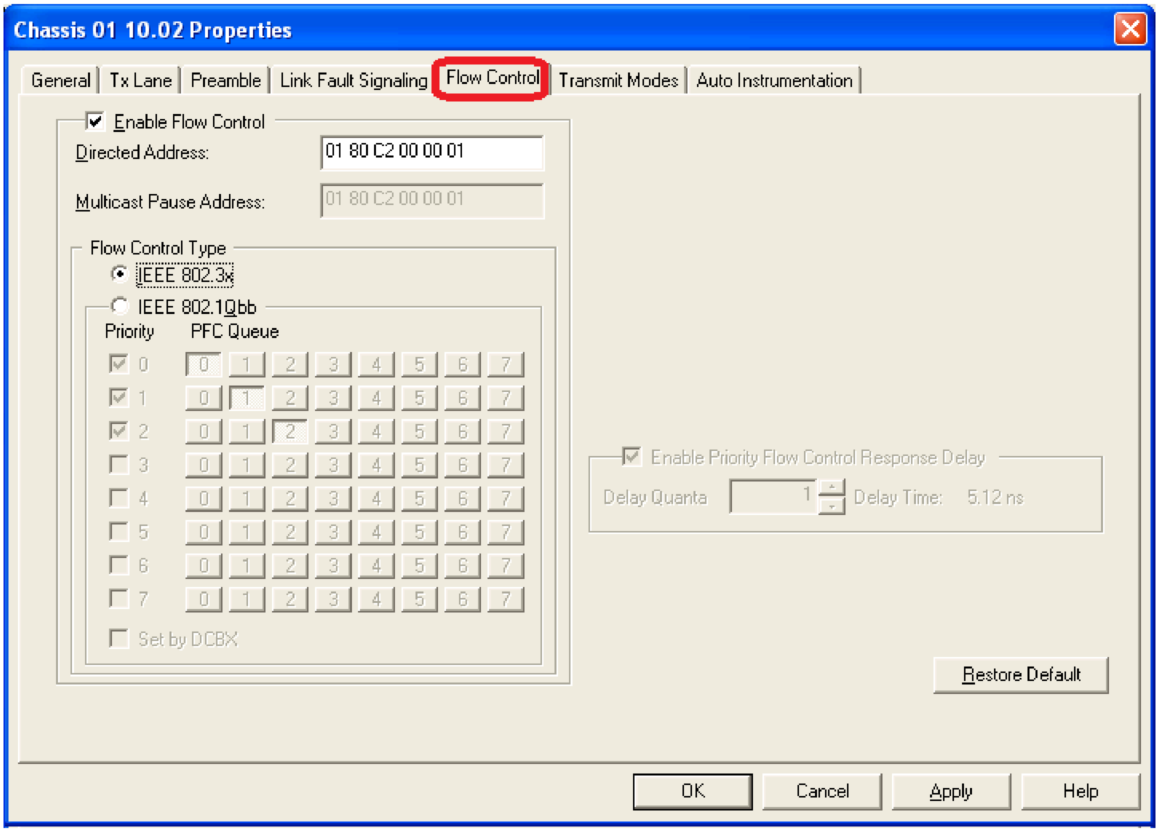
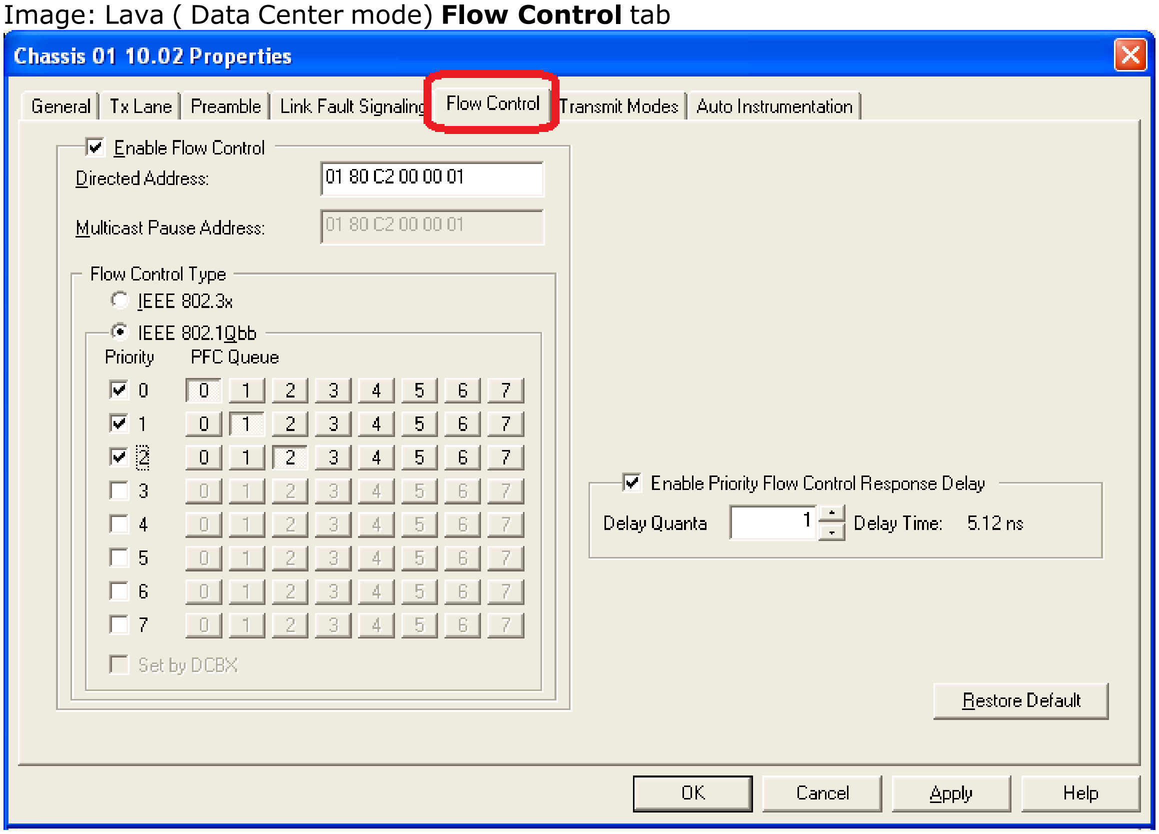


Image: Lava (Data Center mode) **Flow Control** tab



The controls for **Flow Control** tab configuration are described in the following table:

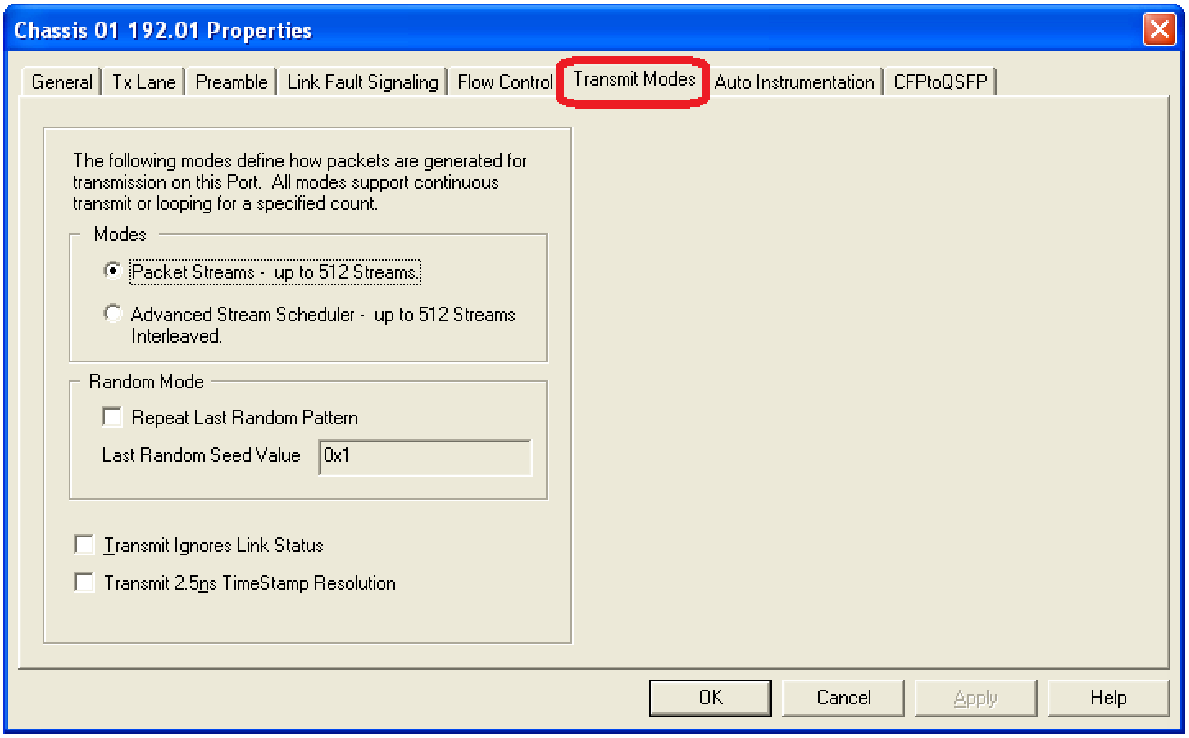
Section	Field/Control	Description
Enable Flow Control	(check box)	Enables the port's MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type	IEEE 802.3x or IEEE 802.1Qbb	Priority-based Flow Control When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame. When not in Data Center mode, only IEEE 802.3x is available.
	Priority	Priority-based Flow Control.
	PFC Queue	Priority-based Flow Control
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

Lava Port Properties—Transmit Modes

The **Transmit Modes** tab for Lava load modules is shown in the following image. It is accessed by double-clicking a port in Resources window, or by selecting a port and selecting the **Properties** menu option. Then select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following image:

Image: Lava—**Transmit Modes** tab



The controls for **Transmit Modes** tab configuration are described in the following table:

Table: Transmit Modes Configuration

Section	Field/Control	Description
Modes	Packet Streams	Sets the operating mode for the port to sequential packet streams. This allows to configure up to 512 streams which become active sequentially. A stream may be programmed for continuous packet generation—generating a continuous, infinite number of packets.
	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure up to 512 streams which are concurrently active. They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream’s random seed is used).

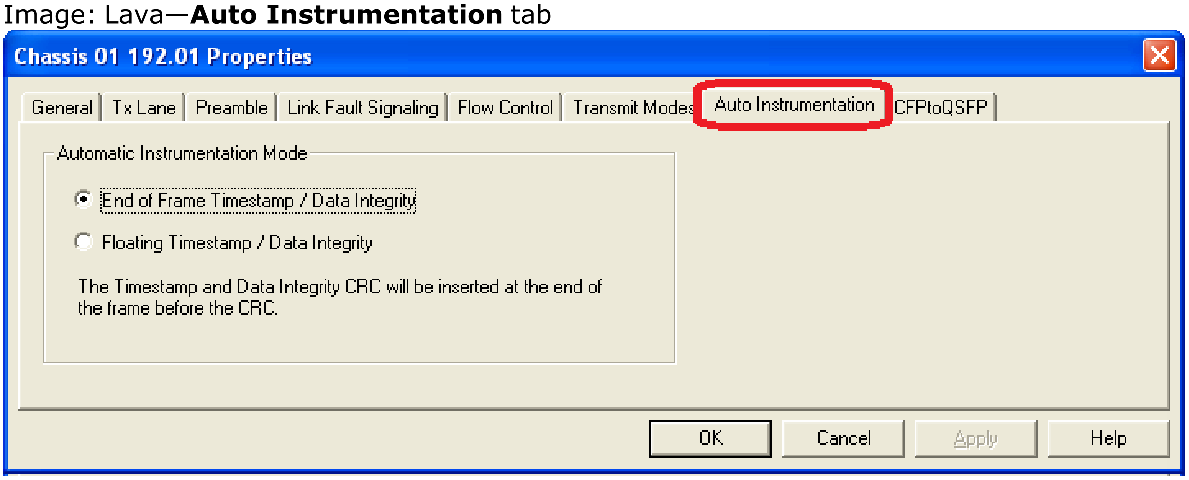
Section	Field/Control	Description
		For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit Ignores Link Status		If selected, will allow transmission of packets even if the link is down.
Transmit 2.5ns Time stamp Resolution		If selected, it will check for the high resolution time stamp.

Lava Port Properties—Auto Instrumentation

The Lava **Auto Instrumentation** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto Instrumentation** tab.

The Lava Port Properties **Auto Instrumentation** tab is shown in the following image:

Image: Lava—**Auto Instrumentation** tab



The options and controls in this tab are described in the following table:

Table: Auto Instrumentation Configuration

Field/Control	Description
End of Frame Timestamp / Data Integrity	Enables inserting Timestamp and Data Integrity CRC at the end of the frame before the CRC.

Field/Control	Description
Floating Timestamp / Data Integrity	Enables adding timestamp as part of floating instrumentation header, and addresses similar issue in Data Integrity checking.

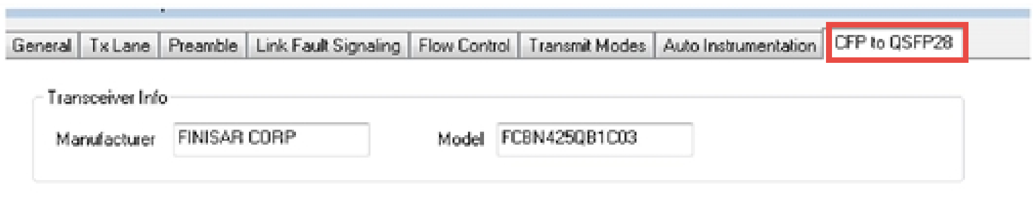
Lava Port Properties—CFPtoQSFP

The Lava **CFPtoQSFP** tab is accessed from the context menu of the port in the **Explore Network Resources** pane, by selecting the **Port Properties** menu option, then selecting the **CFPtoQSFP** tab. The **CFPtoQSFP** tab only exists if a CFPtoQSFP adapter is plugged in, otherwise it is not visible.

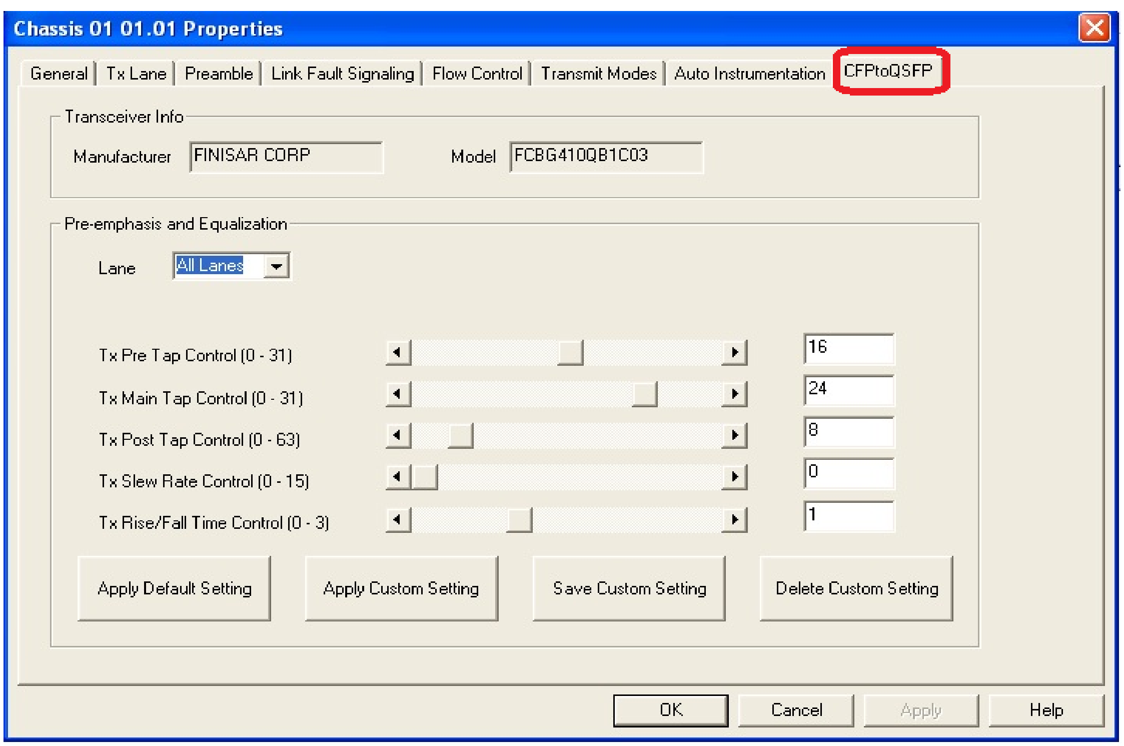
For more information on the adapters, see the *Ixia Platform Reference Guide*.

NOTE If the QSFP28 adapter is plugged in, the **CFP to QSFP28** tab is shown. The Port Properties are similar to the ones for the **CFPtoQSFP** tab.

The Lava Port Properties **CFP to QSFP28** tab is shown in the following image.



The Lava Port Properties **CFPtoQSFP** tab is shown in the following image.



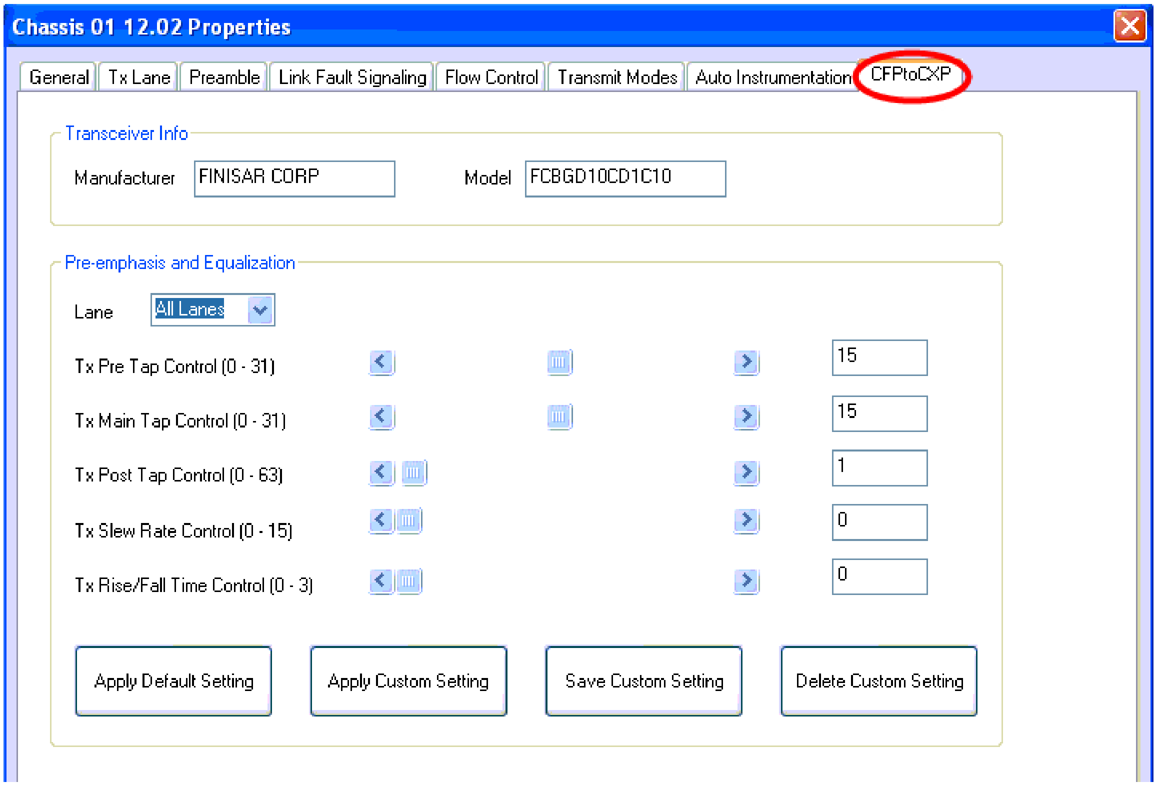
The options and controls in this tab are described in the following table.

Section	Field/Control	Description
Transceiver Info	Manufacturer	This is the **Vendor Name** field read from the actual transceiver currently being plugged in.
	Model	This is the **Part Number** field read from the actual transceiver currently being plugged in.
Pre-emphasis and Equalization	Lane	Specifies in which lane (from 0-3) the current settings on.
	Tx Pre Tap Control (0-31)	This helps to control the Pre Tap value for Tx.
	Tx Main Tap Control (0-31)	This helps to control the Main Tap Control for Tx.
	Tx Post Tap Control (0-63)	This helps to control the Post Tap value for Tx.
	Tx Slew Rate Control (0-15)	This helps to control the slewrate value for Tx.
	Tx Rise/Fall Time Control (0-3)	This helps to control the Post Tap value for Tx.
	Apply Default Settings	If selected, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Settings	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	If selected, if a custom setting exists in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel that. If no custom setting exists, users will be prompted that nothing will be deleted.

Lava Port Properties—CFPtoCXP

The Lava **CFPtoCXP** tab is accessed from the context menu of the port in the **Explore Network Resources** pane, by selecting the **Port Properties** menu option, then selecting the **CFPtoCXP** tab. **CFPtoCXP** tab only exists if a CFPtoCXP adapter is plugged in, otherwise it is not visible.

The Lava Port Properties **CFPtoCXP** tab is shown in the following image.



The options and controls in this tab are described in the following table.

Section	Field/Control	Description
Transceiver Info	Manufacturer	This is the **Vendor Name** field read from the actual transceiver currently being plugged in.
	Model	This is the **Part Number** field read from the actual transceiver currently being plugged in.
Pre-emphasis and Eqalization	Lane	Specifies in which lane (from 0-3) the current settings on.
	Tx Pre Tap Control (0-31)	This helps to control the Pre Tap value for Tx.
	Tx Main Tap Control (0-31)	This helps to control the Main Tap Control for Tx.

Section	Field/Control	Description
	Tx Post Tap Control (0-63)	This helps to control the Post Tap value for Tx.
	Tx Slew Rate Control (0-15)	This helps to control the slewrate value for Tx.
	Tx Rise/Fall Time Control (0-3)	This helps to control the Post Tap value for Tx.
	Apply Default Settings	If selected, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Settings	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	If selected, if there exists a custom setting in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel with that. If no custom setting exists, users will be prompted that nothing will be deleted.

CHAPTER 24

Port Properties–Xcellon-Multis Load Module

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the Xcellon-Multis load module.

Port Properties for Xcellon-Multis Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option.

The complete specification for the Xcellon-Multis is found in the *Ixia Platform Reference Manual*.

The following port property tabs are available for Xcellon-Multis modules:

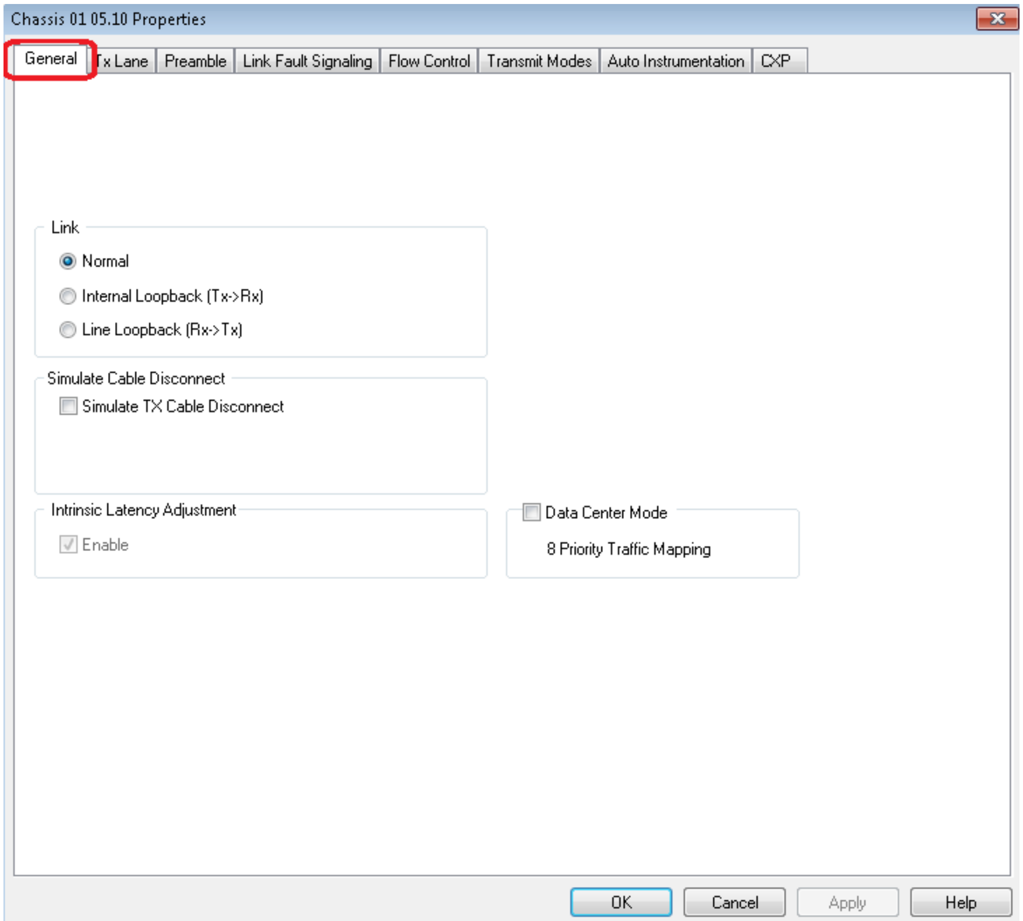
- Xcellon-Multis Port Properties—General
- Xcellon-Multis Port Properties—TX-Lane
- Xcellon-Multis Port Properties—Preamble
- Xcellon-Multis Port Properties—Link Fault Signaling
- Xcellon-Multis Port Properties—Flow Control
- Xcellon-Multis Port Properties—Transmit Modes
- Xcellon-Multis Port Properties—Auto Instrumentation
- Xcellon-Multis Port Properties—CXP
- Xcellon-Multis Port Properties—QSFP
- Xcellon-Multis Port Properties—QSFP28
- Xcellon-Multis Port Properties—CFP4
- Xcellon-Multis CXP Port Properties—Auto Negotiation
- Xcellon-Multis QSFP Port Properties—Auto Negotiation
- Xcellon-Multis CFP4 Port Properties—Auto Negotiation
- Xcellon-Multis QSFP28 Port Properties—Auto Negotiation

Xcellon-Multis Port Properties—General

The Xcellon-Multis **General** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, and then selecting the **General** tab.

The Port Properties **General** tab is shown in the following image:

Image: Xcellon-Multis—**General** tab



The controls for **General** tab configuration are described in the following table:

Table: General Configuration

Section	Control/Field	Usage
Link	Normal	Normal operation
	Internal Loopback (Tx -> Rx)	Internal Loopback—Transmit to Receive.
	Line Loopback (Rx -> Tx)	Enable/disable the Line Loopback—Receive to Transmit. NOTE The **Line Loopback** option is not available for Multis QSFP28 load modules.
Simulate Cable Disconnect		If this is selected, the port acts as if the cable has been disconnected. The port will neither transmit nor receive.
Intrinsic Latency Adjustment	Enable	The **Enable** check box is selected by default. This enables the intrinsic latency adjustment.

Section	Control/Field	Usage
		The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia Platform Reference Manual*.
Data Center Mode		See Frame Data for FCoE Support.

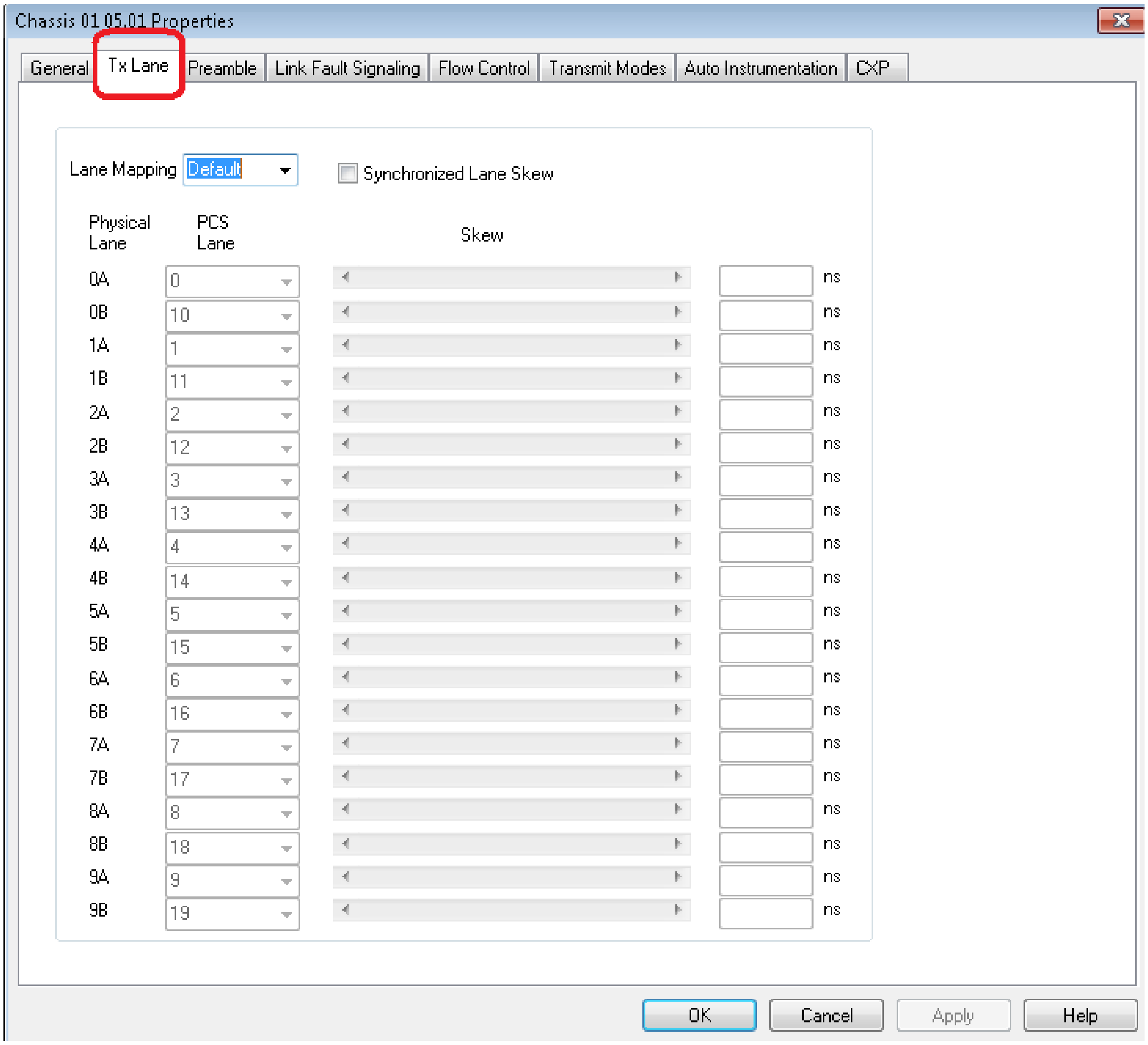
Xcellon-Multis Port Properties—TX-Lane

The **Tx Lane** tab allows to control the PCS lane order and skew rate for each lane.

For more information on Lane Skewing, see the Lane Skew topic in the ‘Multilane Distribution Configuration’ chapter of the *Ixia Platform Reference Manual*. The Lane Skew topic is located under ‘Types of Ports’ / ‘100GE’.

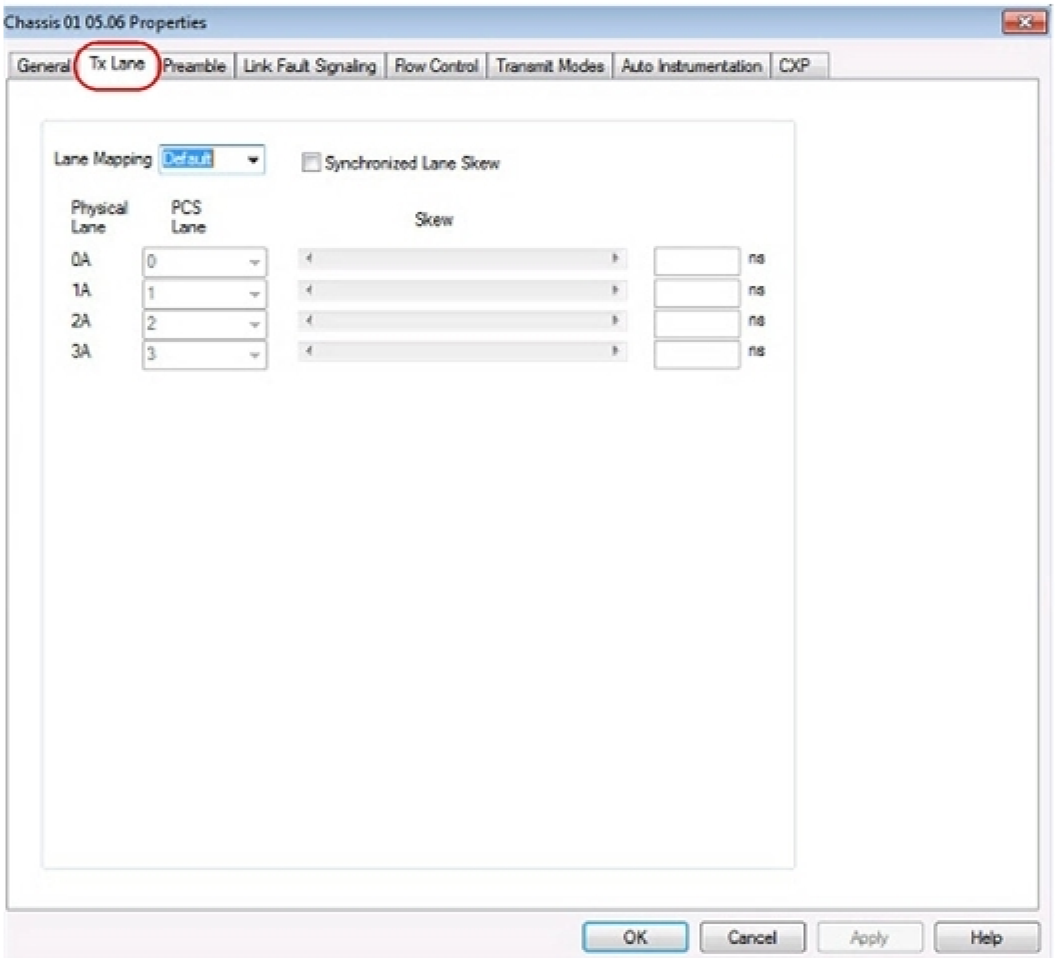
The Xcellon-Multis Port Properties ***Tx Lane*** tab for the 100GE mode is shown in the following image:

Image: Xcellon-Multis—**Tx Lane** tab



The Xcellon-Multis Port Properties ***Tx Lane*** tab for the 40GE mode is shown in the following image:

Image: Xcellon-Multis—**Tx Lane** tab



The controls for the ***Tx Lane*** tab configuration are described in the following table:

Table: **Tx Lane** Tab Configuration

Field	Description
Lane Mapping	Allows you to select a PCS lane ordering method. There are five options: • Default–the default ordering method. The default order is each physical port corresponds to 2 PCS lanes that are n and n+10, where n = physical lane number. • Increment–orders the lanes from 0 to 19, straight down the list. • Decrement–orders the lanes from 19 to 0, straight down the list. • Custom–allows to put the lanes in any order by manually entering the numbers in the fields. The starting order is the last selected mapping. • Random - Allows to put the lanes in any random order, values will be any value from 0 to 19.
Synchronized Lane Skew	All lanes are skewed by the same amount of skew.

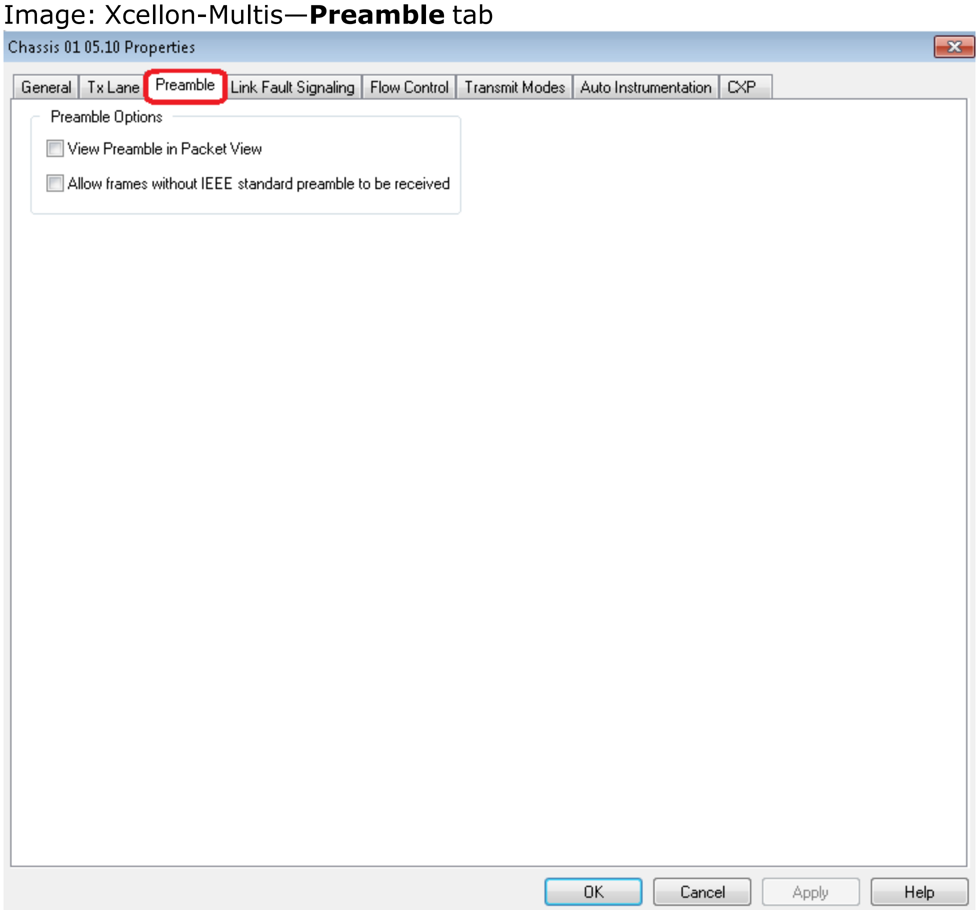
Field	Description
Physical Lane	The physical lane identifier. The physical lane is paired with a corresponding PCS lane.
PCS Lane	A number identifier for the PCS lane. The PCS lane is paired with a corresponding physical lane.
Skew	The skew slider is used to set a skew value for the PCS lane, in nanoseconds, on the transmit side. Lane Skew is the ability to independently delay one or more of the 20 PCS lanes. When the slider is moved, the nanoseconds field is correspondingly adjusted. You can also enter a nano second value directly into this field. When the slider is fully pushed to the right, the skew injected into the transmit stream is 0 (minimum). When the slider is pushed all the way to the left. the skew injected into the transmit stream is 3 uS (maximum).

Xcellon-Multis Port Properties—Preamble

the preamble precedes the frame, but is not part of the frame itself.

The Xcellon-Multis Port Properties **Preamble** tab is shown in the following image:

Image: Xcellon-Multis—**Preamble** tab



The fields and controls in this tab are described in the following table:

Table: Preamble Configuration

Section	Choices	Description
Preamble Options	View Preamble in Packet View	When this check box is selected, the preamble data will be visible in the Packet View (transmit side) and the Capture View (receive side).
	Allow frames without IEE standard preamble to be received	When this check box is selected, it allows frames without IEEE standard preamble to be received.

Xcellon-Multis Port Properties—Link Fault Signaling

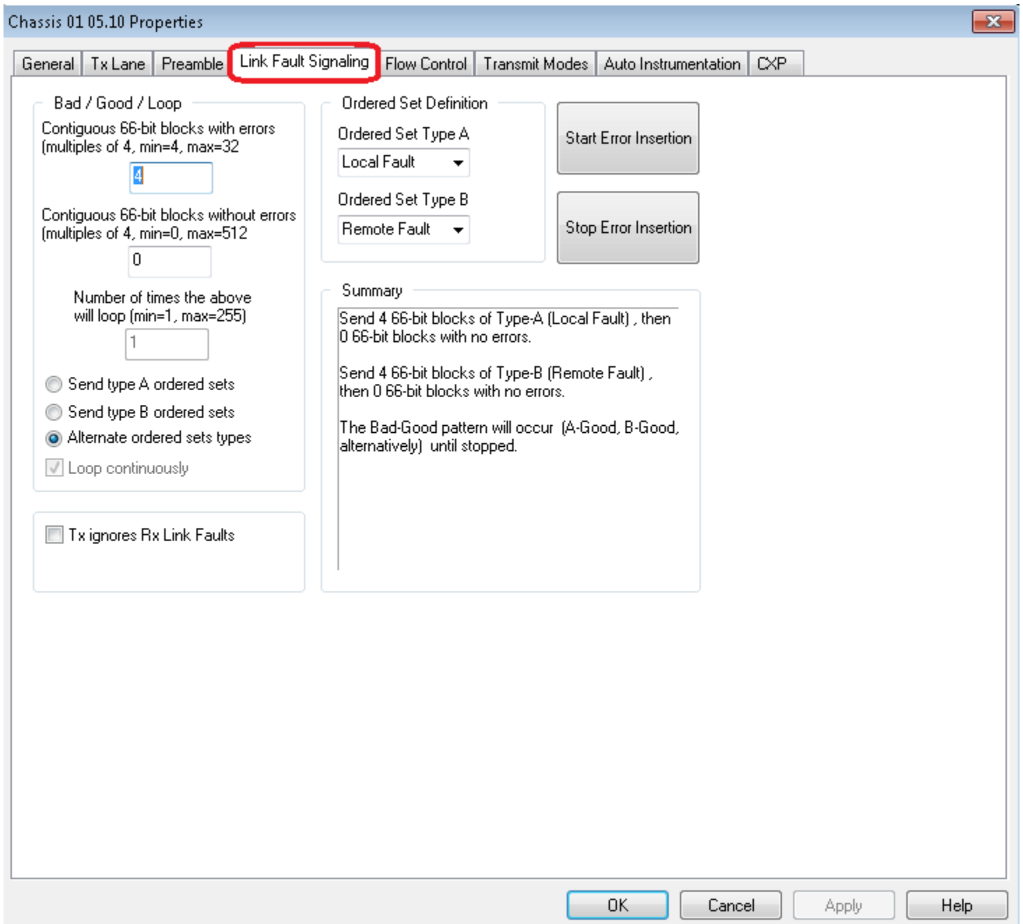
Link Fault Signaling is defined in Section 81.3.3.3 of the IEEE 802.3ba specification for 40 Gb/s and 100 Gb/s Ethernet. Link Fault Signaling is defined in Section 46 of the IEEE 802.3ae specification for 10 Gigabit Ethernet. When the feature is enabled, four statistics will be added to the list in Statistic View for the port. One is for monitoring the Link Fault State. Two provide a count of the Local Faults and Remote Faults. The last one is for indicating the state of error insertion, whether or not it is ongoing.

The 3x10GE and 8x10GE CXP and QSFP Multis ports support Link Fault Signaling. Link Fault Signaling for Xcellon-Multis originates with the PHY sending an indication of a local fault condition in the link being used as a path for MAC data. In the typical scenario, the Reconciliation Sublayer (RS) that had been receiving the data will receive this Local Fault status, and then send a Remote Fault status to the RS that was sending the data. Upon receipt of this Remote Fault status message, the sending RS will terminate transmission of MAC Data, sending only 'Idle' control characters until the link fault is resolved.

The **Link Fault Signaling** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the **Link Fault Signaling** tab.

The ***Link Fault Signaling*** tab for Xcellon-Multis load module is shown in the following image:

Image: Xcellon-Multis—**Link Fault Signaling** tab



The controls for **Link Fault Signaling** tab configuration are described in the following table:

Table: Link Fault Signaling Configuration

Section	Field/Control	Description
Bad/Good/Loop	(Bad) Contiguous 66-bit blocks with errors (multiples of 4; min = 4, max = 32)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks with errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive fault sequences allowed are minimum 4 sequences and maximum 32 sequences.
	(Good) Contiguous 66-bit blocks without errors (multiples of 4; min = 0, max = 512)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks without errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive regular data sequences allowed are minimum 0 sequences and maximum 512 sequences.
	Number of times the above will	Specifies the number of loops for the user defined sequence. There are two modes:

Section	Field/Control	Description
	loop (min = 1, max = 255)	• Discrete iterations: 1. Minimum of 1 iteration 2. Maximum of 255 iterations • Continuous loop 1. User cannot specify number of iterations
	Choose one of: • Send type A ordered sets • Send type B ordered sets • Alternate ordered set types	Defines the ordered set pattern that will be sent. (The two Ordered Sets—A and B—are defined in the **Ordered Set Definition** box in this tab.) This pattern will be combined with the Good blocks/Bad blocks pattern for transmission. • Only Type A fault sequence and regular good data sequences • Only Type B fault sequence and regular good data sequences • Alternate Type A, regular good data sequences and Type B fault sequence, regular good data sequences NOTE If this field is available, and the Alternate ordered set types option is selected, the minimum value for this field should be '2,' to allow the entire pattern to be sent once. If left at the minimum value of '1'— only two groups of blocks (one of good blocks and one of bad blocks) will be sent, which means that only the first ordered set will be sent. A minimum of eight blocks is required for one complete pattern including Types A and B.
	Loop continuously	If selected, the loop defined by the combination of the Bad and Good blocks plus the pattern of ordered sets, will be transmitted continuously until the *Stop Error Insertion* button is selected.
Ordered Set Definition	Ordered Set Type A	Choose one of: • Local Fault • Remote Fault
	Ordered Set Type B	Choose one of: • Local Fault • Remote Fault
Tx ignores Rx		If selected, ongoing transmission will continue even if Link

Section	Field/Control	Description
Link Faults		Fault messages are received by the sending RS.
Summary (Window)		(Read-only) Shows descriptions of the patterns that will be transmitted.
Start Error Insertion		Select this button to start the transmission of the configured error patterns.
Stop Error Insertion		(Available only for use with the *Loop continuously* option.) Select this button to stop the transmission of the configured error patterns.

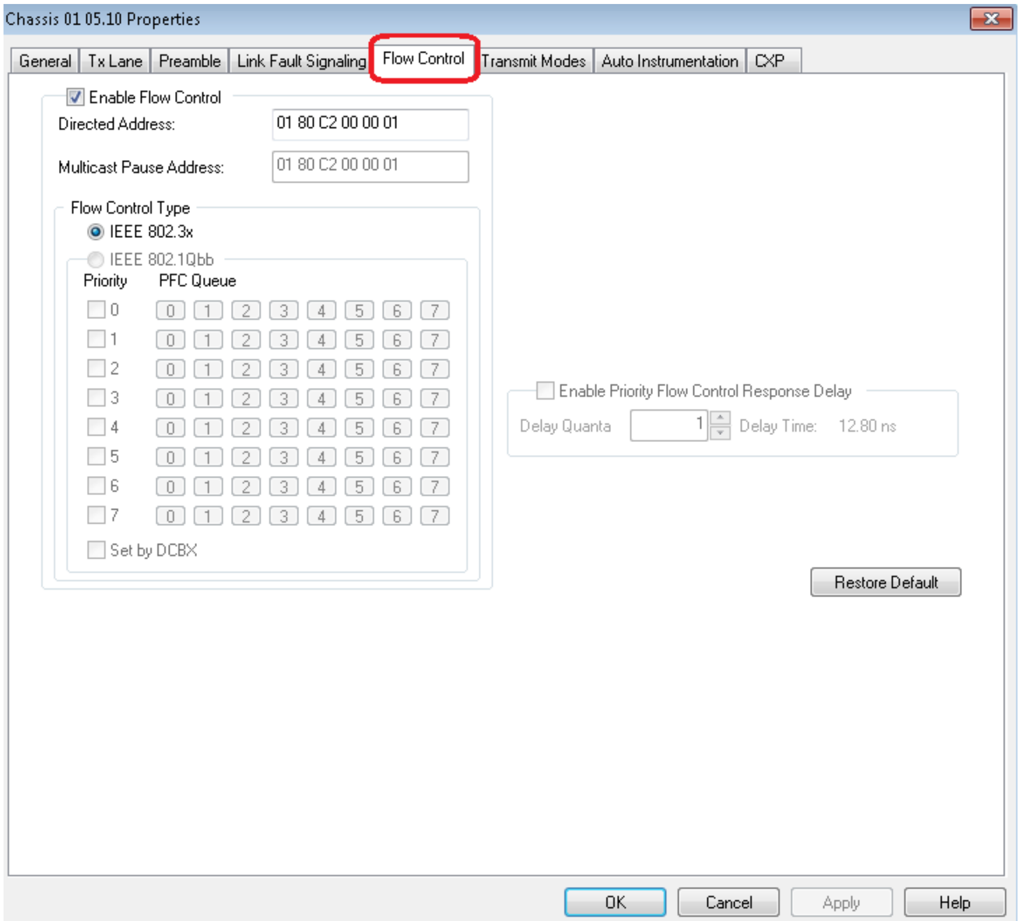
Xcellon-Multis Port Properties—Flow Control

The Xcellon-Multis **Flow Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

NOTE You can view this help page for the Port Properties - **Flow Control** tab by selecting the Help button and not F1.

The Port Properties **Flow Control** tab is shown in the following image:

Image: Xcellon-Multis **Flow Control** tab



The controls for **Flow Control** tab configuration are described in the following table:

Section	**Field/Control**	**Description**
Enable Flow Control	(check box)	Enables the port's MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type	IEEE 802.3x or IEEE 802.1Qbb	Priority-based Flow Control. When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame. When not in Data Center mode, only IEEE 802.3x is available.
	Priority	Priority-based Flow Control.
	PFC Queue	Priority-based Flow Control

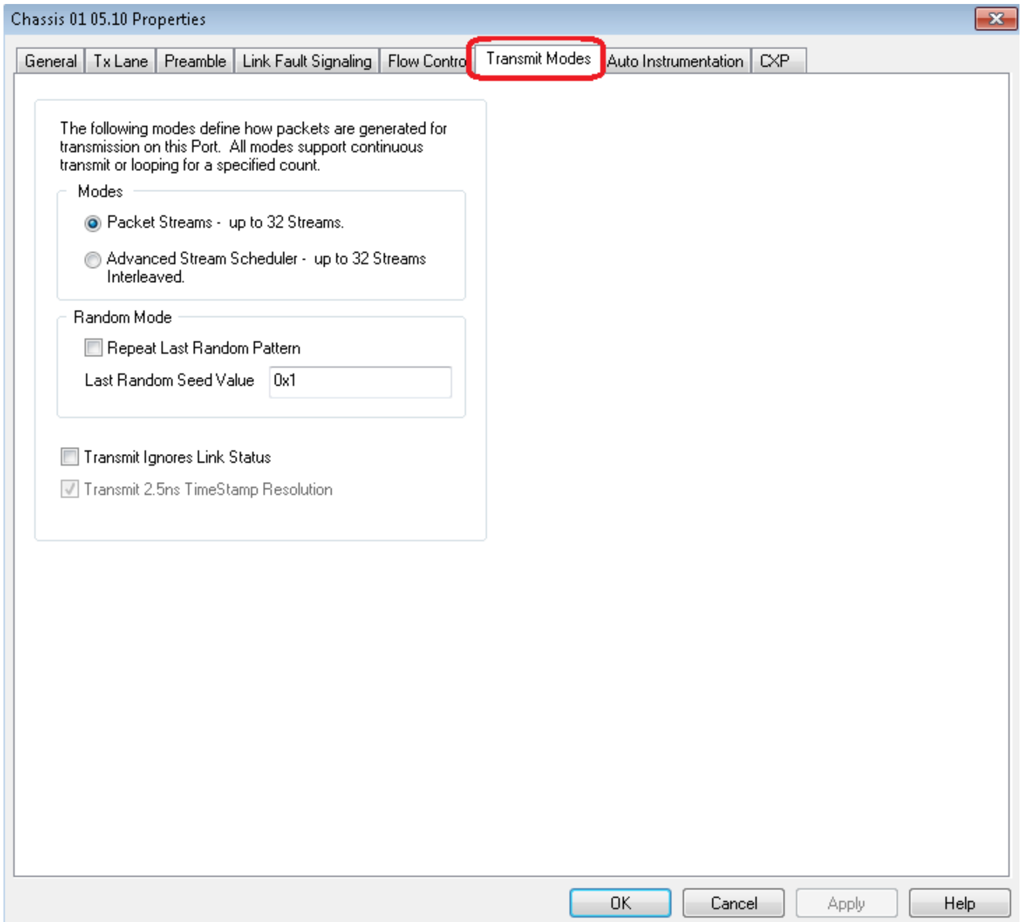
Section	Field/Control	Description
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

Xcellon-Multis Port Properties—Transmit Modes

The **Transmit Modes** tab for Xcellon-Multis load modules is shown in the following image. It is accessed by double-clicking a port in Resources window, or by selecting a port and selecting the **Properties** menu option. Then select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following image:

Image: Xcellon-Multis—**Transmit Modes** tab



The controls for **Transmit Modes** tab configuration are described in the following table:

Table: Transmit Modes Configuration

Section	Field/Control	Description
Modes	Packet Streams	Sets the operating mode for the port to sequential packet streams. This allows to configure up to 128 streams in 100G and 32 streams in both 40G and 10G modes. A stream may be programmed for continuous packet generation—generating a continuous, infinite number of packets.
	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure up to 128 streams in 100G and 32 streams in both 40G and 10G modes. They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in

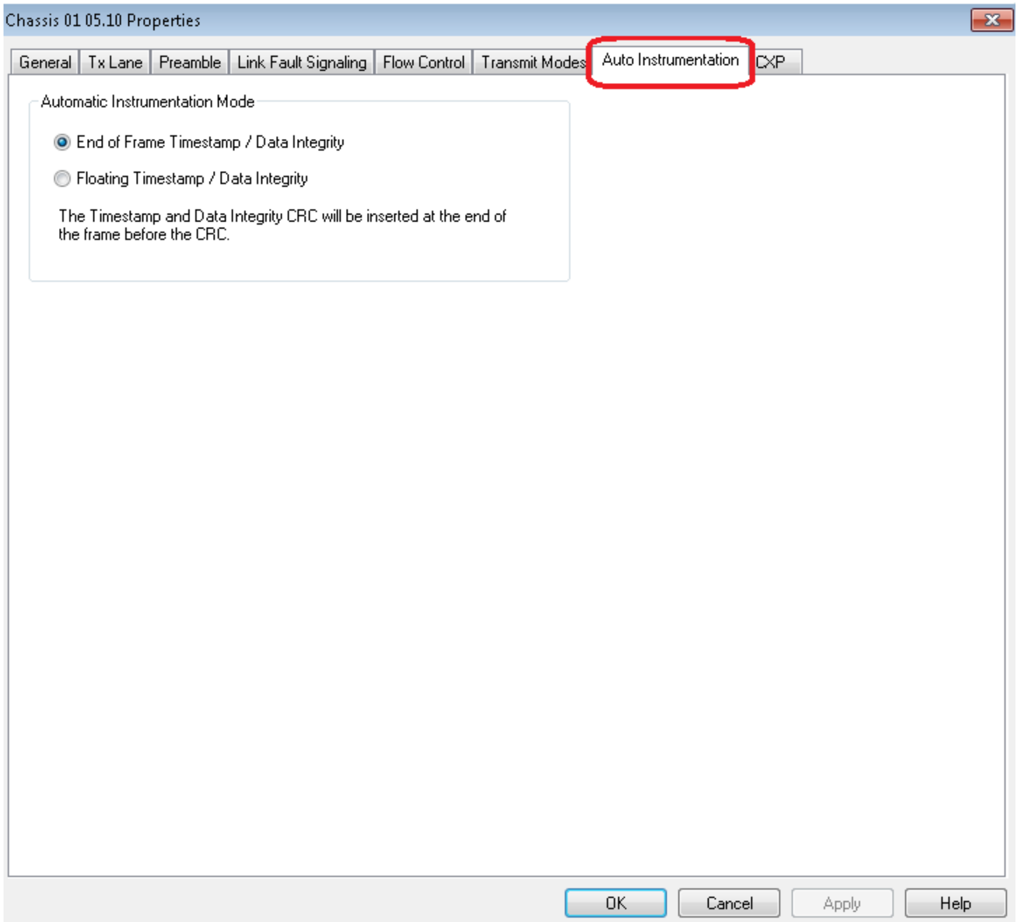
Section	Field/Control	Description
		the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream's random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit Ignores Link Status		If selected, will allow transmission of packets even if the link is down.
Transmit 2.5ns Time stamp Resolution		If selected, it will check for the high resolution time stamp.The check box is selected by default.

Xcellon-Multis Port Properties—Auto Instrumentation

The Xcellon-Multis **Auto Instrumentation** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto Instrumentation** tab.

The Xcellon-Multis Port Properties **Auto Instrumentation** tab is shown in the following image:

Image: Xcellon-Multis—**Auto Instrumentation** tab



The options and controls in this tab are described in the following table:

Table: Auto Instrumentation Configuration

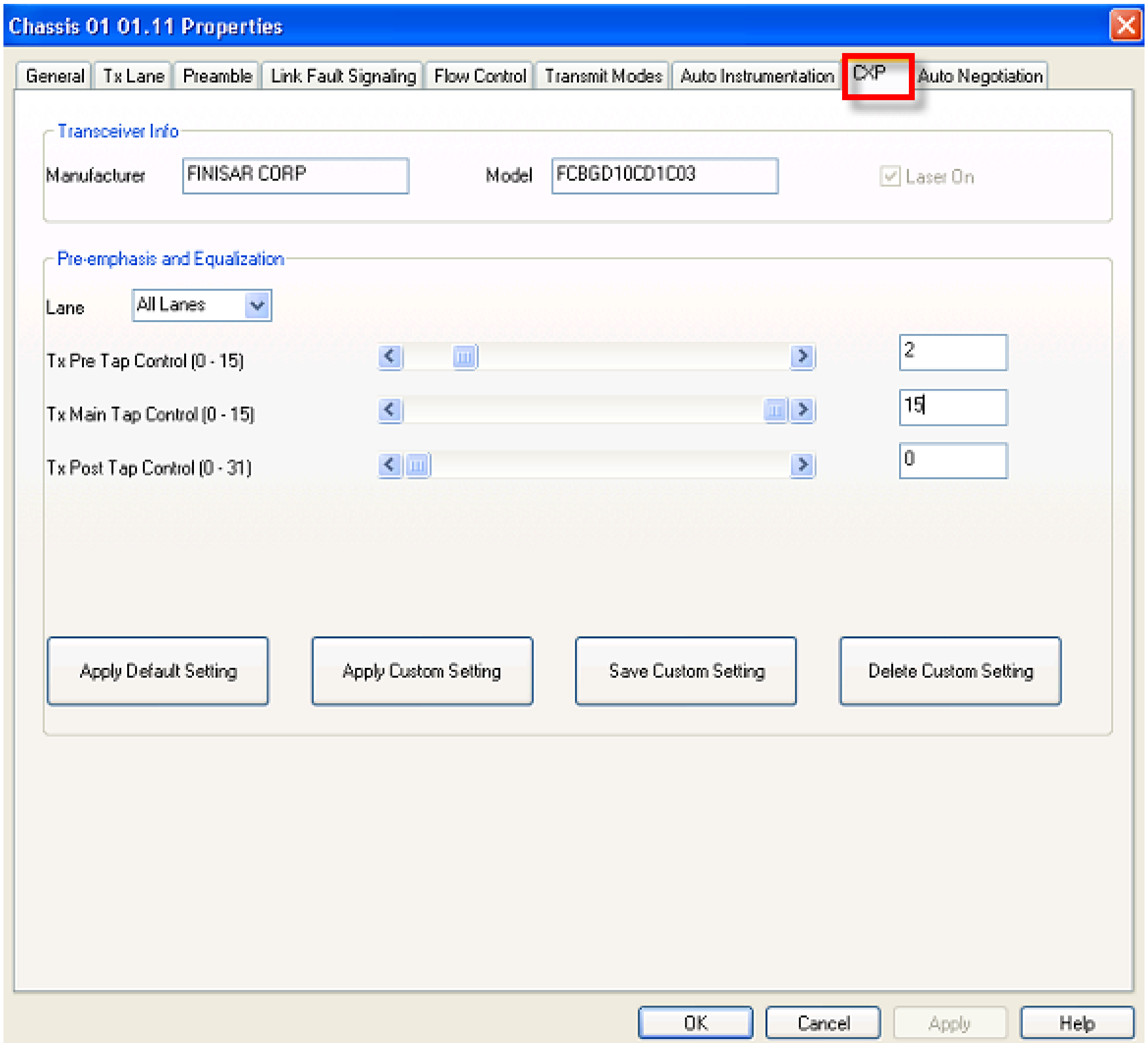
Field/Control	Description
End of Frame Timestamp / Data Integrity	Enables inserting Timestamp and Data Integrity CRC at the end of the frame before the CRC.
Floating Timestamp / Data Integrity	Enables adding timestamp as part of floating instrumentation header, and addresses similar issue in Data Integrity checking.

Xcellon-Multis Port Properties—CXP

The Xcellon-Multis **CXP** tab is accessed from the context menu of the port in the **Explore Network Resources** pane, by selecting the **Port Properties** menu option, then selecting the **CXP** tab. **CXP** tab only exists if a CXP adapter is plugged in, otherwise it is not visible.

NOTE The **QSFP** tab for Xcellon-Multis provides the QSFP Port properties of the Multis modules. See Xcellon-Multis Port Properties—QSFP for additional information.

The Xcellon-Multis Port Properties **CXP** tab is shown in the following image.



The options and controls in this tab are described in the following table.

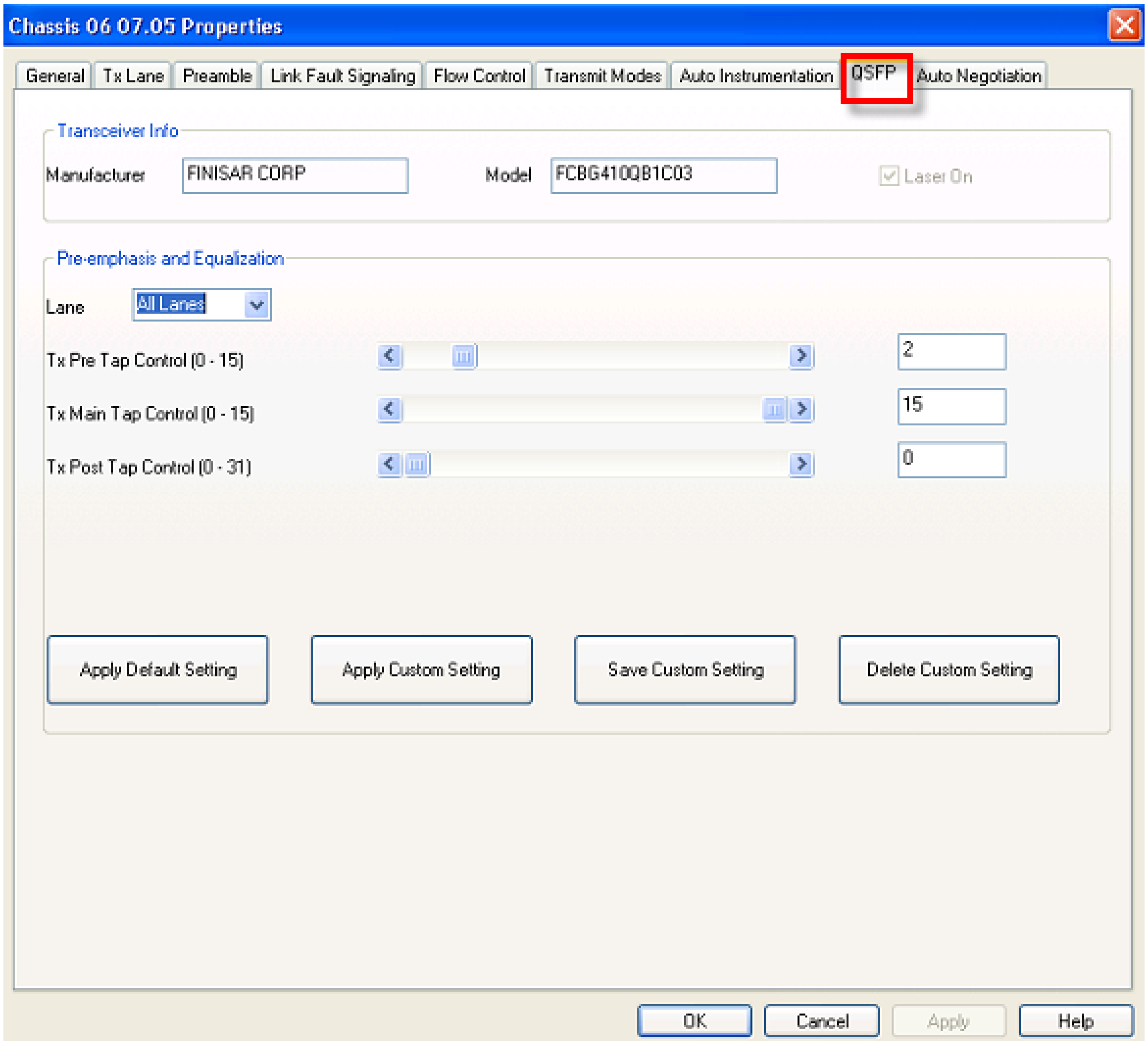
Section	Field/Control	Description
Transceiver Info	Manufacturer	This is the **Vendor Name** field read from the actual transceiver currently being plugged in.
	Model	This is the **Part Number** field read from the actual transceiver currently being plugged in.
	Laser On	Select this check box to enable the laser power.The laser is the actual data emitting device within the transceiver. The Laser On is available only for connectors that permit cutting the laser off. These connectors are not supported on Active Optical Cable Assembly (AOCs).
Pre-emphasis and Eqalization	Lane	Specifies in which lane (from 0-3) the current settings on.

Section	Field/Control	Description
	Tx Pre Tap Control (0-31)	This helps to control the Pre Tap value for Tx.
	Tx Main Tap Control (0-31)	This helps to control the Main Tap Control for Tx.
	Tx Post Tap Control (0-63)	This helps to control the Post Tap value for Tx.
	Apply Default Settings	If selected, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Settings	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The “TapConfigurations.xml” file will be created at the Ixia\IxOS folder once users select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	If selected, if a custom setting exists in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel with that. If no custom setting exists, users will be prompted that nothing will be deleted.

Xcellon-Multis Port Properties—QSFP

The Xcellon-Multis **QSFP** tab is accessed from the context menu of the Xcellon-Multis port in the **Explore Network Resources** pane, by selecting the **Port Properties** menu option, then selecting the **QSFP** tab.

The Xcellon-Multis Port Properties **QSFP** tab is shown in the following image.



The options and controls in this tab are described in the following table.

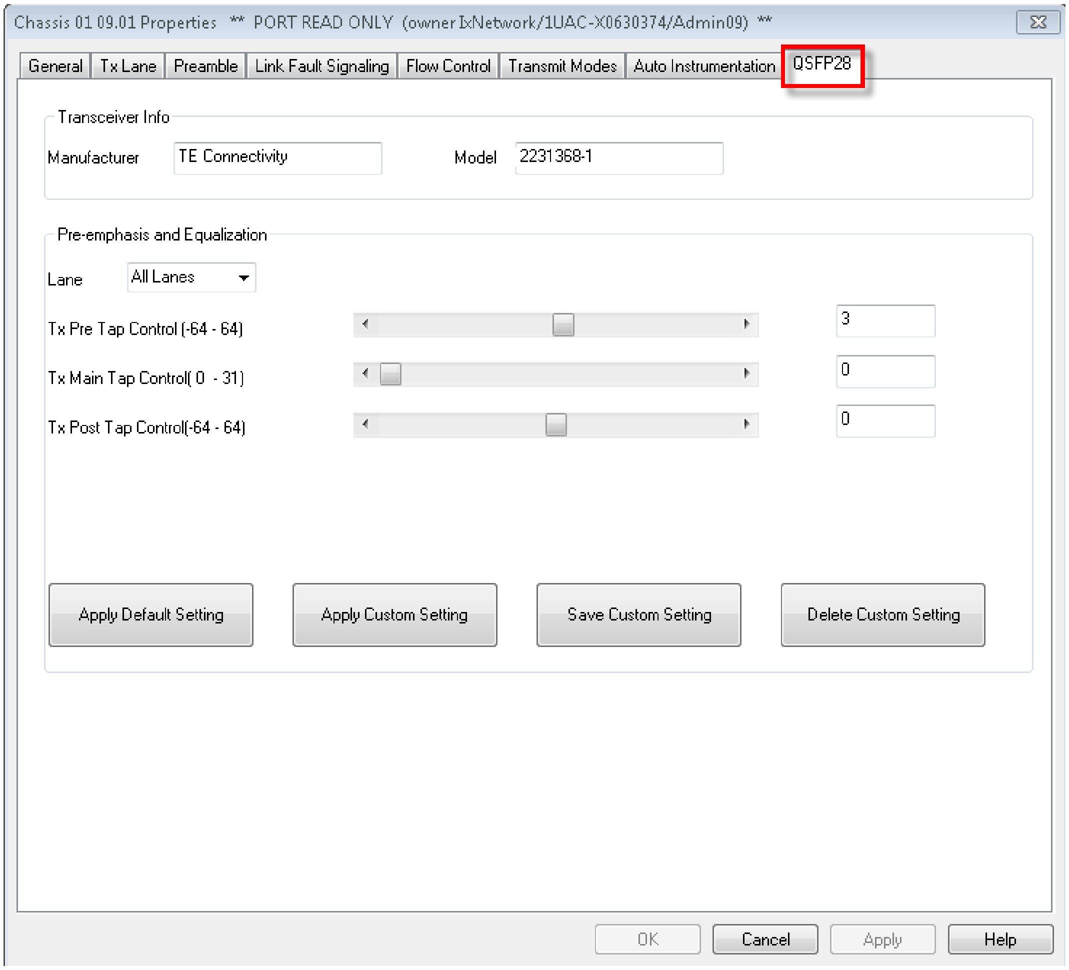
Section	Field/Control	Description
Transceiver Info	Manufacturer	This is the **Vendor Name** field read from the actual transceiver currently being plugged in.
	Model	This is the **Part Number** field read from the actual transceiver currently being plugged in.
	Laser On	Select this check box to enable the laser power.The laser is the actual data emitting device within the transceiver. The Laser On is available only for connectors that permit cutting the laser off. These connectors are not supported on Active Optical Cable Assembly (AOCs).
Pre-emphasis and Equalization		

Section	Field/Control	Description
	Lane	Specifies in which lane (from 0-3) the current settings are.
	Tx Main Tap Control (0-31)	This helps to control the Main Tap Control for Tx.
	Tx Post Tap Control (0-31)	This helps to control the Post Tap value for Tx.
	Tx Pre Tap Control (0-16)	This helps to control the Pre Tap value for Tx.
	Apply Default Setting	If selected, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Setting	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Delete Custom Setting	If selected, if a custom setting exists in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel that. If no custom setting exists, users will be prompted that nothing will be deleted.

Xcellon-Multis Port Properties—QSFP28

The Xcellon-Multis **QSFP28** tab is accessed from the context menu of the Xcellon-Multis port in the **Explore Network Resources** pane, by selecting the **Port Properties** menu option, then selecting the **QSFP28** tab.

The Xcellon-Multis Port Properties **QSFP28** tab is shown in the following image.



The options and controls in this tab are described in the following table.

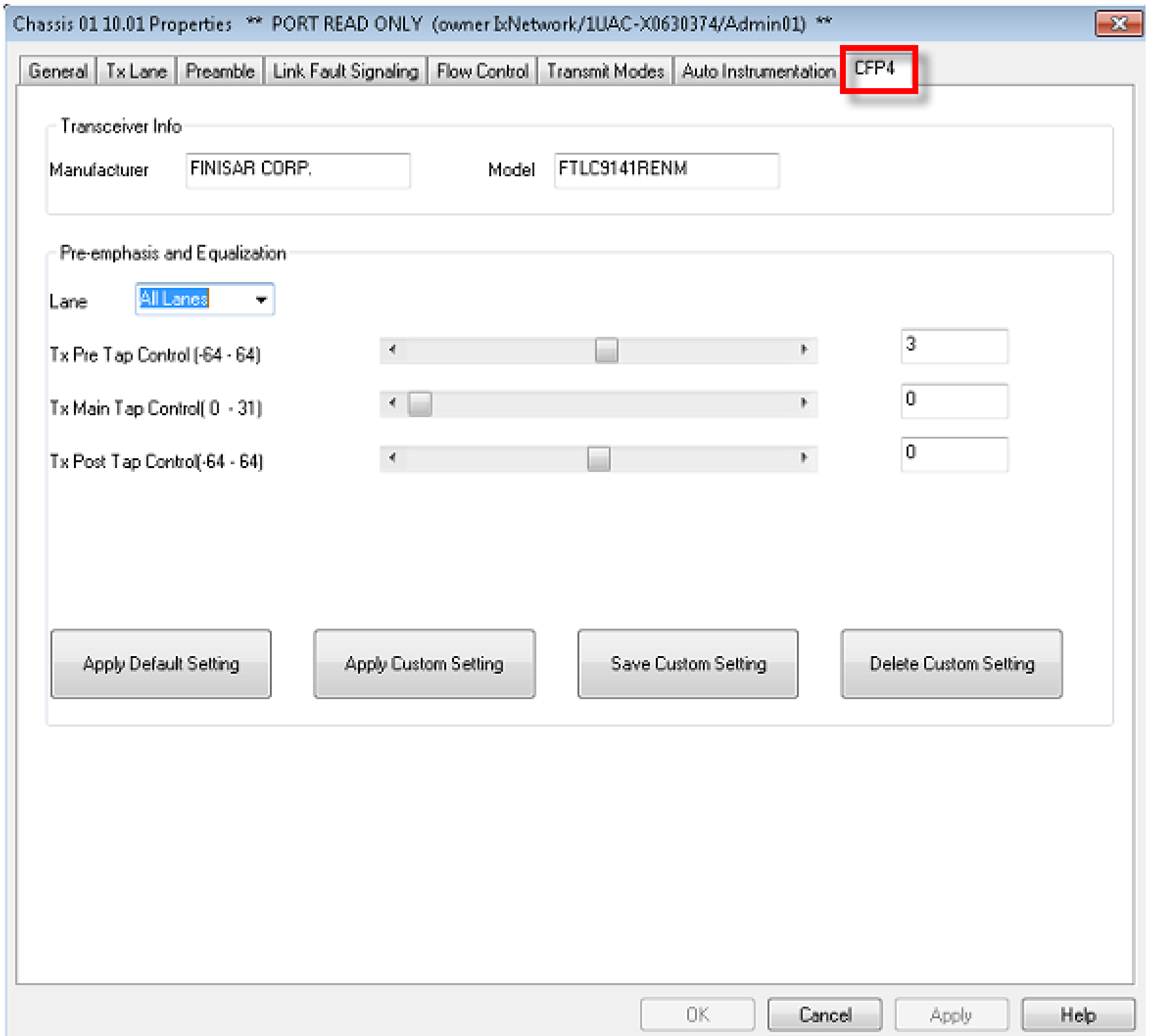
Section	Field/Control	Description
Transceiver Info	Manufacturer	This is the **Vendor Name** field read from the actual transceiver currently being plugged in.
	Model	This is the **Part Number** field read from the actual transceiver currently being plugged in.
Pre-emphasis and Eqalization	Lane	Specifies in which lane (from 0-3) the current settings on.
	Tx Pre Tap Control (0-31)	This helps to control the Pre Tap value for Tx.
	Tx Main Tap Control (0-31)	This helps to control the Main Tap Control for Tx.
	Tx Post Tap Control (0-63)	This helps to control the Post Tap value for Tx.

Section	Field/Control	Description
	Apply Default Settings	If selected, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Settings	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	If selected, if a custom setting exists in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel that. If no custom setting exists, users will be prompted that nothing will be deleted.

Xcellon-Multis Port Properties—CFP4

The Xcellon-Multis **CFP4** tab is accessed from the context menu of the Xcellon-Multis port in the **Explore Network Resources** pane, by selecting the **Port Properties** menu option, then selecting the **CFP4** tab.

The Xcellon-Multis Port Properties **CFP4** tab is shown in the following image.



The options and controls in this tab are described in the following table.

Section	Field/Control	Description
Transceiver Info	Manufacturer	This is the **Vendor Name** field read from the actual transceiver currently being plugged in.
	Model	This is the **Part Number** field read from the actual transceiver currently being plugged in.
Pre-emphasis and Equalization	Lane	Specifies in which lane (from 0-3) the current settings on.
	Tx Pre Tap Control (0-31)	This helps to control the Pre Tap value for Tx.
	Tx Main Tap Control (0-31)	This helps to control the Main Tap Control for Tx.

Section	Field/Control	Description
	Tx Post Tap Control (0-63)	This helps to control the Post Tap value for Tx.
	Apply Default Settings	If selected, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Settings	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	If selected, if a custom setting exists in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel that. If no custom setting exists, users will be prompted that nothing will be deleted.

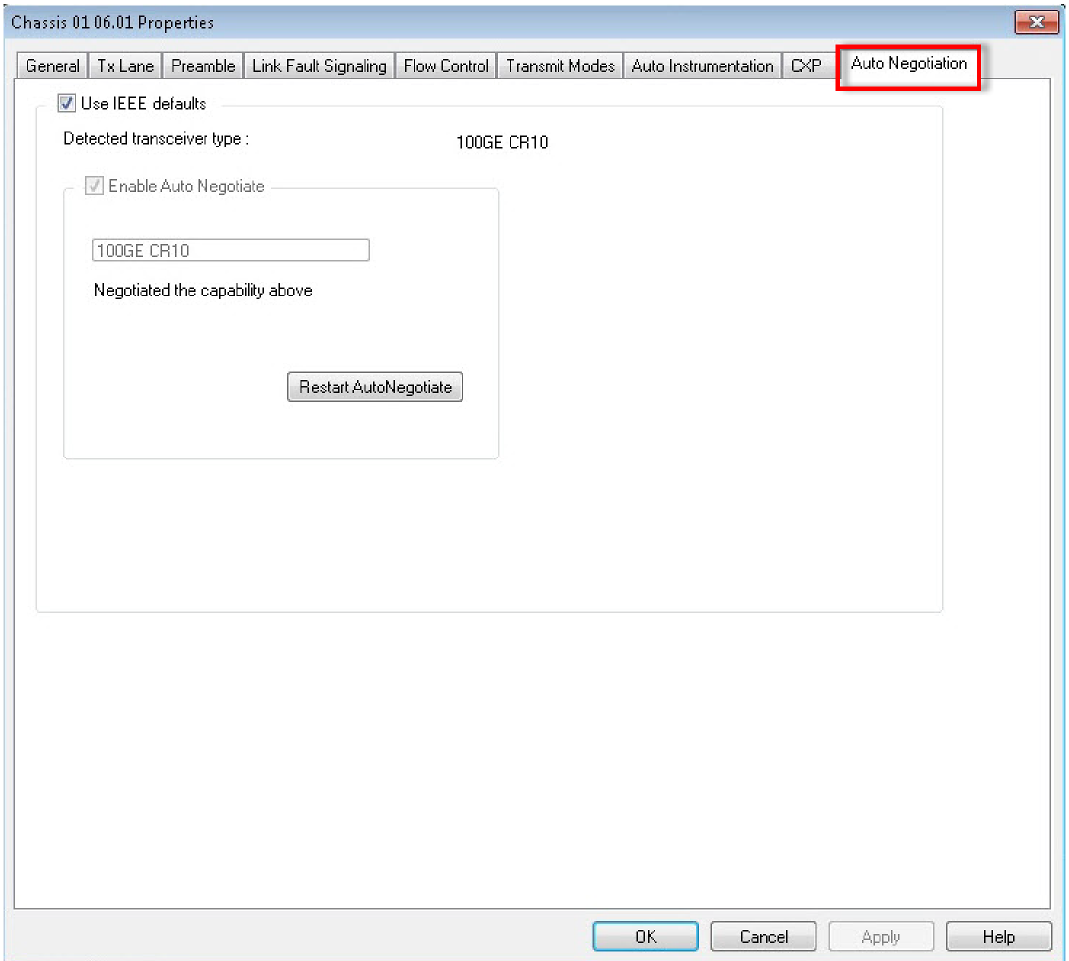
Xcellon-Multis CXP Port Properties—Auto Negotiation

For DCS100GE2Q28ALL module, see DCS100GE2Q28ALL Port Properties—Auto Negotiation.

The Xcellon-Multis **Auto Negotiation** tab is accessed by selecting a Xcellon-Multis port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto Negotiation** tab.

The Port Properties **Auto Negotiation** tab for Xcellon-Multis CXP is shown in the following image:

Image: Xcellon-Multis—**CXP Auto Negotiation** tab



The fields and controls in this tab are described in the following table:

Table: Xcellon-**Multis CXP Auto Negotiation** tab

Field/Control	Description
Use IEEE defaults	When you select the Use IEEE Defaults check box, the L1 parameters like Autonegotiation, Link Training, and FEC, are enabled or disabled per IEEE requirements, and you will not be able to enable or disable these manually. If the check box is cleared, you will be able to manually enable or disable L1 features – even if it violates IEEE specifications. By default the check box is selected.
Detected transceiver type	When a transceiver is inserted into the load module, the software reads IEEE registers to determine the transceiver capabilities and media type. If the transceiver contains this information, it is shown in this read-only field.If the transceiver is capable of multiple speeds, the highest supported speed is shown.

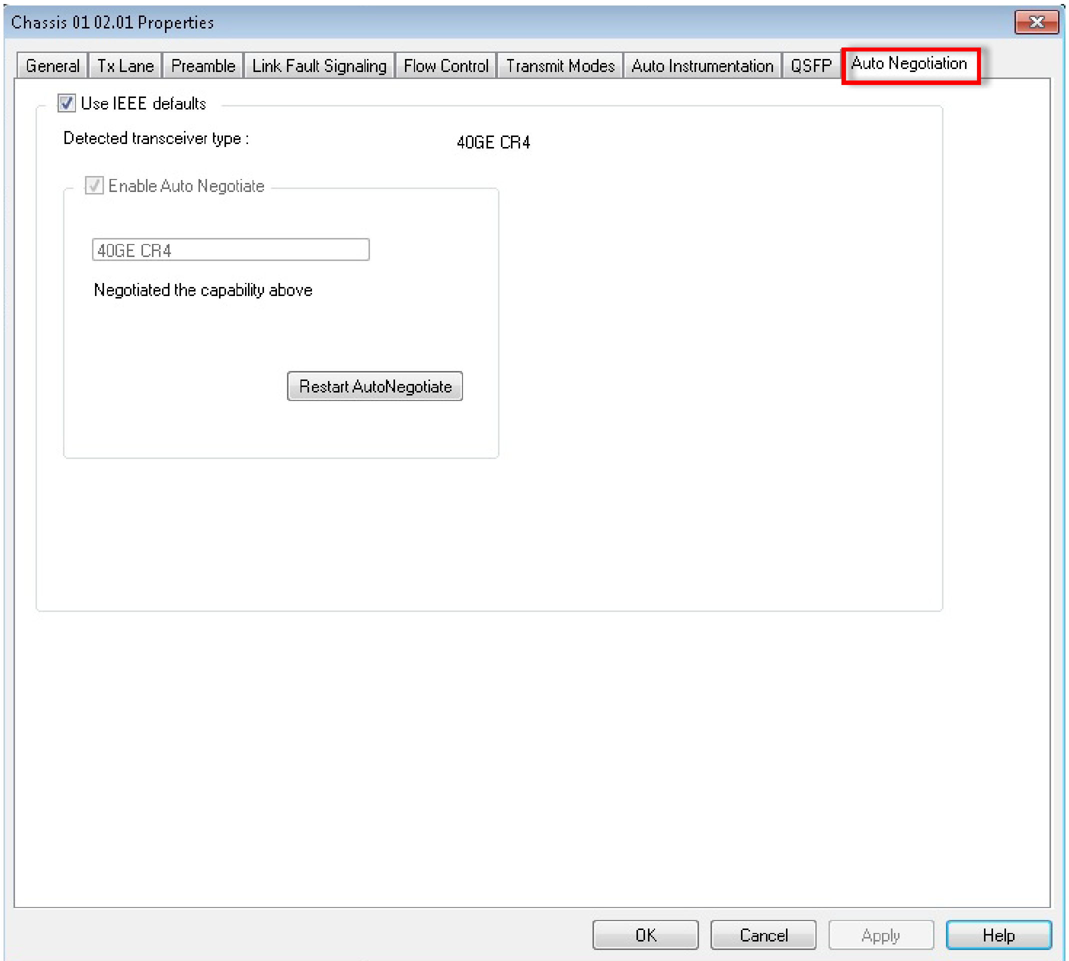
Field/Control	Description
	NOTE The speed at which the Resource Group is currently operating, does not affect this. For example, if the Resource Group is configured to operate in 40GE mode, but the transceiver is capable of 100G and 40G, then the Detected transceiver type still indicates 100GBASE.
Enable Auto Negotiate	Auto negotiation controls how a port communicates with other ports.If you select the check box, it allows auto-negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing • **Restart Auto-Negotiate** button is selected (this does a forced restart) For Xcellon-Multis QSFP 40GE load modules, autonegotiate will advertise 40 Gbps full duplex operation. **Note**: The **Enable Auto Negotiate** check box is available for selection only if the **Use IEEE Defaults** check box is cleared.Auto Negotiation is supported on 40GE and 100GE.
Negotiated the capability above	The text box indicates the speed that was negotiated due to Auto-Negotiation. NOTE This speed may be different than the speed indicated for the transceiver detected. For example: If you insert a 100GBASE-CR10 CXP cable that fans out to three 40G QSFP cables, the transceiver detected is indicated as 100GBASE-CR10. If you configure the Resource Group for 3x40G mode, Ixia advertises 40G speed during Auto-Negotiation. The negotiated capability will be 40GBASE-CR4.
Restart AutoNegotiate	Restarts the Auto Negotiate sequence.

Xcellon-Multis QSFP Port Properties—Auto Negotiation

The Xcellon-Multis **Auto Negotiation**tab is accessed by selecting an Xcellon-Multis port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto Negotiation** tab.

The Port Properties **Auto Negotiation** tab for Xcellon-Multis QSFP is shown in the following image:

Image: Xcellon-Multis—**QSFP Auto Negotiation** tab



The fields and controls in this tab are described in the following table:

Table: Xcellon-Multis QSFP **Auto Negotiation** tab

Field/Control	Description
Use IEEE defaults	When you select the Use IEEE Defaults check box, the L1 parameters like Autonegotiation, Link Training, and FEC, are enabled or disabled per IEEE requirements, and you will not be able to enable or disable these manually. If the check box is cleared, you will be able to manually enable or disable L1 features – even if it violates IEEE specifications. By default the check box is selected.
Detected transceiver type	When a transceiver is inserted into the load module, the software reads IEEE registers to determine the transceiver capabilities and media type. If the transceiver contains this information, it is shown in this read-only field.If the transceiver is capable of multiple speeds, the highest supported speed is shown.

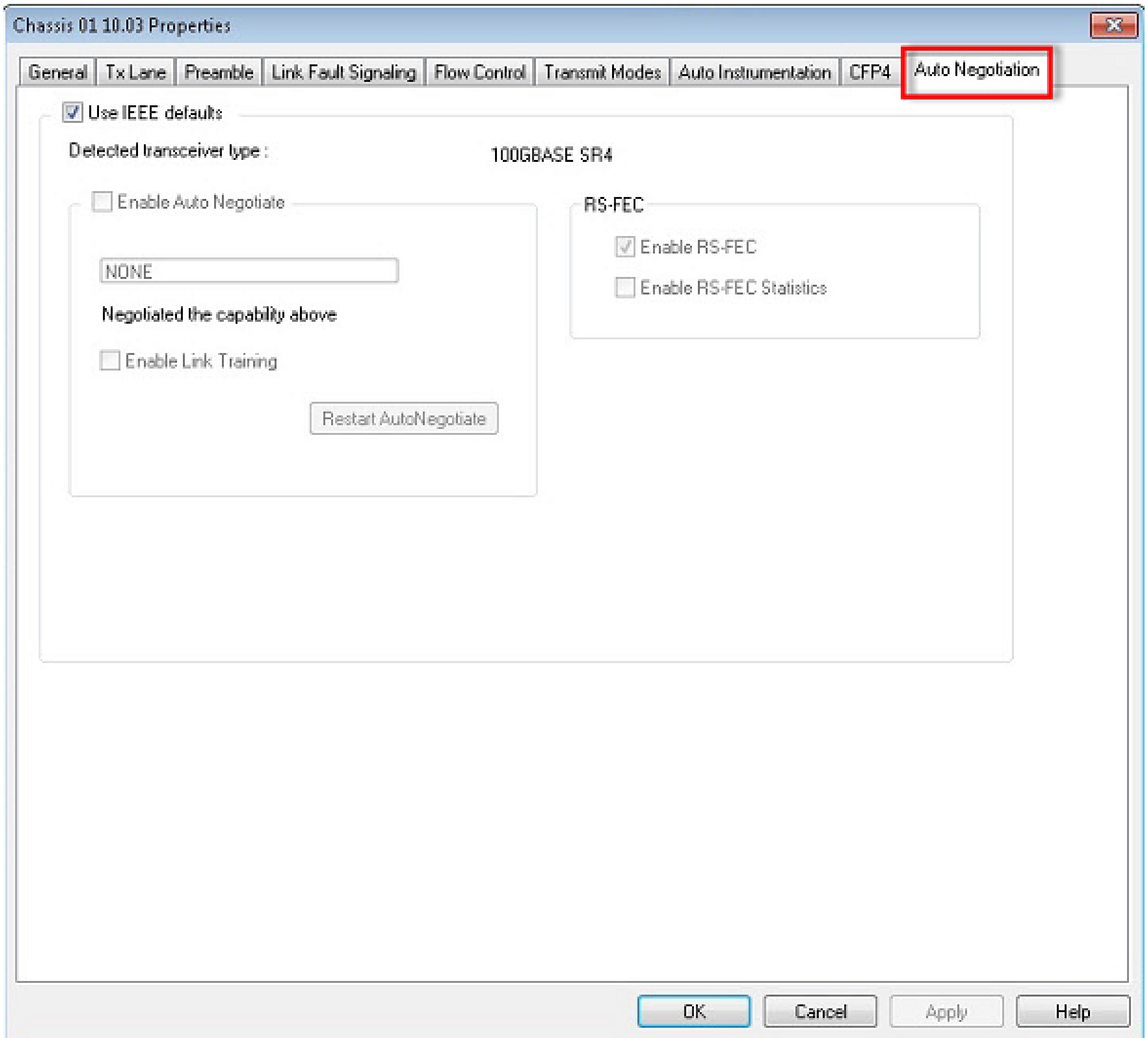
Field/Control	Description
	NOTE The speed at which the Resource Group is currently operating, does not affect this. For example, if the Resource Group is configured to operate in 40GE mode, but the transceiver is capable of 100G and 40G, then the Detected transceiver type still indicates 100GBASE.
Enable Auto Negotiate	Auto negotiation controls how a port communicates with other ports.If you select the check box, it allows auto-negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing • **Restart Auto-Negotiate** button is selected (this does a forced restart) For Xcellon-Multis QSFP 40GE load modules, autonegotiate will advertise 40 Gbps full duplex operation. NOTE The **Enable Auto Negotiate** check box is available for selection only if the **Use IEEE Defaults** check box is cleared.Auto Negotiation is supported on 40GE and 100GE.
Negotiated the capability above	The text box indicates the speed that was negotiated due to Auto-Negotiation. NOTE This speed may be different than the speed indicated for the transceiver detected. For example: If you insert a 100GBASE-CR10 CXP cable that fans out to three 40G QSFP cables, the transceiver detected is indicated as 100GBASE-CR10. If you configure the Resource Group for 3x40G mode, Ixia advertises 40G speed during Auto-Negotiation. The negotiated capability will be 40GBASE-CR4.
Restart AutoNegotiate	Restarts the Auto Negotiate sequence.

Xcellon-Multis CFP4 Port Properties—Auto Negotiation

The Xcellon-Multis **CFP4**tab is accessed by selecting an Xcellon-Multis port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **CFP4** tab.

The Xcellon-Multis Port Properties **CFP4** tab is shown in the following image:

Image: Xcellon-Multis—**CFP4 Auto Negotiation** tab



The fields and controls in this tab are described in the following table:

Table: Xcellon-**Multis CFP4 Auto Negotiation** Tab

Field/Control	Description
Use IEEE defaults	When you select the Use IEEE Defaults check box, the L1 parameters like Autonegotiation, Link Training, and FEC, are enabled or disabled per IEEE requirements, and you will not be able to enable or disable these manually. If the check box is cleared, you will be able to manually enable or disable L1 features – even if it violates IEEE specifications. By default the check box is selected.
Detected transceiver type	When a transceiver is inserted into the load module, the software reads IEEE registers to determine the transceiver capabilities and media type. If the transceiver contains this information, it is shown in this read-only field.If the transceiver is capable of multiple speeds, the highest supported speed is shown.

Field/Control	Description
	NOTE The speed at which the Resource Group is currently operating, does not affect this. For example, if the Resource Group is configured to operate in 40GE mode, but the transceiver is capable of 100G and 40G, then the Detected transceiver type still indicates 100GBASE.
Enable Auto Negotiate	Auto negotiation controls how a port communicates with other ports.If you select the check box, it allows auto-negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing • **Restart Auto-Negotiate** button is selected (this does a forced restart) For Xcellon-Multis QSFP 40GE load modules, autonegotiate will advertise 40 Gbps full duplex operation. NOTE The **Enable Auto Negotiate** check box is available for selection only if the **Use IEEE Defaults** check box is cleared.Auto Negotiation is supported on 40GE and 100GE.
Negotiated the capability above	The text box indicates the speed that was negotiated due to Auto-Negotiation. NOTE This speed may be different than the speed indicated for the transceiver detected. For example: If you insert a 100GBASE-CR10 CXP cable that fans out to three 40G QSFP cables, the transceiver detected is indicated as 100GBASE-CR10. If you configure the Resource Group for 3x40G mode, Ixia advertises 40G speed during Auto-Negotiation. The negotiated capability will be 40GBASE-CR4.
Enable Link Training	Select the check box to allow longer length copper cables to be used. This means that during the next Auto-Negotiation, KR training will be used. NOTE This check box is available for selection only if the **Use IEEE Defaults** check box is cleared. KR Training is not available on Multis QSFP+ and CXP load modules.
Restart AutoNegotiate	Restarts the Auto Negotiate sequence.
Enable RS-FEC	FEC or Forward Error Correction is available for XM100GE4CFP4+ENH load module.If you select this check box, RS-FEC is used. FEC encrypts data sent on the line using some overhead for error correction code. This allows bit errors in flight to be corrected on the receiving side. The benefit of FEC is that it allows very long copper cables to be used and allows cheaper parts to be used in optical transceivers as errors will be corrected.RS-

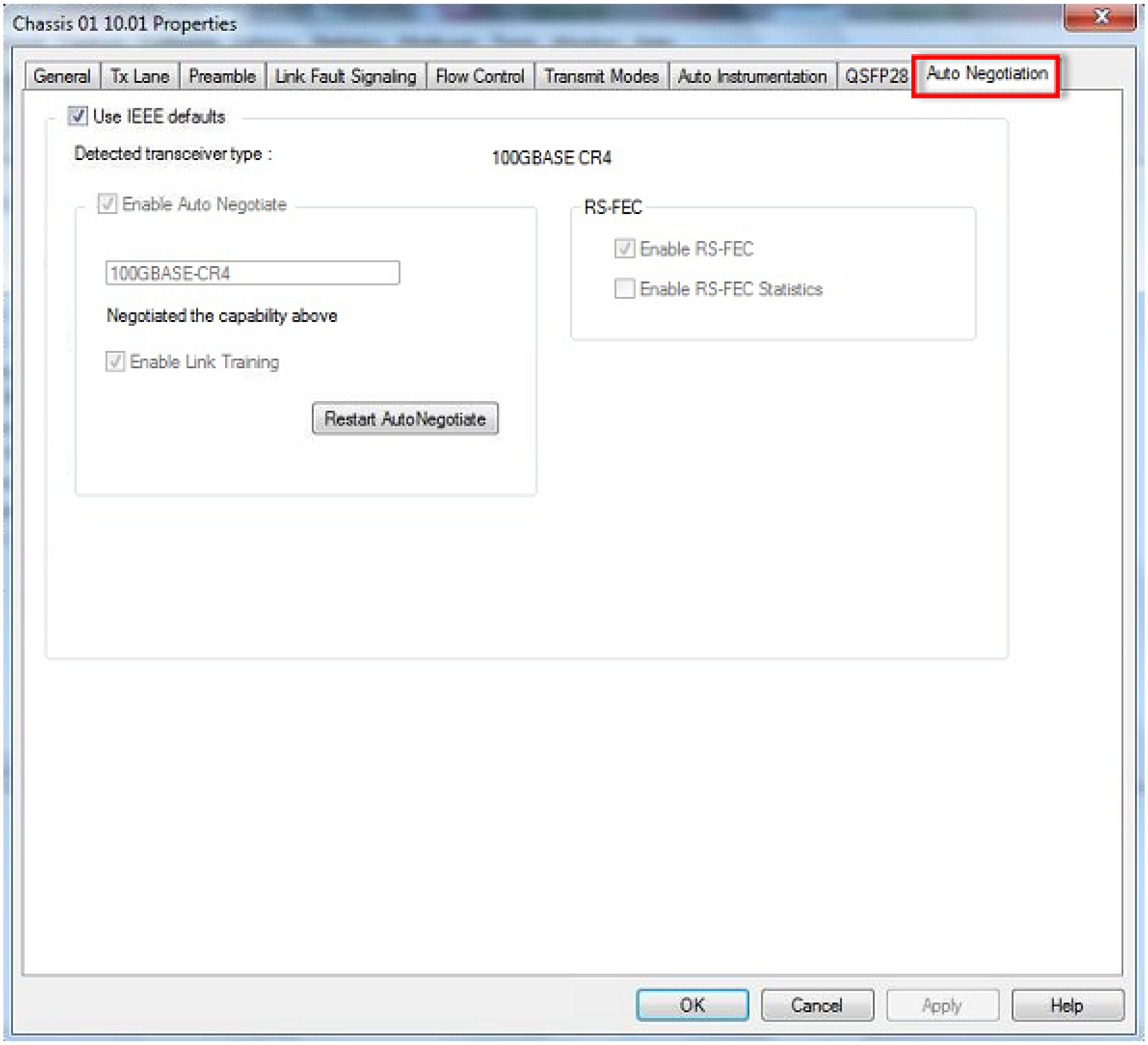
Field/Control	Description
	FEC is compatible with Auto-Negotiation and KR Training. NOTE • This check box is available for selection only if the **Use IEEE Defaults** check box is cleared. • FEC should be enabled on both back-to-back ports for the link to be up. • CXP and QSFP+ load modules do not support FEC.
Enable RS-FEC Statistics	If you select this check box, RS-FEC Statistics is available.An RS-FEC codeword is a block of contiguous packets on the line. All RS-FEC codewords are of the same size. Thus, a block can represent many packets, few packets, portions of packets, or no packets at all. The two RS-FEC statistics are: • RS-FEC Corrected Codeword Count - Indicates that at least one error was encountered in a block that was able to be corrected. • RS-FEC Uncorrected Codeword Count - Indicates that too many errors existed within a block to be corrected. These statistics can increment when a link pair is idle. Any uncorrected FEC block can indicate any of the following problems: • Ixia is unable to insert RS-FEC errors. • Ixia is unable to drill-down into any FEC block to show what it represented. NOTE By default, the check box is not available for selection. It is available only if the **Use IEEE Defaults** check box is cleared.

Xcellon-Multis QSFP28 Port Properties—Auto Negotiation

This tab is available for XM100GE4QSFP28+ENH load module. The Xcellon-Multis **Auto Negotiation** tab is accessed by selecting a Xcellon-Multis port in the Explore Network Resources pane, selecting the Port Properties menu option, then selecting the **Auto Negotiation** tab.

The Port Properties **Auto Negotiation** tab for Xcellon-Multis QSFP28 is shown in the following image:

Image: Xcellon-Multis—QSFP28 **Auto Negotiation** tab



The fields and controls in this tab are described in the following table:

Table: Xcellon-Multis QSFP28 **Auto Negotiation** Tab

Field/Control	Description
Use IEEE defaults	When you select the Use IEEE Defaults check box, the L1 parameters like Autonegotiation, Link Training, and FEC, are enabled or disabled per IEEE requirements, and you will not be able to enable or disable these manually. If the check box is cleared, you will be able to manually enable or disable L1 features – even if it violates IEEE specifications. By default the check box is selected.
Detected transceiver type	When a transceiver is inserted into the load module, the software reads IEEE registers to determine the transceiver capabilities and media type. If the transceiver contains this information, it is shown in this read-only field.If the transceiver is capable of multiple speeds, the highest supported speed is shown.

Field/Control	Description
	NOTE The speed at which the Resource Group is currently operating, does not affect this. For example, if the Resource Group is configured to operate in 40GE mode, but the transceiver is capable of 100G and 40G, then the Detected transceiver type still indicates 100GBASE.
Enable Auto Negotiate	Auto negotiation controls how a port communicates with other ports.If you select the check box, it allows auto-negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing • **Restart Auto-Negotiate** button is selected (this does a forced restart) For Xcellon-Multis QSFP 40GE load modules, autonegotiate will advertise 40 Gbps full duplex operation. NOTE The **Enable Auto Negotiate** check box is available for selection only if the **Use IEEE Defaults** check box is cleared.Auto Negotiation is supported on 40GE and 100GE.
Negotiated the capability above	The text box indicates the speed that was negotiated due to Auto-Negotiation. NOTE This speed may be different than the speed indicated for the transceiver detected. For example: If you insert a 100GBASE-CR10 CXP cable that fans out to three 40G QSFP cables, the transceiver detected is indicated as 100GBASE-CR10. If you configure the Resource Group for 3x40G mode, Ixia advertises 40G speed during Auto-Negotiation. The negotiated capability will be 40GBASE-CR4.
Enable Link Training	Select the check box to allow longer length copper cables to be used. This means that during the next Auto-Negotiation, KR training will be used. NOTE This check box is available for selection only if the **Use IEEE Defaults** check box is cleared. KR Training is not available on Multis QSFP+ and CXP load modules.
Restart AutoNegotiate	Restarts the Auto Negotiate sequence.
Enable RS-FEC	FEC or Forward Error Correction is available for XM100GE4QSFP28+ENH load module.If you select this check box, RS-FEC is used. FEC encrypts data sent on the line using some overhead for error correction code. This allows bit errors in flight to be corrected on the receiving side. The benefit of FEC is that it allows very long copper cables to be used and allows cheaper parts to be used in optical transceivers as errors will be corrected.RS-

Field/Control	Description
	FEC is compatible with Auto-Negotiation and KR Training. NOTE • This check box is available for selection only if the **Use IEEE Defaults** check box is cleared. • FEC should be enabled on both back-to-back ports for the link to be up. • CXP and QSFP+ load modules do not support FEC.
Enable RS-FEC Statistics	If you select this check box, RS-FEC Statistics is available.An RS-FEC codeword is a block of contiguous packets on the line. All RS-FEC codewords are of the same size. Thus, a block can represent many packets, few packets, portions of packets, or no packets at all. The two RS-FEC statistics are: • RS-FEC Corrected Codeword Count - Indicates that at least one error was encountered in a block that was able to be corrected. • RS-FEC Uncorrected Codeword Count - Indicates that too many errors existed within a block to be corrected. These statistics can increment when a link pair is idle. Any uncorrected FEC block can indicate any of the following problems: • Ixia is unable to insert RS-FEC errors. • Ixia is unable to drill-down into any FEC block to show what it represented. NOTE By default, the check box is not available for selection. It is available only if the **Use IEEE Defaults** check box is cleared.

PCS Lane Statistics for Xcellon-Multis modules

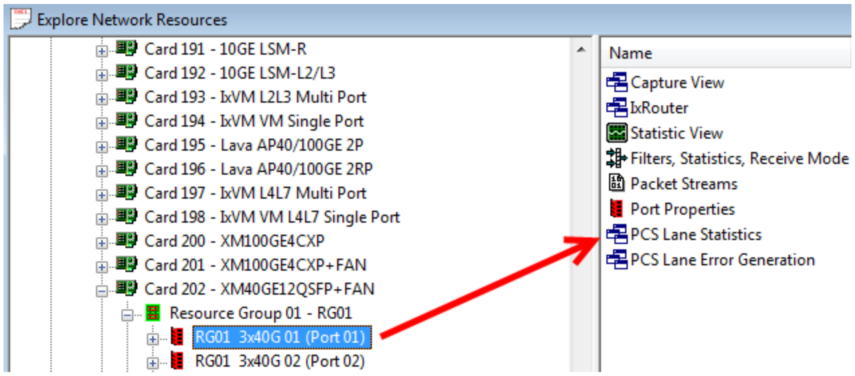
The PCS Lane Statistics table allows you to view the statistics for the configured PCS lanes. It is part of the Port Properties for the module.

NOTE PCS Lane Statistics is not available for the 3x10GE and 8x10GE CXP and QSFP Multis modes.

To open the PCS Lane Statistics table:

1. Select the Xcellon-Multis module in the left pane of the IxExplorer window
2. Expand the node, and select the Port object. In the right window pane, double-click the PCS Lane Statistics object as shown in the following image:

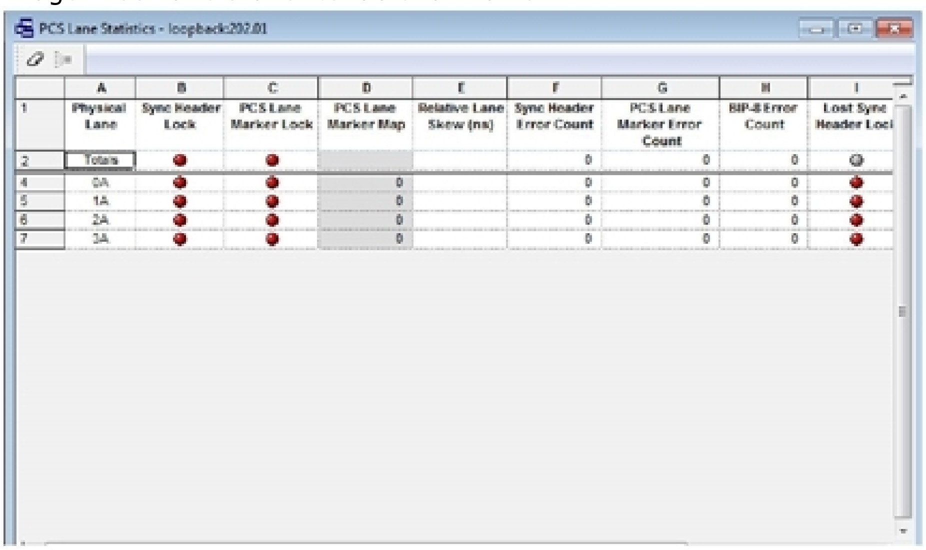
Image: PCS Lane Statistics



The PCS Lane Statistics table opens. Use this table to view the PCS lane statistics for each lane. The statistics are for the receive side.

The PCS Lane Statistics table is shown in the following image:

Image: PCS Lane Statistics table for Multis



The following table explains the entries in the PCS Lane Statistics table:

Table: PCS Lane Statistics Data

Field/Control	Description
Physical Lane	The identifier for the Receive physical lane. This is a tag /fixed label to ID each lane.
Sync Header Lock	Indicates if the received PCS lane achieved sync-bit lock. Green indicates success, red indicates failure.
PCS Lane Marker Lock	Indicates if the received PCS lane has achieved alignment Green indicates success, red indicates failure.
PCS Lane Marker	The VL number identified by the alignment marker. This is only valid when VL Lock is green.

Field/Control	Description
Map	
Relative Lane Skew (ns)	Shows the actual skew in nanoseconds. Skew measurements are valid only when all lanes are locked with 20 unique lane markers. The first VL markers to arrive have skew of 0. All other lane skews are relative to them.
Sync Header Error Count	The number of synchronization bit errors received.
PCS Lane Marker Error Count	The number of incorrect PCS lane markers received while in PCS lane lock state.
BIP-8 Error Count	The number of BIP-8 errors for a PCS lane. BIP-8 = Bit-Interleaved Parity with eight bit errors (BIP-8). Each bit in the BIP field is an even parity calculation over all previous selected bits of a PCS lane.
Lost Sync Header Lock	When lit, indicates the loss of sync header lock since the last statistic was read. If colored gray, there is no error. If colored red, an error has occurred.
Lost PCS Lane Marker Lock	When lit, indicates the loss of PCS lane marker lock since the last statistic was read. If colored gray, there is no error.If colored red, an error has occurred.

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CHAPTER 25

Port Properties–Novus, Novus-R and Novus-M QSFP28 Load Modules

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the Novus, Novus-R and Novus-M QSFP28 load modules.

NOTE The GUI for Novus, Novus-R and Novus-M QSFP28 load modules are the same. In this chapter, the port properties are explained as per the Novus load module, but the documentation is also applicable for the Novus-R and Novus-M load modules.

Port Properties for Novus Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option.

The complete specification for the Novus is found in the *Ixia Platform Reference Manual*.

The following port property tabs are available for Novus modules:

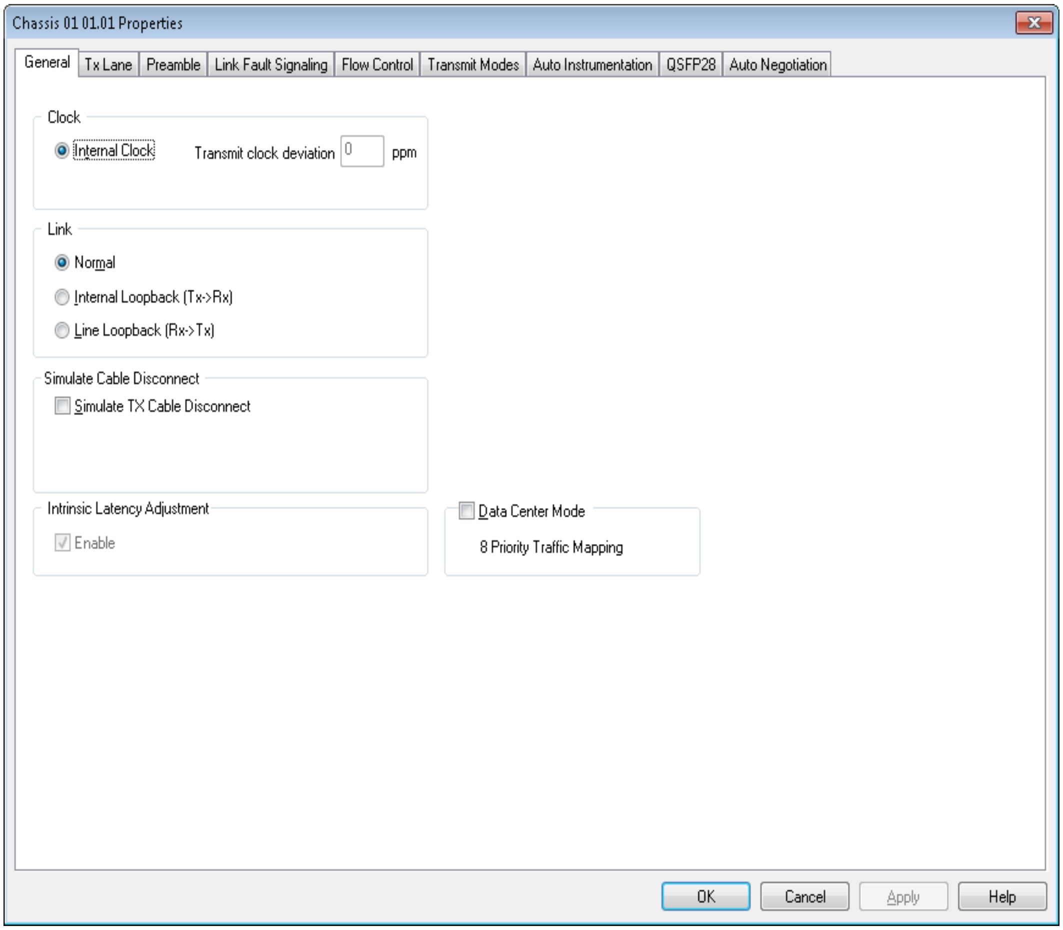
- Novus Port Properties—General
- Novus Port Properties—TX-Lane
- Novus Port Properties—Preamble
- Novus Port Properties—Link Fault Signaling
- Novus Port Properties—Flow Control
- Novus Port Properties—Transmit Modes
- Novus Port Properties—Auto Instrumentation
- Novus Port Properties—QSFP28
- Novus Port Properties—Auto Negotiation

Novus Port Properties—General

The Novus **General** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, and then selecting the **General** tab.

The Port Properties **General** tab is shown in the following image:

Image: Novus—**General** tab



The controls for **General** tab configuration are described in the following table:

Table: General Configuration

Section	Control/Field	Usage
Clock	Internal Clock	If selected, the timing for the SerDes reference clock comes from an internal oscillator.
	Transmit clock deviation	Allows to adjust the line transmit frequency for the port. The initial rate is controlled by the chassis chain reference clock. Then you can adjust the line transmit frequency for the port.
Link	Normal	Normal operation
	Internal Loopback (Tx -> Rx)	Internal Loopback—Transmit to Receive.
	Line Loopback (Rx -> Tx)	Enable/disable the Line Loopback—Receive to Transmit. NOTE The **Line Loopback** option is not available for Multis QSFP28 load modules.

Section	Control/Field	Usage
Simulate Cable Disconnect		If this is selected, the port acts as if the cable has been disconnected. The port will neither transmit nor receive.
Intrinsic Latency Adjustment	Enable	The **Enable** check box is selected by default. This enables the intrinsic latency adjustment. The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia Platform Reference Manual*.
Data Center Mode		See Frame Data for FCoE Support.

Novus Port Properties—TX-Lane

For Xcellon-Multis module, see Xcellon-Multis Port Properties—TX-Lane.

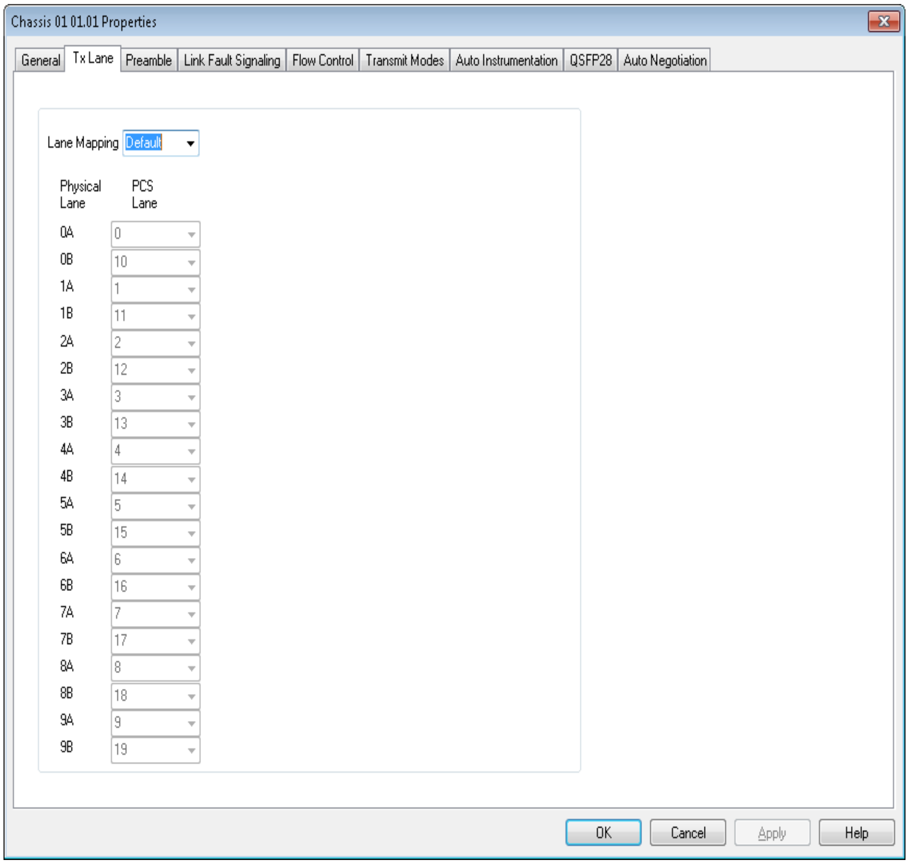
For 40/100GE module, see 40/100GE Port Properties—TX-Lane.

The **Tx Lane** tab allows to control the PCS lane order and skew rate for each lane.

For more information on Lane Skewing, see the Lane Skew topic in the 'Multilane Distribution Configuration' chapter of the *Ixia Platform Reference Manual*. The Lane Skew topic is located under 'Types of Ports' / '100GE'.

The Novus Port Properties ***Tx Lane*** tab for the 100GE mode is shown in the following figure:

Figure: Novus 100GE—**Tx Lane** tab



The Novus Port Properties ***Tx Lane*** tab for the 40GE mode is shown in the following figure:

Figure: Novus 40GE—**Tx Lane** tab

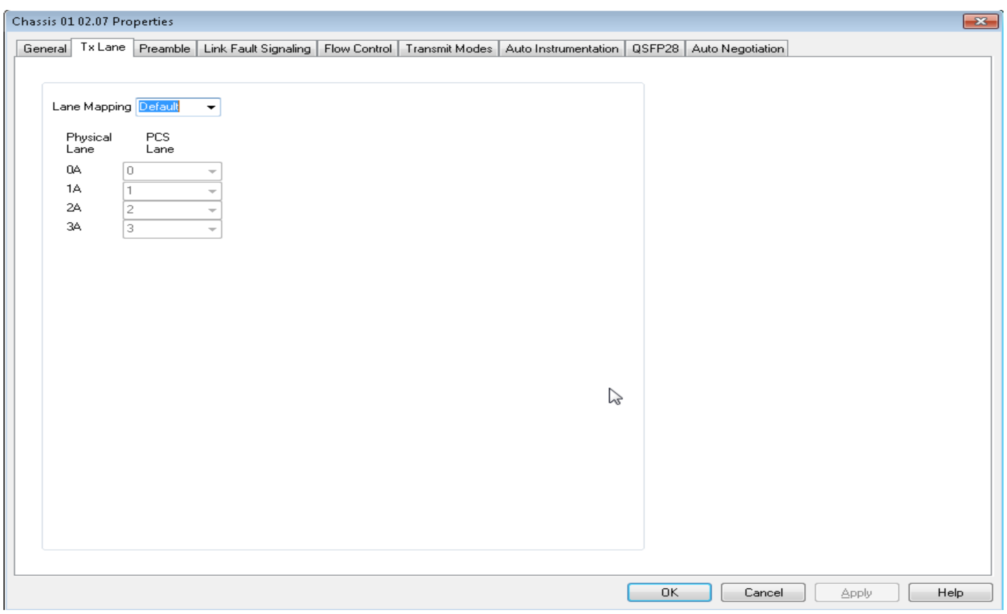


Table: **Tx Lane** Tab Configuration

Field	Description
Lane Mapping	Allows you to select a PCS lane ordering method. There are five options: • Default–the default ordering method. The default order is each physical port corresponds to 2 PCS lanes that are n and n+10, where n = physical lane number. • Increment–orders the lanes from 0 to 19, straight down the list. • Decrement–orders the lanes from 19 to 0, straight down the list. • Custom–allows to put the lanes in any order by manually entering the numbers in the fields. The starting order is the last selected mapping. • Random - Allows to put the lanes in any random order, values will be any value from 0 to 19.
Physical Lane	The physical lane identifier. The physical lane is paired with a corresponding PCS lane.
PCS Lane	A number identifier for the PCS lane. The PCS lane is paired with a corresponding physical lane.

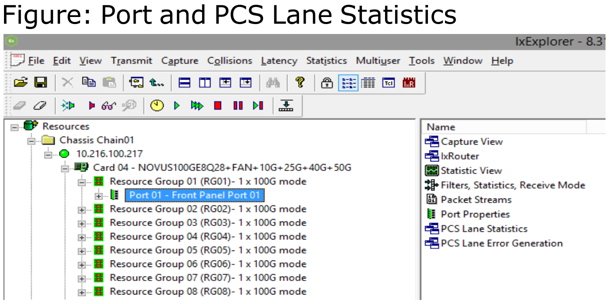
PCS Lane Statistics

The PCS Lane Statistics table allows you to view the statistics for the configured PCS lanes. It is part of the Port Properties for the module.

To open the PCS Lane Statistics table:

1. Select the Novus 100GE load module in the left pane of the IxExplorer window.
2. Expand the node, and select the Port object. In the right window pane, double-click the PCS Lane Statistics object as shown in the following figure:

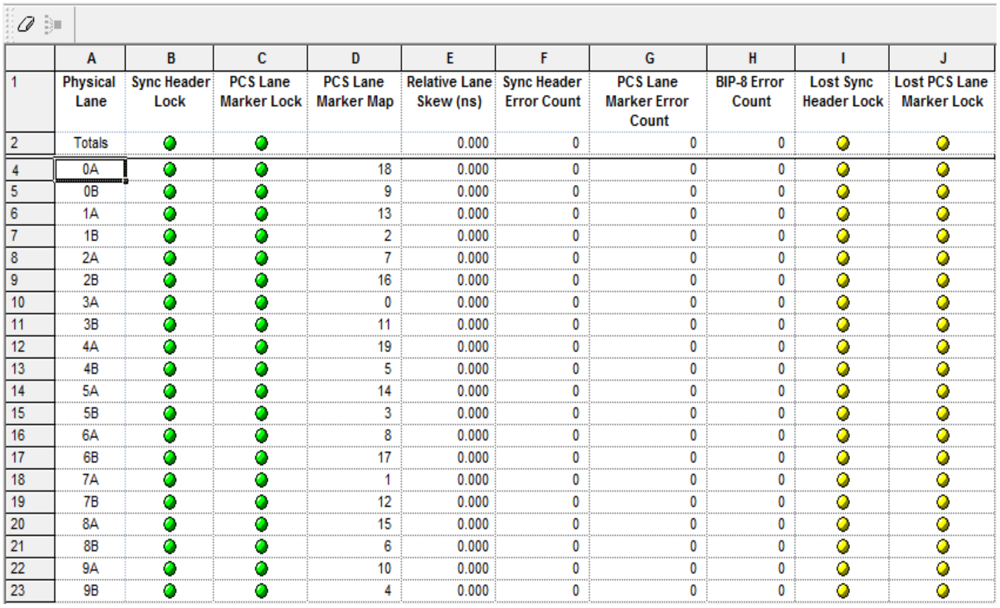
   Figure: Port and PCS Lane Statistics

3. The PCS Lane Statistics table opens. Use this table to view the PCS lane statistics for each lane. The statistics are for the **receive** side.

The PCS Lane Statistics table for Novus 100GE mode is shown in the following figure:

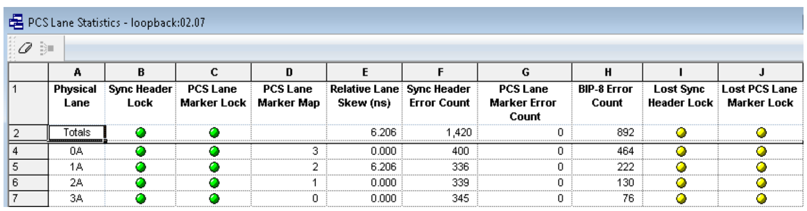
Figure: Novus 100GE—PCS Lane Statistics



	A	B	C	D	E	F	G	H	I	J
1	Physical Lane	Sync Header Lock	PCS Lane Marker Lock	PCS Lane Marker Map	Relative Lane Skew (ns)	Sync Header Error Count	PCS Lane Marker Error Count	BIP-8 Error Count	Lost Sync Header Lock	Lost PCS Lane Marker Lock
2	Totals	●	●		0.000	0	0	0	●	●
4	0A	●	●	18	0.000	0	0	0	●	●
5	0B	●	●	9	0.000	0	0	0	●	●
6	1A	●	●	13	0.000	0	0	0	●	●
7	1B	●	●	2	0.000	0	0	0	●	●
8	2A	●	●	7	0.000	0	0	0	●	●
9	2B	●	●	16	0.000	0	0	0	●	●
10	3A	●	●	0	0.000	0	0	0	●	●
11	3B	●	●	11	0.000	0	0	0	●	●
12	4A	●	●	19	0.000	0	0	0	●	●
13	4B	●	●	5	0.000	0	0	0	●	●
14	5A	●	●	14	0.000	0	0	0	●	●
15	5B	●	●	3	0.000	0	0	0	●	●
16	6A	●	●	8	0.000	0	0	0	●	●
17	6B	●	●	17	0.000	0	0	0	●	●
18	7A	●	●	1	0.000	0	0	0	●	●
19	7B	●	●	12	0.000	0	0	0	●	●
20	8A	●	●	15	0.000	0	0	0	●	●
21	8B	●	●	6	0.000	0	0	0	●	●
22	9A	●	●	10	0.000	0	0	0	●	●
23	9B	●	●	4	0.000	0	0	0	●	●

The PCS Lane Statistics table for Novus 40GE mode is shown in the following figure:

Figure: Novus 40GE—PCS Lane Statistics



PCS Lane Statistics - loopback:02.07

	A	B	C	D	E	F	G	H	I	J
1	Physical Lane	Sync Header Lock	PCS Lane Marker Lock	PCS Lane Marker Map	Relative Lane Skew (ns)	Sync Header Error Count	PCS Lane Marker Error Count	BIP-8 Error Count	Lost Sync Header Lock	Lost PCS Lane Marker Lock
2	Totals	●	●		6.206	1,420	0	892	●	●
4	0A	●	●	3	0.000	400	0	464	●	●
5	1A	●	●	2	6.206	336	0	222	●	●
6	2A	●	●	1	0.000	339	0	130	●	●
7	3A	●	●	0	0.000	345	0	76	●	●

The following table explains the entries in the PCS Lane Statistics table:

Table: PCS Lane Statistics Data

Field	Description
Physical Lane	The identifier for the Receive physical lane. This is a tag / fixed label to ID each lane.
Sync Header Lock	Indicates if the received PCS lane achieved sync-bit lock. Green indicates success, red indicates failure.
PCS Lane Marker Lock	Indicates if the received PCS lane has achieved alignment marker lock. Green indicates success, red indicates failure.
PCS Lane Marker Map	The VL number identified by the alignment marker. This is only valid when VL Lock is green.
Relative Lane Skew (ns)	Shows the actual skew in nanoseconds. Skew measurements are valid only when all lanes are locked with 20 unique lane markers. The first VL markers to arrive have skew of 0. All other lane skews are relative to

Field	Description
	them.
Sync Header Error Count	The number of synchronization bit errors received.
PCS Lane Marker Error Count	The number of incorrect PCS lane markers received while in PCS lane lock state.
BIP-8 Error Count	The number of BIP-8 errors for a PCS lane. BIP-8 = Bit-Interleaved Parity with eight bit errors (BIP-8). Each bit in the BIP field is an even parity calculation over all previous selected bits of a PCS lane.
Lost Sync Header Lock	When lit, indicates the loss of sync header lock since the last statistic was read. If colored gray, there is no error. If colored red, an error has occurred.
Lost PCS Lane Marker Lock	When lit, indicates the loss of PCS lane marker lock since the last statistic was read. If colored gray, there is no error. If colored red, an error has occurred.

PCS Lane Error Generation

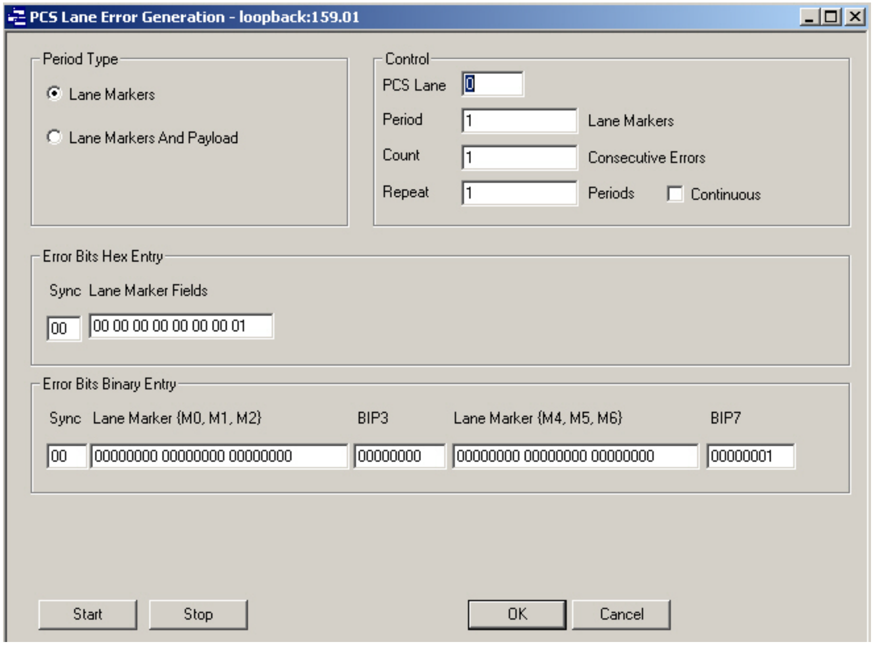
The Novus 100GE load module, HSE 100GE load module, Lava load module, S400GD-16P-QDD+FAN+NRZ load module and other 40/100 GE load modules can generate errors in the BIP-8 field, or anywhere in the 40/100 GE lane markers or in the payload.

PCS Lane (virtual lane) selection is 0-19 for 100GE and 0-3 for 40GE.

Errors can be inserted either in only the Lane Marker fields or in both Lane Markers and Payload. The Period Type makes this choice and the Error Bits Binary Entry units change based on the selected period type, either Lane Markers or 64/66 Bit Words.

Starting and stopping errors is independent of stream transmit. Errors can be inserted when transmit is idle or active.

Figure: PCS Lane Error Generation



The following table describes the fields of the **PCS Lane Error Generation** dialog box:

Table: PCS Lane Error Generation

Section	Field	Description
Period Type	Lane Markers	Insert errors only in the Lane Marker fields.
	Lane Markers and Payload	Insert errors in both Lane Markers and Payload fields.
Control	PCS Lane	Specify which lane to insert errors. 0-19 for 100G and 0-3 for 40G
	Period	(Number) Lane Markers or 64/66 Bit Words (depending on Period Type) Define the period by the number of consecutive Lane Markers or 64/66 Bit Words.
	Count	(Number) Consecutive Errors Define the number of consecutive Lane Markers or 64/66 Bit Words containing defined errors.
	Repeat	(Number) Periods Define the number of periods to repeat the error pattern.
		Continuous (check box)–if selected, the Repeat ___ Periods field is disabled, and errors are inserted continuously.
Error Bits	Sync / Lane Marker Fields	Defines which bits to error, in hex format.

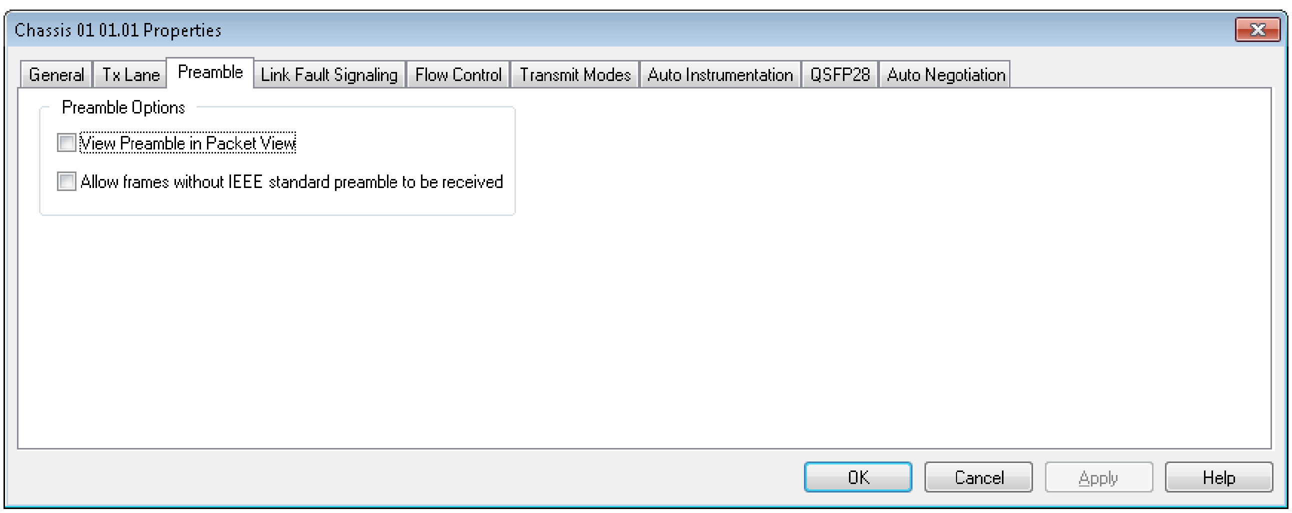
Section	Field	Description
Hex Entry	(or) Lane Markers and Payloads	
Error Bits Binary Entry		Defines which bits to error, in binary format. Depending on the selected Period Type, the Error Bits Binary Entry units change, either Lane Markers or 64/66 Bit Words.
	If Lane Markers is selected as Period Type	Sync Lane Marker (M0, M1, M2) BIP 3 Lane Marker (M4, M5, M6) BIP 7
	If Lane Markers and Payload is selected as Period Type	Sync Byte 0 through Byte 7

Novus Port Properties—Preamble

The preamble precedes the frame, but is not part of the frame itself.

The Novus Port Properties **Preamble** tab is shown in the following image:

Image: Novus —**Preamble** tab



The fields and controls in this tab are described in the following table:

Table: Preamble Configuration

Section	Choices	Description
Preamble Options	View Preamble in Packet View	When this check box is selected, the preamble data will be visible in the Packet View (transmit side) and the Capture View (receive side).
	Allow frames without IEE standard preamble to be received	When this check box is selected, it allows frames without IEEE standard preamble to be received.

Novus Port Properties—Link Fault Signaling

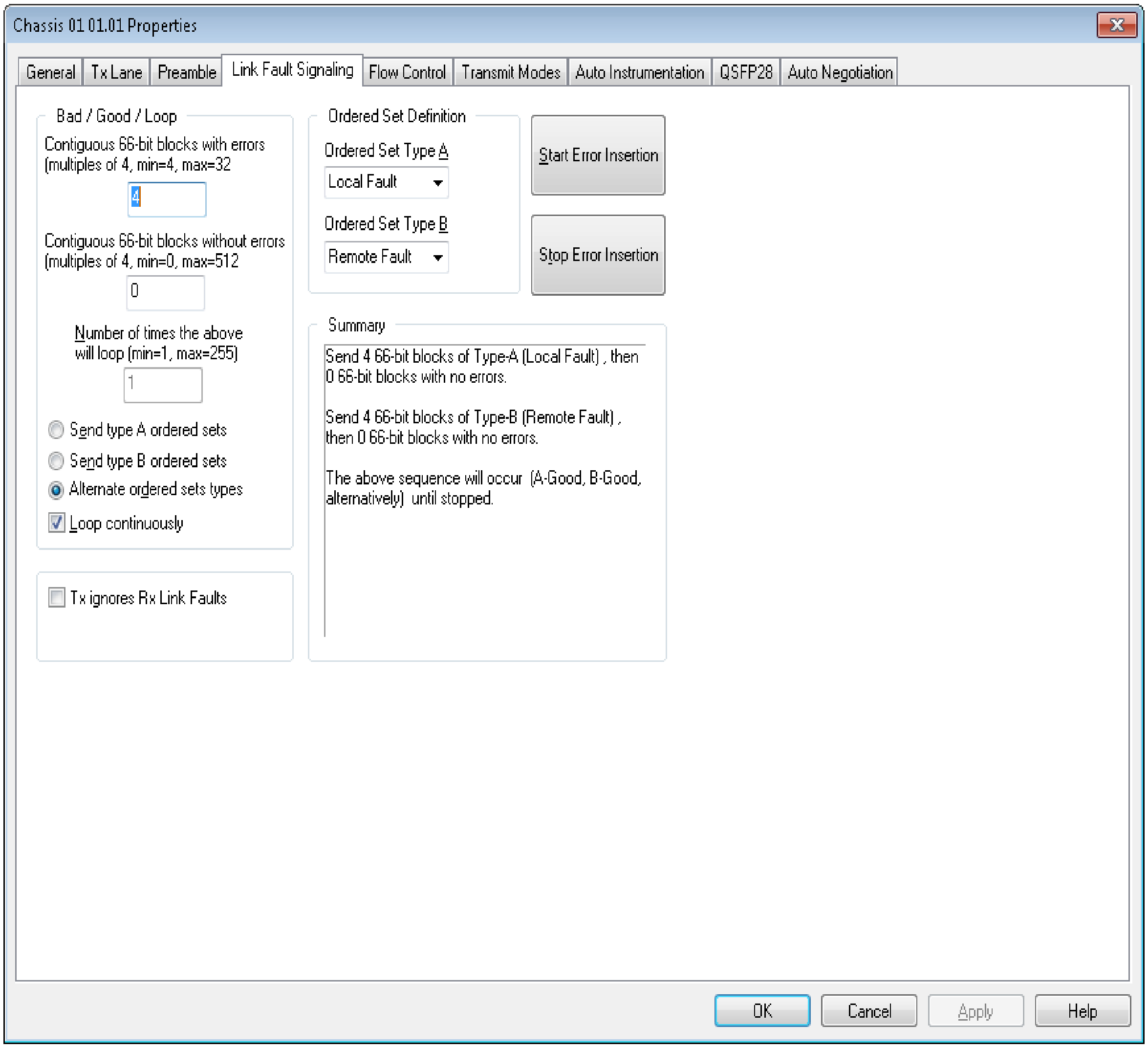
Link Fault Signaling is defined in Section 81.3.3.3 of the IEEE 802.3ba specification for 40 Gb/s and 100 Gb/s Ethernet. Link Fault Signaling is defined in Section 46 of the IEEE 802.3ae specification for 10 Gigabit Ethernet. When the feature is enabled, four statistics will be added to the list in Statistic View for the port. One is for monitoring the Link Fault State. Two provide a count of the Local Faults and Remote Faults. The last one is for indicating the state of error insertion, whether or not it is ongoing.

The 1x100GE Novus ports support Link Fault Signaling. Link Fault Signaling for Novus originates with the PHY sending an indication of a local fault condition in the link being used as a path for MAC data. In the typical scenario, the Reconciliation Sublayer (RS) that had been receiving the data will receive this Local Fault status, and then send a Remote Fault status to the RS that was sending the data. Upon receipt of this Remote Fault status message, the sending RS will terminate transmission of MAC Data, sending only ‘Idle’ control characters until the link fault is resolved.

The **Link Fault Signaling** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Link Fault Signaling*** tab.

The ***Link Fault Signaling*** tab for Novus load module is shown in the following image:

Image: Novus—**Link Fault Signaling** tab



The controls for **Link Fault Signaling** tab configuration are described in the following table:

Table: Link Fault Signaling Configuration

Section	Field/Control	Description
Bad/Good/Loop	(Bad) Contiguous 66-bit blocks with errors (multiples of 4; min = 4, max = 32)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks with errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive fault sequences allowed are minimum 4 sequences and maximum 32 sequences.
	(Good) Contiguous 66-bit blocks without errors (multiples of 4; min = 0, max =	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks without errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive regular data sequences allowed are minimum 0 sequences and maximum 512

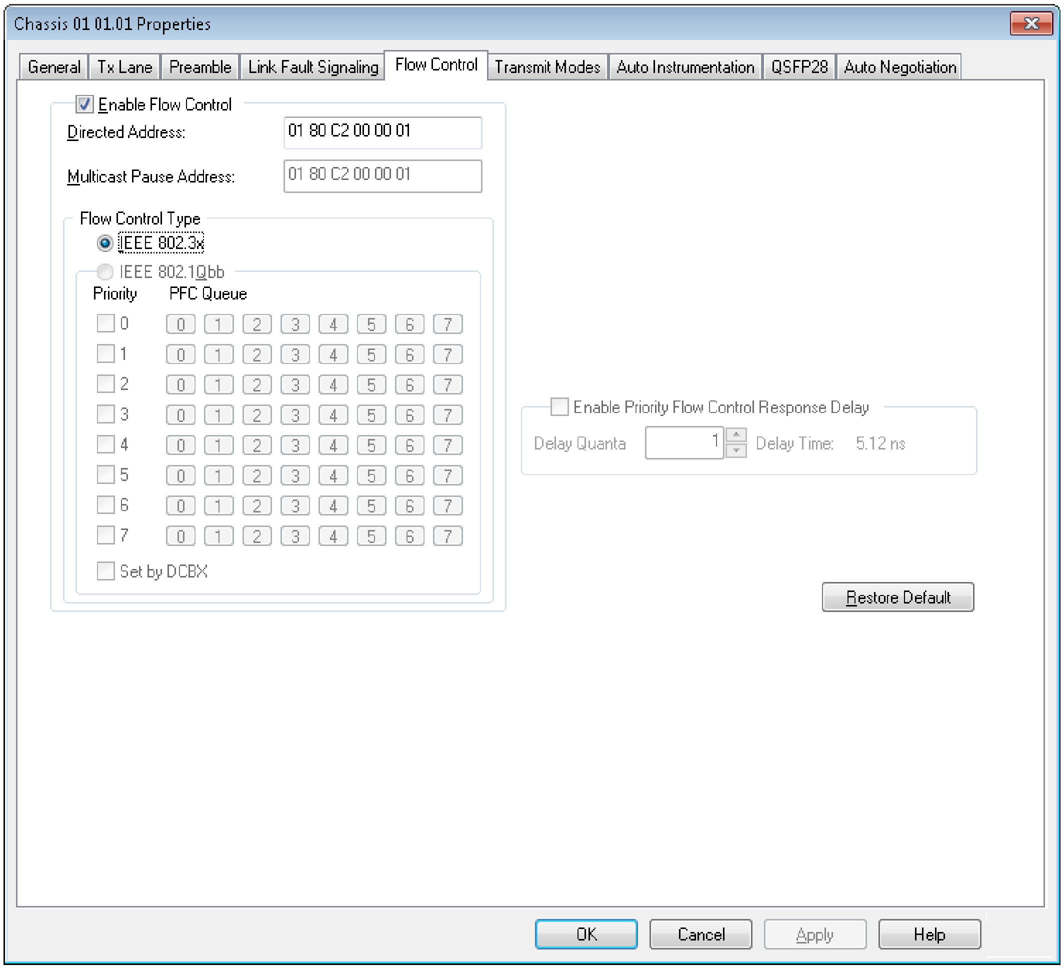
Section	Field/Control	Description
	512)	sequences.
	Number of times the above will loop (min = 1, max = 255)	Specifies the number of loops for the user defined sequence. There are two modes: • Discrete iterations: 1. Minimum of 1 iteration 2. Maximum of 255 iterations • Continuous loop 1. User cannot specify number of iterations
	Choose one of: • Send type A ordered sets • Send type B ordered sets • Alternate ordered set types	Defines the ordered set pattern that will be sent. (The two Ordered Sets—A and B—are defined in the **Ordered Set Definition** box in this tab.) This pattern will be combined with the Good blocks/Bad blocks pattern for transmission. • Only Type A fault sequence and regular good data sequences • Only Type B fault sequence and regular good data sequences • Alternate Type A, regular good data sequences and Type B fault sequence, regular good data sequences NOTE If this field is available, and the Alternate ordered set types option is selected, the minimum value for this field should be '2,' to allow the entire pattern to be sent once. If left at the minimum value of '1'— only two groups of blocks (one of good blocks and one of bad blocks) will be sent, which means that only the first ordered set will be sent. A minimum of eight blocks is required for one complete pattern including Types A and B.
	Loop continuously	If selected, the loop defined by the combination of the Bad and Good blocks plus the pattern of ordered sets, will be transmitted continuously until the *Stop Error Insertion* button is selected.
Ordered Set Definition	Ordered Set Type A	Choose one of: • Local Fault • Remote Fault
	Ordered Set Type B	Choose one of:

Section	Field/Control	Description
		• Local Fault • Remote Fault
Tx ignores Rx Link Faults		If selected, ongoing transmission will continue even if Link Fault messages are received by the sending RS.
Summary (Window)		(Read-only) Shows descriptions of the patterns that will be transmitted.
Start Error Insertion		Select this button to start the transmission of the configured error patterns.
Stop Error Insertion		(Available only for use with the *Loop continuously* option.) Select this button to stop the transmission of the configured error patterns.

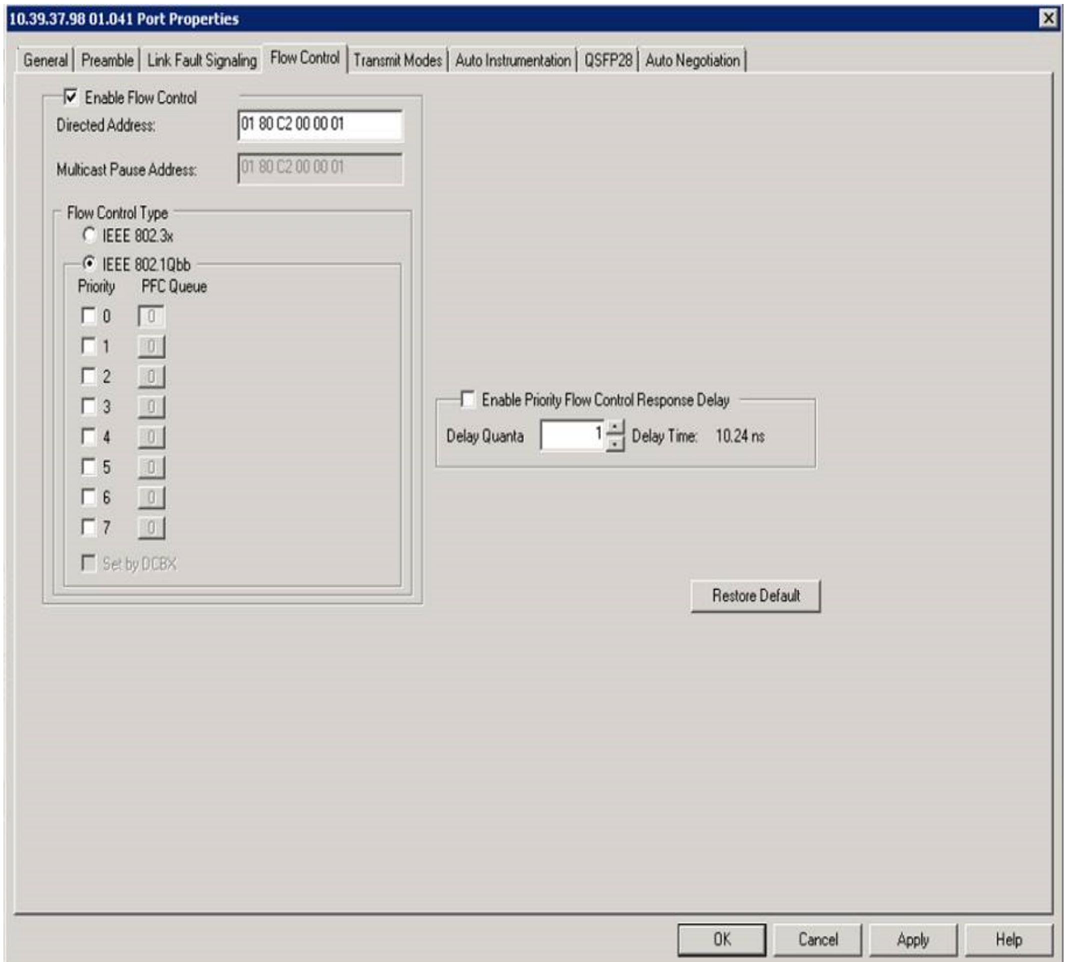
Novus Port Properties—Flow Control

The Novus **Flow Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

NOTE You can view this help page for the Port Properties - **Flow Control** tab by selecting the Help button and not F1.



See the following image for the **Flow Control** tab of high stream modes.



The controls for **Flow Control** tab configuration are described in the following table:

Section	Field/Control	Description
Enable Flow Control	(check box)	Enables the port's MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type	IEEE 802.3x or IEEE 802.1Qbb	Priority-based Flow Control. When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame. When not in Data Center mode, only IEEE 802.3x is available.
	Priority	Priority-based Flow Control.

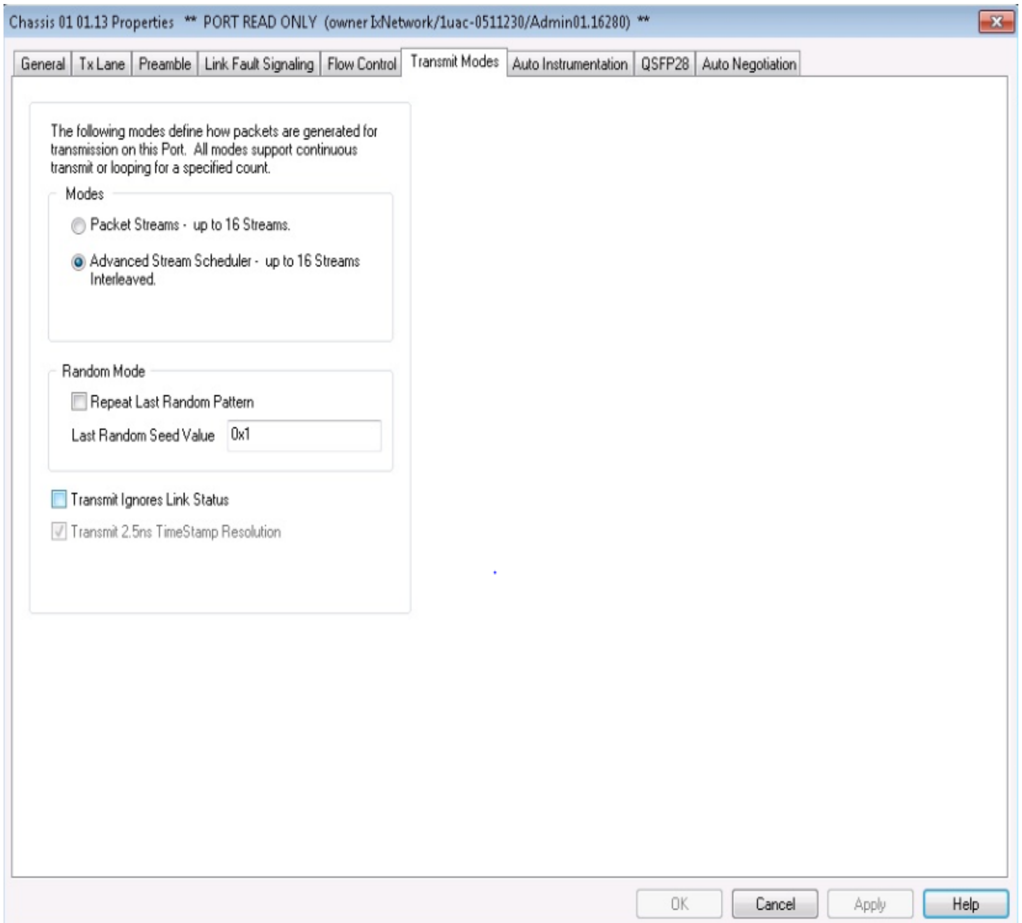
Section	Field/Control	Description
	PFC Queue	Priority-based Flow Control
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

Novus Port Properties—Transmit Modes

The **Transmit Modes** tab for Novus load modules is shown in the following figure. It is accessed by double-clicking a port in Resources window, or by selecting a port and selecting the **Properties** menu option. Then select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following figure:

Figure: Novus—**Transmit Modes** tab



The controls for **Transmit Modes** tab configuration are described in the following table:

Table: Transmit Modes Configuration

Section	**Field/Control**	**Description**
Modes	Packet Streams	Sets the operating mode for the port to sequential packet streams. This allows to configure 64 streams in 40GE and 100GE mode, and 16 streams in 10GE, 25GE, and 50GE mode. A stream may be programmed for continuous packet generation—generating a continuous, infinite number of packets.
	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure 64 streams in 40GE and 100GE mode, and 16 streams in 10GE, 25GE and 50GE mode. They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in

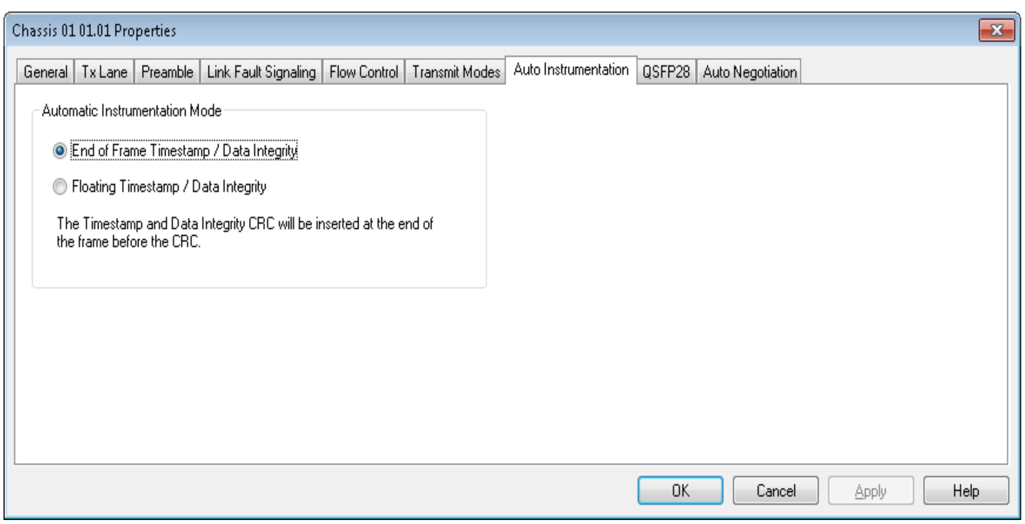
Section	Field/Control	Description
		the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream's random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit Ignores Link Status		If selected, will allow transmission of packets even if the link is down.
Transmit 2.5ns Time stamp Resolution		If selected, it will check for the high resolution time stamp. The check box is selected by default.

Novus Port Properties—Auto Instrumentation

The Novus **Auto Instrumentation** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto Instrumentation** tab.

The Novus Port Properties **Auto Instrumentation** tab is shown in the following image:

Image: Novus—**Auto Instrumentation** tab



The options and controls in this tab are described in the following table:

Table: Auto Instrumentation Configuration

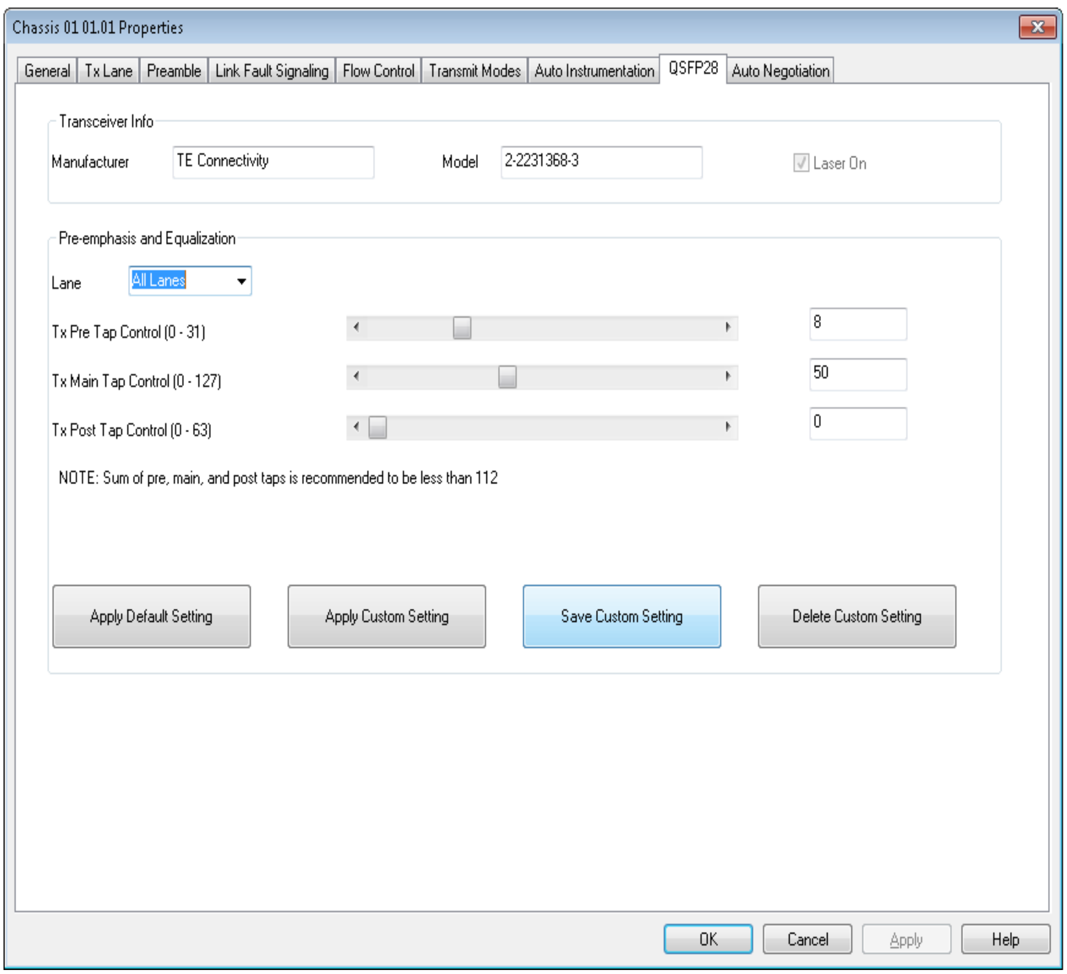
Field/Control	Description
End of Frame Timestamp / Data Integrity	Enables inserting Timestamp and Data Integrity CRC at the end of the frame before the CRC.
Floating Timestamp / Data Integrity	Enables adding timestamp as part of floating instrumentation header, and addresses similar issue in Data Integrity checking.

Novus Port Properties—QSFP28

For DCS100GE2Q28ALL module, see DCS100GE2Q28ALL Port Properties—QSFP28

The Novus **QSFP28**tab is accessed from the context menu of the Novus port in the **Explore Network Resources** pane, by selecting the **Por Properties** menu option, then selecting the **QSFP28** tab.

The Novus Port Properties **QSFP28** tab is shown in the following image.



The options and controls in this tab are described in the following table.

Section	Field/Control	Description
Transceiver Info	Manufacturer	This is the Vendor Name field read from the actual transceiver currently being plugged in.
	Model	This is the Part Number field read from the actual transceiver currently being plugged in.
	Laser On	Select this check box to enable the laser power. Note that the actual reading will be displayed in the Value field.
Pre-emphasis and Eqalization	Lane	Specifies in which lane (from 0-3) the current settings on.
	Tx Pre Tap Control (0-31)	This helps to control the Pre Tap value for Tx.
	Tx Main Tap Control (0-31)	This helps to control the Main Tap Control for Tx.
	Tx Post Tap Control (0-63)	This helps to control the Post Tap value for Tx.
	Apply Default Settings	If selected, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Settings	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	If selected, if there exists a custom setting in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	If selected, if there exists a custom setting in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel that. If no custom setting exists, users will be prompted that nothing will be deleted.

Novus Port Properties—Auto Negotiation

For NOVUS25/10GE8SFP28 module, see NOVUS25/10GE8SFP28 Port Properties—Auto Negotiation.

This tab is available for Novus load module. The Novus **Auto Negotiation** tab is accessed by selecting a Novus port in the Explore Network Resources pane, selecting the Port Properties menu option, then selecting the **Auto Negotiation** tab.

NOTE Auto negotiation is not available for 10GE speed.

The Port Properties **Auto Negotiation** tabs for Novus are shown in the following images:

Image: Novus 100GE—**Auto Negotiation** tab

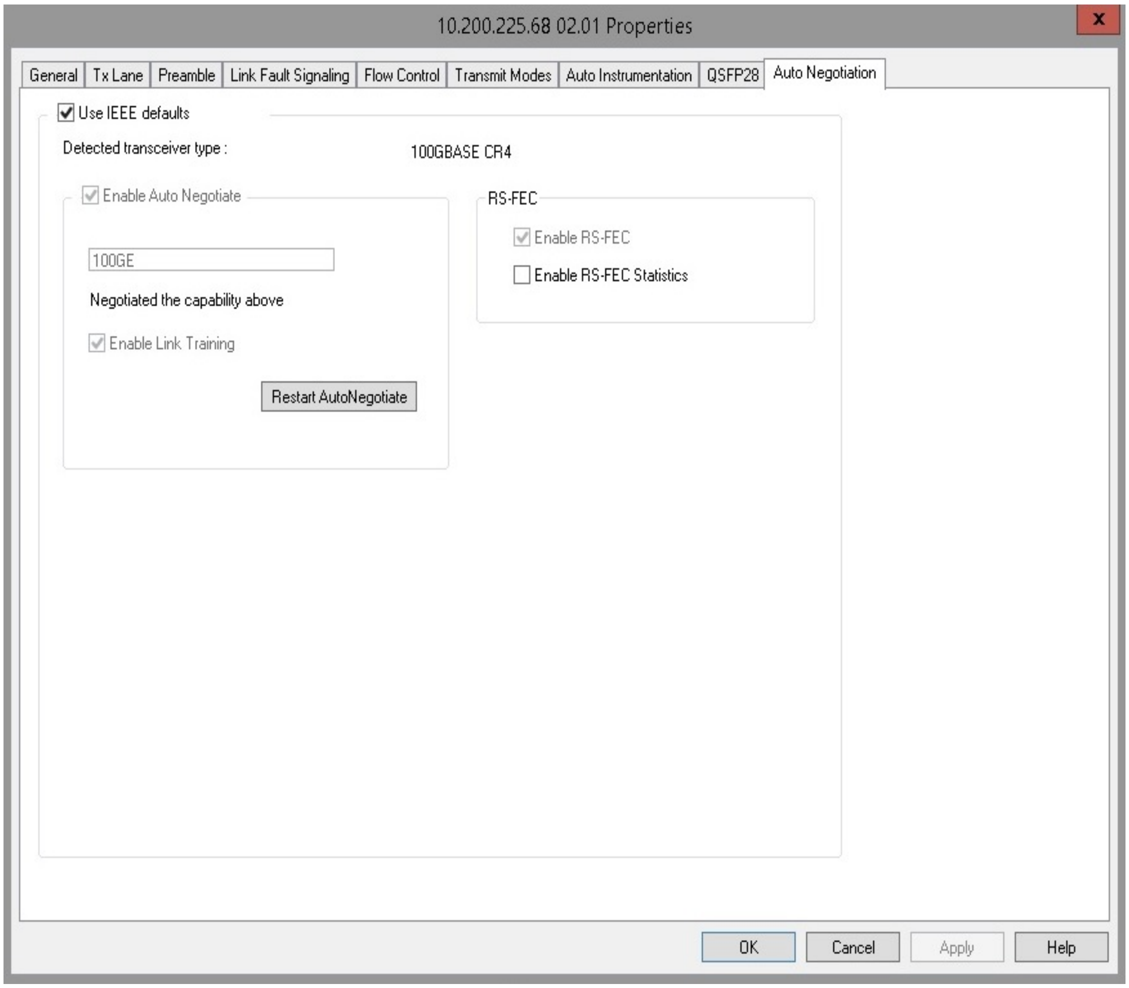


Image: Novus 50GE—**Auto Negotiation** tab

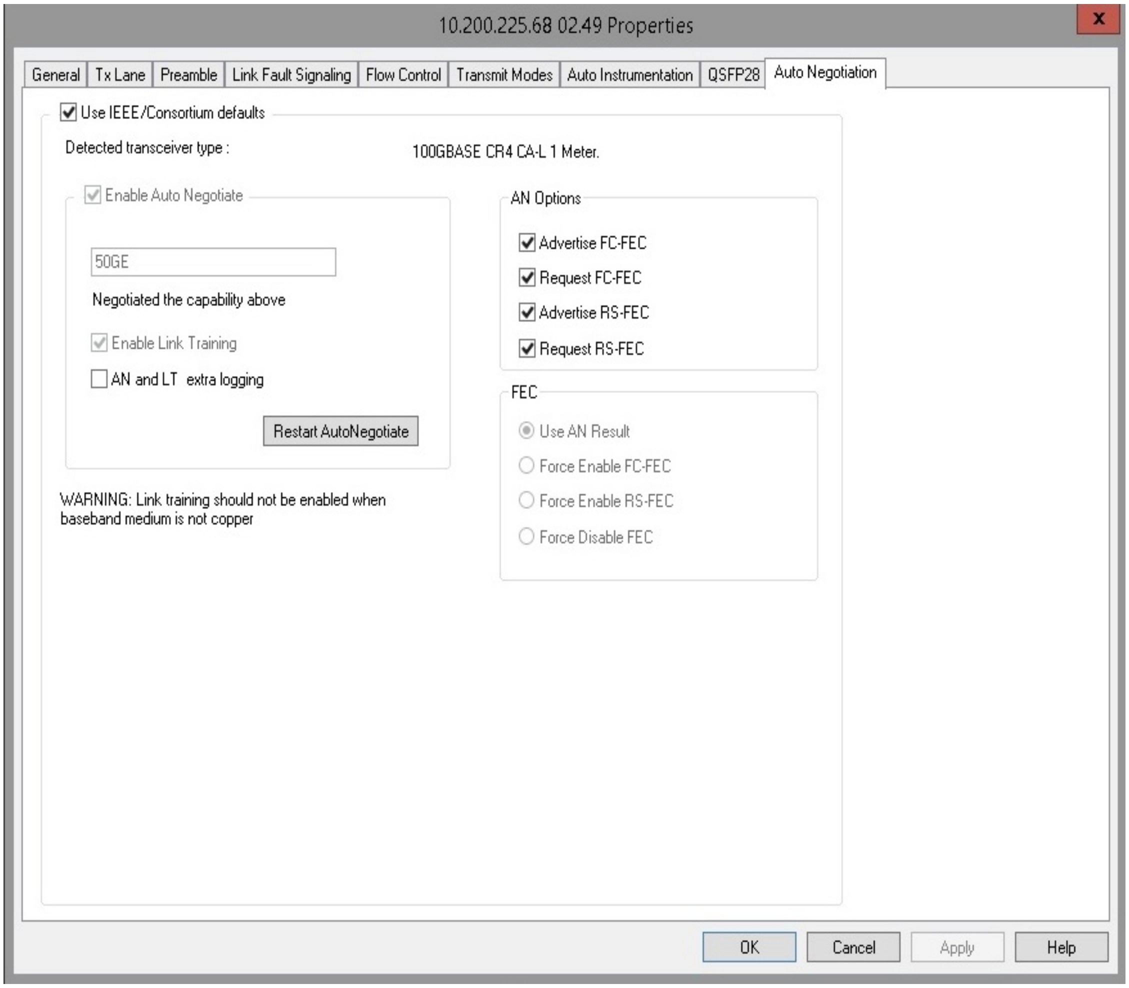


Image: Novus 40GE—**Auto Negotiation** tab

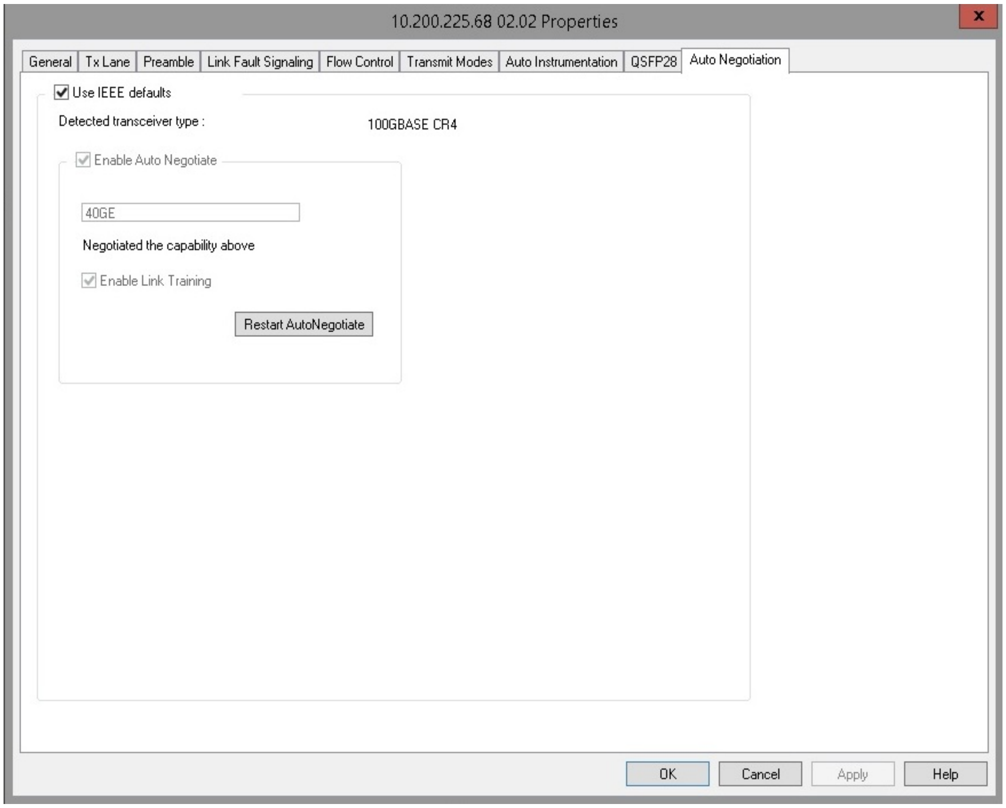
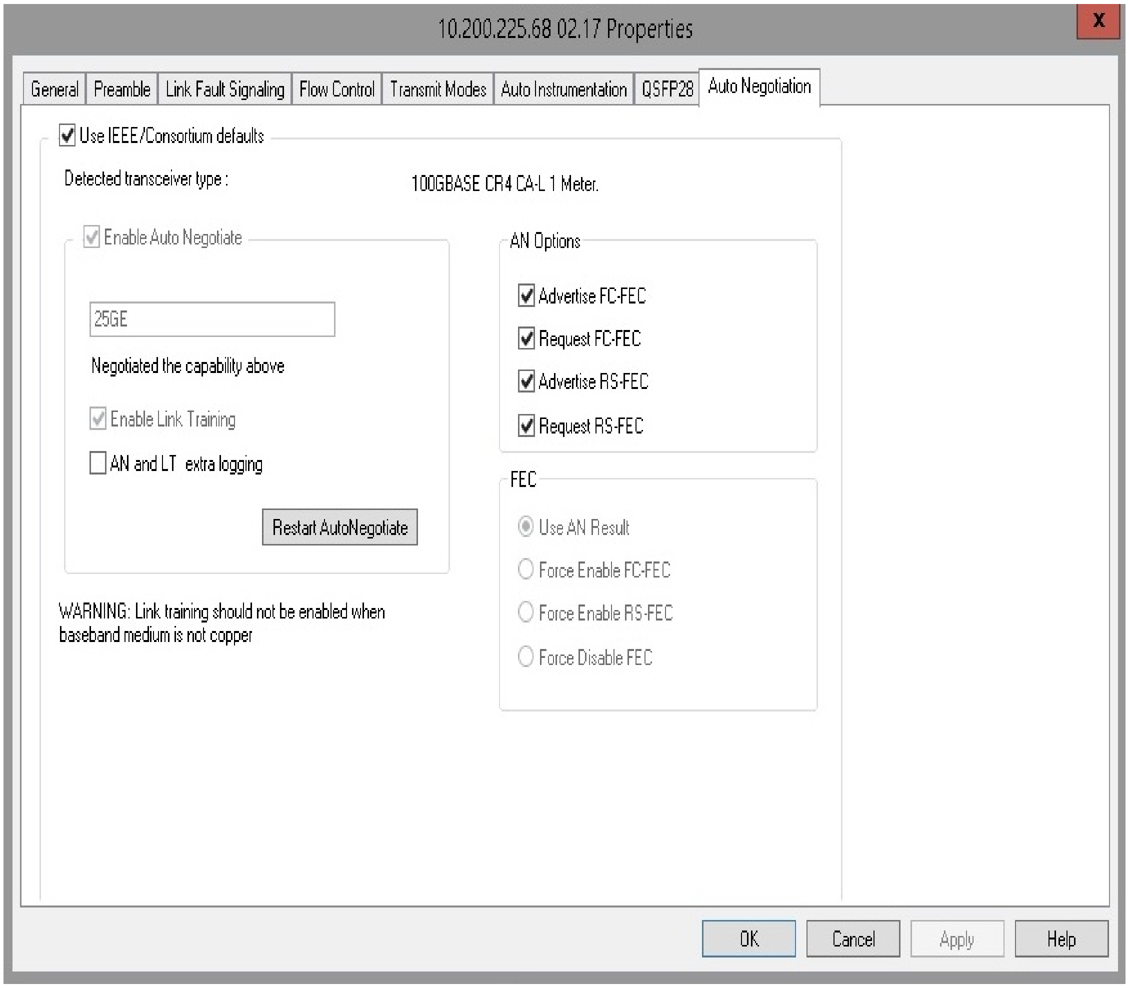


Image: Novus 25GE—**Auto Negotiation** tab



The fields and controls in these tabs are described in the following table:

Table: Novus **Auto Negotiation** Tab

Field/Control	Description
Use IEEE defaults	When you select the Use IEEE Defaults check box, the L1 parameters like Autonegotiation, Link Training, and FEC, are enabled or disabled per IEEE requirements, and you will not be able to enable or disable these manually. If the check box is cleared, you will be able to manually enable or disable L1 features – even if it violates IEEE specifications. By default the check box is selected.
Detected transceiver type	When a transceiver is inserted into the load module, the software reads IEEE registers to determine the transceiver capabilities and media type. If the transceiver contains this information, it is shown in this read-only field.If the transceiver is capable of multiple speeds, the supported speed is shown.

Field/Control	Description
	NOTE The speed at which the Resource Group is currently operating, does not affect this. For example, if the Resource Group is configured to operate in 100GE/50GE/40GE/25GE mode, then the Detected transceiver type indicates 100GE. If the ports are in 10GE mode, the 'Type' appears as LAN SFP+.
Enable Auto Negotiate	Auto negotiation controls how a port communicates with other ports.If you select the check box, it allows auto-negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing • **Restart Auto-Negotiate** button is selected (this does a forced restart) NOTE The **Enable Auto Negotiate** check box is available for selection only if the **Use IEEE Defaults** check box is cleared.
Negotiated the capability above	The text box indicates the speed that was negotiated due to Auto-Negotiation. NOTE This speed may be different than the speed indicated for the transceiver detected. For example: If the detected transceiver type is 100GBASE CR4, the negotiated speed is 100GE.
Enable Link Training	Select the check box to allow longer length copper cables to be used. This means that during the next Auto-Negotiation, KR training will be used. Link Training is enabled by default when Auto-Negotiation is enabled.
Restart AutoNegotiate	Restarts the Auto Negotiate sequence.
Enable RS-FEC	RS-FEC or Reed-Solomon Forward Error Correction is available for Novus load modules except 40GE and 10GE load modules, for 100GE ports.If you select this check box, RS-FEC is used. FEC encrypts data sent on the line using some overhead for error correction code. This allows bit errors in flight to be corrected on the receiving side. The benefit of FEC is that it allows very long copper cables to be used and allows cheaper parts to be used in optical transceivers as errors will be corrected.RS-FEC is compatible with Auto-Negotiation and KR Training. • This check box is available for selection only if the **Use IEEE Defaults** check box is cleared • FEC should be enabled on both back-to-back ports for the link to be up • CXP and QSFP+ load modules do not support FEC
Enable RS-FEC	If you select this check box, RS-FEC Statistics is available.An RS-FEC codeword

Field/Control	Description
Statistics	is a block of contiguous packets on the line. All RS-FEC codewords are of the same size. Thus, a block can represent many packets, few packets, portions of packets, or no packets at all. The two RS-FEC statistics are: • RS-FEC Corrected Codeword Count - Indicates that at least one error was encountered in a block that was able to be corrected. • RS-FEC Uncorrected Codeword Count - Indicates that too many errors existed within a block to be corrected. These statistics can increment when a link pair is idle. Any uncorrected FEC block can indicate any of the following problems: • Ixia is unable to insert RS-FEC errors. • Ixia is unable to drill-down into any FEC block to show what it represented. NOTE This check box is enable by default.
• Advertise FC-FEC • Request FC-FEC • Advertise RS-FEC • Request RS-FEC	FC-FEC or Fire Code-Forward Error Correction is available for Novus load module for 25G mode. When a port participates in 25G Auto-negotiation, it tells the link partner if it supports FC-FEC and if it wants the link partner to turn FC-FEC on. The four available FC-FEC statistics are: • Advertise FC-FEC: If enabled, the port tells a link partner to support FC-FEC the next time it participates in Auto-negotiation • Request FC-FEC: If enabled, the port tells a link partner to turn on FC-FEC the next time it participates in Auto-negotiation • Advertise RS-FEC: If enabled, the port tells a link partner to support RS-FEC the next time it participates in Auto-negotiation • Request RS-FEC: If enabled, the port tells a link partner to turn on RS-FEC the next time it participates in Auto-negotiation • This check box is available for selection only if the **Use IEEE Defaults** check box is cleared. • FEC should be enabled on both back-to-back ports for the link to be up.
• Use AN Result • Force Enable FC-FEC • Force Enable RS-FEC • Force	The four available statistics are: • Use AN Result: Use FEC decided by Auto-negotiation • Force Enable FC-FEC: Turns FC-FEC on by bypassing Auto-negotiation • Force Enable RS-FEC: Turns RS-FEC on by bypassing Auto-negotiation • Force Disable FEC: Turns FEC off by bypassing Auto-negotiation

Field/Control	Description
Disable FEC	
FC-FEC Statistics	The three FC-FEC statistics are: • FC-FEC Corrected Block Count - Indicates that at least one error was encountered in a block that was able to be corrected. • FC-FEC Uncorrected Block Count - Indicates that too many errors existed within a block to be corrected. • FS-FEC Corrected Error Bits - Indicates that at least one error was encountered in the data (in bits) that was able to be corrected. • Fire code FEC Sync - Indicates whether the FEC engine has locked onto a FEC pattern. **Sync** indicates that FEC is up. **No Sync** indicates that FEC is not locked onto a pattern. NOTE **No Sync** appears even if FEC is not actively used.

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CHAPTER 26

Port Properties–Novus DP and Novus NP 10GE/1GE/100M Ethernet Load Module

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the Novus 10GE/1GE/100M and NOVUS-NP10/1GE16DP Ethernet load modules.

NOTE The GUI for Novus DP and Novus NP 10GE/1GE/100M load modules are the same. In this chapter, the port properties are explained as per the Novus DP load module, but the documentation is also applicable for the Novus NP load module.

Port Properties for Novus 10GE/1GE/100M Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option.

The complete specification for the Novus is found in the *Ixia Platform Reference Manual*.

The following port property tabs are available for the Novus 10/1 family of load modules:

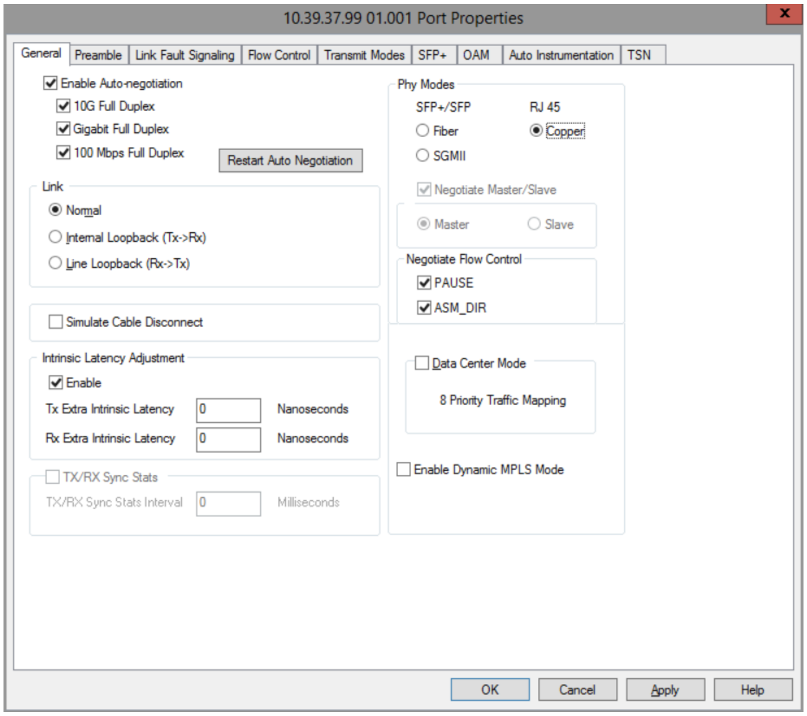
- Novus Port Properties—General
- Novus Port Properties—Preamble
- Novus Port Properties—Link Fault Signaling
- Novus Port Properties—Flow Control
- Novus Port Properties—Transmit Modes
- Novus Port Properties—Auto Instrumentation
- Novus Port Properties—SFP+
- Novus Port Properties—OAM

Novus 10GE/1GE/100M Port Properties—General

The Novus 10/1 **General** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, and then selecting the **General** tab.

The Port Properties **General** tab is shown in the following images:

Image: Novus 10/1—**General** tab



The controls for **General** tab configuration are described in the following table:

Table: General Configuration

Section	Control/Field	Usage
Auto-negotation	Enable Auto-negotation	Auto negotiation controls how a port communicates with other ports.If you select the check box, it allows auto-negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing • **Restart Auto Negotiation** button is selected (this does a forced restart). This button restarts the Auto Negotiation sequence. NOTE Both **Enable Auto-negotiation** and **Restart Auto Negotiation** are available for Copper, SGMII, and 1G Fiber modes. If Auto-Negotiation is unavailable for SGMII, you can configure the ports using the following modes : • **Master** - Port is configured as Master • **Slave** - Port is configured as Slave If 100Mbps is not available for Copper, you can

Section		Control/Field	Usage
			manually configure the ports using the following modes : • **Master** - Port is configured as Master • **Slave** - Port is configured as Slave
		10G Full Duplex	Select the check box to choose the desired port speed.
		Gigabit Full Duplex	Select the check box to choose the desired port speed.
		100 Mbps Full Duplex	Select the check box to choose the desired port speed.
Phy Modes	SFP+/SFP	Fiber	If selected, keeps the port in Fiber mode. NOTE This is the default mode.
		SGMII	If selected, keeps the port in SGMII mode.
	RJ 45	Copper	If selected, keeps the port in Copper mode.
Negotiate Flow Control		PAUSE	The flow control receive capability is enabled as per IEEE 802.3 guidance, in conjunction with ASM_DIR.
		ASM_DIR	The flow control receive capability is enabled as per IEEE 802.3 guidance, in conjunction with Pause.
Link		Normal	Normal operation
		Internal Loopback (Tx -> Rx)	Internal Loopback—Transmit to Receive.
		Line Loopback (Rx -> Tx)	Enable/disable the Line Loopback—Receive to Transmit. NOTE The **Line Loopback** option is not available for Multis QSFP28 load modules.
Simulate Cable Disconnect			If selected, the port acts as if the cable has been disconnected. If this is selected, the port acts as if the cable has been disconnected. The port will neither transmit nor receive. NOTE Available for both Copper and Fiber modes.
Intrinsic Latency		Enable	The **Enable** check box is selected by default. This

Section	Control/Field	Usage
Adjustment		enables the intrinsic latency adjustment. The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia Platform Reference Manual*.
	Tx Extra Intrinsic Latency	The default value is 0. If the value is non-zero, it reduces the measured latency by this value in addition to the intrinsic latency value on the transmitting test equipment port.
	Rx Extra Intrinsic Latency	The default value is 0. If the value is non-zero, it reduces the measured latency by this value in addition to the intrinsic latency value on the receiving test equipment port.
Data Center Mode		See Frame Data for FCoE Support.

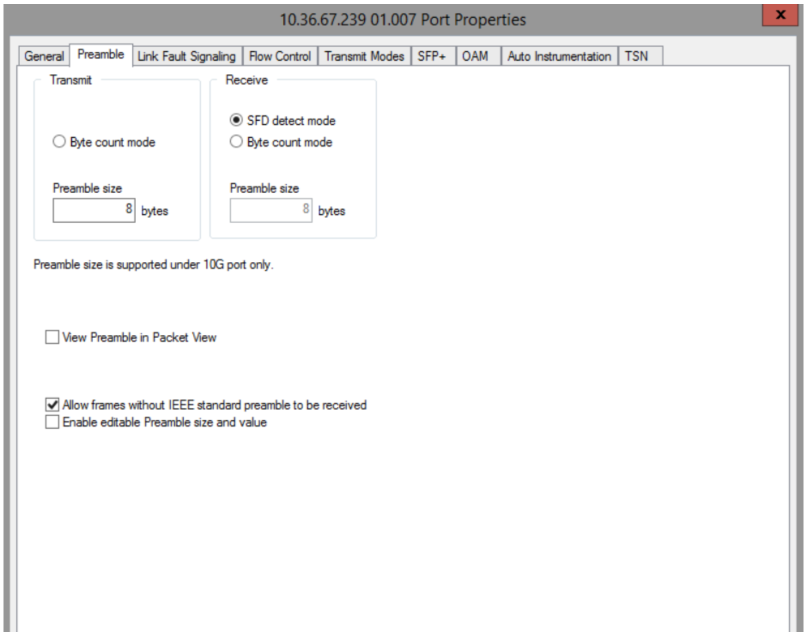
Novus 10GE/1GE/100M Port Properties—Preamble

The Novus 10/1 **Preamble** tab allows to select the method for detecting the start of a frame. The preamble precedes the frame, but is not part of the frame itself, so a method must be used to determine the first of the bytes making up the frame itself—SFD detect mode or Byte count mode.

The choice in this tab for transmitted frames is reflected in the Frame Data tab in the Stream Properties dialog box. The number of configurable bytes in the preamble depends on the start-of-frame mode.

The Novus 10/1 Port Properties **Preamble** tab is shown in the following image:

Image: Novus 10/1—**Preamble** tab



The fields and controls in this tab are described in the following table:

Table: Preamble Configuration

Section	Choices	Description
Transmit	Byte count mode	This mode counts the bytes of the preamble (8 bytes in this case), and considers the next byte (9th) the first byte of the frame.
	Preamble Size	(Read-only) The length of the preamble, in bytes. This field shows the value set in the **Frame Data** tab in the Stream Properties dialog box. This value is currently fixed at 8 bytes (the default).
Receive	SFD Detect mode	The Start of Frame Descriptor (SFD) is the last byte in the preamble (the 8th byte, in this case). This mode checks for the first occurrence of the SFD byte. The next byte is considered the start of the frame.
	Byte count mode	This mode counts the bytes of the preamble (8 bytes in this case) and considers the next byte (9th byte) the first byte of the frame.
	Preamble Size	(Read-only) The length of the preamble, in bytes. This field shows the value set in the **Frame Data** tab in the Stream Properties dialog box. This value is currently fixed at 8 bytes (the default).
View Preamble in Packet View		Select this check box to make the preamble data visible in the Packet View (transmit side).
Enable editable Preamble		Select this check box to edit both preamble length and data inside stream properties.

Section	Choices	Description
size and value		

Novus 10GE/1GE/100M Port Properties—Link Fault Signaling

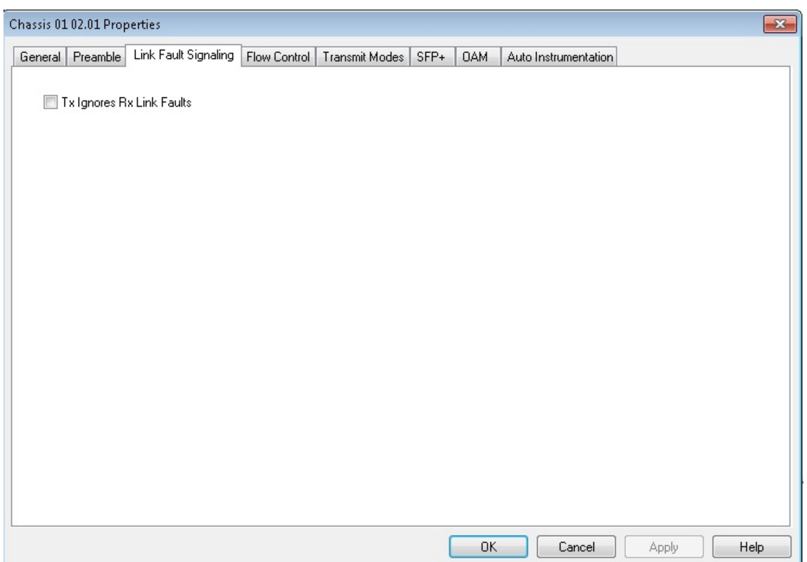
Link Fault Signaling is a simple method to indicate certain types of faults between Ethernet stations. The Reconciliation Sublayer (RS) controls whether the MAC is allowed to transmit. In the typical scenario, the RS that had been receiving the data will receive this Local Fault status, and then send a Remote Fault status to the RS that was sending the data. Upon receipt of this Remote Fault status message, the sending RS will terminate transmission of MAC Data, sending only 'Idle' control characters until the link fault is resolved.

In the Novus 10/1 configuration, you can select the option to have the transmitting RS ignore link faults from the receiving RS.

The **Link Fault Signaling** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Link Fault Signaling*** tab.

The ***Link Fault Signaling*** tab for Novus 10/1 load modules is shown in the following image:

Image: Novus 10/1—**Link Fault Signaling** tab



The controls for **Link Fault Signaling** tab configuration are described in the following table:

Table: Link Fault Signaling Configuration

Section	Field/Control	Description
Tx ignores Rx Link Faults		If selected, ongoing transmission will continue even if Link Fault messages are received by the sending RS.

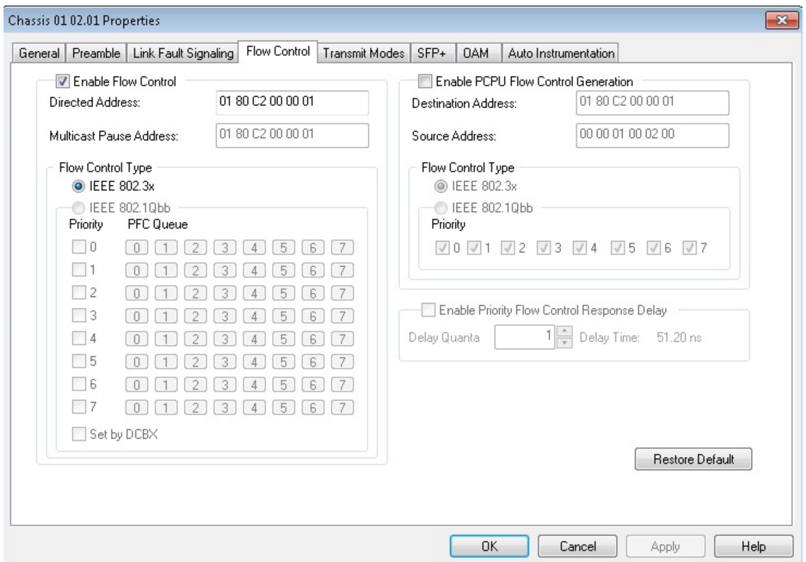
Novus 10GE/1GE/100M Port Properties—Flow Control

When a port is receiving data at a faster rate than it can handle from another, directly connected port, the receiving port can send a MAC control PAUSE frame to the sending port to temporarily halt transmission of frames. The PAUSE function is defined in IEEE 802.3 and IEEE 802.1Qbb.

The Novus 10/1 **Flow Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

The Novus 10/1 Port Properties **Flow Control** tab is shown in the following image:

Image: Novus 10/1 **Flow Control** tab



The controls for **Flow Control** tab configuration are described in the following table:

Table: **Flow Control** Tab

Section	Field/Control	Description
Force Enable Flow Control	(check box)	This option ignores Auto-negotiation result and always enable flow control receive on the port. Enables the port's MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type	IEEE 802.3x or IEEE 802.1Qbb	Priority-based Flow Control. When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame.

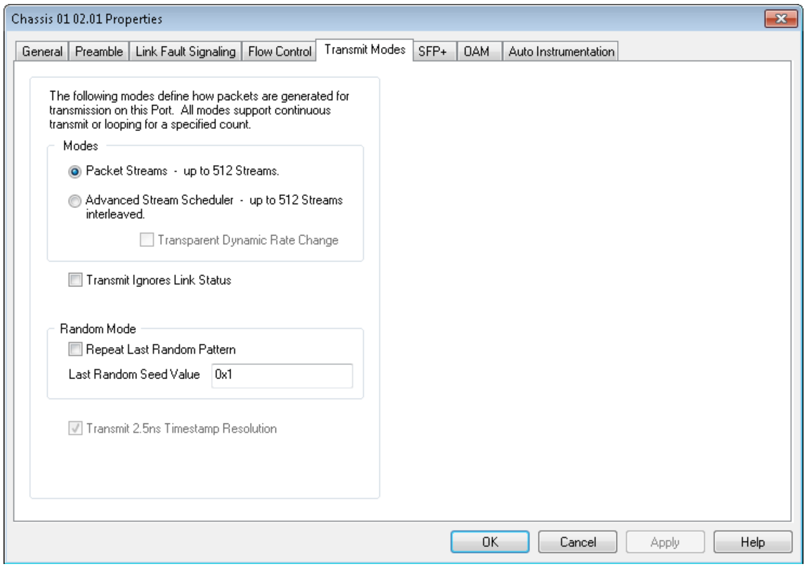
Section	Field/Control	Description
		When not in Data Center mode, only IEEE 802.3x is available.
	Priority	Priority-based Flow Control.
	PFC Queue	Priority-based Flow Control
Enable PCPU Flow Control Generation	(check box)	Enables port CPU flow control generation. When the rate of incoming packets is more than the port CPU can keep up with, a pause packet will be sent to the DUT, causing it to pause transmitting for a fixed interval.
	Destination Address	The DA and SA, taken together, identify the pause packet (to the DUT).
	Source Address	See Destination Address, above.
	Flow Control Type	See Flow Control Type, above.
	Priority	In Data Center mode, when flow control type IEEE 802.1Qbb is selected, these are the channels of data that can be paused. Select to select one or more channels.
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

Novus 10GE/1GE/100M Port Properties—Transmit Modes

The **Transmit Modes** tab for Novus 10/1 load modules is shown in the following image. It is accessed by double-clicking a port in Resources window, or by selecting a port and selecting the **Properties** menu option. Then select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following image:

Image: Novus 10/1—**Transmit Modes** tab



The controls for **Transmit Modes** tab configuration are described in the following table:

Table: Transmit Modes Configuration

Section	Field/Control	Description
Modes	Packet Streams	Sets the operating mode for the port to sequential packet streams. This allows to configure maximum 512 streams. The maximum number of streams supported in DCM mode is 256. A stream may be programmed for continuous packet generation—generating a continuous, infinite number of packets.
	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure maximum 512 streams. The maximum number of streams supported in DCM mode is 256. They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Transmit Ignores Link Status		If selected, will allow transmission of packets even if the link is down.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after

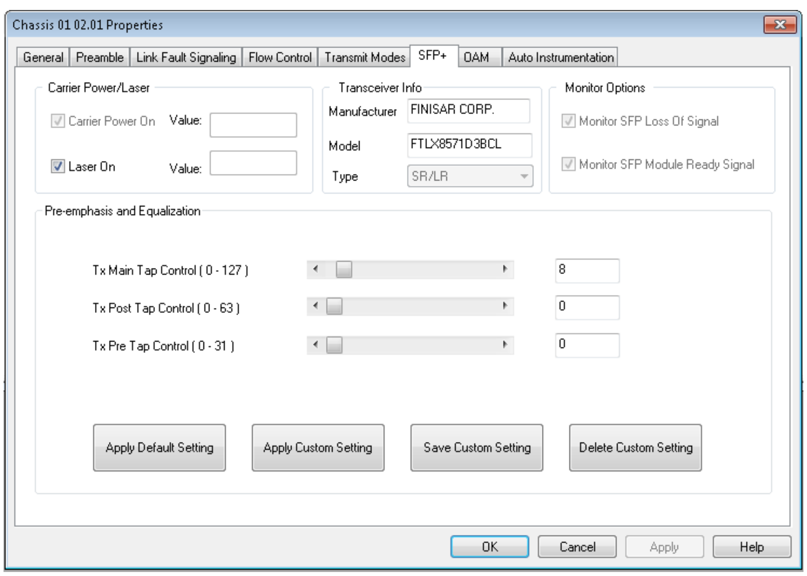
Section	Field/Control	Description
		a stream has been sent (in which case the last stream's random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit High TimeStamp Resolution		If selected, Novus 10/1 load module will support 2.5 ns Resolution Timestamp on selected modes.

Novus 10GE/1GE/100M Port Properties—SFP+

This tab is available for Novus 10/1 load module. The Novus 10/1 **SFP+** tab is accessed from the context menu of the Novus 10/1 port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **SFP+** tab.

NOTE This tab is available for Fiber mode only.

The Port Properties **SFP+** tabs for Novus 10/1 are shown in the following image.



Field/Control		Description
Carrier Power/Laser	Carrier Power On	If selected, enables the carrier power. The actual reading appears in the **Value** field.

Field/Control		Description
	Laser On	Select this check box to enable the laser power. Note that the actual reading appears in the **Value** field.
Transceiver Info	Manufacturer	Shows the name of the manufacturer.
	Model	Shows the model number.
	Type	Shows the type of the transceiver.
Monitor Options	Monitor SFP Loss of Signal	When selected, indicates the interface will conform to SFP specifications and require the absence of a Loss of Signal for transmitting and receiving.
	Monitor SFP Module Ready Signal	When selected, indicates the interface will conform to SFP specifications and require the detection of a Module Ready signal for transmitting and receiving.
Pre-emphasis and Equalisation	Push to get recommended setting for passive	This will be disabled on Flex.
	Tx Main Tap Control (0-63)	This helps to control the Main Tap Control for Tx.
	Tx Post Tap Control (0-31)	This helps to control the Post Tap value for Tx.
	Tx Pre Tap Control (0-31)	This helps to control the Pre Tap value for Tx.
	Apply Default Settings	If selected, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Settings	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The “TapConfigurations.xml” file will be created at the Ixia\IxOS folder once users select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	If selected, if a custom setting exists in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose

Field/Control		Description
		to ok or cancel that. If no custom setting exists, users will be prompted that nothing will be deleted.

Novus 10GE/1GE/100M Port Properties—OAM

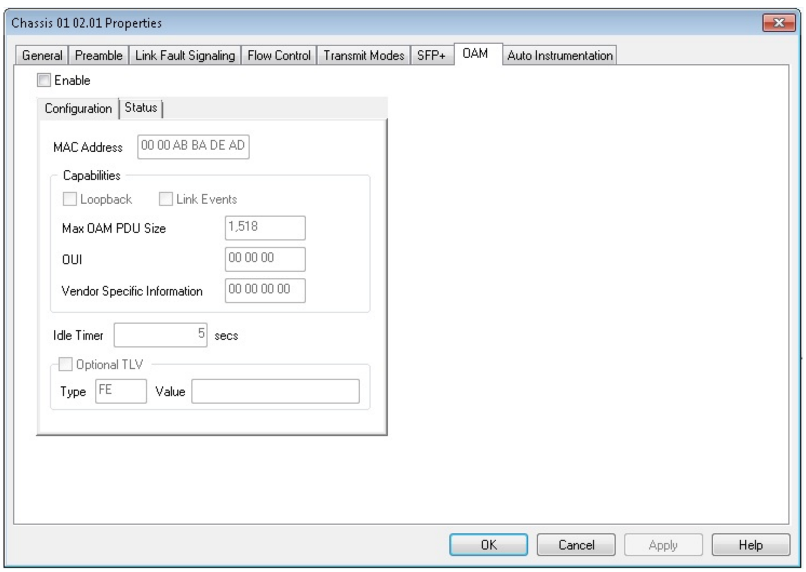
The Novus 10/1 **OAM** tab is accessed by selecting a Novus 10/1 port in the Explore Network Resources pane, selecting the Port Properties menu option, then selecting the **OAM** tab.

The Operations, Administration, and Maintenance (OAM) sublayer provides mechanisms useful for monitoring link operation such as remote fault indication and remote loopback control. In general, OAM provides network operators the ability to monitor the health of the network and quickly determine the location of failing links or fault conditions.

OAM information is conveyed in Slow Protocol frames called OAM Protocol Data Units (OAM PDUs). OAM PDUs contain the appropriate control and status information used to monitor, test and troubleshoot OAM-enabled links.

The Novus 10/1 Port Properties ***OAM*** tab is shown in the following image:

Image: Novus 10/1—**OAM** tab (Configuration)



The fields and controls in this tab are described in the following table:

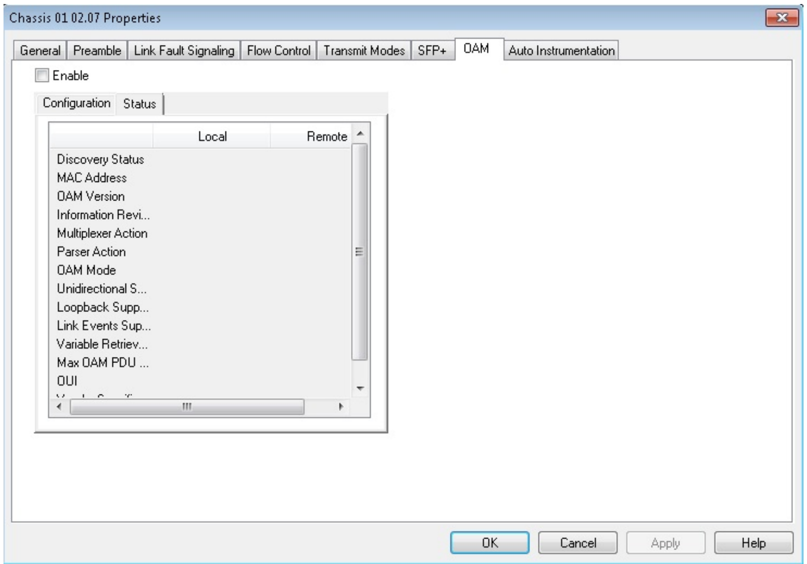
NOTE After making configuration changes, select **Apply** to send the changes to the chassis without leaving the tab. Select **OK** to send changes and close the Properties window.

Table: **OAM** (Configuration) Tab

Field/Control	Description
Enable	Enables and starts OAM state machine configuration.

Field/Control	Description
MAC Address	The individual source MAC address of the Ixia port acting as DTE (through which the OAM PDU is transmitted).
Loopback	Advertises OAM remote loopback capability.
Link Events	Advertises link event capability.
Max OAM PDU Size	11-bit field which represents the largest OAM PDU, in octets, supported by the DTE. This value is compared to the remote's Maximum PDU Size and the smaller of the two is used.
OUI	24-bit 3-octet field, Organizationally Unique Identifier. Example: 00 00 00.
Vendor Specific Information	4-octet field, 32-bit identifier that may be used to differentiate a vendor's product models/versions.
Idle Timer	local_lost_link_timer Timer used to reset the Discovery state. Duration: 5 sec ± 10%.
Type	This is any Information TLV that you want to send. This one-octet field indicates the nature of the data carried in this TLV-tuple. • 0x00 End of TLV marker • 0x01 Local Information • 0x02 Remote Information • 0x03-0xFD Reserved - shall not be transmitted, should be ignored on reception by OAM client • 0xFE Organization Specific Information • 0xFF Reserved - shall not be transmitted, should be ignored on reception by OAM client
Value	This field indicates the value of the Information TLV. This field's length and contents are unspecified.

Image: Novus 10/1—**OAM** tab (Status)



The fields and controls in this tab are described in the following table:

NOTE For each category, there is both a Local and a Remote status indicator.

Table: **OAM** (Status) Tab

Field/Control	Description
Discovery Status	Enables and starts OAM state machine configuration.Detects the presence of an OAM sublayer at the remote DTE.
MAC Address	Defined in Table: OAM Configuration.
OAM Version	This one-octet field indicates the version supported by the DTE. This field always contains the value 0x01.
Information Revision	This two-octet field indicates the current revision of the Information TLV. The value of this field shall start at zero and be incremented each time something in the Information TLV changes.
Multiplexer Action	Forward (0) = Device is forwarding non-OAMPDUs to the lower sublayer (= FWD). Discard (1) = Device is discarding non-OAMPDUs (local_mux_action = DISCARD).
Parser Action	00 = Device is forwarding non-OAMPDUs to higher sublayer (local_par_action = FWD). 01 = Device is looping back non-OAMPDUs to the lower sublayer (local_par_ action = LB). 10 = Device is discarding non-OAMPDUs (local_par_action = DISCARD). 11 = Reserved. In Local Information TLVs, this value shall not be sent.

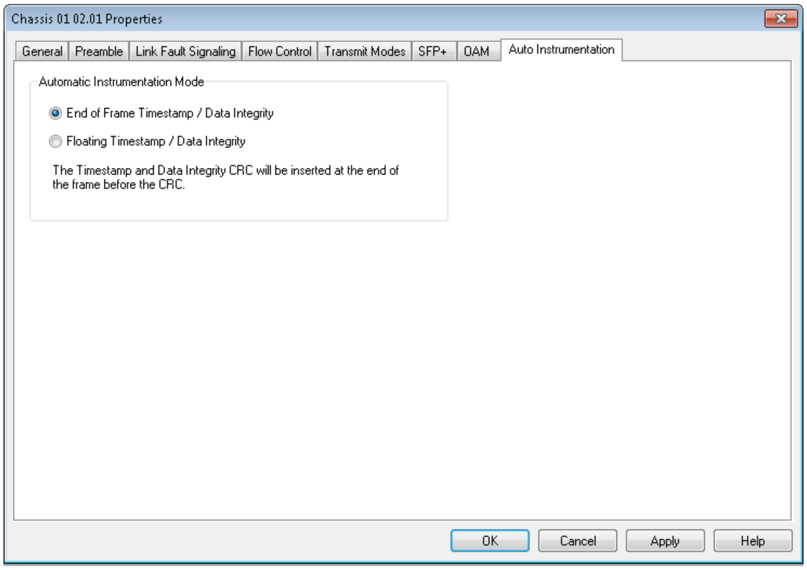
Field/Control	Description
	If the value 11 is received, it should be ignored and not change the last received value.
OAM Mode	1 = DTE configured in Active mode. 0 = DTE configured in Passive mode.
Unidirectional Support	1 = DTE is capable of sending OAMPDUs when the receive path is non-operational. 0 = DTE is not capable of sending OAMPDUs when the receive path is non-operational.
Loopback Support	Advertises OAM remote loopback capability.
Link Events Support	Advertises link event capability.
Variable Retrieval Support	1 = DTE supports sending Variable Response OAMPDUs. 0 = DTE does not support sending Variable Response OAMPDUs.
Max OAM PDU Size	11-bit field which represents the largest OAM PDU, in octets, supported by the DTE. This value is compared to the remote's Maximum PDU Size and the smaller of the two is used.
OUI	24-bit 3-octet field, Organizationally Unique Identifier. Example: 00 00 00.
Vendor Specific Information	4-octet field, 32-bit identifier that may be used to differentiate a vendor's product models/versions.

Novus 10GE/1GE/100M Port Properties—Auto Instrumentation

The Novus Novus 10/1 **Auto Instrumentation** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto Instrumentation** tab.

The Novus 10/1 Port Properties **Auto Instrumentation** tab is shown in the following image:

Image: Novus 10/1—**Auto Instrumentation** tab



The options and controls in this tab are described in the following table:

Table: Auto Instrumentation Configuration

Field/Control	Description
End of Frame Timestamp / Data Integrity	Enables inserting Timestamp and Data Integrity CRC at the end of the frame before the CRC.
Floating Timestamp / Data Integrity	Enables adding timestamp as part of floating instrumentation header, and addresses similar issue in Data Integrity checking.

CHAPTER 27

Port Properties–NOVUS10/1GE32S Load Modules

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the NOVUS10/1GE32S Ethernet load modules.

Port Properties for NOVUS10/1GE32S Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option.

The complete specification for the Novus is found in the *Ixia Platform Reference Manual*.

The following port property tabs are available for the NOVUS10/1GE32S family of load modules:

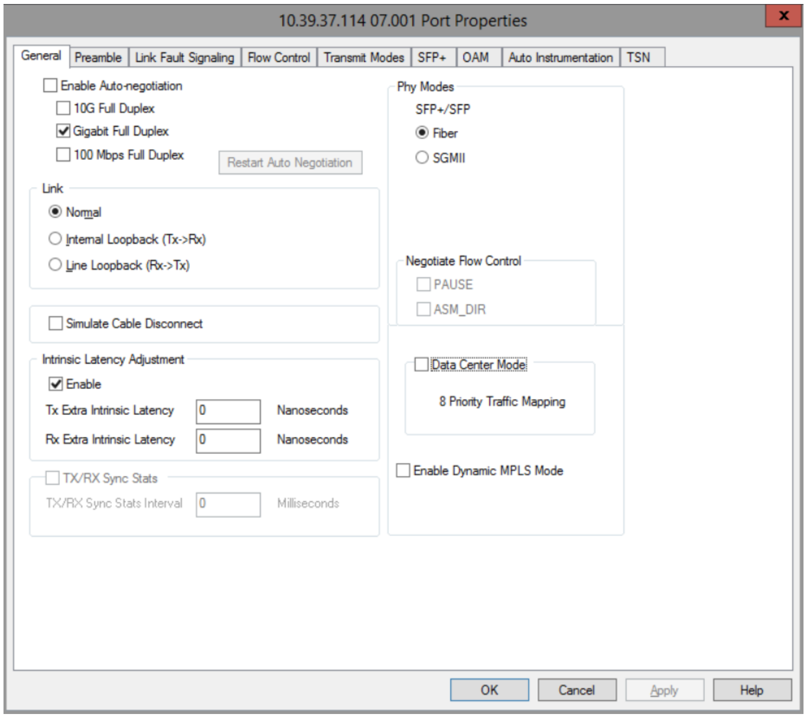
- Novus Port Properties—General
- Novus Port Properties—Preamble
- Novus Port Properties—Link Fault Signaling
- Novus Port Properties—Flow Control
- Novus Port Properties—Transmit Modes
- Novus Port Properties—Auto Instrumentation
- Novus Port Properties—SFP+
- Novus Port Properties—OAM

Novus10/1GE32S Port Properties—General

The NOVUS10/1GE32S **General** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, and then selecting the **General** tab.

The Port Properties **General** tab is shown in the following images:

Image: NOVUS10/1GE32S—**General** tab



The controls for **General** tab configuration are described in the following table:

Table: General Configuration

Section	Control/Field	Usage
Auto-negotation	Enable Auto-negotation	Auto negotiation controls how a port communicates with other ports.If you select the check box, it allows auto-negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing • **Restart Auto Negotiation** button is selected (this does a forced restart). This button restarts the Auto Negotiation sequence. NOTE Both **Enable Auto-negotiation** and **Restart Auto Negotiation** are available for Copper, SGMII, and 1G Fiber modes. If Auto-Negotiation is unavailable for SGMII, you can configure the ports using the following modes : • **Master** - Port is configured as Master • **Slave** - Port is configured as Slave

Section		Control/Field	Usage
		10G Full Duplex	Select the check box to choose the desired port speed.
		Gigabit Full Duplex	Select the check box to choose the desired port speed.
		100 Mbps Full Duplex	Select the check box to choose the desired port speed.
Phy Modes	SFP+/SFP	Fiber	If selected, keeps the port in Fiber mode. NOTE This is the default mode.
		SGMII	If selected, keeps the port in SGMII mode.
Link		Normal	Normal operation
		Internal Loopback (Tx -> Rx)	Internal Loopback—Transmit to Receive.
		Line Loopback (Rx -> Tx)	Enable/disable the Line Loopback—Receive to Transmit. NOTE The **Line Loopback** option is not available for Multis QSFP28 load modules.
Simulate Cable Disconnect			If selected, the port acts as if the cable has been disconnected. If this is selected, the port acts as if the cable has been disconnected. The port will neither transmit nor receive.
Intrinsic Latency Adjustment		Enable	The **Enable** check box is selected by default. This enables the intrinsic latency adjustment. The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia Platform Reference Manual*.
		Tx Extra Intrinsic Latency	The default value is 0. If the value is non-zero, it reduces the measured latency by this value in addition to the intrinsic latency value on the transmitting test equipment port.
		Rx Extra Intrinsic Latency	The default value is 0. If the value is non-zero, it reduces the measured latency by this value in

Section	Control/Field	Usage
		addition to the intrinsic latency value on the receiving test equipment port.
Data Center Mode		See Frame Data for FCoE Support.

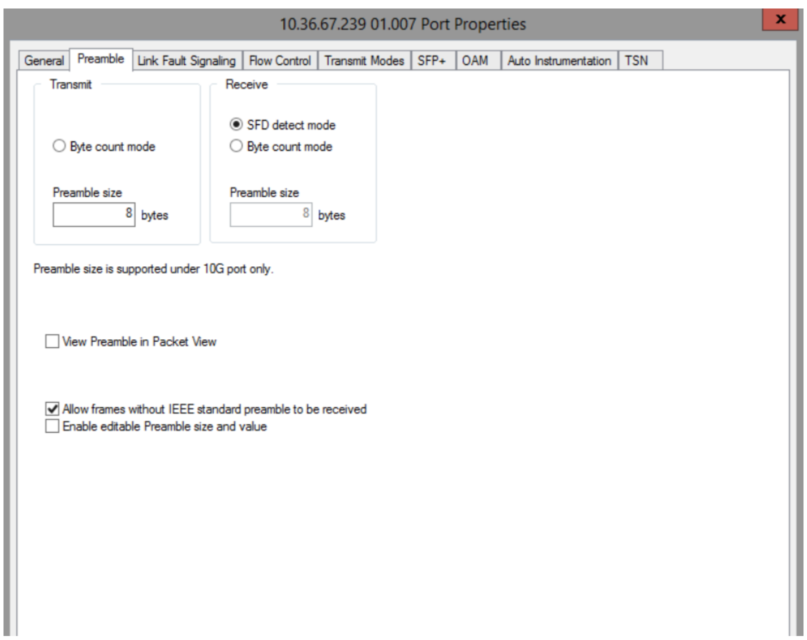
NOVUS10/1GE32S Port Properties—Preamble

The NOVUS10/1GE32S **Preamble** tab allows to select the method for detecting the start of a frame. The preamble precedes the frame, but is not part of the frame itself, so a method must be used to determine the first of the bytes making up the frame itself—SFD detect mode or Byte count mode.

The choice in this tab for transmitted frames is reflected in the **Frame Data** tab in the Stream Properties dialog box. The number of configurable bytes in the preamble depends on the start-of-frame mode.

The NOVUS10/1GE32S Port Properties **Preamble** tab is shown in the following image:

Image: NOVUS10/1GE32S—**Preamble** tab



The fields and controls in this tab are described in the following table:

Table: Preamble Configuration

Section	Choices	Description
Transmit	Byte count mode	This mode counts the bytes of the preamble (8 bytes in this case), and considers the next byte (9th) the first byte of the frame.
	Preamble Size	(Read-only) The length of the preamble, in bytes. This field shows the value set in the **Frame Data** tab in the Stream Properties dialog box. This value is currently fixed at 8 bytes (the default).

Section	Choices	Description
Receive	SFD Detect mode	The Start of Frame Descriptor (SFD) is the last byte in the preamble (the 8th byte, in this case). This mode checks for the first occurrence of the SFD byte. The next byte is considered the start of the frame.
	Byte count mode	This mode counts the bytes of the preamble (8 bytes in this case) and considers the next byte (9th byte) the first byte of the frame.
	Preamble Size	(Read-only) The length of the preamble, in bytes. This field shows the value set in the **Frame Data** tab in the Stream Properties dialog box. This value is currently fixed at 8 bytes (the default).
View Preamble in Packet View		When this check box is selected, the preamble data will be visible in the Packet View (transmit side).
Enable editable Preamble size and value		Select this check box to edit both preamble length and data inside stream properties. Preamble length should be within 5 bytes– 10 bytes. Only last 7 Bytes are editable in preamble data.

NOVUS10/1GE32S Port Properties—Link Fault Signaling

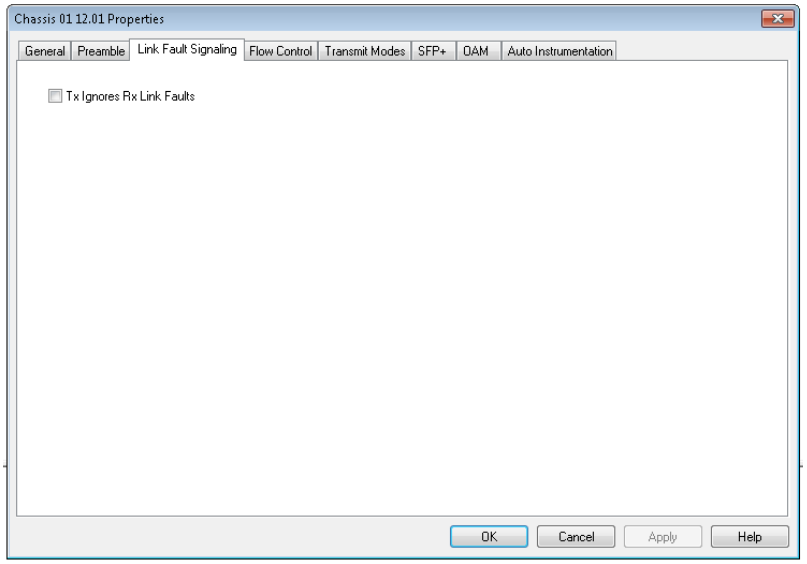
Link Fault Signaling is a simple method to indicate certain types of faults between Ethernet stations. The Reconciliation Sublayer (RS) controls whether the MAC is allowed to transmit. In the typical scenario, the RS that had been receiving the data will receive this Local Fault status, and then send a Remote Fault status to the RS that was sending the data. Upon receipt of this Remote Fault status message, the sending RS will terminate transmission of MAC Data, sending only ‘Idle’ control characters until the link fault is resolved.

In the NOVUS10/1GE32S configuration, you can select the option to have the transmitting RS ignore link faults from the receiving RS.

The **Link Fault Signaling** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Link Fault Signaling*** tab.

The **Link Fault Signaling** tab for NOVUS10/1GE32S load modules is shown in the following image:

Image: NOVUS10/1GE32S—**Link Fault Signaling** tab



The controls for **Link Fault Signaling** tab configuration are described in the following table:

Table: Link Fault Signaling Configuration

Section	Field/Control	Description
Tx ignores Rx Link Faults		If selected, ongoing transmission will continue even if Link Fault messages are received by the sending RS.

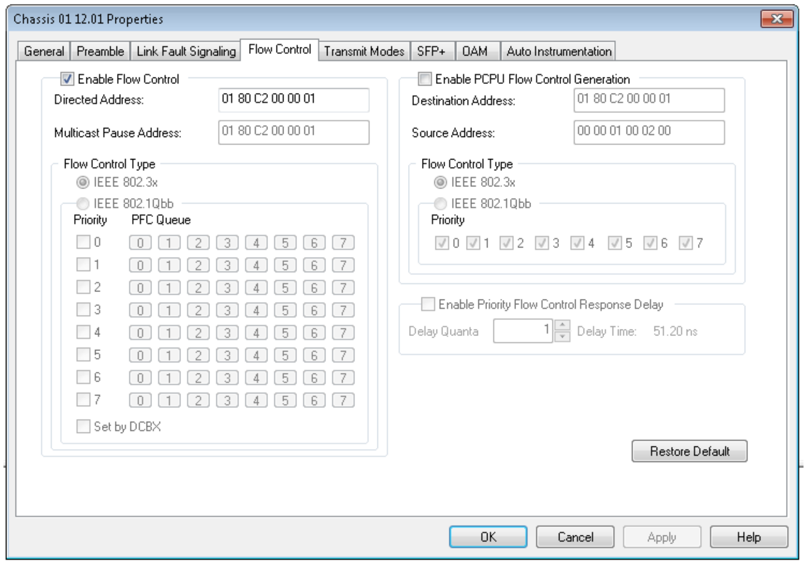
NOVUS10/1GE32S Port Properties—Flow Control

When a port is receiving data at a faster rate than it can handle from another, directly connected port, the receiving port can send a MAC control PAUSE frame to the sending port to temporarily halt transmission of frames. The PAUSE function is defined in IEEE 802.3 and IEEE 802.1Qbb.

The NOVUS10/1GE32S **Flow Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

The NOVUS10/1GE32S **Flow Control** tab is shown in the following image:

Image: NOVUS10/1GE32S **Flow Control** tab



The controls for **Flow Control** tab configuration are described in the following table:

Table: **Flow Control** Tab

Section	Field/Control	Description
Enable Flow Control	(check box)	Enables the port's MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type	IEEE 802.3x or IEEE 802.1Qbb	Priority-based Flow Control. When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame. When not in Data Center mode, only IEEE 802.3x is available.
	Priority	Priority-based Flow Control.
	PFC Queue	Priority-based Flow Control
Enable PCPU Flow Control Generation	(check box)	Enables port CPU flow control generation. When the rate of incoming packets is more than the port CPU can keep up with, a pause packet will be sent to the DUT, causing it to pause transmitting for a fixed interval.
	Destination Address	The DA and SA, taken together, identify the pause packet (to the DUT).

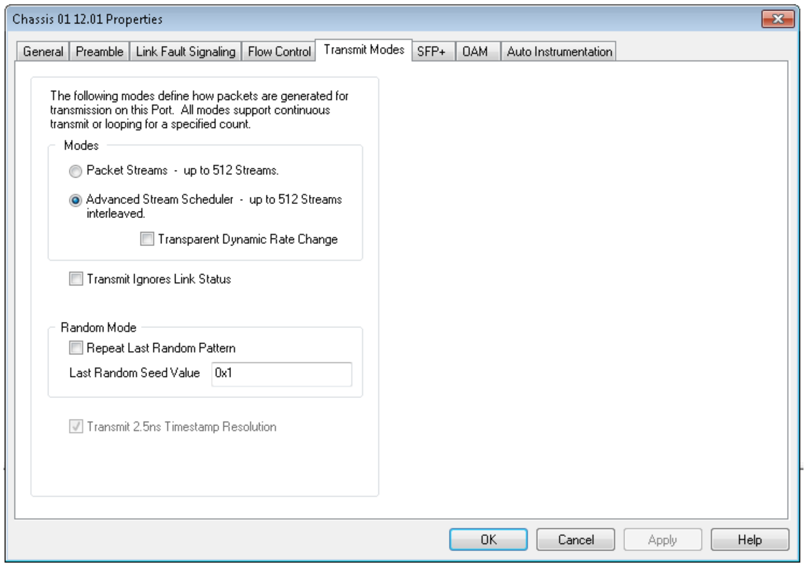
Section	Field/Control	Description
	Source Address	See Destination Address, above.
	Flow Control Type	See Flow Control Type, above.
	Priority	In Data Center mode, when flow control type IEEE 802.1Qbb is selected, these are the channels of data that can be paused. Select to select one or more channels.
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

NOVUS10/1GE32S Port Properties—Transmit Modes

The **Transmit Modes** tab for NOVUS10/1GE32S load modules is shown in the following image. It is accessed by double-clicking a port in Resources window, or by selecting a port and selecting the **Properties** menu option. Then select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following image:

Image: NOVUS10/1GE32S—**Transmit Modes** tab



The controls for **Transmit Modes** tab configuration are described in the following table:

Table: Transmit Modes Configuration

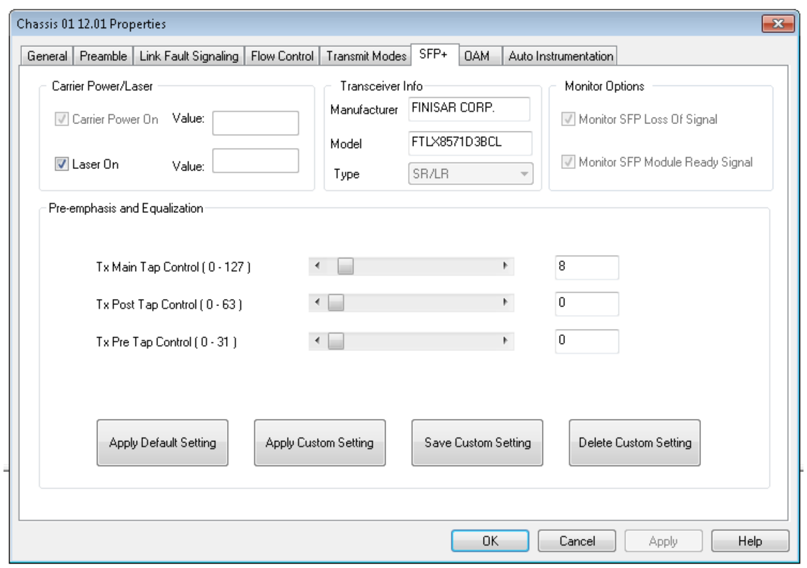
Section	Field/Control	Description
Modes	Packet Streams	Sets the operating mode for the port to sequential packet streams. This allows to configure maximum 512 streams. The maximum number of streams supported in DCM mode is 256. A stream may be programmed for continuous packet generation—generating a continuous, infinite number of packets.
	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure maximum 512 streams. The maximum number of streams supported in DCM mode is 256. They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Transmit Ignores Link Status		If selected, will allow transmission of packets even if the link is down.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream's random seed is used). For more information, see the Repeat Last Random Pattern

Section	Field/Control	Description
		section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit High TimeStamp Resolution		If selected, Novus 10/1 load module will support 2.5 ns Resolution Timestamp on selected modes.

NOVUS10/1GE32S Port Properties—SFP+

This tab is available for NOVUS10/1GE32S load module. The Novus NOVUS10/1GE32S **SFP+ tab** is accessed from the context menu of the NOVUS10/1GE32S port in the **Explore Network Resources** pane, by selecting the **Port Properties** menu option, then selecting the **SFP+** tab.

The Port Properties **SFP+** tabs for NOVUS10/1GE32S are shown in the following images.



Field/Control		Description
Carrier Power/Laser	Carrier Power On	If selected, enables the carrier power. The actual reading appears in the **Value** field.
	Laser On	Select this check box to enable the laser power. Note that the actual reading appears in the **Value** field.

Field/Control		**Description**
Transceiver Info	Manufacturer	Shows the name of the manufacturer.
	Model	Shows the model number.
	Type	Shows the type of the transceiver.
Monitor Options	Monitor SFP Loss of Signal	When selected, indicates the interface will conform to SFP specifications and require the absence of a Loss of Signal for transmitting and receiving.
	Monitor SFP Module Ready Signal	When selected, indicates the interface will conform to SFP specifications and require the detection of a Module Ready signal for transmitting and receiving.
Pre-emphasis and Equalisation	Push to get recommended setting for passive	This will be disabled on Flex.
	Tx Main Tap Control (0-63)	This helps to control the Main Tap Control for Tx.
	Tx Post Tap Control (0-31)	This helps to control the Post Tap value for Tx.
	Tx Pre Tap Control (0-31)	This helps to control the Pre Tap value for Tx.
	Apply Default Settings	If selected, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Settings	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users Select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	If selected, if a custom setting exists in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel that. If no custom setting exists, users will be prompted that nothing will be deleted.

NOVUS10/1GE32S Port Properties—OAM

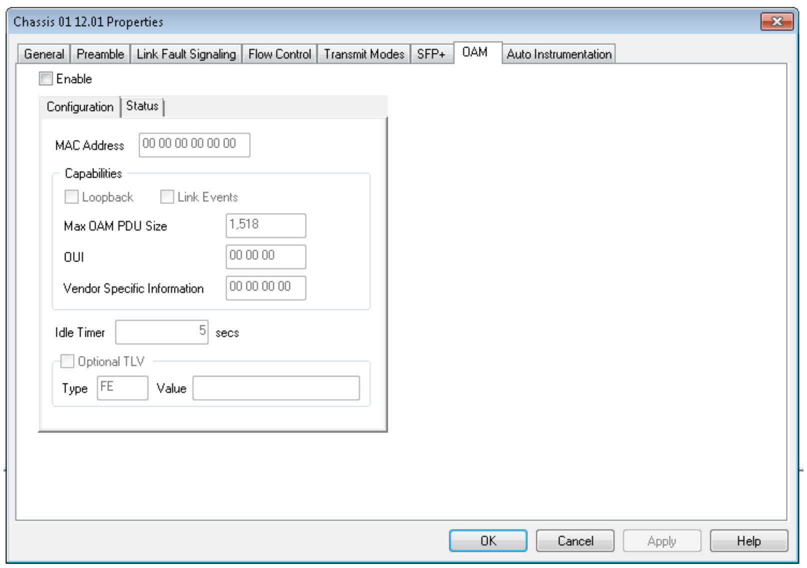
The NOVUS10/1GE32S OAM tab is accessed by selecting a NOVUS10/1GE32S port in the Explore Network Resources pane, selecting the Port Properties menu option, then selecting the **OAM** tab.

The Operations, Administration, and Maintenance (OAM) sublayer provides mechanisms useful for monitoring link operation such as remote fault indication and remote loopback control. In general, OAM provides network operators the ability to monitor the health of the network and quickly determine the location of failing links or fault conditions.

OAM information is conveyed in Slow Protocol frames called OAM Protocol Data Units (OAM PDUs). OAM PDUs contain the appropriate control and status information used to monitor, test and troubleshoot OAM-enabled links.

The NOVUS10/1GE32S Port Properties **OAM** tab is shown in the following image:

Image: NOVUS10/1GE32S—**OAM** tab (Configuration)



The fields and controls in this tab are described in the following table:

NOTE

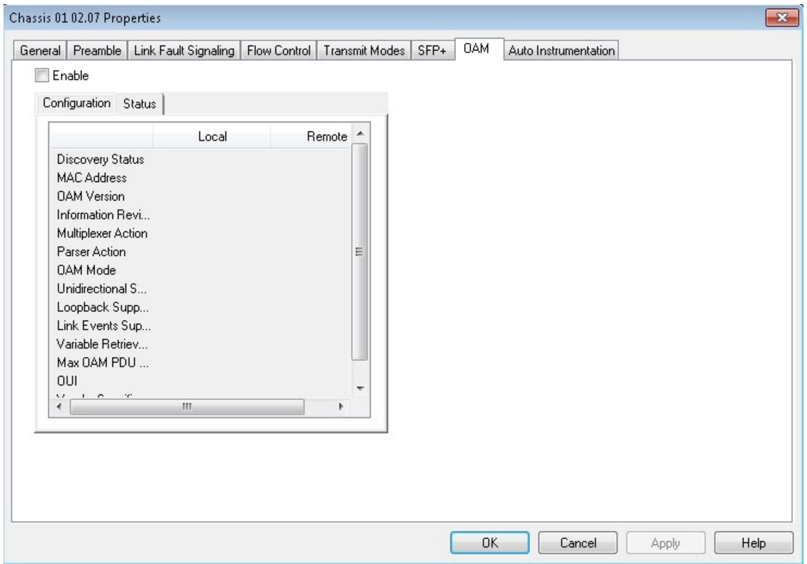
After making configuration changes, select **Apply** to send the changes to the chassis without leaving the tab. Select **OK** to send changes and close the Properties window.

Table: **OAM** (Configuration) Tab

Field/Control	Description
Enable	Enables and starts OAM state machine configuration.
MAC Address	The individual source MAC address of the Ixia port acting as DTE (through which the OAM PDU is transmitted).
Loopback	Advertises OAM remote loopback capability.

<table>
<tr><th>Field/Control</th><th>Description</th></tr>
<tr><td>Link Events</td><td>Advertises link event capability.</td></tr>
<tr><td>Max OAM PDU Size</td><td>11-bit field which represents the largest OAM PDU, in octets, supported by the DTE. This value is compared to the remote’s Maximum PDU Size and the smaller of the two is used.</td></tr>
<tr><td>OUI</td><td>24-bit 3-octet field, Organizationally Unique Identifier. Example: 00 00 00.</td></tr>
<tr><td>Vendor Specific Information</td><td>4-octet field, 32-bit identifier that may be used to differentiate a vendor’s product models/versions.</td></tr>
<tr><td>Idle Timer</td><td>local_lost_link_timer
Timer used to reset the Discovery state.
Duration: 5 sec ± 10%.</td></tr>
<tr><td>Type</td><td>This is any Information TLV that you want to send. This one-octet field indicates the nature of the data carried in this TLV-tuple.
0x00 End of TLV marker
0x01 Local Information
0x02 Remote Information
0x03-0xFD Reserved - shall not be transmitted, should be ignored on reception by OAM client
0xFE Organization Specific Information
0xFF Reserved - shall not be transmitted, should be ignored on reception by OAM client</td></tr>
<tr><td>Value</td><td>This field indicates the value of the Information TLV. This field’s length and contents are unspecified.</td></tr>
</table>

Image: NOVUS10/1GE32S—**OAM** tab (Status)



The fields and controls in this tab are described in the following table:

NOTE For each category, there is both a Local and a Remote status indicator.

Table: **OAM** (Status) Tab

Field/Control	Description
Discovery Status	Enables and starts OAM state machine configuration.Detects the presence of an OAM sublayer at the remote DTE.
MAC Address	Defined in Table: OAM Configuration.
OAM Version	This one-octet field indicates the version supported by the DTE. This field always contains the value 0x01.
Information Revision	This two-octet field indicates the current revision of the Information TLV. The value of this field shall start at zero and be incremented each time something in the Information TLV changes.
Multiplexer Action	Forward (0) = Device is forwarding non-OAMPDUs to the lower sublayer (= FWD). Discard (1) = Device is discarding non-OAMPDUs (local_mux_action = DISCARD).
Parser Action	00 = Device is forwarding non-OAMPDUs to higher sublayer (local_par_action = FWD). 01 = Device is looping back non-OAMPDUs to the lower sublayer (local_par_ action = LB). 10 = Device is discarding non-OAMPDUs (local_par_action = DISCARD). 11 = Reserved. In Local Information TLVs, this value shall not be sent.

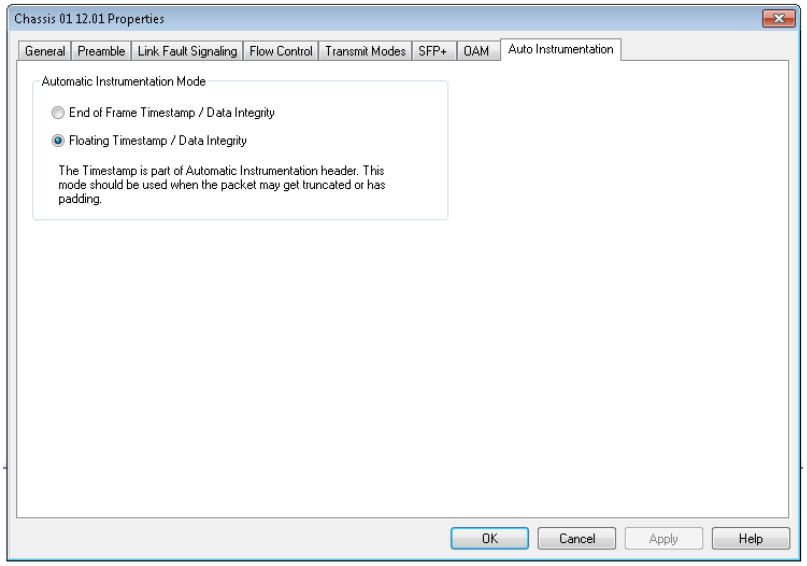
Field/Control	Description
	If the value 11 is received, it should be ignored and not change the last received value.
OAM Mode	1 = DTE configured in Active mode. 0 = DTE configured in Passive mode.
Unidirectional Support	1 = DTE is capable of sending OAMPDUs when the receive path is non-operational. 0 = DTE is not capable of sending OAMPDUs when the receive path is non-operational.
Loopback Support	Advertises OAM remote loopback capability.
Link Events Support	Advertises link event capability.
Variable Retrieval Support	1 = DTE supports sending Variable Response OAMPDUs. 0 = DTE does not support sending Variable Response OAMPDUs.
Max OAM PDU Size	11-bit field which represents the largest OAM PDU, in octets, supported by the DTE. This value is compared to the remote's Maximum PDU Size and the smaller of the two is used.
OUI	24-bit 3-octet field, Organizationally Unique Identifier. Example: 00 00 00.
Vendor Specific Information	4-octet field, 32-bit identifier that may be used to differentiate a vendor's product models/versions.

NOVUS10/1GE32S Port Properties—Auto Instrumentation

The NOVUS10/1GE32S **Auto Instrumentation** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto Instrumentation** tab.

The NOVUS10/1GE32S **Auto Instrumentation** tab is shown in the following image:

Image: NOVUS10/1GE32S—**Auto Instrumentation** tab



The options and controls in this tab are described in the following table:

Table: Auto Instrumentation Configuration

Field/Control	Description
End of Frame Timestamp / Data Integrity	Enables inserting Timestamp and Data Integrity CRC at the end of the frame before the CRC.
Floating Timestamp / Data Integrity	Enables adding timestamp as part of floating instrumentation header, and addresses similar issue in Data Integrity checking.

CHAPTER 28

Port Properties–Novus 10GE/5GE/2.5GE/1GE/100M Ethernet Load Module

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the Novus 10GE/5GE/2.5GE/1GE/100M Ethernet load modules.

Port Properties for Novus 10GE/5GE/2.5GE/1GE/100M Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option.

The complete specification for the Novus is found in the *Ixia Platform Reference Manual*.

The following port property tabs are available for the Novus 10/1 5-speed family of load modules:

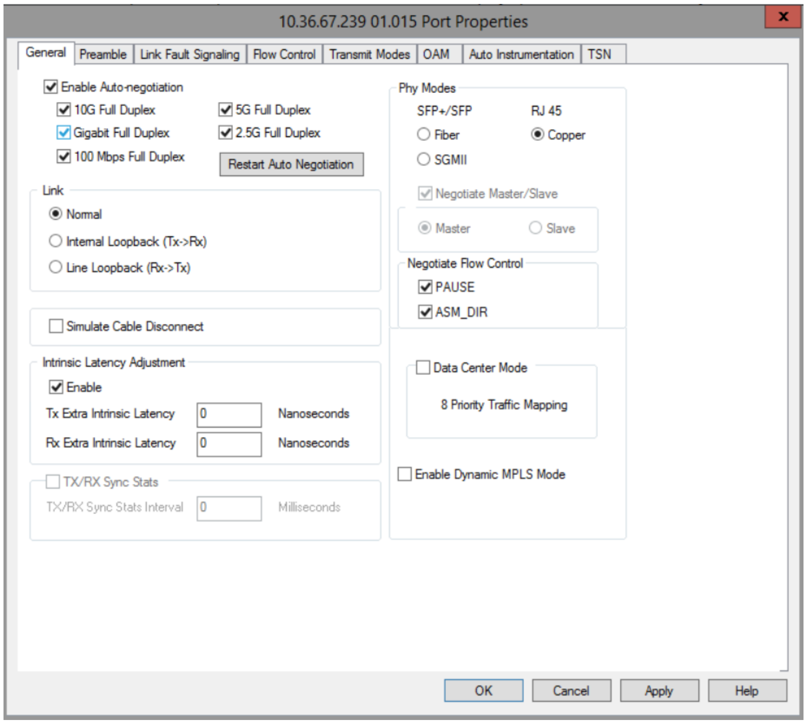
- Novus Port Properties—General
- Novus Port Properties—Preamble
- Novus Port Properties—Link Fault Signaling
- Novus Port Properties—Flow Control
- Novus Port Properties—Transmit Modes
- Novus Port Properties—Auto Instrumentation
- Novus Port Properties—SFP+
- Novus Port Properties—OAM

Novus 10GE/5GE/2.5GE/1GE/100M Port Properties—General

The Novus 10/1 5-speed **General** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, and then selecting the **General** tab.

The Port Properties **General** tab is shown in the following images:

Image: Novus 10/1 5-speed—**General** tab



The controls for **General** tab configuration are described in the following table:

Table: General Configuration

Section	Control/Field	Usage
Auto-negotation	Enable Auto-negotation	Auto negotiation controls how a port communicates with other ports.If you select the check box, it allows auto-negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing • **Restart Auto Negotiation** button is selected (this does a forced restart). This button restarts the Auto Negotiation sequence. NOTE Both **Enable Auto-negotiation** and **Restart Auto Negotiation** are available for Copper, SGMII, and 1G Fiber modes. If Auto-Negotiation is unavailable for SGMII, you can configure the ports using the following modes : • **Master** - Port is configured as Master • **Slave** - Port is configured as Slave If 100Mbps is not available for Copper, you can

Section		Control/Field	Usage
			manually configure the ports using the following modes : • **Master** - Port is configured as Master • **Slave** - Port is configured as Slave
		10G Full Duplex	Select the check box to choose the desired port speed.
		5G Full Duplex	Select the check box to choose the desired port speed.
		2.5G Full Duplex	Select the check box to choose the desired port speed.
		Gigabit Full Duplex	Select the check box to choose the desired port speed.
		100 Mbps Full Duplex	Select the check box to choose the desired port speed.
Phy Modes	SFP+/SFP	Fiber	If selected, keeps the port in Fiber mode. NOTE This is the default mode.
		SGMII	If selected, keeps the port in SGMII mode.
	RJ 45	Copper	If selected, keeps the port in Copper mode.
Negotiate Flow Control		PAUSE	The flow control receive capability is enabled as per IEEE 802.3 guidance, in conjunction with ASM_DIR.
		ASM_DIR	The flow control receive capability is enabled as per IEEE 802.3 guidance, in conjunction with Pause.
Link		Normal	Normal operation
		Internal Loopback (Tx -> Rx)	Internal Loopback—Transmit to Receive.
		Line Loopback (Rx -> Tx)	Enable/disable the Line Loopback—Receive to Transmit. NOTE The **Line Loopback** option is not available for Multis QSFP28 load modules.
Simulate Cable Disconnect			If this is selected, the port acts as if the cable has been disconnected. The port will neither transmit nor receive.

Section	Control/Field	Usage
		NOTE Available for both Copper and Fiber modes.
Intrinsic Latency Adjustment	Enable	The **Enable** check box is selected by default. This enables the intrinsic latency adjustment. The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia Platform Reference Manual*.
	Tx Extra Intrinsic Latency	The default value is 0. If the value is non-zero, it reduces the measured latency by this value in addition to the intrinsic latency value on the transmitting test equipment port.
	Rx Extra Intrinsic Latency	The default value is 0. If the value is non-zero, it reduces the measured latency by this value in addition to the intrinsic latency value on the receiving test equipment port.
Data Center Mode		See Frame Data for FCoE Support.

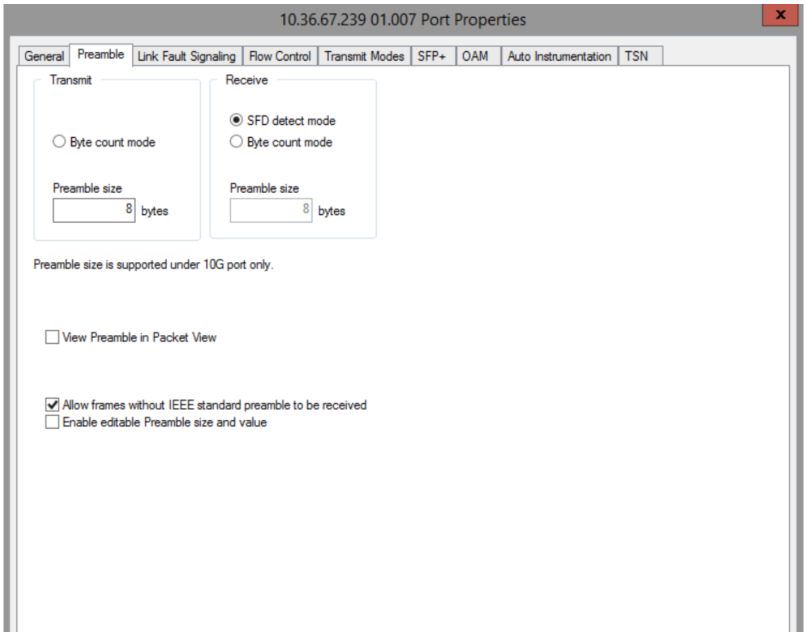
Novus 10GE/5GE/2.5GE/1GE/100M Port Properties—Preamble

The Novus 10/1 5-speed **Preamble** tab allows to select the method for detecting the start of a frame. The preamble precedes the frame, but is not part of the frame itself, so a method must be used to determine the first of the bytes making up the frame itself —SFD detect mode or Byte count mode.

The choice in this tab for transmitted frames is reflected in the **Frame Data** tab in the Stream Properties dialog box. The number of configurable bytes in the preamble depends on the start-of-frame mode.

The Novus 10/1 5-speed Port Properties **Preamble** tab is shown in the following image:

Image: Novus 10/1 5-Speed—**Preamble** tab



The fields and controls in this tab are described in the following table:

Table: Preamble Configuration

Section	Choices	Description
Transmit	Byte count mode	This mode counts the bytes of the preamble (8 bytes in this case), and considers the next byte (9th) the first byte of the frame.
	Preamble Size	(Read-only) The length of the preamble, in bytes. This field shows the value set in the **Frame Data** tab in the Stream Properties dialog box. This value is currently fixed at 8 bytes (the default).
Receive	Byte count mode	This mode counts the bytes of the preamble (8 bytes in this case) and considers the next byte (9th byte) the first byte of the frame.
	Preamble Size	(Read-only) The length of the preamble, in bytes. This field shows the value set in the **Frame Data** tab in the Stream Properties dialog box. This value is currently fixed at 8 bytes (the default).
View Preamble in Packet View		When this check box is selected, the preamble data will be visible in the Packet View (transmit side).

Novus 10GE/5GE/2.5GE/1GE/100M Port Properties—Link Fault Signaling

Link Fault Signaling is a simple method to indicate certain types of faults between Ethernet stations. The Reconciliation Sublayer (RS) controls whether the MAC is allowed to transmit. In the typical scenario, the RS that had been receiving the data will receive this Local Fault status, and then send a

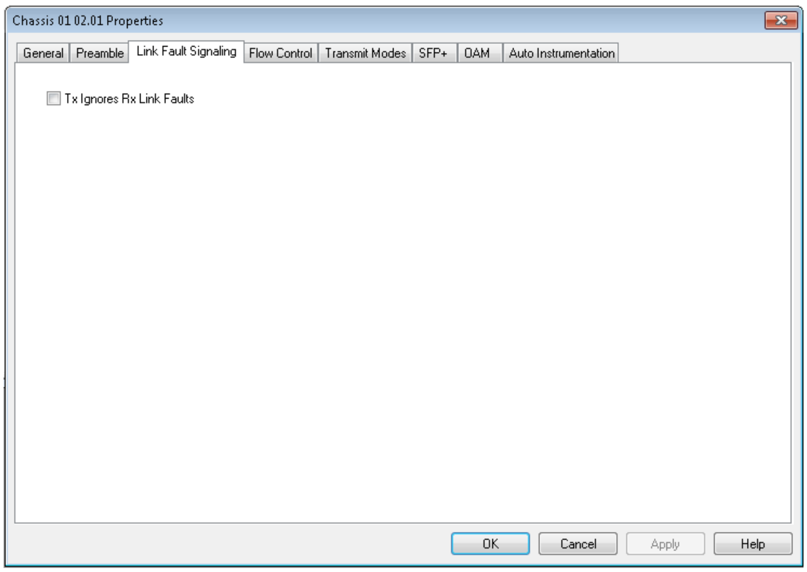
Remote Fault status to the RS that was sending the data. Upon receipt of this Remote Fault status message, the sending RS will terminate transmission of MAC Data, sending only 'Idle' control characters until the link fault is resolved.

In the Novus 10/1 5-speed configuration, you can select the option to have the transmitting RS ignore link faults from the receiving RS.

The **Link Fault Signaling** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Link Fault Signaling*** tab.

The ***Link Fault Signaling*** tab for Novus 10/15-speed load modules is shown in the following image:

Image: Novus 10/1 5-speed—**Link Fault Signaling** tab



The controls for **Link Fault Signaling** tab configuration are described in the following table:

Table: Link Fault Signaling Configuration

Section	Field/Control	Description
Tx ignores Rx Link Faults		If selected, ongoing transmission will continue even if Link Fault messages are received by the sending RS.

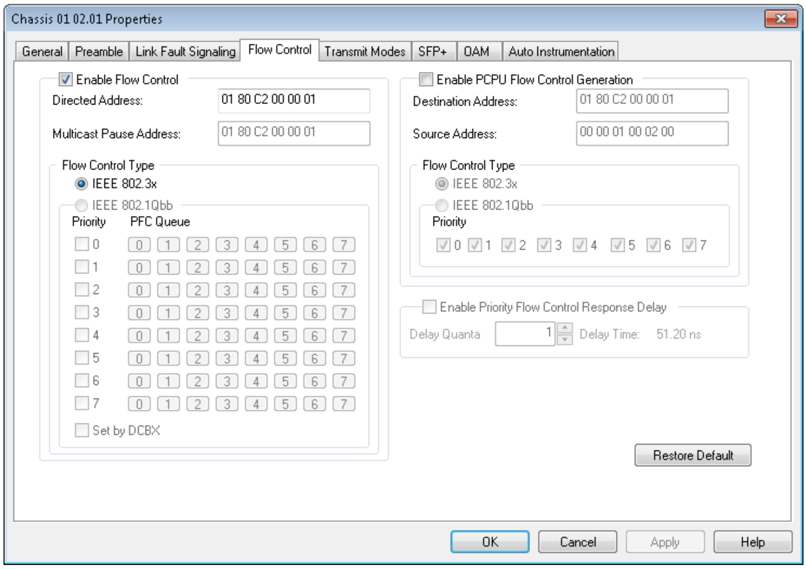
Novus 10GE/5GE/2.5GE/1GE/100M Port Properties—Flow Control

When a port is receiving data at a faster rate than it can handle from another, directly connected port, the receiving port can send a MAC control PAUSE frame to the sending port to temporarily halt transmission of frames. The PAUSE function is defined in IEEE 802.3 and IEEE 802.1Qbb.

The Novus 10/1 5-speed **Flow Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

The Novus 10/1 5-speed Port Properties **Flow Control** tab is shown in the following image:

Image: Novus 10/1 5-Speed **Flow Control** tab



The controls for **Flow Control** tab configuration are described in the following table:

Table: **Flow Control** Tab

Section	Field/Control	Description
Force Enable Flow Control	(check box)	This option ignores Auto-negotiation result and always enable flow control receive on the port. Enables the port's MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type	IEEE 802.3x or IEEE 802.1Qbb	Priority-based Flow Control. When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame. When not in Data Center mode, only IEEE 802.3x is available.
	Priority	Priority-based Flow Control.
	PFC Queue	Priority-based Flow Control
Enable PCPU Flow Control Generation	(check box)	Enables port CPU flow control generation. When the rate of incoming packets is more than the port CPU can keep up with, a pause packet will be sent to the DUT, causing it to pause transmitting for a fixed interval.
	Destination Address	The DA and SA, taken together, identify the pause packet (to the DUT).

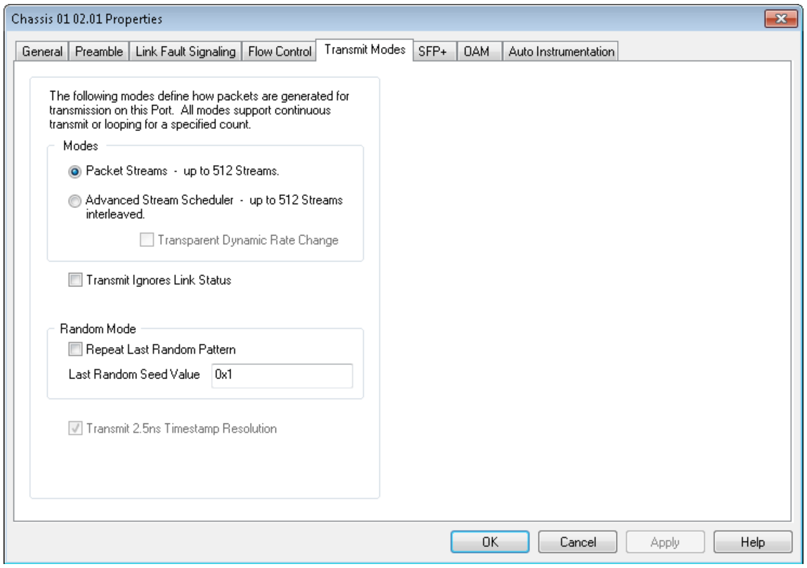
Section	Field/Control	Description
	Source Address	See Destination Address, above.
	Flow Control Type	See Flow Control Type, above.
	Priority	In Data Center mode, when flow control type IEEE 802.1Qbb is selected, these are the channels of data that can be paused. Select one or more channels.
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

Novus 10GE/5GE/2.5GE/1GE/100M Port Properties—Transmit Modes

The **Transmit Modes** tab for Novus 10/1 5-speed load modules is shown in the following image. It is accessed by double-clicking a port in Resources window, or by selecting a port and selecting the **Properties** menu option. Then select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following image:

Image: Novus 10/1 5-Speed—**Transmit Modes** tab



The controls for **Transmit Modes** tab configuration are described in the following table:

Table: Transmit Modes Configuration

Section	Field/Control	Description
Modes	Packet Streams	Sets the operating mode for the port to sequential packet streams. This allows to configure maximum 512 streams. The maximum number of streams supported in DCM mode is 256. A stream may be programmed for continuous packet generation—generating a continuous, infinite number of packets.
	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure maximum 512 streams. The maximum number of streams supported in DCM mode is 256. They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Transmit Ignores Link Status		If selected, will allow transmission of packets even if the link is down.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream's random seed is used). For more information, see the Repeat Last Random Pattern

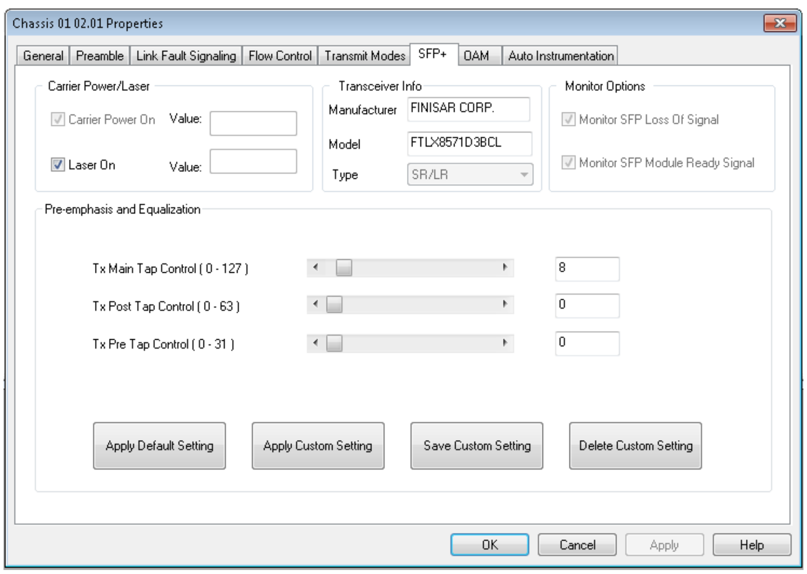
Section	Field/Control	Description
		section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit High TimeStamp Resolution		If selected, Novus 10/1 load module will support 2.5 ns Resolution Timestamp on selected modes.

Novus 10GE/5GE/2.5GE/1GE/100M Port Properties—SFP+

This tab is available for Novus 10/1 5-speed load module. The Novus 10/1 **SFP+** tab is accessed from the context menu of the Novus 10/1 5-speed port in the **Explore Network Resources** pane, by selecting the **Port Properties** menu option, then selecting the **SFP+** tab.

NOTE This tab is available for Fiber mode only.

The Port Properties **SFP+** tabs for Novus 10/1 5-speed are shown in the following images.



Section	Field/Control	Description
Carrier Power/Laser	Carrier Power On	If selected, enables the carrier power. The actual reading appears in the **Value** field.
	Laser On	Select this check box to enable the laser power. Note that the actual reading appears in the **Value** field.

Section	Field/Control	Description
Transceiver Info	Manufacturer	Shows the name of the manufacturer.
	Model	Shows the model number.
	Type	Shows the type of the transceiver.
Monitor Options	Monitor SFP Loss of Signal	When selected, indicates the interface will conform to SFP specifications and require the absence of a Loss of Signal for transmitting and receiving.
	Monitor SFP Module Ready Signal	When selected, indicates the interface will conform to SFP specifications and require the detection of a Module Ready signal for transmitting and receiving.
Pre-emphasis and Equalization	Push to get recommended setting for passive	This will be disabled on Flex.
	Tx Main Tap Control (0-63)	This helps to control the Main Tap Control for Tx.
	Tx Post Tap Control (0-31)	This helps to control the Post Tap value for Tx.
	Tx Pre Tap Control (0-31)	This helps to control the Pre Tap value for Tx.
	Apply Default Settings	If selected, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Settings	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	If selected, if a custom setting exists in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel that. If no custom setting exists, users will be prompted that nothing will be deleted.

Novus 10GE/5GE/2.5GE/1GE/100M Port Properties—OAM

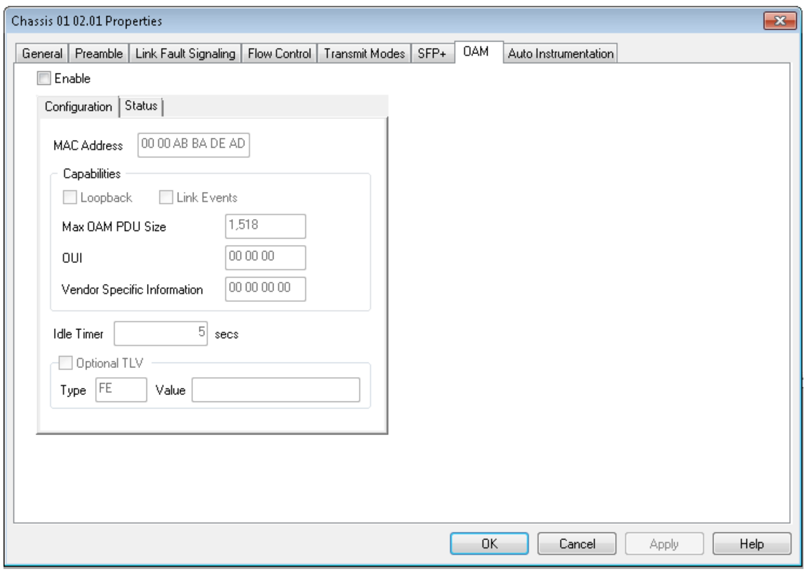
The Novus 10/1 5-speed **OAM** tab is accessed by selecting a Novus 10/1 5-speed port in the Explore Network Resources pane, selecting the Port Properties menu option, then selecting the **OAM** tab.

The Operations, Administration, and Maintenance (OAM) sublayer provides mechanisms useful for monitoring link operation such as remote fault indication and remote loopback control. In general, OAM provides network operators the ability to monitor the health of the network and quickly determine the location of failing links or fault conditions.

OAM information is conveyed in Slow Protocol frames called OAM Protocol Data Units (OAM PDUs). OAM PDUs contain the appropriate control and status information used to monitor, test and troubleshoot OAM-enabled links.

The Novus 10/1 5-speed Port Properties ***OAM*** tab is shown in the following image:

Image: Novus 10/1 5-Speed—**OAM** tab (Configuration)



The fields and controls in this tab are described in the following table:

NOTE

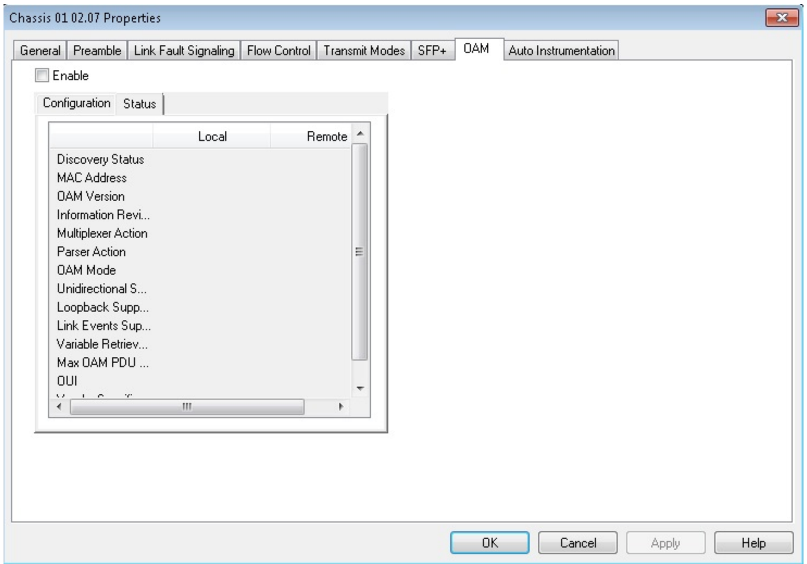
After making configuration changes, select **Apply** to send the changes to the chassis without leaving the tab. Select **OK** to send changes and close the Properties window.

Table: **OAM** (Configuration) Tab

Field/Control	Description
Enable	Enables and starts OAM state machine configuration.
MAC Address	The individual source MAC address of the Ixia port acting as DTE (through which the OAM PDU is transmitted).

Field/Control	Description
Loopback	Advertises OAM remote loopback capability.
Link Events	Advertises link event capability.
Max OAM PDU Size	11-bit field which represents the largest OAM PDU, in octets, supported by the DTE. This value is compared to the remote's Maximum PDU Size and the smaller of the two is used.
OUI	24-bit 3-octet field, Organizationally Unique Identifier. Example: 00 00 00.
Vendor Specific Information	4-octet field, 32-bit identifier that may be used to differentiate a vendor's product models/versions.
Idle Timer	local_lost_link_timer Timer used to reset the Discovery state. Duration: 5 sec ± 10%.
Type	This is any Information TLV that you want to send. This one-octet field indicates the nature of the data carried in this TLV-tuple. • 0x00 End of TLV marker • 0x01 Local Information • 0x02 Remote Information • 0x03-0xFD Reserved - shall not be transmitted, should be ignored on reception by OAM client • 0xFE Organization Specific Information • 0xFF Reserved - shall not be transmitted, should be ignored on reception by OAM client
Value	This field indicates the value of the Information TLV. This field's length and contents are unspecified.

Image: Novus 10/1 5-Speed—**OAM** tab (Status)



The fields and controls in this tab are described in the following table:

NOTE For each category, there is both a Local and a Remote status indicator.

Table: **OAM** (Status) Tab

Field/Control	Description
Discovery Status	Enables and starts OAM state machine configuration. Detects the presence of an OAM sublayer at the remote DTE.
MAC Address	Defined in Table: OAM Configuration.
OAM Version	This one-octet field indicates the version supported by the DTE. This field always contains the value 0x01.
Information Revision	This two-octet field indicates the current revision of the Information TLV. The value of this field shall start at zero and be incremented each time something in the Information TLV changes.
Multiplexer Action	Forward (0) = Device is forwarding non-OAMPDUs to the lower sublayer (= FWD). Discard (1) = Device is discarding non-OAMPDUs (local_mux_action = DISCARD).
Parser Action	00 = Device is forwarding non-OAMPDUs to higher sublayer (local_par_action = FWD). 01 = Device is looping back non-OAMPDUs to the lower sublayer (local_par_ action = LB). 10 = Device is discarding non-OAMPDUs (local_par_action = DISCARD). 11 = Reserved. In Local Information TLVs, this value shall not be sent.

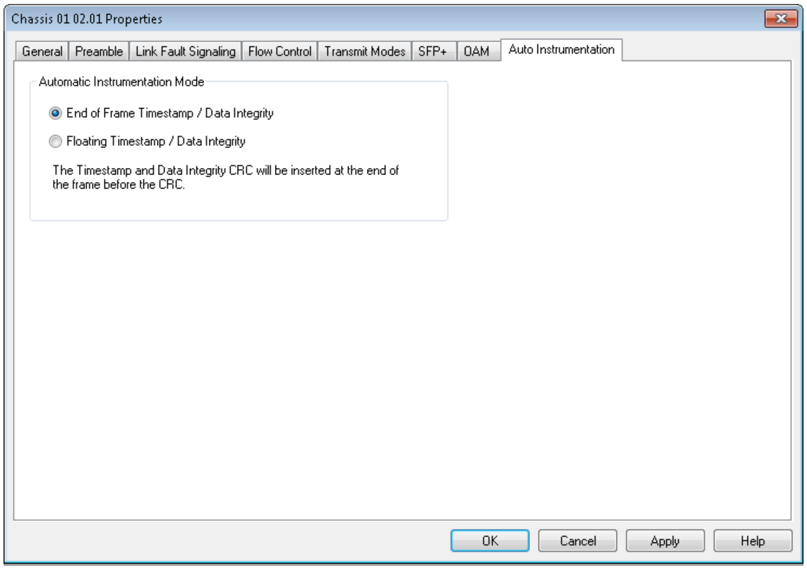
Field/Control	Description
	If the value 11 is received, it should be ignored and not change the last received value.
OAM Mode	1 = DTE configured in Active mode. 0 = DTE configured in Passive mode.
Unidirectional Support	1 = DTE is capable of sending OAMPDUs when the receive path is non-operational. 0 = DTE is not capable of sending OAMPDUs when the receive path is non-operational.
Loopback Support	Advertises OAM remote loopback capability.
Link Events Support	Advertises link event capability.
Variable Retrieval Support	1 = DTE supports sending Variable Response OAMPDUs. 0 = DTE does not support sending Variable Response OAMPDUs.
Max OAM PDU Size	11-bit field which represents the largest OAM PDU, in octets, supported by the DTE. This value is compared to the remote's Maximum PDU Size and the smaller of the two is used.
OUI	24-bit 3-octet field, Organizationally Unique Identifier. Example: 00 00 00.
Vendor Specific Information	4-octet field, 32-bit identifier that may be used to differentiate a vendor's product models/versions.

Novus 10GE/5GE/2.5GE/1GE/100M Port Properties—Auto Instrumentation

The Novus Novus 10/1 5-speed **Auto Instrumentation** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto Instrumentation** tab.

The Novus 10/1 5-speed Port Properties **Auto Instrumentation** tab is shown in the following image:

Image: Novus 10/1 5-speed —**Auto Instrumentation** tab



The options and controls in this tab are described in the following table:

Table: Auto Instrumentation Configuration

Field/Control	Description
End of Frame Timestamp / Data Integrity	Enables inserting Timestamp and Data Integrity CRC at the end of the frame before the CRC.
Floating Timestamp / Data Integrity	Enables adding timestamp as part of floating instrumentation header, and addresses similar issue in Data Integrity checking.

CHAPTER 29

Port Properties–Novus25/10GE8SFP28 Load Modules

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the Novus25/10GE8SFP28 load modules.

Port Properties for Novus25/10GE8SFP28 Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option.

The complete specification for the Novus25/10GE8SFP28 load module is found in the *Ixia Platform Reference Manual*.

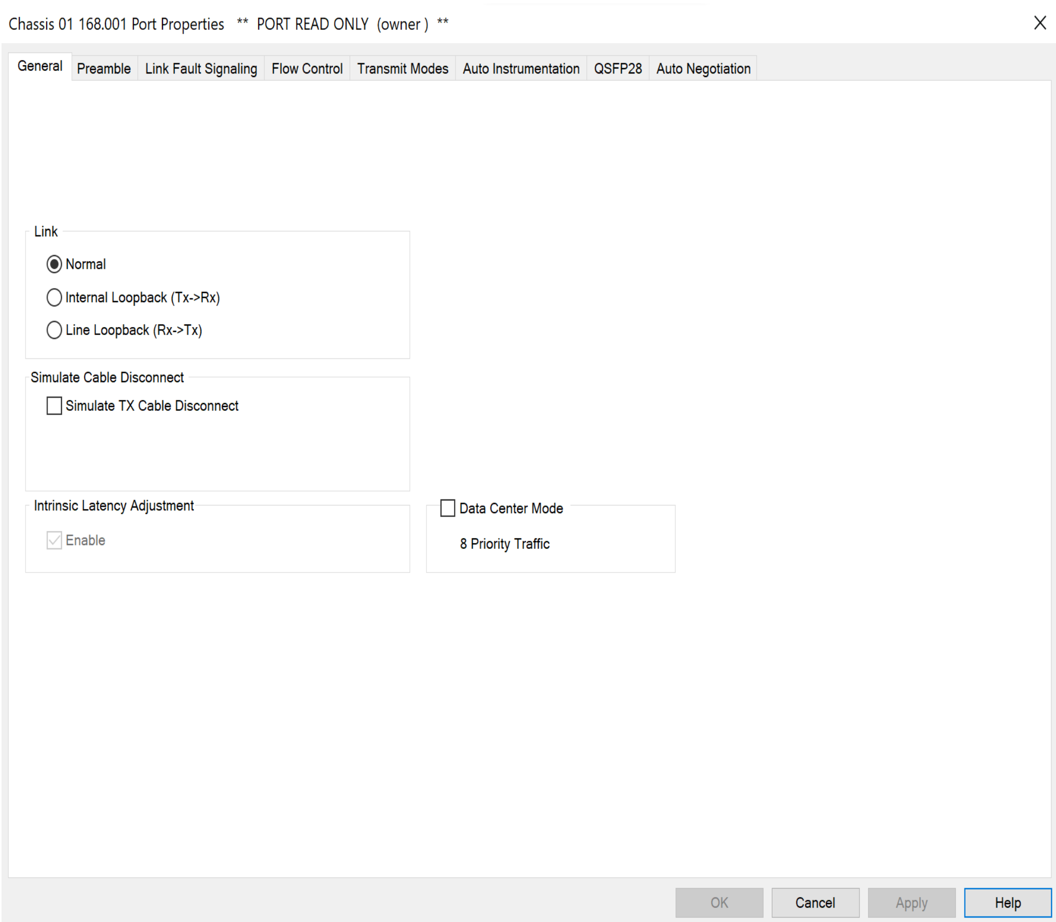
The following port property tabs are available for Novus25/10GE8SFP28 modules:

- Novus25/10GE8SFP28 Port Properties —General
- Novus25/10GE8SFP28 Port Properties—Preamble
- Novus25/10GE8SFP28 Port Properties—Link Fault Signaling
- Novus25/10GE8SFP28 Port Properties—Flow Control
- Novus25/10GE8SFP28 Port Properties—Transmit Modes
- Novus25/10GE8SFP28 Port Properties—Auto Instrumentation
- Novus25/10GE8SFP28 Port Properties—QSFP28
- Novus25/10GE8SFP28 Port Properties—Auto Negotiation

NOVUS25/10GE8SFP28 Port Properties—General

The NOVUS25/10GE8SFP28 **General** tab is accessed from the context menu of the port in the **Explore Network Resources** pane. Select the **Port Properties** menu option, and then select the **General** tab.

The Port Properties **General** tab for NOVUS25/10GE8SFP28 is shown in the following image.



The controls for **General** tab configuration are described in the following table.

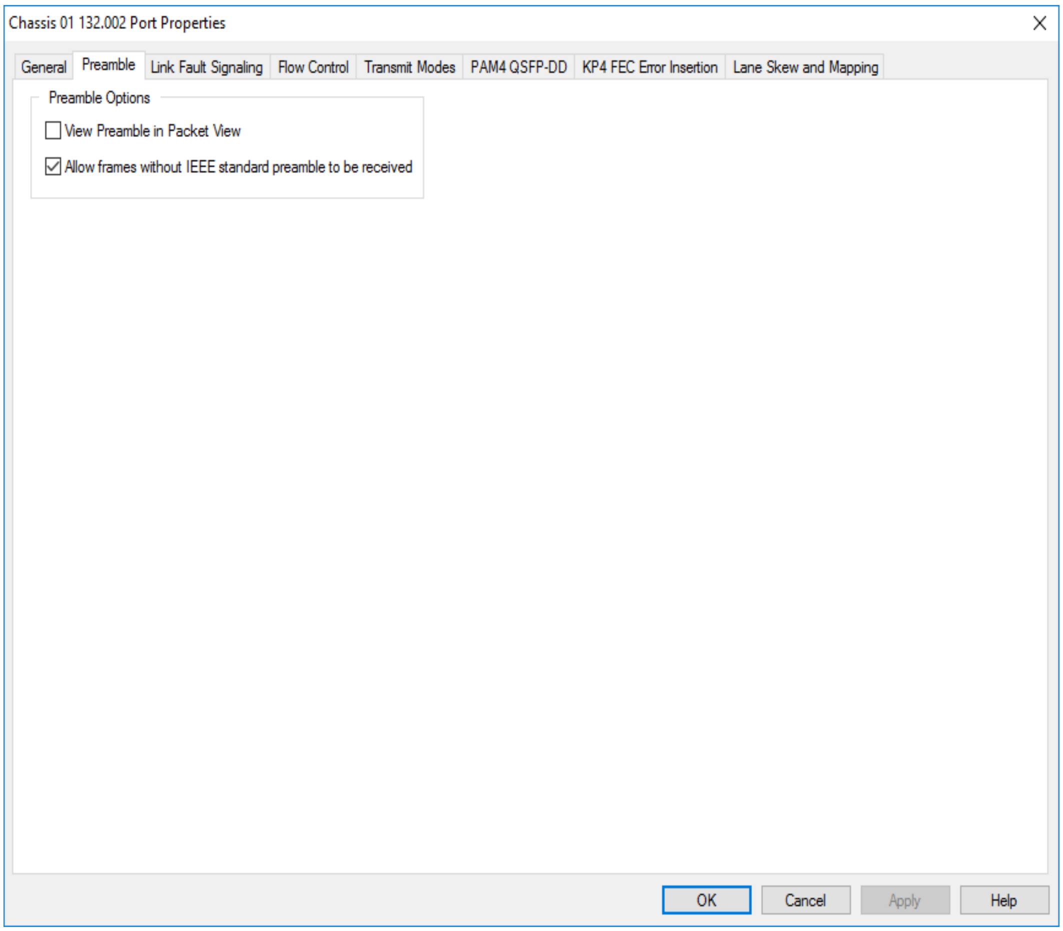
Section	Control/Field	Usage
Link	Normal	Normal operation
	Internal Loopback (Tx -> Rx)	Internal Loopback—Transmit to Receive.
	Line Loopback (Rx -> Tx)	Check this box to enable/turn on the Line Loopback–Receive to Transmit.
Simulate Cable Disconnect	Simulate Tx Cable Disconnect	If this is selected, the port acts as if the cable has been disconnected on the transmit side only. Incoming packets may still be received and port may show link up, but no packets or PCS data will be transmitted.
Intrinsic Latency Adjustment	Enable	The **Enable** check box is selected by default. This enables the intrinsic latency adjustment. The **Enable** check box is dimmed when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file).

Section	Control/Field	Usage
		For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia Platform Reference Manual*.
Data Center Mode	8 Priority Traffic Mapping	See Frame Data for FCoE Support.

NOVUS25/10GE8SFP28 Port Properties—Preamble

The preamble precedes the frame, but is not part of the frame itself.

The NOVUS25/10GE8SFP28 Port Properties **Preamble** tab is shown in the following image:



The fields and controls in this tab are described in the following table:

Section	Choices	Description
Preamble Options	View Preamble in Packet View	When this check box is selected, the preamble data will be visible in the Packet View (transmit side) and the

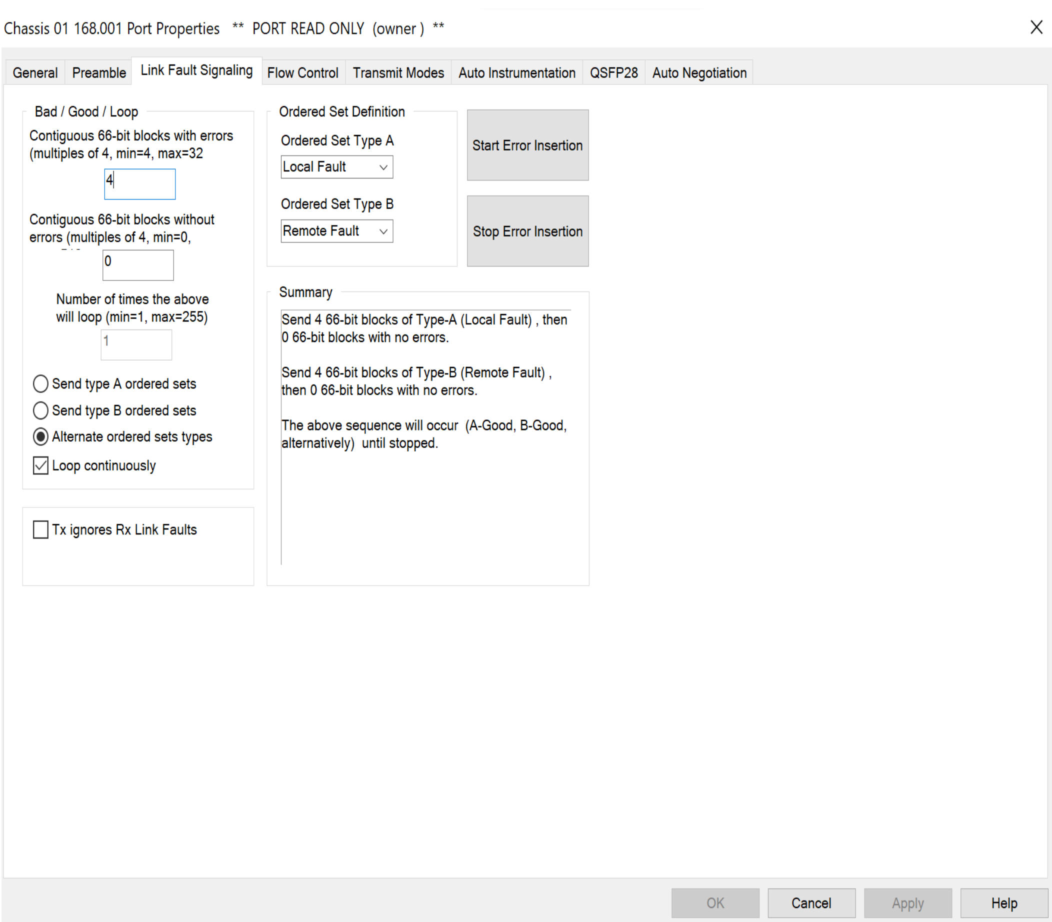
Section	Choices	Description
		Capture View (receive side).
	Allow frames without IEEE standard preamble to be received	When this check box is selected, it allows frames without IEEE standard preamble to be received.

NOVUS25/10GE8SFP28 Port Properties—Link Fault Signaling

When Link Fault Signaling is enabled, four statistics will be added to the list in Statistic View for the port. One is for monitoring the Link Fault State. Two provide a count of the Local Faults and Remote Faults. The last one is for indicating the state of error insertion, whether or not it is ongoing.

The **Link Fault Signaling** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Link Fault Signaling*** tab.

The ***Link Fault Signaling*** tab for NOVUS25/10GE8SFP28 load module is shown in the following image:



The controls for **Link Fault Signaling** tab configuration are described in the following table:

Section	**Field/Control**	**Description**
Bad/Good/Loop	(Bad) Contiguous 66-bit blocks with errors (multiples of 4; min = 4, max = 32)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks with errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive fault sequences allowed are minimum 4 sequences and maximum 32 sequences.
	(Good) Contiguous 66-bit blocks without errors (multiples of 4; min = 0, max = 512)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks without errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive regular data sequences allowed are minimum 0 sequences and maximum 512 sequences.
	Number of times the above will loop (min = 1, max = 255)	Specifies the number of loops for the user defined sequence. There are two modes: • Discrete iterations: i) Minimum of 1 iteration ii) Maximum of 255 iterations • Continuous loop i) User cannot specify number of iterations
	Choose one of: • Send type A ordered sets • Send type B ordered sets • Alternate ordered set types	Defines the ordered set pattern that will be sent. (The two Ordered Sets—A and B—are defined in the *Ordered Set Definition* box in this tab.) This pattern will be combined with the Good blocks/Bad blocks pattern for transmission. • Only Type A fault sequence and regular good data sequences • Only Type B fault sequence and regular good data sequences • Alternate Type A, regular good data sequences and Type B fault sequence, regular good data sequences

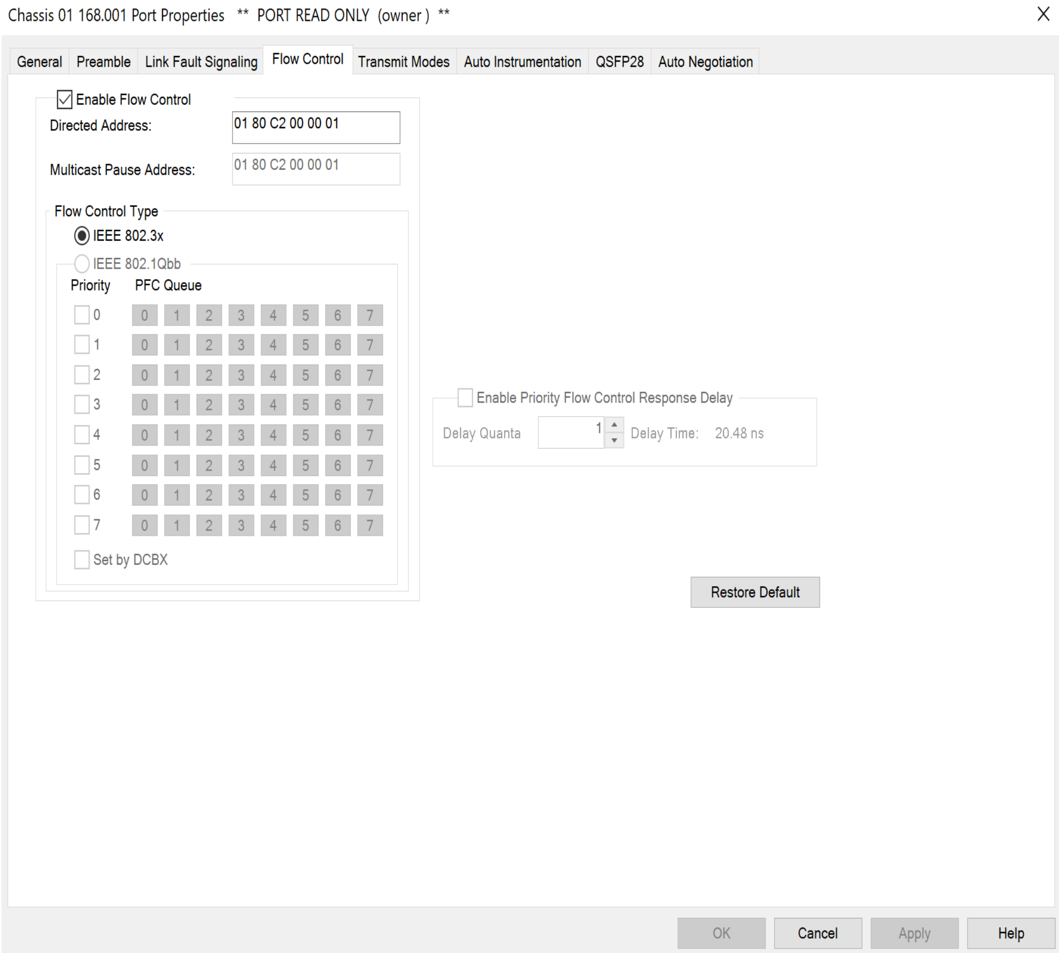
Section	Field/Control	Description
		NOTE If this field is available, and the Alternate ordered set types option is selected, the minimum value for this field should be '2,' to allow the entire pattern to be sent once. If left at the minimum value of '1'— only two groups of blocks (one of good blocks and one of bad blocks) will be sent, which means that only the first ordered set will be sent. A minimum of eight blocks is required for one complete pattern including Types A and B.
	Loop continuously	If selected, the loop defined by the combination of the Bad and Good blocks plus the pattern of ordered sets, will be transmitted continuously until the *Stop Error Insertion* button is selected.
Ordered Set Definition	Ordered Set Type A	Choose one of: • Local Fault • Remote Fault
	Ordered Set Type B	Choose one of: • Local Fault • Remote Fault
Tx ignores Rx Link Faults		If selected, ongoing transmission will continue even if Link Fault messages are received by the sending RS.
Summary (Window)		(Read-only) Shows descriptions of the patterns that will be transmitted.
Start Error Insertion		Select this button to start the transmission of the configured error patterns.
Stop Error Insertion		(Available only for use with the *Loop continuously* option.) Select this button to stop the transmission of the configured error patterns.

NOVUS25/10GE8SFP28 Port Properties—Flow Control

The NOVUS25/10GE8SFP28 **Flow Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

NOTE	You can view this help page for the Port Properties - **Flow Control** tab by selecting the Help button and not F1.

The Port Properties **Flow Control** tab for NOVUS25/10GE8SFP28 is shown in the following image:



The controls for **Flow Control** tab configuration are described in the following table:

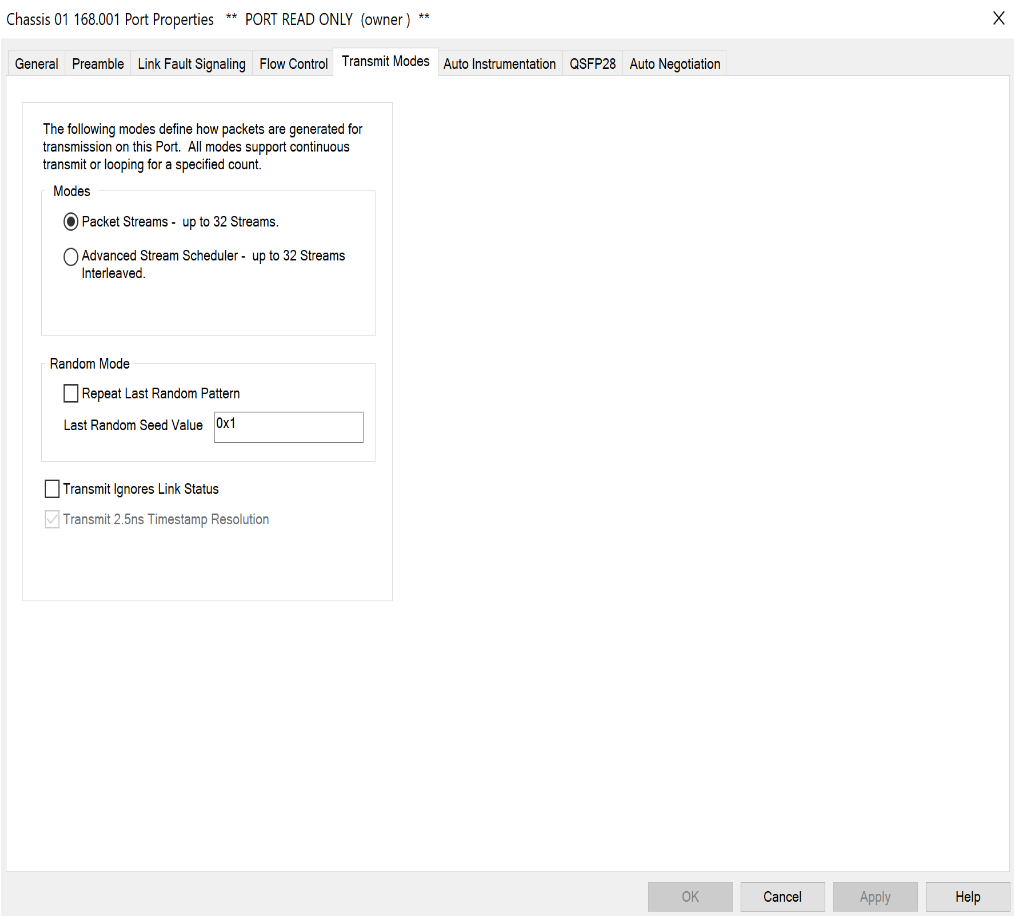
Section	Field/Control	Description
Enable Flow Control	(check box)	Enables the port's MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type	IEEE 802.3x or IEEE 802.1Qbb	Priority-based Flow Control. When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame.

Section	Field/Control	Description
		When not in Data Center mode, only IEEE 802.3x is available.
	Priority	When flow control type IEEE 802.1Qbb is selected in Data Center mode, priority options are the channels of data that can be paused. Select to select one or more channels.
	PFC Queue	The PFC Queue can be mapped to the priority field in the frame.
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

NOVUS25/10GE8SFP28—Transmit Modes

The **Transmit Modes** tab for NOVUS25/10GE8SFP28 load modules is shown in the following image. It is accessed by double-clicking a port in Resources window, or by selecting a port and selecting the **Properties** menu option. Then select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following image:



The controls for **Transmit Modes** tab configuration are described in the following table:

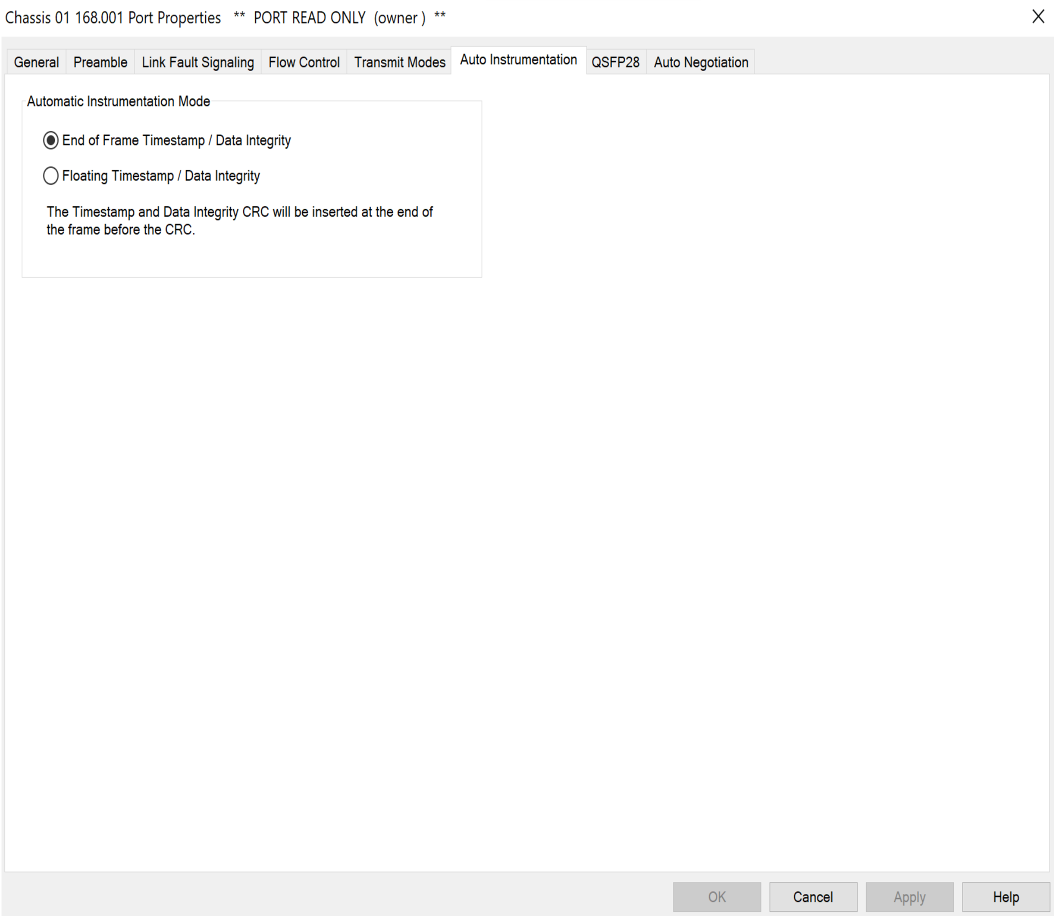
Section	Field/Control	Description
Modes	Packet Streams	Sets the operating mode for the port to sequential packet streams. This allows to configure 32 streams in 10GE and 25GE mode. A stream may be programmed for continuous packet generation—generating a continuous, infinite number of packets.
	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure 32 streams in 10GE and 25GE mode. They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed

Section	Field/Control	Description
		from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream's random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit Ignores Link Status		If selected, will allow transmission of packets even if the link is down.
Transmit 2.5ns Time stamp Resolution		If selected, it will check for the high resolution time stamp. The check box is selected by default.

NOVUS25/10GE8SFP28 Port Properties—Auto Instrumentation

The NOVUS25/10GE8SFP28 **Auto Instrumentation** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto Instrumentation** tab.

The NOVUS25/10GE8SFP28 Port Properties **Auto Instrumentation** tab is shown in the following image:



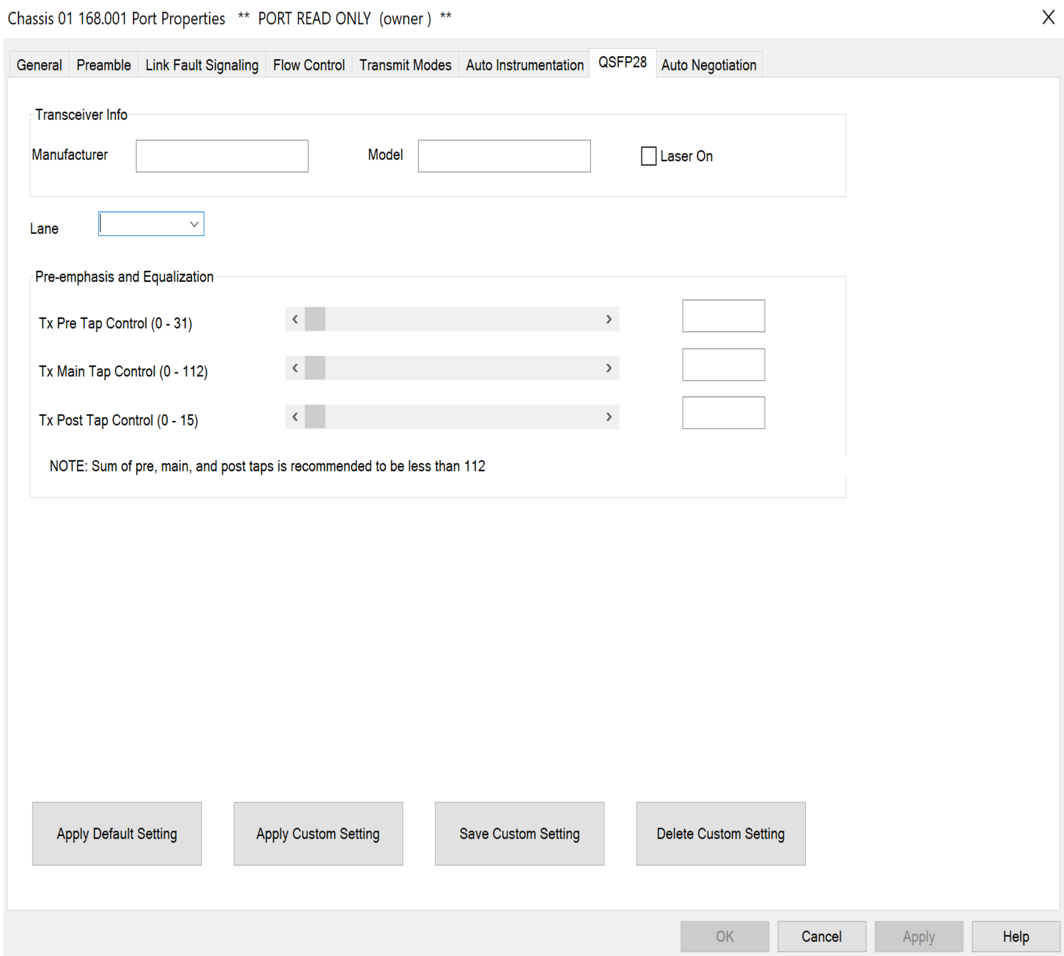
The options and controls in this tab are described in the following table:

Field/Control	Description
End of Frame Timestamp / Data Integrity	Enables inserting Timestamp and Data Integrity CRC at the end of the frame before the CRC.
Floating Timestamp / Data Integrity	Enables adding timestamp as part of floating instrumentation header, and addresses similar issue in Data Integrity checking.

NOVUS25/10GE8SFP28 Port Properties—QSFP28

The NOVUS25/10GE8SFP28 **QSFP28** tab is accessed from the context menu of the NOVUS25/10GE8SFP28 port in the **Explore Network Resources** pane, by selecting the **Port Properties** menu option, then selecting the **QSFP28** tab.

The **QSFP28** tab of NOVUS25/10GE8SFP28 is shown in the following image.



The options and controls in this tab are described in the following table.

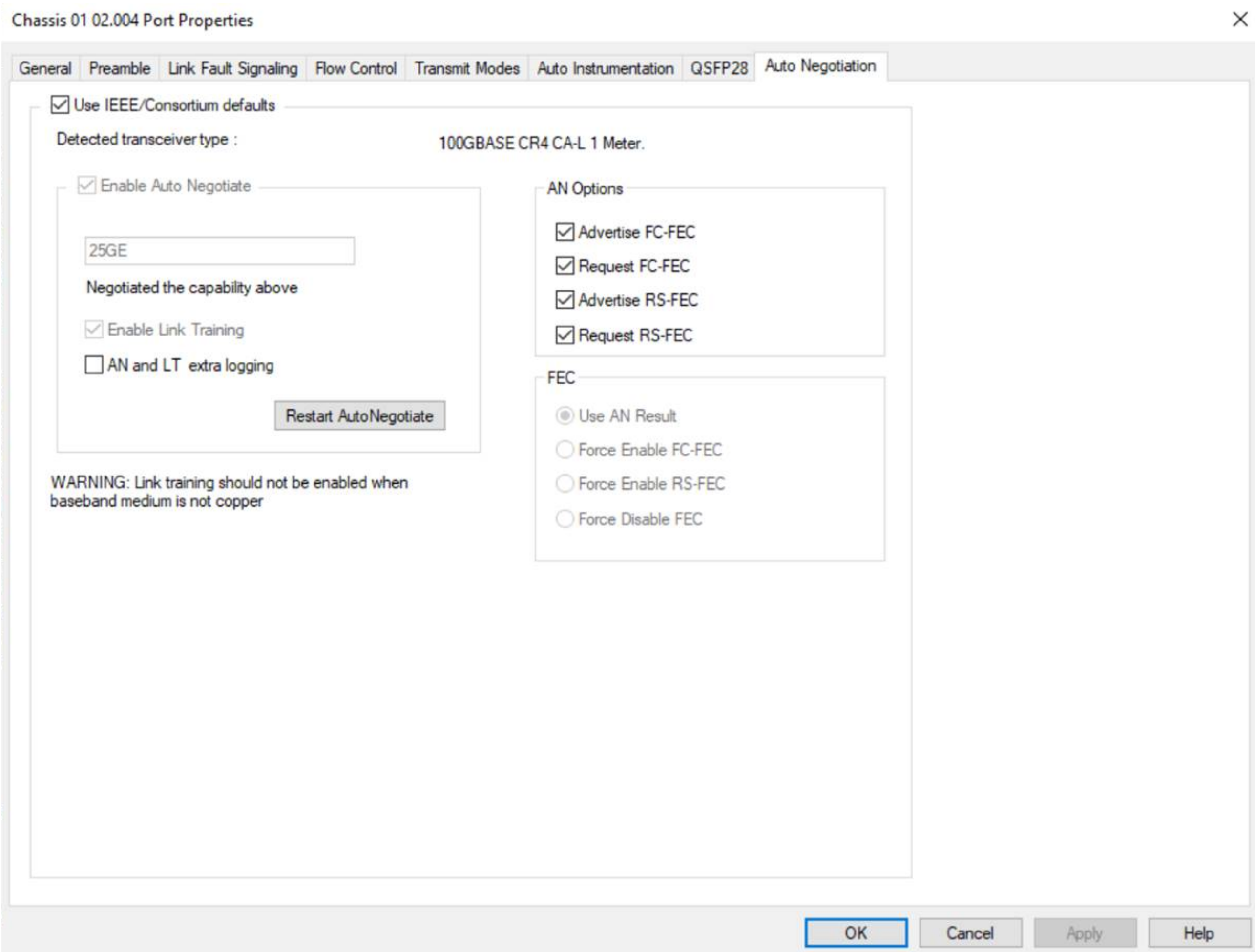
Section	Field/Control	Description
Transceiver Info	Manufacturer	This is the Vendor Name field read from the actual transceiver currently being plugged in.
	Model	This is the Part Number field read from the actual transceiver currently being plugged in.
	Laser On	Select this check box to enable the laser power. Note that the actual reading appears in the Value field.
Lane		Specifies in which lane (from 0-3) the current settings on.
Pre-emphasis and Equalization	Tx Pre Tap Control (0-31)	This helps to control the Pre Tap value for Tx.
	Tx Main Tap Control (0-31)	This helps to control the Main Tap Control for Tx.
	Tx Post Tap	This helps to control the Post Tap value for Tx.

Section	Field/Control	Description
	Control (0-63)	
	Apply Default Settings	If selected, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Settings	If selected, if a custom setting exists in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	If selected, if there exists a custom setting in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that .xml file. If no custom setting exists, the setting will be saved to the .xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	If selected, if there exists a custom setting in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel that. If no custom setting exists, users will be prompted that nothing will be deleted.

NOVUS25/10GE8SFP28 Port Properties—Auto Negotiation

This tab is available for NOVUS25/10GE8SFP28 load module. The NOVUS25/10GE8SFP28 **Auto Negotiation** tab is accessed by selecting a NOVUS25/10GE8SFP28 port in the Explore Network Resources pane, selecting the Port Properties menu option, then selecting the **Auto Negotiation** tab.

The Port Properties **Auto Negotiation** tab for NOVUS25/10GE8SFP28 is shown in the following image:



The fields and controls in this tab are described in the following table:

Field/Control	Description
Use IEEE defaults	When you select the Use IEEE Defaults check box, the L1 parameters like Autonegotiation, Link Training, and FEC, are enabled or disabled per IEEE requirements, and you will not be able to enable or disable these manually. If the check box is cleared, you will be able to manually enable or disable L1 features – even if it violates IEEE specifications. By default the check box is selected.
Detected transceiver type	When a transceiver is inserted into the load module, the software reads IEEE registers to determine the transceiver capabilities and media type. If the transceiver contains this information, it is shown in this read-only field.If the transceiver is capable of multiple speeds, the supported speed is shown. NOTE The speed at which the Resource Group is currently operating, does not affect this. If the ports are in 10GE mode, the 'Type' appears as LAN SFP+.
Enable Auto	Auto negotiation controls how a port communicates with other ports.If you

Field/Control	Description
Negotiate	select the check box, it allows auto-negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing • **Restart Auto-Negotiate** button is selected (this does a forced restart) NOTE The **Enable Auto Negotiate** check box is available for selection only if the **Use IEEE Defaults** check box is cleared.
Negotiated the capability above	The text box indicates the speed that was negotiated due to Auto-Negotiation. NOTE This speed may be different than the speed indicated for the transceiver detected. For example: If the detected transceiver type is 100GBASE CR4, the negotiated speed is 25GE.
Enable Link Training	Select the check box to allow longer length copper cables to be used. This means that during the next Auto-Negotiation, KR training will be used. Link Training is enabled by default when Auto-Negotiation is enabled.
Restart AutoNegotiate	Restarts the Auto Negotiate sequence.
• Advertise FC-FEC • Request FC-FEC • Advertise RS-FEC • Request RS-FEC	FC-FEC or Fire Code-Forward Error Correction is available for Novus load module for 25G mode. When a port participates in 25G Auto-negotiation, it tells the link partner if it supports FC-FEC and if it wants the link partner to turn FC-FEC on. The four available FC-FEC statistics are: • Advertise FC-FEC: If enabled, the port tells a link partner to support FC-FEC the next time it participates in Auto-negotiation • Request FC-FEC: If enabled, the port tells a link partner to turn on FC-FEC the next time it participates in Auto-negotiation • Advertise RS-FEC: If enabled, the port tells a link partner to support RS-FEC the next time it participates in Auto-negotiation • Request RS-FEC: If enabled, the port tells a link partner to turn on RS-FEC the next time it participates in Auto-negotiation • This check box is available for selection only if the **Use IEEE Defaults** check box is cleared. • FEC should be enabled on both back-to-back ports for the link to be up.
FEC	The four available statistics are: • Use AN Result: Use FEC decided by Auto-negotiation • Force Enable FC-FEC: Turns FC-FEC on by bypassing Auto-negotiation

Field/Control	Description
	• Force Enable RS-FEC: Turns RS-FEC on by bypassing Auto-negotiation • Force Disable FEC: Turns FEC off by bypassing Auto-negotiation

CHAPTER 30

Port Properties–QSFP-DD Load Modules

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the QSFP-DD load modules.

Port Properties for QSFP-DD Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option.

The complete specification for the QSFP-DD load module is found in the *Ixia Platform Reference Manual*.

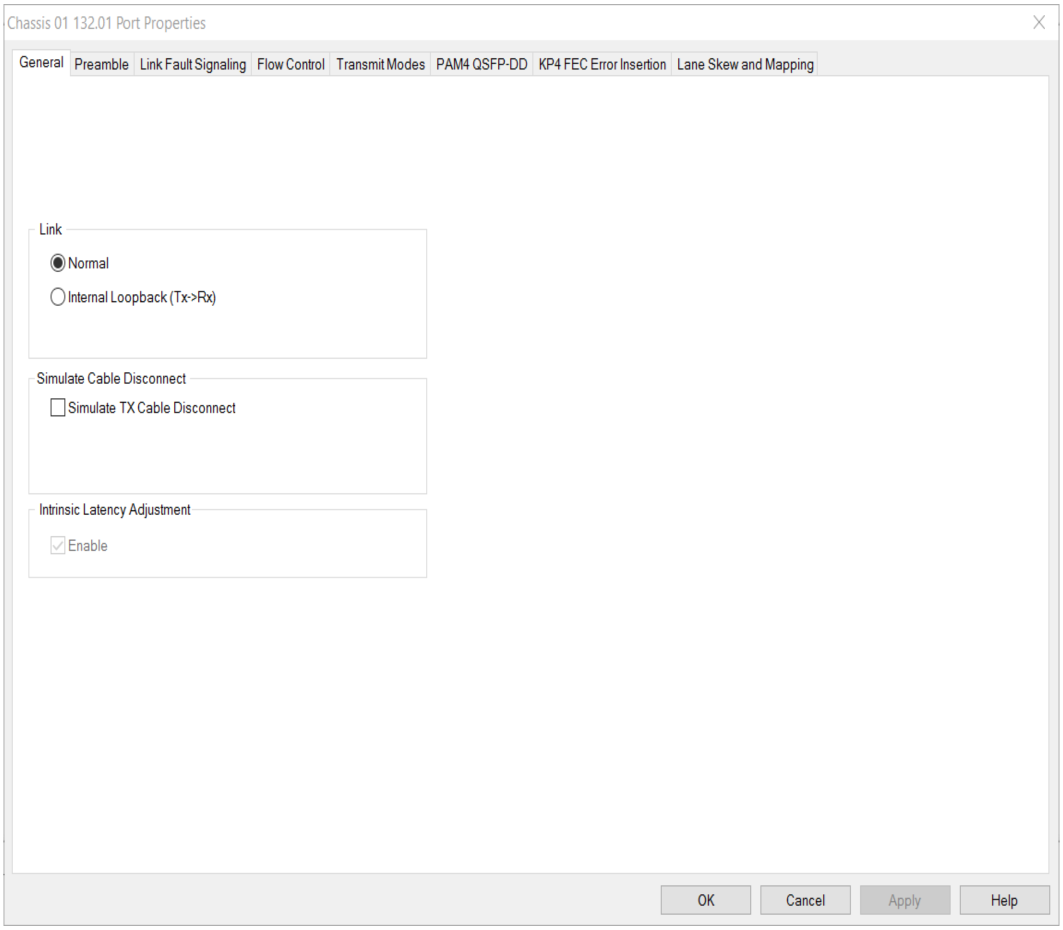
The following port property tabs are available for QSFP-DD modules:

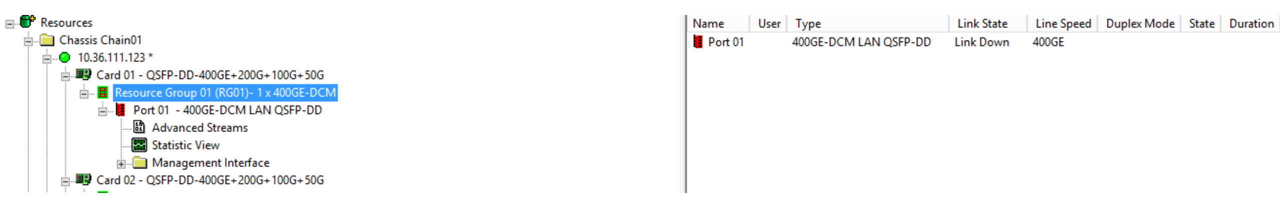
- QSFP-DD Port Properties —General
- QSFP-DD Port Properties—Preamble
- QSFP-DD Port Properties—Link Fault Signaling
- QSFP-DD Port Properties—Flow Control
- QSFP-DD Port Properties—Transmit Modes
- QSFP-DD Port Properties—PAM4
- QSFP-DD Port Properties—KP4 FEC Error Insertion
- QSFP-DD Port Properties—Lane Skew and Mapping

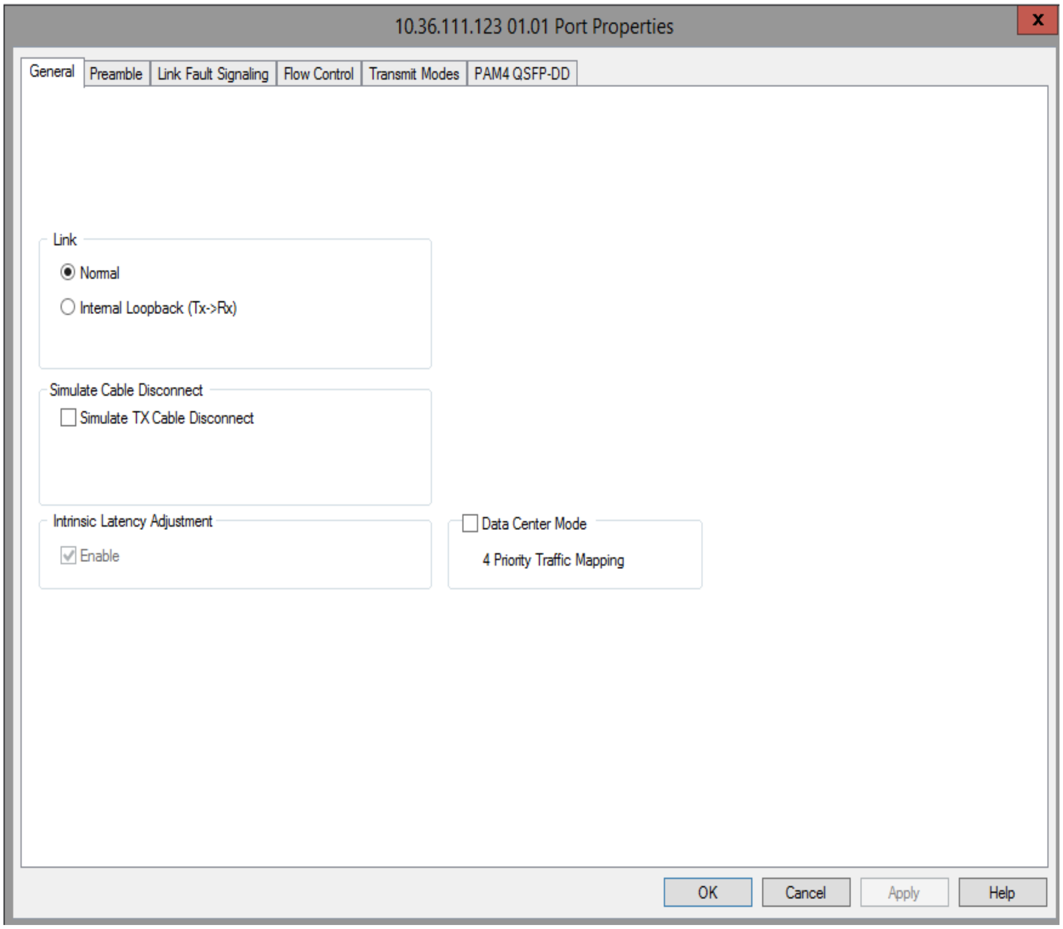
QSFP-DD Port Properties—General

The QSFP-DD **General** tab is accessed from the context menu of the port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, and then selecting the **General** tab.

The Port Properties **General** tab for QSFP-DD is shown in the following image.


Chassis 01 132.01 Port Properties
General
Preamble
Link Fault Signaling
Flow Control
Transmit Modes
PAM4 QSFP-DD
KP4 FEC Error Insertion
Lane Skew and Mapping
Link
Normal
Internal Loopback (Tx->Rx)
Simulate Cable Disconnect
Simulate TX Cable Disconnect
Intrinsic Latency Adjustment
Enable
OK
Cancel
Apply
Help


Resources
Chassis Chain01
10.36.111.123 *
Card 01 - QSFP-DD-400GE+200G+100G+50G
Resource Group 01 (RG01)- 1 x 400GE-DCM
Port 01 - 400GE-DCM LAN QSFP-DD
Advanced Streams
Statistic View
Management Interface
Card 02 - QSFP-DD-400GE+200G+100G+50G
Name
User
Type
Link State
Line Speed
Duplex Mode
State
Duration
Port 01
400GE-DCM LAN QSFP-DD
Link Down
400GE



The controls for **General** tab configuration are described in the following table.

Section	Control/Field	Usage
Link	Normal	Normal operation
	Internal Loopback (Tx -> Rx)	Internal Loopback—Transmit to Receive.
Simulate Cable Disconnect		If this is selected, the port acts as if the cable has been disconnected. The port will neither transmit nor receive.
Intrinsic Latency Adjustment	Enable	The **Enable** check box is selected by default. This enables the intrinsic latency adjustment. The **Enable** check box is dimmed when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia Platform Reference Manual*.

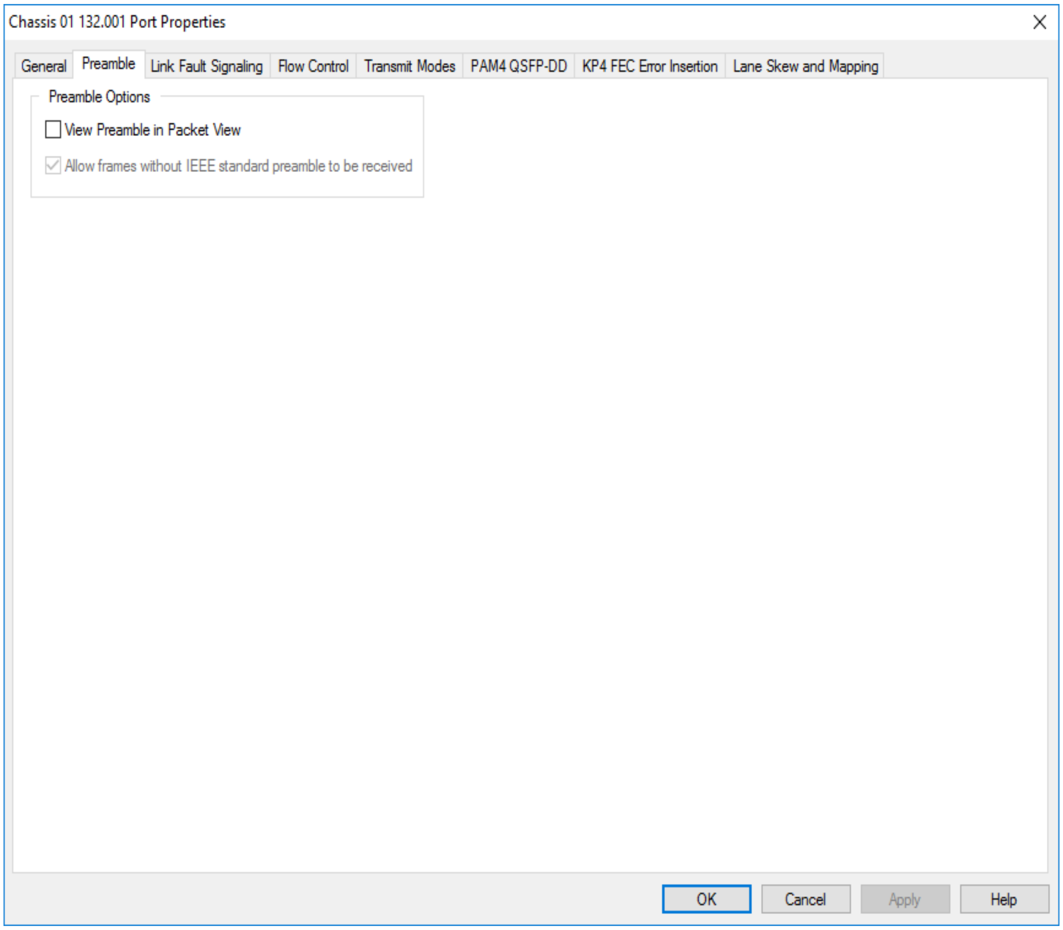
Section	Control/Field	Usage
Data Center Mode	4 Priority Traffic Mapping	This check box appears only on selecting **1x400GE DCM** in **Port Speed** list in the **Operation Mode** tab for **QSFP-DD** module. For all non-DCM speed modes, this check box does not appear. If selected, enables the **Data Center Mode** option. When **Data Center Mode** option is selected, the various changes take place, as shown in the following section: • The selected port is automatically placed into Advanced Stream mode. • Only Auto Instrumentation mode (Floating Timestamp/Data Integrity) is supported, both for transmit and receive. • 4-Priority Traffic Mapping is enabled. It supports various frame size for each PFC control (0-4).

QSFP-DD Port Properties—Preamble

The preamble precedes the frame, but is not part of the frame itself.

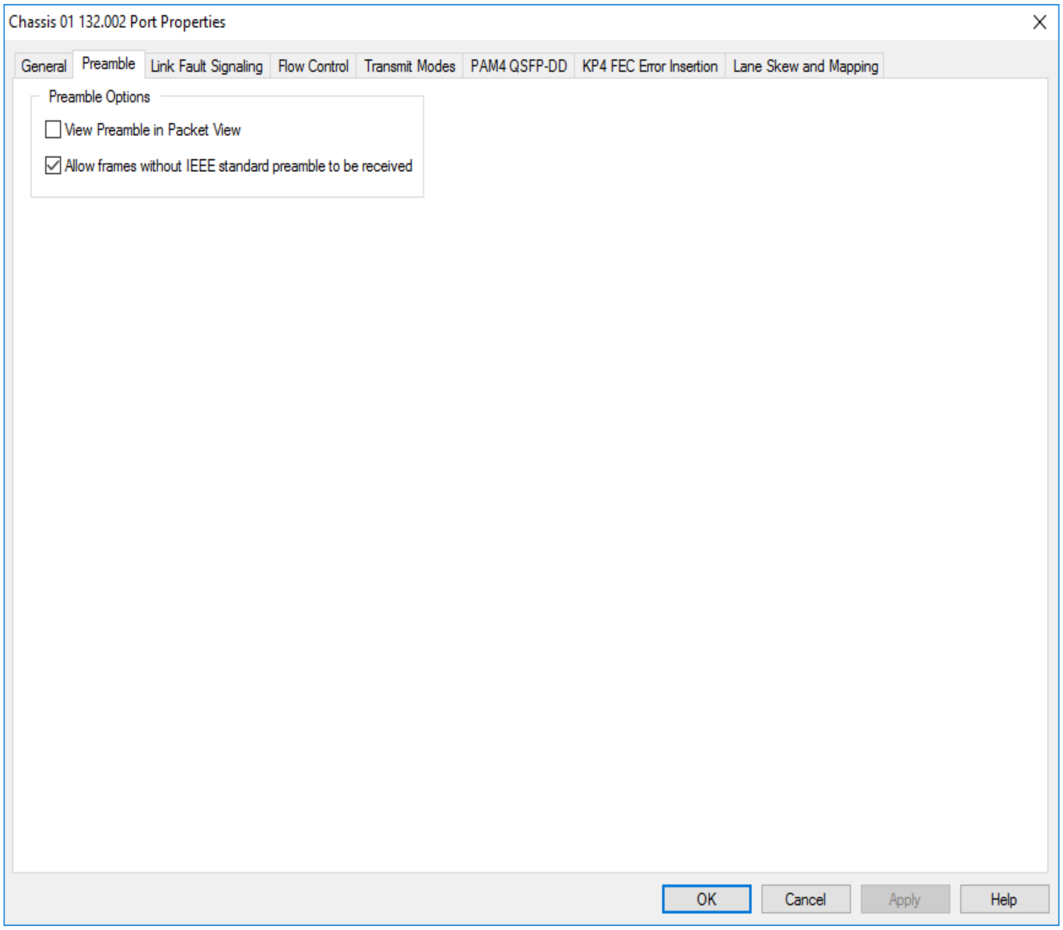
The QSFP-DD Port Properties **Preamble** tab for 400GE and 200GE speed modes is shown in the following image:

Image: QSFP-DD—**Preamble** tab



The QSFP-DD Port Properties **Preamble** tab for 100GE and 50GE speed modes is shown in the following image:

Image: QSFP-DD—**Preamble** tab



The fields and controls in this tab are described in the following table:

Table: Preamble Configuration

Section	Choices	Description
Preamble Options	View Preamble in Packet View	When this check box is selected, the preamble data will be visible in the Packet View (transmit side) and the Capture View (receive side).
	Allow frames without IEEE standard preamble to be received	When this check box is selected, it allows frames without IEEE standard preamble to be received. • This check box is selected by default. • For 400G and 200G speed modes, this check box is not available.

QSFP-DD Port Properties—Link Fault Signaling

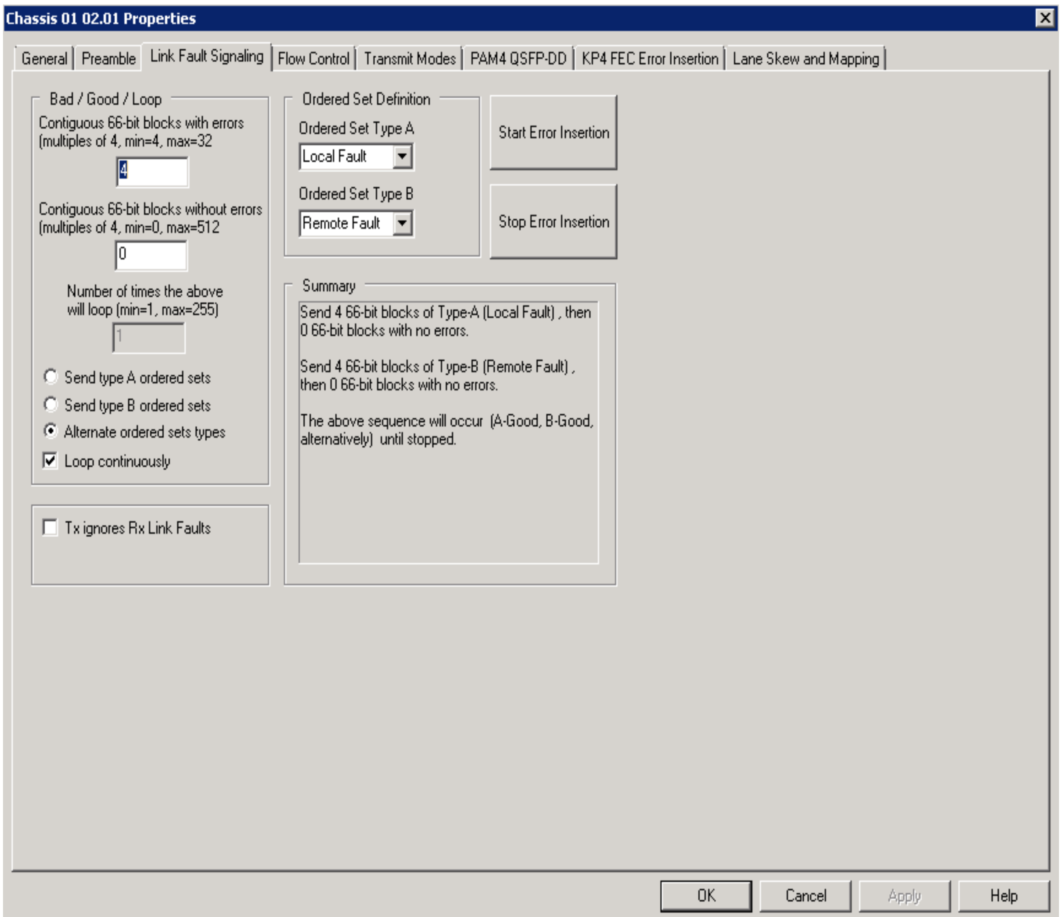
When Link Fault Signaling is enabled, four statistics will be added to the list in Statistic View for the port. One is for monitoring the Link Fault State. Two provide a count of the Local Faults and Remote

Faults. The last one is for indicating the state of error insertion, whether or not it is ongoing.

The **Link Fault Signaling** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Link Fault Signaling*** tab.

The ***Link Fault Signaling*** tab for QSFP-DD load module is shown in the following image:

Image: QSFP-DD—**Link Fault Signaling** tab



The controls for **Link Fault Signaling** tab configuration are described in the following table:

Table: Link Fault Signaling Configuration

Section	Field/Control	Description
Bad/Good/Loop	(Bad) Contiguous 66-bit blocks with errors (multiples of 4; min = 4, max = 32)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks with errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive fault sequences allowed are minimum 4 sequences and maximum 32 sequences.
	(Good)	Part of the Bad block/Good block alternating pattern. Enter

Section	Field/Control	Description
	Contiguous 66-bit blocks without errors (multiples of 4; min = 0, max = 512)	the number of 66-bit blocks without errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive regular data sequences allowed are minimum 0 sequences and maximum 512 sequences.
	Number of times the above will loop (min = 1, max = 255)	Specifies the number of loops for the user defined sequence. There are two modes: • Discrete iterations: i) Minimum of 1 iteration ii) Maximum of 255 iterations • Continuous loop i) User cannot specify number of iterations
	Choose one of: • Send type A ordered sets • Send type B ordered sets • Alternate ordered set types	Defines the ordered set pattern that will be sent. (The two Ordered Sets—A and B—are defined in the **Ordered Set Definition** box in this tab.) This pattern will be combined with the Good blocks/Bad blocks pattern for transmission. • Only Type A fault sequence and regular good data sequences • Only Type B fault sequence and regular good data sequences • Alternate Type A, regular good data sequences and Type B fault sequence, regular good data sequences NOTE If this field is available, and the Alternate ordered set types option is selected, the minimum value for this field should be '2,' to allow the entire pattern to be sent once. If left at the minimum value of '1'— only two groups of blocks (one of good blocks and one of bad blocks) will be sent, which means that only the first ordered set will be sent. A minimum of eight blocks is required for one complete pattern including Types A and B.
	Loop continuously	If selected, the loop defined by the combination of the Bad and Good blocks plus the pattern of ordered sets, will be transmitted continuously until the *Stop Error Insertion* button is selected.
Ordered Set	Ordered Set	Choose one of:

Section	Field/Control	Description
Definition	Type A	• Local Fault • Remote Fault
	Ordered Set Type B	Choose one of: • Local Fault • Remote Fault
Tx ignores Rx Link Faults		If selected, ongoing transmission will continue even if Link Fault messages are received by the sending RS.
Summary (Window)		(Read-only) Shows descriptions of the patterns that will be transmitted.
Start Error Insertion		Select this button to start the transmission of the configured error patterns.
Stop Error Insertion		(Available only for use with the *Loop continuously* option.) Select this button to stop the transmission of the configured error patterns.

QSFP-DD Port Properties—Flow Control

The QSFP-DD **Flow Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

NOTE You can view this help page for the Port Properties - **Flow Control** tab by selecting the Help button and not F1.

The Port Properties **Flow Control** tab for QSFP-DD is shown in the following image:

Image: QSFP-DD **Flow Control** tab

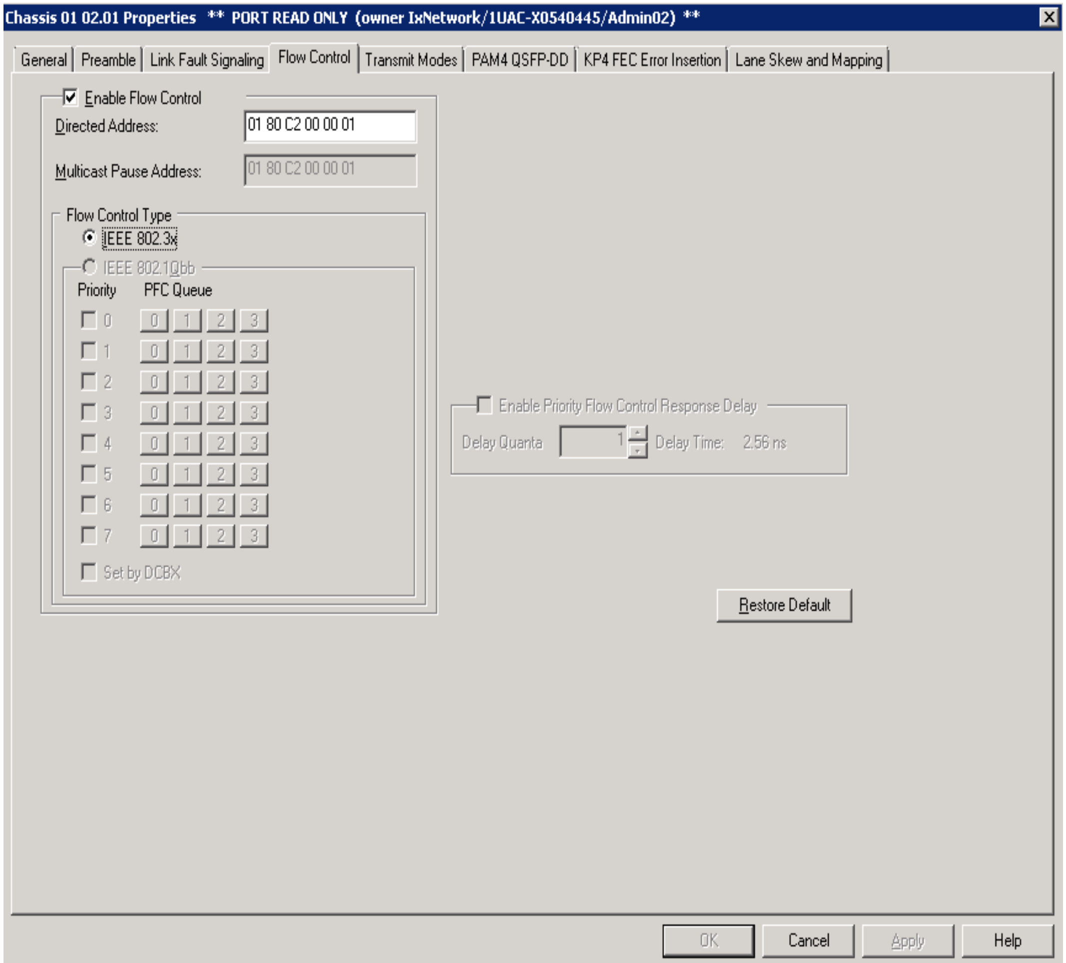


Table: Flow Control Configuration

Section	Field/Control	Description
Enable Flow Control	(check box)	Enables the port's MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type		
	IEEE 802 3x	When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame.

Section	Field/Control	Description
	IEEE 802.1Qbb	When not in Data Center mode, only IEEE 802.3x is available.
	Priority	When flow control type IEEE 802.1Qbb is selected in Data Center mode, priority options are the channels of data that can be paused. Select to select one or more channels.
	PFC Queue	The PFC Queue can be mapped to the priority field in the frame.
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

QSFP-DD Port Properties—Transmit Modes

The **Transmit Modes** tab for QSFP-DD load modules is shown in the following image. It is accessed by double-clicking a port in Resources window, or by selecting a port and selecting the **Properties** menu option. Then select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following images:

Image: QSFP-DD-400GE+200G+100G+50G—**Transmit Modes** tab for 400G speed mode

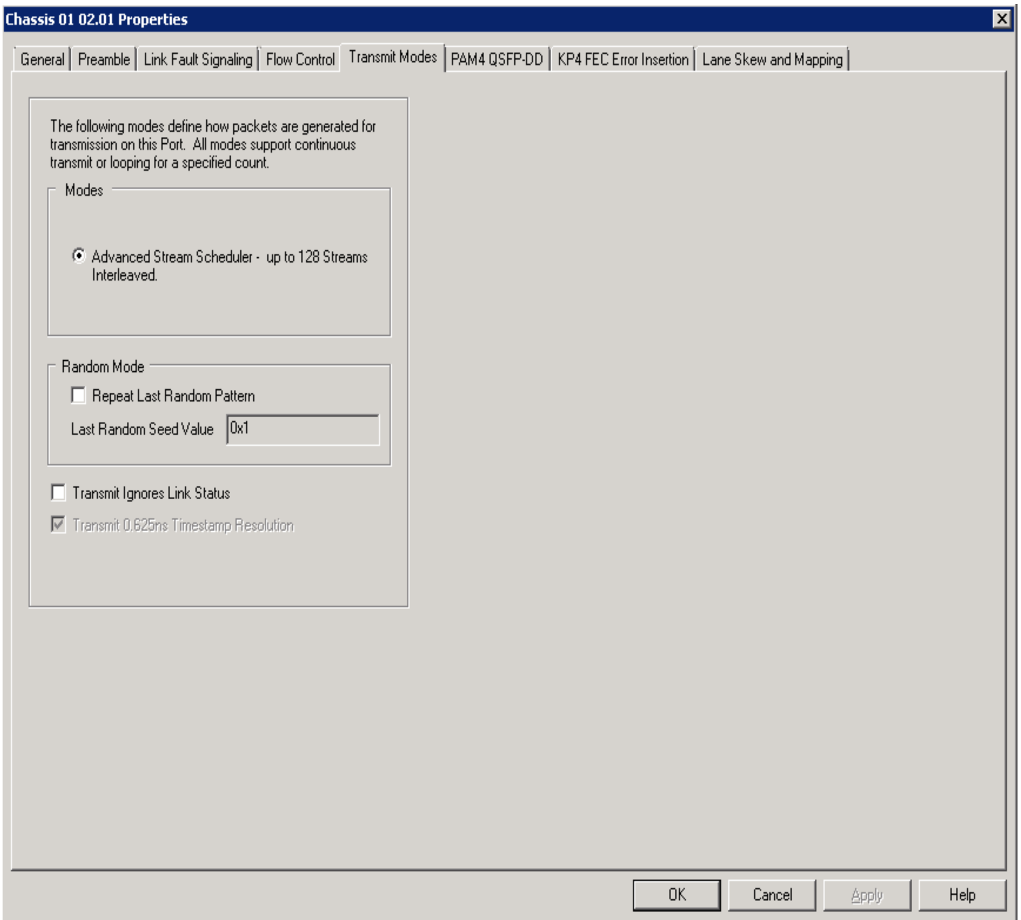


Image: QSFP-DD-400GE+200G+100G+50G—**Transmit Modes** tab for 200G speed mode

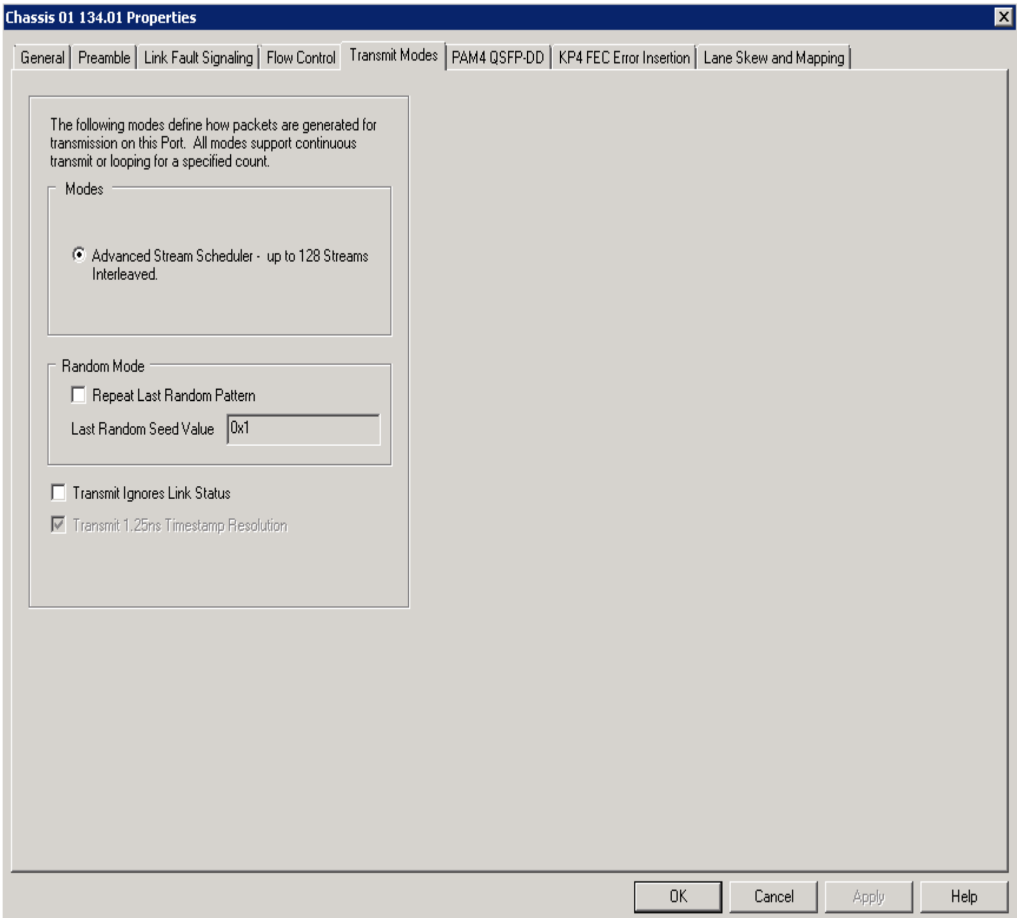


Image: QSFP-DD-400GE+200G+100G+50G—**Transmit Modes** tab for 100G speed mode

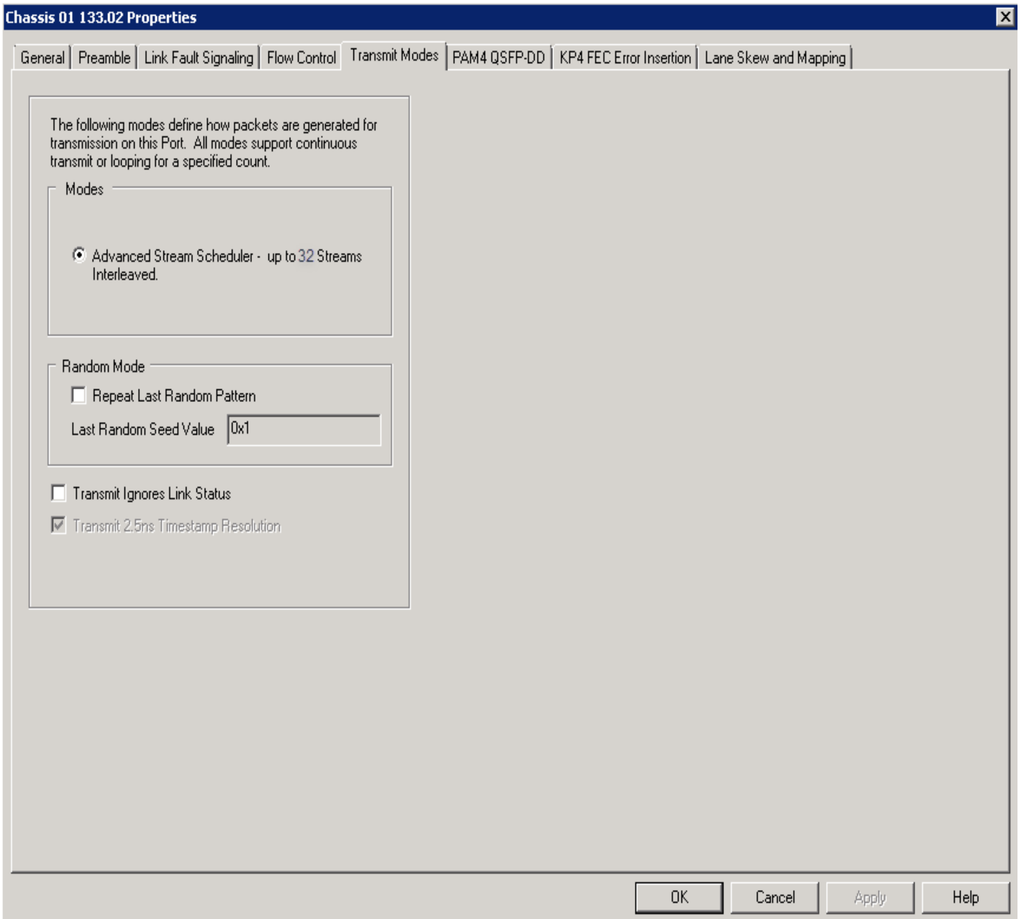
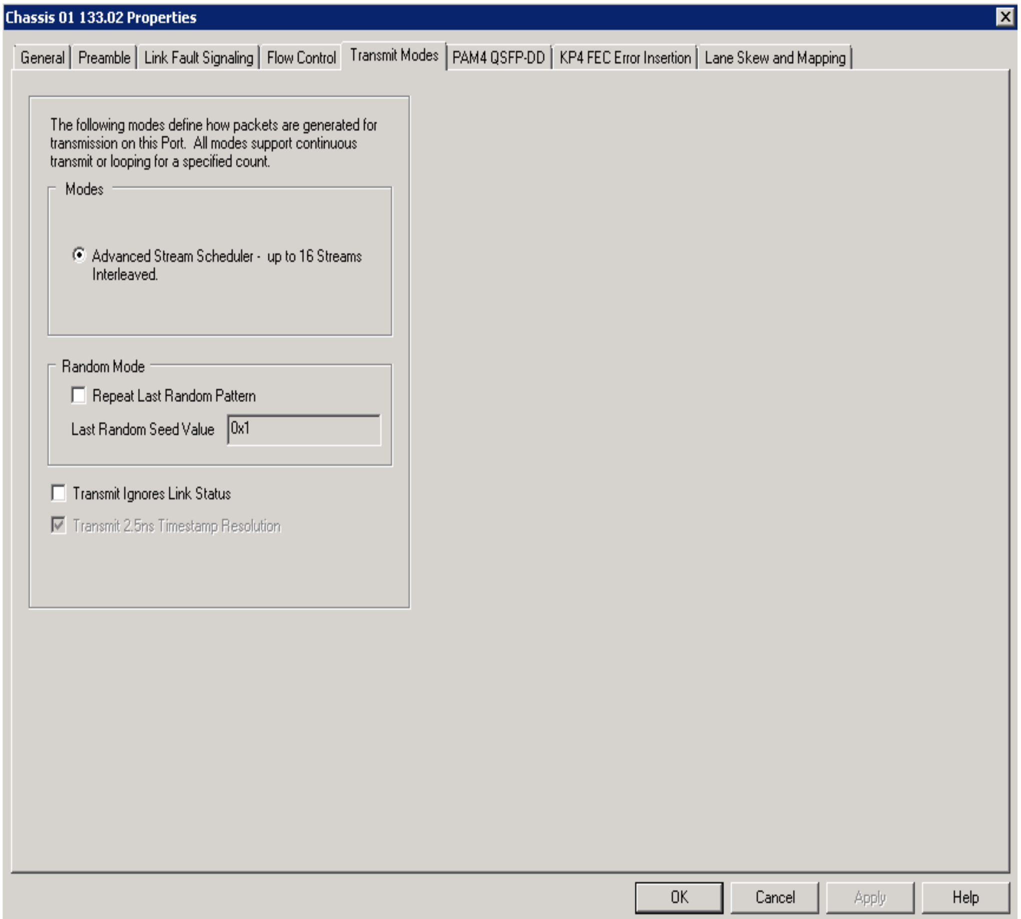


Image: QSFP-DD-400GE+200G+100G+50G—**Transmit Modes** tab for 50G speed mode



The controls for **Transmit Modes** tab configuration are described in the following table:

Table: Transmit Modes Configuration

Section	Field/Control	Description
Modes	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure up to 128 streams for 400GE and 200GE and up to 32 streams for 100GE and up to 16 streams for 50GE speeds. They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream's random seed is used). For more information, see the Repeat Last Random Pattern

Section	Field/Control	Description
		section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit Ignores Link Status		If selected, will allow transmission of packets even if the link is down.
Transmit High TimeStamp Resolution		If selected, the QSFP-DD-400GE+200G+100G+50G load module will support the following Resolution Timestamp on selected modes: • 0.625 ns for 400G speed mode • 1.25 ns for 200G speed mode • 2.5 ns for 100G and 50G speed modes

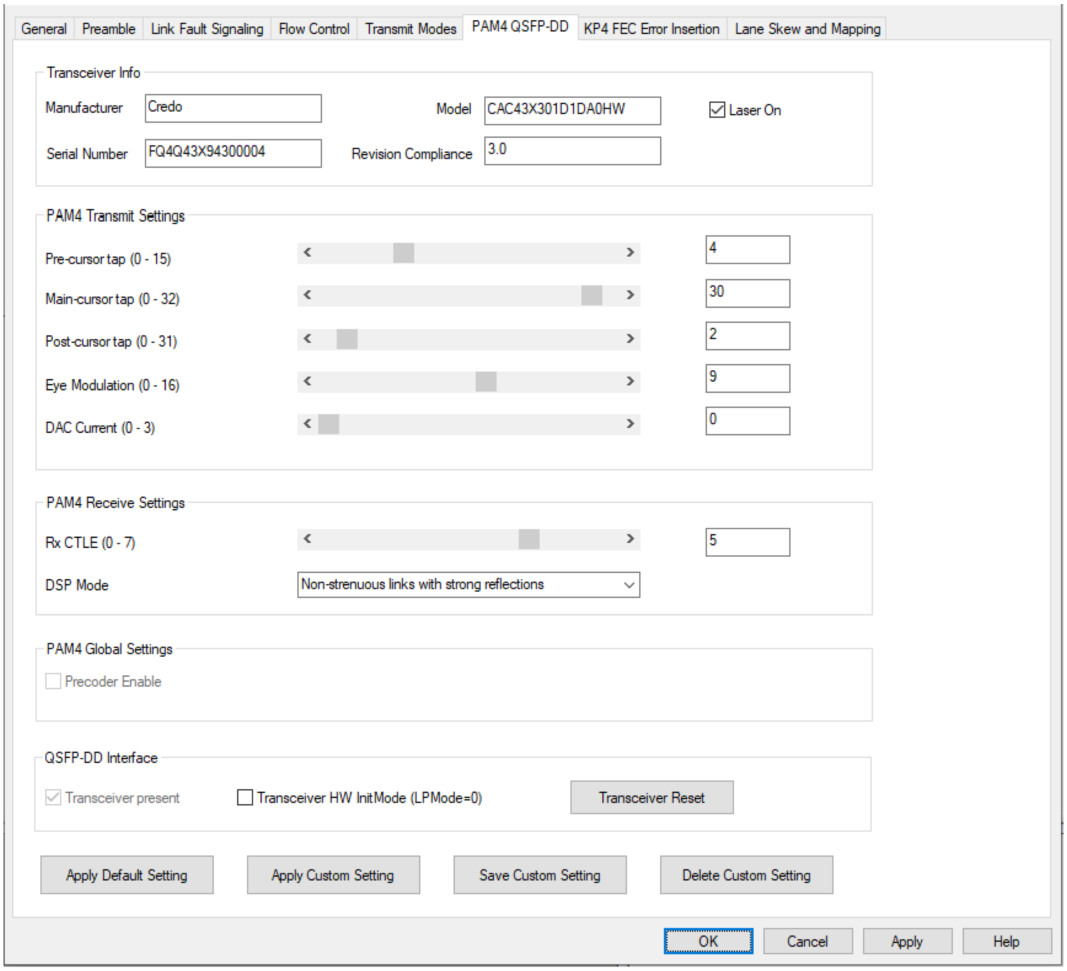
QSFP-DD Port Properties—PAM4

PAM-4 is a four-level pulse-amplitude modulation that uses four distinct amplitude levels to encode two bits of data, essentially doubling the bandwidth of a connection. The PAM4 settings are defined using the **PAM4 QSFP-DD** tab.

The **PAM4 QSFP-DD** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **PAM4 QSFP-DD** tab.

The Port Properties **PAM4** tab for QSFP-DD when the default passive copper transceiver is used is shown in the following image.

Image: QSFP-DD—**PAM4** tab for passive copper transceiver



When QSFP-DD detects an optical transceiver, it will apply a transmit and receive equalization combination that is well suited for optics, as highlighted in the following image.

Image: QSFP-DD—**PAM4** tab for optical transceiver

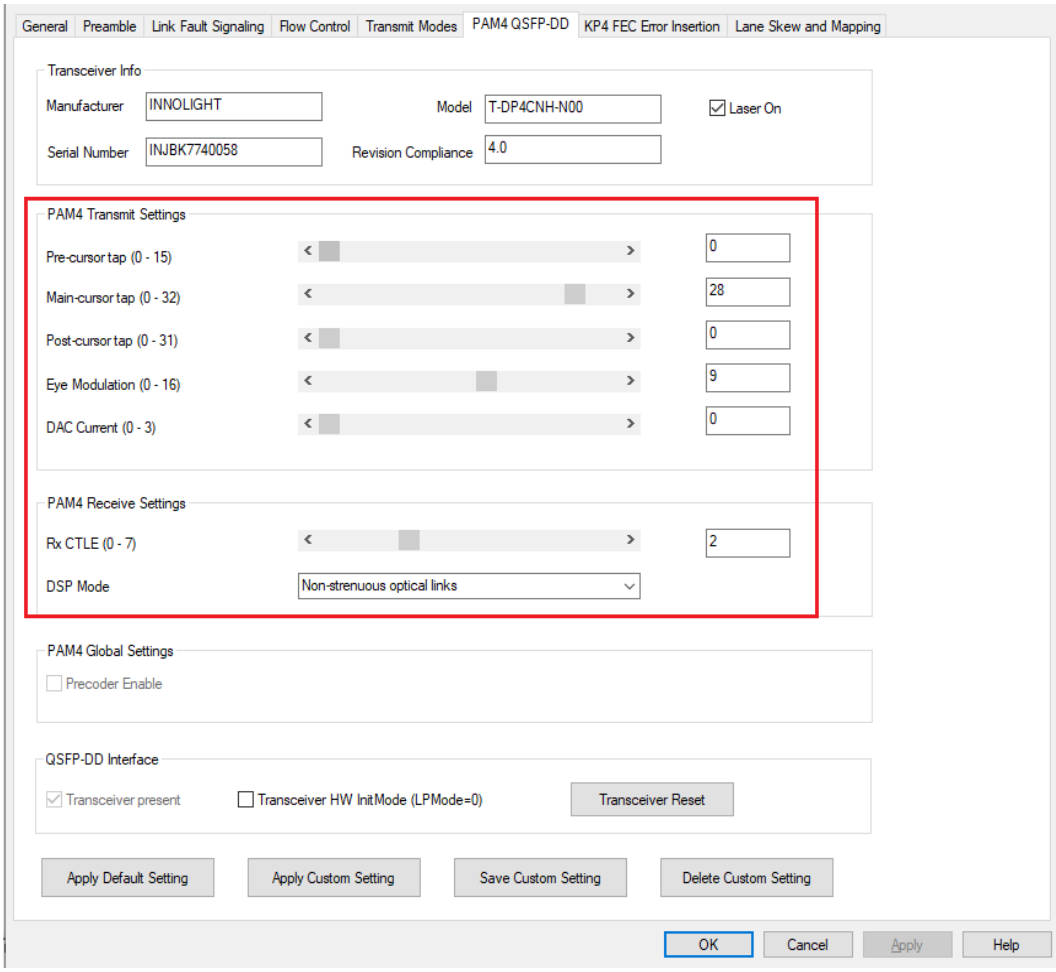


Table: PAM4 Configuration

Section	Field/Control	Description
Transceiver Info		
	Manufacturer	This is the Vendor Name field read from the actual transceiver currently being plugged in.
	Model	This is the Part Number field read from the actual transceiver currently being plugged in.
	Serial Number	The serial number of the transceiver.
	Revision Compliance	The implemented CMIS revision of the transceiver. QSFP-DD supports both CMIS 3.0 and CMIS 4.0 transceivers. See Management Interface.

Section	Field/Control	Description
	Laser On	Select this check box to enable the laser power.
PAM4 Transmit Settings		
	Pre-cursor tap (0-15)	This helps to control the Pre Tap value for Tx.
	Main-cursor tap (0-63)	This helps to control the Main Tap Control for Tx.
	Post-cursor tap (0-31)	This helps to control the Post Tap value for Tx.
	Eye Modulation (0-16)	Represents the difference between optical power levels of a digital signal.The control is the coefficient for how high or low the modulation should be.
	DAC Current (0-3)	This helps to control the Coarse Swing Control for Tx.
PAM4 Receive Settings		
	Rx CTLE (0-7)	Represents the receive sides continuous time linear equalizer. The control is the coefficient for how strong or weak the equalization should be.
	DSP Mode	Represents the Inphi Retimer's proprietary digital signal processing modes. The controls are different channel descriptions corresponding to different operation modes. The options are the following: • Short non strenuous links • Non-strenuous optical links • Non-strenuous links w/ strong reflections • Non-strenuous optical links w/ strong reflections • Strenuous links • Strenuous optical links w/ strong reflections
PAM4 Global Settings		
	Precoder Enable	Represents a PAM4 encoding scheme to reduce DFE bit errors. This feature is not supported in the QSFP-DD load module.
QSFP-DD Interface		
	Transceiver HW InitMode	Selecting the check box configures the QSFP-DD InitMode pin to perform the optional Hardware Init mode initialization as described in the Common Management Interface Specification

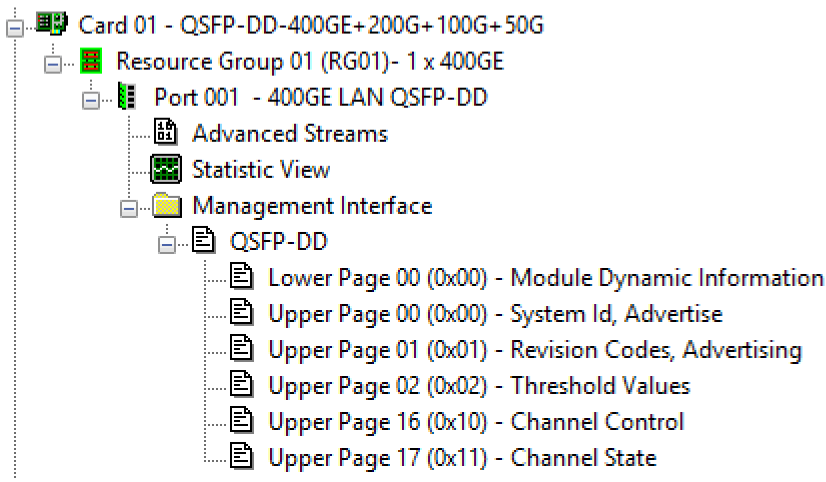
Section	Field/Control	Description
		(CMIS) Rev 3.0. When a transceiver boots into Hardware Init mode, the datapath is automatically configured by the module without intervention from the host (that is Ixia tester). When disabled, the software-controlled initialization (Software Init) is instead performed. This is the recommended initialization mode for any transceiver since the appropriate checks are performed between the Ixia tester and the transceiver before the module's datapath initialization.
	Transceiver Reset	Resets the transceiver.
	Apply Default Setting	If selected, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Setting	If selected, if there exists a custom setting in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	If selected, if there exists a custom setting in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	If selected, if there exists a custom setting in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel with that. If no custom setting exists, users will be prompted that nothing will be deleted.

Management Interface

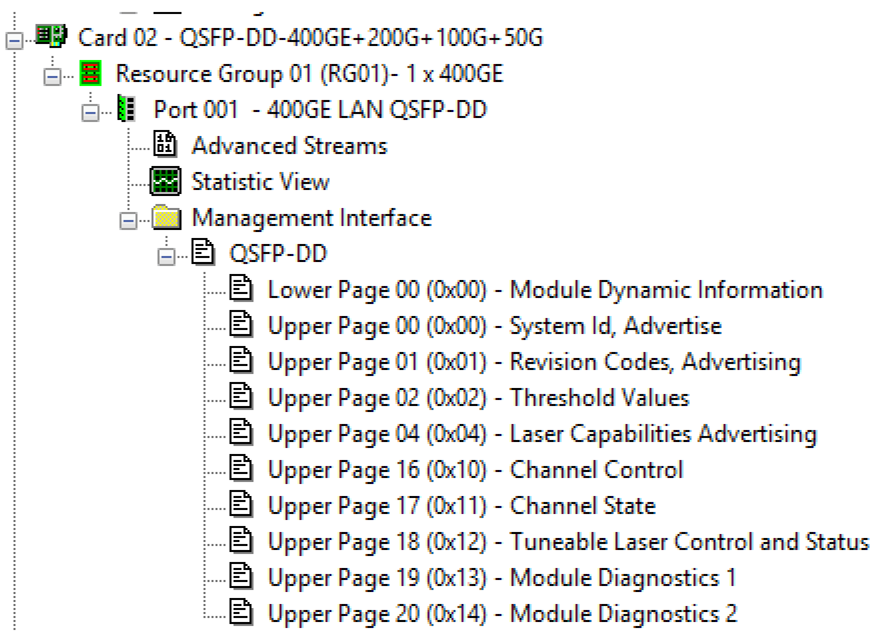
A management interface specification CMIS defines the management interface and associated protocols for all required and allowable management interactions between a CMIS aware host and a CMIS compliant module that are relevant for the host using the module in an application.

The Management Interface appears in the IxExplorer Resources Tree and switches on the fly depending on the CMIS revision. This means that the transceiver automatically reads the management interface and populates the lower and upper pages depending on the transceiver type.

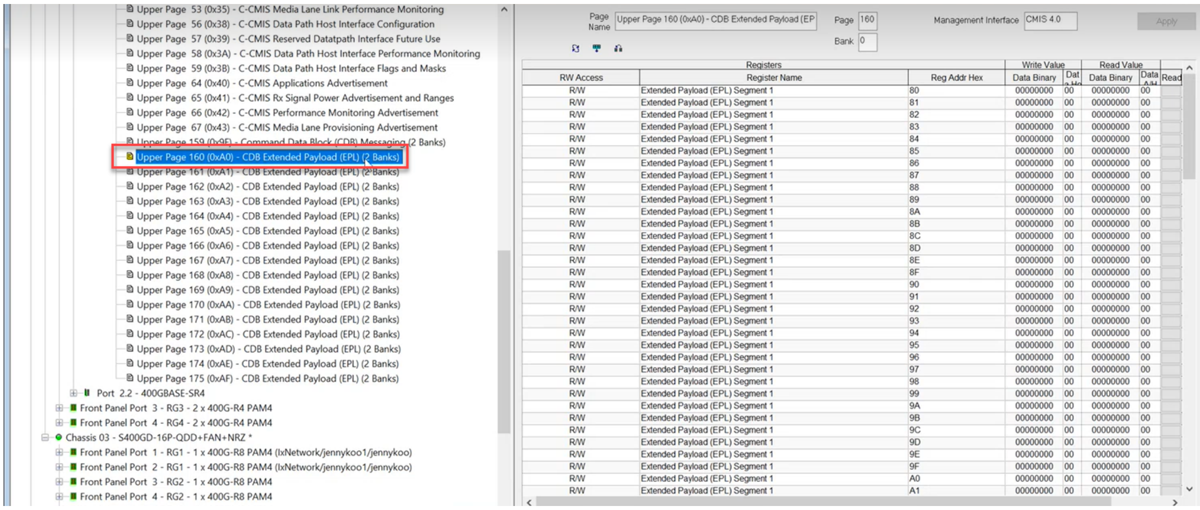
With a CMIS 3.0 (or lower) transceiver, you will see the following pages:



With a CMIS 4.0 transceiver, you will see the following pages:

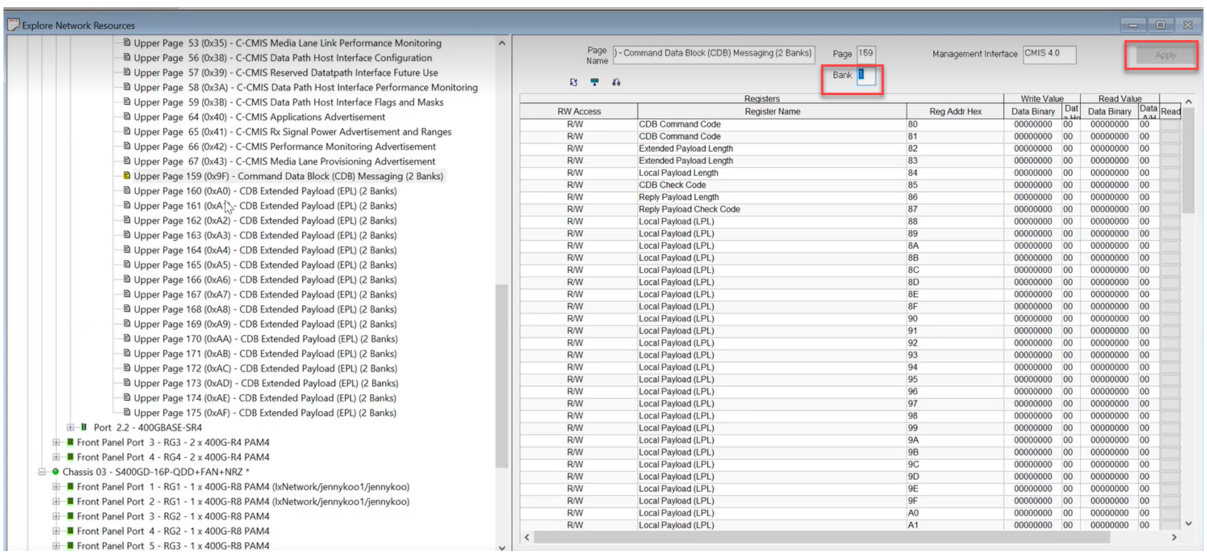


With a CMIS 5.0 transceiver, you will see the following pages:



If a page is supported in multiple banks of the transceiver memory, the page mentions *(2 Banks)* as highlighted in the previous image.

The Bank 0 page appears by default on the right pane. The page for bank 1 can be fetched from the transceiver by entering 1 in the **Bank** text box, and then clicking **Apply**, as shown in the following image:



QSFP-DD Port Properties—KP4 FEC Error Insertion

Forward Error Correction (FEC) is a method of communicating data that corrects errors in transmission on the receiving end. Before transmission, the data is put through a predetermined algorithm that adds extra bits specifically for error correction to any character or code block. If the transmission is received in error, the correction bits are used to check and repair the data.

For CFP8 module, see CFP8 Port Properties - KP4 FEC Error Insertion.

For T400GD-8P-QDD module, see T400GD-8P-QDD Port Properties—KP4 FEC Error Insertion.

For T400GD-8P-OSFP module, see T400GD-8P-OSFP Port Properties—KP4 FEC Error Insertion.

For T400GD-4P-QDD module, see T400GP-4P-QDD Port Properties—KP4 FEC Error Insertion.

For T400GD-2P-QDD module, see T400GP-2P-QDD Port Properties—KP4 FEC Error Insertion.

For S400GD-16P-QDD+FAN+NRZ module, see S400GD-16P-QDD+FAN+NRZ Port Properties—KP4 FEC Error Insertion.

For 800GE-4P-QDD module, see 800GE-4P-QDD Port Properties—KP4 FEC Error Insertion.

For 800GE-4P-QDD-C module, see 800GE-4P-QDD-C Card Properties—KP4 FEC Error Insertion.

For 800GE-4P-OSFP-C module, see 800GE-4P-OSFP-C Card Properties—KP4 FEC Error Insertion.

For 800GE-8P-QDD-M+NRZ module, see 800GE-8P-QDD-M+NRZ Card Properties—KP4 FEC Error Insertion.

The FEC Error Insertion tab allows to inject FEC errors into transmitted data, and is shown in *Figure: FEC Error Insertion Tab*

Figure: KP4 FEC Error Insertion Tab with Error Type selected as Random

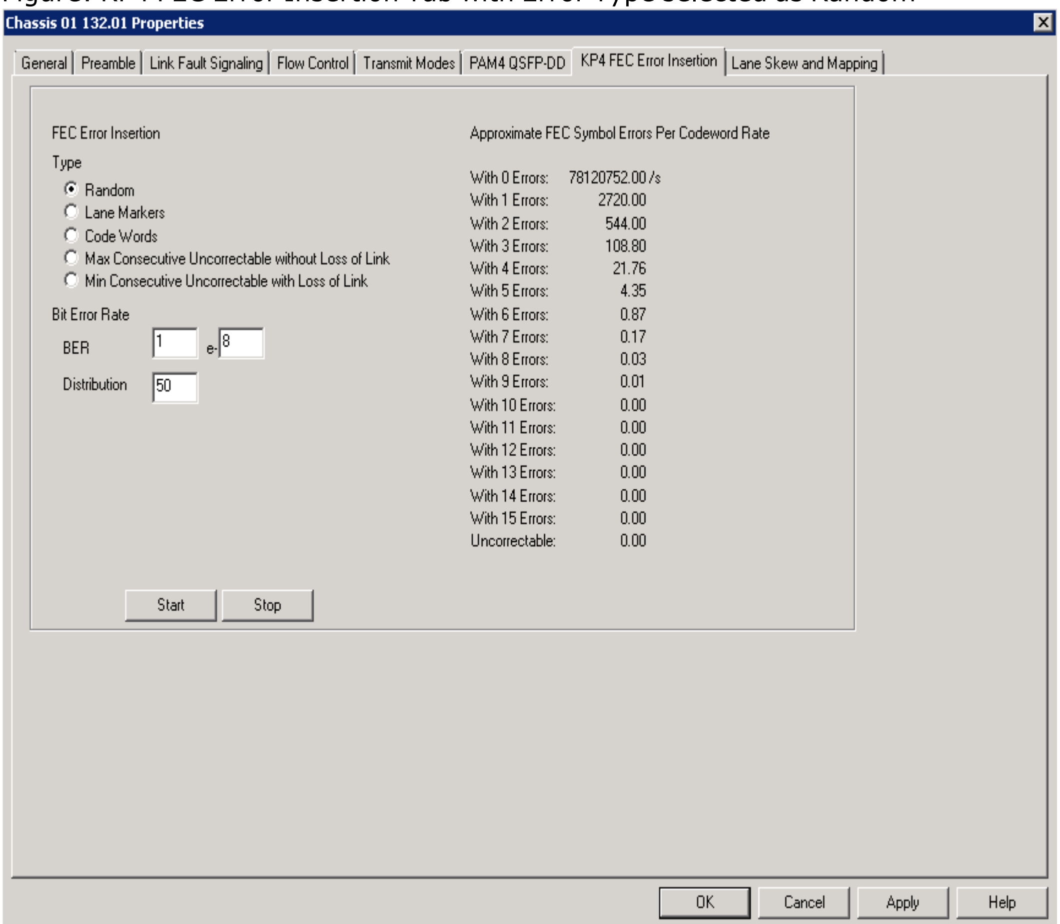


Figure: KP4 FEC Error Insertion Tab with Error Type selected as Lane Markers

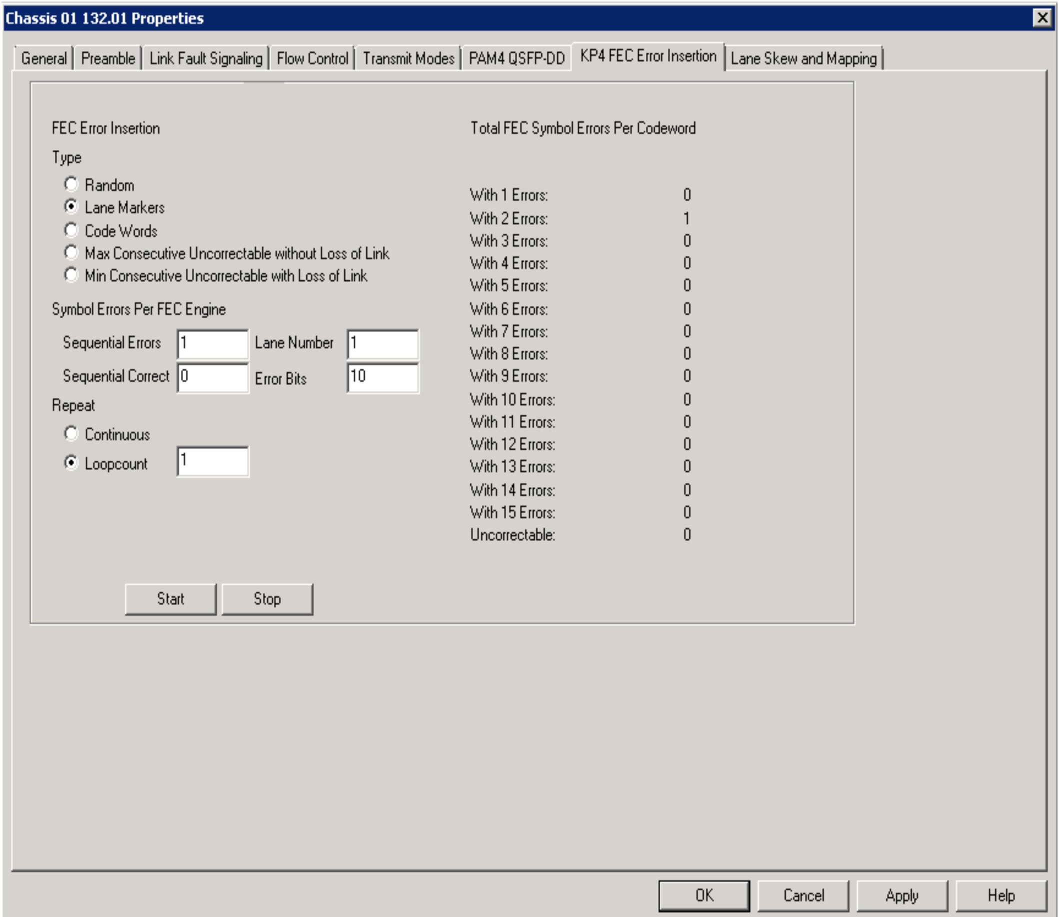


Figure: KP4 FEC Error Insertion Tab with Error Type selected as Code Words

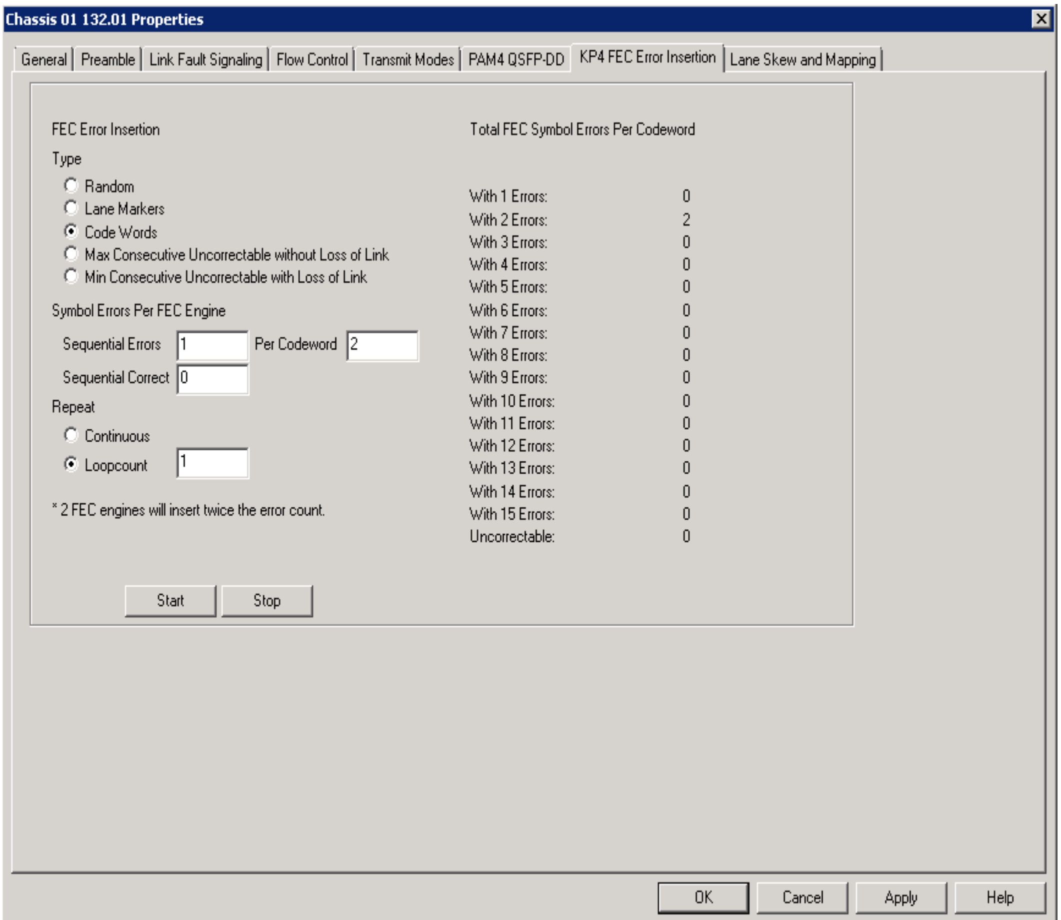


Figure: KP4 FEC Error Insertion Tab with Error Type selected as Max Consecutive Uncorrectable without Loss of Link

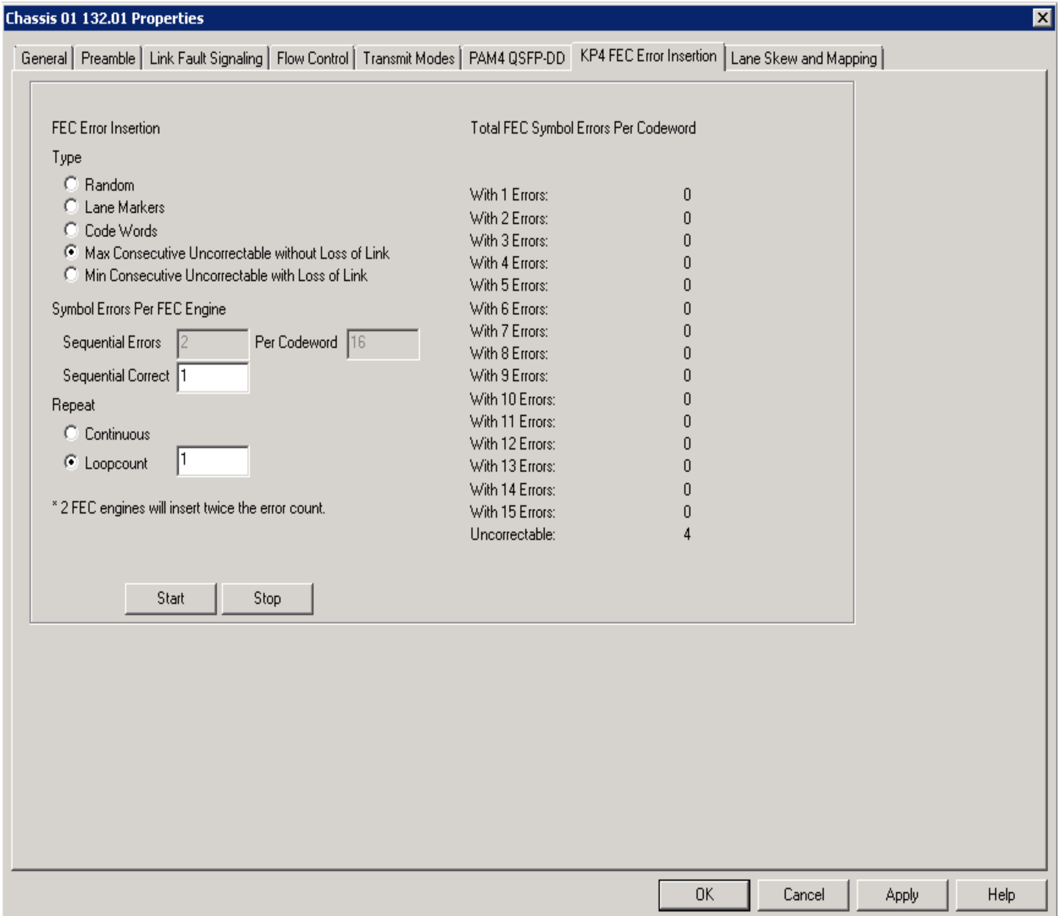


Figure: KP4 FEC Error Insertion Tab with Error Type selected as Min Consecutive Uncorrectable with Loss of Link

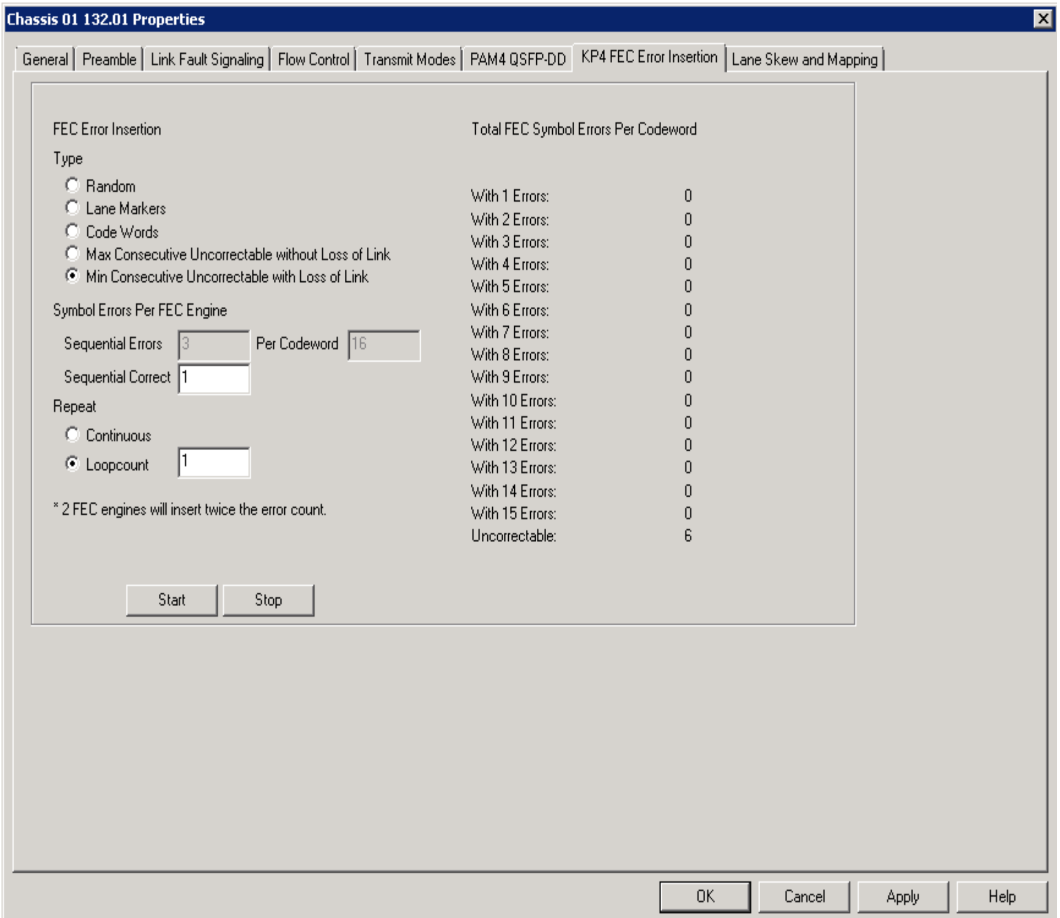


Table: KP4 FEC Tab Configuration

Section	**Field**	**Usage**
FEC Error Insertion		
Type	Random	Random FEC symbol error insertion will introduce a deterministic number of errors, evenly spread across all PCS lanes, on top the intrinsic BER (Bit Error Rate) of the interconnect.
	Lane Markers	Inserts errors only in the Lane Marker fields.
	Code Words	This is the fundamental unit of data that the FEC engine operates on sequentially. It is composed of blocks that carry the payload and parity information for the 64/66B scrambled data that arrives from the PCS Scrambler on Egress and from the PMA on Ingress.The code word size and layout can vary from each coding scheme. For example, RS, KR, and KP4 all have different code words because their coding schemes are different.
	Max Consecutive Uncorrectable	Uncorrectable errors are those with more than 15 symbol errors. As per IEEE, the maximum number of consecutive uncorrectable errors without loss of link is 2.

Section	Field	Usage
	without Loss of Link	
	Min Consecutive Uncorrectable with Loss of Link	The Max Consecutive Uncorrectable WITHOUT Loss of Link + 1. This is the threshold where the receiver should declare Local Fault due to bad data. The minimum number of consecutive uncorrectable errors with loss of link is 3.
Bit Error Rate	BER	The Bit Error Ratio (BER) is the ratio of the number of error bits compared to the total number of bits transmitted. In the BER field, enter the coefficient of the BER.The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	e-	Enter the exponent of the BER. The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	Distribution	Controls how the errors are distributed. This modifies the probability distribution of errors while maintaining the average Bit Error Rate. For example, you can have a BER of 10E-8 but have all of the errors be single errors OR you can have the errors be distributed across a variety of errors. The purpose is to thoroughly test a receiver to see if all possible errors are being corrected at varying rates.
Symbol Errors Per FEC Engine		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Sequential Errors	In burst mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.

Section	Field	Usage
		NOTE Per 802.3bs and 802.3cd, reception of 3 or more consecutive uncorrectable codewords will result in Loss of Link. In burst mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. This sequence will be repeated until stopped. NOTE Per 802.3bs and 802.3cd, reception of 5 or more Alignment Marker errors will result in Loss of Link. • In 400G and 200G modes, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines. In 100G and 50G modes, there is only a single FEC engine present. • The symbol errors are not evenly distributed across the PCS lanes (use Random error insertion mode for that case) • The maximum number of sequential uncorrectable errors without loss of link is 2 and the minimum number of sequential uncorrectable errors with loss of link is 3.
	Lane Number	The Lane Number specifies which PCS lane will be affected by the Lane Marker error insertion.This field is available only if you select the error insertion type as Lane Markers.
	Sequential Correct	The number of consecutive code words without errors.
	Error Bits	The Error Bits specifies how many errors will be inserted on each of the two symbol errors of the codeword that carries the Lane Marker. There is a minimum Error Bits required (2) before corrupting the symbol that maps to the Lane Marker field. This field is available only if you select the error insertion type as Lane Markers.
	Per Codeword	Codeword is a block of contiguous packets on the line. All RS-FEC codewords are of the same size.The Per Codeword value denotes the number of symbol errors per codeword to insert. KP4 FEC can correct up to 15 symbols, and detect up to 30 symbols. If the user specifies 16, an Uncorrectable Codeword will be issued. This field is available only if you select the error insertion type as

Section	Field	Usage
		Code Words.
Repeat		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Continuous	Continuous error insertion.In continuous mode, the Sequential Errors field will specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.
	Loopcount	The sequence of correct and incorrect codewords or symbol errors inserted will be repeated by the number specified in the Loopcount field.
Start		Starts the error insertion process.
Stop		Stops the error insertion process.
Appropriate FEC Symbol Errors Per Codeword Rate		The Appropriate FEC Symbol Errors Per Codeword Rate is an approximation for how many symbol errors there will be per codeword every second. NOTE In 400G and 200G modes, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines. In 100G and 50G modes, there is only a single FEC engine present.

QSFP-DD Port Properties—Lane Skew and Mapping

The **Lane Skew and Mapping** tab allows to control the PCS lane order and skew rate for each lane.

For more information on Lane Skewing, see the Lane Skew topic in the 'Multilane Distribution Configuration' chapter of the *Ixia Platform Reference Manual*. The Lane Skew topic is located under 'Types of Ports' / '100GE'.

The QSFP-DD Port Properties **Lane Skew and Mapping** tab for the different speed modes is shown in the following image:

Image: QSFP-DD **Lane Skew and Mapping** tab for 400GE mode

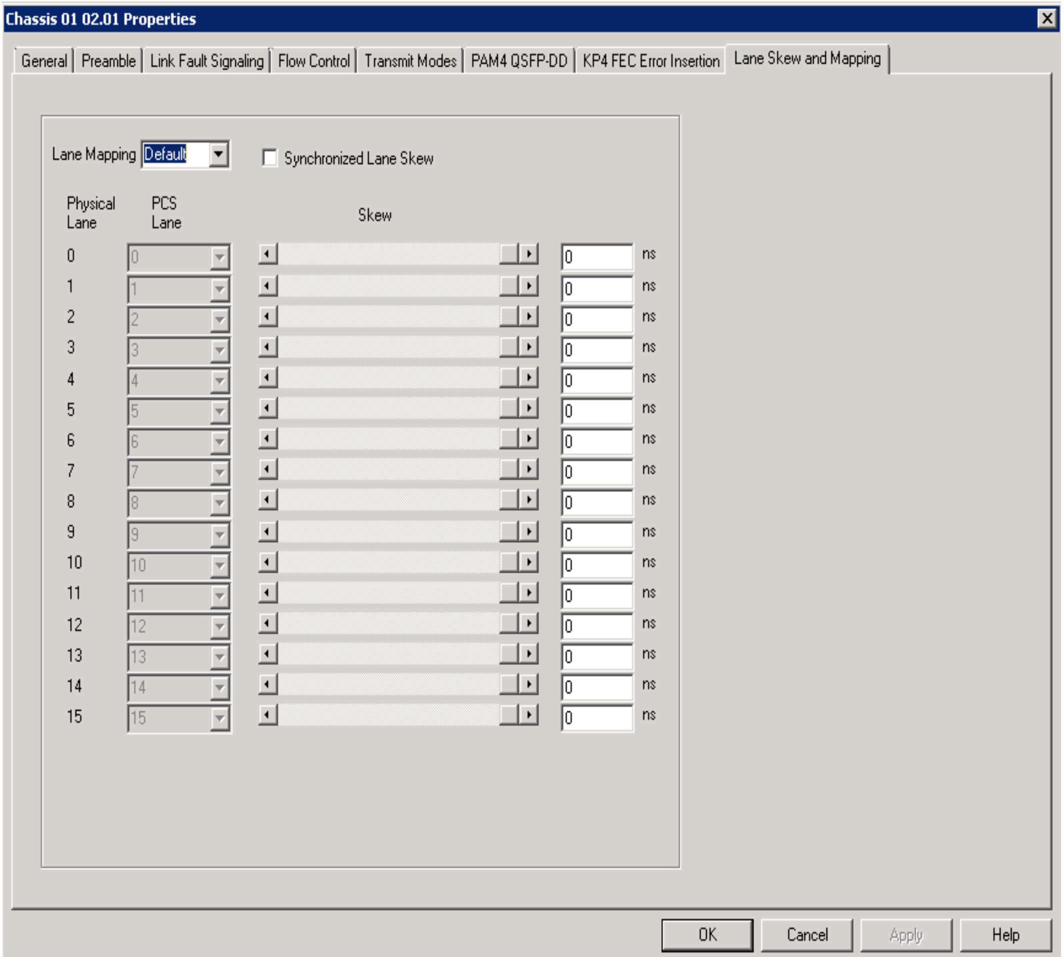


Image: QSFP-DD **Lane Skew and Mapping** tab for 1x200GE Fan-out Mode

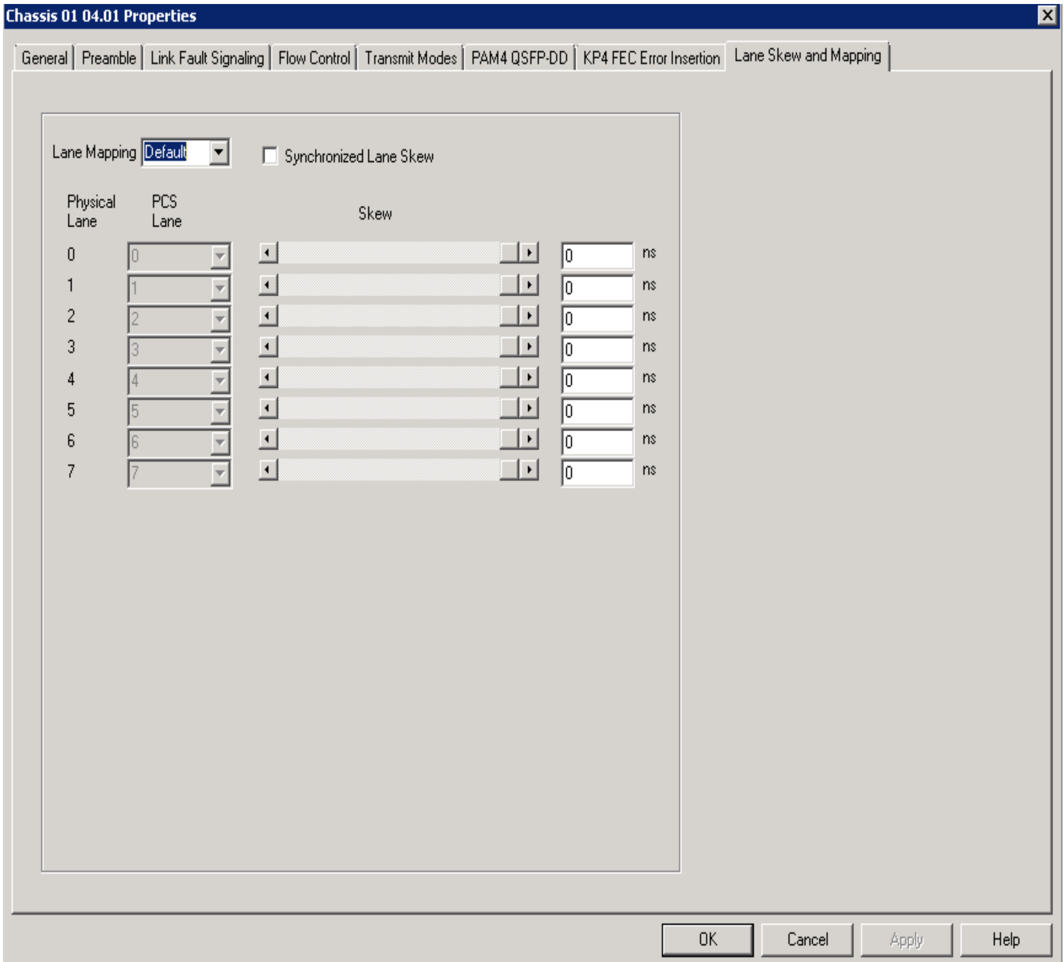


Image: QSFP-DD **Lane Skew and Mapping** tab for 2x100GE Fan-out Mode

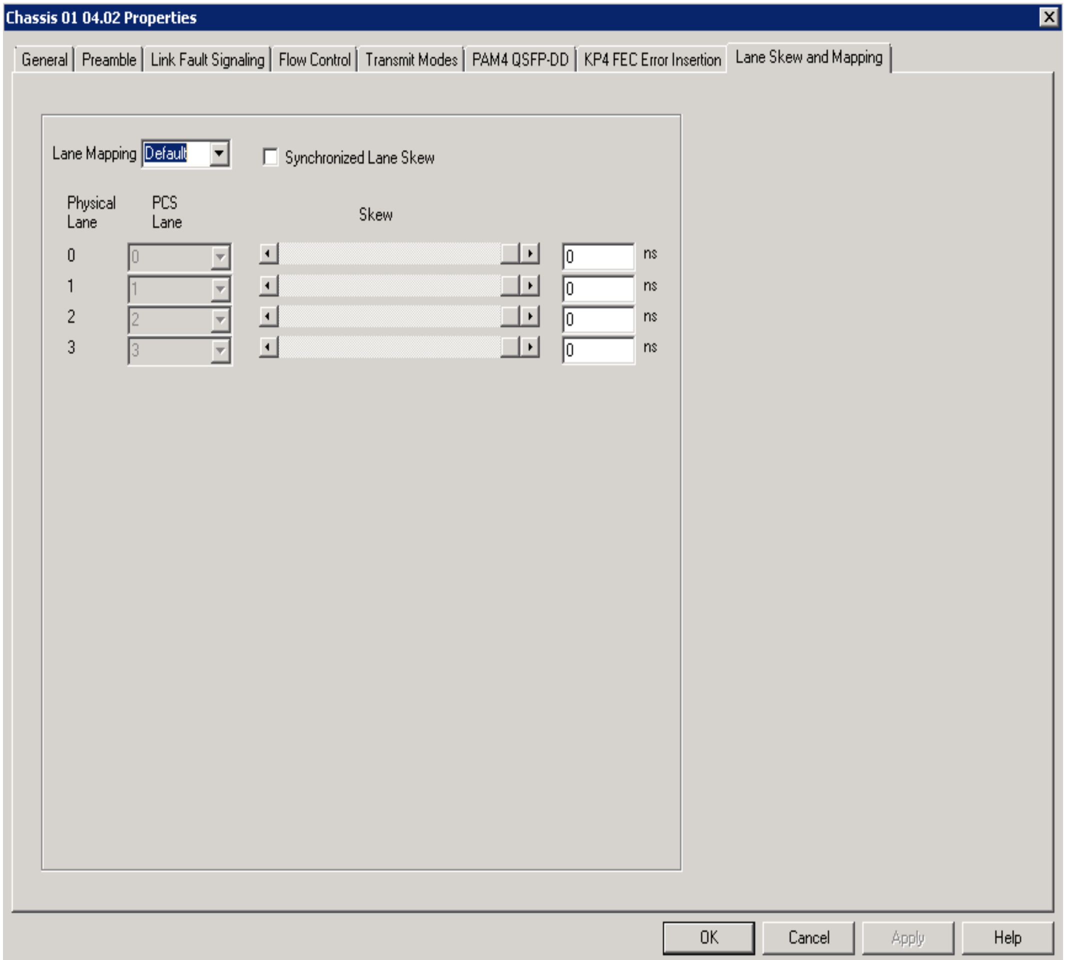


Image: QSFP-DD **Lane Skew and Mapping** tab for 4x50GE Fan-out Mode

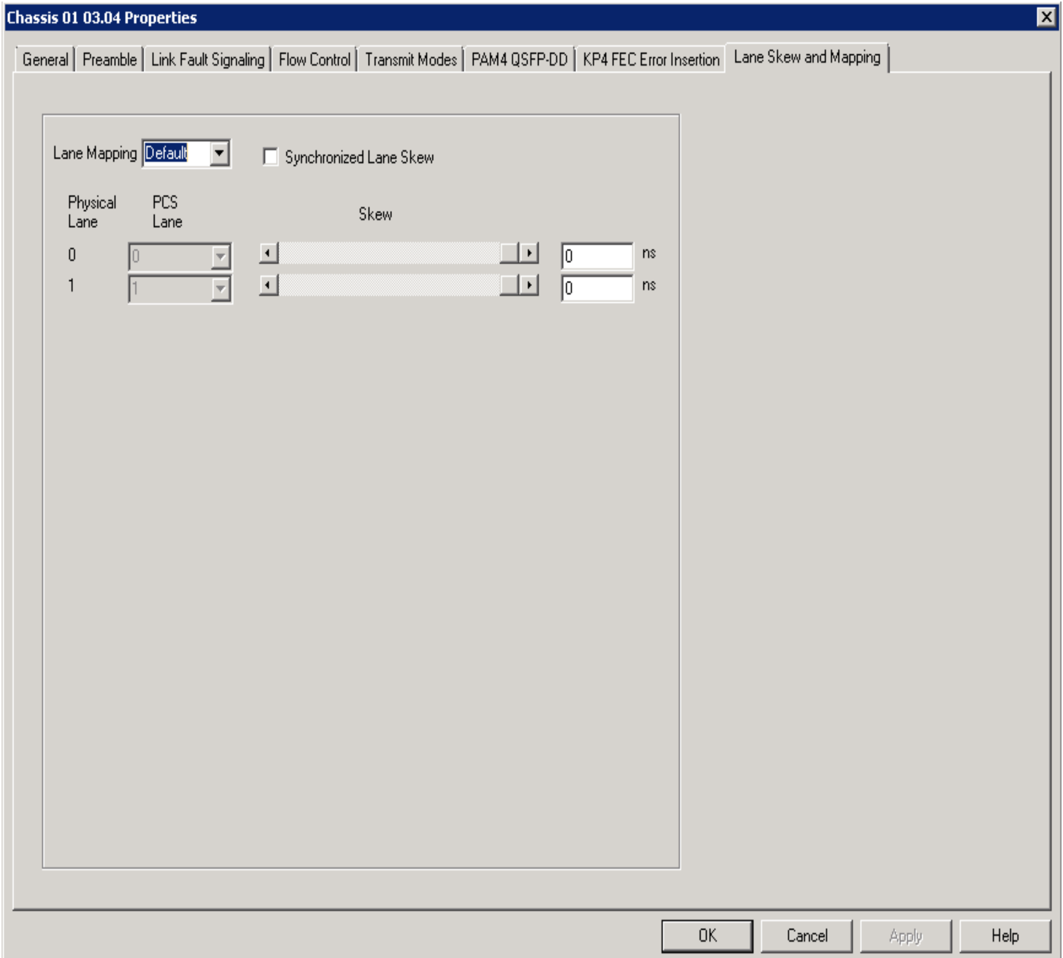


Table: Lane Skew and Mapping Configuration

Field	Description

Lane Mapping	Allows you to select a PCS lane ordering method. There are five options:
	• Default: The default ordering method. The default order is each physical lane corresponds to single PCS lane.
	• Increment:
	  ▪ For 400G, orders the lanes from 0 to 15, straight down the list.
	  ▪ For 200G, order the lanes from 0 to 7, straight down the list.
	  ▪ For 100G, order the lanes from 0 to 3, straight down the list.
	  ▪ For 50G, order the lanes from 0 to 1, straight down the list.
	• Decrement:
	  ▪ For 400G, orders the lanes from 15 to 0, straight down the list.
	  ▪ For 200G, order the lanes from 7 to 0, straight down the list.
	  ▪ For 100G, order the lanes from 3 to 0, straight down the list.
	  ▪ For 50G, order the lanes from 1 to 0, straight down the list.

Field	Description
	• Custom: Allows to put the lanes in any order by manually entering the numbers in the fields. The starting order is the last selected mapping. Mapping between physical and PCS lanes should be one-to-one, else it will result into link down. • Random: Allows to put the lanes in any random order, values will be any value from 0 to the total number of lanes.
Synchronized Lane Skew	If selected, enables to synchronize the skewing or delaying of one or more PCS lanes.
Physical Lane	The physical lane identifier. The physical lane is paired with a corresponding PCS lane.
PCS Lane	A number identifier for the PCS lane. The PCS lane is paired with a corresponding physical lane.
Skew	The skew slider is used to set a skew value for the PCS lane, in nanoseconds, on the transmit side. Lane Skew is the ability to independently delay one or more of the total number of PCS lanes. When the slider is moved, the nanoseconds field is correspondingly adjusted. You can also enter a nano second value directly into this field. When the slider is fully pushed to the right, the skew injected into the transmit stream is 0 (minimum). When the slider is pushed all the way to the left. the skew injected into the transmit stream is 1002.918 ns (maximum).

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CHAPTER 31

Port Properties–T400GD-8P-OSFP Load Modules

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the T400GD-8P-OSFP load modules.

Port Properties for T400GD-8P-OSFP Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option.

The complete specification for the T400GD-8P-OSFP load module is found in the *Ixia Platform Reference Manual*.

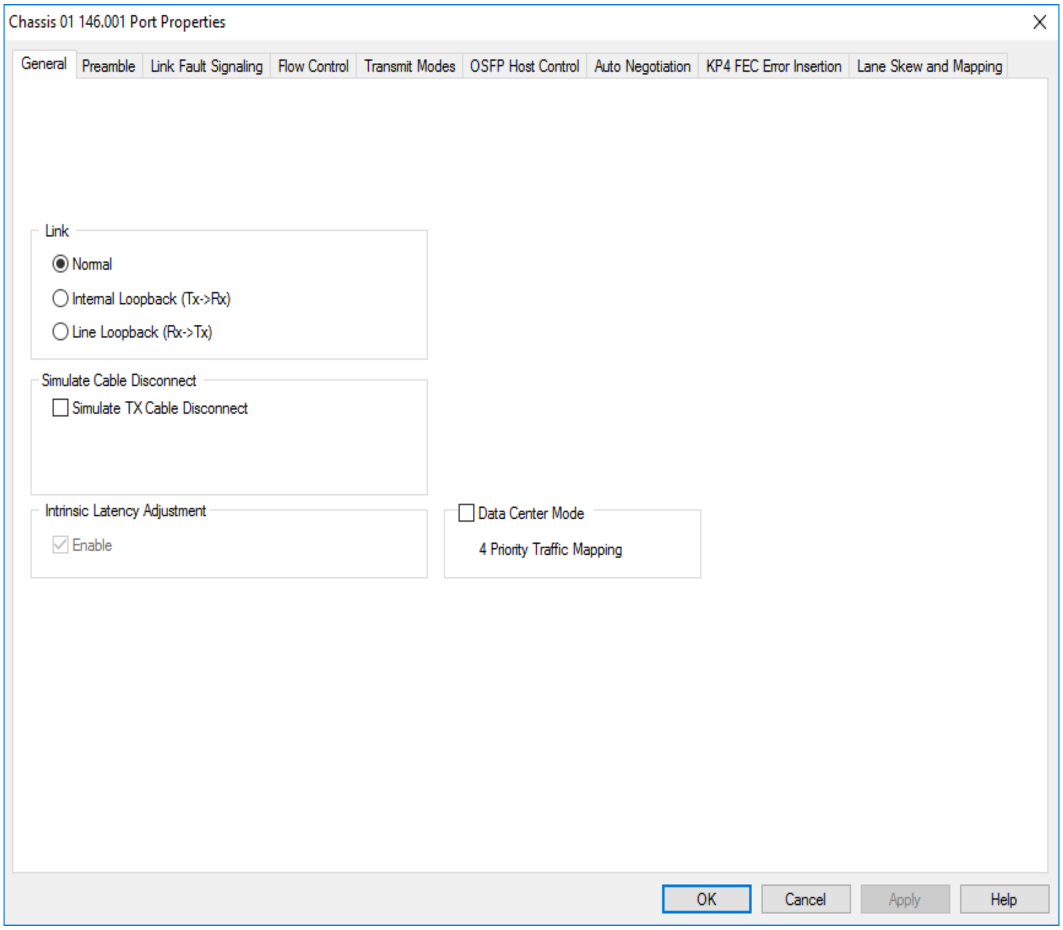
The following port property tabs are available for T400GD-8P-OSFP modules:

T400GD-8P-OSFP Port Properties—General

The T400GD-8P-OSFP **General** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, and then selecting the **General** tab.

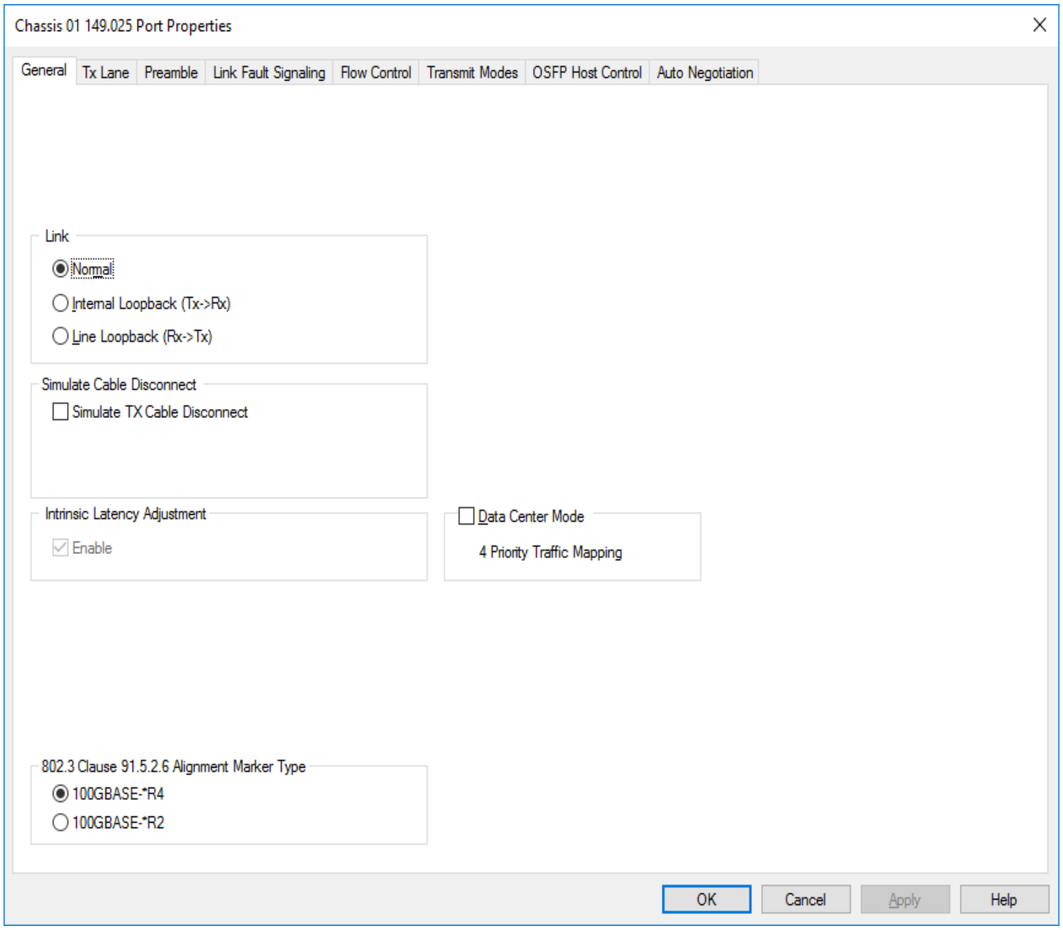
The Port Properties **General** tab for T400GD-8P-OSFP is shown in the following image:

Image: T400GD-8P-OSFP—**General** tab



The Port Properties **General** tab for T400GD-8P-OSFP 100GE mode is shown in the following image:

Image: T400GD-8P-OSFP—**General** tab for 100GE speed mode



The controls for **General** tab configuration are described in the following table:

Table: General Configuration

Section	Control/Field	Usage
Link	Normal	Normal operation
	Internal Loopback (Tx -> Rx)	Select this check box to turn on Internal Loopback—Transmit to Receive.
	Enable Line Loopback (Rx -> Tx)	Select this check box to turn on the Line Loopback— Receive to Transmit.
Simulate Cable Disconnect	Simulate TX Cable Disconnect	If this is selected, the port acts as if the cable has been disconnected on the transmit side only. Incoming packets may still be received and port may show link up, but no packets or PCS data will be transmitted.
Intrinsic Latency	Enable	The **Enable** check box is selected by default. This enables the intrinsic latency adjustment.

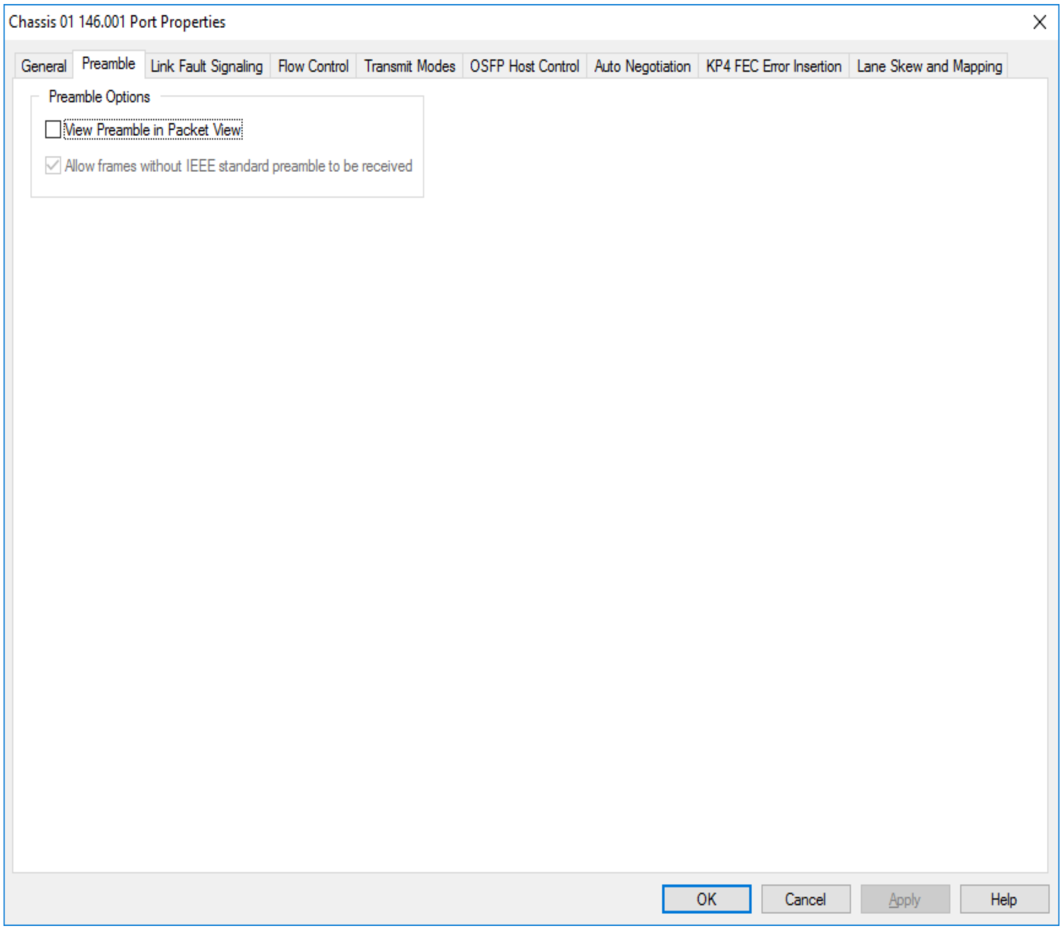
Section	Control/Field	Usage
Adjustment		The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia Platform Reference Manual*.
Data Center Mode		If selected, enables the Data Center Mode option. When Data Center Mode option is selected, the following changes take place: • The selected port is automatically placed into Advanced Stream mode. In this case, Packet Stream mode is not supported. • Only Auto Intrumentation mode (Floating Timestamp/Data Integrity) is supported, both for transmit and receive. • 4-Priority Traffic Mapping is enabled. It supports various frame size for each PFC control (0-4). • FCoE protocol can be edited for Ethernet II and Ethernet Snap in **Frame Data** tab.
802.3 Clause 91.5.2.6 Alignment Marker Type		This option is available for the 100GE speed mode. It controls the alignment marker mapping on transmit, and requires the same mapping to be used on receive.
	100GBASE *R4	The 100GBASE-*R4 format complies with some 100GE two-lane PMD PAM4 devices that set four_lane_pmd=1.
	100GBASE *R2	The 100GBASE-*R2 format complies with IEEE 802.3cd clause 91.6.2a setting of four_lane_pmd=0, and sets the alignment markers in two-lane PMD style per clause 91.5.2.6.

T400GD-8P-OSFP Port Properties—Preamble

The preamble precedes the frame, but is not part of the frame itself.

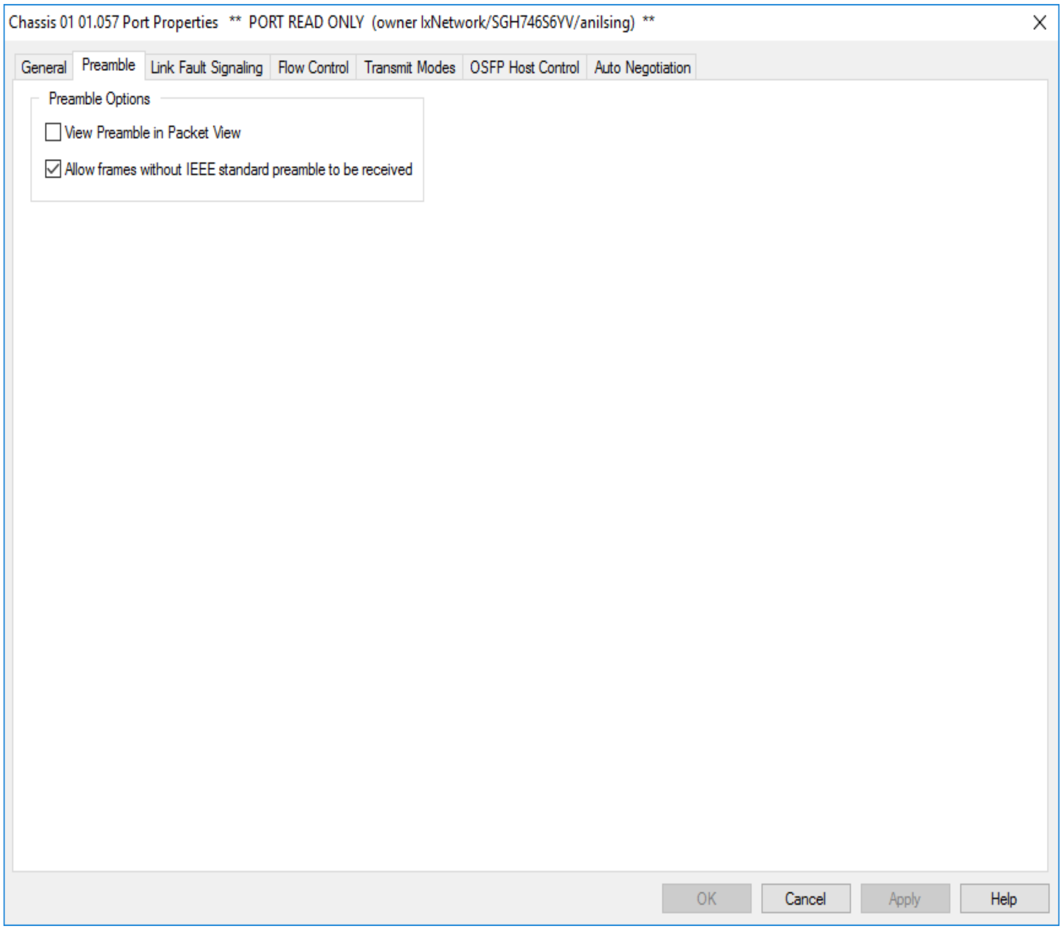
The T400GD-8P-OSFP Port Properties **Preamble** tab for 400GE and 200GE speed modes is shown in the following image:

Image: T400GD-8P-OSFP—**Preamble** tab for 400GE and 200GE



The T400GD-8P-OSFP Port Properties **Preamble** tab for 100GE and 50GE speed modes is shown in the following image:

Image: T400GD-8P-OSFP—**Preamble** tab for 100GE and 50GE



The fields and controls in this tab are described in the following table:

Table: Preamble Configuration

Section	Choices	Description
Preamble Options	View Preamble in Packet View	When this check box is selected, the preamble data will be visible in the Packet View (transmit side) and the Capture View (receive side).
	Allow frames without IEEE standard preamble to be received	When this check box is selected, it allows frames without IEEE standard preamble to be received. • This check box is selected by default. • For 400G and 200G speed modes, this check box is not available.

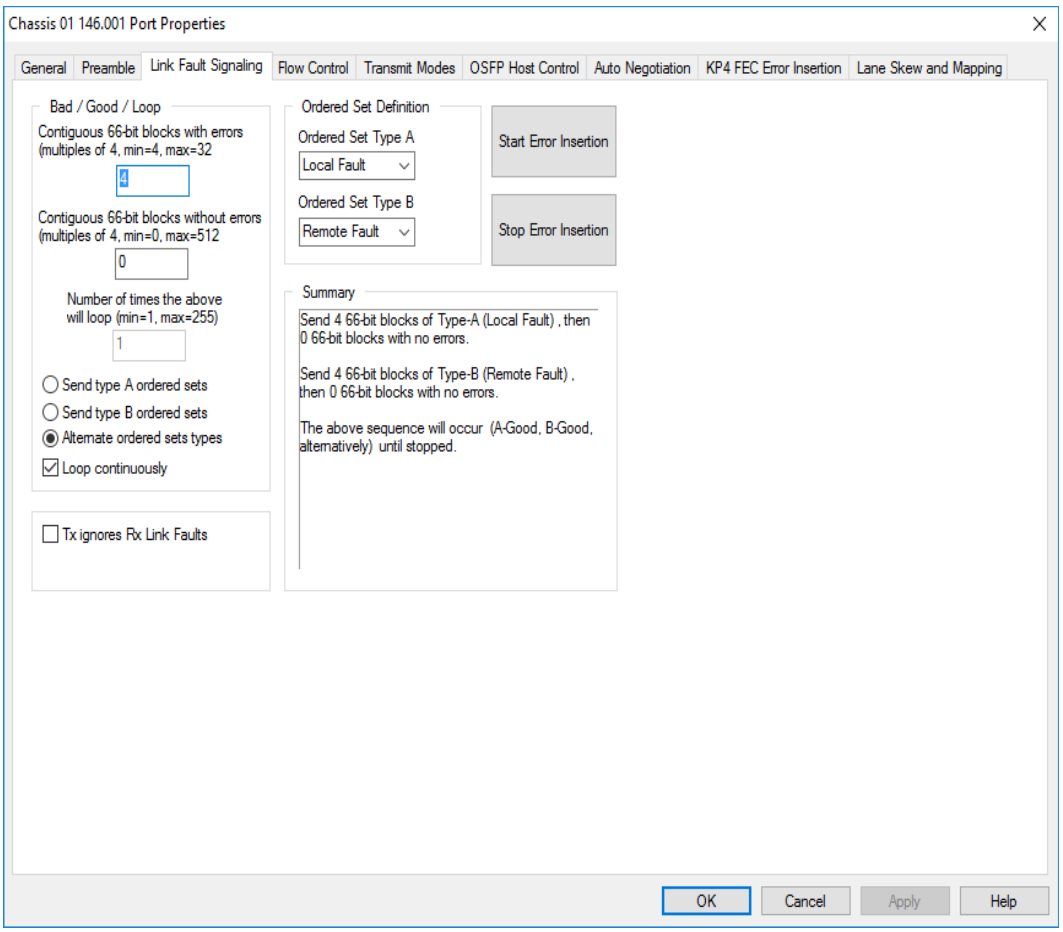
T400GD-8P-OSFP Port Properties—Link Fault Signaling

When Link Fault Signaling is enabled, four statistics will be added to the list in Statistic View for the port. One is for monitoring the Link Fault State. Two provide a count of the Local Faults and Remote Faults. The last one is for indicating the state of error insertion, whether or not it is ongoing.

The **Link Fault Signaling** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Link Fault Signaling*** tab.

The ***Link Fault Signaling*** tab for T400GD-8P-OSFP load module is shown in the following image:

Image: T400GD-8P-OSFP—**Link Fault Signaling** tab



The controls for **Link Fault Signaling** tab configuration are described in the following table:

Table: Link Fault Signaling Configuration

Section	Field/Control	Description
Bad/Good/Loop	(Bad) Contiguous 66-bit blocks with errors (multiples	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks with errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive fault sequences allowed are

Section	Field/Control	Description
	of 4; min = 4, max = 32)	minimum 4 sequences and maximum 32 sequences.
	(Good) Contiguous 66-bit blocks without errors (multiples of 4; min = 0, max = 512)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks without errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive regular data sequences allowed are minimum 0 sequences and maximum 512 sequences.
	Number of times the above will loop (min = 1, max = 255)	Specifies the number of loops for the user defined sequence. There are two modes: • Discrete iterations: 1. Minimum of 1 iteration 2. Maximum of 255 iterations • Continuous loop 1. User cannot specify number of iterations
	Choose one of: • Send type A ordered sets • Send type B ordered sets • Alternate ordered set types	Defines the ordered set pattern that will be sent. (The two Ordered Sets—A and B—are defined in the **Ordered Set Definition** box in this tab.) This pattern will be combined with the Good blocks/Bad blocks pattern for transmission. • Only Type A fault sequence and regular good data sequences • Only Type B fault sequence and regular good data sequences • Alternate Type A, regular good data sequences and Type B fault sequence, regular good data sequences NOTE If this field is available, and the Alternate ordered set types option is selected, the minimum value for this field should be '2,' to allow the entire pattern to be sent once. If left at the minimum value of '1'— only two groups of blocks (one of good blocks and one of bad blocks) will be sent, which means that only the first ordered set will be sent. A minimum of eight blocks is required for one complete pattern including Types A and B.
	Loop continuously	If selected, the loop defined by the combination of the Bad and Good blocks plus the pattern of ordered sets, will be

Section	Field/Control	Description
		transmitted continuously until the *Stop Error Insertion* button is selected.
Ordered Set Definition	Ordered Set Type A	Choose one of: • Local Fault • Remote Fault
	Ordered Set Type B	Choose one of: • Local Fault • Remote Fault
Tx ignores Rx Link Faults		If selected, ongoing transmission will continue even if Link Fault messages are received by the sending RS.
Summary (Window)		(Read-only) Shows descriptions of the patterns that will be transmitted.
Start Error Insertion		Select this button to start the transmission of the configured error patterns.
Stop Error Insertion		(Available only for use with the *Loop continuously* option.) Select this button to stop the transmission of the configured error patterns.

T400GD-8P-OSFP Port Properties—Flow Control

The T400GD-8P-OSFP **Flow Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

NOTE You can view this help page for the Port Properties - **Flow Control** tab by selecting the Help button and not F1.

The Port Properties **Flow Control** tab for T400GD-8P-OSFP is shown in the following image:

Image: T400GD-8P-OSFP **Flow Control** tab

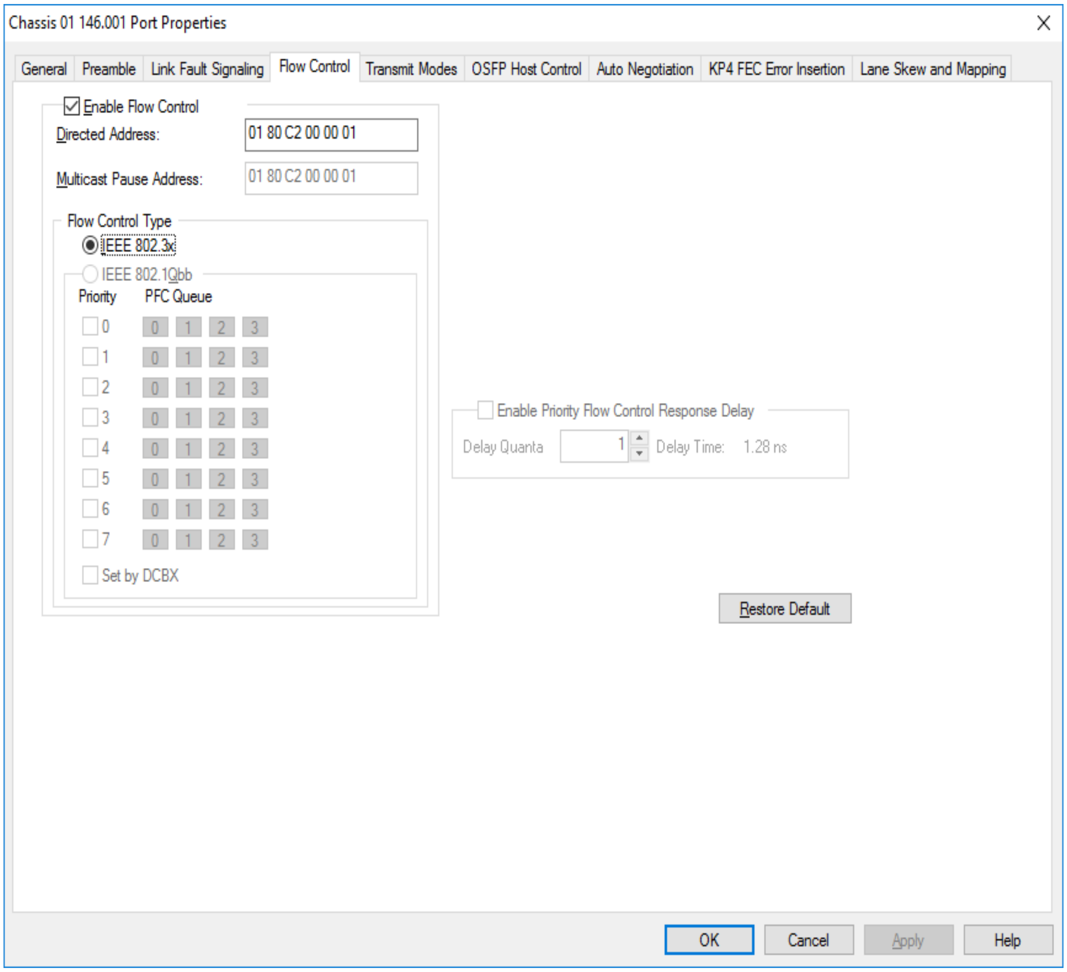


Table: Flow Control Configuration

Section	Field/Control	Description
Enable Flow Control	(check box)	Enables the port’s MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type		
	IEEE 802 3x	When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame.

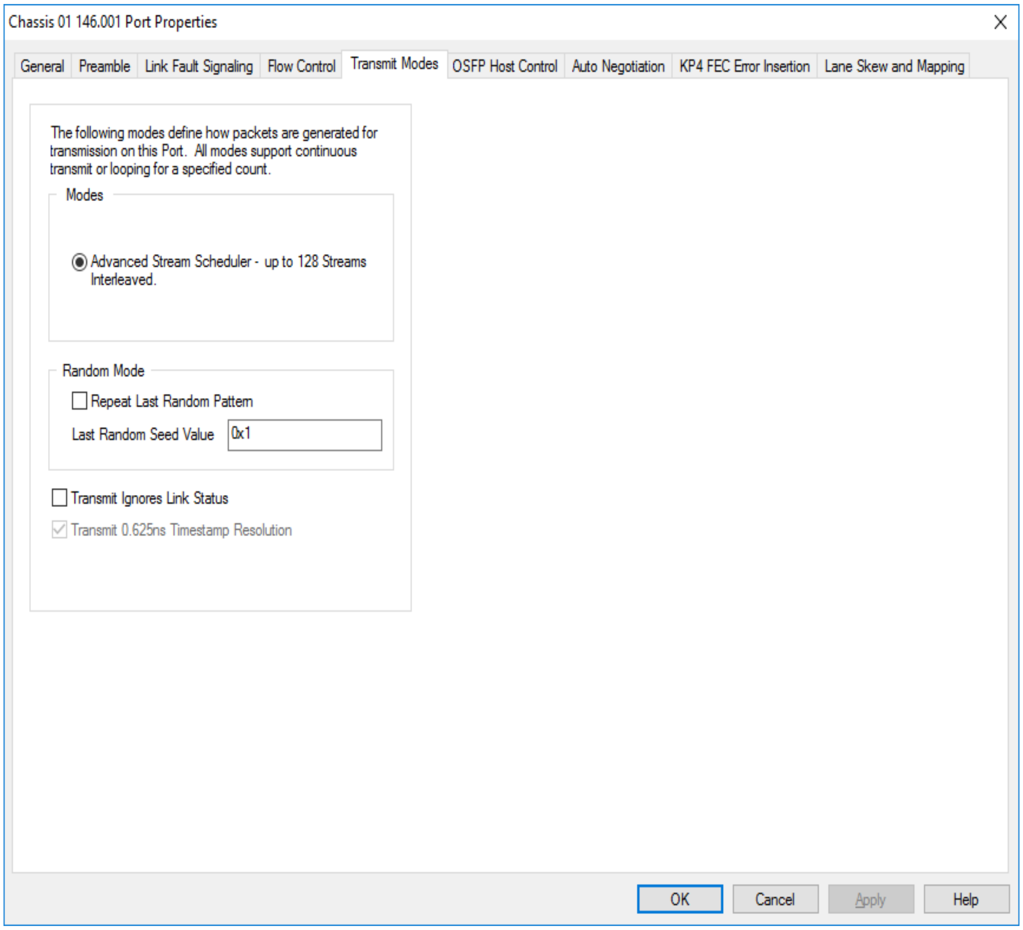
Section	Field/Control	Description
	IEEE 802.1Qbb	When not in Data Center mode, only IEEE 802.3x is available.
	Priority	When flow control type IEEE 802.1Qbb is selected in Data Center mode, priority options are the channels of data that can be paused. Select one or more channels.
	PFC Queue	The PFC Queue can be mapped to the priority field in the frame.
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

T400GD-8P-OSFP Port Properties—Transmit Modes

The **Transmit Modes** tab for T400GD-8P-OSFP load modules is shown in the following image. It is accessed by double-clicking a port in Resources window, or by selecting a port and selecting the **Properties** menu option. Then select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following images:

Image: T400GD-8P-OSFP—**Transmit Modes** tab



The controls for **Transmit Modes** tab configuration are described in the following table:

Table: Transmit Modes Configuration

Section	Field/Control	Description
Modes	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure up to 128 streams for 400GE and 200GE and up to 32 streams for 100GE and up to 16 streams for 50GE speeds. They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream's

Section	Field/Control	Description
		random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit Ignores Link Status		If selected, will allow transmission of packets even if the link is down.
Transmit High TimeStamp Resolution		If selected, the T400GD-8P-QDD load module will support the 0.625 ns for 400G speed mode.

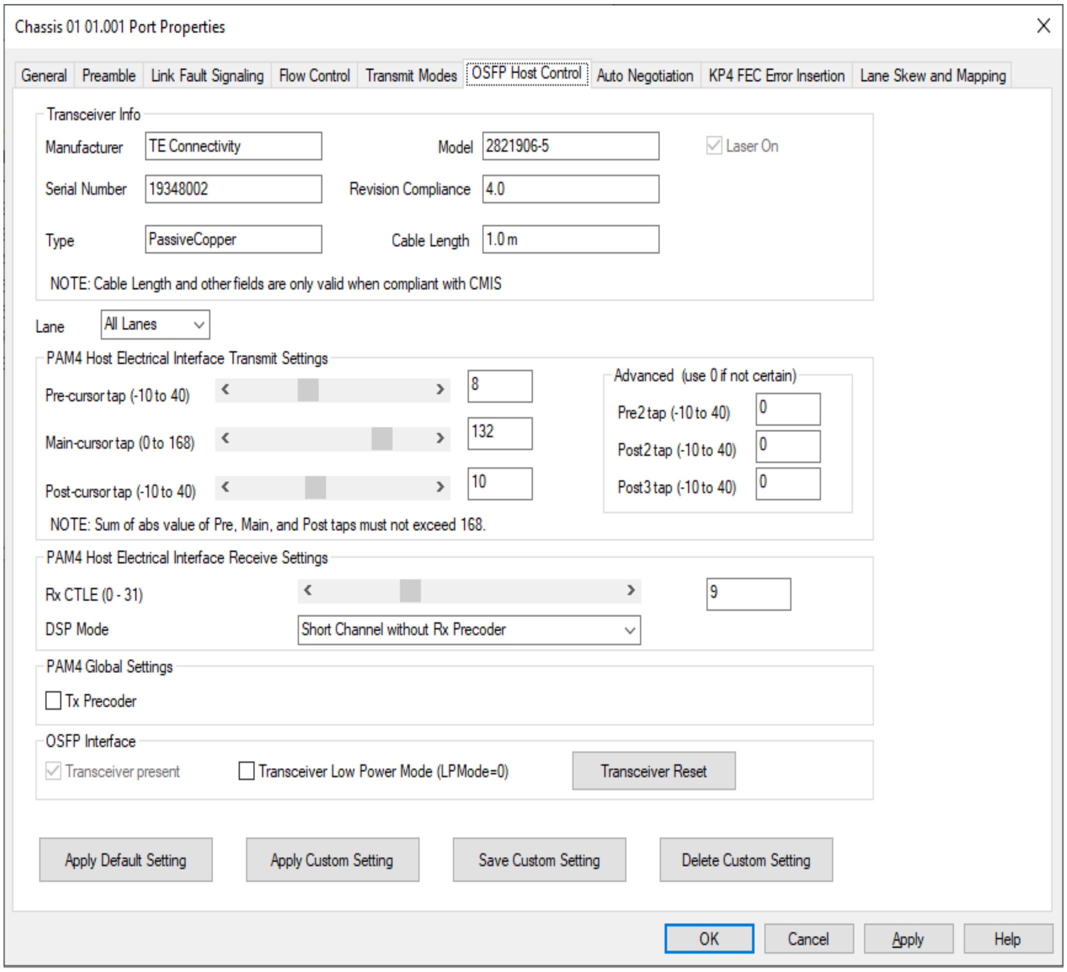
T400GD-8P-OSFP Port Properties—OSFP Host Control

PAM-4 is a four-level pulse-amplitude modulation that uses four distinct amplitude levels to encode two bits of data, essentially doubling the bandwidth of a connection. The PAM4 settings are defined using the **OSFP Host Control** tab.

The **OSFP Host Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **OSFP Host Control** tab.

The Port Properties **OSFP Host Control** tab for T400GD-8P-OSFP when the default passive copper transceiver is used is shown in the following image:

Image: **OSFP Host Control** tab for passive copper transceiver



When T400GD-8P-OSFP detects an optical transceiver, it will apply a transmit and receive equalization combination that is well suited for optics, as highlighted in the following image.

Image: **OSFP—Host Control** tab for optical transceiver

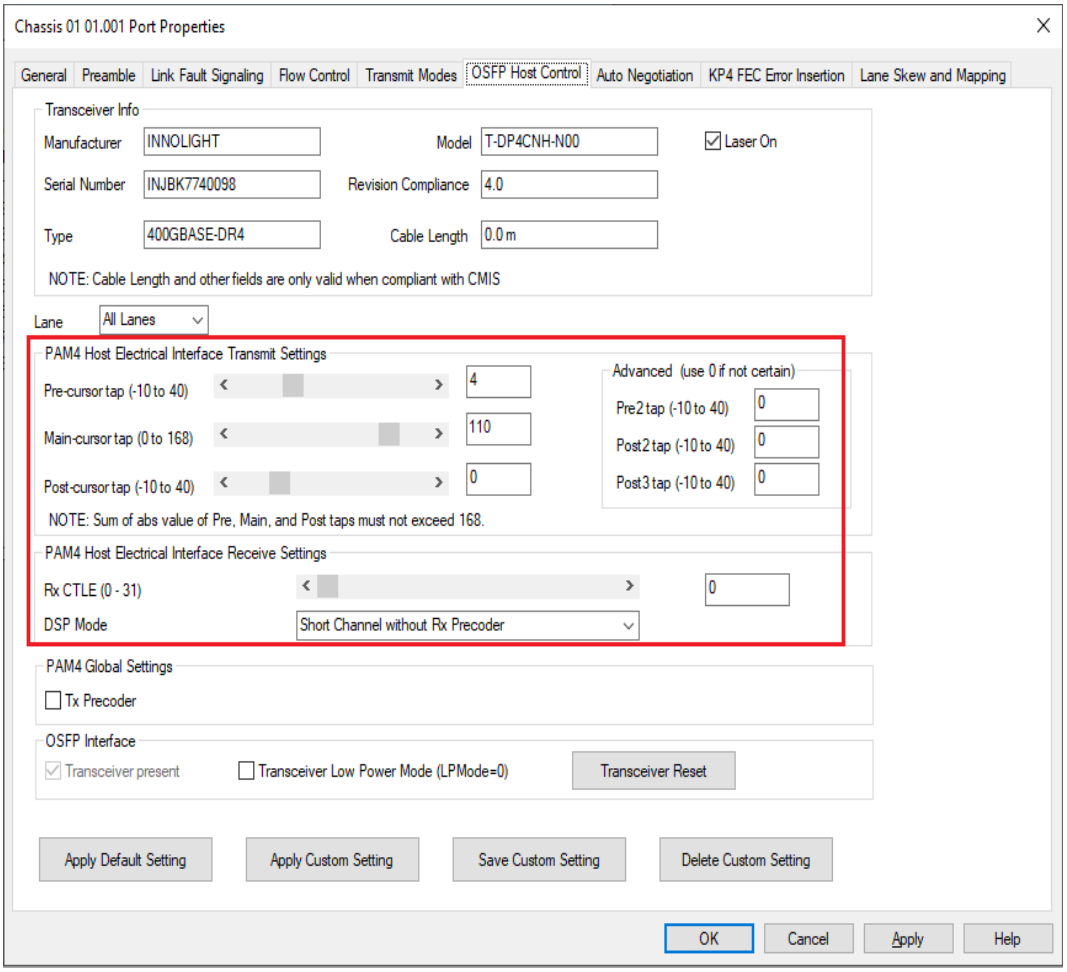


Table: OSFP Host Control Configuration

Section	Field/Control	Description
Transceiver Info		
	Manufacturer	This is the Vendor Name field read from the actual transceiver currently being plugged in.
	Model	This is the Part Number field read from the actual transceiver currently being plugged in.
	Serial Number	The serial number of the transceiver.
	Revision Compliance	The implemented CMIS revision of the transceiver. T400GD-8P-OSFP supports both CMIS 3.0 and CMIS 4.0 transceivers. See Management Interface.
	Type	When a transceiver is inserted into the load module, the software reads IEEE registers to determine the transceiver capabilities and media type. If the transceiver contains this information, it is

Section	Field/Control	Description
		shown in this read-only field.
	Cable Length	The length of Ixia-supplied cable which connects this chassis to the previous chassis in the chain.
	Laser On	Select this check box to enable the laser power.
PAM4 Host Electrical Interface Transmit Settings		
	Pre-cursor tap (-10 to 40)	This helps to control the Pre Tap value for Tx.
	Main-cursor tap (0-168)	This helps to control the Main Tap Control for Tx.
	Post-cursor tap (-10 to 40)	This helps to control the Post Tap value for Tx.
Advanced (use 0 if not certain)		
	Pre2 tap (-10 to 40)	The Pre2 Tap value for Tx which is generally negative. The negative precursor tap values are used to optimize the signal at the receiver.
	Post2 tap (-10 to 40)	The Post2 Tap value for Tx which is generally negative.
	Post3 tap (-10 to 40)	The Post3 Tap value for Tx which is generally negative.
PAM4 Host Electrical Interface Receive Settings		
	Rx CTLE (0-31)	Represents the receive sides continuous time linear equalizer.The control is the coefficient for how strong or weak the equalization should be.
	DSP Mode	Represents the Inphi Retimer’s proprietary digital signal processing modes. The controls are different channel descriptions corresponding to different operation modes. The options are the following: • Short non strenuous links • Non-strenuous optical links • Non-strenuous links w/ strong reflections • Non-strenuous optical links w/ strong reflections • Strenuous links • Strenuous optical links w/ strong reflections
PAM4 Global Settings		

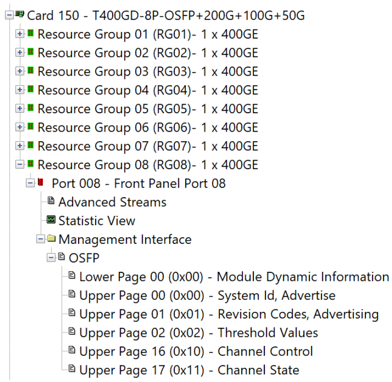
Section	Field/Control	Description
	Tx Precoder	Represents a PAM4 encoding scheme to reduce DFE bit errors.This also means that both sides of the link must have precoder enabled for link to come up.
OSFP Interface		
	Transceiver HW InitMode	Selecting the check box configures the QSFP-DD InitMode pin to perform the optional Hardware Init mode initialization as described in the Common Management Interface Specification (CMIS) Rev 3.0. When a transceiver boots into Hardware Init mode, the datapath is automatically configured by the module without intervention from the host (that is Ixia tester). When disabled, the software-controlled initialization (Software Init) is instead performed. This is the recommended initialization mode for any transceiver since the appropriate checks are performed between the Ixia tester and the transceiver before the module's datapath initialization.
	Transceiver Reset	Resets the transceiver.
	Apply Default Setting	When you select this button, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Setting	When you select this button, if there exists a custom setting in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	When you select this button, if there exists a custom setting in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users click the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	When you select this button, if there exists a custom setting in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel with that. If no custom setting exists, users will be prompted that nothing will be deleted.

Management Interface

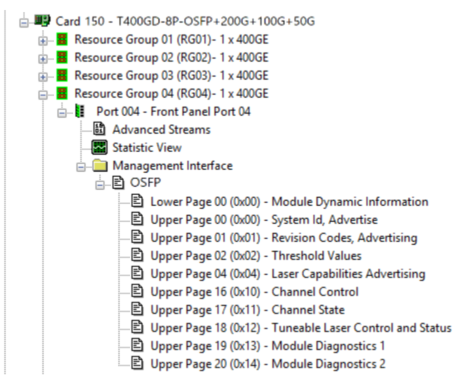
A management interface specification CMIS defines the management interface and associated protocols for all required and allowable management interactions between a CMIS aware host and a CMIS compliant module that are relevant for the host using the module in an application.

The Management Interface appears in the IxExplorer Resources Tree and switches on the fly depending on the CMIS revision. This means that the transceiver automatically reads the management interface and populates the lower and upper pages depending on the transceiver type.

With a CMIS 3.0 (or lower) transceiver, you will see the following pages:



With a CMIS 4.0 transceiver, you will see the following pages:

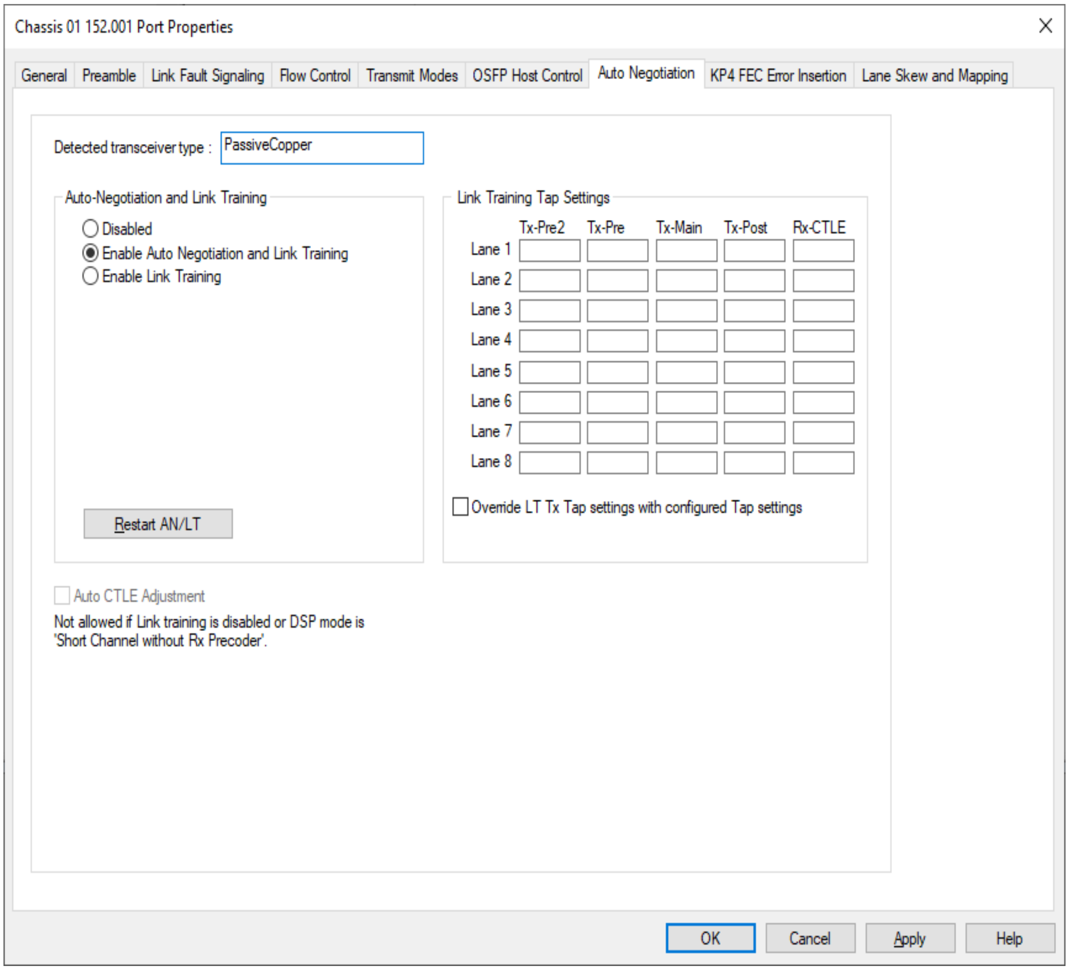


T400GD-8P-OSFP Port Properties—Auto Negotiation

The T400GD-8P-OSFP **Auto Negotiation**tab is accessed by selecting a T400GD-8P-OSFP port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto Negotiation** tab.

The Port Properties **Auto Negotiation** tab for T400GD-8P-OSFP is shown in the following image:

Image: T400GD-8P-OSFP **Auto Negotiation** tab

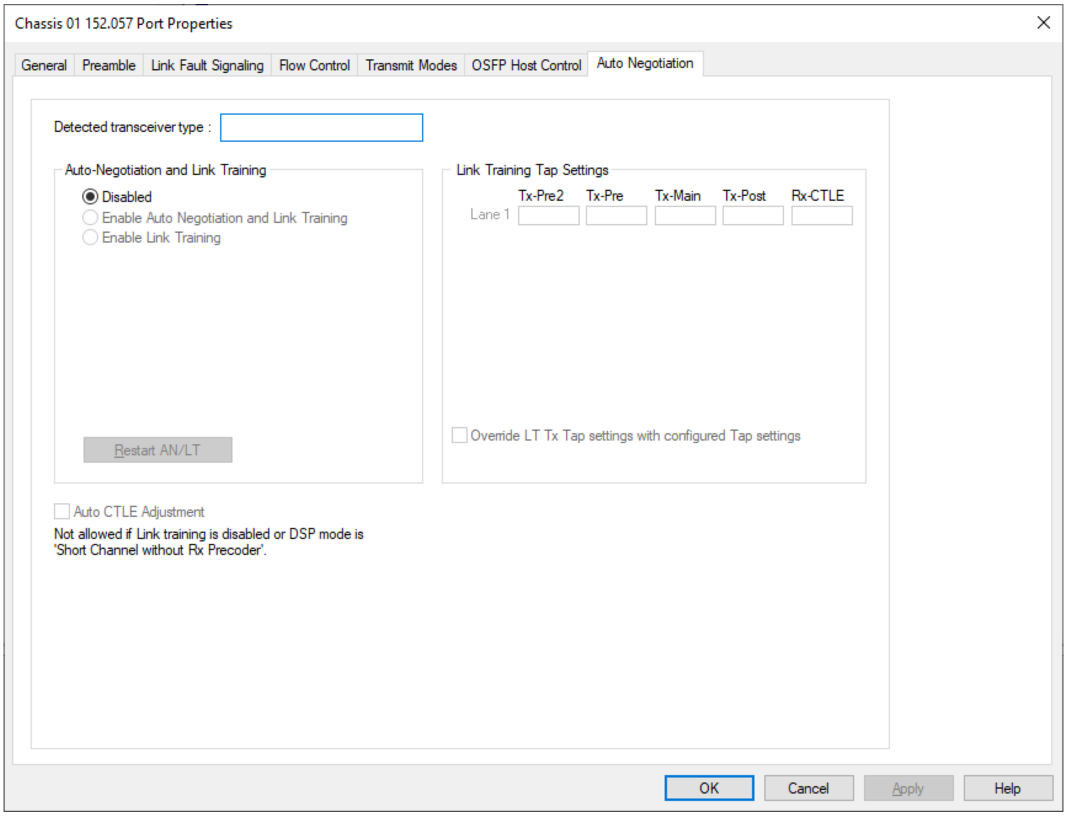


The following lanes are available depending on the port speed:

Speed Mode	Lanes
400GE	8 lanes (1-8)
200GE	4 lanes (1-4)
100GE	2 lanes (1-2)
50GE	1 lane (1)

For 50GE speed mode, if the **All Ports, No AN** is enabled, the Auto-Negotiation and Link Training options are not available for selection.These options are available if the **Odd Ports Only** option is selected. See Operation Mode.

Image: T400GD-8P-OSFP **Auto Negotiation** tab for 50GE speed mode



The fields and controls in this tab are described in the following table:

Table: T400GD-8P-OSFP **Auto Negotiation** tab

Field/Control	Description
Detected transceiver type	The type of transceiver that is plugged in.
Disabled	When you select the check box, the L1 parameters like Autonegotiation, Link Training, and FEC, are enabled or disabled per IEEE requirements, and you will not be able to enable or disable these manually. If the check box is cleared, you will be able to manually enable or disable L1 features – even if it violates IEEE specifications. By default the check box is selected.
Enable Auto Negotiate and Link Training	Auto negotiation controls how a port communicates with other ports.If you select the check box, it allows auto-negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing • **Restart Auto-Negotiate** button is selected (this does a forced restart) **Note**: The **Enable Auto Negotiate** check box is available for selection only if

Field/Control	Description
	the **Disabled** check box is cleared.
Enable Link Training	Select the check box to allow longer length copper cables to be used. This means that during the next Auto-Negotiation, KR training will be used. NOTE This check box is available for selection only if the **Disabled** check box is cleared.
Negotiated the capability above	The text box indicates the speed that was negotiated due to Auto-Negotiation.
Restart AN/LT	Restarts the Auto Negotiate sequence.
Auto CTLE Adjustment	When you select the check box, the load module offers CTLE or control over the receiver's Continuous Time Linear Equalizer stage, which is a linear filter that can attenuate the low-frequency components, boost the signal components at the Nyquist frequency, and attenuate higher frequencies past that peak.
Link Training Tap Settings	
Tx-Pre2-cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Pre-cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Main-cursor Lane 1-8	The per-lane transmit main-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Post-cursor Lane 1-8	The per-lane transmit post-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Rx-CTLE Lane 1-8	The CTLE settings applied by the receiver.
Override LT Tx Tap settings with configured Tap settings	Selecting this check box overrides the taps settings derived by the link training process, and configures the transmit pre/main/post cursor settings and receiver CTLE setting with the static values specified in the **OSFP Host Control** tab.

T400GD-8P-OSFP Port Properties—KP4 FEC Error Insertion

Forward Error Correction (FEC) is a method of communicating data that corrects errors in transmission on the receiving end. Before transmission, the data is put through a predetermined algorithm that adds extra bits specifically for error correction to any character or code block. If the transmission is received in error, the correction bits are used to check and repair the data.

NOTE **KP4 FEC Error Insertion** tab is not available for T400GD-8P-OSFP 100G and 50G models.

The **FEC Error Insertion** tab allows to inject FEC errors into transmitted data, and is shown in *Image: **FEC Error Insertion** Tab*

Image: **KP4 FEC Error Insertion** Tab with Error Type selected as Random

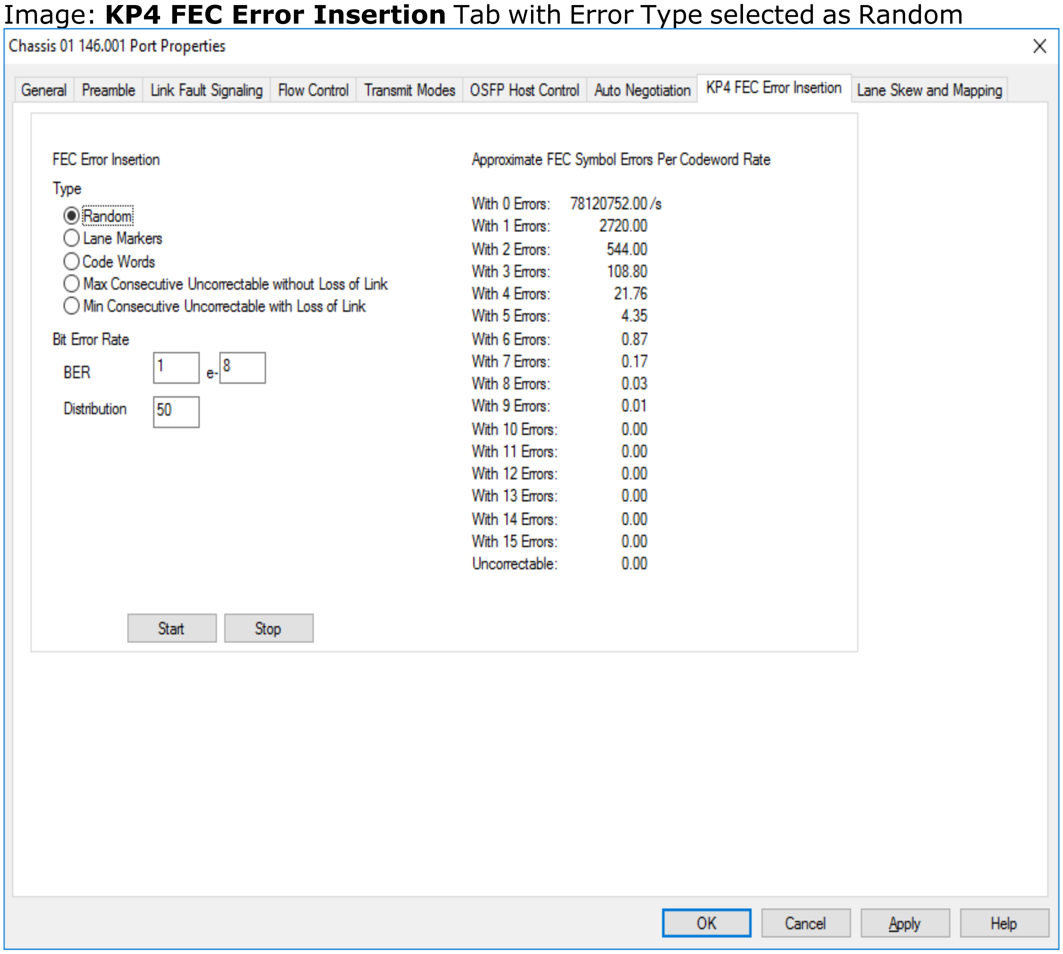


Image: **KP4 FEC Error Insertion** Tab with Error Type selected as Lane Markers

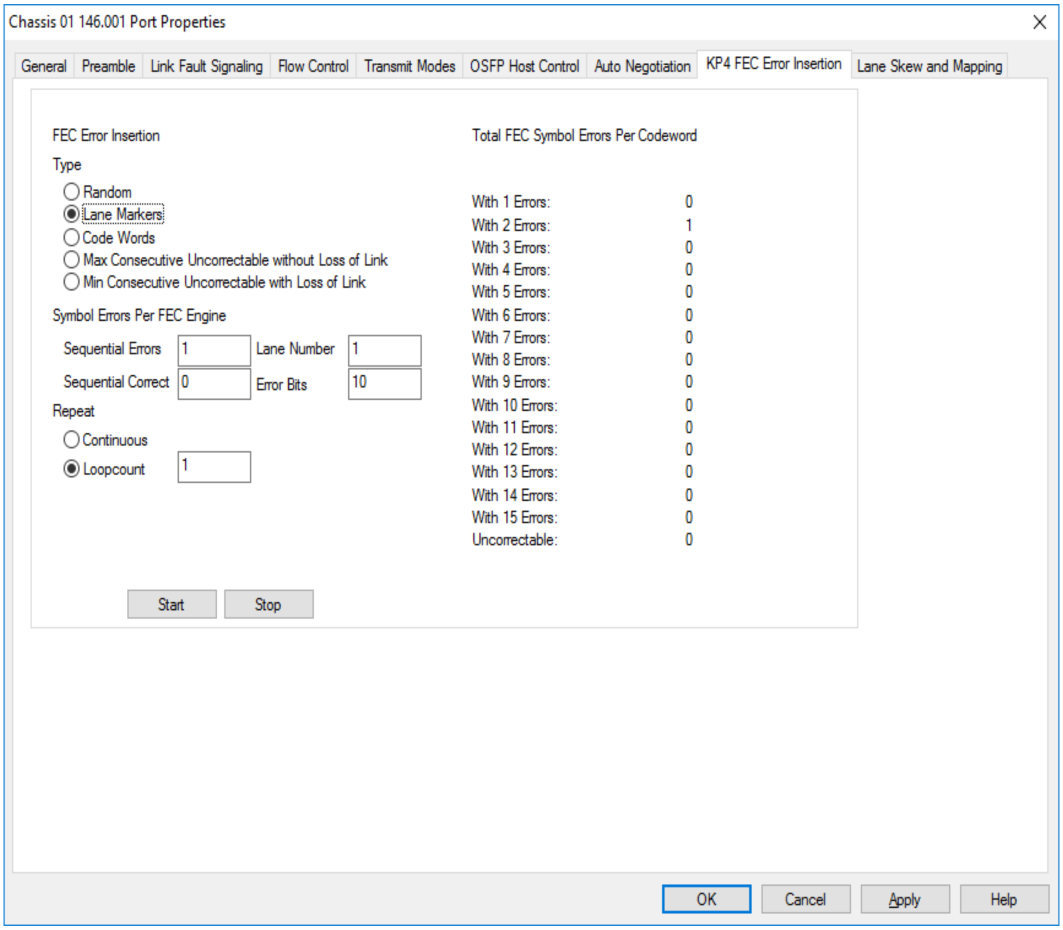


Image: **KP4 FEC Error Insertion** Tab with Error Type selected as Code Words

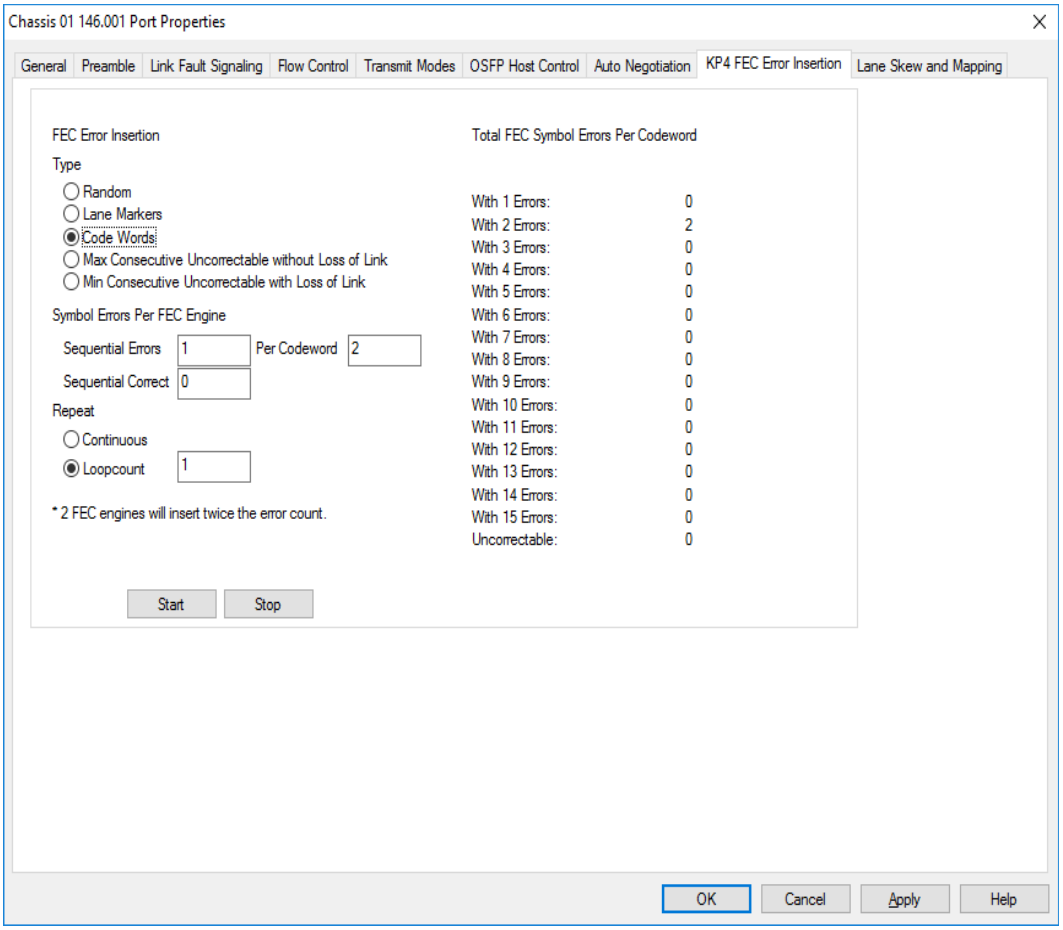


Image: **KP4 FEC Error Insertion** Tab with Error Type selected as Max Consecutive Uncorrectable without Loss of Link

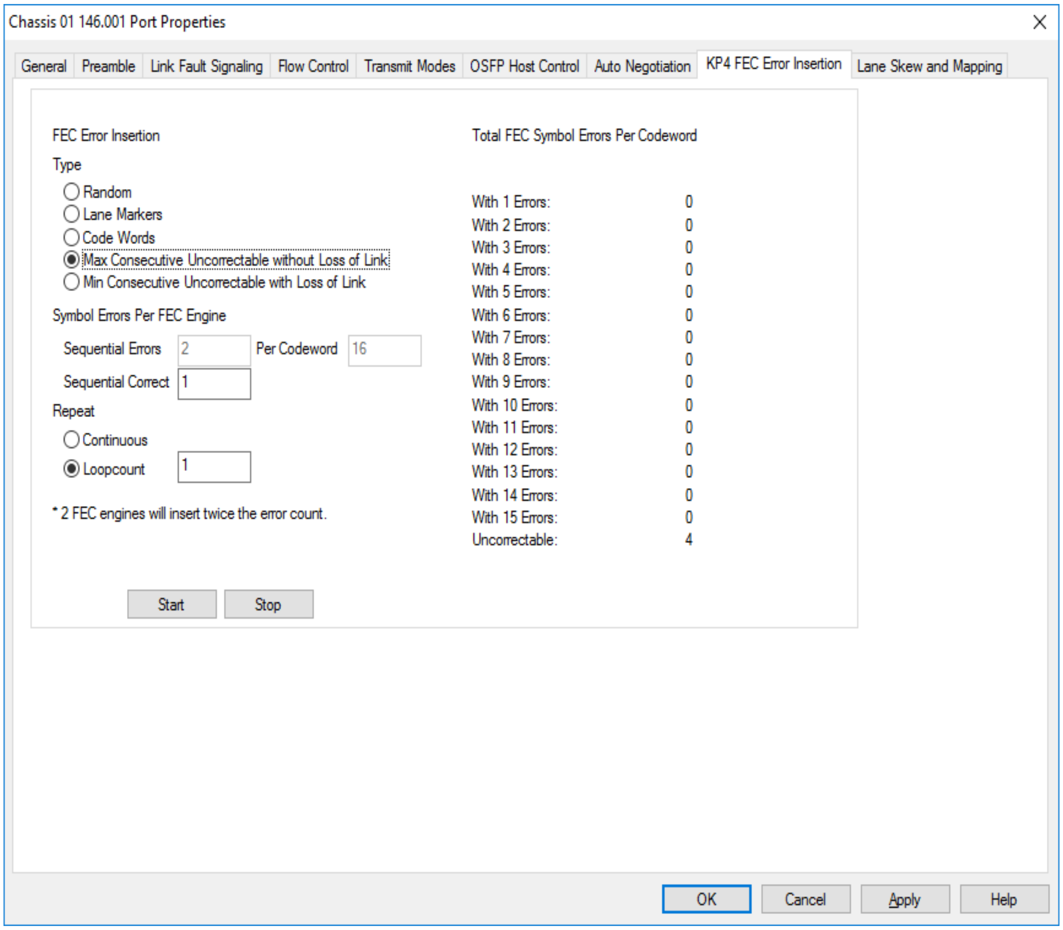


Image: **KP4 FEC Error Insertion** Tab with Error Type selected as Min Consecutive Uncorrectable with Loss of Link

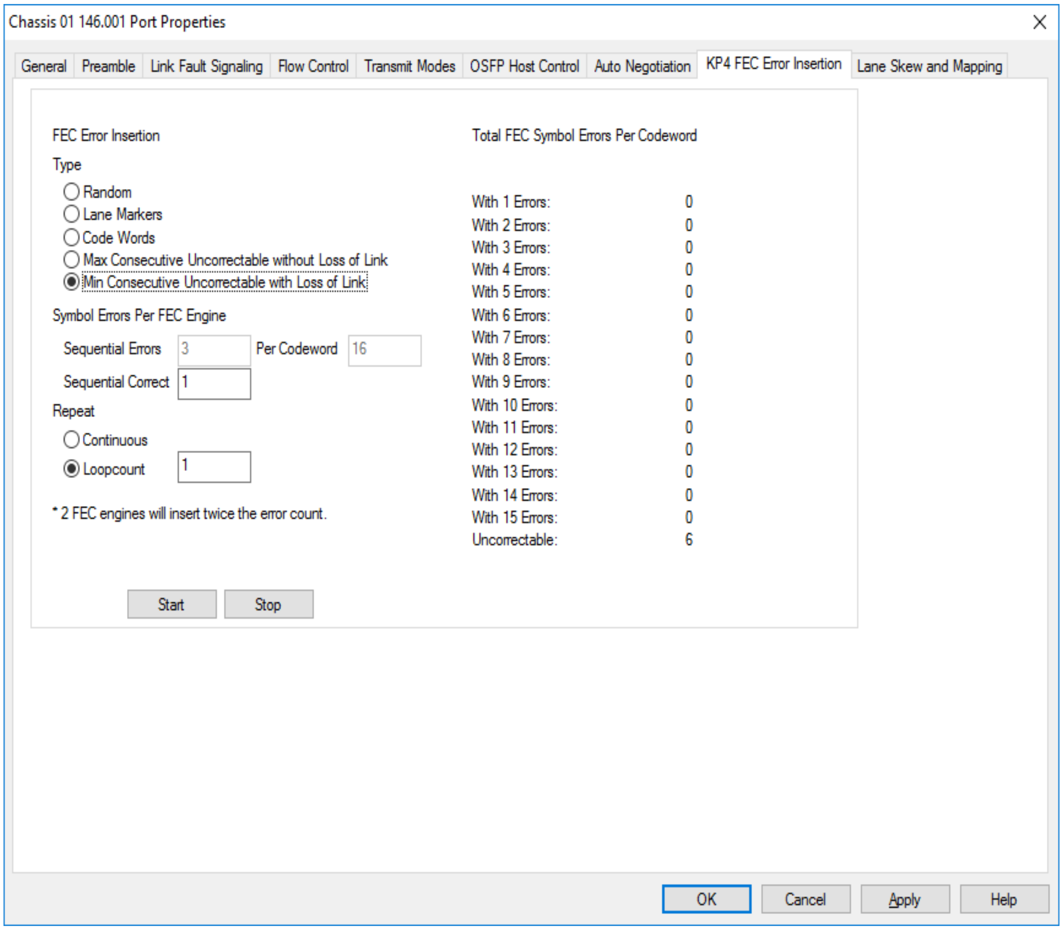


Table: **KP4 FEC** Tab Configuration

Section	Field	Usage
FEC Error Insertion		
Type	Random	Random FEC symbol error insertion will introduce a deterministic number of errors, evenly spread across all PCS lanes, on top the intrinsic BER (Bit Error Rate) of the interconnect.
	Lane Markers	Inserts errors only in the Lane Marker fields.
	Code Words	This is the fundamental unit of data that the FEC engine operates on sequentially. It is composed of blocks that carry the payload and parity information for the 64/66B scrambled data that arrives from the PCS Scrambler on Egress and from the PMA on Ingress.The code word size and layout can vary from each coding scheme. For example, RS, KR, and KP4 all have different code words because their coding schemes are different.
	Max Consecutive Uncorrectable	Uncorrectable errors are those with more than 15 symbol errors. As per IEEE, the maximum number of consecutive uncorrectable errors without loss of link is 2.

Section	Field	Usage
	without Loss of Link	
	Min Consecutive Uncorrectable with Loss of Link	The Max Consecutive Uncorrectable WITHOUT Loss of Link + 1. This is the threshold where the receiver should declare Local Fault due to bad data. The minimum number of consecutive uncorrectable errors with loss of link is 3.
Bit Error Rate	BER	The Bit Error Ratio (BER) is the ratio of the number of error bits compared to the total number of bits transmitted. In the BER field, enter the coefficient of the BER.The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	e-	Enter the exponent of the BER. The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	Distribution	Controls how the errors are distributed. This modifies the probability distribution of errors while maintaining the average Bit Error Rate. For example, you can have a BER of 10E-8 but have all of the errors be single errors OR you can have the errors be distributed across a variety of errors. The purpose is to thoroughly test a receiver to see if all possible errors are being corrected at varying rates.
Symbol Errors Per FEC Engine		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Sequential Errors	In burst mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.

Section	Field	Usage
		NOTE Per 802.3bs and 802.3cd, reception of 3 or more consecutive uncorrectable codewords will result in Loss of Link. In burst mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. This sequence will be repeated until stopped. NOTE Per 802.3bs and 802.3cd, reception of 5 or more Alignment Marker errors will result in Loss of Link. • In 400G mode, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines. • The symbol errors are not evenly distributed across the PCS lanes (use Random error insertion mode for that case) • The maximum number of sequential uncorrectable errors without loss of link is 2 and the minimum number of sequential uncorrectable errors with loss of link is 3.
	Lane Number	The Lane Number specifies which PCS lane will be affected by the Lane Marker error insertion.This field is available only if you select the error insertion type as Lane Markers.
	Sequential Correct	The number of consecutive code words without errors.
	Error Bits	The Error Bits specifies how many errors will be inserted on each of the two symbol errors of the codeword that carries the Lane Marker. There is a minimum Error Bits required (2) before corrupting the symbol that maps to the Lane Marker field. This field is available only if you select the error insertion type as Lane Markers.
	Per Codeword	Codeword is a block of contiguous packets on the line. All RS-FEC codewords are of the same size.The Per Codeword value denotes the number of symbol errors per codeword to insert. KP4 FEC can correct up to 15 symbols, and detect up to 30 symbols. If the user specifies 16, an Uncorrectable Codeword will be issued. This field is available only if you select the error insertion type as Code Words.

Section	Field	Usage
Repeat		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Continuous	Continuous error insertion.In continuous mode, the Sequential Errors field will specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.
	Loopcount	The sequence of correct and incorrect codewords or symbol errors inserted will be repeated by the number specified in the Loopcount field.
Start		Starts the error insertion process.
Stop		Stops the error insertion process.
Appropriate FEC Symbol Errors Per Codeword Rate		The Appropriate FEC Symbol Errors Per Codeword Rate is an approximation for how many symbol errors there will be per codeword every second. NOTE In 400G mode, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines.

T400GD-8P-OSFP Port Properties—Lane Skew and Mapping

The **Lane Skew and Mapping** tab allows to control the PCS lane order and skew rate for each lane.

For more information on Lane Skewing, see the Lane Skew topic in the 'Multilane Distribution Configuration' chapter of the *Ixia Platform Reference Manual*. The Lane Skew topic is located under 'Types of Ports' / '100GE'.

NOTE **Lane Skew and Mapping** tab is not available for T400GD-8P-OSFP 100G and 50G speed modes.

The T400GD-8P-OSFP Port Properties **Lane Skew and Mapping** tab for the 400GE and 200GE speed modes is shown in the following image:

Image: T400GD-8P-OSFP **Lane Skew and Mapping** tab

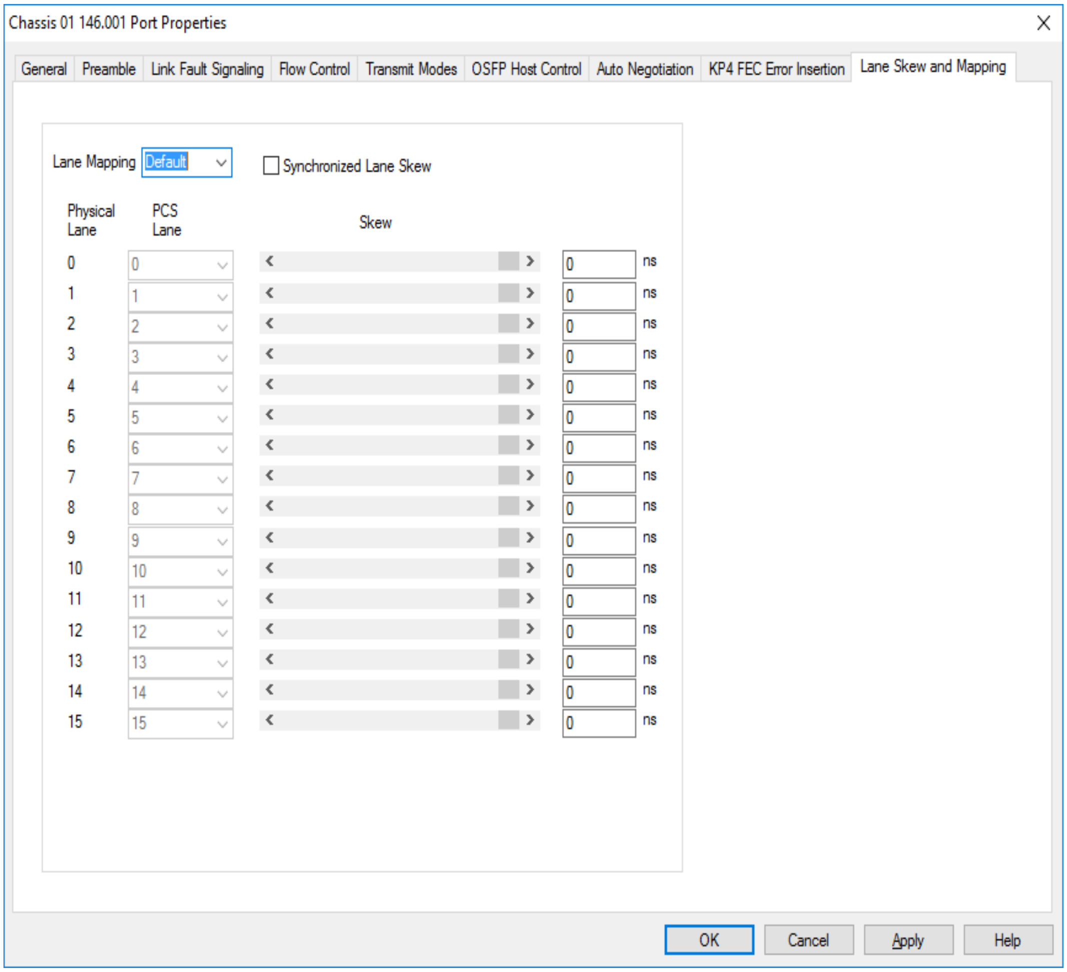


Table: Lane Skew and Mapping Configuration

Field	Description

Lane Mapping	Allows you to select a PCS lane ordering method. There are five options:
	• Default: The default ordering method. The default order is each physical lane corresponds to single PCS lane.
	• Incrementing:
	  ■ For 400G, orders the lanes from 0 to 15, straight down the list.
	• Decrementing:
	  ■ For 400G, orders the lanes from 15 to 0, straight down the list.
	• Custom: Allows to put the lanes in any order by manually entering the numbers in the fields. The starting order is the last selected mapping. Mapping between physical and PCS lanes should be one-to-one, else it will result into link down.
	• Random: Allows to put the lanes in any random order, values will be any value from 0 to the total number of lanes.

Synchronized	If selected, enables to synchronize the skewing or delaying of one or more PCS

Field	Description
Lane Skew	lanes.
Physical Lane	The physical lane identifier. The physical lane is paired with a corresponding PCS lane.
PCS Lane	A number identifier for the PCS lane. The PCS lane is paired with a corresponding physical lane.
Skew	The skew slider is used to set a skew value for the PCS lane, in nanoseconds, on the transmit side. Lane Skew is the ability to independently delay one or more of the total number of PCS lanes. When the slider is moved, the nanoseconds field is correspondingly adjusted. You can also enter a nano second value directly into this field. When the slider is fully pushed to the right, the skew injected into the transmit stream is 0 (minimum). When the slider is pushed all the way to the left. the skew injected into the transmit stream is 1002.918 ns (maximum).

T400GD-8P-OSFP Port Properties—RX Diagnostics

The T400GD-8P-OSFP load module has eight electrical lanes at the cage where you insert your optics or DACs. In order to evaluate the link quality and determine if the transmitters are driving the right kind of signal, you can diagnose the signals that are actually being received at the electrical lane receivers. The **RX Diagnostics** tab allows you to do this.

This feature is also available for T400GD-8P-QDD and T400GP-4P-QDD load modules.

See T400GD-8P-QDD Port Properties—RX Diagnostics for more details on the histogram and diagnostics.

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CHAPTER 32

Port Properties–CFP8 400 GE Load Modules

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the CFP8 400 GE load modules.

Port Properties for CFP8 400 GE Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option.

The complete specification for the CFP8 400 GE is found in the *Ixia Platform Reference Manual*.

The following port property tabs are available for CFP8 400 GE modules:

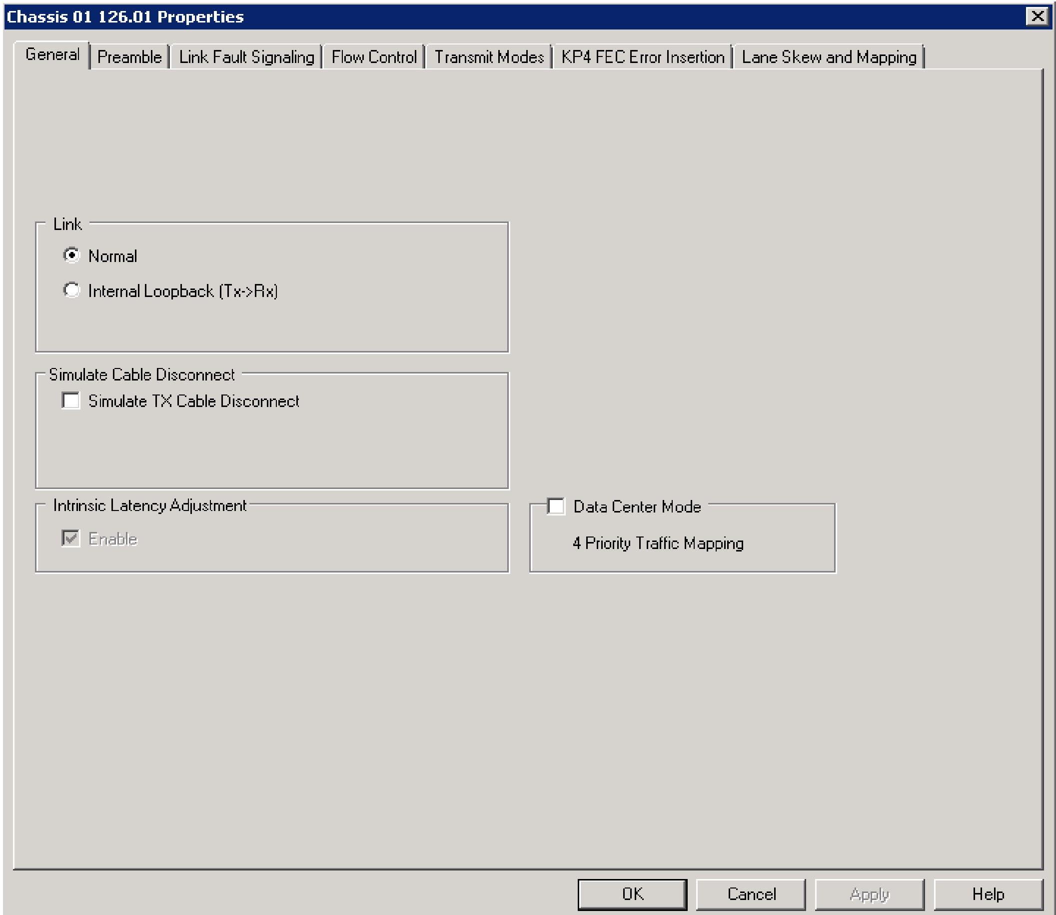
- CFP8 400 GE Port Properties—General
- CFP8 400 GE Port Properties—Preamble
- CFP8 400 GE Port Properties—Link Fault Signaling
- CFP8 400 GE Port Properties—Flow Control
- CFP8 400 GE Port Properties—Transmit Modes
- CFP8 400 GE Port Properties—KP4 FEC Error Insertion
- CFP8 400 GE Port Properties—Lane Skew and Mapping

CFP8 Port Properties—General

The CFP8 **General** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, and then selecting the **General** tab.

The Port Properties **General** tab is shown in the following image:

Image: CFP8—**General** tab



The controls for **General** tab configuration are described in the following table:

Table: General Configuration

Section	Control/Field	Usage
Link	Normal	Normal operation
	Internal Loopback (Tx -> Rx)	Internal Loopback—Transmit to Receive.
Simulate Cable Disconnect		If this is selected, the port acts as if the cable has been disconnected. The port will neither transmit nor receive.
Intrinsic Latency Adjustment	Enable	The **Enable** check box is selected by default. This enables the intrinsic latency adjustment. The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia*

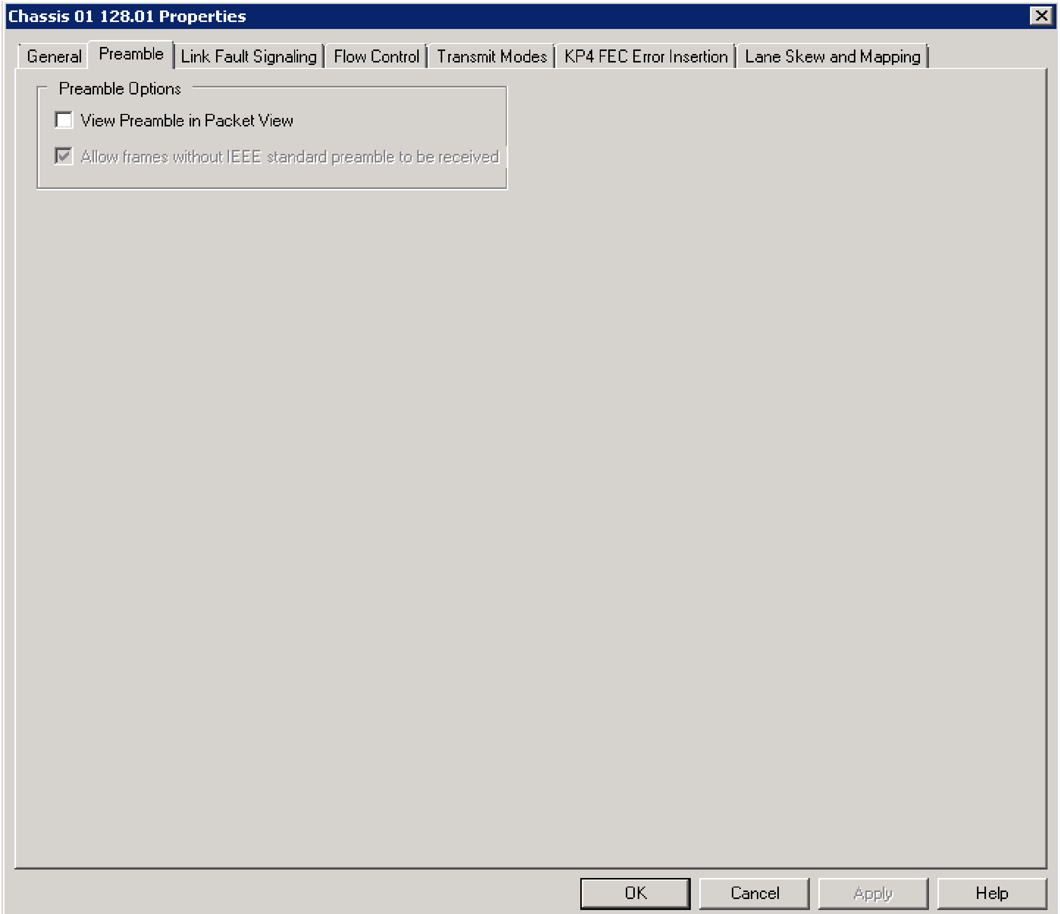
Section	Control/Field	Usage
		40/100 Gigabit Ethernet Load Modules chapter of the *Ixia Platform Reference Manual*.
Data Center Mode	4 Priority Traffic Mapping	If selected, enables the Data Center Mode option. When Data Center Mode option is selected, the following changes take place: • The selected port is automatically placed into Advanced Stream mode. • Only Auto Intrumentation mode (Floating Timestamp/Data Integrity) is supported, both for transmit and receive. • 4-Priority Traffic Mapping is enabled. It supports various frame size for each PFC control (0-4). • FCoE protocol can be edited for Ethernet II and Ethernet Snap in **Frame Data** tab.

CFP8 Port Properties—Preamble

The preamble precedes the frame, but is not part of the frame itself.

The CFP8 Port Properties **Preamble** tab is shown in the following image:

Image: CFP8—**Preamble** tab



The fields and controls in this tab are described in the following table:

Table: Preamble Configuration

Section	Choices	Description
Preamble Options	View Preamble in Packet View	When this check box is selected, the preamble data will be visible in the Packet View (transmit side) and the Capture View (receive side).
	Allow frames without IEEE standard preamble to be received	When this check box is selected, it allows frames without IEEE standard preamble to be received. NOTE This check box is selected by default and is not available for editing.

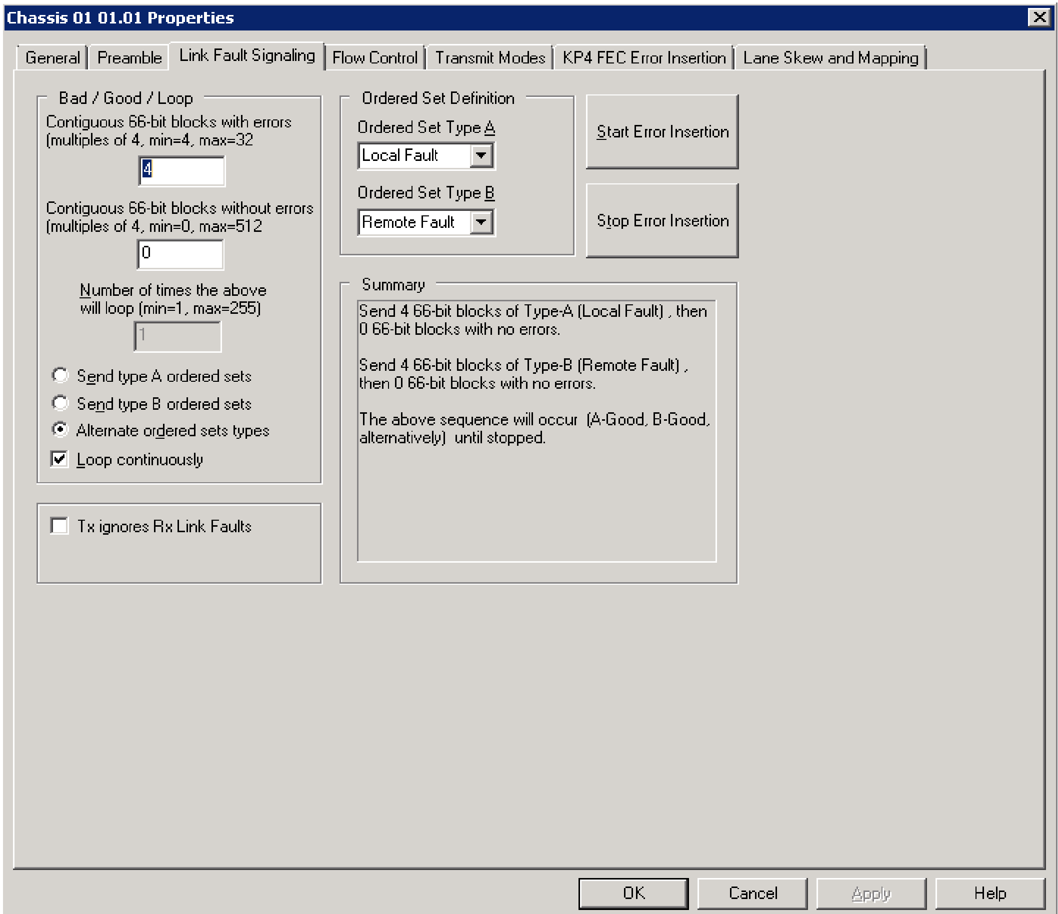
CFP8 Port Properties—Link Fault Signaling

When Link Fault Signaling is enabled, four statistics will be added to the list in Statistic View for the port. One is for monitoring the Link Fault State. Two provide a count of the Local Faults and Remote Faults. The last one is for indicating the state of error insertion, whether or not it is ongoing.

The **Link Fault Signaling** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Link Fault Signaling*** tab.

The **Link Fault Signaling** tab for CFP8 load module is shown in the following image:

Image: CFP8—**Link Fault Signaling** tab



The controls for **Link Fault Signaling** tab configuration are described in the following table:

Table: Link Fault Signaling Configuration

Section	Field/Control	Description
Bad/Good/Loop	(Bad) Contiguous 66-bit blocks with errors (multiples of 4; min = 4, max = 32)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks with errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive fault sequences allowed are minimum 4 sequences and maximum 32 sequences.
	(Good) Contiguous 66-bit blocks	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks without errors that should be included in the pattern. This value must be a multiple of 4.

Section	Field/Control	Description
	without errors (multiples of 4; min = 0, max = 512)	The number of consecutive regular data sequences allowed are minimum 0 sequences and maximum 512 sequences.
	Number of times the above will loop (min = 1, max = 255)	Specifies the number of loops for the user defined sequence. There are two modes: • Discrete iterations: 1. Minimum of 1 iteration 2. Maximum of 255 iterations • Continuous loopi) User cannot specify number of iterations
	Choose one of: • Send type A ordered sets • Send type B ordered sets • Alternate ordered set types	Defines the ordered set pattern that will be sent. (The two Ordered Sets—A and B—are defined in the **Ordered Set Definition** box in this tab.) This pattern will be combined with the Good blocks/Bad blocks pattern for transmission. • Only Type A fault sequence and regular good data sequences • Only Type B fault sequence and regular good data sequences • Alternate Type A, regular good data sequences and Type B fault sequence, regular good data sequences NOTE If this field is available, and the Alternate ordered set types option is selected, the minimum value for this field should be '2,' to allow the entire pattern to be sent once. If left at the minimum value of '1'— only two groups of blocks (one of good blocks and one of bad blocks) will be sent, which means that only the first ordered set will be sent. A minimum of eight blocks is required for one complete pattern including Types A and B.
	Loop continuously	If selected, the loop defined by the combination of the Bad and Good blocks plus the pattern of ordered sets, will be transmitted continuously until the *Stop Error Insertion* button is selected.
Ordered Set Definition	Ordered Set Type A	Choose one of: • Local Fault • Remote Fault

Section	Field/Control	Description
	Ordered Set Type B	Choose one of: • Local Fault • Remote Fault
Tx ignores Rx Link Faults		If selected, ongoing transmission will continue even if Link Fault messages are received by the sending RS.
Summary (Window)		(Read-only) Shows descriptions of the patterns that will be transmitted.
Start Error Insertion		Select this button to start the transmission of the configured error patterns.
Stop Error Insertion		(Available only for use with the *Loop continuously* option.) Select this button to stop the transmission of the configured error patterns.

CFP8 Port Properties—Flow Control

The CFP8 **Flow Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

NOTE You can view this help page for the Port Properties - **Flow Control** tab by selecting the Help button and not F1.

The Port Properties **Flow Control** tab is shown in the following image:

Image: CFP8 **Flow Control** tab

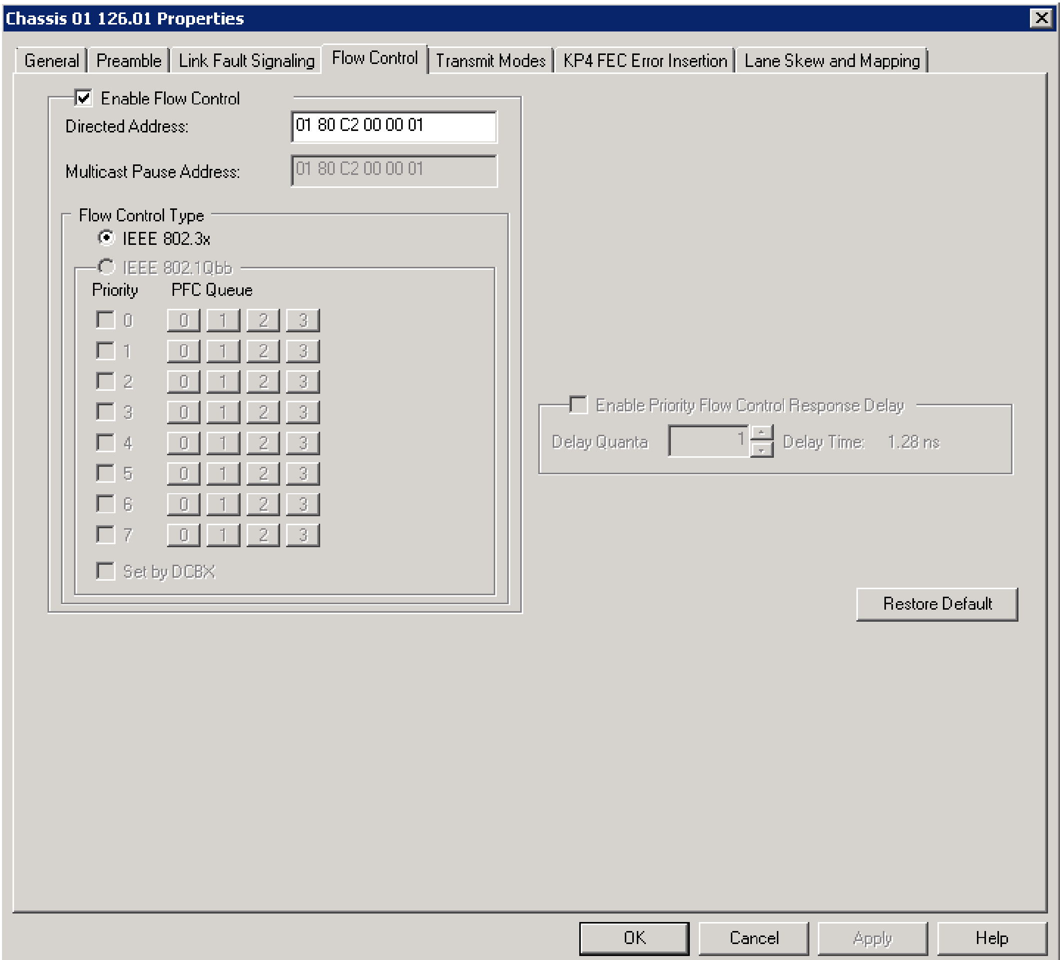


Table: Flow Control Configuration

Section	Field/Control	Description
Enable Flow Control	(check box)	Enables the port’s MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type		
	IEEE 802 3x	When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame.

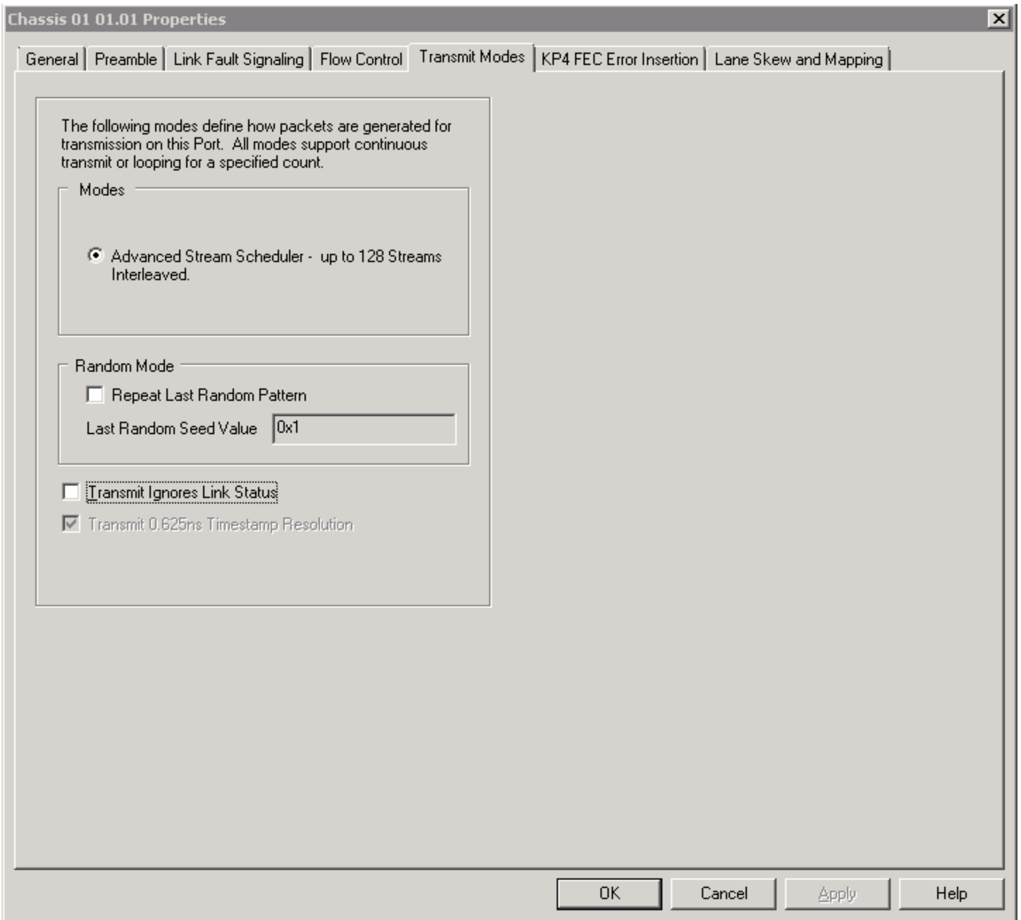
Section	Field/Control	Description
	IEEE 802.1Qbb	When not in Data Center mode, only IEEE 802.3x is available.
	Priority	When flow control type IEEE 802.1Qbb is selected in Data Center mode, priority options are the channels of data that can be paused. Select one or more channels.
	PFC Queue	The PFC Queue can be mapped to the priority field in the frame.
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

CFP8 Port Properties—Transmit Modes

The **Transmit Modes** tab for CFP8 load modules is shown in the following image. It is accessed by double-clicking a port in Resources window, or by selecting a port and selecting the **Properties** menu option. Then select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following image:

Image: CFP8—**Transmit Modes** tab



The controls for **Transmit Modes** tab configuration are described in the following table:

Table: Transmit Modes Configuration

Section	Field/Control	Description
Modes	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure up to 128 streams. They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream's random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.

Section	Field/Control	Description
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit Ignores Link Status		If selected, will allow transmission of packets even if the link is down.

CFP8 Port Properties—KP4 FEC Error Insertion

Forward Error Correction (FEC) is a method of communicating data that corrects errors in transmission on the receiving end. Before transmission, the data is put through a predetermined algorithm that adds extra bits specifically for error correction to any character or code block. If the transmission is received in error, the correction bits are used to check and repair the data.

The **FEC Error Insertion** tab allows to inject FEC errors into transmitted data, and is shown in *Image: **FEC Error Insertion** Tab*

Image: KP4 **FEC Error Insertion** Tab with Error Type selected as Random

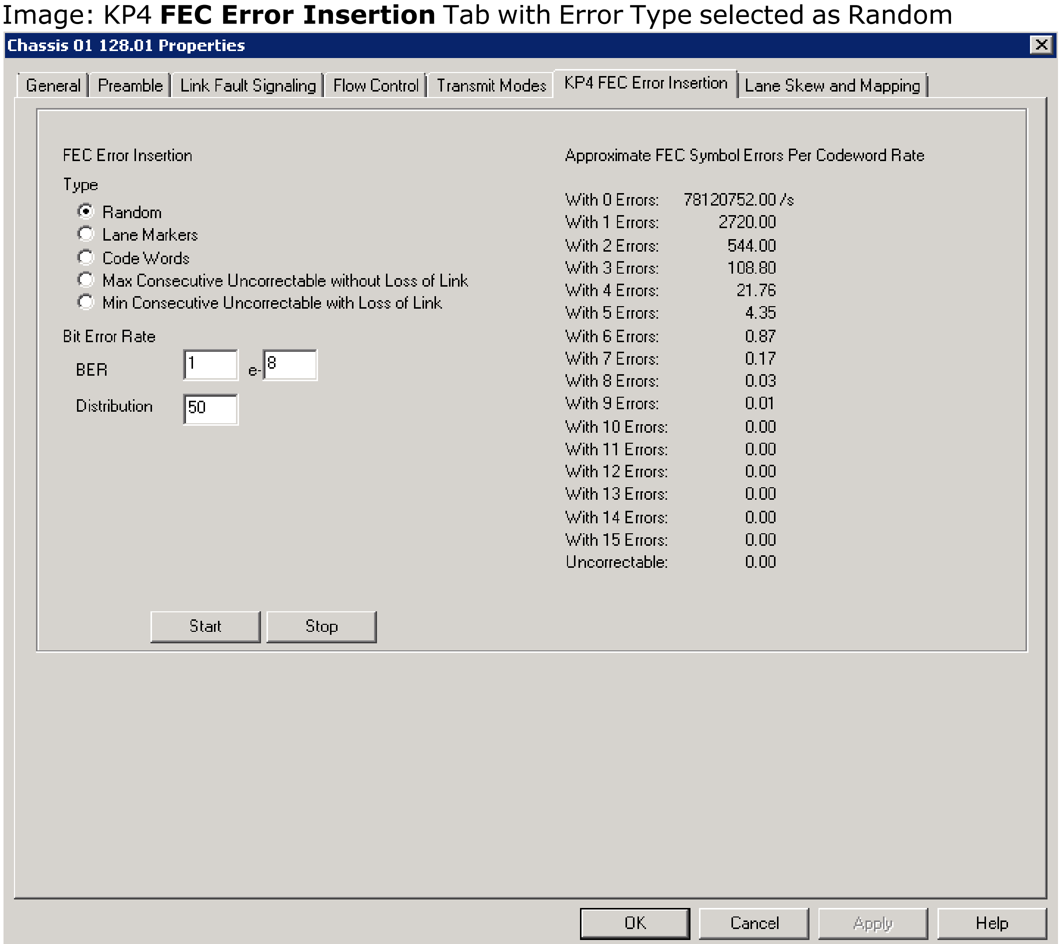


Image: KP4 **FEC Error Insertion** Tab with Error Type selected as Lane Markers

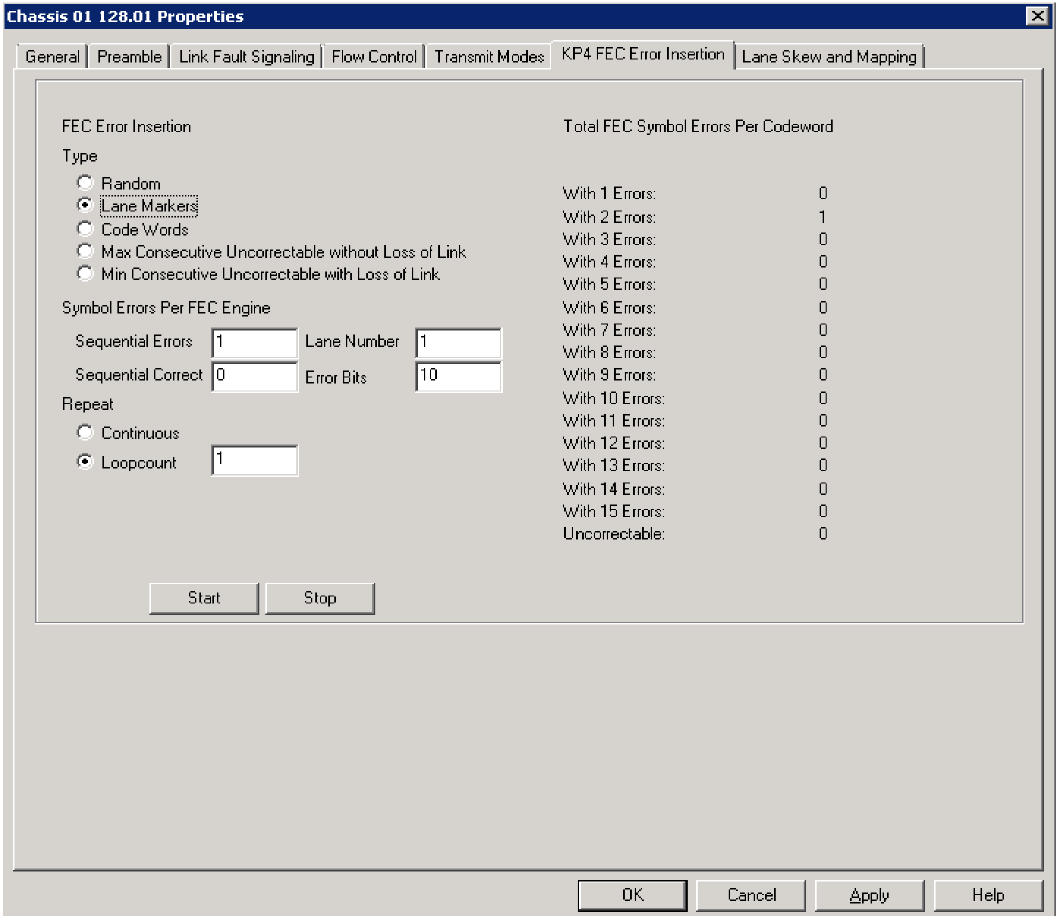


Image: KP4 **FEC Error Insertion** Tab with Error Type selected as Code Words

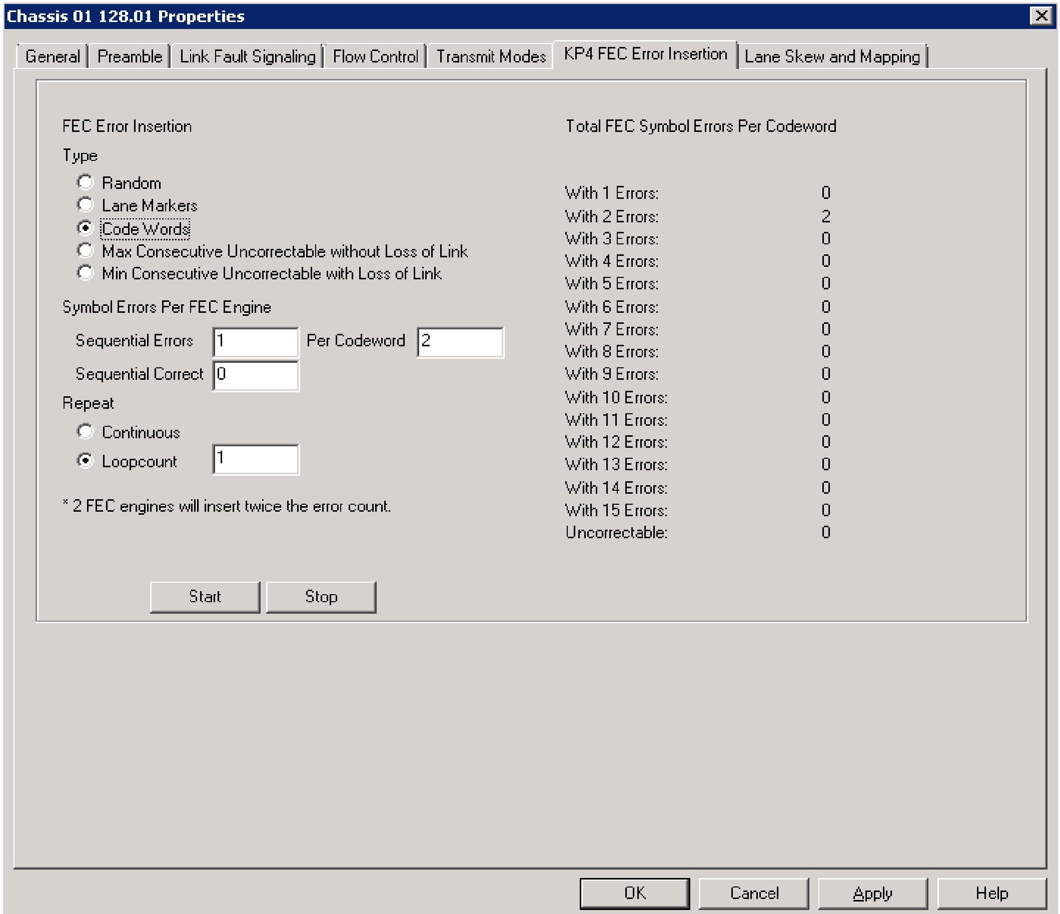


Image: KP4 **FEC Error Insertion** Tab with Error Type selected as Max Consecutive Uncorrectable without Loss of Link

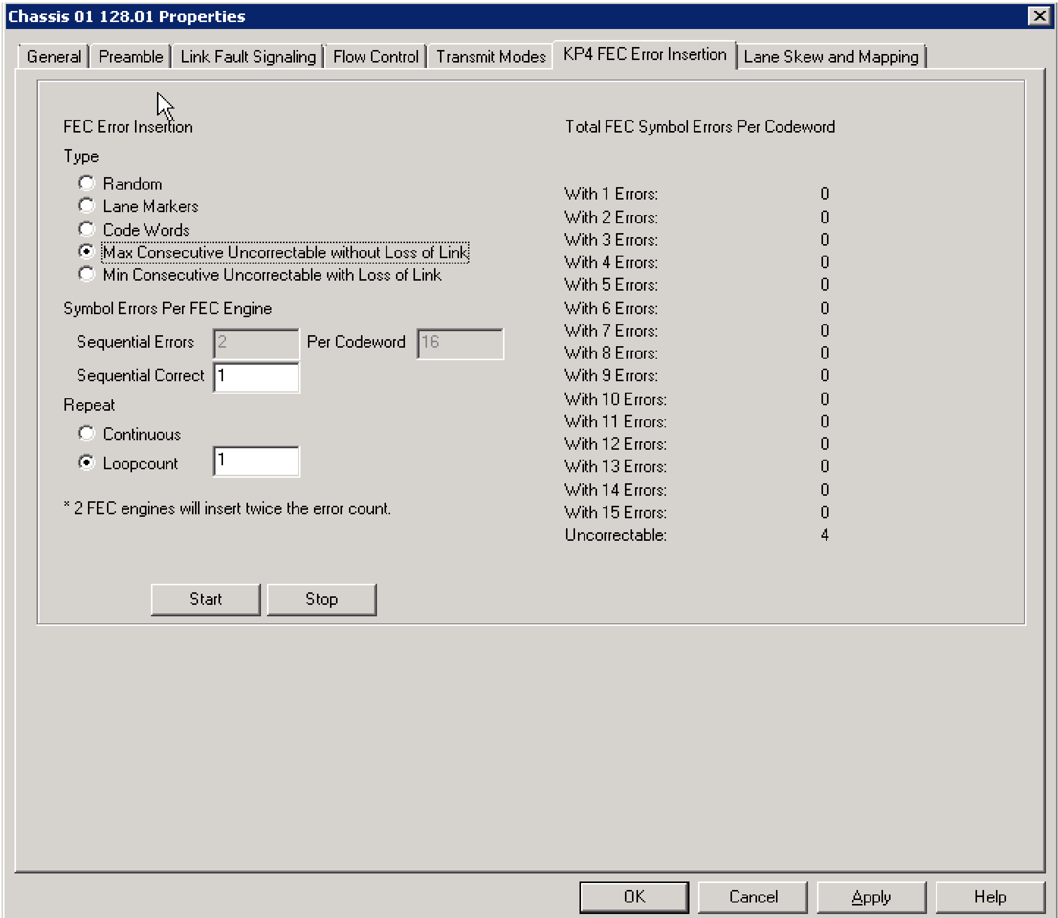


Image: KP4 **FEC Error Insertion** Tab with Error Type selected as Min Consecutive Uncorrectable with Loss of Link

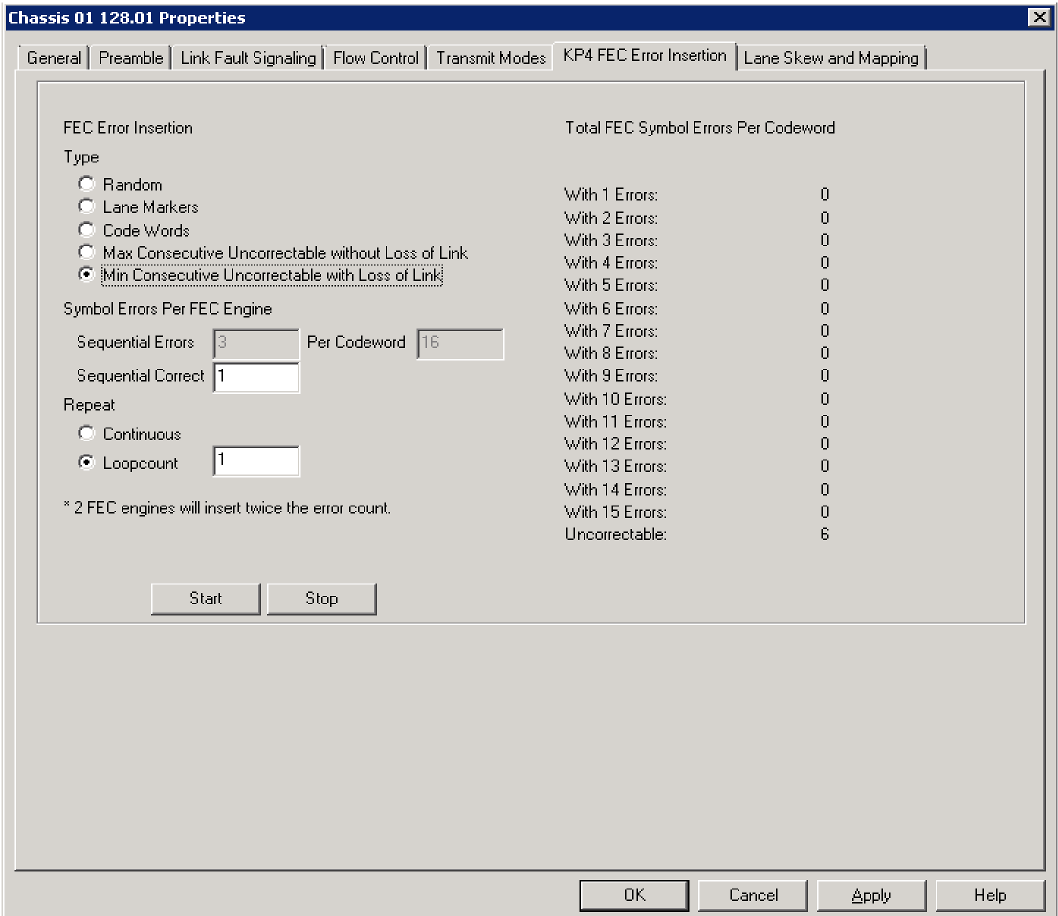


Table: KP4 FEC Configuration

Section	Field	Usage
FEC Error Insertion		
Type	Random	Random FEC symbol error insertion will introduce a deterministic number of errors, evenly spread across all PCS lanes, on top the intrinsic BER (Bit Error Rate) of the interconnect.
	Lane Markers	Inserts errors only in the Lane Marker fields.
	Code Words	This is the fundamental unit of data that the FEC engine operates on sequentially. It is composed of blocks that carry the payload and parity information for the 64/66B scrambled data that arrives from the PCS Scrambler on Egress and from the PMA on Ingress.The code word size and layout can vary from each coding scheme. For example, RS, KR, and KP4 all have different code words because their coding schemes are different.
	Max Consecutive Uncorrectable	Uncorrectable errors are those with more than 15 symbol errors. As per IEEE, the maximum number of consecutive uncorrectable errors without loss of link is 2.

Section	Field	Usage
	without Loss of Link	
	Min Consecutive Uncorrectable with Loss of Link	The Max Consecutive Uncorrectable WITHOUT Loss of Link + 1. This is the threshold where the receiver should declare Local Fault due to bad data. The minimum number of consecutive uncorrectable errors with loss of link is 3.
Bit Error Rate	BER	The Bit Error Ratio (BER) is the ratio of the number of error bits compared to the total number of bits transmitted. In the BER field, enter the coefficient of the BER.The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	e-	Enter the exponent of the BER. The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	Distribution	Controls how the errors are distributed. This modifies the probability distribution of errors while maintaining the average Bit Error Rate. For example, you can have a BER of 10E-8 but have all of the errors be single errors OR you can have the errors be distributed across a variety of errors. The purpose is to thoroughly test a receiver to see if all possible errors are being corrected at varying rates.
Symbol Errors Per FEC Engine		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Sequential Errors	In burst mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.

Section	Field	Usage
		NOTE: Per 802.3bs and 802.3cd, reception of 3 or more consecutive uncorrectable codewords will result in Loss of Link. In burst mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. This sequence will be repeated until stopped. NOTE: Per 802.3bs and 802.3cd, reception of 5 or more Alignment Marker errors will result in Loss of Link. • In 400G and 200G modes, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines. In 100G and 50G modes, there is only a single FEC engine present. • The symbol errors are not evenly distributed across the PCS lanes (use Random error insertion mode for that case) • The maximum number of sequential uncorrectable errors without loss of link is 2 and the minimum number of sequential uncorrectable errors with loss of link is 3.
	Lane Number	The Lane Number specifies which PCS lane will be affected by the Lane Marker error insertion.This field is available only if you select the error insertion type as Lane Markers.
	Sequential Correct	The number of consecutive code words without errors.
	Error Bits	The Error Bits specifies how many errors will be inserted on each of the two symbol errors of the codeword that carries the Lane Marker. There is a minimum Error Bits required (2) before corrupting the symbol that maps to the Lane Marker field. This field is available only if you select the error insertion type as Lane Markers.
	Per Codeword	Codeword is a block of contiguous packets on the line. All RS-FEC codewords are of the same size.The Per Codeword value denotes the number of symbol errors per codeword to insert. KP4 FEC can correct up to 15 symbols, and detect up to 30 symbols. If the user specifies 16, an Uncorrectable Codeword will be issued. This field is available only if you select the error insertion type as

Section	Field	Usage
		Code Words.
Repeat		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Continuous	Continuous error insertion.In continuous mode, the Sequential Errors field will specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.
	Loopcount	The sequence of correct and incorrect codewords or symbol errors inserted will be repeated by the number specified in the Loopcount field.
Start		Starts the error insertion process.
Stop		Stops the error insertion process.
Appropriate FEC Symbol Errors Per Codeword Rate		The Appropriate FEC Symbol Errors Per Codeword Rate is an approximation for how many symbol errors there will be per codeword every second. NOTE In 400G and 200G modes, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines. In 100G and 50G modes, there is only a single FEC engine present.

CFP8 Port Properties—Lane Skew and Mapping

For Xcellon-Multis module, see Xcellon-Multis Port Properties—TX-Lane.

For 40/100GE module, see 40/100GE Port Properties—TX-Lane.

The **Lane Skew and Mapping** tab allows to control the PCS lane order and skew rate for each lane.

For more information on Lane Skewing, see the Lane Skew topic in the 'Multilane Distribution Configuration' chapter of the *Ixia Platform Reference Manual*. The Lane Skew topic is located under 'Types of Ports' / '100GE'.

The CFP8 Port Properties **Lane Skew and Mapping** tab is shown in the following image:

Image: CFP8—**Lane Skew and Mapping** tab

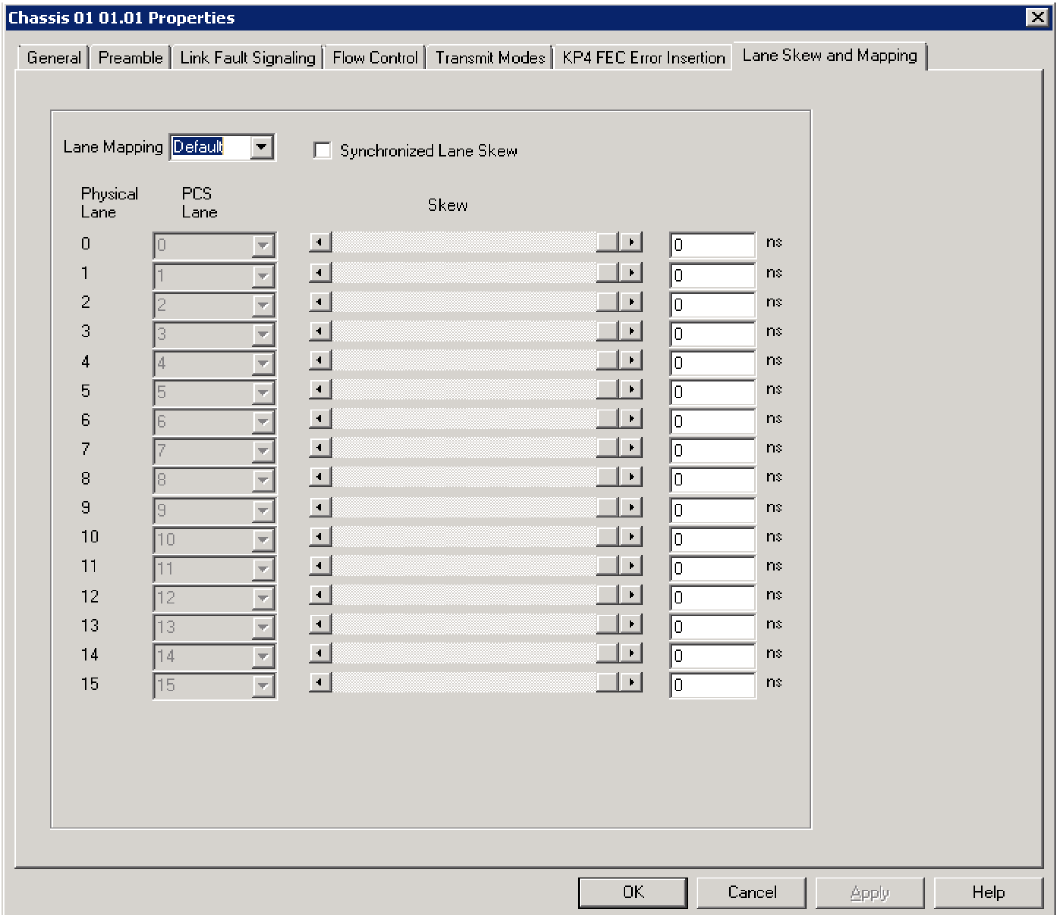


Table: Lane Skew and Mapping Configuration

Field	Description
Lane Mapping	Allows you to select a PCS lane ordering method. There are five options: • Default: The default ordering method. The default order is each physical lane corresponds to single PCS lane. • Increment: For 400G, orders the lanes from 0 to 15, straight down the list. • Decrement: For 400G, orders the lanes from 15 to 0, straight down the list. • Custom: Allows to put the lanes in any order by manually entering the numbers in the fields. The starting order is the last selected mapping. Mapping between physical and PCS lanes should be one-to-one, else it will result into link down. • Random: Allows to put the lanes in any random order, values will be any value from 0 to the total number of lanes.
Synchronized Lane Skew	If selected, enables to synchronize the skewing or delaying of one or more PCS lanes.
Physical Lane	The physical lane identifier. The physical lane is paired with a corresponding PCS lane.

Field	Description
PCS Lane	A number identifier for the PCS lane. The PCS lane is paired with a corresponding physical lane.
Skew	The skew slider is used to set a skew value for the PCS lane, in nanoseconds, on the transmit side. Lane Skew is the ability to independently delay one or more of the total number of PCS lanes. When the slider is moved, the nanoseconds field is correspondingly adjusted. You can also enter a nano second value directly into this field. When the slider is fully pushed to the right, the skew injected into the transmit stream is 0 (minimum). When the slider is pushed all the way to the left. the skew injected into the transmit stream is 1002.918 ns (maximum).

CHAPTER 33

Port Properties–T400GD-8P-QDD Load Modules

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the T400GD-8P-QDD load modules.

Port Properties for T400GD-8P-QDD Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option.

The complete specification for the T400GD-8P-QDD load module is found in the *Ixia Platform Reference Manual*.

The following port property tabs are available for T400GD-8P-QDD modules:

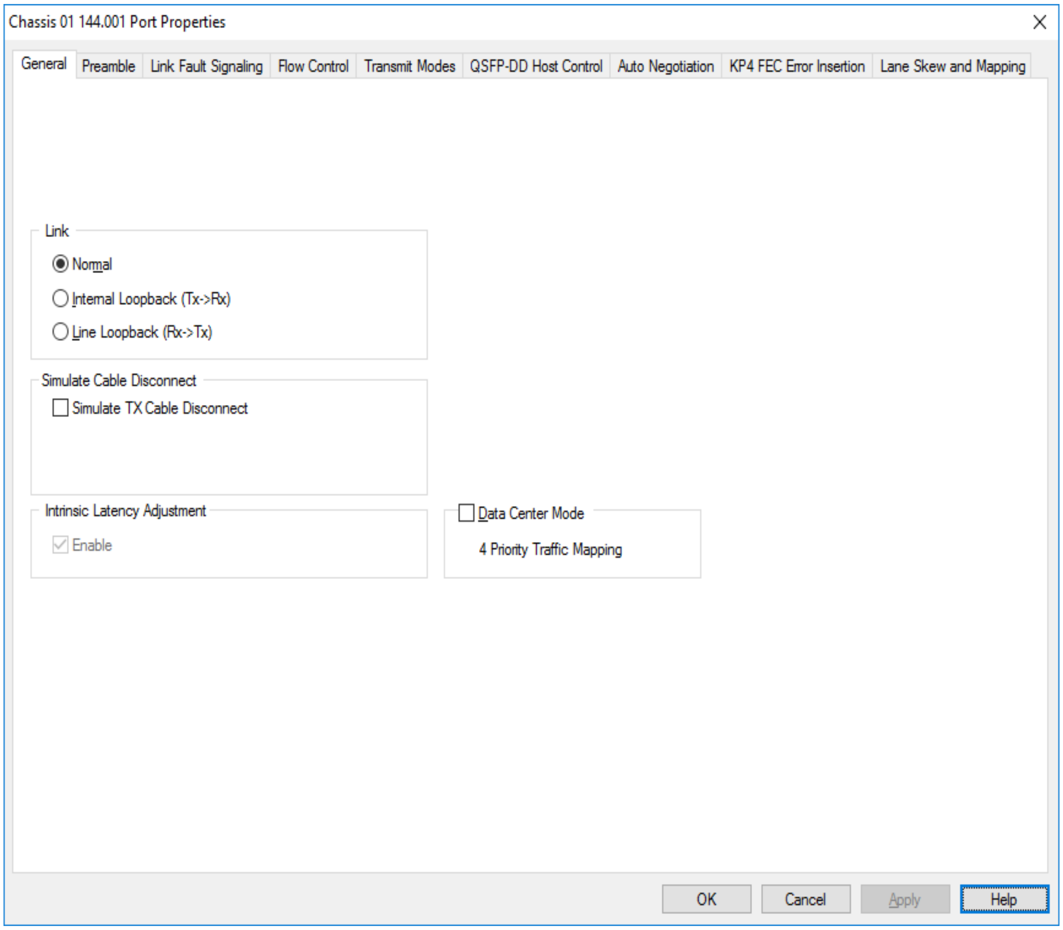
- T400GD-8P-QDD Port Properties —General
- T400GD-8P-QDD Port Properties—Preamble
- T400GD-8P-QDD Port Properties—Link Fault Signaling
- T400GD-8P-QDD Port Properties—Flow Control
- T400GD-8P-QDD Port Properties—Transmit Modes
- T400GD-8P-QDD Port Properties—QSFP-DD Host Control
- T400GD-8P-QDD Port Properties—Auto Negotiation
- T400GD-8P-QDD Port Properties—KP4 FEC Error Insertion
- T400GD-8P-QDD Port Properties—Lane Skew and Mapping
- T400GD-8P-QDD Port Properties—RX Diagnostics

T400GD-8P-QDD Port Properties—General

The T400GD-8P-QDD **General** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, and then selecting the **General** tab.

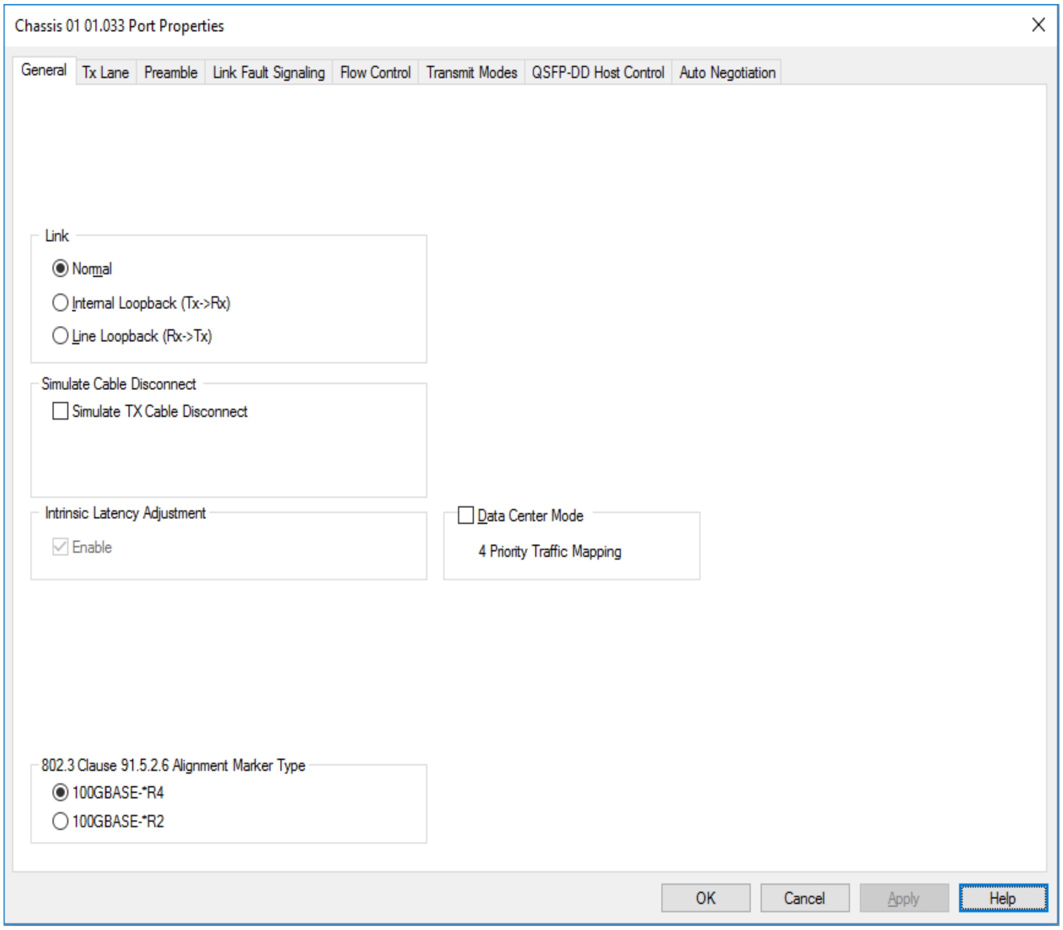
The Port Properties **General** tab for T400GD-8P-QDD is shown in the following image:

Image: T400GD-8P-QDD—General tab



The Port Properties **General** tab for T400GD-8P-QDD 100GE mode is shown in the following image:

Image: T400GD-8P-QDD—General tab for 100GE speed mode



The controls for **General** tab configuration are described in the following table:

Table: General Configuration

Section	Control/Field	Usage
Link	Normal	Normal operation
	Internal Loopback (Tx -> Rx)	Select this check box to turn on Internal Loopback—Transmit to Receive.
	Enable Line Loopback (Rx -> Tx)	Select this check box to turn on the Line Loopback— Receive to Transmit.
Simulate Cable Disconnect	Simulate TX Cable Disconnect	If this is selected, the port acts as if the cable has been disconnected on the transmit side only. Incoming packets may still be received and port may show link up, but no packets or PCS data will be transmitted.
Intrinsic Latency	Enable	The **Enable** check box is selected by default. This enables the intrinsic latency adjustment.

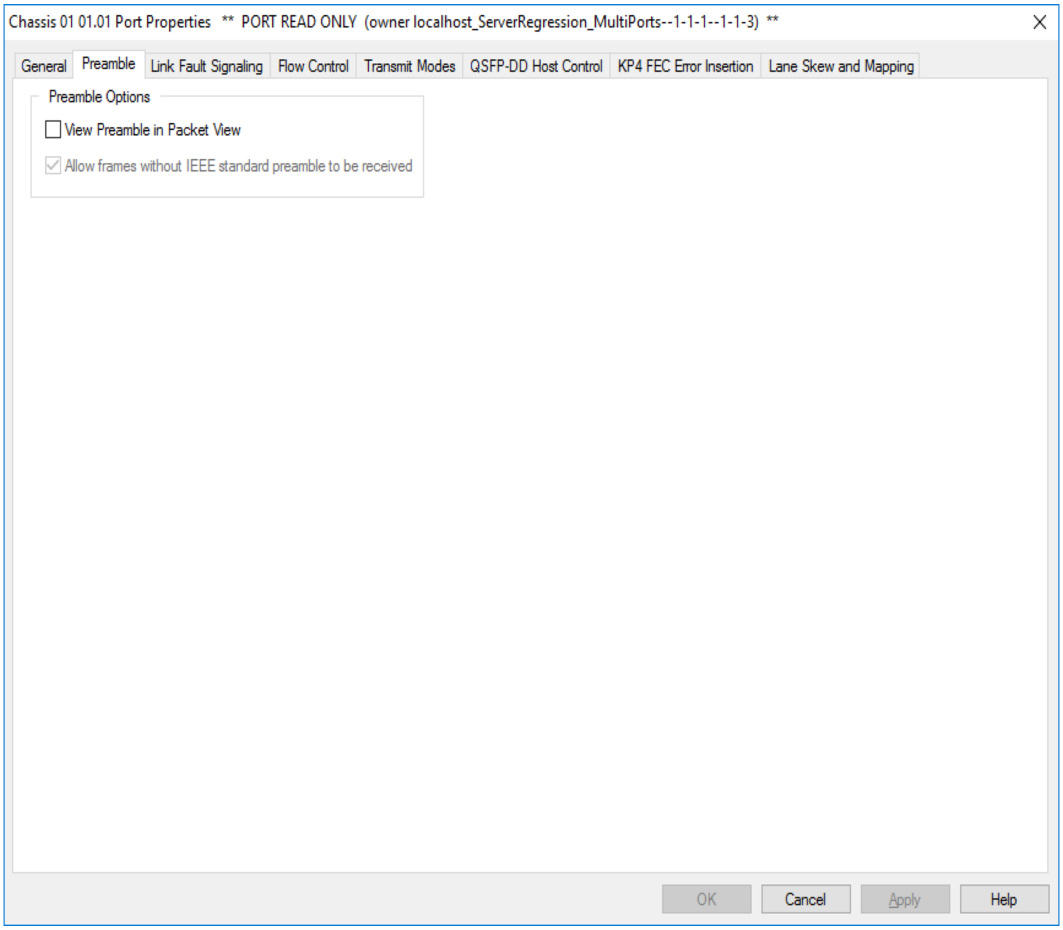
Section	Control/Field	Usage
Adjustment		The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia Platform Reference Manual*.
Data Center Mode		If selected, enables the Data Center Mode option. When Data Center Mode option is selected, the following changes take place: • The selected port is automatically placed into Advanced Stream mode. In this case, Packet Stream mode is not supported. • Only Auto Intrumentation mode (Floating Timestamp/Data Integrity) is supported, both for transmit and receive. • 4-Priority Traffic Mapping is enabled. It supports various frame size for each PFC control (0-4). • FCoE protocol can be edited for Ethernet II and Ethernet Snap in Frame Data tab.
802.3 Clause 91.5.2.6 Alignment Marker Type		This option is available for the 100GE speed mode. It controls the alignment marker mapping on transmit, and requires the same mapping to be used on receive.
	100GBASE *R4	The 100GBASE-*R4 format complies with some 100GE two-lane PMD PAM4 devices that set four_lane_pmd=1.
	100GBASE *R2	The 100GBASE-*R2 format complies with IEEE 802.3cd clause 91.6.2a setting of four_lane_pmd=0, and sets the alignment markers in two-lane PMD style per clause 91.5.2.6.

QSFP-DD Port Properties—Preamble

The preamble precedes the frame, but is not part of the frame itself.

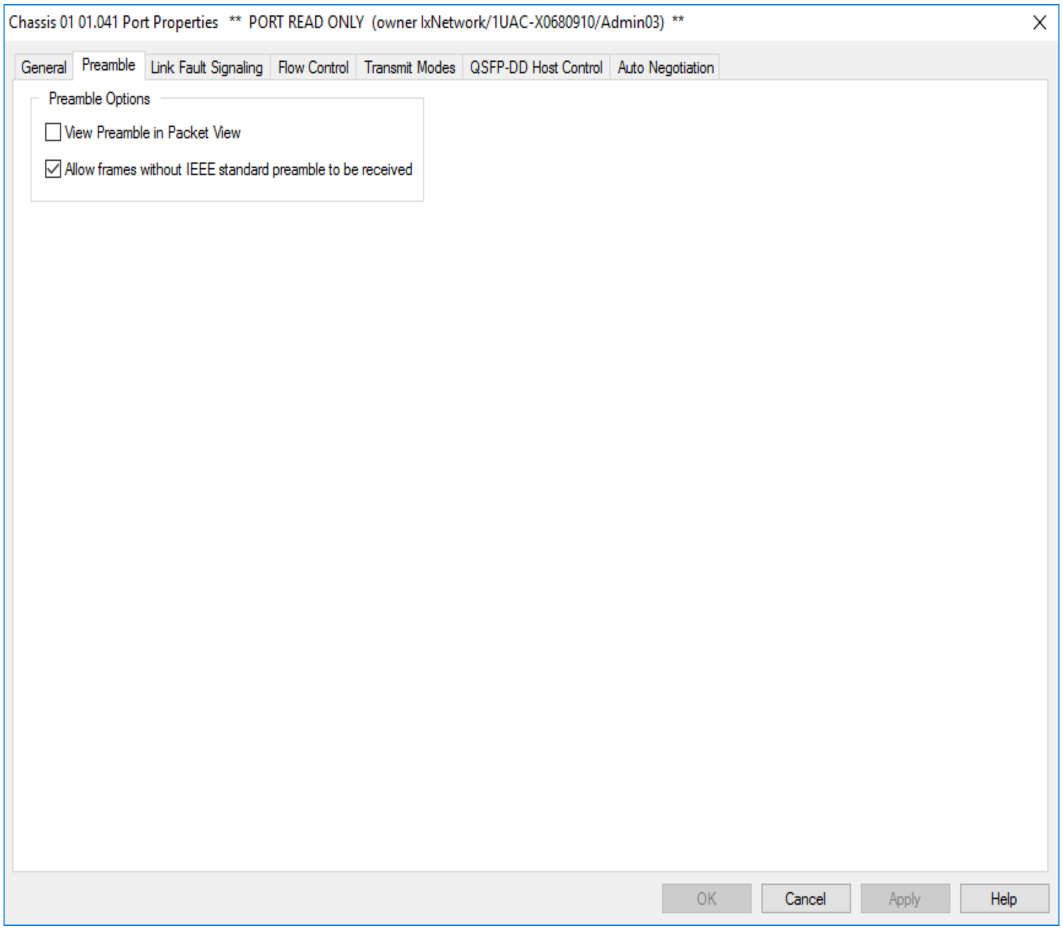
The T400GD-8P-QDD Port Properties **Preamble** tab for 400G and 200G speed modes is shown in the following image:

Image: T400GD-8P-QDD—**Preamble** tab for 400GE and 200GE



The T400GD-8P-QDD Port Properties **Preamble** tab for 100G and 50G speed modes is shown in the following image:

Image: T400GD-8P-QDD—**Preamble** tab for 100G and 50G



The fields and controls in this tab are described in the following table:

Table: Preamble Configuration

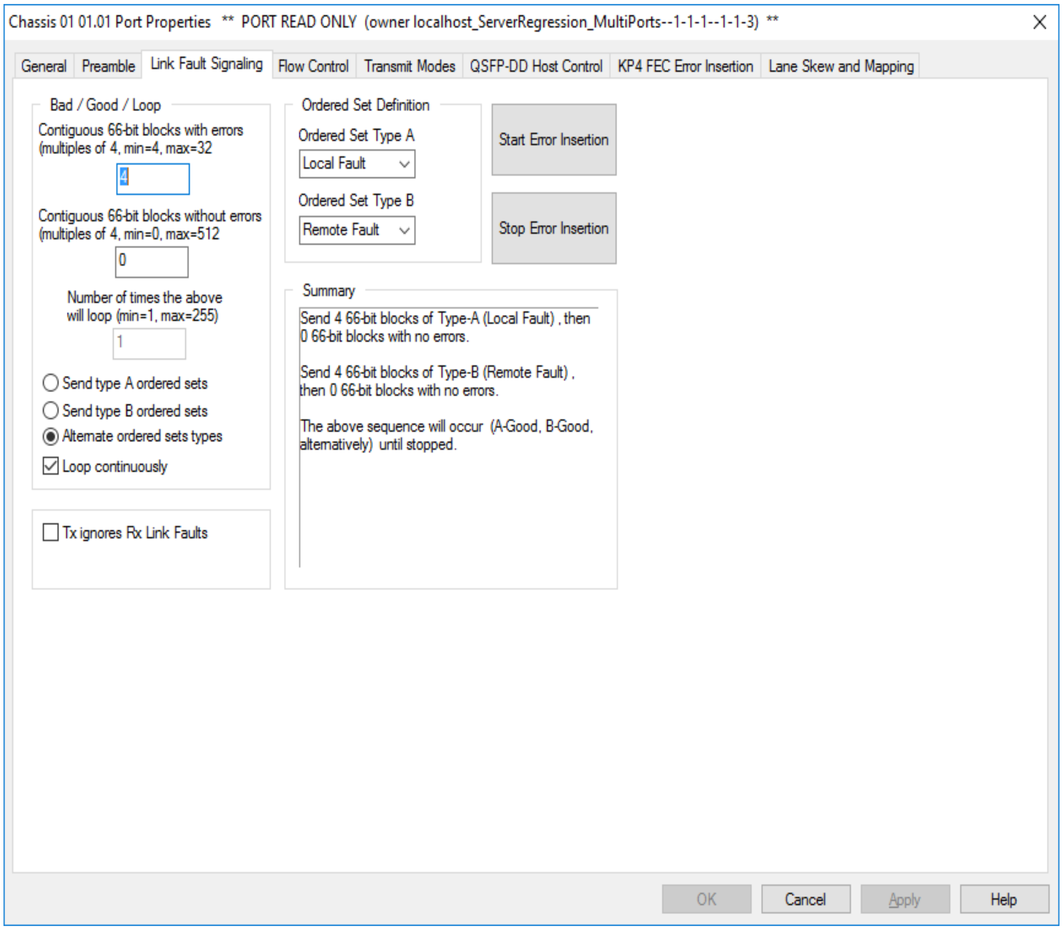
Section	Choices	Description
Preamble Options	View Preamble in Packet View	When this check box is selected, the preamble data will be visible in the Packet View (transmit side) and the Capture View (receive side).
	Allow frames without IEEE standard preamble to be received	When this check box is selected, it allows frames without IEEE standard preamble to be received. • This check box is selected by default. • For 400G and 200G speed modes, this check box is not available.

T400GD-8P-QDD Port Properties—Link Fault Signaling

When **Link Fault Signaling** is enabled, four statistics will be added to the list in Statistic View for the port. One is for monitoring the Link Fault State. Two provide a count of the Local Faults and Remote Faults. The last one is for indicating the state of error insertion, whether or not it is ongoing.

The **Link Fault Signaling** tab is accessed from the context menu of the a port in **Resources** pane by selecting the **Properties** menu option, or by double-clicking a port in the **Detail** pane. Then select the **Link Fault Signaling** tab.

The **Link Fault Signaling** tab for T400GD-8P-QDD load module is shown in the following image.



The controls for **Link Fault Signaling** tab configuration are described in the following table.

Section	Field/Control	Description
Bad/Good/Loop	(Bad) Contiguous 66-bit blocks with errors (multiples of 4; min = 4, max = 32)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks with errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive fault sequences allowed are minimum 4 sequences and maximum 32 sequences.
	(Good) Contiguous 66-bit blocks without errors (multiples of 4; min = 0, max =	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks without errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive regular data sequences allowed are minimum 0 sequences and maximum 512 sequences.

Section	Field/Control	Description
	512)	
	Number of times the above will loop (min = 1, max = 255)	Specifies the number of loops for the user defined sequence. Options include the following: • Discrete iterations: 1. Minimum of 1 iteration 2. Maximum of 255 iterations • Continuous loop 1. User cannot specify number of iterations
	Options include the following: • Send type A ordered sets • Send type B ordered sets • Alternate ordered set types	Defines the ordered set pattern that will be sent. (The two Ordered Sets—A and B—are defined in the **Ordered Set Definition** box in this tab.) This pattern will be combined with the Good blocks/Bad blocks pattern for transmission. • Only Type A fault sequence and regular good data sequences • Only Type B fault sequence and regular good data sequences • Alternate Type A, regular good data sequences and Type B fault sequence, regular good data sequences NOTE If this field is available, and the Alternate ordered set types option is selected, the minimum value for this field should be '2,' to allow the entire pattern to be sent once. If left at the minimum value of '1'— only two groups of blocks (one of good blocks and one of bad blocks) will be sent, which means that only the first ordered set will be sent. A minimum of eight blocks is required for one complete pattern including Types A and B.
	Loop continuously	If selected, the loop defined by the combination of the Bad and Good blocks plus the pattern of ordered sets, will be transmitted continuously until the **Stop Error Insertion** option is selected.
Ordered Set Definition	Ordered Set Type A	Options include the following: • Local Fault • Remote Fault
	Ordered Set Type B	Options include the following:

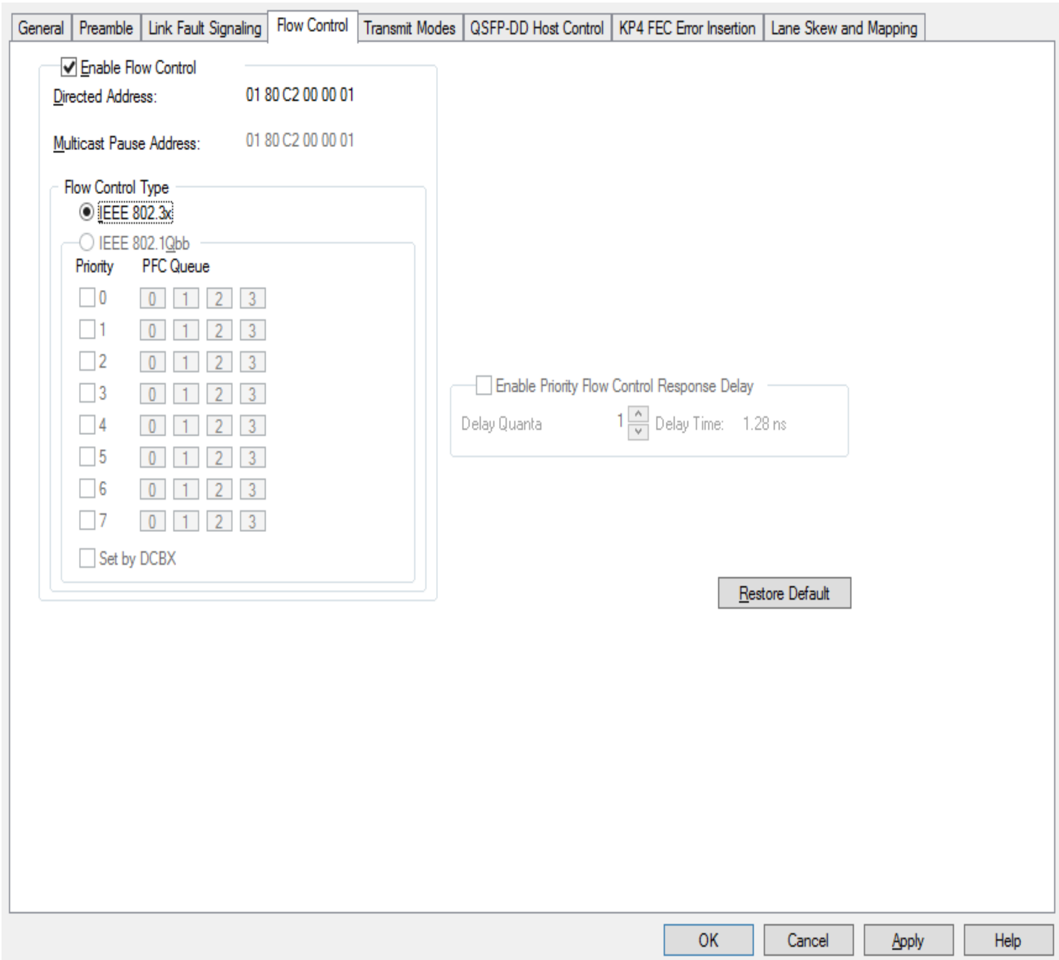
Section	Field/Control	Description
		• Local Fault • Remote Fault
Tx ignores Rx Link Faults		If selected, ongoing transmission will continue even if Link Fault messages are received by the sending RS.
Summary (Window)		(Read-only) Shows descriptions of the patterns that will be transmitted.
Start Error Insertion		Select this option to start the transmission of the configured error patterns.
Stop Error Insertion		(Available only for use with the **Loop continuously** option.) Select this option to stop the transmission of the configured error patterns.

T400GD-8P-QDD Port Properties—Flow Control

The T400GD-8P-QDD **Flow Control** tab is accessed from the context menu of the port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

NOTE You can view this help page for the **Port Properties - Flow Control** tab by selecting the **Help** option and not F1.

The Port Properties **Flow Control** tab for T400GD-8P-QDD is shown in the following image.



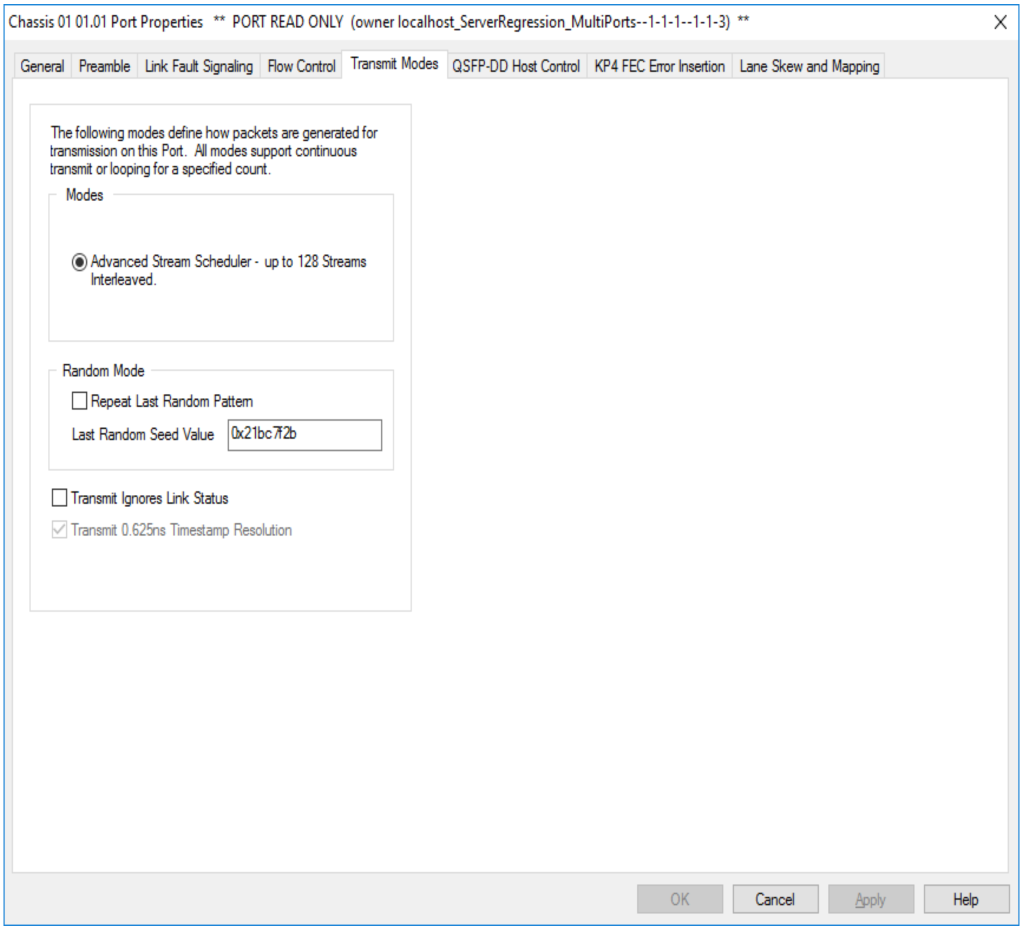
Section	Field/Control	Description
Enable Flow Control	(check box)	Enables the port's MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type		
	IEEE 802 3x	When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame.
	IEEE 802.1Qbb	When not in Data Center mode, only IEEE 802.3x is available.

Section	Field/Control	Description
	Priority	When flow control type IEEE 802.1Qbb is selected in Data Center mode, priority options are the channels of data that can be paused. Select to select one or more channels.
	PFC Queue	The PFC Queue can be mapped to the priority field in the frame.
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

T400GD-8P-QDD Port Properties—Transmit Modes

The **Transmit Modes** tab for T400GD-8P-QDD load modules is shown in the following image. It is accessed by double-clicking a port in **Resources** window, or by from the context menu of the port by selecting the **Properties** menu option. Then select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following image.



The controls for **Transmit Modes** tab configuration are described in the following table.

Section	Field/Control	Description
Modes	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure up to 128 streams for 400GE and 200GE and up to 32 streams for 100GE and up to 16 streams for 50GE speeds. They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream's random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia*

Section	Field/Control	Description
		Platform Reference Manual.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit Ignores Link Status		If selected, will allow transmission of packets even if the link is down.
Transmit High TimeStamp Resolution		If selected, the T400GD-8P-QDD load module will support the 0.625 ns for 400G speed mode.

T400GD-8P-QDD Port Properties—QSFP-DD Host Control

PAM-4 is a four-level pulse-amplitude modulation that uses four distinct amplitude levels to encode two bits of data, essentially doubling the bandwidth of a connection. The PAM4 settings are defined using the **QSFP-DD Host Control** tab.

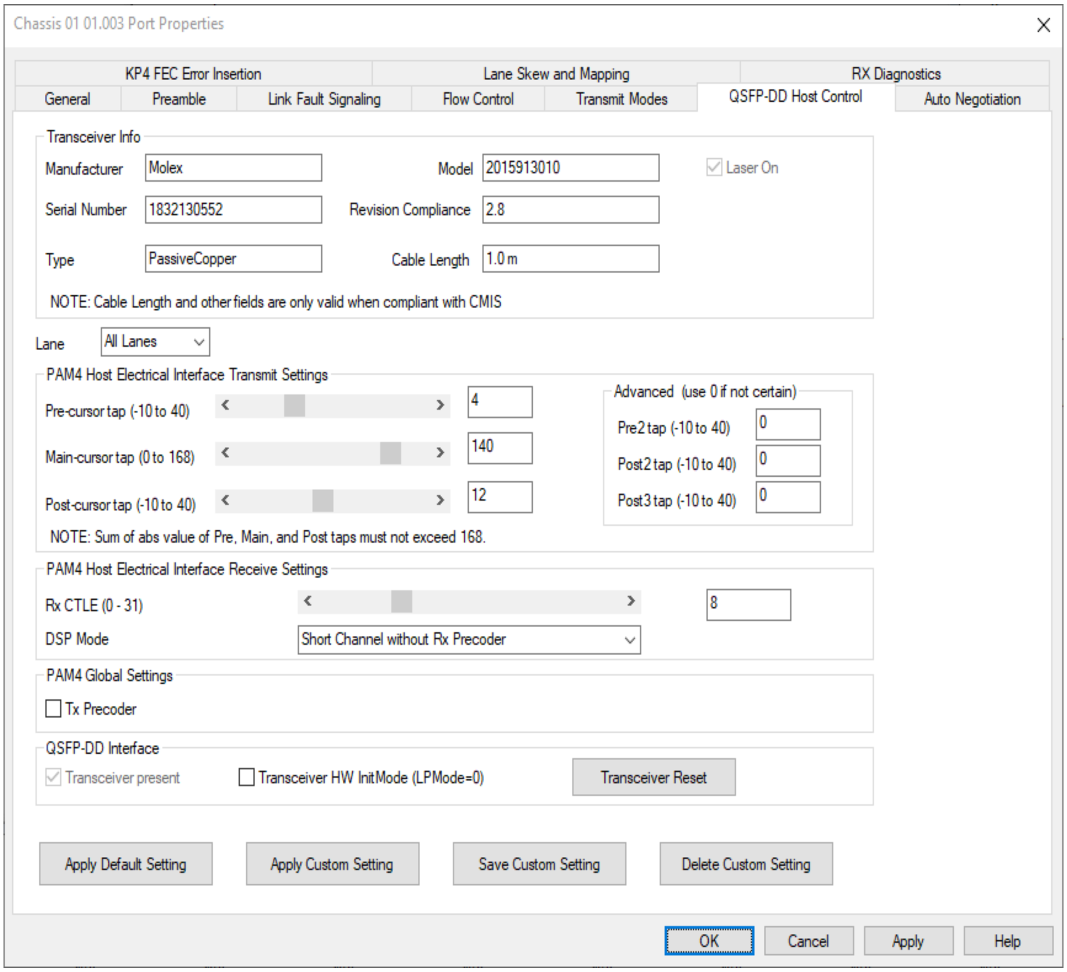
For T400GP-4P-QDD module, see T400GP-4P-QDD Port Properties—QSFP-DD Host Control.

For T400GP-2P-QDD module, see T400GP-2P-QDD Port Properties—QSFP-DD Host Control.

The **QSFP-DD Host Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **QSFP-DD Host Control** tab.

The Port Properties **QSFP-DD Host Control** tab for T400GD-8P-QDD when the default passive copper transceiver is used is shown in the following figure:

Figure: **QSFP-DD Host Control** tab for passive copper transceiver



When T400GD-8P-QDD detects an optical transceiver, it will apply a transmit and receive equalization combination that is well suited for optics, as highlighted in the following figure.

Figure: QSFP-DD—**Host Control** tab for optical transceiver

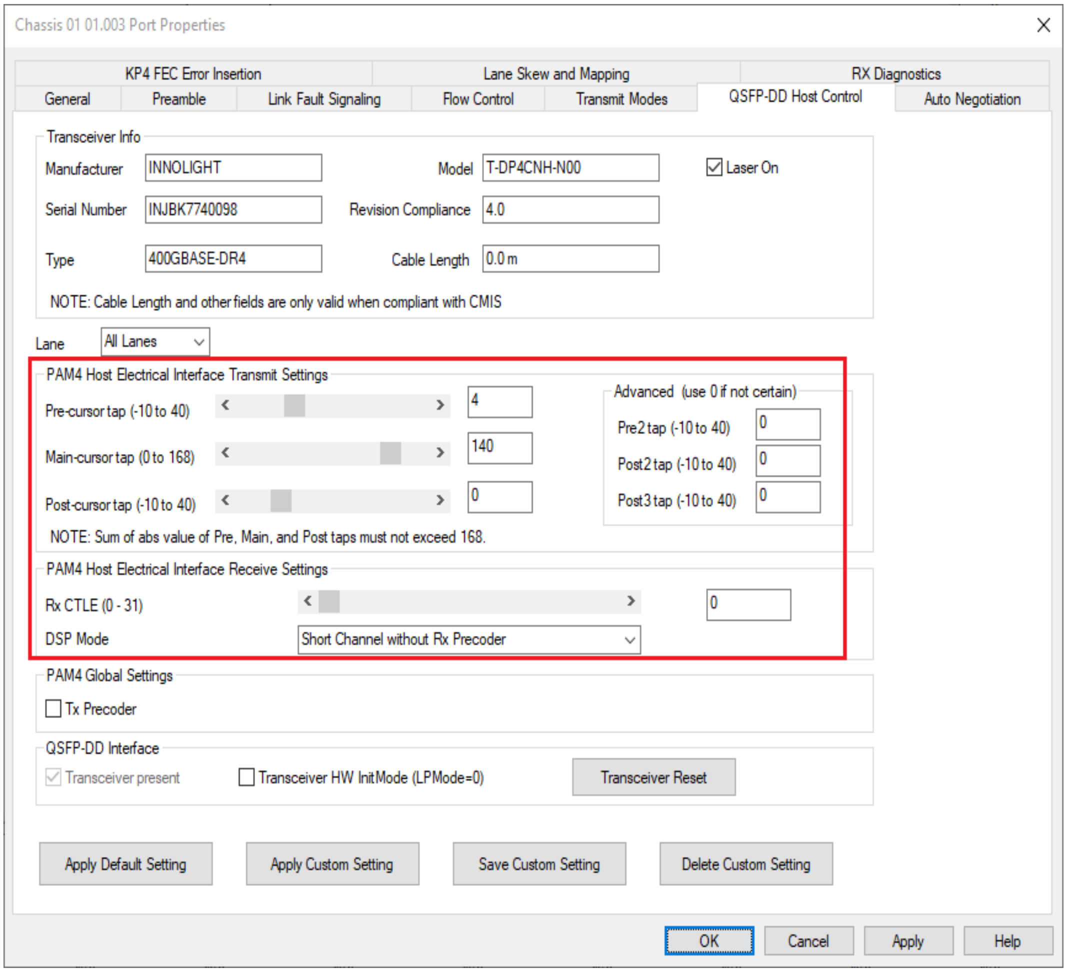


Table: QSFP-DD Host Control Configuration

Section	Field/Control	Description
Transceiver Info		
	Manufacturer	This is the Vendor Name field read from the actual transceiver currently being plugged in.
	Model	This is the Part Number field read from the actual transceiver currently being plugged in.
	Serial Number	The serial number of the transceiver.
	Revision Compliance	The implemented CMIS revision of the transceiver. T400GD-8P-QDD supports both CMIS 3.0 and CMIS 4.0 transceivers. See Management Interface.
	Type	When a transceiver is inserted into the load module, the software reads IEEE registers to determine the transceiver capabilities and

Section	Field/Control	Description
		media type. If the transceiver contains this information, it is shown in this read-only field.
	Cable Length	The length of Ixia-supplied cable which connects this chassis to the previous chassis in the chain.
	Laser On	Select this check box to enable the laser power.
PAM4 Host Electrical Interface Transmit Settings		
	Pre-cursor tap (-10 to 40)	This helps to control the Pre Tap value for Tx.
	Main-cursor tap (0 to 168)	This helps to control the Main Tap Control for Tx.
	Post-cursor tap (-10 to 40)	This helps to control the Post Tap value for Tx.
Advanced (use 0 if not certain)		
	Pre2 tap (-10 to 40)	The Pre2 Tap value for Tx which is generally negative. The negative precursor tap values are used to optimize the signal at the receiver.
	Post2 tap (-10 to 40)	The Post2 Tap value for Tx which is generally negative.
	Post3 tap (-10 to 40)	The Post3 Tap value for Tx which is generally negative.
PAM4 Host Electrical Interface Receive Settings		
	Rx CTLE (0-31)	Represents the receive sides continuous time linear equalizer.The control is the coefficient for how strong or weak the equalization should be.
	DSP Mode	Represents the Inphi Retimer's proprietary digital signal processing modes. The controls are different channel descriptions corresponding to different operation modes. The options are the following: • Short non strenuous links • Non-strenuous optical links • Non-strenuous links w/ strong reflections • Non-strenuous optical links w/ strong reflections • Strenuous links • Strenuous optical links w/ strong reflections

Section	Field/Control	Description
PAM4 Global Settings		
	Tx Precoder	Represents a PAM4 encoding scheme to reduce DFE bit errors. This also means that both sides of the link must have precoder enabled for link to come up.
QSFP-DD Interface		
	Transceiver HW InitMode	Selecting the check box configures the QSFP-DD InitMode pin to perform the optional Hardware Init mode initialization as described in the Common Management Interface Specification (CMIS) Rev 3.0. When a transceiver boots into Hardware Init mode, the datapath is automatically configured by the module without intervention from the host (that is Ixia tester). When disabled, the software-controlled initialization (Software Init) is instead performed. This is the recommended initialization mode for any transceiver since the appropriate checks are performed between the Ixia tester and the transceiver before the module's datapath initialization.
	Transceiver Reset	Resets the transceiver.
	Apply Default Setting	When you select this button, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Setting	When you select this button, if there exists a custom setting in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	When you select this button, if there exists a custom setting in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	When you select this button, if there exists a custom setting in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel with that. If no custom setting exists, users will be prompted that nothing will be deleted.

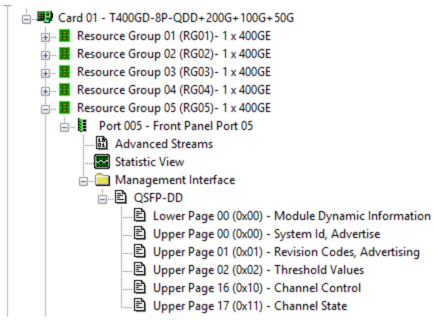
Management Interface

A management interface specification CMIS defines the management interface and associated protocols for all required and allowable management interactions between a CMIS aware host and a

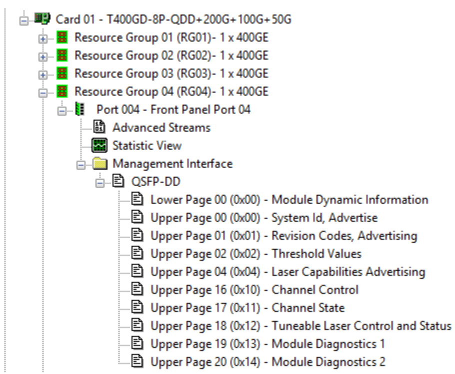
CMIS compliant module that are relevant for the host using the module in an application.

The Management Interface appears in the IxExplorer Resources Tree and switches on the fly depending on the CMIS revision. This means that the transceiver automatically reads the management interface and populates the lower and upper pages depending on the transceiver type.

With a CMIS 3.0 (or lower) transceiver, you will see the following pages:



With a CMIS 4.0 transceiver, you will see the following pages:



T400GD-8P-QDD Port Properties—Auto Negotiation

The T400GD-8P-QDD **Auto Negotiation**tab is accessed by selecting a T400GD-8P-QDD port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto Negotiation** tab.

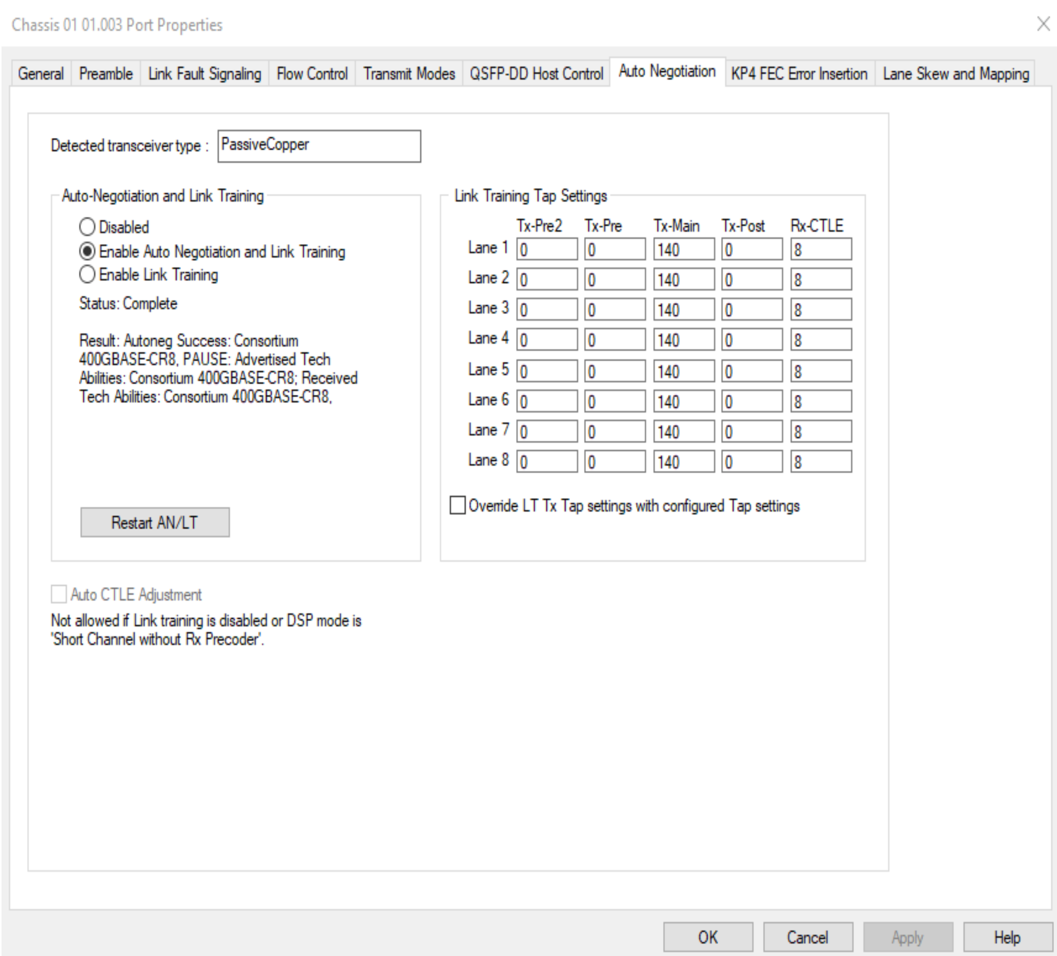
For T400GD-8P-OSFP module, see T400GD-8P-OSFP Port Properties—Auto Negotiation.

For T400GP-4P-QDD module, see T400GP-4P-QDD Port Properties—Auto Negotiation.

For T400GP-2P-QDD module, see T400GP-2P-QDD Port Properties—Auto Negotiation.

The Port Properties **Auto Negotiation** tab for T400GD-8P-QDD is shown in the following figure:

Figure: T400GD-8P-QDD **Auto Negotiation** tab

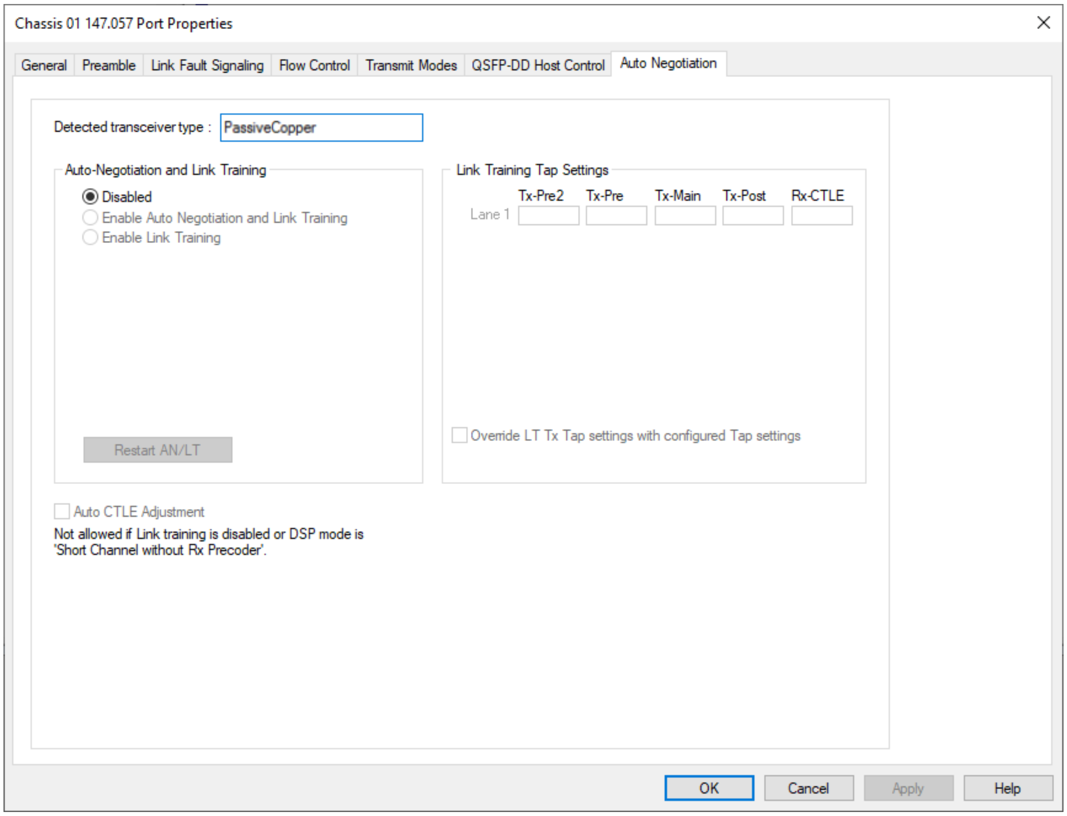


The following lanes are available depending on the port speed:

Speed Mode	Lanes
400GE	8 lanes (1-8)
200GE	4 lanes (1-4)
100GE	2 lanes (1-2)
50GE	1 lane (1)

For 50GE speed mode, if the **All Ports, No AN** is enabled, the Auto-Negotiation and Link Training options are not available for selection.These options are available if the **Odd Ports Only** option is selected. See Operation Mode.

Figure: T400GD-8P-QDD **Auto Negotiation** tab for 50GE All Ports, No AN mode



The fields and controls in this tab are described in the following table:

Table: T400GD-8P-QDD **Auto Negotiation** tab

Field/Control	Description
Detected transceiver type	The type of transceiver that is plugged in.
Disabled	When you select the check box, the L1 parameters like Autonegotiation, Link Training, and FEC, are enabled or disabled per IEEE requirements, and you will not be able to enable or disable these manually. If the check box is cleared, you will be able to manually enable or disable L1 features – even if it violates IEEE specifications. By default the check box is selected.
Enable Auto Negotiate and Link Training	Auto negotiation controls how a port communicates with other ports.If you select the check box, it allows auto-negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing • **Restart Auto-Negotiate** button is selected (this does a forced restart)

Field/Control	Description
	NOTE The **Enable Auto Negotiate** check box is available for selection only if the **Disabled** check box is cleared.
Enable Link Training	Select the check box to allow longer length copper cables to be used. This means that during the next Auto-Negotiation, KR training will be used. NOTE This check box is available for selection only if the **Disabled** check box is cleared.
Negotiated the capability above	The text box indicates the speed that was negotiated due to Auto-Negotiation.
Restart AN/LT	Restarts the Auto Negotiate sequence.
Auto CTLE Adjustment	When you select the check box, the load module offers CTLE or control over the receiver's Continuous Time Linear Equalizer stage, which is a linear filter that can attenuate the low-frequency components, boost the signal components at the Nyquist frequency, and attenuate higher frequencies past that peak.
Link Training Tap Settings	
Tx-Pre2-cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Pre-cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Main-cursor Lane 1-8	The per-lane transmit main-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Post-cursor Lane 1-8	The per-lane transmit post-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Rx-CTLE Lane 1-8	The CTLE settings applied by the receiver.
Override LT Tx Tap settings with configured Tap settings	Selecting this check box overrides the taps settings derived by the link training process, and configures the transmit pre/main/post cursor settings and receiver CTLE setting with the static values specified in the **QSFP-DD Host Control** tab.

T400GD-8P-QDD Port Properties—KP4 FEC Error Insertion

Forward Error Correction (FEC) is a method of communicating data that corrects errors in transmission on the receiving end. Prior to transmission, the data is put through a predetermined algorithm that adds extra bits specifically for error correction to any character or code block. If the transmission is received in error, the correction bits are used to check and repair the data.

NOTE **KP4 FEC Error Insertion** tab is not available for T400GD-8P-QDD 100G and 50G models.

The **FEC Error Insertion** tab allows to inject FEC errors into transmitted data, and is shown in *Image: **FEC Error Insertion** Tab*

Image: **KP4 FEC Error Insertion** Tab with Error Type selected as Random

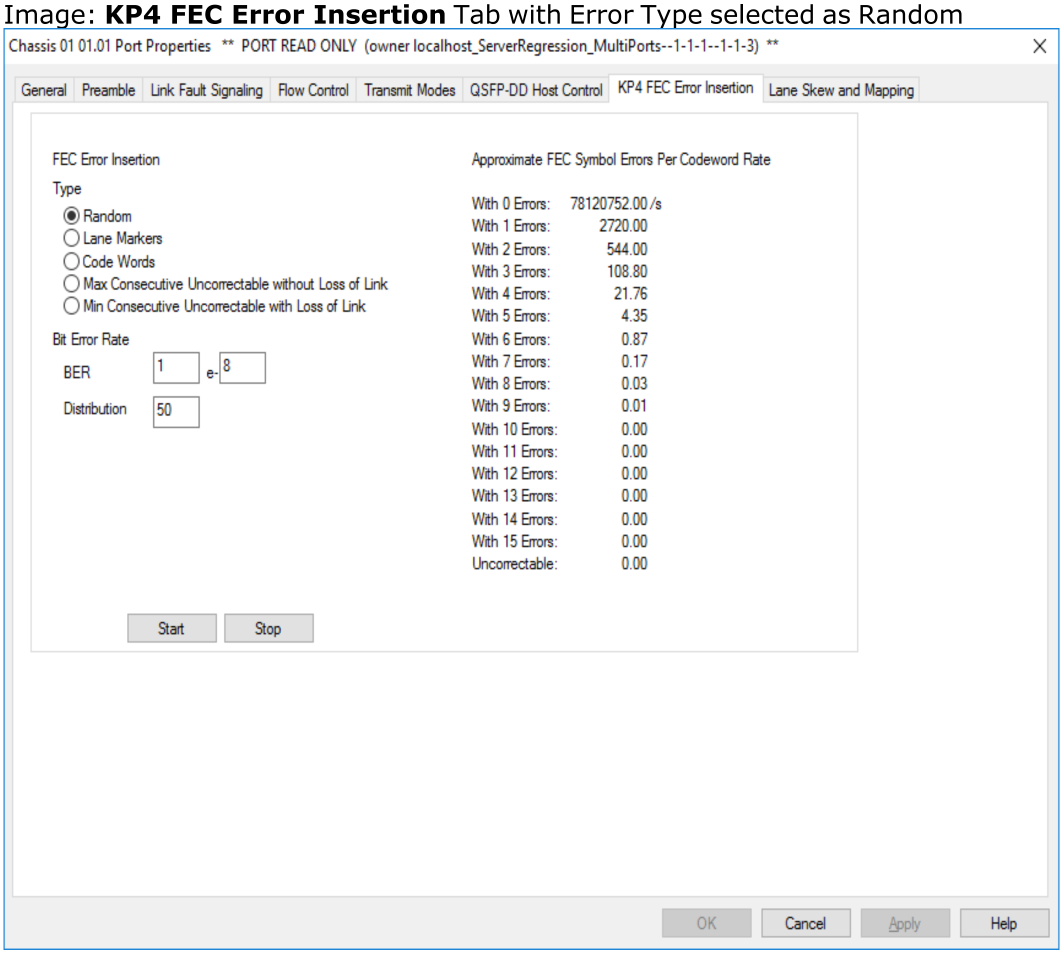


Image: **KP4 FEC Error Insertion** Tab with Error Type selected as Lane Markers

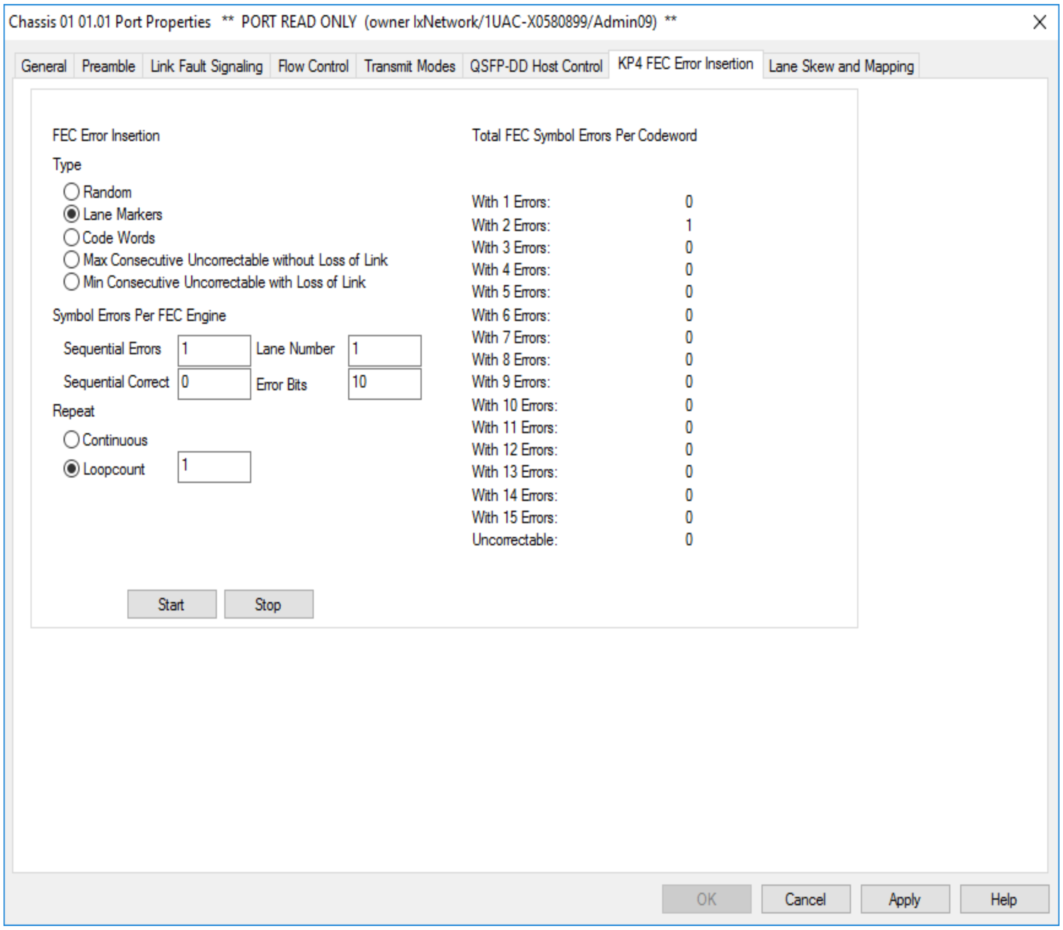


Image: **KP4 FEC Error Insertion** Tab with Error Type selected as Code Words

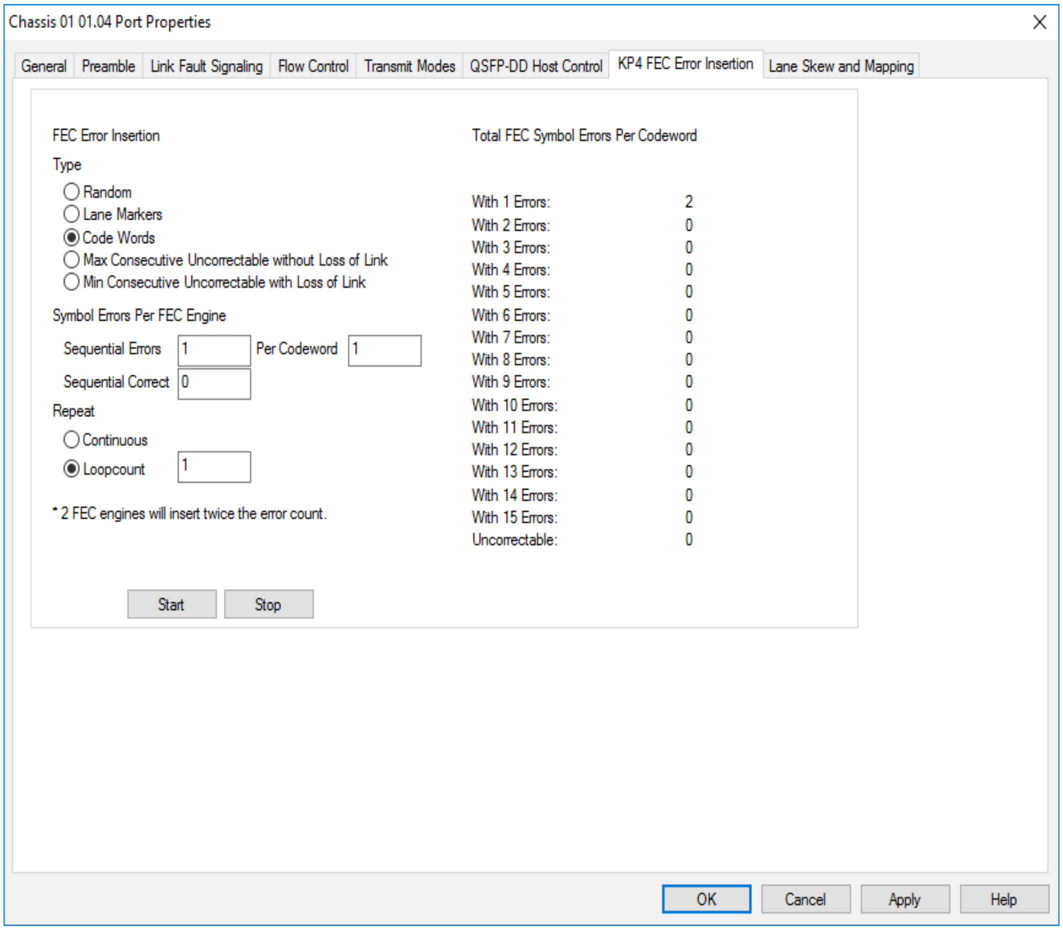


Image: **KP4 FEC Error Insertion** Tab with Error Type selected as Max Consecutive Uncorrectable without Loss of Link

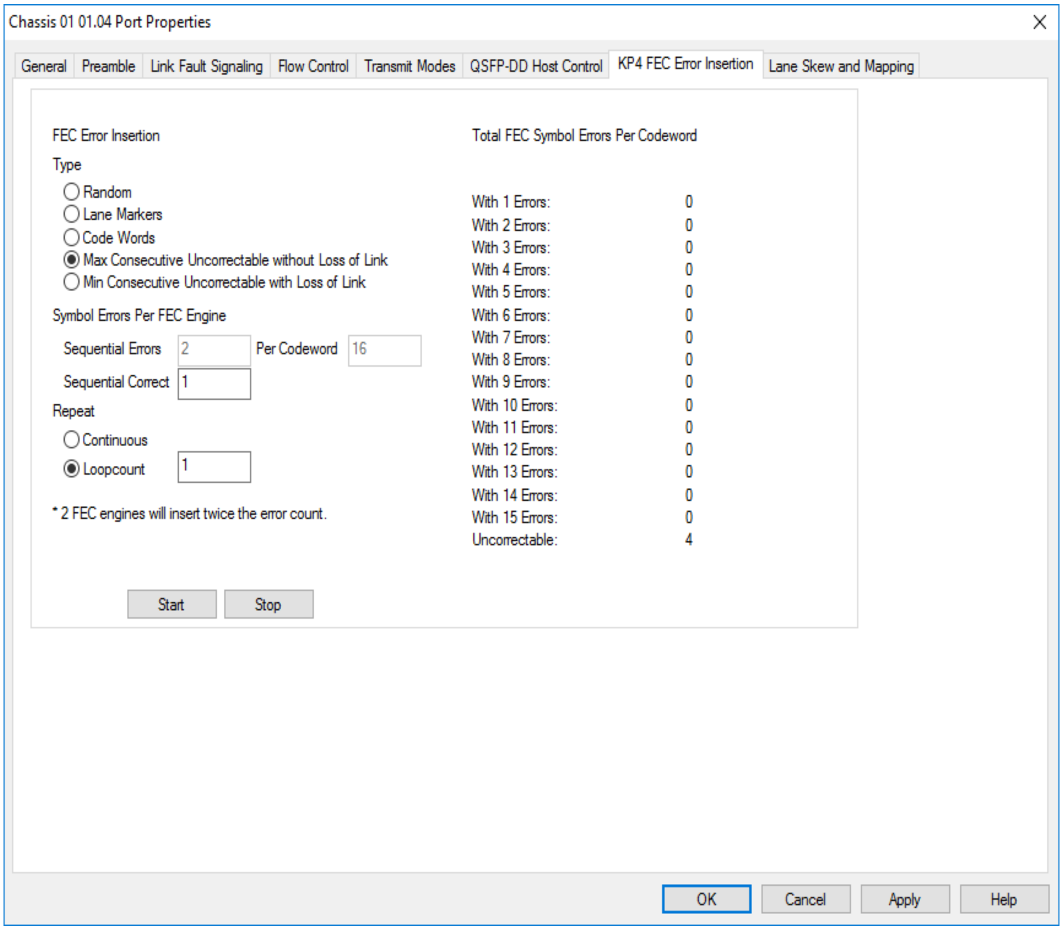


Image: **KP4 FEC Error Insertion** Tab with Error Type selected as Min Consecutive Uncorrectable with Loss of Link

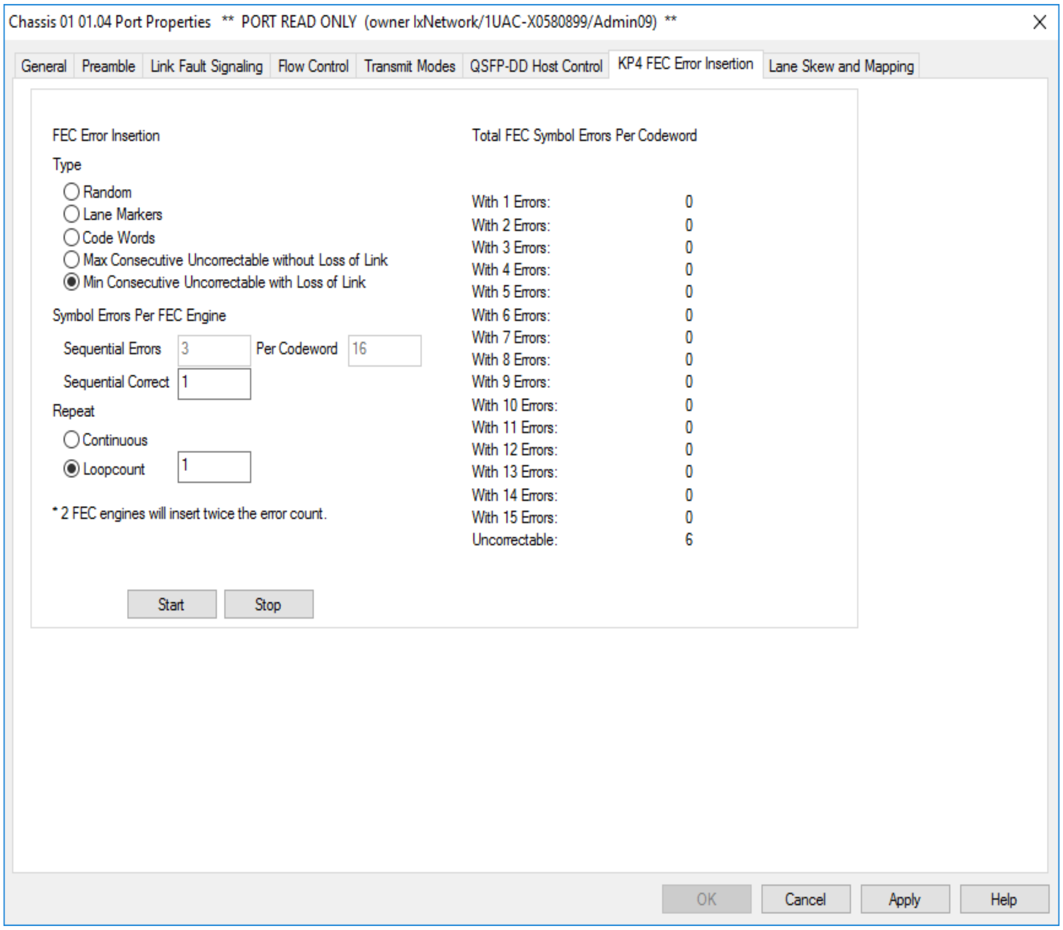


Table: **KP4 FEC** Tab Configuration

Section	Field	Usage
FEC Error Insertion		
Type	Random	Random FEC symbol error insertion will introduce a deterministic number of errors, evenly spread across all PCS lanes, on top the intrinsic BER (Bit Error Rate) of the interconnect.
	Lane Markers	Inserts errors only in the Lane Marker fields.
	Code Words	This is the fundamental unit of data that the FEC engine operates on sequentially. It is composed of blocks that carry the payload and parity information for the 64/66B scrambled data that arrives from the PCS Scrambler on Egress and from the PMA on Ingress.The code word size and layout can vary from each coding scheme. For example, RS, KR, and KP4 all have different code words because their coding schemes are different.
	Max Consecutive Uncorrectable	Uncorrectable errors are those with more than 15 symbol errors. As per IEEE, the maximum number of consecutive uncorrectable errors without loss of link is 2.

Section	Field	Usage
	without Loss of Link	
	Min Consecutive Uncorrectable with Loss of Link	The Max Consecutive Uncorrectable WITHOUT Loss of Link + 1. This is the threshold where the receiver should declare Local Fault due to bad data. The minimum number of consecutive uncorrectable errors with loss of link is 3.
Bit Error Rate	BER	The Bit Error Ratio (BER) is the ratio of the number of error bits compared to the total number of bits transmitted. In the BER field, enter the coefficient of the BER.The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	e-	Enter the exponent of the BER. The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	Distribution	Controls how the errors are distributed. This modifies the probability distribution of errors while maintaining the average Bit Error Rate. For example, you can have a BER of 10E-8 but have all of the errors be single errors OR you can have the errors be distributed across a variety of errors. The purpose is to thoroughly test a receiver to see if all possible errors are being corrected at varying rates.
Symbol Errors Per FEC Engine		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Sequential Errors	In burst mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.

Section	Field	Usage
		NOTE Per 802.3bs and 802.3cd, reception of 3 or more consecutive uncorrectable codewords will result in Loss of Link. In burst mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. This sequence will be repeated until stopped. NOTE Per 802.3bs and 802.3cd, reception of 5 or more Alignment Marker errors will result in Loss of Link. • In 400G mode, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines. • The symbol errors are not evenly distributed across the PCS lanes (use Random error insertion mode for that case) • The maximum number of sequential uncorrectable errors without loss of link is 2 and the minimum number of sequential uncorrectable errors with loss of link is 3.
	Lane Number	The Lane Number specifies which PCS lane will be affected by the Lane Marker error insertion.This field is available only if you select the error insertion type as Lane Markers.
	Sequential Correct	The number of consecutive code words without errors.
	Error Bits	The Error Bits specifies how many errors will be inserted on each of the two symbol errors of the codeword that carries the Lane Marker. There is a minimum Error Bits required (2) before corrupting the symbol that maps to the Lane Marker field. This field is available only if you select the error insertion type as Lane Markers.
	Per Codeword	Codeword is a block of contiguous packets on the line. All RS-FEC codewords are of the same size.The Per Codeword value denotes the number of symbol errors per codeword to insert. KP4 FEC can correct up to 15 symbols, and detect up to 30 symbols. If the user specifies 16, an Uncorrectable Codeword will be issued. This field is available only if you select the error insertion type as Code Words.

Section	Field	Usage
Repeat		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Continuous	Continuous error insertion.In continuous mode, the Sequential Errors field will specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.
	Loopcount	The sequence of correct and incorrect codewords or symbol errors inserted will be repeated by the number specified in the Loopcount field.
Start		Starts the error insertion process.
Stop		Stops the error insertion process.
Appropriate FEC Symbol Errors Per Codeword Rate		The Appropriate FEC Symbol Errors Per Codeword Rate is an approximation for how many symbol errors there will be per codeword every second. NOTE In 400G mode, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines.

T400GD-8P-QDD Port Properties—Lane Skew and Mapping

The **Lane Skew and Mapping** tab allows to control the PCS lane order and skew rate for each lane.

For more information on Lane Skewing, see the Lane Skew topic in the ‘Multilane Distribution Configuration’ chapter of the *Ixia Platform Reference Manual*. The Lane Skew topic is located under ‘Types of Ports’ / ‘100GE’.

NOTE **Lane Skew and Mapping** tab is not available for T400GD-8P-QDD 100GE and 50GE speed modes.

The T400GD-8P-QDD Port Properties **Lane Skew and Mapping** tab for the 400GE and 200GE speed modes is shown in the following image:

Image: T400GD-8P-QDD **Lane Skew and Mapping** tab for 400GE

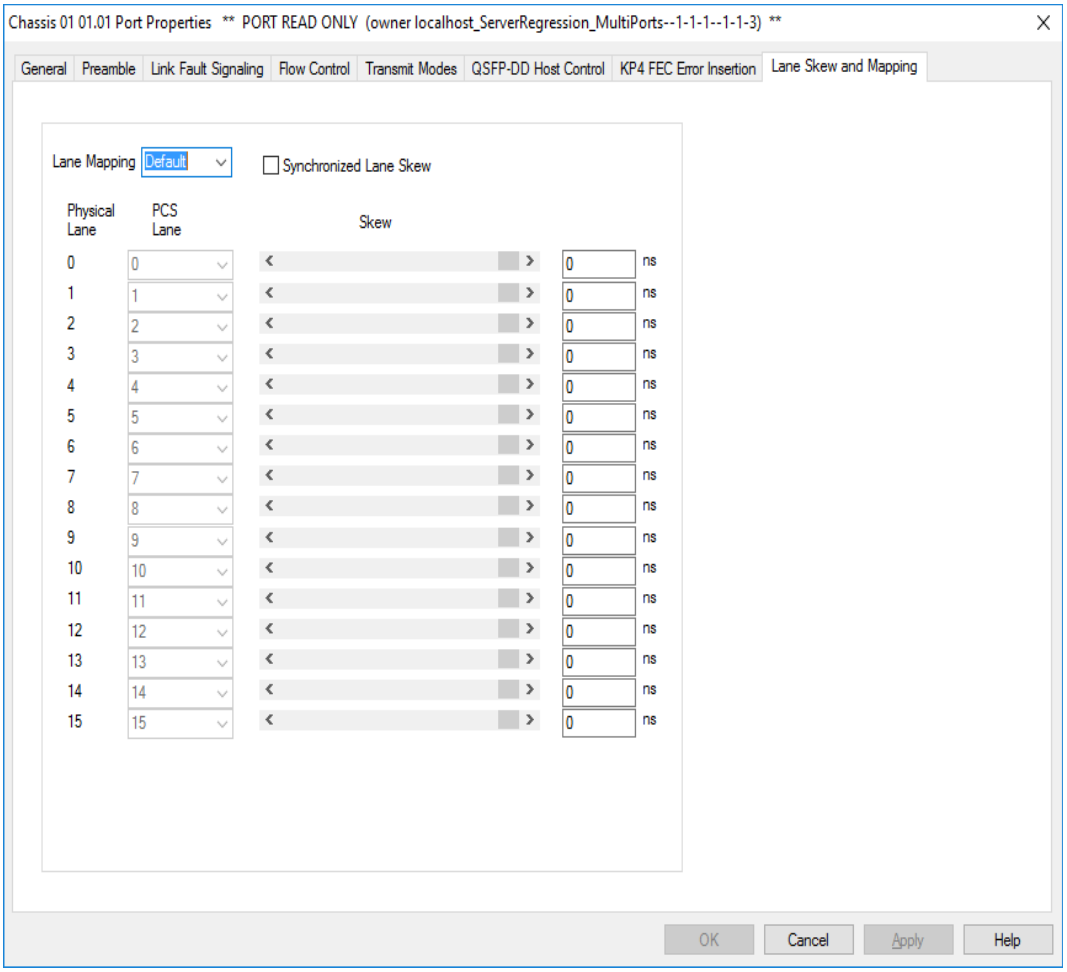


Image: T400GD-8P-QDD **Lane Skew and Mapping** tab for 200GE

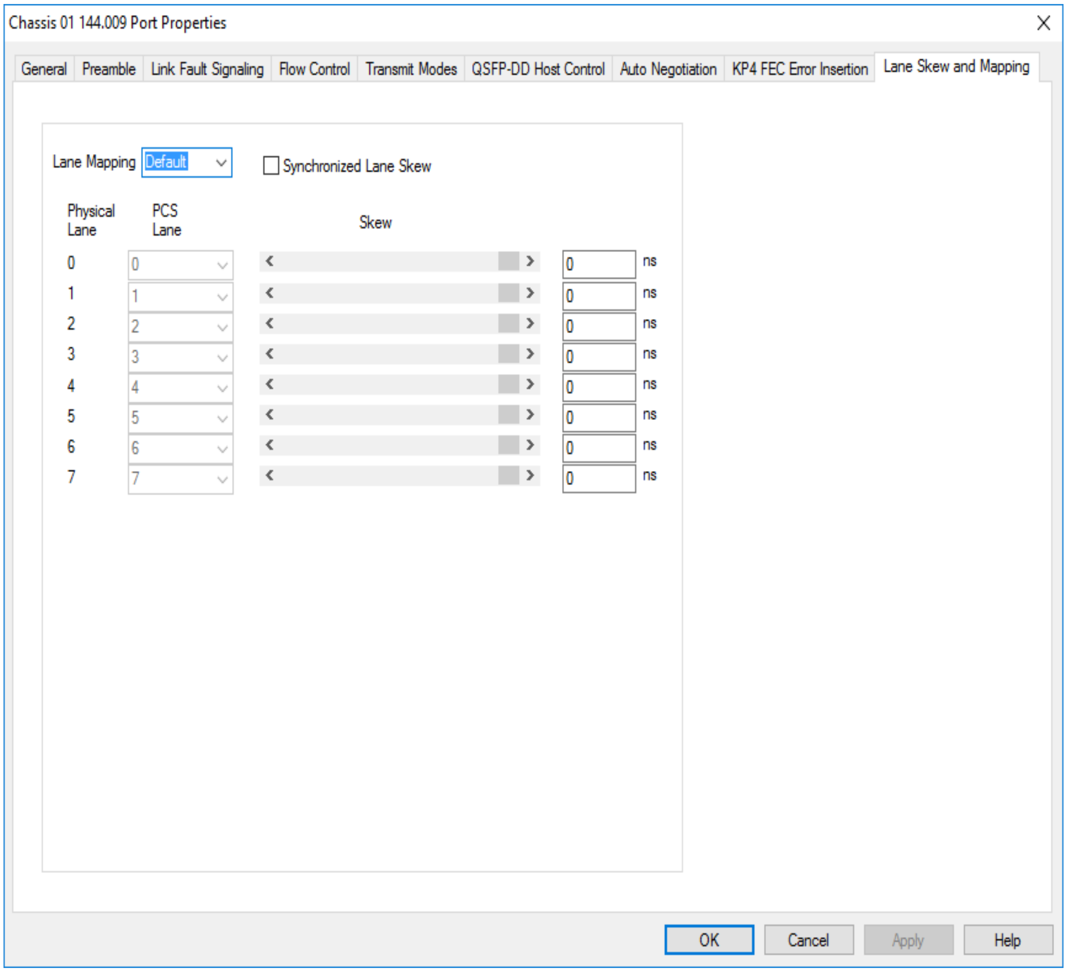


Table: Lane Skew and Mapping Configuration

Field	Description

Lane Mapping	Allows you to select a PCS lane ordering method. There are five options:
	• Default: The default ordering method. The default order is each physical lane corresponds to single PCS lane.
	• Incrementing:
	  ▪ For 400G, orders the lanes from 0 to 15, straight down the list.
	• Decrementing:
	  ▪ For 400G, orders the lanes from 15 to 0, straight down the list.
	• Custom: Allows to put the lanes in any order by manually entering the numbers in the fields. The starting order is the last selected mapping. Mapping between physical and PCS lanes should be one-to-one, else it will result into link down.
	• Random: Allows to put the lanes in any random order, values will be any value from 0 to the total number of lanes.

Synchronized	If selected, enables to synchronize the skewing or delaying of one or more PCS

Field	Description
Lane Skew	lanes.
Physical Lane	The physical lane identifier. The physical lane is paired with a corresponding PCS lane.
PCS Lane	A number identifier for the PCS lane. The PCS lane is paired with a corresponding physical lane.
Skew	The skew slider is used to set a skew value for the PCS lane, in nanoseconds, on the transmit side. Lane Skew is the ability to independently delay one or more of the total number of PCS lanes. When the slider is moved, the nanoseconds field is correspondingly adjusted. You can also enter a nano second value directly into this field. When the slider is fully pushed to the right, the skew injected into the transmit stream is 0 (minimum). When the slider is pushed all the way to the left. the skew injected into the transmit stream is 1002.918 ns (maximum).

T400GD-8P-QDD Port Properties—RX Diagnostics

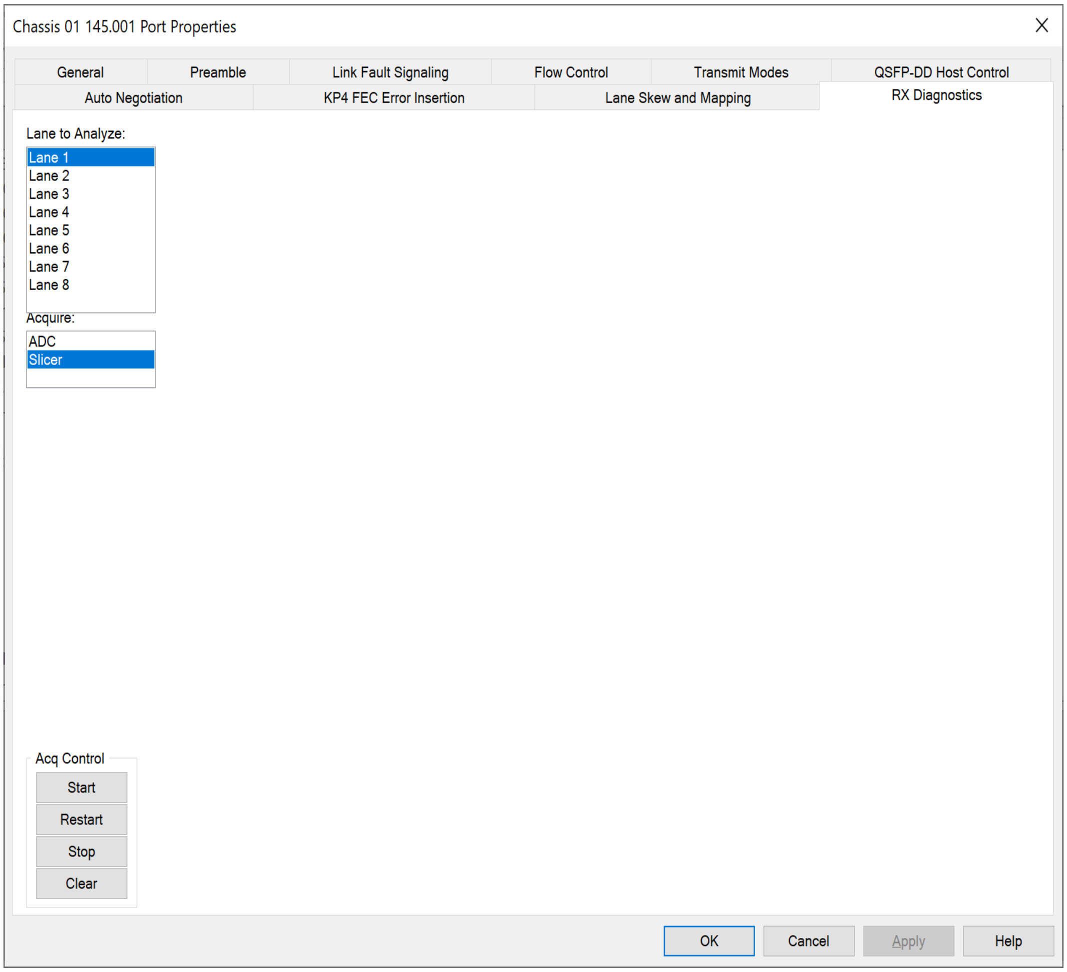
The T400GD-8P-QDD load module has eight electrical lanes at the cage where you insert your optics or DACs. In order to evaluate the link quality and determine if the transmitters are driving the right kind of signal, you can diagnose the signals that are actually being received at the cage. The **RX Diagnostics** tab allows you to do this.

For T400GD-8P-OSFP module, see T400GD-8P-OSFP Port Properties—RX Diagnostics

For T400GD-4P-QDD module, see T400GP-4P-QDD Port Properties—RX Diagnostics

For T400GD-2P-QDD module, see T400GP-2P-QDD Port Properties—RX Diagnostics on page 1490

The T400GD-8P-QDD Port Properties **RX Diagnostics** tab, with no data, is shown in the following figure:



Key components of the T400GD-8P-QDD receiver are the following:

- Variable Gain Amplifier (VGA) to apply gain against broadband channel loss.
- Continuous-Time Linear Equalizer (CTLE) to boost the higher frequencies or emphasize the lower frequencies.
- Analog to Digital Converter (ADC) to convert the signal into a set of sample at 26.5625 GS/s.
- Feed-Forward Equalizer (FFE) to cancel time-domain channel effects.
- Slicer to determine the value {0, 1, 2, 3}, that indicates the level of PAM4 signaling.

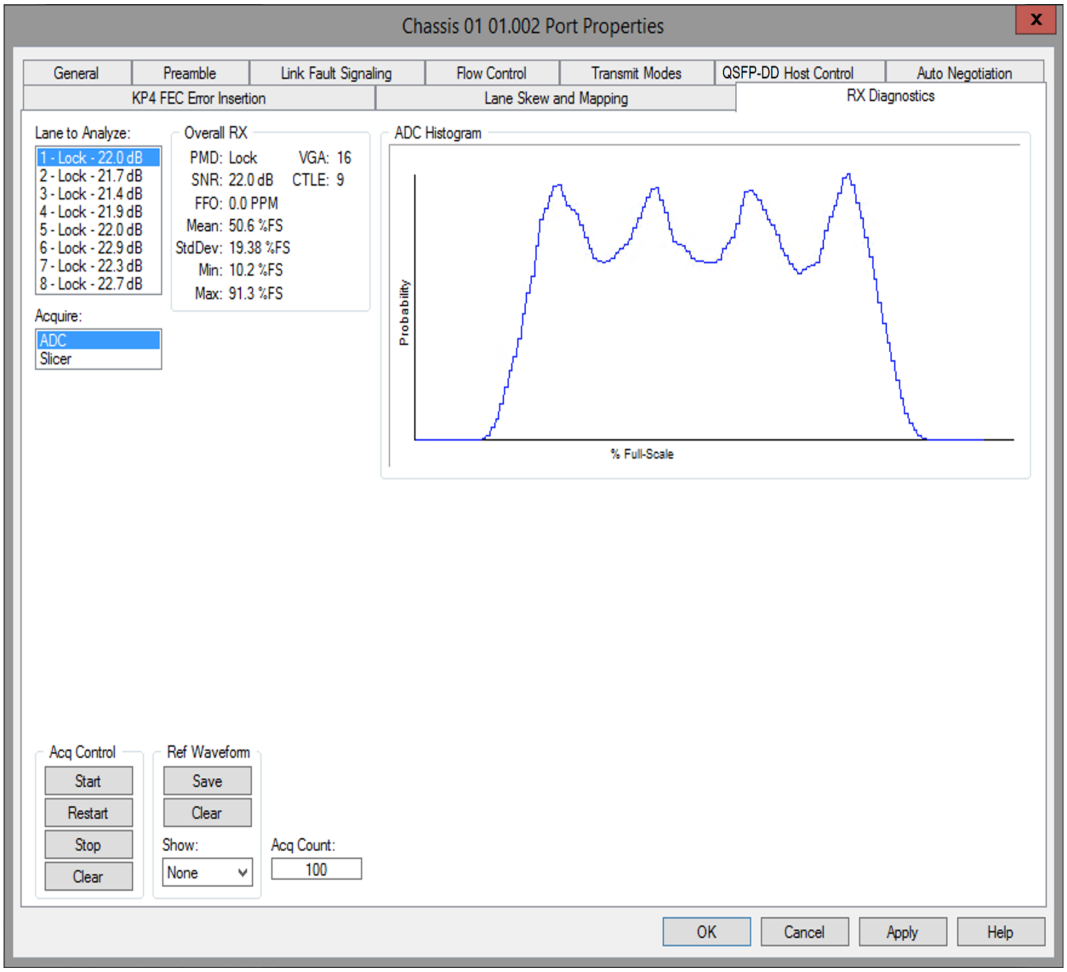
You can view the electrical signals at the following two places in the receiver - output of ADC and Slicer.

Output of ADC

At the output of the ADC (Analog to Digital Converter), we get a measurement of the signal without the Feed-Forward Equalizer (FFE) in the receiver. We cannot use this to assess the quality of the signal, instead, it provides a rough view of the voltages (after amplification by the VGA and equalization by the CTLE) at the receiver.
We can use this to demonstrate that a DC, NRZ, auto negotiation, or PAM4 signal is being received. For signal quality metrics, we can use the SNR measurement, Slicer Histogram, or SER Projection.

SNR is presented here in the **RX Diagnostics** tab, Slicer Histogram and SNR Projection are presented when measuring at the Slicer.

At the output of the ADC, a limited set of analytics is shown:



The histogram plot places each code on the X axis and the number of times it was received on the Y axis to show a waveform of the incoming signal. This allows you to quickly see the quality of a PAM4 signal.

The following details of the signal received are shown in the **Overall RX** box:

Diagnostics	Description
RX Lock	Reports the lock state of the receiver. This can be one of the following: • Reset: The receiver is being reset. • LOS: No signal is detected. • Unlock: A signal is detected, but cannot lock to the incoming data stream. • Lock: The receiver is locked to the incoming data stream.
VGA	The current setting of the Variable Gain Amplifier which automatically adapts to

Diagnostics	Description
	the signal strength at the receiver. A higher value indicates a weaker signal.
CTLE	The current setting of the Continuous-Time Linear Equalizer, which is set by the **QSFP-DD Host Control** or **OSFP Host Control** tab unless the **Auto CTLE Adjustment** check box is selected in the Port Properties **Auto Negotiation** tab. A higher value is suitable for higher loss at the Nyquist frequency.
SNR	The Signal to Noise Ratio (SNR), in Decibels (dB), of the signal being received. This is a primary metric of signal quality at the receiver. A higher value indicates a signal with higher quality and a lower value indicates a signal with higher noise.
FFO	The fractional frequency offset, in Parts Per Million (PPM), of the signal being received, relative to the transmit frequency.

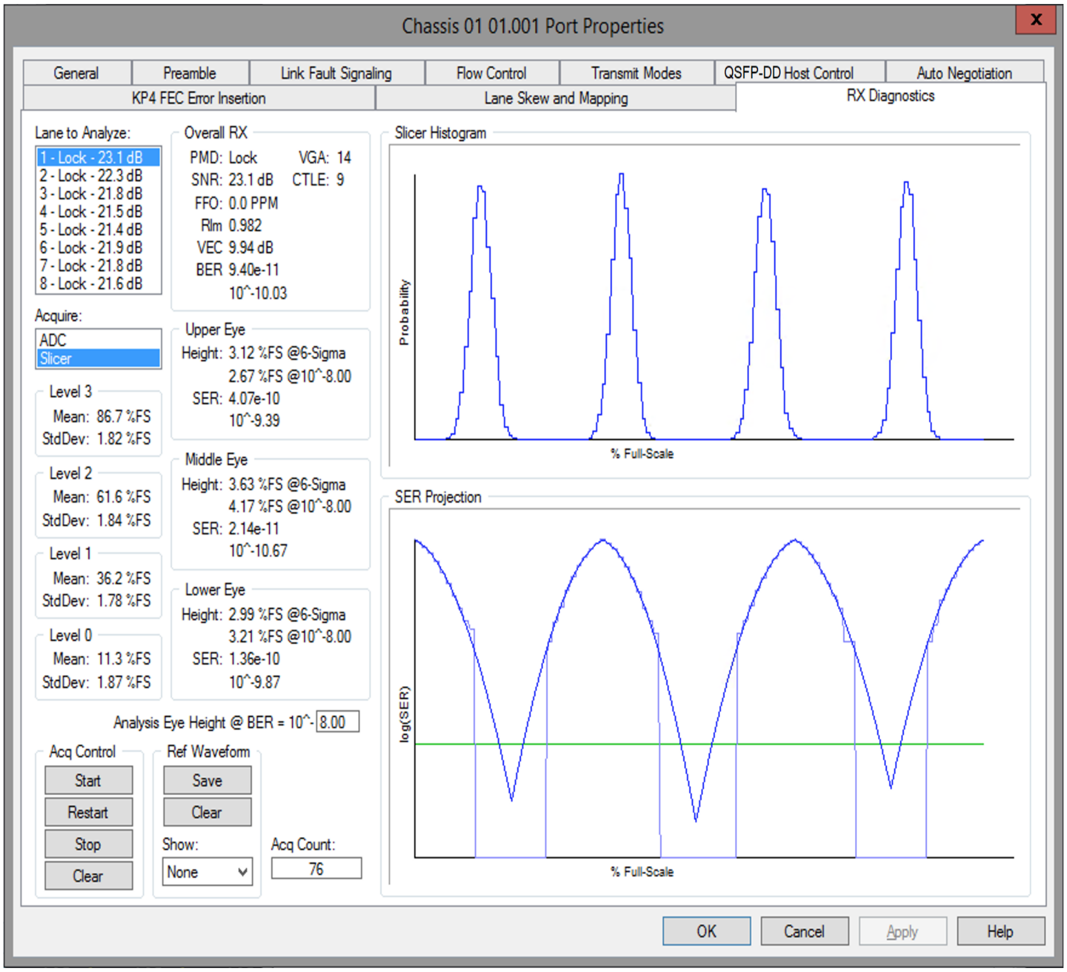
NOTE The Mean, StdDev, Min, and Max values relate statistical performance of this histogram in units of percentage of full-scale (%FS).

Slicer

At the slicer, we get a measurement of the signal at the point where a PAM4 code {0, 1, 2, 3} is determined. This represents the quality of the signal with the best-effort adaptation of the receiver.

NOTE This feature is available only with an additional license.

At the slicer, the full set of analytics is shown, including the histogram and Symbol Error Ratio (SER) Projection plot.



The following analytics are shown:

- **Statistical performance of each of the four levels**

  The statistical performance of each of the four levels in the Slicer Histogram are reported in the **Level 0**, **Level 1**, **Level 2**, and **Level 3** boxes.

NOTE	All Mean, StdDev, and Height measurements are in units of RX DSP codes which are subject to amplitude and filter adjustment as driven by receive adaptation.

- **SER Projection graph**

  The **SER Projection** graph shows the projected Symbol Error Ratio (SER) along the vertical axis of the three eyes; this is commonly called a vertical bathtub curve.

  - The X axis is a slicer threshold, in units of percentage of full-scale.
  - The Y axis is the projected SER for the given eye if the slicer threshold were used. This is a fixed logarithmic range. A lower Y value in the middle of the eye represents higher link quality.
  - The lighter blue plot is the measured SER, based on the Slicer Histogram graph.

- The darker blue plot is the projection beyond the actual measurement. As more data comes in, the projection becomes more accurate. For T400, it is best to wait for the **Acq Count** to be above 20 before drawing any conclusions from the projection.
- The green horizontal line represents where the **Analysis Eye Height @ BER** is configured.

- **Vertical projections of the three eyes**

  Vertical projections of the three eyes in the SER Projection are reported in the **Upper Eye**, **Middle Eye**, and **Lower Eye** boxes. The following details are shown:

Diagnostics	Description
Height @6-sigma	The eye height at 6 standard deviations (StdDev) distance from the means. A higher value represents better link quality for a given target BER.
Height @10^-X.XX	The projected eye height at the Analysis Eye Height. This measures how much margin is present for a given eye relative to a target BER. This is a useful measurement for comparing the links. It can be useful in selecting TX and RX tap values or comparing copper cable quality. A higher value represents better link quality.
SER	The projected final Symbol Error Rate (SER) for the given eye. This corresponds to where the projected eye height reaches zero. A lower value represents better link quality.

NOTE Two equivalent forms of this measurement are provided:
- the first as a mantissa-exponent (for example, 4.22e-12)
- the second as a power of ten (for example, 10^-11.38).
Both values are equal. The first form is the same as what is found elsewhere in IxExplorer and the second form allows a quick comparison, since the exponent is the only thing that needs to be compared.

- **Overall RX**

  In the **Overall RX** box you can view the following indications from the Slicer measurement:

Diagnostics	Description
Rlm	The linearity measurement as identified by the **Level 0**, **Level 1**, **Level 2**, **Level 3** boxes. 1.000 represents perfect linearity and the value lowers as linearity decreases. This measurement reflects IEEE 802.3 clause 120D.3.1.2, but it should not be used as a compliance test.
VEC	The Vertical Eye closure as identified by the SER Projection. A lower value represents better link quality. This measurement reflects IEEE 802.3 clause 120E.4.3, but it should not be used as a compliance test.
BER	The final projected BER of the link, composited from the SER readings in the **Upper Eye**, **Middle Eye**, and **Lower Eye** boxes. See the description of the SER readings in the previous section for more details.

NOTE

- This BER projection is based on rather sparse data and an idealized model of the slicer. Furthermore, it does not take into account the re-timing that may be present in an optical transceiver. Therefore, this cannot be compared against the pre-FEC bit error rate that is reported elsewhere in IxExplorer.
- Bit Error Rate (BER) and Symbol Error Rate (SER) relate to each other for an Ethernet signal: BER = SER / 2. In terms of a power of 10: log10(BER) = log10(SER) - 0.301.
  This relationship assumes randomly distributed bit errors on a uniform distribution of PAM4 codes {0, 1, 2, 3} and the use of gray-coding in Ethernet.

Fields and Controls

The fields and controls that allow you to analyze the electrical signals are explained in the following table:

Field	Description
Lane to Analyze	Allows you to select a physical lane you want to analyze. This also reports the RX Lock and SNR for convenience.
Acquire	Enables you to start the acquisition at one of the following receiver components: • ADC • Slicer Slicer is available only with an additional license.
Acq Control	Controls the histogram acquisition for all lanes simultaneously on a port. Options include the following: **Start**: Acquires 100 captures. It stops Slicer captures if in ADC mode and stops ADC captures if in Slicer mode. **Restart**: Clears previous results and starts. **Stop**: Stops acquiring captures. **Clear**: Clears previous results and stops acquiring captures.
Acq Count	Shows how many captures of the particular type were acquired on that lane.
Ref Waveform	Shows the reference waveforms. • **Save**: Saves all acquired lane histograms as reference for comparison. This action is only performed for the current Acquire type (ADC or Slicer). The reference data is stored on a per-port, per-type basis by IxExplorer, and it will go away if IxExplorer closes. • **Clear**: Clears all reference histograms.

Field	Description
	• **Show**: Controls the view of reference waveforms as a red plot in the ADC Histogram, Slicer Histogram, and SER Projection, as follows: - None (shows no reference) - Current Lane (shows reference for the current lane) - Lane N (shows the reference for a specific lane for the current port)

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CHAPTER 34

Port Properties–T400GP-4P-QDD Load Modules

The **Port Properties** dialog box controls a number of properties related to the port's operation. The **Port Properties** dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the T400GP-4P-QDD load modules.

Port Properties for T400GP-4P-QDD Load Modules

For a port in the **Resources** window, open the context menu, and then select **Properties** to open the **Port Properties** dialog box.

The complete specification for the T400GP-4P-QDD load module is found in the *Ixia Platform Reference Manual*.

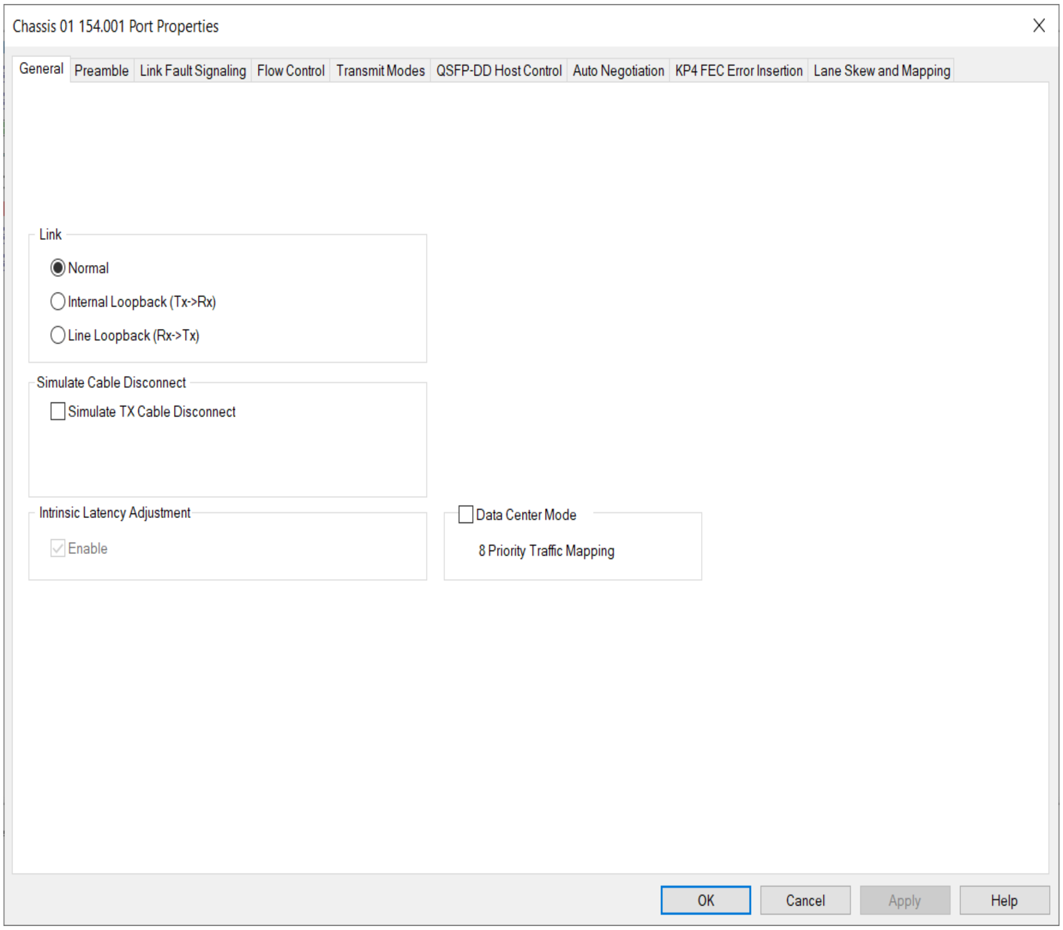
The following port property tabs are available for the T400GP-4P-QDD modules:

- T400GP-4P-QDD Port Properties —General
- T400GP-4P-QDD Port Properties—Preamble
- T400GP-4P-QDD Port Properties—Link Fault Signaling
- T400GP-4P-QDD Port Properties—Flow Control
- T400GP-4P-QDD Port Properties—Transmit Modes
- T400GP-4P-QDD Port Properties—QSFP-DD Host Control
- T400GP-4P-QDD Port Properties—Auto Negotiation
- T400GP-4P-QDD Port Properties—KP4 FEC Error Insertion
- T400GP-4P-QDD Port Properties—Lane Skew and Mapping
- T400GP-4P-QDD Port Properties—RX Diagnostics

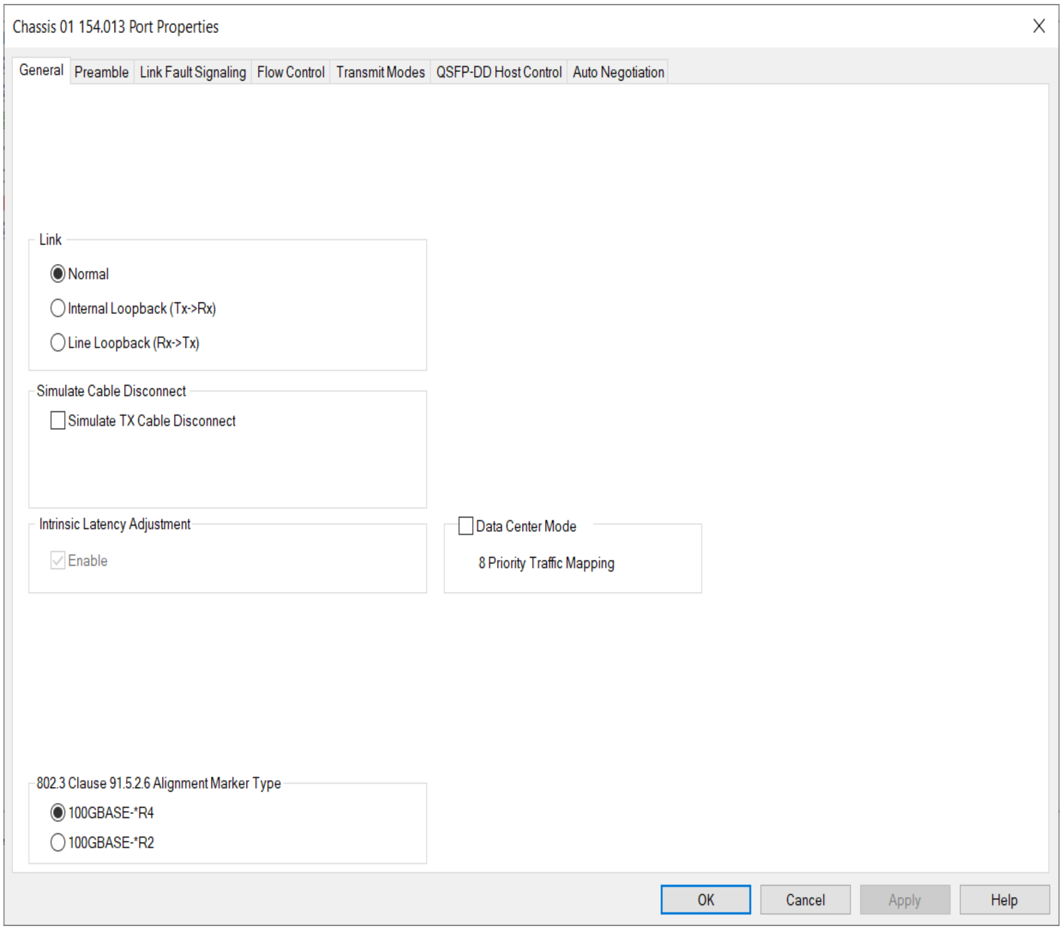
T400GP-4P-QDD Port Properties—General

For a port in the **Explore Network Resources** pane, open the context menu, and then select the **Port Properties** menu to open the **General** tab.

The Port Properties **General** tab for T400GP-4P-QDD is shown in the following image:



The Port Properties **General** tab for T400GP-4P-QDD 100GE mode is shown in the following image:



The controls for **General** tab configuration are described in the following table:

Table: General Configuration

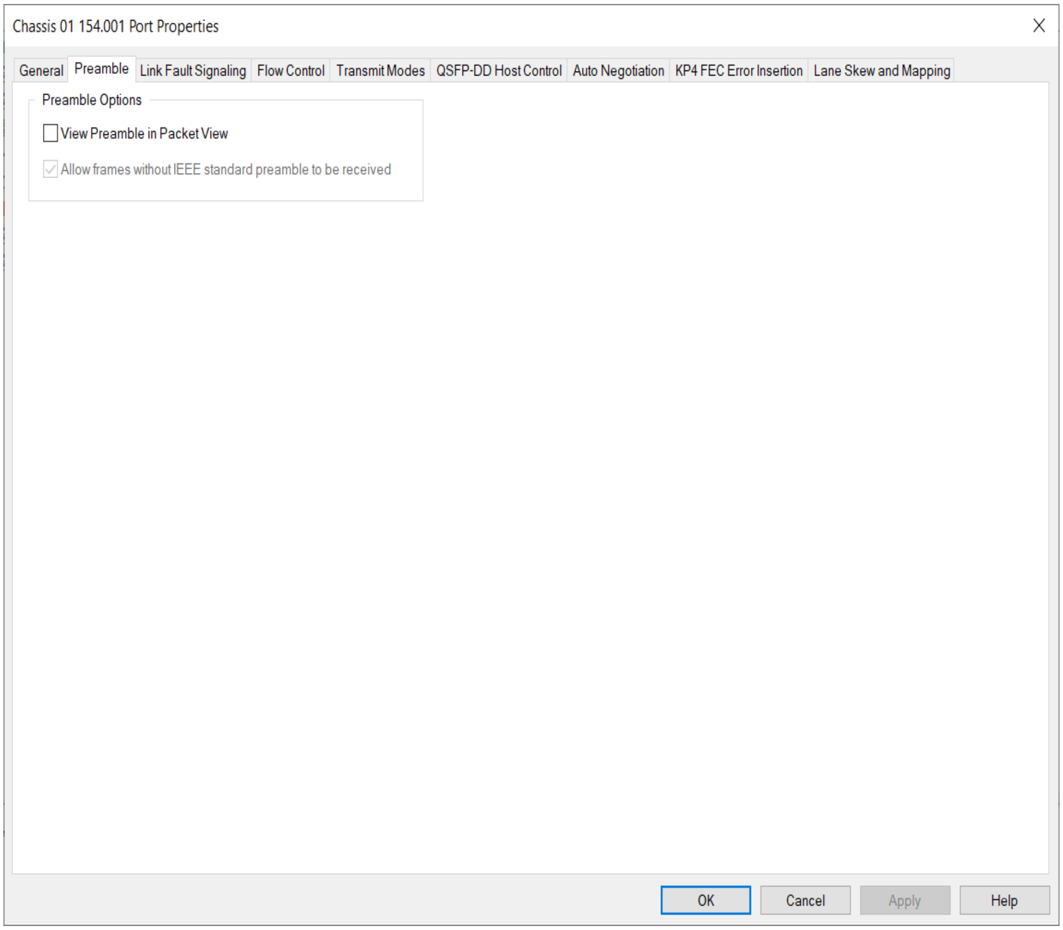
Section	Control/Field	Usage
Link	Normal	Normal operation
	Internal Loopback (Tx -> Rx)	Select this check box to turn on Internal Loopback—Transmit to Receive.
	Enable Line Loopback (Rx -> Tx)	Select this check box to turn on the Line Loopback— Receive to Transmit.
Simulate Cable Disconnect	Simulate TX Cable Disconnect	If this is selected, the port acts as if the cable has been disconnected on the transmit side only. Incoming packets may still be received and port may show link up, but no packets or PCS data will be transmitted.
Intrinsic Latency	Enable	The **Enable** check box is selected by default. This enables the intrinsic latency adjustment.

Section	Control/Field	Usage
Adjustment		The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia Platform Reference Manual*.
Data Center Mode		If selected, enables the Data Center Mode option. When Data Center Mode option is selected, the following changes take place: • The selected port is automatically placed into Advanced Stream mode. In this case, Packet Stream mode is not supported. • Only Auto Instrumentation mode (Floating Timestamp/Data Integrity) is supported, both for transmit and receive. • 8-Priority Traffic Mapping is enabled. It supports various frame size for each PFC control (0-8). • FCoE protocol can be edited for Ethernet II and Ethernet Snap in **Frame Data** tab.
802.3 Clause 91.5.2.6 Alignment Marker Type		This option is available for the 100GE speed mode. It controls the alignment marker mapping on transmit, and requires the same mapping to be used on receive.
	100GBASE *R4	The 100GBASE-*R4 format complies with some 100GE two-lane PMD PAM4 devices that set four_lane_pmd=1.
	100GBASE *R2	The 100GBASE-*R2 format complies with IEEE 802.3cd clause 91.6.2a setting of four_lane_pmd=0, and sets the alignment markers in two-lane PMD style per clause 91.5.2.6.

T400GP-4P-QDD Port Properties—Preamble

The preamble precedes the frame, but is not part of the frame itself.

The T400GP-4P-QDD Port Properties **Preamble** tab for 200 G, 100 G, and 50 G speed modes is shown in the following image:



The fields and controls in this tab are described in the following table:

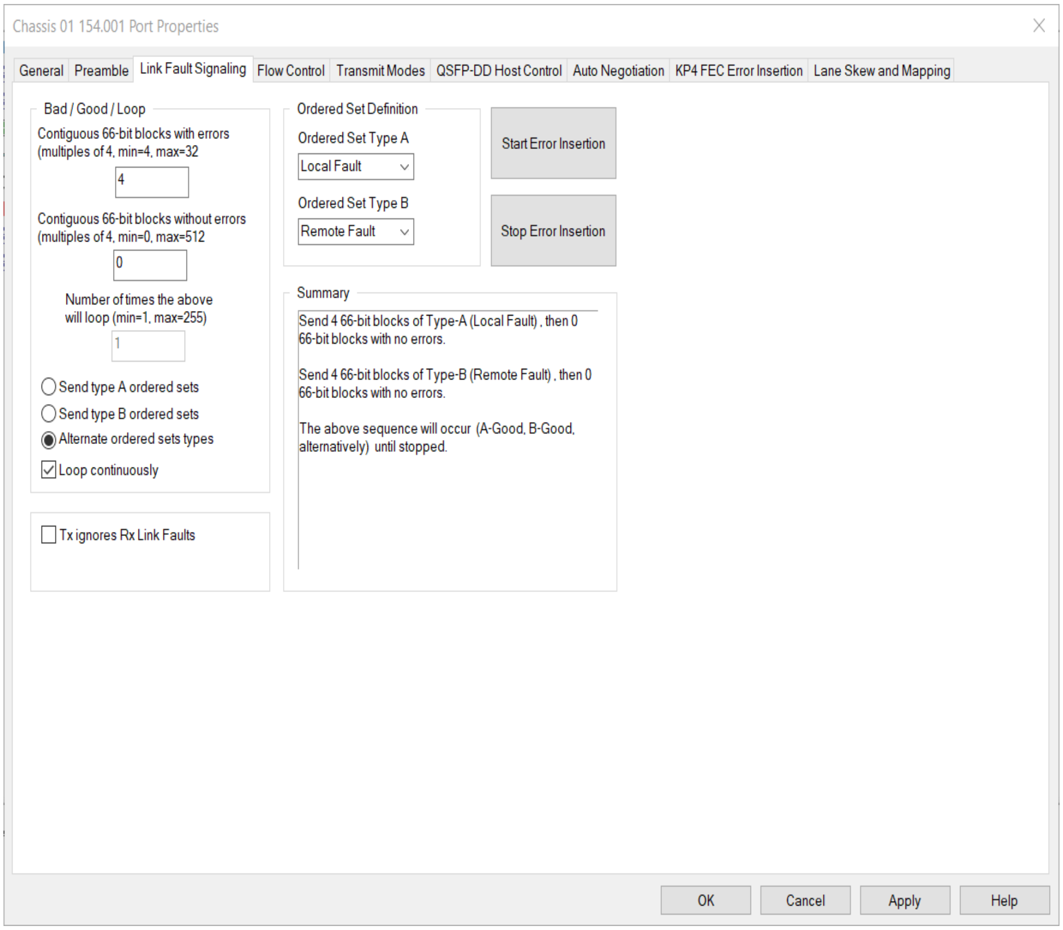
Section	Choices	Description
Preamble Options	View Preamble in Packet View	When this check box is selected, the preamble data is visible in the Packet View (transmit side) and the Capture View (receive side).
	Allow frames without IEEE standard preamble to be received	When this check box is selected, it allows frames without IEEE standard preamble to be received. • This check box is selected by default.

T400GP-4P-QDD Port Properties—Link Fault Signaling

When **Link Fault Signaling** is enabled, four statistics will be added to the list in **Statistic View** for the port. One monitors the Link Fault State, the other two provide a count of the Local Faults and Remote Faults. The last one indicates the state of error insertion, whether or not it is ongoing.

For a port in **Resources** pane, open the context menu, and then select **Properties** to open the **Port Properties** dialog box. Next, select the **Link Fault Signaling** tab. You can also double-click a port in the **Detail** pane to open **Link Fault Signaling**.

The **Link Fault Signaling** tab for T400GP-4P-QDD load module is shown in the following image:



The controls for **Link Fault Signaling** tab configuration are described in the following table:

Section	Field/Control	Description
Bad/Good/Loop	(Bad) Contiguous 66-bit blocks with errors (multiples of 4; min = 4, max = 32)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks with errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive fault sequences allowed are minimum 4 sequences and maximum 32 sequences.
	(Good) Contiguous 66-bit blocks without errors (multiples of 4; min = 0, max = 512)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks without errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive regular data sequences allowed are minimum 0 sequences and maximum 512 sequences.
	Number of times the above will loop (min = 1, max = 255)	Specifies the number of loops for the user defined sequence. Options include the following: • Discrete iterations:

Section	Field/Control	Description
		1. Minimum of 1 iteration 2. Maximum of 255 iterations • Continuous loop 1. User cannot specify number of iterations
	Options include the following: • Send type A ordered sets • Send type B ordered sets • Alternate ordered set types	Defines the ordered set pattern that will be sent. (The two Ordered Sets—A and B—are defined in the **Ordered Set Definition** box in this tab.) This pattern is combined with the Good blocks/Bad blocks pattern for transmission. • Only Type A fault sequence and regular good data sequences • Only Type B fault sequence and regular good data sequences • Alternate Type A, regular good data sequences and Type B fault sequence, regular good data sequences NOTE If this field is available, and the Alternate ordered set types option is selected, the minimum value for this field should be '2,' to allow the entire pattern to be sent once. If left at the minimum value of '1'— only two groups of blocks (one of good blocks and one of bad blocks) is sent, which means that only the first ordered set is sent. A minimum of eight blocks is required for one complete pattern, including Types A and B.
	Loop continuously	If selected, the loop defined by the combination of the Bad and Good blocks, and the pattern of ordered sets, is transmitted continuously until the **Stop Error Insertion** option is selected.
Ordered Set Definition	Ordered Set Type A	Options include the following: • Local Fault • Remote Fault
	Ordered Set Type B	Options include the following: • Local Fault • Remote Fault
Tx ignores Rx Link Faults		If selected, ongoing transmission continues even if Link Fault messages are received by the sending RS.
Summary		(Read-only) Shows descriptions of the patterns that are

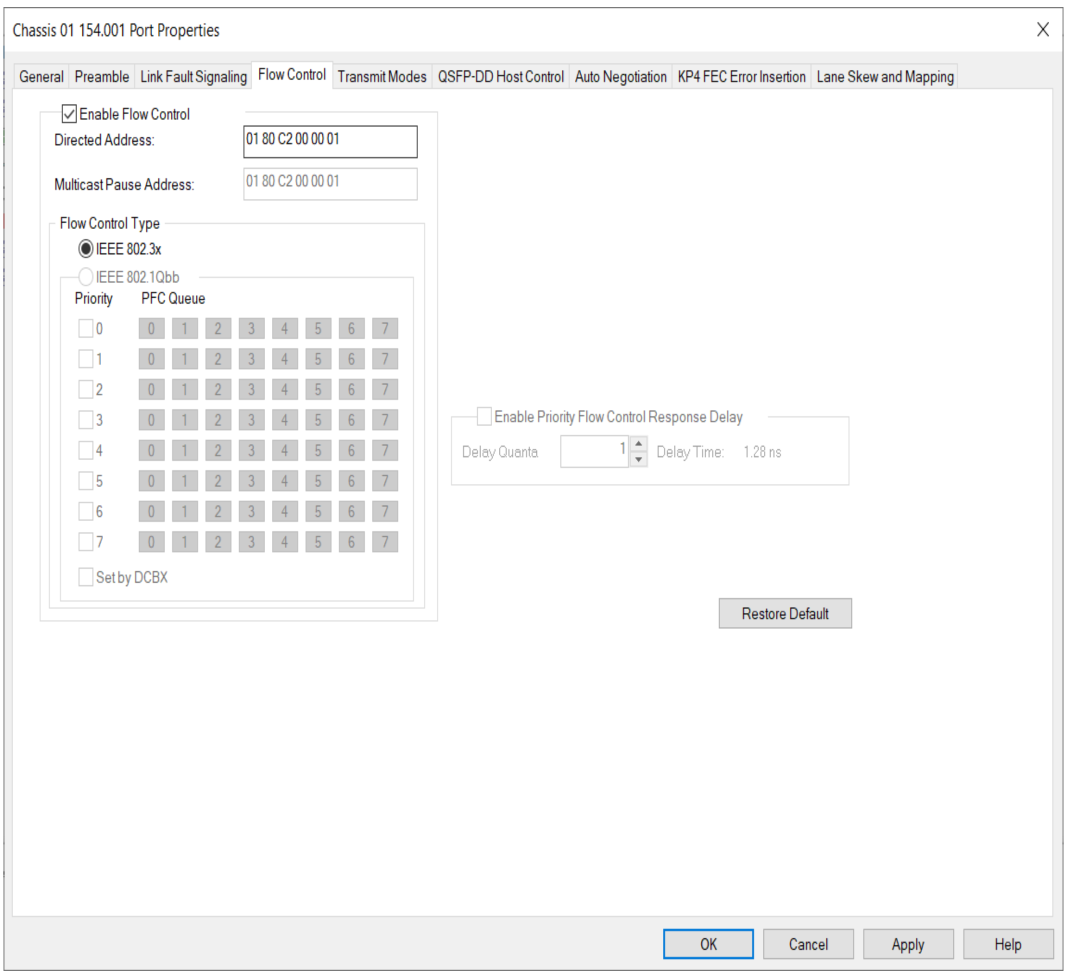
Section	Field/Control	Description
(Window)		transmitted.
Start Error Insertion		Select this option to start the transmission of the configured error patterns.
Stop Error Insertion		(Available only for use with the **Loop continuously** option.) Select this option to stop the transmission of the configured error patterns.

T400GP-4P-QDD Port Properties—Flow Control

For a port in the **Explore Network Resources** pane, open the context menu, and then select **Properties** to open the **Port Properties** dialog box. Next, select the **Flow Control** tab.

NOTE You can view the help page for the **Port Properties - Flow Control** tab by selecting the **Help** option and not F1.

The Port Properties **Flow Control** tab for T400GP-4P-QDD is shown in the following image:

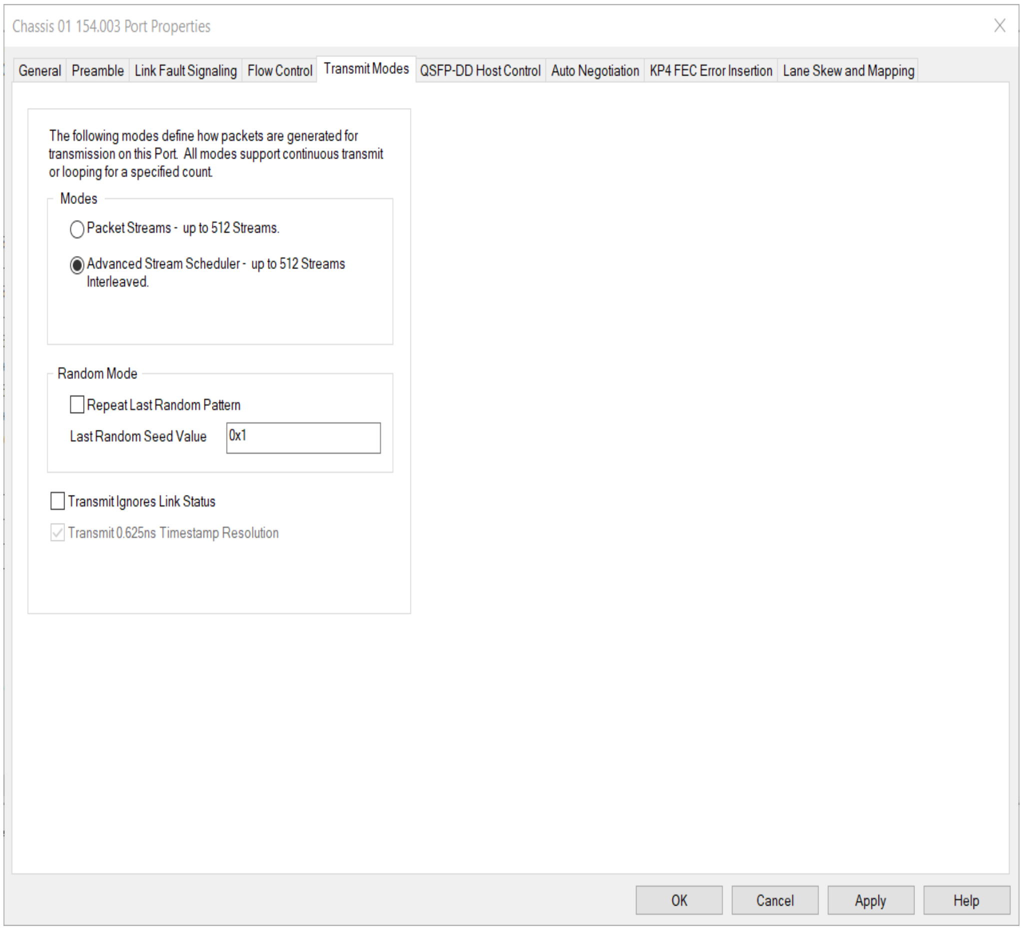


Section	Field/Control	Description
Enable Flow Control	(check box)	Enables the port's MAC flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port listens to for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port listens to for a multicast pause message.
Flow Control Type		
	IEEE 802 3x	When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame.
	IEEE 802.1Qbb	When not in Data Center mode, only IEEE 802.3x is available.
	Priority	When flow control type IEEE 802.1Qbb is selected in Data Center mode, priority options are the channels of data that can be paused. Select one or more channels.
	PFC Queue	The PFC Queue can be mapped to the priority field in the frame.
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to the required offset, and then releases the pause request to the TX engine. For example, if running at 100 % line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames after the pause request is received. With this feature, a delay by number of timestamp ticks is programmed.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

T400GP-4P-QDD Port Properties—Transmit Modes

For a port in the **Resources** window, open the context menu, and then select **Properties** to open the **Port Properties** dialog box. Next, select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following image:



The controls for **Transmit Modes** tab configuration are described in the following table:

Section	Field/Control	Description
Modes	Packet Streams - up to 512 Streams	Following packet streams are supported: • 400 G – 512 • 200 G – 512 • 100 G – 512 • 50 G - 256
	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure up to 512 streams for 400 GE, 200 GE, and 100 GE and up to 256 streams for 50 GE speeds. They transmit packets in an interleaved fashion. For additional information on Advanced Streams, see Stream Control for Advanced Streams.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in

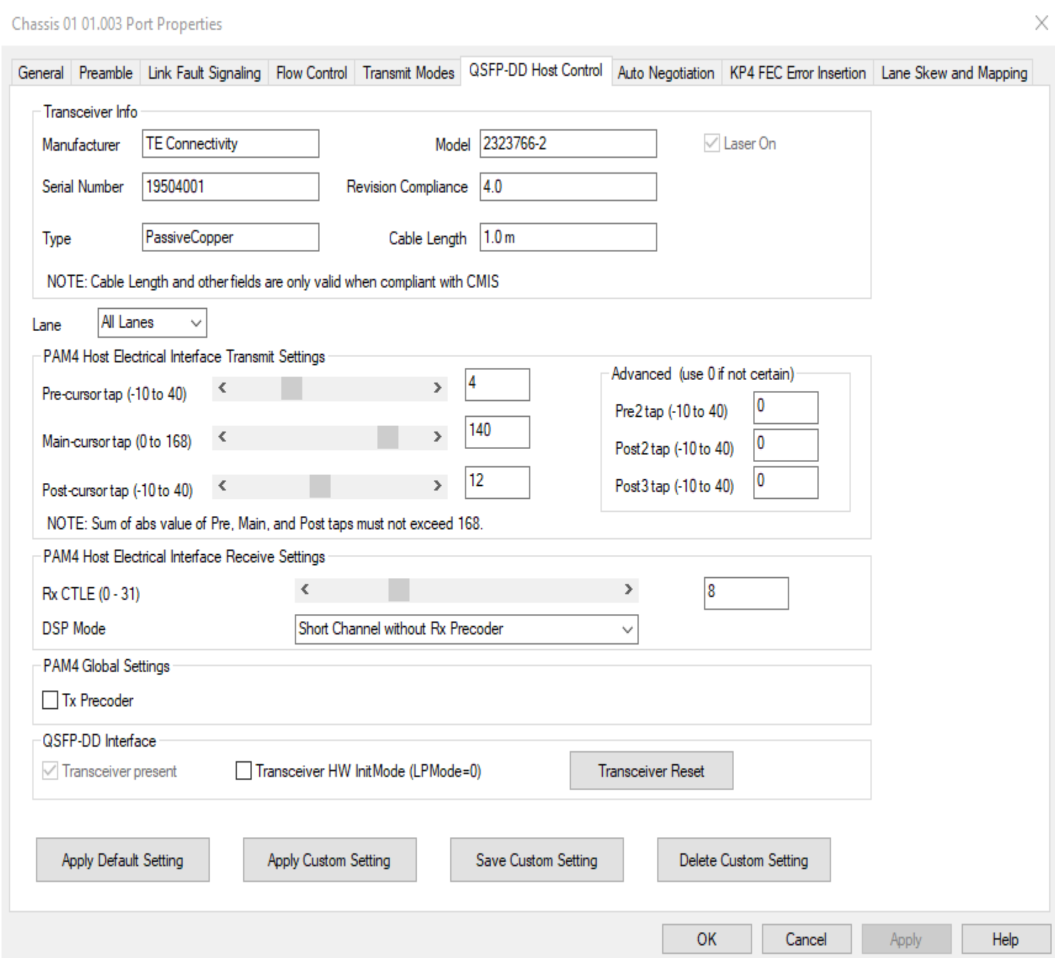
Section	Field/Control	Description
		the stream, including payload, frame size, and UDFs. This can be used before transmission (in which case the seed from the first packet stream is used), or immediately after a stream has been sent (in which case the last stream's random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read-only field represents the initial value that the hardware uses to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit Ignores Link Status		If selected, allows transmission of packets even if the link is down.
Transmit High TimeStamp Resolution		• 400G: 0.625 ns • 200G:1.25 ns • 100G: 2.5 ns • 50G: 2.5 ns

T400GP-4P-QDD Port Properties—QSFP-DD Host Control

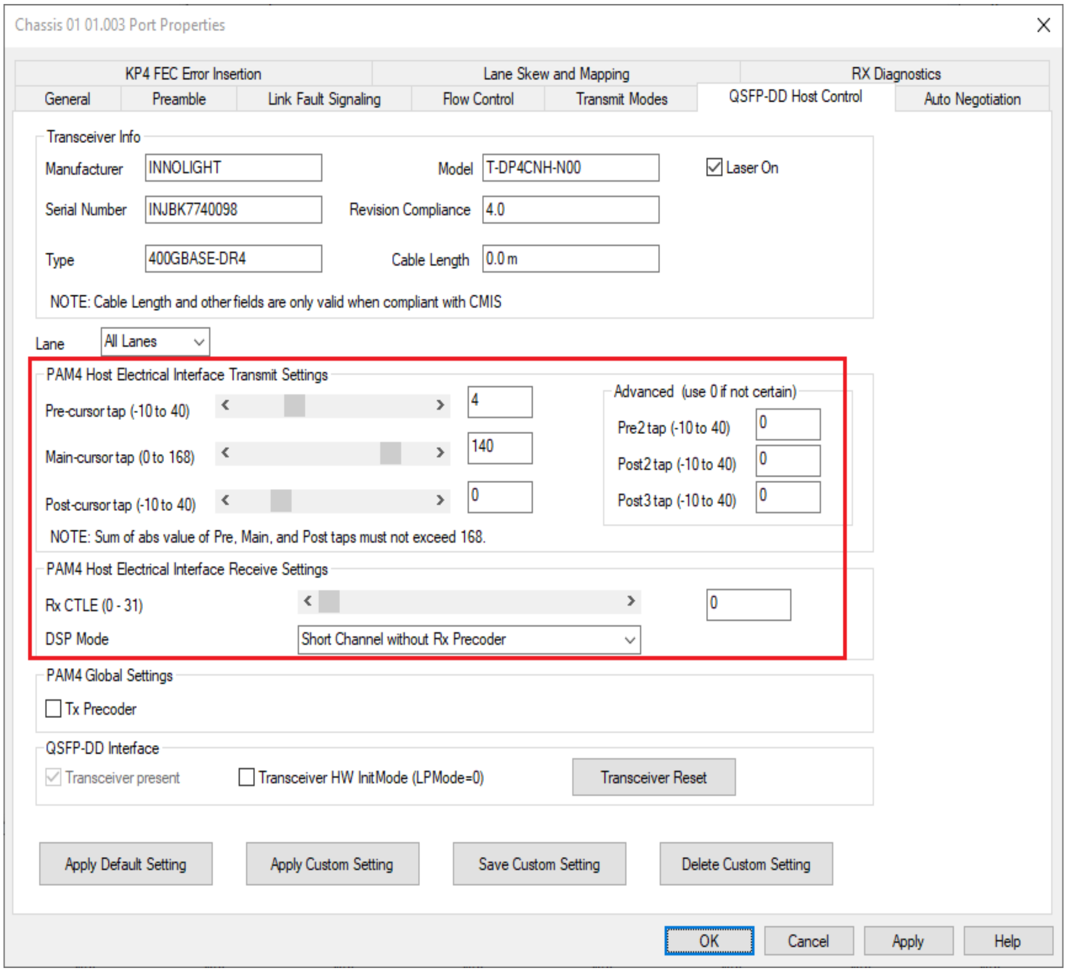
PAM-4 is a four-level pulse-amplitude modulation that uses four distinct amplitude levels to encode two bits of data, essentially doubling the bandwidth of a connection. The PAM4 settings are defined by using the **QSFP-DD Host Control** tab.

For a port in the **Explore Network Resources** pane, open the context menu, and then select **Properties** to open the **Port Properties** dialog box. Next, select the **QSFP-DD Host Control** tab.

The Port Properties **QSFP-DD Host Control** tab for T400GP-4P-QDD when the default passive copper transceiver is used is shown in the following image:



When T400GP-4P-QDD detects an optical transceiver, it will apply a transmit and receive equalization combination that is well suited for optics, as highlighted in the following image.



Section	Field/Control	Description
Transceiver Info		
	Manufacturer	This is the Vendor Name field read from the actual transceiver currently being plugged in.
	Model	This is the Part Number field read from the actual transceiver currently being plugged in.
	Serial Number	The serial number of the transceiver.
	Revision Compliance	The implemented CMIS revision of the transceiver. T400GP-4P-QDD supports both CMIS 3.0 and CMIS 4.0 transceivers. See Management Interface.
	Type	When a transceiver is inserted into the load module, the software reads IEEE registers to determine the transceiver capabilities and media type. If the transceiver contains this information, it is shown in this read-only field.

Section	Field/Control	Description
	Cable Length	The length of Ixia-supplied cable, which connects this chassis to the previous chassis in the chain.
	Laser On	Select this check box to enable the laser power.
PAM4 Host Electrical Interface Transmit Settings		
	Pre-cursor tap (-10 to 40)	This helps to control the Pre Tap value for Tx.
	Main-cursor tap (0 to 168)	This helps to control the Main Tap Control for Tx.
	Post-cursor tap (-10 to 40)	This helps to control the Post Tap value for Tx.
Advanced (use 0 if not certain)		
	Pre2 tap (-10 to 40)	The Pre2 Tap value for Tx, which is generally negative. The negative precursor tap values are used to optimize the signal at the receiver.
	Post2 tap (-10 to 40)	The Post2 Tap value for Tx, which is generally negative.
	Post3 tap (-10 to 40)	The Post3 Tap value for Tx, which is generally negative.
PAM4 Host Electrical Interface Receive Settings		
	Rx CTLE (0-31)	Represents the receive sides' continuous time linear equalizer.The control is the coefficient for how strong or weak the equalization should be.
	DSP Mode	Represents the Inphi Retimer's proprietary digital signal processing modes. The controls are different channel descriptions corresponding to different operation modes. Options include the following: • Short non strenuous links • Non-strenuous optical links • Non-strenuous links w/ strong reflections • Non-strenuous optical links w/ strong reflections • Strenuous links • Strenuous optical links w/ strong reflections
PAM4 Global Settings		

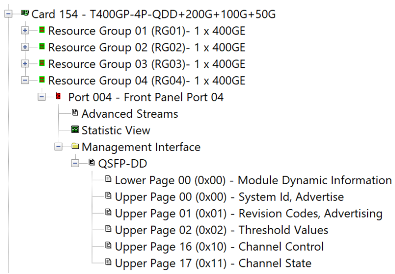
Section	Field/Control	Description
	Tx Precoder	Represents a PAM4 encoding scheme to reduce DFE bit errors.This also means that both sides of the link must have precoder enabled for link to come up.
QSFP-DD Interface		
	Transceiver HW InitMode	Selecting the check box configures the QSFP-DD InitMode pin to perform the optional Hardware Init mode initialization as described in the Common Management Interface Specification (CMIS) Rev 3.0. When a transceiver boots into Hardware Init mode, the data path is automatically configured by the module without intervention from the host (that is, Ixia tester). When disabled, the software-controlled initialization (Software Init) is performed instead . We recommended this initialization mode for any transceiver because the appropriate checks are performed between the Ixia tester and the transceiver before the module's data path initialization.
	Transceiver Reset	Resets the transceiver.
	Apply Default Setting	A default setting is applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Setting	If there exists a custom setting in the xml file for the same adapter/xcvr type, this custom setting is applied to the current user setting and to the actual hardware.
	Save Custom Setting	If there exists a custom setting in the xml file for the same adapter/xcvr type, users are prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting is saved to the xml file. The 'TapConfigurations.xml' file is created at the Ixia\IxOS folder after users select **Save Custom Setting**. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	If there exists a custom setting in the xml file for the same adapter/xcvr type, users are prompted to confirm that they are about to delete it. If no custom setting exists, users are prompted that nothing is deleted.

Management Interface

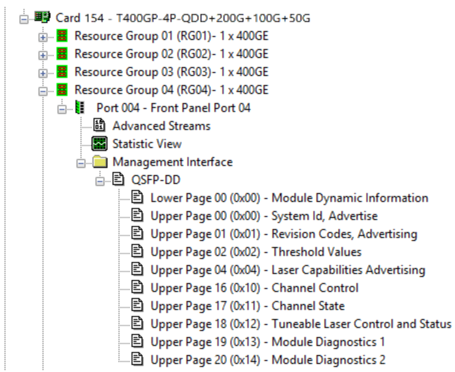
A management interface specification CMIS defines the management interface and associated protocols for all required and allowable management interactions between a CMIS aware host and a CMIS compliant module that are relevant for the host using the module in an application.

The Management Interface appears in the IxExplorer Resources Tree and switches on the fly depending on the CMIS revision. This means that the transceiver automatically reads the management interface and populates the lower and upper pages depending on the transceiver type.

With a CMIS 3.0 (or lower) transceiver, you will see the following pages:



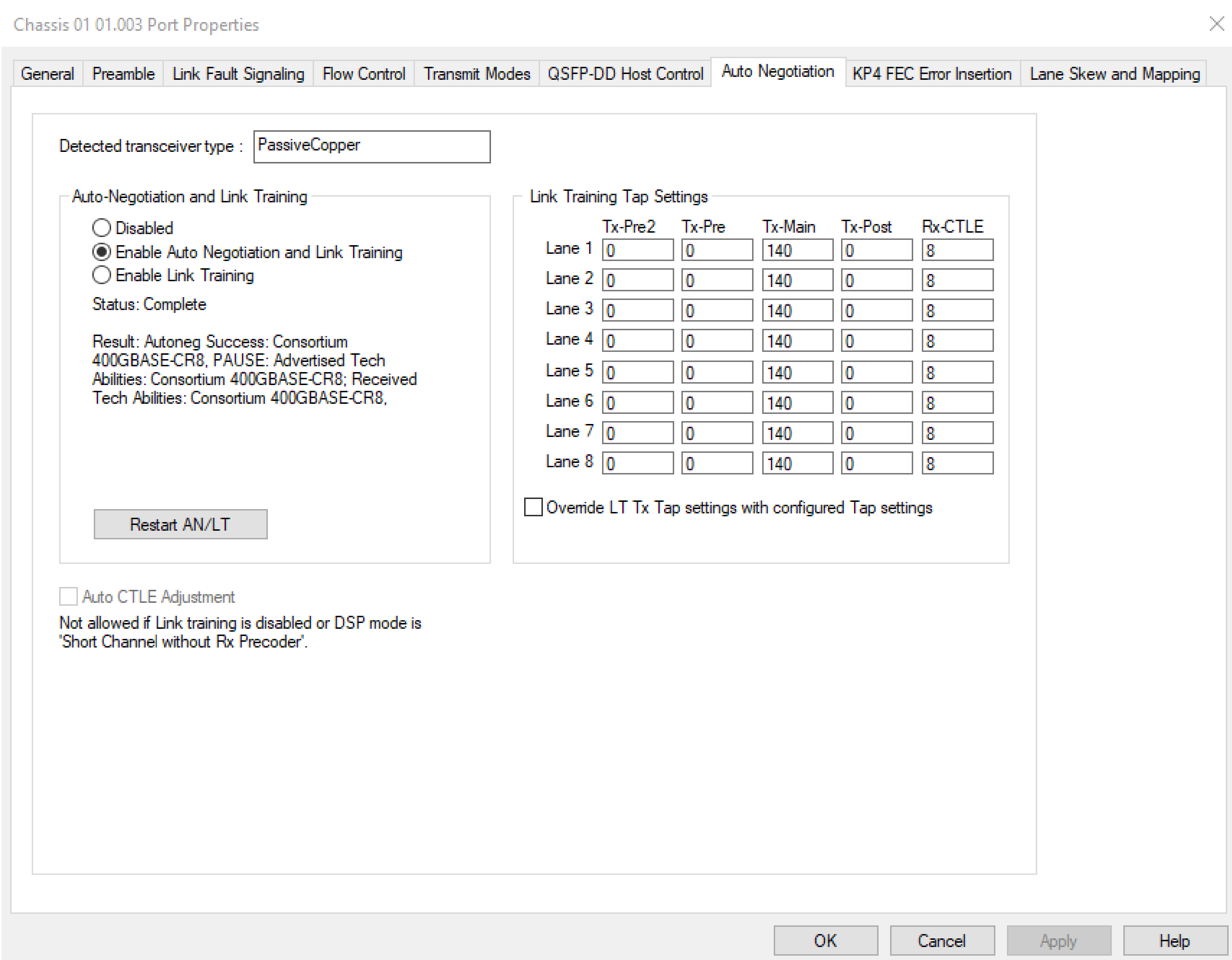
With a CMIS 4.0 transceiver, you will see the following pages:



T400GP-4P-QDD Port Properties—Auto Negotiation

For a port in the **Explore Network Resources** pane, open the context menu, and then select **Properties** to open the **Port Properties** dialog box. Next, select the **Auto Negotiation** tab.

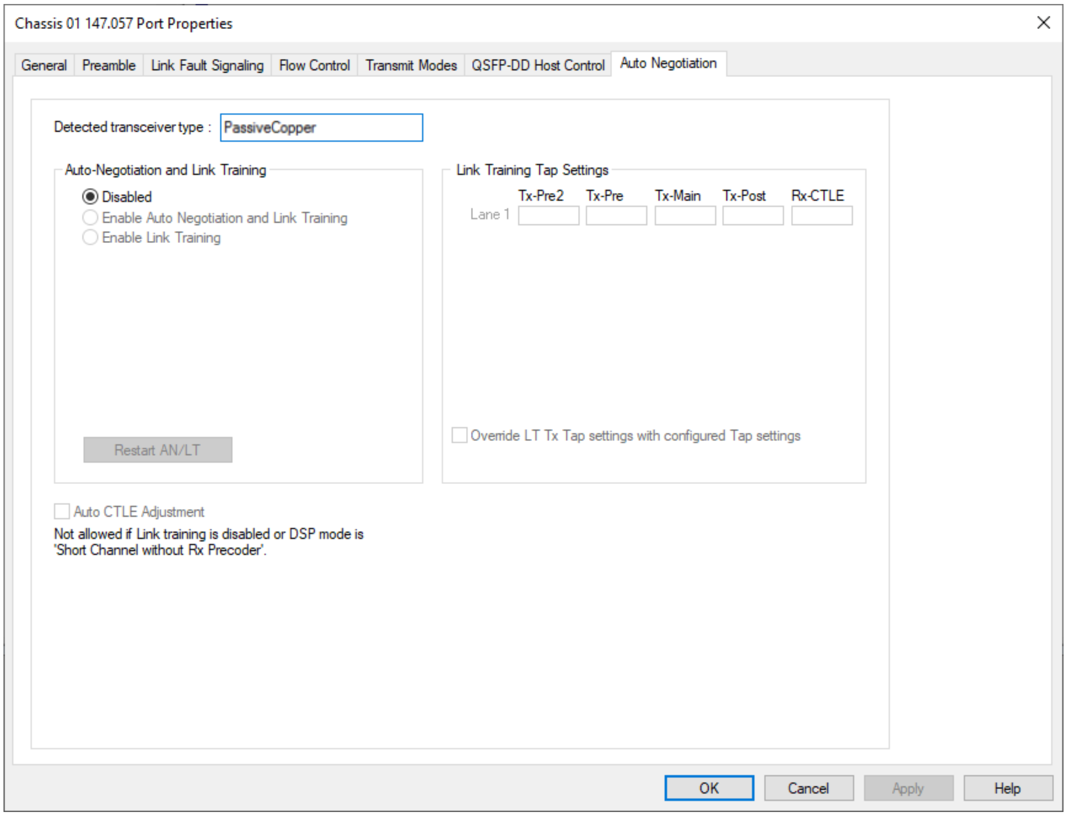
The Port Properties **Auto Negotiation** tab for T400GP-4P-QDD is shown in the following image:



The following lanes are available depending on the port speed:

Speed Mode	Lanes
400 GE	8 lanes (1-8)
200 GE	4 lanes (1-4)
100 GE	2 lanes (1-2)
50 GE	1 lane (1)

For 50 GE speed mode, if the **All Ports, No AN** is enabled, the Auto-Negotiation and Link Training options are not available for selection.These options are available if the **Odd Ports Only** option is selected. See Operation Mode.



The fields and controls in this tab are described in the following table:

Field/Control	Description
Detected transceiver type	The type of transceiver that is plugged in.
Disabled	When you select the check box, the L1 parameters like Autonegotiation, Link Training, and FEC are enabled or disabled as per the IEEE requirements, and you cannot enable or disable these manually. If the check box is cleared, you can manually enable or disable L1 features, even if it violates the IEEE specifications. By default, the check box is selected.
Enable Auto Negotiate and Link Training	Auto negotiation controls how a port communicates with other ports.If you select the check box, it allows auto-negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing • **Restart Auto-Negotiate** is selected (this does a forced restart) NOTE The **Enable Auto Negotiate** check box is available for selection only if the **Disabled** check box is cleared.

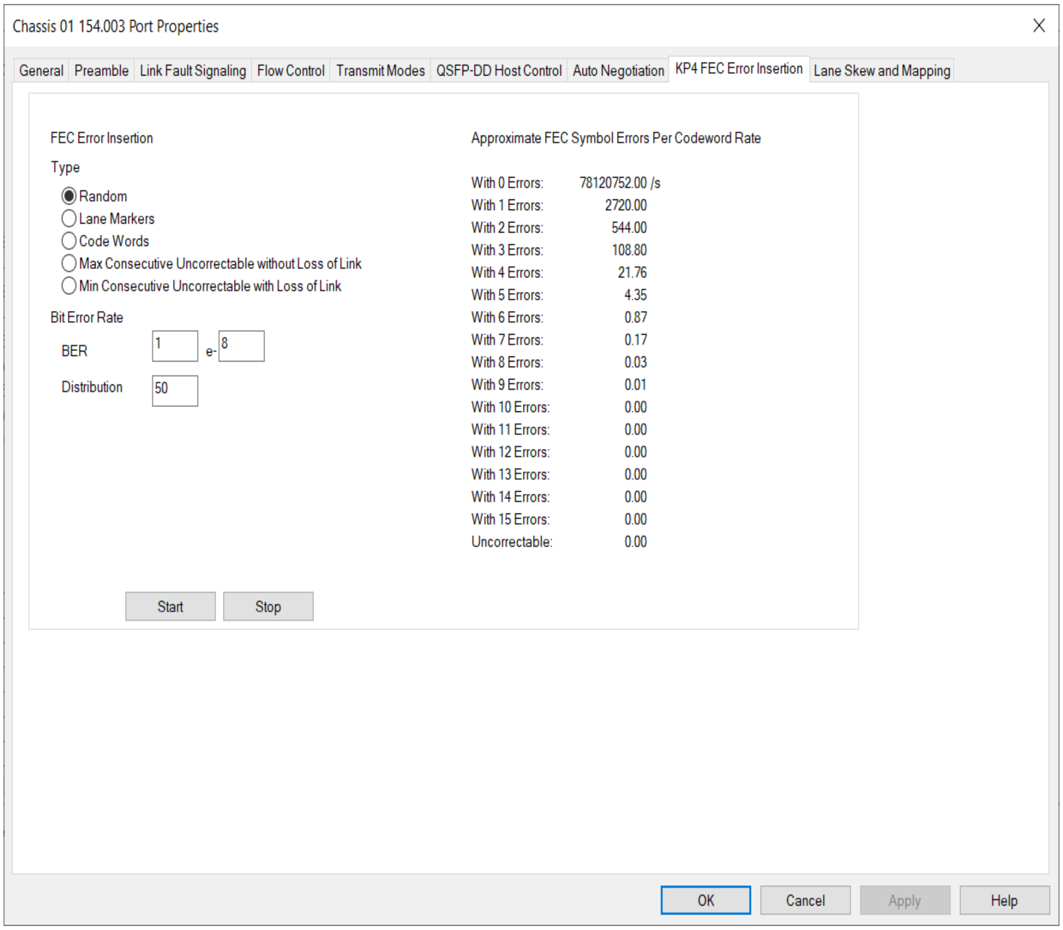
Field/Control	Description
Enable Link Training	Select the check box to allow longer length copper cables to be used. This means that during the next Auto-Negotiation, KR training is used. NOTE This check box is available for selection only if the **Disabled** check box is cleared.
Negotiated the capability above	The text box indicates the speed that was negotiated because of Auto-Negotiation.
Restart AN/LT	Restarts the Auto Negotiate sequence.
Auto CTLE Adjustment	When you select the check box, the load module offers CTLE or control over the receiver's Continuous Time Linear Equalizer stage, which is a linear filter that can attenuate the low-frequency components, boost the signal components at the Nyquist frequency, and attenuate higher frequencies past that peak.
Link Training Tap Settings	
Pre2-Cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Pre-cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Main-cursor Lane 1-8	The per-lane transmit main-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Post-cursor Lane 1-8	The per-lane transmit post-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Rx-CTLE Lane 1-8	The CTLE settings applied by the receiver.
Override LT Tap settings with configured Tap settings	Selecting this check box overrides the taps settings derived by the link training process, and configures the transmit pre/main/port cursor settings and receiver CTLE setting with the static values specified in the **QSFP-DD Host Control** tab.

T400GP-4P-QDD Port Properties—KP4 FEC Error Insertion

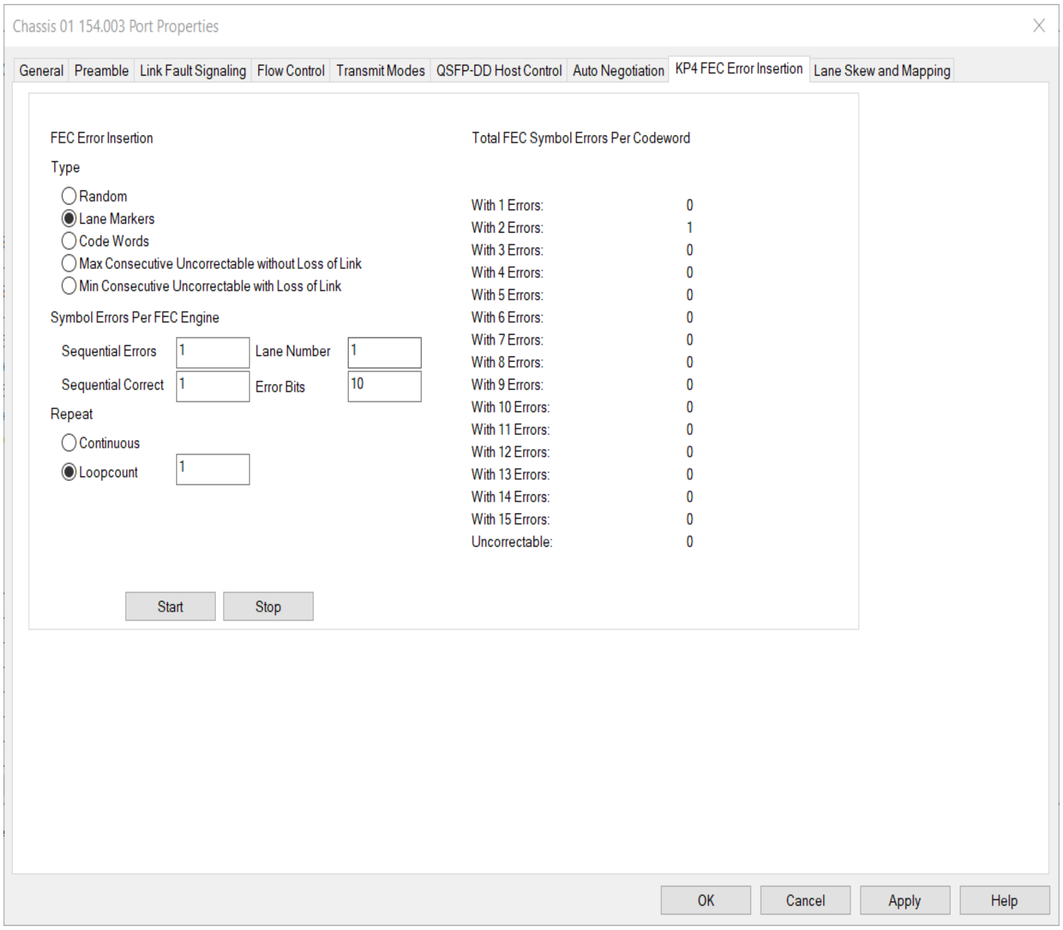
Forward Error Correction (FEC) is a method of communicating data that corrects errors in transmission on the receiving end. Before transmission, the data is put through a predetermined algorithm that adds extra bits specifically for error correction to any character or code block. If the transmission is received in error, the correction bits are used to check and repair the data.

NOTE **KP4 FEC Error Insertion** tab is not available for T400GP-4P-QDD 100G and 50G models.

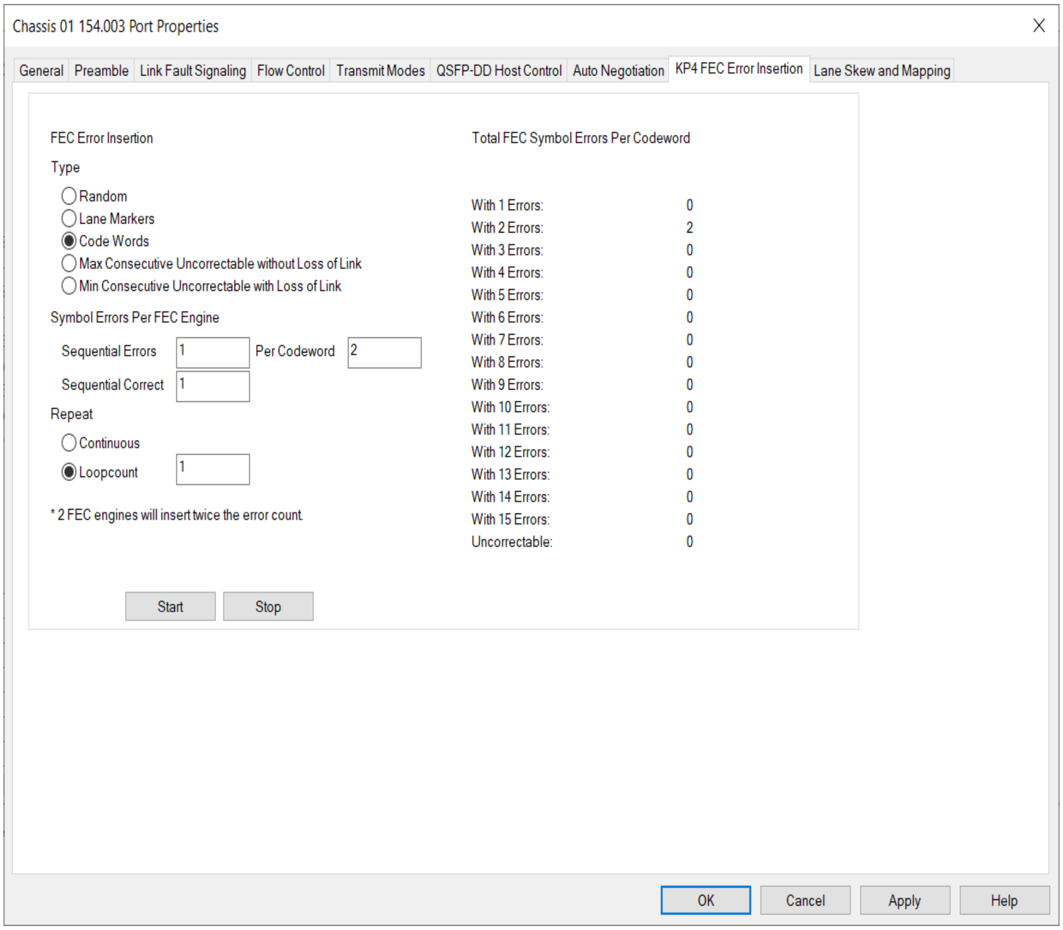
The **FEC Error Insertion** tab allows to inject FEC errors into transmitted data and is shown in the following image:



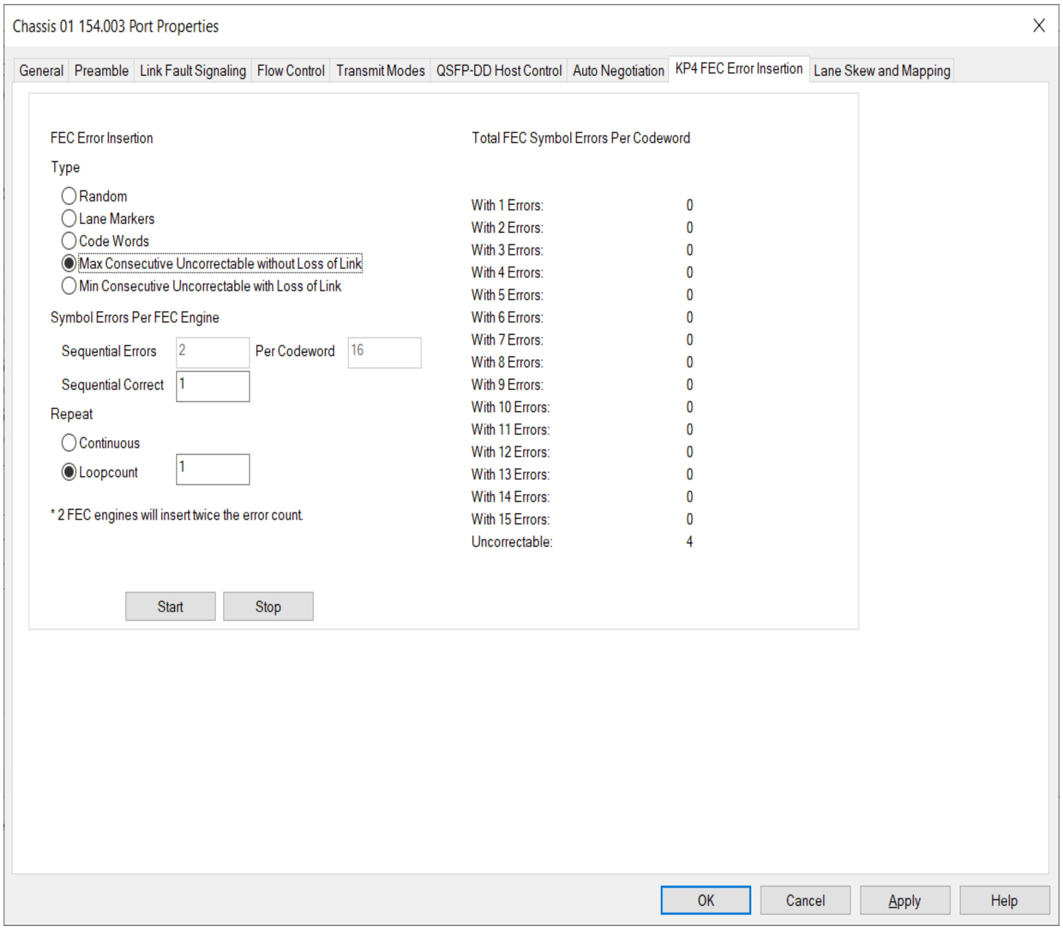
The following image shows **KP4 FEC Error Insertion** Tab with Error Type selected as Lane Markers:



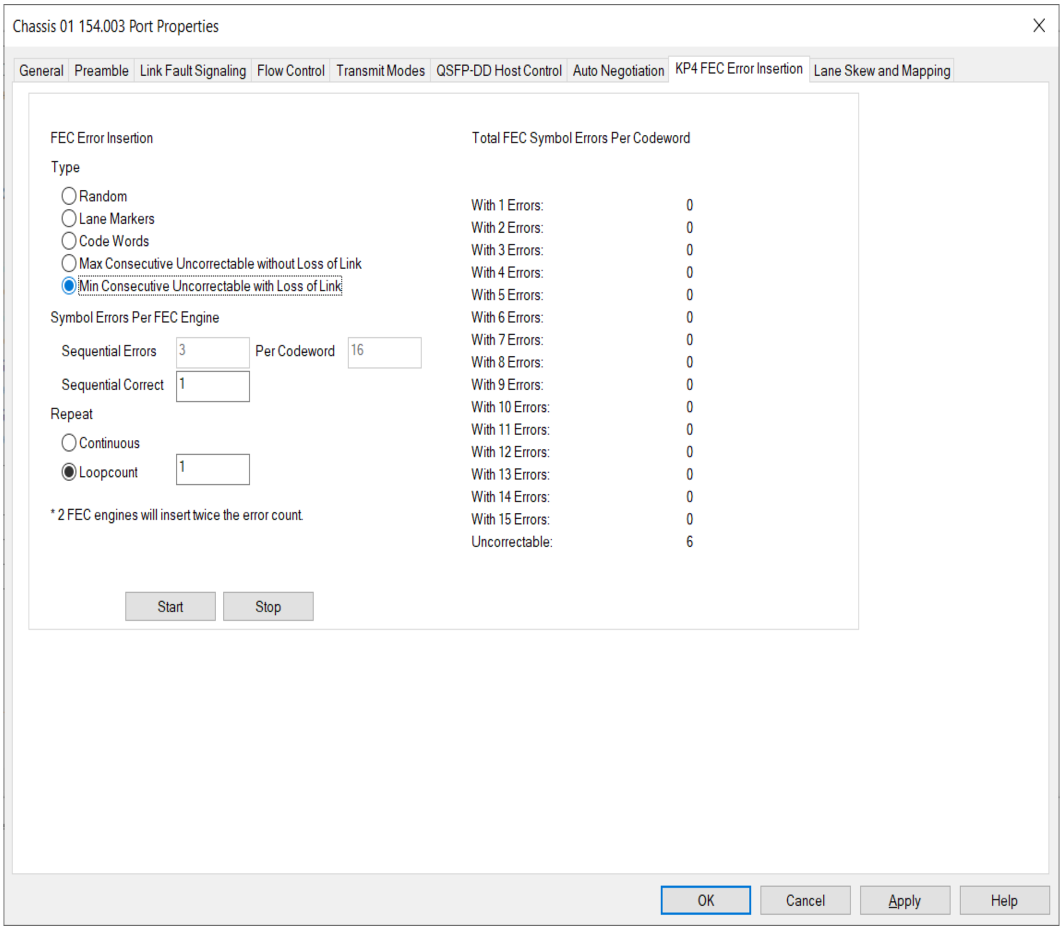
The following image shows **KP4 FEC Error Insertion** Tab with Error Type selected as Code Words:



The following image shows **KP4 FEC Error Insertion** Tab with Error Type selected as Max Consecutive Uncorrectable without Loss of Link:



The following image shows **KP4 FEC Error Insertion** Tab with Error Type selected as Min Consecutive Uncorrectable with Loss of Link:



Section	Field	Usage
FEC Error Insertion		
Type	Random	Random FEC symbol error insertion introduces a deterministic number of errors, evenly spread across all PCS lanes, on top of the intrinsic Bit Error Rate (BER) of the interconnect.
	Lane Markers	Inserts errors only in the Lane Marker fields.
	Code Words	This is the fundamental unit of data that the FEC engine operates on sequentially. It is composed of blocks that carry the payload and parity information for the 64/66B scrambled data that arrives from the PCS Scrambler on Egress and from the PMA on Ingress.The code word size and layout can vary from each coding scheme. For example, RS, KR, and KP4 have different code words because their coding schemes are different.
	Max Consecutive Uncorrectable without Loss of	Uncorrectable errors are those with more than 15 symbol errors. As per IEEE, the maximum number of consecutive uncorrectable errors without loss of link is 2.

Section	Field	Usage
	Link	
	Min Consecutive Uncorrectable with Loss of Link	The Max Consecutive Uncorrectable WITHOUT Loss of Link + 1. This is the threshold where the receiver should declare Local Fault because of bad data. The minimum number of consecutive uncorrectable errors with loss of link is 3.
Bit Error Rate	BER	The Bit Error Ratio (BER) is the ratio of the number of error bits compared to the total number of bits transmitted. In the BER field, enter the coefficient of the BER.You can achieve the required BER by changing the coefficient and exponent of the BER fields. You can distribute erroneous FEC symbols across codewords by varying the Distribution parameter.
	e-	Enter the exponent of the BER. You can achieve the required BER by changing the coefficient and exponent of the BER fields.You can distribute erroneous FEC symbols across codewords by varying the Distribution parameter.
	Distribution	Controls how the errors are distributed. This modifies the probability distribution of errors while maintaining the average Bit Error Rate. For example, you can have a BER of 10E-8 but have all of the errors be single errors OR you can have the errors distributed across a variety of errors. The purpose is to thoroughly test a receiver to see if all possible errors are being corrected at varying rates.
Symbol Errors Per FEC Engine		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Sequential Errors	In burst mode, the Sequential Errors specify how many sequential FEC codewords have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential FEC codewords have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence is repeated until stopped.

Section	Field	Usage
		NOTE Per 802.3bs and 802.3cd, reception of 3 or more consecutive uncorrectable codewords result in Loss of Link. In burst mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) have symbol errors, followed by a number of Lane Markers without errors as per the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) have symbol errors, followed by a number of Lane Markers without errors as per the Sequential Correct field. This sequence is repeated until stopped. NOTE Per 802.3bs and 802.3cd, reception of 5 or more Alignment Marker errors result in Loss of Link. • In 400G mode, the total number of FEC symbol errors sent is doubled because of the presence of two FEC engines. • The symbol errors are not evenly distributed across the PCS lanes (use Random error insertion mode for that case) • The maximum number of sequential uncorrectable errors without loss of link is 2 and the minimum number of sequential uncorrectable errors with loss of link is 3.
	Lane Number	The Lane Number specifies the PCS lane that is affected by the Lane Marker error insertion.This field is available only if you select the error insertion type as Lane Markers.
	Sequential Correct	The number of consecutive code words without errors.
	Error Bits	The Error Bits specifies how many errors are inserted on each of the two symbol errors of the codeword that carries the Lane Marker. There is a minimum Error Bits required (2) before corrupting the symbol that maps to the Lane Marker field. This field is available only if you select the error insertion type as Lane Markers.
	Per Codeword	Codeword is a block of contiguous packets on the line. All RS-FEC codewords are of the same size.The Per Codeword value denotes the number of symbol errors per codeword to insert. KP4 FEC can correct up to 15 symbols, and detect up to 30 symbols. If the user specifies 16, an Uncorrectable Codeword will be issued. This field is available only if you select the error insertion type as Code Words.
Repeat		This is available only if you select the error insertion type as one of

Section	Field	Usage
		the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Continuous	Continuous error insertion.In continuous mode, the Sequential Errors field specifies how many sequential FEC codewords have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence is repeated until stopped.
	Loopcount	The sequence of correct and incorrect codewords or symbol errors inserted are repeated by the number specified in the Loopcount field.
Start		Starts the error insertion process.
Stop		Stops the error insertion process.
Appropriate FEC Symbol Errors Per Codeword Rate		The Appropriate FEC Symbol Errors Per Codeword Rate is an approximation for how many symbol errors there are per codeword every second. NOTE In 400 G mode, the total number of FEC symbol errors sent is doubled because the presence of two FEC engines.

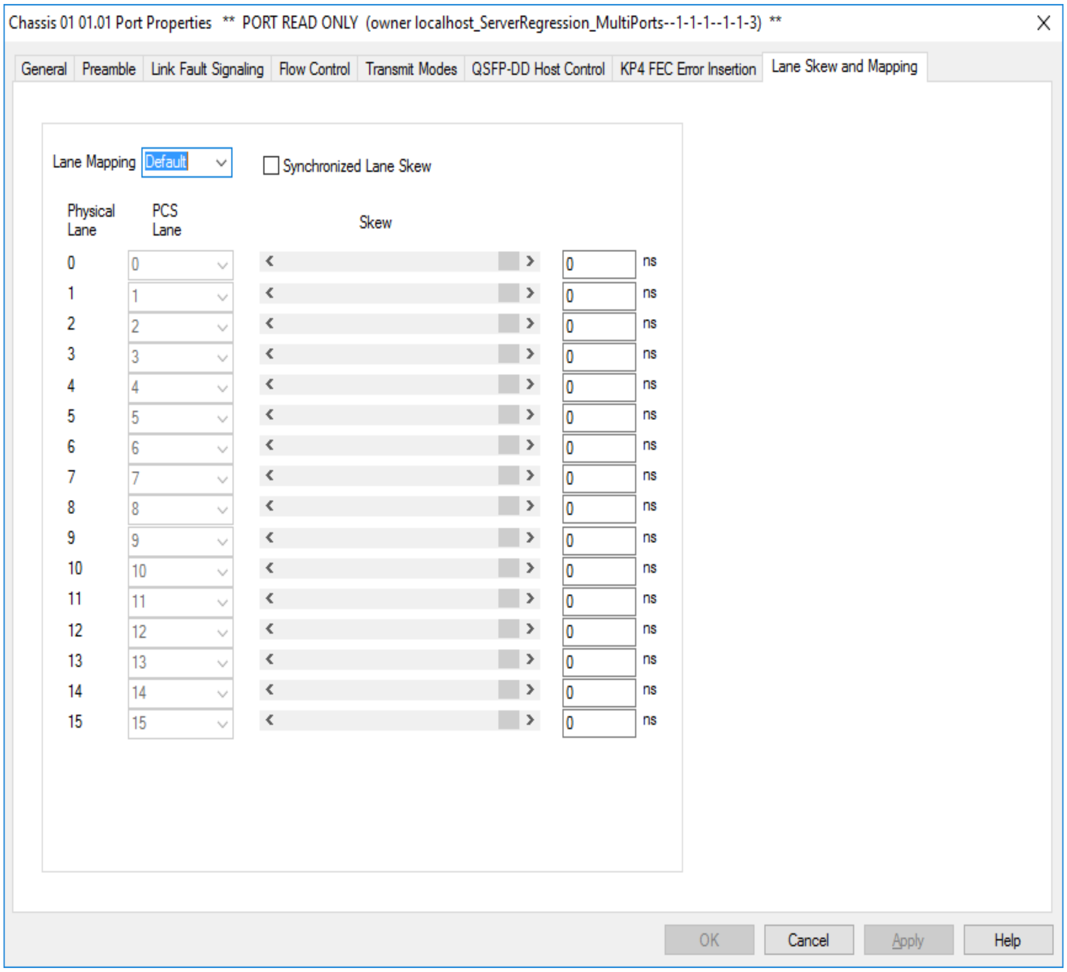
T400GP-4P-QDD Port Properties—Lane Skew and Mapping

The **Lane Skew and Mapping** tab allows you to control the PCS lane order and skew rate for each lane.

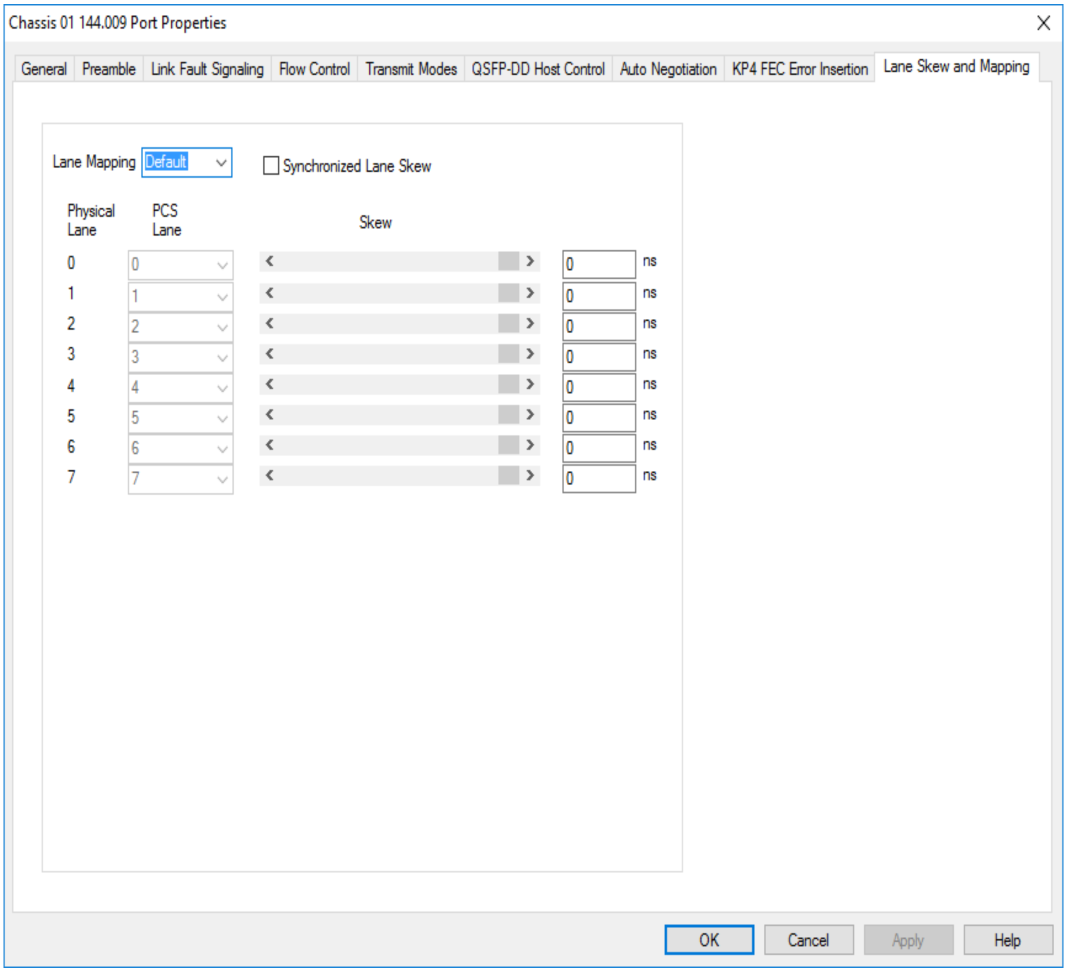
For more information on Lane Skewing, see the Lane Skew topic in the 'Multilane Distribution Configuration' chapter of the *Ixia Platform Reference Manual*. The Lane Skew topic is located under Types of Ports/100 GE.

NOTE The **Lane Skew and Mapping** tab is not available for T400GP-4P-QDD 100 GE and 50 GE speed modes.

The T400GP-4P-QDD Port Properties **Lane Skew and Mapping** tab for the 400 GE speed mode is shown in the following image:



The T400GP-4P-QDD Port Properties **Lane Skew and Mapping** tab for the 200 GE speed mode is shown in the following image:



Field	Description
Lane Mapping	Allows you to select a PCS lane ordering method. Options include the following: • Default: The default ordering method. The default order is each physical lane corresponds to single PCS lane. • Incrementing: For 400 G, orders the lanes from 0 to 15, straight down the list. • Decrementing: For 400 G, orders the lanes from 15 to 0, straight down the list. • Custom: Allows you to put the lanes in any order by manually entering the numbers in the fields. The starting order is the last selected mapping. Mapping between physical and PCS lanes should be one-to-one, else it will result into link down. • Random: Allows you to put the lanes in any random order, values will be any value from 0 to the total number of lanes.
Synchronized Lane Skew	If selected, enables you to synchronize the skewing or delaying of one or more PCS lanes.

Field	Description
Physical Lane	The physical lane identifier. The physical lane is paired with a corresponding PCS lane.
PCS Lane	A number identifier for the PCS lane. The PCS lane is paired with a corresponding physical lane.
Skew	The skew slider is used to set a skew value for the PCS lane, in nanoseconds, on the transmit side. Lane Skew is the ability to independently delay one or more of the total number of PCS lanes. When the slider is moved, the nanoseconds field is correspondingly adjusted. You can also enter a nano second value directly into this field. When the slider is fully pushed to the right, the skew injected into the transmit stream is 0 (minimum). When the slider is pushed all the way to the left. The skew injected into the transmit stream is 1002.918 ns (maximum).

T400GP-4P-QDD Port Properties—RX Diagnostics

The T400GP-4P-QDD load module has eight electrical lanes at the cage where you insert your optics or DACs. In order to evaluate the link quality and determine if the transmitters are driving the right kind of signal, you can diagnose the signals that are actually being received at the electrical lane receivers. The **RX Diagnostics** tab allows you to do this.

This feature is also available for T400GD-8P-QDD and T400GD-8P-OSFP load modules.

See T400GD-8P-QDD Port Properties—RX Diagnostics for more details on the histogram and diagnostics.

CHAPTER 35

Port Properties–T400GP-2P-QDD Load Modules

The **Port Properties** dialog box controls a number of properties related to the port's operation. The **Port Properties** dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the T400GP-2P-QDD load modules.

Port Properties for T400GP-2P-QDD Load Modules

For a port in the **Resources** window, open the context menu, and then select **Properties** to open the **Port Properties** dialog box.

The complete specification for the T400GP-2P-QDD load module is found in the *Ixia Platform Reference Manual*.

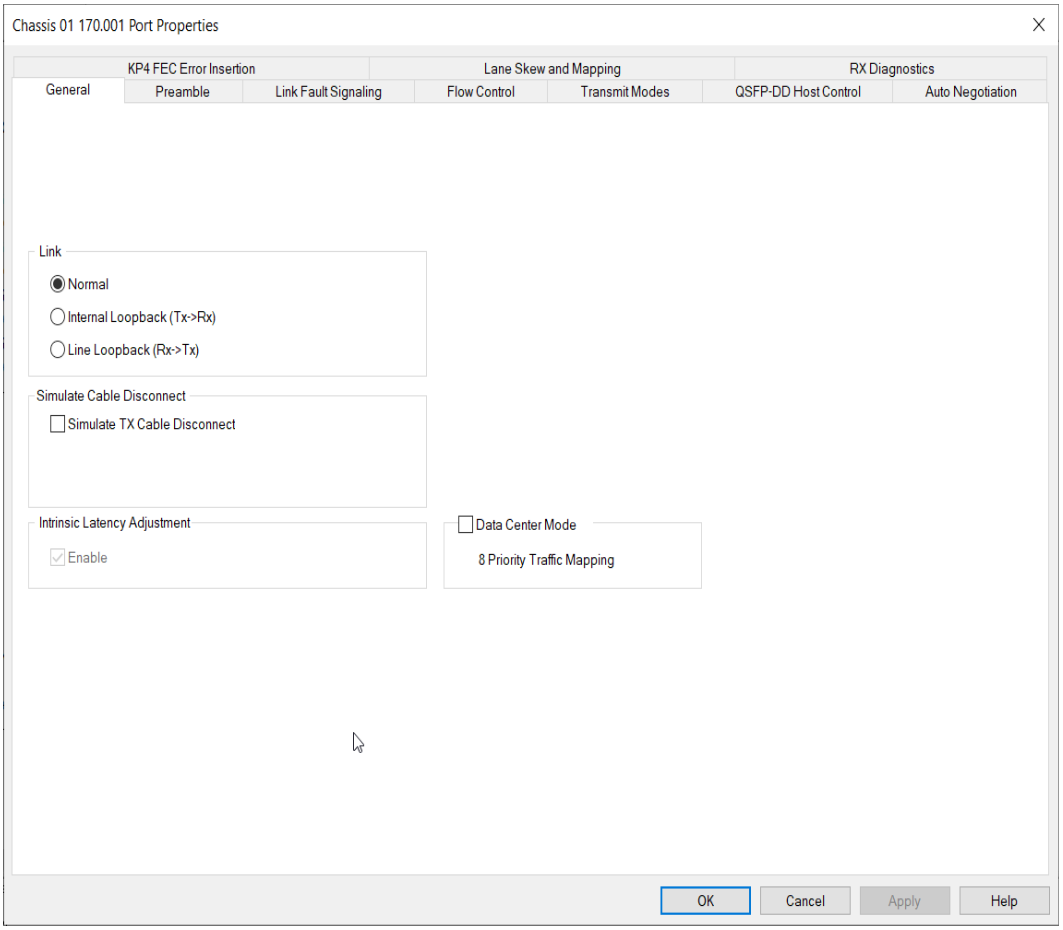
The following port property tabs are available for the T400GP-2P-QDD modules:

- T400GP-2P-QDD Port Properties —General
- T400GP-2P-QDD Port Properties—Preamble
- T400GP-2P-QDD Port Properties—Link Fault Signaling
- T400GP-2P-QDD Port Properties—Flow Control
- T400GP-2P-QDD Port Properties—Transmit Modes
- T400GP-2P-QDD Port Properties—QSFP-DD Host Control
- T400GP-2P-QDD Port Properties—Auto Negotiation
- T400GP-2P-QDD Port Properties—KP4 FEC Error Insertion
- T400GP-2P-QDD Port Properties—Lane Skew and Mapping
- T400GP-2P-QDD Port Properties—RX Diagnostics

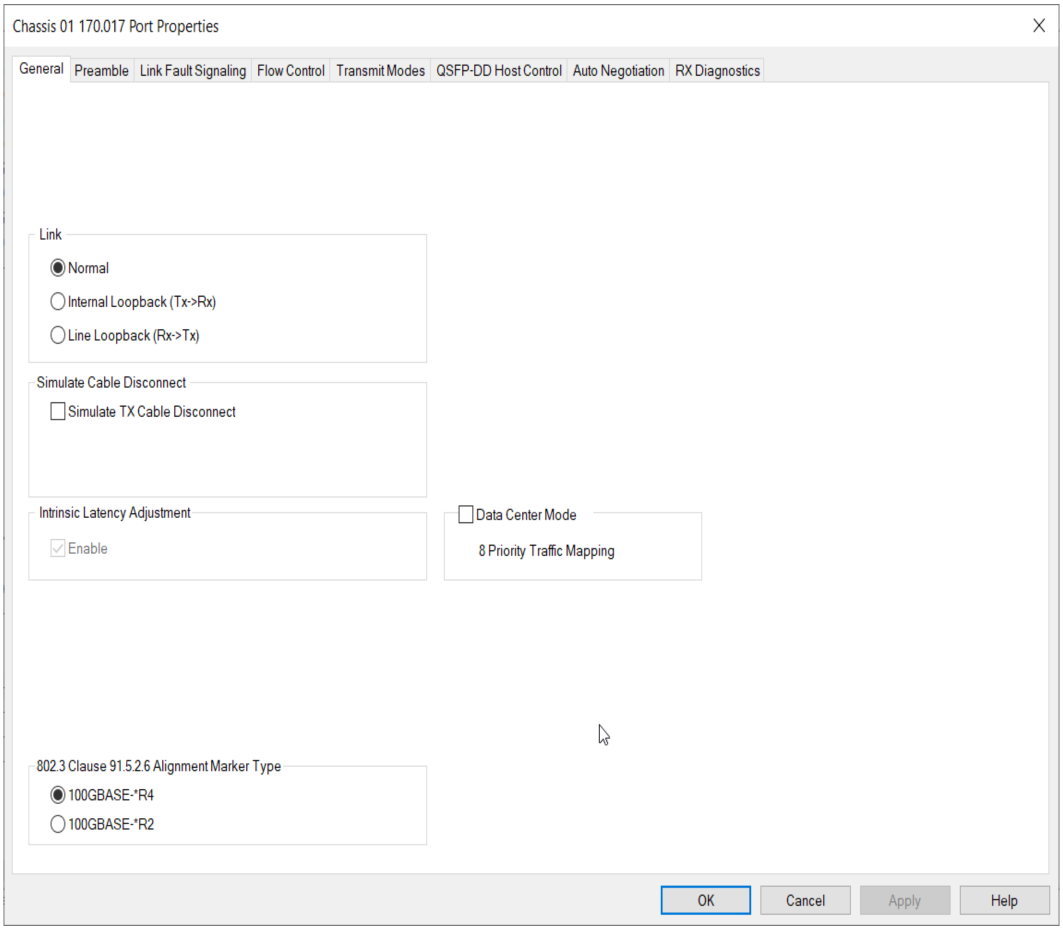
T400GP-2P-QDD Port Properties—General

For a port in the **Explore Network Resources** pane, open the context menu, and then select the **Port Properties** menu to open the **General** tab.

The Port Properties **General** tab for T400GP-2P-QDD is shown in the following image:



The Port Properties **General** tab for T400GP-2P-QDD 100GE mode is shown in the following image:



The controls for **General** tab configuration are described in the following table:

Table: General Configuration

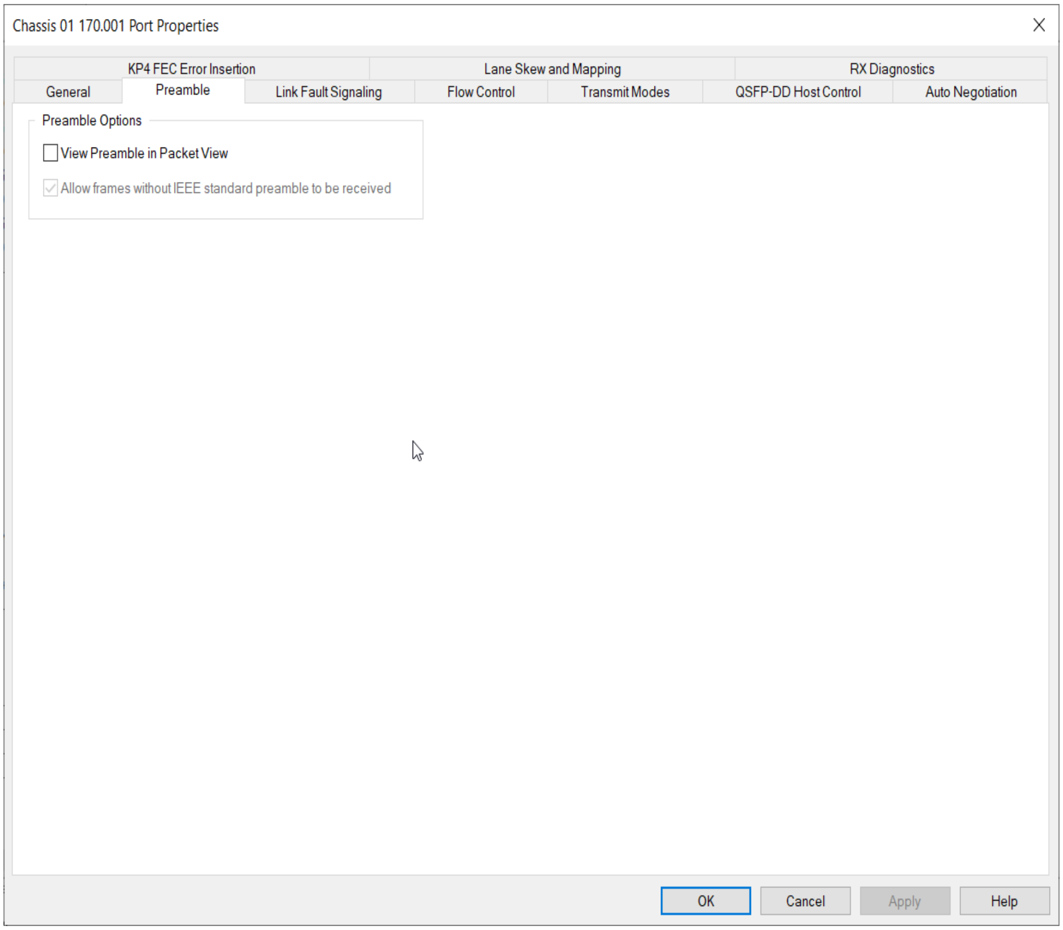
Section	Control/Field	Usage
Link	Normal	Normal operation
	Internal Loopback (Tx -> Rx)	Select this check box to turn on Internal Loopback—Transmit to Receive.
	Enable Line Loopback (Rx -> Tx)	Select this check box to turn on the Line Loopback— Receive to Transmit.
Simulate Cable Disconnect	Simulate TX Cable Disconnect	If this is selected, the port acts as if the cable has been disconnected on the transmit side only. Incoming packets may still be received and port may show link up, but no packets or PCS data will be transmitted.
Intrinsic Latency	Enable	The **Enable** check box is selected by default. This enables the intrinsic latency adjustment.

Section	Control/Field	Usage
Adjustment		The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia Platform Reference Manual*.
Data Center Mode		If selected, enables the Data Center Mode option. When Data Center Mode option is selected, the following changes take place: • The selected port is automatically placed into Advanced Stream mode. In this case, Packet Stream mode is not supported. • Only Auto Instrumentation mode (Floating Timestamp/Data Integrity) is supported, both for transmit and receive. • 8-Priority Traffic Mapping is enabled. It supports various frame size for each PFC control (0-8). • FCoE protocol can be edited for Ethernet II and Ethernet Snap in **Frame Data** tab.
802.3 Clause 91.5.2.6 Alignment Marker Type		This option is available for the 100GE speed mode. It controls the alignment marker mapping on transmit, and requires the same mapping to be used on receive.
	100GBASE *R4	The 100GBASE-*R4 format complies with some 100GE two-lane PMD PAM4 devices that set four_lane_pmd=1.
	100GBASE *R2	The 100GBASE-*R2 format complies with IEEE 802.3cd clause 91.6.2a setting of four_lane_pmd=0, and sets the alignment markers in two-lane PMD style per clause 91.5.2.6.

T400GP-2P-QDD Port Properties—Preamble

The preamble precedes the frame, but is not part of the frame itself.

The T400GP-2P-QDD Port Properties **Preamble** tab for 200 G, 100 G, and 50 G speed modes is shown in the following image:



The fields and controls in this tab are described in the following table:

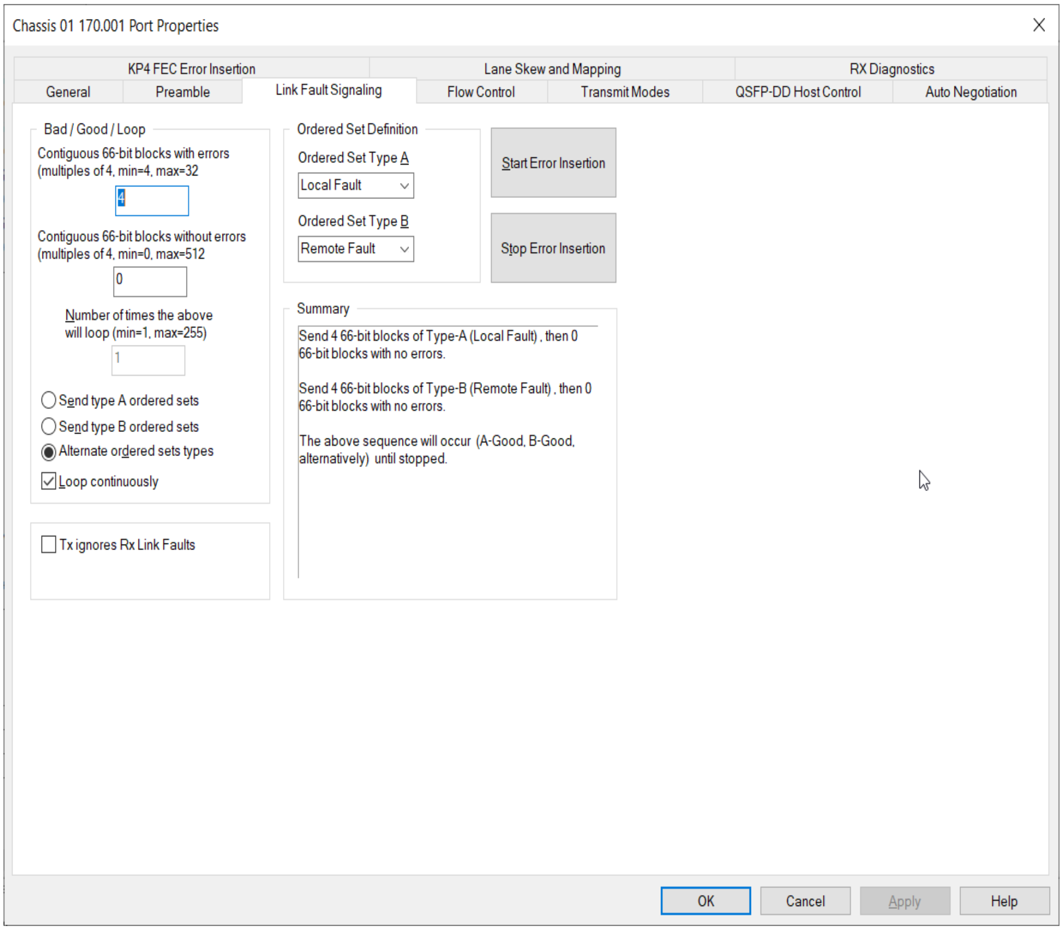
Section	Choices	Description
Preamble Options	View Preamble in Packet View	When this check box is selected, the preamble data is visible in the Packet View (transmit side) and the Capture View (receive side).
	Allow frames without IEEE standard preamble to be received	When this check box is selected, it allows frames without IEEE standard preamble to be received. • This check box is selected by default.

T400GP-2P-QDD Port Properties—Link Fault Signaling

When **Link Fault Signaling** is enabled, four statistics will be added to the list in **Statistic View** for the port. One monitors the Link Fault State, the other two provide a count of the Local Faults and Remote Faults. The last one indicates the state of error insertion, whether or not it is ongoing.

For a port in **Resources** pane, open the context menu, and then select **Properties** to open the **Port Properties** dialog box. Next, select the **Link Fault Signaling** tab. You can also double-click a port in the **Detail** pane to open **Link Fault Signaling**.

The **Link Fault Signaling** tab for T400GP-2P-QDD load module is shown in the following image:



The controls for **Link Fault Signaling** tab configuration are described in the following table:

Section	Field/Control	Description
Bad/Good/Loop	(Bad) Contiguous 66-bit blocks with errors (multiples of 4; min = 4, max = 32)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks with errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive fault sequences allowed are minimum 4 sequences and maximum 32 sequences.
	(Good) Contiguous 66-bit blocks without errors (multiples of 4; min = 0, max = 512)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks without errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive regular data sequences allowed are minimum 0 sequences and maximum 512 sequences.
	Number of times the above will loop (min = 1, max = 255)	Specifies the number of loops for the user defined sequence. Options include the following: • Discrete iterations:

Section	Field/Control	Description
		1. Minimum of 1 iteration 2. Maximum of 255 iterations • Continuous loop 1. User cannot specify number of iterations
	Options include the following: • Send type A ordered sets • Send type B ordered sets • Alternate ordered set types	Defines the ordered set pattern that will be sent. (The two Ordered Sets—A and B—are defined in the **Ordered Set Definition** box in this tab.) This pattern is combined with the Good blocks/Bad blocks pattern for transmission. • Only Type A fault sequence and regular good data sequences • Only Type B fault sequence and regular good data sequences • Alternate Type A, regular good data sequences and Type B fault sequence, regular good data sequences NOTE If this field is available, and the Alternate ordered set types option is selected, the minimum value for this field should be '2,' to allow the entire pattern to be sent once. If left at the minimum value of '1'— only two groups of blocks (one of good blocks and one of bad blocks) is sent, which means that only the first ordered set is sent. A minimum of eight blocks is required for one complete pattern, including Types A and B.
	Loop continuously	If selected, the loop defined by the combination of the Bad and Good blocks, and the pattern of ordered sets, is transmitted continuously until the **Stop Error Insertion** option is selected.
Ordered Set Definition	Ordered Set Type A	Options include the following: • Local Fault • Remote Fault
	Ordered Set Type B	Options include the following: • Local Fault • Remote Fault
Tx ignores Rx Link Faults		If selected, ongoing transmission continues even if Link Fault messages are received by the sending RS.
Summary		(Read-only) Shows descriptions of the patterns that are

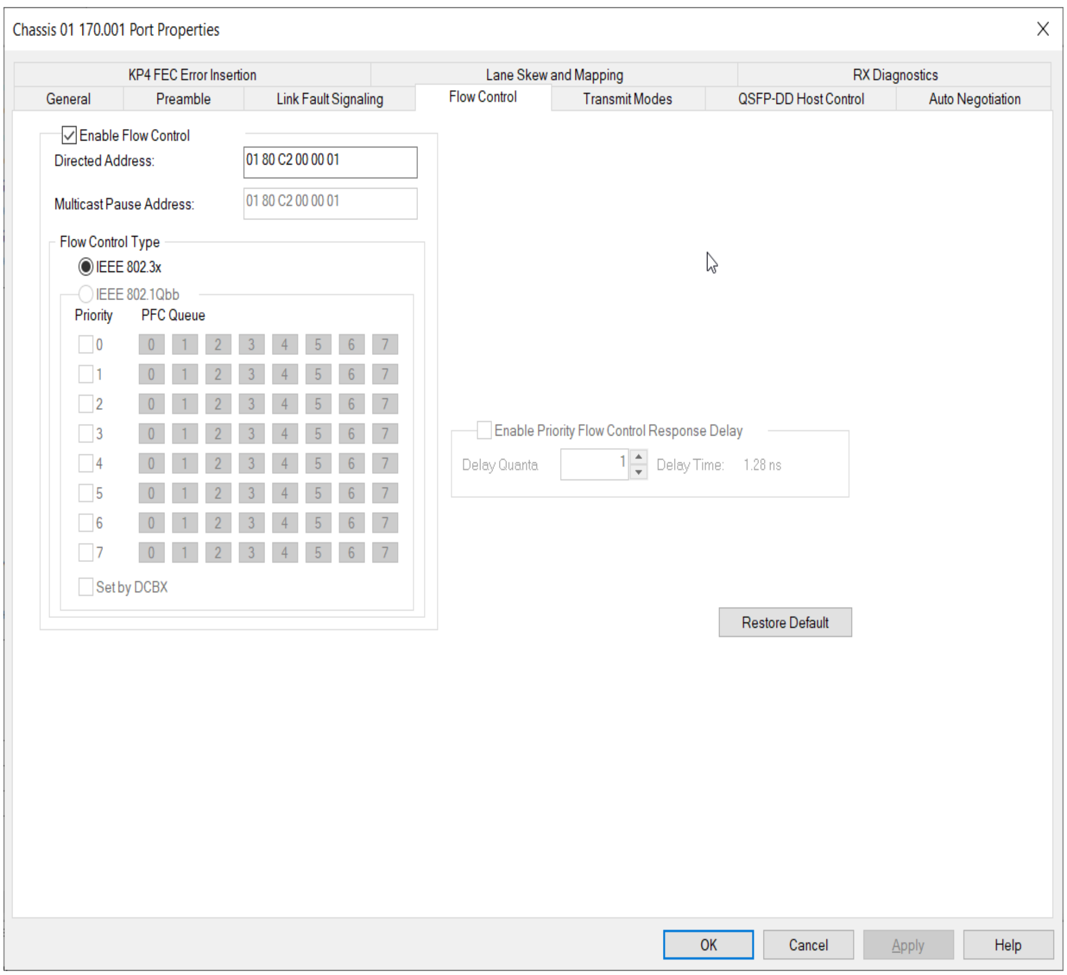
Section	Field/Control	Description
(Window)		transmitted.
Start Error Insertion		Select this option to start the transmission of the configured error patterns.
Stop Error Insertion		(Available only for use with the **Loop continuously** option.) Select this option to stop the transmission of the configured error patterns.

T400GP-2P-QDD Port Properties—Flow Control

For a port in the **Explore Network Resources** pane, open the context menu, and then select **Properties** to open the **Port Properties** dialog box. Next, select the **Flow Control** tab.

NOTE You can view the help page for the **Port Properties - Flow Control** tab by selecting the **Help** option and not F1.

The Port Properties **Flow Control** tab for T400GP-2P-QDD is shown in the following image:

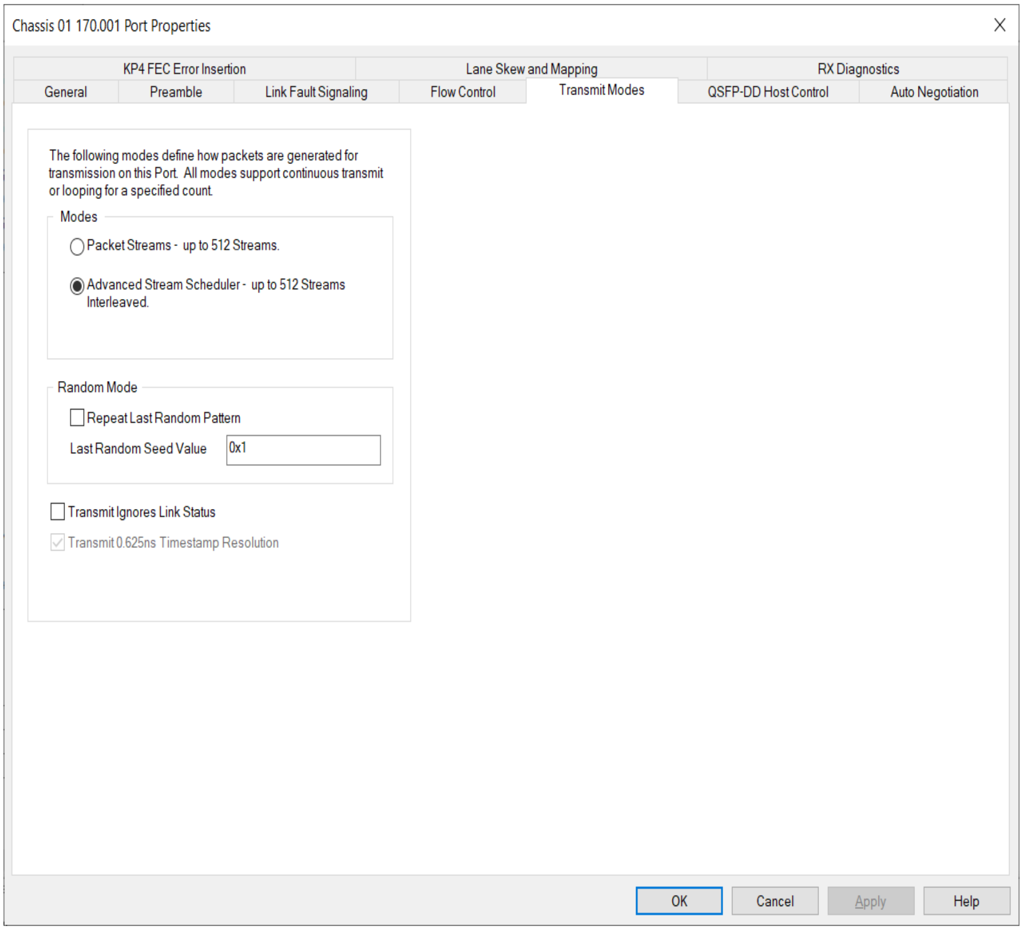


Section	Field/Control	Description
Enable Flow Control	(check box)	Enables the port's MAC flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port listens to for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port listens to for a multicast pause message.
Flow Control Type		
	IEEE 802 3x	When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame.
	IEEE 802.1Qbb	When not in Data Center mode, only IEEE 802.3x is available.
	Priority	When flow control type IEEE 802.1Qbb is selected in Data Center mode, priority options are the channels of data that can be paused. Select one or more channels.
	PFC Queue	The PFC Queue can be mapped to the priority field in the frame.
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to the required offset, and then releases the pause request to the TX engine. For example, if running at 100 % line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames after the pause request is received. With this feature, a delay by number of timestamp ticks is programmed.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

T400GP-2P-QDD Port Properties—Transmit Modes

For a port in the **Resources** window, open the context menu, and then select **Properties** to open the **Port Properties** dialog box. Next, select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following image:



The controls for **Transmit Modes** tab configuration are described in the following table:

Section	Field/Control	Description
Modes	Packet Streams - up to 512 Streams	Following packet streams are supported: • 400 G – 512 • 200 G – 512 • 100 G – 512 • 50 G - 256
	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure up to 512 streams for 400 GE, 200 GE, and 100 GE and up to 256 streams for 50 GE speeds. They transmit packets in an interleaved fashion. For additional information on Advanced Streams, see Stream Control for Advanced Streams.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in

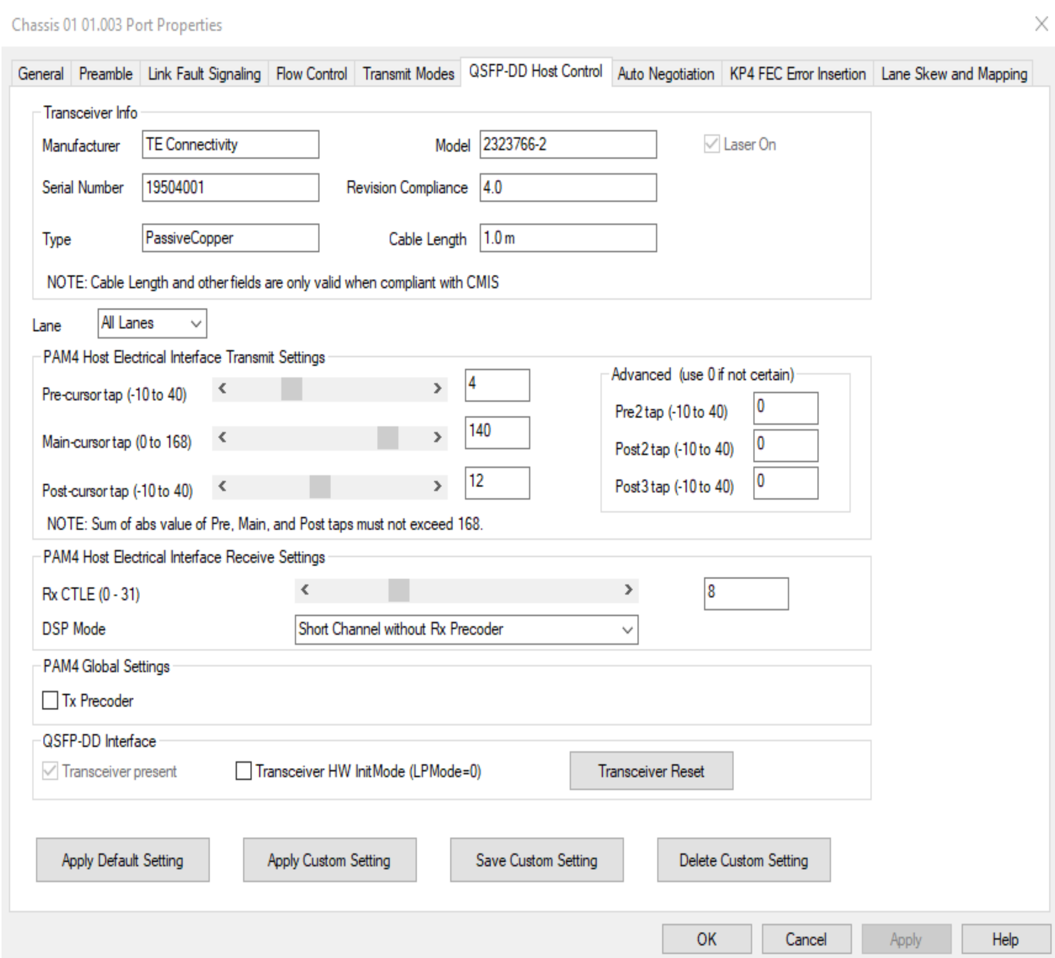
Section	Field/Control	Description
		the stream, including payload, frame size, and UDFs. This can be used before transmission (in which case the seed from the first packet stream is used), or immediately after a stream has been sent (in which case the last stream's random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read-only field represents the initial value that the hardware uses to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit Ignores Link Status		If selected, allows transmission of packets even if the link is down.
Transmit High TimeStamp Resolution		• 400G: 0.625 ns • 200G:1.25 ns • 100G: 2.5 ns • 50G: 2.5 ns

T400GP-2P-QDD Port Properties—QSFP-DD Host Control

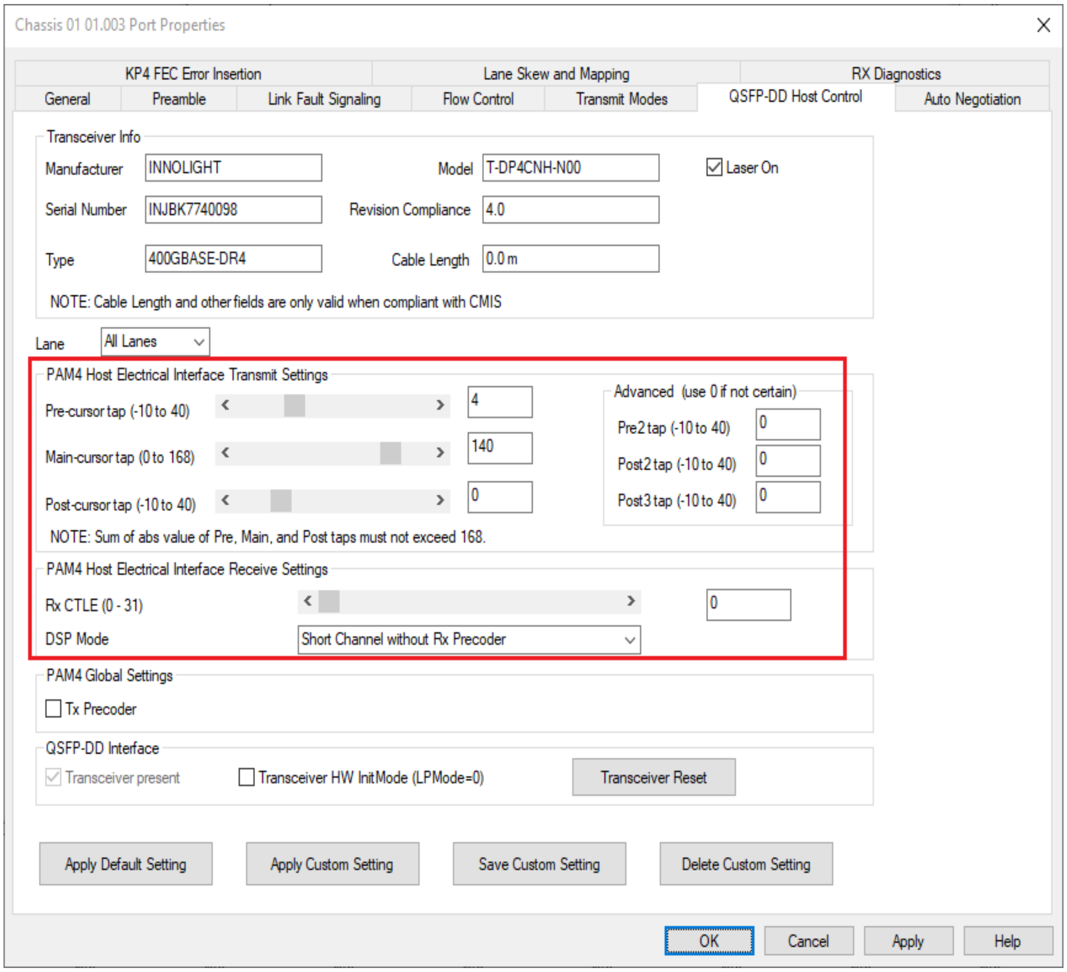
PAM-4 is a four-level pulse-amplitude modulation that uses four distinct amplitude levels to encode two bits of data, essentially doubling the bandwidth of a connection. The PAM4 settings are defined by using the **QSFP-DD Host Control** tab.

For a port in the **Explore Network Resources** pane, open the context menu, and then select **Properties** to open the **Port Properties** dialog box. Next, select the **QSFP-DD Host Control** tab.

The Port Properties **QSFP-DD Host Control** tab for T400GP-2P-QDD when the default passive copper transceiver is used is shown in the following image:



When T400GP-2P-QDD detects an optical transceiver, it will apply a transmit and receive equalization combination that is well suited for optics, as highlighted in the following figure.



Section	Field/Control	Description
Transceiver Info		
	Manufacturer	This is the Vendor Name field read from the actual transceiver currently being plugged in.
	Model	This is the Part Number field read from the actual transceiver currently being plugged in.
	Serial Number	The serial number of the transceiver.
	Revision Compliance	The implemented CMIS revision of the transceiver. T400GP-2P-QDD supports both CMIS 3.0 and CMIS 4.0 transceivers. See Management Interface.
	Type	When a transceiver is inserted into the load module, the software reads IEEE registers to determine the transceiver capabilities and media type. If the transceiver contains this information, it is shown in this read-only field.

Section	Field/Control	Description
	Cable Length	The length of Ixia-supplied cable, which connects this chassis to the previous chassis in the chain.
	Laser On	Select this check box to enable the laser power.
PAM4 Host Electrical Interface Transmit Settings		
	Pre-cursor tap (-10 to 40)	This helps to control the Pre Tap value for Tx.
	Main-cursor tap (0 to 168)	This helps to control the Main Tap Control for Tx.
	Post-cursor tap (-10 to 40)	This helps to control the Post Tap value for Tx.
Advanced (use 0 if not certain)		
	Pre2 tap (-10 to 40)	The Pre2 Tap value for Tx, which is generally negative. The negative precursor tap values are used to optimize the signal at the receiver.
	Post2 tap (-10 to 40)	The Post2 Tap value for Tx, which is generally negative.
	Post3 tap (-10 to 40)	The Post3 Tap value for Tx, which is generally negative.
PAM4 Host Electrical Interface Receive Settings		
	Rx CTLE (0-31)	Represents the receive sides' continuous time linear equalizer.The control is the coefficient for how strong or weak the equalization should be.
	DSP Mode	Represents the Inphi Retimer’s proprietary digital signal processing modes. The controls are different channel descriptions corresponding to different operation modes. Options include the following: • Short non strenuous links • Non-strenuous optical links • Non-strenuous links w/ strong reflections • Non-strenuous optical links w/ strong reflections • Strenuous links • Strenuous optical links w/ strong reflections
PAM4 Global Settings		

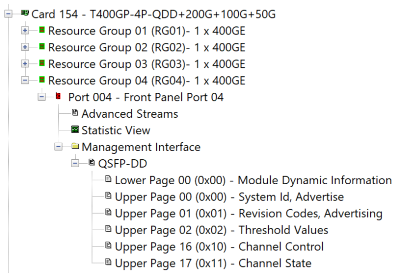
Section	Field/Control	Description
	Tx Precoder	Represents a PAM4 encoding scheme to reduce DFE bit errors.This also means that both sides of the link must have precoder enabled for link to come up.
QSFP-DD Interface		
	Transceiver HW InitMode	Selecting the check box configures the QSFP-DD InitMode pin to perform the optional Hardware Init mode initialization as described in the Common Management Interface Specification (CMIS) Rev 3.0. When a transceiver boots into Hardware Init mode, the data path is automatically configured by the module without intervention from the host (that is, Ixia tester). When disabled, the software-controlled initialization (Software Init) is performed instead . We recommended this initialization mode for any transceiver because the appropriate checks are performed between the Ixia tester and the transceiver before the module's data path initialization.
	Transceiver Reset	Resets the transceiver.
	Apply Default Setting	A default setting is applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Setting	If there exists a custom setting in the xml file for the same adapter/xcvr type, this custom setting is applied to the current user setting and to the actual hardware.
	Save Custom Setting	If there exists a custom setting in the xml file for the same adapter/xcvr type, users are prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting is saved to the xml file. The 'TapConfigurations.xml' file is created at the Ixia\IxOS folder after users select **Save Custom Setting**. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	If there exists a custom setting in the xml file for the same adapter/xcvr type, users are prompted to confirm that they are about to delete it. If no custom setting exists, users are prompted that nothing is deleted.

Management Interface

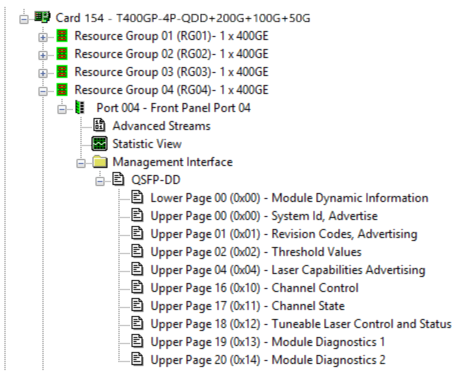
A management interface specification CMIS defines the management interface and associated protocols for all required and allowable management interactions between a CMIS aware host and a CMIS compliant module that are relevant for the host using the module in an application.

The Management Interface appears in the IxExplorer Resources Tree and switches on the fly depending on the CMIS revision. This means that the transceiver automatically reads the management interface and populates the lower and upper pages depending on the transceiver type.

With a CMIS 3.0 (or lower) transceiver, you will see the following pages:



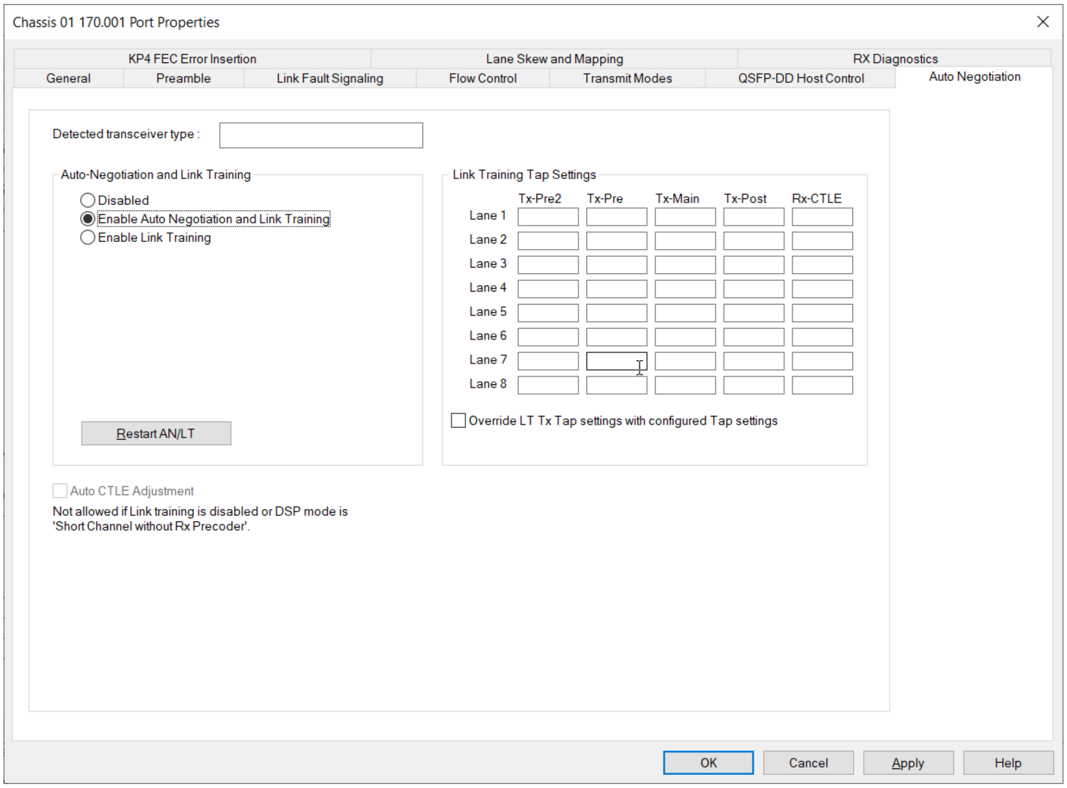
With a CMIS 4.0 transceiver, you will see the following pages:



T400GP-2P-QDD Port Properties—Auto Negotiation

For a port in the **Explore Network Resources** pane, open the context menu, and then select **Properties** to open the **Port Properties** dialog box. Next, select the **Auto Negotiation** tab.

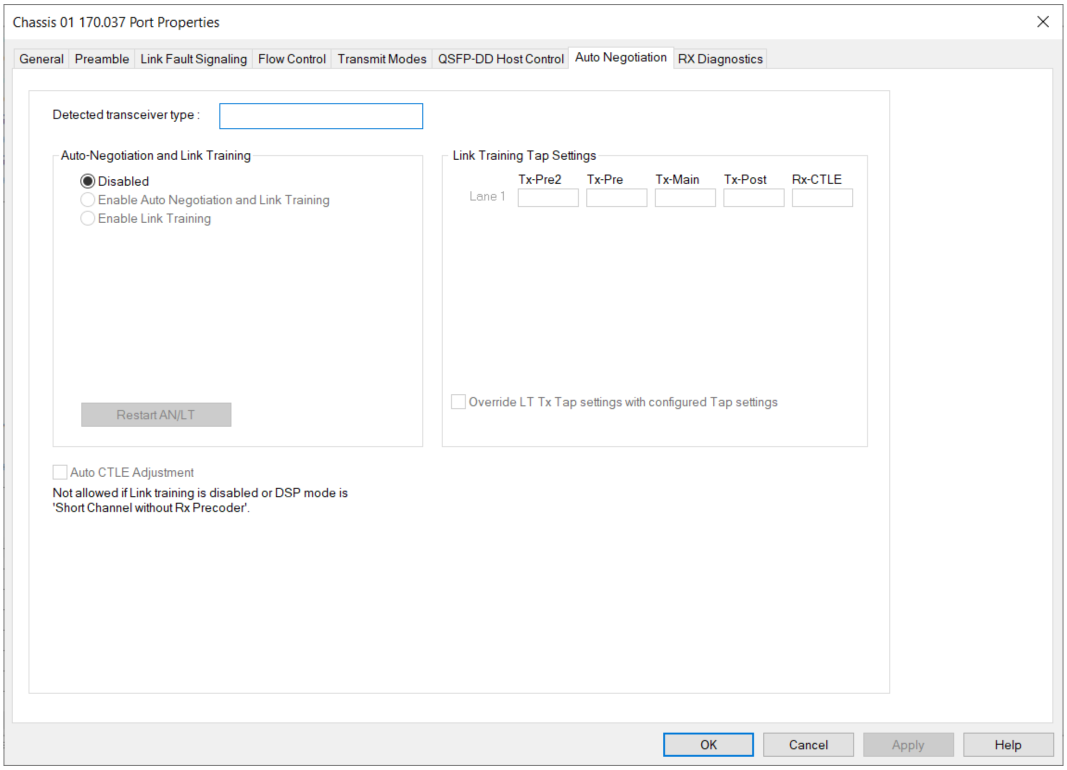
The Port Properties **Auto Negotiation** tab for T400GP-2P-QDD is shown in the following image:



The following lanes are available depending on the port speed:

Speed Mode	Lanes
400 GE	8 lanes (1-8)
200 GE	4 lanes (1-4)
100 GE	2 lanes (1-2)
50 GE	1 lane (1)

For 50 GE speed mode, if the **All Ports, No AN** is enabled, the Auto-Negotiation and Link Training options are not available for selection. These options are available if the **Odd Ports Only** option is selected. See Operation Mode.



The fields and controls in this tab are described in the following table:

Field/Control	Description
Detected transceiver type	The type of transceiver that is plugged in.
Disabled	When you select the check box, the L1 parameters like Autonegotiation, Link Training, and FEC are enabled or disabled as per the IEEE requirements, and you cannot enable or disable these manually. If the check box is cleared, you can manually enable or disable L1 features, even if it violates the IEEE specifications. By default, the check box is selected.
Enable Auto Negotiate and Link Training	Auto negotiation controls how a port communicates with other ports.If you select the check box, it allows auto-negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing • **Restart Auto-Negotiate** is selected (this does a forced restart) NOTE The **Enable Auto Negotiate** check box is available for selection only if the **Disabled** check box is cleared.
Enable Link	Select the check box to allow longer length copper cables to be used. This

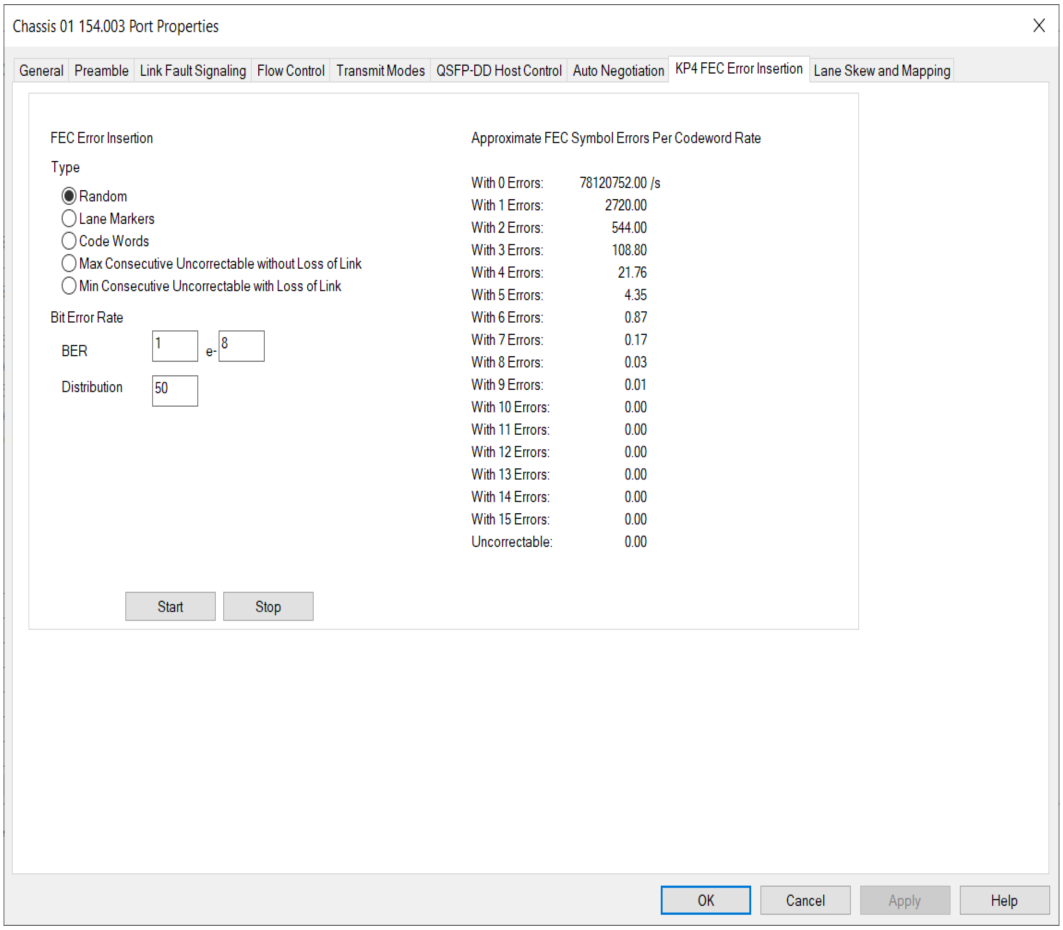
Field/Control	Description
Training	means that during the next Auto-Negotiation, KR training is used. NOTE This check box is available for selection only if the **Disabled** check box is cleared.
Negotiated the capability above	The text box indicates the speed that was negotiated because of Auto-Negotiation.
Restart AN/LT	Restarts the Auto Negotiate sequence.
Auto CTLE Adjustment	When you select the check box, the load module offers CTLE or control over the receiver's Continuous Time Linear Equalizer stage, which is a linear filter that can attenuate the low-frequency components, boost the signal components at the Nyquist frequency, and attenuate higher frequencies past that peak.
Link Training Tap Settings	
Pre2-Cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Pre-cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Main-cursor Lane 1-8	The per-lane transmit main-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Post-cursor Lane 1-8	The per-lane transmit post-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Rx-CTLE Lane 1-8	The CTLE settings applied by the receiver.
Override LT Tap settings with configured Tap settings	Selecting this check box overrides the taps settings derived by the link training process, and configures the transmit pre/main/port cursor settings and receiver CTLE setting with the static values specified in the **QSFP-DD Host Control** tab.

T400GP-2P-QDD Port Properties—KP4 FEC Error Insertion

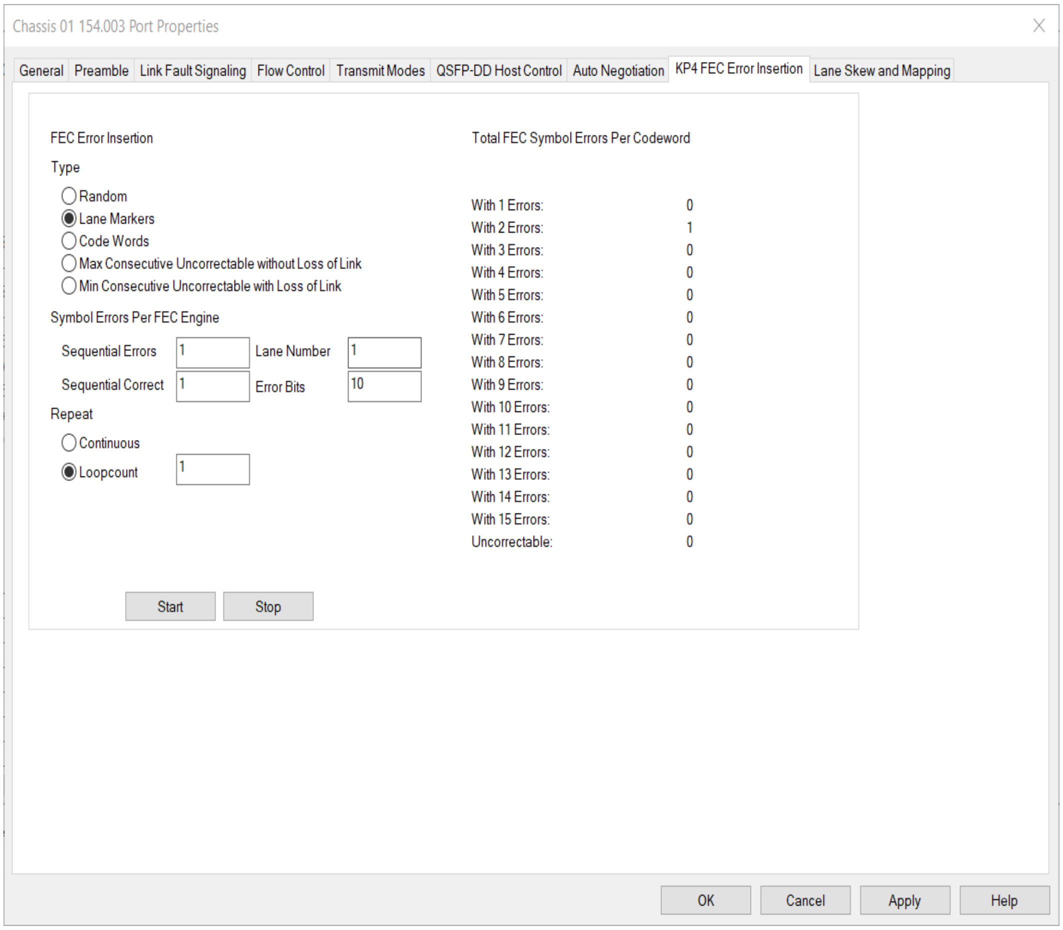
Forward Error Correction (FEC) is a method of communicating data that corrects errors in transmission on the receiving end. Before transmission, the data is put through a predetermined algorithm that adds extra bits specifically for error correction to any character or code block. If the transmission is received in error, the correction bits are used to check and repair the data.

NOTE **KP4 FEC Error Insertion** tab is not available for T400GP-2P-QDD 100G and 50G models.

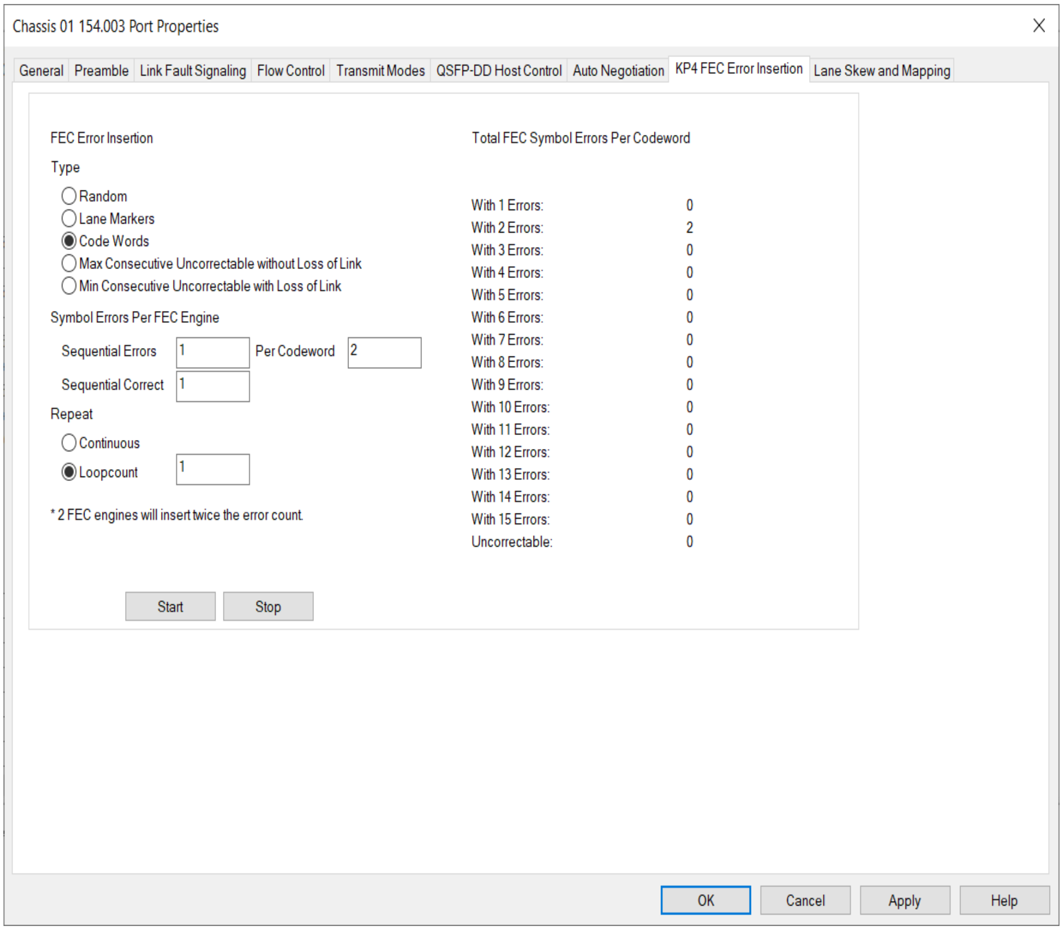
The **FEC Error Insertion** tab allows to inject FEC errors into transmitted data and is shown in the following image:



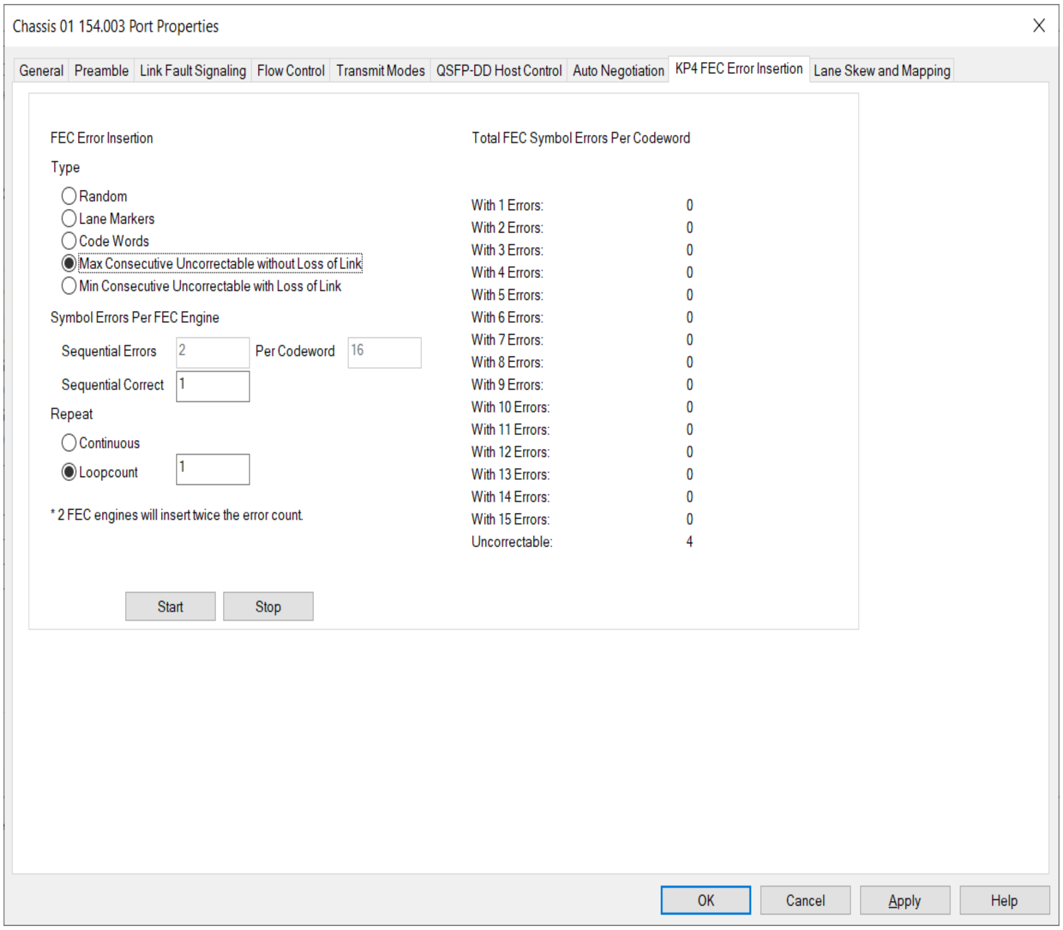
The following image shows **KP4 FEC Error Insertion** Tab with Error Type selected as Lane Markers:



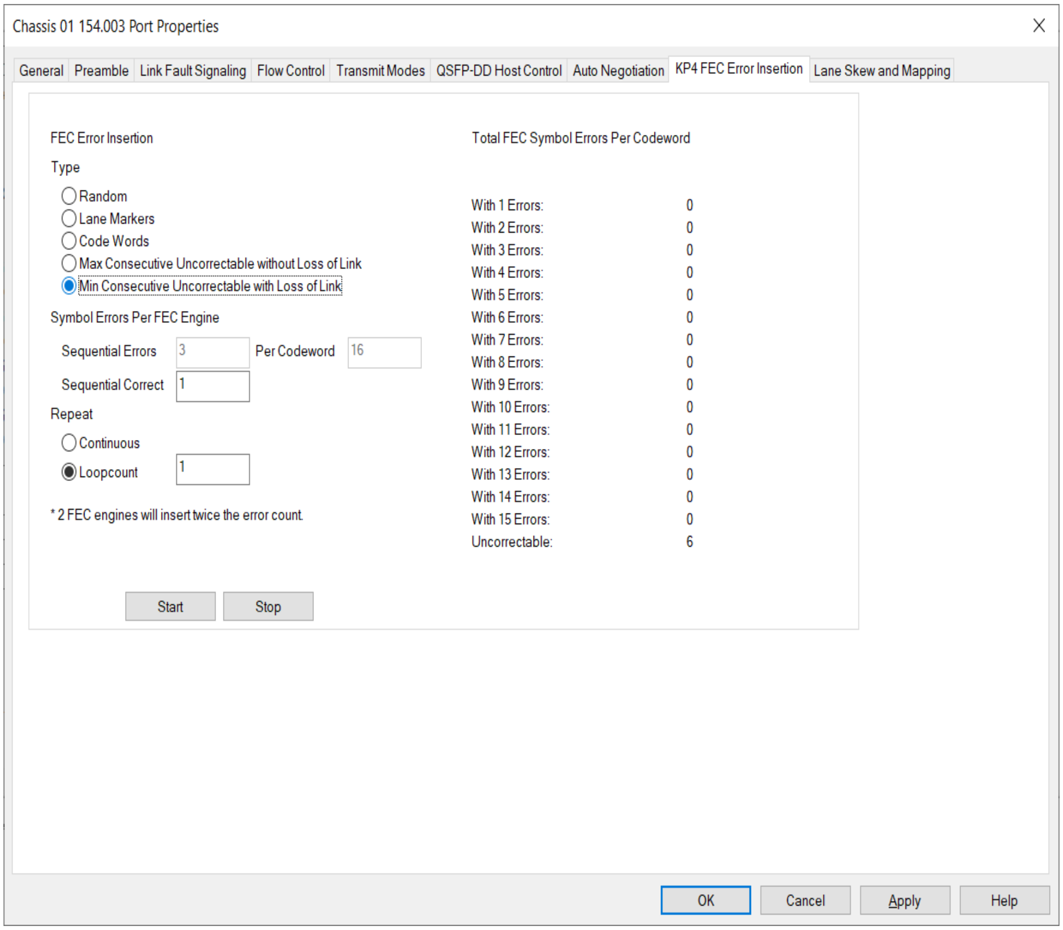
The following image shows **KP4 FEC Error Insertion** Tab with Error Type selected as Code Words:



The following image shows **KP4 FEC Error Insertion** Tab with Error Type selected as Max Consecutive Uncorrectable without Loss of Link:



The following image shows **KP4 FEC Error Insertion** Tab with Error Type selected as Min Consecutive Uncorrectable with Loss of Link:



Section	Field	Usage
FEC Error Insertion		
Type	Random	Random FEC symbol error insertion introduces a deterministic number of errors, evenly spread across all PCS lanes, on top of the intrinsic Bit Error Rate (BER) of the interconnect.
	Lane Markers	Inserts errors only in the Lane Marker fields.
	Code Words	This is the fundamental unit of data that the FEC engine operates on sequentially. It is composed of blocks that carry the payload and parity information for the 64/66B scrambled data that arrives from the PCS Scrambler on Egress and from the PMA on Ingress.The code word size and layout can vary from each coding scheme. For example, RS, KR, and KP4 have different code words because their coding schemes are different.
	Max Consecutive Uncorrectable without Loss of	Uncorrectable errors are those with more than 15 symbol errors. As per IEEE, the maximum number of consecutive uncorrectable errors without loss of link is 2.

Section	Field	Usage
	Link	
	Min Consecutive Uncorrectable with Loss of Link	The Max Consecutive Uncorrectable WITHOUT Loss of Link + 1. This is the threshold where the receiver should declare Local Fault because of bad data. The minimum number of consecutive uncorrectable errors with loss of link is 3.
Bit Error Rate	BER	The Bit Error Ratio (BER) is the ratio of the number of error bits compared to the total number of bits transmitted. In the BER field, enter the coefficient of the BER.You can achieve the required BER by changing the coefficient and exponent of the BER fields. You can distribute erroneous FEC symbols across codewords by varying the Distribution parameter.
	e-	Enter the exponent of the BER. You can achieve the required BER by changing the coefficient and exponent of the BER fields.You can distribute erroneous FEC symbols across codewords by varying the Distribution parameter.
	Distribution	Controls how the errors are distributed. This modifies the probability distribution of errors while maintaining the average Bit Error Rate. For example, you can have a BER of 10E-8 but have all of the errors be single errors OR you can have the errors distributed across a variety of errors. The purpose is to thoroughly test a receiver to see if all possible errors are being corrected at varying rates.
Symbol Errors Per FEC Engine		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Sequential Errors	In burst mode, the Sequential Errors specify how many sequential FEC codewords have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential FEC codewords have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence is repeated until stopped.

Section	Field	Usage
		NOTE Per 802.3bs and 802.3cd, reception of 3 or more consecutive uncorrectable codewords result in Loss of Link. In burst mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) have symbol errors, followed by a number of Lane Markers without errors as per the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) have symbol errors, followed by a number of Lane Markers without errors as per the Sequential Correct field. This sequence is repeated until stopped. NOTE Per 802.3bs and 802.3cd, reception of 5 or more Alignment Marker errors result in Loss of Link. • In 400G mode, the total number of FEC symbol errors sent is doubled because of the presence of two FEC engines. • The symbol errors are not evenly distributed across the PCS lanes (use Random error insertion mode for that case) • The maximum number of sequential uncorrectable errors without loss of link is 2 and the minimum number of sequential uncorrectable errors with loss of link is 3.
	Lane Number	The Lane Number specifies the PCS lane that is affected by the Lane Marker error insertion.This field is available only if you select the error insertion type as Lane Markers.
	Sequential Correct	The number of consecutive code words without errors.
	Error Bits	The Error Bits specifies how many errors are inserted on each of the two symbol errors of the codeword that carries the Lane Marker. There is a minimum Error Bits required (2) before corrupting the symbol that maps to the Lane Marker field. This field is available only if you select the error insertion type as Lane Markers.
	Per Codeword	Codeword is a block of contiguous packets on the line. All RS-FEC codewords are of the same size.The Per Codeword value denotes the number of symbol errors per codeword to insert. KP4 FEC can correct up to 15 symbols, and detect up to 30 symbols. If the user specifies 16, an Uncorrectable Codeword will be issued. This field is available only if you select the error insertion type as Code Words.
Repeat		This is available only if you select the error insertion type as one of

Section	Field	Usage
		the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Continuous	Continuous error insertion.In continuous mode, the Sequential Errors field specifies how many sequential FEC codewords have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence is repeated until stopped.
	Loopcount	The sequence of correct and incorrect codewords or symbol errors inserted are repeated by the number specified in the Loopcount field.
Start		Starts the error insertion process.
Stop		Stops the error insertion process.
Appropriate FEC Symbol Errors Per Codeword Rate		The Appropriate FEC Symbol Errors Per Codeword Rate is an approximation for how many symbol errors there are per codeword every second. NOTE In 400 G mode, the total number of FEC symbol errors sent is doubled because the presence of two FEC engines.

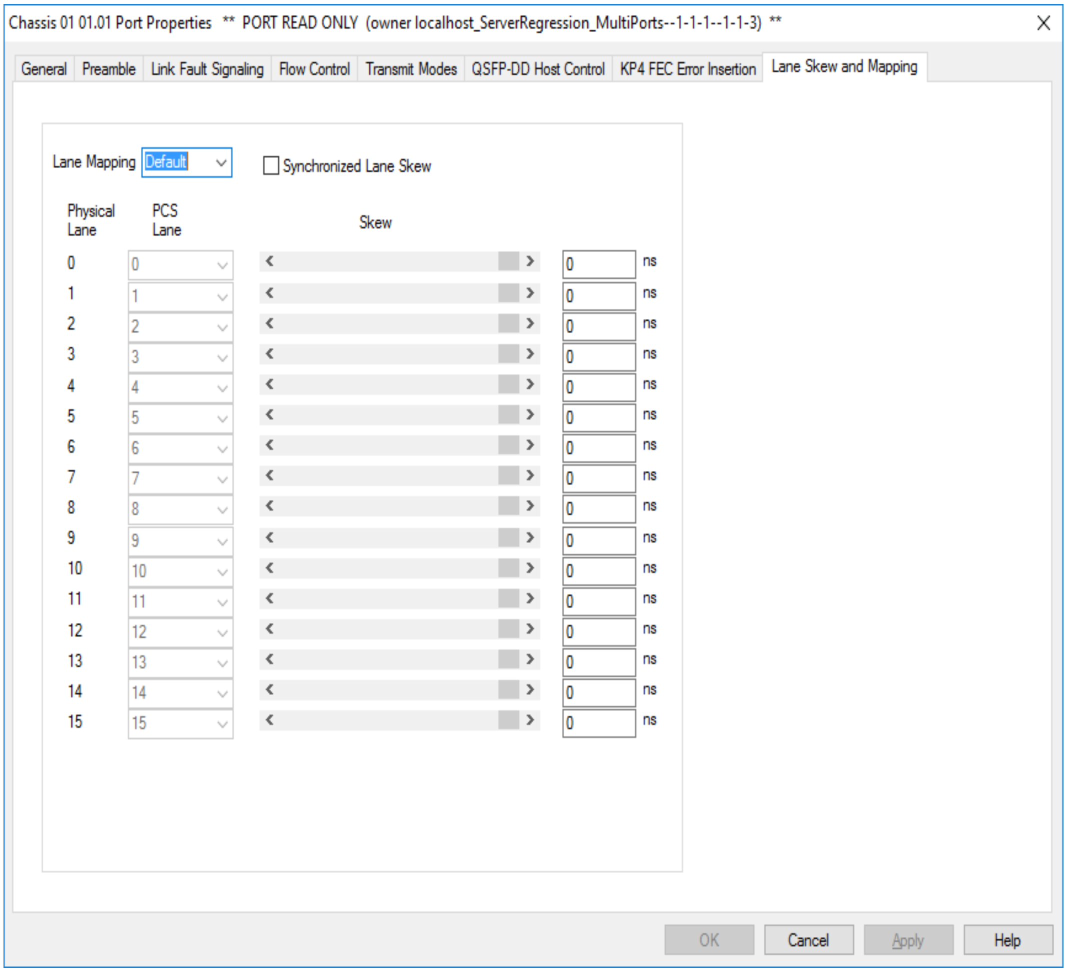
T400GP-2P-QDD Port Properties—Lane Skew and Mapping

The **Lane Skew and Mapping** tab allows you to control the PCS lane order and skew rate for each lane.

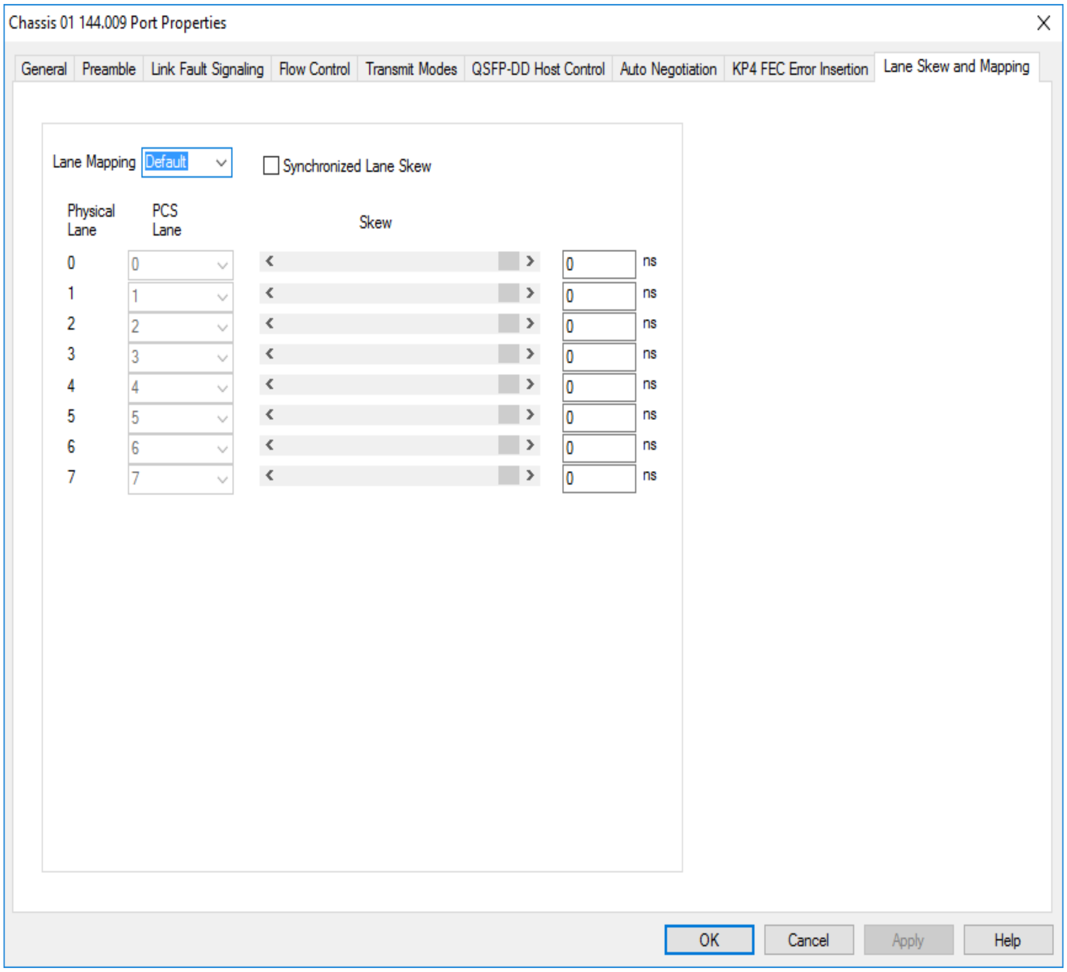
For more information on Lane Skewing, see the Lane Skew topic in the 'Multilane Distribution Configuration' chapter of the *Ixia Platform Reference Manual*. The Lane Skew topic is located under Types of Ports/100 GE.

NOTE The **Lane Skew and Mapping** tab is not available for T400GP-2P-QDD 100 GE and 50 GE speed modes.

The T400GP-2P-QDD Port Properties **Lane Skew and Mapping** tab for the 400 GE speed mode is shown in the following image:



The T400GP-2P-QDD Port Properties **Lane Skew and Mapping** tab for the 200 GE speed mode is shown in the following image:



Field	Description
Lane Mapping	Allows you to select a PCS lane ordering method. Options include the following: • Default: The default ordering method. The default order is each physical lane corresponds to single PCS lane. • Incrementing: For 400 G, orders the lanes from 0 to 15, straight down the list. • Decrementing: For 400 G, orders the lanes from 15 to 0, straight down the list. • Custom: Allows you to put the lanes in any order by manually entering the numbers in the fields. The starting order is the last selected mapping. Mapping between physical and PCS lanes should be one-to-one, else it will result into link down. • Random: Allows you to put the lanes in any random order, values will be any value from 0 to the total number of lanes.
Synchronized Lane Skew	If selected, enables you to synchronize the skewing or delaying of one or more PCS lanes.

Field	Description
Physical Lane	The physical lane identifier. The physical lane is paired with a corresponding PCS lane.
PCS Lane	A number identifier for the PCS lane. The PCS lane is paired with a corresponding physical lane.
Skew	The skew slider is used to set a skew value for the PCS lane, in nanoseconds, on the transmit side. Lane Skew is the ability to independently delay one or more of the total number of PCS lanes. When the slider is moved, the nanoseconds field is correspondingly adjusted. You can also enter a nano second value directly into this field. When the slider is fully pushed to the right, the skew injected into the transmit stream is 0 (minimum). When the slider is pushed all the way to the left. The skew injected into the transmit stream is 1002.918 ns (maximum).

T400GP-2P-QDD Port Properties—RX Diagnostics

The T400GP-2P-QDD load module has eight electrical lanes at the cage where you insert your optics or DACs. In order to evaluate the link quality and determine if the transmitters are driving the right kind of signal, you can diagnose the signals that are actually being received at the electrical lane receivers. The **RX Diagnostics** tab allows you to do this.

This feature is also available for T400GD-8P-QDD and T400GD-8P-OSFP load modules.

See T400GD-8P-QDD Port Properties—RX Diagnostics for more details on the histogram and diagnostics.

CHAPTER 36

Port Properties–S400GD-16P-QDD+FAN+NRZ Load Modules

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the S400GD-16P-QDD+FAN+NRZ load modules.

Following variants of S400GD are available:

- S400GD-16P-QDD+FAN+NRZ - Full and reduced
- S400GD-8P-QDD+FAN+NRZ - Full and reduced
- S400GD-4P-QDD+FAN+NRZ - Full and reduced

Port Properties for S400GD-16P-QDD+FAN+NRZ Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option.

The complete specification for the S400GD-16P-QDD+FAN+NRZ load module is found in the *Ixia Platform Reference Manual*.

The following port property tabs are available for S400GD-16P-QDD+FAN+NRZ modules:

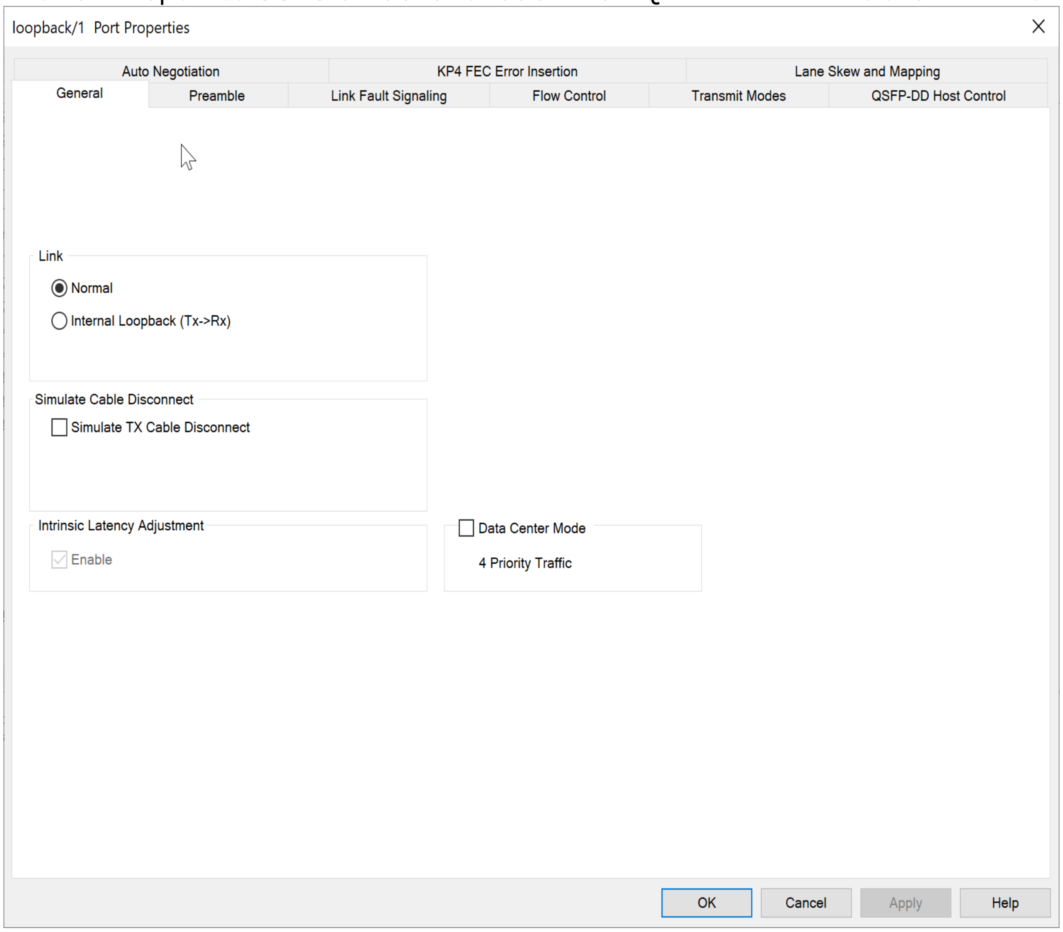
- S400GD-16P-QDD+FAN+NRZ Port Properties —General
- S400GD-16P-QDD+FAN+NRZ Port Properties—TX Lane
- S400GD-16P-QDD+FAN+NRZ Port Properties—Preamble
- S400GD-16P-QDD+FAN+NRZ Port Properties—Link Fault Signaling
- S400GD-16P-QDD+FAN+NRZ Port Properties—Flow Control
- S400GD-16P-QDD+FAN+NRZ Port Properties—Transmit Modes
- S400GD-16P-QDD+FAN+NRZ Port Properties—QSFP-DD Host Control
- S400GD-16P-QDD+FAN+NRZ Port Properties—Auto Negotiation
- S400GD-16P-QDD+FAN+NRZ Port Properties—KP4 FEC Error Insertion
- S400GD-16P-QDD+FAN+NRZ Port Properties—Lane Skew and Mapping
- S400GD-16P-QDD+FAN+NRZ Port Properties—RX Diagnostics

S400GD-16P-QDD+FAN+NRZ Port Properties—General

The S400GD-16P-QDD+FAN+NRZ **General** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, and then selecting the

General tab.

The Port Properties **General** tab for S400GD-16P-QDD+FAN+NRZ is shown in the following figure:



The controls for **General** tab configuration are described in the following table:

Section	Control/Field	Usage
Link	Normal	Normal operation
	Internal Loopback (Tx -> Rx)	Select this check box to turn on Internal Loopback—Transmit to Receive.
Simulate Cable Disconnect	Simulate TX Cable Disconnect	If this is selected, the port acts as if the cable has been disconnected on the transmit side only. Incoming packets may still be received and port may show link up, but no packets or PCS data will be transmitted.
Intrinsic Latency Adjustment	Enable	The **Enable** check box is selected by default. This enables the intrinsic latency adjustment. The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file).

Section	Control/Field	Usage
		For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia Platform Reference Manual*.
Data Center Mode		If selected, enables the Data Center Mode option. When Data Center Mode option is selected, the following changes take place: • The selected port is automatically placed into Advanced Stream mode. In this case, Packet Stream mode is not supported. • Only Auto Intrumentation mode (Floating Timestamp/Data Integrity) is supported, both for transmit and receive. • 4-Priority Traffic Mapping is enabled. It supports various frame size for each PFC control (0-4). • FCoE protocol can be edited for Ethernet II and Ethernet Snap in **Frame Data** tab.

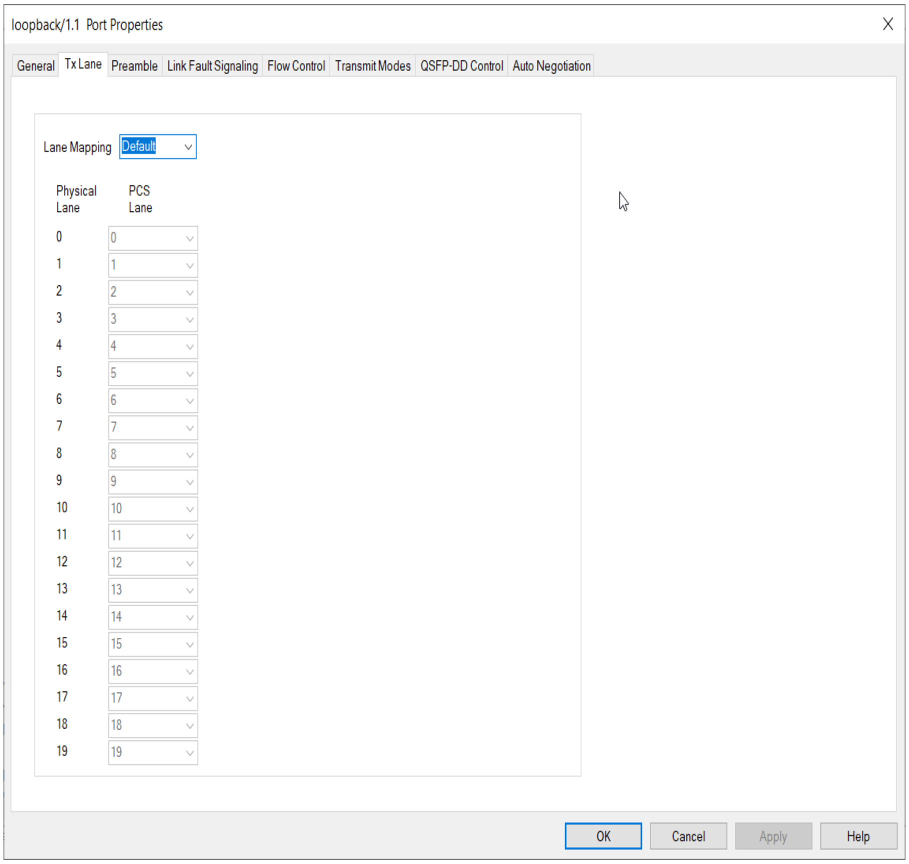
S400GD-16P-QDD+FAN+NRZ Port Properties—TX Lane

The **Tx Lane** tab allows to control the PCS lane order and skew rate for each lane.

For more information on Lane Skewing, see the Lane Skew topic in the 'Multilane Distribution Configuration' chapter of the *Ixia Platform Reference Manual*. The Lane Skew topic is located under 'Types of Ports' / '100GE'.

The S400GD-16P-QDD+FAN+NRZ Port Properties ***Tx Lane*** tab is available for only 100 GE and 40 GE NRZ speed modes.

The S400GD-16P-QDD+FAN+NRZ Port Properties ***Tx Lane*** tab for the 100 GE mode is shown in the following figure:



The S400GD-16P-QDD+FAN+NRZ Port Properties ***Tx Lane*** tab for the 40 GE mode is shown in the following figure:

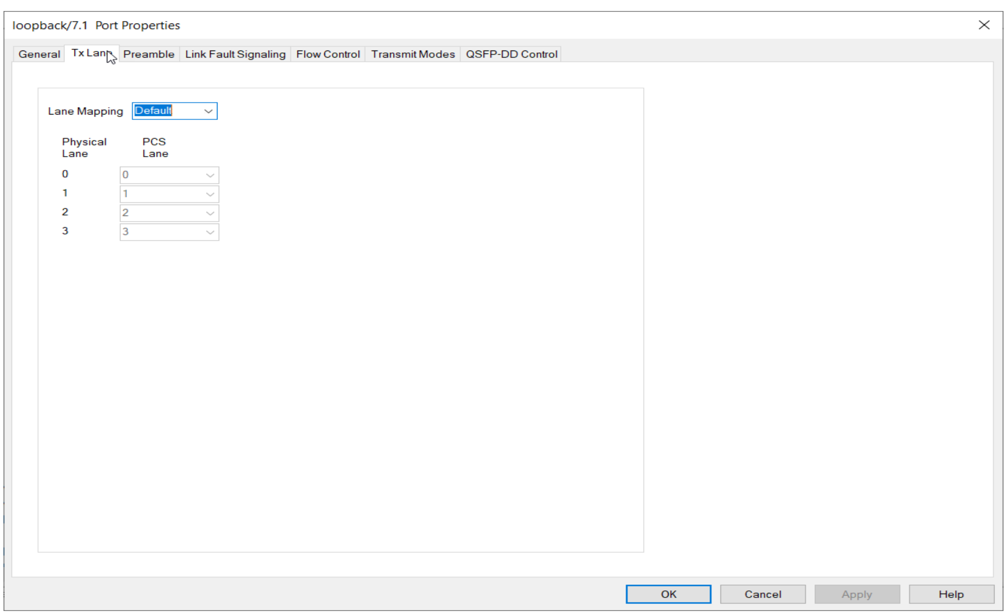


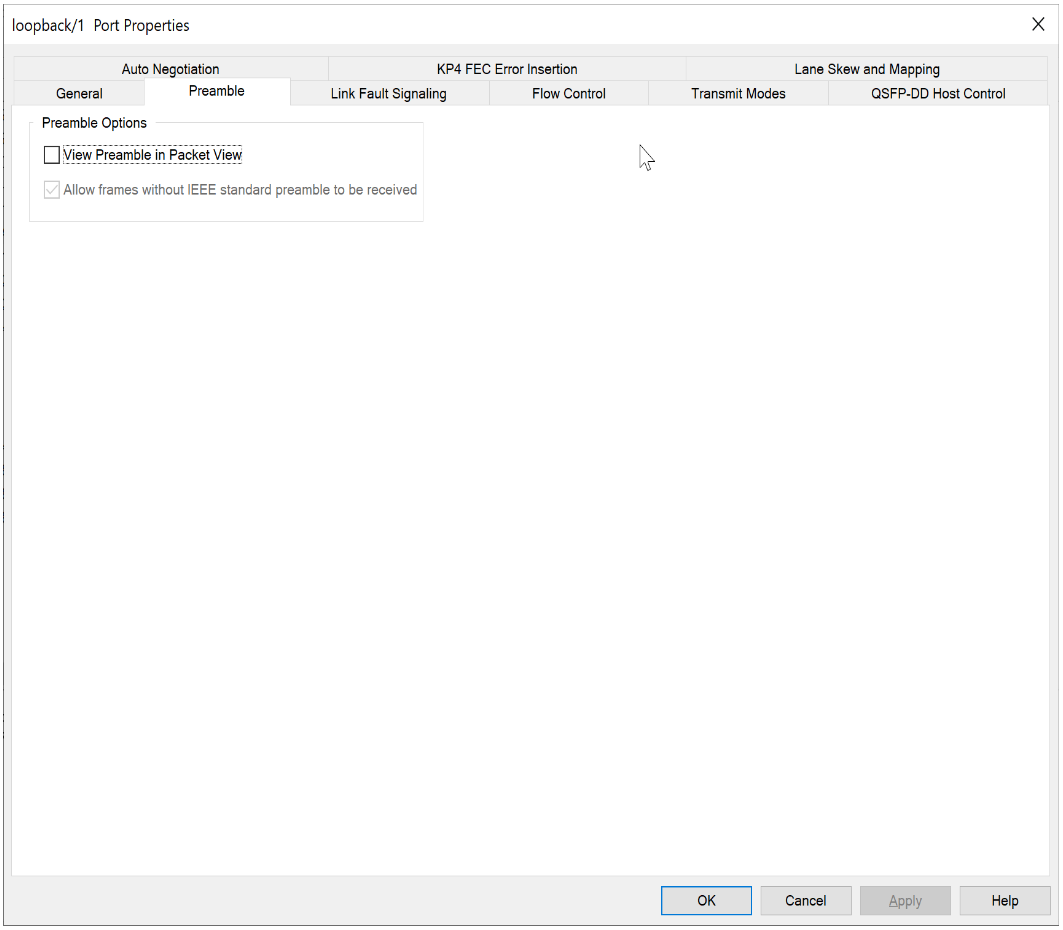
Table: **Tx Lane** Tab Configuration

Field	Description
Lane Mapping	Allows you to select a PCS lane ordering method. There are five options: • Default–the default ordering method. The default order is each physical port corresponds to 2 PCS lanes that are n and n+10, where n = physical lane number. • Increment–orders the lanes from 0 to 19, straight down the list. • Decrement–orders the lanes from 19 to 0, straight down the list. • Custom–allows to put the lanes in any order by manually entering the numbers in the fields. The starting order is the last selected mapping. • Random - Allows to put the lanes in any random order, values will be any value from 0 to 19.
Physical Lane	The physical lane identifier. The physical lane is paired with a corresponding PCS lane.
PCS Lane	A number identifier for the PCS lane. The PCS lane is paired with a corresponding physical lane.

S400GD-16P-QDD+FAN+NRZ Port Properties—Preamble

The preamble precedes the frame, but is not part of the frame itself.

The S400GD-16P-QDD+FAN+NRZ Port Properties **Preamble** tab is shown in the following figure:



The fields and controls in this tab are described in the following table:

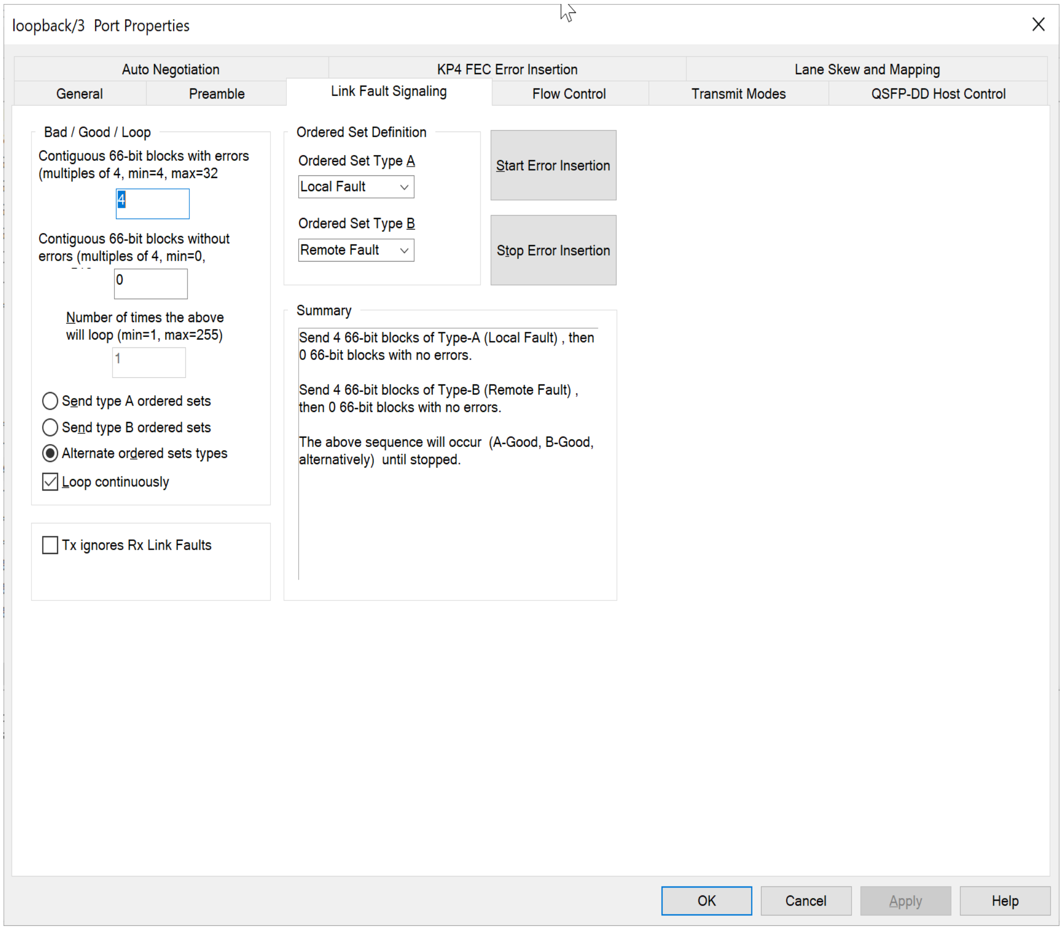
Section	Choices	Description
Preamble Options	View Preamble in Packet View	When this check box is selected, the preamble data will be visible in the Packet View (transmit side) and the Capture View (receive side).
	Allow frames without IEEE standard preamble to be received	When this check box is selected, it allows frames without IEEE standard preamble to be received. • This check box is selected by default.

S400GD-16P-QDD+FAN+NRZ Port Properties—Link Fault Signaling

When **Link Fault Signaling** is enabled, four statistics will be added to the list in Statistic View for the port. One is for monitoring the Link Fault State. Two provide a count of the Local Faults and Remote Faults. The last one is for indicating the state of error insertion, whether or not it is ongoing.

The **Link Fault Signaling** tab is accessed from the context menu of the a port in **Resources** pane by selecting the **Properties** menu option, or by double-clicking a port in the **Detail** pane. Then select the **Link Fault Signaling** tab.

The **Link Fault Signaling** tab for S400GD-16P-QDD+FAN+NRZ load module is shown in the following image.



The controls for **Link Fault Signaling** tab configuration are described in the following table.

Section	Field/Control	Description
Bad/Good/Loop	(Bad) Contiguous 66-bit blocks with errors (multiples of 4; min = 4, max = 32)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks with errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive fault sequences allowed are minimum 4 sequences and maximum 32 sequences.
	(Good) Contiguous 66-bit blocks without errors (multiples of 4; min = 0, max = 512)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks without errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive regular data sequences allowed are minimum 0 sequences and maximum 512 sequences.
	Number of times	Specifies the number of loops for the user defined

Section	Field/Control	Description
	the above will loop (min = 1, max = 255)	sequence. Options include the following: • Discrete iterations: 1. Minimum of 1 iteration 2. Maximum of 255 iterations • Continuous loop 1. User cannot specify number of iterations
	Options include the following: • Send type A ordered sets • Send type B ordered sets • Alternate ordered set types	Defines the ordered set pattern that will be sent. (The two Ordered Sets—A and B—are defined in the **Ordered Set Definition** box in this tab.) This pattern will be combined with the Good blocks/Bad blocks pattern for transmission. • Only Type A fault sequence and regular good data sequences • Only Type B fault sequence and regular good data sequences • Alternate Type A, regular good data sequences and Type B fault sequence, regular good data sequences NOTE If this field is available, and the Alternate ordered set types option is selected, the minimum value for this field should be '2,' to allow the entire pattern to be sent once. If left at the minimum value of '1'— only two groups of blocks (one of good blocks and one of bad blocks) will be sent, which means that only the first ordered set will be sent. A minimum of eight blocks is required for one complete pattern including Types A and B.
	Loop continuously	If selected, the loop defined by the combination of the Bad and Good blocks plus the pattern of ordered sets, will be transmitted continuously until the **Stop Error Insertion** option is selected.
Ordered Set Definition	Ordered Set Type A	Options include the following: • Local Fault • Remote Fault
	Ordered Set Type B	Options include the following: • Local Fault • Remote Fault

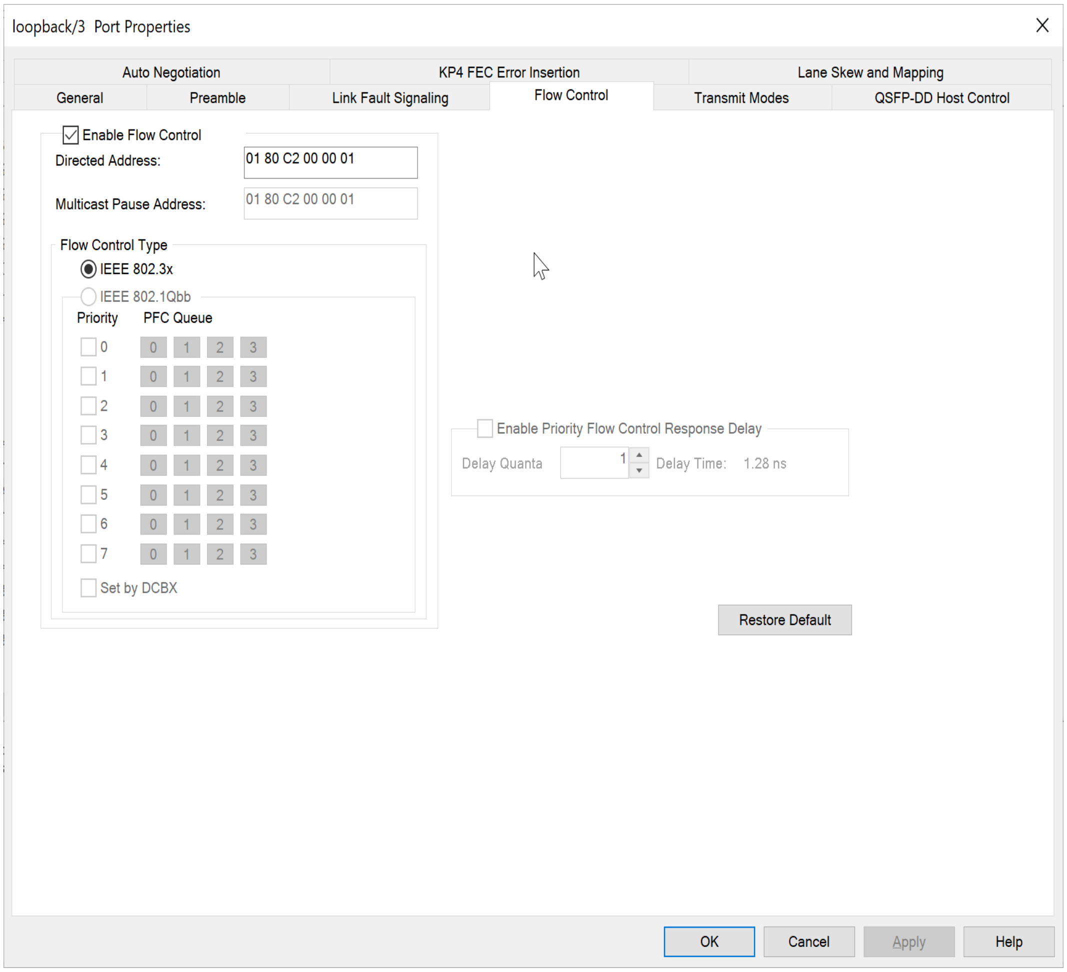
Section	Field/Control	Description
Tx ignores Rx Link Faults		If selected, ongoing transmission will continue even if Link Fault messages are received by the sending RS.
Summary (Window)		(Read-only) Shows descriptions of the patterns that will be transmitted.
Start Error Insertion		Select this option to start the transmission of the configured error patterns.
Stop Error Insertion		(Available only for use with the **Loop continuously** option.) Select this option to stop the transmission of the configured error patterns.

S400GD-16P-QDD+FAN+NRZ Port Properties—Flow Control

The S400GD-16P-QDD+FAN+NRZ **Flow Control** tab is accessed from the context menu of the port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

NOTE You can view this help page for the **Port Properties - Flow Control** tab by selecting the **Help** option and not F1.

The Port Properties **Flow Control** tab for S400GD-16P-QDD+FAN+NRZ is shown in the following image.



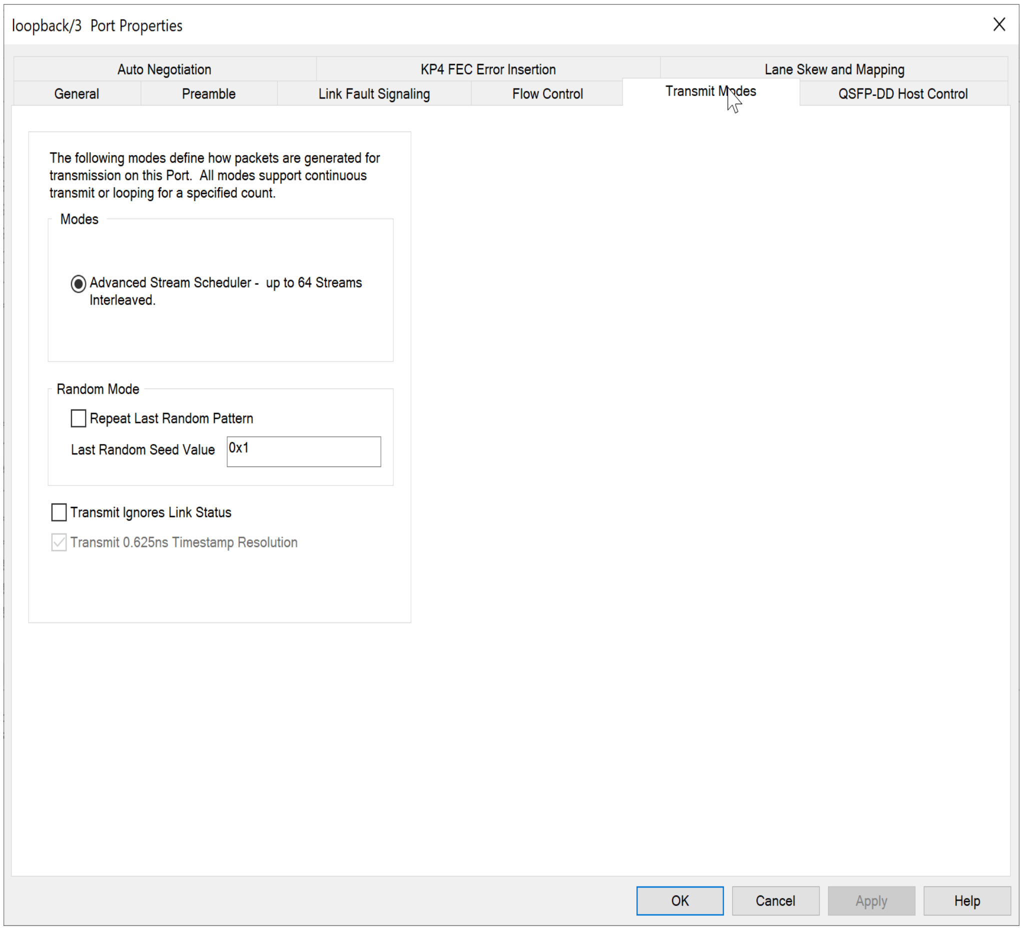
Section	Field/Control	Description
Enable Flow Control	(check box)	Enables the port's MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type	IEEE 802 3x	When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame.
	IEEE 802.1Qbb	When not in Data Center mode, only IEEE 802.3x is available.
	Priority	When flow control type IEEE 802.1Qbb is selected in Data Center mode, priority options are the channels of data that can be paused. Select to select one or more channels.

Section	Field/Control	Description
	PFC Queue	The PFC Queue can be mapped to the priority field in the frame.
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

S400GD-16P-QDD+FAN+NRZ Port Properties—Transmit Modes

The **Transmit Modes** tab for S400GD-16P-QDD+FAN+NRZ load modules is shown in the following image. It is accessed by double-clicking a port in **Resources** window, or by from the context menu of the port by selecting the **Properties** menu option. Then select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following image.



The controls for **Transmit Modes** tab configuration are described in the following table.

Section	Field/Control	Description
Modes	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure the following: • 400 GE - up to 64 streams • 200 GE - up to 64 streams • 100 GE - up to 32 streams • 50 GE - up to 16 streams They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream's

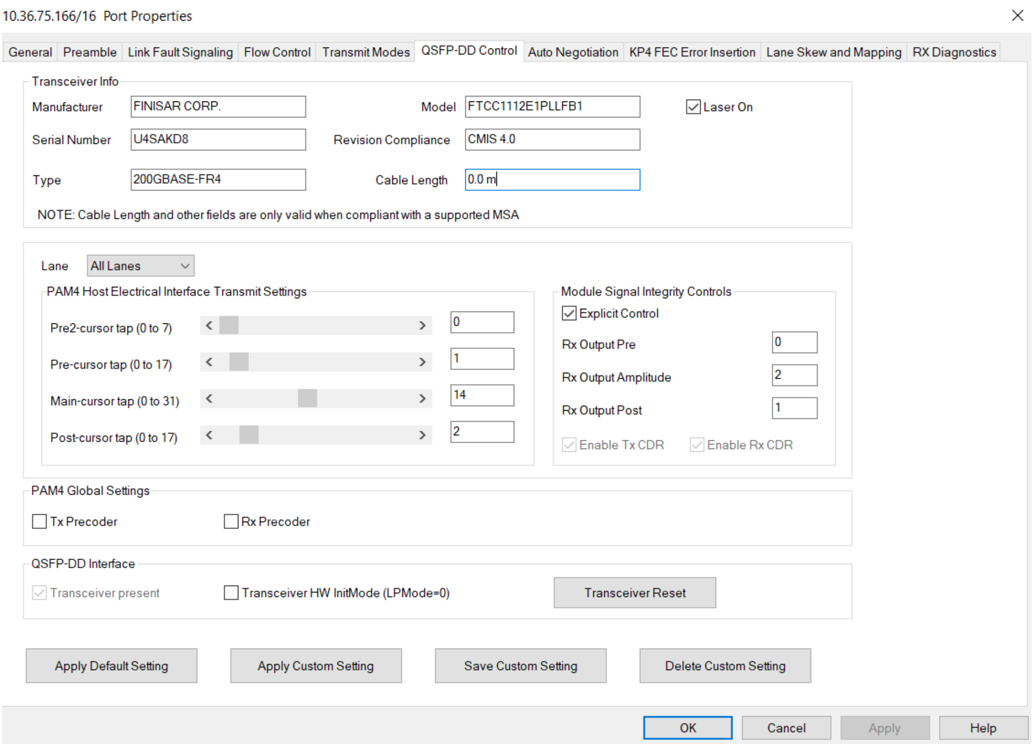
Section	Field/Control	Description
		random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit Ignores Link Status		If selected, will allow transmission of packets even if the link is down.
Transmit High TimeStamp Resolution		If selected, the T400GD-8P-QDD load module will support the following: • 0.625 ns for 400 GE • 1.25 ns for 200 GE • 2.5 ns for 100 GE • 2.5 ns for 50 GE

S400GD-16P-QDD+FAN+NRZ Port Properties—QSFP-DD Control

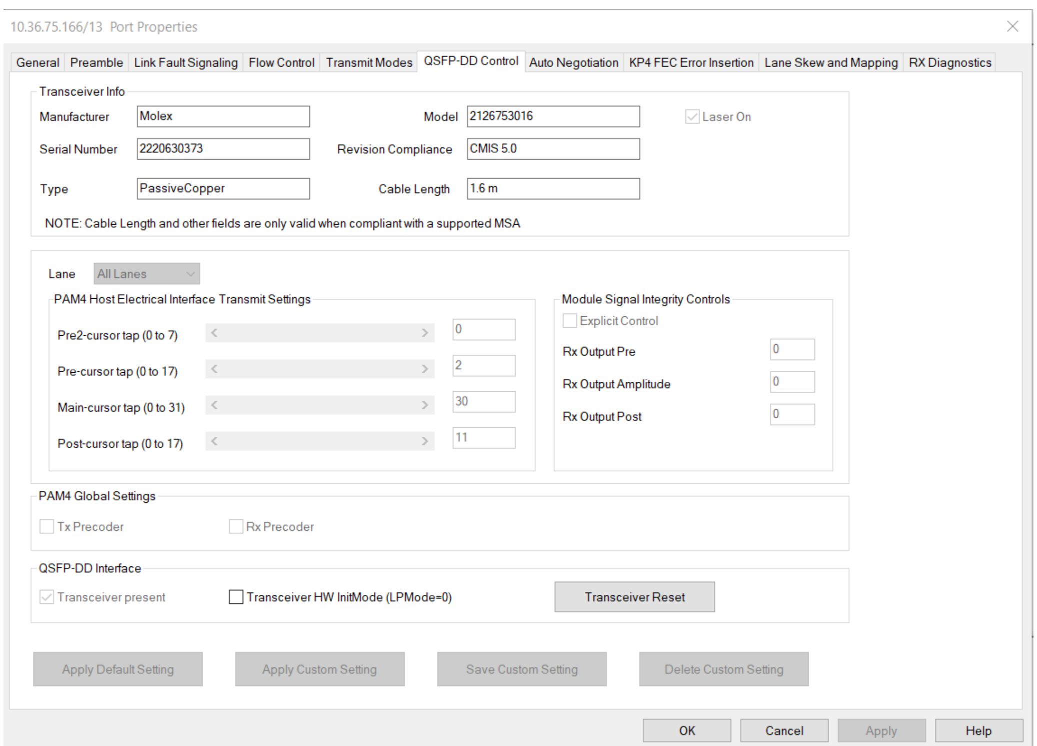
PAM-4 is a four-level pulse-amplitude modulation that uses four distinct amplitude levels to encode two bits of data, essentially doubling the bandwidth of a connection. The PAM4 settings are defined using the **QSFP-DD Control** tab.

The **QSFP-DD Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **QSFP-DD Control** tab.

The Port Properties **QSFP-DD Control** tab for S400GD-16P-QDD+FAN+NRZ when the fiber optic transceiver is used is shown in the following figure:



The Port Properties **QSFP-DD Control** tab for S400GD-16P-QDD+FAN+NRZ when the passive copper transceiver is used is shown in the following figure:



When S400GD-16P-QDD+FAN+NRZ detects an optical transceiver, it will apply a Host Transmit equalization combination that is well suited for optics, and also expose the transceiver's signal integrity controls.

The supported module signal integrity fields of CMIS 3.0 and 4.1 transceivers are listed below:

- Rx Output EQ Control Pre-Cursor
- Rx Output EQ Control Post-Cursor
- Rx Output Amplitude Control
- Tx CDR Control
- Rx CDR Control

The signal integrity fields are configurable based on the capability of the transceiver. The default value and maximum allowed range for each of the fields are read from the transceiver during transceiver initialization.

Section	Field/Control	Description
Transceiver Info		
	Manufacturer	This is the Vendor Name field read from the actual transceiver currently being plugged in.
	Model	This is the Part Number field read from the actual transceiver currently being plugged in.
	Serial Number	The serial number of the transceiver.
	Revision Compliance	The implemented CMIS revision of the transceiver. S400GD-16P-QDD+FAN+NRZ supports both CMIS 3.0 and CMIS 4.0 transceivers. See Management Interface.
	Type	When a transceiver is inserted into the load module, the software reads IEEE registers to determine the transceiver capabilities and media type. If the transceiver contains this information, it is shown in this read-only field.
	Cable Length	The length of Ixia-supplied cable which connects this chassis to the previous chassis in the chain.
	Laser On	Select this check box to enable the laser power.
PAM4 Host Electrical Interface Transmit Settings		
	Pre2 tap (-10 to 40)	This helps to control the Pre2 Tap value for Tx.
	Pre-cursor tap (0 to 17)	This helps to control the Pre Tap value for Tx.
	Main-cursor tap (0 to 31)	This helps to control the Main Tap Control for Tx.

Section	Field/Control	Description
	Post-cursor tap (0 to 17)	This helps to control the Post Tap value for Tx.
Module Signal Integrity Controls		
	Explicit Control	Select this check box to enable the Rx Output pre, Rx Output Amplitude, and Rx Output Post fields. This check box is available for selection only if the fiber optic transceiver is used.
	Rx Output (0 to 7)	Allowed range of values for Rx Output. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Rx Output Amplitude (0 to 3)	Allowed range of values for Rx Output amplitude. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Rx Output Post (0 to 7)	Allowed range of values for Rx Output post. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Enable Tx CDR	Turn on Tx CDR Control. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Enable Rx CDR	Turn on Rx CDR Control . This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
PAM4 Global Settings		
	Tx Precoder	Represents a PAM4 encoding scheme to reduce DFE bit errors. This also means that both sides of the link must have precoder enabled for link to come up.
	Rx Precoder	Represents a PAM4 encoding scheme to reduce DFE bit errors. This also means that both sides of the link must have precoder enabled for link to come up.
QSFP-DD Interface		
	Transceiver HW InitMode	Selecting the check box configures the QSFP-DD InitMode pin to perform the optional Hardware Init mode initialization as

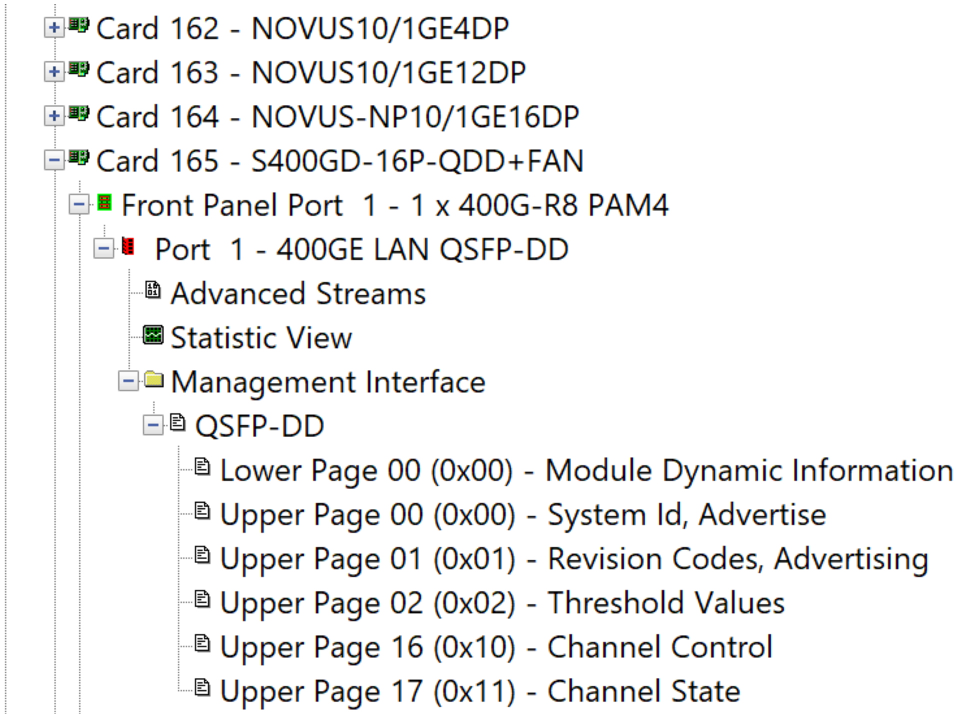
Section	Field/Control	Description
		described in the Common Management Interface Specification (CMIS) Rev 3.0. When a transceiver boots into Hardware Init mode, the datapath is automatically configured by the module without intervention from the host (that is Ixia tester). When disabled, the software-controlled initialization (Software Init) is instead performed. This is the recommended initialization mode for any transceiver since the appropriate checks are performed between the Ixia tester and the transceiver before the module's datapath initialization.
	Transceiver Reset	Resets the transceiver.
	Apply Default Setting	When you select this button, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Setting	When you select this button, if there exists a custom setting in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	When you select this button, if there exists a custom setting in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	When you select this button, if there exists a custom setting in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel with that. If no custom setting exists, users will be prompted that nothing will be deleted.

Management Interface

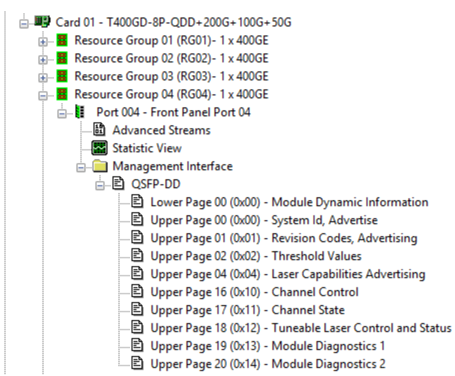
A management interface specification CMIS defines the management interface and associated protocols for all required and allowable management interactions between a CMIS aware host and a CMIS compliant module that are relevant for the host using the module in an application.

The Management Interface appears in the IxExplorer Resources Tree and switches on the fly depending on the CMIS revision. This means that the transceiver automatically reads the management interface and populates the lower and upper pages depending on the transceiver type.

With a CMIS 3.0 (or lower) transceiver, you will see the following pages:



With a CMIS 4.0 transceiver, you will see the following pages:



S400GD-16P-QDD+FAN+NRZ Port Properties—Auto Negotiation

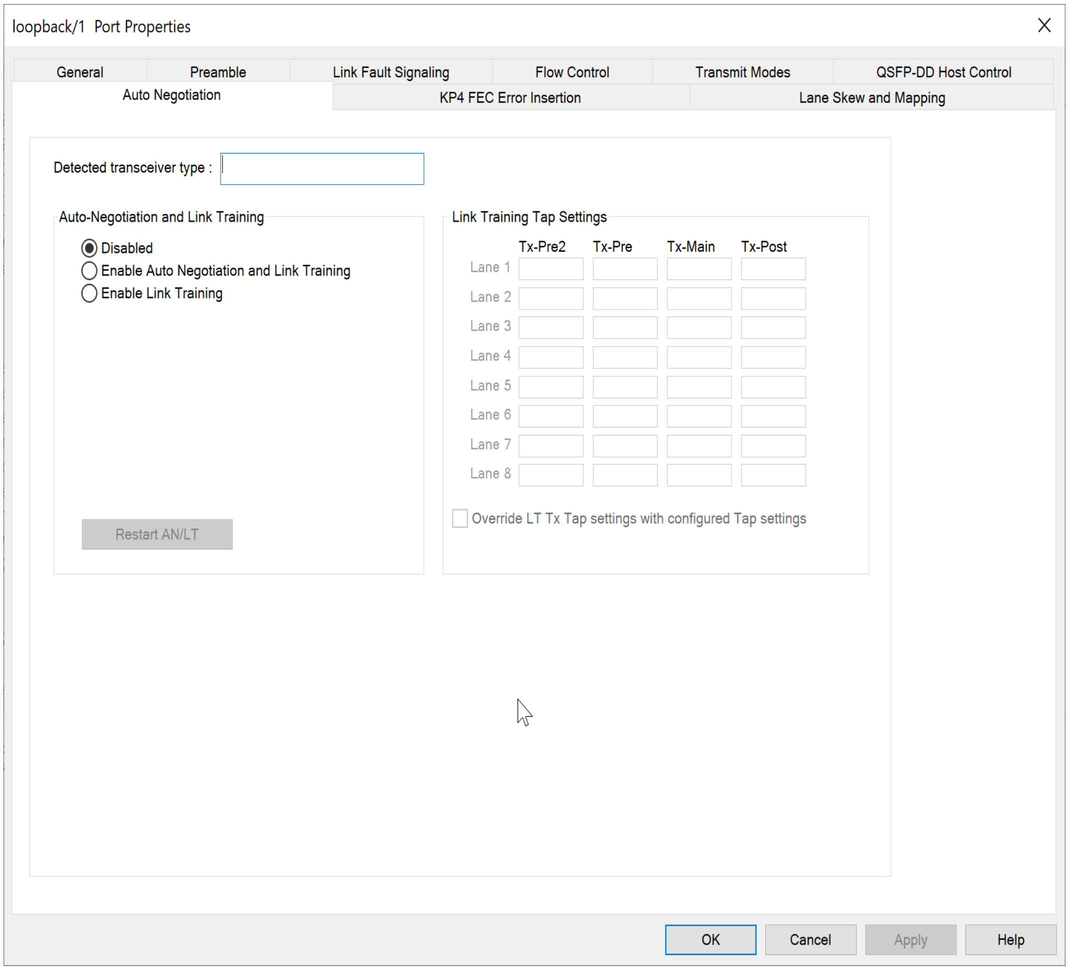
The S400GD-16P-QDD+FAN+NRZ **Auto Negotiation**tab is accessed by selecting a S400GD-16P-QDD+FAN+NRZ port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto Negotiation** tab.

For 800GE-4P-QDD-C module, see 800GE-4P-QDD-C Card Properties—Auto Negotiation.

For 800GE-4P-OSFP-C module, see 800GE-4P-OSFP-C Card Properties—Auto Negotiation.

For 800GE-8P-QDD-M+NRZ module, see 800GE-8P-QDD-M+NRZ Card Properties—Auto Negotiation.

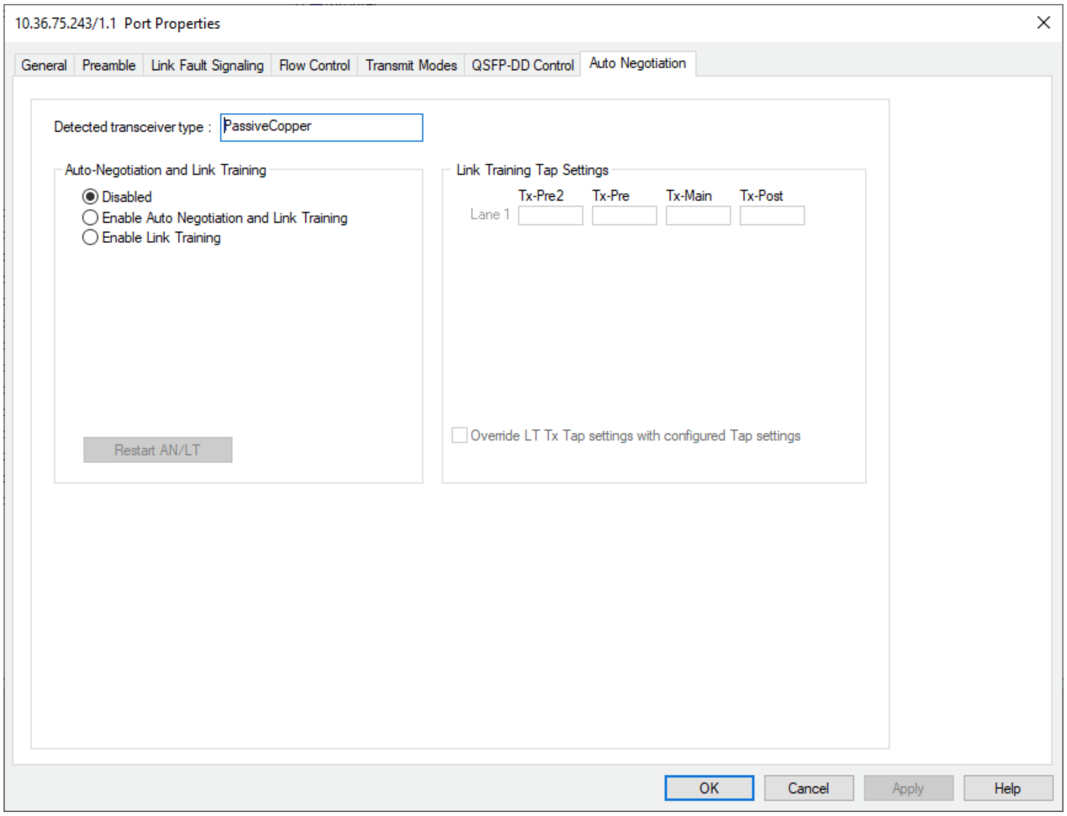
The Port Properties **Auto Negotiation** tab for S400GD-16P-QDD+FAN+NRZ PAM4 speed mode is shown in the following figure:



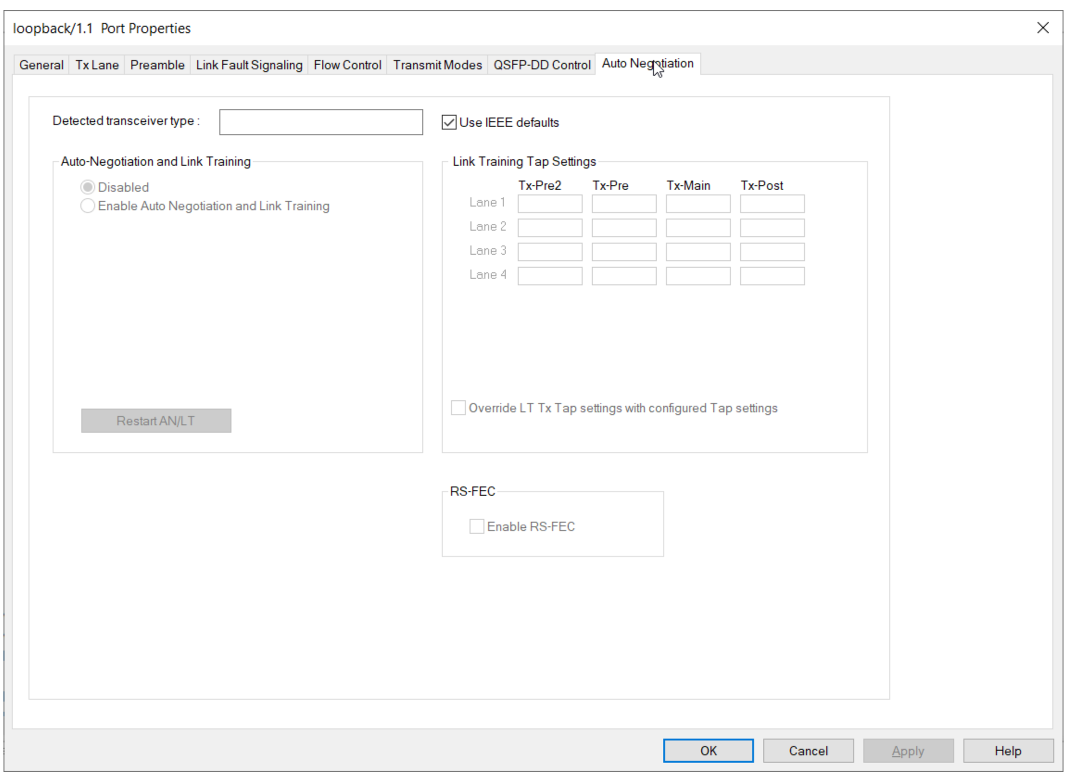
The following lanes are available depending on the port speed:

Speed Mode	Lanes
400GE	8 lanes (1-8)
200GE	4 lanes (1-4)
100GE	2 lanes (1-2)
50GE	1 lane (1)

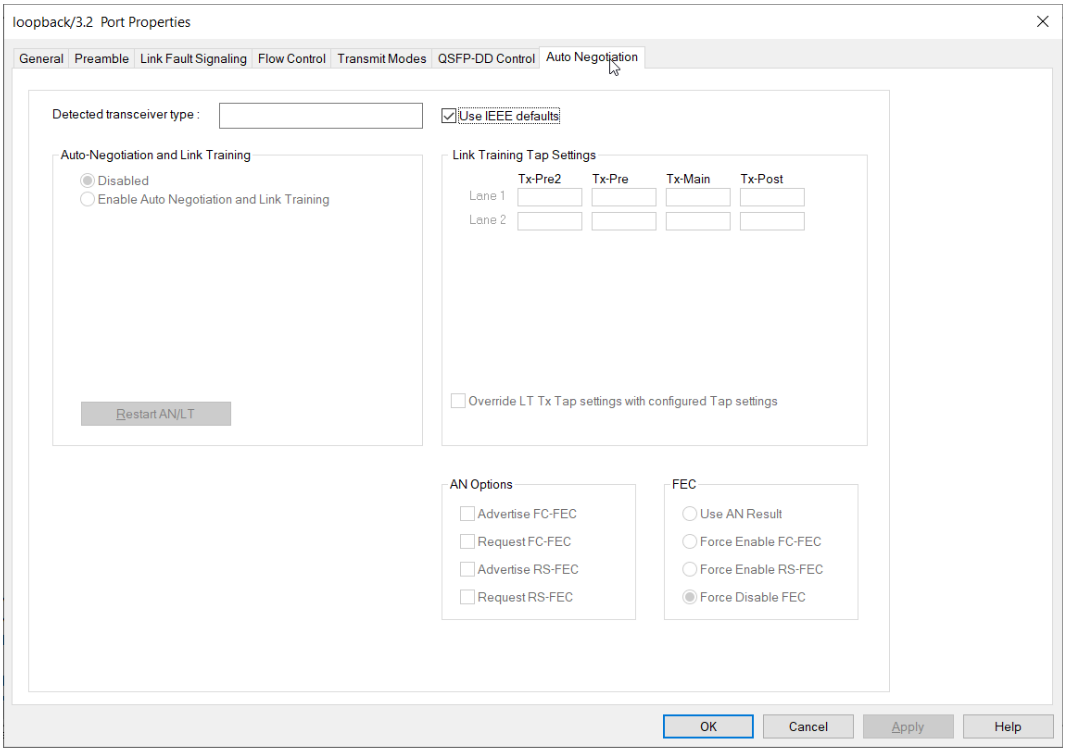
Figure: S400GD-16P-QDD+FAN+NRZ **Auto Negotiation** tab for 50GE PAM4 All Ports, No AN mode



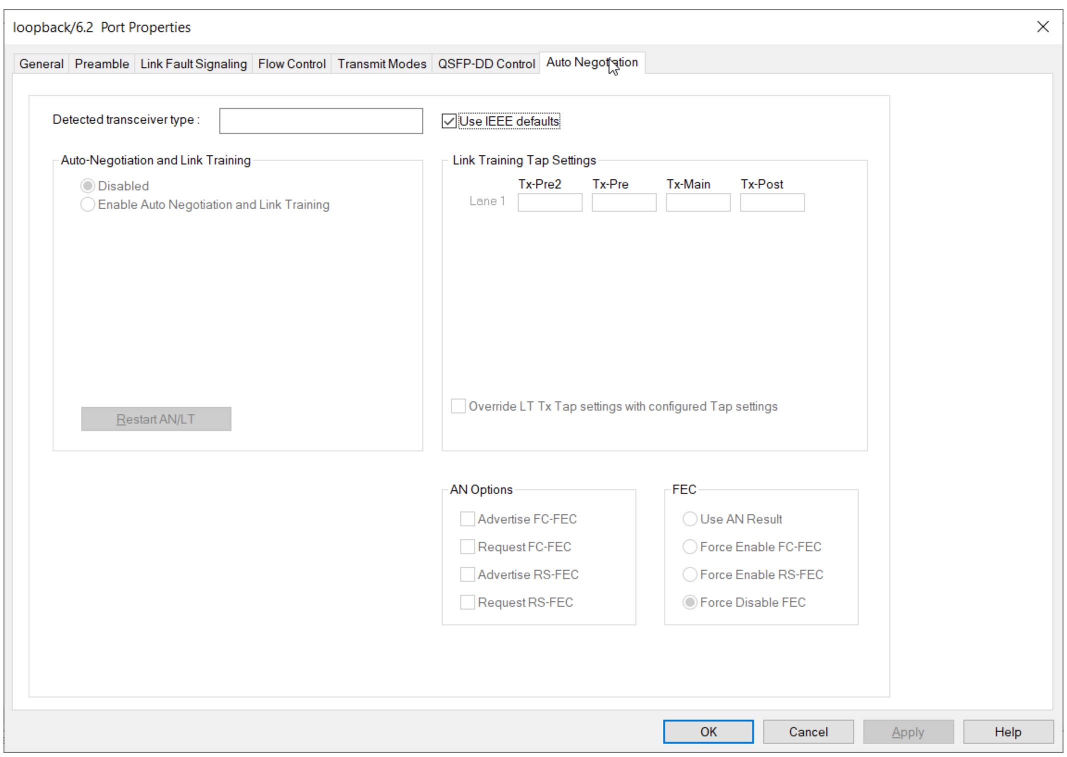
S400GD-16P-QDD+FAN+NRZ **Auto Negotiation** tab for 100 GE NRZ speed mode is shown below:



S400GD-16P-QDD+FAN+NRZ **Auto Negotiation** tab for 50 GE NRZ speed mode is shown below:



S400GD-16P-QDD+FAN+NRZ **Auto Negotiation** tab for 25 GE NRZ speed mode is shown below:



NOTE This tab is not available for 40 GE and 10 GE NRZ speed modes.

The fields and controls in this tab are described in the following table:

Field/Control	Description
Detected transceiver type	The type of transceiver that is plugged in.
Disabled	When you select the check box, the L1 parameters like Autonegotiation, Link Training, and FEC, are enabled or disabled per IEEE requirements, and you will not be able to enable or disable these manually. If the check box is cleared, you will be able to manually enable or disable L1 features – even if it violates IEEE specifications. By default the check box is selected.
Enable Auto Negotiate and Link Training	Auto negotiation controls how a port communicates with other ports.If you select the check box, it allows auto-negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing • **Restart Auto-Negotiate** button is selected (this does a forced restart) NOTE The **Enable Auto Negotiate** check box is available for selection only if the **Disabled** check box is cleared.
Enable Link Training	Select the check box to allow longer length copper cables to be used. This means that during the next Auto-Negotiation, KR training will be used. NOTE This check box is available for selection only if the **Disabled** check box is cleared.
Negotiated the capability above	The text box indicates the speed that was negotiated due to Auto-Negotiation.
Restart AN/LT	Restarts the Auto Negotiate sequence.
Link Training Tap Settings	
Tx-Pre2-cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Pre-cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Main-cursor Lane 1-8	The per-lane transmit main-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Post-cursor	The per-lane transmit post-cursor settings selected by the link training process

Field/Control	Description
Lane 1-8	when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Override LT Tx Tap settings with configured Tap settings	Selecting this check box overrides the taps settings derived by the link training process, and configures the transmit pre/main/post cursor settings and receiver CTLE setting with the static values specified in the **QSFP-DD Host Control** tab.
• Advertise FC-FEC • Request FC-FEC • Advertise RS-FEC • Request RS-FEC	FC-FEC or Fire Code-Forward Error Correction is available for Novus load module for 25G mode. When a port participates in 25G Auto-negotiation, it tells the link partner if it supports FC-FEC and if it wants the link partner to turn FC-FEC on. The four available FC-FEC statistics are: • Advertise FC-FEC: If enabled, the port tells a link partner to support FC-FEC the next time it participates in Auto-negotiation • Request FC-FEC: If enabled, the port tells a link partner to turn on FC-FEC the next time it participates in Auto-negotiation • Advertise RS-FEC: If enabled, the port tells a link partner to support RS-FEC the next time it participates in Auto-negotiation • Request RS-FEC: If enabled, the port tells a link partner to turn on RS-FEC the next time it participates in Auto-negotiation • This check box is available for selection only if the **Use IEEE Defaults** check box is cleared. • FEC should be enabled on both back-to-back ports for the link to be up.
• Use AN Result • Force Enable FC-FEC • Force Enable RS-FEC • Force Disable FEC	The four available statistics are: • Use AN Result: Use FEC decided by Auto-negotiation • Force Enable FC-FEC: Turns FC-FEC on by bypassing Auto-negotiation • Force Enable RS-FEC: Turns RS-FEC on by bypassing Auto-negotiation • Force Disable FEC: Turns FEC off by bypassing Auto-negotiation

S400GD-16P-QDD+FAN+NRZ Port Properties—KP4 FEC Error Insertion

Forward Error Correction (FEC) is a method of communicating data that corrects errors in transmission on the receiving end. Prior to transmission, the data is put through a predetermined algorithm that adds extra bits specifically for error correction to any character or code block. If the transmission is received in error, the correction bits are used to check and repair the data.

NOTE **KP4 FEC Error Insertion** tab is not available for S400GD-16P-QDD+FAN+NRZ PAM4 100G and 50G modes and all NRZ modes.

The **FEC Error Insertion** tab allows to inject FEC errors into transmitted data, and is shown in *Figure: **FEC Error Insertion** Tab*

Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Random

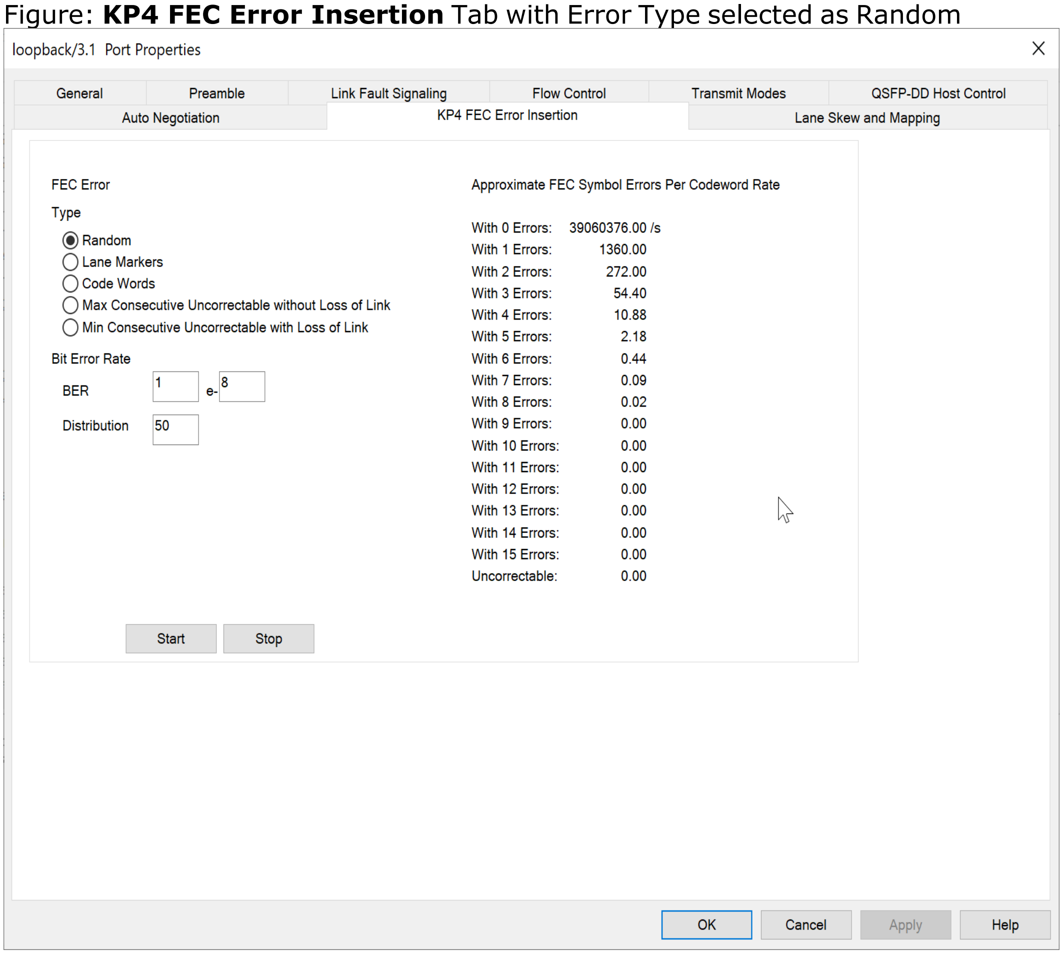


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Lane Markers

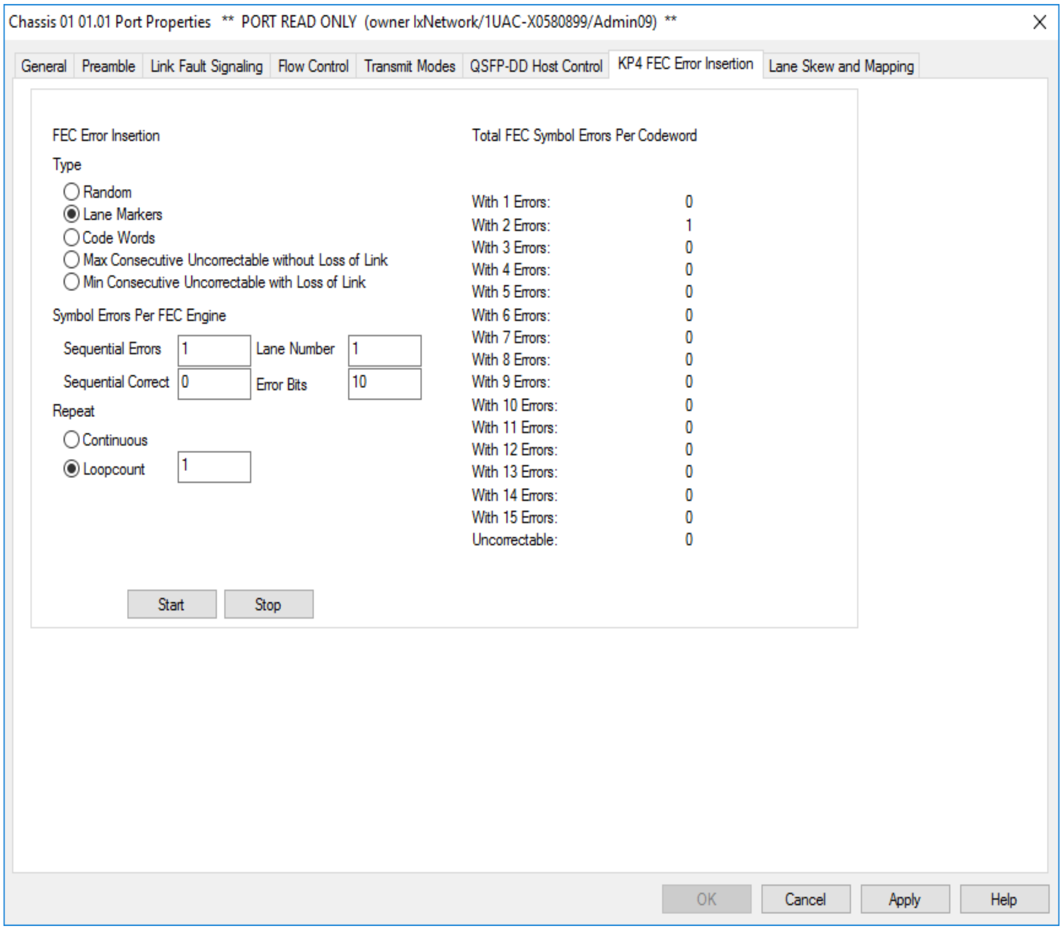


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Code Words

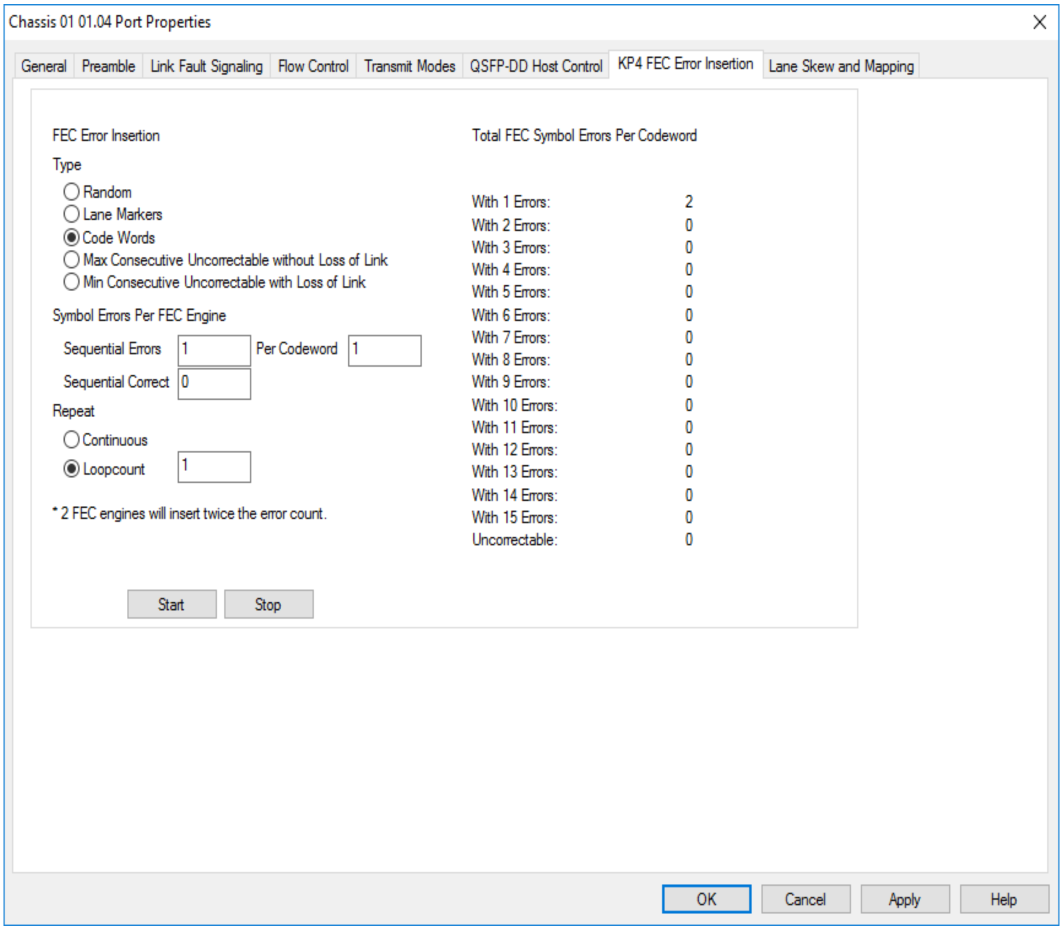


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Max Consecutive Uncorrectable without Loss of Link

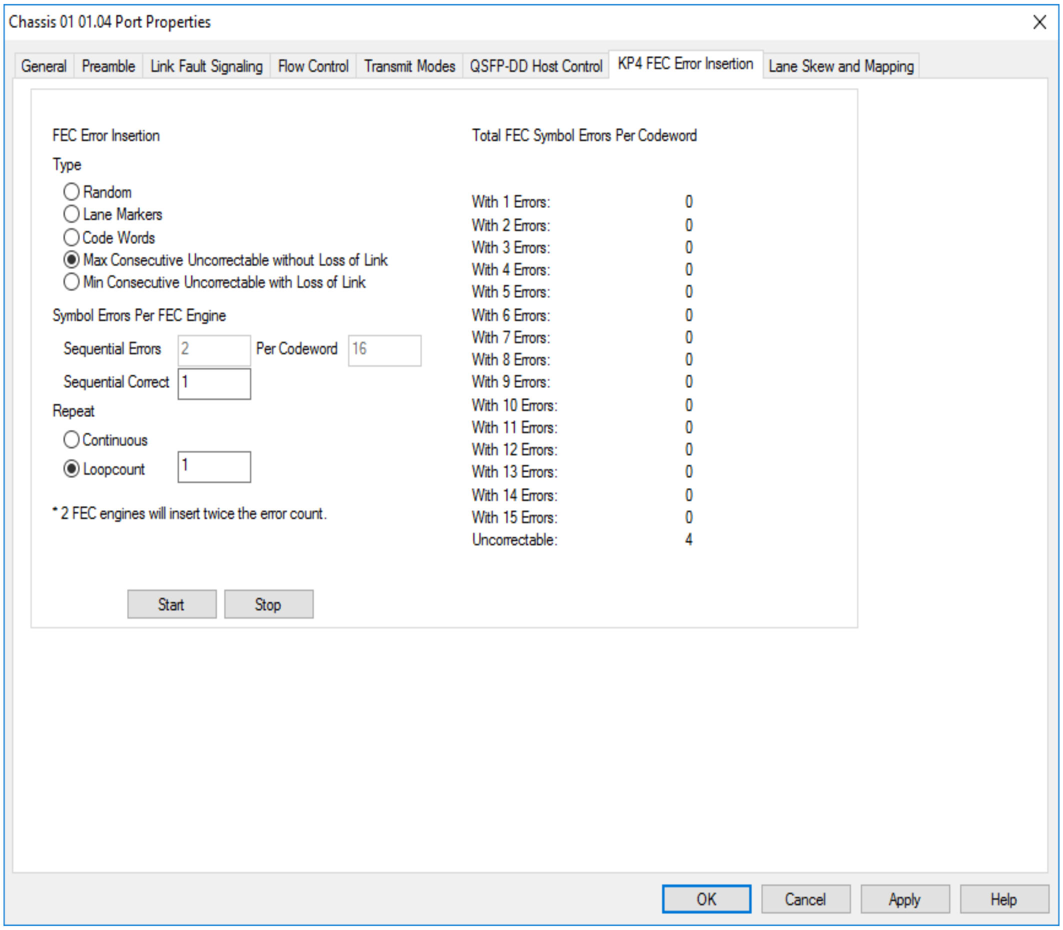


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Min Consecutive Uncorrectable with Loss of Link

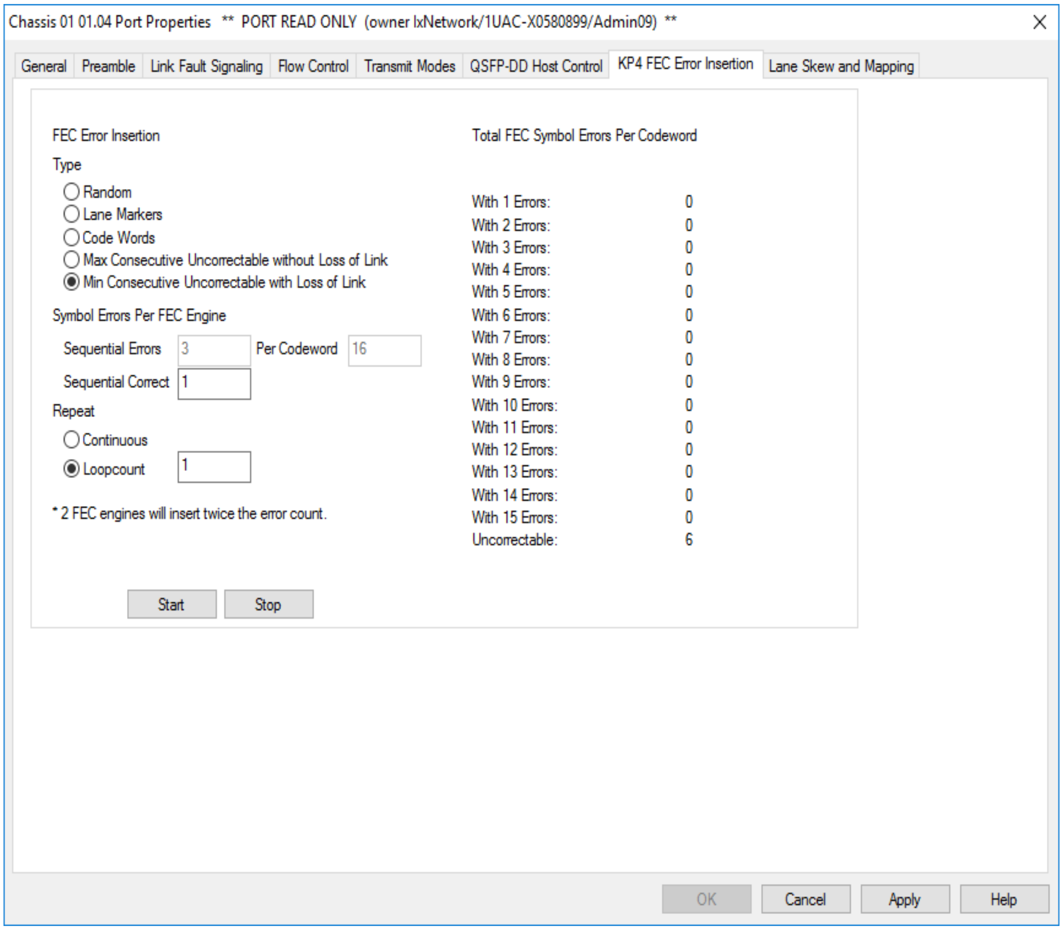


Table: **KP4 FEC** Tab Configuration

Section	Field	Usage
FEC Error Insertion		
Type	Random	Random FEC symbol error insertion will introduce a deterministic number of errors, evenly spread across all PCS lanes, on top the intrinsic BER (Bit Error Rate) of the interconnect.
	Lane Markers	Inserts errors only in the Lane Marker fields.
	Code Words	This is the fundamental unit of data that the FEC engine operates on sequentially. It is composed of blocks that carry the payload and parity information for the 64/66B scrambled data that arrives from the PCS Scrambler on Egress and from the PMA on Ingress.The code word size and layout can vary from each coding scheme. For example, RS, KR, and KP4 all have different code words because their coding schemes are different.
	Max Consecutive Uncorrectable	Uncorrectable errors are those with more than 15 symbol errors. As per IEEE, the maximum number of consecutive uncorrectable errors without loss of link is 2.

Section	Field	Usage
	without Loss of Link	
	Min Consecutive Uncorrectable with Loss of Link	The Max Consecutive Uncorrectable WITHOUT Loss of Link + 1. This is the threshold where the receiver should declare Local Fault due to bad data. The minimum number of consecutive uncorrectable errors with loss of link is 3.
Bit Error Rate	BER	The Bit Error Ratio (BER) is the ratio of the number of error bits compared to the total number of bits transmitted. In the BER field, enter the coefficient of the BER.The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	e-	Enter the exponent of the BER. The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	Distribution	Controls how the errors are distributed. This modifies the probability distribution of errors while maintaining the average Bit Error Rate. For example, you can have a BER of 10E-8 but have all of the errors be single errors OR you can have the errors be distributed across a variety of errors. The purpose is to thoroughly test a receiver to see if all possible errors are being corrected at varying rates.
Symbol Errors Per FEC Engine		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Sequential Errors	In burst mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.

Section	Field	Usage
		NOTE Per 802.3bs and 802.3cd, reception of 3 or more consecutive uncorrectable codewords will result in Loss of Link. In burst mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. This sequence will be repeated until stopped. NOTE Per 802.3bs and 802.3cd, reception of 5 or more Alignment Marker errors will result in Loss of Link. • In 400G mode, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines. • The symbol errors are not evenly distributed across the PCS lanes (use Random error insertion mode for that case) • The maximum number of sequential uncorrectable errors without loss of link is 2 and the minimum number of sequential uncorrectable errors with loss of link is 3.
	Lane Number	The Lane Number specifies which PCS lane will be affected by the Lane Marker error insertion.This field is available only if you select the error insertion type as Lane Markers.
	Sequential Correct	The number of consecutive code words without errors.
	Error Bits	The Error Bits specifies how many errors will be inserted on each of the two symbol errors of the codeword that carries the Lane Marker. There is a minimum Error Bits required (2) before corrupting the symbol that maps to the Lane Marker field. This field is available only if you select the error insertion type as Lane Markers.
	Per Codeword	Codeword is a block of contiguous packets on the line. All RS-FEC codewords are of the same size.The Per Codeword value denotes the number of symbol errors per codeword to insert. KP4 FEC can correct up to 15 symbols, and detect up to 30 symbols. If the user specifies 16, an Uncorrectable Codeword will be issued. This field is available only if you select the error insertion type as Code Words.

Section	Field	Usage
Repeat		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Continuous	Continuous error insertion.In continuous mode, the Sequential Errors field will specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.
	Loopcount	The sequence of correct and incorrect codewords or symbol errors inserted will be repeated by the number specified in the Loopcount field.
Start		Starts the error insertion process.
Stop		Stops the error insertion process.
Appropriate FEC Symbol Errors Per Codeword Rate		The Appropriate FEC Symbol Errors Per Codeword Rate is an approximation for how many symbol errors there will be per codeword every second. NOTE In 400G mode, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines.

S400GD-16P-QDD+FAN+NRZ Port Properties—Lane Skew and Mapping

The **Lane Skew and Mapping** tab allows to control the PCS lane order and skew rate for each lane.

For more information on Lane Skewing, see the Lane Skew topic in the 'Multilane Distribution Configuration' chapter of the *Ixia Platform Reference Manual*. The Lane Skew topic is located under 'Types of Ports' / '100GE'.

NOTE **Lane Skew and Mapping** tab is not available for S400GD-16P-QDD+FAN+NRZ PAM4 100G and 50G modes and all NRZ modes.

The S400GD-16P-QDD+FAN+NRZ Port Properties **Lane Skew and Mapping** tab for the 400GE and 200GE speed modes is shown in the following figure:

Figure: S400GD-16P-QDD+FAN+NRZ **Lane Skew and Mapping** tab for 400GE

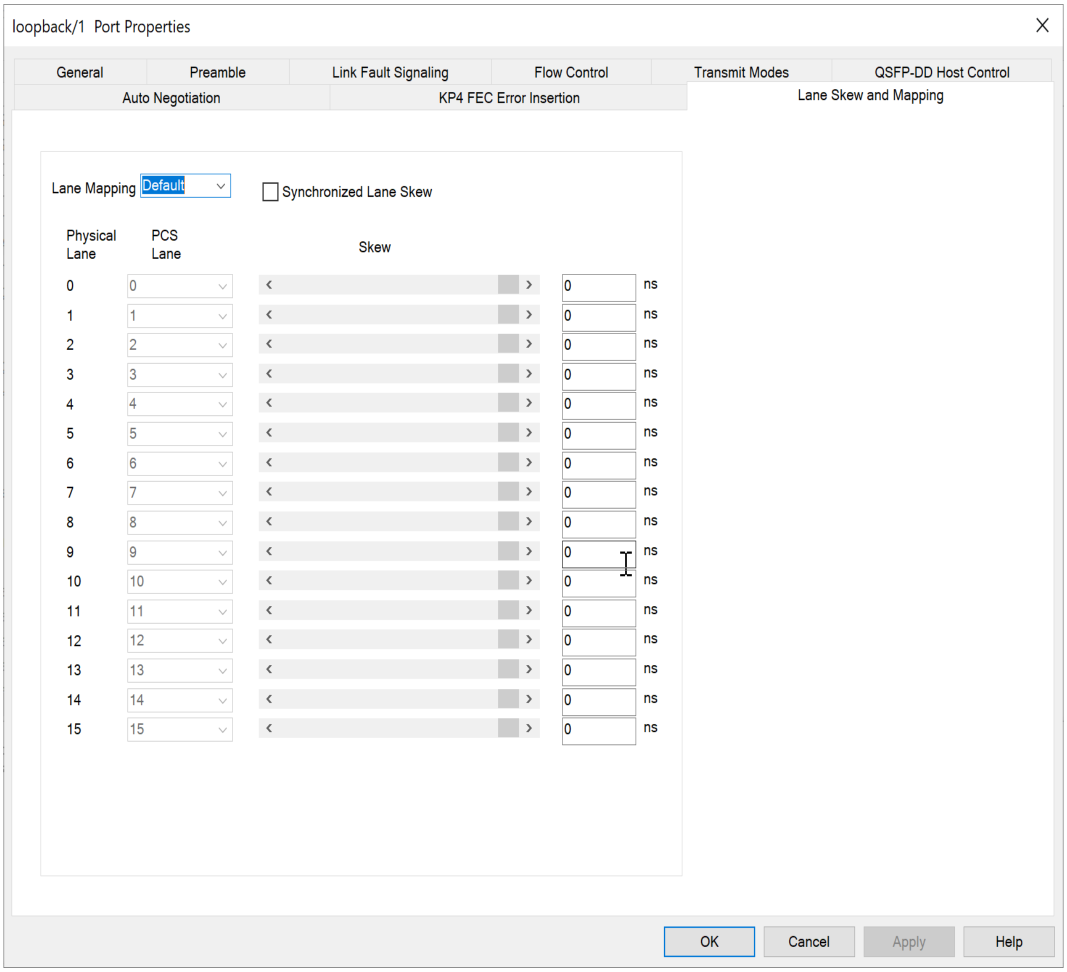


Figure: S400GD-16P-QDD+FAN+NRZ **Lane Skew and Mapping** tab for 200GE

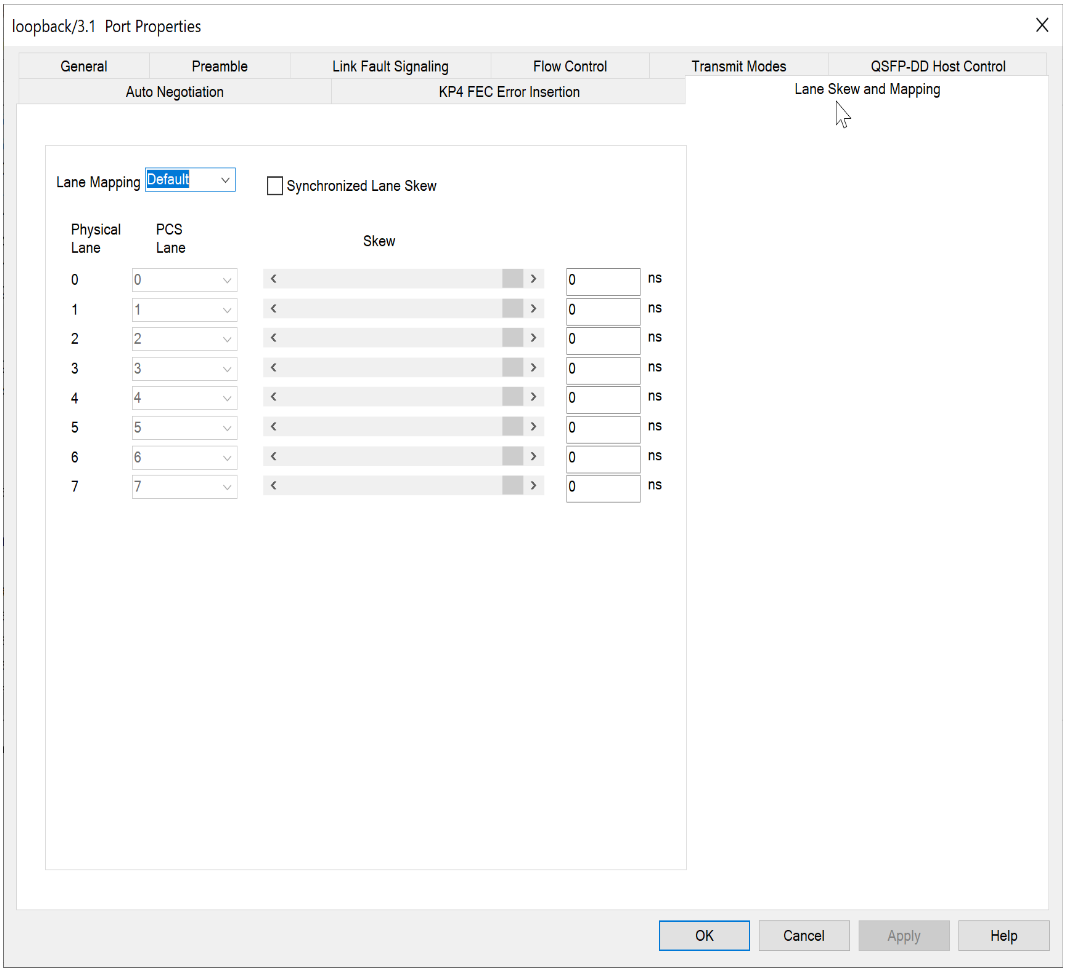


Table: Lane Skew and Mapping Configuration

Field	Description

Lane Mapping	Allows you to select a PCS lane ordering method. There are five options:
	• Default: The default ordering method. The default order is each physical lane corresponds to single PCS lane.
	• Incrementing:
	  ▪ For 400G, orders the lanes from 0 to 15, straight down the list.
	• Decrementing:
	  ▪ For 400G, orders the lanes from 15 to 0, straight down the list.
	• Custom: Allows to put the lanes in any order by manually entering the numbers in the fields. The starting order is the last selected mapping. Mapping between physical and PCS lanes should be one-to-one, else it will result into link down.
	• Random: Allows to put the lanes in any random order, values will be any value from 0 to the total number of lanes.

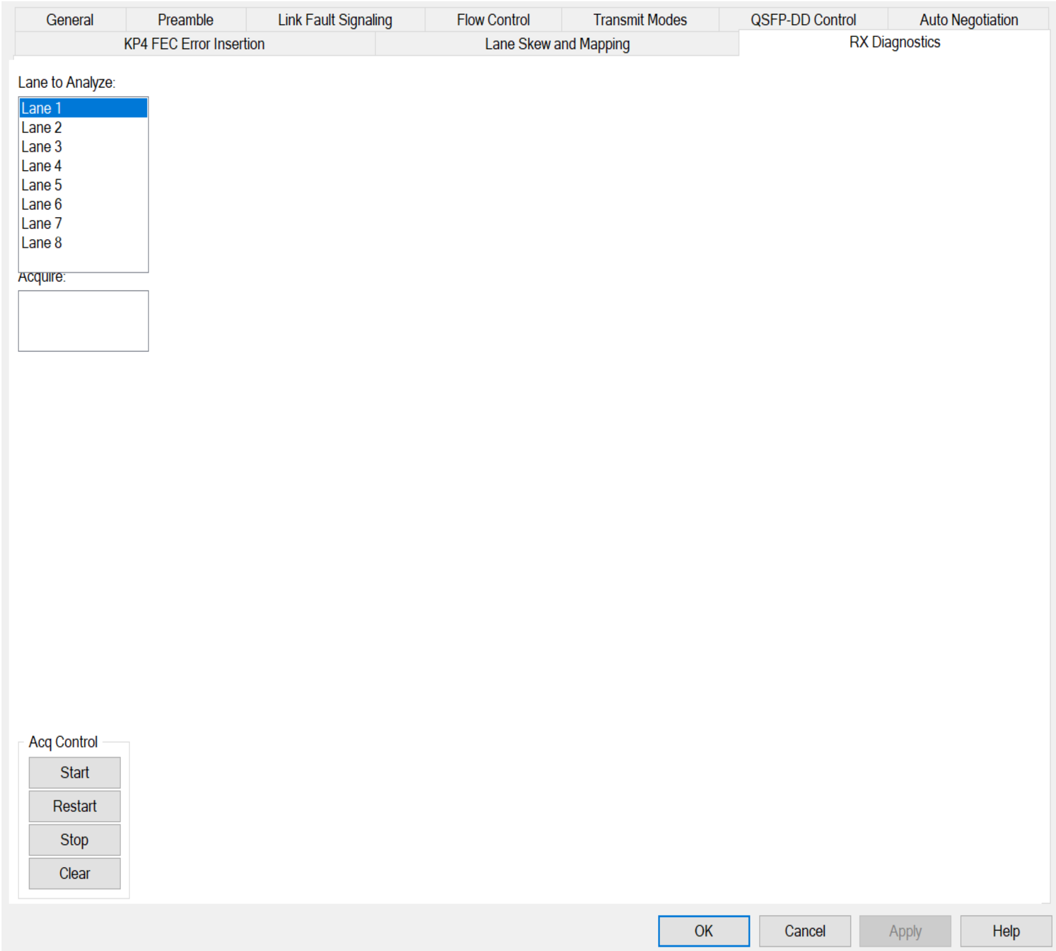
Synchronized	If selected, enables to synchronize the skewing or delaying of one or more PCS

Field	Description
Lane Skew	lanes.
Physical Lane	The physical lane identifier. The physical lane is paired with a corresponding PCS lane.
PCS Lane	A number identifier for the PCS lane. The PCS lane is paired with a corresponding physical lane.
Skew	The skew slider is used to set a skew value for the PCS lane, in nanoseconds, on the transmit side. Lane Skew is the ability to independently delay one or more of the total number of PCS lanes. When the slider is moved, the nanoseconds field is correspondingly adjusted. You can also enter a nano second value directly into this field. When the slider is fully pushed to the right, the skew injected into the transmit stream is 0 (minimum). When the slider is pushed all the way to the left. the skew injected into the transmit stream is 1002.918 ns (maximum).

S400GD-16P-QDD+FAN+NRZ Port Properties—RX Diagnostics

The S400GD-16P-QDD load module has eight electrical lanes at the cage where you insert your optics or DACs. In order to evaluate the link quality and determine if the transmitters are driving the right kind of signal, you can diagnose the signals that are actually being received at the electrical lane receivers. The **RX Diagnostics** tab allows you to do this.

The S400GD-16P-QDD Port Properties **RX Diagnostics** tab, with no data, is shown in the following figure:



S400GD-16P-QDD adds NRZ analysis, which means:

- Two signal levels instead of four
- One bathtub eye instead of three
- No Rlim or VEC readings
- Bathtub plot goes down to E-18 instead of E-12
- Default BER for Eye Height drops from E-8 to E-15

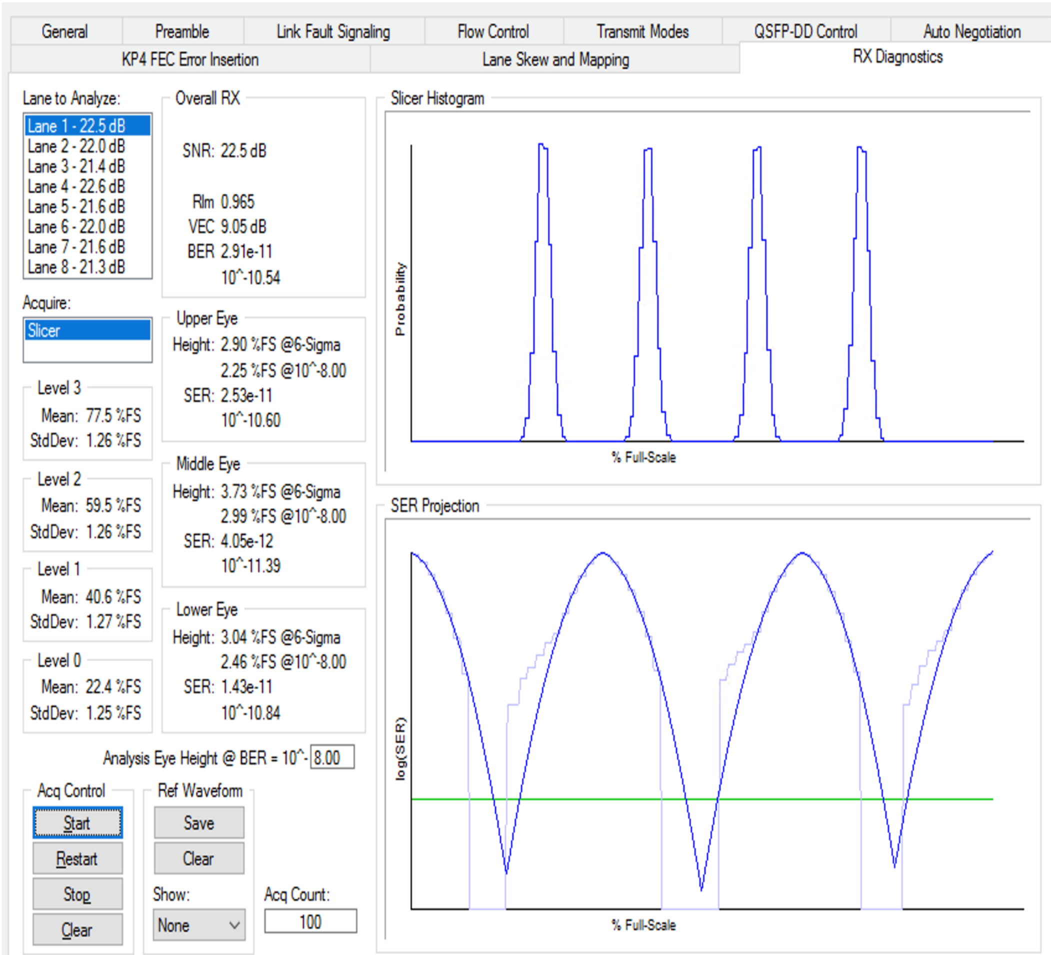
NOTE On S400GD-16P-QDD, it will not perform acquisitions if any port in the same QSFP-DD connector has autonegotiation or link training available. Furthermore, if any port in the same QSFP-DD connector has not linked up at the same time as acquisitions are being performed, then both the acquisitions and link-up process may be impaired.

Slicer

You can view the electrical signal at the Slicer. Here, we get a measurement of the signal at the point where a PAM4 code {0, 1, 2, 3} or NRZ code {0,1} is determined. This represents the quality of the signal with the best-effort adaptation of the receiver.

NOTE This feature is available only with an additional license.

At the slicer, the full set of analytics is shown, including the histogram and Symbol Error Ratio (SER) Projection plot.



The following analytics are shown:

- **Statistical performance of each of the four levels**

  The statistical performance of each of the four levels in the Slicer Histogram are reported in the **Level 0**, **Level 1**, **Level 2**, and **Level 3** boxes.

  NOTE All Mean, StdDev, and Height measurements are in units of RX DSP codes which are subject to amplitude and filter adjustment as driven by receive adaptation.

- **SER Projection graph**

  The **SER Projection** graph shows the projected Symbol Error Ratio (SER) along the vertical axis of the three eyes; this is commonly called a vertical bathtub curve.

  - The X axis is a slicer threshold, in units of percentage of full-scale.
  - The Y axis is the projected SER for the given eye if the slicer threshold were used. This is a fixed logarithmic range. A lower Y value in the middle of the eye represents higher link quality.

  - The lighter blue plot is the measured SER, based on the Slicer Histogram graph.
  - The darker blue plot is the projection beyond the actual measurement. As more data comes in, the projection becomes more accurate. For S400, it is best to wait for the **Acq Count** to be above 20 before drawing any conclusions from the projection.
  - The green horizontal line represents where the **Analysis Eye Height @ BER** is configured.

- **Vertical projections of the three eyes**

  Vertical projections of the three eyes in the SER Projection are reported in the **Upper Eye**, **Middle Eye**, and **Lower Eye** boxes. The following details are shown:

Diagnostics	Description
Height @6-sigma	The eye height at 6 standard deviations (StdDev) distance from the means. A higher value represents better link quality for a given target BER.
Height @10^-X.XX	The projected eye height at the Analysis Eye Height. This measures how much margin is present for a given eye relative to a target BER. This is a useful measurement for comparing the links. It can be useful in selecting TX and RX tap values or comparing copper cable quality. A higher value represents better link quality.
SER	The projected final Symbol Error Rate (SER) for the given eye. This corresponds to where the projected eye height reaches zero. A lower value represents better link quality.

NOTE

Two equivalent forms of this measurement are provided:
- the first as a mantissa-exponent (for example, 4.22e-12)
- the second as a power of ten (for example, 10^-11.38).

Both values are equal. The first form is the same as what is found elsewhere in IxExplorer and the second form allows a quick comparison, since the exponent is the only thing that needs to be compared.

- **Overall RX**

  In the **Overall RX** box you can view the following indications from the Slicer measurement:

Diagnostics	Description
Rlm	The linearity measurement as identified by the **Level 0**, **Level 1**, **Level 2**, **Level 3** boxes. 1.000 represents perfect linearity and the value lowers as linearity decreases. This measurement reflects IEEE 802.3 clause 120D.3.1.2, but it should not be used as a compliance test.
VEC	The Vertical Eye closure as identified by the SER Projection. A lower value represents better link quality. This measurement reflects IEEE 802.3 clause 120E.4.3, but it should not be used as a compliance test.
BER	The final projected BER of the link, composited from the SER readings in the **Upper Eye**, **Middle Eye**, and **Lower Eye** boxes. See the description of the SER readings in the previous section for more

Diagnostics	Description
	details.

NOTE

- This BER projection is based on rather sparse data and an idealized model of the slicer. Furthermore, it does not take into account the re-timing that may be present in an optical transceiver. Therefore, this cannot be compared against the pre-FEC bit error rate that is reported elsewhere in IxExplorer.
- Bit Error Rate (BER) and Symbol Error Rate (SER) relate to each other for an Ethernet signal: BER = SER / 2. In terms of a power of 10: log10(BER) = log10(SER) - 0.301.
  This relationship assumes randomly distributed bit errors on a uniform distribution of PAM4 or NRZ codes and the use of gray-coding in PAM4, as present in Ethernet.

Fields and Controls

The fields and controls that allow you to analyze the electrical signals are explained in the following table:

Field	Description
Lane to Analyze	Allows you to select a physical lane you want to analyze. This also reports the SNR for convenience.
Acquire	Enables you to start the acquisition at the Slicer, which is available only with an additional license.
Acq Control	Controls the histogram acquisition for all lanes simultaneously on a port. Options include the following: **Start**: Acquires 100 captures. **Restart**: Clears previous results and starts. **Stop**: Stops acquiring captures. **Clear**: Clears previous results and stops acquiring captures.
Acq Count	Shows how many captures of the particular type were acquired on that lane.
Ref Waveform	Shows the reference waveforms. • **Save**: Saves all acquired lane histograms as reference for comparison. The reference data is stored on a per-port, per-type basis by IxExplorer, and it will go away if IxExplorer closes. • **Clear**: Clears all reference histograms. • **Show**: Controls the view of reference waveforms as a red plot in the Slicer Histogram and SER Projection, as follows:

Field	Description
	- None (shows no reference) - Current Lane (shows reference for the current lane) - Lane N (shows the reference for a specific lane for the current port)

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CHAPTER 37

Port Properties–800GE-4P-QDD Load Modules

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the 800GE-4P-QDD load modules.

Following variants of 800GE are available:

- 800GE-4P-QDD - Full and reduced
- 800GE-2P-QDD - Full and reduced

Port Properties for 800GE-4P-QDD Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option.

The complete specification for the 800GE-4P-QDD load module is found in the *Ixia Platform Reference Manual*.

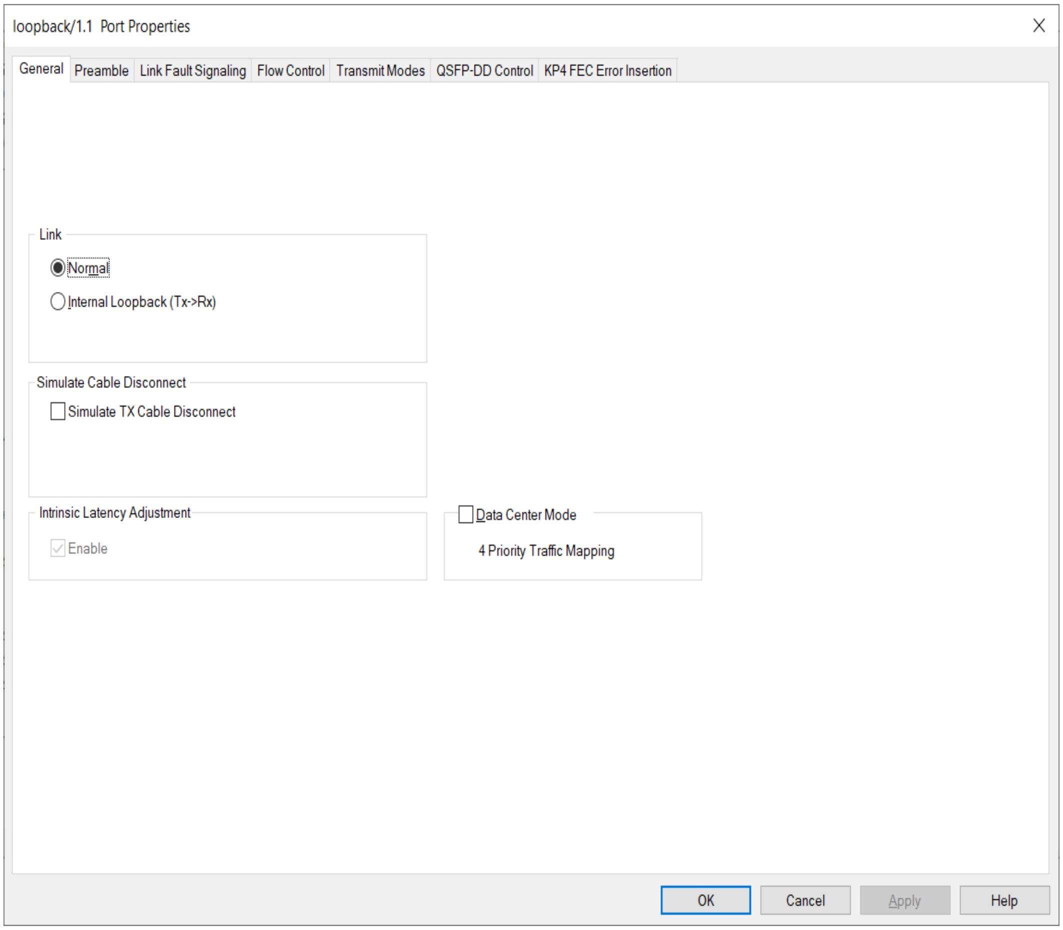
The following port property tabs are available for 800GE-4P-QDD modules:

- 800GE-4P-QDD Port Properties—General
- 800GE-4P-QDD Port Properties—Preamble
- 800GE-4P-QDD Port Properties—Link Fault Signaling
- 800GE-4P-QDD Port Properties—Flow Control
- 800GE-4P-QDD Port Properties—Transmit Modes
- 800GE-4P-QDD Port Properties—QSFP-DD Control
- 800GE-4P-QDD Port Properties—KP4 FEC Error Insertion

800GE-4P-QDD Port Properties—General

The 800GE-4P-QDD **General** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, and then selecting the **General** tab.

The Port Properties **General** tab for 800GE-4P-QDD is shown in the following figure:



The controls for **General** tab configuration are described in the following table:

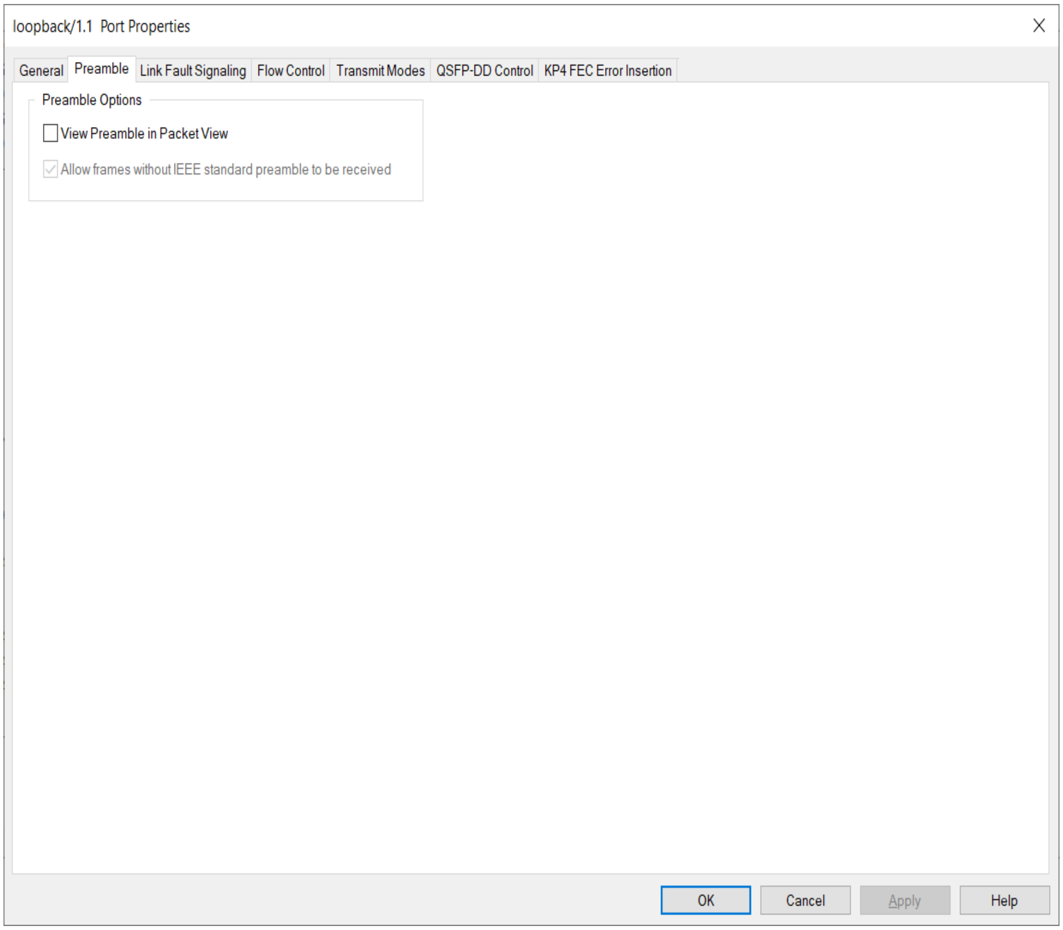
Section	Control/Field	Usage
Link	Normal	Normal operation
	Internal Loopback (Tx -> Rx)	Select this check box to turn on Internal Loopback—Transmit to Receive.
Simulate Cable Disconnect	Simulate TX Cable Disconnect	If this is selected, the port acts as if the cable has been disconnected on the transmit side only. Incoming packets may still be received and port may show link up, but no packets or PCS data will be transmitted.
Intrinsic Latency Adjustment	Enable	The **Enable** check box is selected by default. This enables the intrinsic latency adjustment. The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia*

Section	Control/Field	Usage
		Platform Reference Manual.
Data Center Mode		If selected, enables the Data Center Mode option. When Data Center Mode option is selected, the following changes take place: • The selected port is automatically placed into Advanced Stream mode. In this case, Packet Stream mode is not supported. • Only Auto Intrumentation mode (Floating Timestamp/Data Integrity) is supported, both for transmit and receive. • 4-Priority Traffic Mapping is enabled. It supports various frame size for each PFC control (0-4). NOTE This feature is not supported in 800 GE speed mode. • FCoE protocol can be edited for Ethernet II and Ethernet Snap in **Frame Data** tab.

800GE-4P-QDD Port Properties—Preamble

The preamble precedes the frame, but is not part of the frame itself.

The 800GE-4P-QDD Port Properties **Preamble** tab is shown in the following figure:



The fields and controls in this tab are described in the following table:

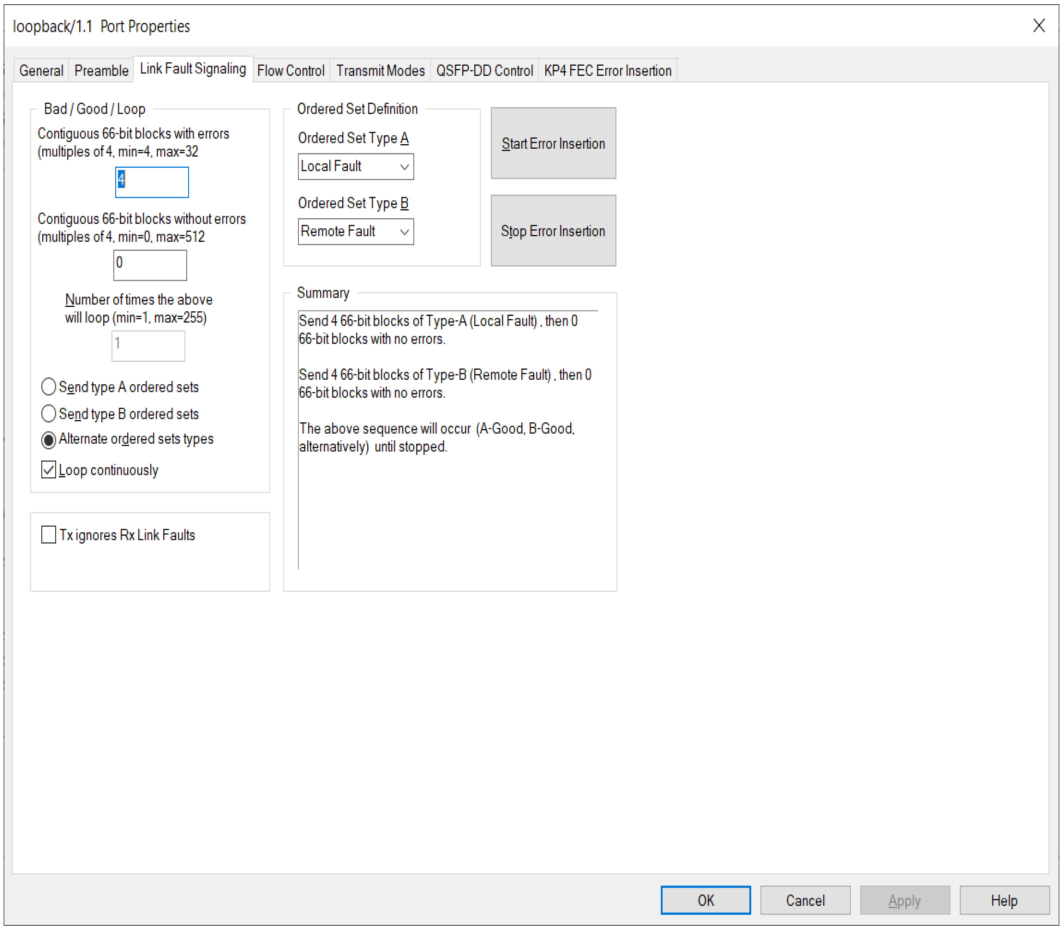
Section	Choices	Description
Preamble Options	View Preamble in Packet View	When this check box is selected, the preamble data will be visible in the Packet View (transmit side) and the Capture View (receive side).
	Allow frames without IEEE standard preamble to be received	When this check box is selected, it allows frames without IEEE standard preamble to be received. • This check box is selected by default.

800GE-4P-QDD Port Properties—Link Fault Signaling

When **Link Fault Signaling** is enabled, four statistics will be added to the list in Statistic View for the port. One is for monitoring the Link Fault State. Two provide a count of the Local Faults and Remote Faults. The last one is for indicating the state of error insertion, whether or not it is ongoing

The **Link Fault Signaling** tab is accessed from the context menu of the a port in **Resources** pane by selecting the **Properties** menu option, or by double-clicking a port in the **Detail** pane. Then select the **Link Fault Signaling** tab.

The **Link Fault Signaling** tab for 800GE-4P-QDD load module is shown in the following image.



The controls for **Link Fault Signaling** tab configuration are described in the following table.

Section	Field/Control	Description
Bad/Good/Loop	(Bad) Contiguous 66-bit blocks with errors (multiples of 4; min = 4, max = 32)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks with errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive fault sequences allowed are minimum 4 sequences and maximum 32 sequences.
	(Good) Contiguous 66-bit blocks without errors (multiples of 4; min = 0, max = 512)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks without errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive regular data sequences allowed are minimum 0 sequences and maximum 512 sequences.
	Number of times the above will loop (min = 1, max = 255)	Specifies the number of loops for the user defined sequence. Options include the following: • Discrete iterations:

<table>
<tr><th>Section</th><th>Field/Control</th><th>Description</th></tr>
<tr><td rowspan="3"></td><td></td><td>1. Minimum of 1 iteration
2. Maximum of 255 iterations
• Continuous loop
1. User cannot specify number of iterations</td></tr>
<tr><td>Options include the following:
• Send type A ordered sets
• Send type B ordered sets
• Alternate ordered set types</td><td>Defines the ordered set pattern that will be sent. (The two Ordered Sets—A and B—are defined in the Ordered Set Definition box in this tab.) This pattern will be combined with the Good blocks/Bad blocks pattern for transmission.
• Only Type A fault sequence and regular good data sequences
• Only Type B fault sequence and regular good data sequences
• Alternate Type A, regular good data sequences and Type B fault sequence, regular good data sequences
NOTE If this field is available, and the Alternate ordered set types option is selected, the minimum value for this field should be '2,' to allow the entire pattern to be sent once. If left at the minimum value of '1'— only two groups of blocks (one of good blocks and one of bad blocks) will be sent, which means that only the first ordered set will be sent. A minimum of eight blocks is required for one complete pattern including Types A and B.</td></tr>
<tr><td>Loop continuously</td><td>If selected, the loop defined by the combination of the Bad and Good blocks plus the pattern of ordered sets, will be transmitted continuously until the Stop Error Insertion option is selected.</td></tr>
<tr><td rowspan="2">Ordered Set Definition</td><td>Ordered Set Type A</td><td>Options include the following:
• Local Fault
• Remote Fault</td></tr>
<tr><td>Ordered Set Type B</td><td>Options include the following:
• Local Fault
• Remote Fault</td></tr>
<tr><td>Tx ignores Rx Link Faults</td><td></td><td>If selected, ongoing transmission will continue even if Link Fault messages are received by the sending RS.</td></tr>
</table>

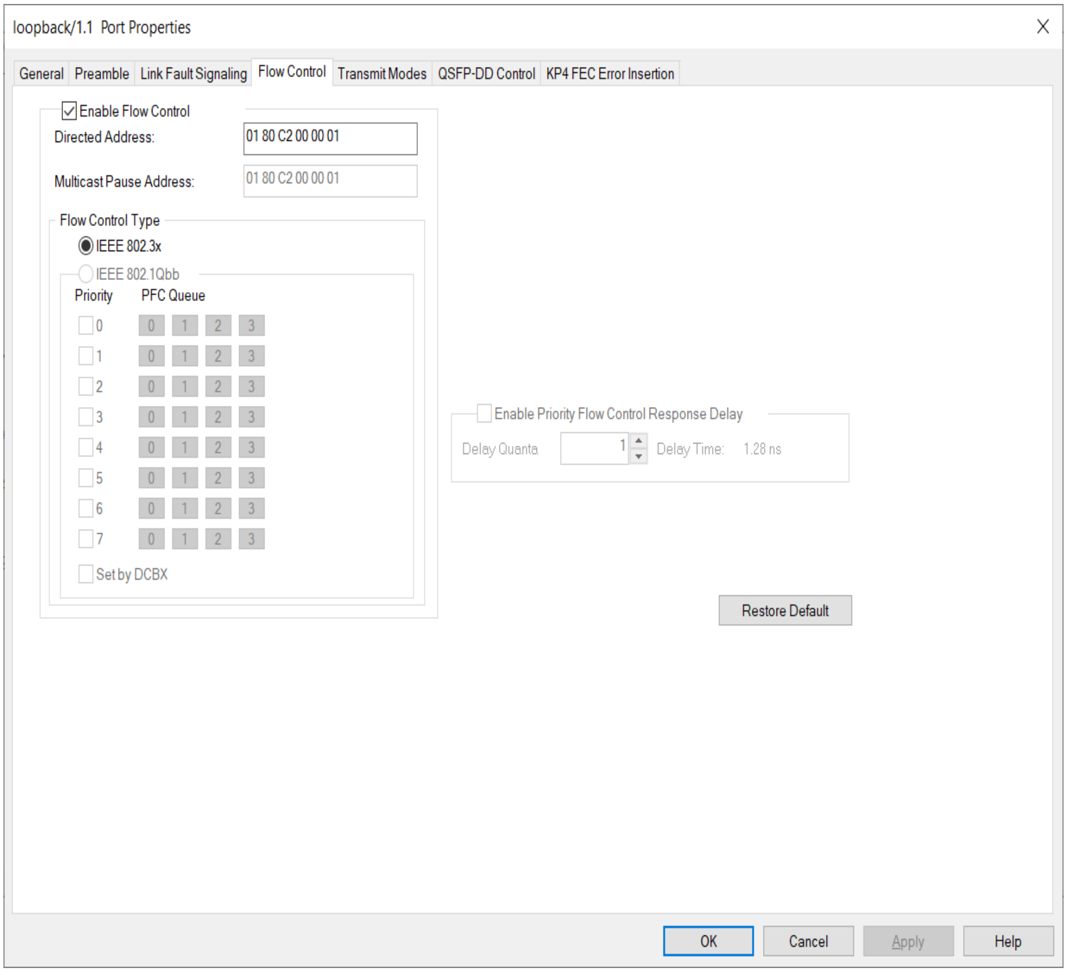
Section	Field/Control	Description
Summary (Window)		(Read-only) Shows descriptions of the patterns that will be transmitted.
Start Error Insertion		Select this option to start the transmission of the configured error patterns.
Stop Error Insertion		(Available only for use with the **Loop continuously** option.) Select this option to stop the transmission of the configured error patterns.

800GE-4P-QDD Port Properties—Flow Control

The 800GE-4P-QDD **Flow Control** tab is accessed from the context menu of the port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

NOTE You can view this help page for the **Port Properties - Flow Control** tab by selecting the **Help** option and not F1.

The Port Properties **Flow Control** tab for 800GE-4P-QDD is shown in the following image.



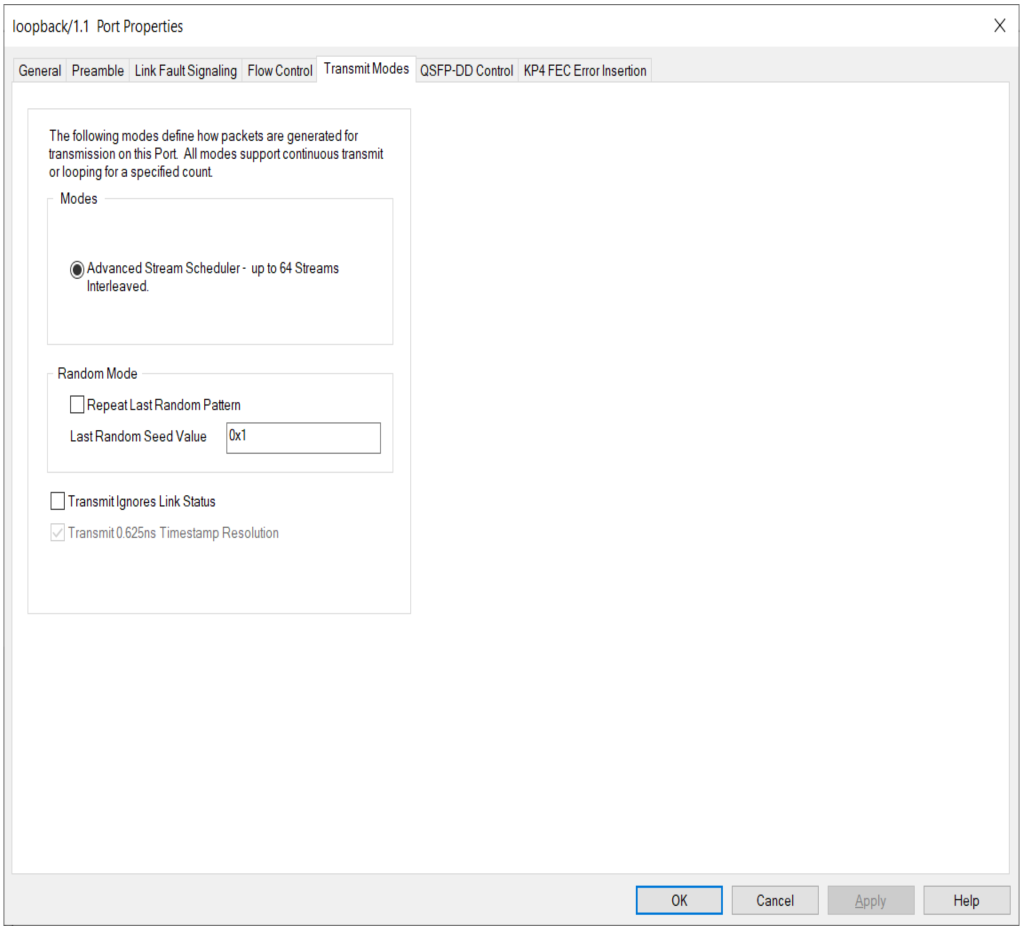
Section	**Field/Control**	**Description**
Enable Flow Control	(check box)	Enables the port's MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type	IEEE 802 3x	When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame.
	IEEE 802.1Qbb	When not in Data Center mode, only IEEE 802.3x is available. NOTE This feature is not supported in 800 GE speed mode.
	Priority	When flow control type IEEE 802.1Qbb is selected in Data Center

Section	Field/Control	Description
		mode, priority options are the channels of data that can be paused. Select to select one or more channels.
	PFC Queue	The PFC Queue can be mapped to the priority field in the frame.
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed. NOTE This feature is not supported in 800 GE speed mode.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

800GE-4P-QDD Port Properties—Transmit Modes

The **Transmit Modes** tab for 800GE-4P-QDD load modules is shown in the following image. It is accessed by double-clicking a port in **Resources** window, or by from the context menu of the port by selecting the **Properties** menu option. Then select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following image.



The controls for **Transmit Modes** tab configuration are described in the following table.

Section	Field/Control	Description
Modes	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure the following: • 800 GE - up to 64 streams • 400 GE - up to 64 streams • 200 GE - up to 64 streams • 100 GE - up to 32 streams They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream's

Section	Field/Control	Description
		random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit Ignores Link Status		If selected, will allow transmission of packets even if the link is down.
Transmit High TimeStamp Resolution		If selected, the 800GE-4P-QDD load module will support the following: • 0.625 ns for 800 GE • 0.625 ns for 400 GE • 1.25 ns for 200 GE • 2.5 ns for 100 GE

800GE-4P-QDD Port Properties—QSFP-DD Control

PAM-4 is a four-level pulse-amplitude modulation that uses four distinct amplitude levels to encode two bits of data, essentially doubling the bandwidth of a connection. The PAM4 settings are defined using the **QSFP-DD Control** tab.

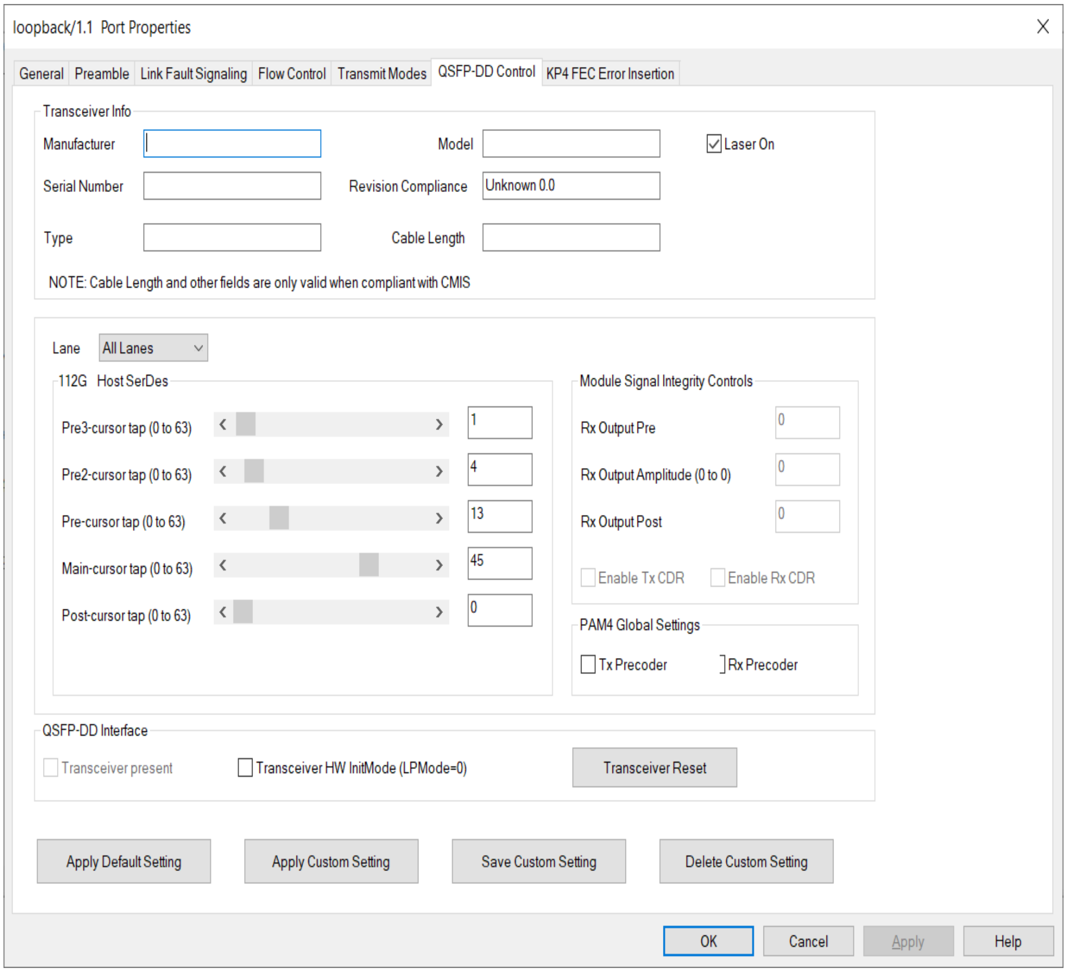
For 800GE-4P-QDD-C module, see 800GE-4P-QDD-C Card Properties—QSFP-DD Control.

For 800GE-8P-QDD-M+NRZ module, see 800GE-8P-QDD-M+NRZ Card Properties—QSFP-DD Control.

For 800GER-4P-QDD-OSFP-M+NRZ module, see 800GER-4P-QDD-OSFP-M+NRZ Port Properties—QSFP-DD Control.

The **QSFP-DD Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **QSFP-DD Control** tab.

The Port Properties **QSFP-DD Control** tab for 800GE-4P-QDD when the default passive copper transceiver is used is shown in the following figure:



When 800GE-4P-QDD detects an optical transceiver, it will apply a Host Transmit equalization combination that is well suited for optics, and also expose the transceiver's signal integrity controls.

The supported module signal integrity fields of CMIS 3.0 and 4.1 transceivers are listed below:

- Rx Output EQ Control Pre-Cursor
- Rx Output EQ Control Post-Cursor
- Rx Output Amplitude Control
- Tx CDR Control
- Rx CDR Control

The signal integrity fields are configurable based on the capability of the transceiver. The default value and maximum allowed range for each of the fields are read from the transceiver during transceiver initialization.

Section	Field/Control	Description
Transceiver Info		
	Manufacturer	This is the Vendor Name field read from the actual transceiver currently being plugged in.

Section	Field/Control	Description
	Model	This is the Part Number field read from the actual transceiver currently being plugged in.
	Serial Number	The serial number of the transceiver.
	Revision Compliance	The implemented CMIS revision of the transceiver. 800GE-4P-QDD supports both CMIS 3.0 and CMIS 4.0 transceivers. See Management Interface.
	Type	When a transceiver is inserted into the load module, the software reads IEEE registers to determine the transceiver capabilities and media type. If the transceiver contains this information, it is shown in this read-only field.
	Cable Length	The length of Ixia-supplied cable which connects this chassis to the previous chassis in the chain.
	Laser On	Select this check box to enable the laser power.
112G Host SerDes		
	Pre3 cursor tap (0 to 63)	This helps to control the Pre3 Tap value for Tx.
	Pre2 cursor tap (0 to 63)	This helps to control the Pre2 Tap value for Tx.
	Pre-cursor tap (0 to 63)	This helps to control the Pre Tap value for Tx.
	Main-cursor tap (0 to 63)	This helps to control the Main Tap Control for Tx.
	Post-cursor tap (0 to 63)	This helps to control the Post Tap value for Tx.
Module Signal Integrity Controls		
	Rx Output pre	Allowed range of values for Rx Output. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Rx Output Amplitude (0 to 0)	Allowed range of values for Rx Output amplitude. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Rx Output Post	Allowed range of values for Rx Output post. This field is greyed out if the transceiver does not support it. IxExplorer automatically

Section	Field/Control	Description
		moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Enable Tx CDR	Turn on Tx CDR Control. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Enable Rx CDR	Turn on Rx CDR Control . This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
PAM4 Global Settings		
	Tx Precoder	Represents a PAM4 encoding scheme to reduce DFE bit errors. This also means that both sides of the link must have precoder enabled for link to come up.
	Rx Precoder	Represents a PAM4 encoding scheme to reduce DFE bit errors. This also means that both sides of the link must have precoder enabled for link to come up.
QSFP-DD Interface		
	Transceiver HW InitMode	Selecting the check box configures the QSFP-DD InitMode pin to perform the optional Hardware Init mode initialization as described in the Common Management Interface Specification (CMIS) Rev 3.0. When a transceiver boots into Hardware Init mode, the datapath is automatically configured by the module without intervention from the host (that is Ixia tester). When disabled, the software-controlled initialization (Software Init) is instead performed. This is the recommended initialization mode for any transceiver since the appropriate checks are performed between the Ixia tester and the transceiver before the module's datapath initialization.
	Transceiver Reset	Resets the transceiver.
	Apply Default Setting	When you select this button, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Setting	When you select this button, if there exists a custom setting in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom	When you select this button, if there exists a custom setting in the

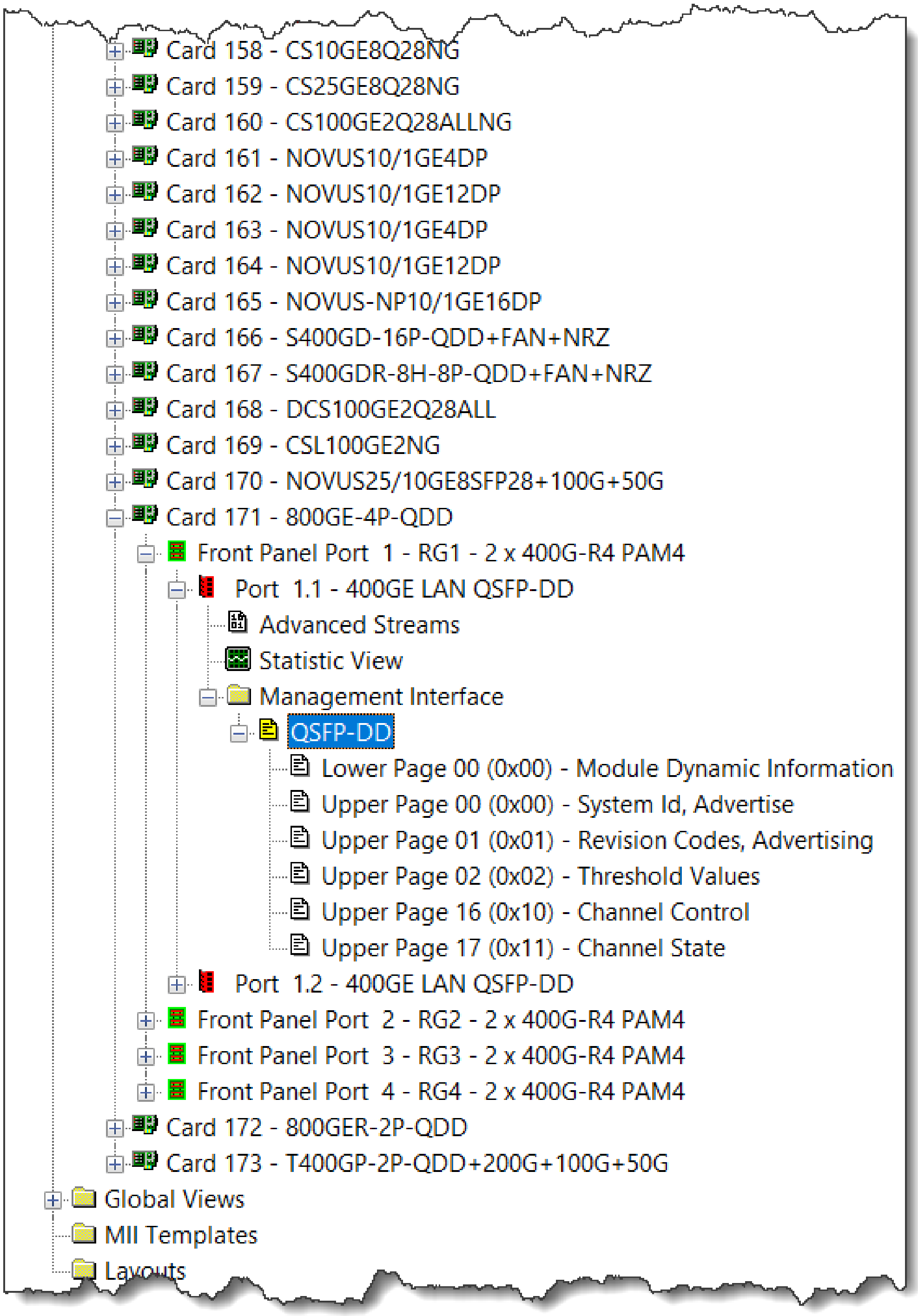
Section	Field/Control	Description
	Setting	xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	When you select this button, if there exists a custom setting in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel with that. If no custom setting exists, users will be prompted that nothing will be deleted.

Management Interface

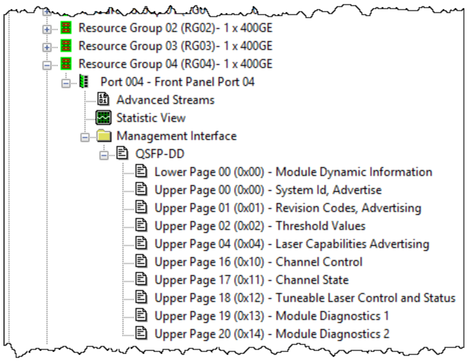
A management interface specification CMIS defines the management interface and associated protocols for all required and allowable management interactions between a CMIS aware host and a CMIS compliant module that are relevant for the host using the module in an application.

The Management Interface appears in the IxExplorer Resources Tree and switches on the fly depending on the CMIS revision. This means that the transceiver automatically reads the management interface and populates the lower and upper pages depending on the transceiver type.

With a CMIS 3.0 (or lower) transceiver, you will see the following pages:



With a CMIS 4.0 transceiver, you will see the following pages:



800GE-4P-QDD Port Properties—KP4 FEC Error Insertion

Forward Error Correction (FEC) is a method of communicating data that corrects errors in transmission on the receiving end. Prior to transmission, the data is put through a predetermined algorithm that adds extra bits specifically for error correction to any character or code block. If the transmission is received in error, the correction bits are used to check and repair the data.

NOTE **KP4 FEC Error Insertion** tab is not available for 800GE-4P-QDD PAM4 100G mode.

The **FEC Error Insertion** tab allows to inject FEC errors into transmitted data, and is shown in *Figure: **FEC Error Insertion** Tab*

Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Random

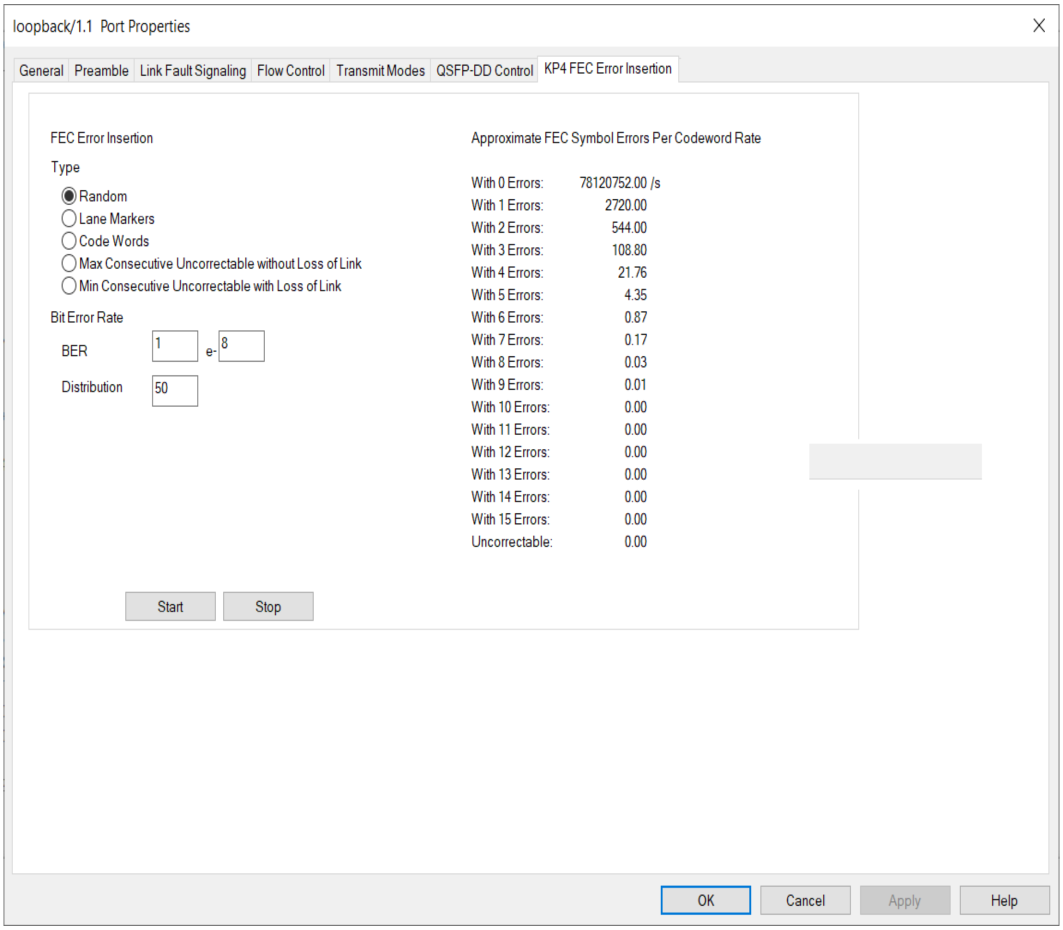


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Lane Markers

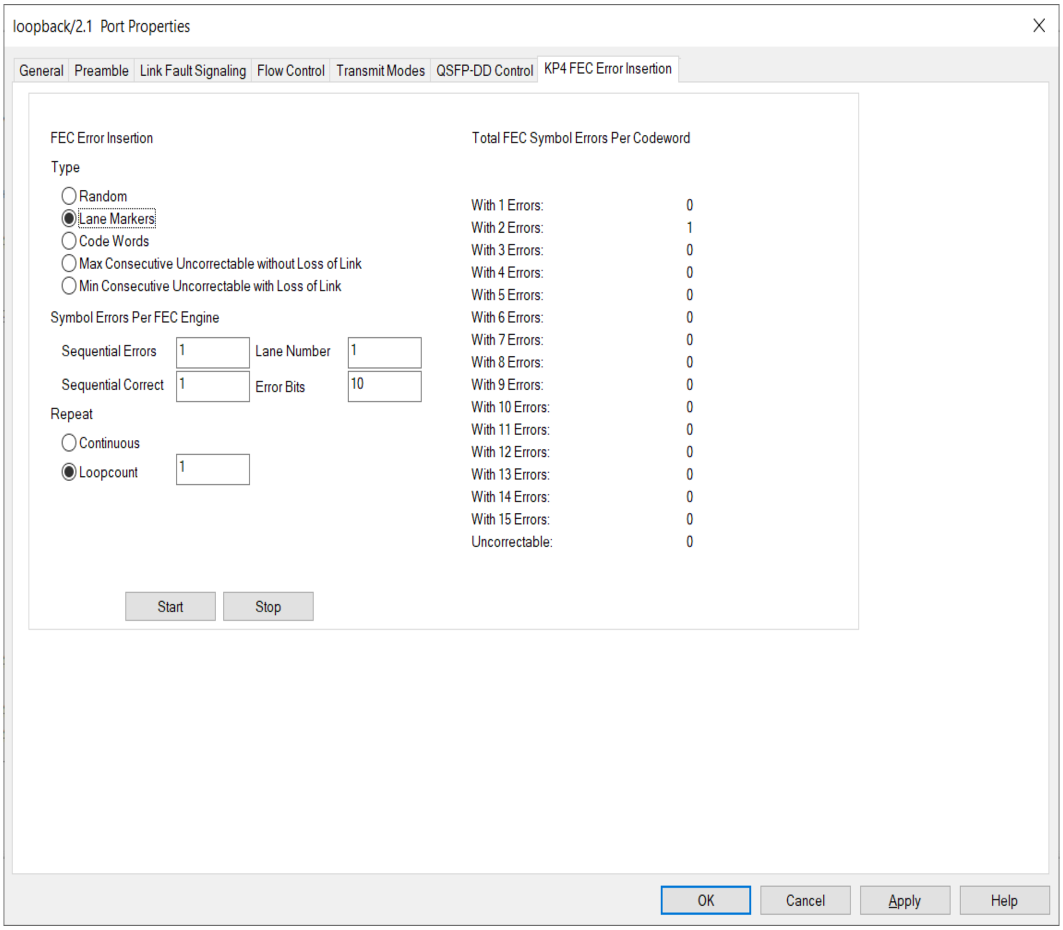


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Code Words

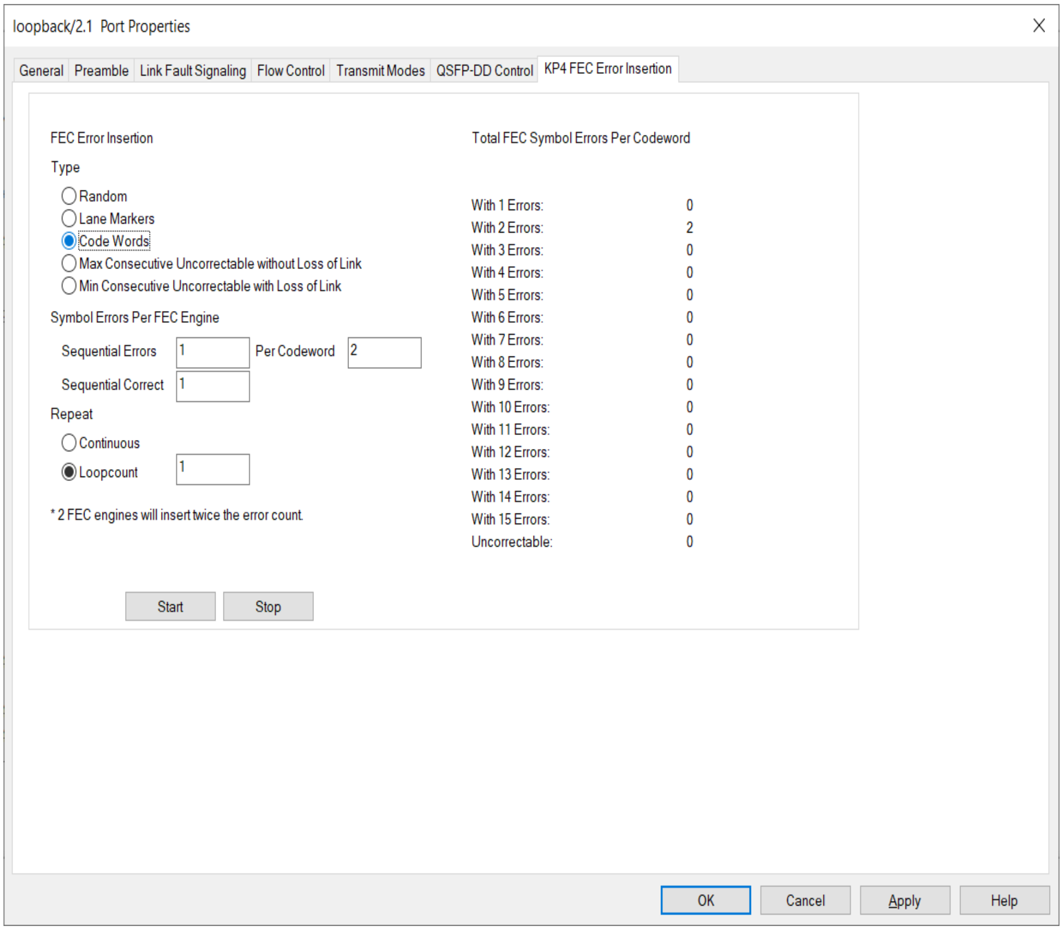


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Max Consecutive Uncorrectable without Loss of Link

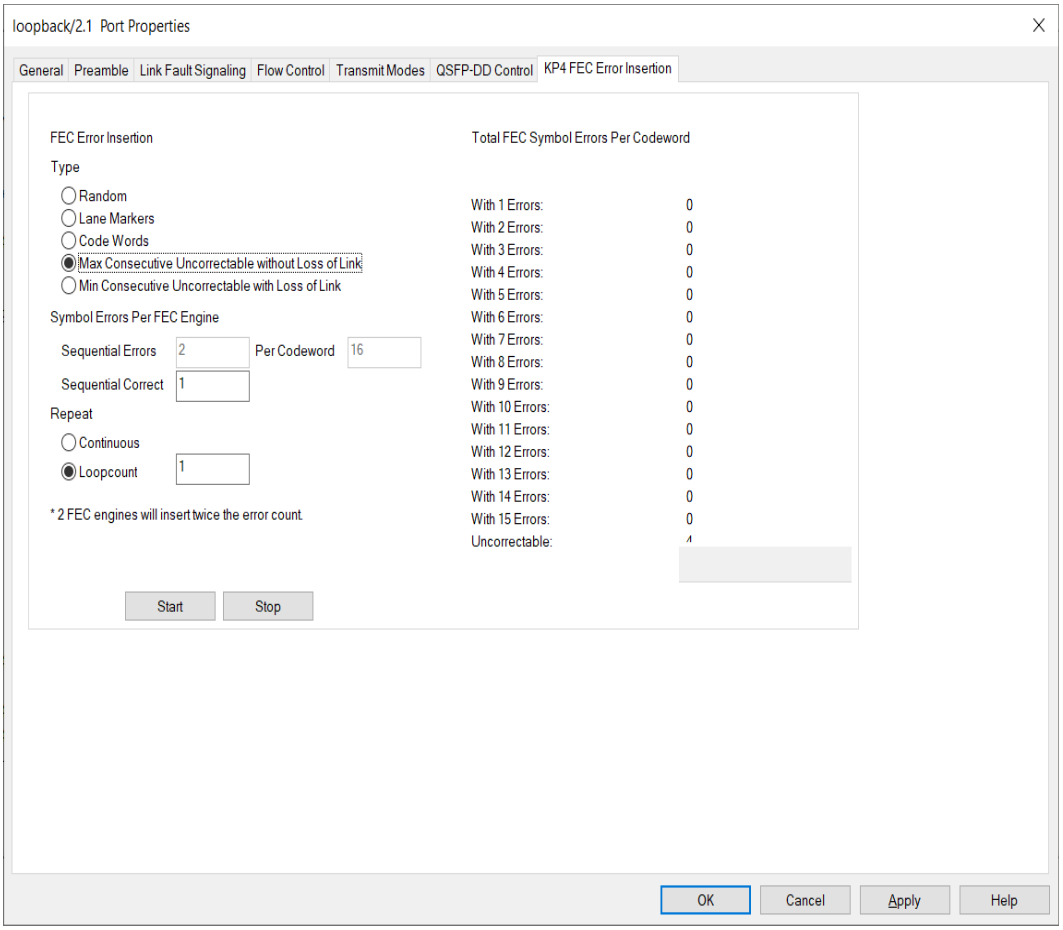


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Min Consecutive Uncorrectable with Loss of Link

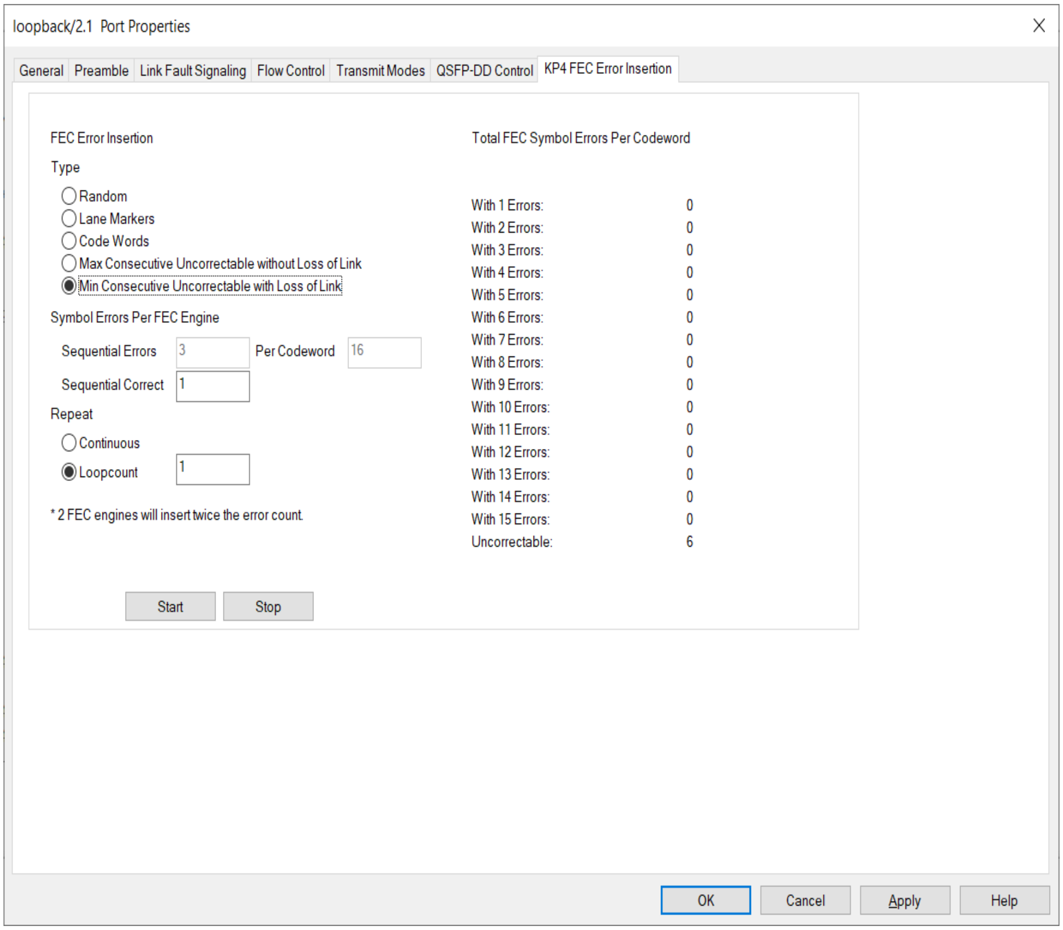


Table: **KP4 FEC** Tab Configuration

Section	Field	Usage
FEC Error Insertion		
Type	Random	Random FEC symbol error insertion will introduce a deterministic number of errors, evenly spread across all PCS lanes, on top the intrinsic BER (Bit Error Rate) of the interconnect.
	Lane Markers	Inserts errors only in the Lane Marker fields.
	Code Words	This is the fundamental unit of data that the FEC engine operates on sequentially. It is composed of blocks that carry the payload and parity information for the 64/66B scrambled data that arrives from the PCS Scrambler on Egress and from the PMA on Ingress.The code word size and layout can vary from each coding scheme. For example, RS, KR, and KP4 all have different code words because their coding schemes are different.
	Max Consecutive Uncorrectable	Uncorrectable errors are those with more than 15 symbol errors. As per IEEE, the maximum number of consecutive uncorrectable errors without loss of link is 2.

Section	Field	Usage
	without Loss of Link	
	Min Consecutive Uncorrectable with Loss of Link	The Max Consecutive Uncorrectable WITHOUT Loss of Link + 1. This is the threshold where the receiver should declare Local Fault due to bad data. The minimum number of consecutive uncorrectable errors with loss of link is 3.
Bit Error Rate	BER	The Bit Error Ratio (BER) is the ratio of the number of error bits compared to the total number of bits transmitted. In the BER field, enter the coefficient of the BER.The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	e-	Enter the exponent of the BER. The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	Distribution	Controls how the errors are distributed. This modifies the probability distribution of errors while maintaining the average Bit Error Rate. For example, you can have a BER of 10E-8 but have all of the errors be single errors OR you can have the errors be distributed across a variety of errors. The purpose is to thoroughly test a receiver to see if all possible errors are being corrected at varying rates.
Symbol Errors Per FEC Engine		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Sequential Errors	In burst mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.

Section	Field	Usage
		NOTE Per 802.3bs and 802.3cd, reception of 3 or more consecutive uncorrectable codewords will result in Loss of Link. In burst mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. This sequence will be repeated until stopped. NOTE Per 802.3bs and 802.3cd, reception of 5 or more Alignment Marker errors will result in Loss of Link. • In 400G mode, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines. • The symbol errors are not evenly distributed across the PCS lanes (use Random error insertion mode for that case) • The maximum number of sequential uncorrectable errors without loss of link is 2 and the minimum number of sequential uncorrectable errors with loss of link is 3.
	Lane Number	The Lane Number specifies which PCS lane will be affected by the Lane Marker error insertion.This field is available only if you select the error insertion type as Lane Markers.
	Sequential Correct	The number of consecutive code words without errors.
	Error Bits	The Error Bits specifies how many errors will be inserted on each of the two symbol errors of the codeword that carries the Lane Marker. There is a minimum Error Bits required (2) before corrupting the symbol that maps to the Lane Marker field. This field is available only if you select the error insertion type as Lane Markers.
	Per Codeword	Codeword is a block of contiguous packets on the line. All RS-FEC codewords are of the same size.The Per Codeword value denotes the number of symbol errors per codeword to insert. KP4 FEC can correct up to 15 symbols, and detect up to 30 symbols. If the user specifies 16, an Uncorrectable Codeword will be issued. This field is available only if you select the error insertion type as Code Words.

Section	Field	Usage
Repeat		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Continuous	Continuous error insertion.In continuous mode, the Sequential Errors field will specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.
	Loopcount	The sequence of correct and incorrect codewords or symbol errors inserted will be repeated by the number specified in the Loopcount field.
Start		Starts the error insertion process.
Stop		Stops the error insertion process.
Appropriate FEC Symbol Errors Per Codeword Rate		The Appropriate FEC Symbol Errors Per Codeword Rate is an approximation for how many symbol errors there will be per codeword every second. NOTE In 400G mode, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines.

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CHAPTER 38

Port Properties–800GE-4P-QDD-C Load Modules

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the 800GE-4P-QDD-C load modules.

Following variants of 800GE are available:

- 800GE-8P-QDD-C - Full and reduced
- 800GE-4P-QDD-C - Full and reduced
- 800GE-2P-QDD-C - Full and reduced
- 800GER-8PHW-4P-QDD-C - Full and reduced

Port Properties for 800GE-4P-QDD-C Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option.

The complete specification for the 800GE-4P-QDD-C load module is found in the *Platform Reference Manual*.

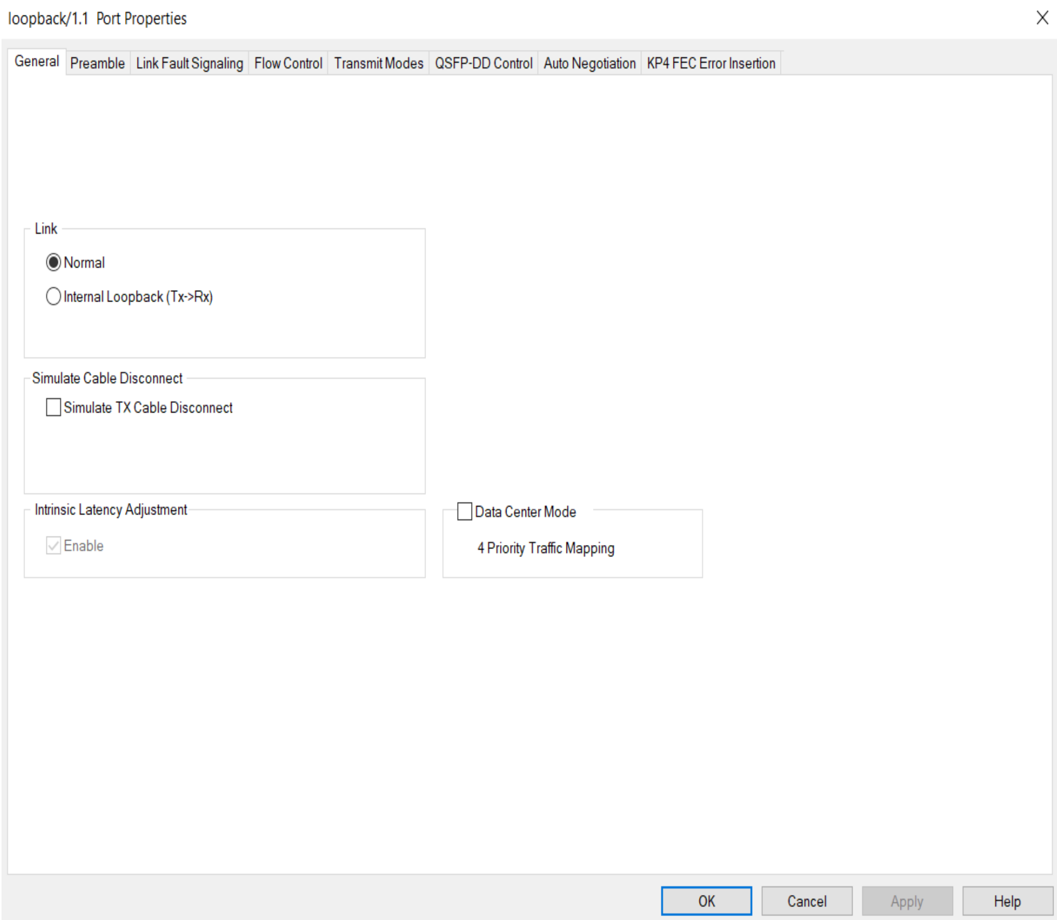
The following port property tabs are available for 800GE-4P-QDD-C modules:

- 800GE-4P-QDD-C Port Properties—General
- 800GE-4P-QDD-C Port Properties—Preamble
- 800GE-4P-QDD-C Port Properties—Link Fault Signaling
- 800GE-4P-QDD-C Port Properties—Flow Control
- 800GE-4P-QDD-C Port Properties—Transmit Modes
- 800GE-4P-QDD-C Port Properties—QSFP-DD Control
- 800GE-4P-QDD-C Port Properties—Auto Negotiation
- 800GE-4P-QDD-C Port Properties—KP4 FEC Error Insertion

800GE-4P-QDD-C Port Properties—General

The 800GE-4P-QDD-C **General** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, and then selecting the **General** tab.

The Port Properties **General** tab for 800GE-4P-QDD-C is shown in the following figure:



The controls for **General** tab configuration are described in the following table:

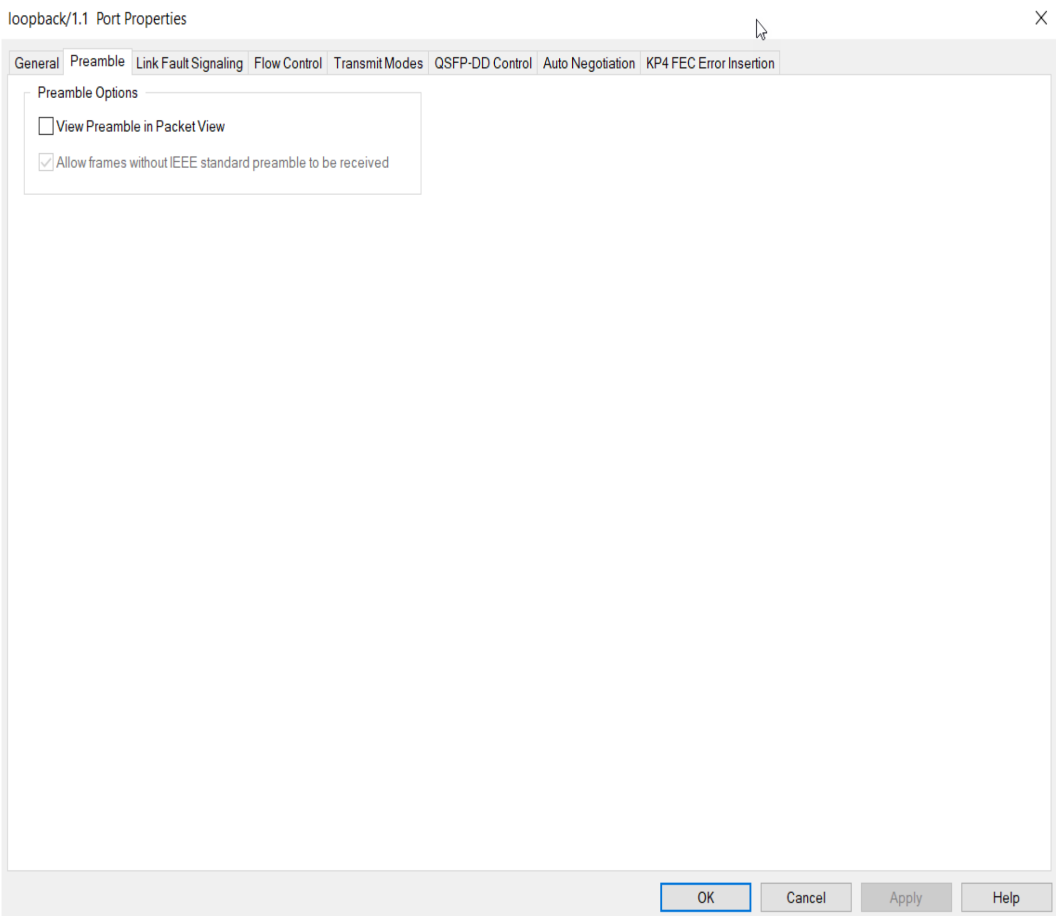
Section	Control/Field	Usage
Link	Normal	Normal operation
	Internal Loopback (Tx -> Rx)	Select this check box to turn on Internal Loopback—Transmit to Receive.
Simulate Cable Disconnect	Simulate TX Cable Disconnect	If this is selected, the port acts as if the cable has been disconnected on the transmit side only. Incoming packets may still be received and port may show link up, but no packets or PCS data will be transmitted.
Intrinsic Latency Adjustment	Enable	The **Enable** check box is selected by default. This enables the intrinsic latency adjustment. The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia*

Section	Control/Field	Usage
		Platform Reference Manual.
Data Center Mode		If selected, enables the Data Center Mode option. When Data Center Mode option is selected, the following changes take place: • The selected port is automatically placed into Advanced Stream mode. In this case, Packet Stream mode is not supported. • Only Auto Intrumentation mode (Floating Timestamp/Data Integrity) is supported, both for transmit and receive. • 4-Priority Traffic Mapping is enabled. It supports various frame size for each PFC control (0-4). NOTE This feature is not supported in 800 GE speed mode. • FCoE protocol can be edited for Ethernet II and Ethernet Snap in **Frame Data** tab.

800GE-4P-QDD-C Port Properties—Preamble

The preamble precedes the frame, but is not part of the frame itself.

The 800GE-4P-QDD-C Port Properties **Preamble** tab is shown in the following figure:



The fields and controls in this tab are described in the following table:

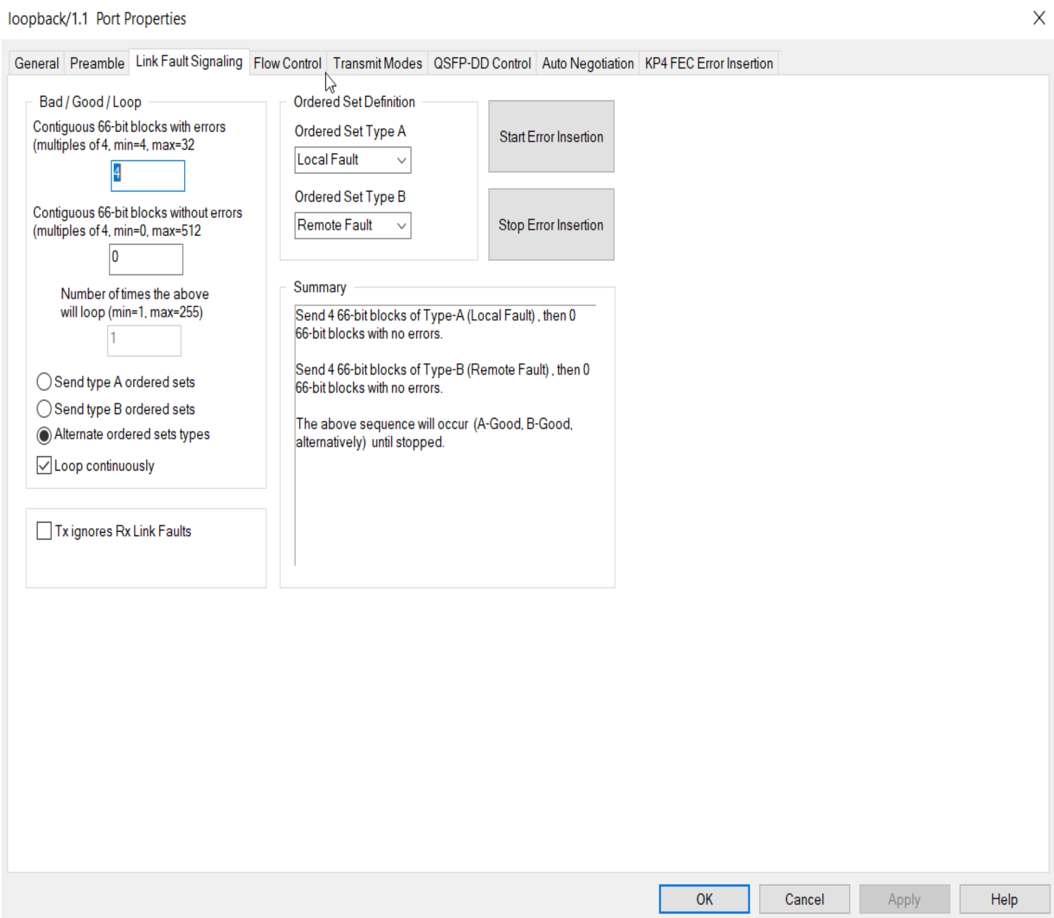
Section	Choices	Description
Preamble Options	View Preamble in Packet View	When this check box is selected, the preamble data will be visible in the Packet View (transmit side) and the Capture View (receive side).
	Allow frames without IEEE standard preamble to be received	When this check box is selected, it allows frames without IEEE standard preamble to be received. • This check box is selected by default.

800GE-4P-QDD-C Port Properties—Link Fault Signaling

When **Link Fault Signaling** is enabled, four statistics will be added to the list in Statistic View for the port. One is for monitoring the Link Fault State. Two provide a count of the Local Faults and Remote Faults. The last one is for indicating the state of error insertion, whether or not it is ongoing

The **Link Fault Signaling** tab is accessed from the context menu of the a port in **Resources** pane by selecting the **Properties** menu option, or by double-clicking a port in the **Detail** pane. Then select the **Link Fault Signaling** tab.

The **Link Fault Signaling** tab for 800GE-4P-QDD-C load module is shown in the following image.



The controls for **Link Fault Signaling** tab configuration are described in the following table.

Section	Field/Control	Description
Bad/Good/Loop	(Bad) Contiguous 66-bit blocks with errors (multiples of 4; min = 4, max = 32)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks with errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive fault sequences allowed are minimum 4 sequences and maximum 32 sequences.
	(Good) Contiguous 66-bit blocks without errors (multiples of 4; min = 0, max = 512)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks without errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive regular data sequences allowed are minimum 0 sequences and maximum 512 sequences.
	Number of times the above will loop (min = 1, max = 255)	Specifies the number of loops for the user defined sequence. Options include the following: • Discrete iterations:

<table>
<tr><th>Section</th><th>Field/Control</th><th>Description</th></tr>
<tr><td rowspan="3"></td><td></td><td>1. Minimum of 1 iteration
2. Maximum of 255 iterations
• Continuous loop
1. User cannot specify number of iterations</td></tr>
<tr><td>Options include the following:
• Send type A ordered sets
• Send type B ordered sets
• Alternate ordered set types</td><td>Defines the ordered set pattern that will be sent. (The two Ordered Sets—A and B—are defined in the Ordered Set Definition box in this tab.) This pattern will be combined with the Good blocks/Bad blocks pattern for transmission.
• Only Type A fault sequence and regular good data sequences
• Only Type B fault sequence and regular good data sequences
• Alternate Type A, regular good data sequences and Type B fault sequence, regular good data sequences
NOTE If this field is available, and the Alternate ordered set types option is selected, the minimum value for this field should be '2,' to allow the entire pattern to be sent once. If left at the minimum value of '1'— only two groups of blocks (one of good blocks and one of bad blocks) will be sent, which means that only the first ordered set will be sent. A minimum of eight blocks is required for one complete pattern including Types A and B.</td></tr>
<tr><td>Loop continuously</td><td>If selected, the loop defined by the combination of the Bad and Good blocks plus the pattern of ordered sets, will be transmitted continuously until the Stop Error Insertion option is selected.</td></tr>
<tr><td rowspan="2">Ordered Set Definition</td><td>Ordered Set Type A</td><td>Options include the following:
• Local Fault
• Remote Fault</td></tr>
<tr><td>Ordered Set Type B</td><td>Options include the following:
• Local Fault
• Remote Fault</td></tr>
<tr><td>Tx ignores Rx Link Faults</td><td></td><td>If selected, ongoing transmission will continue even if Link Fault messages are received by the sending RS.</td></tr>
</table>

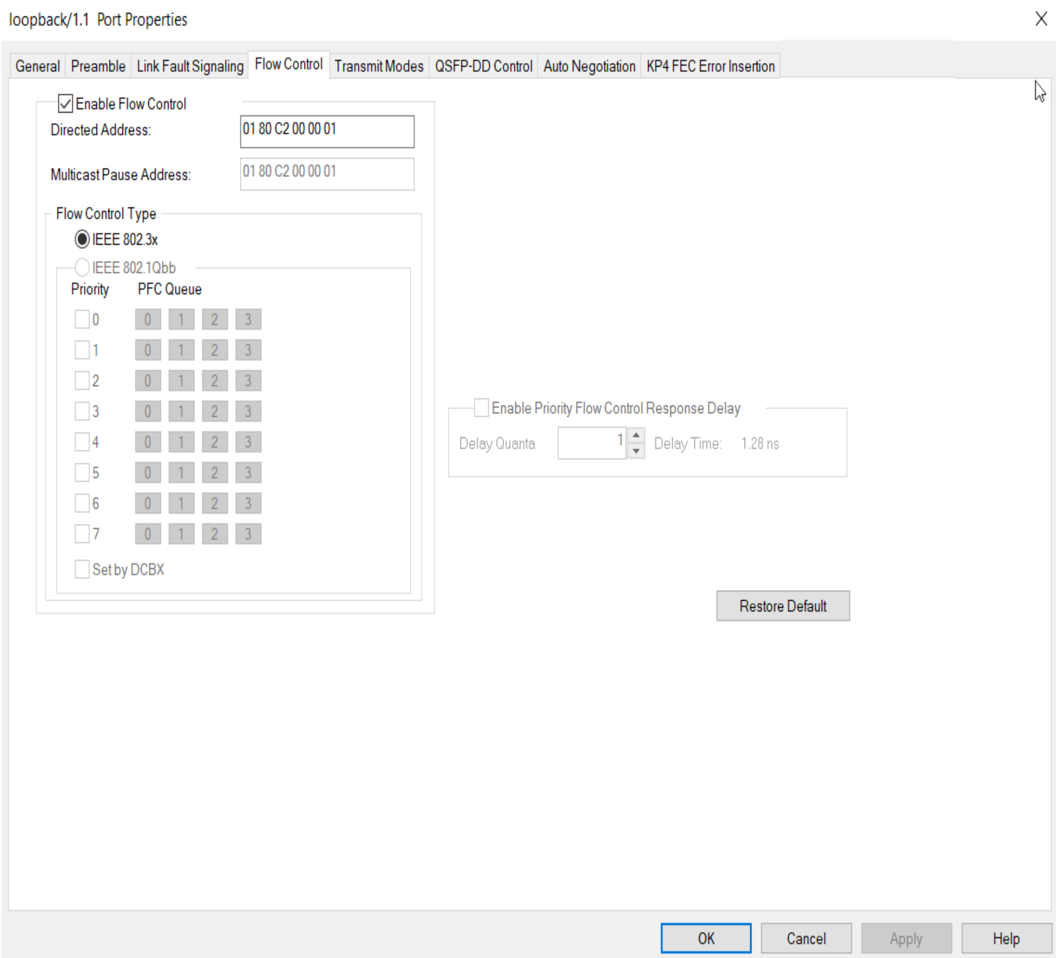
Section	Field/Control	Description
Summary (Window)		(Read-only) Shows descriptions of the patterns that will be transmitted.
Start Error Insertion		Select this option to start the transmission of the configured error patterns.
Stop Error Insertion		(Available only for use with the **Loop continuously** option.) Select this option to stop the transmission of the configured error patterns.

800GE-4P-QDD-C Port Properties—Flow Control

The 800GE-4P-QDD-C **Flow Control** tab is accessed from the context menu of the port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

NOTE: You can view this help page for the **Port Properties - Flow Control** tab by selecting the **Help** option and not F1.

The Port Properties **Flow Control** tab for 800GE-4P-QDD-C is shown in the following image.



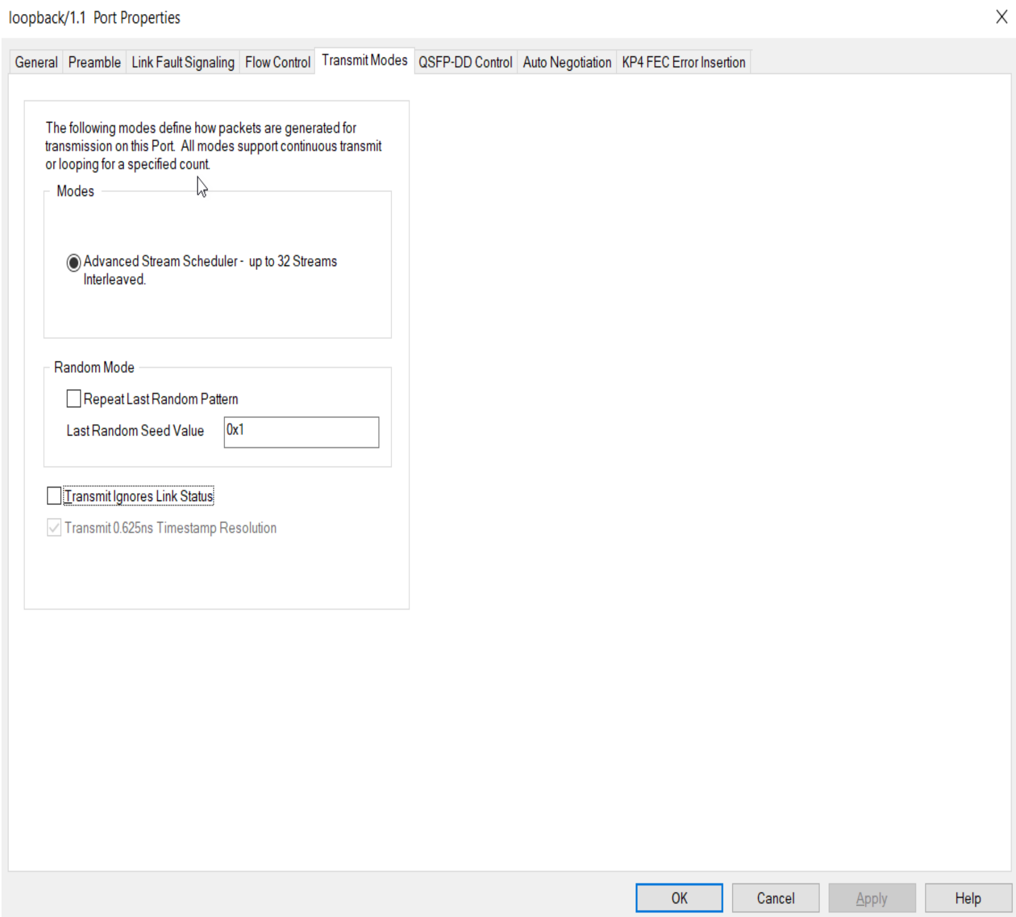
Section	Field/Control	Description
Enable Flow Control	(check box)	Enables the port's MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type	IEEE 802 3x	When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame.
	IEEE 802.1Qbb	When not in Data Center mode, only IEEE 802.3x is available. NOTE This feature is not supported in 800 GE speed mode.
	Priority	When flow control type IEEE 802.1Qbb is selected in Data Center

Section	Field/Control	Description
		mode, priority options are the channels of data that can be paused. Select to select one or more channels.
	PFC Queue	The PFC Queue can be mapped to the priority field in the frame.
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed. NOTE This feature is not supported in 800 GE speed mode.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

800GE-4P-QDD-C Port Properties—Transmit Modes

The **Transmit Modes** tab for 800GE-4P-QDD-C load modules is shown in the following image. It is accessed by double-clicking a port in **Resources** window, or by from the context menu of the port by selecting the **Properties** menu option. Then select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following image.



The controls for **Transmit Modes** tab configuration are described in the following table.

Section	Field/Control	Description
Modes	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure the following: • 800 GE - up to 64 streams • 400 GE - up to 64 streams • 200 GE - up to 64 streams • 100 GE - up to 32 streams They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream's

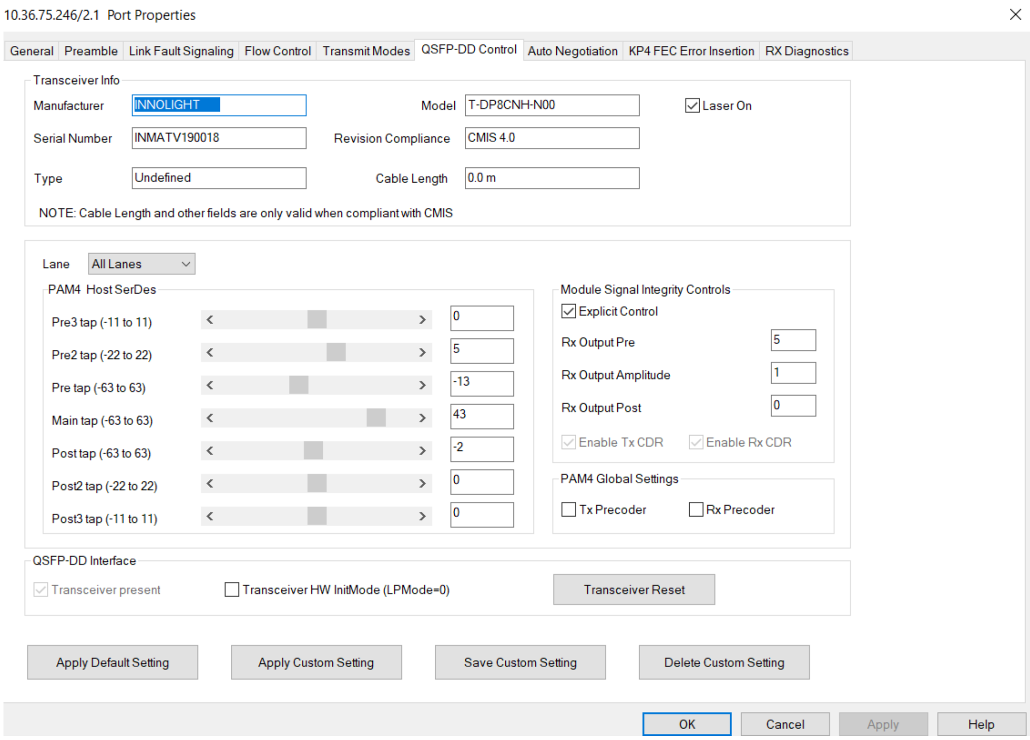
Section	Field/Control	Description
		random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit Ignores Link Status		If selected, will allow transmission of packets even if the link is down.
Transmit High TimeStamp Resolution		If selected, the 800GE-4P-QDD-C load module will support the following: • 0.625 ns for 800 GE • 0.625 ns for 400 GE • 1.25 ns for 200 GE • 2.5 ns for 100 GE

800GE-4P-QDD-C Port Properties—QSFP-DD Control

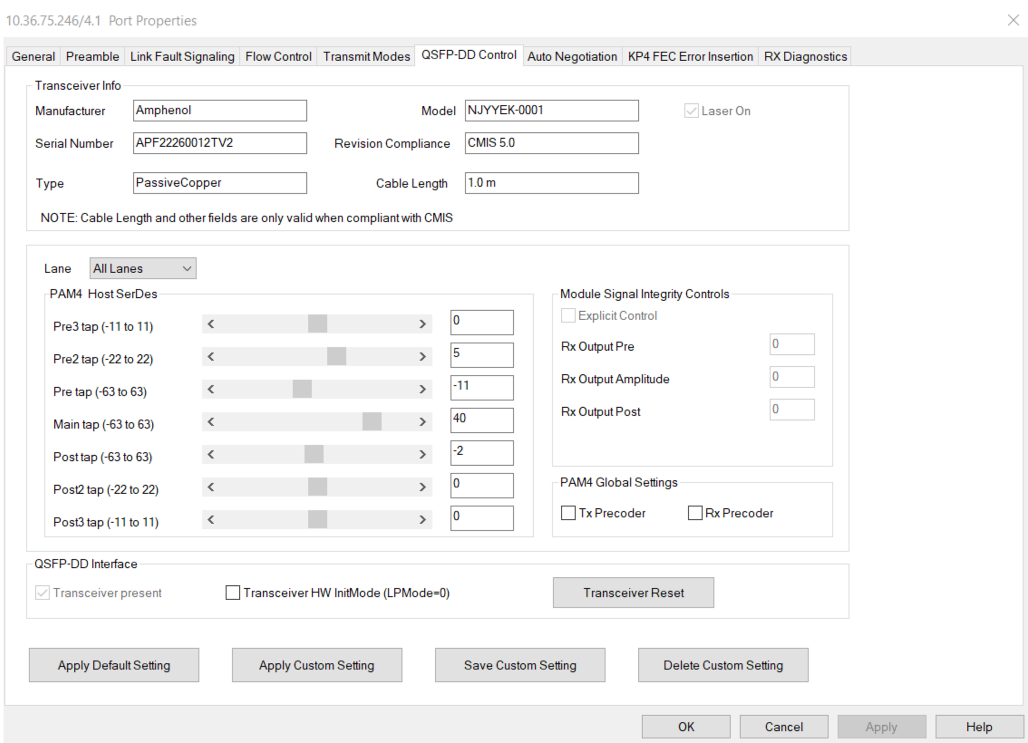
PAM-4 is a four-level pulse-amplitude modulation that uses four distinct amplitude levels to encode two bits of data, essentially doubling the bandwidth of a connection. The PAM4 settings are defined using the **QSFP-DD Control** tab.

The **QSFP-DD Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **QSFP-DD Control** tab.

The Port Properties **QSFP-DD Control** tab for 800GE-4P-QDD-C when the fiber optic transceiver is used is shown in the following figure:



The Port Properties **QSFP-DD Control** tab for 800GE-4P-QDD-C when the passive copper transceiver is used is shown in the following figure:



When 800GE-4P-QDD-C detects an optical transceiver, it will apply a Host Transmit equalization combination that is well suited for optics, and also expose the transceiver's signal integrity controls.

The supported module signal integrity fields of CMIS 3.0 and 4.1 transceivers are listed below:

- Rx Output EQ Control Pre-Cursor
- Rx Output EQ Control Post-Cursor
- Rx Output Amplitude Control
- Tx CDR Control
- Rx CDR Control

The signal integrity fields are configurable based on the capability of the transceiver. The default value and maximum allowed range for each of the fields are read from the transceiver during transceiver initialization.

Section	Field/Control	Description
Transceiver Info		
	Manufacturer	This is the Vendor Name field read from the actual transceiver currently being plugged in.
	Model	This is the Part Number field read from the actual transceiver currently being plugged in.
	Serial Number	The serial number of the transceiver.
	Revision Compliance	The implemented CMIS revision of the transceiver. 800GE-4P-QDD-C supports both CMIS 3.0 and CMIS 4.0 transceivers. See Management Interface.
	Type	When a transceiver is inserted into the load module, the software reads IEEE registers to determine the transceiver capabilities and media type. If the transceiver contains this information, it is shown in this read-only field.
	Cable Length	The length of Ixia-supplied cable which connects this chassis to the previous chassis in the chain.
	Laser On	Select this check box to enable the laser power.
112G Host SerDes		
	Pre3 cursor tap (0 to 63)	This helps to control the Pre3 Tap value for Tx.
	Pre2 cursor tap (0 to 63)	This helps to control the Pre2 Tap value for Tx.
	Pre-cursor tap (0 to 63)	This helps to control the Pre Tap value for Tx.
	Main-cursor tap (0 to 63)	This helps to control the Main Tap Control for Tx.

Section	Field/Control	Description
	Post-cursor tap (0 to 63)	This helps to control the Post Tap value for Tx.
Module Signal Integrity Controls		
	Explicit Control	Select this check box to enable the Rx Output pre, Rx Output Amplitude, and Rx Output Post fields. This check box is available for selection only if the fiber optic transceiver is used.
	Rx Output pre	Allowed range of values for Rx Output. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Rx Output Amplitude (0 to 0)	Allowed range of values for Rx Output amplitude. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Rx Output Post	Allowed range of values for Rx Output post. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Enable Tx CDR	Turn on Tx CDR Control. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Enable Rx CDR	Turn on Rx CDR Control . This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
PAM4 Global Settings		
	Tx Precoder	Represents a PAM4 encoding scheme to reduce DFE bit errors. This also means that both sides of the link must have precoder enabled for link to come up.
	Rx Precoder	Represents a PAM4 encoding scheme to reduce DFE bit errors. This also means that both sides of the link must have precoder enabled for link to come up.
QSFP-DD Interface		
	Transceiver HW InitMode	Selecting the check box configures the QSFP-DD InitMode pin to perform the optional Hardware Init mode initialization as

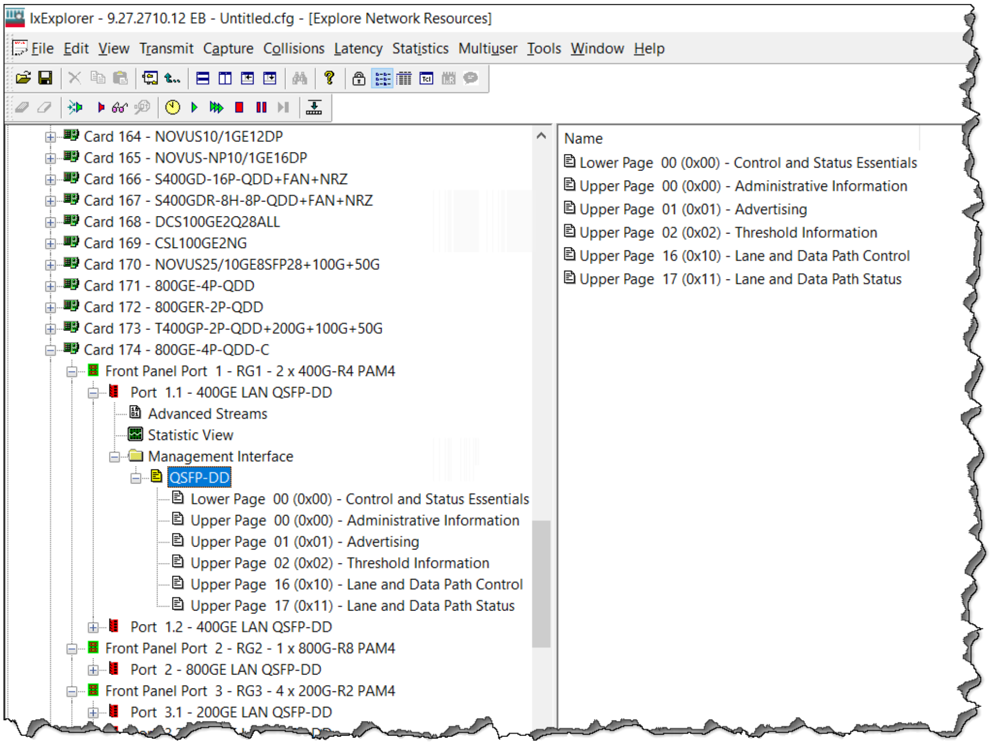
Section	Field/Control	Description
		described in the Common Management Interface Specification (CMIS) Rev 3.0. When a transceiver boots into Hardware Init mode, the datapath is automatically configured by the module without intervention from the host (that is Ixia tester). When disabled, the software-controlled initialization (Software Init) is instead performed. This is the recommended initialization mode for any transceiver since the appropriate checks are performed between the Ixia tester and the transceiver before the module's datapath initialization.
	Transceiver Reset	Resets the transceiver.
	Apply Default Setting	When you select this button, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Setting	When you select this button, if there exists a custom setting in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	When you select this button, if there exists a custom setting in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	When you select this button, if there exists a custom setting in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel with that. If no custom setting exists, users will be prompted that nothing will be deleted.

Management Interface

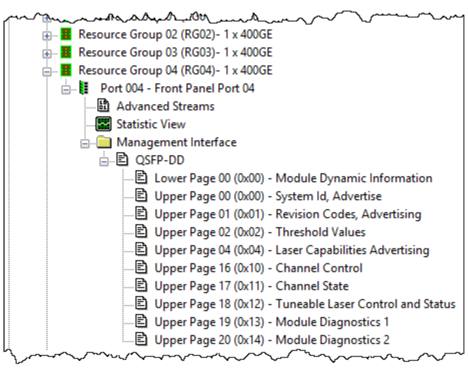
A management interface specification CMIS defines the management interface and associated protocols for all required and allowable management interactions between a CMIS aware host and a CMIS compliant module that are relevant for the host using the module in an application.

The Management Interface appears in the IxExplorer Resources Tree and switches on the fly depending on the CMIS revision. This means that the transceiver automatically reads the management interface and populates the lower and upper pages depending on the transceiver type.

With a CMIS 3.0 (or lower) transceiver, you will see the following pages:



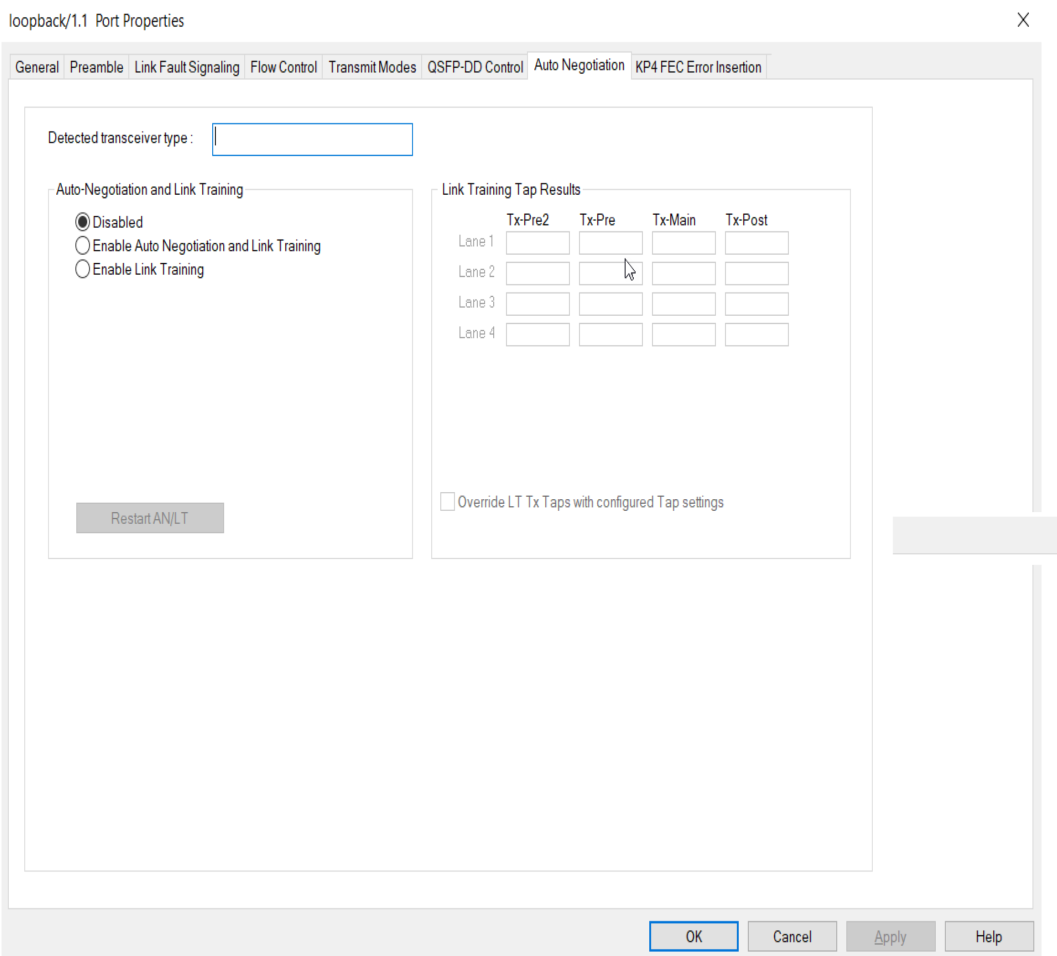
With a CMIS 4.0 transceiver, you will see the following pages:



800GE-4P-QDD-C Port Properties—Auto Negotiation

The 800GE-4P-QDD-C **Auto Negotiation**tab is accessed by selecting a 800GE-4P-QDD-C port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto Negotiation** tab.

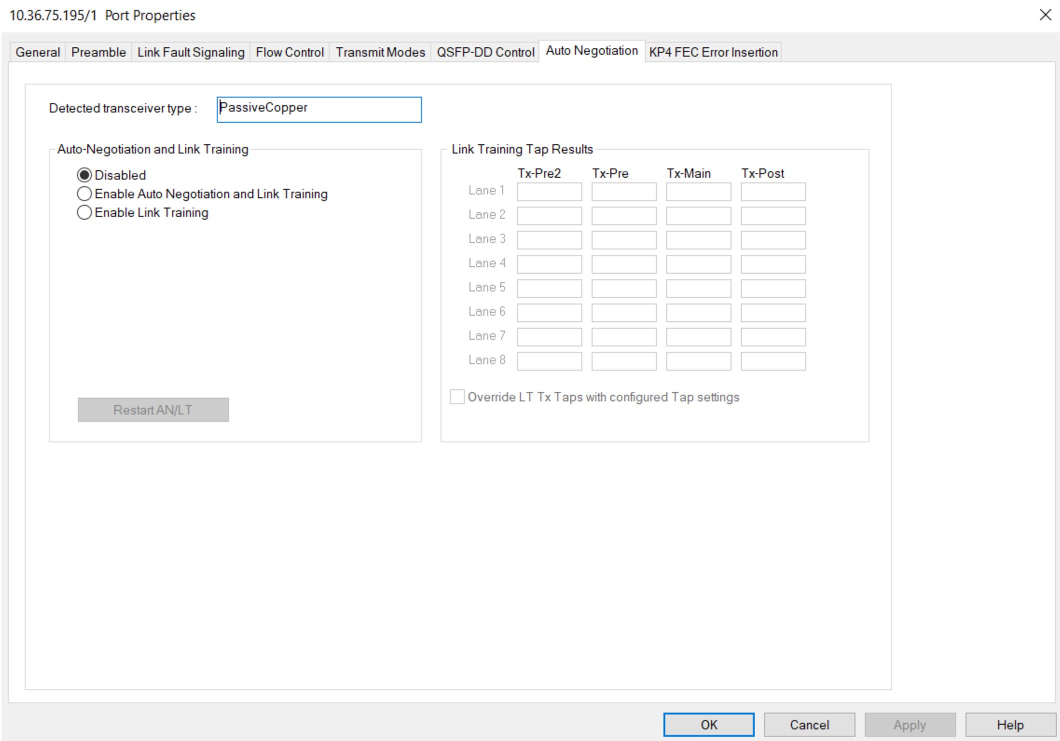
The Port Properties **Auto Negotiation** tab for 800GE-4P-QDD-C speed mode is shown in the following figure:



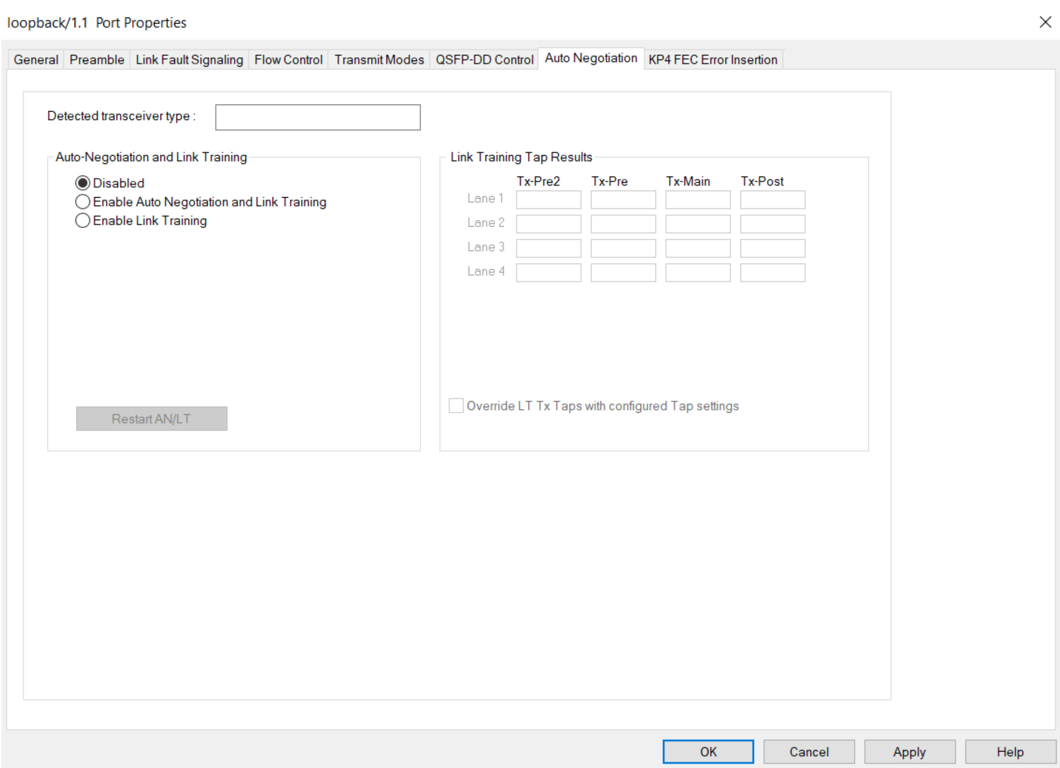
The following lanes are available depending on the port speed:

Speed Mode	Lanes
800GE	8 lanes (1-8)
400GE	4 lanes (1-4)
200GE	2 lanes (1-2)
100GE	1 lane (1)

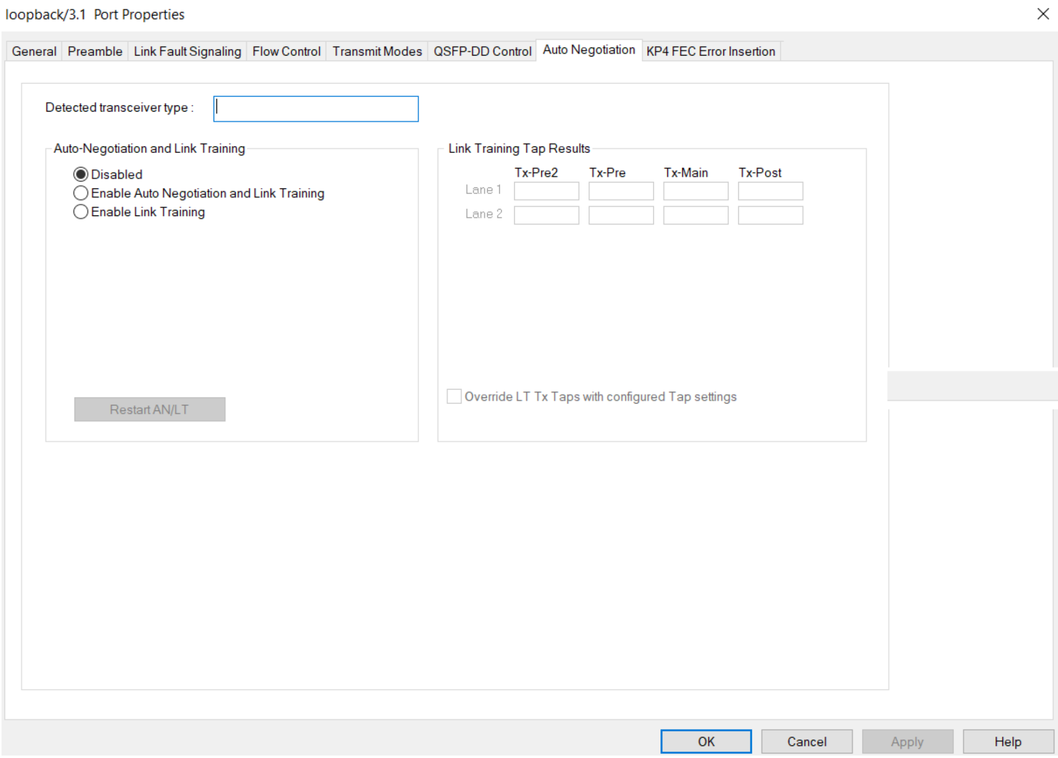
800GE-4P-QDD-C **Auto Negotiation** tab for 800 GE speed mode is shown below:



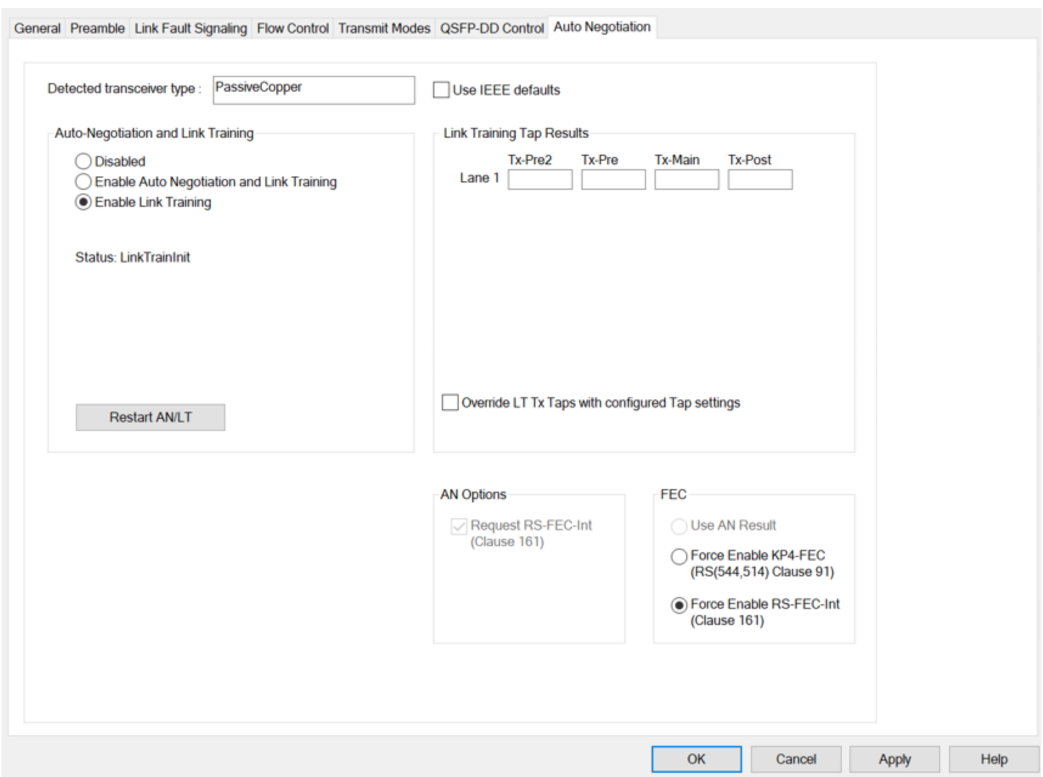
800GE-4P-QDD-C **Auto Negotiation** tab for 400 GE speed mode is shown below:



800GE-4P-QDD-C **Auto Negotiation** tab for 200 GE speed mode is shown below:



800GE-4P-QDD-C **Auto Negotiation** tab for 100 GE speed mode is shown below:



The fields and controls in this tab are described in the following table:

Field/Control	Description
Detected transceiver type	The type of transceiver that is plugged in.
Use IEEE defaults	Clear this check box to make **AN Options** and **FEC** groups available. By default this check box will remain selected and FEC that will be active is based on Autonegotiation.
Disabled	When you select the check box, the L1 parameters like Autonegotiation, Link Training, and FEC, are enabled or disabled per IEEE requirements, and you will not be able to enable or disable these manually. If the check box is cleared, you will be able to manually enable or disable L1 features – even if it violates IEEE specifications. By default the check box is selected.
Enable Auto Negotiate and Link Training	Auto negotiation controls how a port communicates with other ports.If you select the check box, it allows auto-negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing • **Restart Auto-Negotiate** button is selected (this does a forced restart) NOTE The **Enable Auto Negotiate** check box is available for selection only if the **Disabled** check box is cleared.
Enable Link Training	Select the check box to allow longer length copper cables to be used. This means that during the next Auto-Negotiation, KR training will be used. NOTE This check box is available for selection only if the **Disabled** check box is cleared.
Negotiated the capability above	The text box indicates the speed that was negotiated due to Auto-Negotiation.
Restart AN/LT	Restarts the Auto Negotiate sequence.
Link Training Tap Settings	
Tx-Pre2-cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Pre-cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Main-cursor Lane 1-8	The per-lane transmit main-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.

Field/Control	Description
Tx-Post-cursor Lane 1-8	The per-lane transmit post-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Override LT Tx Tap settings with configured Tap settings	Selecting this check box overrides the taps settings derived by the link training process, and configures the transmit pre/main/post cursor settings and receiver CTLE setting with the static values specified in the **QSFP-DD Host Control** tab.
AN Option	The available option is the following: • Request RS-FEC-Int:This is applicable only when Auto negotiation is turned on. Its value is preserved by IxServer and applied when Auto negotiation is turned on a port. With this check box selected, the port is requesting remote partner to use RS-FEC-Int FEC.
FEC	The available options are the following: • Use AN Result: Use FEC decided by Auto negotiation. • Force Enable KP4-FEC: Force enable KP4-FEC on the port. • Force Enable RS-FEC-Int: Force enable RS-FEC-Int on the port.

800GE-4P-QDD-C Port Properties—KP4 FEC Error Insertion

Forward Error Correction (FEC) is a method of communicating data that corrects errors in transmission on the receiving end. Prior to transmission, the data is put through a predetermined algorithm that adds extra bits specifically for error correction to any character or code block. If the transmission is received in error, the correction bits are used to check and repair the data.

NOTE **KP4 FEC Error Insertion** tab is not available for 800GE-4P-QDD-C PAM4 100G mode.

The **FEC Error Insertion** tab allows to inject FEC errors into transmitted data, and is shown in *Figure: **FEC Error Insertion** Tab*

Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Random

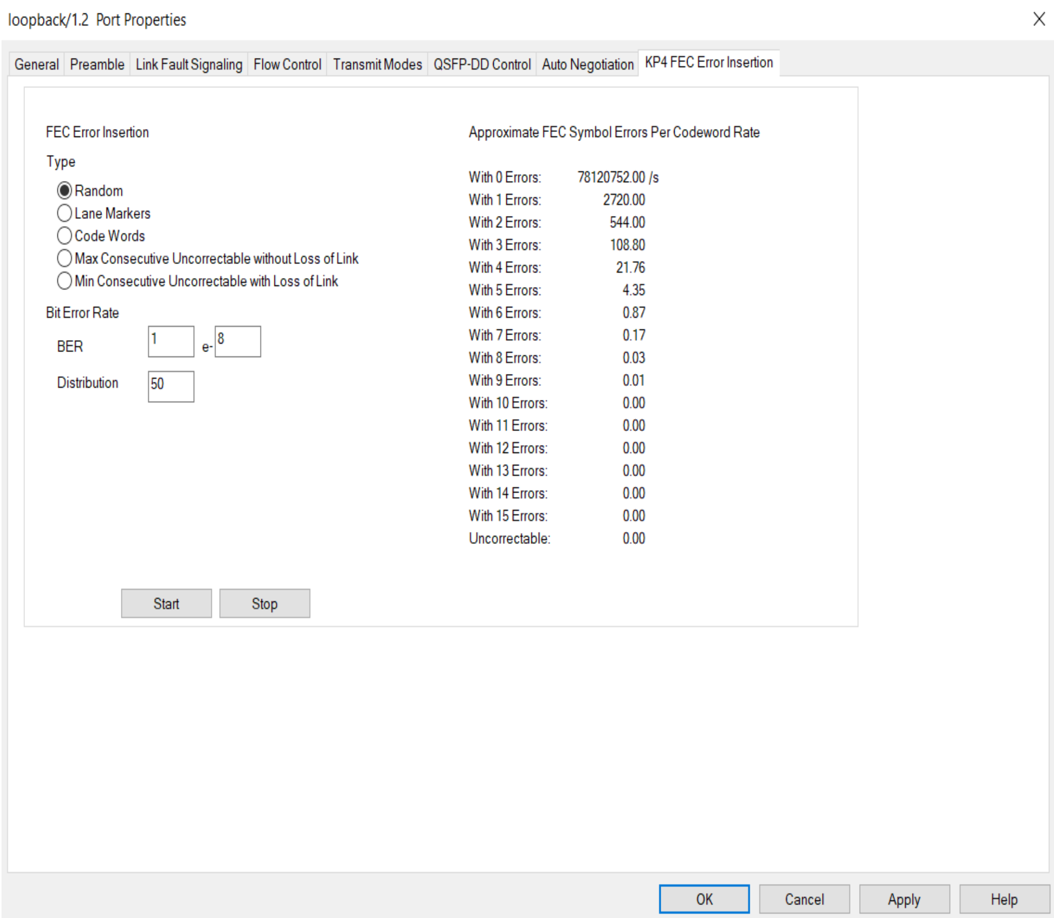


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Lane Markers

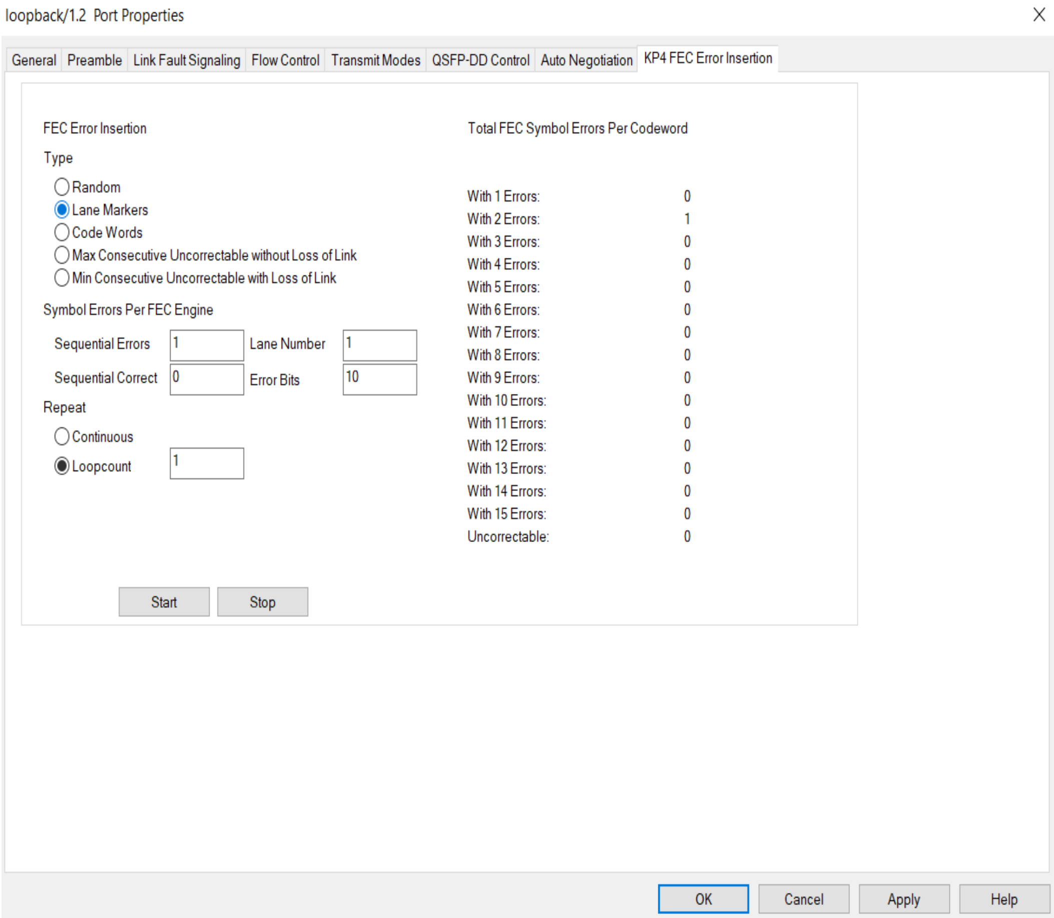


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Code Words

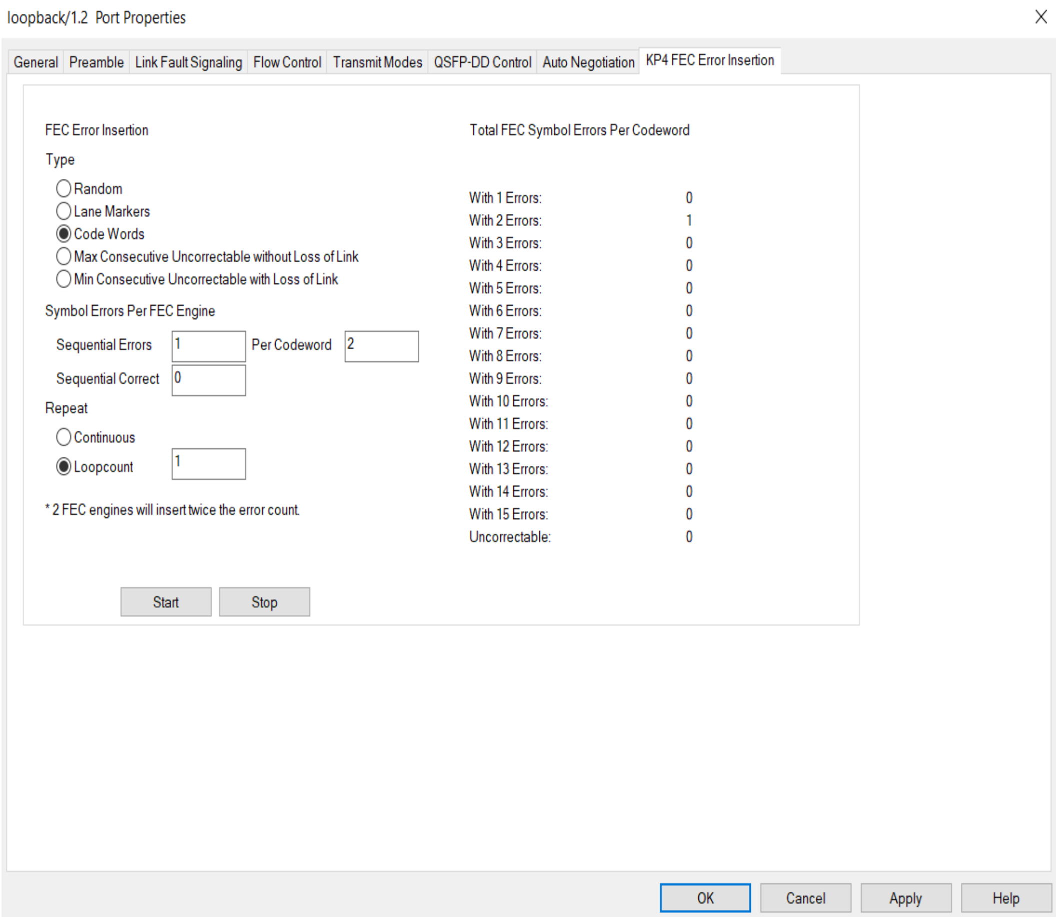


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Max Consecutive Uncorrectable without Loss of Link

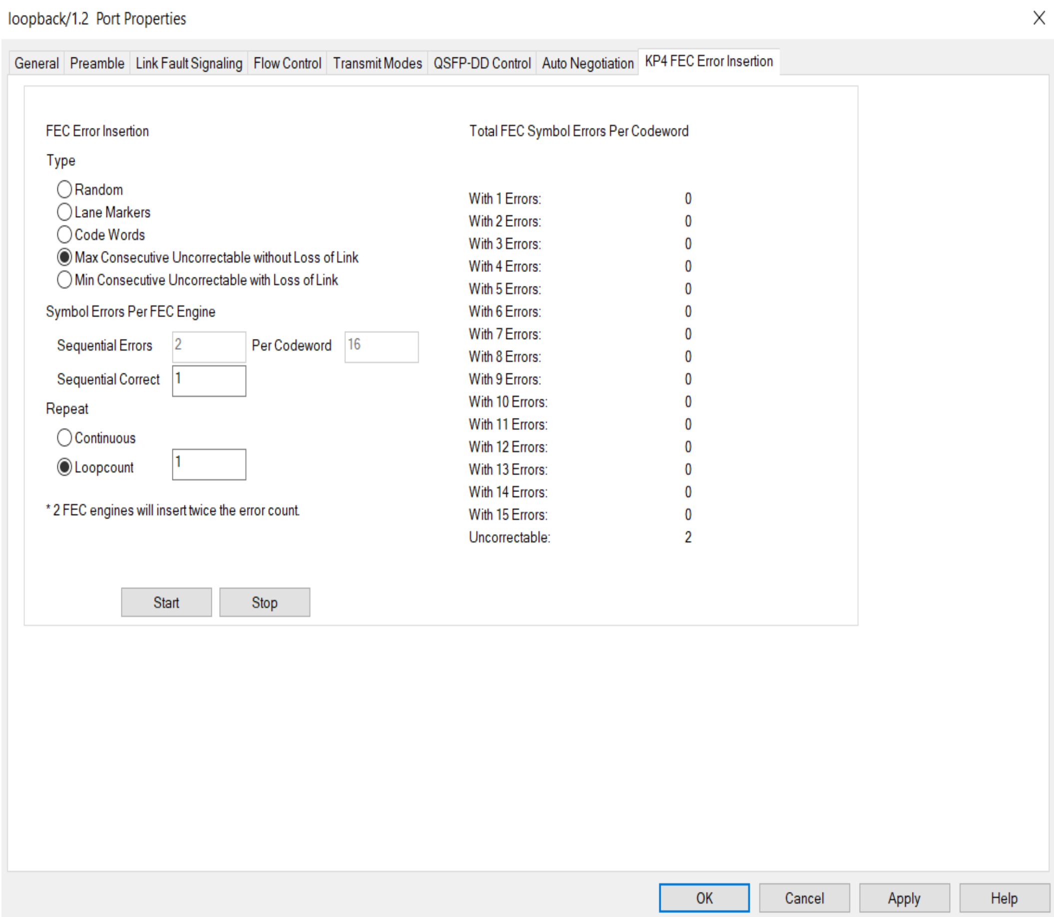


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Min Consecutive Uncorrectable with Loss of Link

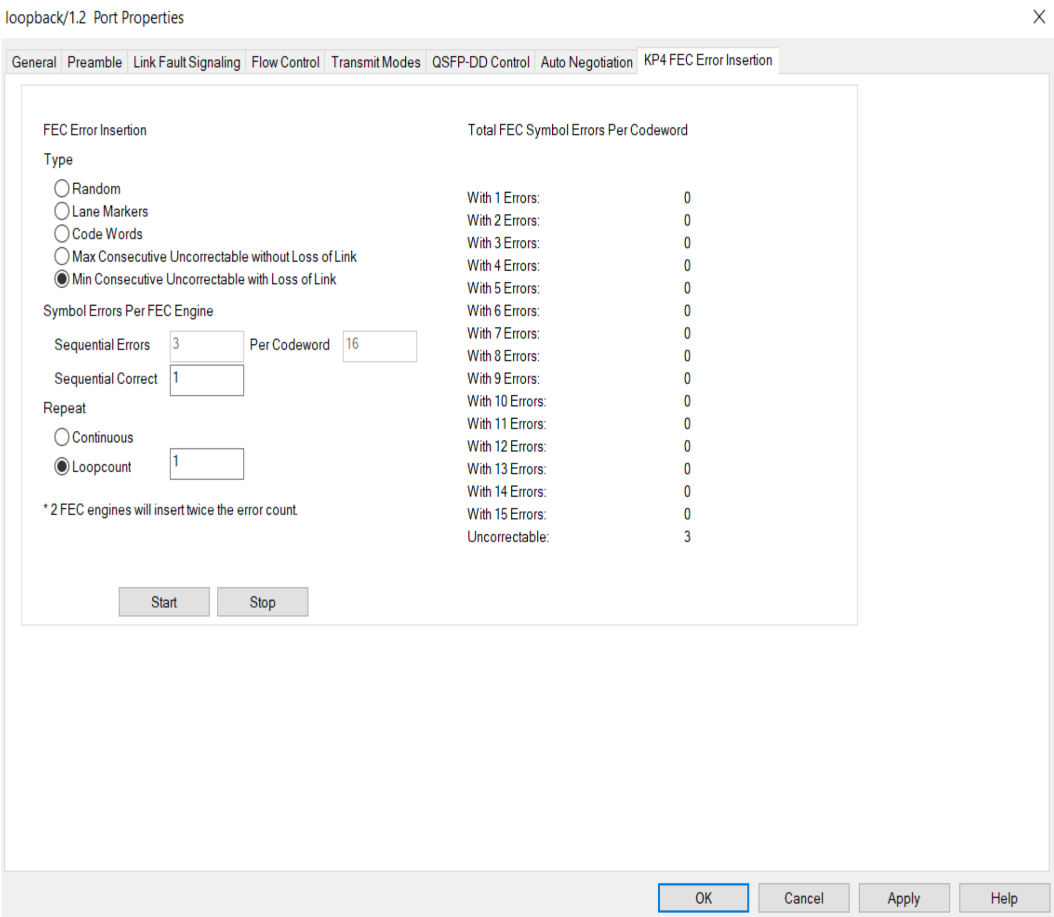


Table: **KP4 FEC** Tab Configuration

Section	Field	Usage
FEC Error Insertion		
Type	Random	Random FEC symbol error insertion will introduce a deterministic number of errors, evenly spread across all PCS lanes, on top the intrinsic BER (Bit Error Rate) of the interconnect.
	Lane Markers	Inserts errors only in the Lane Marker fields.
	Code Words	This is the fundamental unit of data that the FEC engine operates on sequentially. It is composed of blocks that carry the payload and parity information for the 64/66B scrambled data that arrives from the PCS Scrambler on Egress and from the PMA on Ingress.The code word size and layout can vary from each coding scheme. For example, RS, KR, and KP4 all have different code words because their coding schemes are different.
	Max Consecutive Uncorrectable	Uncorrectable errors are those with more than 15 symbol errors. As per IEEE, the maximum number of consecutive uncorrectable errors without loss of link is 2.

Section	Field	Usage
	without Loss of Link	
	Min Consecutive Uncorrectable with Loss of Link	The Max Consecutive Uncorrectable WITHOUT Loss of Link + 1. This is the threshold where the receiver should declare Local Fault due to bad data. The minimum number of consecutive uncorrectable errors with loss of link is 3.
Bit Error Rate	BER	The Bit Error Ratio (BER) is the ratio of the number of error bits compared to the total number of bits transmitted. In the BER field, enter the coefficient of the BER.The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	e-	Enter the exponent of the BER. The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	Distribution	Controls how the errors are distributed. This modifies the probability distribution of errors while maintaining the average Bit Error Rate. For example, you can have a BER of 10E-8 but have all of the errors be single errors OR you can have the errors be distributed across a variety of errors. The purpose is to thoroughly test a receiver to see if all possible errors are being corrected at varying rates.
Symbol Errors Per FEC Engine		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Sequential Errors	In burst mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.

Section	Field	Usage
		NOTE Per 802.3bs and 802.3cd, reception of 3 or more consecutive uncorrectable codewords will result in Loss of Link. In burst mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. This sequence will be repeated until stopped. NOTE Per 802.3bs and 802.3cd, reception of 5 or more Alignment Marker errors will result in Loss of Link. • In 400G mode, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines. • The symbol errors are not evenly distributed across the PCS lanes (use Random error insertion mode for that case) • The maximum number of sequential uncorrectable errors without loss of link is 2 and the minimum number of sequential uncorrectable errors with loss of link is 3.
	Lane Number	The Lane Number specifies which PCS lane will be affected by the Lane Marker error insertion.This field is available only if you select the error insertion type as Lane Markers.
	Sequential Correct	The number of consecutive code words without errors.
	Error Bits	The Error Bits specifies how many errors will be inserted on each of the two symbol errors of the codeword that carries the Lane Marker. There is a minimum Error Bits required (2) before corrupting the symbol that maps to the Lane Marker field. This field is available only if you select the error insertion type as Lane Markers.
	Per Codeword	Codeword is a block of contiguous packets on the line. All RS-FEC codewords are of the same size.The Per Codeword value denotes the number of symbol errors per codeword to insert. KP4 FEC can correct up to 15 symbols, and detect up to 30 symbols. If the user specifies 16, an Uncorrectable Codeword will be issued. This field is available only if you select the error insertion type as Code Words.

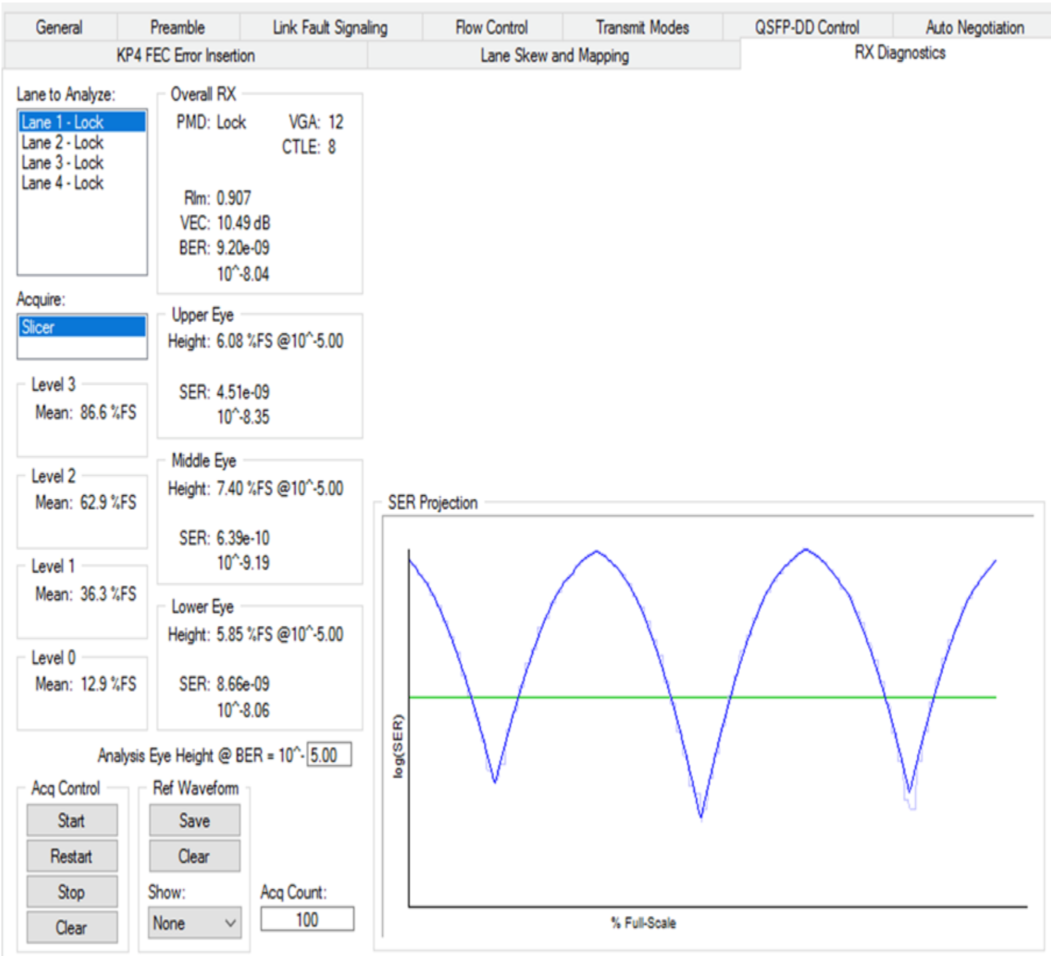
<table>
<tr><th>Section</th><th>Field</th><th>Usage</th></tr>
<tr><td>Repeat</td><td></td><td>This is available only if you select the error insertion type as one of the following:
Lane Markers
Code words
Max Consecutive Uncorrectable without Loss of Link
Min Consecutive Uncorrectable with Loss of Link</td></tr>
<tr><td></td><td>Continuous</td><td>Continuous error insertion.In continuous mode, the Sequential Errors field will specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.</td></tr>
<tr><td></td><td>Loopcount</td><td>The sequence of correct and incorrect codewords or symbol errors inserted will be repeated by the number specified in the Loopcount field.</td></tr>
<tr><td>Start</td><td></td><td>Starts the error insertion process.</td></tr>
<tr><td>Stop</td><td></td><td>Stops the error insertion process.</td></tr>
<tr><td colspan="2">Appropriate FEC Symbol Errors Per Codeword Rate</td><td>The Appropriate FEC Symbol Errors Per Codeword Rate is an approximation for how many symbol errors there will be per codeword every second.
NOTE In 400G mode, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines.</td></tr>
</table>

800GE-4P-QDD-C Port Properties—RX Diagnostics

The 800GE-4P-QDD-C load module has eight electrical lanes at the cage where you insert your optics or DACs. In order to evaluate the link quality and determine if the transmitters are driving the right kind of signal, you can diagnose the signals that are actually being received at the electrical lane receivers. The **RX Diagnostics** tab allows you to do this.

This feature is also available for 800GE-8P-QDD-C and 800GE-2P-QDD-C load modules.

The 800GE-4P-QDD-C Port Properties **RX Diagnostics** tab is shown in the following figure:



See [S400GD-16P-QDD+FAN+NRZ Port Properties—RX Diagnostics](#) for more details.

800GE-4P-QDD-C performs a single-shot acquisition for each lane every time you select Start or Restart in IxExplorer. This means results will appear on each lane once the complete acquisition is made.
The hardware architecture arrives at a quality bathtub analysis in shorter time than S400GD-16P-QDD. However, there are no ADC or Slicer Histograms or measurements related to Standard Deviations of the slicer histogram. Furthermore, SNR Projection and Fractional Frequency Offset (FFO) are not available.

Fields and Controls

The fields and controls that allow you to analyze the electrical signals are explained in the following table:

Field	Description
Lane to Analyze	Allows you to select a physical lane you want to analyze. This also reports the SNR for convenience.

Field	Description
Acquire	Enables you to start the acquisition at the Slicer, which is available only with an additional license.
Acq Control	Controls the histogram acquisition for all lanes simultaneously on a port. Options include the following: **Start**: Acquires 100 captures. **Restart**: Clears previous results and starts. **Stop**: Stops acquiring captures. **Clear**: Clears previous results and stops acquiring captures.
Acq Count	Shows how many captures of the particular type were acquired on that lane.
Ref Waveform	Shows the reference waveforms. • **Save**: Saves all acquired lane histograms as reference for comparison. The reference data is stored on a per-port, per-type basis by IxExplorer, and it will go away if IxExplorer closes. • **Clear**: Clears all reference histograms. • **Show**: Controls the view of reference waveforms as a red plot in the Slicer Histogram and SER Projection, as follows: - None (shows no reference) - Current Lane (shows reference for the current lane) - Lane N (shows the reference for a specific lane for the current port)

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CHAPTER 39

Port Properties–800GE-4P-OSFP-C Load Modules

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the 800GE-4P-OSFP-C load modules.

Following variants of 800GE are available:

- 800GE-8P-OSFP-C - Full and reduced
- 800GE-4P-OSFP-C - Full and reduced
- 800GE-2P-OSFP-C - Full and reduced
- 800GER-8PHW-4P-OSFP-C - Full and reduced

Port Properties for 800GE-4P-OSFP-C Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option.

The complete specification for the 800GE-4P-OSFP-C load module is found in the *Platform Reference Manual*.

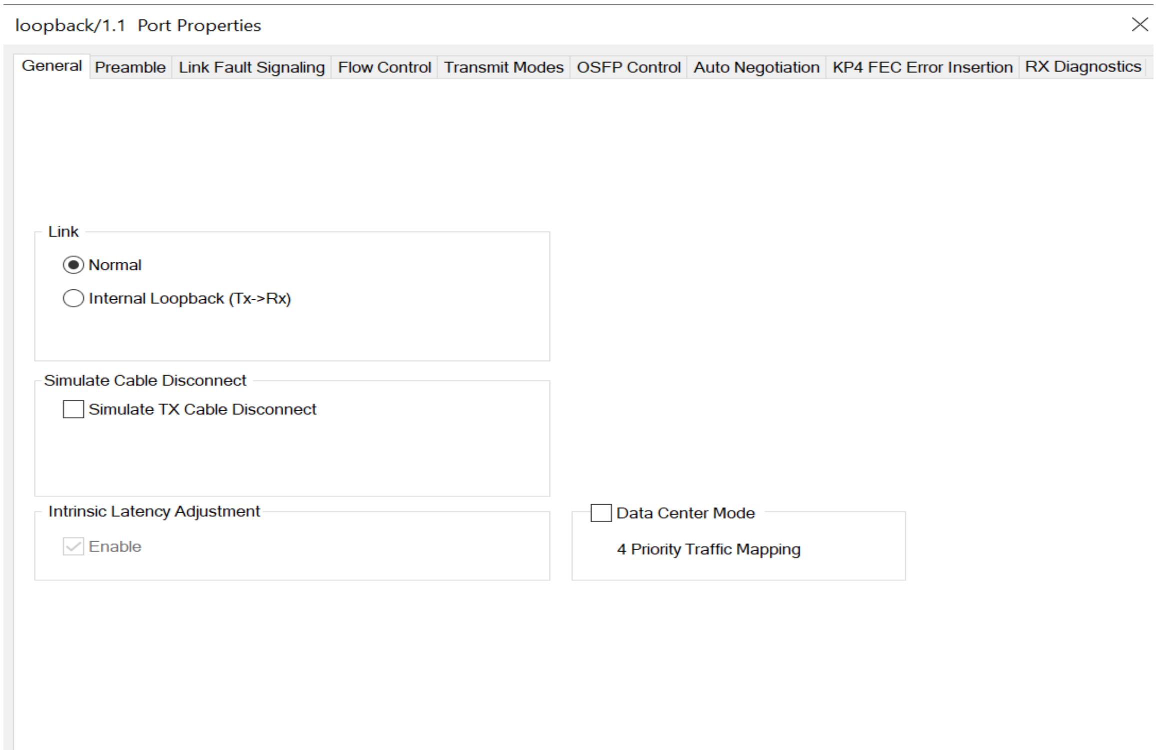
The following port property tabs are available for 800GE-4P-OSFP-C modules:

- 800GE-4P-OSFP-C Port Properties—General
- 800GE-4P-OSFP-C Port Properties—Preamble
- 800GE-4P-OSFP-C Port Properties—Link Fault Signaling
- 800GE-4P-OSFP-C Port Properties—Flow Control
- 800GE-4P-OSFP-C Port Properties—Transmit Modes
- 800GE-4P-OSFP-C Port Properties—OSFP Control
- 800GE-4P-OSFP-C Port Properties—Auto Negotiation
- 800GE-4P-OSFP-C Port Properties—KP4 FEC Error Insertion

800GE-4P-OSFP-C Port Properties—General

The 800GE-4P-OSFP-C **General** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, and then selecting the **General** tab.

The Port Properties **General** tab for 800GE-4P-OSFP-C is shown in the following figure:



The controls for **General** tab configuration are described in the following table:

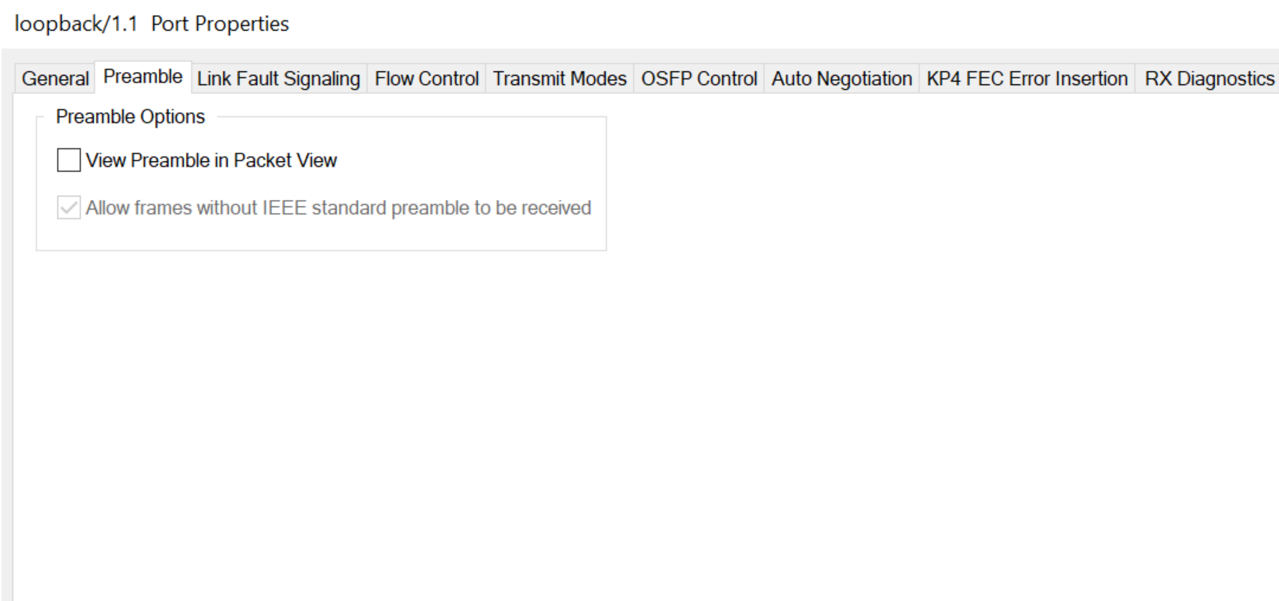
Section	Control/Field	Usage
Link	Normal	Normal operation
	Internal Loopback (Tx -> Rx)	Select this check box to turn on Internal Loopback—Transmit to Receive.
Simulate Cable Disconnect	Simulate TX Cable Disconnect	If this is selected, the port acts as if the cable has been disconnected on the transmit side only. Incoming packets may still be received and port may show link up, but no packets or PCS data will be transmitted.
Intrinsic Latency Adjustment	Enable	The **Enable** check box is selected by default. This enables the intrinsic latency adjustment. The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia Platform Reference Manual*.
Data Center Mode		If selected, enables the Data Center Mode option. When Data Center Mode option is selected, the following changes take place:

Section	Control/Field	Usage
		• The selected port is automatically placed into Advanced Stream mode. In this case, Packet Stream mode is not supported. • Only Auto Intrumentation mode (Floating Timestamp/Data Integrity) is supported, both for transmit and receive. • 4-Priority Traffic Mapping is enabled. It supports various frame size for each PFC control (0-4). NOTE This feature is not supported in 800 GE speed mode. • FCoE protocol can be edited for Ethernet II and Ethernet Snap in **Frame Data** tab.

800GE-4P-OSFP-C Port Properties—Preamble

The preamble precedes the frame, but is not part of the frame itself.

The 800GE-4P-OSFP-C Port Properties **Preamble** tab is shown in the following figure:



The fields and controls in this tab are described in the following table:

Section	Choices	Description
Preamble Options	View Preamble in Packet View	When this check box is selected, the preamble data will be visible in the Packet View (transmit side) and the Capture View (receive side).
	Allow frames without	When this check box is selected, it allows frames without

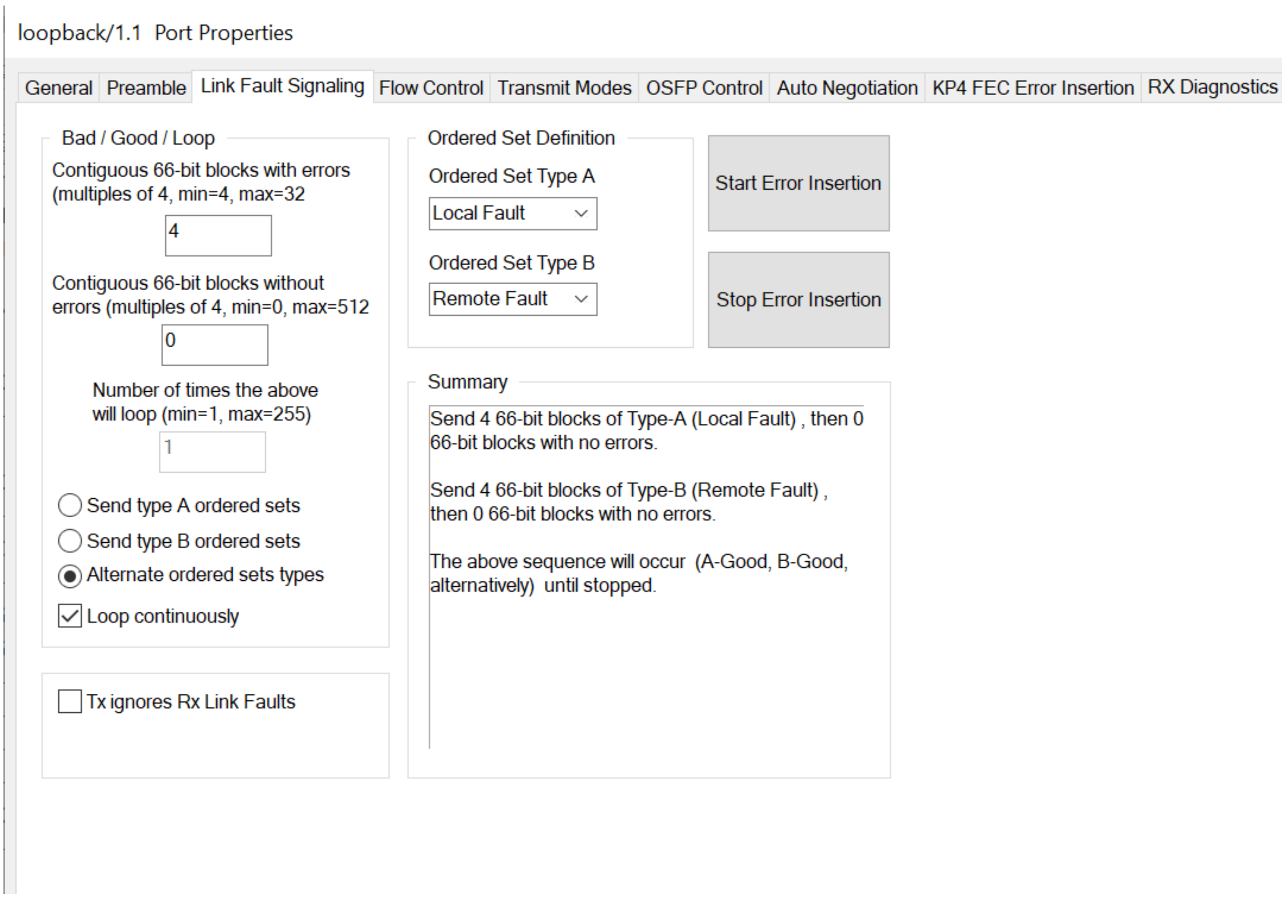
Section	Choices	Description
	IEEE standard preamble to be received	IEEE standard preamble to be received. • This check box is selected by default.

800GE-4P-OSFP-C Port Properties—Link Fault Signaling

When **Link Fault Signaling** is enabled, four statistics will be added to the list in Statistic View for the port. One is for monitoring the Link Fault State. Two provide a count of the Local Faults and Remote Faults. The last one is for indicating the state of error insertion, whether or not it is ongoing

The **Link Fault Signaling** tab is accessed from the context menu of the a port in **Resources** pane by selecting the **Properties** menu option, or by double-clicking a port in the **Detail** pane. Then select the **Link Fault Signaling** tab.

The **Link Fault Signaling** tab for 800GE-4P-OSFP-C load module is shown in the following image.



The controls for **Link Fault Signaling** tab configuration are described in the following table.

Section	Field/Control	Description
Bad/Good/Loop	(Bad) Contiguous 66-bit blocks with	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks with errors that should be included in the pattern. This value must be a multiple of 4.

Section	Field/Control	Description
	errors (multiples of 4; min = 4, max = 32)	The number of consecutive fault sequences allowed are minimum 4 sequences and maximum 32 sequences.
	(Good) Contiguous 66-bit blocks without errors (multiples of 4; min = 0, max = 512)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks without errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive regular data sequences allowed are minimum 0 sequences and maximum 512 sequences.
	Number of times the above will loop (min = 1, max = 255)	Specifies the number of loops for the user defined sequence. Options include the following: • Discrete iterations: 1. Minimum of 1 iteration 2. Maximum of 255 iterations • Continuous loop 1. User cannot specify number of iterations
	Options include the following: • Send type A ordered sets • Send type B ordered sets • Alternate ordered set types	Defines the ordered set pattern that will be sent. (The two Ordered Sets—A and B—are defined in the **Ordered Set Definition** box in this tab.) This pattern will be combined with the Good blocks/Bad blocks pattern for transmission. • Only Type A fault sequence and regular good data sequences • Only Type B fault sequence and regular good data sequences • Alternate Type A, regular good data sequences and Type B fault sequence, regular good data sequences NOTE If this field is available, and the Alternate ordered set types option is selected, the minimum value for this field should be '2,' to allow the entire pattern to be sent once. If left at the minimum value of '1'— only two groups of blocks (one of good blocks and one of bad blocks) will be sent, which means that only the first ordered set will be sent. A minimum of eight blocks is required for one complete pattern including Types A and B.
	Loop	If selected, the loop defined by the combination of the Bad

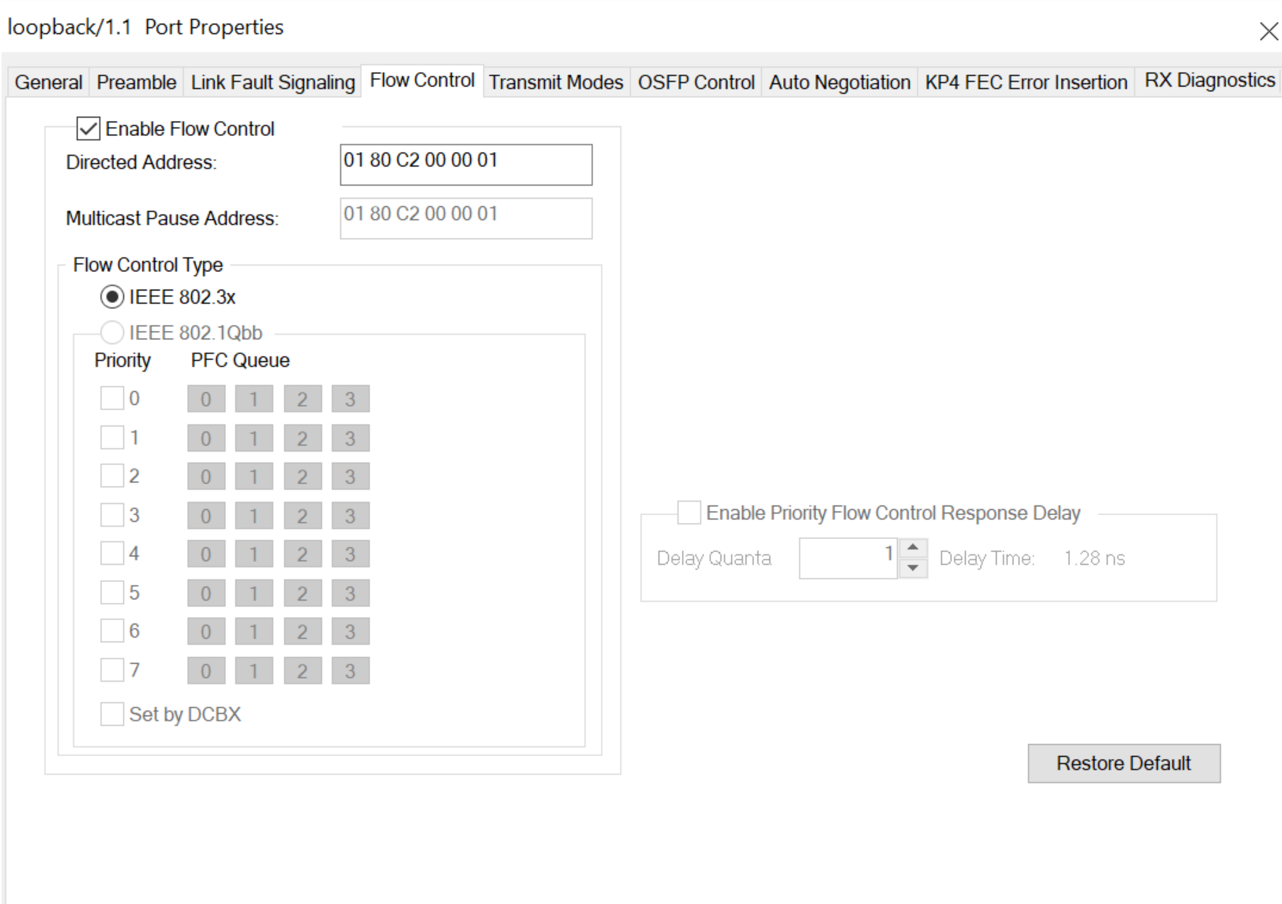
Section	Field/Control	Description
	continuously	and Good blocks plus the pattern of ordered sets, will be transmitted continuously until the **Stop Error Insertion** option is selected.
Ordered Set Definition	Ordered Set Type A	Options include the following: • Local Fault • Remote Fault
	Ordered Set Type B	Options include the following: • Local Fault • Remote Fault
Tx ignores Rx Link Faults		If selected, ongoing transmission will continue even if Link Fault messages are received by the sending RS.
Summary (Window)		(Read-only) Shows descriptions of the patterns that will be transmitted.
Start Error Insertion		Select this option to start the transmission of the configured error patterns.
Stop Error Insertion		(Available only for use with the **Loop continuously** option.) Select this option to stop the transmission of the configured error patterns.

800GE-4P-OSFP-C Port Properties—Flow Control

The 800GE-4P-OSFP-C **Flow Control** tab is accessed from the context menu of the port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

NOTE You can view this help page for the **Port Properties - Flow Control** tab by selecting the **Help** option and not F1.

The Port Properties **Flow Control** tab for 800GE-4P-OSFP-C is shown in the following image.



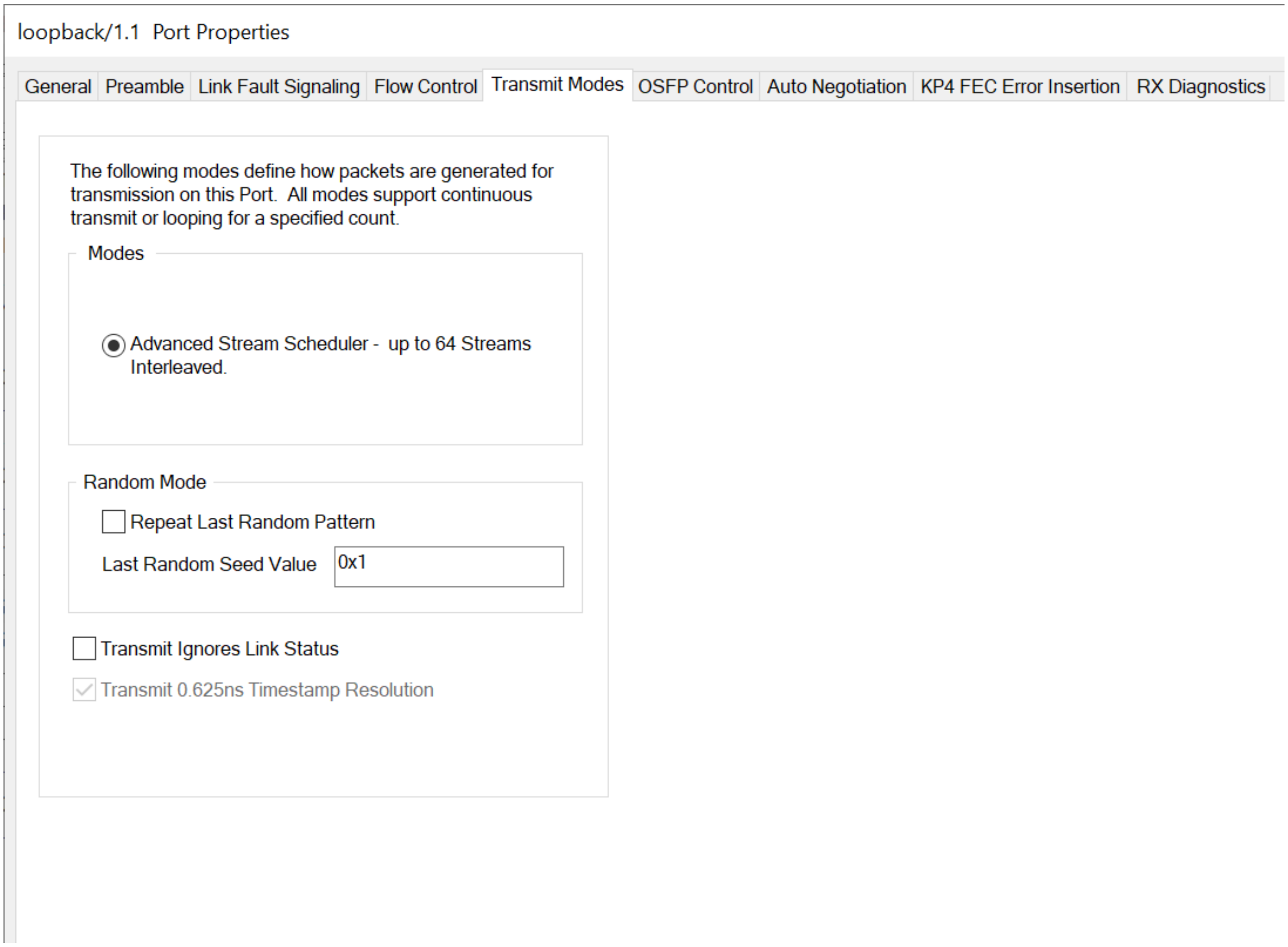
Section	Field/Control	Description
Enable Flow Control	(check box)	Enables the port's MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type	IEEE 802 3x	When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame.
	IEEE 802.1Qbb	When not in Data Center mode, only IEEE 802.3x is available. NOTE This feature is not supported in 800 GE speed mode.
	Priority	When flow control type IEEE 802.1Qbb is selected in Data Center mode, priority options are the channels of data that can be paused. Select to select one or more channels.

Section	Field/Control	Description
	PFC Queue	The PFC Queue can be mapped to the priority field in the frame.
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed. NOTE This feature is not supported in 800 GE speed mode.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

800GE-4P-OSFP-C Port Properties—Transmit Modes

The **Transmit Modes** tab for 800GE-4P-OSFP-C load modules is shown in the following image. It is accessed by double-clicking a port in **Resources** window, or by from the context menu of the port by selecting the **Properties** menu option. Then select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following image.



The controls for **Transmit Modes** tab configuration are described in the following table.

Section	Field/Control	Description
Modes	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure the following: • 800 GE - up to 64 streams • 400 GE - up to 64 streams • 200 GE - up to 64 streams • 100 GE - up to 32 streams They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after

Section	Field/Control	Description
		a stream has been sent (in which case the last stream's random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit Ignores Link Status		If selected, will allow transmission of packets even if the link is down.
Transmit High TimeStamp Resolution		If selected, the 800GE-4P-OSFP-C load module will support the following: • 0.625 ns for 800 GE • 0.625 ns for 400 GE • 1.25 ns for 200 GE • 2.5 ns for 100 GE

800GE-4P-OSFP-C Port Properties—OSFP Control

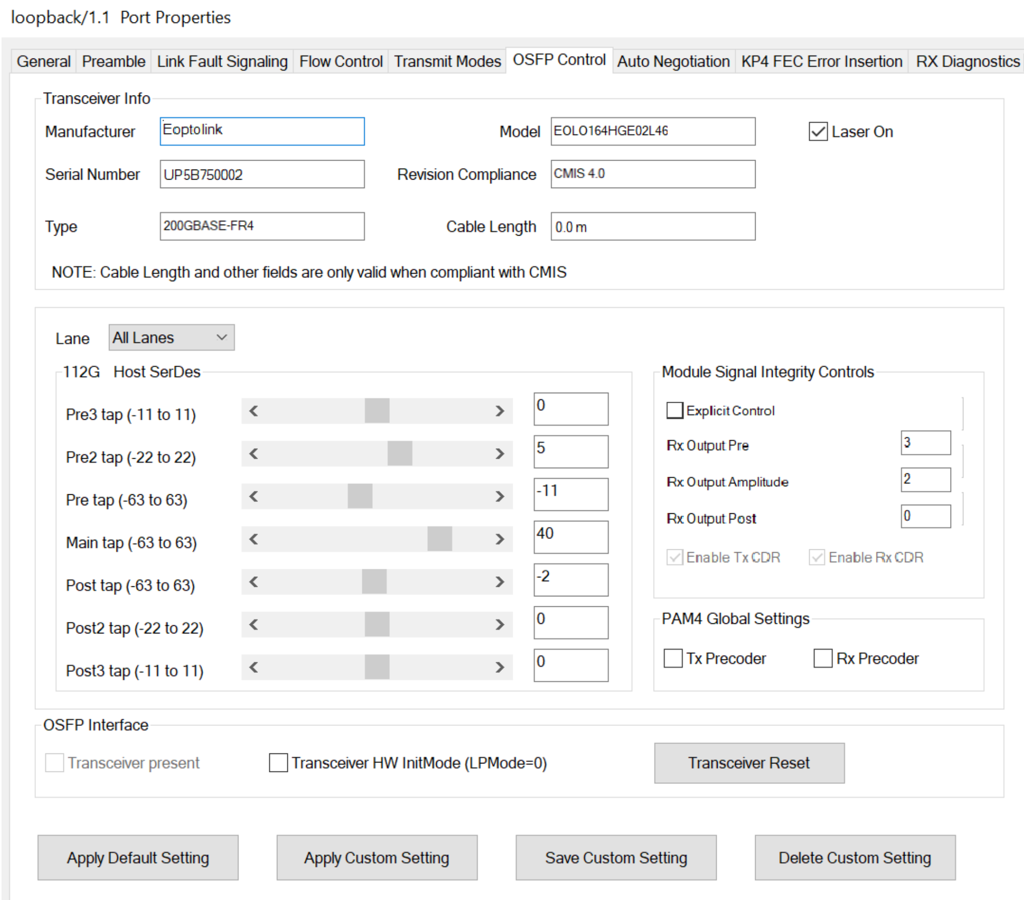
PAM-4 is a four-level pulse-amplitude modulation that uses four distinct amplitude levels to encode two bits of data, essentially doubling the bandwidth of a connection. The PAM4 settings are defined using the **OSFP Control** tab.

For 800GE-8P-OSFP-M+NRZ module, see 800GE-8P-OSFP-M+NRZ Port Properties—OSFP Control.

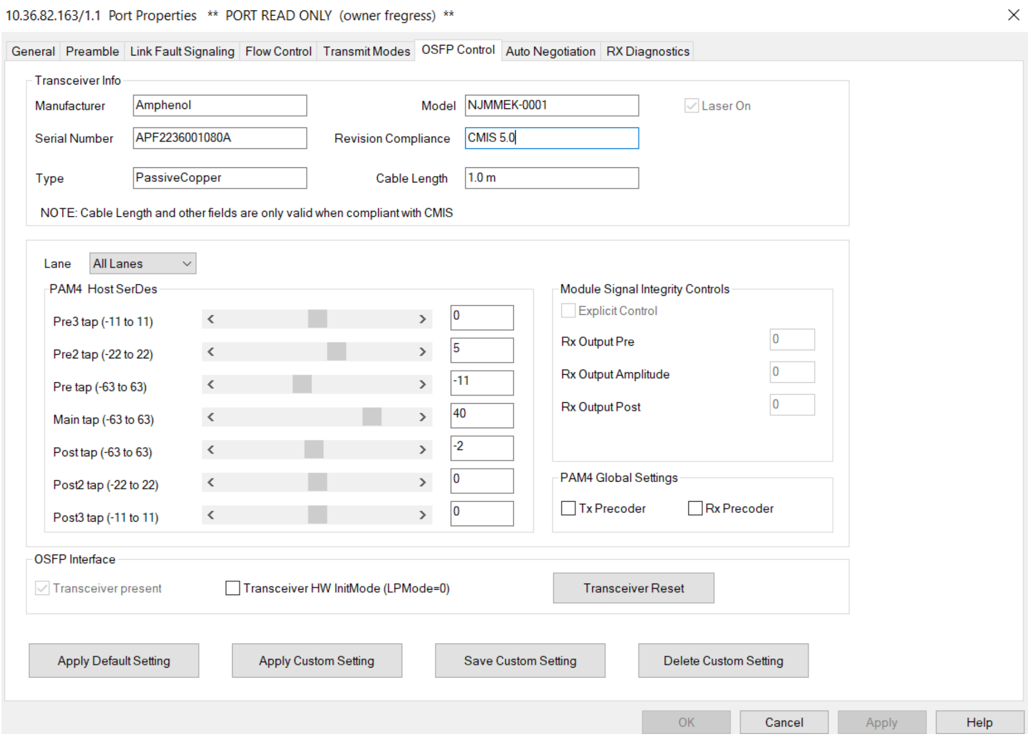
For 800GER-4P-QDD-OSFP-M+NRZ module, see 800GER-4P-QDD-OSFP-M+NRZ Port Properties—QSFP-DD Control.

The **OSFP Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **OSFP Control** tab.

The Port Properties **OSFP Control** tab for 800GE-4P-OSFP-C when the fiber optic transceiver is used is shown in the following figure:



The Port Properties **OSFP Control** tab for 800GE-4P-OSFP-C when the passive copper transceiver is used is shown in the following figure:



When 800GE-4P-OSFP-C detects an optical transceiver, it will apply a Host Transmit equalization combination that is well suited for optics, and also expose the transceiver's signal integrity controls.

The supported module signal integrity fields of CMIS 3.0 and 4.1 transceivers are listed below:

- Rx Output EQ Control Pre-Cursor
- Rx Output EQ Control Post-Cursor
- Rx Output Amplitude Control
- Tx CDR Control
- Rx CDR Control

The signal integrity fields are configurable based on the capability of the transceiver. The default value and maximum allowed range for each of the fields are read from the transceiver during transceiver initialization.

Section	Field/Control	Description
Transceiver Info		
	Manufacturer	This is the Vendor Name field read from the actual transceiver currently being plugged in.
	Model	This is the Part Number field read from the actual transceiver currently being plugged in.
	Serial Number	The serial number of the transceiver.
	Revision	The implemented CMIS revision of the transceiver.

Section	Field/Control	Description
	Compliance	800GE-4P-OSFP-C supports both CMIS 3.0 and CMIS 4.0 transceivers. See Management Interface.
	Type	When a transceiver is inserted into the load module, the software reads IEEE registers to determine the transceiver capabilities and media type. If the transceiver contains this information, it is shown in this read-only field.
	Cable Length	The length of Ixia-supplied cable which connects this chassis to the previous chassis in the chain.
	Laser On	Select this check box to enable the laser power.
112G Host SerDes		
	Pre3 cursor tap (0 to 63)	This helps to control the Pre3 Tap value for Tx.
	Pre2 cursor tap (0 to 63)	This helps to control the Pre2 Tap value for Tx.
	Pre-cursor tap (0 to 63)	This helps to control the Pre Tap value for Tx.
	Main-cursor tap (0 to 63)	This helps to control the Main Tap Control for Tx.
	Post-cursor tap (0 to 63)	This helps to control the Post Tap value for Tx.
Module Signal Integrity Controls		
	Explicit Control	Select this check box to enable the Rx Output pre, Rx Output Amplitude, and Rx Output Post fields. This check box is available for selection only if the fiber optic transceiver is used.
	Rx Output pre	Allowed range of values for Rx Output. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Rx Output Amplitude (0 to 0)	Allowed range of values for Rx Output amplitude. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Rx Output Post	Allowed range of values for Rx Output post. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field

Section	Field/Control	Description
		is configurable per-lane.
	Enable Tx CDR	Turn on Tx CDR Control. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Enable Rx CDR	Turn on Rx CDR Control . This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
PAM4 Global Settings		
	Tx Precoder	Represents a PAM4 encoding scheme to reduce DFE bit errors. This also means that both sides of the link must have precoder enabled for link to come up.
	Rx Precoder	Represents a PAM4 encoding scheme to reduce DFE bit errors. This also means that both sides of the link must have precoder enabled for link to come up.
OSFP Interface		
	Transceiver HW InitMode	Selecting the check box configures the OSFP InitMode pin to perform the optional Hardware Init mode initialization as described in the Common Management Interface Specification (CMIS) Rev 3.0. When a transceiver boots into Hardware Init mode, the datapath is automatically configured by the module without intervention from the host (that is Ixia tester). When disabled, the software-controlled initialization (Software Init) is instead performed. This is the recommended initialization mode for any transceiver since the appropriate checks are performed between the Ixia tester and the transceiver before the module's datapath initialization.
	Transceiver Reset	Resets the transceiver.
	Apply Default Setting	When you select this button, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Setting	When you select this button, if there exists a custom setting in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	When you select this button, if there exists a custom setting in the xml file for the same adapter/xcvr type, users will be prompted to

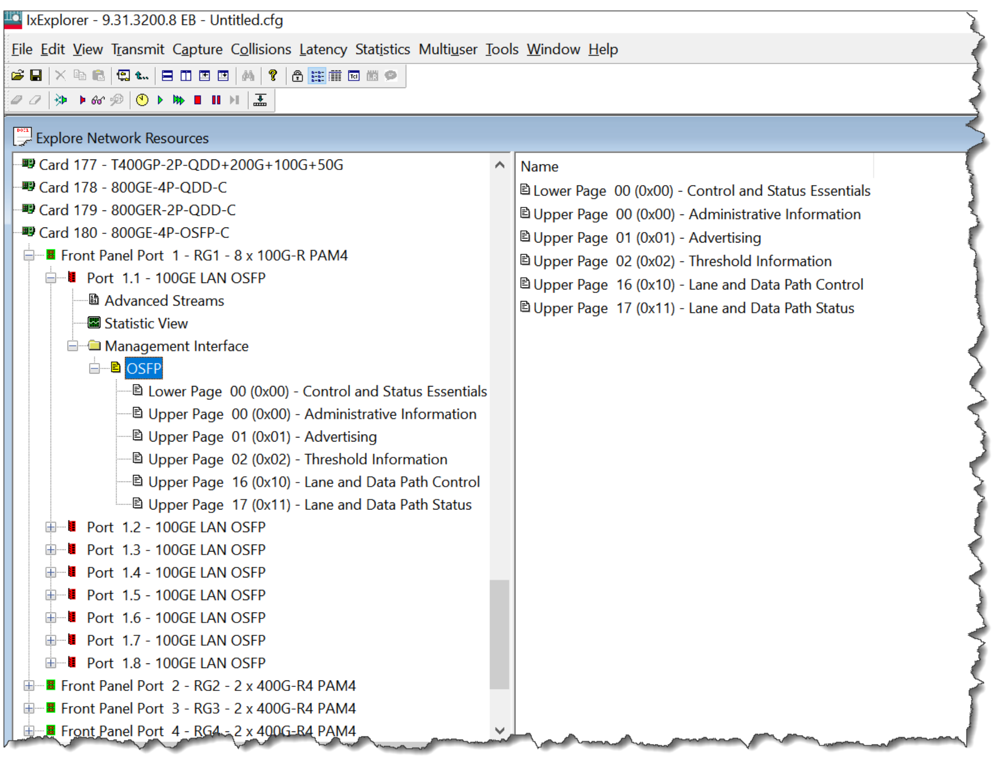
Section	Field/Control	Description
		choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	When you select this button, if there exists a custom setting in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel with that. If no custom setting exists, users will be prompted that nothing will be deleted.

Management Interface

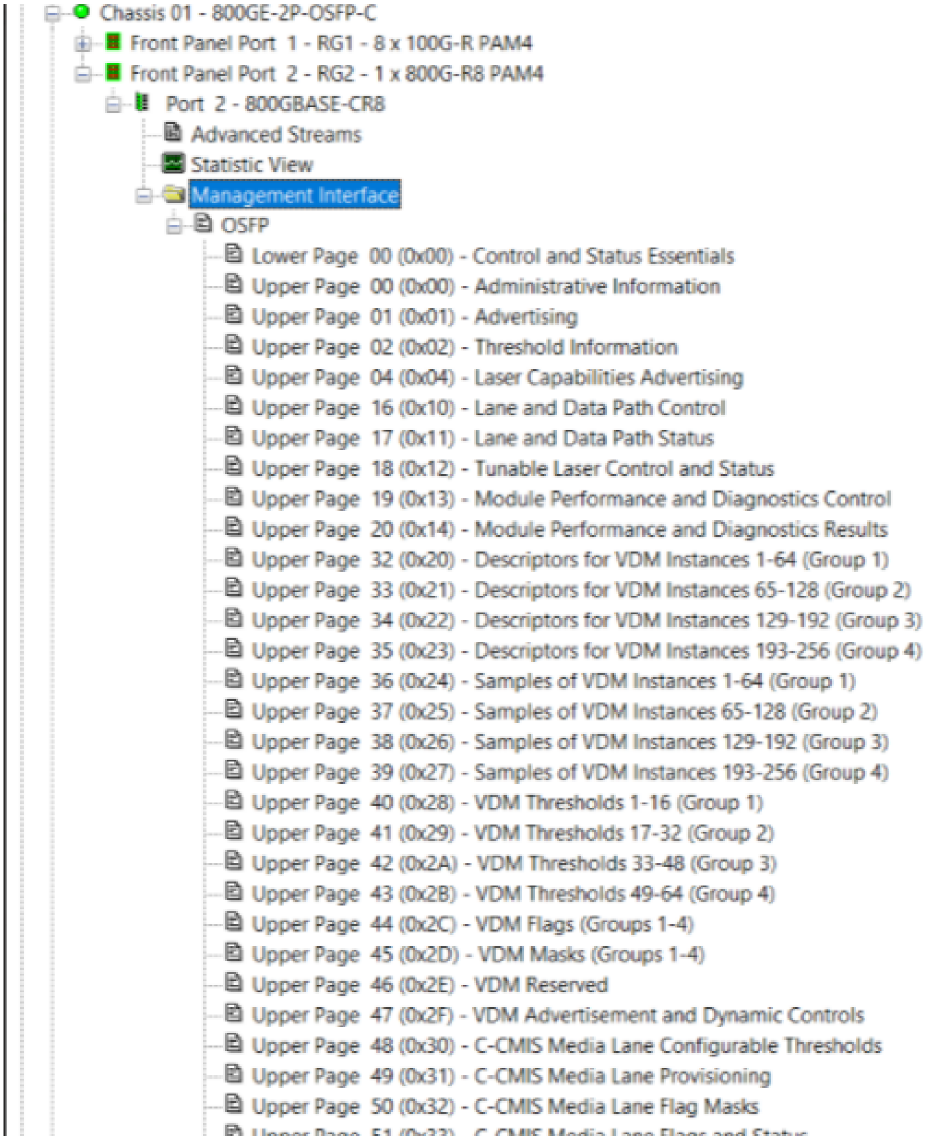
A management interface specification CMIS defines the management interface and associated protocols for all required and allowable management interactions between a CMIS aware host and a CMIS compliant module that are relevant for the host using the module in an application.

The Management Interface appears in the IxExplorer Resources Tree and switches on the fly depending on the CMIS revision. This means that the transceiver automatically reads the management interface and populates the lower and upper pages depending on the transceiver type.

With a CMIS 3.0 (or lower) transceiver, you will see the following pages:



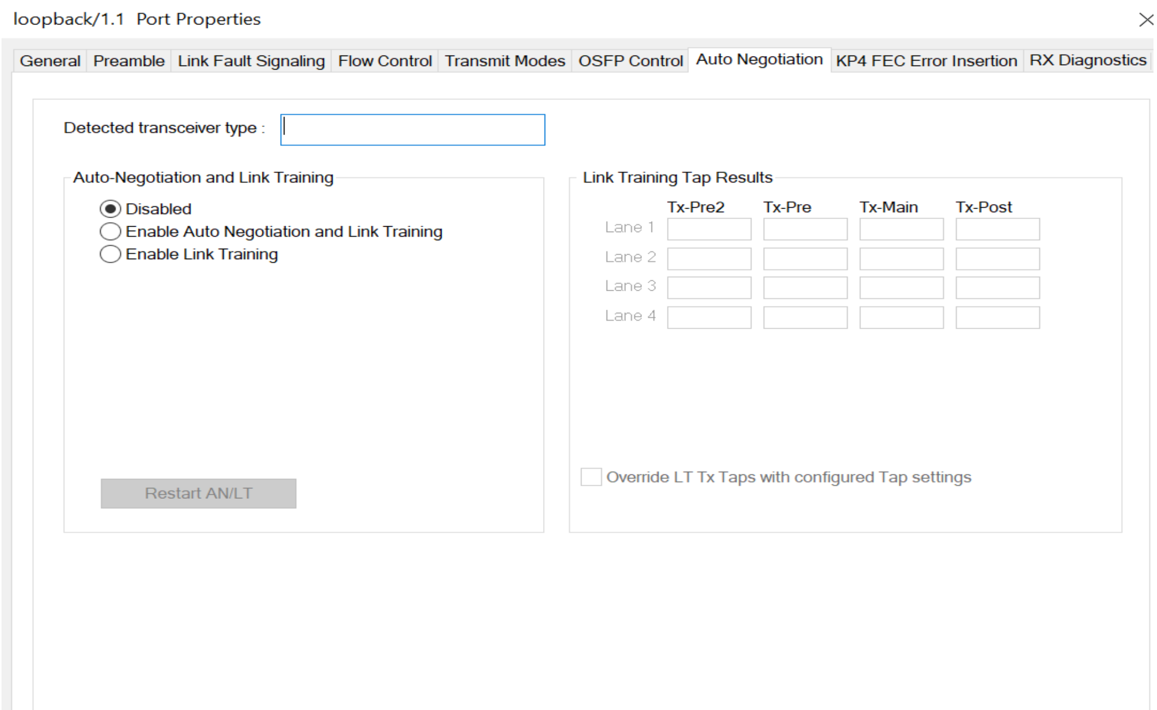
With a CMIS 4.0 transceiver, you will see the following pages:



800GE-4P-OSFP-C Port Properties—Auto Negotiation

The 800GE-4P-OSFP-C **Auto Negotiation**tab is accessed by selecting a 800GE-4P-OSFP-C port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto Negotiation** tab.

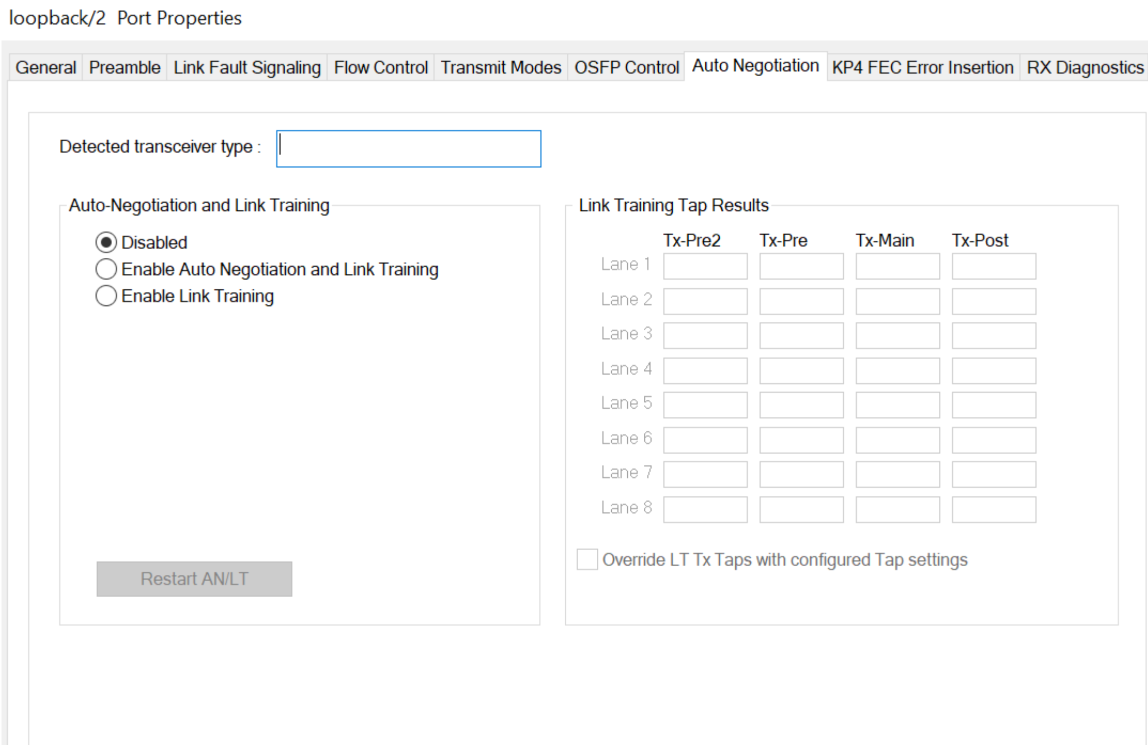
The Port Properties **Auto Negotiation** tab for 800GE-4P-OSFP-C speed mode is shown in the following figure:



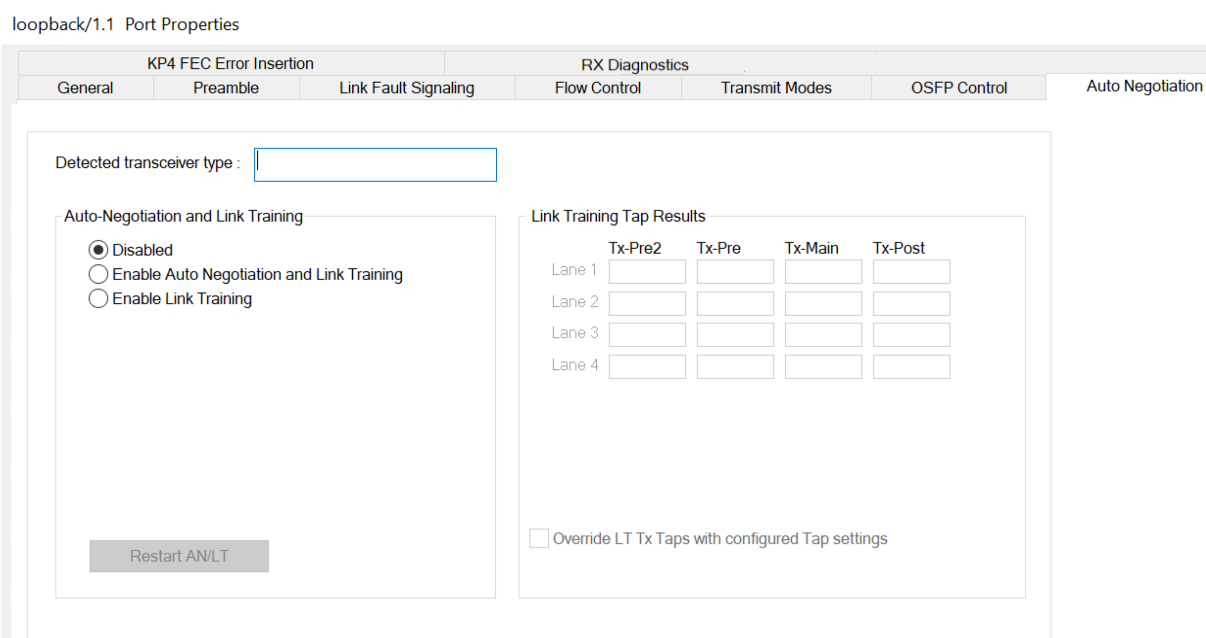
The following lanes are available depending on the port speed:

Speed Mode	Lanes
800GE	8 lanes (1-8)
400GE	4 lanes (1-4)
200GE	2 lanes (1-2)
100GE	1 lane (1)

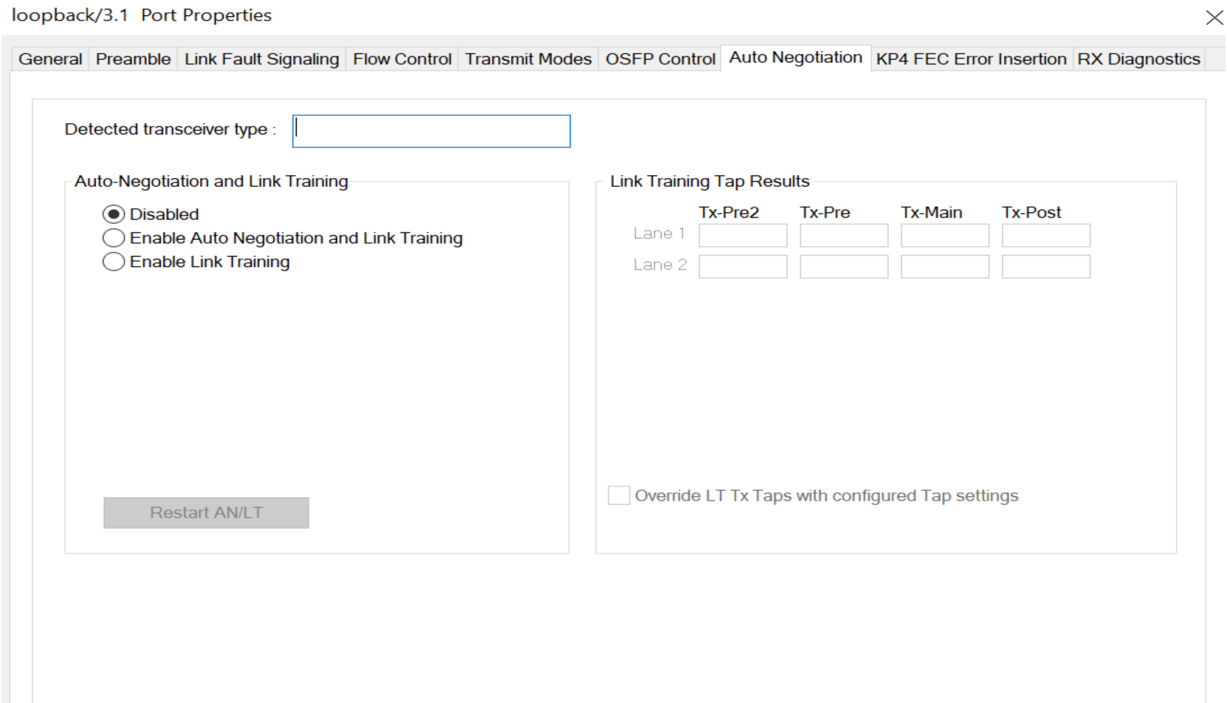
800GE-4P-OSFP-C **Auto Negotiation** tab for 800 GE speed mode is shown below:



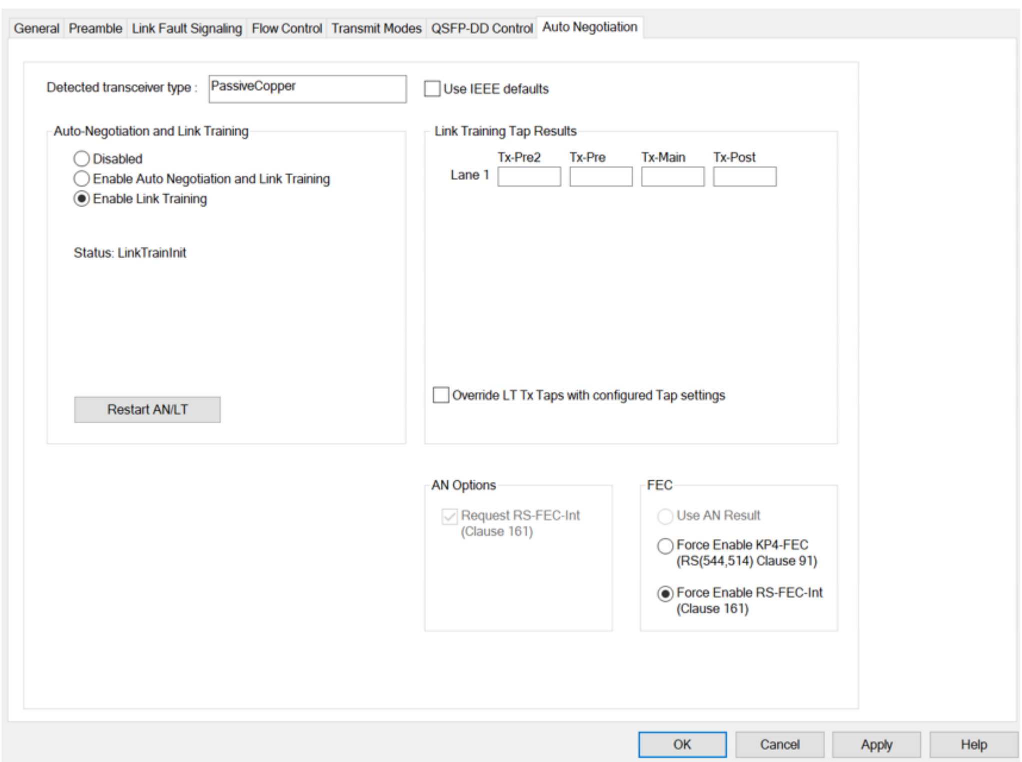
800GE-4P-OSFP-C **Auto Negotiation** tab for 400 GE speed mode is shown below:



800GE-4P-OSFP-C **Auto Negotiation** tab for 200 GE speed mode is shown below:



800GE-4P-OSFP-C **Auto Negotiation** tab for 100 GE speed mode is shown below:



The fields and controls in this tab are described in the following table:

Field/Control	Description
Detected transceiver type	The type of transceiver that is plugged in.
Use IEEE defaults	Clear this check box to make **AN Options** and **FEC** groups available. By default this check box will not remain selected and FEC that will be active is based on Autonegotiation.
Disabled	When you select the check box, the L1 parameters like Autonegotiation, Link Training, and FEC, are enabled or disabled per IEEE requirements, and you will not be able to enable or disable these manually. If the check box is cleared, you will be able to manually enable or disable L1 features – even if it violates IEEE specifications. By default the check box is selected.
Enable Auto Negotiate and Link Training	Auto negotiation controls how a port communicates with other ports.If you select the check box, it allows auto negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing • **Restart Auto-Negotiate** button is selected (this does a forced restart) NOTE The **Enable Auto Negotiate** check box is available for selection only if the **Disabled** check box is cleared.
Enable Link Training	Select the check box to allow longer length copper cables to be used. This means that during the next Auto.Negotiation, KR training will be used. NOTE This check box is available for selection only if the **Disabled** check box is cleared.
Negotiated the capability above	The text box indicates the speed that was negotiated due to Auto Negotiation.
Restart AN/LT	Restarts the Auto Negotiate sequence.
Link Training Tap Settings	
Tx-Pre2-cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto Negotiation and Link Training mode, or in Link Training mode.
Tx-Pre-cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto Negotiation and Link Training mode, or in Link Training mode.
Tx-Main-cursor Lane 1-8	The per-lane transmit main-cursor settings selected by the link training process when a port is in either Auto Negotiation and Link Training mode, or in Link Training mode.

Field/Control	Description
Tx-Post-cursor Lane 1-8	The per-lane transmit post-cursor settings selected by the link training process when a port is in either Auto Negotiation and Link Training mode, or in Link Training mode.
Override LT Tx Tap settings with configured Tap settings	Selecting this check box overrides the taps settings derived by the link training process, and configures the transmit pre/main/post cursor settings and receiver CTLE setting with the static values specified in the **QSFP-DD Host Control** tab.
AN Option	The available option is the following: • Request RS-FEC-Int:This is applicable only when Auto negotiation is turned on. Its value is preserved by IxServer and applied when Auto negotiation is turned on a port. With this check box selected, the port is requesting remote partner to use RS-FEC-Int FEC.
FEC	The available options are the following: • Use AN Result: Use FEC decided by Auto negotiation. • Force Enable KP4-FEC: Force enable KP4-FEC on the port. • Force Enable RS-FEC-Int: Force enable RS-FEC-Int on the port.

800GE-4P-OSFP-C Port Properties—KP4 FEC Error Insertion

Forward Error Correction (FEC) is a method of communicating data that corrects errors in transmission on the receiving end. Prior to transmission, the data is put through a predetermined algorithm that adds extra bits specifically for error correction to any character or code block. If the transmission is received in error, the correction bits are used to check and repair the data.

NOTE **KP4 FEC Error Insertion** tab is not available for 800GE-4P-OSFP-C PAM4 100G mode.

The **FEC Error Insertion** tab allows to inject FEC errors into transmitted data, and is shown in *Figure: **FEC Error Insertion** Tab*

Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Random

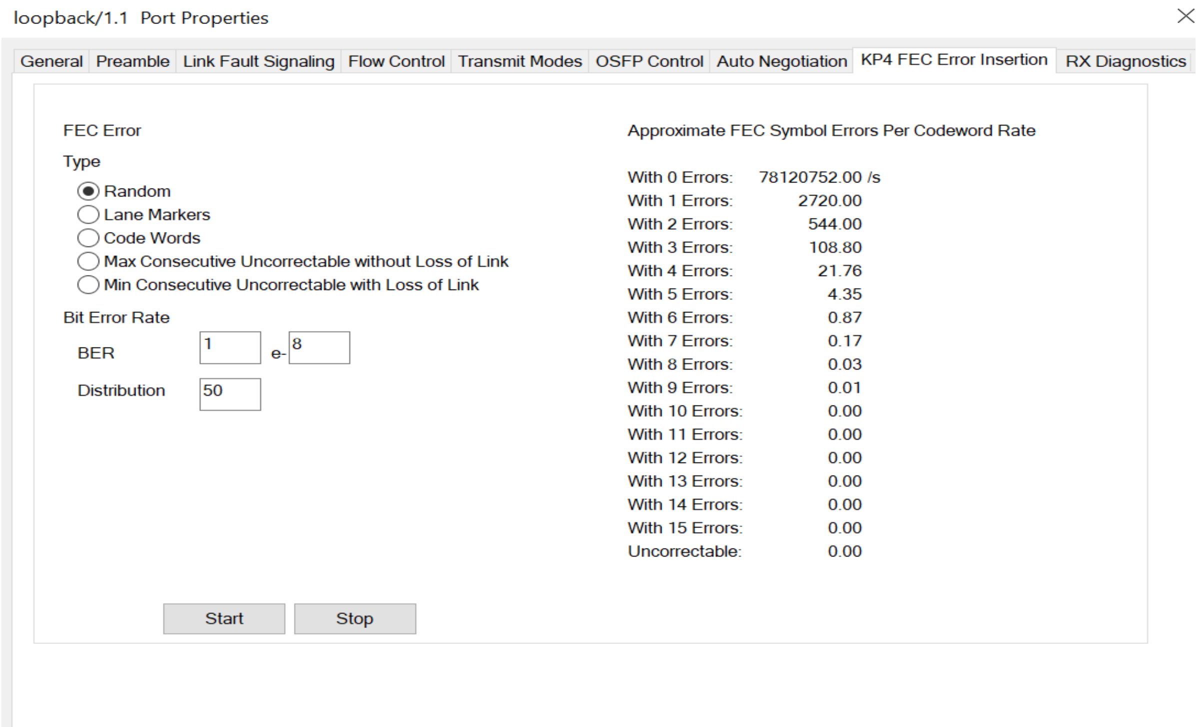


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Lane Markers

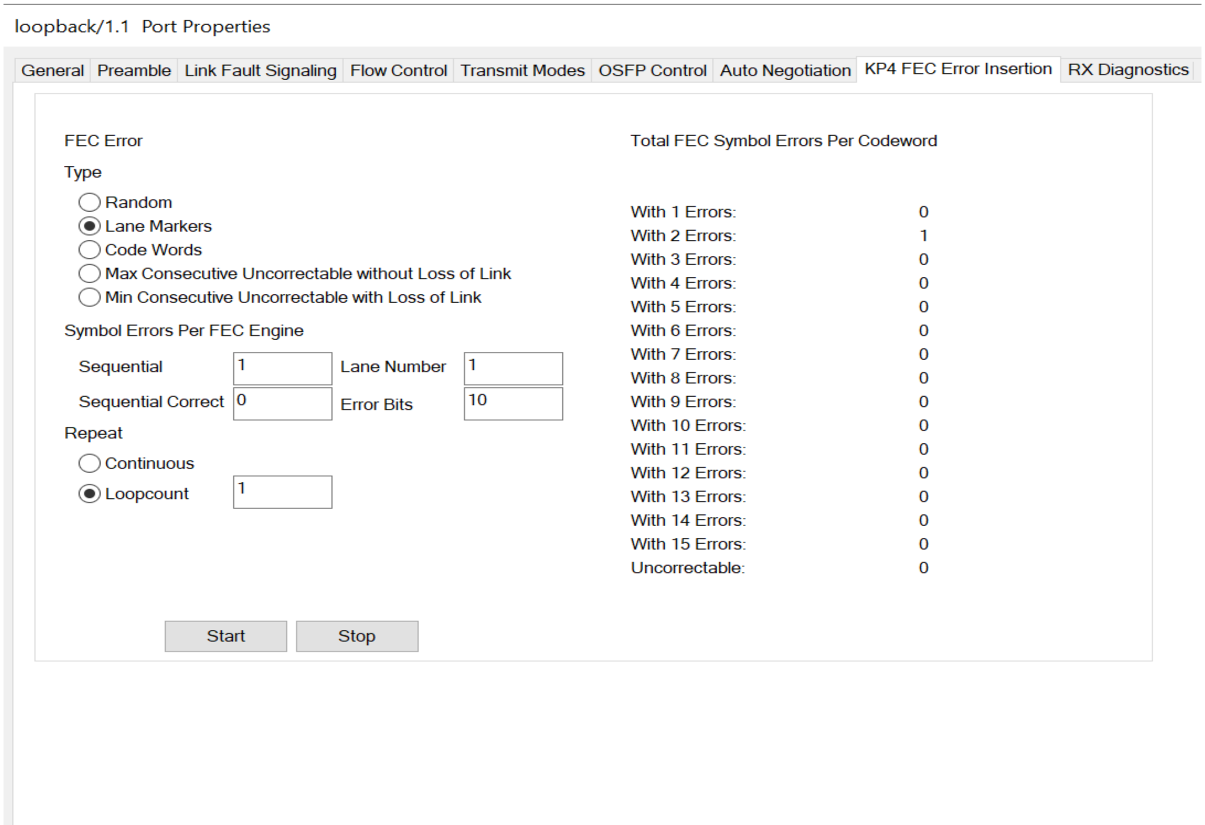


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Code Words

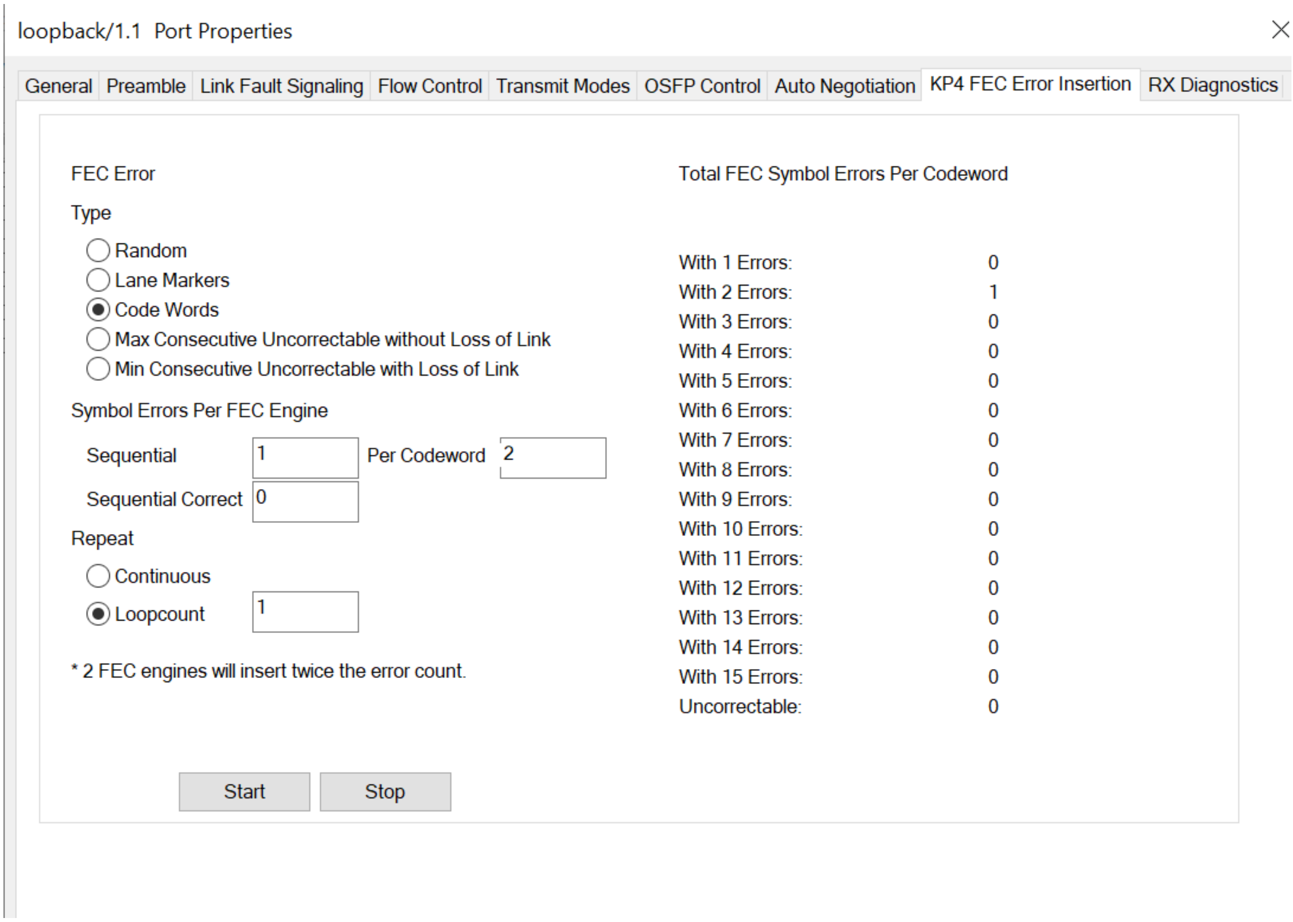


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Max Consecutive Uncorrectable without Loss of Link

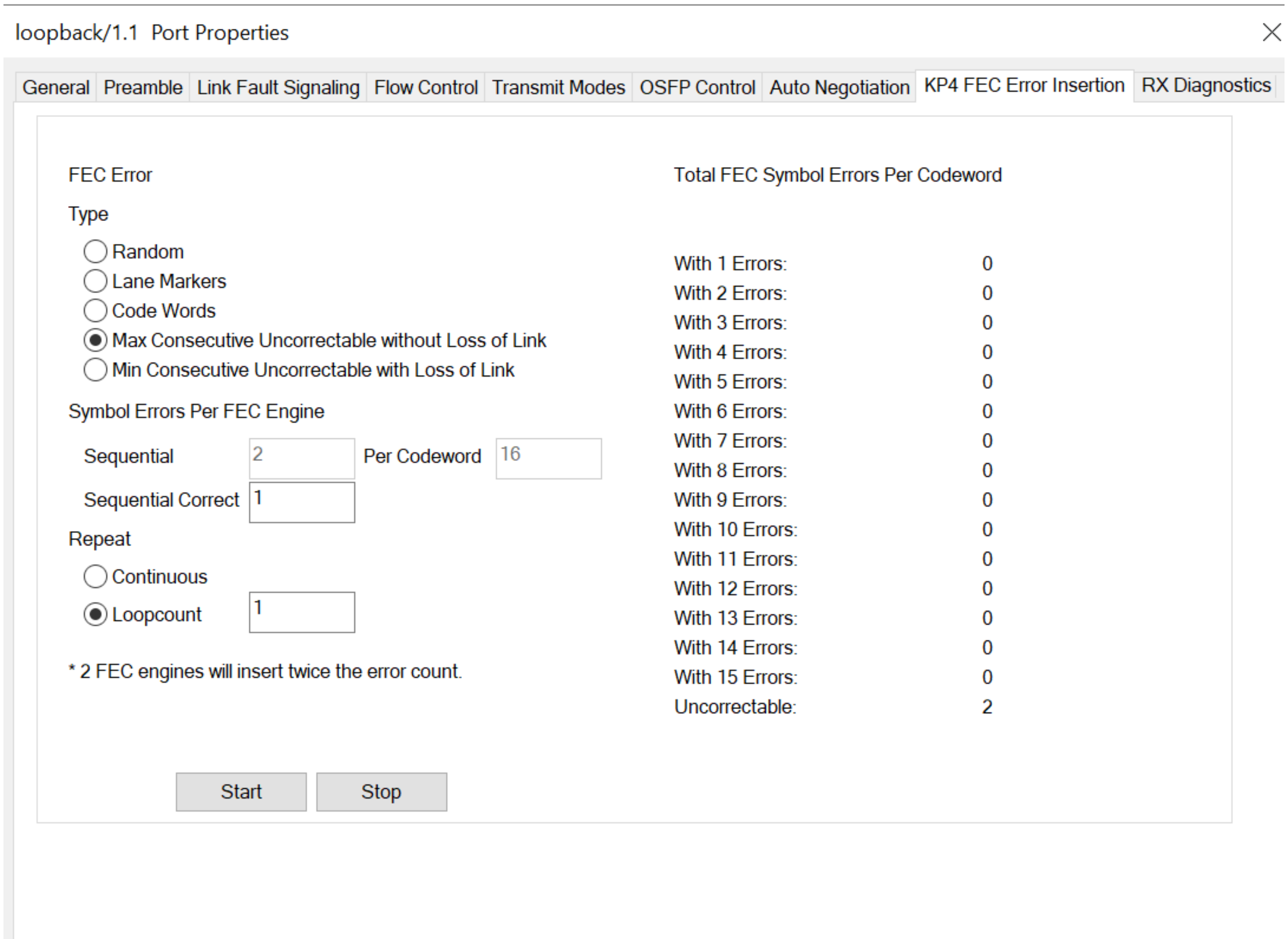


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Min Consecutive Uncorrectable with Loss of Link

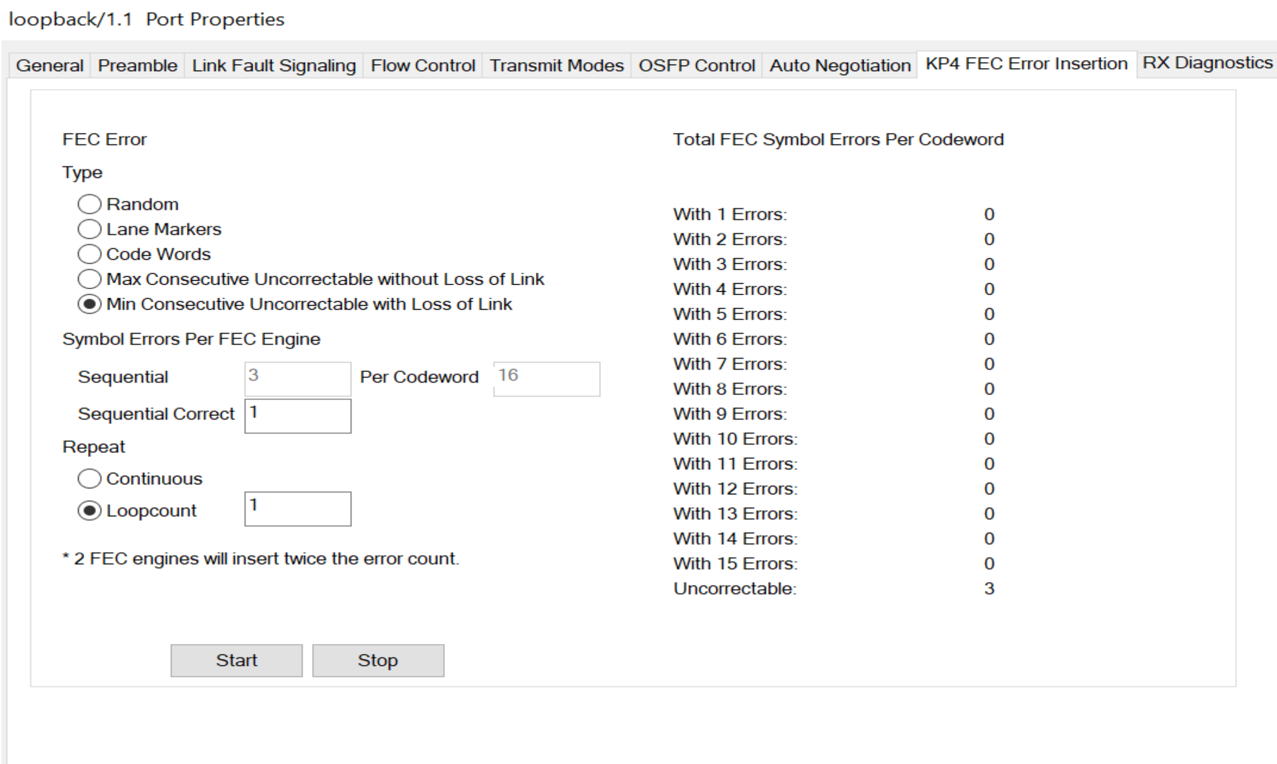


Table: **KP4 FEC** Tab Configuration

Section	Field	Usage
FEC Error Insertion		
Type	Random	Random FEC symbol error insertion will introduce a deterministic number of errors, evenly spread across all PCS lanes, on top the intrinsic BER (Bit Error Rate) of the interconnect.
	Lane Markers	Inserts errors only in the Lane Marker fields.
	Code Words	This is the fundamental unit of data that the FEC engine operates on sequentially. It is composed of blocks that carry the payload and parity information for the 64/66B scrambled data that arrives from the PCS Scrambler on Egress and from the PMA on Ingress.The code word size and layout can vary from each coding scheme. For example, RS, KR, and KP4 all have different code words because their coding schemes are different.
	Max Consecutive Uncorrectable without Loss of Link	Uncorrectable errors are those with more than 15 symbol errors. As per IEEE, the maximum number of consecutive uncorrectable errors without loss of link is 2.
	Min	The Max Consecutive Uncorrectable WITHOUT Loss of Link + 1.

Section	Field	Usage
	Consecutive Uncorrectable with Loss of Link	This is the threshold where the receiver should declare Local Fault due to bad data. The minimum number of consecutive uncorrectable errors with loss of link is 3.
Bit Error Rate	BER	The Bit Error Ratio (BER) is the ratio of the number of error bits compared to the total number of bits transmitted. In the BER field, enter the coefficient of the BER.The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	e-	Enter the exponent of the BER. The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	Distribution	Controls how the errors are distributed. This modifies the probability distribution of errors while maintaining the average Bit Error Rate. For example, you can have a BER of 10E-8 but have all of the errors be single errors OR you can have the errors be distributed across a variety of errors. The purpose is to thoroughly test a receiver to see if all possible errors are being corrected at varying rates.
Symbol Errors Per FEC Engine		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Sequential Errors	In burst mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped. NOTE Per 802.3bs and 802.3cd, reception of 3 or more consecutive uncorrectable codewords will result in Loss of Link.

Section	Field	Usage
		In burst mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. This sequence will be repeated until stopped. NOTE Per 802.3bs and 802.3cd, reception of 5 or more Alignment Marker errors will result in Loss of Link. • In 400G mode, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines. • The symbol errors are not evenly distributed across the PCS lanes (use Random error insertion mode for that case) • The maximum number of sequential uncorrectable errors without loss of link is 2 and the minimum number of sequential uncorrectable errors with loss of link is 3.
	Lane Number	The Lane Number specifies which PCS lane will be affected by the Lane Marker error insertion.This field is available only if you select the error insertion type as Lane Markers.
	Sequential Correct	The number of consecutive code words without errors.
	Error Bits	The Error Bits specifies how many errors will be inserted on each of the two symbol errors of the codeword that carries the Lane Marker. There is a minimum Error Bits required (2) before corrupting the symbol that maps to the Lane Marker field. This field is available only if you select the error insertion type as Lane Markers.
	Per Codeword	Codeword is a block of contiguous packets on the line. All RS-FEC codewords are of the same size.The Per Codeword value denotes the number of symbol errors per codeword to insert. KP4 FEC can correct up to 15 symbols, and detect up to 30 symbols. If the user specifies 16, an Uncorrectable Codeword will be issued. This field is available only if you select the error insertion type as Code Words.
Repeat		This is available only if you select the error insertion type as one of the following: • Lane Markers

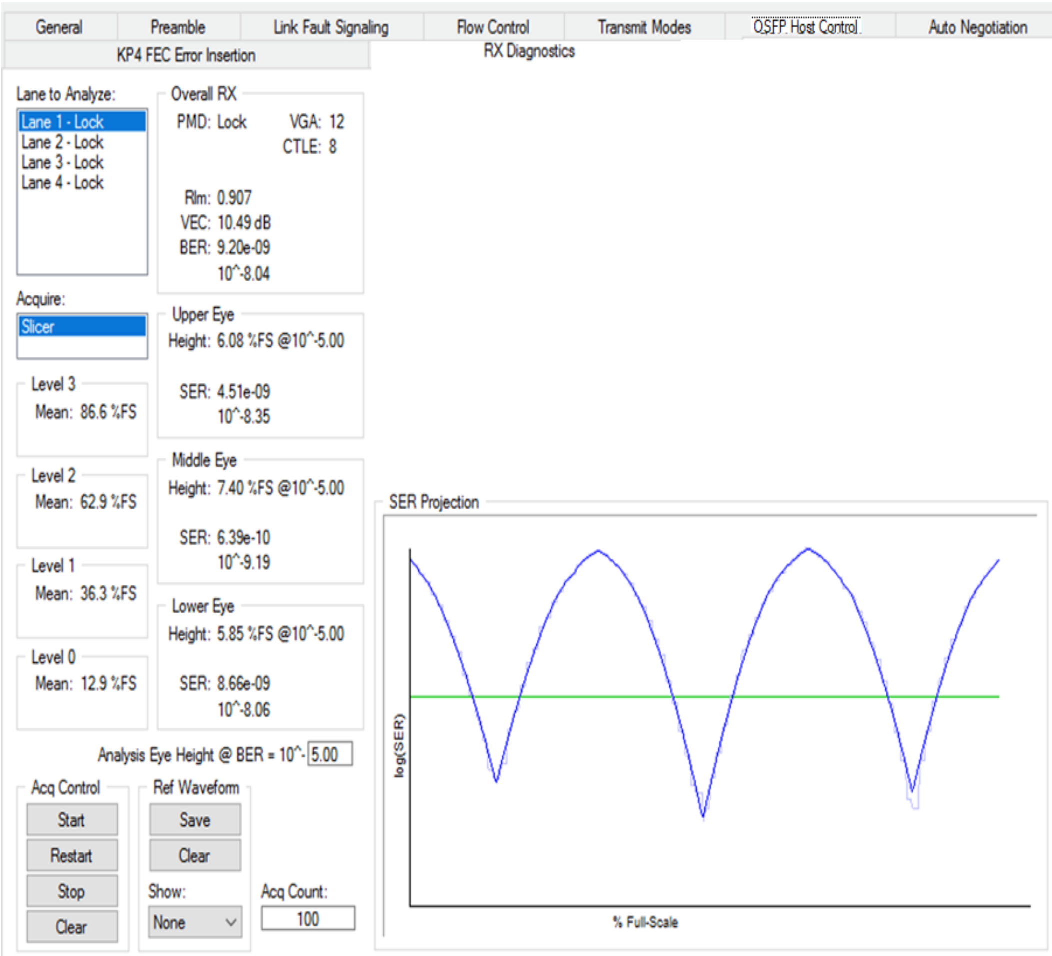
Section	Field	Usage
		• Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Continuous	Continuous error insertion.In continuous mode, the Sequential Errors field will specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.
	Loopcount	The sequence of correct and incorrect codewords or symbol errors inserted will be repeated by the number specified in the Loopcount field.
Start		Starts the error insertion process.
Stop		Stops the error insertion process.
Appropriate FEC Symbol Errors Per Codeword Rate		The Appropriate FEC Symbol Errors Per Codeword Rate is an approximation for how many symbol errors there will be per codeword every second. NOTE In 400G mode, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines.

800GE-4P-OSFP-C Port Properties—RX Diagnostics

The 800GE-4P-OSFP-C load module has eight electrical lanes at the cage where you insert your optics or DACs. In order to evaluate the link quality and determine if the transmitters are driving the right kind of signal, you can diagnose the signals that are actually being received at the electrical lane receivers. The **RX Diagnostics** tab allows you to do this.

This feature is also available for 800GE-8P-OSFP-C and 800GE-2P-OSFP-C load modules.

The 800GE-4P-OSFP-C Port Properties **RX Diagnostics** tab is shown in the following figure:



See S400GD-16P-QDD+FAN+NRZ Port Properties—RX Diagnostics for more details.

800GE-4P-OSFP-C performs a single-shot acquisition for each lane every time you select Start or Restart in IxExplorer. This means results will appear on each lane once the complete acquisition is made.
The hardware architecture arrives at a quality bathtub analysis in shorter time than S400GD-16P-QDD. However, there are no ADC or Slicer Histograms or measurements related to Standard Deviations of the slicer histogram. Furthermore, SNR Projection and Fractional Frequency Offset (FFO) are not available.

Fields and Controls

The fields and controls that allow you to analyze the electrical signals are explained in the following table:

Field	Description
Lane to Analyze	Allows you to select a physical lane you want to analyze. This also reports the SNR for convenience.

Field	Description
Acquire	Enables you to start the acquisition at the Slicer, which is available only with an additional license.
Acq Control	Controls the histogram acquisition for all lanes simultaneously on a port. Options include the following: **Start**: Acquires 100 captures. **Restart**: Clears previous results and starts. **Stop**: Stops acquiring captures. **Clear**: Clears previous results and stops acquiring captures.
Acq Count	Shows how many captures of the particular type were acquired on that lane.
Ref Waveform	Shows the reference waveforms. • **Save**: Saves all acquired lane histograms as reference for comparison. The reference data is stored on a per-port, per-type basis by IxExplorer, and it will go away if IxExplorer closes. • **Clear**: Clears all reference histograms. • **Show**: Controls the view of reference waveforms as a red plot in the Slicer Histogram and SER Projection, as follows: - None (shows no reference) - Current Lane (shows reference for the current lane) - Lane N (shows the reference for a specific lane for the current port)

CHAPTER 40

Port Properties–800GE QDD-M Load Modules

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the 800GE QDD-M load modules.

The following variants of 800GE QDD-M load modules are available:

- 800GE-8P-QDD-M+NRZ - Full and reduced performance
- 800GER-4P-QDD-M+NRZ - Full and reduced performance
- 800GE-2P-QDD-M+NRZ - Full and reduced performance
- 800GER-8PHW-4P-QDD-M+NRZ - Full and reduced performance

Port Properties for 800GE-8P-QDD-M+NRZ Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option. The properties are similar for all variants of 800GE QDD-M load modules.

The complete specification for the 800GE-8P-QDD-M+NRZ load module is found in the *Platform Reference Manual*.

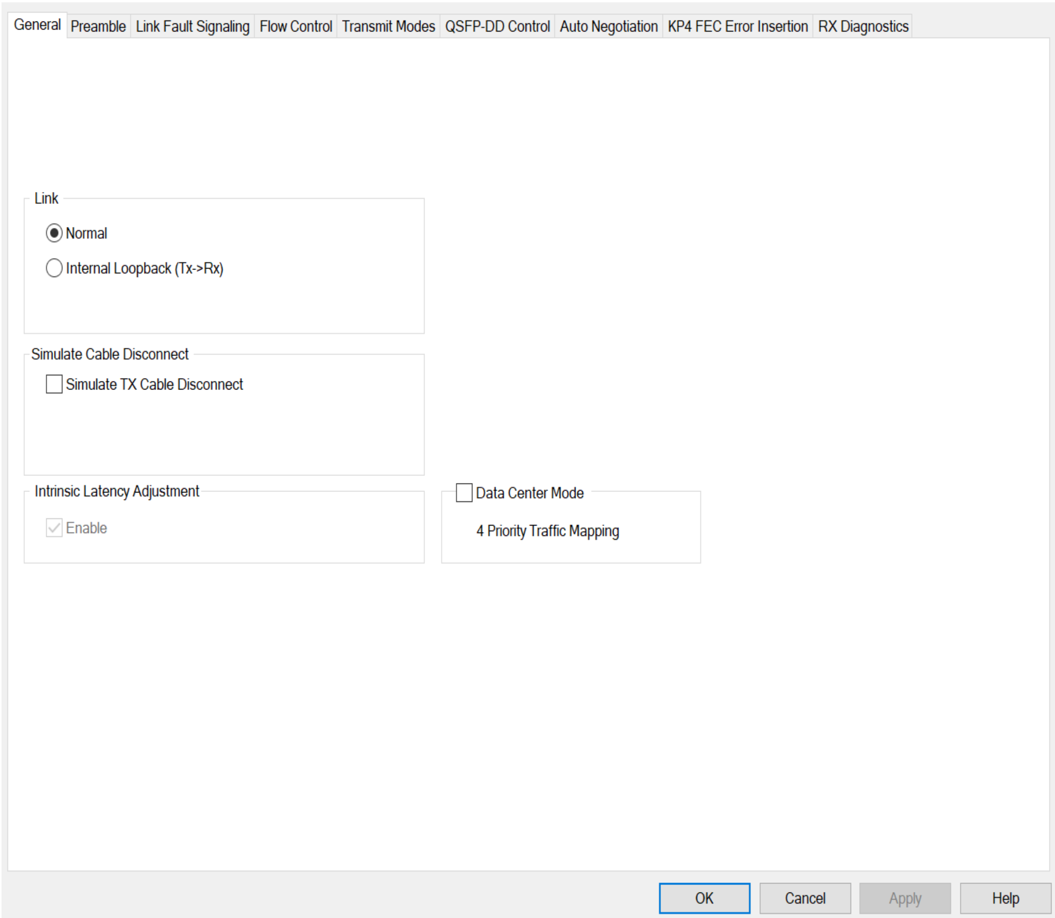
The following port property tabs are available for 800GE-8P-QDD-M+NRZ modules:

- 800GE-8P-QDD-M+NRZ Port Properties—General
- 800GE-8P-QDD-M+NRZ Port Properties—Preamble
- 800GE-8P-QDD-M+NRZ Port Properties—Link Fault Signaling
- 800GE-8P-QDD-M+NRZ Port Properties—Flow Control
- 800GE-8P-QDD-M+NRZ Port Properties—Transmit Modes
- 800GE-8P-QDD-M+NRZ Port Properties—QSFP-DD Control
- 800GE-8P-QDD-M+NRZ Port Properties—Auto Negotiation
- 800GE-8P-QDD-M+NRZ Port Properties—KP4 FEC Error Insertion

800GE-8P-QDD-M+NRZ Port Properties—General

The 800GE-8P-QDD-M+NRZ **General** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, and then selecting the **General** tab.

The Port Properties **General** tab for 800GE-8P-QDD-M+NRZ is shown in the following figure:



The controls for **General** tab configuration are described in the following table:

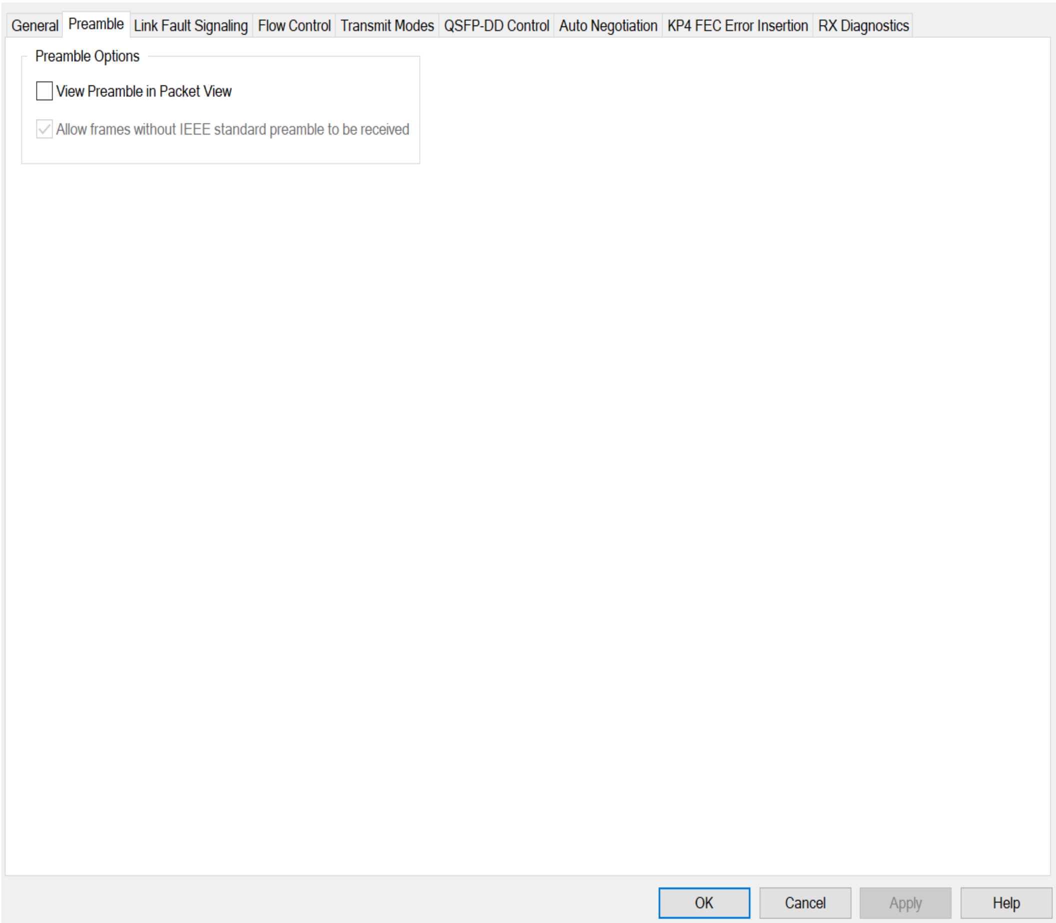
Section	Control/Field	Usage
Link	Normal	Normal operation
	Internal Loopback (Tx -> Rx)	Select this check box to turn on Internal Loopback—Transmit to Receive.
Simulate Cable Disconnect	Simulate TX Cable Disconnect	If this is selected, the port acts as if the cable has been disconnected on the transmit side only. Incoming packets may still be received and port may show link up, but no packets or PCS data will be transmitted.
Intrinsic Latency Adjustment	Enable	The **Enable** check box is selected by default. This enables the intrinsic latency adjustment. The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia*

Section	Control/Field	Usage
		Platform Reference Manual.
Data Center Mode		If selected, enables the Data Center Mode option. When Data Center Mode option is selected, the following changes take place: • The selected port is automatically placed into Advanced Stream mode. In this case, Packet Stream mode is not supported. • Only Auto Intrumentation mode (Floating Timestamp/Data Integrity) is supported, both for transmit and receive. • 4-Priority Traffic Mapping is enabled. It supports various frame size for each PFC control (0-4). NOTE This feature is not supported in 800 GE speed mode. • FCoE protocol can be edited for Ethernet II and Ethernet Snap in **Frame Data** tab.

800GE-8P-QDD-M+NRZ Port Properties—Preamble

The preamble precedes the frame, but is not part of the frame itself.

The 800GE-8P-QDD-M+NRZ Port Properties **Preamble** tab is shown in the following figure:



The fields and controls in this tab are described in the following table:

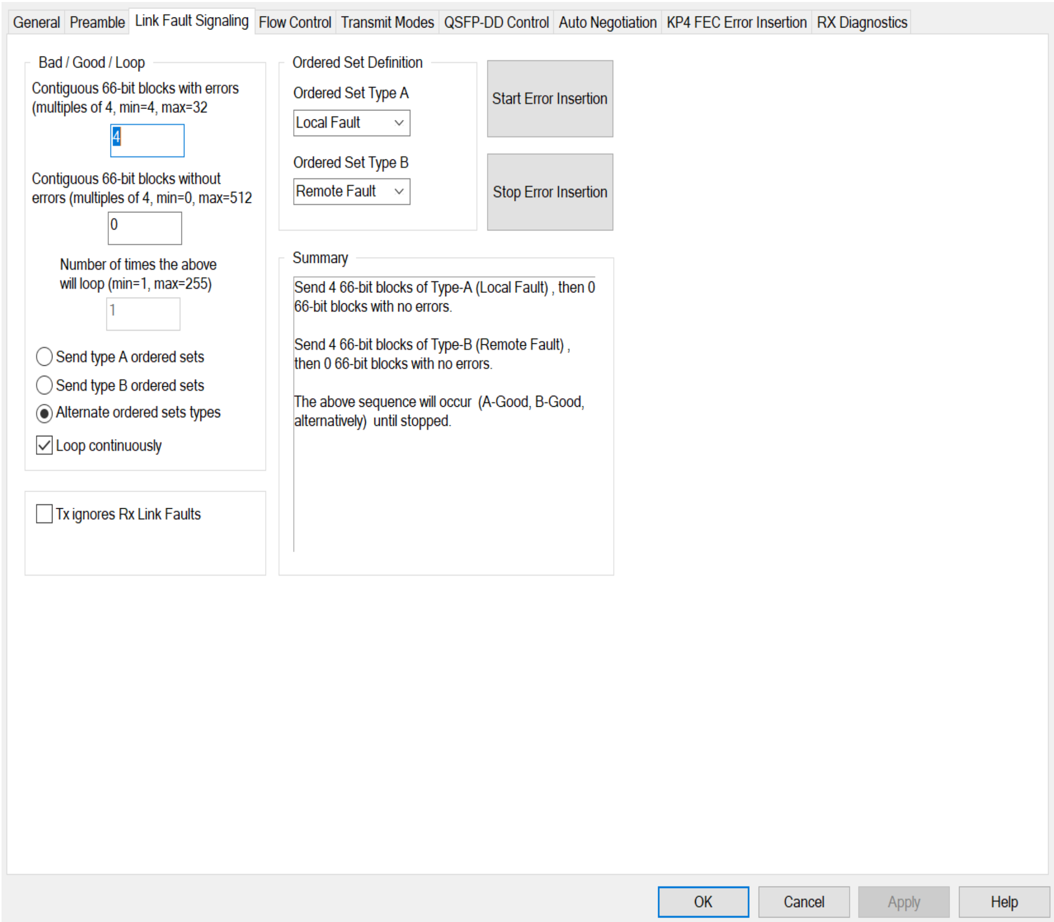
Section	Choices	Description
Preamble Options	View Preamble in Packet View	When this check box is selected, the preamble data will be visible in the Packet View (transmit side) and the Capture View (receive side).
	Allow frames without IEEE standard preamble to be received	When this check box is selected, it allows frames without IEEE standard preamble to be received. • This check box is selected by default.

800GE-8P-QDD-M+NRZ Port Properties—Link Fault Signaling

When **Link Fault Signaling** is enabled, four statistics will be added to the list in Statistic View for the port. One is for monitoring the Link Fault State. Two provide a count of the Local Faults and Remote Faults. The last one is for indicating the state of error insertion, whether or not it is ongoing

The **Link Fault Signaling** tab is accessed from the context menu of the a port in **Resources** pane by selecting the **Properties** menu option, or by double-clicking a port in the **Detail** pane. Then select the **Link Fault Signaling** tab.

The **Link Fault Signaling** tab for800GE-8P-QDD-M+NRZ load module is shown in the following image.



The controls for **Link Fault Signaling** tab configuration are described in the following table.

Section	Field/Control	Description
Bad/Good/Loop	(Bad) Contiguous 66-bit blocks with errors (multiples of 4; min = 4, max = 32)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks with errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive fault sequences allowed are minimum 4 sequences and maximum 32 sequences.
	(Good) Contiguous 66-bit blocks without errors (multiples of 4; min = 0, max = 512)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks without errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive regular data sequences allowed are minimum 0 sequences and maximum 512 sequences.
	Number of times	Specifies the number of loops for the user defined

<table>
<tr><th>Section</th><th>Field/Control</th><th>Description</th></tr>
<tr><td></td><td>the above will loop (min = 1, max = 255)</td><td>sequence. Options include the following:
Discrete iterations:
Minimum of 1 iteration
Maximum of 255 iterations
Continuous loop
User cannot specify number of iterations</td></tr>
<tr><td></td><td>Options include the following:
Send type A ordered sets
Send type B ordered sets
Alternate ordered set types</td><td>Defines the ordered set pattern that will be sent. (The two Ordered Sets—A and B—are defined in the Ordered Set Definition box in this tab.) This pattern will be combined with the Good blocks/Bad blocks pattern for transmission.
Only Type A fault sequence and regular good data sequences
Only Type B fault sequence and regular good data sequences
Alternate Type A, regular good data sequences and Type B fault sequence, regular good data sequences
NOTE If this field is available, and the Alternate ordered set types option is selected, the minimum value for this field should be '2,' to allow the entire pattern to be sent once. If left at the minimum value of '1'— only two groups of blocks (one of good blocks and one of bad blocks) will be sent, which means that only the first ordered set will be sent. A minimum of eight blocks is required for one complete pattern including Types A and B.</td></tr>
<tr><td></td><td>Loop continuously</td><td>If selected, the loop defined by the combination of the Bad and Good blocks plus the pattern of ordered sets, will be transmitted continuously until the Stop Error Insertion option is selected.</td></tr>
<tr><td>Ordered Set Definition</td><td>Ordered Set Type A</td><td>Options include the following:
Local Fault
Remote Fault</td></tr>
<tr><td></td><td>Ordered Set Type B</td><td>Options include the following:
Local Fault
Remote Fault</td></tr>
</table>

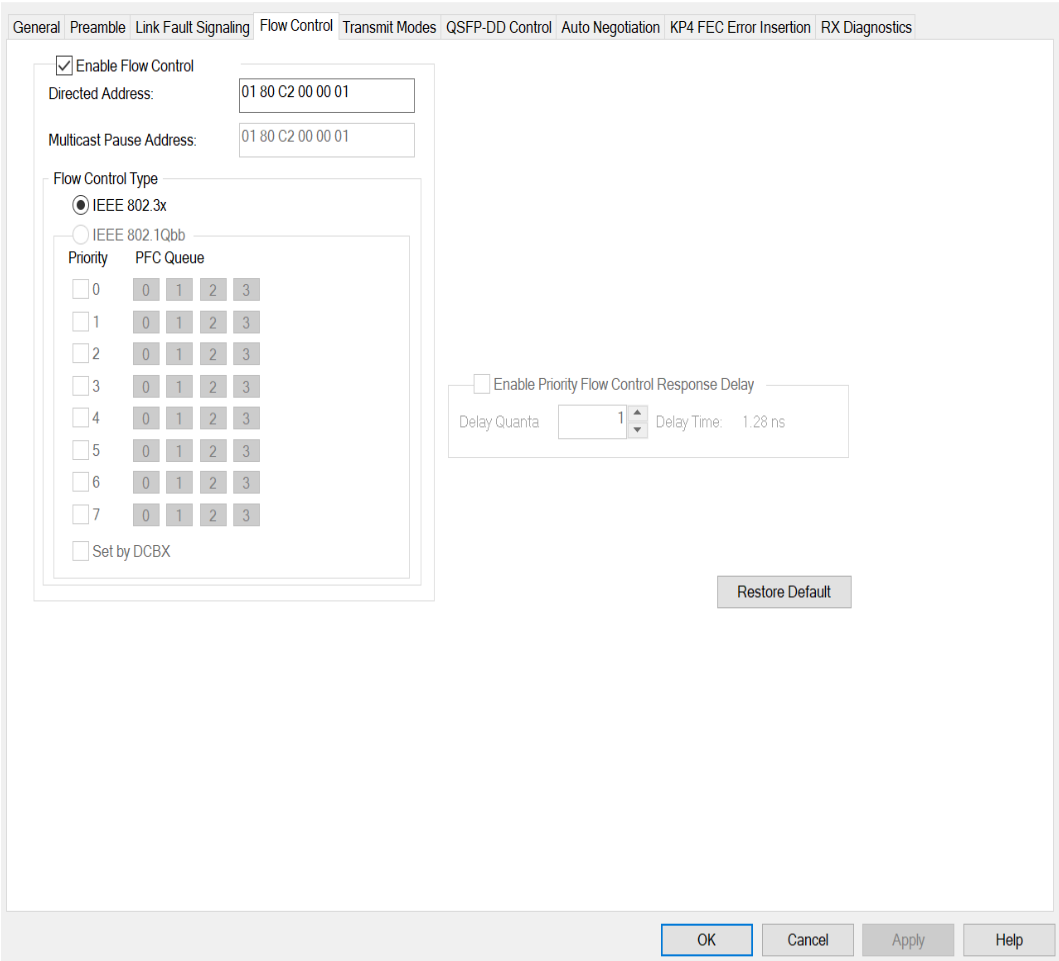
Section	Field/Control	Description
Tx ignores Rx Link Faults		If selected, ongoing transmission will continue even if Link Fault messages are received by the sending RS.
Summary (Window)		(Read-only) Shows descriptions of the patterns that will be transmitted.
Start Error Insertion		Select this option to start the transmission of the configured error patterns.
Stop Error Insertion		(Available only for use with the **Loop continuously** option.) Select this option to stop the transmission of the configured error patterns.

800GE-8P-QDD-M+NRZ Port Properties—Flow Control

The 800GE-8P-QDD-M+NRZ **Flow Control** tab is accessed from the context menu of the port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

NOTE You can view this help page for the **Port Properties - Flow Control** tab by selecting the **Help** option and not F1.

The Port Properties **Flow Control** tab for 800GE-8P-QDD-M+NRZ is shown in the following image.



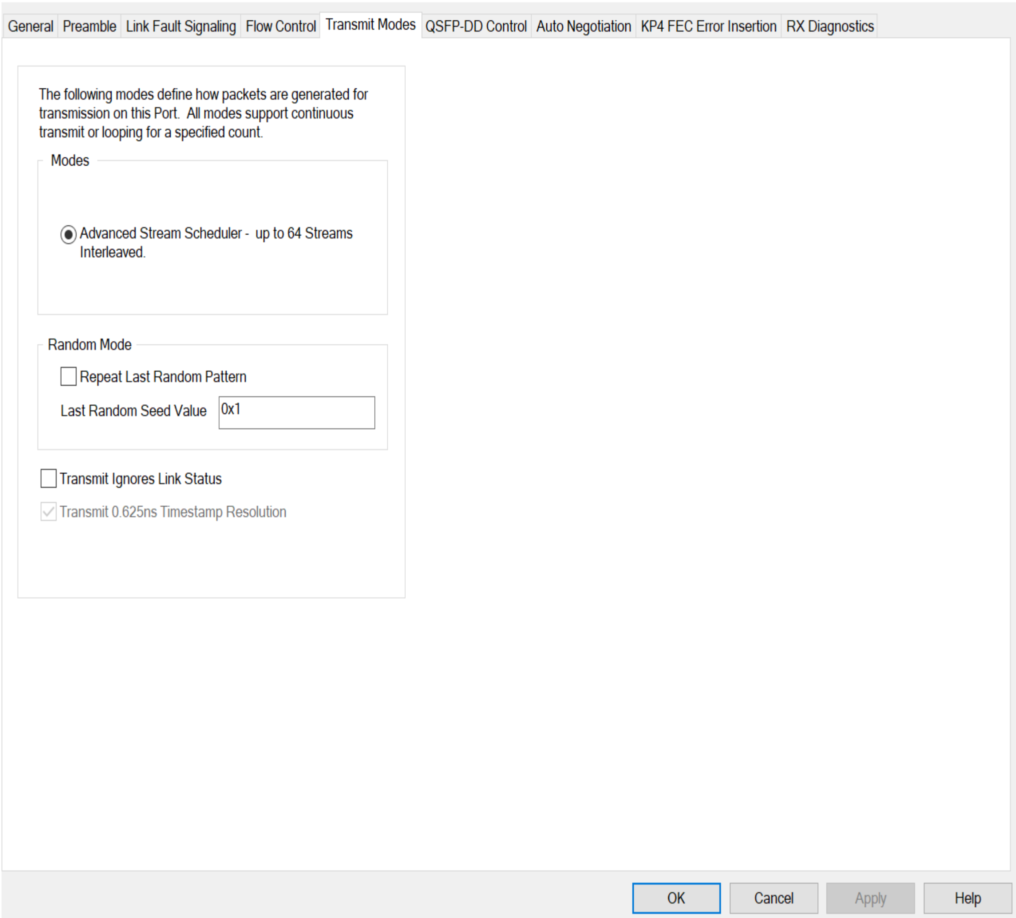
Section	Field/Control	Description
Enable Flow Control	(check box)	Enables the port's MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type	IEEE 802 3x	When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame.
	IEEE 802.1Qbb	When not in Data Center mode, only IEEE 802.3x is available. NOTE This feature is not supported in 800 GE speed mode.
	Priority	When flow control type IEEE 802.1Qbb is selected in Data Center

Section	Field/Control	Description
		mode, priority options are the channels of data that can be paused. Select to select one or more channels.
	PFC Queue	The PFC Queue can be mapped to the priority field in the frame.
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed. NOTE This feature is not supported in 800 GE speed mode.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

800GE-8P-QDD-M+NRZ Port Properties—Transmit Modes

The **Transmit Modes** tab for 800GE-8P-QDD-M+NRZ load modules is shown in the following image. It is accessed by double-clicking a port in **Resources** window, or by from the context menu of the port by selecting the **Properties** menu option. Then select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following image.



The controls for **Transmit Modes** tab configuration are described in the following table.

Section	Field/Control	Description
Modes	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure the following: • 800 GE - up to 64 streams • 400 GE - up to 64 streams • 200 GE - up to 64 streams • 100 GE - up to 32 streams They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream's

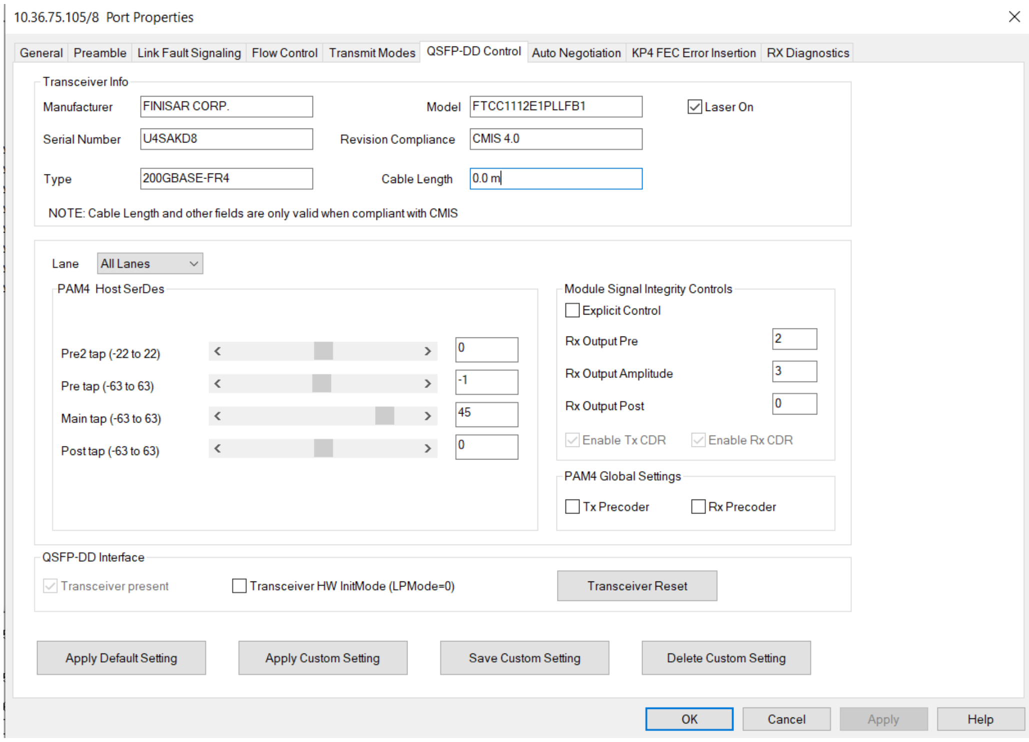
Section	Field/Control	Description
		random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit Ignores Link Status		If selected, will allow transmission of packets even if the link is down.
Transmit 0.625ns TimeStamp Resolution		If selected, the 800GE-8P-QDD-M+NRZ load module will support 0.625 ns.

800GE-8P-QDD-M+NRZ Port Properties—QSFP-DD Control

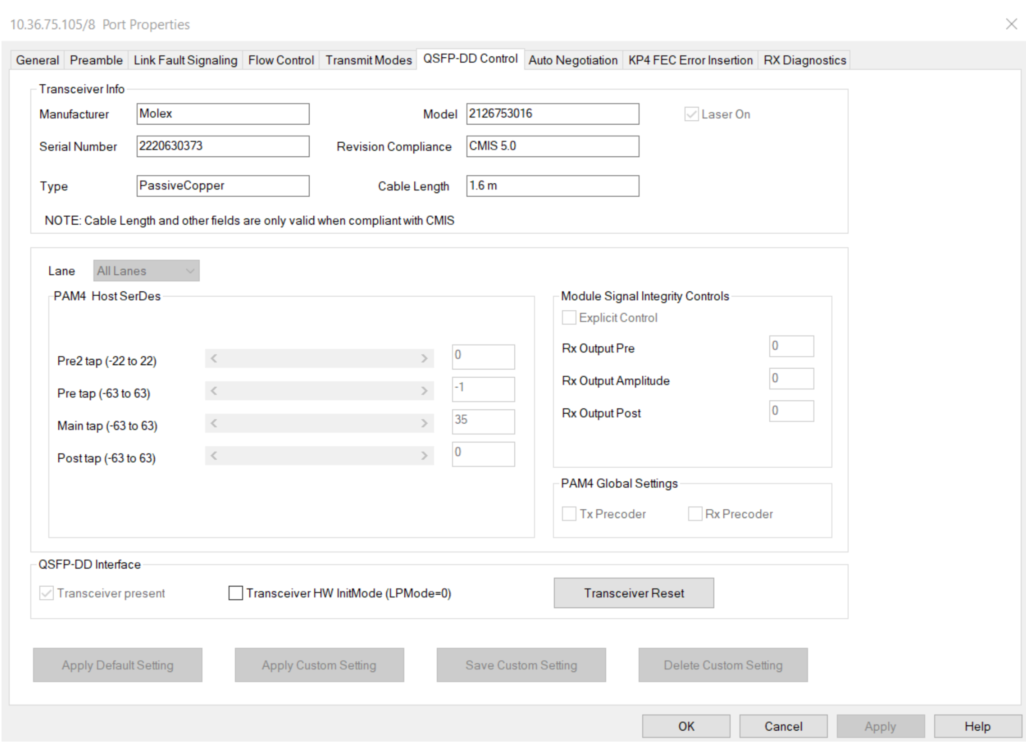
PAM-4 is a four-level pulse-amplitude modulation that uses four distinct amplitude levels to encode two bits of data, essentially doubling the bandwidth of a connection. The PAM4 settings are defined using the **QSFP-DD Control** tab.

The **QSFP-DD Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **QSFP-DD Control** tab.

The Port Properties **QSFP-DD Control** tab for 800GE-8P-QDD-M+NRZ when the fiber optic transceiver is used is shown in the following figure:



The Port Properties **QSFP-DD Control** tab for 800GE-8P-QDD-M+NRZ when the passive copper transceiver is used is shown in the following figure:



When 800GE-8P-QDD-M+NRZ detects an optical transceiver, it will apply a Host Transmit equalization combination that is well suited for optics, and also expose the transceiver's signal integrity controls.

The supported module signal integrity fields of CMIS 3.0 and 4.1 transceivers are listed below:

- Rx Output EQ Control Pre-Cursor
- Rx Output EQ Control Post-Cursor
- Rx Output Amplitude Control
- Tx CDR Control
- Rx CDR Control

The signal integrity fields are configurable based on the capability of the transceiver. The default value and maximum allowed range for each of the fields are read from the transceiver during transceiver initialization.

Section	Field/Control	Description
Transceiver Info		
	Manufacturer	This is the Vendor Name field read from the actual transceiver currently being plugged in.
	Model	This is the Part Number field read from the actual transceiver currently being plugged in.
	Serial Number	The serial number of the transceiver.
	Revision Compliance	The implemented CMIS revision of the transceiver. 800GE-4P-QDD-C supports both CMIS 3.0 and CMIS 4.0 transceivers. See Management Interface.
	Type	When a transceiver is inserted into the load module, the software reads IEEE registers to determine the transceiver capabilities and media type. If the transceiver contains this information, it is shown in this read-only field.
	Cable Length	The length of Ixia-supplied cable which connects this chassis to the previous chassis in the chain.
	Laser On	Select this check box to enable the laser power.
112G Host SerDes		
	Pre3 cursor tap (0 to 63)	This helps to control the Pre3 Tap value for Tx.
	Pre2 cursor tap (0 to 63)	This helps to control the Pre2 Tap value for Tx.
	Pre-cursor tap (0 to 63)	This helps to control the Pre Tap value for Tx.

Section	Field/Control	Description
	Main-cursor tap (0 to 63)	This helps to control the Main Tap Control for Tx.
	Post-cursor tap (0 to 63)	This helps to control the Post Tap value for Tx.
Module Signal Integrity Controls		
	Explicit Control	Select this check box to enable the Rx Output pre, Rx Output Amplitude, and Rx Output Post fields. This check box is available for selection only if the fiber optic transceiver is used.
	Rx Output Pre	Allowed range of values for Rx Output pre. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Rx Output Amplitude (0 to 0)	Allowed range of values for Rx Output amplitude. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Rx Output Post	Allowed range of values for Rx Output post. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Enable Tx CDR	Turn on Tx CDR Control. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Enable Rx CDR	Turn on Rx CDR Control . This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
PAM4 Global Settings		
	Tx Precoder	Represents a PAM4 encoding scheme to reduce DFE bit errors. This also means that both sides of the link must have precoder enabled for link to come up.
	Rx Precoder	Represents a PAM4 encoding scheme to reduce DFE bit errors. This also means that both sides of the link must have precoder enabled for link to come up.
QSFP-DD Interface		

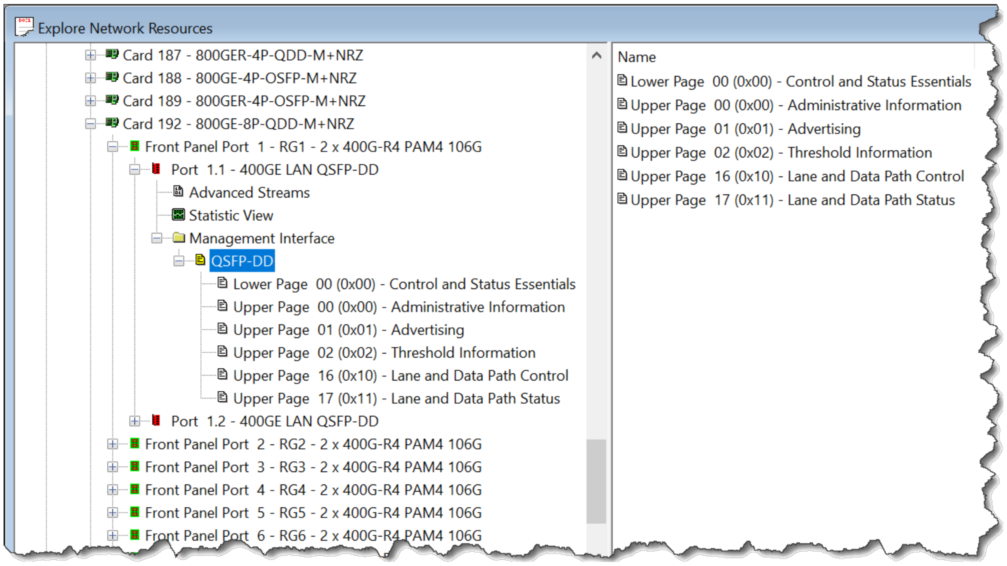
Section	Field/Control	Description
	Transceiver HW InitMode	Selecting the check box configures the QSFP-DD InitMode pin to perform the optional Hardware Init mode initialization as described in the Common Management Interface Specification (CMIS) Rev 3.0. When a transceiver boots into Hardware Init mode, the datapath is automatically configured by the module without intervention from the host (that is Ixia tester). When disabled, the software-controlled initialization (Software Init) is instead performed. This is the recommended initialization mode for any transceiver since the appropriate checks are performed between the Ixia tester and the transceiver before the module's datapath initialization.
	Transceiver Reset	Resets the transceiver.
	Apply Default Setting	When you select this button, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Setting	When you select this button, if there exists a custom setting in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	When you select this button, if there exists a custom setting in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	When you select this button, if there exists a custom setting in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel with that. If no custom setting exists, users will be prompted that nothing will be deleted.

Management Interface

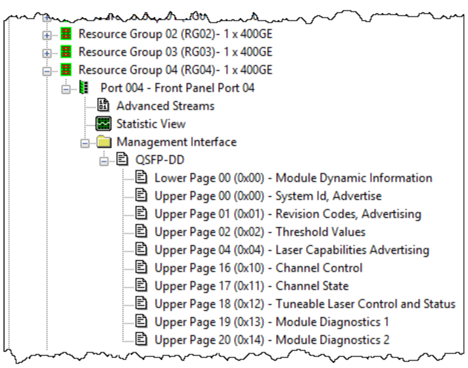
A management interface specification CMIS defines the management interface and associated protocols for all required and allowable management interactions between a CMIS aware host and a CMIS compliant module that are relevant for the host using the module in an application.

The Management Interface appears in the IxExplorer Resources Tree and switches on the fly depending on the CMIS revision. This means that the transceiver automatically reads the management interface and populates the lower and upper pages depending on the transceiver type.

With a CMIS 3.0 (or lower) transceiver, you will see the following pages:



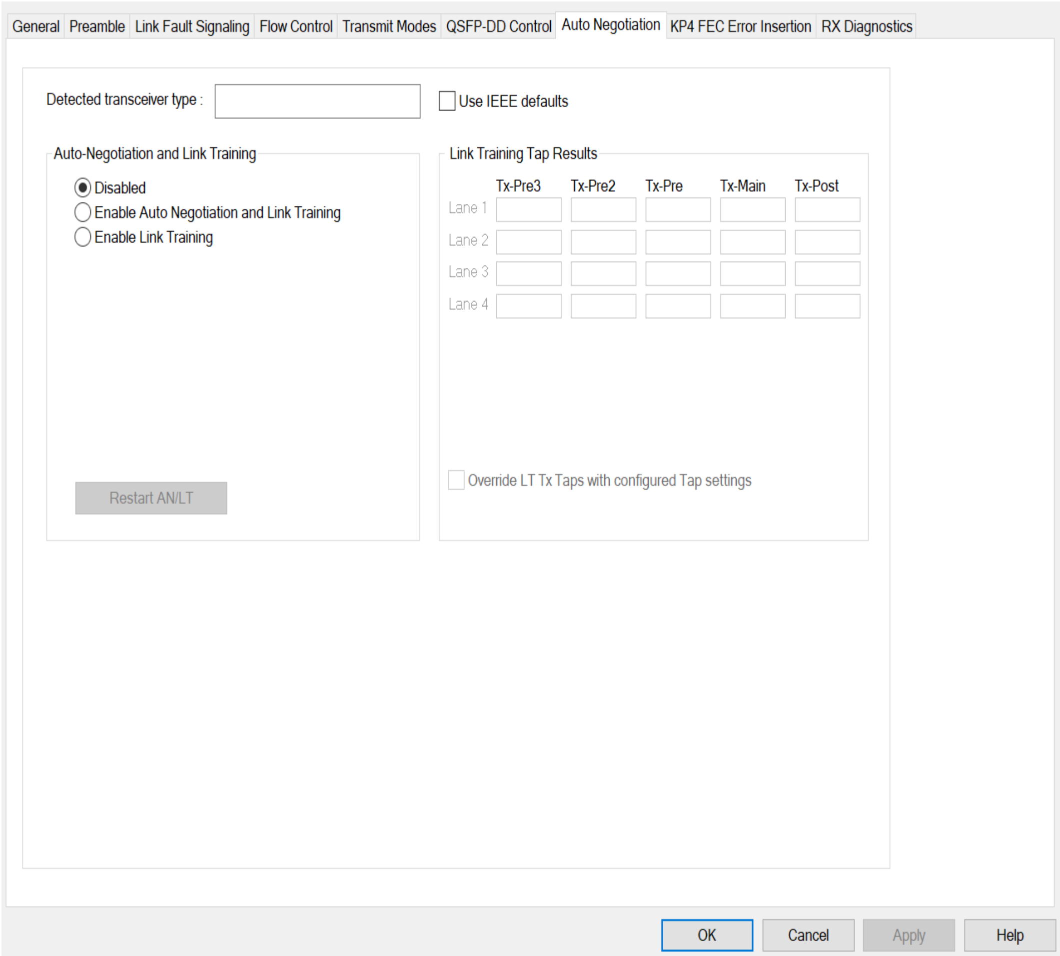
With a CMIS 4.0 transceiver, you will see the following pages:



800GE-8P-QDD-M+NRZ Port Properties—Auto Negotiation

The 800GE-8P-QDD-M+NRZ **Auto Negotiation**tab is accessed by selecting a 800GE-8P-QDD-M+NRZ port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto Negotiation** tab.

The Port Properties **Auto Negotiation** tab for 800GE-8P-QDD-M+NRZ is shown in the following figure:

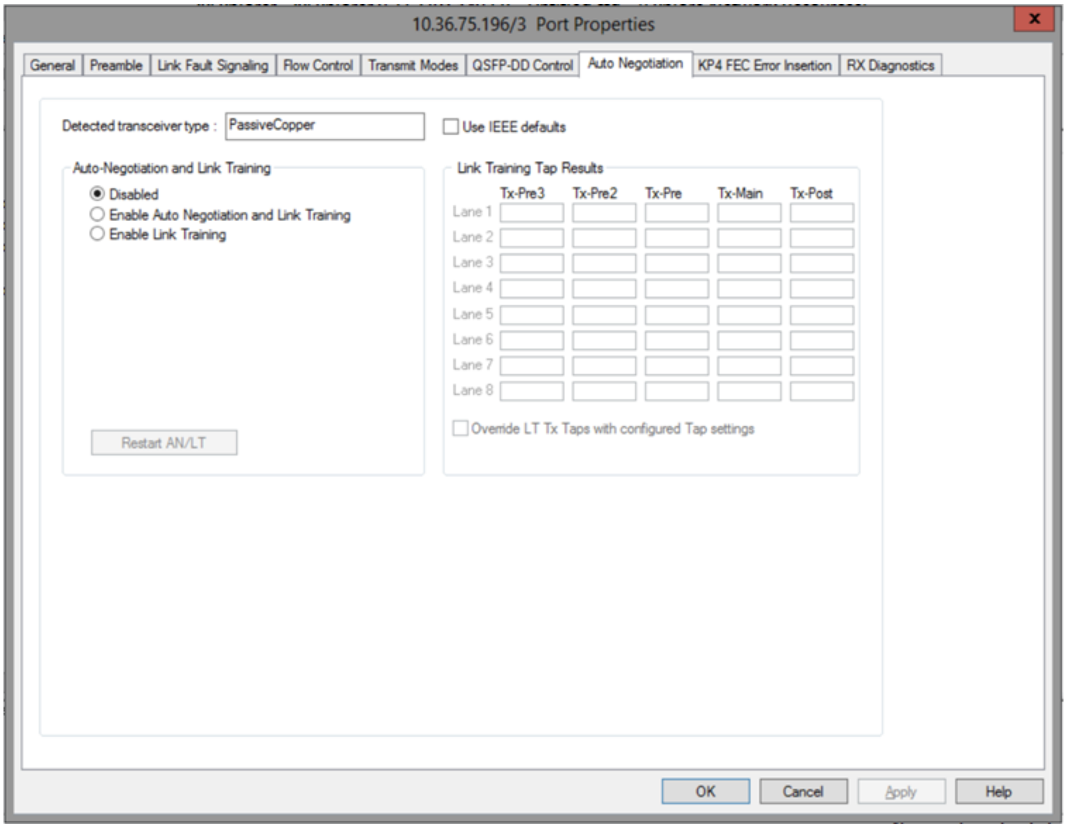


The following lanes are available depending on the port speed:

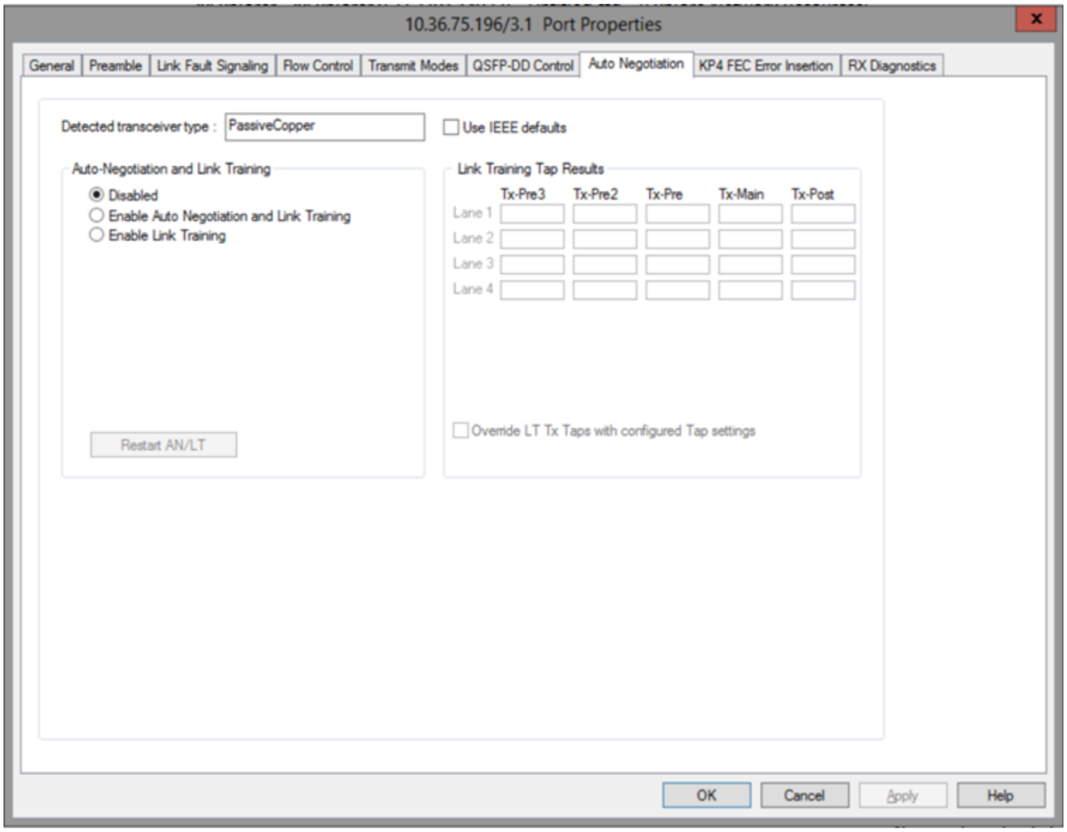
Speed Mode	Lanes
800GE PAM4 106G	8 lanes (1-8)
400GE PAM4 106G	4 lanes (1-4)
200GE PAM4 106G	2 lanes (1-2)
100GE PAM4 106G	1 lane (1)
400GE PAM4 53G	8 lanes (1-8)
200GE PAM4 53G	4 lanes (1-4)
100GE PAM4 53G	2 lanes (1-2)
50GE PAM4 53G	1 lane (1)
100GE NRZ 26G	4 lanes (1-4)

Speed Mode	Lanes
50G NRZ 26G	2 lanes (1-2)
25G NRZ 26G	1 lane (1)

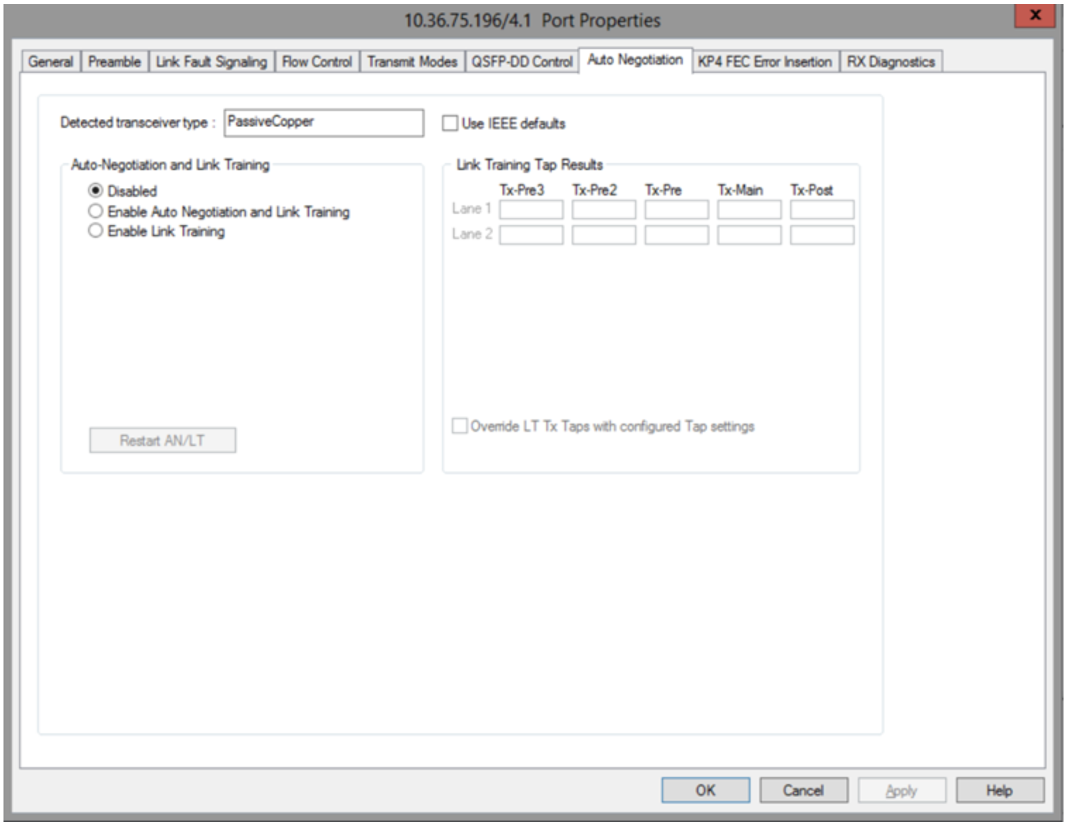
800GE-8P-QDD-M+NRZ **Auto Negotiation** tab for 800GE PAM4 106G speed mode is shown below:



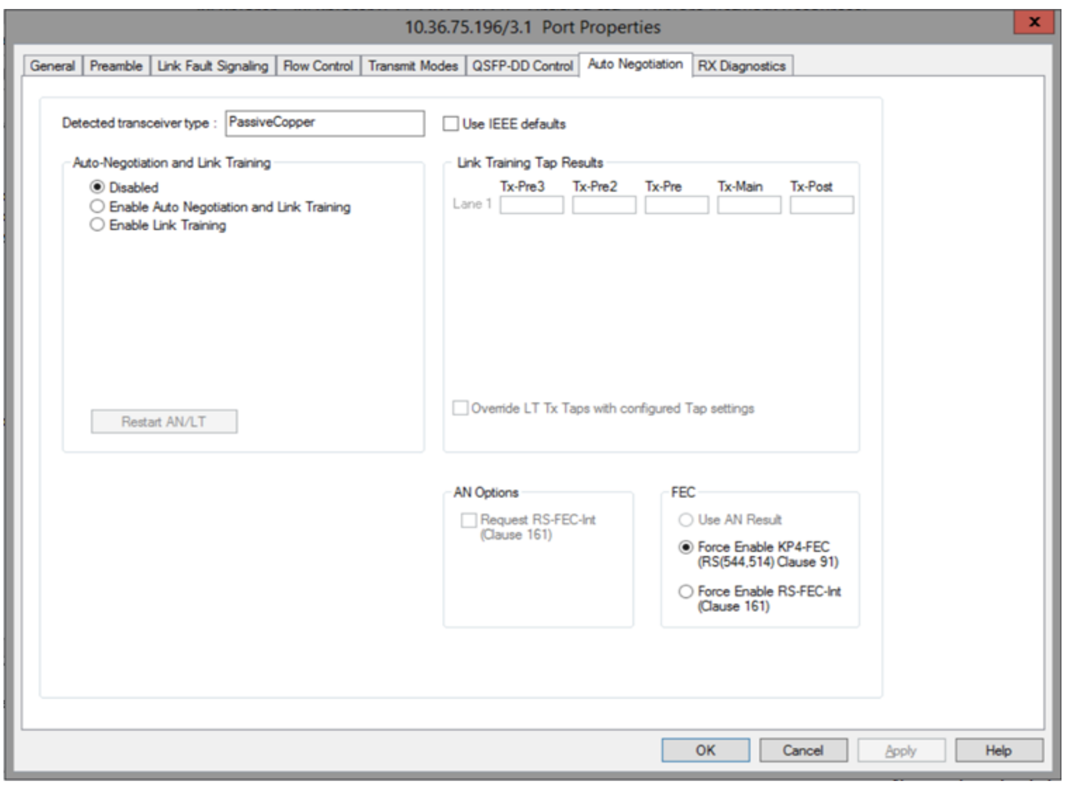
800GE-8P-QDD-M+NRZ **Auto Negotiation** tab for 400GE PAM4 106G speed mode is shown below:



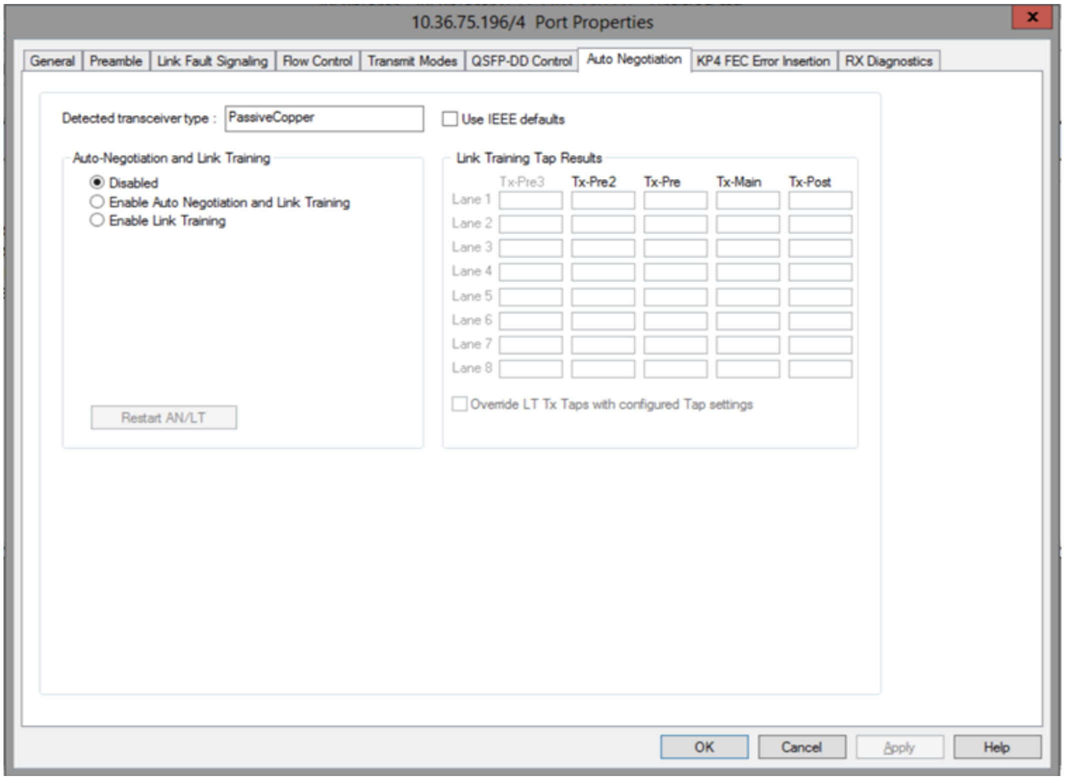
800GE-8P-QDD-M+NRZ **Auto Negotiation** tab for 200GE PAM4 106G speed mode is shown below:



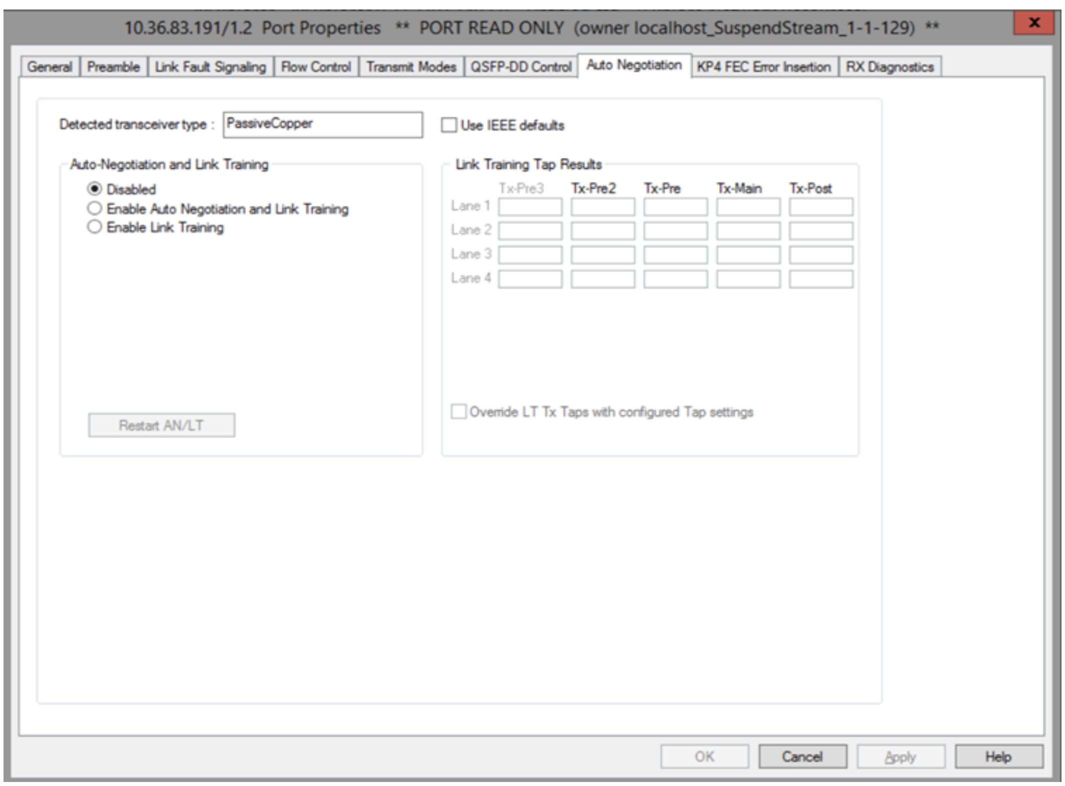
800GE-8P-QDD-M+NRZ **Auto Negotiation** tab for 100GE PAM4 106G speed mode is shown below:



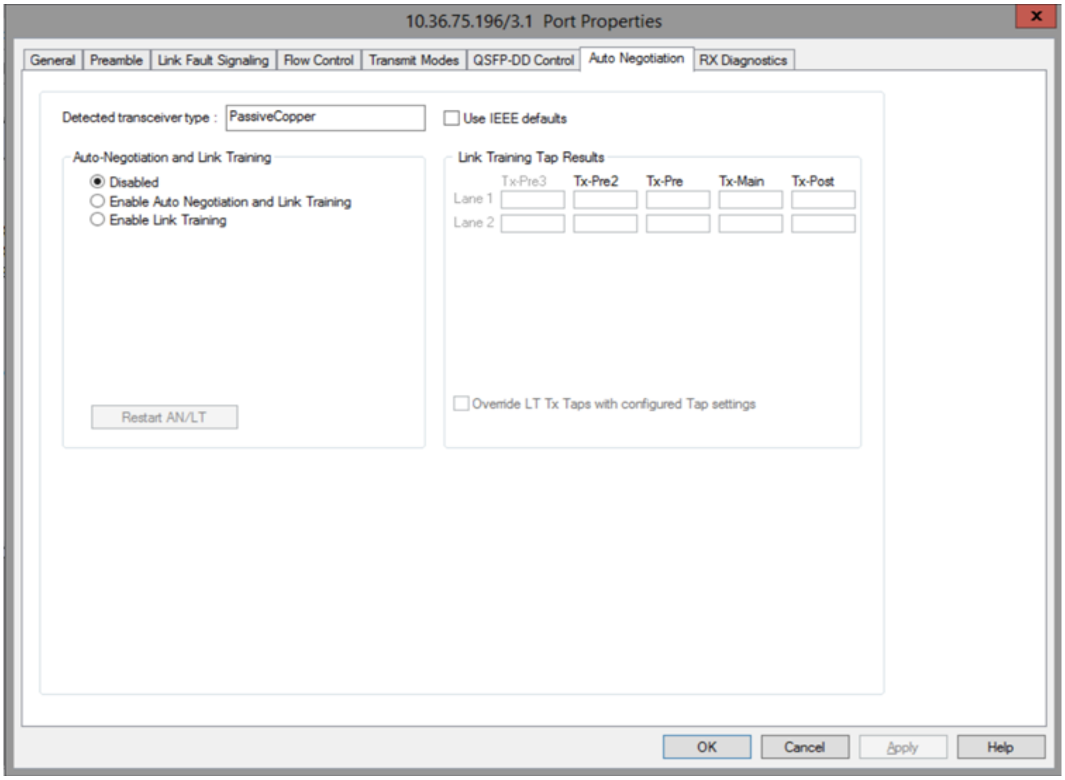
800GE-8P-QDD-M+NRZ **Auto Negotiation** tab for 400GE PAM4 53G speed mode is shown below:



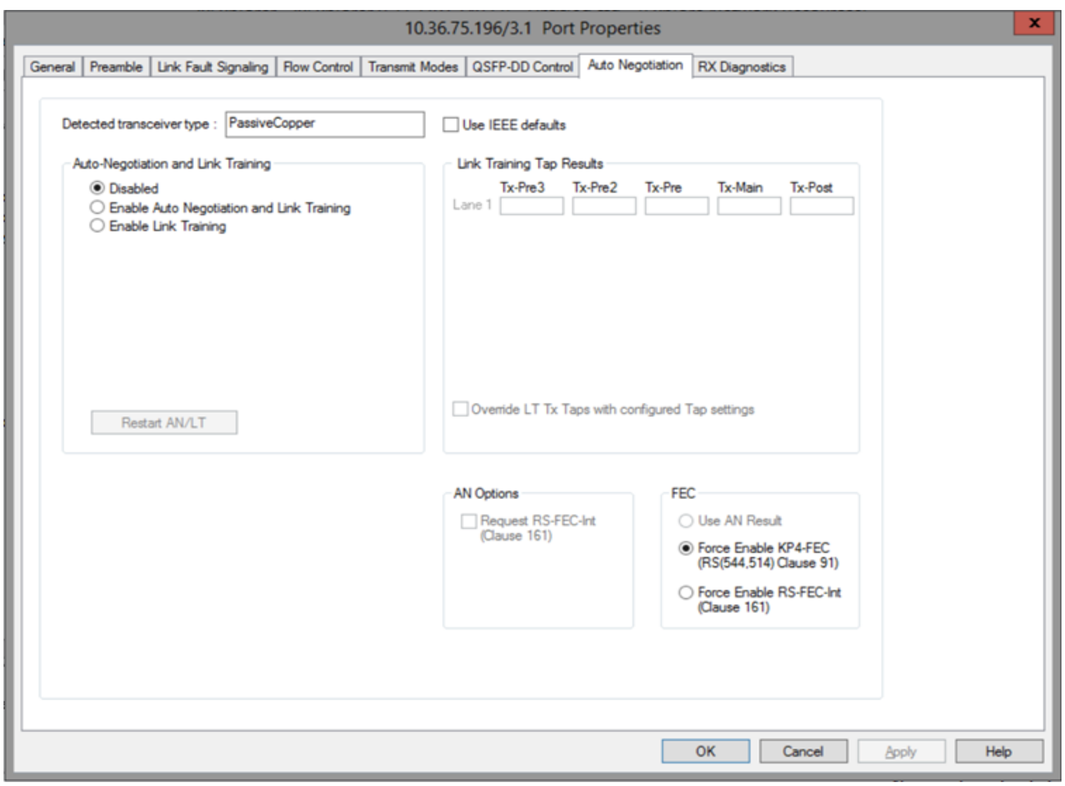
800GE-8P-QDD-M+NRZ **Auto Negotiation** tab for 200GE PAM4 53G speed mode is shown below:



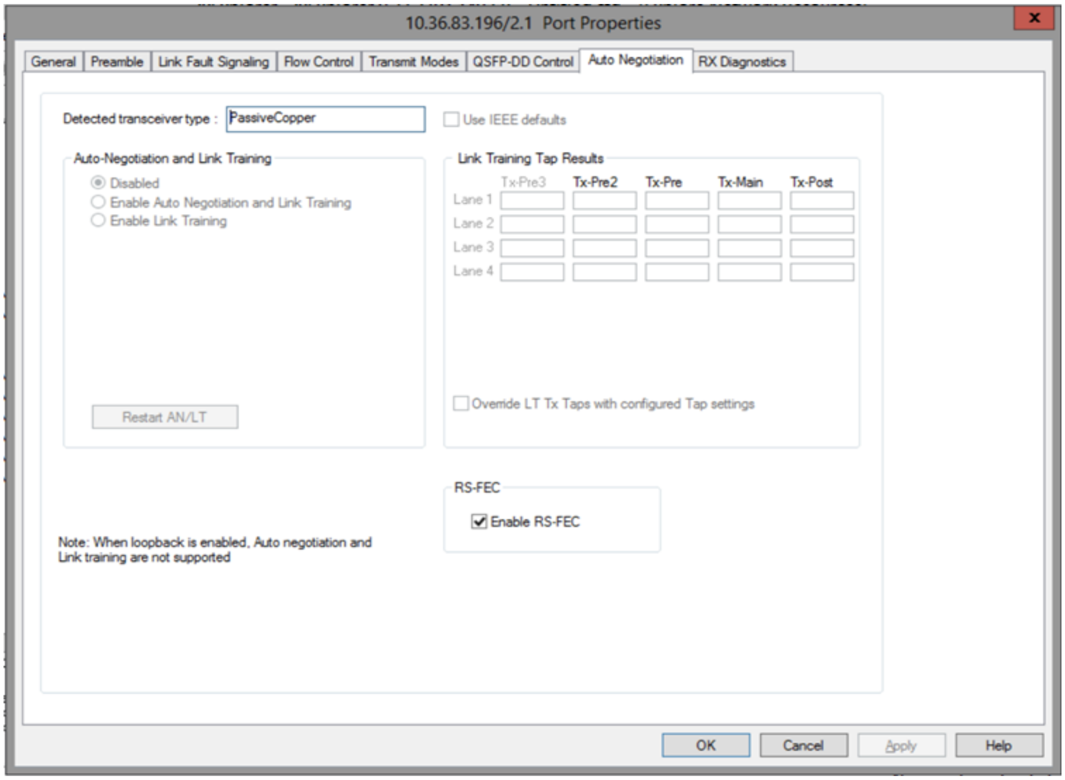
800GE-8P-QDD-M+NRZ **Auto Negotiation** tab for 100GE PAM4 53G speed mode is shown below:



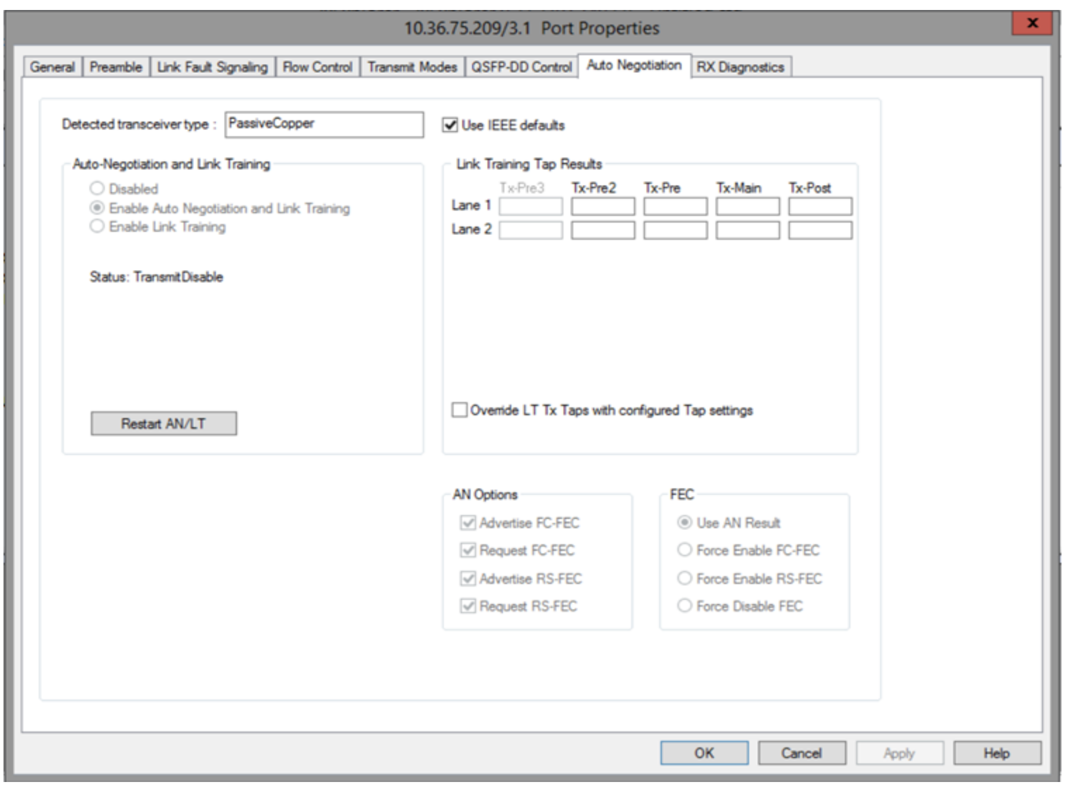
800GE-8P-QDD-M+NRZ **Auto Negotiation** tab for 50GE PAM4 53G speed mode is shown below:



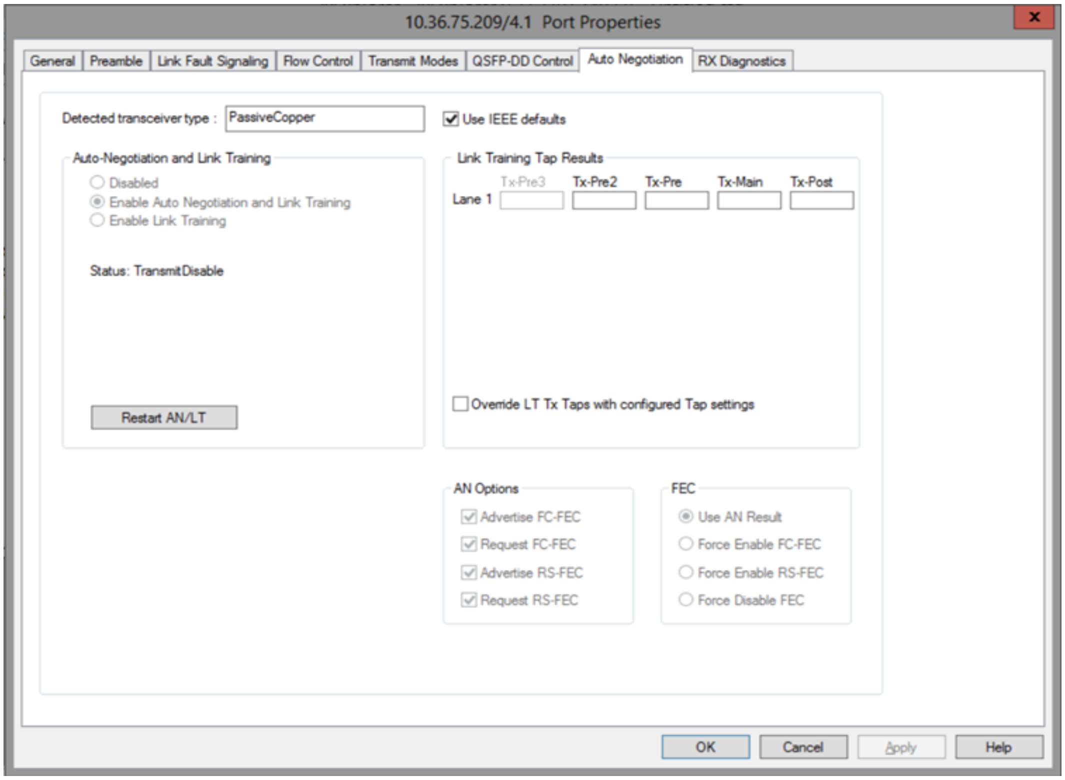
800GE-8P-QDD-M+NRZ **Auto Negotiation** tab for 100GE NRZ 26G speed mode is shown below:



800GE-8P-QDD-M+NRZ **Auto Negotiation** tab for 50GE NRZ 26G speed mode is shown below:



800GE-8P-QDD-M+NRZ **Auto Negotiation** tab for 25GE NRZ 26G speed mode is shown below:



The fields and controls in this tab are described in the following table:

Field/Control	Description
Detected transceiver type	The type of transceiver that is plugged in.
Use IEEE defaults	Clear this check box to make **AN Options** and **FEC** groups available. By default this check box will remain selected and FEC that will be active is based on Autonegotiation.
Disabled	When you select the check box, the L1 parameters like Autonegotiation, Link Training, and FEC, are enabled or disabled per IEEE requirements, and you will not be able to enable or disable these manually. If the check box is cleared, you will be able to manually enable or disable L1 features – even if it violates IEEE specifications. By default the check box is selected.
Enable Auto Negotiate and Link Training	Auto negotiation controls how a port communicates with other ports.If you select the check box, it allows auto-negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing

Field/Control	Description
	• **Restart Auto-Negotiate** button is selected (this does a forced restart) NOTE The **Enable Auto Negotiate** check box is available for selection only if the **Disabled** check box is cleared.
Enable Link Training	Select the check box to allow longer length copper cables to be used. This means that during the next Auto-Negotiation, KR training will be used. NOTE This check box is available for selection only if the **Disabled** check box is cleared.
Negotiated the capability above	The text box indicates the speed that was negotiated due to Auto-Negotiation.
Restart AN/LT	Restarts the Auto Negotiate sequence.
Link Training Tap Settings	
Tx-Pre2-cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Pre-cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Main-cursor Lane 1-8	The per-lane transmit main-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Post-cursor Lane 1-8	The per-lane transmit post-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Override LT Tx Tap settings with configured Tap settings	Selecting this check box overrides the taps settings derived by the link training process, and configures the transmit pre/main/post cursor settings and receiver CTLE setting with the static values specified in the **QSFP-DD Host Control** tab.
AN Option	The available option is the following: • Request RS-FEC-Int:This is applicable only when Auto negotiation is turned on. Its value is preserved by IxServer and applied when Auto negotiation is turned on a port. With this check box selected, the port is requesting remote partner to use RS-FEC-Int FEC.
FEC	The available options are the following: • Use AN Result: Use FEC decided by Auto negotiation. • Force Enable KP4-FEC: Force enable KP4-FEC on the port. • Force Enable RS-FEC-Int: Force enable RS-FEC-Int on the port.

800GE-8P-QDD-M+NRZ Port Properties—KP4 FEC Error Insertion

Forward Error Correction (FEC) is a method of communicating data that corrects errors in transmission on the receiving end. Prior to transmission, the data is put through a predetermined algorithm that adds extra bits specifically for error correction to any character or code block. If the transmission is received in error, the correction bits are used to check and repair the data.

The **FEC Error Insertion** tab allows to inject FEC errors into transmitted data, and is shown in *Figure: **FEC Error Insertion** Tab*

Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Random

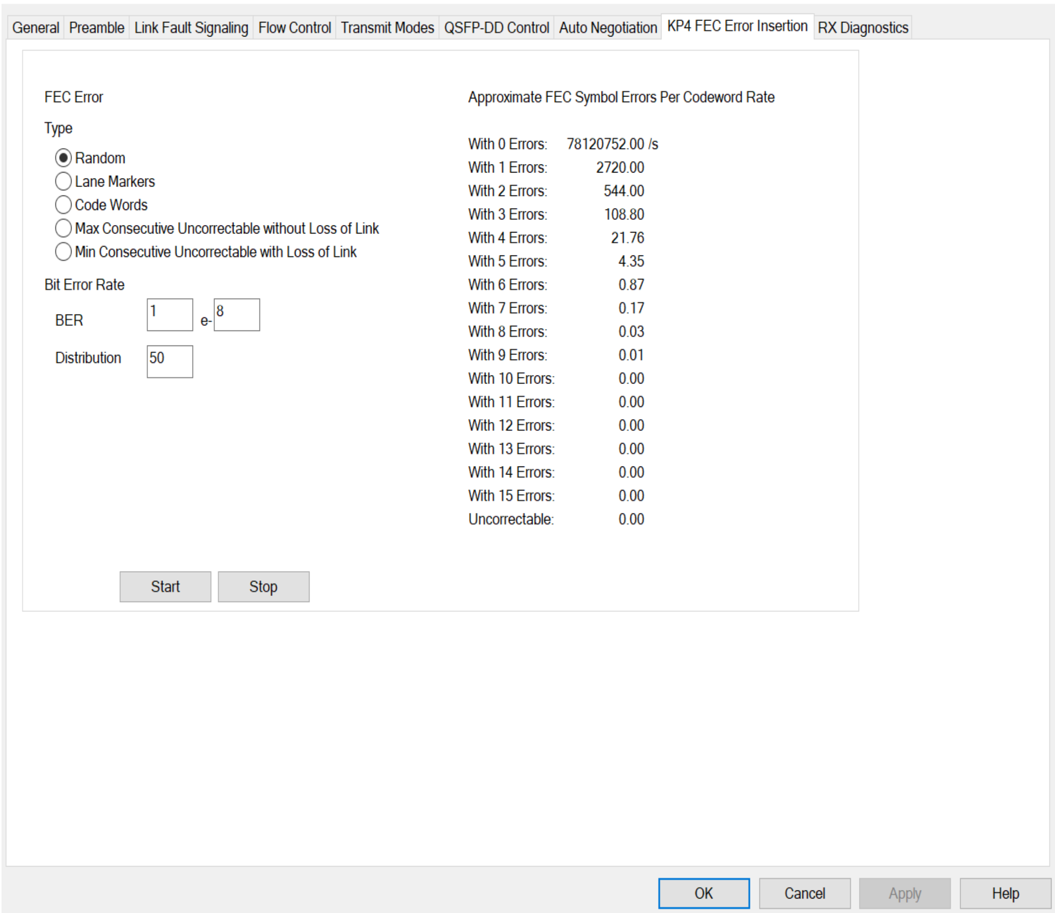


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Lane Markers

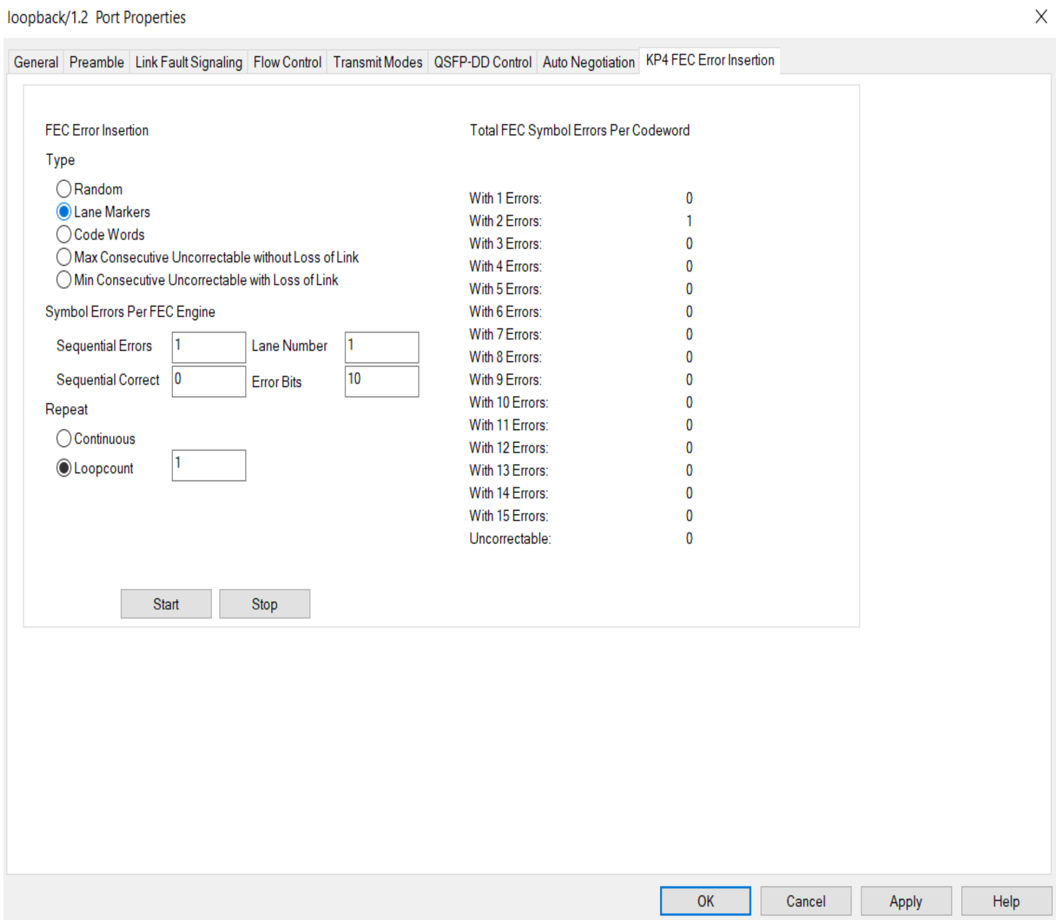


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Code Words

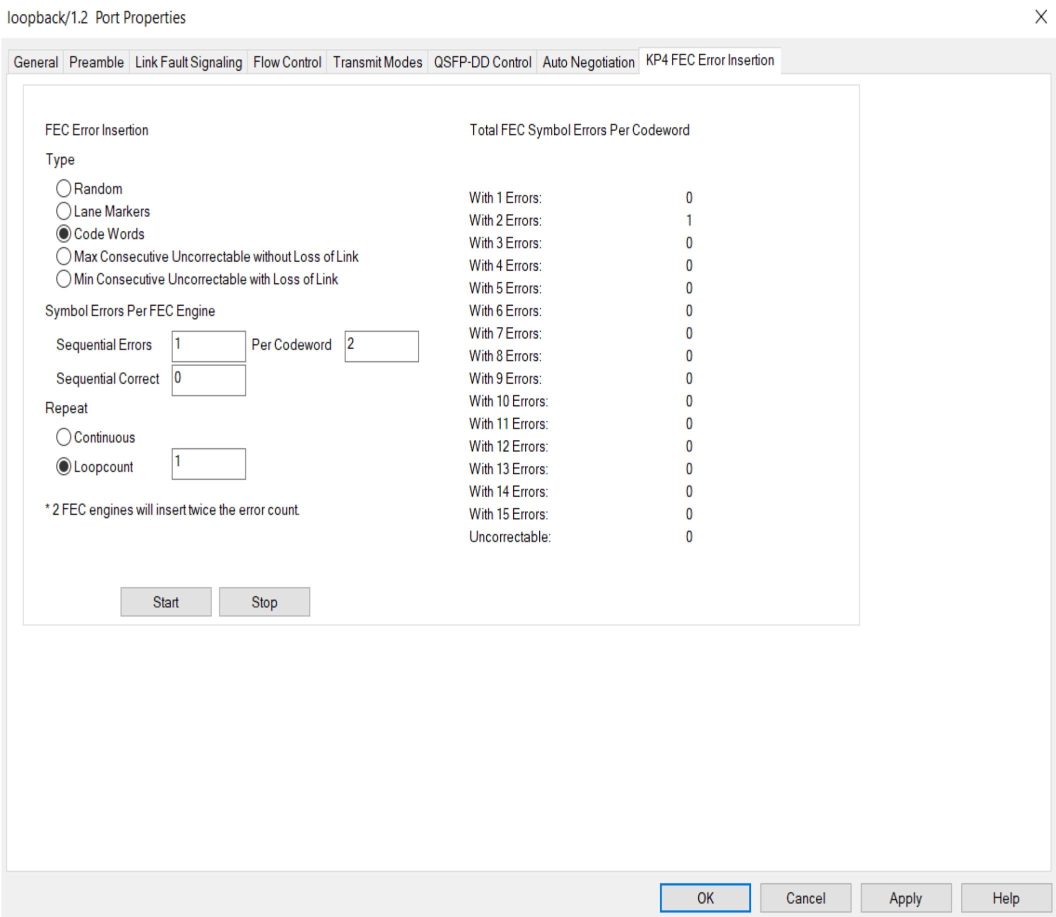


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Max Consecutive Uncorrectable without Loss of Link

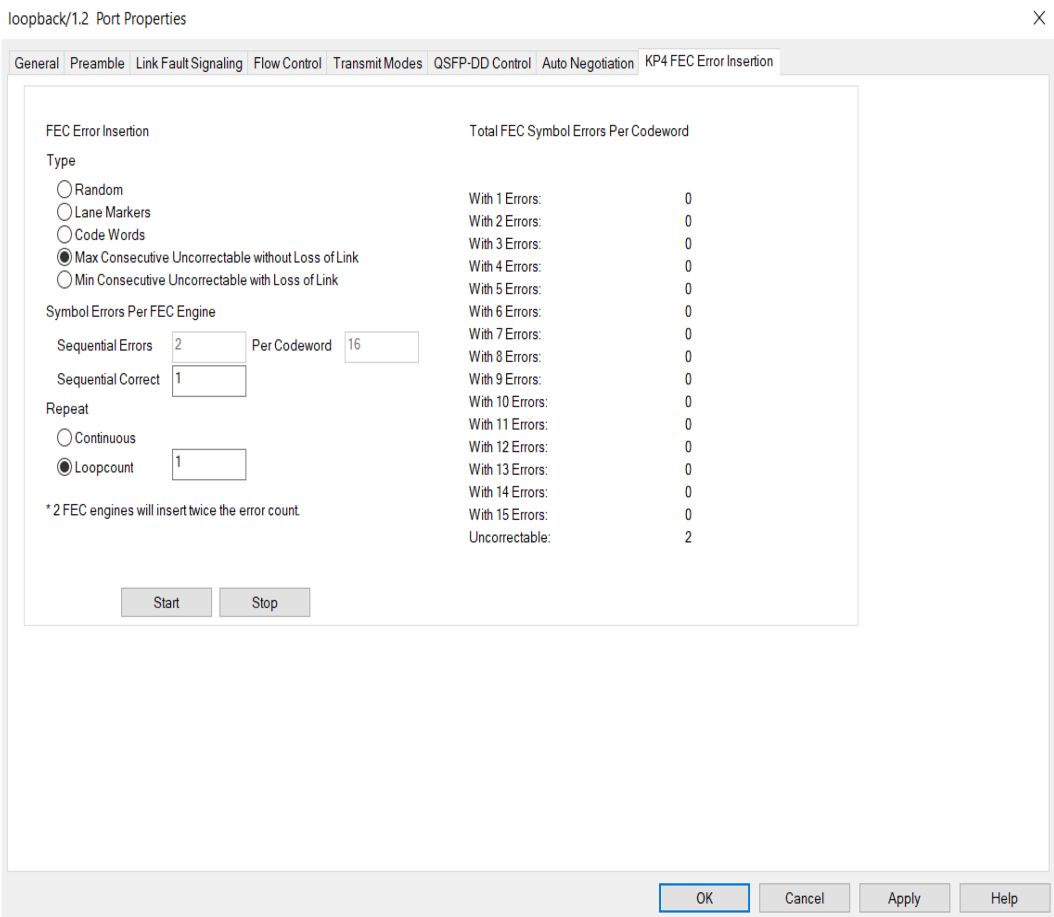


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Min Consecutive Uncorrectable with Loss of Link

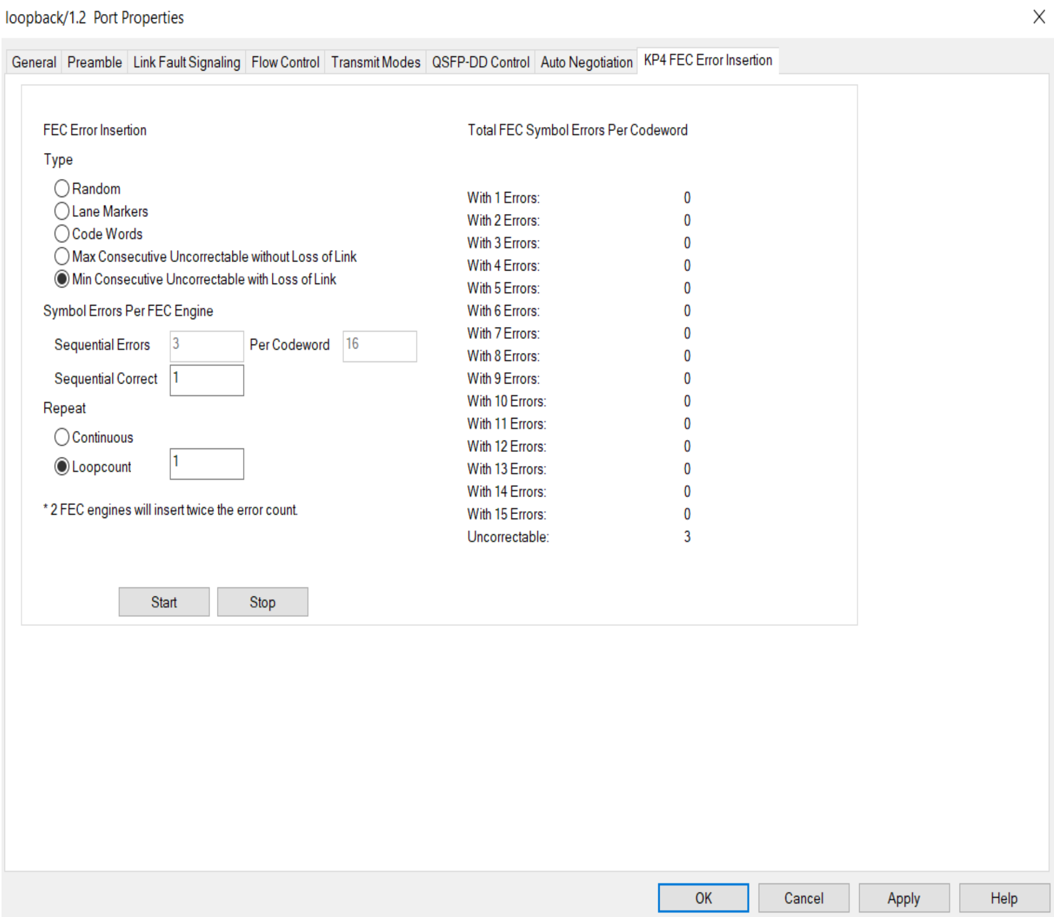


Table: **KP4 FEC** Tab Configuration

Section	Field	Usage
FEC Error Insertion		
Type	Random	Random FEC symbol error insertion will introduce a deterministic number of errors, evenly spread across all PCS lanes, on top the intrinsic BER (Bit Error Rate) of the interconnect.
	Lane Markers	Inserts errors only in the Lane Marker fields.
	Code Words	This is the fundamental unit of data that the FEC engine operates on sequentially. It is composed of blocks that carry the payload and parity information for the 64/66B scrambled data that arrives from the PCS Scrambler on Egress and from the PMA on Ingress.The code word size and layout can vary from each coding scheme. For example, RS, KR, and KP4 all have different code words because their coding schemes are different.
	Max Consecutive Uncorrectable	Uncorrectable errors are those with more than 15 symbol errors. As per IEEE, the maximum number of consecutive uncorrectable errors without loss of link is 2.

Section	Field	Usage
	without Loss of Link	
	Min Consecutive Uncorrectable with Loss of Link	The Max Consecutive Uncorrectable WITHOUT Loss of Link + 1. This is the threshold where the receiver should declare Local Fault due to bad data. The minimum number of consecutive uncorrectable errors with loss of link is 3.
Bit Error Rate	BER	The Bit Error Ratio (BER) is the ratio of the number of error bits compared to the total number of bits transmitted. In the BER field, enter the coefficient of the BER.The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	e-	Enter the exponent of the BER. The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	Distribution	Controls how the errors are distributed. This modifies the probability distribution of errors while maintaining the average Bit Error Rate. For example, you can have a BER of 10E-8 but have all of the errors be single errors OR you can have the errors be distributed across a variety of errors. The purpose is to thoroughly test a receiver to see if all possible errors are being corrected at varying rates.
Symbol Errors Per FEC Engine		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Sequential Errors	In burst mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.

Section	Field	Usage
		NOTE Per 802.3bs and 802.3cd, reception of 3 or more consecutive uncorrectable codewords will result in Loss of Link. In burst mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. This sequence will be repeated until stopped. NOTE Per 802.3bs and 802.3cd, reception of 5 or more Alignment Marker errors will result in Loss of Link. • In 400G mode, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines. • The symbol errors are not evenly distributed across the PCS lanes (use Random error insertion mode for that case) • The maximum number of sequential uncorrectable errors without loss of link is 2 and the minimum number of sequential uncorrectable errors with loss of link is 3.
	Lane Number	The Lane Number specifies which PCS lane will be affected by the Lane Marker error insertion.This field is available only if you select the error insertion type as Lane Markers.
	Sequential Correct	The number of consecutive code words without errors.
	Error Bits	The Error Bits specifies how many errors will be inserted on each of the two symbol errors of the codeword that carries the Lane Marker. There is a minimum Error Bits required (2) before corrupting the symbol that maps to the Lane Marker field. This field is available only if you select the error insertion type as Lane Markers.
	Per Codeword	Codeword is a block of contiguous packets on the line. All RS-FEC codewords are of the same size.The Per Codeword value denotes the number of symbol errors per codeword to insert. KP4 FEC can correct up to 15 symbols, and detect up to 30 symbols. If the user specifies 16, an Uncorrectable Codeword will be issued. This field is available only if you select the error insertion type as Code Words.

Section	Field	Usage
Repeat		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Continuous	Continuous error insertion.In continuous mode, the Sequential Errors field will specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.
	Loopcount	The sequence of correct and incorrect codewords or symbol errors inserted will be repeated by the number specified in the Loopcount field.
Start		Starts the error insertion process.
Stop		Stops the error insertion process.
Appropriate FEC Symbol Errors Per Codeword Rate		The Appropriate FEC Symbol Errors Per Codeword Rate is an approximation for how many symbol errors there will be per codeword every second. NOTE In 400G mode, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines.

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CHAPTER 41

Port Properties–800GE OSFP-M Load Modules

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the 800GE OSFP-M load modules.

The following variants of 800GE OSFP-M load modules are available:

- 800GE-8P-OSFP-M+NRZ - Full and reduced performance
- 800GER-4P-OSFP-M+NRZ - Full and reduced performance
- 800GE-2P-OSFP-M+NRZ - Full and reduced performance
- 800GER-8PHW-4P-OSFP-M+NRZ - Full and reduced performance

Port Properties for 800GE-8P-OSFP-M+NRZ Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option. The properties are similar for all variants of 800GE OSFP-M load modules.

The complete specification for the 800GE-8P-OSFP-M+NRZ load module is found in the *Platform Reference Manual*.

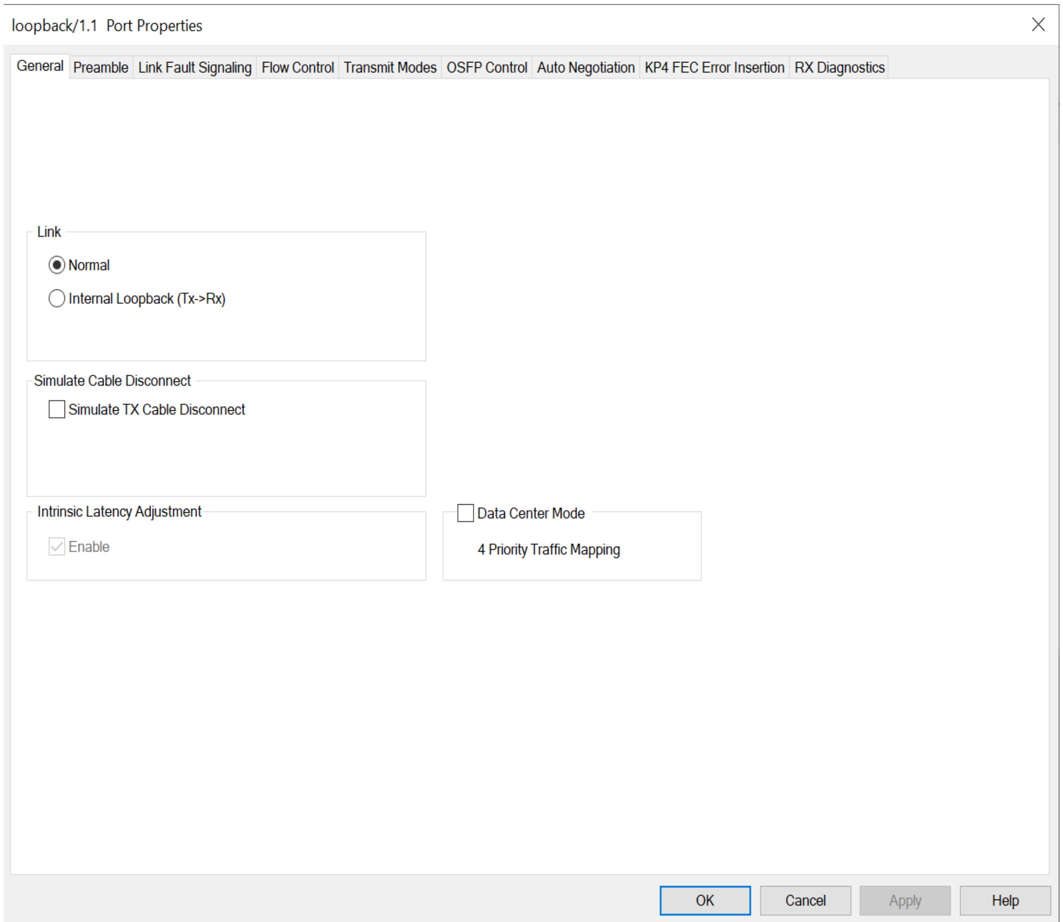
The following port property tabs are available for 800GE-8P-OSFP-M+NRZ modules:

- 800GE-8P-OSFP-M+NRZ Port Properties—General
- 800GE-8P-OSFP-M+NRZ Port Properties—Preamble
- 800GE-8P-OSFP-M+NRZ Port Properties—Link Fault Signaling
- 800GE-8P-OSFP-M+NRZ Port Properties—Flow Control
- 800GE-8P-OSFP-M+NRZ Port Properties—Transmit Modes
- 800GE-8P-OSFP-M+NRZ Port Properties—OSFP Control
- 800GE-8P-OSFP-M+NRZ Port Properties—Auto Negotiation
- 800GE-8P-OSFP-M+NRZ Port Properties—KP4 FEC Error Insertion

800GE-8P-OSFP-M+NRZ Port Properties—General

The 800GE-8P-OSFP-M+NRZ **General** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, and then selecting the **General** tab.

The Port Properties **General** tab for 800GE-8P-OSFP-M+NRZ is shown in the following figure:



The controls for **General** tab configuration are described in the following table:

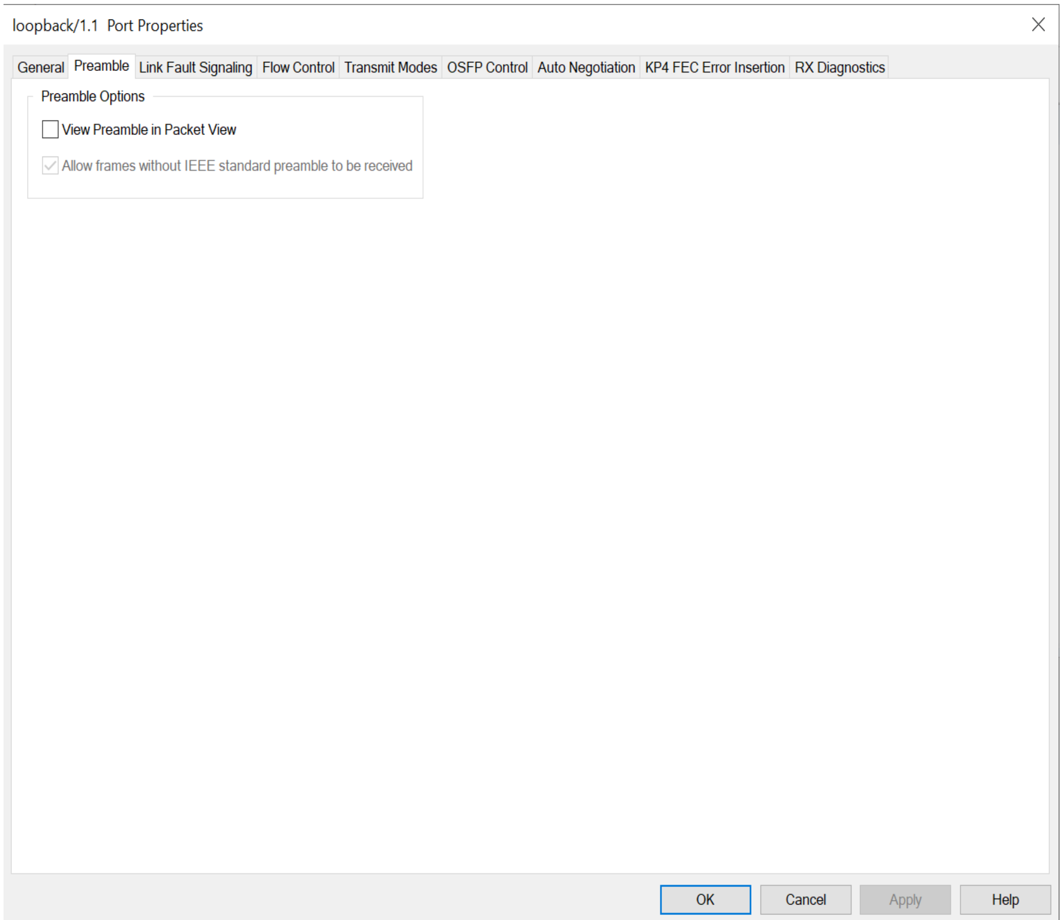
Section	Control/Field	Usage
Link	Normal	Normal operation
	Internal Loopback (Tx -> Rx)	Select this check box to turn on Internal Loopback—Transmit to Receive.
Simulate Cable Disconnect	Simulate TX Cable Disconnect	If this is selected, the port acts as if the cable has been disconnected on the transmit side only. Incoming packets may still be received and port may show link up, but no packets or PCS data will be transmitted.
Intrinsic Latency Adjustment	Enable	The **Enable** check box is selected by default. This enables the intrinsic latency adjustment. The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia*

Section	Control/Field	Usage
		Platform Reference Manual.
Data Center Mode		If selected, enables the Data Center Mode option. When Data Center Mode option is selected, the following changes take place: • The selected port is automatically placed into Advanced Stream mode. In this case, Packet Stream mode is not supported. • Only Auto Intrumentation mode (Floating Timestamp/Data Integrity) is supported, both for transmit and receive. • 4-Priority Traffic Mapping is enabled. It supports various frame size for each PFC control (0-4). NOTE This feature is not supported in 800 GE speed mode. • FCoE protocol can be edited for Ethernet II and Ethernet Snap in **Frame Data** tab.

800GE-8P-OSFP-M+NRZ Port Properties—Preamble

The preamble precedes the frame, but is not part of the frame itself.

The 800GE-8P-OSFP-M+NRZ Port Properties **Preamble** tab is shown in the following figure:



The fields and controls in this tab are described in the following table:

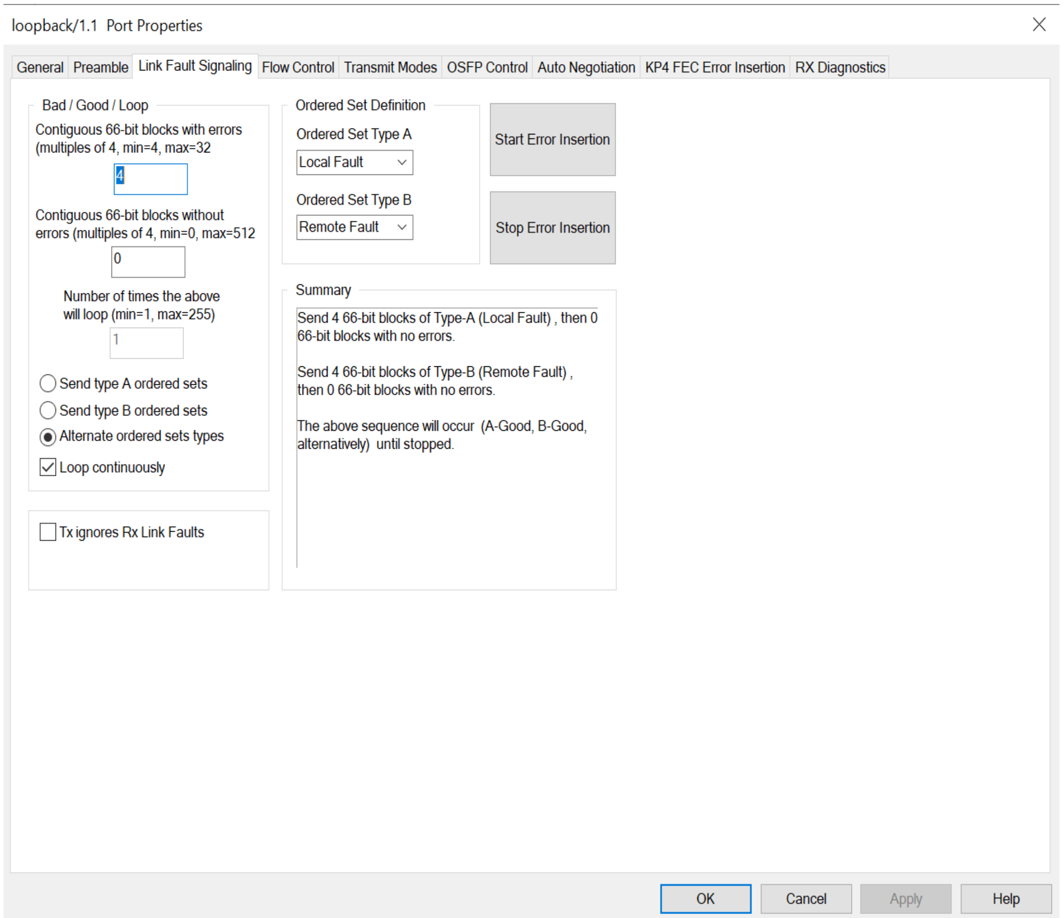
Section	Choices	Description
Preamble Options	View Preamble in Packet View	When this check box is selected, the preamble data will be visible in the Packet View (transmit side) and the Capture View (receive side).
	Allow frames without IEEE standard preamble to be received	When this check box is selected, it allows frames without IEEE standard preamble to be received. • This check box is selected by default.

800GE-8P-OSFP-M+NRZ Port Properties—Link Fault Signaling

When **Link Fault Signaling** is enabled, four statistics will be added to the list in Statistic View for the port. One is for monitoring the Link Fault State. Two provide a count of the Local Faults and Remote Faults. The last one is for indicating the state of error insertion, whether or not it is ongoing

The **Link Fault Signaling** tab is accessed from the context menu of the a port in **Resources** pane by selecting the **Properties** menu option, or by double-clicking a port in the **Detail** pane. Then select the **Link Fault Signaling** tab.

The **Link Fault Signaling** tab for800GE-8P-OSFP-M+NRZ load module is shown in the following image.



The controls for **Link Fault Signaling** tab configuration are described in the following table.

Section	Field/Control	Description
Bad/Good/Loop	(Bad) Contiguous 66-bit blocks with errors (multiples of 4; min = 4, max = 32)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks with errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive fault sequences allowed are minimum 4 sequences and maximum 32 sequences.
	(Good) Contiguous 66-bit blocks without errors (multiples of 4; min = 0, max = 512)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks without errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive regular data sequences allowed are minimum 0 sequences and maximum 512 sequences.
	Number of times	Specifies the number of loops for the user defined

<table>
<tr><th>Section</th><th>Field/Control</th><th>Description</th></tr>
<tr><td></td><td>the above will loop (min = 1, max = 255)</td><td>sequence. Options include the following:
Discrete iterations:
Minimum of 1 iteration
Maximum of 255 iterations
Continuous loop
User cannot specify number of iterations</td></tr>
<tr><td></td><td>Options include the following:
Send type A ordered sets
Send type B ordered sets
Alternate ordered set types</td><td>Defines the ordered set pattern that will be sent. (The two Ordered Sets—A and B—are defined in the Ordered Set Definition box in this tab.) This pattern will be combined with the Good blocks/Bad blocks pattern for transmission.
Only Type A fault sequence and regular good data sequences
Only Type B fault sequence and regular good data sequences
Alternate Type A, regular good data sequences and Type B fault sequence, regular good data sequences
NOTE If this field is available, and the Alternate ordered set types option is selected, the minimum value for this field should be '2,' to allow the entire pattern to be sent once. If left at the minimum value of '1'— only two groups of blocks (one of good blocks and one of bad blocks) will be sent, which means that only the first ordered set will be sent. A minimum of eight blocks is required for one complete pattern including Types A and B.</td></tr>
<tr><td></td><td>Loop continuously</td><td>If selected, the loop defined by the combination of the Bad and Good blocks plus the pattern of ordered sets, will be transmitted continuously until the Stop Error Insertion option is selected.</td></tr>
<tr><td>Ordered Set Definition</td><td>Ordered Set Type A</td><td>Options include the following:
Local Fault
Remote Fault</td></tr>
<tr><td></td><td>Ordered Set Type B</td><td>Options include the following:
Local Fault
Remote Fault</td></tr>
</table>

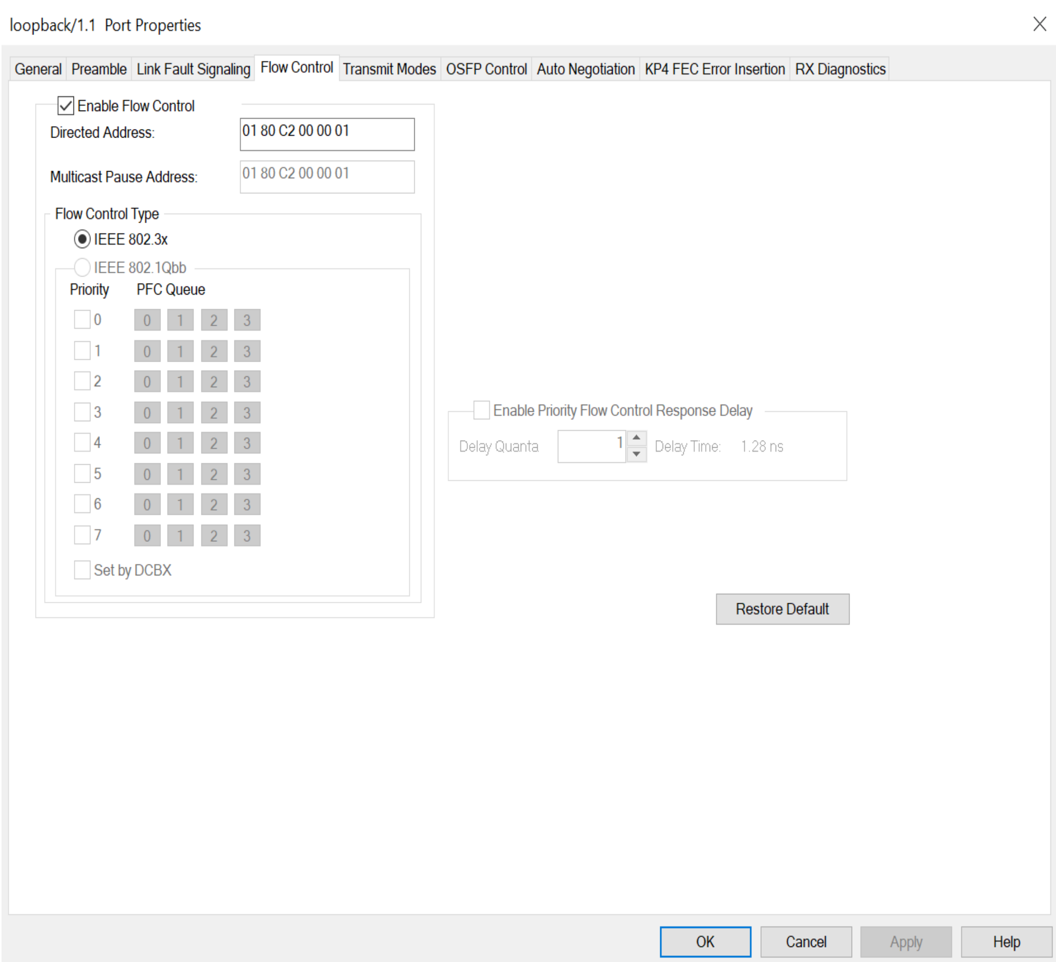
Section	Field/Control	Description
Tx ignores Rx Link Faults		If selected, ongoing transmission will continue even if Link Fault messages are received by the sending RS.
Summary (Window)		(Read-only) Shows descriptions of the patterns that will be transmitted.
Start Error Insertion		Select this option to start the transmission of the configured error patterns.
Stop Error Insertion		(Available only for use with the **Loop continuously** option.) Select this option to stop the transmission of the configured error patterns.

800GE-8P-OSFP-M+NRZ Port Properties—Flow Control

The 800GE-8P-OSFP-M+NRZ **Flow Control** tab is accessed from the context menu of the port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

NOTE You can view this help page for the **Port Properties - Flow Control** tab by selecting the **Help** option and not F1.

The Port Properties **Flow Control** tab for 800GE-8P-OSFP-M+NRZ is shown in the following image.



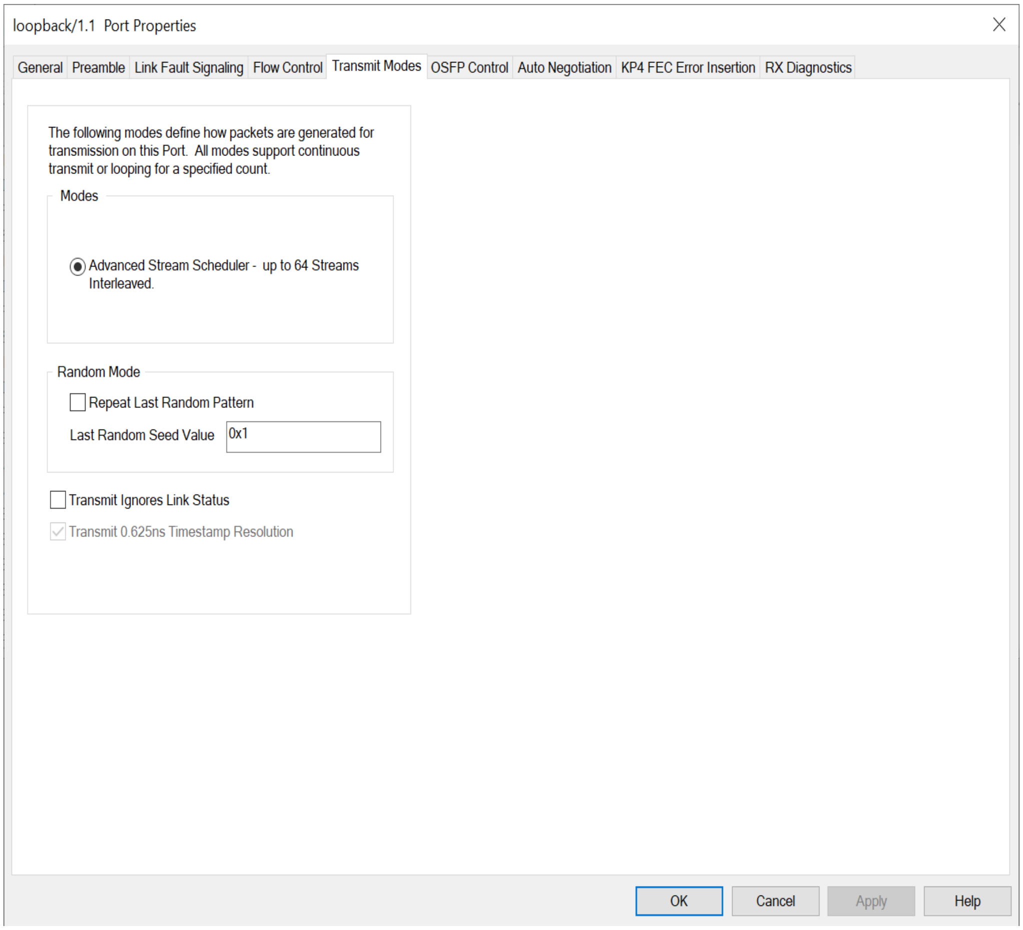
Section	Field/Control	Description
Enable Flow Control	(check box)	Enables the port's MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type	IEEE 802 3x	When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame.
	IEEE 802.1Qbb	When not in Data Center mode, only IEEE 802.3x is available. NOTE This feature is not supported in 800 GE speed mode.
	Priority	When flow control type IEEE 802.1Qbb is selected in Data Center

Section	Field/Control	Description
		mode, priority options are the channels of data that can be paused. Select to select one or more channels.
	PFC Queue	The PFC Queue can be mapped to the priority field in the frame.
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed. NOTE This feature is not supported in 800 GE speed mode.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

800GE-8P-OSFP-M+NRZ Port Properties—Transmit Modes

The **Transmit Modes** tab for 800GE-8P-OSFP-M+NRZ load modules is shown in the following image. It is accessed by double-clicking a port in **Resources** window, or by from the context menu of the port by selecting the **Properties** menu option. Then select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following image.



The controls for **Transmit Modes** tab configuration are described in the following table.

Section	Field/Control	Description
Modes	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure the following: • 800 GE - up to 64 streams • 400 GE - up to 64 streams • 200 GE - up to 64 streams • 100 GE - up to 32 streams They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream's

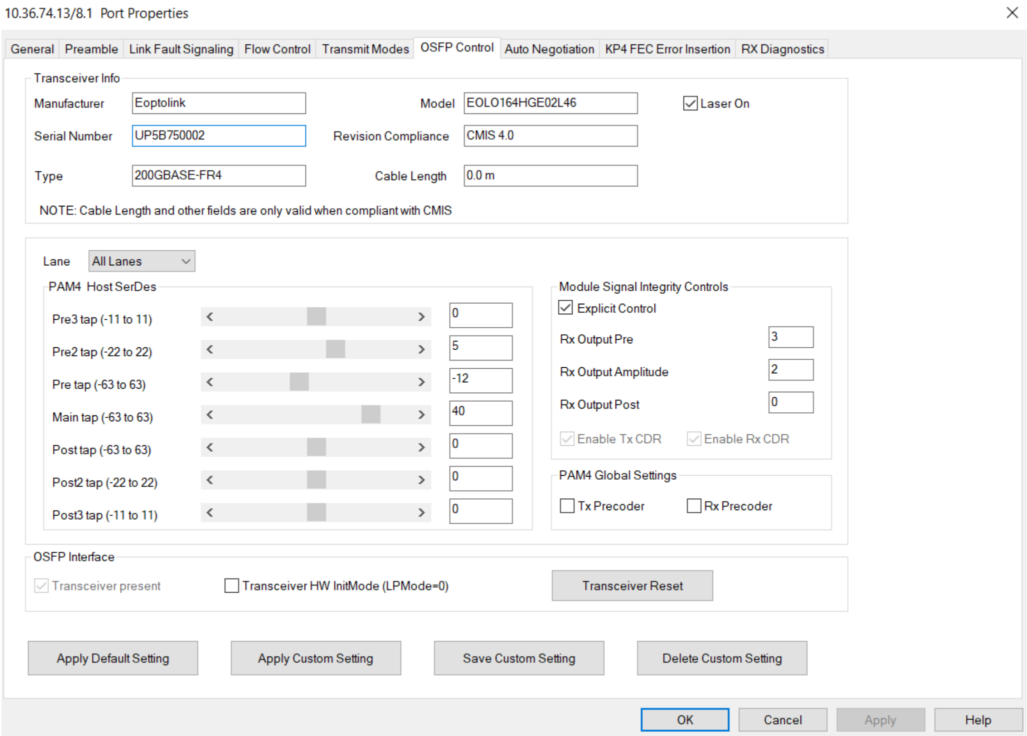
Section	Field/Control	Description
		random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit Ignores Link Status		If selected, will allow transmission of packets even if the link is down.
Transmit 0.625ns TimeStamp Resolution		If selected, the 800GE-8P-OSFP-M+NRZ load module will support 0.625 ns.

800GE-8P-OSFP-M+NRZ Port Properties—OSFP Control

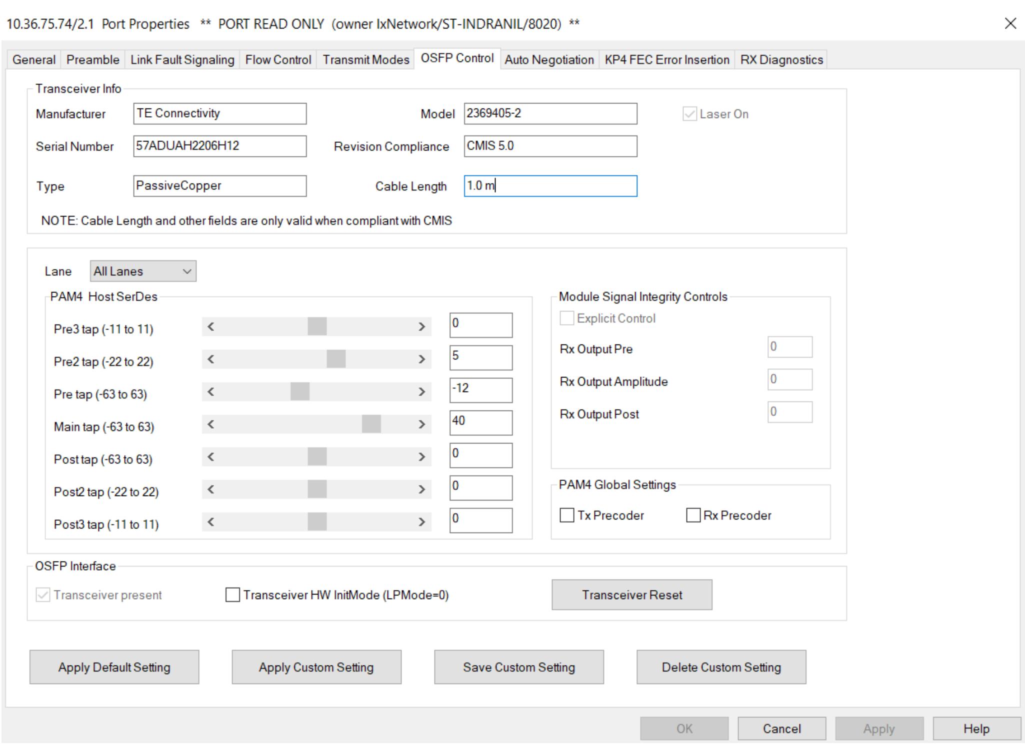
PAM-4 is a four-level pulse-amplitude modulation that uses four distinct amplitude levels to encode two bits of data, essentially doubling the bandwidth of a connection. The PAM4 settings are defined using the **OSFP Control** tab.

The **OSFP Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **OSFP Control** tab.

The Port Properties **OSFP Control** tab for 800GE-8P-OSFP-M+NRZ when the fiber optic transceiver is used is shown in the following figure:



The Port Properties **OSFP Control** tab for 800GE-8P-OSFP-M+NRZ when the passive copper transceiver is used is shown in the following figure:



When 800GE-8P-OSFP-M+NRZ detects an optical transceiver, it will apply a Host Transmit equalization combination that is well suited for optics, and also expose the transceiver's signal integrity controls.

The supported module signal integrity fields of CMIS 3.0 and 4.1 transceivers are listed below:

- Rx Output EQ Control Pre-Cursor
- Rx Output EQ Control Post-Cursor
- Rx Output Amplitude Control
- Tx CDR Control
- Rx CDR Control

The signal integrity fields are configurable based on the capability of the transceiver. The default value and maximum allowed range for each of the fields are read from the transceiver during transceiver initialization.

Section	Field/Control	Description
Transceiver Info		
	Manufacturer	This is the Vendor Name field read from the actual transceiver currently being plugged in.
	Model	This is the Part Number field read from the actual transceiver currently being plugged in.
	Serial Number	The serial number of the transceiver.
	Revision Compliance	The implemented CMIS revision of the transceiver. 800GE-4P-QDD-C supports both CMIS 3.0 and CMIS 4.0 transceivers. See Management Interface.
	Type	When a transceiver is inserted into the load module, the software reads IEEE registers to determine the transceiver capabilities and media type. If the transceiver contains this information, it is shown in this read-only field.
	Cable Length	The length of Ixia-supplied cable which connects this chassis to the previous chassis in the chain.
	Laser On	Select this check box to enable the laser power.
112G Host SerDes		
	Pre3 cursor tap (0 to 63)	This helps to control the Pre3 Tap value for Tx.
	Pre2 cursor tap (0 to 63)	This helps to control the Pre2 Tap value for Tx.
	Pre-cursor tap (0 to 63)	This helps to control the Pre Tap value for Tx.

Section	Field/Control	Description
	Main-cursor tap (0 to 63)	This helps to control the Main Tap Control for Tx.
	Post-cursor tap (0 to 63)	This helps to control the Post Tap value for Tx.
Module Signal Integrity Controls		
	Explicit Control	Select this check box to enable the Rx Output pre, Rx Output Amplitude, and Rx Output Post fields. This check box is available for selection only if the fiber optic transceiver is used.
	Rx Output Pre	Allowed range of values for Rx Output pre. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Rx Output Amplitude (0 to 0)	Allowed range of values for Rx Output amplitude. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Rx Output Post	Allowed range of values for Rx Output post. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Enable Tx CDR	Turn on Tx CDR Control. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Enable Rx CDR	Turn on Rx CDR Control . This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
PAM4 Global Settings		
	Tx Precoder	Represents a PAM4 encoding scheme to reduce DFE bit errors. This also means that both sides of the link must have precoder enabled for link to come up.
	Rx Precoder	Represents a PAM4 encoding scheme to reduce DFE bit errors. This also means that both sides of the link must have precoder enabled for link to come up.
OSFP Interface		

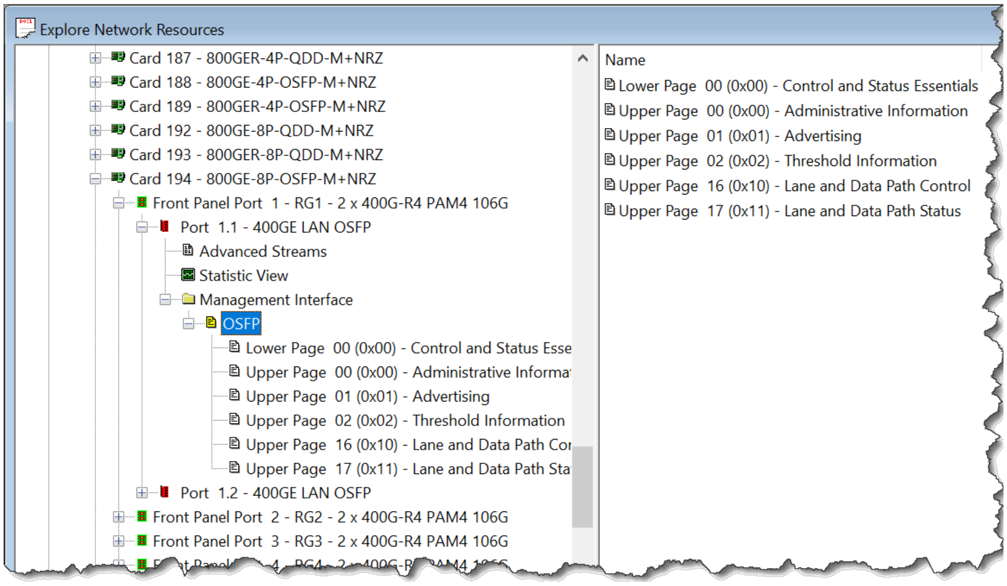
Section	Field/Control	Description
	Transceiver HW InitMode	Selecting the check box configures the QSFP-DD InitMode pin to perform the optional Hardware Init mode initialization as described in the Common Management Interface Specification (CMIS) Rev 3.0. When a transceiver boots into Hardware Init mode, the datapath is automatically configured by the module without intervention from the host (that is Ixia tester). When disabled, the software-controlled initialization (Software Init) is instead performed. This is the recommended initialization mode for any transceiver since the appropriate checks are performed between the Ixia tester and the transceiver before the module's datapath initialization.
	Transceiver Reset	Resets the transceiver.
	Apply Default Setting	When you select this button, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Setting	When you select this button, if there exists a custom setting in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	When you select this button, if there exists a custom setting in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	When you select this button, if there exists a custom setting in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel with that. If no custom setting exists, users will be prompted that nothing will be deleted.

Management Interface

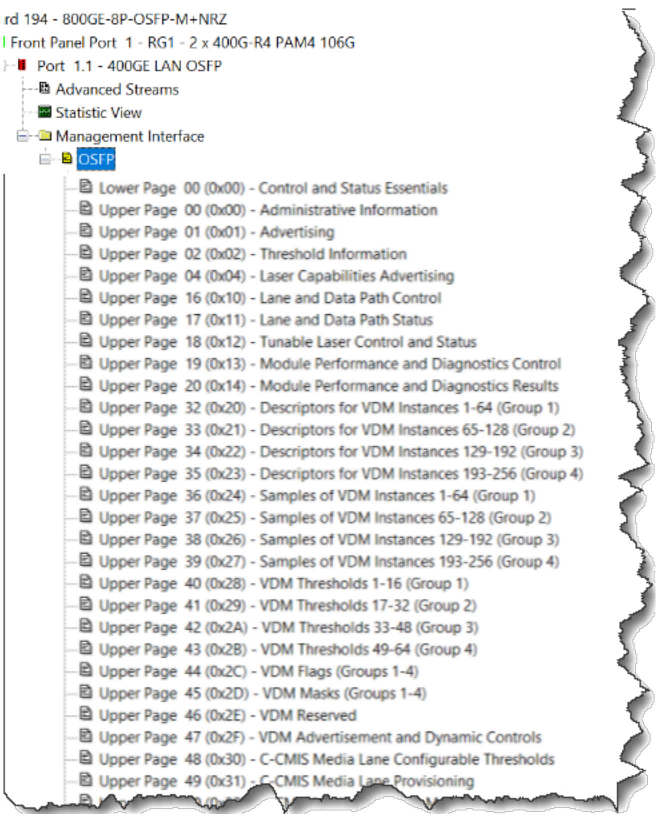
A management interface specification CMIS defines the management interface and associated protocols for all required and allowable management interactions between a CMIS aware host and a CMIS compliant module that are relevant for the host using the module in an application.

The Management Interface appears in the IxExplorer Resources Tree and switches on the fly depending on the CMIS revision. This means that the transceiver automatically reads the management interface and populates the lower and upper pages depending on the transceiver type.

With a CMIS 3.0 (or lower) transceiver, you will see the following pages:



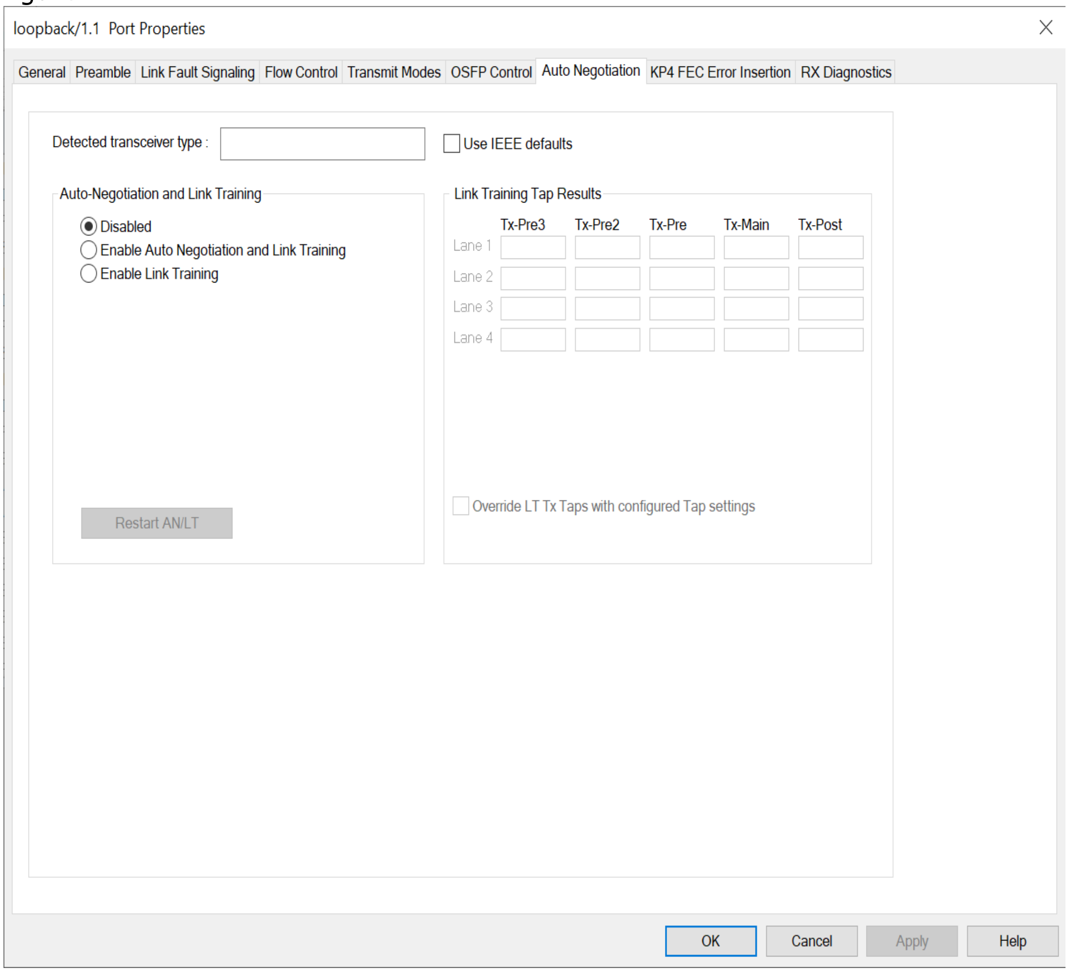
With a CMIS 4.0 transceiver, you will see the following pages:



800GE-8P-OSFP-M+NRZ Port Properties—Auto Negotiation

The 800GE-8P-OSFP-M+NRZ **Auto Negotiation**tab is accessed by selecting a 800GE-8P-OSFP-M+NRZ port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto Negotiation** tab.

The Port Properties **Auto Negotiation** tab for 800GE-8P-OSFP-M+NRZ is shown in the following figure:

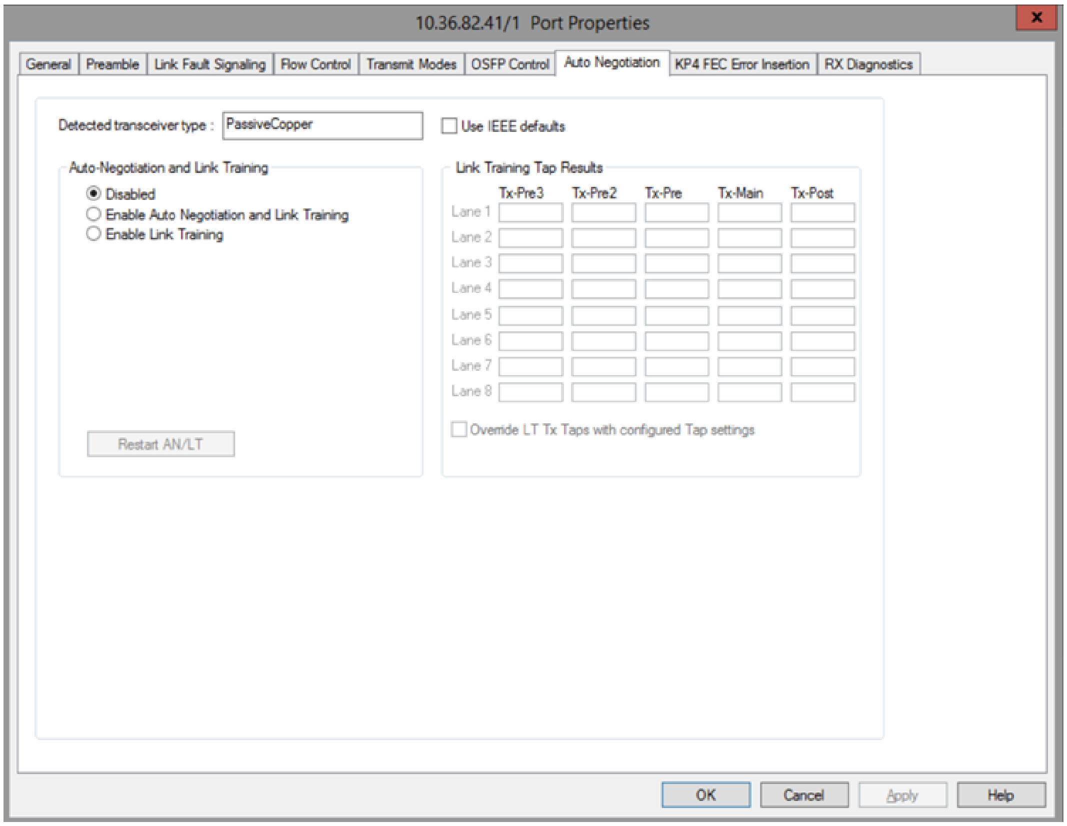


The following lanes are available depending on the port speed:

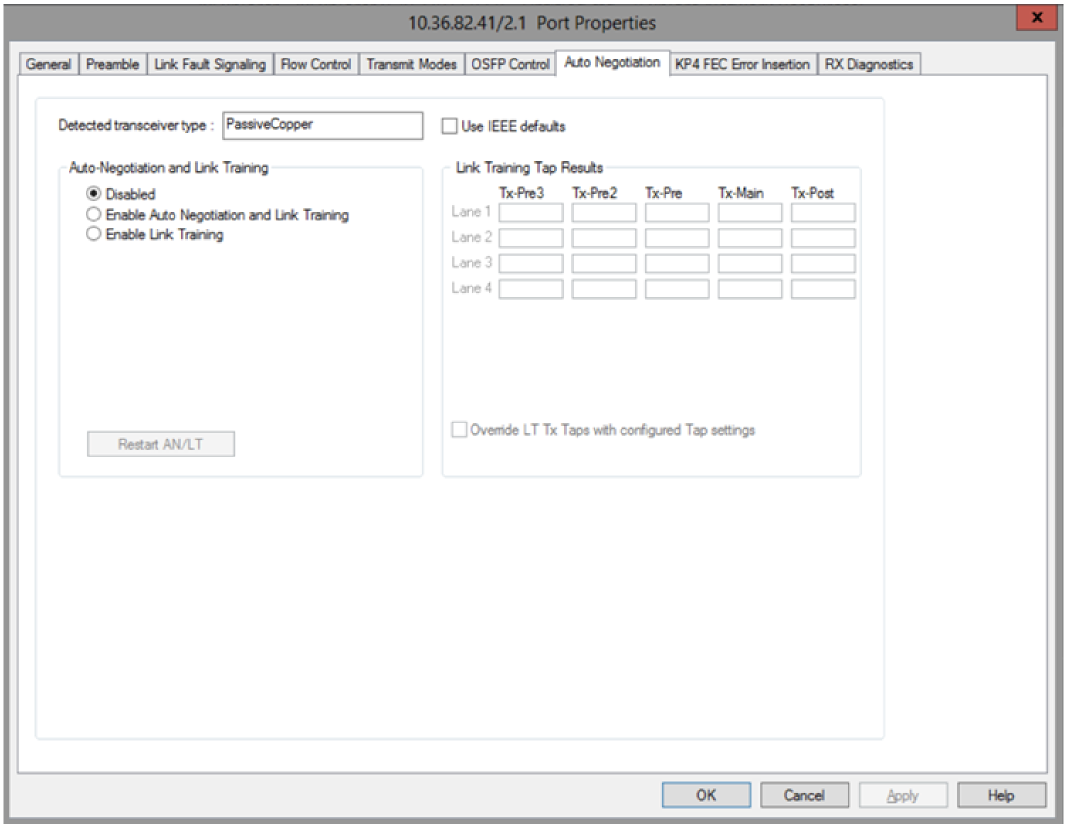
Speed Mode	Lanes
800GE PAM4 106G	8 lanes (1-8)
400GE PAM4 106G	4 lanes (1-4)
200GE PAM4 106G	2 lanes (1-2)
100GE PAM4 106G	1 lane (1)
400GE PAM4 53G	8 lanes (1-8)
200GE PAM4 53G	4 lanes (1-4)
100GE PAM4 53G	2 lanes (1-2)
50GE PAM4 53G	1 lane (1)

Speed Mode	Lanes
100GE NRZ 26G	4 lanes (1-4)
50G NRZ 26G	2 lanes (1-2)
25G NRZ 26G	1 lane (1)

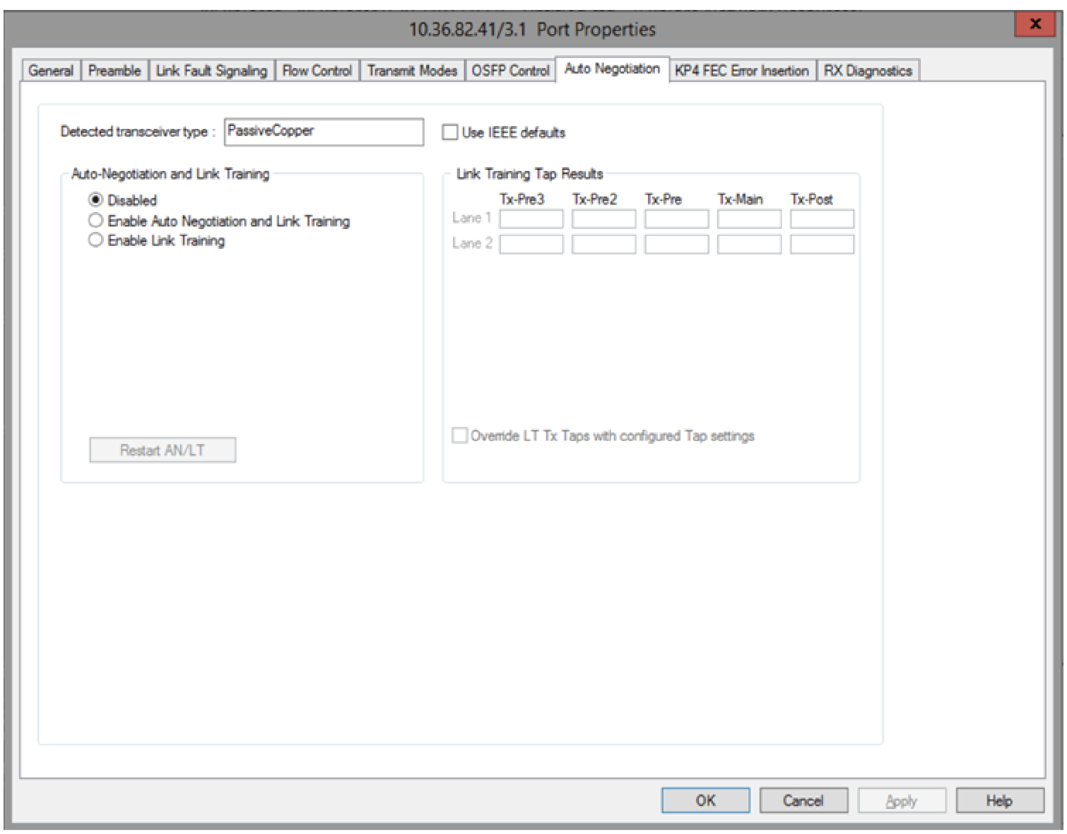
800GE-8P-OSFP-M+NRZ **Auto Negotiation** tab for 800GE PAM4 106G speed mode is shown below:



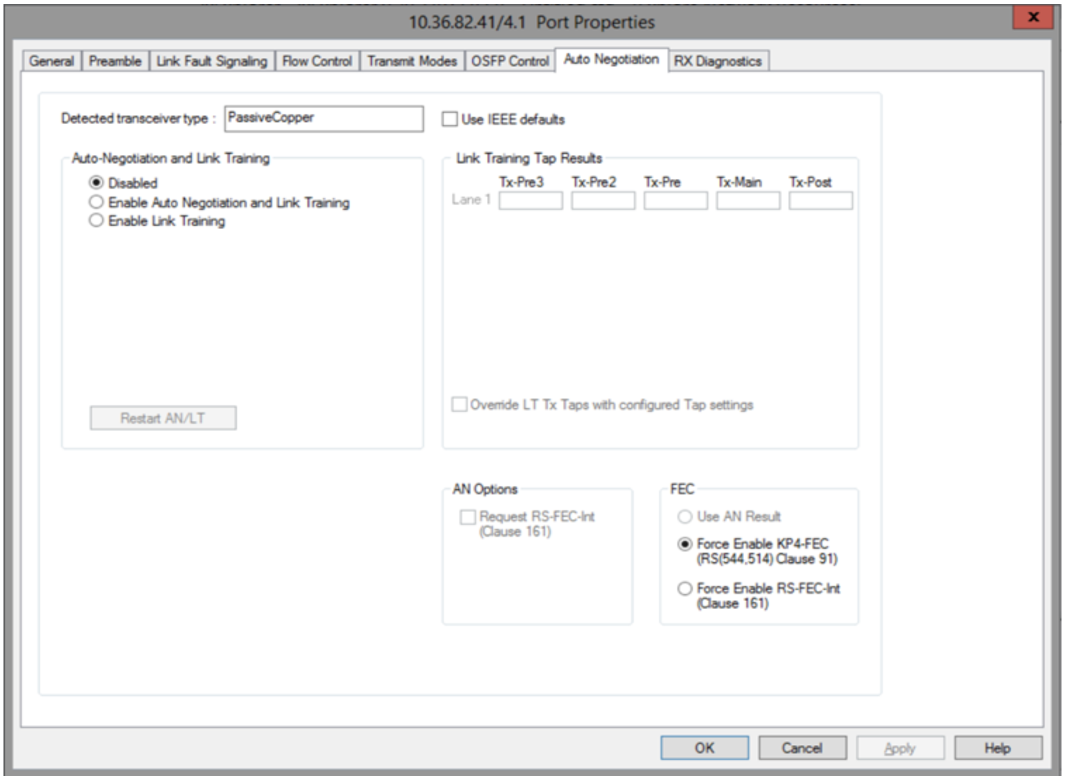
800GE-8P-OSFP-M+NRZ **Auto Negotiation** tab for 400GE PAM4 106G speed mode is shown below:



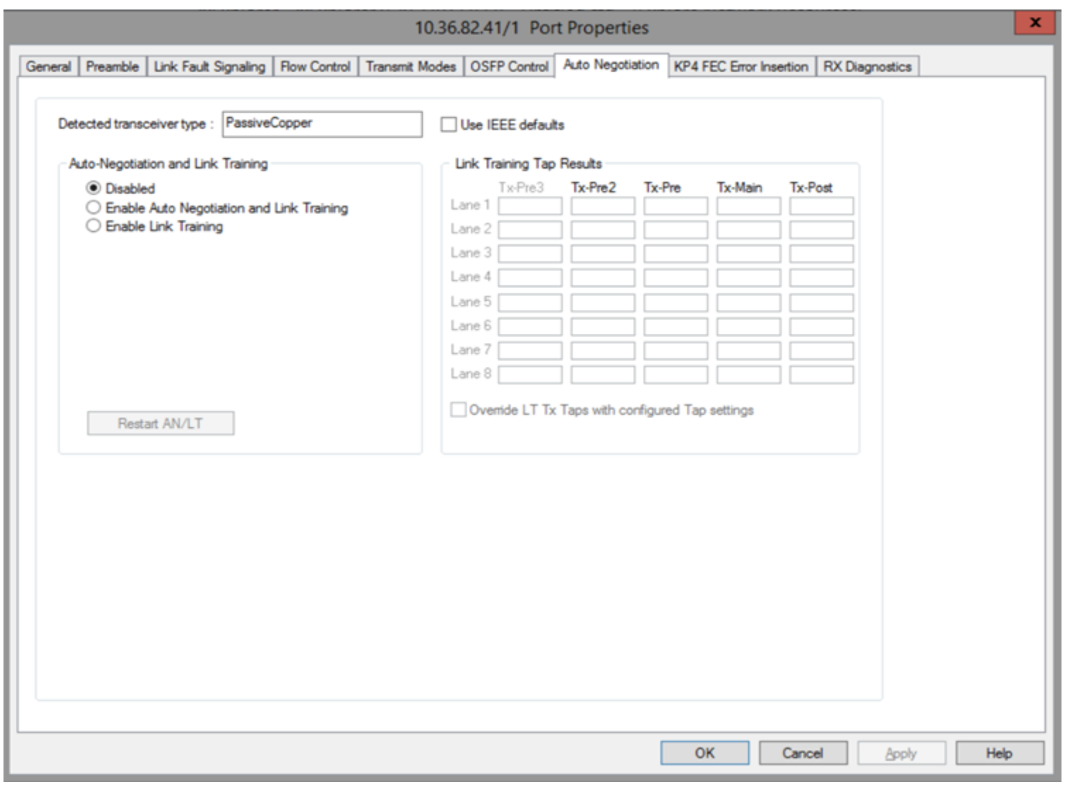
800GE-8P-OSFP-M+NRZ **Auto Negotiation** tab for 200GE PAM4 106G speed mode is shown below:



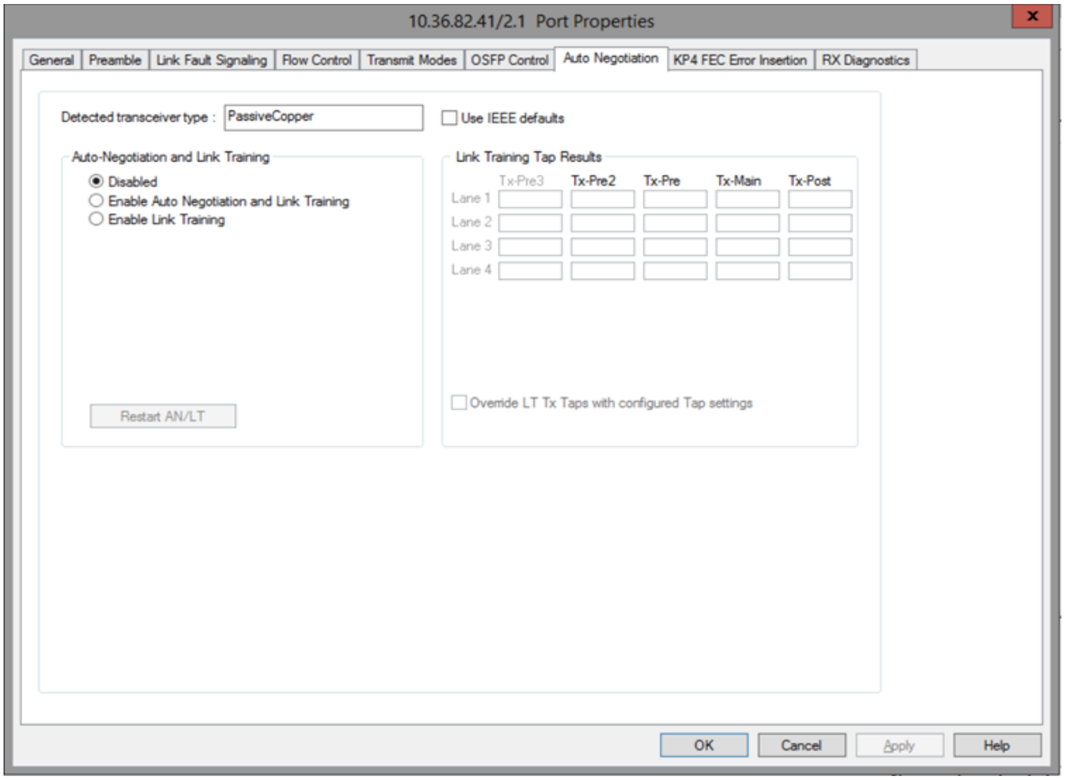
800GE-8P-OSFP-M+NRZ **Auto Negotiation** tab for 100GE PAM4 106G speed mode is shown below:



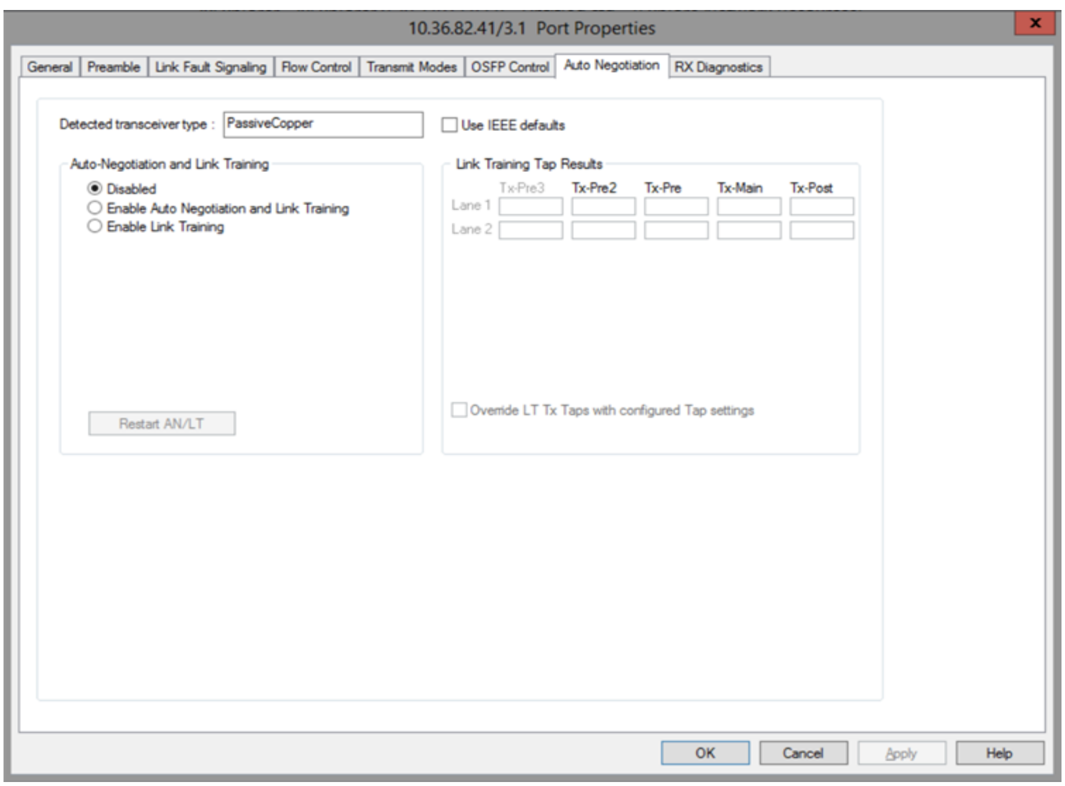
800GE-8P-OSFP-M+NRZ **Auto Negotiation** tab for 400GE PAM4 53G speed mode is shown below:



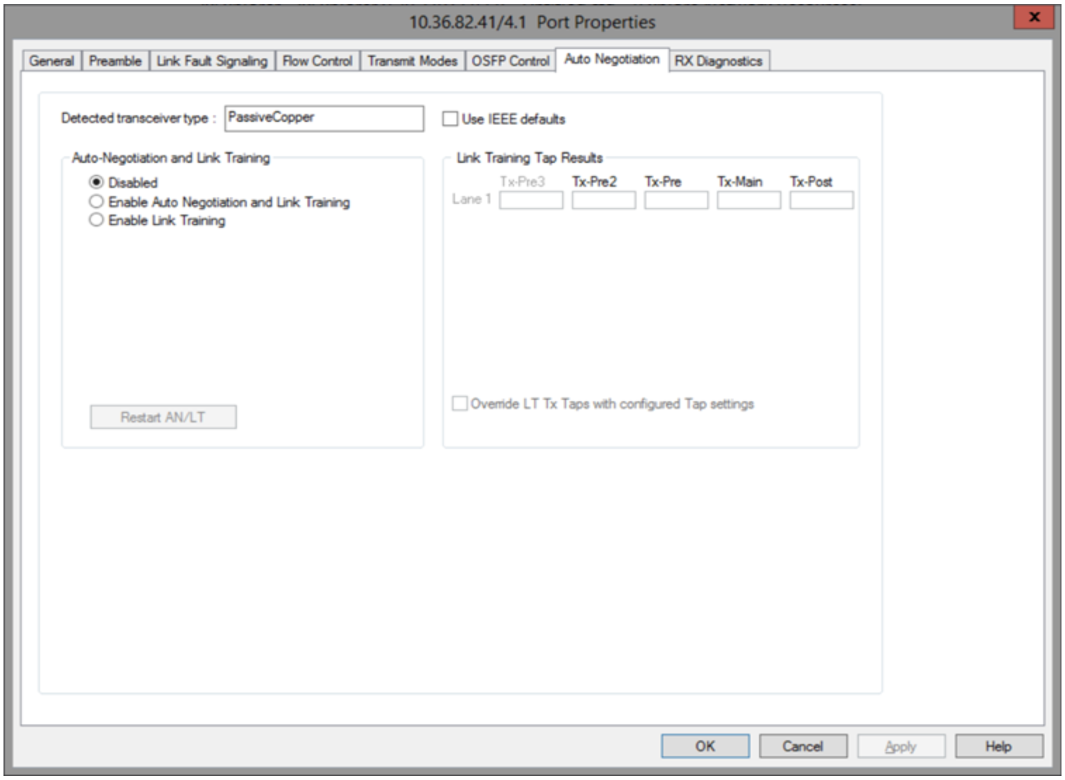
800GE-8P-OSFP-M+NRZ **Auto Negotiation** tab for 200GE PAM4 53G speed mode is shown below:



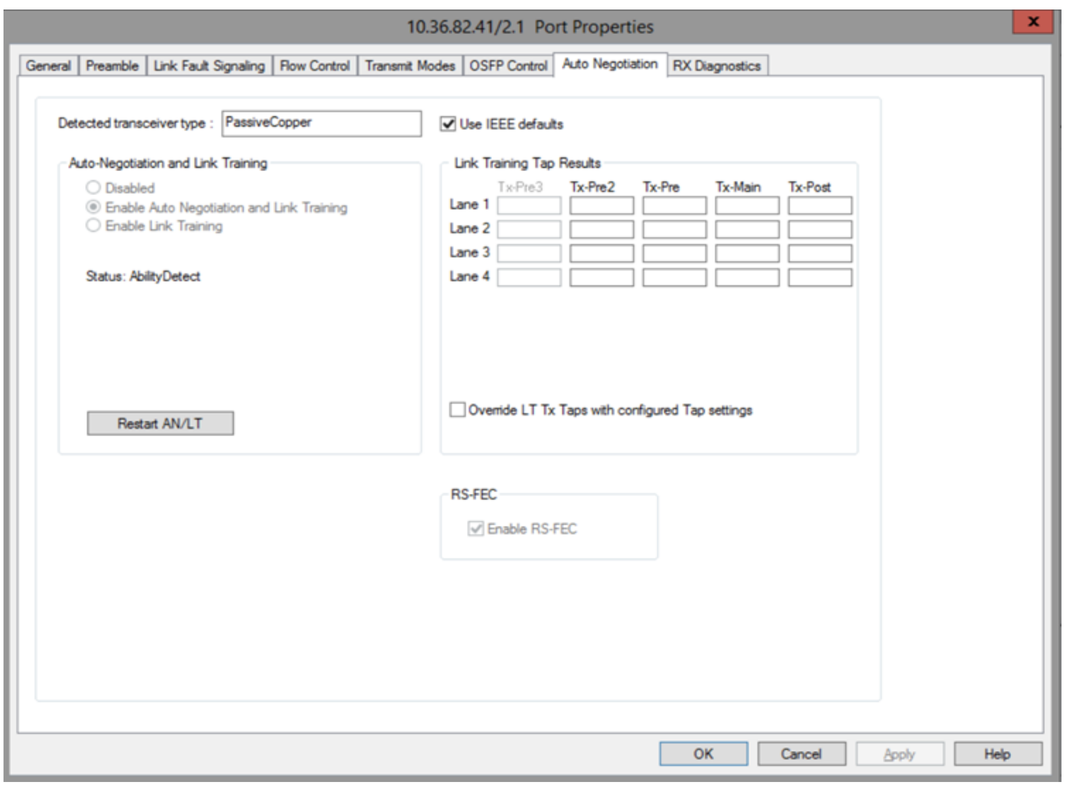
800GE-8P-OSFP-M+NRZ **Auto Negotiation** tab for 100GE PAM4 53G speed mode is shown below:



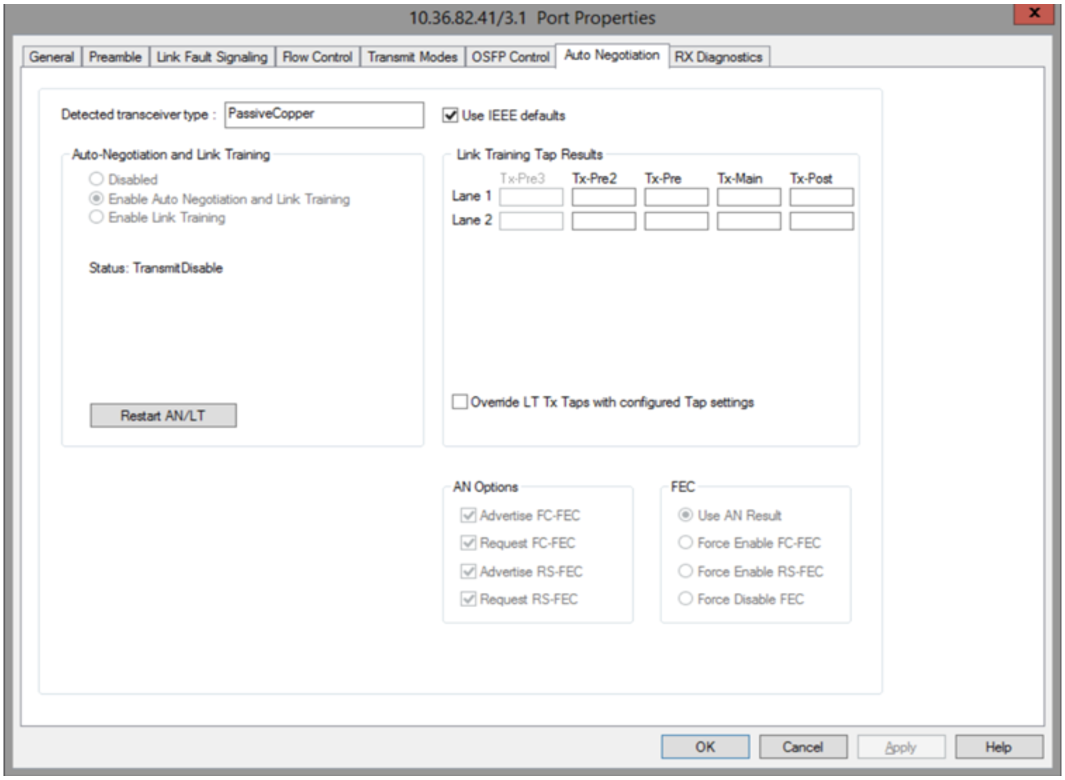
800GE-8P-OSFP-M+NRZ **Auto Negotiation** tab for 50GE PAM4 53G speed mode is shown below:



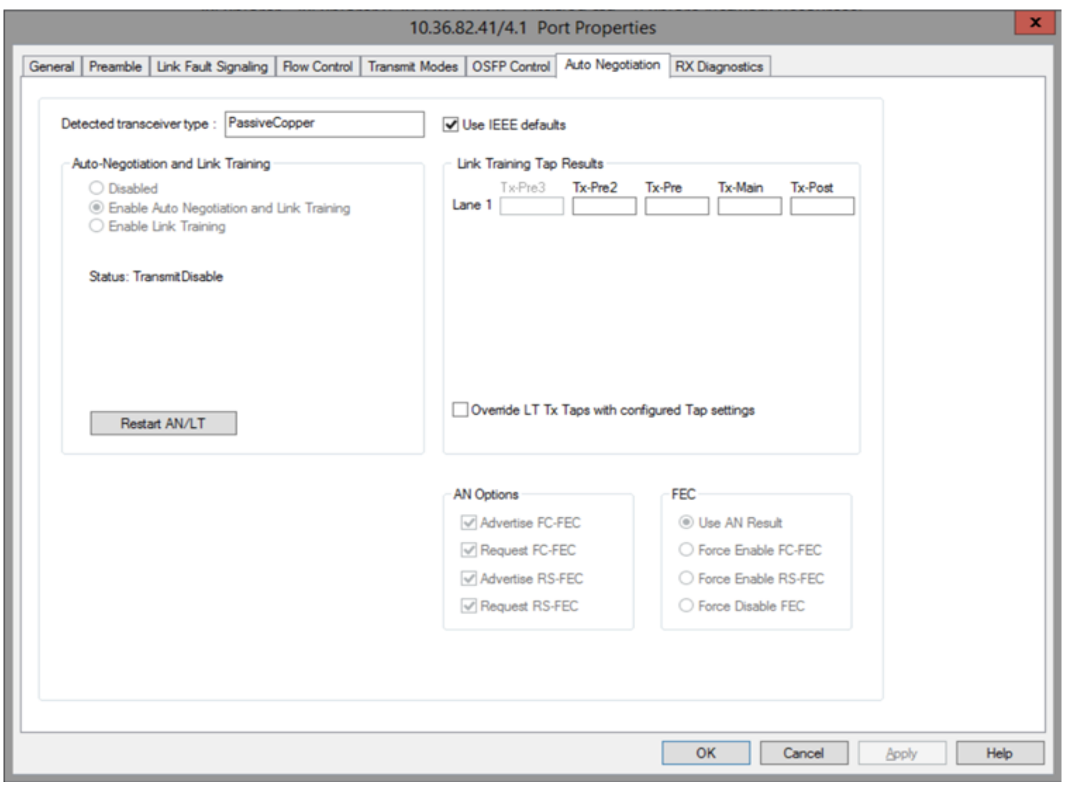
800GE-8P-OSFP-M+NRZ **Auto Negotiation** tab for 100GE NRZ speed mode is shown below:



800GE-8P-OSFP-M+NRZ **Auto Negotiation** tab for 50GE NRZ speed mode is shown below:



800GE-8P-OSFP-M+NRZ **Auto Negotiation** tab for 25GE NRZ speed mode is shown below:



The fields and controls in this tab are described in the following table:

Field/Control	Description
Detected transceiver type	The type of transceiver that is plugged in.
Use IEEE defaults	Clear this check box to make **AN Options** and **FEC** groups available. By default this check box will remain selected and FEC that will be active is based on Autonegotiation.
Disabled	When you select the check box, the L1 parameters like Autonegotiation, Link Training, and FEC, are enabled or disabled per IEEE requirements, and you will not be able to enable or disable these manually. If the check box is cleared, you will be able to manually enable or disable L1 features – even if it violates IEEE specifications. By default the check box is selected.
Enable Auto Negotiate and Link Training	Auto negotiation controls how a port communicates with other ports.If you select the check box, it allows auto-negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing • **Restart Auto-Negotiate** button is selected (this does a forced restart) NOTE The **Enable Auto Negotiate** check box is available for selection only if the **Disabled** check box is cleared.
Enable Link Training	Select the check box to allow longer length copper cables to be used. This means that during the next Auto-Negotiation, KR training will be used. NOTE This check box is available for selection only if the **Disabled** check box is cleared.
Negotiated the capability above	The text box indicates the speed that was negotiated due to Auto-Negotiation.
Restart AN/LT	Restarts the Auto Negotiate sequence.
Link Training Tap Settings	
Tx-Pre2-cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Pre-cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Main-cursor	The per-lane transmit main-cursor settings selected by the link training

Field/Control	Description
Lane 1-8	process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Post-cursor Lane 1-8	The per-lane transmit post-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Override LT Tx Tap settings with configured Tap settings	Selecting this check box overrides the taps settings derived by the link training process, and configures the transmit pre/main/post cursor settings and receiver CTLE setting with the static values specified in the **OSFP Host Control** tab.
AN Option	The available option is the following: • Request RS-FEC-Int:This is applicable only when Auto negotiation is turned on. Its value is preserved by IxServer and applied when Auto negotiation is turned on a port. With this check box selected, the port is requesting remote partner to use RS-FEC-Int FEC.
FEC	The available options are the following: • Use AN Result: Use FEC decided by Auto negotiation. • Force Enable KP4-FEC: Force enable KP4-FEC on the port. • Force Enable RS-FEC-Int: Force enable RS-FEC-Int on the port.

800GE-8P-OSFP-M+NRZ Port Properties—KP4 FEC Error Insertion

Forward Error Correction (FEC) is a method of communicating data that corrects errors in transmission on the receiving end. Prior to transmission, the data is put through a predetermined algorithm that adds extra bits specifically for error correction to any character or code block. If the transmission is received in error, the correction bits are used to check and repair the data.

The **FEC Error Insertion** tab allows to inject FEC errors into transmitted data, and is shown in *Figure: **FEC Error Insertion** Tab*

Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Random

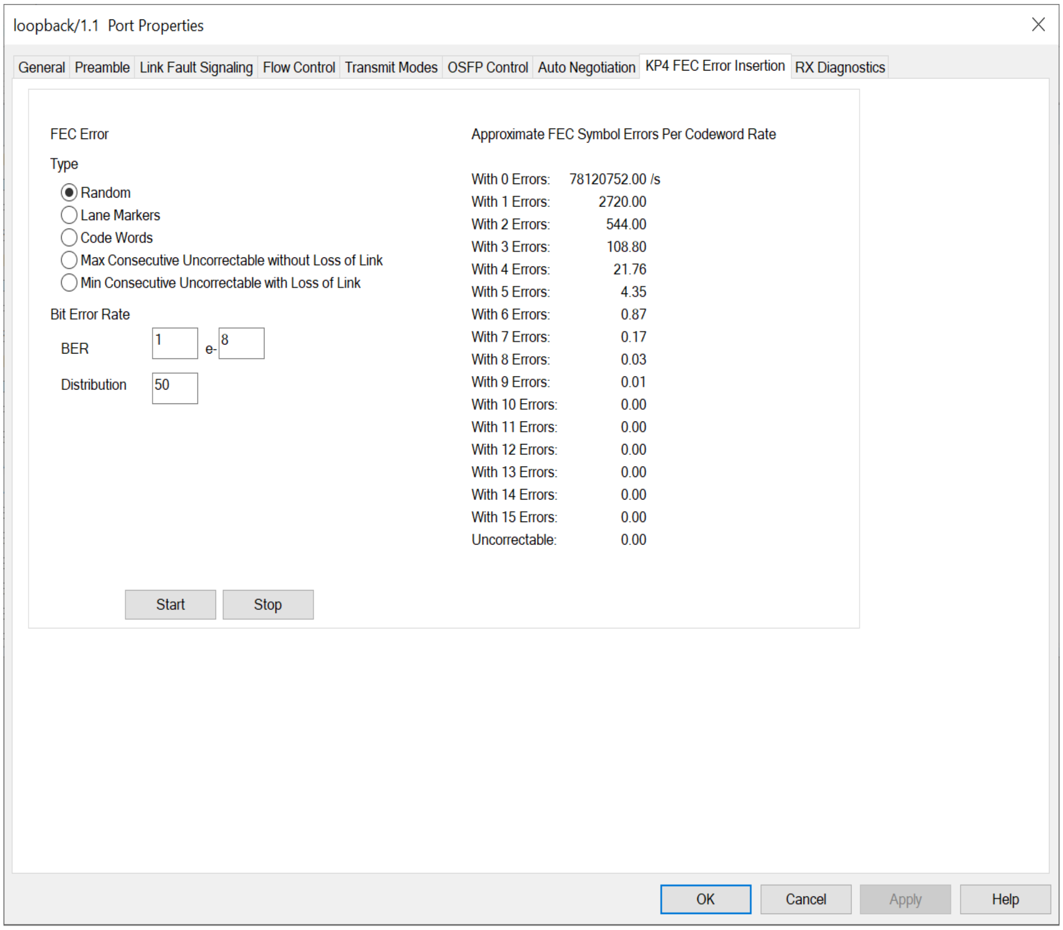


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Lane Markers

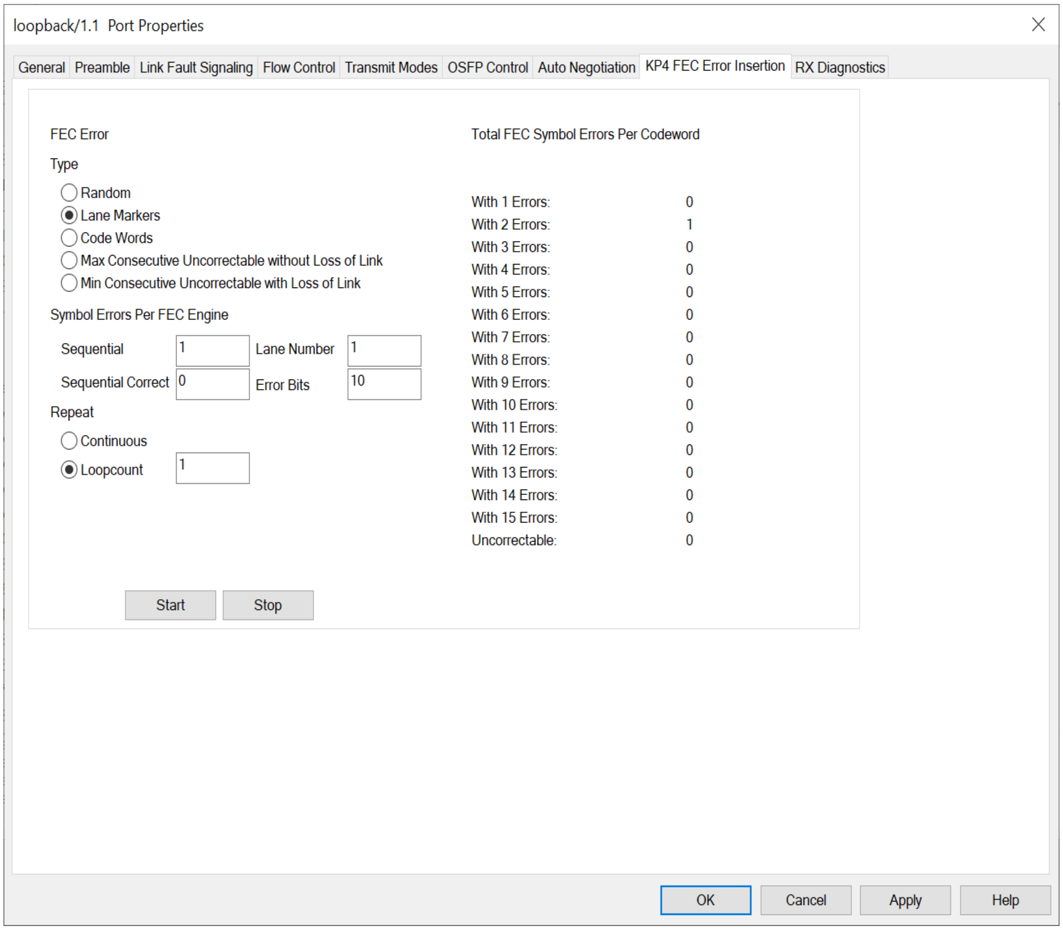


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Code Words

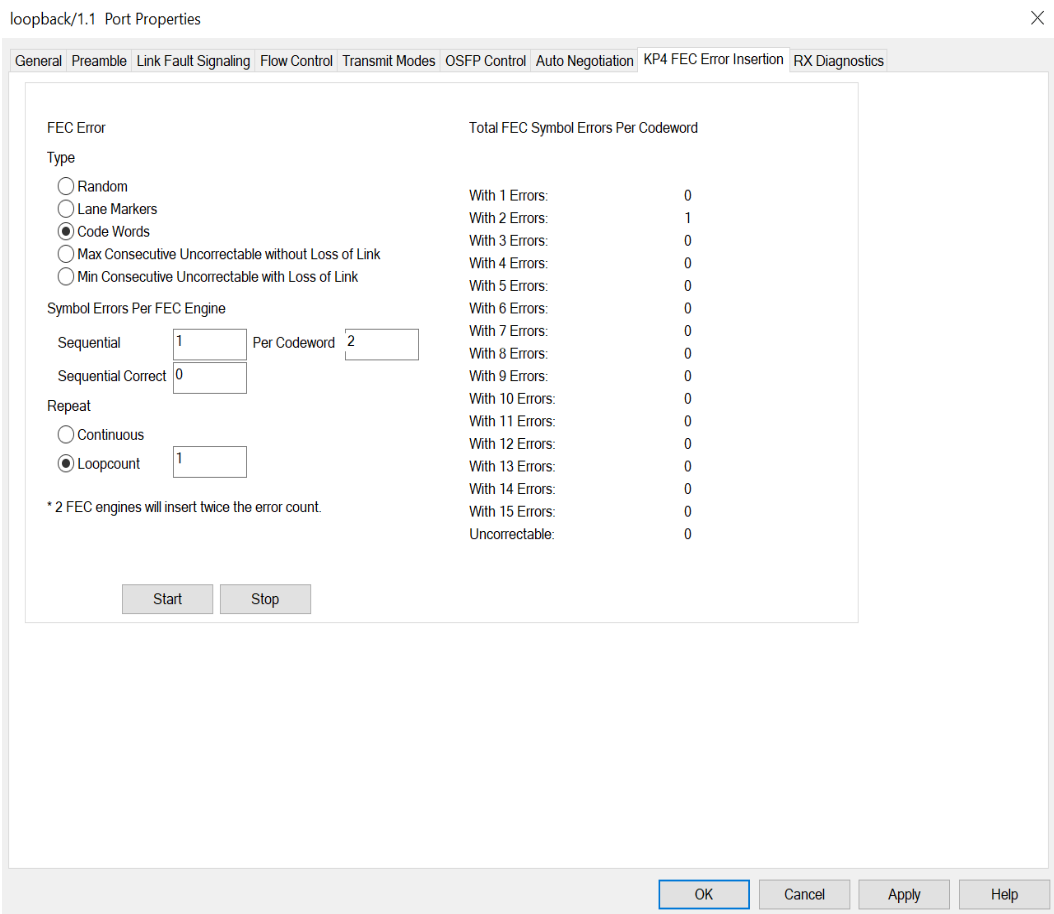


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Max Consecutive Uncorrectable without Loss of Link

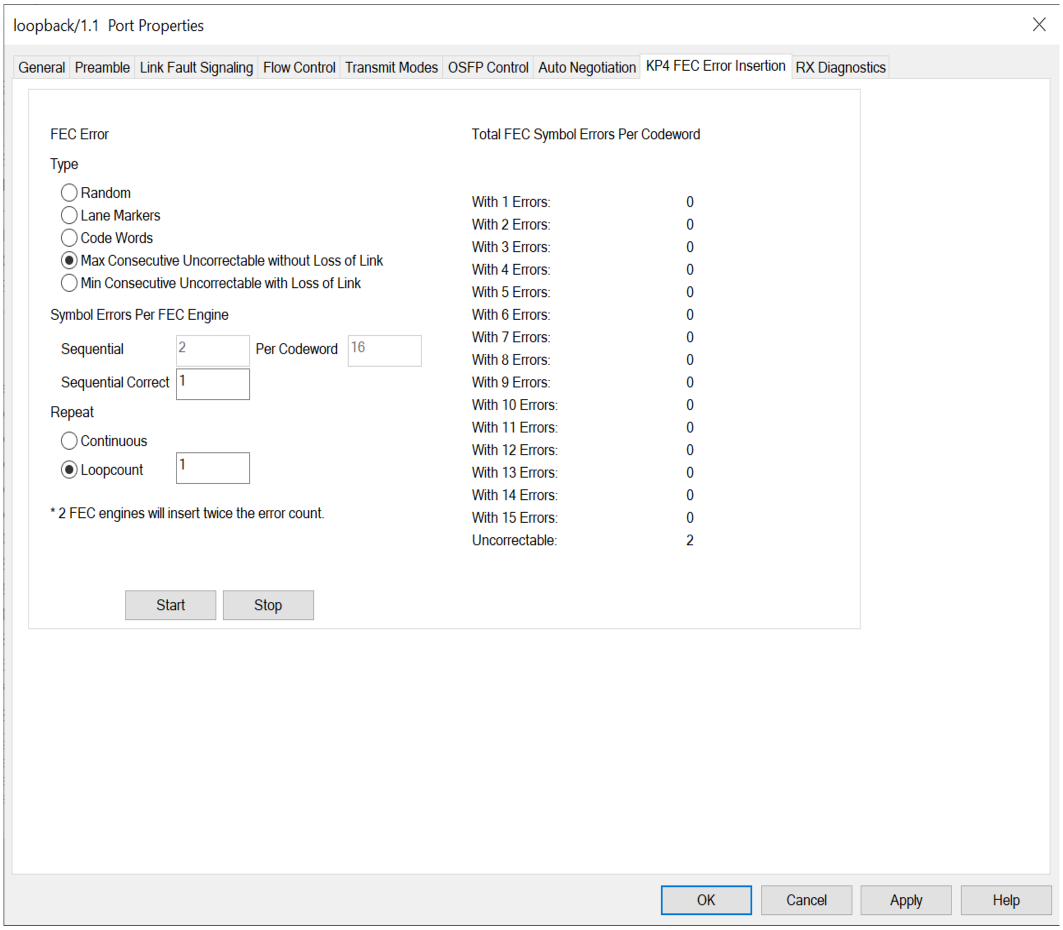


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Min Consecutive Uncorrectable with Loss of Link

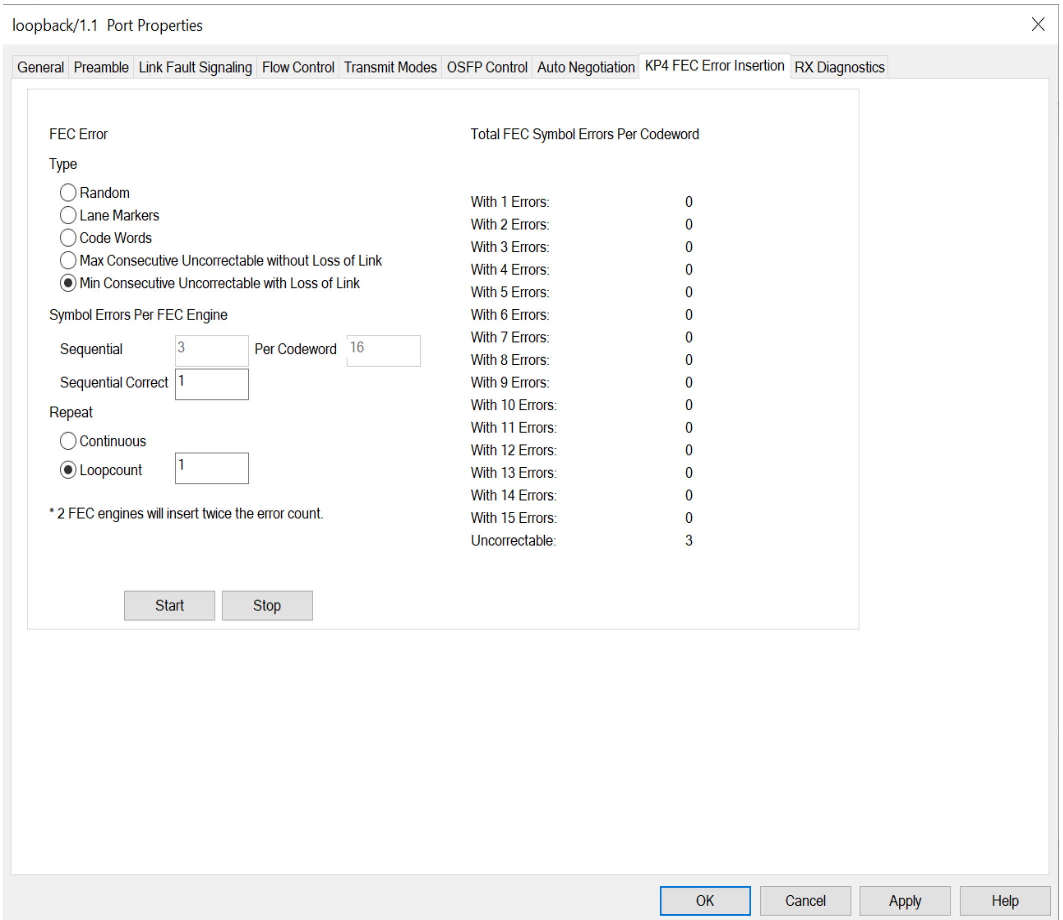


Table: **KP4 FEC** Tab Configuration

Section	Field	Usage
FEC Error Insertion		
Type	Random	Random FEC symbol error insertion will introduce a deterministic number of errors, evenly spread across all PCS lanes, on top the intrinsic BER (Bit Error Rate) of the interconnect.
	Lane Markers	Inserts errors only in the Lane Marker fields.
	Code Words	This is the fundamental unit of data that the FEC engine operates on sequentially. It is composed of blocks that carry the payload and parity information for the 64/66B scrambled data that arrives from the PCS Scrambler on Egress and from the PMA on Ingress.The code word size and layout can vary from each coding scheme. For example, RS, KR, and KP4 all have different code words because their coding schemes are different.
	Max Consecutive Uncorrectable	Uncorrectable errors are those with more than 15 symbol errors. As per IEEE, the maximum number of consecutive uncorrectable errors without loss of link is 2.

Section	Field	Usage
	without Loss of Link	
	Min Consecutive Uncorrectable with Loss of Link	The Max Consecutive Uncorrectable WITHOUT Loss of Link + 1. This is the threshold where the receiver should declare Local Fault due to bad data. The minimum number of consecutive uncorrectable errors with loss of link is 3.
Bit Error Rate	BER	The Bit Error Ratio (BER) is the ratio of the number of error bits compared to the total number of bits transmitted. In the BER field, enter the coefficient of the BER.The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	e-	Enter the exponent of the BER. The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	Distribution	Controls how the errors are distributed. This modifies the probability distribution of errors while maintaining the average Bit Error Rate. For example, you can have a BER of 10E-8 but have all of the errors be single errors OR you can have the errors be distributed across a variety of errors. The purpose is to thoroughly test a receiver to see if all possible errors are being corrected at varying rates.
Symbol Errors Per FEC Engine		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Sequential Errors	In burst mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.

Section	Field	Usage
		NOTE Per 802.3bs and 802.3cd, reception of 3 or more consecutive uncorrectable codewords will result in Loss of Link. In burst mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. This sequence will be repeated until stopped. NOTE Per 802.3bs and 802.3cd, reception of 5 or more Alignment Marker errors will result in Loss of Link. • In 400G mode, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines. • The symbol errors are not evenly distributed across the PCS lanes (use Random error insertion mode for that case) • The maximum number of sequential uncorrectable errors without loss of link is 2 and the minimum number of sequential uncorrectable errors with loss of link is 3.
	Lane Number	The Lane Number specifies which PCS lane will be affected by the Lane Marker error insertion.This field is available only if you select the error insertion type as Lane Markers.
	Sequential Correct	The number of consecutive code words without errors.
	Error Bits	The Error Bits specifies how many errors will be inserted on each of the two symbol errors of the codeword that carries the Lane Marker. There is a minimum Error Bits required (2) before corrupting the symbol that maps to the Lane Marker field. This field is available only if you select the error insertion type as Lane Markers.
	Per Codeword	Codeword is a block of contiguous packets on the line. All RS-FEC codewords are of the same size.The Per Codeword value denotes the number of symbol errors per codeword to insert. KP4 FEC can correct up to 15 symbols, and detect up to 30 symbols. If the user specifies 16, an Uncorrectable Codeword will be issued. This field is available only if you select the error insertion type as Code Words.

Section	Field	Usage
Repeat		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Continuous	Continuous error insertion.In continuous mode, the Sequential Errors field will specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.
	Loopcount	The sequence of correct and incorrect codewords or symbol errors inserted will be repeated by the number specified in the Loopcount field.
Start		Starts the error insertion process.
Stop		Stops the error insertion process.
Appropriate FEC Symbol Errors Per Codeword Rate		The Appropriate FEC Symbol Errors Per Codeword Rate is an approximation for how many symbol errors there will be per codeword every second. NOTE In 400G mode, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines.

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CHAPTER 42

Port Properties–800GE QDD-OSFP-M Load Modules

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box varies according to the module type. The following sections describe the functions and configuration of the port properties of the 800GE QDD-OSFP-M load module.

The following variant of 800GER QDD-OSFP-M load module is available:

- 800GER-4P-QDD-OSFP-M+NRZ - Reduced performance

Port Properties for 800GER-4P-QDD-OSFP-M+NRZ Load Modules

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option.

The complete specification for the 800GER-4P-QDD-OSFP-M+NRZ load module is found in the *Platform Reference Manual*.

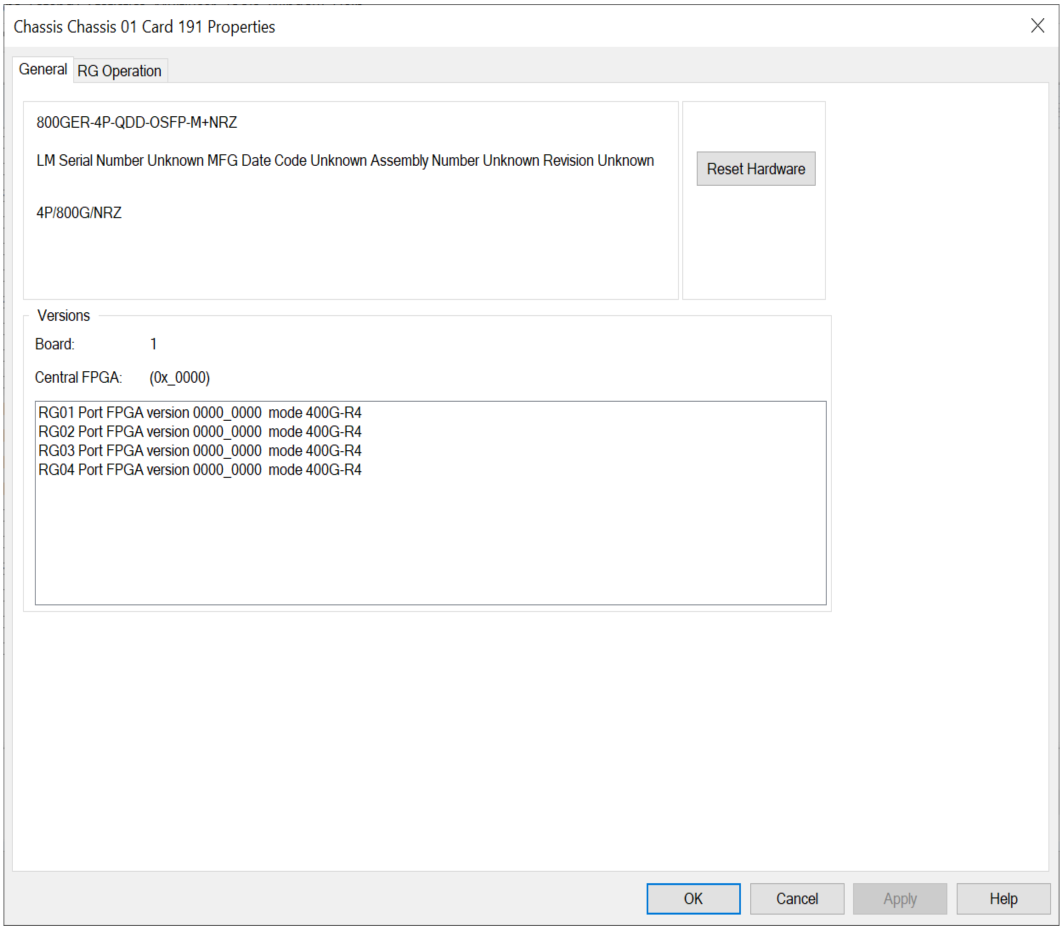
The following port property tabs are available for 800GER-4P-QDD-OSFP-M+NRZ modules:

- 800GER-4P-QDD-OSFP-M+NRZ Port Properties—General
- 800GER-4P-QDD-OSFP-M+NRZ Port Properties—Preamble
- 800GER-4P-QDD-OSFP-M+NRZ Port Properties—Link Fault Signaling
- 800GER-4P-QDD-OSFP-M+NRZ Port Properties—Flow Control
- 800GER-4P-QDD-OSFP-M+NRZ Port Properties—Transmit Modes
- 800GER-4P-QDD-OSFP-M+NRZ Port Properties—OSFP Control
- 800GER-4P-QDD-OSFP-M+NRZ Port Properties—Auto Negotiation
- 800GER-4P-QDD-OSFP-M+NRZ Port Properties—KP4 FEC Error Insertion

800GER-4P-QDD-OSFP-M+NRZ Port Properties—General

The 800GER-4P-QDD-OSFP-M+NRZ **General** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, and then selecting the **General** tab.

The Port Properties **General** tab for 800GER-4P-QDD-OSFP-M+NRZ is shown in the following figure:



The controls for **General** tab configuration are described in the following table:

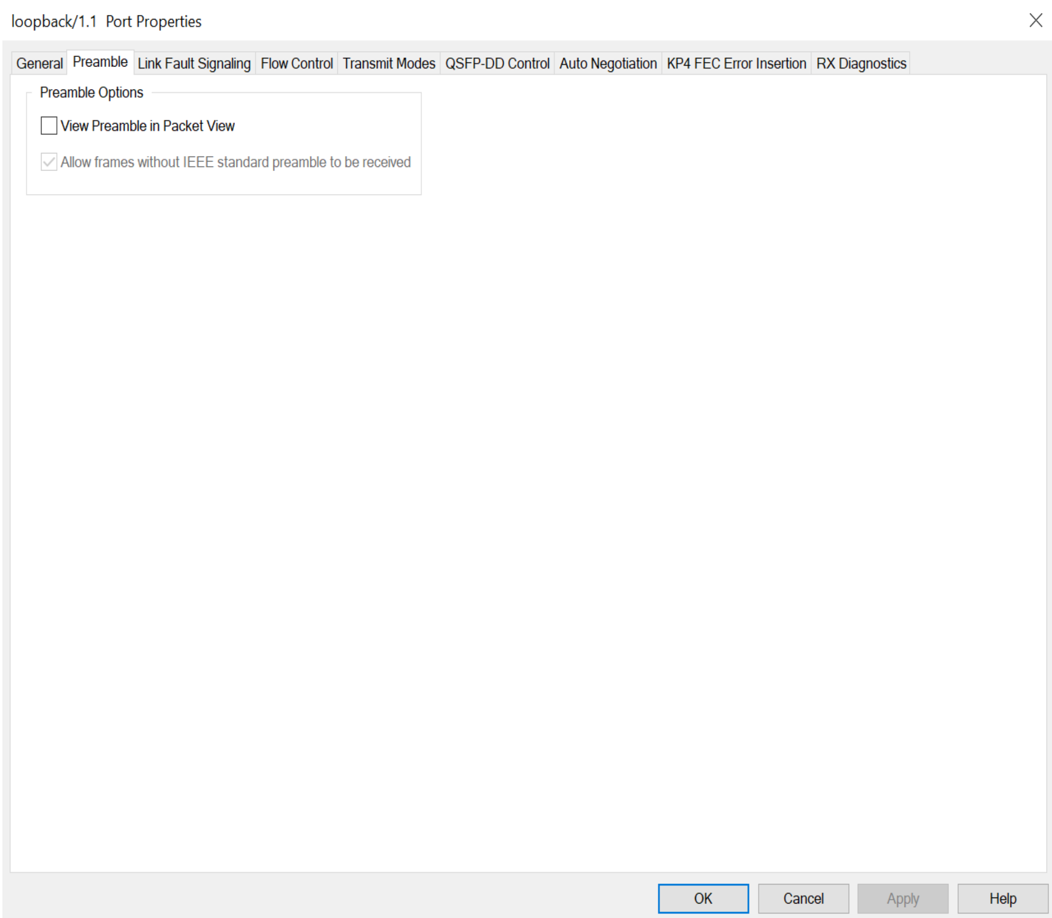
Section	Control/Field	Usage
Link	Normal	Normal operation
	Internal Loopback (Tx -> Rx)	Select this check box to turn on Internal Loopback—Transmit to Receive.
Simulate Cable Disconnect	Simulate TX Cable Disconnect	If this is selected, the port acts as if the cable has been disconnected on the transmit side only. Incoming packets may still be received and port may show link up, but no packets or PCS data will be transmitted.
Intrinsic Latency Adjustment	Enable	The **Enable** check box is selected by default. This enables the intrinsic latency adjustment. The *Enable* check box is grayed out when no value exists in the system for the specific transceiver. It is available if a value exists (in the .xml file). For details, see *Intrinsic Latency Adjustment* section in the *Ixia 40/100 Gigabit Ethernet Load Modules* chapter of the *Ixia*

Section	Control/Field	Usage
		Platform Reference Manual.
Data Center Mode		If selected, enables the Data Center Mode option. When Data Center Mode option is selected, the following changes take place: • The selected port is automatically placed into Advanced Stream mode. In this case, Packet Stream mode is not supported. • Only Auto Intrumentation mode (Floating Timestamp/Data Integrity) is supported, both for transmit and receive. • 4-Priority Traffic Mapping is enabled. It supports various frame size for each PFC control (0-4). NOTE This feature is not supported in 800 GE speed mode. • FCoE protocol can be edited for Ethernet II and Ethernet Snap in **Frame Data** tab.

800GER-4P-QDD-OSFP-M+NRZ Port Properties—Preamble

The preamble precedes the frame, but is not part of the frame itself.

The 800GER-4P-QDD-OSFP-M+NRZ Port Properties **Preamble** tab is shown in the following figure:



The fields and controls in this tab are described in the following table:

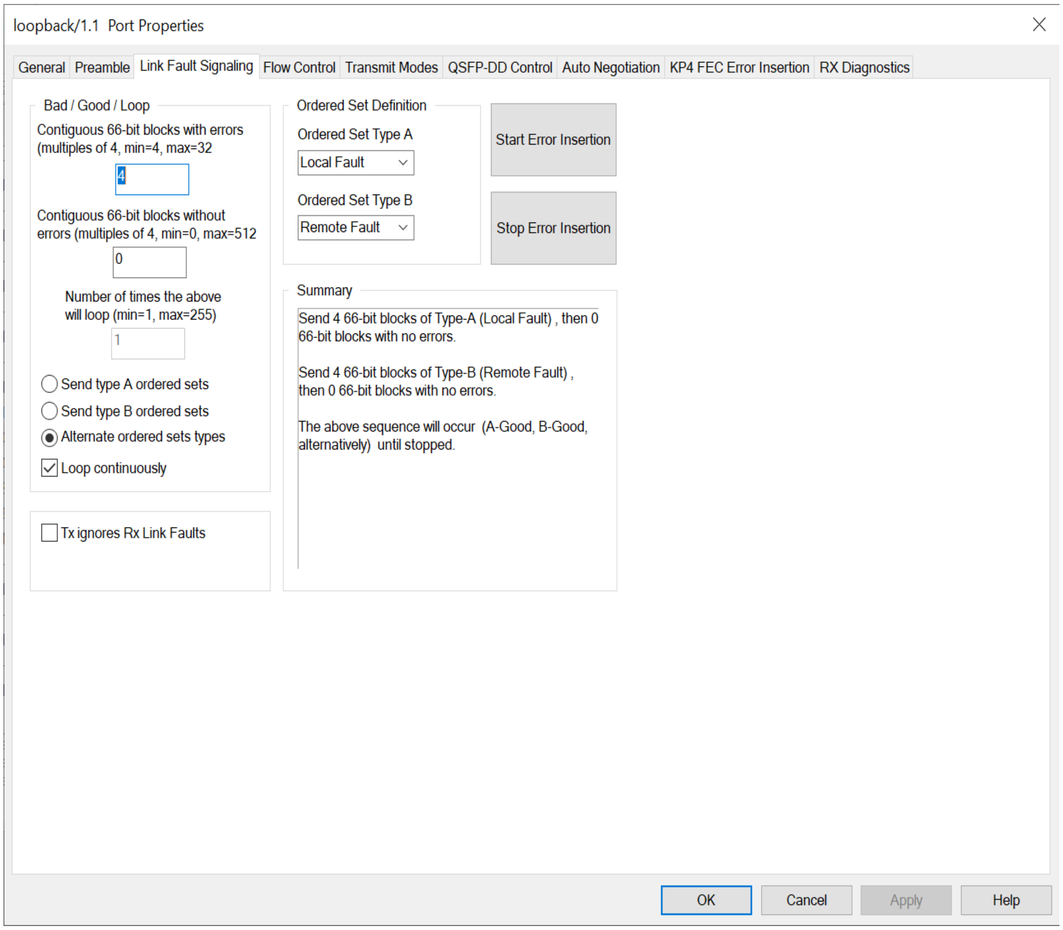
Section	Choices	Description
Preamble Options	View Preamble in Packet View	When this check box is selected, the preamble data will be visible in the Packet View (transmit side) and the Capture View (receive side).
	Allow frames without IEEE standard preamble to be received	When this check box is selected, it allows frames without IEEE standard preamble to be received. • This check box is selected by default.

800GER-4P-QDD-OSFP-M+NRZ Port Properties—Link Fault Signaling

When **Link Fault Signaling** is enabled, four statistics will be added to the list in Statistic View for the port. One is for monitoring the Link Fault State. Two provide a count of the Local Faults and Remote Faults. The last one is for indicating the state of error insertion, whether or not it is ongoing

The **Link Fault Signaling** tab is accessed from the context menu of the a port in **Resources** pane by selecting the **Properties** menu option, or by double-clicking a port in the **Detail** pane. Then select the **Link Fault Signaling** tab.

The **Link Fault Signaling** tab for 800GER-4P-QDD-OSFP-M+NRZ load module is shown in the following image.



The controls for **Link Fault Signaling** tab configuration are described in the following table.

Section	Field/Control	Description
Bad/Good/Loop	(Bad) Contiguous 66-bit blocks with errors (multiples of 4; min = 4, max = 32)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks with errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive fault sequences allowed are minimum 4 sequences and maximum 32 sequences.
	(Good) Contiguous 66-bit blocks without errors (multiples of 4; min = 0, max = 512)	Part of the Bad block/Good block alternating pattern. Enter the number of 66-bit blocks without errors that should be included in the pattern. This value must be a multiple of 4. The number of consecutive regular data sequences allowed are minimum 0 sequences and maximum 512 sequences.
	Number of times	Specifies the number of loops for the user defined

Section	Field/Control	Description
	the above will loop (min = 1, max = 255)	sequence. Options include the following: • Discrete iterations: 1. Minimum of 1 iteration 2. Maximum of 255 iterations • Continuous loop 1. User cannot specify number of iterations
	Options include the following: • Send type A ordered sets • Send type B ordered sets • Alternate ordered set types	Defines the ordered set pattern that will be sent. (The two Ordered Sets—A and B—are defined in the **Ordered Set Definition** box in this tab.) This pattern will be combined with the Good blocks/Bad blocks pattern for transmission. • Only Type A fault sequence and regular good data sequences • Only Type B fault sequence and regular good data sequences • Alternate Type A, regular good data sequences and Type B fault sequence, regular good data sequences NOTE If this field is available, and the Alternate ordered set types option is selected, the minimum value for this field should be '2,' to allow the entire pattern to be sent once. If left at the minimum value of '1'— only two groups of blocks (one of good blocks and one of bad blocks) will be sent, which means that only the first ordered set will be sent. A minimum of eight blocks is required for one complete pattern including Types A and B.
	Loop continuously	If selected, the loop defined by the combination of the Bad and Good blocks plus the pattern of ordered sets, will be transmitted continuously until the **Stop Error Insertion** option is selected.
Ordered Set Definition	Ordered Set Type A	Options include the following: • Local Fault • Remote Fault
	Ordered Set Type B	Options include the following: • Local Fault • Remote Fault

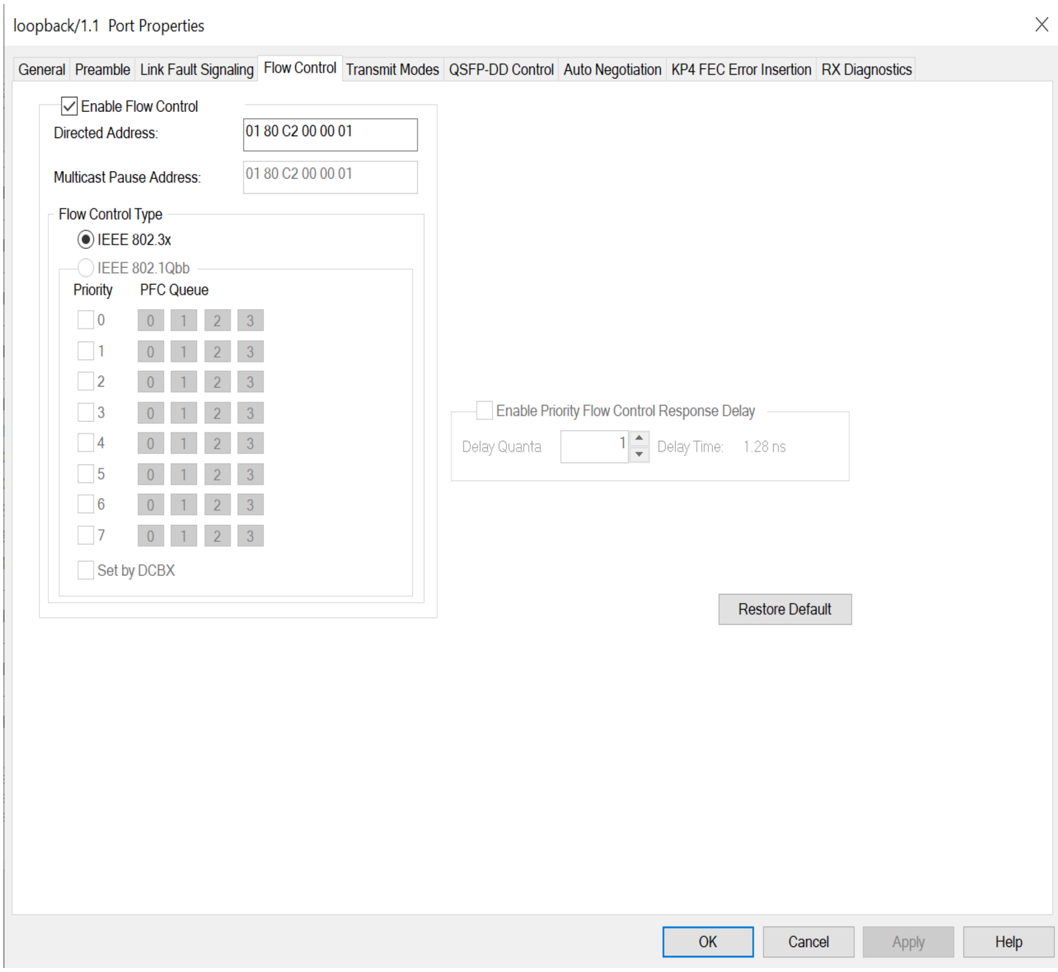
Section	Field/Control	Description
Tx ignores Rx Link Faults		If selected, ongoing transmission will continue even if Link Fault messages are received by the sending RS.
Summary (Window)		(Read-only) Shows descriptions of the patterns that will be transmitted.
Start Error Insertion		Select this option to start the transmission of the configured error patterns.
Stop Error Insertion		(Available only for use with the **Loop continuously** option.) Select this option to stop the transmission of the configured error patterns.

800GER-4P-QDD-OSFP-M+NRZ Port Properties—Flow Control

The 800GER-4P-QDD-OSFP-M+NRZ **Flow Control** tab is accessed from the context menu of the port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Flow Control** tab.

NOTE You can view this help page for the **Port Properties - Flow Control** tab by selecting the **Help** option and not F1.

The Port Properties **Flow Control** tab for 800GER-4P-QDD-OSFP-M+NRZ is shown in the following image.



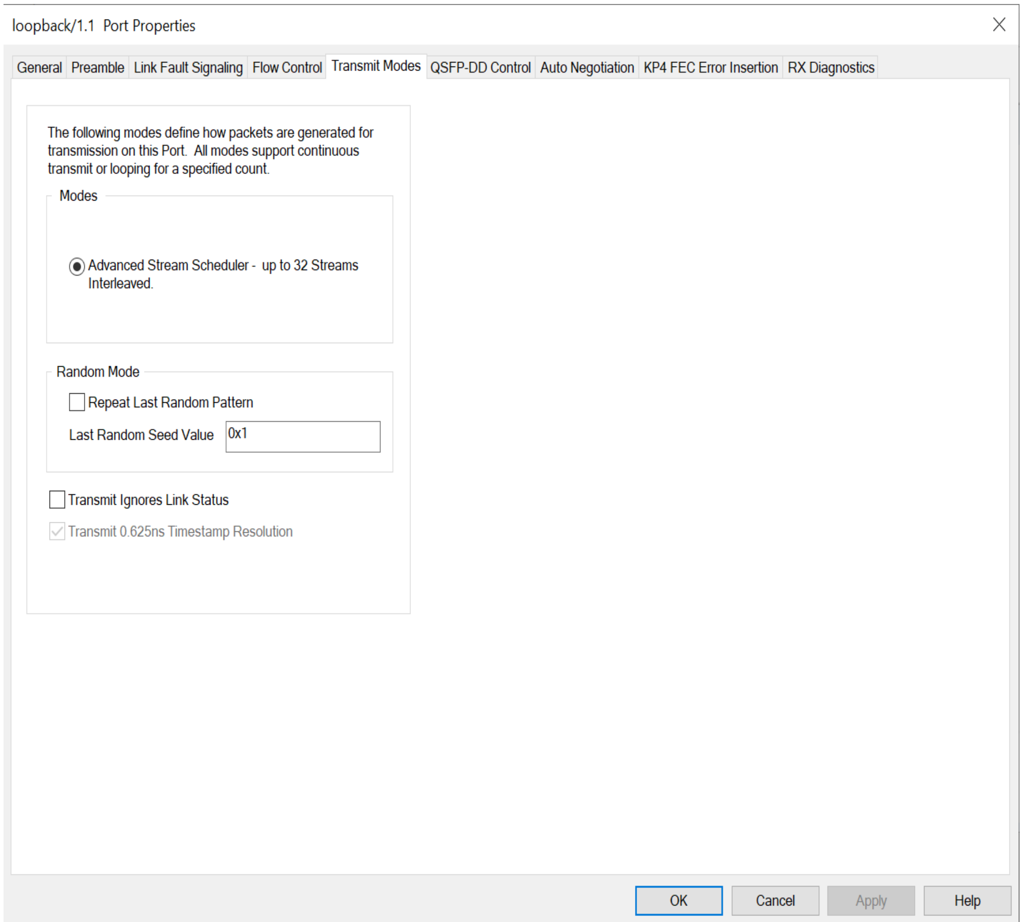
Section	Field/Control	Description
Enable Flow Control	(check box)	Enables the port's MAC Flow control mechanisms to listen for a directed address pause message.
	Directed Address	This is the MAC address that the port will listen on for a directed pause message.
	Multicast Pause Address	(Read-only) This is the MAC address that the port will listen on for a multicast pause message.
Flow Control Type	IEEE 802 3x	When in Data Center mode, the port responds to either IEEE 802.3x pause frame or to IEEE 802.1Qbb Priority-based Flow Control (PFC) frame.
	IEEE 802.1Qbb	When not in Data Center mode, only IEEE 802.3x is available. NOTE This feature is not supported in 800 GE speed mode.
	Priority	When flow control type IEEE 802.1Qbb is selected in Data Center

Section	Field/Control	Description
		mode, priority options are the channels of data that can be paused. Select to select one or more channels.
	PFC Queue	The PFC Queue can be mapped to the priority field in the frame.
Enable Priority Flow Control Response Delay	(check box)	If selected, enables to increase the number of frames that is sent when a pause frame is received. Priority Flow Control (PFC) pause allows to set the delay of flow control. When a pause frame is received for a certain priority, a count of the number of timestamp ticks increments up to a desired offset and then releases the pause request to the TX engine. For example, if running at 100% line rate and there is no delay in the pause request, the TX pipeline transmits the specified number of frames once the pause request is received. With this feature, a delay by number of timestamp ticks is programmed. NOTE This feature is not supported in 800 GE speed mode.
	Delay Quanta	This field allows to set the delay quanta of flow control.
	Delay Time	The delay time, in nanoseconds, of frames.
Restore Default		Resets the Directed Address back to the default value of *01 80 C2 00 00 01.*

800GER-4P-QDD-OSFP-M+NRZ Port Properties—Transmit Modes

The **Transmit Modes** tab for 800GER-4P-QDD-OSFP-M+NRZ load modules is shown in the following image. It is accessed by double-clicking a port in **Resources** window, or by from the context menu of the port by selecting the **Properties** menu option. Then select the **Transmit Modes** tab.

The Port Properties **Transmit Modes** tab is shown in the following image.



The controls for **Transmit Modes** tab configuration are described in the following table.

Section	Field/Control	Description
Modes	Advanced Stream Scheduler	Sets the operating mode for the port to interleaved packet streams. This allows to configure the following: • 800 GE - up to 64 streams • 400 GE - up to 64 streams • 200 GE - up to 64 streams • 100 GE - up to 32 streams They will transmit packets in an interleaved fashion. Refer to Stream Control for Advanced Streams for additional information on Advanced Streams.
Random Mode	Repeat Last Random Pattern	Selecting this check box causes the port to retransmit the last random pattern of data sent. This affects any random data in the stream, including payload, frame size, UDFs, and so forth. This can be used before transmission (in which case the seed from the first packet stream will be used), or immediately after a stream has been sent (in which case the last stream's

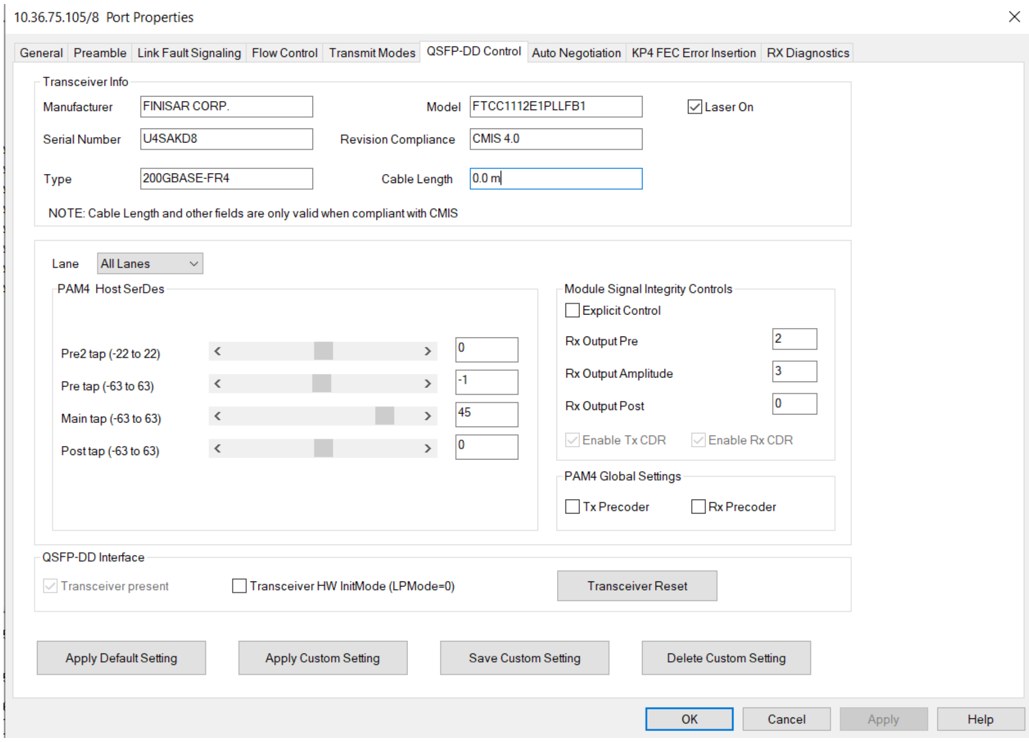
Section	Field/Control	Description
		random seed is used). For more information, see the Repeat Last Random Pattern section in the 'Theory of Operation: General' chapter of the *Ixia Platform Reference Manual*.
	Last Random Seed Value	This read only field represents the initial value that hardware will use to seed its random number generators. Note that it is not a one-to-one mapping.
Transmit Ignores Link Status		If selected, will allow transmission of packets even if the link is down.
Transmit 0.625ns TimeStamp Resolution		If selected, the 800GER-4P-QDD-OSFP-M+NRZ load module will support 0.625 ns.

800GER-4P-QDD-OSFP-M+NRZ Port Properties—QSFP-DD Control

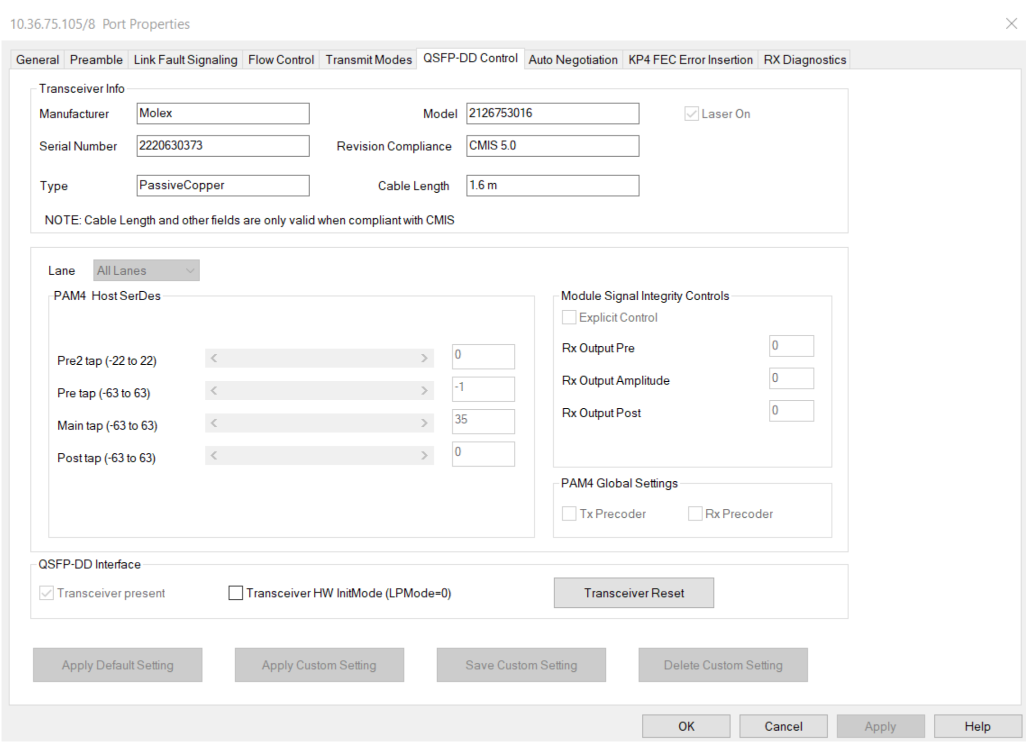
PAM-4 is a four-level pulse-amplitude modulation that uses four distinct amplitude levels to encode two bits of data, essentially doubling the bandwidth of a connection. The PAM4 settings are defined using the **QSFP-DD Control** tab.

The **QSFP-DD Control** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **QSFP-DD Control** tab.

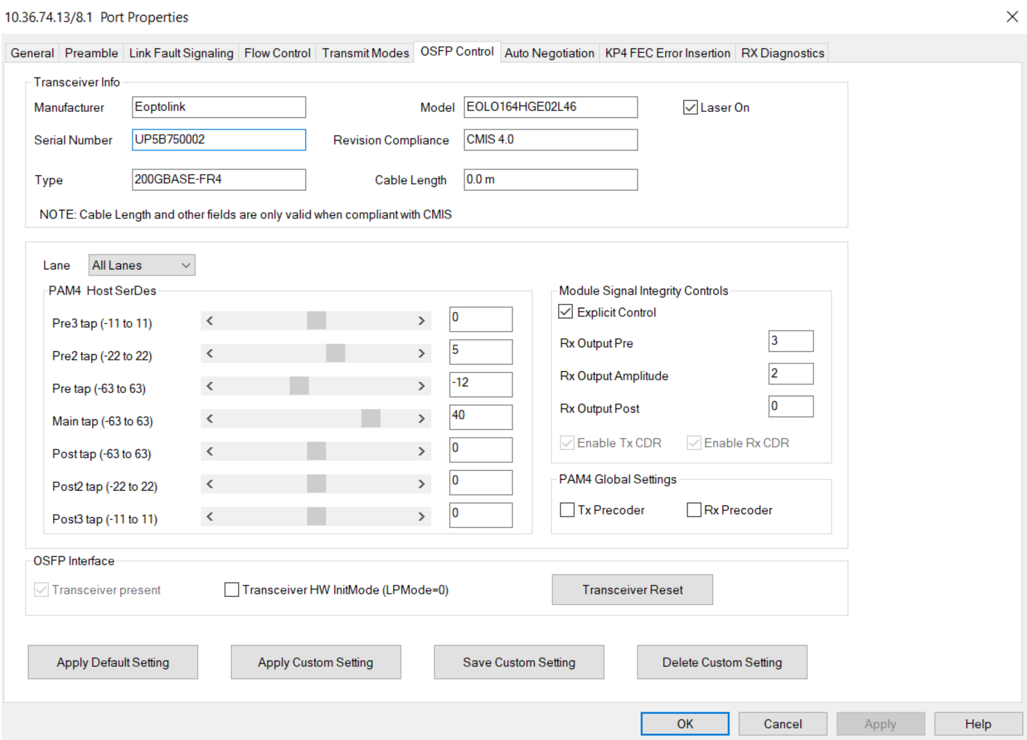
The Port Properties **QSFP-DD Control** tab for 800GER-4P-QDD-OSFP-M+NRZ when the fiber optic transceiver is used is shown in the following figure:



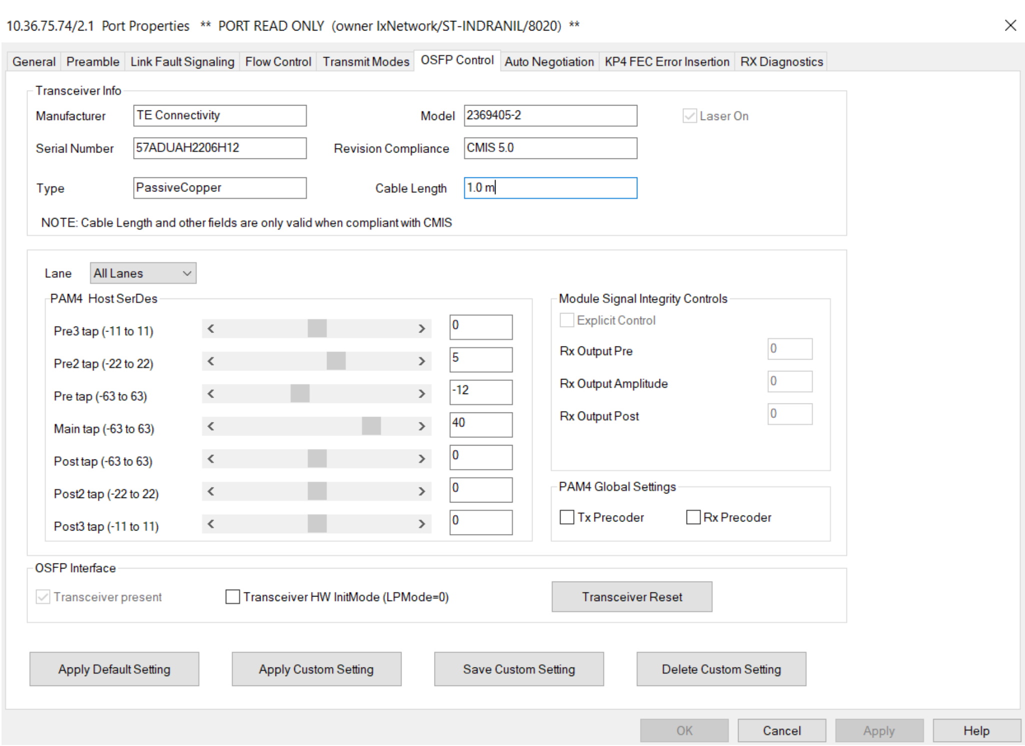
The Port Properties **QSFP-DD Control** tab for 800GER-4P-QDD-OSFP-M+NRZ when the passive copper transceiver is used is shown in the following figure:



If an OSFP interface is used, the **OSFP Control** tab is shown. The Port Properties **OSFP Control** tab for 800GER-4P-QDD-OSFP-M+NRZ when the fiber optic transceiver is used is shown in the following figure:



The Port Properties **OSFP Control** tab for 800GER-4P-QDD-OSFP-M+NRZ when the passive copper transceiver is used is shown in the following figure:



When 800GER-4P-QDD-OSFP-M+NRZ detects an optical transceiver, it will apply a Host Transmit equalization combination that is well suited for optics, and also expose the transceiver's signal integrity controls.

The supported module signal integrity fields of CMIS 3.0 and 4.1 transceivers are listed below:

- Rx Output EQ Control Pre-Cursor
- Rx Output EQ Control Post-Cursor
- Rx Output Amplitude Control
- Tx CDR Control
- Rx CDR Control

The signal integrity fields are configurable based on the capability of the transceiver. The default value and maximum allowed range for each of the fields are read from the transceiver during transceiver initialization.

Section	Field/Control	Description
Transceiver Info		
	Manufacturer	This is the Vendor Name field read from the actual transceiver currently being plugged in.
	Model	This is the Part Number field read from the actual transceiver currently being plugged in.
	Serial Number	The serial number of the transceiver.
	Revision Compliance	The implemented CMIS revision of the transceiver. 800GER-4P-QDD-OSFP-M+NRZ supports both CMIS 3.0 and CMIS 4.0 transceivers. See Management Interface.
	Type	When a transceiver is inserted into the load module, the software reads IEEE registers to determine the transceiver capabilities and media type. If the transceiver contains this information, it is shown in this read-only field.
	Cable Length	The length of Ixia-supplied cable which connects this chassis to the previous chassis in the chain.
	Laser On	Select this check box to enable the laser power.
112G Host SerDes		
	Pre3 cursor tap (0 to 63)	This helps to control the Pre3 Tap value for Tx.
	Pre2 cursor tap (0 to 63)	This helps to control the Pre2 Tap value for Tx.
	Pre-cursor tap (0 to 63)	This helps to control the Pre Tap value for Tx.

Section	Field/Control	Description
	Main-cursor tap (0 to 63)	This helps to control the Main Tap Control for Tx.
	Post-cursor tap (0 to 63)	This helps to control the Post Tap value for Tx.
Module Signal Integrity Controls		
	Explicit Control	Select this check box to enable the Rx Output pre, Rx Output Amplitude, and Rx Output Post fields. This check box is available for selection only if the fiber optic transceiver is used.
	Rx Output Pre	Allowed range of values for Rx Output pre. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Rx Output Amplitude (0 to 0)	Allowed range of values for Rx Output amplitude. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Rx Output Post	Allowed range of values for Rx Output post. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Enable Tx CDR	Turn on Tx CDR Control. This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
	Enable Rx CDR	Turn on Rx CDR Control . This field is greyed out if the transceiver does not support it. IxExplorer automatically moderates the value, if the entered value is out of range. This field is configurable per-lane.
PAM4 Global Settings		
	Tx Precoder	Represents a PAM4 encoding scheme to reduce DFE bit errors. This also means that both sides of the link must have precoder enabled for link to come up.
	Rx Precoder	Represents a PAM4 encoding scheme to reduce DFE bit errors. This also means that both sides of the link must have precoder enabled for link to come up.
QSFP-DD Interface		

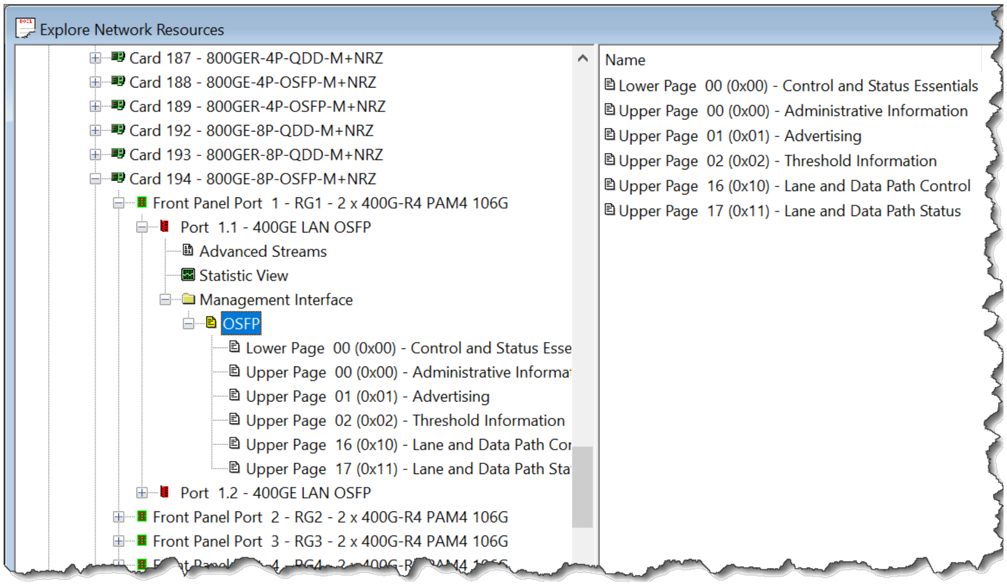
Section	Field/Control	Description
	Transceiver HW InitMode	Selecting the check box configures the QSFP-DD InitMode pin to perform the optional Hardware Init mode initialization as described in the Common Management Interface Specification (CMIS) Rev 3.0. When a transceiver boots into Hardware Init mode, the datapath is automatically configured by the module without intervention from the host (that is Ixia tester). When disabled, the software-controlled initialization (Software Init) is instead performed. This is the recommended initialization mode for any transceiver since the appropriate checks are performed between the Ixia tester and the transceiver before the module's datapath initialization.
	Transceiver Reset	Resets the transceiver.
	Apply Default Setting	When you select this button, a default setting will be applied to the current user setting for the current adapter/xcvr type and to the actual hardware.
	Apply Custom Setting	When you select this button, if there exists a custom setting in the xml file for the same adapter/xcvr type, this custom setting will be applied to the current user setting and to the actual hardware.
	Save Custom Setting	When you select this button, if there exists a custom setting in the xml file for the same adapter/xcvr type, users will be prompted to choose to cancel or overwrite the record from that xml file. If no custom setting exists, the setting will be saved to the xml file. The "TapConfigurations.xml" file will be created at the Ixia\IxOS folder once users select the Save Custom Setting. All the custom settings (if any) are stored in this folder.
	Delete Custom Setting	When you select this button, if there exists a custom setting in the xm file for the same adapter/xcvr type, users will be prompted to confirm that they are about to delete it and they will have to choose to ok or cancel with that. If no custom setting exists, users will be prompted that nothing will be deleted.

Management Interface

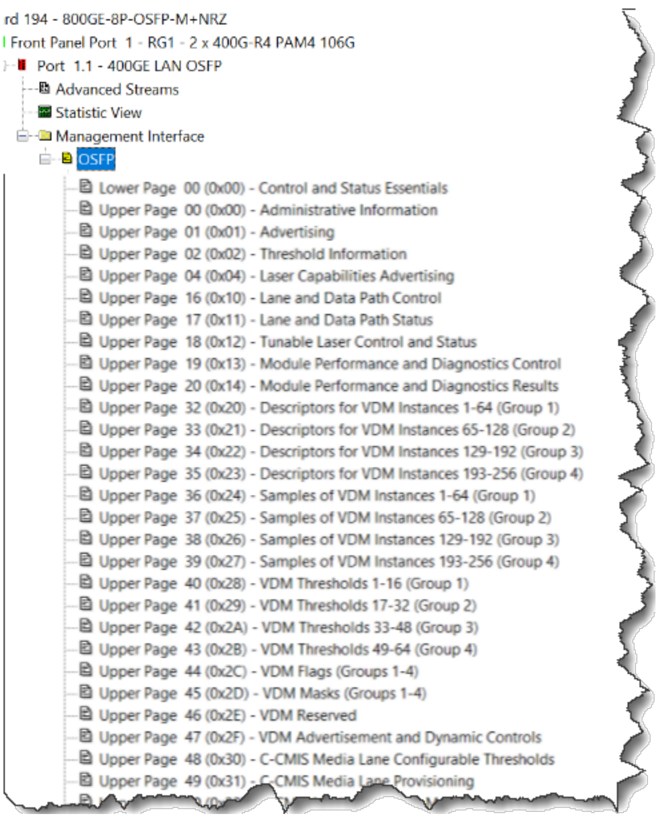
A management interface specification CMIS defines the management interface and associated protocols for all required and allowable management interactions between a CMIS aware host and a CMIS compliant module that are relevant for the host using the module in an application.

The Management Interface appears in the IxExplorer Resources Tree and switches on the fly depending on the CMIS revision. This means that the transceiver automatically reads the management interface and populates the lower and upper pages depending on the transceiver type.

With a CMIS 3.0 (or lower) transceiver, you will see the following pages:



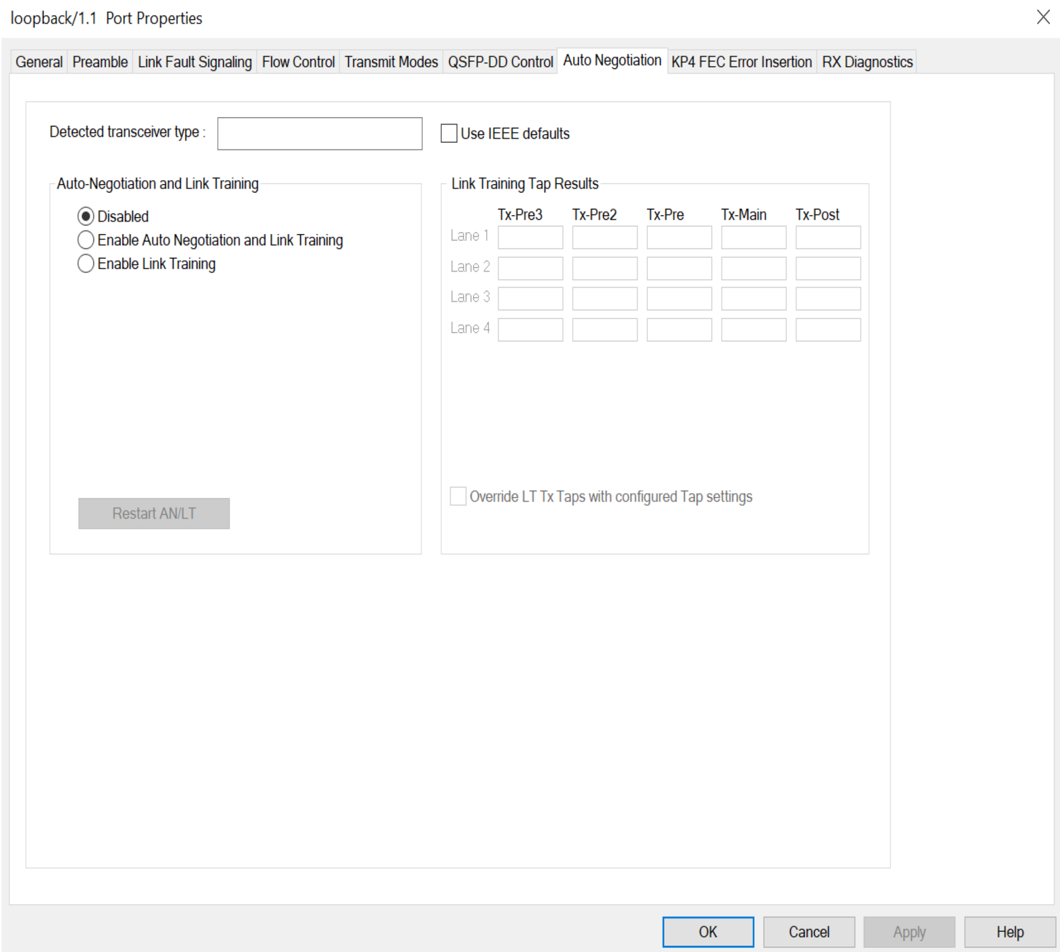
With a CMIS 4.0 transceiver, you will see the following pages:



800GER-4P-QDD-OSFP-M+NRZ Port Properties—Auto Negotiation

The 800GER-4P-QDD-OSFP-M+NRZ **Auto Negotiation**tab is accessed by selecting a 800GER-4P-QDD-OSFP-M+NRZ port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto Negotiation** tab.

The Port Properties **Auto Negotiation** tab for 800GER-4P-QDD-OSFP-M+NRZ is shown in the following figure:

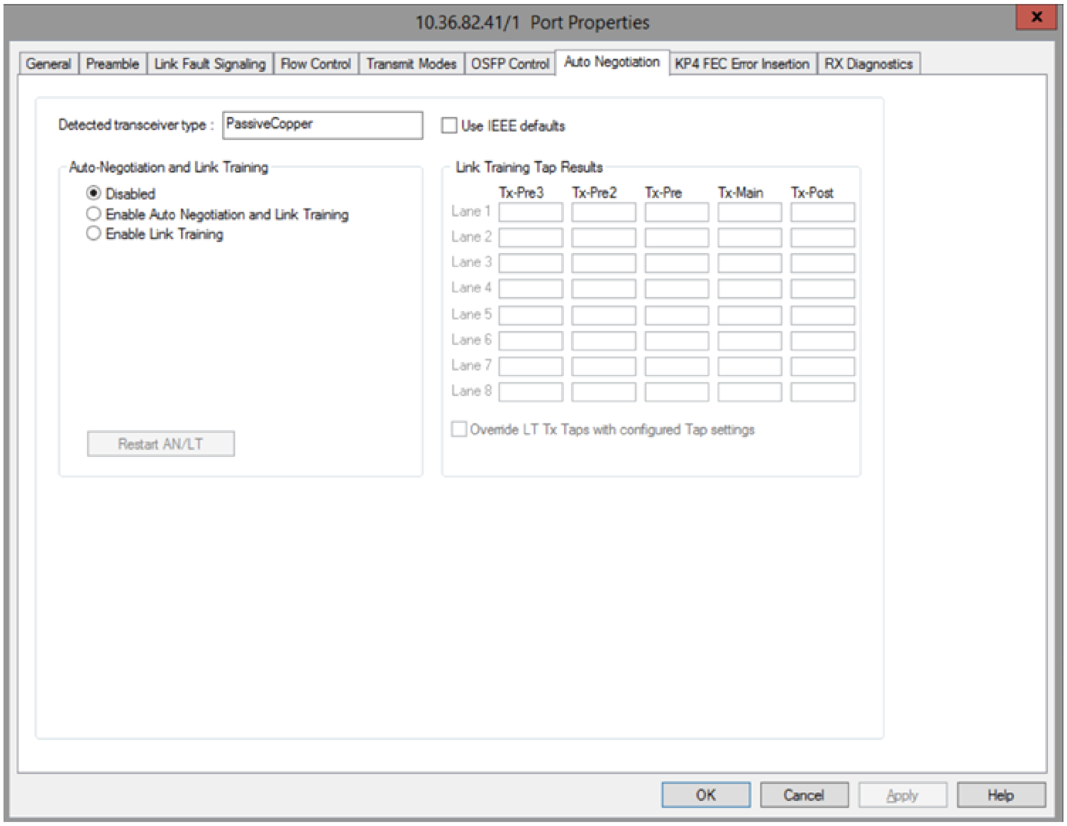


The following lanes are available depending on the port speed:

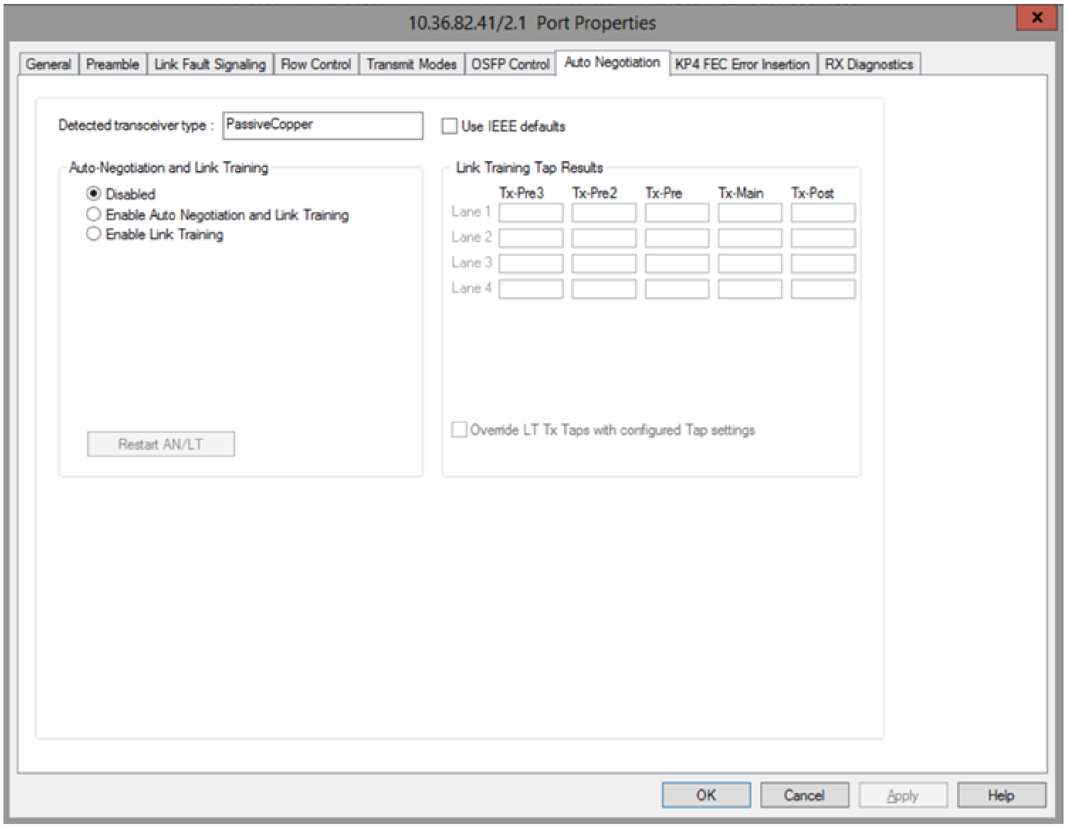
Speed Mode	Lanes
800GE PAM4 106G	8 lanes (1-8)
400GE PAM4 106G	4 lanes (1-4)
200GE PAM4 106G	2 lanes (1-2)
100GE PAM4 106G	1 lane (1)
400GE PAM4 53G	8 lanes (1-8)
200GE PAM4 53G	4 lanes (1-4)
100GE PAM4 53G	2 lanes (1-2)
50GE PAM4 53G	1 lane (1)

Speed Mode	Lanes
100GE NRZ 26G	4 lanes (1-4)
50G NRZ 26G	2 lanes (1-2)
25G NRZ 26G	1 lane (1)

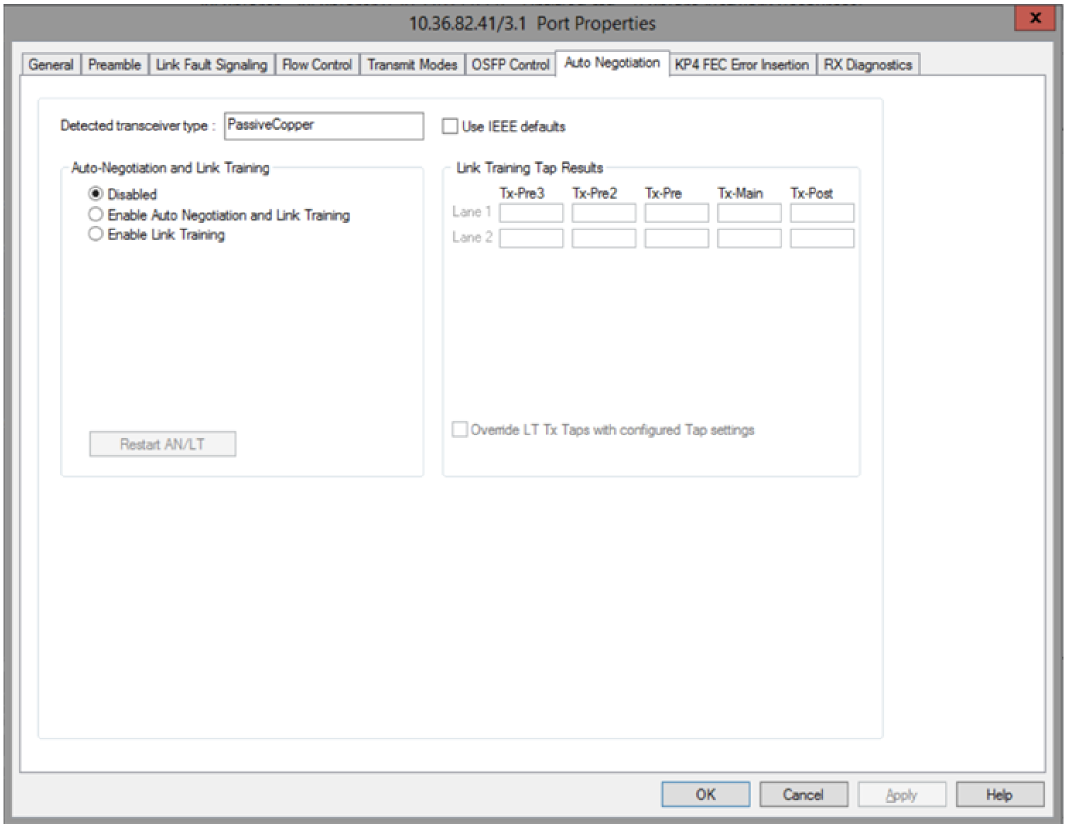
800GER-4P-QDD-OSFP-M+NRZ **Auto Negotiation** tab for 800GE PAM4 106G speed mode is shown below:



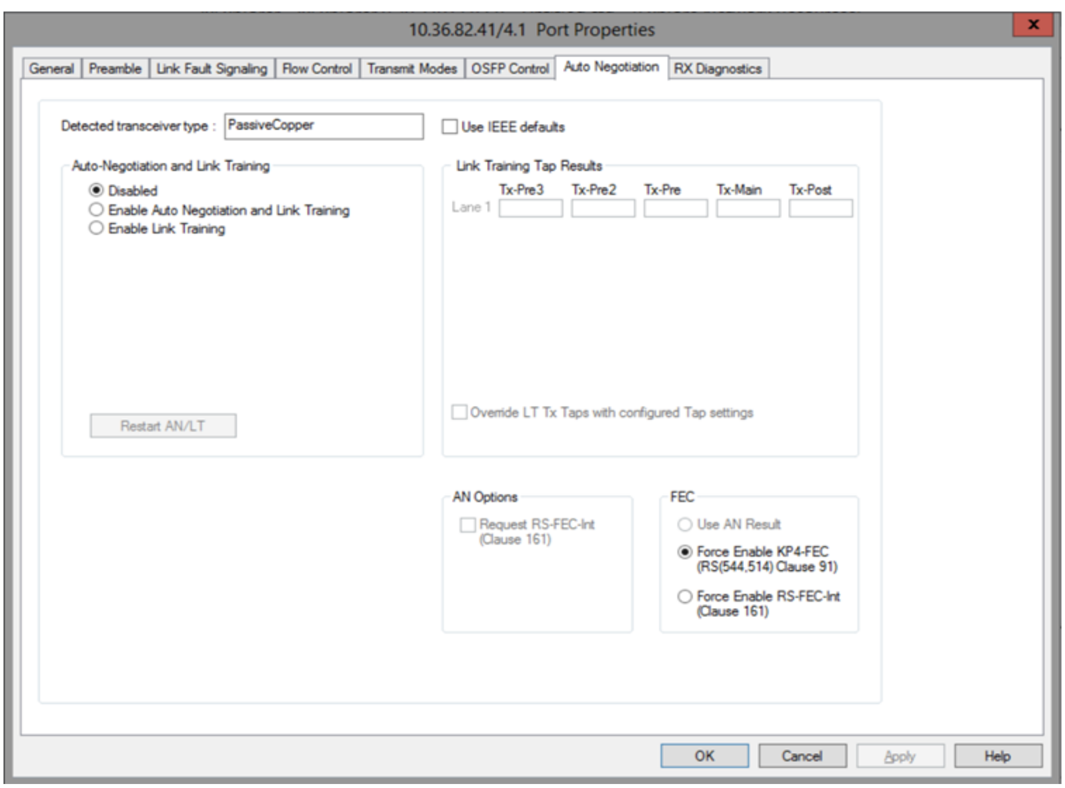
800GER-4P-QDD-OSFP-M+NRZ **Auto Negotiation** tab for 400GE PAM4 106G speed mode is shown below:



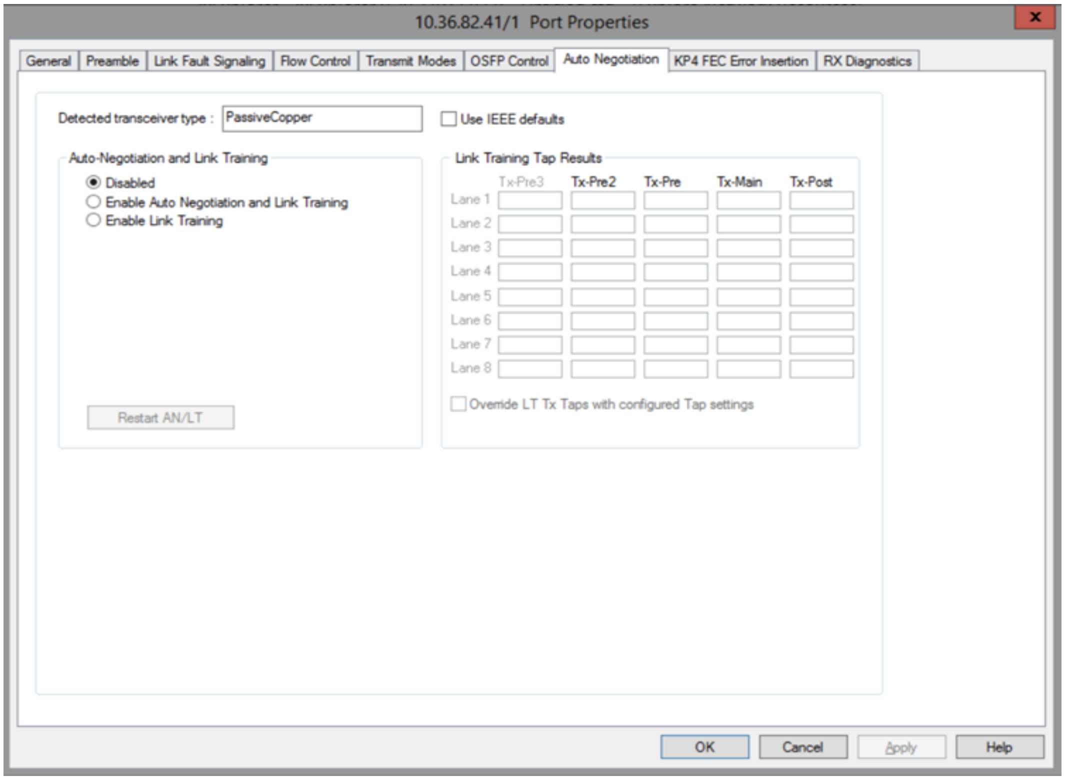
800GER-4P-QDD-OSFP-M+NRZ **Auto Negotiation** tab for 200GE PAM4 106G speed mode is shown below:



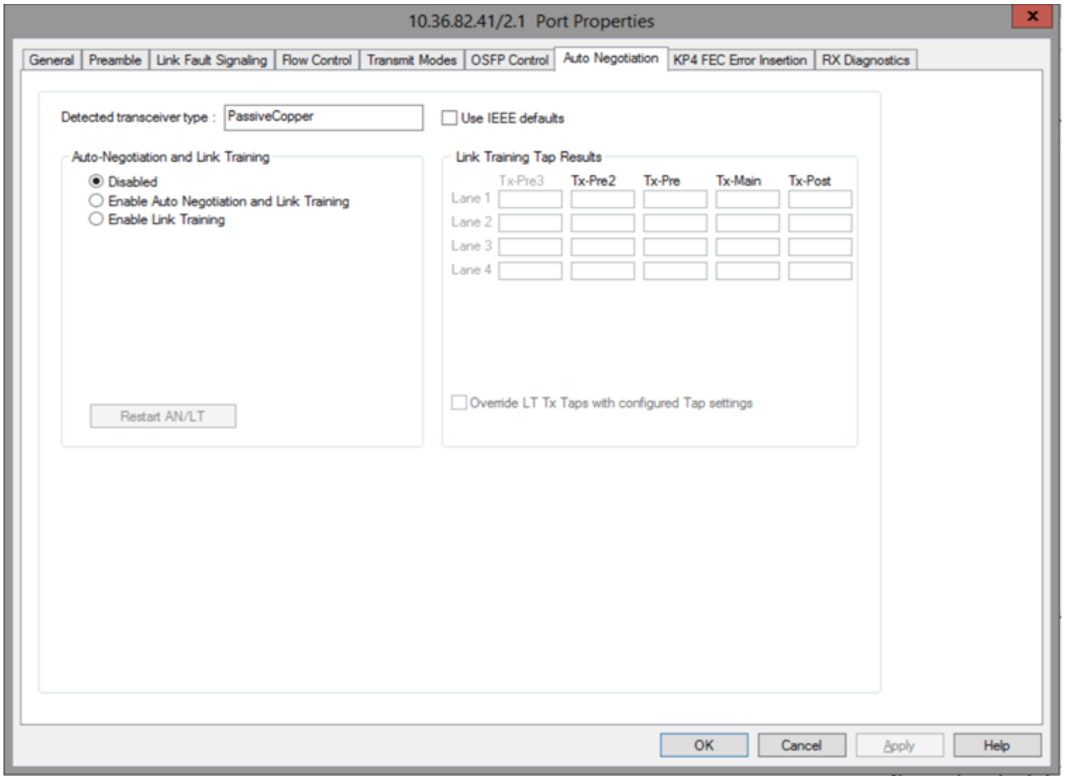
800GER-4P-QDD-OSFP-M+NRZ **Auto Negotiation** tab for 100GE PAM4 106G speed mode is shown below:



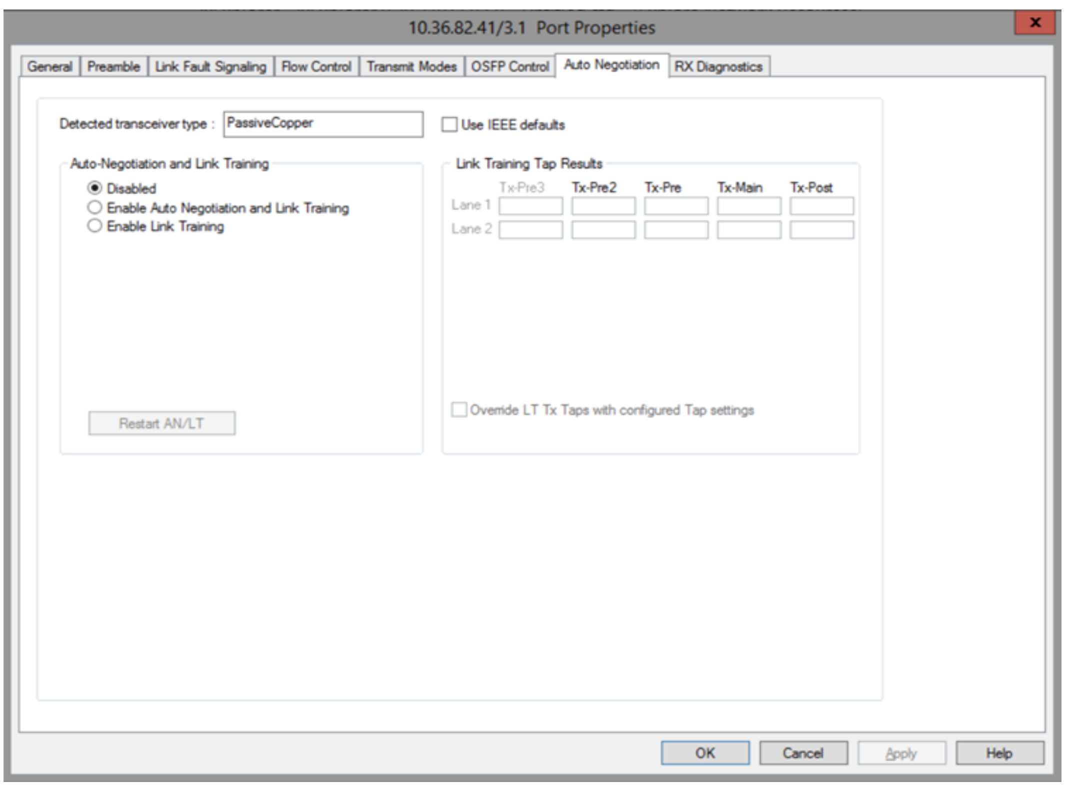
800GER-4P-QDD-OSFP-M+NRZ **Auto Negotiation** tab for 400GE PAM4 53G speed mode is shown below:



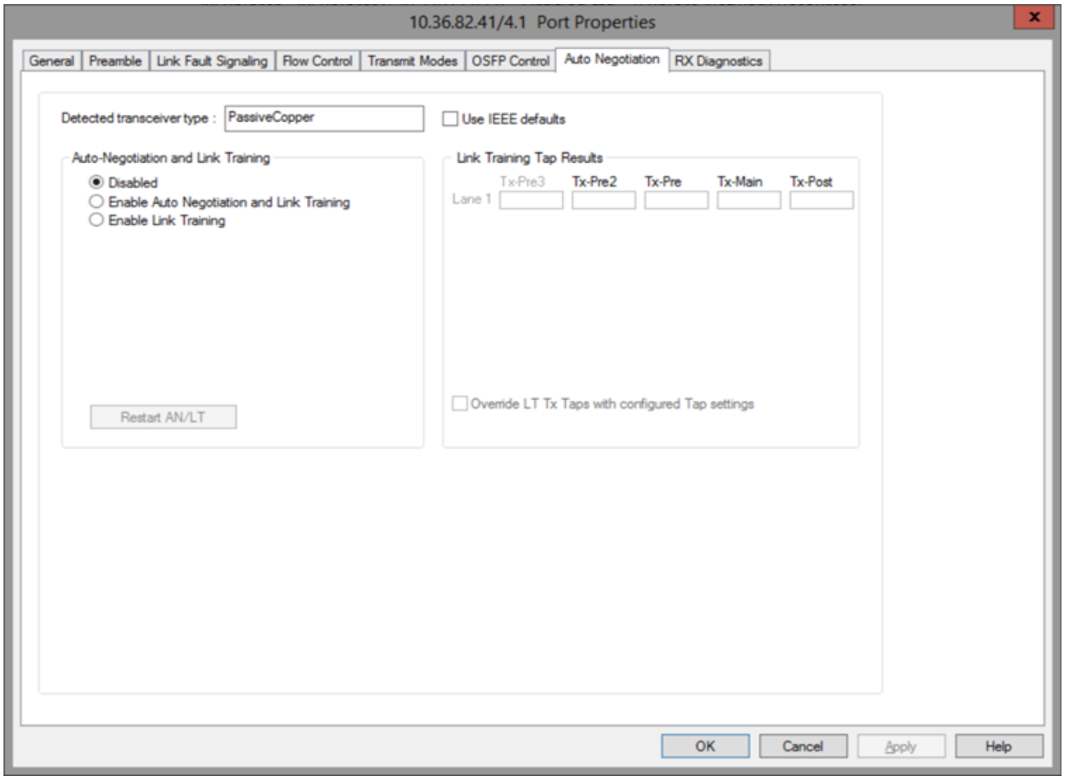
800GER-4P-QDD-OSFP-M+NRZ **Auto Negotiation** tab for 200GE PAM4 53G speed mode is shown below:



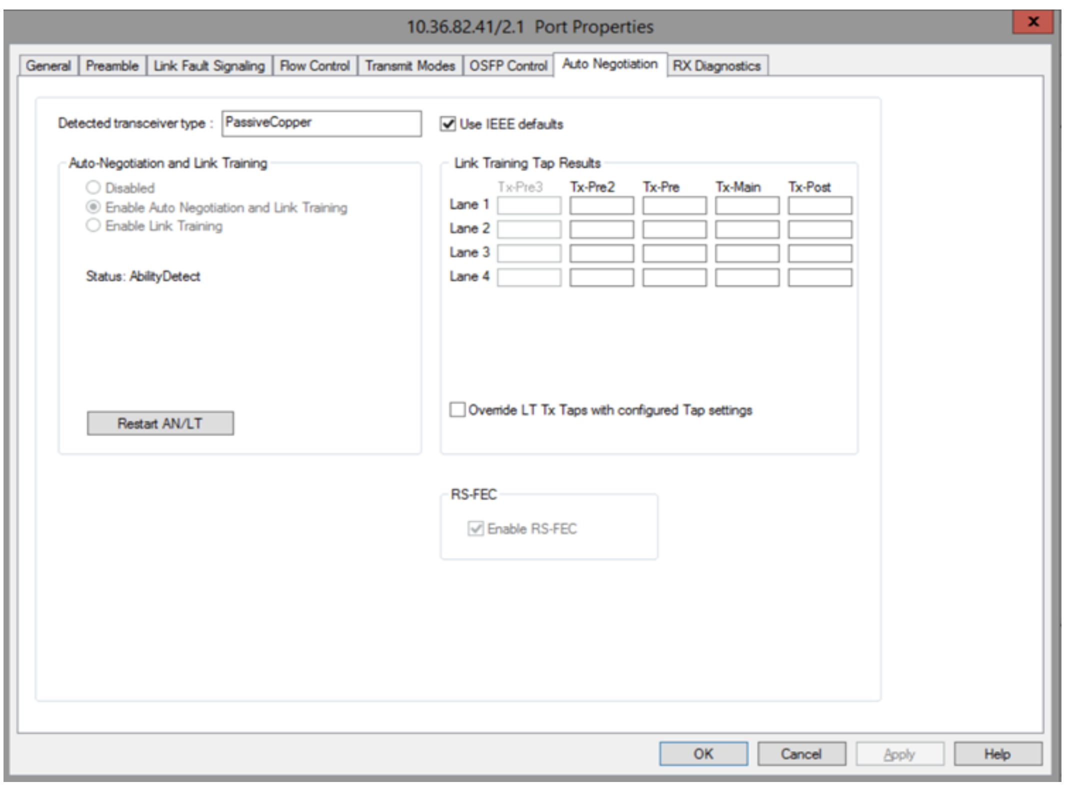
800GER-4P-QDD-OSFP-M+NRZ **Auto Negotiation** tab for 100GE PAM4 53G speed mode is shown below:



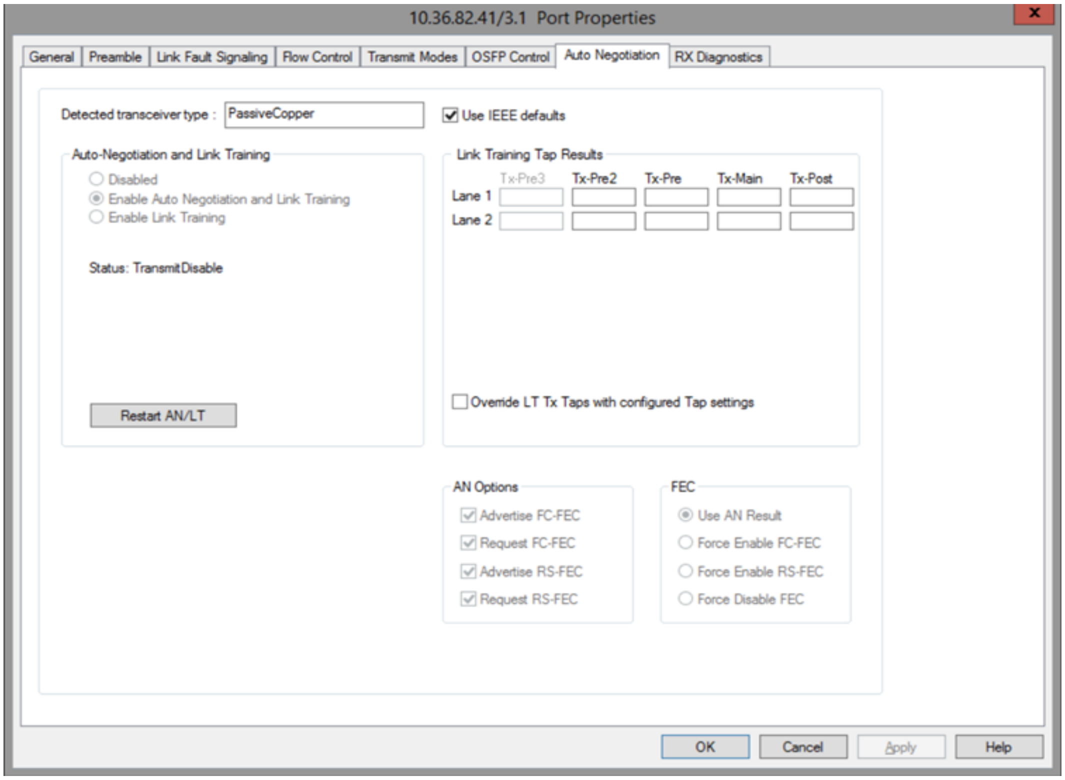
800GER-4P-QDD-OSFP-M+NRZ **Auto Negotiation** tab for 50GE PAM4 53G speed mode is shown below:



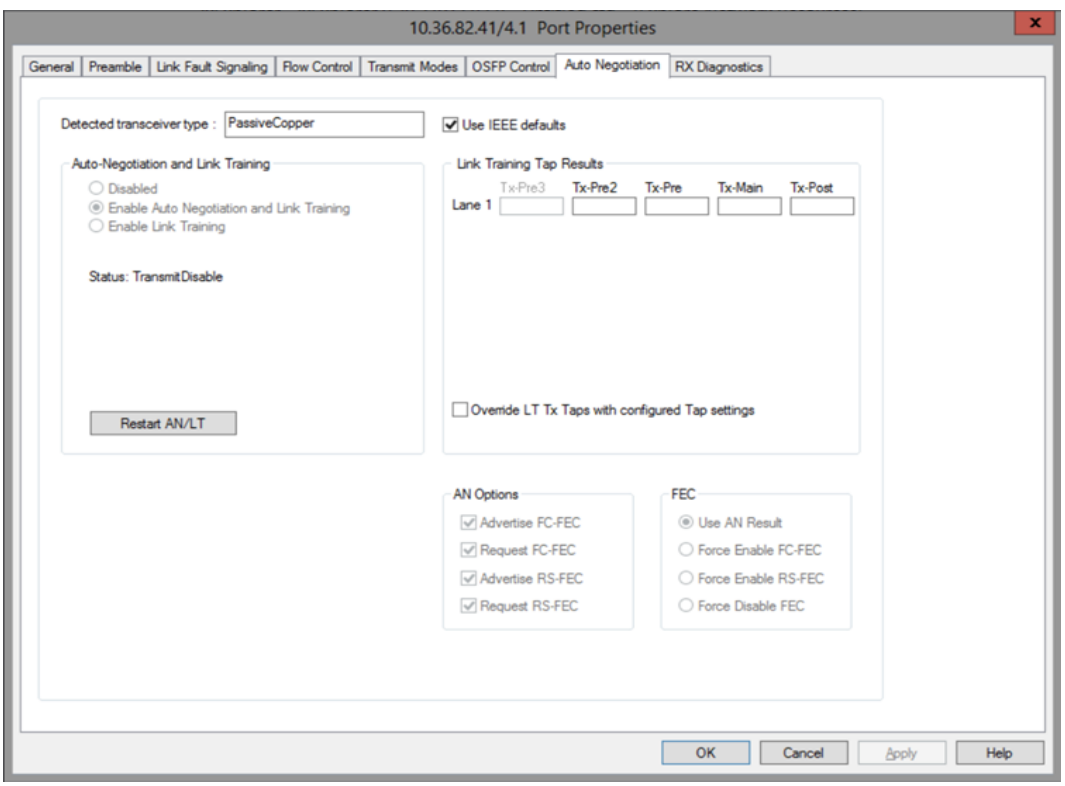
800GER-4P-QDD-OSFP-M+NRZ **Auto Negotiation** tab for 100GE NRZ speed mode is shown below:



800GER-4P-QDD-OSFP-M+NRZ **Auto Negotiation** tab for 50GE NRZ speed mode is shown below:



800GER-4P-QDD-OSFP-M+NRZ **Auto Negotiation** tab for 25GE NRZ speed mode is shown below:



The fields and controls in this tab are described in the following table:

Field/Control	Description
Detected transceiver type	The type of transceiver that is plugged in.
Use IEEE defaults	Clear this check box to make **AN Options** and **FEC** groups available. By default this check box will remain selected and FEC that will be active is based on Autonegotiation.
Disabled	When you select the check box, the L1 parameters like Autonegotiation, Link Training, and FEC, are enabled or disabled per IEEE requirements, and you will not be able to enable or disable these manually. If the check box is cleared, you will be able to manually enable or disable L1 features – even if it violates IEEE specifications. By default the check box is selected.
Enable Auto Negotiate and Link Training	Auto negotiation controls how a port communicates with other ports.If you select the check box, it allows auto-negotiation of speed and duplex operation based on the various choices. The capabilities that are selected are advertised during auto-negotiation.Auto-Negotiation starts when: • Link is attempting to be established • Link has dropped and is re-establishing • **Restart Auto-Negotiate** button is selected (this does a forced restart) NOTE The **Enable Auto Negotiate** check box is available for selection only if the **Disabled** check box is cleared.
Enable Link Training	Select the check box to allow longer length copper cables to be used. This means that during the next Auto-Negotiation, KR training will be used. NOTE This check box is available for selection only if the **Disabled** check box is cleared.
Negotiated the capability above	The text box indicates the speed that was negotiated due to Auto-Negotiation.
Restart AN/LT	Restarts the Auto Negotiate sequence.
Link Training Tap Settings	
Tx-Pre2-cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Pre-cursor Lane 1-8	The per-lane transmit pre-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Main-cursor	The per-lane transmit main-cursor settings selected by the link training

Field/Control	Description
Lane 1-8	process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Tx-Post-cursor Lane 1-8	The per-lane transmit post-cursor settings selected by the link training process when a port is in either Auto-Negotiation and Link Training mode, or in Link Training mode.
Override LT Tx Tap settings with configured Tap settings	Selecting this check box overrides the taps settings derived by the link training process, and configures the transmit pre/main/post cursor settings and receiver CTLE setting with the static values specified in the **QSFP-DD Host Control** tab.
AN Option	The available option is the following: • Request RS-FEC-Int:This is applicable only when Auto negotiation is turned on. Its value is preserved by IxServer and applied when Auto negotiation is turned on a port. With this check box selected, the port is requesting remote partner to use RS-FEC-Int FEC.
FEC	The available options are the following: • Use AN Result: Use FEC decided by Auto negotiation. • Force Enable KP4-FEC: Force enable KP4-FEC on the port. • Force Enable RS-FEC-Int: Force enable RS-FEC-Int on the port.

800GER-4P-QDD-OSFP-M+NRZ Port Properties—KP4 FEC Error Insertion

Forward Error Correction (FEC) is a method of communicating data that corrects errors in transmission on the receiving end. Prior to transmission, the data is put through a predetermined algorithm that adds extra bits specifically for error correction to any character or code block. If the transmission is received in error, the correction bits are used to check and repair the data.

The **FEC Error Insertion** tab allows to inject FEC errors into transmitted data, and is shown in *Figure: **FEC Error Insertion** Tab*

Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Random

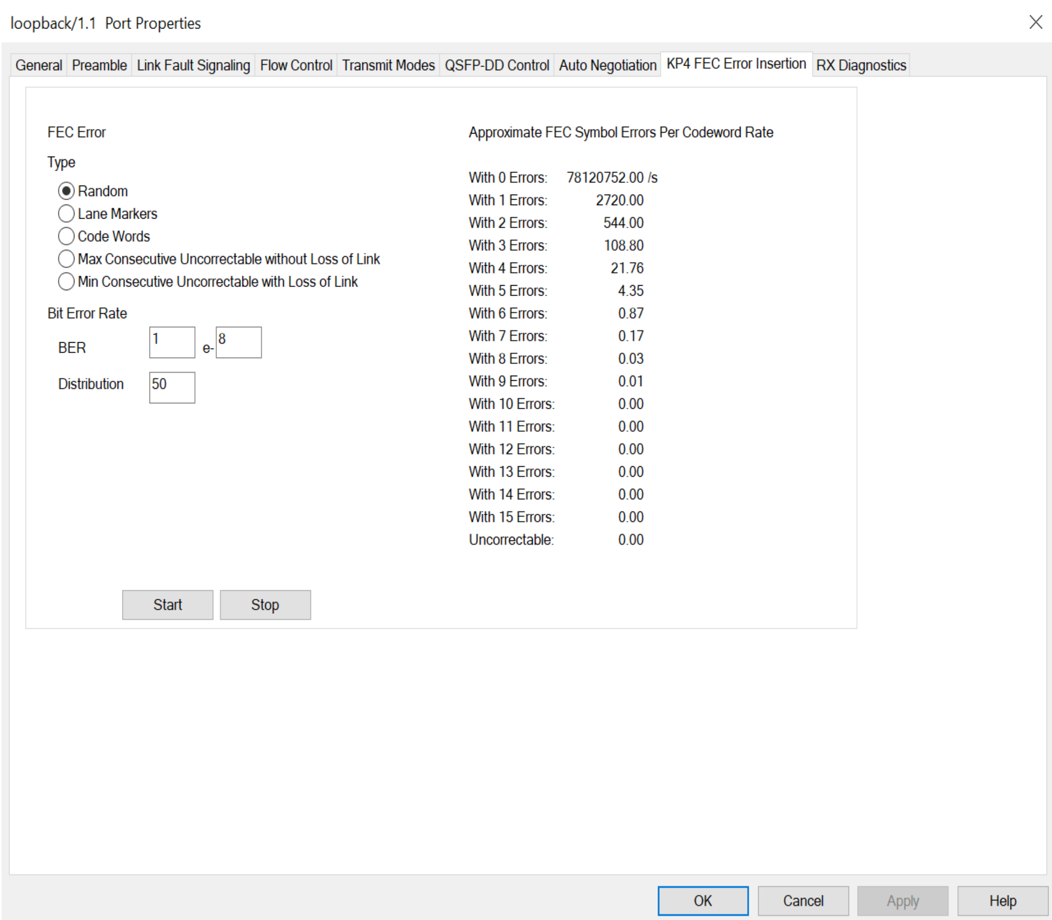


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Lane Markers

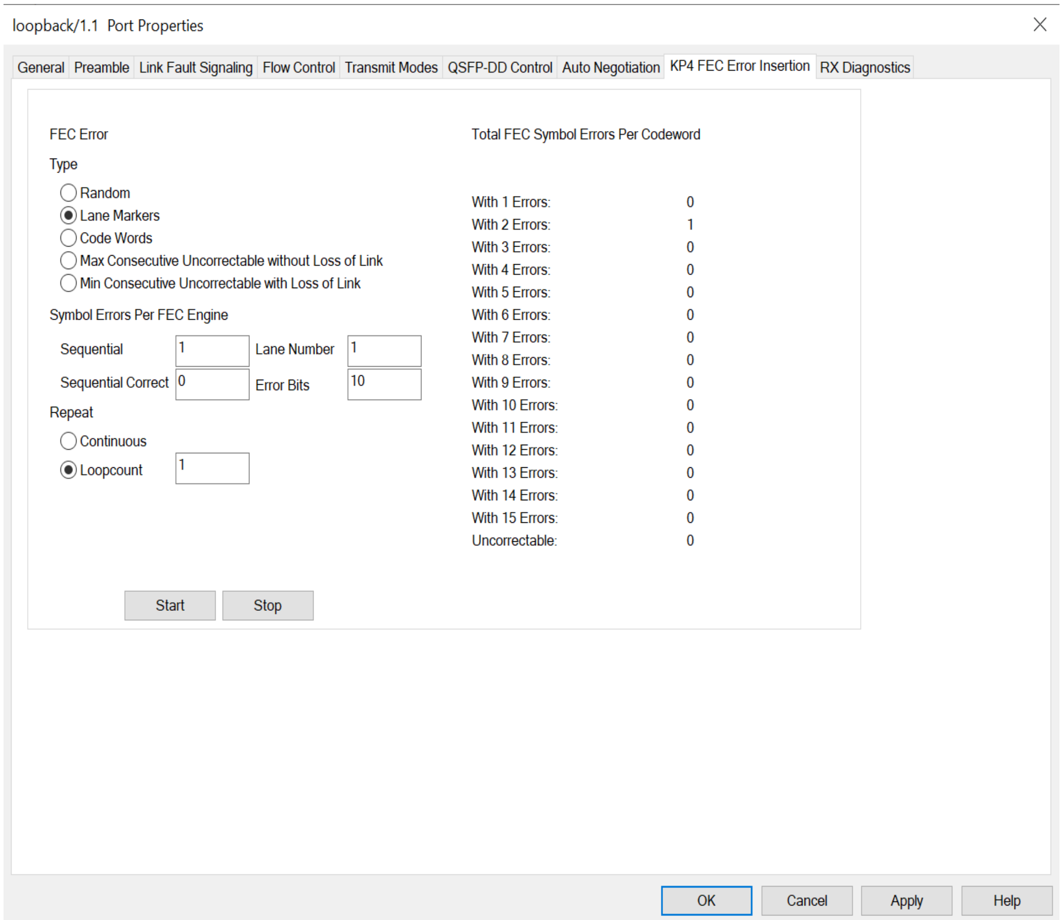


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Code Words

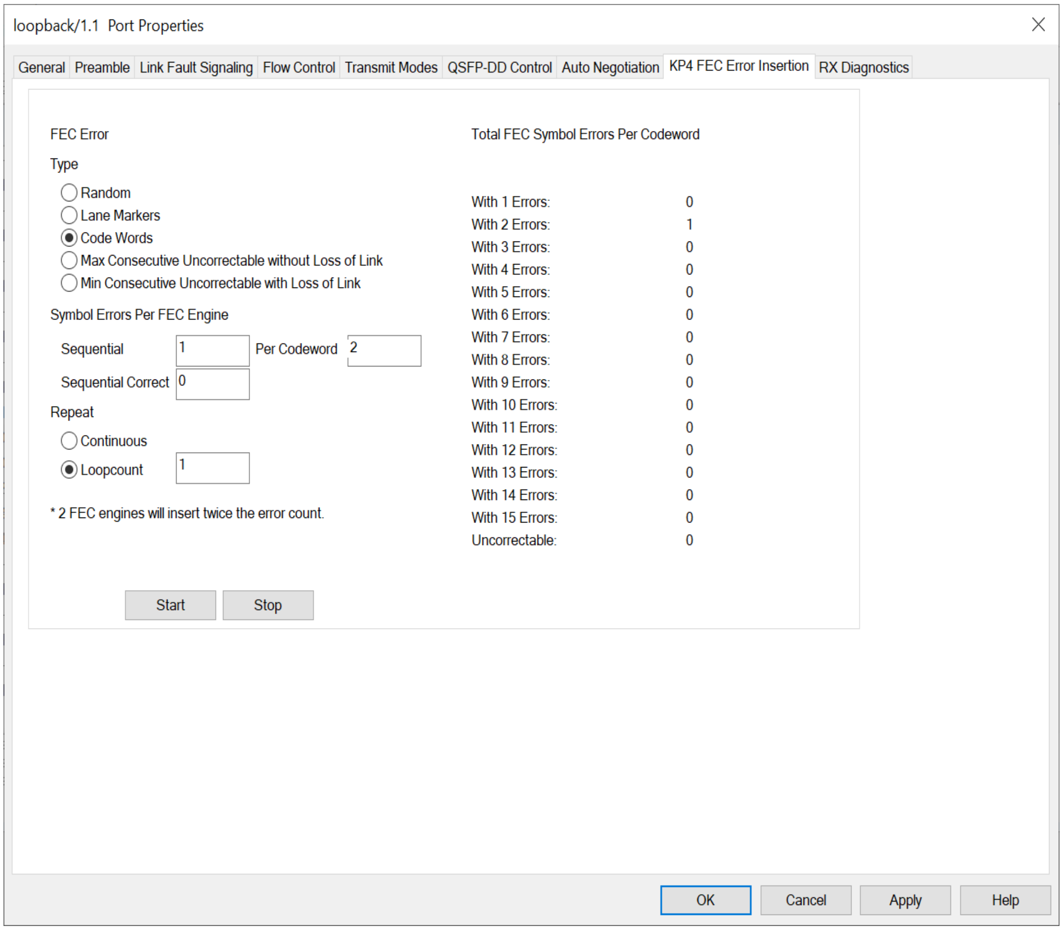


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Max Consecutive Uncorrectable without Loss of Link

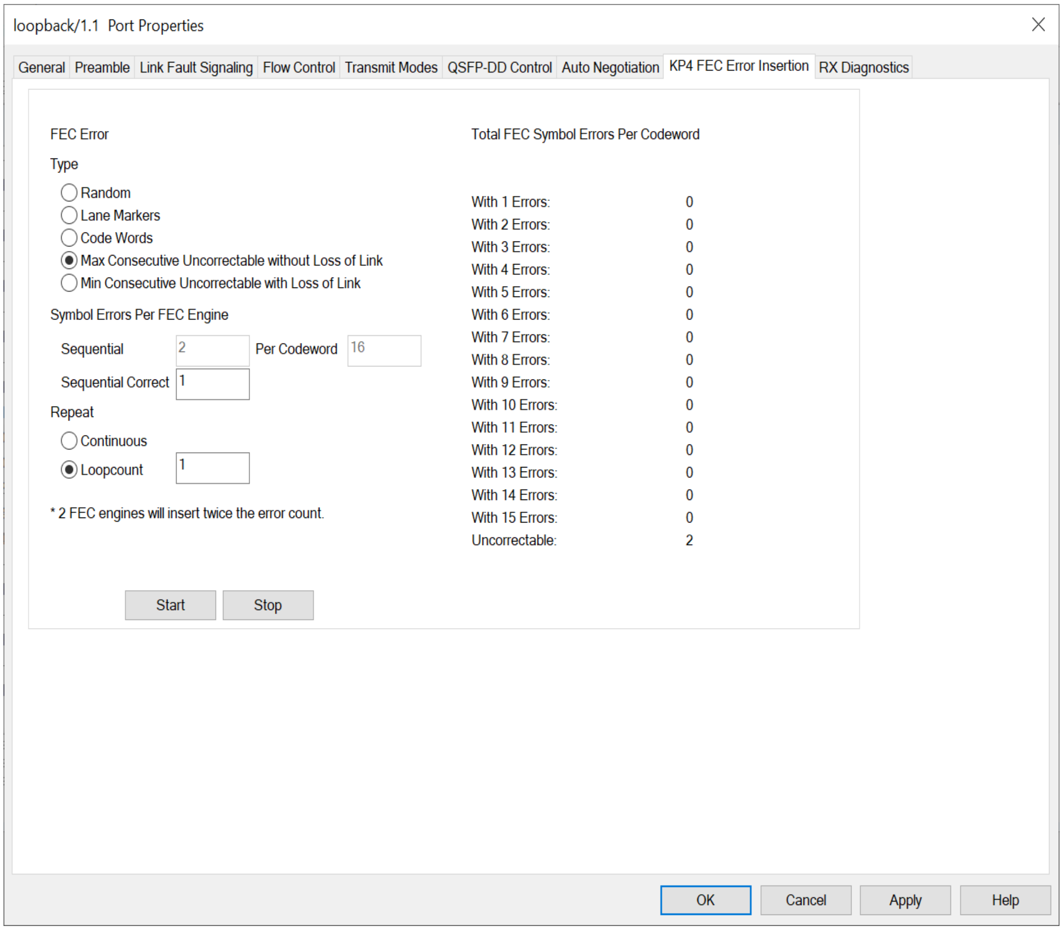


Figure: **KP4 FEC Error Insertion** Tab with Error Type selected as Min Consecutive Uncorrectable with Loss of Link

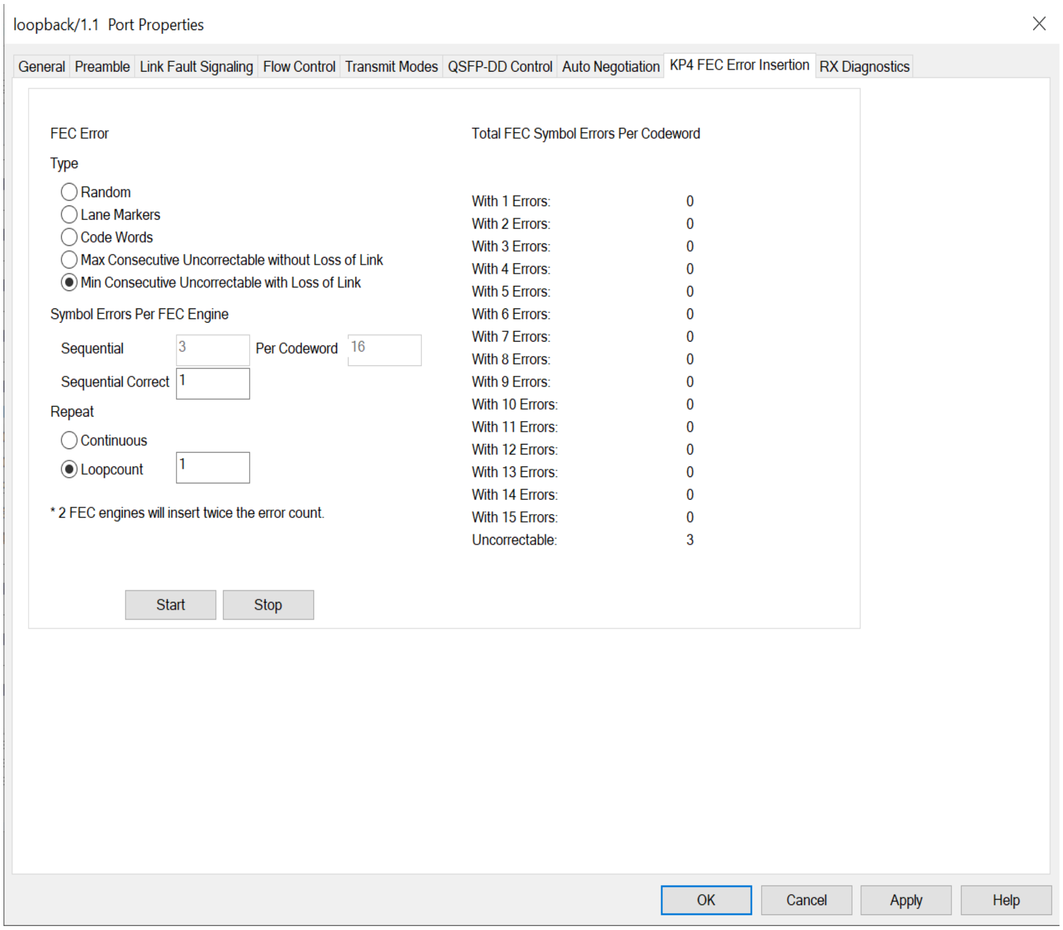


Table: **KP4 FEC** Tab Configuration

Section	Field	Usage
FEC Error Insertion		
Type	Random	Random FEC symbol error insertion will introduce a deterministic number of errors, evenly spread across all PCS lanes, on top the intrinsic BER (Bit Error Rate) of the interconnect.
	Lane Markers	Inserts errors only in the Lane Marker fields.
	Code Words	This is the fundamental unit of data that the FEC engine operates on sequentially. It is composed of blocks that carry the payload and parity information for the 64/66B scrambled data that arrives from the PCS Scrambler on Egress and from the PMA on Ingress.The code word size and layout can vary from each coding scheme. For example, RS, KR, and KP4 all have different code words because their coding schemes are different.
	Max Consecutive Uncorrectable	Uncorrectable errors are those with more than 15 symbol errors. As per IEEE, the maximum number of consecutive uncorrectable errors without loss of link is 2.

Section	Field	Usage
	without Loss of Link	
	Min Consecutive Uncorrectable with Loss of Link	The Max Consecutive Uncorrectable WITHOUT Loss of Link + 1. This is the threshold where the receiver should declare Local Fault due to bad data. The minimum number of consecutive uncorrectable errors with loss of link is 3.
Bit Error Rate	BER	The Bit Error Ratio (BER) is the ratio of the number of error bits compared to the total number of bits transmitted. In the BER field, enter the coefficient of the BER.The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	e-	Enter the exponent of the BER. The desired BER can be achieved by changing the coefficient and exponent of the BER fields. The distribution of errored FEC symbols across codewords can be done by varying the Distribution parameter.
	Distribution	Controls how the errors are distributed. This modifies the probability distribution of errors while maintaining the average Bit Error Rate. For example, you can have a BER of 10E-8 but have all of the errors be single errors OR you can have the errors be distributed across a variety of errors. The purpose is to thoroughly test a receiver to see if all possible errors are being corrected at varying rates.
Symbol Errors Per FEC Engine		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Sequential Errors	In burst mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.

Section	Field	Usage
		NOTE Per 802.3bs and 802.3cd, reception of 3 or more consecutive uncorrectable codewords will result in Loss of Link. In burst mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. In continuous mode, the Sequential Errors specify how many sequential Lane Markers (Alignment Markers) will have symbol errors, followed by a number of Lane Markers without errors per the Sequential Correct field. This sequence will be repeated until stopped. NOTE Per 802.3bs and 802.3cd, reception of 5 or more Alignment Marker errors will result in Loss of Link. • In 400G mode, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines. • The symbol errors are not evenly distributed across the PCS lanes (use Random error insertion mode for that case) • The maximum number of sequential uncorrectable errors without loss of link is 2 and the minimum number of sequential uncorrectable errors with loss of link is 3.
	Lane Number	The Lane Number specifies which PCS lane will be affected by the Lane Marker error insertion.This field is available only if you select the error insertion type as Lane Markers.
	Sequential Correct	The number of consecutive code words without errors.
	Error Bits	The Error Bits specifies how many errors will be inserted on each of the two symbol errors of the codeword that carries the Lane Marker. There is a minimum Error Bits required (2) before corrupting the symbol that maps to the Lane Marker field. This field is available only if you select the error insertion type as Lane Markers.
	Per Codeword	Codeword is a block of contiguous packets on the line. All RS-FEC codewords are of the same size.The Per Codeword value denotes the number of symbol errors per codeword to insert. KP4 FEC can correct up to 15 symbols, and detect up to 30 symbols. If the user specifies 16, an Uncorrectable Codeword will be issued. This field is available only if you select the error insertion type as Code Words.

Section	Field	Usage
Repeat		This is available only if you select the error insertion type as one of the following: • Lane Markers • Code words • Max Consecutive Uncorrectable without Loss of Link • Min Consecutive Uncorrectable with Loss of Link
	Continuous	Continuous error insertion.In continuous mode, the Sequential Errors field will specify how many sequential FEC codewords will have one or more symbols with errors, followed by the number of FEC codewords without symbol errors indicated in the Sequential Correct field. This sequence will be repeated until stopped.
	Loopcount	The sequence of correct and incorrect codewords or symbol errors inserted will be repeated by the number specified in the Loopcount field.
Start		Starts the error insertion process.
Stop		Stops the error insertion process.
Appropriate FEC Symbol Errors Per Codeword Rate		The Appropriate FEC Symbol Errors Per Codeword Rate is an approximation for how many symbol errors there will be per codeword every second. NOTE In 400G mode, the total number of FEC symbol errors sent will be doubled due to the presence of two FEC engines.

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CHAPTER 43

Port Properties–VM

The *Port Properties* dialog box controls a number of properties related to the port's operation. The *Port Properties* dialog box is a view that corresponds to the module type. The following sections describe the functions and configuration of the VM family of module port properties.

Port Properties for VM Ports

The **Port Properties** dialog box is accessed by selecting a port in the **Resources** window, then selecting the **Properties** menu option.

The complete specification for the VM is found in the *Ixia Platform Reference Manual*.

The following port property tabs are available for the various VM ports:

- VM Port Properties—Status
- VM Port Properties—Transmit Modes
- VM Port Properties—VM Port Info
- VM Port Properties—Auto Instrumentation

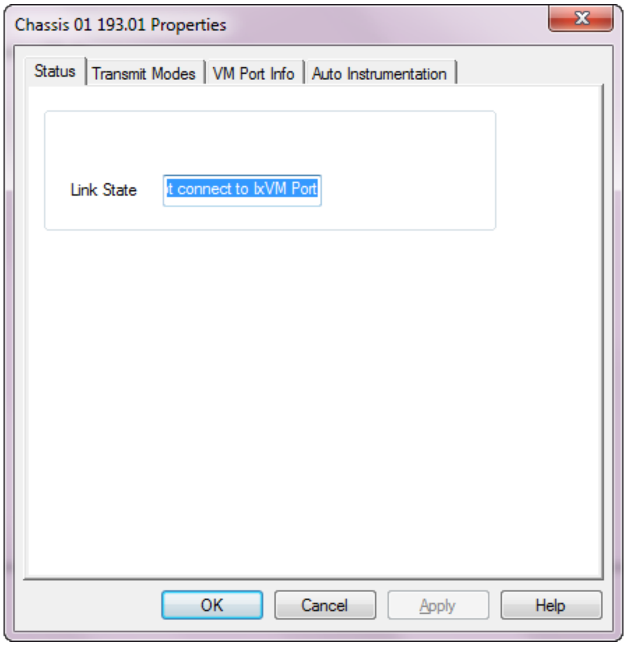
VM Port Properties—Status

The **Status** tab shows the link state and allows the port to be disabled manually. This feature also automatically disables a port which has a hardware fault—at power up or at run time. It allows the chassis to restart without taking the time to check the status of this port. The port can also be disabled if a hardware fault occurred, or for some other purpose. The *Enable Port* check box is enabled by default.

The ***Status*** tab is accessed by selecting a port in Resources pane and selecting the *Properties* menu option, or by double-clicking a port in the Detail pane. Then select the ***Status*** tab.

The **Status** tab is shown in the following image.

Image: VM **Status** tab



The view of the status of the link is also shown in the Statistic View for this port. The possible states are:

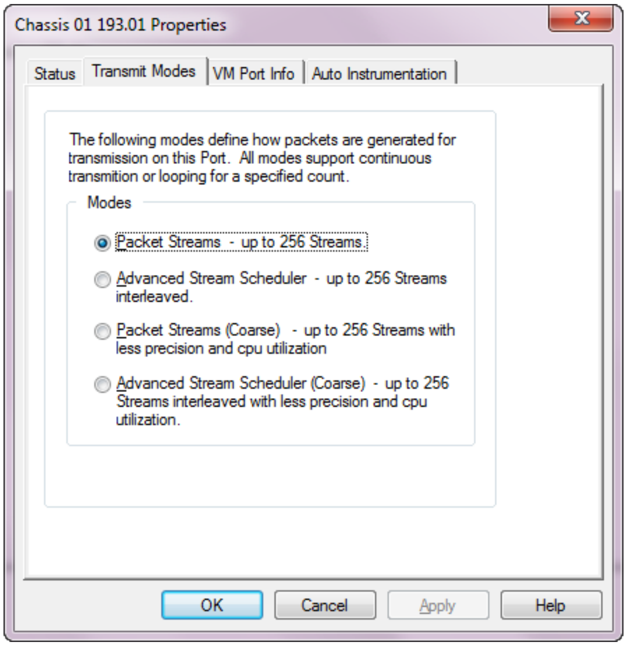
- Hardware Fault
- Disabled, Busy
- Link Up
- Link Down
- Loopback
- WriteMII
- Demo Mode
- empty (no status appear if the chassis is disabled)

VM Port Properties—Transmit Modes

The **Transmit Modes** tab is shown in the following image. It is accessed by selecting a port in Resources window and selecting the **Properties** menu option, or by double-clicking a port in the Detail pane.. Then select the **Transmit Modes** tab.

The VM Port Properties **Transmit Modes** tab is shown in the following image:

Image: VM **Transmit Modes** tab



The controls for **Transmit Modes** tab configuration are described in the following table:

Table: Transmit Modes Configuration

Field/Control	Description
Packet Streams	Sets the basic operating mode for the port to packet streams. This allows to configure up to 256 streams. A stream may be programmed for continuous burst or packet generation-generating a continuous, infinite number of packets.
Advanced Stream Scheduler	Up to 256 streams can be interleaved at the same time for IxVM. Each stream is assigned a percentage of the maximum rate. The streams are mixed in a pseudo-random manner so that each stream's long-term percentage of the total transmitted data is as assigned.
Packet Streams (Coarse)	Sets the basic operating mode for the port to packet streams with less precision and cpu utilization. This allows to configure up to 256 streams. A stream may be programmed for continuous burst or packet generation-generating a continuous, infinite number of packets.
Advanced Stream Scheduler (Coarse)	Up to 256 streams can be interleaved at the same time for IxVM with less precision and cpu utilization. Each stream is assigned a percentage of the maximum rate. The streams are mixed in a pseudo-random manner so that each stream's long-term percentage of the total transmitted data is as assigned.

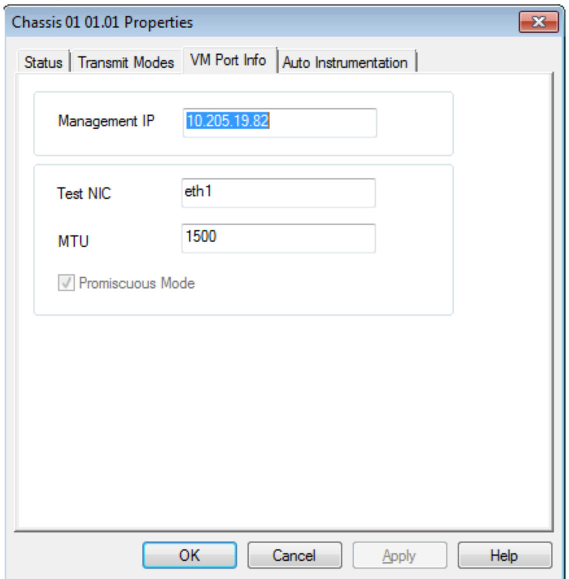
NOTE Coarse mode is used mostly on large scale setups to reduce cpu power used by ports, this comes with a precision loss because of this use it only if normal mode can't be used.

VM Port Properties—VM Port Info

The **VM Port Info** tab is accessed by selecting a port in Resources pane and selecting the **Properties** menu option, or by double-clicking a port in the **Detail** pane. Then select the **VM Port Info** tab. This tab provides basic port configurations. All this options are read only and are inherited from VM Card, to change some of the options please go to Card proprieties.

The VM Port Properties **VM Port Info** tab is shown in the following image:

Image: **VM Port Info** tab



The controls for **VM Port Info** tab configuration are described in the following table:

Table: TVM Port Info Configuration

Field/Control	Description
Management IP	Management IP address of the Linux machine with the IxVM software agent installed.
Test NIC	Name of the virtual interface that will be used as a traffic generator. Virtual interface must be created before adding the port.
MTU	MTU value of test interface from a virtual machine. The minimum value is 1500 and the maximum value is 9000 and should be changed mainly when there are control plane frames bigger than 1500.
Promiscuous mode	Denote the promiscuous or non-promiscuous mode in which a virtual port is added to a virtual card.

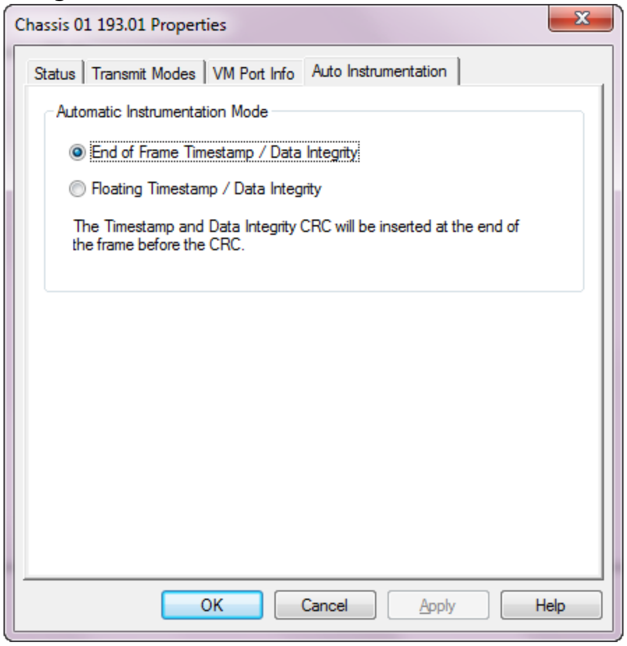
VM Port Properties—Auto Instrumentation

The VM **Auto Instrumentation** tab is accessed by selecting a port in the **Explore Network Resources** pane, selecting the **Port Properties** menu option, then selecting the **Auto**

Instrumentation tab.

The VM Port Properties **Auto Instrumentation** tab is shown in the following image:

Image: VM **Auto Instrumentation** tab



The options and controls in this tab are described in the following table:

Table: Auto Instrumentation Configuration

Field/Control	Description
End of Frame Timestamp / Data Integrity	Enables inserting Timestamp and Data Integrity CRC at the end of the frame before the CRC.
Floating Timestamp / Data Integrity	Enables adding timestamp as part of floating instrumentation header, and addresses similar issue in Data Integrity checking.

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CHAPTER 44
MII Registers

MII Register Files

Media-Independent Interface (MII) files store the settings of the PHY registers for Ethernet load modules. The MII files used on a particular chassis are located in the *MII Templates* directory in the IxExplorer Resources tree.

MII information can be shown in IxExplorer for two modes:

- Internal MIIs—This MII contains the PHY register information for the internal PHY (physical layer device) for the local load module/port.
- External MIIs—These MIIs are available for 10GE XAUI, 10GE XENPAK, Novus QSFP28, and Novus 10GE Dual Phy load modules/ports.

Internal MIIs

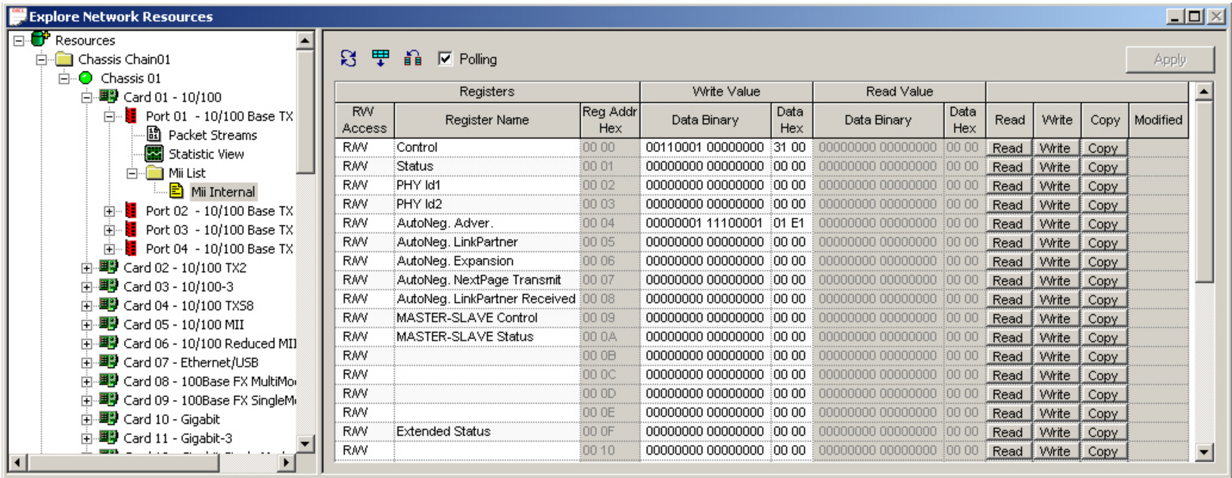
Default internal MII template files exist for each of the Ethernet-type load modules. These files can be accessed in several ways:

- MII Lists—Internal MII Registers
- Auto Negotiation Tab
- Advanced MII Tab

MII Lists—Internal MII Registers

These files are listed in the IxExplorer Resources Tree for each Ethernet-type port in a subdirectory named *MII List*. The contents of the MII List for a 10/100 load module consist of one file (Internal MII), as shown in *Image: Internal MII Registers for 10/100 Module*.

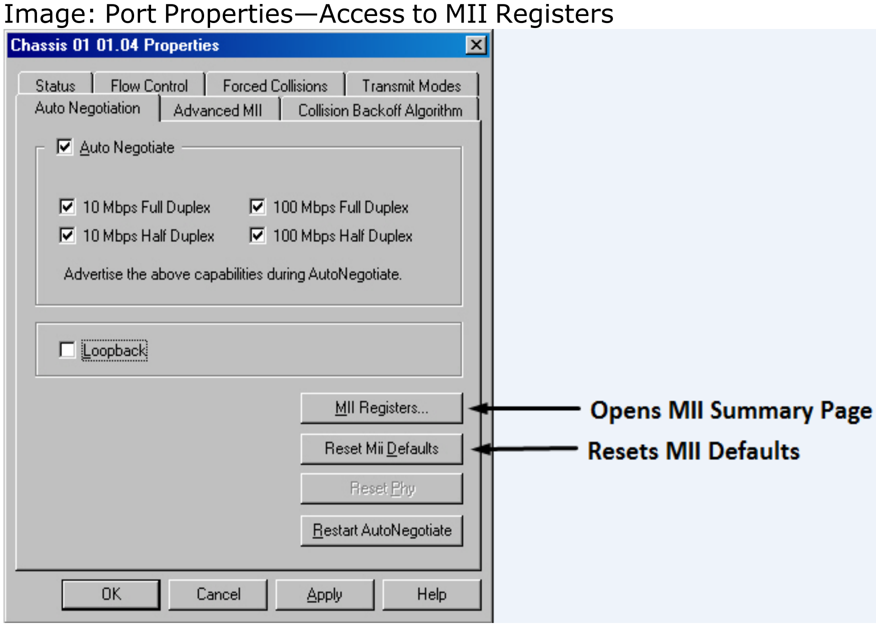
Image: Internal MII Registers for 10/100 Module



Auto Negotiation Tab

The Internal MII register information is also available through the Port Properties **Auto Negotiation** tab for the load module, as shown in *Image: Port Properties—Access to MII Registers*.

Image: Port Properties—Access to MII Registers



The controls in this tab related to MII Registers are described in *Table: Access to MII Registers by Port Properties*.

Table: Access to MII Registers by Port Properties

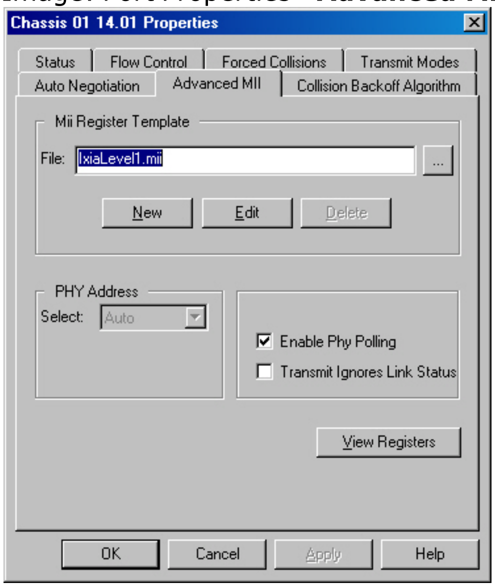
Control	Usage
MII Registers...	Opens a dialog box with a set of tabs for the MII Registers associated with the port. These tabs allow the current MII register values to be read, written, and saved to a file.MII Register Summary Tab.
Reset MII	Resets all of the port's PHY properties back to the default MII settings.

Control	Usage
Defaults	

Advanced MII Tab

The *Advanced MII* tab in the *Port Properties* dialog box allows for the proper association of MII registers to the port. The **Advanced MII** tab for a 10/100 port is shown in *Image: Port Properties—**Advanced MII** Tab*.

Image: Port Properties—**Advanced MII** Tab



The upper section, labeled *MII Register Template*, is used to control the selection and editing of a register template file. MII Register Template files hold the register definitions. It is initially set to use the appropriate default template that corresponds to one of the PHYs in use on that Ixia module card. Additions or corrections can be made, and even saved under a different template name. Once the proper associations are made, the current MII register values are easily read and modified using the MII Register Summary Tab. The fields and controls in this tab are described in *Table**: Advanced MII** Tab*

Table: **Advanced MII** Tab

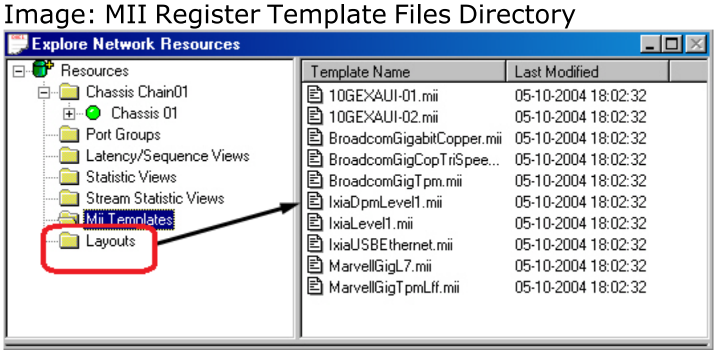
Section	Field/Control	Usage
MII Register Template	File	The name of the MII register file.
	Browse	Opens up a standard Windows file browsing window in the directory `C:\Program Files\Ixia\MII`, looking for files that end in *.mii*.
	New	Allows the creation of a new MII register Template file. *New/Edit MII Register Template Setup—Management Page for operational*

Section	Field/Control	Usage
		details.
	Edit	Allows the editing of the indicated file. *New/Edit MII Register Template Setup—Management Page for operational details.*
	Delete	Deletes the current file after a confirmation dialog box.
PHY Address	Select	Allows the address of the PHY to be set to Auto, or a constant from 0 to 31. (For other than 10/100 modules, it is configured for Auto and manual configuration is disabled.)
	Enable Phy Polling	If selected, then the PHY is continuously polled during MII setup operation.
	Transmit Ignores Link Status	If selected, allows transmission of packets with the link down.

MII Register Template Files

The MII Register Templates are located in `C:\Program Files\Ixia\MII Templates`. A list of MII template files available in the Demo Mode is shown in *Image: MII Register Template Files Directory*.

Image: MII Register Template Files Directory

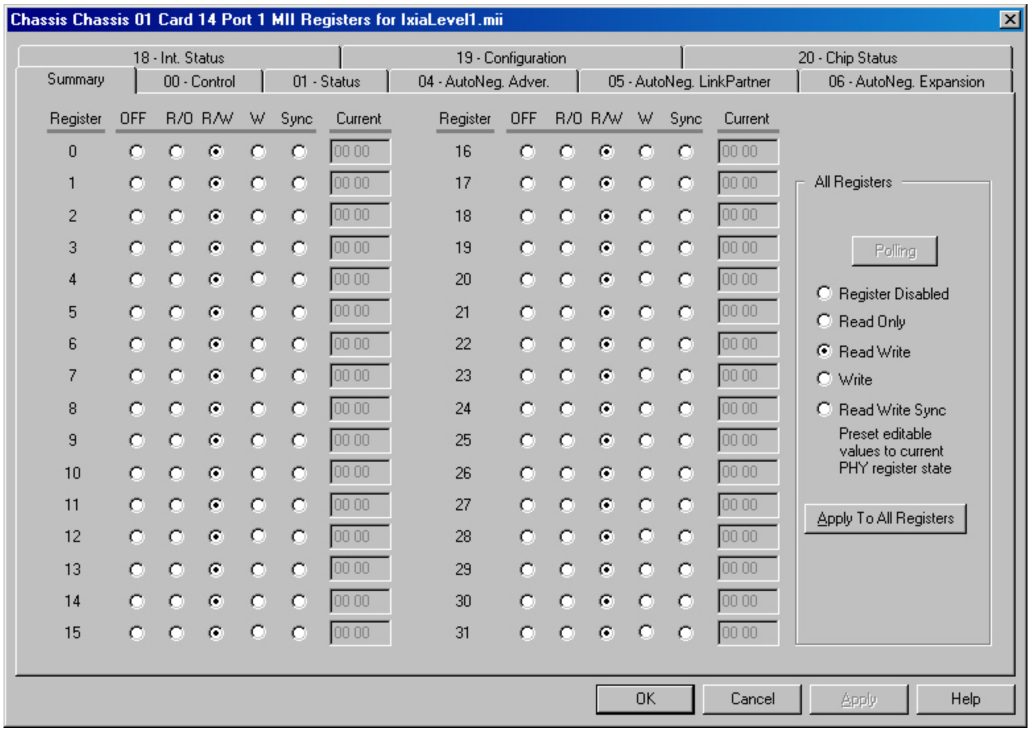


Selecting one of the file names opens a set of register dialog boxes for that file, with the Edit/Update dialog box shown. This template file may be saved under a different file name, by pressing the *Change Template Name...* button and renaming it in the *Save* dialog box.

MII Register Summary Tab

MII register properties are available through the **MII Registers** dialog box set of tabs, as shown for a `IxiaLevel1.mii` file for a 10/100 module in *Image: MII Registers Summary Page*.

Image: MII Registers Summary Page



The MII register **Summary** tab shows the status of all 32 MII registers. Each register's value, as well as the state of each register, appears. The default setting for the state is *Sync* (*Read Write Sync*), but different states may be selected for individual registers on this page. The register states are one of:

- OFF (Register Disabled)—The register is neither read nor written during operation.
- R/O (Read Only)—The register is read-only.
- R/W (Read Write)—(default setting) The register may be read or written.
- W (Write)—The register is write-only.
- Sync (Read Write Sync)—The register is read and written during operation. In addition, the read values are placed into the editable fields at the same time.

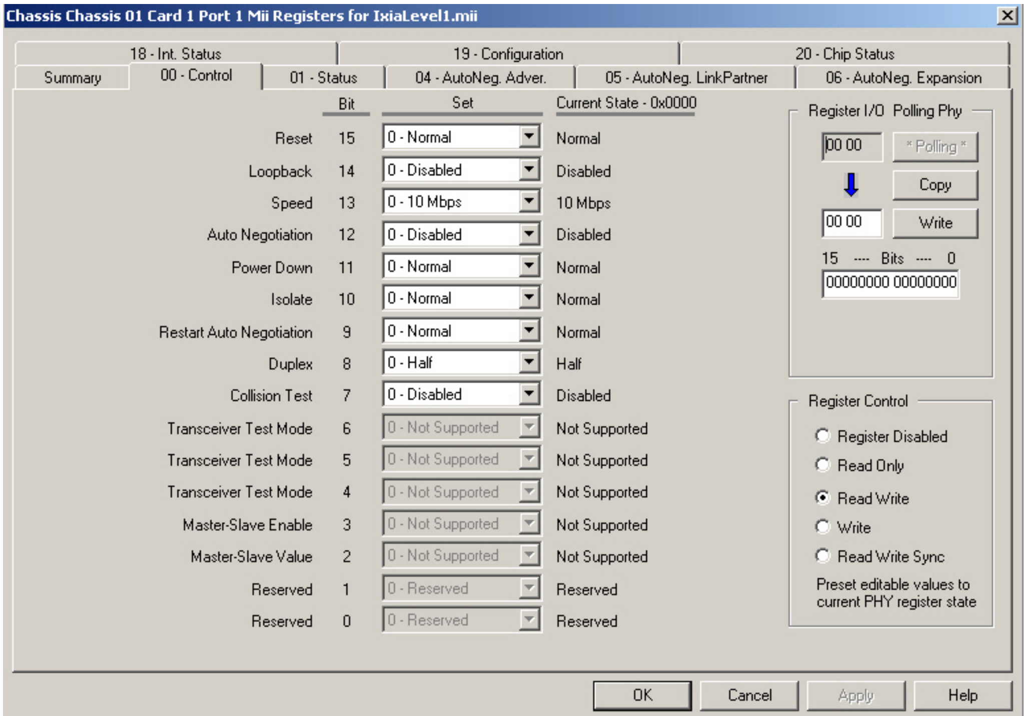
The state for all of the registers may be set at one time through the *All Registers* box. The five choices in the choice box correspond to the five states. The *Apply To All Registers* button must be selected to apply a new choice.

The particular tabs available at the top of the dialog box are dictated by the contents of the MII template in use. They correspond to the MII registers which are available for that port. The Control register is shown in ***MII Control** Tab*.

MII Control Tab

The MII **Control** tab for the`IxiaLevel1.mii` file is shown in *Image: MII **Control Register** Tab*.

Image: MII **Control Register** Tab



The 00-Control and 01-Status registers are mandatory for all PHYs, and the labels and values are usually consistent across all PHYs within each of the two groups. The properties that may be set, and the acceptable values for the required bits on the control registers, are shown in *Table: MII Control Register Properties (for IxiaLevel1.mii)*.

Table: MII Control Register Properties (for IxiaLevel1.mii)

Property	Bit	‘0’ Value	‘1’ Value
Reset	15	Normal	PHY Reset
Loopback	14	Disabled	Enabled
Speed	13	10 Mbps	100 Mbps
Auto Negotiation	12	Disabled	Enabled
Power Down	11	Normal	Power Down
Isolate	10	Normal	Isolate
Restart Auto-Negotiation	9	Normal	Restart
Duplex	8	Half	Full
Collision Test	7	Disabled	Enabled

The columns and fields in a register tab are described in *Table: MII Register Display Controls.*

Table: MII Register Display Controls

<table>
<tr><th>Control</th><th>Usage</th></tr>
<tr><td>(Bit label)</td><td>The left-most column in the view is the label for the bit in the register; for example, Reset or Loopback in Image: MII Control Register Tab</td></tr>
<tr><td>Bit</td><td>The position of this bit within the register. Bits are numbered from the least significant end.</td></tr>
<tr><td>Set</td><td>Reflects the value that the bit will be set to with the next use of the Apply button.</td></tr>
<tr><td>Current State–0xn</td><td>This indicates the current state of the register numbered 0xn (hex). This column is not shown when the Register Control is set to Write.</td></tr>
<tr><td>Register Control</td><td>The register may be operated in one of three states:

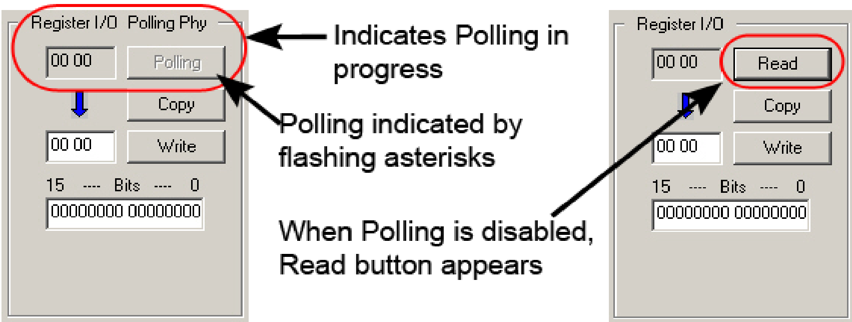
Register Disabled—The register is neither read nor written during operation.
Read Only—The register value is only read during operation.
Read Write—The register is read and written during operation.
Write—The register values are only written during operation. (The Current State column is not shown.)
Read Write Sync—The register is read and written during operation. In addition, the read values are placed into the editable fields at the same time. (Preset editable values to current PHY register state.)

The initial setting of these bits comes from the MII template in use.</td></tr>
<tr><td>Register I/O Polling Phy</td><td>The hex input field and the field labeled 15 --- Bits --- 0 allow the register values to be changed directly, instead of using the Set column. After any change, select the Write button; this will cause the Set column and other input values to reflect the new value. When the cursor is positioned within either type of numeric field, the label shown below applies to the byte or bit to the right of the cursor.

In addition, if the register is not disabled, and PHY polling is enabled in the Advanced MII tab in the Port Properties dialog box), it will be continually read from the PHY. If PHY polling is not enabled, the Read button is visible and may be used to read current values, as shown in Image: Polling PHY versus Manual Read. The current value may be copied into the hex and bit fields.</td></tr>
<tr><td>Apply</td><td>Select this button to immediately change the port’s properties without leaving the dialog box.</td></tr>
<tr><td>OK</td><td>Select this button to immediately change the port’s properties, and exit the dialog box.</td></tr>
</table>

The *Polling* and *Read* buttons for the Register I/O Polling Phy are shown in *Image: Polling PHY versus Manual Read*.

Image: Polling PHY versus Manual Read



The lower part of the tab allows the PHY address to be set. The controls available in this part of the tab are described in *Table: PHY Address Controls*.

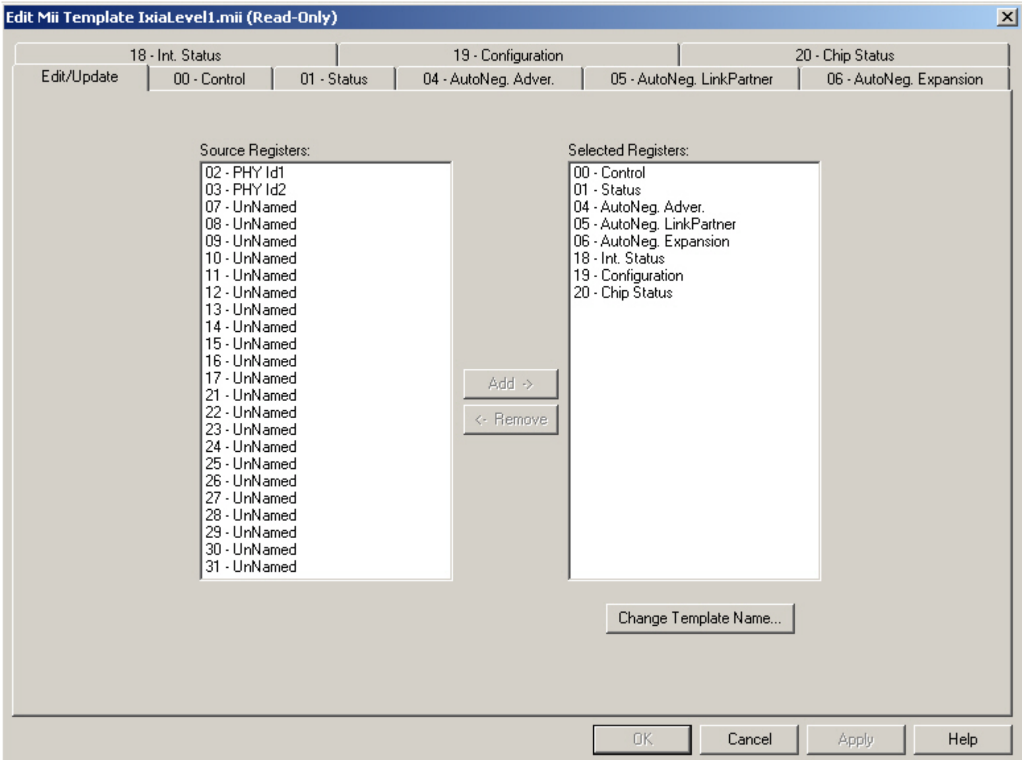
Table: PHY Address Controls

Control	Usage
PHY Address	Allows the address of the PHY to be set to Auto or a constant from 0 to 31. (For other than 10/100 modules, it is configured for Auto and manual configuration is disabled.)
Enable Phy Polling	If selected, then the PHY is continuously polled during MII setup operation.
Ignore Link	If selected, will allow transmission of packets with the link down.

New/Edit MII Register Template Setup—Management Page

Whether creating a new MII register template or editing an existing one, the operations are the same. The form of the interactive window is shown for IxiaLevel1.mii file (for a 10/100 module) in *Image: MII Register Template Setup—**Edit/Update** Tab*.

Image: MII Register Template Setup—**Edit/Update** Tab

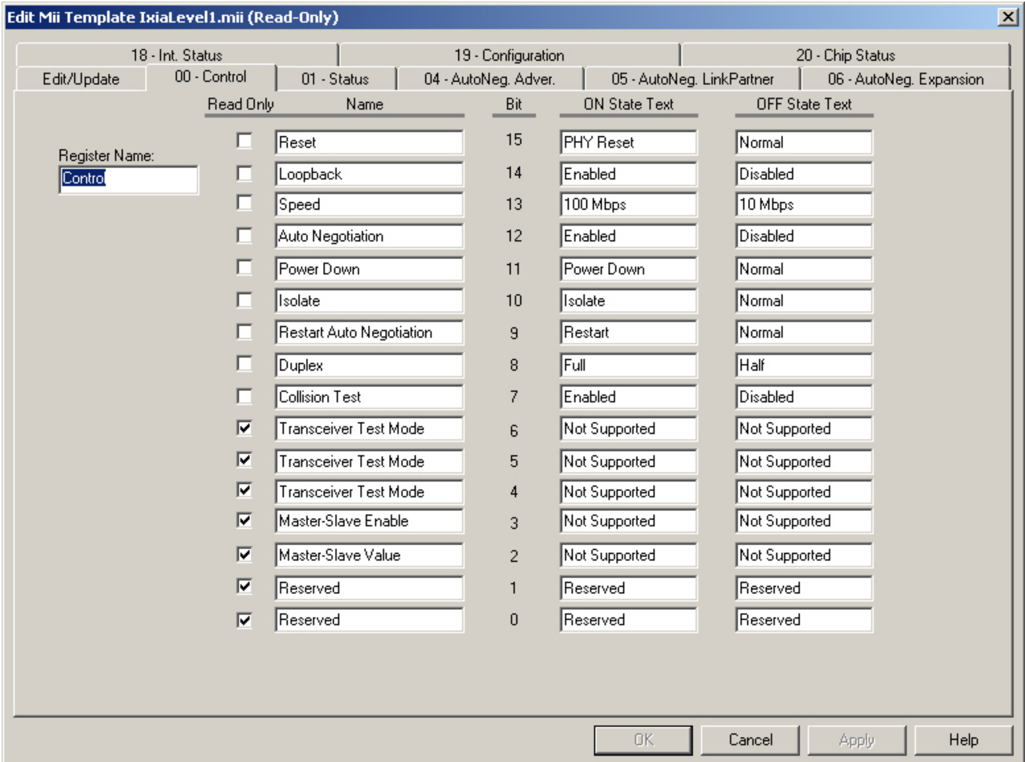


The **Edit/Update** tab controls the selection of registers that will be used from the entire 32-register set. The registers already selected are listed under *Selected Registers* at the right. In this case, the selected list begins with *00 - Control*. The unused registers are listed under *Source Registers* at the left. In this case, the unused list begins with *02 -PHY Id1.* Items are moved from the *Source Registers* to the *Selected Registers* by selecting the item(s) in the *Source Registers* and pressing the *Add ->* button. Likewise, items may be moved from the *Selected Register* list to the *Source Registers* list by selecting the item(s) in the *Selected Registers* and pressing the *<- Remove* button.

The names of the selected registers appear on the tabs at the top of the dialog box set. Selecting one of the tabs shows the information about the bits in the register. An example dialog box is shown in New/Edit MII Register Template Setup—Register Page.

New/Edit MII Register Template Setup—Register Page

Image: MII Register Template Setup—Register Definition Page



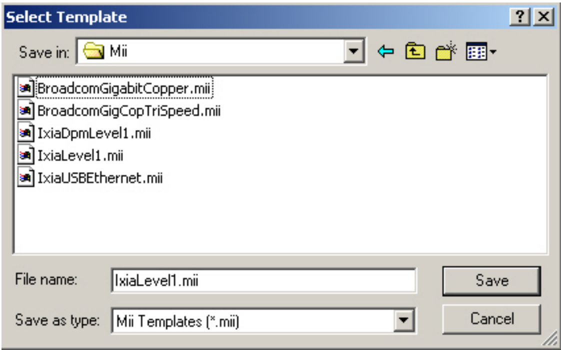
The columns on each of the register tabs are described in *Table: **MII Register Setup** Tab Controls*.

Table: **MII Register Setup** Tab Controls

Column Heading	Usage
Register Name	The name of the register, as it appears in the tab and in the Selected Register list on the main page is shown here and is editable.
Read Only	If selected, the register is read only when the MII registers are viewed.
(Name)	The text in this column holds the name of the bit in the register.
Bit	This column indicates the bit position within the register word.
ON State Text	The text in this column is shown for the ON state of the bit.
OFF State Text	The text in this column is shown for the OFF state of the bit.

The MII register template can be saved by pressing the *OK* button. If a new template is being defined when the *OK* button is selected, or the *Change Template Name...* button was used, then a standard Windows *Save* dialog box is presented to allow for saving the template as a different file on a disk. A sample dialog box is shown in *Image: MII Register Setup—Save File dialog box*. For ease of finding the file at a later time, it should be saved with an *.mii* extension.

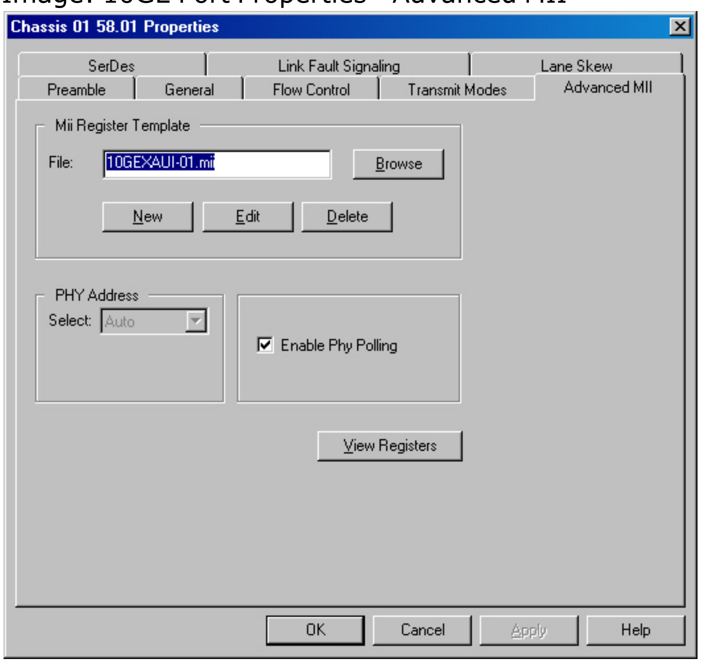
Image: MII Register Setup—Save File dialog box



The *Apply* button can be used to immediately change the port's properties without leaving the dialog box; the *OK* button performs the same function and exits the dialog box as well.

10GE Port Properties—Advanced MII

Image: 10GE Port Properties—Advanced MII



The **Advanced MII** tab for the 10GE XAUI and XENPAK modules is similar to those for the 10/100 modules. For detailed information refer to Advanced MII Tab.

10GE Module MII Lists

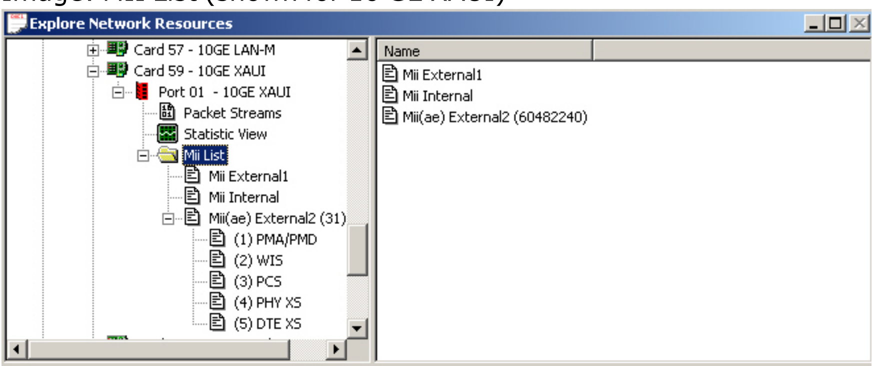
The 10GE XAUI, XENPAK, 10GE LSM LAN 10GBASE-T, and Novus 10G Dual Phy modules, have an additional configuration capability for a set of unique External MII(ae) templates.Novus 10GE Dual Phy modules support only External MII(ae) 802.3 Clause 45 for Copper phy mode. In the MII List there is one default MII Internal interface for the port resident on the board. In addition, two external MII interfaces can be defined for the XAUI card, in an MII or MII(ae) format, to support two Management Data Input Output (MDIO) Devices (MMDs). The MII (ae) format also permits custom, user-defined templates. The XENPAK module and the 10GE LSM LAN 10GBASE-T and Novus 10G

Dual Phy modules support only the MII(ae) external MII format (not the MII type). The templates are:

- MII Internal Template= 'MII Internal'
- External MIIs
  - External MII 802.3 Clause 22= 'MII External'
  - External MII (ae) 802.3 Clause 45= 'MII(ae) External'—includes a set of default templates, and allows to define custom templates.

The MII interface templates are located in the Network Resources Tree, under the in a directory named *MII List*, as shown for a 10GE XAUI module in *Image: MII List (shown for 10 GE XAUI)*.

Image: MII List (shown for 10 GE XAUI)



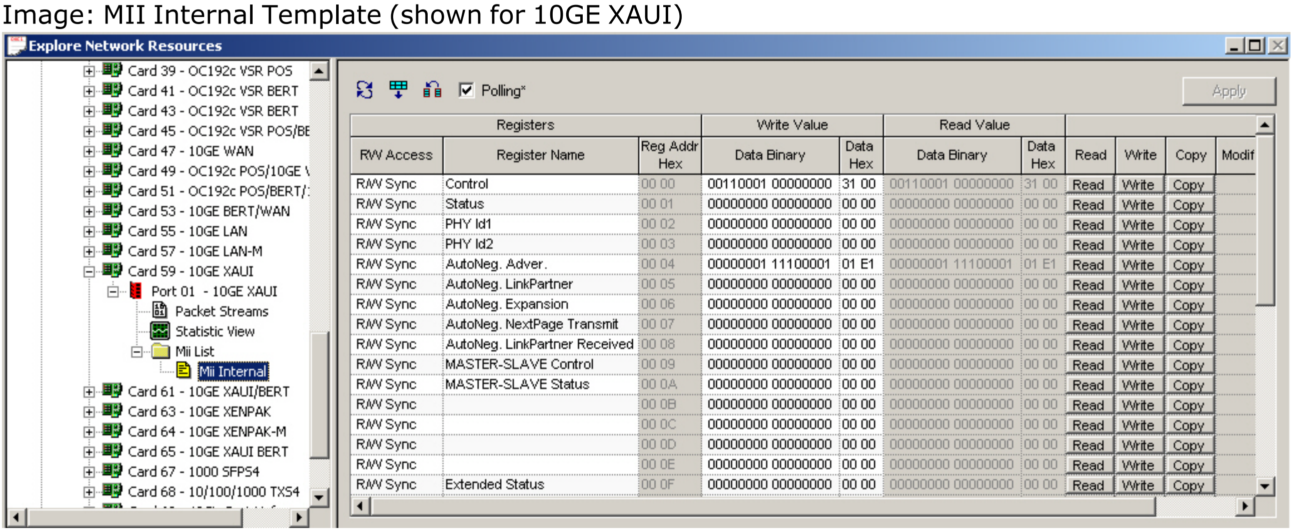
The different types of MII templates available are described in the following sections.

MII Internal Template

An example of an MII Internal template is shown in *Image: MII Internal Template (shown for 10GE XAUI)*.

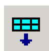
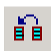
> For MII External:
>
> For information on the MII External template, External MII 802.3 Clause 22.

Image: MII Internal Template (shown for 10GE XAUI)



The fields and controls for this window are described in *Table: Internal MII Template Window*.

Table: Internal MII Template Window

Section	**Controls**	**Usage**
Header	 Refresh (Global Read)	This icon is used to repaint the screen to update all of the values.
	 Global Write	(Applicable for registers that are set to R/W or Write Only.) When this icon is selected, all changes made to the *Write Values* are copied to the registers and the corresponding *Read Values* columns.
	 Global Sync (Copy Read to Write)	(Applicable for registers that are set to R/W or Write Only.) When this icon is selected, the values in the *Read Values* columns are copied to the corresponding *Write Values*.
	Polling	This check box is used to enable the polling function. The MII register values are read (polled) periodically.
		*Apply* button. This global command saves all changes.
Registers	RW Access	Choose one of: Disabled—the register is disabled. Read Only—the information in this register can only be read, not modified. Write Only—this register accepts modifications. R/W—(Read/Write) this register can accept modifications, and those modifications can be read. R/W Sync—(Read/Write Sync) this register can accept modifications.
	Register Name	The user-assigned name for this register.
	Reg Address Hex	(Read-only) The Register Address, exclicked as a hexadecimal.
Write Value	Data Binary	The binary data contained in this register.
	Data Hex	Equivalent of the binary data, exclicked in hexadecimal.
Read Value	Data Binary	The binary data contained in this register.
	Data Hex	Equivalent of the binary data, exclicked in hexadecimal.

Section	Controls	Usage
(Controls)	 Read	(Enabled if Read Only or R/W is selected.) If new binary data has been entered into the *Write Value* column, pressing this button causes the data to be entered into the binary field, starting with LSB and with appropriate addition of '0's. The Data Hex value is also updated to match.
	 Write	(Enabled if Write Only or R/W is selected.) If new binary data has been entered into the *Write Value* column, pressing this button causes the new binary and hex data to be copied into the *Read Value* column.
	 Sync	(Enabled if Write Only or R/W is selected.) When this button is selected, the binary and hex data in the *Read Value* columns is copied to the *Write Value* columns.
Modified		When any of the registers has been modified, an asterisk (*) appears in the *Modified* field of the corresponding row, to remind you that changes have been made, but not applied or copied. When the *Apply* or *Write* button is pushed, the (*) disappears.

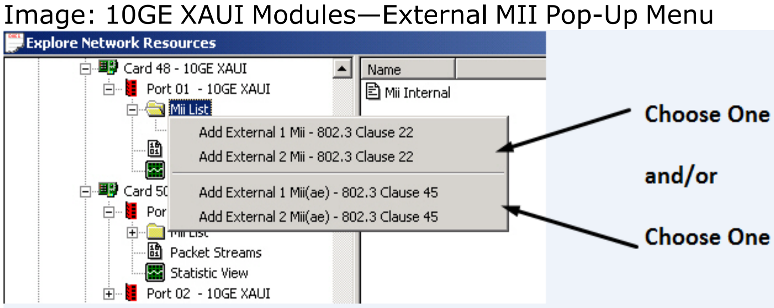
External MIIs

External MII templates may be added to the 10GE XAUI and 10GE XENPAK modules through the MII List pop-up menu selections, as shown in *Image: 10GE XAUI Modules—External MII Pop-Up Menu*:

- External MII 802.3 Clause 22 (1 or 2)—for 10GE XAUI only
- External MII (ae) 802.3 Clause 45 (1 or 2)—for 10GE XAUI, 10GE XENPAK, 10GE LSM LAN 10GBASE-T and Novus 10GE Dual Phy

For the 10GE XENPAK module, *MII(ae) External1 MII* is already listed in the MII List. To set up an External MII for the 10GE XAUI module, first select **MII List** under the port to show the pop-up menu. Then select an option in the menu, to add it to the MII List. A maximum of *one* External 1 MII plus *one* External 2 MII may be added for XAUI. Both MIIs may be Clause 22 or Clause 45 type MIIs, or you may select one MII of each type.

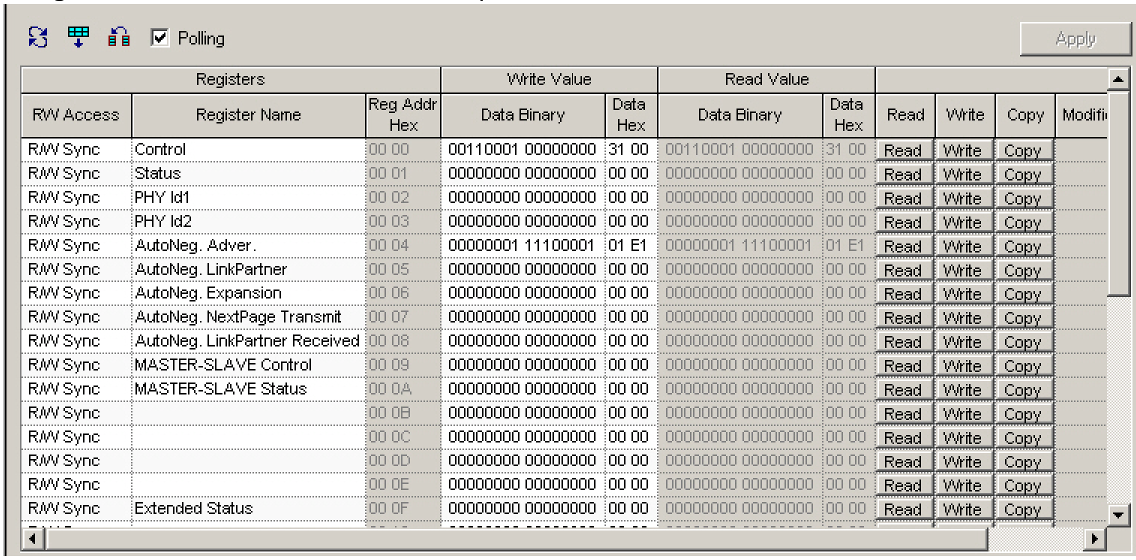
Image: 10GE XAUI Modules—External MII Pop-Up Menu



External MII 802.3 Clause 22

This External MII template is defined per Clause 22 of the IEEE 802.3 standard. An example of this template is shown in *Image: 10GE XAUI–MII External Template–802.3 Clause 22*.

Image: 10GE XAUI–MII External Template–802.3 Clause 22



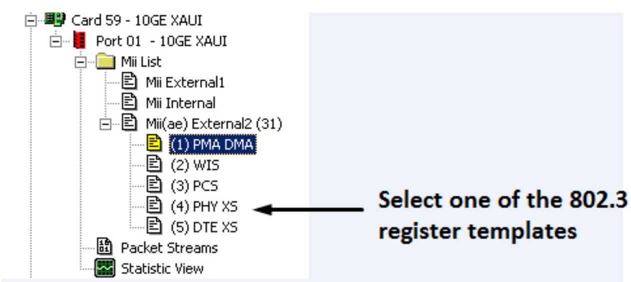
Registers			Write Value		Read Value					
RW Access	Register Name	Reg Addr Hex	Data Binary	Data Hex	Data Binary	Data Hex	Read	Write	Copy	Modifi
R/W Sync	Control	00 00	00110001 00000000	31 00	00110001 00000000	31 00	Read	Write	Copy	
R/W Sync	Status	00 01	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	PHY Id1	00 02	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	PHY Id2	00 03	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	AutoNeg. Adver.	00 04	00000001 11100001	01 E1	00000001 11100001	01 E1	Read	Write	Copy	
R/W Sync	AutoNeg. LinkPartner	00 05	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	AutoNeg. Expansion	00 06	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	AutoNeg. NextPage Transmit	00 07	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	AutoNeg. LinkPartner Received	00 08	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	MASTER-SLAVE Control	00 09	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	MASTER-SLAVE Status	00 0A	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync		00 0B	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync		00 0C	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync		00 0D	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync		00 0E	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	Extended Status	00 0F	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	

The fields and controls for this window operate in the same manner as those for the Internal MII window. Refer to *Table: Internal MII Template Window* for information about the usage.

External MII (ae) 802.3 Clause 45

When *External MII (ae) 802.3 Clause 45* is selected for a 10GE XAUI or XENPAK module, or for a 10GE LSM 10GBASE-T module, or for a Novus 10GE Dual Phy module, a directory of templates is added to the MII list, as shown in *Image: 10GE XAUI and XENPAK—MII Register Templates for 802.3 (ae)*.

Image: 10GE XAUI and XENPAK—MII Register Templates for 802.3 (ae)



This directory includes a standard set of MII registers that are defined per Clause 45 of the IEEE specification for 802.3ae, and include an MII template for each of the following MDIO Manageable Device (MMD) addresses:

- **(1) PMA/PMD—**Physical Media Attachment Sublayer (upper)/Physical Media Dependent Sublayer (lower). These are the two lower sublayers of the PHY device. (Shown in *Image: MII (ae) External Template—PMA/PMD*.)

- **(2) WIS—**WAN Interface Sublayer. An additional, optional PHY sublayer. For the 10GBASE-W interface, it applies a rate control mode to the MAC, resulting in a modification of the data rate to SONET STS-192c/SDH VC-4-64c levels for use with WAN applications. (Shown in *Image: MII (ae) External Template—WIS (partial)*)
- **(3) PCS—**Physical Coding Sublayer. This is the upper sublayer of the PHY device. (Shown in *Image: MII (ae) External Template—PCS (partial).*)
- **(4) PHY XS—**Physical Layer Device XGMII Extender Sublayer (XGXS) at the PHY End of the XAUI interface. (Shown in *Image: MII (ae) External Template—PHY XS (partial).*) (XGMII = 10 Gigabit Media Independent Interface.)
- **(5) DTE XS—**Data Transmission Equipment XGXS at the Reconciliation Sublayer (RS) end of the XAUI interface. (Shown in *Image: MII(ae) External Template—DTE XS*.)
- **(6) TC**—Transmission Convergence (reserved for future use)
- **(7) Auto Negotiation**—The assignment of registers in the Auto Negotiation MMD (MDIO Manageable Device). (Shown in *Image: MII(ae) External Template—Auto Negotiation.*)

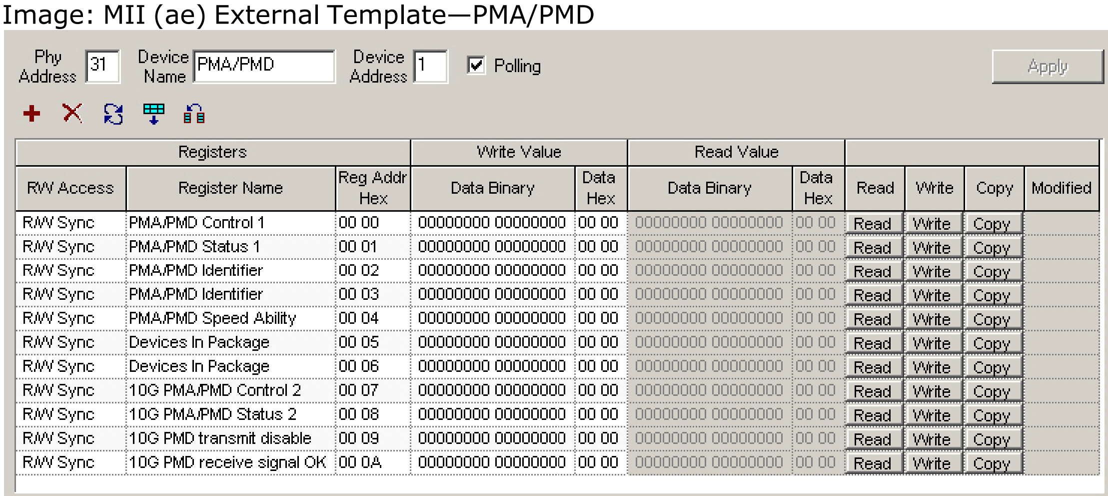
Novus 10GE Dual Phy modules has the following 3 devices instead of 7:

- PMA/PMD
- PCS
- Auto Negotiation.

In addition, User Device MII register templates may be stored in this directory. Refer to User Device MII(ae) Templates for information on how to create User Device templates.

An example of a set of MII(ae) External 802.3–Clause 45 templates for a 10GE XAUI module is shown in *Image: MII (ae) External Template—PMA/PMD* through *Image: MII(ae) External Template—Auto Negotiation*.

Image: MII (ae) External Template—PMA/PMD



Registers			Write Value		Read Value					
RW Access	Register Name	Reg Addr Hex	Data Binary	Data Hex	Data Binary	Data Hex	Read	Write	Copy	Modified
R/W Sync	PMA/PMD Control 1	00 00	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	PMA/PMD Status 1	00 01	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	PMA/PMD Identifier	00 02	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	PMA/PMD Identifier	00 03	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	PMA/PMD Speed Ability	00 04	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	Devices In Package	00 05	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	Devices In Package	00 06	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10G PMA/PMD Control 2	00 07	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10G PMA/PMD Status 2	00 08	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10G PMD transmit disable	00 09	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10G PMD receive signal OK	00 0A	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	

Image: MII (ae) External Template—WIS (partial)

Registers			Write Value		Read Value					
RW Access	Register Name	Reg Addr Hex	Data Binary	Data Hex	Data Binary	Data Hex	Read	Write	Copy	Modified
R/W Sync	WIS Control 1	00 00	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	WIS Status 1	00 01	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	WIS Identifier	00 02	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	WIS Identifier	00 03	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	WIS Speed Ability	00 04	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	Devices In Package	00 05	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	Devices In Package	00 06	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10G WIS Control 2	00 07	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10G WIS Status 2	00 08	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10G WIS Status 3	00 21	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10G WIS J0 Tx	00 23	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10G WIS J0 Rx	00 24	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10G WIS Far End Path Block	00 25	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10G WIS J1 Tx	00 27	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10G WIS J1 Tx	00 28	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	

Image: MII (ae) External Template—PCS (partial)

Registers			Write Value		Read Value					
RW Access	Register Name	Reg Addr Hex	Data Binary	Data Hex	Data Binary	Data Hex	Read	Write	Copy	Modified
R/W Sync	PCS Control 1	00 00	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	PCS Status 1	00 01	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	PCS Identifier	00 02	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	PCS Identifier	00 03	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	PCS Speed Ability	00 04	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	Devices In Package	00 05	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	Devices In Package	00 06	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10G PCS Control 2	00 07	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10G PCS Status 2	00 08	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10GBASE-X PCS Status	00 18	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10GBASE-R PCS Status 1	00 20	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10GBASE-R PCS Status 2	00 21	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10GBASE-R PCS Jitter Test	00 22	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10GBASE-R PCS Jitter Test	00 23	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10GBASE-R PCS Jitter Test	00 24	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	

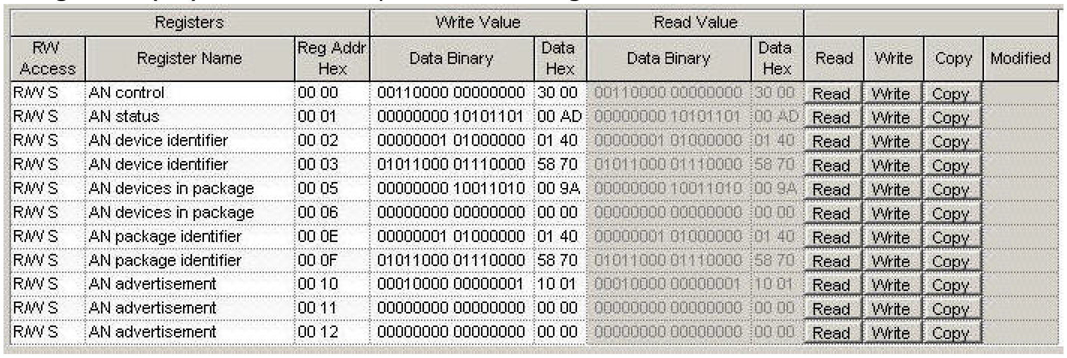
Image: MII (ae) External Template—PHY XS (partial)

Registers			Write Value		Read Value					
RW Access	Register Name	Reg Addr Hex	Data Binary	Data Hex	Data Binary	Data Hex	Read	Write	Copy	Modified
R/W Sync	PHY XS Control 1	00 00	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	PHY XS Status 1	00 01	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	PHY XS Identifier	00 02	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	PHY XS Identifier	00 03	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	PHY XS Speed Ability	00 04	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	Devices In Package	00 05	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	Devices In Package	00 06	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	PHY XS Status 2	00 08	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10G PHY XGXS Lane Status	00 18	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	

Image: MII(ae) External Template—DTE XS

Registers			Write Value		Read Value					
RW Access	Register Name	Reg Addr Hex	Data Binary	Data Hex	Data Binary	Data Hex	Read	Write	Copy	Modified
R/W Sync	DTE XS Control 1	00 00	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	DTE XS Status 1	00 01	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	DTE XS Identifier	00 02	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	DTE XS Identifier	00 03	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	DTE XS Speed Ability	00 04	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	Devices In Package	00 05	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	Devices In Package	00 06	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	DTE XS Status 2	00 08	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W Sync	10G DTE XGXS Lane Status	00 18	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	

Image: MII(ae) External Template—Auto Negotiation



Registers			Write Value		Read Value					
RW Access	Register Name	Reg Addr Hex	Data Binary	Data Hex	Data Binary	Data Hex	Read	Write	Copy	Modified
R/W S	AN control	00 00	00110000 00000000	30 00	00110000 00000000	30 00	Read	Write	Copy	
R/W S	AN status	00 01	00000000 10101101	00 AD	00000000 10101101	00 AD	Read	Write	Copy	
R/W S	AN device identifier	00 02	00000001 01000000	01 40	00000001 01000000	01 40	Read	Write	Copy	
R/W S	AN device identifier	00 03	01011000 01110000	58 70	01011000 01110000	58 70	Read	Write	Copy	
R/W S	AN devices in package	00 05	00000000 10011010	00 9A	00000000 10011010	00 9A	Read	Write	Copy	
R/W S	AN devices in package	00 06	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W S	AN package identifier	00 0E	00000001 01000000	01 40	00000001 01000000	01 40	Read	Write	Copy	
R/W S	AN package identifier	00 0F	01011000 01110000	58 70	01011000 01110000	58 70	Read	Write	Copy	
R/W S	AN advertisement	00 10	00010000 00000001	10 01	00010000 00000001	10 01	Read	Write	Copy	
R/W S	AN advertisement	00 11	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	
R/W S	AN advertisement	00 12	00000000 00000000	00 00	00000000 00000000	00 00	Read	Write	Copy	

Most of the column headings and controls for this window are the same as those found in the External MII and Internal MII windows. Refer to *Table: Internal MII Template Window* for information about the usage.

Additional controls which are unique to the External MII (ae) window are described in *Table: 10GE XAUI, XENPAK, 10GE LSM LAN 10GBASE-T, and Novus 10GE DP External MII (ae) Template Window*

Table: 10GE XAUI, XENPAK, 10GE LSM LAN 10GBASE-T, and Novus 10GE DP External MII (ae) Template Window

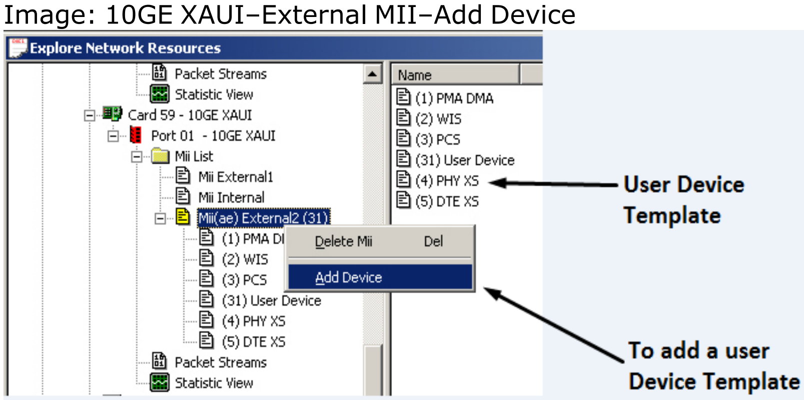
Section	Controls	Usage
Header	Add Register	Adds a new register entry to the bottom of the list of registers. The new 'User Register' is set to 'Read Only' by default.
	Delete Register	Deletes selected Register(s).
	Phy Address	The numerical Phy address.
	Device Name	The name of the (MMD) device being read (for example, 'WIS').
	Device Address	The numerical address of the (MMD) device (for example, '2' for 'WIS').
	Polling	This check box enables the 'Polling' function—reading the MII registers for an MMD in a DUT. The *Apply* button must be selected for polling to begin. NOTE Polling is disabled for Novus 10GE due to reasons related to performance.
	Write	(Enabled if Write Only or R/W is selected.) If new binary data has been entered into the *Write Value* column,

Section	Controls	Usage
	Write	pressing this button causes the new binary and hex data to be copied into the *Read Value* column.

User Device MII(ae) Templates

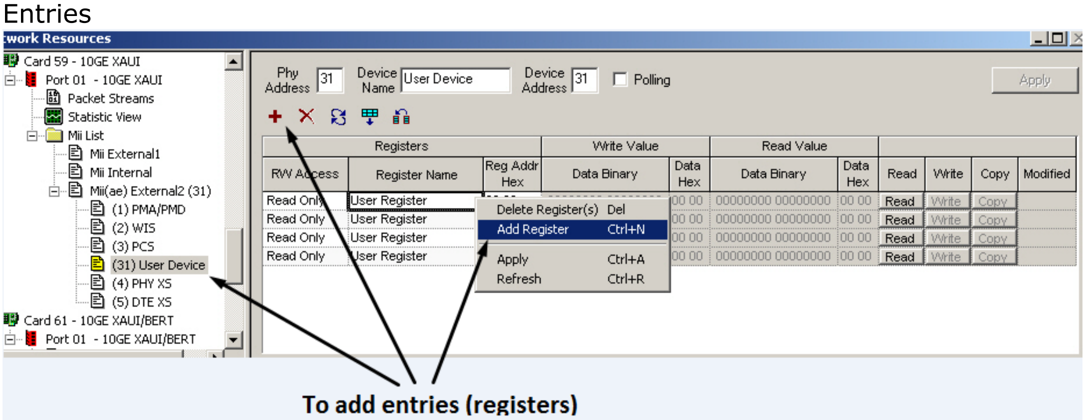
In addition to the standard MII(ae) templates, custom 'User Device' templates can be defined through the context menu below on MII(ae) External 1 or 2. Select *Add Device* as shown in *Image: 10GE XAUI–External MII–Add Device*, and a new, blank template form will be added to the right pane of the Resources window as shown in *Image: 10GE XAUI and XENPAK—User-Defined External MII (ae) Register with User-Defined Register Entries*.

Image: 10GE XAUI–External MII–Add Device



The new, user-defined register template that appears on the right side of the window will not contain any Register entries when it is first appears. Add entries (rows) by selecting in the right side of the window and selecting *Add Register*, using the *Add* icon ( ), or selecting a Device name in the Chassis Chain Tree, as shown in *Image: 10GE XAUI and XENPAK—User-Defined External MII(ae) Register with User-Defined Register Entries*.

Image: 10GE XAUI and XENPAK—User-Defined External MII(ae) Register with User-Defined Register Entries



When the *Add Register* option is selected, the **Add MII(ae) Registers** dialog box appears, as shown in *Image: Add MII(ae) Registers dialog box*.

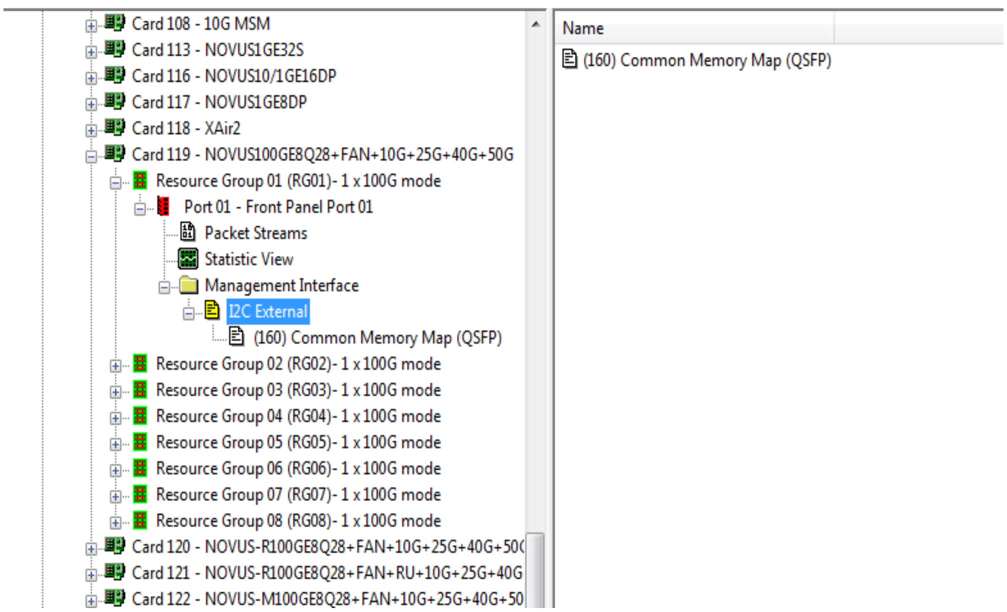
Image: Add MII(ae) Registers dialog box

The configurable fields are described in *Table: Internal MII Template Window* above.

100GE Module MII Registers

Novus 100GE modules with QSFP28 transceivers provides access to additional configuration and status capabilities through an external MII(ae) template that supports a single device accessed though I2C interface.

Image: Image Management Interface for Novus 100GE



External I2C Management Interface

The external management interface registers memory map is defined according to SFF-8636, chapter 6:

- Mandatory lower page 0 with 128 registers (address range 0 to 127)
- Mandatory upper page 0 with 128 registers (address range 128 to 255)
- Optional upper pages each with up to 128 registers (address range 128 to 255)

The current implementation for external I2C management interface supports only the first upper 4 pages (from index 0 to 3). Any attempt to access upper pages greater than upper page 3 will automatically revert to upper page 0.

Image: Lower Page 00h

Registers			Write Value		Read Value					
RW Access	Register Name	Reg Addr	Data Binary	Data Hex	Data Binary	Data A/H	Read	Write	Copy	Modified
Read	Identifier	00	00000000	00	00000000	00 00				
Read	Status - Revision Compliance	01	00000000	00	00000000	00 00				
Read	Status	02	00000000	00	00000000	00 00				
Read	Interrupt Flags - Latched TX/RX LOS indicator	03	00000000	00	00000000	00 00				
Read	Interrupt Flags - Latched TX fault indicator	04	00000000	00	00000000	00 00				
Read	Interrupt Flags - Channel Tx CDR Loss of Lock Flag	05	00000000	00	00000000	00 00				
Read	Interrupt Flags - L-Temp	06	00000000	00	00000000	00 00				
Read	Interrupt Flags - L-Vcc	07	00000000	00	00000000	00 00				
Read	Interrupt Flags - Vendor Specific	08	00000000	00	00000000	00 00				
Read	Interrupt Flags - L-Rx1/Rx2 Power	09	00000000	00	00000000	00 00				
Read	Interrupt Flags - L-Rx3/Rx4 Power	0A	00000000	00	00000000	00 00				
Read	Interrupt Flags - L-Tx1/Tx2 Bias	0B	00000000	00	00000000	00 00				
Read	Interrupt Flags - L-Tx3/Tx4 Bias	0C	00000000	00	00000000	00 00				
Read	Interrupt Flags - L-Tx1/Tx2 PWR	0D	00000000	00	00000000	00 00				
Read	Interrupt Flags - L-Tx3/Tx4 PWR	0E	00000000	00	00000000	00 00				
Read	Interrupt Flags - Reserved channel monitor flags	0F	00000000	00	00000000	00 00				
Read	Interrupt Flags - Reserved	10	00000000	00	00000000	00 00				
Read	Interrupt Flags - Reserved	11	00000000	00	00000000	00 00				
Read	Interrupt Flags - Reserved	12	00000000	00	00000000	00 00				
Read	Interrupt Flags - Vendor Specific	13	00000000	00	00000000	00 00				
Read	Interrupt Flags - Vendor Specific	14	00000000	00	00000000	00 00				
Read	Interrupt Flags - Vendor Specific	15	00000000	00	00000000	00 00				
Read	FREE SIDE MONITORING VALUES - Temperature MSB	16	00000000	00	00000000	00 00				
Read	FREE SIDE MONITORING VALUES - Temperature LSB	17	00000000	00	00000000	00 00				
Read	FREE SIDE MONITORING VALUES - Reserved	18	00000000	00	00000000	00 00				
Read	FREE SIDE MONITORING VALUES - Reserved	19	00000000	00	00000000	00 00				

Image: Upper Page 00h

Upper Memory Page Select 0 Polling Apply

Registers			Write Value		Read Value					
RW Access	Register Name	Reg Addr	Data Binary	Data Hex	Data Binary	Data A/H	Read	Write	Copy	Modified
Read	Identifier	80	00000000	00	00000000	00 00				
Read	Ext. Identifier	81	00000000	00	00000000	00 00				
Read	Connector	82	00000000	00	00000000	00 00				
Read	Specification Compliance	83	00000000	00	00000000	00 00				
Read	Specification Compliance	84	00000000	00	00000000	00 00				
Read	Specification Compliance	85	00000000	00	00000000	00 00				
Read	Specification Compliance	86	00000000	00	00000000	00 00				
Read	Specification Compliance	87	00000000	00	00000000	00 00				
Read	Specification Compliance	88	00000000	00	00000000	00 00				
Read	Specification Compliance	89	00000000	00	00000000	00 00				
Read	Specification Compliance	8A	00000000	00	00000000	00 00				
Read	Encoding	8B	00000000	00	00000000	00 00				
Read	BR Nominal	8C	00000000	00	00000000	00 00				
Read	Extended Rate Select Compliance	8D	00000000	00	00000000	00 00				
Read	Length(SMF)	8E	00000000	00	00000000	00 00				
Read	Length(OM3 50um)	8F	00000000	00	00000000	00 00				
Read	Length(OM2 50um)	90	00000000	00	00000000	00 00				
Read	Length(OM1 62.5um)	91	00000000	00	00000000	00 00				
Read	Length(Passive or Active)	92	00000000	00	00000000	00 00				
Read	Device Tech	93	00000000	00	00000000	00 00				
Read	Vendor Name	94	00000000	00	00000000					
Read	Vendor Name	95	00000000	00	00000000					
Read	Vendor Name	96	00000000	00	00000000					
Read	Vendor Name	97	00000000	00	00000000					
Read	Vendor Name	98	00000000	00	00000000					
Read	Vendor Name	99	00000000	00	00000000					
Read	Vendor Name	9A	00000000	00	00000000					

Upper Page 01h - It is optional and is present if bit 2, register 221 from upper page 0 is high.

Image: Upper Page 01h

Upper Memory Page Select 1 Polling Apply

Registers			Write Value		Read Value					
RW Access	Register Name	Reg Addr	Data Binary	Data Hex	Data Binary	Data A/H	Read	Write	Copy	Modified
Read	CC APPS	80	00000000	00	00000000	00 00				
Read	AST Table Lenght (TL)	81	00000000	00	00000000	00 00				
Read	Application Code Entry 0	82	00000000	00	00000000	00 00				
Read	Application Code Entry 0	83	00000000	00	00000000	00 00				
Read	Application Code Entry 1	84	00000000	00	00000000	00 00				
Read	Application Code Entry 1	85	00000000	00	00000000	00 00				
Read	Other Entries	86	00000000	00	00000000	00 00				
Read	Other Entries	87	00000000	00	00000000	00 00				
Read	Other Entries	88	00000000	00	00000000	00 00				
Read	Other Entries	89	00000000	00	00000000	00 00				
Read	Other Entries	8A	00000000	00	00000000	00 00				
Read	Other Entries	8B	00000000	00	00000000	00 00				
Read	Other Entries	8C	00000000	00	00000000	00 00				
Read	Other Entries	8D	00000000	00	00000000	00 00				
Read	Other Entries	8E	00000000	00	00000000	00 00				
Read	Other Entries	8F	00000000	00	00000000	00 00				
Read	Other Entries	90	00000000	00	00000000	00 00				
Read	Other Entries	91	00000000	00	00000000	00 00				
Read	Other Entries	92	00000000	00	00000000	00 00				
Read	Other Entries	93	00000000	00	00000000	00 00				
Read	Other Entries	94	00000000	00	00000000	00 00				
Read	Other Entries	95	00000000	00	00000000	00 00				
Read	Other Entries	96	00000000	00	00000000	00 00				
Read	Other Entries	97	00000000	00	00000000	00 00				
Read	Other Entries	98	00000000	00	00000000	00 00				
Read	Other Entries	99	00000000	00	00000000	00 00				
Read	Other Entries	9A	00000000	00	00000000	00 00				

Upper Page 02h - It is optionally provided as user writable EEPROM.

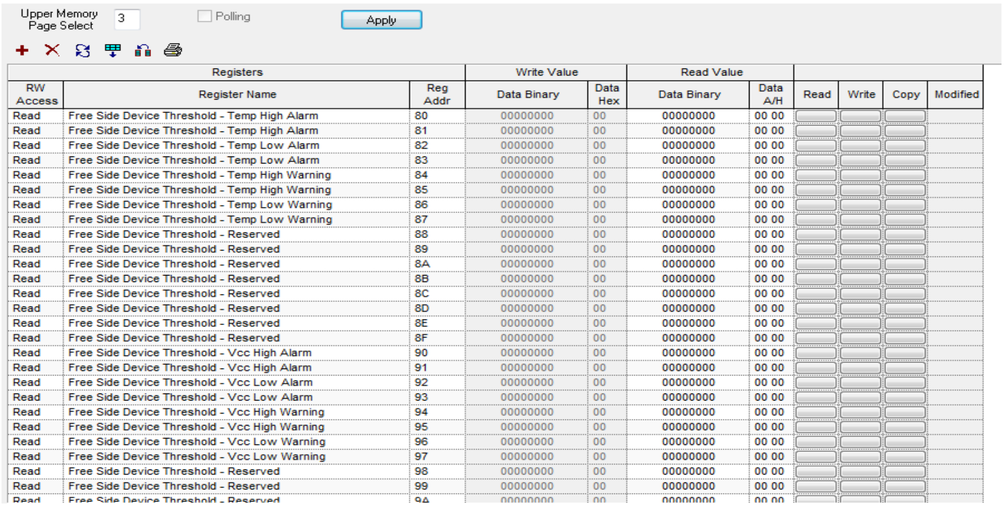
Image: Upper Page 02h

Upper Memory Page Select 2 Polling Apply

Registers			Write Value		Read Value					
RW Access	Register Name	Reg Addr	Data Binary	Data Hex	Data Binary	Data A/H	Read	Write	Copy	Modified
Read	User EEPROM Data	80	00000000	00	00000000	00 00				
Read	User EEPROM Data	81	00000000	00	00000000	00 00				
Read	User EEPROM Data	82	00000000	00	00000000	00 00				
Read	User EEPROM Data	83	00000000	00	00000000	00 00				
Read	User EEPROM Data	84	00000000	00	00000000	00 00				
Read	User EEPROM Data	85	00000000	00	00000000	00 00				
Read	User EEPROM Data	86	00000000	00	00000000	00 00				
Read	User EEPROM Data	87	00000000	00	00000000	00 00				
Read	User EEPROM Data	88	00000000	00	00000000	00 00				
Read	User EEPROM Data	89	00000000	00	00000000	00 00				
Read	User EEPROM Data	8A	00000000	00	00000000	00 00				
Read	User EEPROM Data	8B	00000000	00	00000000	00 00				
Read	User EEPROM Data	8C	00000000	00	00000000	00 00				
Read	User EEPROM Data	8D	00000000	00	00000000	00 00				
Read	User EEPROM Data	8E	00000000	00	00000000	00 00				
Read	User EEPROM Data	8F	00000000	00	00000000	00 00				
Read	User EEPROM Data	90	00000000	00	00000000	00 00				
Read	User EEPROM Data	91	00000000	00	00000000	00 00				
Read	User EEPROM Data	92	00000000	00	00000000	00 00				
Read	User EEPROM Data	93	00000000	00	00000000	00 00				
Read	User EEPROM Data	94	00000000	00	00000000	00 00				
Read	User EEPROM Data	95	00000000	00	00000000	00 00				
Read	User EEPROM Data	96	00000000	00	00000000	00 00				
Read	User EEPROM Data	97	00000000	00	00000000	00 00				
Read	User EEPROM Data	98	00000000	00	00000000	00 00				
Read	User EEPROM Data	99	00000000	00	00000000	00 00				
Read	User EEPROM Data	9A	00000000	00	00000000	00 00				

Upper Page 03h - It is optional and is present if bit 2, register 2 from lower page 0 is low.

Image: Upper Page 03h



Registers			Write Value		Read Value					
RW Access	Register Name	Reg Addr	Data Binary	Data Hex	Data Binary	Data A/H	Read	Write	Copy	Modified
Read	Free Side Device Threshold - Temp High Alarm	80	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Temp High Alarm	81	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Temp Low Alarm	82	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Temp Low Alarm	83	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Temp High Warning	84	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Temp High Warning	85	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Temp Low Warning	86	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Temp Low Warning	87	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Reserved	88	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Reserved	89	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Reserved	8A	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Reserved	8B	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Reserved	8C	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Reserved	8D	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Reserved	8E	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Reserved	8F	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Vcc High Alarm	90	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Vcc High Alarm	91	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Vcc Low Alarm	92	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Vcc Low Alarm	93	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Vcc High Warning	94	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Vcc High Warning	95	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Vcc Low Warning	96	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Vcc Low Warning	97	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Reserved	98	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Reserved	99	00000000	00	00000000	00 00				
Read	Free Side Device Threshold - Reserved	9A	00000000	00	00000000	00 00				

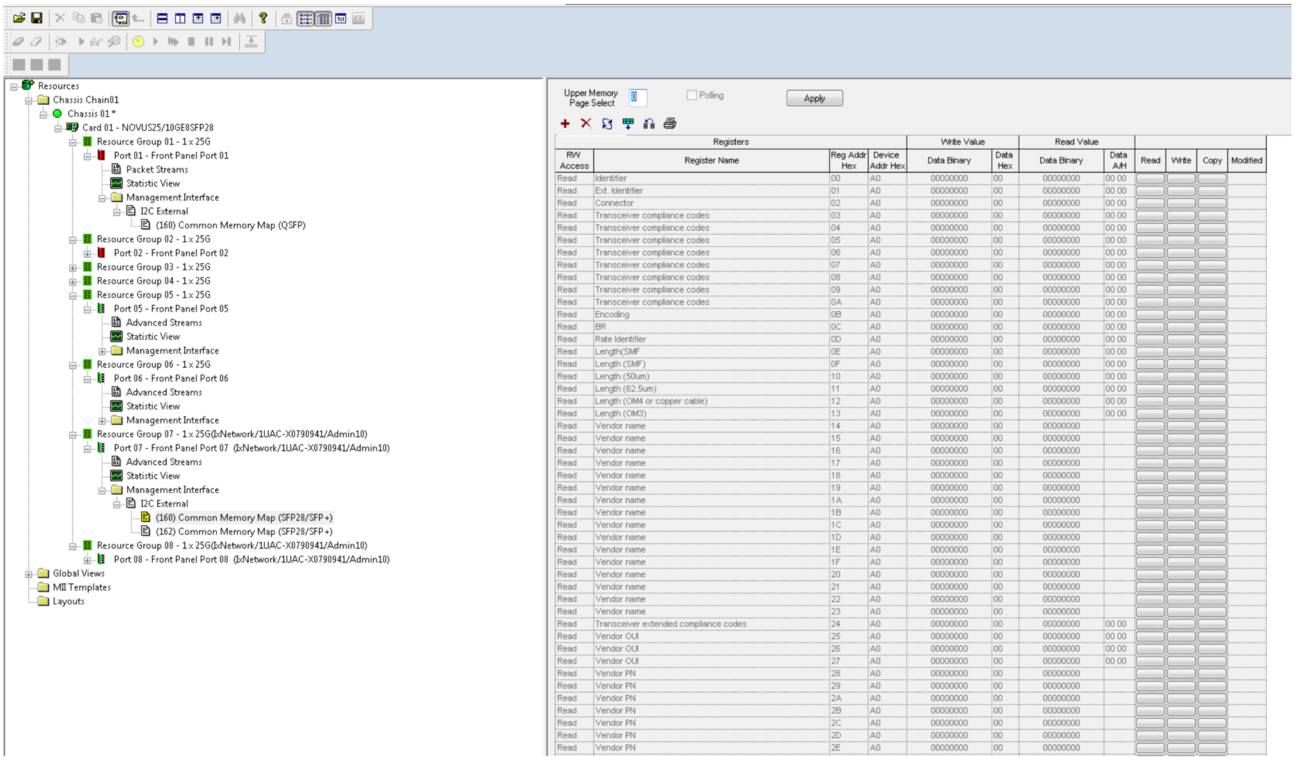
NOTE Most of the column headings and controls for this window are the same as those found in the External MII and Internal MII windows. Refer to Table: Internal MII Template Window for information about the usage.

Additional controls which are unique to the External MII2c window are described in the following table:

Section	Controls	Usage
Header	Upper Memory Page Select	Selects the upper page address. NOTE Only indices from 0 to 3 are allowed. Any value bigger than 3 is reverted to 0.
	Polling	This field is disabled for Novus 100G QSFP due to performance reasons

NOVUS25/10GE8SFP28 Module MII Registers

NOVUS25/10GE8SFP28 module provides access to additional configuration and status capabilities through an external MII(ae) template that supports a single device accessed though SFP+ interface. To see the descriptions of the fields and controls of MII registers, see MII Internal Template.



Management Interface for SFP+

The external management interface registers memory map is defined according to chapter 4 of SFF-8472.

Data fields of address A0H are described in the following table:

A0h	#Bytes	Field	Description
0	1	Identifier	Type of transceiver
1	1	Ext. Identifier	Extended identifier of type of transceiver.
2	1	Connector	Code for connector type.
3-10	8	Transceiver	Code for electronic or optical community.
11	1	Encoding	Code for high speed serial encoding algorithm.
12	1	BR, Nominal	Nominal signalling rate, units of 100 MBd.
13	1	Rate Identifier	Type of rate selected functionality.
14	1	Length (SMF, km)	Link length supported for single mode fiber, units of km
15	1	Length (SMF)	Link length supported for single mode fiber, units of 100 m
16	1	Length (50	Link length supported for 50 um OM2 fiber, units of 10 m

A0h	#Bytes	Field	Description
		um)	
17	1	Length (62.5um)	Link length supported for 62.5 um OM1 fiber, units of 10 m
18	1	Length (OM4 or copper cable)	Link length supported for 50um OM4 fiber, units of 10m. Alternatively copper or direct attach cable, units of m
19	1	Length (OM3)	Link length supported for 50 um OM3 fiber, units of 10 m
20-35	16	Vendor name	SFP vendor name (ASCII)
36	1	Transceiver	Code for electronic or optical compatibility
37-39	3	Vendor OUI	SFP vendor IEEE company ID
40-55	16	Vendor PN	Part number provided by SFP vendor (ASCII)
56-59	4	Vendor rev	Revision level for part number provided by vendor (ASCII)
60-61	2	Wavelength	Laser wavelength (Passive/Active Cable Specification Compliance)
62	1	Unallocated	
63	1	CC_BASE	Check code for Base ID Fields (addresses 0 to 62)
64-65	2	Options	Indicates which optional transceiver signals are implemented
66	1	BR, max	Upper bit rate margin, units of % (see details for rates > 25.4 Gb/s)
67	1	BR, min	Lower bit rate margin, units of % (see details for rates > 25.4 Gb/s)
68-83	16	Vendor SN	Serial number provided by vendor (ASCII)
84-91	8	Date code	Vendor's manufacturing date code
92	1	Diagnostic Monitoring Type	Indicates which type of diagnostic monitoring is implemented (if any) in the transceiver
93	1	Enhanced Options	Indicates which optional enhanced features are implemented (if any) in the transceiver
94	1	SFF-8472 Compliance	Indicates which revision of SFF-8472 the transceiver complies with.

A0h	#Bytes	Field	Description
95	1	CC_EXT	Check code for the Extended ID Fields (addresses 64 to 94)
96-127	32	Vendor Specific	Vendor Specific EEPROM
128-255	128	Reserved	Reserved for SFF-8079

Data fields of address A2H are described in the following table:

A2h	#Bytes	Fields	Description
0-39	40	A/W Thresholds	Diagnostic Flag Alarm and Warning Thresholds
40-55	16	Optional A/W Thresholds	Thresholds for optional Laser Temperature and TEC Current alarms and warnings
56-91	36	Ext Cal Constants	Diagnostic calibration constants for optional External Calibration
92-94	3	Unallocated	
95	1	CC_DMI	Check code for Base Diagnostic Fields
96-105	10	Diagnostics	Diagnostic Monitor Data (internally or externally calibrated)
106-109	4	Optional Diagnostics	Monitor Data for Optional Laser temperature and TEC current
110	1	Status/Control	Optional Status and Control Bits
111	1	Reserved	Reserved for SFF-8079
112-113	2	Alarm Flags	Diagnostic Alarm Flag Status Bits
114	1	Unallocated	
115	1	CDR Unlocked	Optional flags indicating that Tx or Rx CDR is unlocked
116-117	2	Warning Flags	Diagnostic Warning Flag Status Bits
118-119	2	Ext Status/Control	Extended module control and status bytes
120-126	7	Vendor Specific	Vendor specific memory addresses

127	1	Table Select	Optional Page Select

Data fields of page 00-01h are described in the following table:

A2h	**#Bytes**	**Fields**	**Description**
128-247	120	User EEPROM	User writable non-volatile memory
248-255	8	Vendor Control	Vendor specific control addresses

Data fields of page 02h are described in the following table:

A2h	**#Bytes**	**Fields**	**Description**
128-129	2	Reserved	Reserved for SFF-8690 (Tunable Transmitter)
130	1	Reserved	Reserved for future receiver controls
131	1	Rx Decision Threshold	RDT value setting
132-172	41	Reserved	Reserved for SFF-8690
173-255	83	Unallocated	

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CHAPTER 45

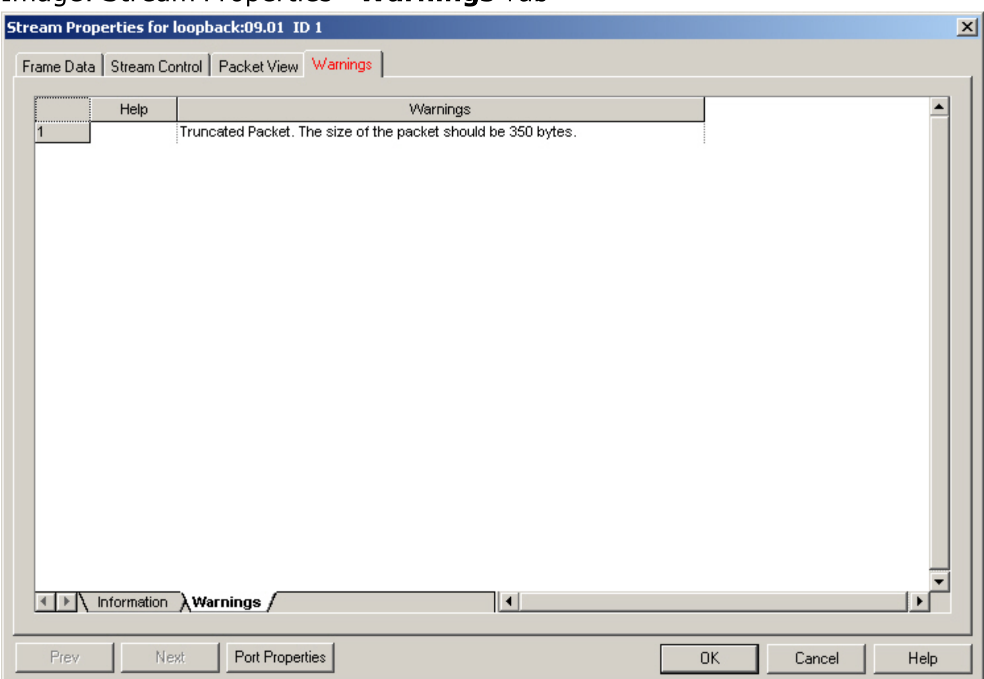
Stream Properties —Warnings/Information Messages

Various Stream Properties Warning and Information messages are provided in IxExplorer to inform you of various stream configuration conditions. These messages concern memory usage, overlapping of user-defined fields, and so forth.

Stream Properties Warnings Tab

The **Warnings** tab in the *Streams Properties* dialog box is shown in *Image: Stream Properties—**Warnings** Tab.*

Image: Stream Properties—**Warnings** Tab



This tab consists of two sub-tab views:

- *List of Warnings*—The Warning messages specify conditions which can impact performance and traffic, including available memory
- *List of Information Messages*—The Information messages specify less serious conditions concerning memory usage, and so forth.

The *Warnings* and *Information* sub-tabs each have three columns:

- The first column assigns a number to each Warning or Information message, to indicate the order in which it was received.
- The second column is labeled *Help*, and will eventually contain links to Help information concerning the warning.
- The third column contains the Warning or Information message.

Warning and Information Message Generation

Each time an error occurs, the IxExplorer software goes through a cycle of checking the entire list of possible error messages, and shows the message list with the new error included. The numbering on the left-hand side of the page reflects the order of messages. The first message in the table, listed as '1,' indicates the first error that generated an error message during the checking cycle; '2' is the second error found, and so forth.

CHAPTER 46

IxVM

IxVM is Ixia's virtual test port product that enables you to use Linux virtual machines (VMs) to generate test traffic.

This section describes how to use IxVM.

Discovery Server

Discovery Server is a service that finds IxVM enabled appliances that can be added as an IxVM load module to participate in a test. Discovery Server is available for download on the IxVM page of Ixia's website.

In Discovery Server, IxVM cards are called endpoints.

NOTE For Discovery Server to work, the Windows VM on which IxServer and Discovery Server are installed must be registered to a DNS server that can respond to queries for the VMs’ hostnames.

Discovering Endpoints

There are four types of discovery you can use to discover IxVM test ports:

- Manual Discovery allows you to discover endpoints within a specific address range.
- VMware Discovery finds all VMs running on the ESX(i) host, including those not running IxVM. Although it will discover non-IxVM VMs, it will not add them to list of available cards. VMware discovery is the slowest form of discovery. VMware Discovery is useful for conducting a server-wide search for IxVM, because VMware Discovery is not limited to a particular subnet.
- Broadcast Discovery finds endpoints by sending packets to the broadcast address of the subnets that the endpoints are on. Broadcast is the quickest way to find IxVM endpoints. Broadcast Discovery can be used when IxVM has been deployed into an ESX(i) environment where the IxVM Server and Discovery Server are on the same LAN as the IxVM test ports.
- XenKvm Discovery finds all VMs running on Xen/Kvm host, that have been deployed using the Ixia Mass Deployment Tool or manually using the Ixia .sh file. XenKvm discovery is the slowest form of discovery. XenKvm Discovery is useful for conducting a server-wide search for IxVM, because XenKvm Discovery is not limited to a particular subnet.

Discovery Server also includes an Automatic Discovery feature; this type of discovery maintains communication with endpoints that have already been discovered through Broadcast Discovery. The number of endpoints that have been discovered through **Broadcast Discovery** appears on this tab. If you need to purge the list of endpoints and re-discover them, select CLEAR DISCOVERED ENDPOINTS.

To find endpoints:

1. After you have configured Discovery Server, start the discovery process using the following command:
   Server | Discovery | Start Broadcast Discovery
   Discovery Server starts the discovery process.
2. Select the **Automatic Discovery** tab, and monitor the count of VMs found and the messages that appear during the discovery process.

   When the discovery process has finished, the following message appears in the message area of the window:

Broadcast Discovery: Broadcast Completed

Configuring Discovery Server

Use the following procedure to configure Discovery Server.

To configure Discovery Server:

1. Start Discovery Server using the following command:
   START | ALL PROGRAMS | IXIA | IXIA DISCOVERY SERVER | IXIA DISCOVERY SERVER
   Discovery Server starts, and minimizes to the tray.
2. Double-click the DISCOVERY SERVER icon.
3. Select the **BROADCAST DISCOVERY** tab.

   The Broadcast Addresses list contains the list of IP addresses configured in the VM. For some installations, this may include the address of the IxVM management port (the first LAN connection), and the second LAN connection. Discovery Server shows the IP addresses for all the network adapters configured on the Windows VM so that you can select the networks that you want to search for IxVM cards.
4. Select the **VMWARE DISCOVERY** tab.

   Add the Hypervisor credentials for each hypervisor on which you deployed IxVM appliances You create a virtual machine on a hypervisor or on a server and then add the server IP, user name and password. Add them to the Server list. You can then discover the IxVM machines that you have created on that server.
5. Select the **XENKVM DISCOVERY** tab.

Add the Hypervisor credentials for the Xen or Kvm hypervisor on which you deployed IxVM appliances similarly as that for VMware.

NOTE On the Server menu, select Discovery and then select Start All plugins. This starts the Discovery and all plugins on VMware and Xen. If you have not configured the Discovery server on VMware or Xen, then it does not go through the plugin.

Adding IxVM Cards Manually

If you do not want to or cannot use Discovery Server to find IxVM cards, you can add the cards manually.

To add IxVM cards manually, perform the following steps:

1. Start the test application (IxExplorer, IxNetwork, or IxLoad) and connect to the IxVM Server IP address (LOCALHOST, if you are using IxExplorer on the Windows VM).

2. Select the new Chassis, and then select **ADD PORTS TO CHASSIS**.

   You can add additional IxVM cards as you add a virtual card to a new virtual slot in a virtual chassis. There are two types of virtual cards that you can add - Single-port and Multi-NIC.

   A single plus sign card icon indicates that you can add a single-port card; a multiple plus sign card icon indicates that you can add a multi-port card. You use the plus sign port icon to add additional ports to a multiple-port card. Single-port cards are identified with a checked checkbox in the Single port column.
3. In the **MANAGEMENT IP ADDRESS** field, enter the management IP address of the Linux machine with the IxVM software agent installed.
4. Select the **Pro Mode** check box to denote the promiscuous or non-promiscuous mode in which a virtual port is added to a virtual card.

   NOTE In most of the test scenarios you must select the Pro Mode check box. In this case, the virtual switch also needs to be set to accept promiscuous mode.
5. The **SOURCE MAC** field shows the MAC address of the test interface (the interface from the virtual machine). Although it can be edited, it does not modify the MAC address of the virtual machine.
6. You can use the **Link MTU** column to modify the MTU value of each test interface from a virtual machine. The minimum value is 1500 and the maximum value is 9000 and should be changed mainly when there are control plane frames bigger than 1500.
7. Each IxVM card has a keep-alive mechanism between the virtual chassis and the virtual card. In case either of these two components do not send or receive a keep-alive message for a certain amount of time, then the virtual card will disconnect from the virtual chassis. By default, the keep-alive timeout is 60 seconds. You can change this from the KEEP ALIVE field, when adding a virtual card.

   NOTE In case the network is not very stable, and you are doing tests with a high number of IxVM ports or cards or the hypervisor is very loaded, it is advised to change the keep-alive timeout to a bigger value (e.g. 120 seconds).
8. In the **PORT TYPE** field, select the port type. Options include the following:
   - L23: Generates layer 2-3 traffic for use with IxNetwork only.
   - L47: Generates layer 4-7 traffic for use with IxLoad only.
9. In the **TEST PORT NAME** field, enter the name of the port on the IxVM card to be used for traffic generation and measurement.
10. In the **LINE SPEED** field, select the line speed. Options include the following:
    - 100MBPS
    - 1000MBPS: 1 Gb speed
    - 10000MBPS: 10 Gb speed
11. Continue adding ports for each VM to be used as an IxVM card (use the plus and icon to add more cards or ports).

NOTE Limitations in the current open kernel of RedHat Enterprise Linux 5.x do not allow it to receive stateful traffic between ports on the same card. If you want to use stateful traffic, you must transmit from one card to another.

Virtual Load Modules

Ixia virtual load modules are of multi-port types. Multi-port load modules have multiple interfaces for generating test traffic.

All Ixia virtual load modules require one interface for management traffic, and at least one interface to generate test traffic.

Multi-port modules are virtual appliances operating in a mode that supports the management interface and one or more test traffic interfaces. On a multi-port load module, the resources are distributed across multiple test ports. On a multiport load module, eth0 interface is the card management interface, and eth1through ethN are the multiple test interfaces. With a multi-port load module, the test traffic and the emulated routing topology may traverse multiple virtual networks. One virtual chassis can control up to 32 virtual load modules.

Converting Multiport load modules

You can convert a a multi-port load module with a single test port into a multiport load module with n number of test ports. You can also add ports to an existing multi-port load module. There are three tasks required for this process:

1. For each test port that you want to add, create an additional test network.
2. Add the additional test ports to the virtual load module.
3. In the test application (IxExplorer, IxNetwork, or IxLoad), add or discover the ports added to the load module.

You can add other test port interfaces to a multi-port card with a single test port.

Create the Additional Test Networks

If you are adding ports to a multi-port card, each port should have its own network in vSphere. Use the procedure below to create an additional test network.

To create an additional test network in vSphere:

1. Login to vSphere client.
2. Select the ESX(i) host.
3. Select the **CONFIGURATION** tab.
4. In the Hardware area, select NETWORKING.
5. Select ADD NETWORKING (upper right).

   The Add Network Wizard appears, with the Connection Type set to Virtual Machine.
6. Select NEXT.

   The Network Access pane shows.
7. Select CREATE A VIRTUAL SWITCH, then select NEXT.

8. In the NETWORK LABEL field, enter a label for the additional test network, then select NEXT, then select FINISH.

Add Ports to the Load Module in vSphere client

To add ports to a virtual load module, use the procedure below. To add ports to a virtual load module:

1. Login to vSphere client.
2. Select the VM you want to add ports to.
3. SHUT DOWN or POWER OFF the VM.
4. Select the VM, and then select EDIT VIRTUAL MACHINE on the **Getting Started** tab
   The Virtual Machine Properties window appears.
5. On the **Hardware** tab, select ADD.
   The Add Hardware wizard appears, with the Device Type pane selected.
6. Select Ethernet Adapter, then select NEXT.
   The Network Connection pane appears.
7. In the Adapter Type field, select VMXNET3.
   In the Network Label field, select the destination test network, then select NEXT, then select FINISH.
8. Repeat steps 4-8 for any additional ports you want to add.
9. Select OK to close the window.
10. Power on the VM.

IxExplorer: Adding a Multi-port Card

In IxExplorer, after adding ports to a card, you must manually add (or re-add) a card to the card list.

To manually add a multi-port card to an IxVM chassis:

1. In vSphere client, select the chassis, select CONSOLE, and login to Windows.
2. Start IxExplorer.
3. Select the chassis, and then select PROPERTIES.
4. Select VIRTUAL PORTS.
5. If the card you added ports to is already in the card list, select the card, and remove it.
6. Select the MULTI-ADD CARD (the +++Card) button.
   IxExplorer adds the card as a multi-port card (the SINGLE-NIC checkbox is not checked).
7. Select the card, then select ADD PORT. Repeat for each additional port you are want to add.
8. Select OK.
   In the chassis/card/port list, the card should now show multiple ports.

IxExplorer VM Statistics

The following table shows IxVM virtual statistics and their details:

Virtual Statistics	Statistics Description	API Statistics Name
IPv4 Packets Received	The number of IPv4 packets received	ipPackets
TCP Packets Received	The number of TCP packets received	tcpPackets
UDP Packets Received	The number of UDP packets received	udpPackets
User Defined Stat Byte Count 1	The number of bytes for the packets that meet the criteria set up using the filter command. This counter is available when stat mode is set to statNormal.	userDefinedStatByteCount1
User Defined Stat Byte Count 2	The number of bytes for the packets that meet the criteria set up using the filter command. This counter is available when stat mode is set to statNormal.	userDefinedStatByteCount2
Link State	'Up' when a link is established with another device, 'Down' when there is no connection to another device	link
Line Speed	'100' or '1000' (denoting Mbps)	lineSpeed
Frames Sent	A counter that increments only when a frame is successfully transmitted. This counter does not count collision attempts.	framesSent
Valid Frames Received	The valid frame size from 64 bytes to 1518 bytes inclusive of FCS, exclusive of preamble and SFD and must be an integer number of octets. This 32 bit counter only counts frames with good FCS. VLAN tagged frames that are greater than 1518 but less than 1522 bytes in size are also counted by this counter.	framesReceived
Valid Frames Received Rate	The valid frame size from 64 bytes to 1518 bytes inclusive of FCS, exclusive of preamble and SFD and must be an integer number of octets. This 32 bit counter only counts frames with good FCS. VLAN tagged frames that are	framesReceived

Virtual Statistics	Statistics Description	API Statistics Name
	greater than 1518 but less than 1522 bytes in size are also counted by this counter.	
Bytes Sent	A counter that counts the total number of bytes transmitted	bytesSent
Bytes Sent Rate	A counter that counts the total number of bytes transmitted	bytesSent
Bytes Received	A counter that counts the total number of bytes received	bytesReceived
Bytes Received Rate	A counter that counts the total number of bytes received	bytesReceived
Vlan Tagged Frames	A counter that counts the number of VLAN tagged frames	vlanTaggedFramesReceived
User Defined Stat 1	Counters that increment each time the statistic conditions are met. The user-defined statistics conditions are set up in the Capture Filter window.	userDefinedStat1
User Defined Stat 2	Counters that increment each time the statistic conditions are met. The user-defined statistics conditions are set up in the Capture Filter window.	userDefinedStat2
Capture Trigger (UDS 3)	A counter that increments each time the capture trigger conditions are met, as in the Capture Filter window.	captureTrigger
Capture Filter (UDS 4)	A counter that increments each time the capture trigger conditions are met, as in the Capture Filter window.	captureFilter
User Defined Stat 5	Counters that increment each time the statistics conditions are met. The user-defined statistics conditions are set up in the Capture Filter window.	streamTrigger1
User Defined Stat 6	Counters that increment each time the statistics conditions are met. The user-defined statistics conditions are set up in the Capture Filter window.	streamTrigger2
ProtocolServer Trasmit	Packets transmitted by the protocol handler	protocolServerTx

Virtual Statistics	**Statistics Description**	**API Statistics Name**
ProtocolServer Receive	Packets received by the protocol handler	protocolServerRx
Transmit Arp Reply	Numbers of ARP replies generated	txArpReply
Transmit Arp Request	Numbers of ARP request generated	txArpRequest
Transmit Ping Reply	Number of Ping replies generated	txPingReply
Transmit Ping Request	Number of Ping requests received	txPingRequest
Receive Arp Reply	Number of ARP replies generated	rxArpReply
Receive Arp Request	Number of ARP requests received	rxArpRequest
Receive Ping Reply	Number of Ping replies received	rxPingReply
Receive Ping Request	Number of Ping requests generated	rxPingRequest
IPv4 Checksum Errors	The numbers of IP checksum errors detected	ipChecksumErrors
UDP Checksum Errors	The numbers of UDP checksum errors detected	udpChecksumErrors
TCP Checksum Errors	The numbers of IP checksum errors detected	tcpChecksumError
Transmit Duration (Cleared on Start TX)	Reserved for future use	transmitDuration
Sequence Frames	The number of sequence checking frames received	sequenceFrames
Sequence Errors	The number of sequence checking errors detected	sequenceErrors
Protocol Server Vlan Dropped Frames	The number of VLAN frames dropped by IxRouter	protocolServerVlanDroppedFrames

Virtual Statistics	**Statistics Description**	**API Statistics Name**
Scheduled Frames Sent	The number of frames originating from the stream engine	scheduledFramesSent
Asynchronous Frames Sent	The number of frames sent as a result of user request	asynchronousFramesSent
Port CPU Frames Sent	The number of frames originating from the port's CPU as opposed to the stream engine	portCPUFramesSent
Scheduled Transmit Duration	The scheduled transmit time associated with the port	scheduledTransmitTime
Bits Sent	A counter that counts the total number of bits transmitted	bitsSent
Bits Received	A counter that counts the total number of bits received	bitsReceived
Bits Received Rate	A counter that counts the total number of bits received	bitsReceived
Virtual Machine Status	The status of port's virtual machine	portCpuStatus
Virtual Machine DoD Status	The status of the port's DoD process	portCpuDodStatus
Dropped Frames	The number of dropped frames	droppedFrames
Egress Dropped Frames	The number of frames that get dropped before they are transmitted	egressDroppedFrames
Port CPU Frames Received	The number of frames that are received by port CPU	portCpuFramesReceived
Port CPU Bytes Received	The number of bytes that are received by port CPU	portCpuBytesReceived
Transmit Neighbor Solicitation	The number of Neighbor Solicitation packets transmitted during the neighbor discovery process for IPv6 protocol	txNeighborSolicits
Transmit Neighbor Advertisements	The number of Neighbor Advertisements packets transmitted during the neighbor discovery process for IPv6 protocol	txNeighborAdvertisements

Virtual Statistics	Statistics Description	API Statistics Name
Receive Neighbor Solicitation	The number of Neighbor Solicitation packets received during the neighbor discovery process for IPv6 protocol	rxNeighborSolicits
Receive Neighbor Advertisements	The number of Neighbor Advertisements packets received during the neighbor discovery process for IPv6 protocol	rxNeighborAdvertisements
Frames Sent (VM)	A counter that increments only when a frame is successfully generated but transmission is not guaranteed. This counter does not count collision attempts. NOTE Only for internal use. Deprecated starting with IxOS 8.50 EA.	framesSentSStream
Frames Received (VM)	Counts number of Frames received for frames that match the signature configured in 'Receive Mode' if Packet Group Statistics View is configured and has 'Start Collecting Metrics' enabled. NOTE Only for internal use. Deprecated starting with IxOS 8.50 EA.	framesReceivedSStream
Bytes Sent (VM)	A counter that counts the total number of bytes generated but transmission is not guaranteed. NOTE Only for internal use. Deprecated starting with IxOS 8.50 EA.	bytesSentSStream
Bytes Received (VM)	Counts number of Bytes received for frames that match the signature configured in 'Receive Mode' if Packet Group Statistics View is configured and has 'Start Collecting Metrics' enabled.	bytesReceivedSStream

Virtual Statistics	Statistics Description	API Statistics Name
	NOTE Only for internal use. Deprecated starting with IxOS 8.50 EA.	
Bits Sent (VM)	A counter that counts the total number of bits generated but transmission is not guaranteed. NOTE Only for internal use. Deprecated starting with IxOS 8.50 EA.	bitsSentSStream
Bits Received (VM)	Counts number of Bits received for frames that match the signature configured in 'Receive Mode' if Packet Group Statistics View is configured and has 'Start Collecting Metrics' enabled. NOTE Only for internal use. Deprecated starting with IxOS 8.50 EA.	bitsReceivedSStream

IxExplorer Tcl Code Example

The following code shows how to use IxVM cards and ports in Tcl.

Adding Cards

The following code fragment shows how to add an IxVM card to an IxExplorer Tcl script:

```
package req IxTclHal
ixInitialize loopback
chassis refresh loopback
chassis addVMCard loopback 10.205.15.124 2 1 60 1
card addVMPort 1 2 1 eth1 1 00:00:00:00:00:00 1500 100
```

For example, to add an L2-3 multi-port card on slot 1:

```
chassis addVMCard loopback 10.200.105.140 1 0 60 0
```

where:

10.200.105.140	card IP address
1	card number
0	multi-port card (1 selects single-port)

60	keep alive timeout
0	L2-3 card type (1 selects L4-7 card type)

Adding Ports

To add an IxVM port:

```
card addVMPort <chassis no> <card no> <port no> <test interface> <promiscuous mode>
<MAC> <MTU> <lineSpeed>
```

For example:

```
card addVMPort 1 1 1 eth1 1
```

Removing Ports

To remove an IxVM port:

```
card removeVMPort <chassis no> <card no> <port no>
```

For example:

```
card removeVMPort 1 1 1
```

Removing Cards

To remove an IxVM card:

```
chassis removeVMCard loopback <Card no>
```

For example:

```
chassis removeVMCard loopback 1
```

Getting CardID from IP address:

```
chassis checkVMForDuplicate <chassis> <IP address>
```

For example:

```
chassis checkVMForDuplicate loopback 10.205.15.125
```

The output of the command returns the card ID, if a card with the specified IP address exists on the chassis, or 0 (zero) if no card ID was found with the specified IP address.

Appendix A: Using ScriptGen

This appendix describes the functionality details of the ScriptGen.

ScriptGen

ScriptGen is a tool that may be used to generate a Tcl script that reflects the current configuration of Ixia ports. It is intended to be used after ports have been successfully configured using IxExplorer, IxAutomate (previously IxScriptmate), the Tcl API, the C++ API, or other tools. The generated Tcl script can be used to re-create a port setup as the basis for a new Tcl test. ScriptGen may be used on both Windows-based and Unix-based computers.

ScriptGen generates a complete Tcl program into an output file. All aspects of a port's configuration is reflected in the output.

NOTE Port ownership can affect ScriptGen's file creation, in the following manner:If the first port is explicitly owned by a user, then all ports in the set of ports to be scripted must either be owned by that user or be 'unowned.'If the first port is 'unowned,' then all ports in the set must be 'unowned.'

Invoking ScriptGen

Windows

To use ScriptGen, open the Windows Start menu for the Ixia group and double-click the ScriptGen icon, as shown in *Image: ScriptGen Icon*.

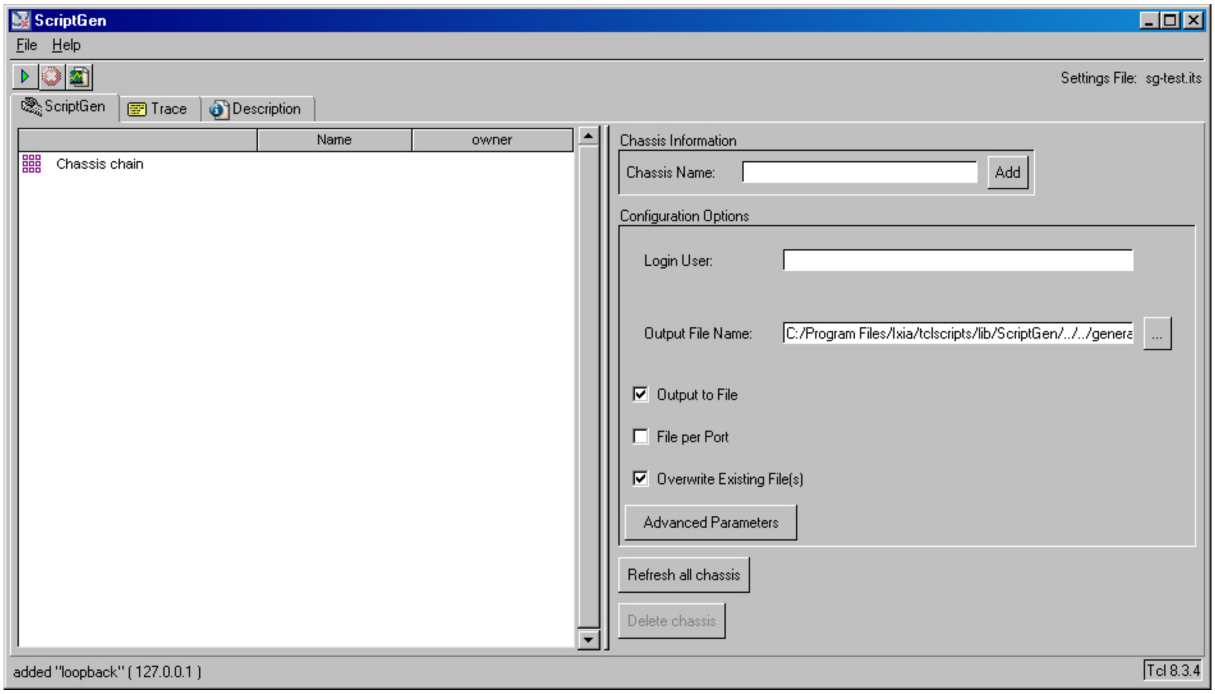
Image: ScriptGen Icon

Unix Systems

On Unix systems, the Wish Console must be used and is usually started by invoking *wish* in the *Ixia/bin* directory, then sourcing *ixSgMain.tcl* in the *Ixia/scriptgen* directory.

Either method brings up the *ScriptGen* dialog box, shown in *Image: ScriptGen Usage dialog box*.

Image: ScriptGen Usage dialog box

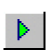
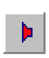


Using the *ScriptGen* dialog box to create Tcl scripts is described in the following sections:

- Adding a Chassis
- Creating a Script for a Port
- Trace Tab
- Description Tab

The fields in this dialog box are described in *Table: ScriptGen Usage dialog box Fields*

Table: ScriptGen Usage dialog box Fields

Section	Field	Usage
		Starts the process of generating the output script based on the other settings in this dialog box. For information on how to create a script for a port or selection of ports, Creating a Script for a Port.
		Stops the script generation process.
		Verifies a generated script for accuracy. The results of the verification appear in the **Trace** tab.Trace Tab for more information on the **Trace** tab.
Chassis Information	Chassis Name	Enter the chassis name or IP address to be added for ScriptGen
	Add	Adds the chassis entered in the field above.

Section	Field	Usage
Configuration Options	Login User	Enter the user login name for the chassis. If this option is not used, then only ports on the chassis that are not owned are scripted. If a login is used, then only ports owned by that login name and unowned ports are scripted.
	Output File Name	The name of the output file to generate the output into. The name of the .tcl file should be changed for each port used.
	Output to File	If selected, the output is saved to the file indicated in *Output File Name*. Output always goes to the **Trace** tab.
	File per Port	If selected, the output for each port is saved as a separate file. The file name is an amalgam of the name indicated in the **Output File Name** and the chassis, slot, and port.
	Overwrite Existing Files	If selected, the saved file or files will overwrite any files with the same name. If not selected, the output will not be saved, and a warning appears in the **Trace** tab.
	Advanced Parameters	This button opens the *Advanced Parameters* dialog box. Advanced Parameters for more information.
	Refresh all chassis	Selecting this button refreshes the view of the chassis in the tree on the left side of the dialog box.
	Delete chassis...	Selecting this button deletes the selected (selected) chassis in the tree on the left side of the dialog box. If only one chassis is selected, the name of the chassis appears in quotes after **Delete Chassis**.

Menu Functions

There are several menu options available under the File menu *Image: ScriptGen Menu Options* shows the options.

Image: ScriptGen Menu Options

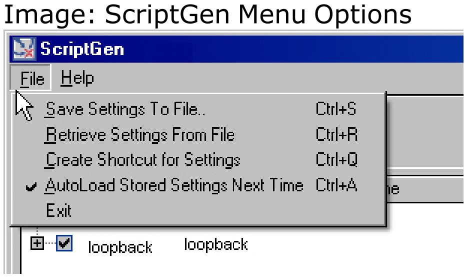


Table: Option Descriptions describes the menu functions. Note that the functions involve the configuration settings for the ScriptGen application, not the created Tcl scripts.

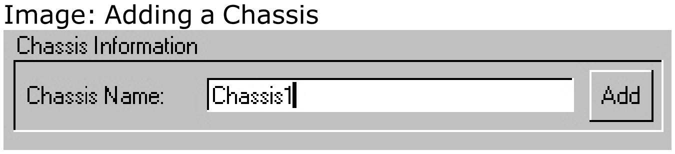
Table: Option Descriptions

Selection	Usage
Save Settings To File...	Saves the configured ScriptGen settings to a specified file.
Retrieve Settings From File...	Retrieves a ScriptGen configuration from a selected file.
Create Shortcut to Settings	Creates a shortcut to a ScriptGen configuration.
Auto Load Stored Settings Next Time	Automatically loads the last configuration when opening ScriptGen. A check next to this options indicates that it is active. This option is selected by default.
Exit	Exits ScriptGen and closes the *ScriptGen* dialog box.

Adding a Chassis

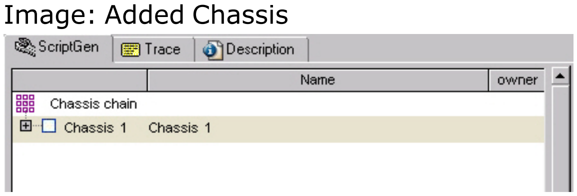
After opening the *ScriptGen* dialog box, the chassis of the port that is to be scripted must be added. Enter the chassis name or IP address in the *Chassis Name* field, as shown in *Image: Adding a Chassis*.

Image: Adding a Chassis



Once the chassis name is entered, select the *Add* button. When the chassis is added, it will appear in the tree in left window as shown in *Image: Added Chassis*.

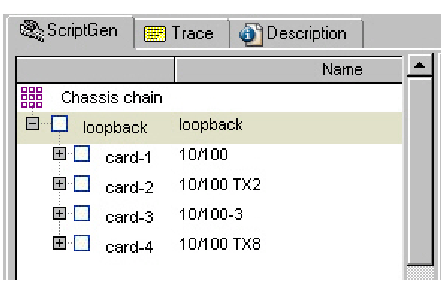
Image: Added Chassis



Chassis in a chain must be added to ScriptGen in the same order they appear in the chain.

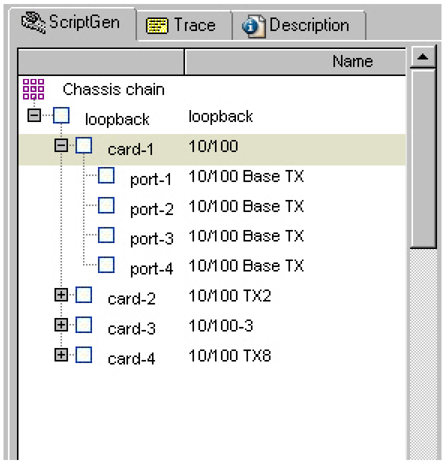
Double-click the chassis to expand the tree and view the modules in the chassis, as shown in *Image: Expanded Chassis Tree (Modules)*.

Image: Expanded Chassis Tree (Modules)



Double-click a module to further expand the tree and view the ports in the module, as shown in *Image: Expanded Chassis Tree (Ports)*.

Image: Expanded Chassis Tree (Ports)

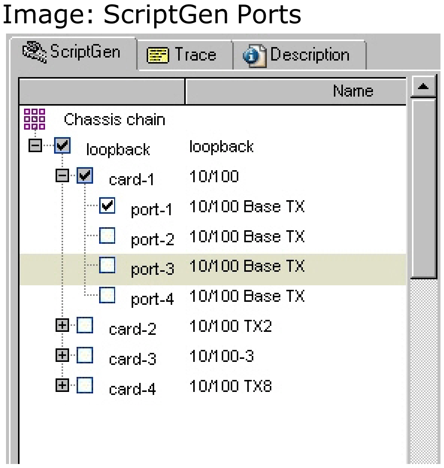


Creating a Script for a Port

To create a script for a port:

1. Expand the chassis tree on the left side of the *ScriptGen* dialog box and select the port or ports for which a script will be created by selecting the empty box to the left of the port. A check mark appears, as shown in *Image: ScriptGen Ports*.

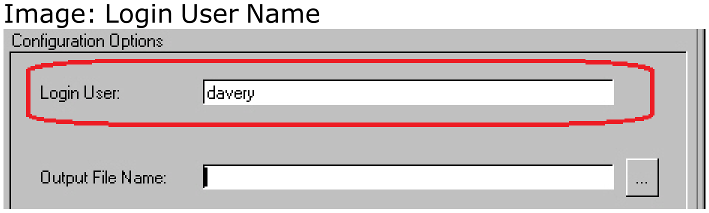
   Image: ScriptGen Ports

   More than one port can be selected for scripting by selecting several ports in the chassis. All ports in a module can be selected by selecting the module box.

2. If desired, enter the login name for the chassis, as shown.

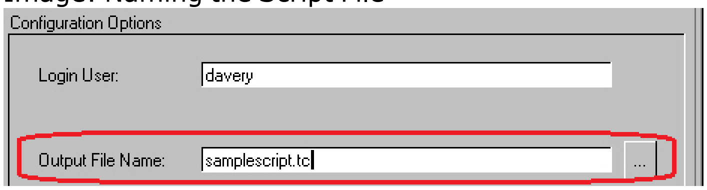
   Image: Login User Name

If this option is used, then only ports owned by the login name entered and unowned ports are scripted.

3. Enter the file name for the script in the *OutPut File Name* field, as shown.

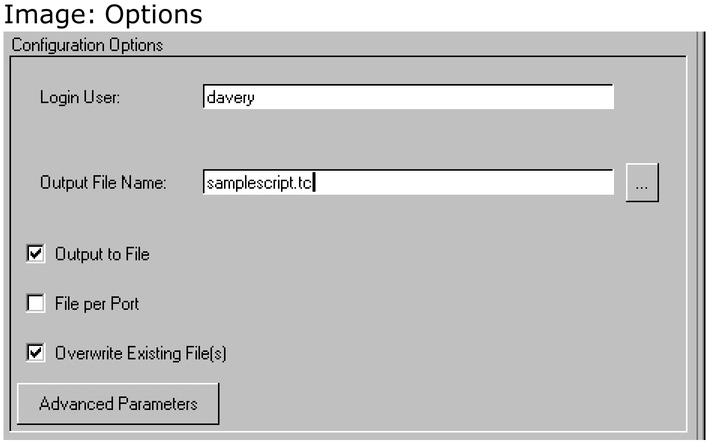
   Image: Naming the Script File

   The '...' button ( ) can also be used to browse to a specific file.

   Beneath the *OutPut File Name* field, set the other configuration options for script generation, which include *Output to File*, *File per Port*, *Overwrite Existing File(s)*, and *Advanced Parameters*, as shown.

   Image: Options

4. 

   Refer to Invoking ScriptGen for more information regarding these options. The *Advanced Parameters* button is described in Advanced Parameters below.

5. When conditions have been accurately configured, select the *Run* icon ( ) to initiate the generation of a script or scripts.

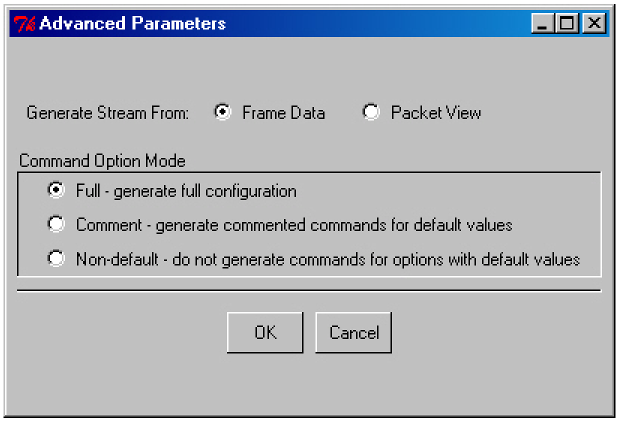
NOTE Port ownership can affect ScriptGen's file creation, in the following manner:If the first port is explicitly owned by a user, then all ports in the set of ports to be scripted must either be owned by that user or be 'unowned.'If the first port is 'unowned,' then all ports in the set must be 'unowned.'

NOTE When using ScriptGen with Port Groups, ports from different chassis chain that are in the same Port Group cause the ScriptGen option to fail. Likewise, ports from chassis that have the same chassis ID will cause the ScriptGen option to fail.

Advanced Parameters

The *Advanced Parameters* button opens the *Advanced Parameters* dialog box, shown in *Image: Advanced Parameters dialog box*.

Image: Advanced Parameters dialog box



The controls for this dialog box are explained in table.

Image: Advanced Parameters Configuration

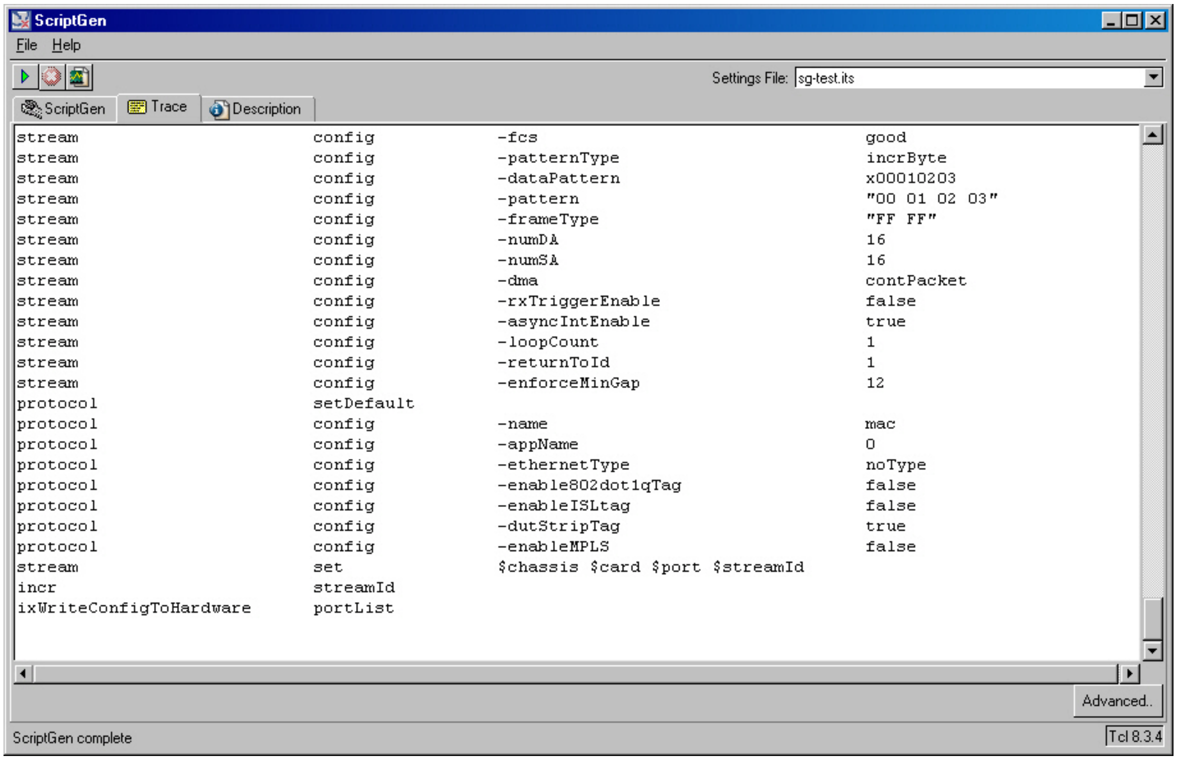
Section	Field/Control	Usage
Generate Stream From		Sets from where to generate the scripted stream. The default is Frame Data.
	Frame Data	Generates the scripted stream from Frame Data controls.
	Packet View	Generates the scripted stream from the Packet View.
Command Option Mode		Sets how much of the default information should be included in the script.
	Full	Generates a script that includes all control information, whether it is default configuration or not. NOTE Use Full option if port configuration is important. Other than Full option may result in configuration that is not complete.
	Comment	Generates a script that includes all control information, but all default configuration is set as a comment. Commented information does not affect card, port, or stream behavior.
	Non-Default	Generates a script that only includes non-default configuration information.

Trace Tab

The **Trace** tab page records and shows the actions of ScriptGen. When a script is created, it appears in the **Trace** tab. The **Trace** tab also shows error messages and warnings.

The **Trace** tab page is shown in *Image: **Trace** Tab*.

Image: **Trace** Tab



Advanced Trace Options

Selecting the *Advanced* button shows the *Trace Settings* dialog box. The *Trace Settings* dialog box is shown in *Image: Trace Settings dialog box*.

Image: Trace Settings dialog box

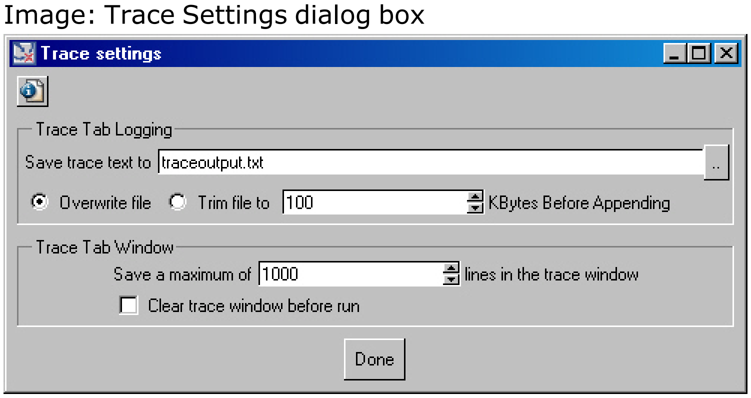


Table: Trace Settings describes the fields in the *Trace Settings* dialog box.

Table: Trace Settings

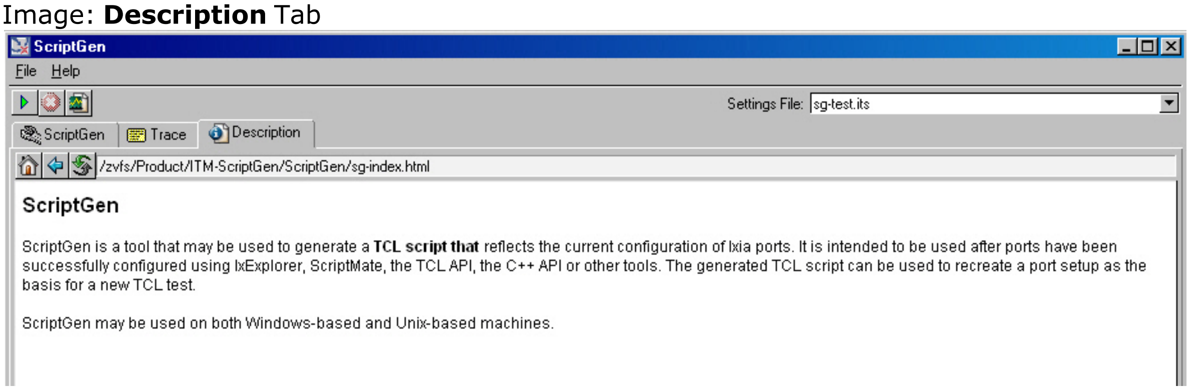
Group	Field	Usage
Trace Tab Logging	Save trace text to	Allows to select the name and destination of the **Trace** tab capture file.
	Overwrite	Overwrites the **Trace** tab capture file each time a new test is run.

Group	Field	Usage
	file	Information from the previous test is lost.
	Trim file to	Trims the old file size to the set level, then appends new test Trace information to the file contents.
Trace Tab Window	Save a maximum of	Limits the size of the **Trace** tab information that appears. The oldest entries in the tab are removed when the line cap is reached.
	Clear trace window before run	Clears the **Trace** tab of all previous test information when a new test is run. If not selected, new test information is added to previous test information.

Description Tab

The **Description** tab provides a basic description of the function of ScriptGen. It is shown in *Image: **Description** Tab*.

Image: **Description** Tab



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This information is subject to change without notice.

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