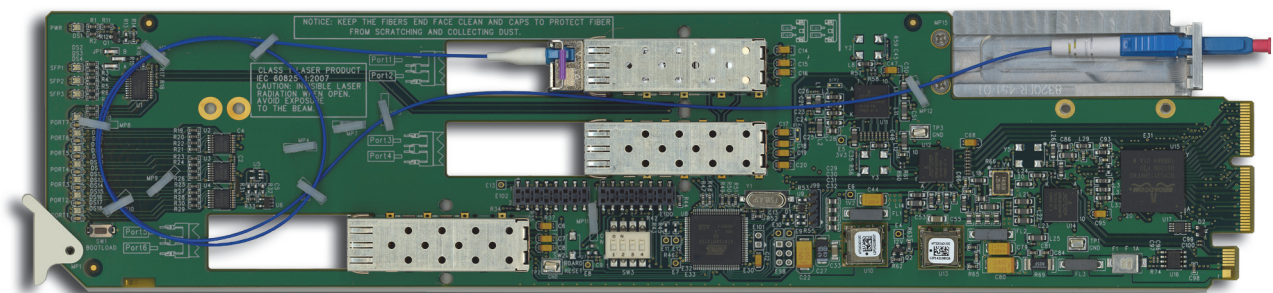openGear

FES-6941, FES-6942, FED-6943, FED-6944, FET-6945, and FET-6946

Fiber Ethernet Switch Transceivers

User Manual

ROSS

Thank You for Choosing Ross

You've made a great choice. We expect you will be very happy with your purchase of Ross Technology. Our mission is to:

1. Provide a Superior Customer Experience
   - offer the best product quality and support
2. Make Cool Practical Technology
   - develop great products that customers love

Ross has become well known for the Ross Video Code of Ethics. It guides our interactions and empowers our employees. I hope you enjoy reading it below.

If anything at all with your Ross experience does not live up to your expectations be sure to reach out to us at *solutions@rossvideo.com*.

David Ross
CEO, Ross Video
dross@rossvideo.com

Ross Video Code of Ethics

Any company is the sum total of the people that make things happen. At Ross, our employees are a special group. Our employees truly care about doing a great job and delivering a high quality customer experience every day. This code of ethics hangs on the wall of all Ross Video locations to guide our behavior:

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2. We will do our best to understand our customers' requirements.
3. We will not ship crap.
4. We will be great to work with.
5. We will do something extra for our customers, as an apology, when something big goes wrong and it's our fault.
6. We will keep our promises.
7. We will treat the competition with respect.
8. We will cooperate with and help other friendly companies.
9. We will go above and beyond in times of crisis. *If there's no one to authorize the required action in times of company or customer crisis - do what you know in your heart is right. (You may rent helicopters if necessary.)*

Fiber Ethernet Switch Transceivers · User Manual

- Ross Part Number: 6941DR-004-04
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Patents

Patent numbers US 7,034,886; US 7,508,455; US 7,602,446; US 7,802,802 B2; US 7,834,886; US 7,914,332; US 8,307,284; US 8,407,374 B2; US 8,499,019 B2; US 8,519,949 B2; US 8,743,292 B2; GB 2,419,119 B; GB 2,447,380 B; and other patents pending.

Notice

The material in this manual is furnished for informational use only. It is subject to change without notice and should not be construed as commitment by Ross Video Limited. Ross Video Limited assumes no responsibility or liability for errors or inaccuracies that may appear in this manual.

Safety Notices

Refer to the "**Important Regulatory and Safety Notices**" document that accompanied your product.

Statement of Compliance

This product has been determined to be compliant with the applicable standards, regulations, and directives for the countries where the product is marketed.

Compliance documentation, such as certification or Declaration of Compliance for the product is available upon request by contacting techsupport@rossvideo.com. Please include the product; model number identifiers and serial number and country that compliance information is needed in request.

EMC Notices

US FCC Part 15

This equipment has been tested and found to comply with the limits for a class A Digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a Commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio

communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

> **Notice** — *Changes or modifications to this equipment not expressly approved by Ross Video Ltd. could void the user's authority to operate this equipment.*

Canada

This Class "A" digital apparatus complies with Canadian ICES-003 and part 15 of the FCC Rules.

Cet appareil numerique de la classe "A" est conforme a la norme NMB-003 du Canada.

European Union

This equipment is in compliance with the essential requirements and other relevant provisions established under regulation (EC) No 765/2008 and Decision No 768/2008/EC referred to as the "New Legislative Framework".

> ⚠️ **Warning** — *This equipment is compliant with Class A of CISPR 32. In a residential environment this equipment may cause radio interference.*

Australia/New Zealand

This equipment is in compliance with the provisions established under the Radiocommunications Act 1992 and Radiocommunications Labeling (Electromagnetic Compatibility) Notice 2008.

Korea

This equipment is in compliance with the provisions established under the Radio Waves Act.

Class A equipment (Broadcasting and communications service for business use)

This device is a business-use (Class A) EMC-compliant device. The seller and user are advised to be aware of this fact. This device is intended for use in areas outside home.

Type of Equipment	User's Guide
A급 기기 (업무용 방송통신기자재)	이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.
Class A Equipment (Industrial Broadcasting & Communication Equipment)	This equipment is **Industrial (Class A) electromagnetic wave suitability equipment** and seller or user should take notice of it, and this equipment is to be used in the places except for home.

International

This equipment has been tested under the requirements of CISPR 22:2008 or CISPR 32:2015 and found to comply with the limits for a Class A Digital device.

> **Notice** — *This is a Class A product. In domestic environments, this product may cause radio interference, in which case the user may have to take adequate measures.*

Maintenance/User Serviceable Parts

Routine maintenance to this openGear product is not required. This product contains no user serviceable parts. If the module does not appear to be working properly, please contact Technical Support using the numbers listed under the "**Contact Us**" section of this manual. All openGear products are covered by a generous 5-year warranty

and will be repaired without charge for materials or labor within this period. See the "**Warranty and Repair Policy**" section in this manual for details.

Environmental Information

The equipment may contain hazardous substances that could impact health and the environment.

To avoid the potential release of those substances into the environment and to diminish the need for the extraction of natural resources, Ross Video encourages you to use the appropriate take-back systems. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner.

The crossed-out wheeled bin symbol invites you to use these systems.

If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration. You can also contact Ross Video for more information on the environmental performances of our products.

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Introduction

In This Chapter

This chapter contains the following sections:

- Overview
- Features
- User Interfaces
- Documentation Terms and Conventions

A Word of Thanks

Congratulations on choosing an openGear Fiber Ethernet Switch Transceiver. Thank you for joining the group of worldwide satisfied Ross Video customers!

Should you have a question pertaining to the installation or operation of your card, please contact us at the numbers listed on the back cover of this manual. Our technical support staff is always available for consultation, training, or service.

Overview

The Fiber Ethernet Switch Transceivers are configured in various modes depending on the number of small form-factor pluggable fiber transceivers (SFPs) installed and the rear module used. There are up to six user ports (a combination of fiber optic and RJ45 connectors) plus one GigE (SERDES) port connected to the OG3-FR series frame midplane that communicates with the switch on the Network Controller Cards.

These seven ports can be configured as a generic switch (any port to any port). They can also be set up for 1:1 trunking between any ports or redundant/load sharing trunking such as two fiber links to three or four wired links with auto fail-over. Port based VLAN is also supported as you can choose to partition the switching ports into virtual private domains assigned on a per port basis.

The switching function operates transparently for DHCP, ARP, Multicast and Broadcast, and VLAN services (except where restricted by configuration). Note that the Fiber Ethernet Switch Transceivers do not provide POE (Power Over Ethernet) but will work with switches that follow 802.3eaf/at.

The Fiber Ethernet Switch Transceivers are fully hot-swappable with all active components on the front removable module. No active components are installed on the rear module. This design greatly reduces down time eliminating any need for users to access the back of the openGear frame.

CWDM Series

Some Fiber Ethernet Switch Transceivers are equipped with Coarse Wavelength Division Multiplexing (CWDM) lasers. This enables you to expand your current fiber infrastructure from one wavelength to up to 16 wavelengths on a fiber. These models are identified with a two digit suffix in their name (e.g. FET-6945-27 and FET-6945-49).

High Sensitivity Series

Some Fiber Ethernet Switch Transceivers are equipped with high sensitivity SFPs for increased link budgets. These cards are compatible with standard 1310nm receivers, and the CWDM receivers from 1270nm to 1610nm (attenuation may be required to reduce optical power below -10dBm).

Features

The following features are common for the Fiber Ethernet Switch Transceivers:

- Compliant with IEEE 802.3 (10/100/1000BASE-T, 1000BASE-X)

- Supports 10/100/1000[1] Base T Ethernet on RJ45 connectors

- Auto negotiation for 10/100/1000[1] speeds, half/full duplex modes, MDI/MDIX auto-crossover

- Supports two trunk groups between two devices with each trunk group having up to four ports

- Supports port-based VLAN by allowing the partition of switching ports into virtual private domains based on individual ports

- Allows for port disabling

- Up to seven available ports using a combination of ethernet (via RJ45 connections), fiber optic ports, and a GigE internal link to the Network Controller Card in the OG3-FR series frames.

- LC/UPC optical blind-mate connections

- Card-edge LED indicator for power status

- Rear modules are fully passive using a blind mate LC connection

- Hot-swappable from front of frame with no external connect/reconnect required

- Reports status and configuration remotely via DashBoard

- Compatible with the DFR-8321 series and OG3-FR series frames

- Fully compliant with openGear specifications

- 5-year transferable warranty

---

1. GigE SERDES support only available when the card is installed in the OG3-FR series frames with Network Controller Card.

User Interfaces

The following interfaces are available for your Fiber Ethernet Switch Transceiver.

DashBoard Control System

DashBoard enables you to monitor and control openGear frames and cards from a computer. DashBoard communicates with the Fiber Ethernet Switch Transceiver and other cards in the openGear frame through the Network Controller Card.

For More Information on...

* installing and using DashBoard, refer to the *DashBoard User Manual*.
* menus available in DashBoard for the Fiber Ethernet Switch Transceiver, refer to the chapter "**DashBoard Menus**" on page 10-1.
* using the Network Controller Card, refer to its user manual.

Card-edge Controls

The front-edge of the Fiber Ethernet Switch Transceiver cards have an LED indicator for power status. LEDs on the rear modules indicate communication and traffic activity.

For More Information on...

* the card-edge LED, refer to the section "**Card-edge LEDs**" on page 9-3.
* the rear module LEDs, refer to the section "**Rear Module LEDs**" on page 9-4.

SNMP Monitoring and Control

The Network Controller Card in the openGear frame provides optional support for remote monitoring of your frame and using the Simple Network Management Protocol (SNMP), which is compatible with many third-party monitoring and control tools.

For More Information on...

* the SNMP controls on the cards, refer to your Fiber Ethernet Switch Transceiver Management Information Base (MIB) files.
* SNMP Monitoring and Control, refer to the user manual for your Network Controller Card.

Documentation Terms and Conventions

The following terms and conventions are used throughout this manual.

Terms

The following terms are used:

- "**Board**", and "**Card**" refer to openGear terminal devices within openGear frames, including all components and switches.
- "**CWDM**" refers to models that include Coarse Wavelength Division Multiplexing lasers.
- "**DashBoard**" refers to the DashBoard Control System.
- "**DFR-8321 series**" refers to all versions of the DFR-8321 frames and any available options unless otherwise noted.
- "**Fiber Ethernet Switch Transceiver**" includes all versions of the FES-6941, FES-6942, FED-6943, FED-6944, FET-6945, FET-6946, and any available options unless otherwise noted.
- "**FES-6941**" includes all versions of the FES-6941 unless otherwise noted.
- "**FES-6942**" includes all versions of the FES-6942 unless otherwise noted.
- "**FED-6943**" includes all versions of the FED-6943 unless otherwise noted.
- "**FED-6944**" includes all versions of the FED-6944 unless otherwise noted.
- "**FET-6945**" includes all versions of the FET-6945 unless otherwise noted.
- "**FET-6946**" includes all versions of the FET-6946 unless otherwise noted.
- "**Network Controller Card**" refers to the MFC-8322-N and MFC-8322-NS unless otherwise noted.
- "**OG3-FR series**" refers to all versions of the OG3-FR frames and any available options unless otherwise noted.
- "**openGear frame**" refers to the DFR-8321 series and the OG3-FR series frames that house openGear cards.
- "**Operator**" and "**User**" refer to the person who uses the Fiber Ethernet Switch Transceiver.
- "**SFP**" refers to a small form-factor pluggable fiber transceiver.
- "**System**" and "**Video system**" refer to the mix of interconnected production and terminal equipment in your environment.
- "**Trunking**" refers to using two or more ethernet links between points to increase bandwidth or provide redundancy.
- "**VLAN**" refers to Virtual Local Area Network.
- "**WDM**" refers to Wavelength Division Multiplexing.

Conventions

The following conventions are used:

- The "**Operating Tips**" and "**Note**" boxes are used throughout this manual to provide additional user information.

Installation

In This Chapter

This chapter provides instructions for installing the rear module(s) for the Fiber Ethernet Switch Transceivers, installing the cards into the frame, cabling details, and updating the software.

⚠️ **Caution** — *Every time you are required to insert a connector into a device, or mating sleeve, you must clean the connector. All exposed surfaces of the ceramic ferrule must be clean. Follow your facility practices of cleaning fiber optic connectors.*

Connectors must always be inserted into a device or have a dust cap on.

The following topics are discussed:

- Before You Begin
- Physical Installation
- Ethernet Communications
- Software Upgrades

Before You Begin

Before proceeding with the instructions in this chapter, ensure that your openGear frame is properly installed according to the instructions in its manual.

Important — *Contact your IT Department before connecting to your facility network to ensure that there are no conflicts or the possibility of creating a network loop.*

Static Discharge

Throughout this chapter, please heed the following cautionary note:

ESD Susceptibility — *Static discharge can cause serious damage to sensitive semiconductor devices. Avoid handling circuit boards in high static environments such as carpeted areas and when synthetic fiber clothing is worn. Always exercise proper grounding precautions when working on circuit boards and related equipment.*

Unpacking

Unpack each Fiber Ethernet Switch Transceiver you received from the shipping container and ensure that all items are included. If any items are missing or damaged, contact your sales representative or Ross Video directly.

Working with Fiber Optic Connectors

Keep the following in mind when working with fiber optic connectors:

- Every time you are required to insert a connector into a device or mating sleeve, you must clean the connector. All exposed surfaces of the ceramic ferrule must be clean. Follow your facility practices of cleaning fiber optic connectors.

- Connectors must always be inserted into a device or have a dust cap on. (**Figure 2.1**)
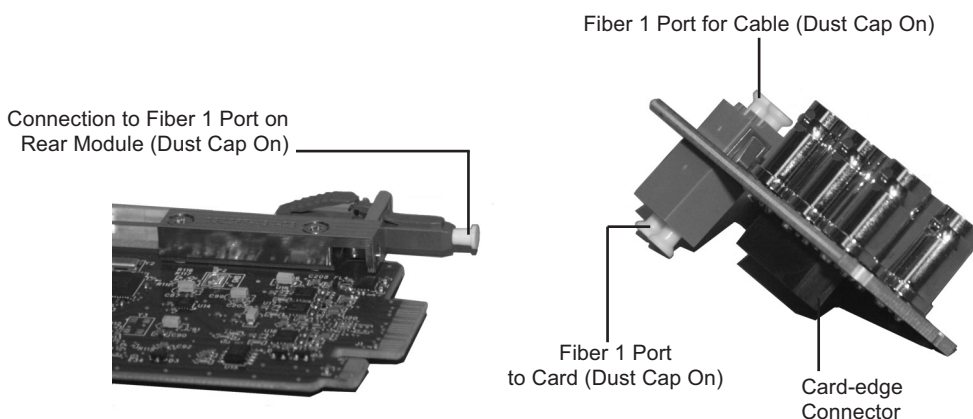

Figure 2.1 Card Connectors with Dust Caps Installed

- A poor optical connection is often similar to a poor electrical connection. Try removing the connector, cleaning, and re-inserting the connector. A bad connection can result in experiencing instability of signal, high loss, or a noisy signal.

Physical Installation

This section outlines how to install a rear module and a card in an openGear frame. However, the specific rear module you need to install depends on your application. You must install the Fiber Ethernet Switch Transceiver in an OG3-FR series frame to take advantage of the internal GigE interface.

Supported Rear Modules

Caution — *Ensure that you install your card using one of the supported rear modules listed in the applicable chapter of this manual. Installing the card with an unsupported rear module can damage the card, the rear module, or both.*

The rear module that your Fiber Ethernet Switch Transceiver requires depends on the card model. Refer to the applicable chapter in this manual to learn which rear module is required for your card.

Installing a Rear Module

To install a rear module in your openGear frame

1. Locate the card frame slots on the rear of the frame.

2. To apply a label to your rear module:

    *   Verify whether your **Rear Module Label** is self-adhesive by checking the back of the label for a thin wax sheet. You will need to remove this wax sheet before applying the label in order that the label can be affixed to the rear module surface.

    *   Affix the supplied **Rear Module Label** to the BNC area of the rear module.

3. Remove the Blank Plate from the slot you have chosen for the installation.

4. Remove the dust caps from the Fiber ports on the rear module that face the interior of the frame.

5. Refer to the applicable chapter in this manual to learn which rear module is supported by your card model.

6. Seat the bottom of the rear module in the **Module Seating Slot** at the base of the frame's back plane. (**Figure 2.2**)
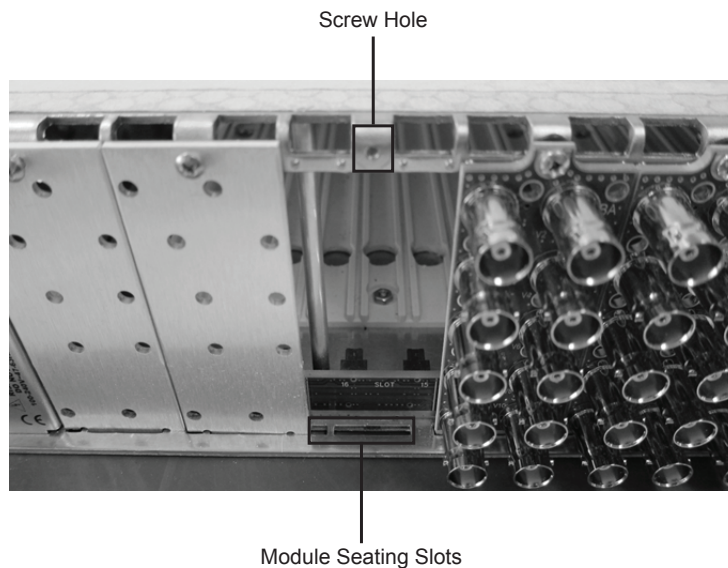
Screw Hole

Module Seating Slots

Figure 2.2 *Rear Module Installation in an OG3-FR Series Frame (Cards not shown)*

7. Align the top hole of the rear module with the screw on the top-edge of the frame back plane.

8. Using a Phillips screwdriver and the supplied screw, fasten the rear module to the back plane of the frame. Do not over tighten.

9. Ensure proper frame cooling and ventilation by having all rear frame slots covered with rear modules or Blank Plates.

Installing a Card

Refer to the document ***Important Regulatory and Safety Notices***, that shipped with your unit, for safety information when handling fiber optic components.

To install the card in an openGear frame

1. Locate the rear module you installed in the procedure "**Installing a Rear Module**" on page 2-3.

2. Ensure that the rear module is one of the required models for your card. Refer to the applicable chapter in this manual to learn which rear module is supported by your card model.

3. Refer to the appropriate chapter in this manual to learn which ports are used by your card and remove the dust caps from the connectors as required.

⚠ **Caution** — *Never attempt to look down the barrel of a connected fiber or device transmitting an optical signal. The transmitted light is not in the visible spectrum and may cause permanent eye damage. Turn off all laser sources before disconnecting devices.*

4. Ensure that the exposed surface of the ceramic ferrule(s) of the connectors are clean. Refer to the section "**Working with Fiber Optic Connectors**" on page 2-2 for cleaning tips.

5. Hold the card by the edges and carefully align the card-edges with the slots in the frame.

6. Fully insert the card into the frame until the rear connection plus is properly seated in the rear module. You will feel a click when the card mates onto the rear module.

7. When are you ready to cable your rear module:

Caution — *Every time you are required to insert a connector into a device, or mating sleeve, you must clean the connector. All exposed surfaces of the ceramic ferrule must be clean. Follow your facility practices of cleaning fiber optic connectors.*

Connectors must always be inserted into a device or have a dust cap on.

- Remove the dust cap from the fiber port(s) that will be used on the rear module that faces the exterior of the frame.
- Ensure the ceramic ferrule of the connector(s) is clean.

Ethernet Communications

The RJ45 ports on the **8320AR-056** and 8320AR-057 rear modules support 10/100/1000 Base T Ethernet communications. The number of ports depends on the card model you are using. Note that the **8320AR-056** provides four ports and the 8320AR-057 provides three ports.

In addition to the **Ethernet** ports on the rear module, you must also provide an ethernet connection to the openGear frame as outlined in its manual.

Important — *Contact your IT Department before connecting to your facility network to ensure that there are no conflicts or the possibility of creating a network loop.*

For More Information on...

- setting up ethernet communications for your openGear frame, refer to the *MFC-8300 Series User Manual*.

Ethernet Cabling Overview

The exact steps for connecting to your facility via an ethernet network depends on the network requirements of your facility.

You will require a standard network CAT-5e cable to connect the card to your facility network. (**Figure 2.3**) There is no need for a crossover cable as the rear modules include an Auto-MDIX ethernet PHY that will switch from straight to crossover automatically as needed. Ross Video does not supply these cables.

OG3-FR Series Frame

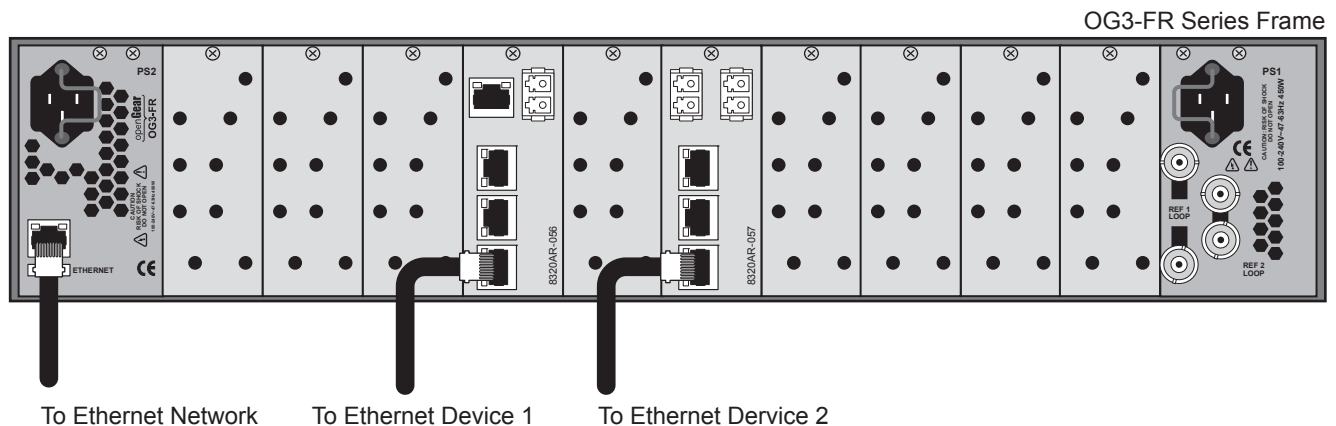*Figure 2.3 Cabling to Ethernet Port 1 on the 8320AR-056 and 8320AR-057 Rear Modules*

Internal GigE Link

Port 7 out of each Fiber Ethernet Switch Transceiver provides a GigE SERDES interface to the OG3-FR midplane to provide a link to the Ethernet switch on the MFC-8322-N Network Controller Card. This interface is identified as **Internal Link** in the DashBoard menus for the Fiber Ethernet Switch Transceiver.

Software Upgrades

This section provides instructions for upgrading the software for your card using the DashBoard Control System.

To upgrade the software on your card

1. Contact Ross Technical Support for the latest software version file.

2. In DashBoard, display the **Device View** of the card by double-clicking its status indicator in the **Basic Tree View**.

3. From the **Device** tab, click **Upload** to display the **Select File for upload** dialog box.

4. Navigate to the ***.bin** file you wish to upload.

5. Click **Open**.

6. If you are upgrading a single card:

   • Click **Finish** to display the **Uploading to Selected Devices** dialog.

   • Proceed to step 8.

7. If you are upgrading multiple cards:

   • Click **Next >** to display the **Select Destination** menu. This menu provides a list of the compatible cards based on the card selected in step 2.

   • Specify the card(s) to upload the file to by selecting the check box(es) for the cards you wish to upload the file to.

   • Verify the card(s) you wish to upload the file to. The **Error/Warning** fields indicate any errors, such as incompatible software or card type mismatch.

   • Click **Finish** to display the **Uploading to Selected Devices** dialog.

8. Monitor the upgrade.

   • The **Uploading to Selected Devices** dialog enables you to monitor the upgrade process.

   • Click **OK** to complete the upgrade process.

   • The card(s) are temporarily taken offline during the re-boot process. The process is complete once the status indicators for the **Card State** and **Connection** fields return to their previous status.

Troubleshooting

If you encounter problems when upgrading your card software, verify that the file you are attempting to load is a ***.bin** file that is for the card you are upgrading and that you have a valid network connection.

FES-6941 Setup

In This Chapter

This chapter provides the cabling designations and the technical specifications for the FES-6941 Single Link Ethernet Switch Transceivers. Note that specifications are subject to change without notice.

The following topics are discussed:

- FES-6941 Overview
- Cabling for the FES-6941-20A and FES-6941-20B
- Cabling for the FES-6941-40A and FES-6941-40B
- FES-6941 Technical Specifications

FES-6941 Overview

These single fiber bi-directional cards use bi-directional SFP transceivers that operate on different transmit (Tx) and receive (Rx) wavelengths over a single fiber and contain an internal WDM splitter. This gives you five links (one fiber and four RJ-45) plus the Internal Link interface. The FES-6941 series requires the **8320AR-056** Full Rear Module which includes one LC duplex fiber optic connector and four RJ-45 connectors.

To make use of the single fiber bi-directional connection, the cards must be used together in pairs based on their WDM, ensuring to pair an -A model with a -B model (e.g. pair an FES-6941-20A with an FES-6941-20B or pair one FED-6943-20A with two FES-6941-20B). Refer to **Table 3.1** for paring details.

Table 3.1 FES-6941 Series Pairs

Model	Description
FES-6941-20A	Single bi-directional Fiber 20km WDM with a 1310nm transmitter and 1550nm receiver
FES-6941-20B	Single bi-directional Fiber 20km WDM with a 1550nm transmitter and 1310nm receiver
FES-6941-40A	Single bi-directional Fiber 40km WDM with a 1310nm transmitter and 1550nm receiver
FES-6941-40B	Single bi-directional Fiber 40km WDM with a 1550nm transmitter and 1310nm receiver

FES-6941 Functional Block Diagram

This section provides a functional block diagram that outlines the workflow of the FES-6941 series regardless of the model type.
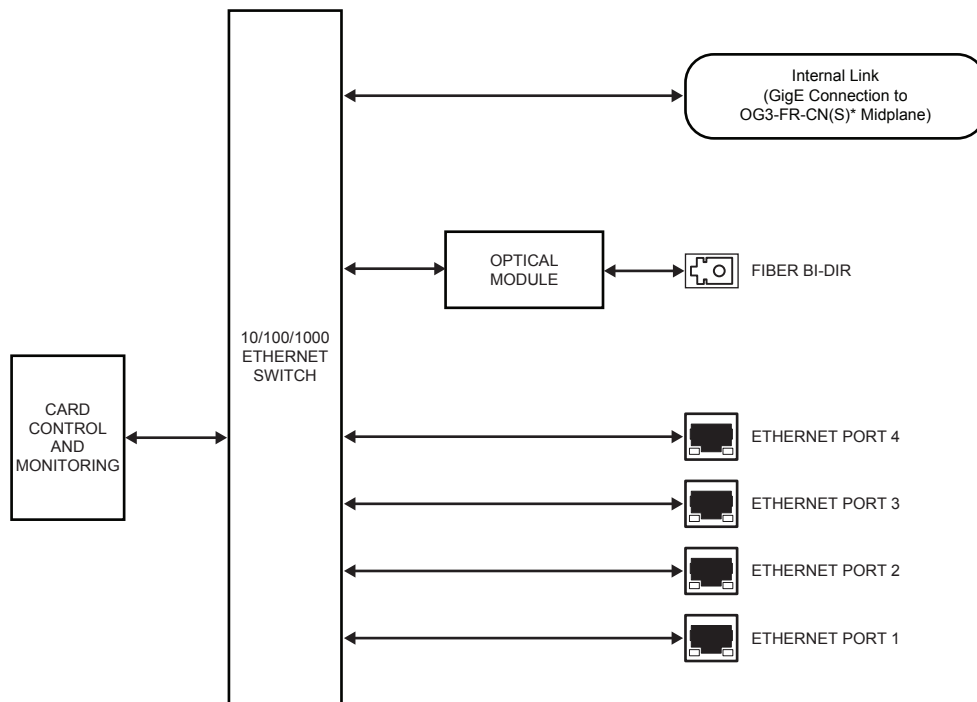
*Internal GigE connection requires the MFC-8322-N(S) network controller card for the OG3-FR frame.

Figure 3.1 FES-6941 Series — Simplified Block Diagram

Cabling for the FES-6941-20A and FES-6941-20B

To calculate your fiber path link budget, refer to **Table 3.2** on page 3-5 for optical budget specifications. Each of the FES-6941-20A and FES-6941-20B supports 20km cable lengths.

FES-6941-20A

The FES-6941-20A is used with the **8320AR-056** Full Rear Module. Each rear module occupies two slots and accommodates one card. This rear module provides one bi-directional optical port and four RJ45 Ethernet 10/100/1000 ports. Refer to **Figure 3.2** for cabling designations.

Figure 3.2 Cable Connections for the FES-6941-20A

FES-6941-20B

The FES-6941-20B is used with the **8320AR-056** Full Rear Module. Each rear module occupies two slots and accommodates one card. This rear module provides one bi-directional optical port and four RJ45 Ethernet 10/100/1000 ports. Refer to **Figure 3.3** for cabling designations.

Figure 3.3 Cable Connections for the FES-6941-20B

Cabling for the FES-6941-40A and FES-6941-40B

To calculate your fiber path link budget, refer to **Table 3.2** on page 3-5 for optical budget specifications. Each of the FES-6941-40A and FES-6941-40B supports 40km cable lengths.

FES-6941-40A

The FES-6941-40A is used with the **8320AR-056** Full Rear Module. Each rear module occupies two slots and accommodates one card. This rear module provides one bi-directional optical port and four RJ45 Ethernet 10/100/1000 ports. Refer to **Figure 3.4** for cabling designations.
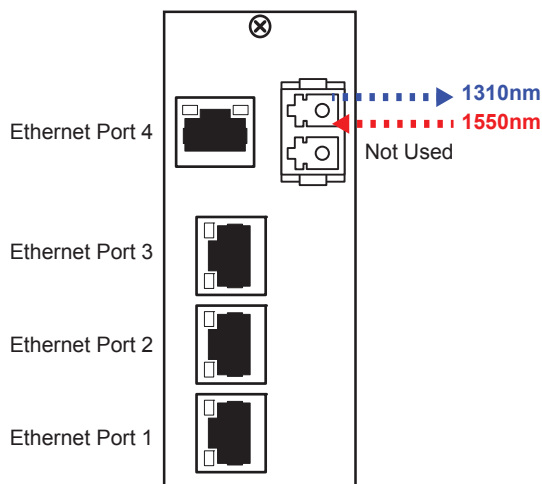

Figure 3.4 Cable Connections for the FES-6941-40A

FES-6941-40B

The FES-6941-20B is used with the **8320AR-056** Full Rear Module. Each rear module occupies two slots and accommodates one card. This rear module provides one bi-directional optical port and four RJ45 Ethernet 10/100/1000 ports. Refer to **Figure 3.5** for cabling designations.
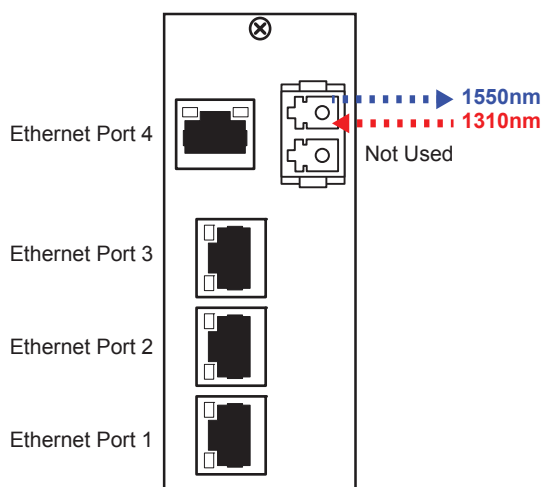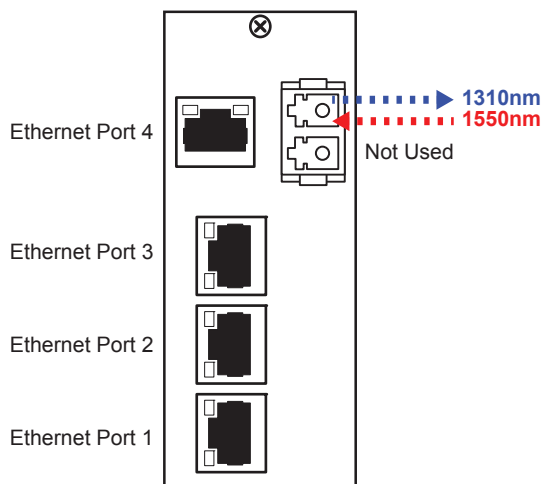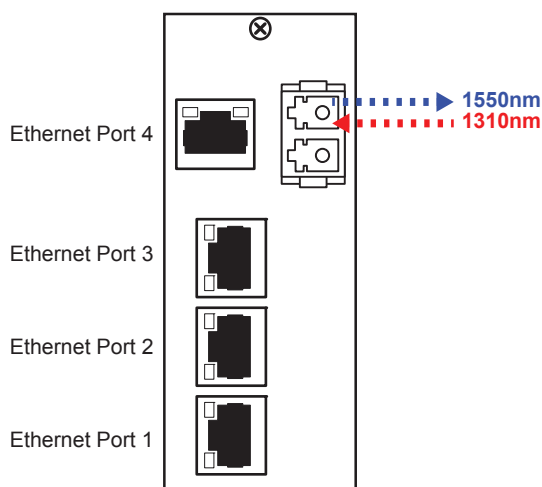

Figure 3.5 Cable Connections for the FES-6941-40B

FES-6941 Technical Specifications

This section provides the technical specifications for the FES-6941.

Table 3.2 FES-6941 Technical Specifications

Category	Parameter	Specification
Optical	Number of Bi-Directional Ports	1
	Tx Power	FES-6941-20A, FES-6941-20B: -3dBm to -8dBm
		FES-6941-40A: +2dBm to -3dBm
		FES-6941-40B: 0dBm to -5dBm
	Tx Wavelength	FES-6941-20A, FES-6941-40A: 1310nm
		FES-6941-20B, FES-6941-40B: 1550nm
	Rx Sensitivity	FES-6941-20A, FES-6941-20B: -3dBm to -22dBm
		FES-6941-40A, FES-6941-40B: -3dBm to -23dBm
	Optical Budget	FES-6941-20A, FES-6941-20B: 14dB
		FES-6941-40A, FES-6941-40B: 18dB
	Receiver Overload	At values above -3dBm
	Connector Type	Dual Mode, LC/UPC, PIN
Ethernet 10/100/1000	Number of Ports	4
	Cable Type	Standard straight-through CAT-5e
	Connector Type	RJ45
Environment	Operating Range	0°C to 40°C
Power	Power Consumption	7W

FES-6942 Setup

In This Chapter

This chapter provides the cabling designations and the technical specifications for the FES-6942 Single Link Ethernet Fiber Transceivers. Note that specifications are subject to change without notice.

The following topics are discussed:

- FES-6942 Overview
- Cabling for the FES-6942-20/40/80
- Cabling for the FES-6942 CWDM Series
- FES-6942 Technical Specifications

FES-6942 Overview

The FES-6942 series provide a two fiber, and four copper (RJ45) ethernet ports. This gives you five links (one fiber and four RJ-45) plus the Internal Link interface. Each card uses a standard SFP with an FP 1310nm laser and PIN receiver. High power and CWDM transmitters are optional, as is a high sensitivity receiver.

The FES-6942 series requires the **8320AR-056** Full Rear Module which includes one LC duplex connector and four RJ-45 connectors.

Table 4.1 FES-6942 Series — Models

| Model	Description
FES-6942-20	Dual Fiber 20km 1310nm transmitter and wideband receiver
FES-6942-40	Dual Fiber 40km 1310nm transmitter and wideband receiver
FES-6942-80	Dual Fiber 80km 1550nm transmitter and wideband receiver

CWDM and High Sensitivity Models

Options are also available with Coarse Wavelength Division Multiplexing (CWDM) transmitters, with a standard or high sensitivity receiver. The high sensitivity models are indicated with an H in the model number (e.g. FES-6942-27H). The CWDM models are identified with a two digit suffix as indicated in **Table 4.2** The wavelength for each model are also indicated.

Table 4.2 FES-6942 — Operating Wavelengths

Model	Transmit Wavelength
FES-6942-27	1270nm
FES-6942-29	1290nm
FES-6942-31	1310nm
FES-6942-33	1330nm
FES-6942-35	1350nm
FES-6942-37	1370nm
FES-6942-43	1430nm
FES-6942-45	1450nm
FES-6942-47	1470nm
FES-6942-49	1490nm
FES-6942-51	1510nm
FES-6942-53	1530nm
FES-6942-55	1550nm
FES-6942-57	1570nm
FES-6942-59	1590nm
FES-6942-61	1610nm

FES-6942 Functional Block Diagram

This section provides a functional block diagram that outlines the workflow of the FES-6942 series regardless of the model type.
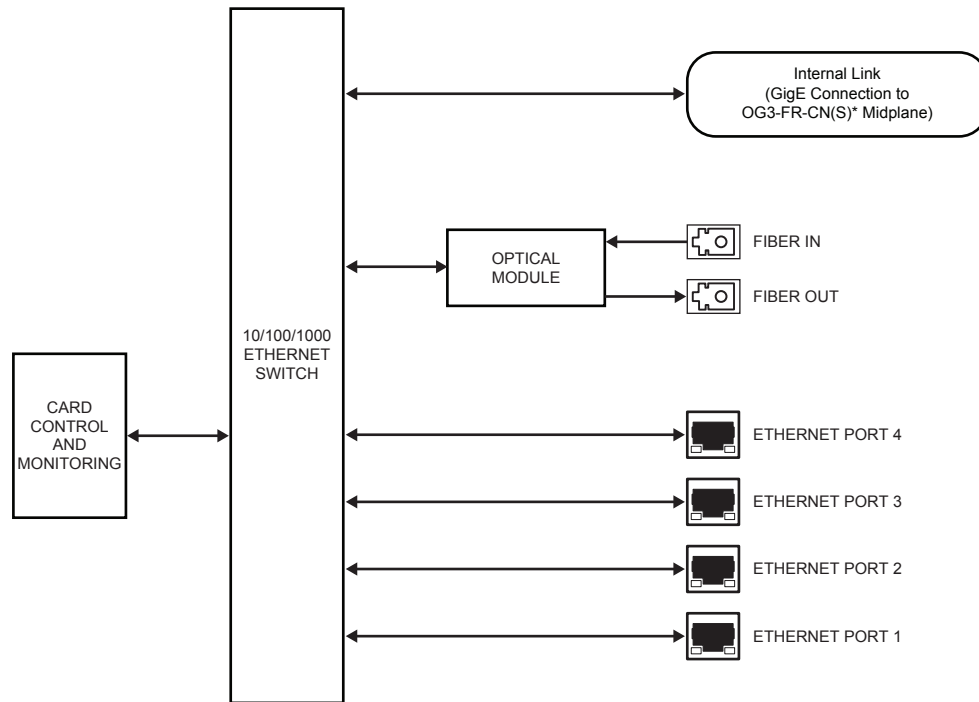
*Internal GigE connection requires the MFC-8322-N(S) network controller card for the OG3-FR frame.

Figure 4.1 *FES-6942 Series — Simplified Block Diagram*

Cabling for the FES-6942-20/40/80

The FES-6942 is used with the **8320AR-056** Full Rear Module. Each rear module occupies two slots and accommodates one card. This rear module provides one single mode optical input, one single mode optical output, and four RJ45 Ethernet 10/100/1000 ports.

If your FES-6942 is a high sensitivity transceiver, the card product number includes an "H". For example, FES-6942-27H.

The optical distance the optical ports of your card support are dependent on the card model. The suggested distances are specified in **Table 4.3**. To calculate your fiber path link budget, refer to **Table 4.4** on page 4-8 and **Table 4.5** on page 4-9 for optical budget specifications.

Table 4.3 FES-6942 Supported Optical Distances

Model	Cable Length
FES-6942-20	20km
FES-6942-40	40km
FES-6942-80	80km

Figure 4.2 Cable Connections for the FES-6942-20

Figure 4.3 Cable Connections for the FES-6942-40
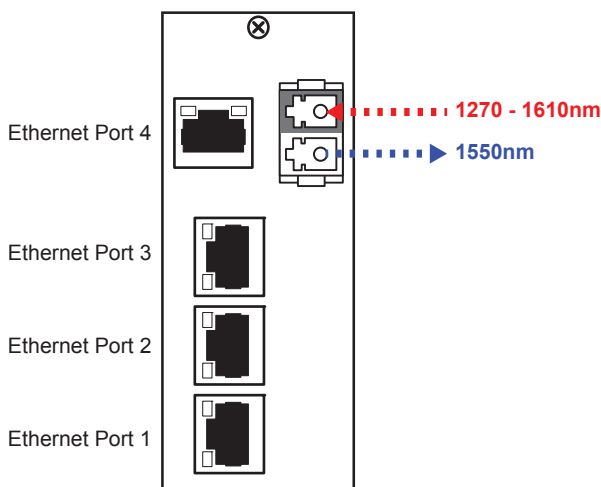
Figure 4.4 Cable Connections for the FES-6942-80

Cabling for the FES-6942 CWDM Series

The FES-6942 CWDM series use the same rear module as the FES-6942-20/40/80 but require a different cabling scheme. The wavelength of the optical inputs and outputs of your card is dependent on the card model. The supported wavelength is indicated in the card product number. For example, the FES-6942-27 supports 1270nm wavelengths. The wavelength designation are specified in the following figures.
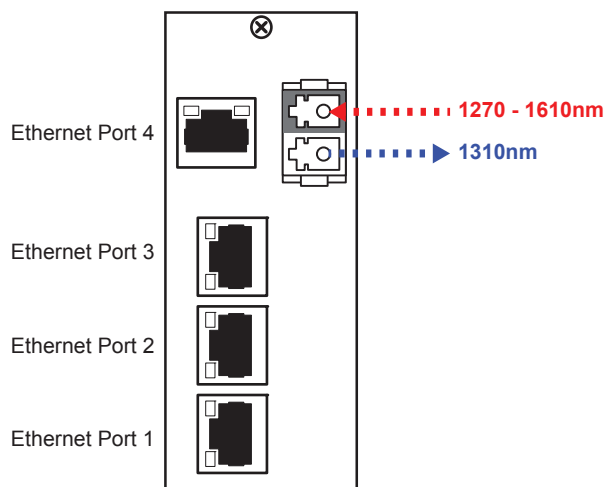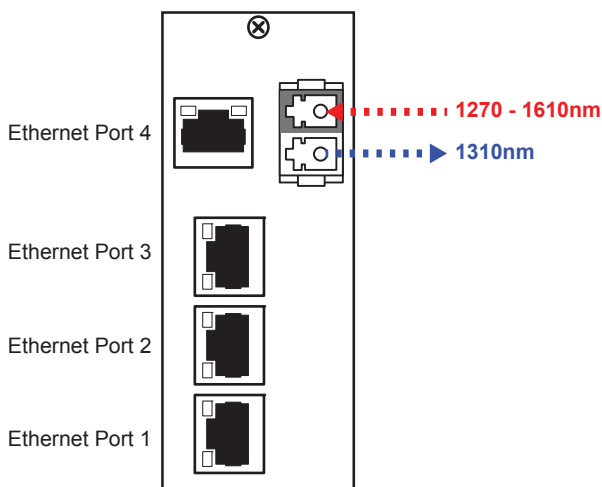

Figure 4.5 Cable Connections for the FES-6942-27

Figure 4.6 Cable Connections for the FES-6942-29

Figure 4.7 Cable Connections for the FES-6942-31

Figure 4.8 Cable Connections for the FES-6942-33

Figure 4.9 *Cable Connections for the FES-6942-35*

Figure 4.10 *Cable Connections for the FES-6942-37*

Figure 4.11 *Cable Connections for the FES-6942-43*
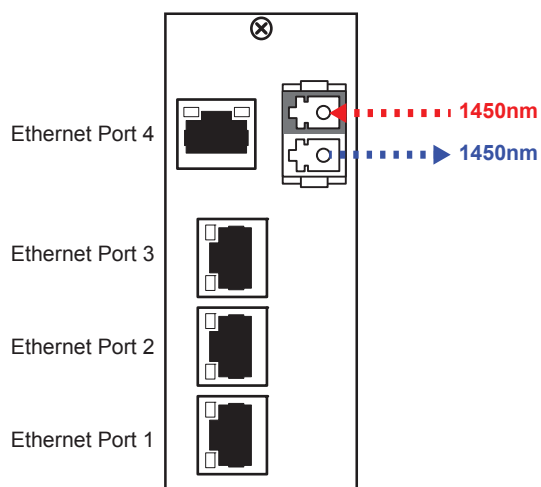
Figure 4.12 *Cable Connections for the FES-6942-45*
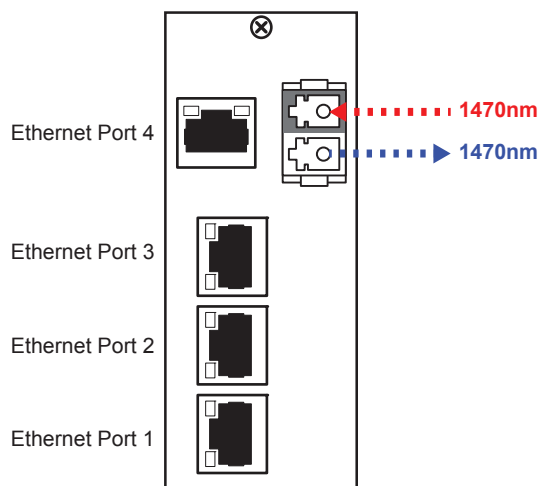
Figure 4.13 *Cable Connections for the FES-6942-47*
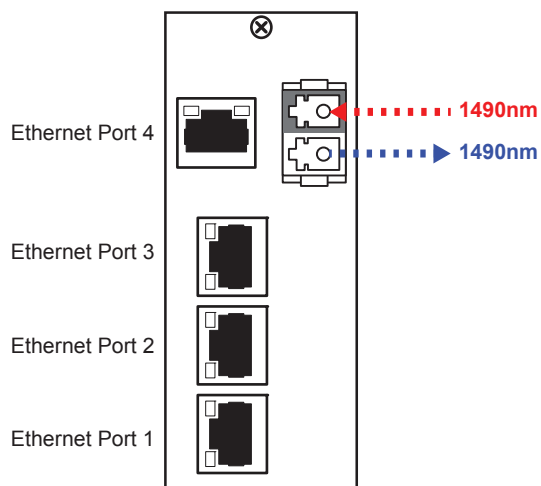
Figure 4.14 *Cable Connections for the FES-6942-49*
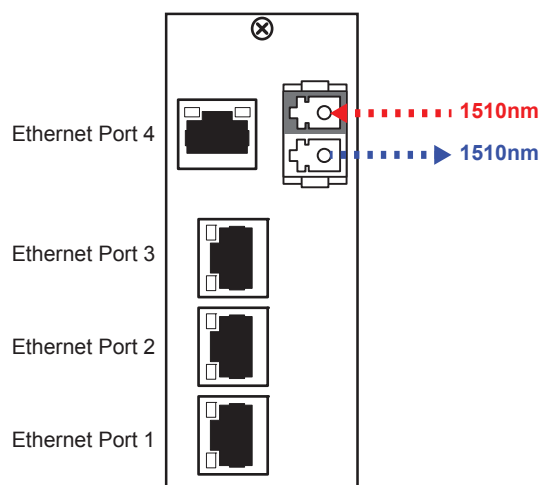
Figure 4.15 *Cable Connections for the FES-6942-51*
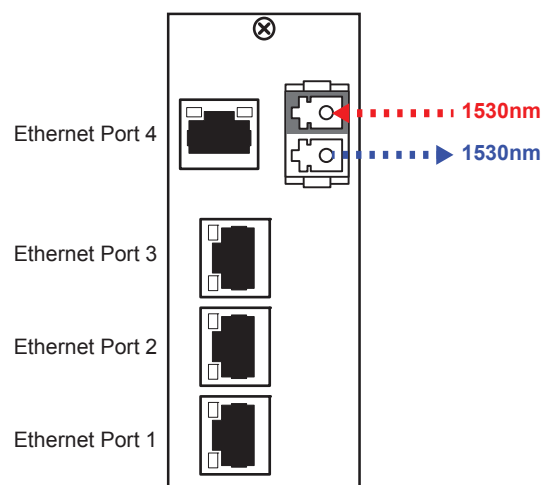
Figure 4.16 *Cable Connections for the FES-6942-53*
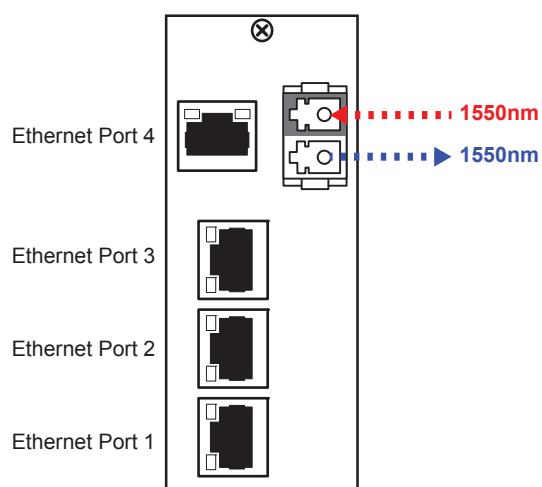
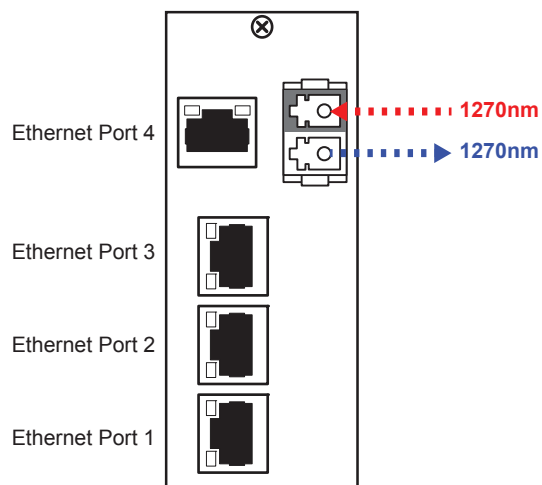**Figure 4.17** *Cable Connections for the FES-6942-55*
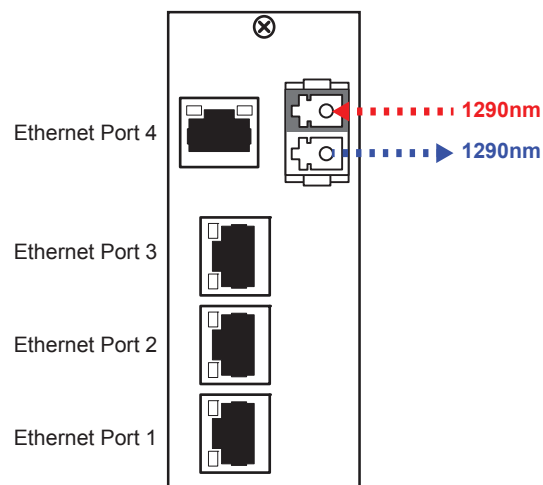

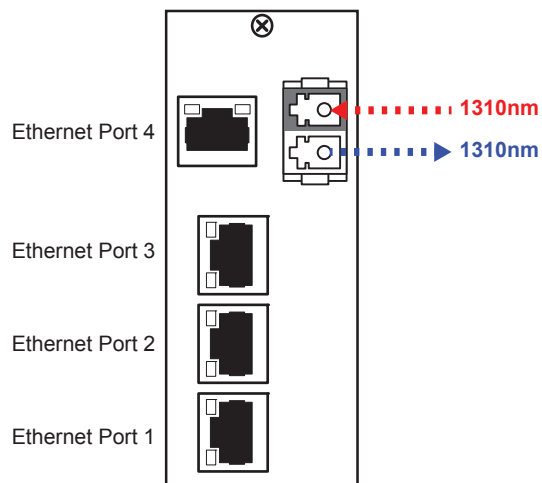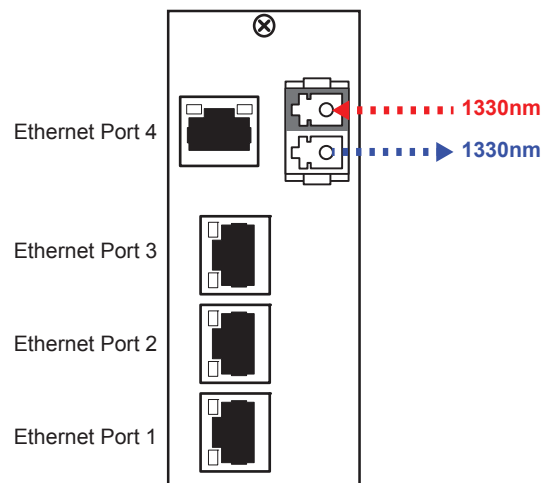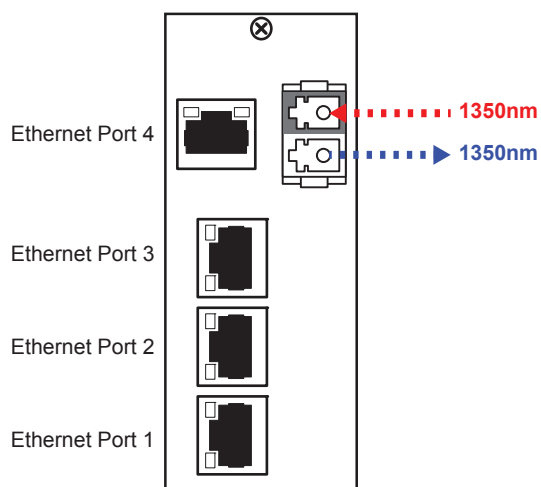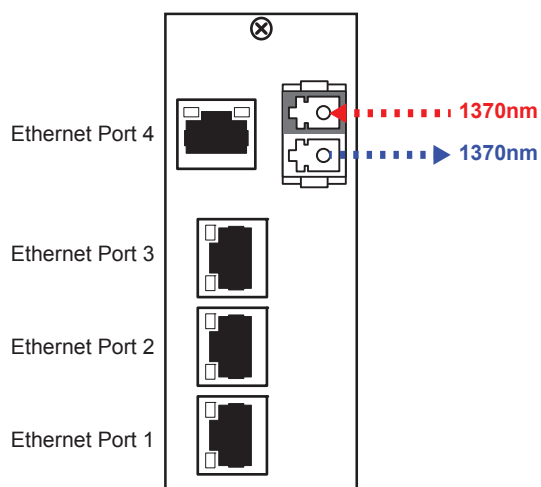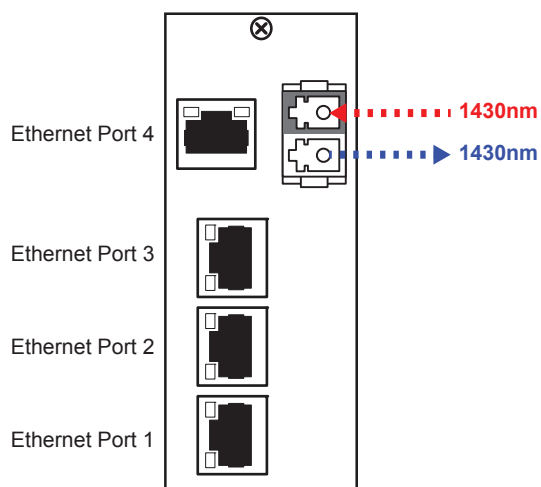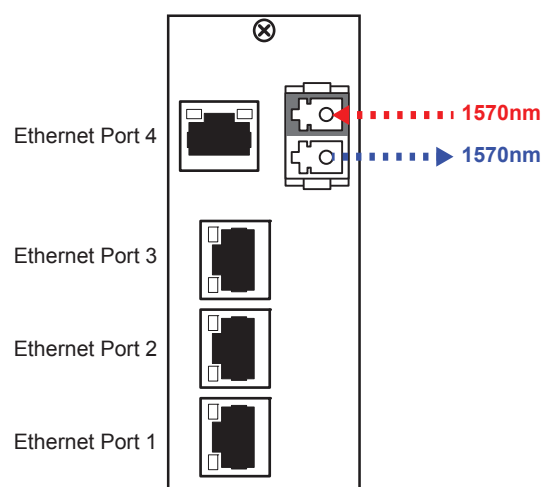**Figure 4.18** *Cable Connections for the FES-6942-57*
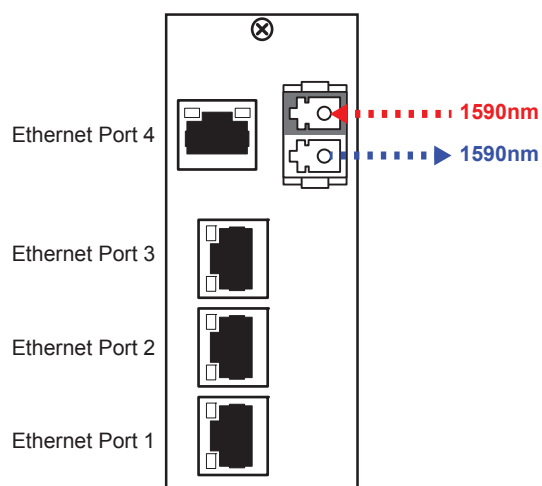
Figure 4.19 *Cable Connections for the FES-6942-59*
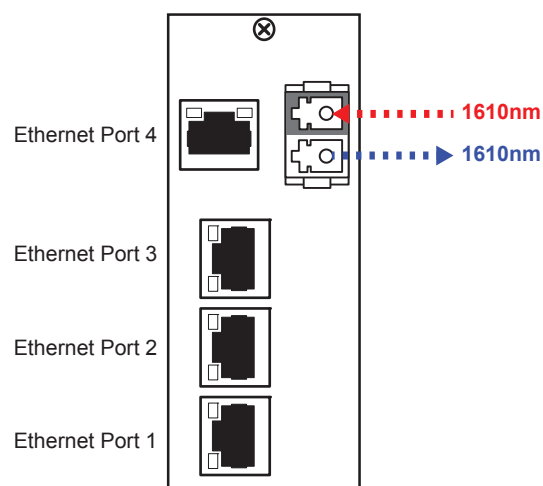
Figure 4.20 *Cable Connections for the FES-6942-61*

FES-6942 Technical Specifications

This section provides the technical specifications for the FES-6942 series.

FES-6942-20/40/80 Series

This section provides the technical specifications for the FES-6942-20, FES-6942-40, and FES-6942-80.

Table 4.4 FES-6942 Technical Specifications

Category	Parameter	Specification
Optical	Number of Inputs	1
	Number of Outputs	1
	Nominal Wavelength	FES-6942-20: 1310nm
		FES-6942-40: 1310nm
		FES-6942-80: 1550nm
	Tx Power	FES-6942-20: -3dBm to -8dBm
		FES-6942-40: +3dBm to -2dBm
		FES-6942-80: +5dBm to 0dBm
	Rx Sensitivity	FES-6942-20: -3dBm to -22dBm
		FES-6942-40: -3dBm to -24dBm
		FES-6942-80: -3dBm to -24dBm
	Optical Budget	FES-6942-20: 14dB
		FES-6942-40: 22dB
		FES-6942-80: 24dB
	Receiver Overload	values above -3dBm
	Connector Type[a]	Single Mode, LC/UPC
	Laser Type	Fabry-Perot (FP)
Ethernet 10/100/1000	Number of Ports	4
	Cable Type	Standard straight-through CAT-5e
	Connector Type	RJ45
Environment	Operating Range	0°C to 40°C
Power	Power Consumption	7W

a.Receiver overload at values above -3dBm.

FES-6942 CWDM Series

This section provides the technical specifications for the FES-6942 CWDM series.

Table 4.5 FES-6942 CWDM Series Technical Specifications

Category	Parameter	Specification
Optical	Number of Inputs	1
	Number of Outputs	1
	Nominal Wavelength	FES-6942-27: 1270nm
		FES-6942-29: 1290nm
		FES-6942-31: 1310nm
		FES-6942-33: 1330nm
		FES-6942-35: 1350nm
		FES-6942-37: 1370nm
		FES-6942-43: 1430nm
		FES-6942-45: 1450nm
		FES-6942-47: 1470nm
		FES-6942-49: 1490nm
		FES-6942-51: 1510nm
		FES-6942-53: 1530nm
		FES-6942-55: 1550nm
		FES-6942-57: 1570nm
		FES-6942-59: 1590nm
		FES-6942-61: 1610nm
	Tx Power	FES-6942-xx CWDM series: +5dBm to 0dBm
		FES-6942-xxH CWDM series: +7dBm to +2dBm
	Rx Sensitivity	FES-6942-xx CWDM series: -3dBm to -24dBm
		FES-6942-xxH series: -10dBm to -32dBm
	Optical Budget	FES-6942-xx CWDM series: 24dB
		FES-6942-xxH series: 34dB
	Receiver Overload	FES-6942-xx CWDM series: -3dBm
		FES-6942-xxH series:-10dBm
	Connector Type	Single Mode, LC/UPC, APD
	Laser Type	Distributed Feedback (DFB)
Ethernet 10/100/1000	Number of Ports	4
	Cable Type	Standard straight-through CAT-5e
	Connector Type	RJ45
Environment	Operating Range	0°C to 40°C
Power	Power Consumption	7W

FED-6943 Setup

In This Chapter

This chapter provides the cabling designations and the technical specifications for the FED-6943 Dual Link Ethernet Fiber Transceivers. Note that specifications are subject to change without notice.

The following topics are discussed:

- FED-6943 Overview
- FED-6943-20A and FED-6943-20B Cabling
- FED-6943-40A and FED-6943-40B Cabling
- FED-6943 Technical Specifications

FED-6943 Overview

The FED-6943 series use two bi-directional SFP transceivers that operate on different transmit (Tx) and receive (Rx) wavelengths. Each SFP uses a single fiber for bi-directional signals and contain an internal WDM splitter. This gives you six links (two fiber and four RJ-45) plus the Internal Link interface. The FED-6943 series requires the **8320AR-056** Full Rear Module which includes one LC duplex and four RJ-45 connectors.

To make use of the dual fiber bi-directional connection, the cards must be used together in pairs based on their WDM, ensuring to pair an -A model with a -B model (e.g. pair an FED-6943-20A with an FED-6943-20B). Alternatively, you could use one FED-6943 series card connected to two FES-6941 series cards of the same WDM. Refer to **Table 5.1** for details.

Table 5.1 FED-6943 Series — Model Pairs

Model	Description
FED-6943-20A	Dual bi-directional Fiber 20km WDM 1310nm transmitters and 1550nm receivers
FED-6943-20B	Dual bi-directional Fiber 20km WDM 1550nm transmitters and 1310nm receivers
FED-6943-40A	Dual bi-directional Fiber 40km WDM 1310nm transmitters and 1550nm receivers
FED-6943-40B	Dual bi-directional Fiber 40km WDM 1550nm transmitters and 1310nm receivers

FED-6943 Functional Block Diagram

This section provides a functional block diagram that outlines the workflow of the FED-6943 series regardless of the model type.
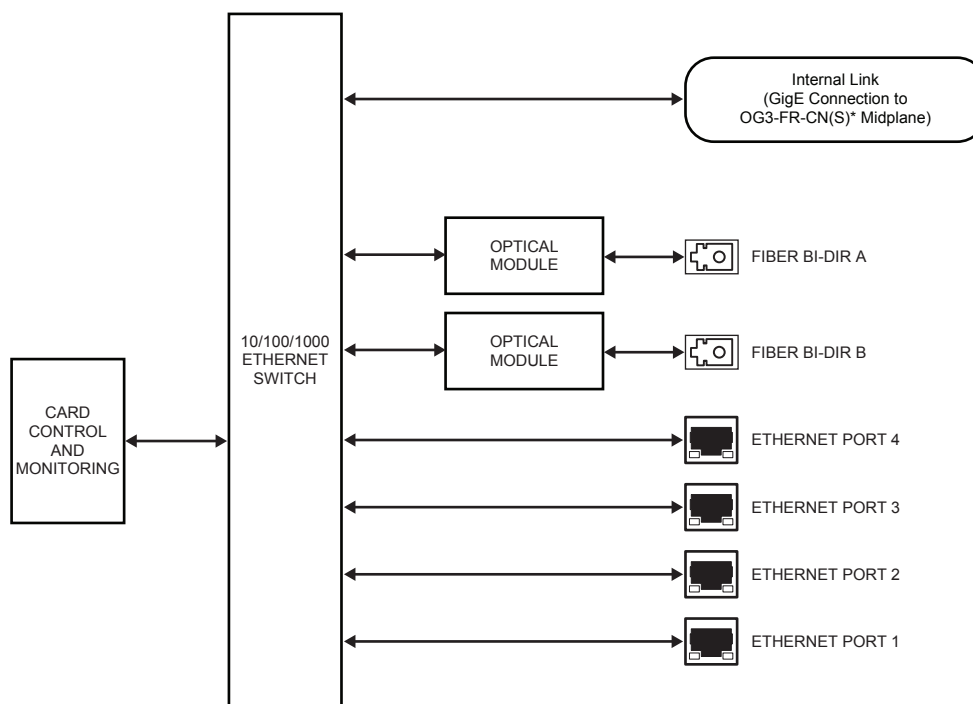
*Internal GigE connection requires the MFC-8322-N(S) network controller card for the OG3-FR frame.

Figure 5.1 *FED-6943 Series — Simplified Block Diagram*

FED-6943-20A and FED-6943-20B Cabling

Each of the FED-6943-20A and FED-6943-20B support 20km cable lengths.

FED-6943-20A

The FED-6943-20A is used with the **8320AR-056** Full Rear Module. Each rear module occupies two slots and accommodates one card. This rear module provides two bi-directional optical ports and four RJ45 Ethernet 10/100/1000 ports. Refer to **Figure 5.2** for cabling designations.
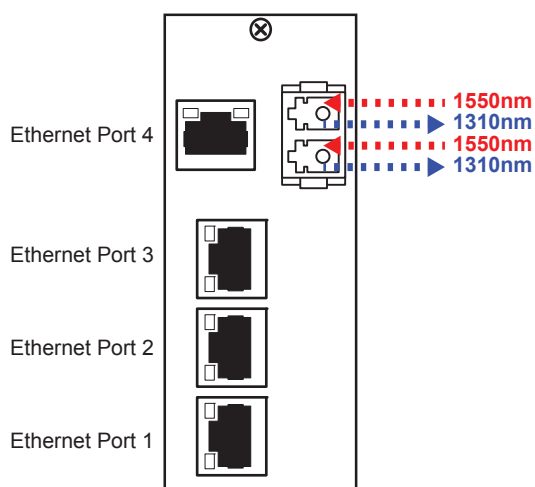
Figure 5.2 Cable Connections for the FED-6943-20A

FED-6943-20B

The FED-6943-20B is used with the **8320AR-056** Full Rear Module. Each rear module occupies two slots and accommodates one card. This rear module provides two bi-directional optical ports and four RJ45 Ethernet 10/100/1000 ports. Refer to **Figure 5.3** for cabling designations.
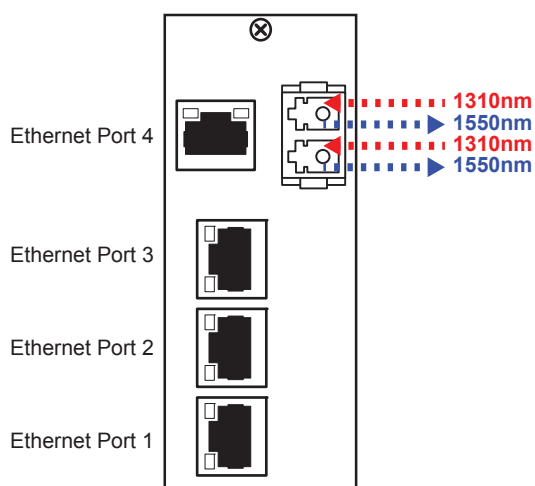
Figure 5.3 Cable Connections for the FED-6943-20B

FED-6943-40A and FED-6943-40B Cabling

Each of the FED-6943-40A and FED-6943-40B supports a 40km cable length.

FED-6943-40A

The FED-6943-40A is used with the **8320AR-056** Full Rear Module. Each rear module occupies two slots and accommodates one card. This rear module provides two bi-directional optical ports and four RJ45 Ethernet 10/100/1000 ports. Refer to **Figure 5.4** for cabling designations.
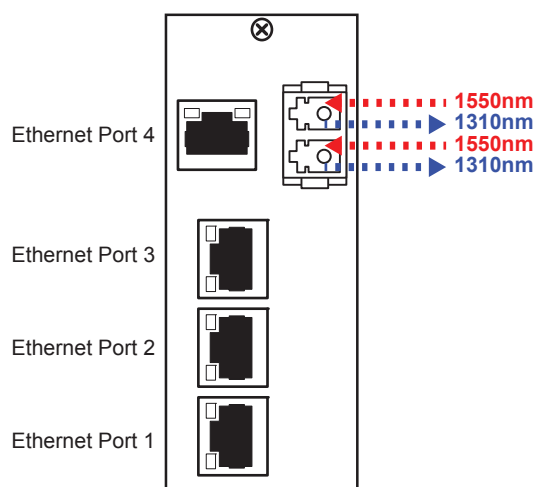
Figure 5.4 Cable Connections for the FED-6943-40A

FED-6943-40B

The FED-6943-40B is used with the **8320AR-056** Full Rear Module. Each rear module occupies two slots and accommodates one card. This rear module provides two bi-directional optical ports and four RJ45 Ethernet 10/100/1000 ports. Refer to **Figure 5.5** for cabling designations.
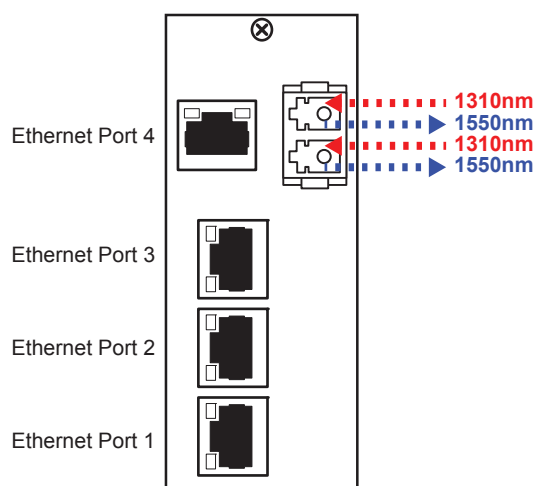
Figure 5.5 Cable Connections for the FED-6943-40B

FED-6943 Technical Specifications

This section provides the technical specifications for the FED-6943.

Table 5.2 FED-6943 Technical Specifications

Category	Parameter	Specification
Optical	Number of Bi-Directional Ports	2
	Tx Power	FED-6943-20A, FED-6943-20B: -3dBm to -8dBm
		FED-6943-40A: +2dBm to -3dBm
		FED-6943-40B: 0dBm to -5dBm
	Tx Wavelength	FED-6943-20A, FED-6943-40A: 1310nm
		FED-6943-20B, FED-6943-40B: 1550nm
	Rx Sensitivity	FED-6943-20A, FED-6943-20B: -3dBm to -22dBm
		FED-6943-40A, FED-6943-40B: -3dBm to -23dBm
	Optical Budget	FED-6943-20A, FED-6943-20B: 14dB
		FED-6943-40A, FED-6943-40B: 18dB
	Receiver Overload	-3dBm
	Connector Type	Dual Mode, LC/UPC
	Laser Type	Fabry-Perot (FP)
Ethernet 10/100/1000	Number of Ports	4
	Cable Type	Standard straight-through CAT-5e
	Connector Type	RJ45
Environment	Operating Range	0°C to 40°C
Power	Power Consumption	8W

FED-6944 Setup

In This Chapter

This chapter includes the technical specifications for the FED-6944 Dual Link Ethernet Fiber Transceivers. Note that specifications are subject to change without notice.

The following topics are discussed:

- FED-6944 Overview
- Cabling for the FED-6944-20/40/80
- Cabling for the FED-6944 CWDM Series
- FED-6944 Technical Specifications

FED-6944 Overview

The FED-6944 series are a quad fiber, with three RJ-45 connection, and two port dual fiber SFPs. This gives you five links (two fiber and three RJ-45) plus the Internal Link interface. Each card uses two standard SFPs with an FP 1310nm laser and PIN receiver. High power and CWDM transmitters are optional, as is a high sensitivity receiver.

The FED-6944 series requires the **8320AR-057** Full Rear Module which includes two LC duplex connectors and three RJ-45 connectors.

Table 6.1 FED-6944 — Models

Model	Description
FED-6944-20	Quad Fiber, Dual 20km with 2 SFPs; each SFP is: 1310nm transmitter and wideband receiver
FED-6944-40	Quad Fiber, Dual 40km with 2 SFPs; each SFP is: 1310nm transmitter and wideband receiver
FED-6944-80	Quad Fiber, Dual 20km with 2 SFPs; each SFP is: 1550nm transmitter and wideband receiver

CWDM and High Sensitivity Models

Options are also available with Coarse Wavelength Division Multiplexing (CWDM) transmitters, or as a high sensitivity receiver. The high sensitivity models are indicated with an H in the model number (e.g. FED-6944-27H). The CWDM models are identified with a two digit suffix as indicated in **Table 6.2** The wavelength for each model are also indicated.

Table 6.2 FED-6944 — Filter Wavelengths

Model	Filter Wavelengths	
	SFP 1	SFP 2
FED-6944-27	1270nm	1290nm
FED-6944-31	1310nm	1330nm
FED-6944-35	1350nm	1370nm
FED-6944-43	1430nm	1450nm
FED-6944-47	1470nm	1490nm
FED-6944-51	1510nm	1530nm
FED-6944-55	1550nm	1570nm
FED-6944-59	1590nm	1610nm

FED-6944 Functional Block Diagram

This section provides a functional block diagram that outlines the workflow of the FED-6944 series regardless of the model type.
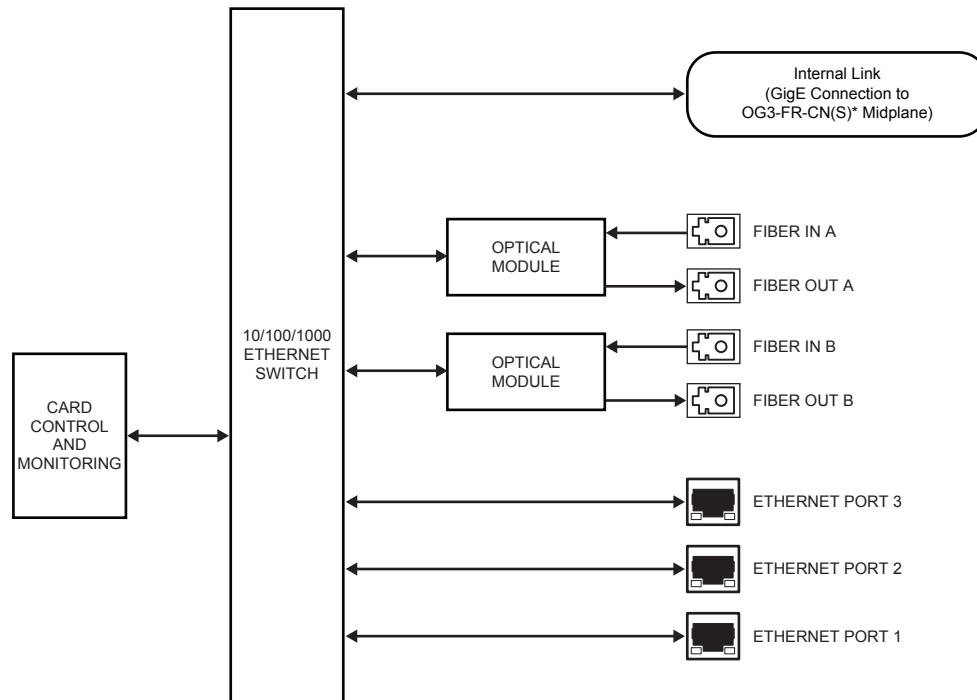
*Internal GigE connection requires the MFC-8322-N(S) network controller card for the OG3-FR frame.

Figure 6.1 FED-6944 Series — Simplified Block Diagram

Cabling for the FED-6944-20/40/80

The FED-6944-20/40/80 is used with the **8320AR-057** Full Rear Module. Each rear module occupies two slots and accommodates one card. This rear module provides two single mode optical inputs, two single mode optical outputs, and three RJ45 Ethernet 10/100/1000 ports.

The wavelength of the optical ports of your card is dependent on the card model. The wavelength designations are specified in the following diagrams.

The optical distance the optical ports of your card support are dependent on the card model. The distances are specified in **Table 6.3**. To calculate your fiber path link budget, refer to **Table 6.4** on page 6-7 and **Table 6.5** on page 6-8 for optical budget specifications.

Table 6.3 FED-6944 Supported Optical Distances

Model	Cable Length
FED-6944-20	20km
FED-6944-40	40km
FED-6944-80	80km
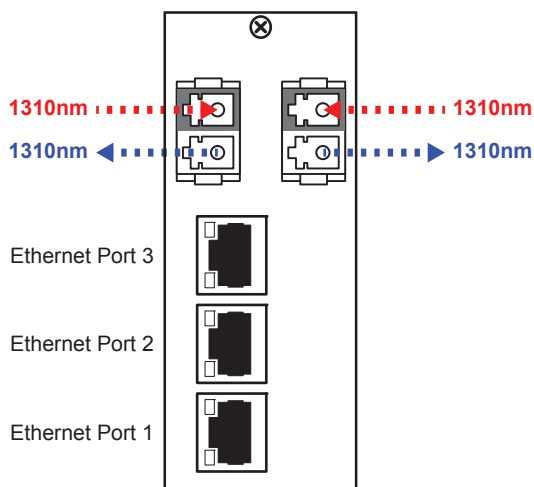
Figure 6.2 Cable Connections for the FED-6944-20
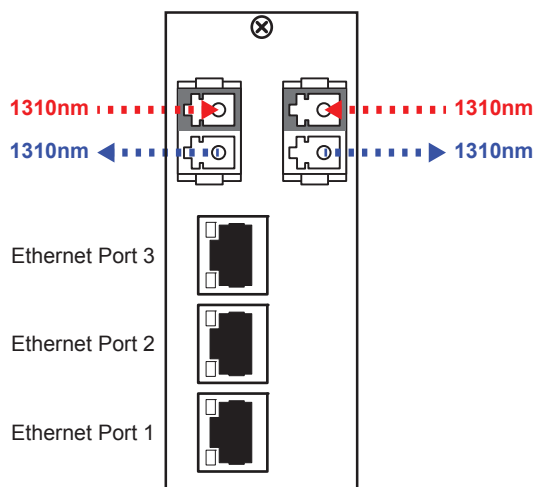
Figure 6.3 Cable Connections for the FED-6944-40
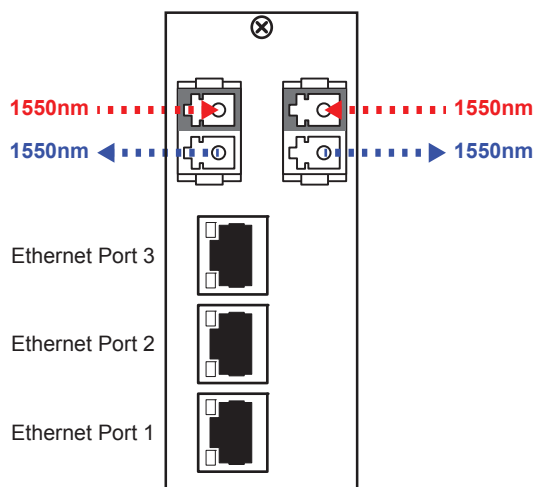
Figure 6.4 Cable Connections for the FED-6944-80

Cabling for the FED-6944 CWDM Series

The FED-6944 CWDM series use the same rear module as the FED-6944-20/40/80, but require a different cabling scheme. The supported wavelength is indicated in the card product number. For example, the FED-6944-27 supports 1270nm wavelengths. If your FED-6944 is a high sensitivity transceiver, the card product number includes the "H" character. For example, FED-6944-27H.
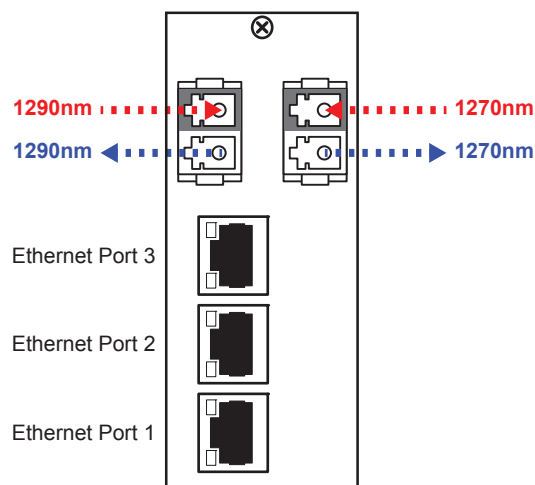
Figure 6.5 *FED-6944-27*
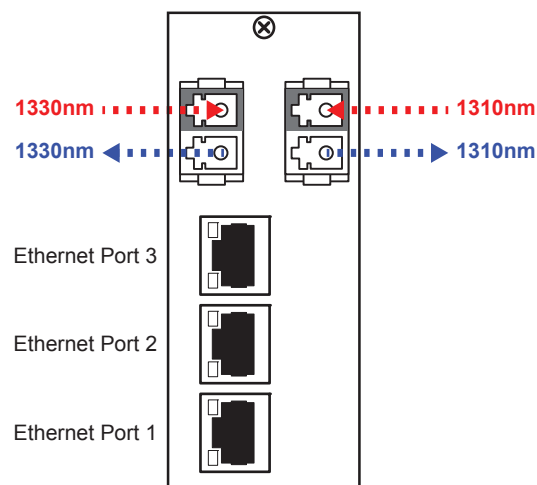
Figure 6.6 *FED-6944-31*
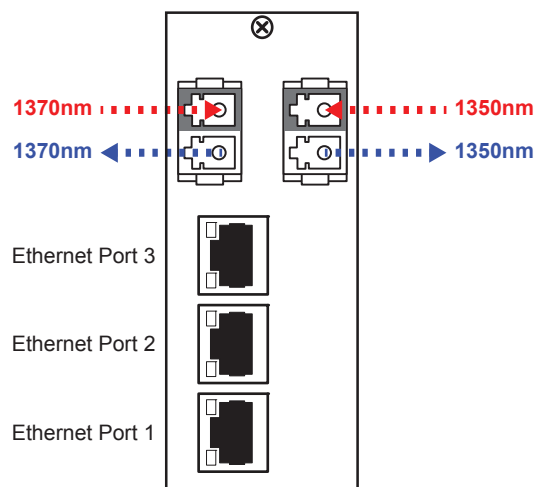
Figure 6.7 *FED-6944-35*
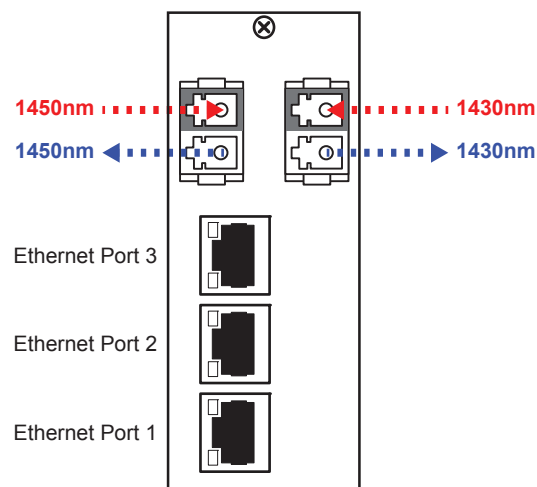
Figure 6.8 *FED-6944-43*

1490nm ······ ▶
1490nm ◀ ······ **1470nm**
······ ◀ **1470nm**
······ ▶ **1470nm**

Ethernet Port 3

Ethernet Port 2

Ethernet Port 1

Figure 6.9 FED-6944-47

1530nm ······ ▶
1530nm ◀ ······
······ ◀ **1510nm**
······ ▶ **1510nm**

Ethernet Port 3

Ethernet Port 2

Ethernet Port 1

Figure 6.10 FED-6944-51

1570nm ······ ▶
1570nm ◀ ······
······ ◀ **1550nm**
······ ▶ **1550nm**

Ethernet Port 3

Ethernet Port 2

Ethernet Port 1

Figure 6.11 FED-6944-55

1610nm ······ ▶
1610nm ◀ ······
······ ◀ **1590nm**
······ ▶ **1590nm**

Ethernet Port 3

Ethernet Port 2

Ethernet Port 1
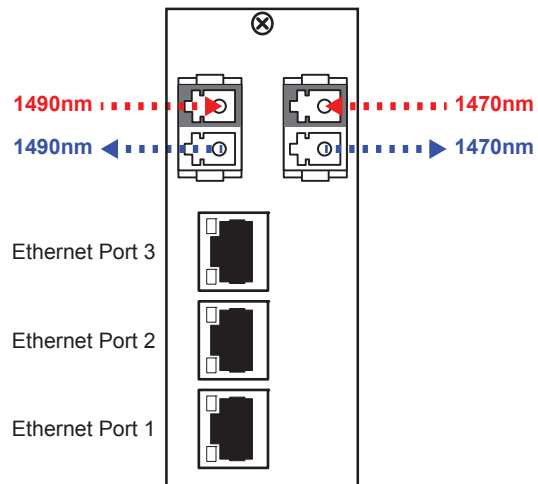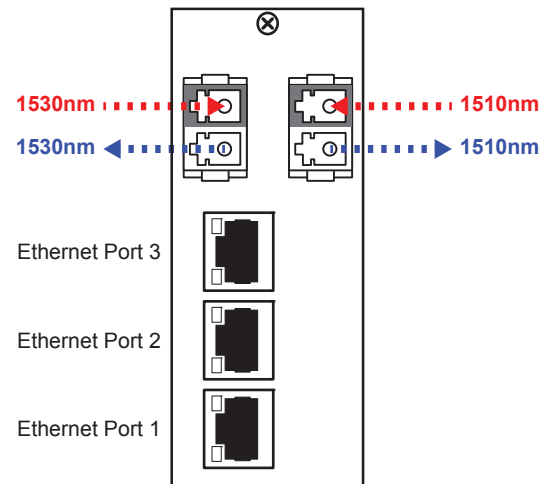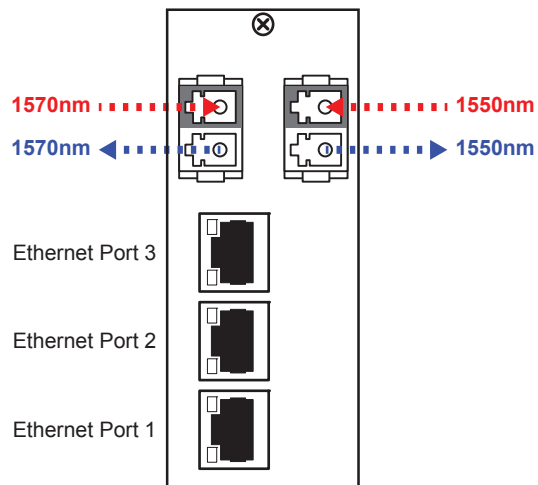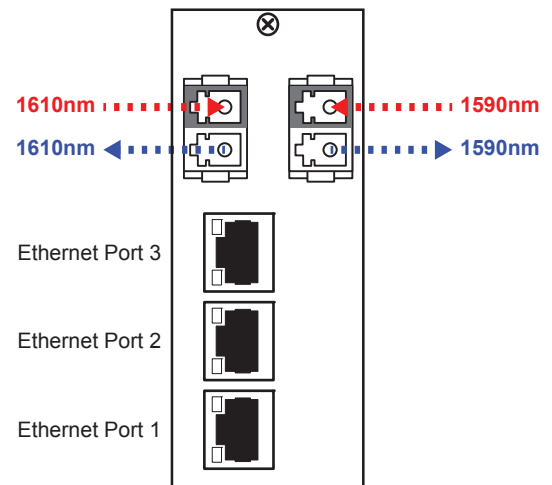
Figure 6.12 FED-6944-59

FED-6944 Technical Specifications

This section provides the technical specifications for the FED-6944.

FED-6944-20/40/80

This section provides the technical specifications for the FED-6944-20, FED-6944-40, and FED-6944-80.

Table 6.4 FED-6944 Technical Specifications

Category	Parameter	Specification
Optical	Number of Inputs	2
	Number of Outputs	2
	Nominal Wavelength	FED-6944-20: 1310nm
		FED-6944-40: 1310nm
		FED-6944-80: 1550nm
	Tx Power	FED-6944-20: -3dBm to -8dBm
		FED-6944-40: +3dBm to -2dBm
		FED-6944-80: +5dBm to 0dBm
	Rx Sensitivity	FED-6944-20: -3dBm to -22dBm
		FED-6944-40: -3dBm to -24dBm
		FED-6944-80: -3dBm to -24dBm
	Optical Budget	FED-6944-20: 14dB
		FED-6944-40: 22dB
		FED-6944-80: 24dB
	Receiver Overload	-3dBm
	Connector Type	Dual Mode, LC/UPC
	Laser Type	Fabry-Perot (FP)
Ethernet 10/100/1000	Number of Ports	3
	Cable Type	Standard straight-through CAT-5e
	Connector Type	RJ45
Environment	Operating Range	0°C to 40°C
Power	Power Consumption	8W

FED-6944 CWDM Series

This section provides the technical specifications for the FED-6944 CWDM series.

Table 6.5 FED-6944 CWDM Technical Specifications

Category	Parameter	Specification
Optical	Number of Inputs	2
	Number of Outputs	2
	Nominal Wavelength	FED-6944-27: 1270nm, 1290nm
		FED-6944-31: 1310nm, 1330nm
		FED-6944-35: 1350nm, 1370nm
		FED-6944-43: 1430nm, 1450nm
		FED-6944-47: 1470nm, 1490nm
		FED-6944-51: 1510nm, 1530nm
		FED-6944-55: 1550nm, 1570nm
		FED-6944-59: 1590nm, 1610nm
	Tx Power	FED-6944-xx CWDM series: +5dBm to 0dBm
		FED-6944-xxH CWDM series: +7dBm to +2dBm
	Rx Sensitivity	FED-6944-xx CWDM series: -3dBm to -24dBm
		FED-6944-xxH CWDM series: -10dBm to -32dBm
	Optical Budget	FED-6944-xx CWDM series: 21dB
		FED-6944-xxH CWDM series: 31dB
	Receiver Overload	FED-6944-xx CWDM series: -3dBm
		FED-6944-xxH CWDM series: -10dBm
	Connector Type	Dual Mode, LC/UPC
	Laser Type	FED-6944 CWDM series: Distributed Feedback (DFB)
		FED-6944-xxH CWDM series:
Ethernet 10/100/1000	Number of Ports	4
	Cable Type	Standard straight-through CAT-5e
	Connector Type	RJ45
Environment	Operating Range	0°C to 40°C
Power	Power Consumption	8W

FET-6945 Setup

In This Chapter

This chapter provides the cabling designations and the technical specifications for the FET-6945 Triple Link Ethernet Switch Transceivers. Note that specifications are subject to change without notice.

The following topics are discussed:

- FET-6945 Overview
- Cabling for the FET-6945-20A and FET-6945-20B
- Cabling for the FET-6945-40A and FET-6945-40B
- FET-6945 Technical Specifications

FET-6945 Overview

The FET-6945 series use three bi-directional SFP transceivers that operate on different transmit (Tx) and receive (Rx) wavelengths over a single fiber and contain an internal WDM splitter. This gives you six links (three fiber and three RJ-45) plus the Internal Link interface. The FET-6945 series requires the **8320AR-057** Full Rear Module which includes four LC duplex fiber optic connectors and three RJ-45 connectors.

To make use of the single fiber bi-directional connection, the cards must be used together in pairs based on their WDM, ensuring to pair an -A model with a -B model (e.g. pair an FET-6945-20A with an FET-6945-20B, or pair an FET-6945-20A with three FES-6941-20B). Refer to **Table 7.1** for paring details.

Table 7.1 FET-6945 Series Pairs

Model	Description
FET-6945-20A	Triple bi-directional Fiber 20km WDM 1310nm transmitter and 1550nm receiver
FET-6945-20B	Triple bi-directional Fiber 20km WDM 1550nm transmitter and 1310nm receiver
FET-6945-40A	Triple bi-directional Fiber 40km WDM 1310nm transmitter and 1550nm receiver
FET-6945-40B	Triple bi-directional Fiber 40km WDM 1550nm transmitter and 1310nm receiver

FET-6945 Functional Block Diagram

This section provides a functional block diagram that outlines the workflow of the FET-6945 series regardless of the model type.
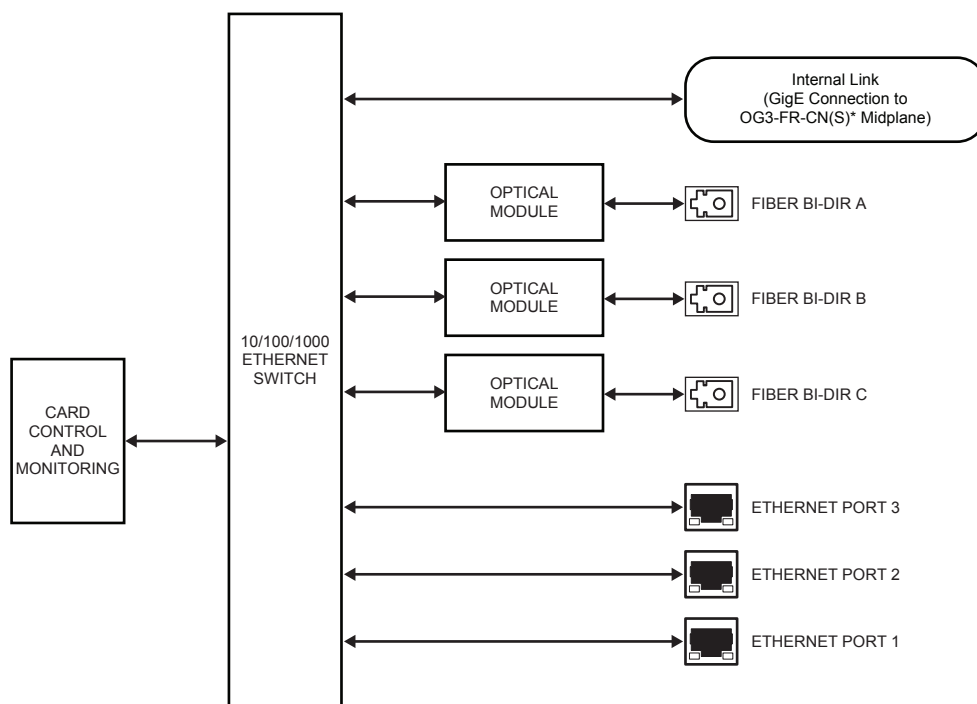
*Internal GigE connection requires the MFC-8322-N(S) network controller card for the OG3-FR frame.

Figure 7.1 *FET-6945 Series — Simplified Block Diagram*

Cabling for the FET-6945-20A and FET-6945-20B

To calculate your fiber path link budget, refer to **Table 7.2** on page 7-5 for optical budget specifications. Each of the FET-6945-20A and FET-6945-20B supports 20km cable lengths.

FET-6945-20A

The FET-6945-20A is used with the **8320AR-057** Full Rear Module. Each rear module occupies two slots and accommodates one card. This rear module provides three bi-directional optical ports and three RJ45 Ethernet 10/100/1000 ports. Refer to **Figure 7.2** for cabling designations.
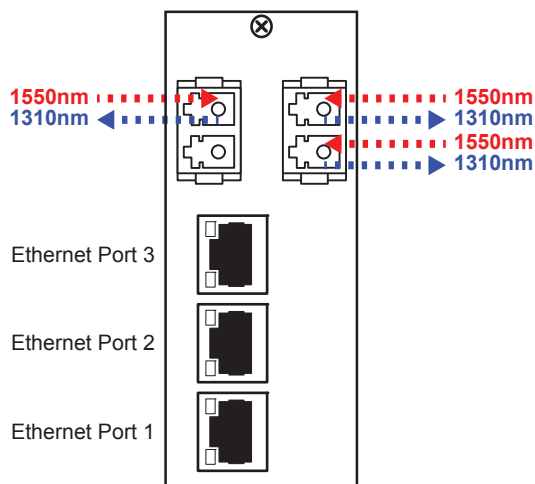
Figure 7.2 Cable Connections for the FET-6945-20A

FET-6945-20B

The FET-6945-20B is used with the **8320AR-057** Full Rear Module. Each rear module occupies two slots and accommodates one card. This rear module provides three bi-directional optical ports and three RJ45 Ethernet 10/100/1000 ports. Refer to **Figure 7.3** for cabling designations.
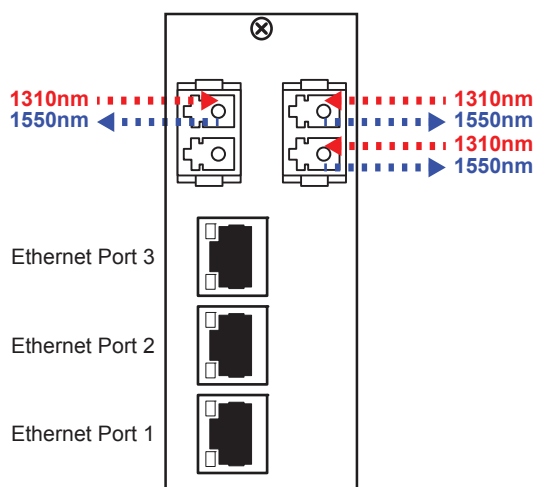
Figure 7.3 Cable Connections for the FET-6945-20B

Cabling for the FET-6945-40A and FET-6945-40B

To calculate your fiber path link budget, refer to **Table 7.2** on page 7-5 for optical budget specifications. Each of the FET-6945-40A and FET-6945-40B supports 40km cable lengths.

FET-6945-40A

The FET-6945-40A is used with the **8320AR-057** Full Rear Module. Each rear module occupies two slots and accommodates one card. This rear module provides three bi-directional optical ports and three RJ45 Ethernet 10/100/1000 ports. Refer to **Figure 7.4** for cabling designations.
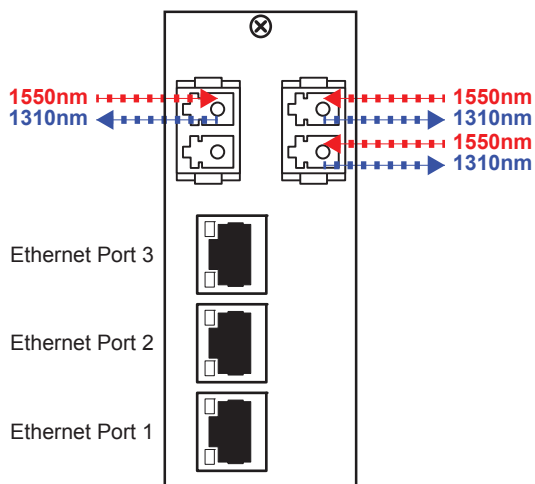
Figure 7.4 Cable Connections for the FET-6945-40A

FET-6945-40B

The FET-6945-40B is used with the **8320AR-057** Full Rear Module. Each rear module occupies two slots and accommodates one card. This rear module provides three bi-directional optical ports and three RJ45 Ethernet 10/100/1000 ports. Refer to **Figure 7.5** for cabling designations.
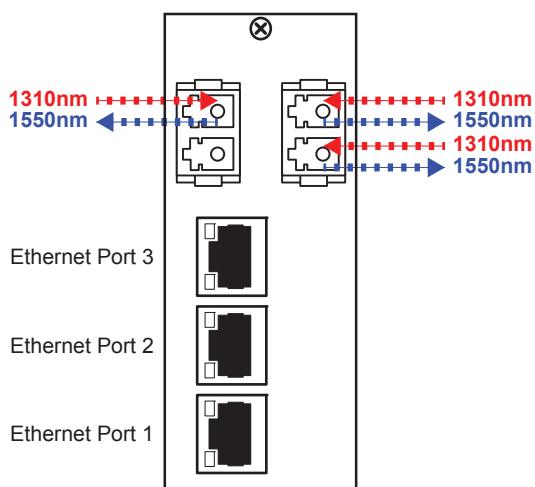
Figure 7.5 Cable Connections for the FET-6945-40B

FET-6945 Technical Specifications

This section provides the technical specifications for the FET-6945.

Table 7.2 FET-6945 Technical Specifications

Category	Parameter	Specification
Optical	Number of Bi-Directional Ports	3
	Tx Wavelength	FET-6945-20A, FET-6945-40A: 1310nm
		FET-6945-20B, FET-6945-40B: 1550nm
	Tx Power	FET-6945-20A, FET-6945-20B: -3dBm to -8dBm
		FET-6945-40A: +2dBm to -3dBm
		FET-6945-40B: 0dBm to -5dBm
	Rx Sensitivity	FET-6945-20A, FET-6945-20B: -3dBm to -22dBm
		FET-6945-40A, FET-6945-40B: -3dBm to -23dBm
	Optical Budget	FET-6945-20A, FET-6945-20B: 14dB
		FET-6945-40A, FET-6945-40B: 18dB
	Receiver Overload	At values above -3dBm
	Connector Type	Dual Mode, LC/UPC
	Laser Type	Fabry-Perot (DFB)
Ethernet 10/100/1000	Number of Ports	3
	Cable Type	Standard straight-through CAT-5e
	Connector Type	RJ45
Environment	Operating Range	0°C to 40°C
Power	Power Consumption	9W

FET-6946 Setup

In This Chapter

This chapter provides the cabling designations and technical specifications for the FET-6946 Triple Link Ethernet Switch Transceivers. Note that specifications are subject to change without notice.

The following topics are discussed:

* FET-6946 Overview
* Cabling for the FET-6946-20A and FET-6946-20B
* Cabling for the FET-6946-40A and FET-6946-40B
* FET-6946 Technical Specifications

FET-6946 Overview

The FET-6946 series includes a dual fiber SFP, three copper (RJ45) ethernet ports, and two bi-directional SFP transceivers. The bi-directional SFP transceiver operates on different transmit (Tx) and receive (Rx) wavelengths over a single fiber and contain an internal WDM splitter. This gives you six links (three fiber and three RJ-45) plus the Internal Link interface. The FET-6946 series requires the **8320AR-057** Full Rear Module.

To make use of the triple fiber bi-directional connection, the cards must be used together in pairs based on their WDM, ensuring to pair an -A model with a -B model (e.g. pair an FET-6946-20A with an FET-6946-20B). Refer to **Table 8.1** for details. Alternatively, you could use one FET-6946 series card connected to a combination of FED-6943 and FES-6941 series cards of the same WDM. The dual fiber port connection can also connect to a dual fiber connection on a FES-6942 or FED-6944 card or a generic switch provided that the power levels match.

Table 8.1 FET-6946 Series — Model Pairs

Model	Description
FET-6946-20A	Dual bi-directional Fiber 20km WDM 1310nm transmitter and 1550nm receiver plus 20km 1310nm transmitter and wideband receiver
FET-6946-20B	Dual bi-directional Fiber 20km WDM 1550nm transmitter and 1310nm receiver plus 20km 1310nm transmitter and wideband receiver
FET-6946-40A	Dual bi-directional Fiber 40km WDM 1310nm transmitter and 1550nm receiver plus 40km 1310nm transmitter and wideband receiver
FET-6946-40B	Dual bi-directional Fiber 40km WDM 1550nm transmitter and 1310nm receiver plus 40km 1310nm transmitter and wideband receiver

FET-6946 Functional Block Diagram

This section provides a functional block diagram that outlines the FET-6946 series workflow.
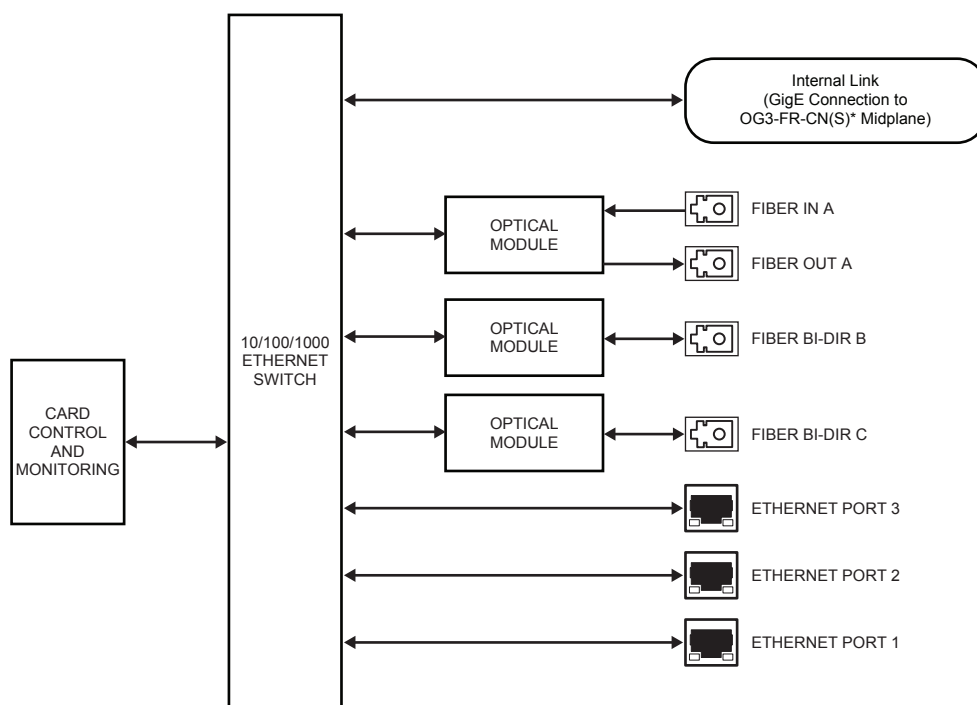
*Internal GigE connection requires the MFC-8322-N(S) network controller card for the OG3-FR frame.

Figure 8.1 FET-6946 Series — Simplified Block Diagram

Cabling for the FET-6946-20A and FET-6946-20B

To calculate your fiber path link budget, refer to **Table 8.2** on page 8-5 for optical budget specifications. Each of the FET-6946-20A and FET-6946-20B supports 20km cable lengths.

FET-6946-20A

The FET-6946-20A is used with the **8320AR-057** Full Rear Module. Each rear module occupies two slots and accommodates one card. This rear module provides two bi-directional optical ports, one single mode optical output, one single mode optical input, and three RJ45 Ethernet 10/100/1000 ports. Refer to **Figure 8.2** for cabling designations.

Figure 8.2 Cable Connections for the FET-6946-20A

FET-6946-20B

The FET-6946-20B is used with the **8320AR-057** Full Rear Module. Each rear module occupies two slots and accommodates one card. This rear module provides two bi-directional optical ports, one single mode optical output, one single mode optical input, and three RJ45 Ethernet 10/100/1000 ports. Refer to **Figure 8.3** for cabling designations.
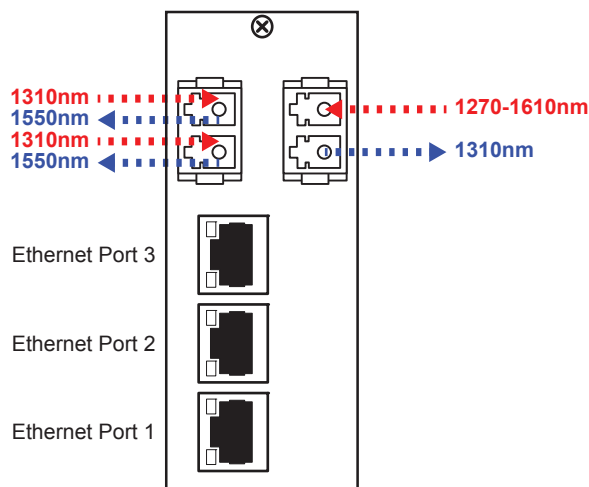
Figure 8.3 Cable Connections for the FET-6946-20B

Cabling for the FET-6946-40A and FET-6946-40B

To calculate your fiber path link budget, refer to **Table 8.2** on page 8-5 for optical budget specifications. Each of the FET-6946-20A and FET-6946-20B supports 40km cable lengths.

FET-6946-40A

The FET-6946-40A is used with the **8320AR-057** Full Rear Module. Each rear module occupies two slots and accommodates one card. This rear module provides two bi-directional optical ports, one single mode optical output, one single mode optical input, and three RJ45 Ethernet 10/100/1000 ports. Refer to **Figure 8.4** for cabling designations.
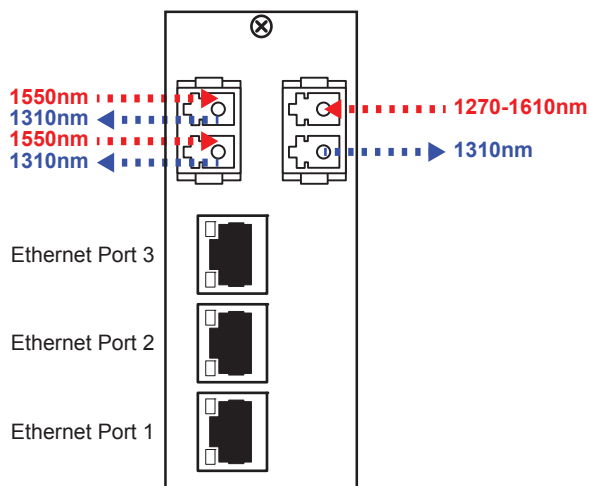
Figure 8.4 Cable Connections for the FET-6946-40A

FET-6946-40B

The FET-6946-40B is used with the **8320AR-057** Full Rear Module. Each rear module occupies two slots and accommodates one card. This rear module provides two bi-directional optical ports, one single mode optical output, one single mode optical input, and three RJ45 Ethernet 10/100/1000 ports. Refer to **Figure 8.5** for cabling designations.
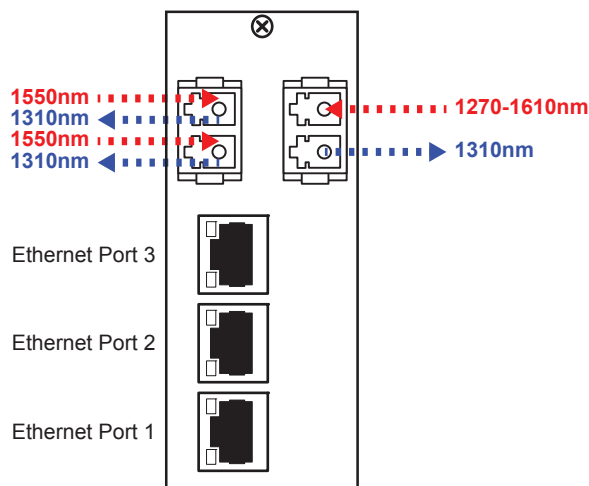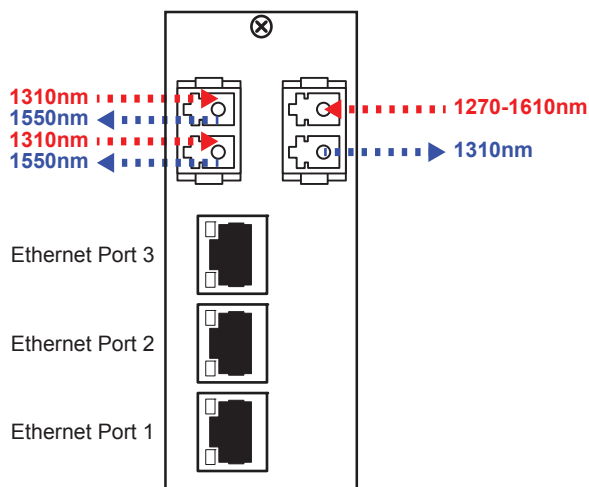

Figure 8.5 Cable Connections for the FET-6946-40B

FET-6946 Technical Specifications

This section provides the technical specifications for the FET-6946.

Table 8.2 FET-6946 Technical Specifications

Category	Parameter	Specification
Optical	Number of Inputs	1
	Number of Outputs	1
	Number of Bi-Directional Ports	2
	Tx Wavelength	Refer to the sections "**Cabling for the FET-6946-20A and FET-6946-20B**" on page 8-3 and "**Cabling for the FET-6946-40A and FET-6946-40B**" on page 8-4
	Tx Power	FET-6946-20A, FET-6946-20B: -3dBm to -8dBm
		FET-6946-40A: +2dBm to -3dBm
		FET-6946-40B: 0dBm to -5dBm
	Rx Sensitivity	FET-6946-20A, FET-6946-20B: -3dBm to -22dBm
		FET-6946-40A, FET-6946-40B: -3dBm to -23dBm
	Optical Budget	FET-6946-20A, FET-6946-20B: 11dB
		FET-6946-40A, FET-6946-40B: 15dB
	Connector Type	Dual Mode, LC/UPC
	Laser Type	Fabry-Perot (FP)
Ethernet 10/100/1000	Number of Ports	3
	Cable Type	Standard straight-through CAT-5e
	Connector Type	RJ45
Environment	Operating Range	0°C to 40°C
Power	Power Consumption	9W

Configuration

In This Chapter

This chapter provides a general overview of the user controls and configuration options available for your Fiber Ethernet Switch Transceiver.

The following topics are discussed:

- Card Overview
- Control and Monitoring Features
- Configuring a VLAN
- Enabling Trunking
- Enabling Alarms

Card Overview

This section provides a general overview of the Fiber Ethernet Switch Transceiver card-edge components. For information on the available LEDs, refer to the section "**Control and Monitoring Features**" on page 9-3. Note that while an FET-6945 is described here, the card-edge components is the same regardless of the card model but the number may differ.
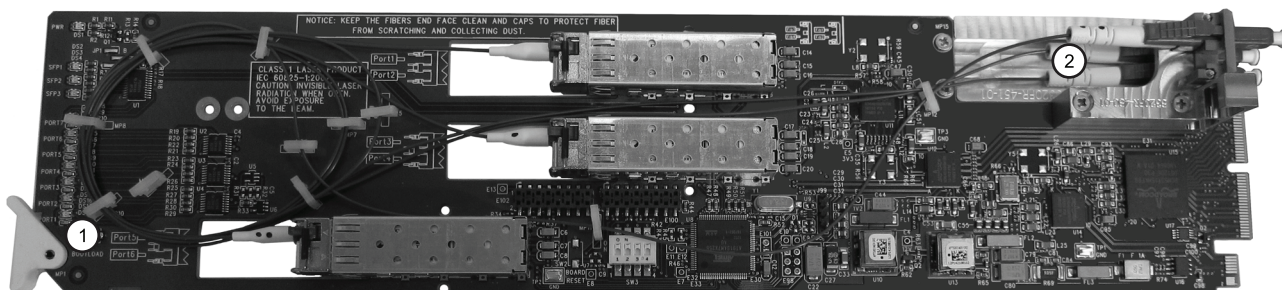
Figure 9.1 FET-6945 — Components

1) Bootload Button (**SW3**)	2) Fiber Optic Connectors

1. Bootload Button (SW3)

SW3 is used for factory service in the unlikely event of a complete card failure. The Bootload process is further described in the section "**Bootload Button**" on page 11-2.

2. Fiber Optic Connectors

The Fiber Ethernet Switch Transceivers use a blind mate LC/UPC connector to interface with the Rear Modules (8320AR-056 and 8320AR-057). The rear module remains passive, while allowing for the Fiber Ethernet Switch Transceiver to be replaced without the need to remove any connected Ethernet or fiber optic cables. The blind mate connector is connected to the optical module via a single mode LC/UPC pigtail.

Note — *The number of fiber optic connectors and SFPs on the card is dependent on the card model.*

Each fiber optic connector for the card includes a dust cap. The dust cap must stay on at all times when the card is not installed in a frame. Ensure to keep the fibers end face clean and use the caps to protect the fiber from scratches and collecting dust. Refer to the document *Important Regulatory and Safety Notices*, that shipped with your unit, for safety information.

Control and Monitoring Features

This section provides information on the power status LED located on the card-edge and the LEDs on all rear modules for the Fiber Ethernet Switch Transceivers.

Note — *The number of SFP and PORT LEDs that are implemented on the card-edge is dependent on your card model.*

Card-edge LEDs

The front-edge of each Fiber Ethernet Switch Transceiver includes LED indicators for alarms, and communication activity. Refer to **Figure 9.2** for the location of this LED on the card-edge.
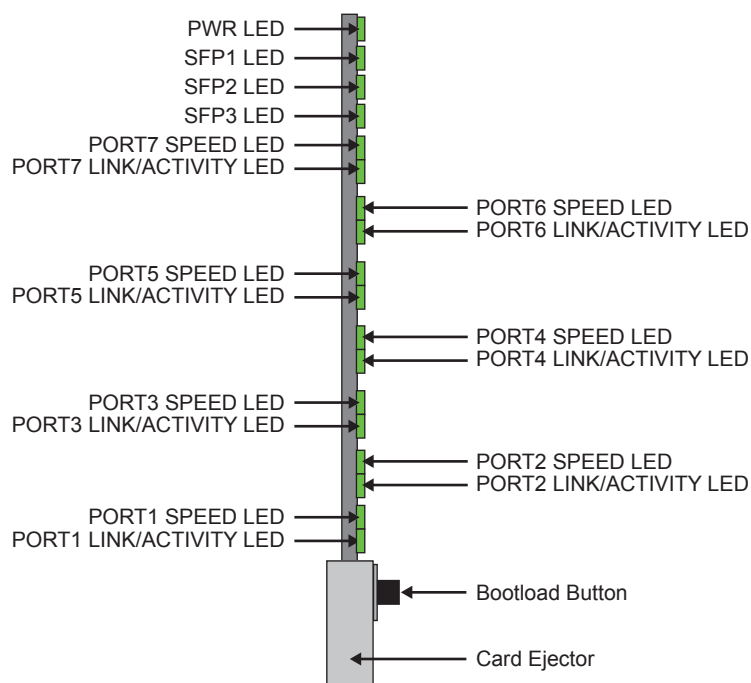
Figure 9.2 Fiber Ethernet Switch Transceiver — Card-edge PWR LED

Each pair of PORT LEDs on the card-edge report on a specific fiber or RJ45 port for your card. **Table 9.1** outlines the mapping of the LEDs based on the rear module type.

Table 9.1 Port LED Mapping

LED	Reports Status of					
	FES-6941	**FES-6942**	**FED-6943**	**FED-6944**	**FET-6945**	**FET-6946**
PORT 7	Internal Link	Internal Link	Internal Link	Internal Link	Internal Link	Internal Link
PORT 6	Fiber A	Fiber A	Fiber A	Fiber A	Fiber A	Fiber A
PORT 5	--	--	Fiber B	Fiber B	Fiber B	Fiber B
PORT 4	RJ45 #4	RJ45 #4	RJ45 #4	--	Fiber C	Fiber C
PORT 3	RJ45 #3	RJ45 #3	RJ45 #3	RJ45 #3	RJ45 #3	RJ45 #3
PORT 2	RJ45 #2	RJ45 #2	RJ45 #2	RJ45 #2	RJ45 #2	RJ45 #2
PORT 1	RJ45 #1	RJ45 #1	RJ45 #1	RJ45 #1	RJ45 #1	RJ45 #1

Card-edge LEDs Overview

Basic LED displays and descriptions are provided in **Table 9.2**.

Table 9.2 Card-edge LEDs

LED	Color	Display and Description
PWR	Green	When lit green, this LED indicates that the card is functioning normal and that no anomalies have been detected.
	Flashing Green	When flashing green, this LED indicates that the bootloader is currently running.
	Yellow	When lit yellow, this LED indicates that the CPU is booting.
	Red	When lit red, this LED indicates that the card is powering on or there is a fault condition.
	Off	When unlit, this LED indicates a lack of power to the card.
SFP #[a]	Green	When lit green, this LED indicates that the Fiber signal on the specified SFP is functioning correctly and that no anomalies have been detected.
PORT # SPEED	Green	When lit green, this LED indicates the port speed is at 1Gbps.
	Orange	When lit orange, this LED indicates the port speed is at 100Mbps.
	Off	When unlit, this LED indicates the port speed is at 10Mbps.
PORT # LINK/ACTIVITY	Green	When lit green, this LED indicates a valid link is established on the port.
	Flashing Green	When flashing green, this LED indicates communication activity is occurring.
	Off	When unlit, this LED indicates an invalid link is detected. Verify the cable connection on the rear module port and your network connections.

a.   Refer to the section "**Card Overview**" on page 9-2 for SFP Optical Module locations.

Rear Module LEDs

Each RJ45 connector on the rear modules include two LEDs that report the ethernet communication activity and speed for the card. Refer to **Figure 9.3** and **Figure 9.4** for LED locations.
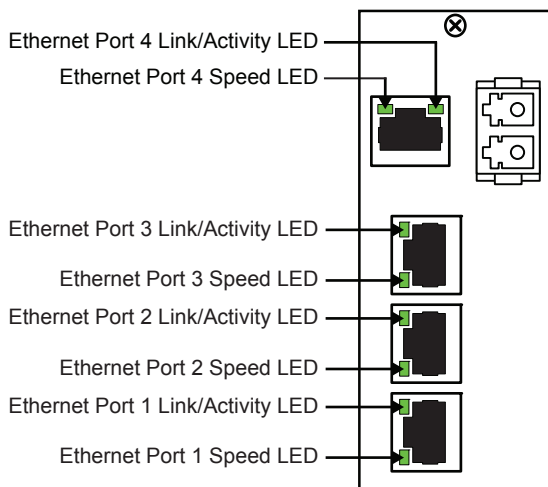
Figure 9.3 8320AR-056 Rear Module LEDs
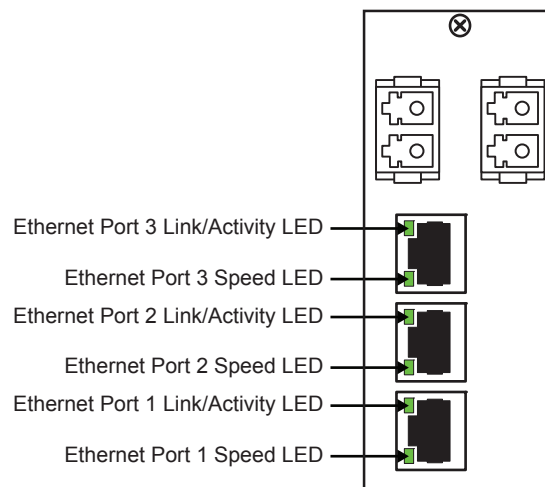
Figure 9.4 8320AR-057 Rear Module LEDs

Rear Module LEDs Overview

Basic LED descriptions are provided in **Table 9.3**.

Table 9.3 LEDs on the Rear Modules

LED	Color	Display and Description
ETHERNET PORT # LINK/ACTIVITY	Green	When lit green, this LED indicates a valid link is established on the specified RJ45 port.
	Flashing Green	When flashing green, this LED indicates communication activity is occurring on the specified RJ45 port.
	Off	When unlit, this LED indicates an invalid link is detected on the specified RJ45 port. Verify the cable connection on the rear module port and your network connections.
ETHERNET PORT # SPEED	Green	When lit green, this LED indicates the Ethernet Port communication speed is at 1Gbps.
	Orange	When lit orange, this LED indicates the Ethernet Port communication speed is at 100Mbps.
	Off	When unlit, this LED indicates the Ethernet Port communication speed is at 10Mbps.

Configuring a VLAN

A virtual local area network (VLAN) is a logical grouping of workstations, servers, and network devices so that they appear to be on the same LAN whether they are part of a larger local LAN or geographically dispersed. A VLAN allows a network of computers and users to communicate in a simulated environment as if they exist in a single LAN and are sharing a single broadcast and multicast domain.

You can create port-based VLANs that act like a straight communication and isolating the traffic from each other. In setups as seen in **Figure 9.5** and **Figure 9.6** the Corporate Network(s) need to recognize port-based VLANs. The Corporate Networks in **Figure 9.5** require the ends at Corporate Network 1 and Corporate Network 2 to be setup as either trunks or port-based VLANs to prevent loops at either end. **Figure 9.6** shows a simple connection where each VLAN terminates in a single device (or isolated subnet). Unlike **Figure 9.5**, there is no requirement for additional setup of the Corporate Network as the Fiber Ethernet Switch Transceiver card appears as a transparent cable extender.
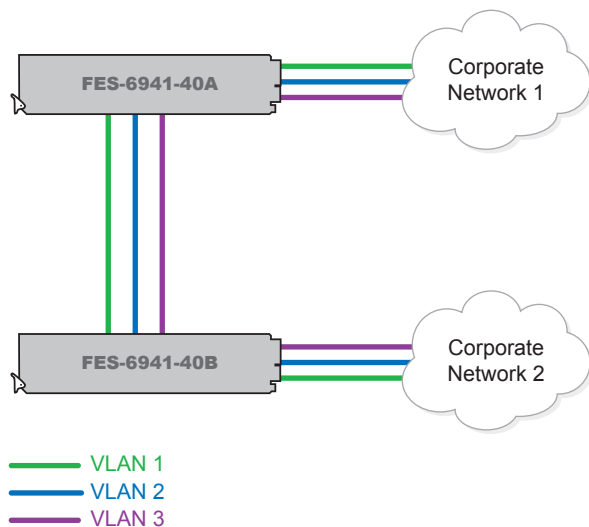
Figure 9.5 *Multiple Cards Setup with Three VLANs*
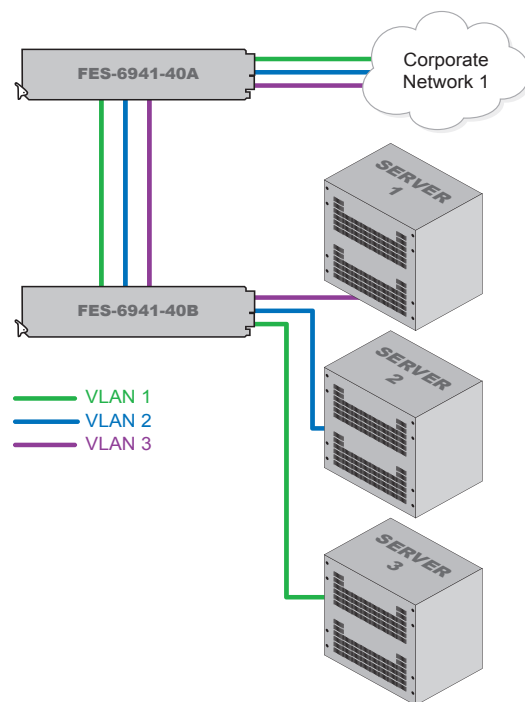
Figure 9.6 *Multiple Cards with Separate End Points*

Configuring the VLAN Feature

The Fiber Ethernet Switch Transceiver cards support port-based VLANs. The switching ports are partitioned into virtual private domains assigned on a per port basis. This provides a simple partitioning of the switch so that different user groups can share the switch yet be isolated from each other.

Note — *By default, all ports are automatically assigned to VLAN 1, allowing each card to operate as a generic ethernet switch (any port to any port). There must always be at least one VLAN enabled for the card to function as an ethernet switch.*
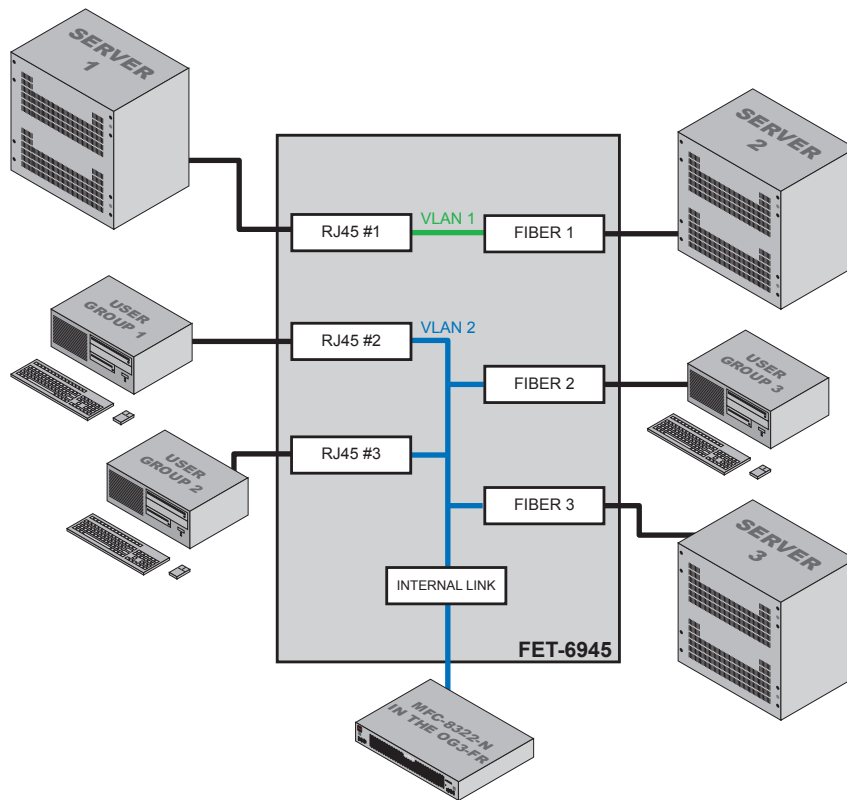
Figure 9.7 Example of Multiple VLAN Setup using a Single FET-6945

For More Information on...

• the ports for your card, refer to the applicable chapter in this manual.

To enable a VLAN setup

1. From the **Device View**, select the **Setup** tab.
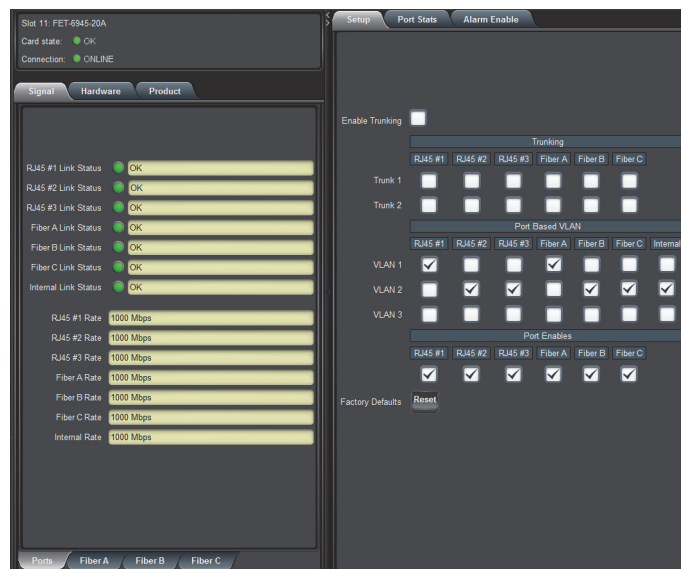
FET-6945 — Configuring a VLAN Group

2. In the **Port Enables** area, select the required check boxes to activate the specified RJ45, Fiber, and Internal ports on your card. To assign ports on the card to a VLAN:

• Locate the **VLAN** area of the **Setup** tab.

• Select the applicable **VLAN** # check box for each port you wish to include. The box displays a check-mark. Note that the number of ports depends on the card model.

Note — *A minimum of two ports must be assigned to a VLAN in order to establish communications. Assigning only one port to a VLAN isolates that port.*

    3. For each VLAN you wish to add ports to, repeat step 2.

Enabling Trunking

Trunking, also known as link aggregation, is the use of two or more links between nodes (switches and/or servers) in parallel to increase the bandwidth. A side benefit is that a failure of a link will cause the traffic to be redistributed among the remaining links, though at reduced overall capacity.
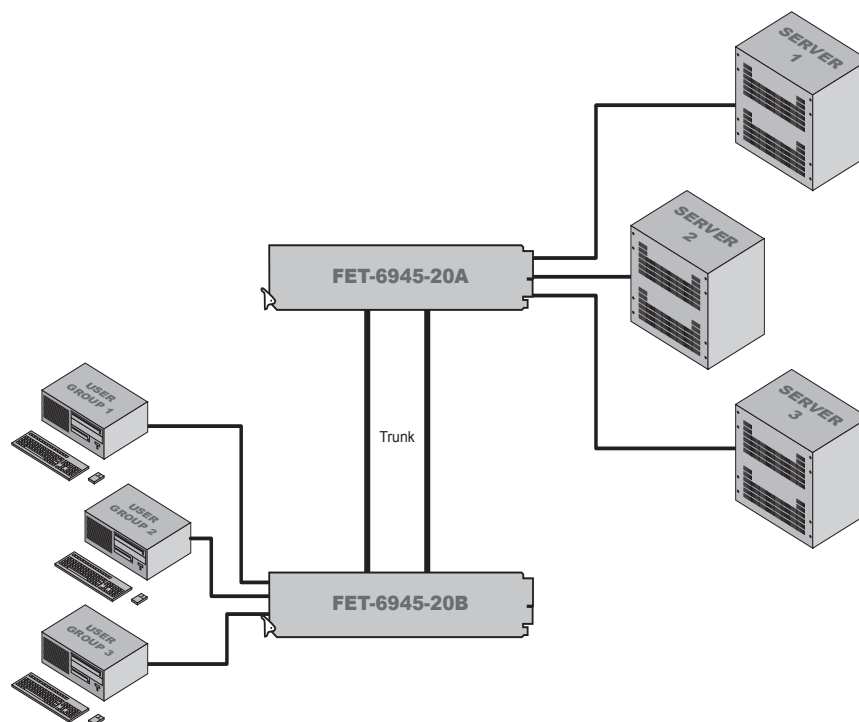
Figure 9.8 Multiple Cards set to Trunk for Increased Bandwidth Between End Points

A Word about Loops

Important — *Each Fiber Ethernet Switch Transceiver defaults as a basic switch where all ports are enabled and assigned to VLAN 1. If the card is wired for VLAN and/or trunking, but is not configured as such, you may create a possible network loop which will impact your network.*

If you have two or more Fiber Ethernet Switch Transceivers (**Figure 9.9**) or an MFC-8322-N with one or more Fiber Ethernet Switch Transceiver cards (**Figure 9.10**), there is potential to create multiple paths between devices, causing loops that can bring down a network. If one or more Fiber Ethernet Switch Transceivers are going to connect to the same network, ensure that the internal GigE ports to those cards are turned off at the MFC-8322-N. This Internal Loop issue cannot occur with an MFC-8322-S or DFR-8321 series frames.
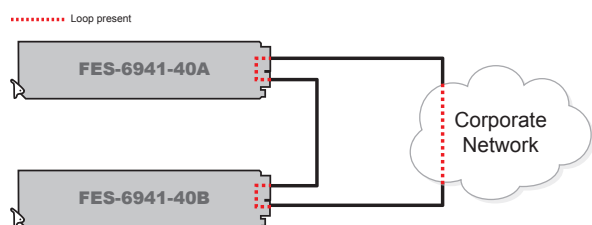
Figure 9.9 Example of a Loop Between Cards via Cabling
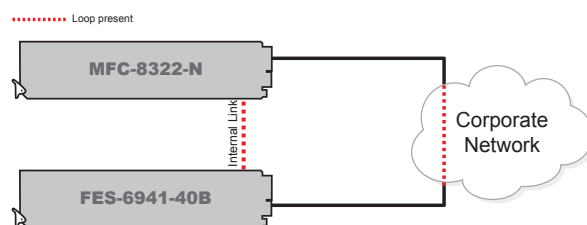
Figure 9.10 Example of Loop Between Cards via Internal Link

Troubleshooting a Loop

When a loop is created, the Fiber Ethernet Switch Transceiver may automatically detect the loop and disable the appropriate ports. When this occurs, the LEDs on the rear module and the card-edge flash in unison for the affected ports. Note that the network may be able to avoid the loop if it has spanning tree capability.

Use one of the following methods to troubleshoot:

- Disable the ports in DashBoard and enable them one at a time to see which port is causing the loop.
- Disconnect the cables from the ports on the rear modules and then re-connect the cables one at a time.
- Disconnect the cables from the ports, re-configure the card, and then re-connect the cables one at a time. Use this method when DashBoard cannot connect to the card.

Exceptions

There are exceptions for permitting a looping system: multiple paths are created for redundancy or for high bandwidth traffic. In the case of the Fiber Ethernet Switch Transceivers, you can have two or more ports acting as a trunk group to increase the bandwidth between two points. The trunk appears as one port in the generic switch mode of operation. It also provides redundancy in that failure of one of the physical ports in the trunk group forces all the traffic to the remaining link(s). **Figure 9.8** illustrates a setup with multiple FET-6945 cards that are set for trunking at double the bandwidth of a single link between the two cards.

Configuring a Trunking Group

The ports on each Fiber Ethernet Switch Transceiver card can be set up for 1:1 trunking between any ports or for redundant/load sharing trunking (such as two fiber links to three or four copper links with auto failover). Each card supports two trunk groups between two devices with each trunk group having up to four ports.

Important — *When using an FED-6942 series, FED-6943 series, FET-6945 series, or FET-6946 series card, there is a potential of a 30 second delay in the event of a link failure on Fiber B or Fiber C before traffic switches to an alternate port in the trunk group. Refer to the section "**To configure a Trunk Group**" on page 9-11 for details on assigning ports to a trunk group.*

In a configuration such as in **Figure 9.11**, you have multiple bandwidths and redundancy between the multiple Corporate Networks with fiber connections. Note that each Corporate Network must be configured to recognize these links are part of a trunk.
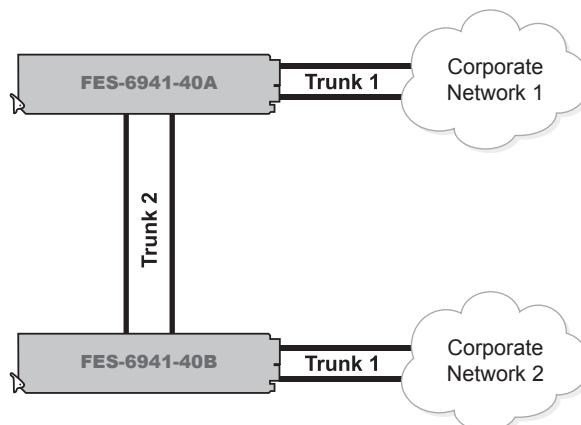
Figure 9.11 *Setup of Multiple Bandwidths with Redundancy*

To configure a Trunk Group

1. From the **Device View**, select the **Setup** tab.
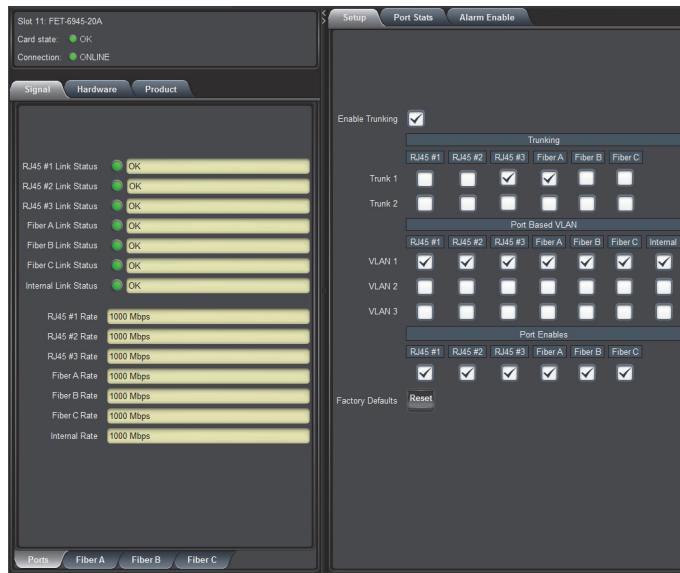
FET-6945 — Configuring a Trunk Group

2. Select the **Enable Trunking** check box.

3. In the **Port Enables** area, select the required check boxes to activate the specified RJ45, and Fiber ports on your card.

4. To configure a Trunk Group:

   • Locate the **Trunking** area of the **Setup** tab.

   • Select the applicable **Trunk #** check box for each port you wish to assign to that Trunk Group. The box displays a check-mark. Note that the number of ports depends on the card model.

5. For each Trunk Group, repeat step 4.

Enabling Alarms

You can configure the Fiber Ethernet Switch Transceivers to report when one or more of the following error conditions occur:

- A link fails on the card switch
- An incompatible rear module is installed with the card
- Temperature of the Fiber Optical Module is not within range
- Optical power of the Fiber Optical Module is not within range

Error conditions are reported in the applicable fields of the Status tabs for each card in DashBoard. If you do not enable the card to report the alarm condition, the affected status field may report a green indicator (if applicable) with the message "`Suppressed Alarm`" even when a related alarm condition is occurring on the card.

For More Information on...

- the possible messages in the Status tab, refer to the section "**Status Tabs**" on page 10-2.

Link Failure Alarms

You can choose which RJ45, fiber optic or Internal links the card monitors for link failures. Once an alarm is enabled, the applicable **Link Status** fields in the **Signal** tab will report when the card detects an invalid or absent connection for that link. To verify which connection to troubleshoot, refer to the rear module label.

To enable an alarm to report a link failure

1. From the **Device View**, select the **Alarm Enable** tab.

2. Select the required **RJ45 Link Fails** check box(es) to enable the card to report when the specified RJ45 connector on the rear module loses network connection.

3. Select the required **Fiber Link Fails** check box(es) to enable the card to report when the specified fiber optic connector on the rear module loses network connection.

4. Select the **Internal Link Fails** check box to enable the card to report when the GigE connection to the OG3-FR midplane loses network connection.

Power and Temperature Monitoring

Once an alarm is enabled, the applicable **Optical** status fields in the **Signal** tab and the **HW Status** field in the **Hardware** tab report when the power and/or temperature values of the Optical Module of the specific fiber connection are out of range.

To enable power monitoring

1. From the **Device View**, select the **Alarm Enable** tab.

2. Select the **Enable Fiber Power Monitoring** check box for the fiber optic connection you wish to monitor. The Power High and Power Low check boxes are now editable.

3. To monitor the optical transmitter power consumption of the card, select the applicable **Tx Power High** and **Tx Power Low** check boxes to enable the card to report when the transmitter power is not within the recommended range for the SFPs.

4. To monitor the optical receiver power consumption of the card, select the applicable **RX Power High** and **Rx Power Low** check boxes to enable the card to report when the receiver power is not within the recommended range for the SFPs.

To enable temperature monitoring

1. From the **Device View**, select the **Alarm Enable** tab.

2. Select the **Enable Fiber Abnormal Temperature** check box for the fiber optic connection you wish to monitor.

Incompatible Rear Module Monitoring

You can choose to enable the card to report when an unsupported rear module is installed with your card. This alarm is reported in the **HW Status** field in the **Hardware** tab.

To enable rear module monitoring

1. From the **Device View**, select the **Alarm Enable** tab.

2. Select the **Incompatible Rear Module** check box.

DashBoard Menus

In This Chapter

This chapter briefly summarizes the menus, items, and parameters available from DashBoard for the Fiber Ethernet Switch Transceiver. Note that default values are indicated with an asterisk (*).

Note — *The Fiber Ethernet Switch Transceivers do not support DataSafe.*

The following topics are discussed:

- Status Tabs
- Port Stats Tab
- Setup Tab
- Alarm Enable Tab

Operating Tip — *Wait 30 seconds after the last setting change to ensure all changes are saved to the non-volatile memory of the card.*

Status Tabs

This section summarizes the read-only information displayed in the **Status** tabs. The fields in the **Status** tabs can vary in severity from green (valid), yellow (caution), to red (alarm). DashBoard reports the most severe alarm for a single field. Alarm colors are noted within the tables as text set in brackets next to the menu parameter name.

Note — *The number of Fiber sub-tabs, RJ45 Link Status fields, and Fiber Link Status fields in the status tabs is dependent on your card model.*

Signal Tab

Table 10.1 summarizes the read-only information displayed in the **Signal** tab.

Table 10.1 Signal Tab Items

Tab Title	Item	Parameters	Description
Ports	RJ45 # Link Status	OK (Green)	The link for the specified port is valid and passes information
		Suppressed Alarm (Green)	An alarm condition exists on the port but the corresponding alarm is disabled in the Alarm Enable tab
		Link Failure (Red)	The link for the specified port is invalid (fails) and the corresponding alarm is enabled in the Alarm Enable tab
	Fiber # Link Status	OK (Green)	The link for the specified port is valid and passes information
		Suppressed Alarm (Green)	An alarm condition exists on the port but the corresponding alarm is disabled in the Alarm Enable tab
		Link Failure (Red)	The link for the specified port is invalid (fails) and the corresponding alarm is enabled in the Alarm Enable tab
	Internal Link Status	OK (Green)	The GigE link to the OG3-FR midplane is valid and passes information
		Suppressed Alarm (Green)	An alarm condition exists on the GigE link to the OG3-FR midplane but the corresponding alarm is disabled in the Alarm Enable tab
		Link Failure (Red)	The GigE link to the OG3-FR midplane for is invalid and the corresponding alarm is enabled in the Alarm Enable tab
	RJ45 # Rate	# Mbps	Indicates the speed of the specified port
		# Gbps	
		N/A	The link has failed
		No Link	The link is invalid

Table 10.1 Signal Tab Items

Tab Title	Item	Parameters	Description
Ports	Fiber # Rate	# Mbps	Indicates the duplex and speed of the specified port
		# Gbps	
		N/A	The link has failed
		No Link	The link is invalid
	Internal Rate	# Mbps	Indicates the duplex and speed of the GigE connection to the OG3-FR midplane
		# Gbps	
		N/A	The GigE link to the OG3-FR midplane has failed
		No Link	The GigE link to the OG3-FR midplane is invalid
Fiber #	Optical Module Status	OK (Green)	Card is operating correctly and all optical signals are valid
		No Signal	Card does not detect a valid fiber optic signal
		Temp High[a]	Indicates when the temperature of the Optical Module does not fall within the SFP recommended range
		Temp Low[a]	
		Rx Power High (Red)[a]	The receiver component of the Optical Module is drawing power outside the SFP recommended range
		Rx Power Low (Red)[a]	
		Tx Power High (Red)[a]	The transmitter component of the Optical Module is drawing power outside the SFP recommended range
		Tx Power Low (Red)[a]	
		Not Detected	The Optical Module is not communicating with the ethernet switch.
	Optical Tx Power (dBm)[b]	#	Indicates the approximate optical transmit power of the Optical Module. This value is typically accurate to +/- 3dBm.
	Optical Tx Wavelength (nm)	#	Indicates the wavelength of the transmit signal
	Optical Rx Power (dBm)[a]	#	Indicates the power consumption of the Optical Module. This value is typically accurate to +/- 3dBm.
	Optical Module Temperature (C)	#	Indicates the internal temperature (in Celsius) as reported by the SFP

a. The check box for the corresponding alarm must be selected in the Alarms Enable tab in order for the card to report the error condition.
b. When operating at the upper or lower optical power limits, it is recommended to use an optical power meter to verify the received power.

Hardware Tab

Table 10.2 summarizes the read-only information displayed in the **Hardware** tab.

Table 10.2 Hardware Tab Items

Tab Title	Item	Parameters	Description
Hardware	HW Status	OK	Indicates the status of the hardware including the SFP module. Some messages displayed are dependent on the settings in the Alarms Enable tab.
		FPGA load invalid	
		Incomp I/O Module	
		Current out of spec	
		Internal Error	
		SFP Temp Low	
		SFP Temp High	
		SFP Power High	
		SFP Power Low	
		SFP Tx Fault	
		SFP Not Detected	
	Voltage (mV)	#	Measured input voltage
	Current (mA)	#	Measured current consumption of card
	CPU headroom	#	Processing power available
	RAM available	#/##	On-board processing memory available
	Uptime (h)	#	Displays the number of hours since the last reboot of the card
	Configuration Bank	#	Storage count

Product Tab

Table 10.3 summarizes the read-only information displayed in the **Product** tab.

Table 10.3 Product Tab Items

Tab Title	Item	Parameters	Description
Product	Product	#	Displays the card name
	Supplier	Ross Video Ltd.	
	Board Rev	##	Indicates the board revision
	Board S/N	######	Indicates the card serial number
	Rear Module	#	Indicates the Rear Module installed
		Rear Module Mismatch[a]	Indicates the rear module is either an 8320AR-056 or 8320AR-057 but is not the one supported by the card
	Software Rev	##.##	Indicates the software version

a. For cards that support the 8320AR-056 rear module, installing the card with the 8320AR-057 does not provide access to Ethernet Port 4. For cards that support the 8320AR-057 rear module, installing the card with the 8320AR-056 does not provide access to Fiber Port 3. You must still configure these ports in the Setup tab of DashBoard, even though they are not accessible.

Port Stats Tab

Table 10.4 summarizes the read-only information displayed in the **Port Stats** tab.

Note — *The number of RJ45 and Fiber Link Status fields in the Port Stats tab is dependent on your card model.*

Table 10.4 Port Stats Tab Items

Menu Title	Item	Parameters	Description
RJ45 # Stats, Fiber # Stats, Internal Stats	RX Packets	#	Reports the number of good packets received by the specified port This number also includes the number of packets received by the specified port that are greater than the standard maximum size and less than or equal to the jumbo packet size, regardless of CRC or alignment errors
	RX Errors	#	Reports the number of packets received by the specified port that have either an FCS error or an alignment error
	RX Dropped	#	Reports the number of good packets received by the specified port but were dropped due to a lack of resources or other reasons
	TX Packets	#	Reports the number of good packets transmitted by the specified port
	TX Dropped	#	Reports the total number of transmit packets that are dropped due to a lock of resources or other reasons
	TX Collisions	#	Reports the number of collisions experienced by the specified port during packet transmissions
Refresh Rate	Refresh Rate	#	Specifies how often the status fields in the Port Stats tabs are updated
		Disabled*	Disables this feature

Setup Tab

Table 10.5 summarizes the **Setup** options available in DashBoard. Note that the number of configurable Port fields in the Setup tab is dependent on your card model.

Important — *Contact your IT Department before connecting to your facility network to ensure that there are no conflicts or the possibility of creating a network loop.*

Table 10.5 Setup Menu Items

Menu Title	Item	Parameters	Description
	Enable Trunking	Selected	Enables the port trunking feature on the card
		Cleared*	Disables this feature
Trunking - RJ45 #, Fiber #	Trunk 1	Selected	Includes the specified ports into Trunk Group 1
		Cleared*	Excludes the port from Trunk Group 1
	Trunk 2	Selected	Includes the specified ports into Trunk Group 2
		Cleared*	Excludes the port from Trunk Group 2
VLAN - RJ45 #, Fiber #, Internal[a]	VLAN 1	Selected*	Includes the specified port into Virtual LAN Group 1
		Cleared	Excludes the port from VLAN 1
	VLAN 2	Selected	Includes the specified port into Virtual LAN Group 2
		Cleared*	Excludes the port from VLAN 2
	VLAN 3	Selected	Includes the specified port into Virtual LAN Group 3
		Cleared*	Excludes the port from VLAN 3
Port Enables	RJ45 #, Fiber #	Selected*	Enables the selected port
		Cleared	Disables the port. This is useful when troubleshooting to turn ports off that are connected to devices without disconnecting cables
Factory Default	Reset		Resets all configurable settings on the card to the factory default values

a.   Note that a minimum of two ports must be assigned to a VLAN in order to establish communications.

Alarm Enable Tab

Table 10.6 summarizes the **Alarm** setup options available in DashBoard.

Note — *The number of sub-tabs, RJ45 Link check boxes, and Fiber Link check boxes in the Alarm Enable tab is dependent on your card model.*

Table 10.6 Alarm Enable Menu Items

Menu Title	Item	Parameters	Description
Switch	RJ45 # Link fails	Selected*	Enables the corresponding RJ45 Link Status field in the Signal tab to report when the specified ethernet port on the rear module loses network connection
		Cleared	Disables this alarm for the specified port
	Fiber # Link fails	Selected*	Enables the corresponding Fiber Link Status field in the Signal tab to report when the specified fiber port loses network connection
		Cleared	Disables this alarm for the specified port
	Internal Link Fails	Selected*	Enables the Internal Link Status field in the Signal tab to report when the GigE connection to the OG3-FR midplane experiences an error condition
		Cleared	Disables this alarm
	Incompatible Rear Module	Selected*	The HW Status field in the Hardware tab reports when an unsupported rear module is installed with the card
		Cleared	Disables this alarm
Fiber #	Fiber # Abnormal Temperature	Selected*	The applicable Optical Module Temperature field in the Signal tab reports when the temperature of the SFP module is not in range (high/low)
		Cleared	Disables this alarm for the specified port
	Enable Fiber # Power Monitoring	Selected*	Enables you to configure the power monitoring alarms for the specified fiber port. Corresponding check boxes in the tab are now editable.
		Cleared	Disables all monitoring of power consumption on the specified port. The corresponding check boxes on this tab are now read-only.
	TX Power High	Selected*	Enables the corresponding Optical Tx Power field in the Signal tab to report when the optical transmit power of the Optical Module is outside the SFP recommended range
		Cleared	Disables this alarm for the specified port

Table 10.6 Alarm Enable Menu Items

Menu Title	Item	Parameters	Description
Fiber #	TX Power Low	Selected*	Enables the corresponding Optical Tx Power field in the Signal tab to report when the optical receiver power of the Optical Module is outside the SFP recommended range
		Cleared	Disables this alarm for the specified port
	RX Power High	Selected*	Enables the corresponding Optical Rx Power field in the Signal tab to report when the optical receiver power of the Optical Module is outside the SFP recommended range
		Cleared	Disables this alarm for the specified port
	RX Power Low	Selected*	Enables the corresponding Optical Rx Power field in the Signal tab to report when the optical receiver power of the Optical Module is outside the SFP recommended range
		Cleared	Disables this alarm for the specified port

Service Information

In This Chapter

This chapter contains the following sections:

- Troubleshooting Checklist
- Warranty and Repair Policy

Troubleshooting Checklist

Routine maintenance to this openGear product is not required. In the event of problems with your Fiber Ethernet Switch Transceiver, the following basic troubleshooting checklist may help identify the source of the problem. If the frame still does not appear to be working properly after checking all possible causes, please contact your openGear products distributor, or the Technical Support department at the numbers listed under the "**Contact Us**" section.

⚠️ **Caution** — *Every time you are required to insert a connector into a device, or mating sleeve, you must clean the connector. All exposed surfaces of the ceramic ferrule must be clean. Follow your facility practices of cleaning fiber optic connectors.*

Connectors must always be inserted into a device or have a dust cap on.

1. **Visual Review** — Performing a quick visual check may reveal many problems, such as connectors not properly seated or loose cables. Check the card, the frame, and any associated peripheral equipment for signs of trouble.

2. **Power Check** — Verify the power indicator LED on the distribution frame front panel for the presence of power. If the power LED is not illuminated, verify that the power cable is connected to a power source and that power is available at the power main. Confirm that the power supplies are fully seated in their slots. If the power LED is still not illuminated, replace the power supply with one that is verified to work.

3. **Input Signal Status** — Verify that source equipment is operating correctly and that a valid signal is being supplied.

4. **Output Signal Path** — Verify that destination equipment is operating correctly and receiving a valid signal.

5. **Unit Exchange** — Exchanging a suspect unit with a unit that is known to be working correctly is an efficient method for localizing problems to individual units.

Bootload Button

In the unlikely event of a complete card failure, you may be instructed by a Ross Technical Support specialist to perform a complete software reload on the card.

To reload the software on a card

1. Eject the card from the frame.

2. Press and hold the **Bootload** button, while re-inserting the card into the frame.

3. Release the button.

   - The **PWR** LED flashes green while the card is waiting for a new software load.

   - If a new software load is not sent to the card within 60 seconds, the card will attempt to restart with its last operational software load.

   - Software loads can be sent to the Fiber Ethernet Switch Transceiver via the ethernet connection on the rear of the frame.

Warranty and Repair Policy

The Fiber Ethernet Switch Transceiver is warranted to be free of any defect with respect to performance, quality, reliability, and workmanship for a period of FIVE (5) years from the date of shipment from our factory. In the event that your Fiber Ethernet Switch Transceiver proves to be defective in any way during this warranty period, Ross Video Limited reserves the right to repair or replace this piece of equipment with a unit of equal or superior performance characteristics.

Should you find that the Fiber Ethernet Switch Transceiver has failed after your warranty period has expired, we will repair your defective product should suitable replacement components be available. You, the owner, will bear any labor and/or part costs incurred in the repair or refurbishment of said equipment beyond the FIVE (5) year warranty period.

In no event shall Ross Video Limited be liable for direct, indirect, special, incidental, or consequential damages (including loss of profits) incurred by the use of this product. Implied warranties are expressly limited to the duration of this warranty.

This Fiber Ethernet Switch Transceiver User Manual provides all pertinent information for the safe installation and operation of your openGear Product. Ross Video policy dictates that all repairs to the Fiber Ethernet Switch Transceiver are to be conducted only by an authorized Ross Video Limited factory representative. Therefore, any unauthorized attempt to repair this product, by anyone other than an authorized Ross Video Limited factory representative, will automatically void the warranty. Please contact Ross Video Technical Support for more information.

In Case of Problems

Should any problem arise with your Fiber Ethernet Switch Transceiver, please contact the Ross Video Technical Support Department. (Contact information is supplied at the end of this publication.)

A Return Material Authorization number (RMA) will be issued to you, as well as specific shipping instructions, should you wish our factory to repair your Fiber Ethernet Switch Transceiver. If required, a temporary replacement frame will be made available at a nominal charge. Any shipping costs incurred will be the responsibility of you, the customer. All products shipped to you from Ross Video Limited will be shipped collect.

The Ross Video Technical Support Department will continue to provide advice on any product manufactured by Ross Video Limited, beyond the warranty period without charge, for the life of the equipment.

Contact Us

Contact our friendly and professional support representatives for the following:

- Name and address of your local dealer
- Product information and pricing
- Technical support
- Upcoming trade show information

Technical Support		
	Telephone:	+1 613 • 652 • 4886
	After Hours Emergency:	+1 613 • 349 • 0006
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