



# CHAPTER 3

## Installing and Removing a Line Card

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**Revised: March 2009, OL-17435-01**

This chapter describes how to remove the 1-Port Channelized OC-12 line card from its supported platform, how to install a new replacement line card, how to install and remove a line card cable management bracket, and how to connect cables.

This chapter contains the following sections:

- [Installation Overview, page 3-1](#)
- [Handling Line Cards, page 3-1](#)
- [Online Insertion and Removal, page 3-2](#)
- [Removing and Installing a Line Card, page 3-2](#)
- [Line Card Cable-Management Bracket, page 3-6](#)
- [Cabling and Specifications, page 3-11](#)

### Installation Overview

Each line card circuit board is mounted to a metal carrier and is sensitive to electrostatic discharge (ESD) damage.



**Note**

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When a slot is not in use, a blank line card must fill the empty slot to allow the router to conform to EMI requirements and to allow proper airflow across the line cards. If you plan to install a new line card in a slot that is not in use, you must first remove the blank line card.

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### Handling Line Cards

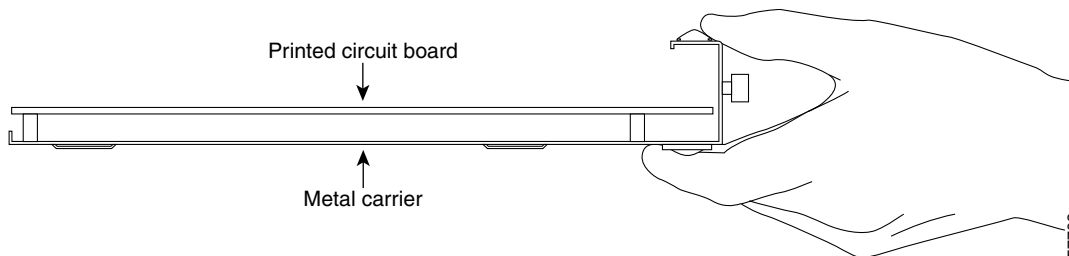


**Caution**

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Always handle the line card by the carrier edges and handle; never touch the line card components or component pins.

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**Figure 3-1 Handling a Line Card**

## Online Insertion and Removal

The Cisco XR 12000 Series Router supports online insertion and removal (OIR) of the 1-Port Channelized OC-12 line card; therefore, you do not have to power down the router when removing and replacing the line card. When the 1-Port Channelized OC-12 line card is removed, the line card configuration is stored in the pre-config area. Relevant configuration is moved to the active area when the 1-Port Channelized OC-12 line card is inserted in the slot.

**Note**

As you disengage the line card from the router, online insertion and removal (OIR) administratively shuts down all active interfaces of the line card.

## Removing and Installing a Line Card

The following sections describe the procedures for removing and installing a line card:

- [Guidelines for Line Card Removal and Installation, page 3-2](#)
- [Removing a Line Card, page 3-3](#)
- [Installing a Line Card, page 3-4](#)

**Note**

Some of the procedures in the following sections use illustrations of a Cisco 12012 Internet Router to support the descriptions of removing and installing line cards. Although the card cages of the Cisco XR 12000 Series Routers differ, the designated use of slots and the process of installing and removing a line card are basically the same. Therefore, separate procedures and illustrations for each platform are not included in this document.

## Guidelines for Line Card Removal and Installation

Guidelines for line card removal and installation include the following:

- Online insertion and removal (OIR) is supported, enabling you to remove and install line cards while the router is operating. OIR is seamless to users on the network, maintains all routing information, and ensures session preservation.



**Note** With OIR, notifying the software or resetting the power is not required. However, you have the option of using the **shutdown** command before removing a line card.

- After you reinstall a line card, the router automatically downloads the necessary software from the route processor (RP). Next, the router brings online only those interfaces that match the current configuration and were previously configured as administratively up. You must configure all others with the **configure** command.



**Caution** The router may indicate a hardware failure if you do not follow proper procedures. Remove or insert only one line card at a time. Allow at least 15 seconds for the router to complete the preceding tasks before removing or inserting another line card.

After removing and inserting a line card into the same slot, allow at least 60 seconds before removing or inserting another line card.

- Line cards have two ejector levers to release the card from its backplane connector. Use the levers when you are removing the line card and to seat the line card firmly in its backplane connector when you are installing the line card. The ejector levers align and seat the card connectors in the backplane.



**Caution** When you remove a line card, always use the ejector levers to ensure that the connector pins disconnect from the backplane in the sequence expected by the router. Any card that is only partially connected to the backplane can halt the router.

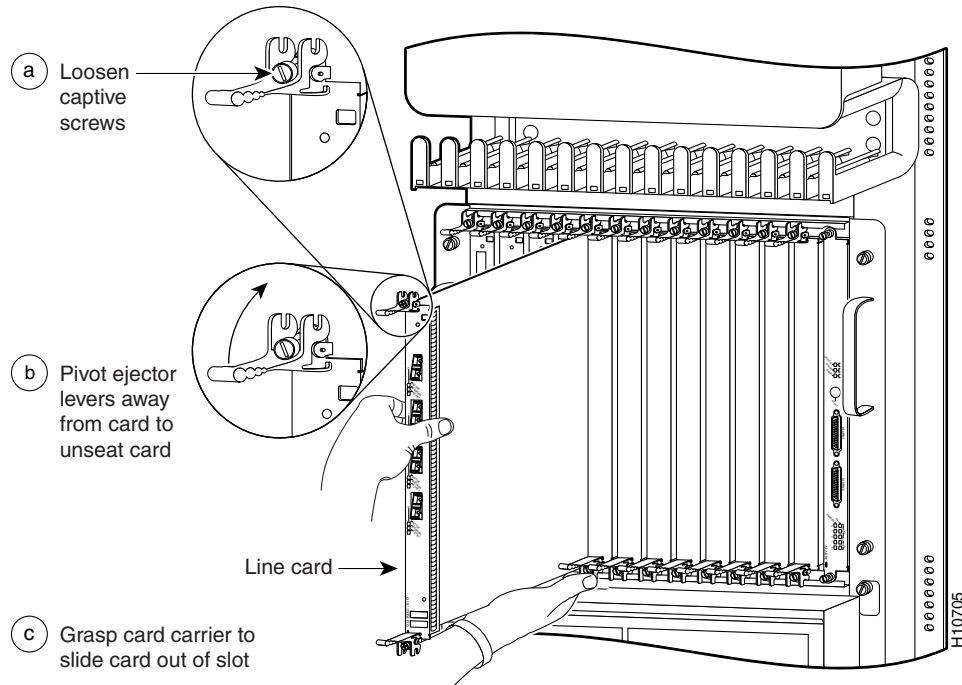
When you install a line card, always use the ejector levers to ensure that the card is correctly aligned with the backplane connector; the connector pins should make contact with the backplane in the correct order, indicating that the card is fully seated in the backplane. If a card is only partially seated in the backplane, the router hangs and subsequently crashes.

## Removing a Line Card

If you are replacing a failed line card, remove the existing line card first, then install the new line card in the same slot. To remove a line card, use [Figure 3-2](#) as a reference and follow these steps:

- Step 1** Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
- Step 2** Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.
- Step 3** Detach the line card cable-management bracket from the line card.
- Step 4** Use a screwdriver to loosen the captive screw at each end of the line card faceplate. (See [Figure 3-2a](#).)

Figure 3-2 Line Card Removal and Installation

**Caution**

When you remove a line card, always use the ejector levers to ensure that the line card connector pins disconnect from the backplane in the logical sequence expected by the router. Any line card that is only partially connected to the backplane can halt the router.

- Step 5** Simultaneously pivot the ejector levers away from each other to release the line card from the backplane connector. (See [Figure 3-2b.](#))
- Step 6** Grasp the ejector levers and pull the line card halfway out of the slot.
- Step 7** Grasp the line card and gently pull it straight out of the slot, keeping your other hand under the line card to guide it. (See [Figure 3-2c.](#)) Avoid touching the line card printed circuit board, components, or any connector pins.
- Step 8** Place the removed line card on an antistatic mat, or immediately place it in an antistatic bag if you plan to return it to the factory.
- Step 9** If the line card slot is to remain empty, install a line card blank (Product Number MAS-GSR-BLANK) to keep dust out of the chassis and to maintain proper airflow through the line card compartment. Secure the line card blank to the chassis by tightening its captive screws.

## Installing a Line Card

A line card slides into almost any available line card slot and connects directly to the backplane. If you install a new line card, you must first remove the line card blank from the available slot.

**Note**

Refer to the installation and configuration guide for your router for information on line card slot types, slot width, and slot location.

**Caution**

The router may indicate a hardware failure if you do not follow proper procedures. Remove or insert only one line card at a time. Allow at least 15 seconds for the router to complete the preceding tasks before removing or inserting another line card.

To install a line card, follow these steps:

**Step 1** Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

**Step 2** Choose an available line card slot for the line card, and verify that the line card interface cable is long enough for you to connect the line card with any external equipment.

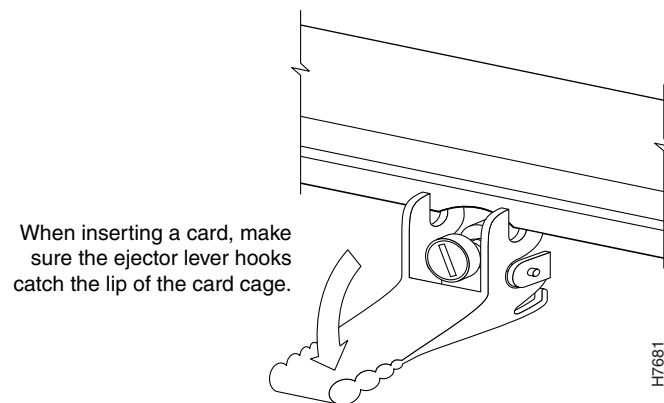
**Caution**

To prevent ESD damage, handle line cards by the captive installation screws, the provided handle, ejector levers, or the card carrier edges only. Do not touch any of the electrical components or circuitry.

**Step 3** Grasp the faceplate (or handle) of the line card with one hand and place your other hand under the card carrier to support the weight of the card; position the card for insertion into the card cage slot. Avoid touching the line card printed circuit board, components, or any connector pins.

**Step 4** Carefully slide the line card into the slot until the ejector levers make contact with the edges of the card cage, then *stop* when the ejector lever hooks catch the lip of the card cage. If they do not catch, try reinserting the line card until the ejector lever hooks are fully latched. (See [Figure 3-3](#).)

**Figure 3-3 Ejector Levers**

**Caution**

When you install a line card, always use the ejector levers to ensure that the card is correctly aligned with the backplane connector, the card connector pins make contact with the backplane in the correct order, and the card is fully seated in the backplane. A card that is only partially seated in the backplane can cause the router to hang and subsequently crash.

**Step 5** Simultaneously pivot both ejector levers toward each other until they are perpendicular to the line card faceplate. This action firmly seats the card in the backplane.

- Step 6** Use a 3/16-inch flat-blade screwdriver to tighten the captive screw on each end of the line card faceplate to ensure proper EMI shielding and to prevent the line card from becoming partially dislodged from the backplane.

**Caution**

To ensure adequate space for additional line cards, always tighten the captive installation screws on each newly installed line card *before* you insert any additional line cards. These screws also prevent accidental removal and provide proper grounding and EMI shielding for the router.

- Step 7** Install the cable-management bracket.

- Step 8** Install the interface cables.

## Line Card Cable-Management Bracket

**Note**

The illustrations in this section show various line cards, but the line card cable-management bracket installation procedure is the same regardless of the specific line card.

Cisco XR 12000 Series Routers include a cable-management system that organizes the interface cables entering and exiting the router, keeping them out of the way and free of sharp bends.

**Caution**

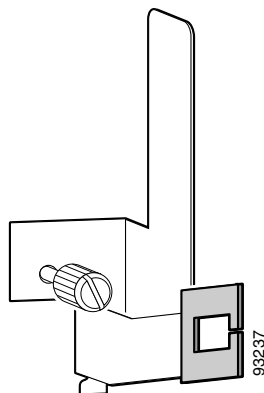
Excessive bending of interface cables can damage the cables.

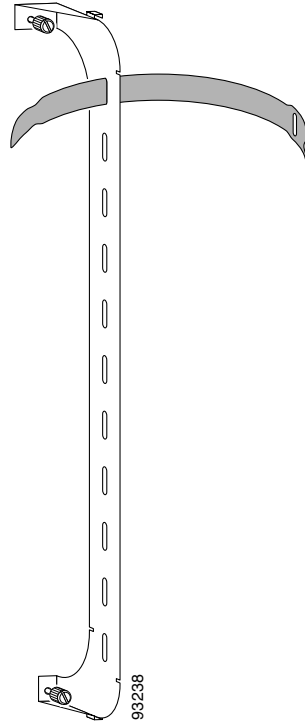
The cable-management system consists of two separate components:

1. A cable-management tray that is mounted on the chassis. Refer to the appropriate Cisco XR 12000 Series Router installation and configuration guide for more information on the cable-management tray.
2. A cable-management bracket that attaches to a line card.

This section describes the line card cable-management bracket. [Figure 3-4](#) shows the single-port line card cable-management bracket; [Figure 3-5](#) shows the multiport line card cable-management bracket.

**Figure 3-4 Single-Port Line Card Cable-Management Bracket**



**Figure 3-5**      **Multiport Line Card Cable-Management Bracket****Note**

When shipped with spare line card orders, the cable-management bracket is not attached to the line card. You must attach the cable-management bracket to the line card before you insert the line card into the router.

**Caution**

Do not use the cable-management bracket as a handle to pull out or push in the line card. The cable-management bracket is designed to hold the interface cables and may break if you use the bracket to push, pull, or carry the line card after it is removed from the router.

Removing and installing the line card cable-management bracket is described in the following procedures:

- [Removing a Line Card Cable-Management Bracket, page 3-7](#)
- [Installing a Line Card Cable-Management Bracket, page 3-10](#)

## Removing a Line Card Cable-Management Bracket

To remove a line card cable-management bracket, follow these steps:

- Step 1** Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
- Step 2** Note the current interface cable connections to the ports on each line card.
- Step 3** Starting with the interface cable for the bottom port on the line card, disconnect the cable from the line card interface.

**Note**

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It is not necessary to remove the interface cables from the line card cable-management bracket. The bracket (with attached cables) can be hooked to the cable-management tray or a bracket on the chassis until a new line card is installed.

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**Step 4** For multiport line card cable-management brackets, proceed upward and remove the interface from the Velcro strap on the end of the cable standoff. (See [Figure 3-6](#).)

For single-port line card cable-management brackets, carefully remove the interface cable from the cable clip. (See [Figure 3-7](#).) Avoid any kinks or sharp bends in the cable.

**Step 5** Repeat Step 3 and Step 4 for all remaining interface cables, then proceed to Step 6.

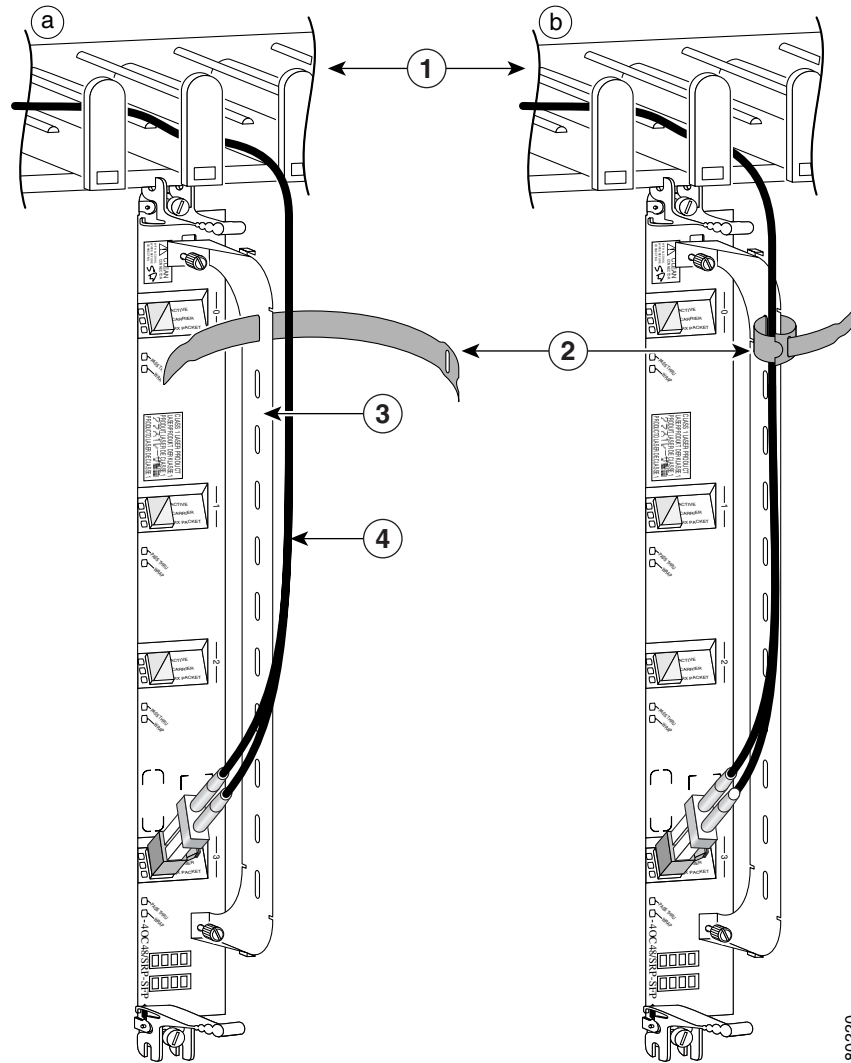
**Step 6** For multiport line card cable-management brackets, loosen the captive installation screw at each end of the cable-management bracket and remove the bracket from the line card.

For single-port line card cable-management brackets, loosen the captive installation screw on the cable-management bracket and remove the bracket from the line card.

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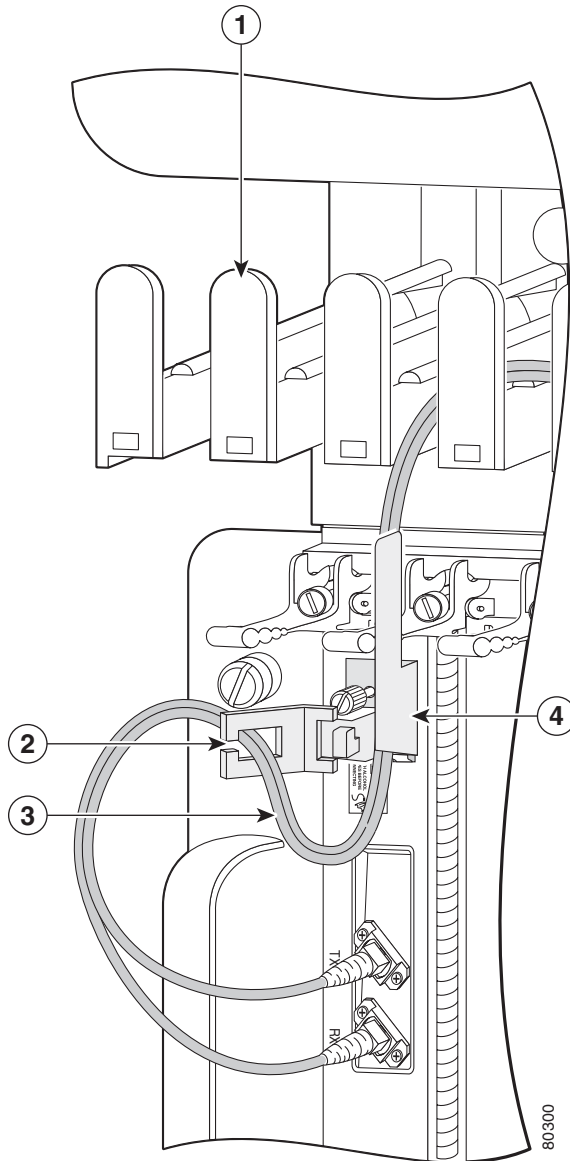
**Figure 3-6** Multiport Line Card Cable-Management Installation and Removal (4-Port OC-48c/STM-16c DPT Line Card Shown)



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<b>1</b>	Chassis cable-management tray	<b>3</b>	Line card cable-management bracket
<b>2</b>	Velcro straps	<b>4</b>	Fiber cable

**Figure 3-7** Single-Port Line Card Cable-Management Bracket Installation and Removal (1-Port OC-192c/STM-64c DPT Line Card Shown)



1	Chassis cable-management tray	3	Interface cable
2	Cable clip	4	Line card cable-management bracket

## Installing a Line Card Cable-Management Bracket

To install a line card cable-management bracket, follow these steps:

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- Step 1** Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

- Step 2** Attach the line card cable-management bracket to the line card as follows:
- a. Position the cable-management bracket over the front of the line card faceplate.
  - b. Insert and tighten the captive screw(s) to secure the bracket to the line card.
  - c. Starting with the bottom port on the line card, connect each interface cable to the intended port.
- Step 3** For multiport line card cable-management brackets, carefully wrap the cables with the supplied Velcro strap. (See [Figure 3-6](#).)
- For single-port line card cable-management brackets, carefully press the interface cable onto the cable clip. (See [Figure 3-7](#).) Avoid any kinks or sharp bends in the cable.

**For information on disconnecting and connecting interface cables, see the "Fiber-Optic Cables" section on page 3-12.**

## Cabling and Specifications

The following sections provide specifications for the channelized line card:

- [Power Budget and Signal Specifications, page 3-11](#)
- [Fiber-Optic Cables, page 3-12](#)

## Power Budget and Signal Specifications

The SONET specification for fiber-optic transmission defines two types of fiber: single-mode and multimode. Signals can travel farther through single-mode fiber than through multimode fiber.

The maximum distance for installations is determined by the amount of light loss in the fiber path. If your environment requires the signal to travel close to the typical maximum distance, you should use an optical time domain reflectometer (OTDR) to measure the power loss.

The following section describes the power budget and signal specifications for the optics used in the 1-Port Channelized OC-12 line cards:

### 1-Port Channelized OC-12/STM-4 (DS1/E1) ISE Line Card Power Specifications

The 1-Port Channelized OC-12/STM-4 (DS1/E1) ISE is available only in a single-mode, intermediate-reach configuration, providing a full-duplex 622.08-Mbps, 1310-nm laser-based SONET-compliant interface. [Table 3-1](#) lists the power budget and signal specifications of the 1-Port Channelized OC-12 line card.

**Table 3-1** 1-Port Channelized OC-12/STM-4 (DS1/E1) ISE Power Specifications

Transceiver	Power Budget	Transmit Power	Receive Power	Typical Maximum Distance
Single-mode, short-reach, 1310 nm	8 dB	-15 to -8 dBm	-28 to -7 dBm	1.2 miles (2 km)

## Fiber-Optic Cables

Channelized line cards with optic ports use fiber-optic cables. Use a single-mode, optical-fiber interface cable to connect a line card with an optical port in your Cisco XR 12000 Series Router to another line card or add/drop multiplexer (ADM).

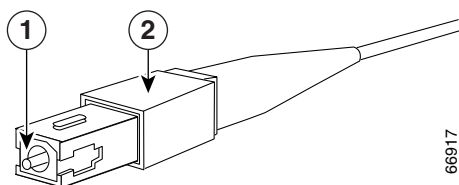


**Note**

Fiber cables are not available from Cisco Systems. They can be purchased from cable vendors. If the plug is supplied with a dust cover, remove it before trying to connect it to the line card port.

The subscriber connector (SC) cable connectors are used with channelized line cards with optic ports (Figure 3-8).

**Figure 3-8 Simplex SC Cable Connector (Single-mode)**



<b>1</b>	SC cable connector	<b>2</b>	Spring-action disconnect latch
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To remove an interface cable, follow these steps:

- Step 1** Attach an ESD-preventive wrist strap to your wrist and follow its instructions for use.
- Step 2** Press on the spring-action disconnect latch to disconnect the cable from the interface ports. (See Figure 3-8.)
- Step 3** Slowly pull the connector from the port.



**Warning**

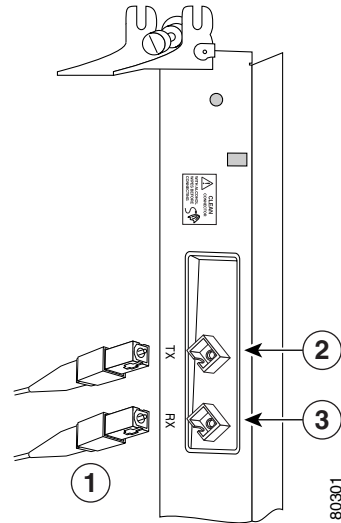
**Invisible laser radiation can be emitted from the aperture of the port when no cable is connected. Avoid exposure to laser radiation and do not stare into open apertures.**

- Step 4** Insert a dust plug into the optical port opening of each interface that is not being used.

To install an interface cable, follow these steps:

- Step 1** Attach an ESD-preventive wrist strap to your wrist and follow its instructions for use.
- Step 2** Remove the connector dust cover, if present.
- Step 3** Align the connector end of the cable to the appropriate port. Observe the receive (RX) and transmit (TX) cable relationship, as shown in Figure 3-9.

**Figure 3-9 Attaching Fiber Cables**



<b>1</b>	Simplex fiber cables
<b>2</b>	TX port
<b>3</b>	RX port

**Step 4** Insert the connector until it clicks and locks into place.

**Step 5** Attach the other end of the cable to another node. The TX port on the line card must be connected to the RX port on the next node, and the RX port on the line card must be connected to the TX port on the next node. The labels next to the fiber connectors identify TX and RX.



**Note**

The fiber-optic connectors must be free of dust, oil, or other contaminants. Carefully clean the fiber-optic connectors using an alcohol wipe or other suitable cleanser.

