



# Installing and Removing Line Cards and Transceiver Modules

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This chapter includes procedures for installing and removing line cards and transceiver modules in the Cisco ASR 9000 Series Aggregation Services Router.

For hardware installation and configuration information for the Cisco ASR 9000 Series Router, see the <http://www.cisco.com/c/en/us/td/docs/routers/asr9000/hardware/installation/guide/asr9kHIGbk.html>

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## Safety

Before you install or remove a line card or transceiver module, review the safety warnings listed in the <http://www.cisco.com/c/en/us/td/docs/routers/asr9000/hardware/rcsi/regulatory/compliance/asr9krcsi.html>

To avoid injuring yourself or damaging the equipment.

- Keep the work area clear and dust free during and after installation. Do not allow dirt or debris to enter into any laser-based components.
- Do not wear loose clothing, jewelry, or other items that could get caught in the router while working with line cards.
- Cisco equipment operates safely when it is used in accordance with its specifications and product usage instructions.

## Electrical Equipment Guidelines

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.
- Disconnect all power and external cables before moving a chassis.
- Do not work alone when potentially hazardous conditions exist.
- Never assume that power has been disconnected from a circuit; always check.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe; carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

## Laser Safety

Single-mode Ethernet line cards (all of the line cards) are equipped with a Class 1 laser. Multimode Ethernet line cards (Gigabit Ethernet) are equipped with a Class 1 LED. These devices emit invisible radiation. Do not stare into operational line card ports. The following laser warnings apply to the line cards:




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**Warning** Class 1 Laser Product. Statement 1008

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**Warning** Class 1 LED Product (Multimode). Statement 123

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**Warning** Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

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## Laser/LED Safety for MPAs

The single-mode transmitter in the module uses a small laser to transmit the light signal to the network ring. Keep the transmit port covered whenever a cable is not connected to it. Although multimode transceivers typically use LEDs for transmission, it is good practice to keep open ports covered and avoid staring into open ports or apertures. The single-mode aperture port contains a laser warning label, as shown in the figure below.

*Figure 1: Laser Warning Labels for Single-Mode Port*




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**Warning** Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

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**Warning** Class 1 laser product. Statement 1008

The multimode aperture contains a Class 1 LED warning label, as shown in the figure below.

*Figure 2: Class 1 LED Warning Label for Multimode Port*



**Warning** Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051



**Warning** Class 1 LED product. Statement 1027

## Preventing Electrostatic Discharge

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. Electromagnetic interference (EMI) shielding is an integral component of the line card and the modular port adapter. Cisco Systems, Inc. recommends using an ESD-preventive strap whenever you are handling network equipment or one of its components.

The following are guidelines for preventing ESD damage:

- Always use an ESD-preventive wrist or ankle strap and ensure that it makes good skin contact. Connect the equipment end of the connection cord to an ESD connection socket on the router or to bare metal on the chassis.
- Avoid touching card circuit boards or connector pins. When sliding cards in or out of slots, you should handle them only by the front panel or metal card carrier.
- When carrying a card, carry it only by the metal card carrier or inside a static shielding bag.



**Caution** To avoid damaging card mechanical components, never carry an Route Switch Processor (RSP), modular port adapter, or line card by the captive installation screws or ejector levers. Doing so can damage these components and cause card insertion problems.

- Place removed line cards or modular port adapters component-side-up on an antistatic surface or in a static shielding bag. If you plan to return the component to the factory, immediately place it in a static shielding bag.
- Avoid contact between the line cards or modular port adapters and clothing. The wrist strap only protects the board from ESD voltages on the body; ESD voltages on clothing can still cause damage.




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**Caution** For safety, periodically check the resistance value of the ESD strap. The measurement should be between 1 and 10 megohms.

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## Required Tools and Equipment

- Flat-blade or Phillips screwdriver
- ESD-preventive wrist or ankle strap and instructions
- Interface cables to connect the line card with another router or switch
- Any SFP/XFP modules you need to install (and are not already installed)




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**Note** If you need additional equipment, see Cisco.com or your service representative for ordering information.

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## Removing and Installing a Line Card

This section includes the following topics:

### Installation Guidelines




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**Caution** Be careful to avoid damaging the electromagnetic interference (EMI) gasket that runs along the full length of the card front panel edges. Damage to the EMI gasket can affect the ability of your system to meet EMI requirements.

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- Every card has a key mounted on the board that matches a corresponding slot on the chassis side (top of each card slot). This key-slot mechanism prevents a card from being inserted into the wrong, non-matching card slot. It also prevents a card from being inserted upside down. If you insert a card into the wrong card slot or upside down, the key gets blocked against the chassis card guide and will not slide through the slot. If the key is blocked, remove the card and find the correct card slot.
- Online insertion and removal (OIR) is supported, enabling you to install a line card while the router is operating. OIR is seamless to users on the network, maintains all routing information, and ensures session preservation. We recommend that you perform a graceful shutdown to shut down a line card prior to removing it from the chassis. See [Steps for OIR Line Card Removal and Insertion, on page 10](#).

The following table displays the supported line cards, ports, and OIR duration for QDD-400G-ZR-S and QDD-400G-ZRP-S optical modules:

**Table 1: Supported Line Cards, Ports, and OIR Duration for QDD-400G-ZR-S and QDD-400G-ZRP-S Optical Modules**

Line card	Supported front panel ports	Maximum supported OIR duration at mean sea level (MSL) with QDD-400G-ZR-S and QDD-400G-ZRP-S optical modules
<a href="#">A9K-20HG-FLEX-SE/A9K-20HG-FLEX-TR</a>	0, 7, 8, 12, 19	1 minute at 30°C (or 86°F)
<a href="#">A9K-8HG-FLEX-SE/A9K-8HG-FLEX-TR</a>	0, 7	3 minutes at 30°C (or 86°F)
<a href="#">A99-10X400GE-X-SE/A99-10X400GE-X-TR</a>	3, 5, 6, 7, 9	1 minute at 30°C (or 86°F)
<a href="#">A9903-20HG-PEC</a>	0, 4, 8, 12, 16	45 seconds at 30°C (or 86°F)



**Note** When you perform a graceful shutdown on a line card, `cefcFRUInserted` and `cefcFRURemoved` traps are not generated.

- When installing a line card, you must first push the OIR button on both the upper and lower ejectors for the mechanical latch to be released.
- The different cards in the chassis are attached to the chassis itself by a pair of ejector levers and captive screws. The two ejector levers release the card from its midplane connector. The exact locations of the ejector levers and captive screws can vary slightly from card to card, but are generally in the same locations: on the upper and bottom ends of the faceplate.



**Caution** When installing a line card, fully tighten both captive installation screws to ensure that the card is correctly seated in the backplane connector. A card that is only partially seated in the backplane might not operate properly, even if it boots.

- The backplane identification (BPID) board monitors OIR by counting the number of card insertions for each slot and saving that information in non-volatile memory. OIR monitoring is done for all line cards, the RSP, and the fan trays. A card insertion is determined by the CAN Bus Controller (CBC) of the inserted card booting up and sending a CBC message which is intercepted by the BPID board. Note that a CBC reset or power cycle on a card will also be interpreted as a card insertion.

A card with an OIR count that exceeds 175 will generate a minor alarm against that slot. If the card OIR count exceeds 200, a major alarm is generated against that slot. Fan tray insertion counts are not checked against a threshold.

See the [Release Notes for Cisco ASR 9000 Series Aggregation Services Routers](#) for information about CLI commands for obtaining and resetting card insertion data. The CLI command indicates whether the particular chassis has the version of BPID that supports the counting of the OIR.

- After you reinstall a line card, the router automatically downloads the necessary software from the RSP. 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.



**Note** 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.



**Caution** To avoid damaging card mechanical components, never carry an RSP or line card by the captive installation screws or ejector levers. Doing so can damage these components and cause card insertion problems.

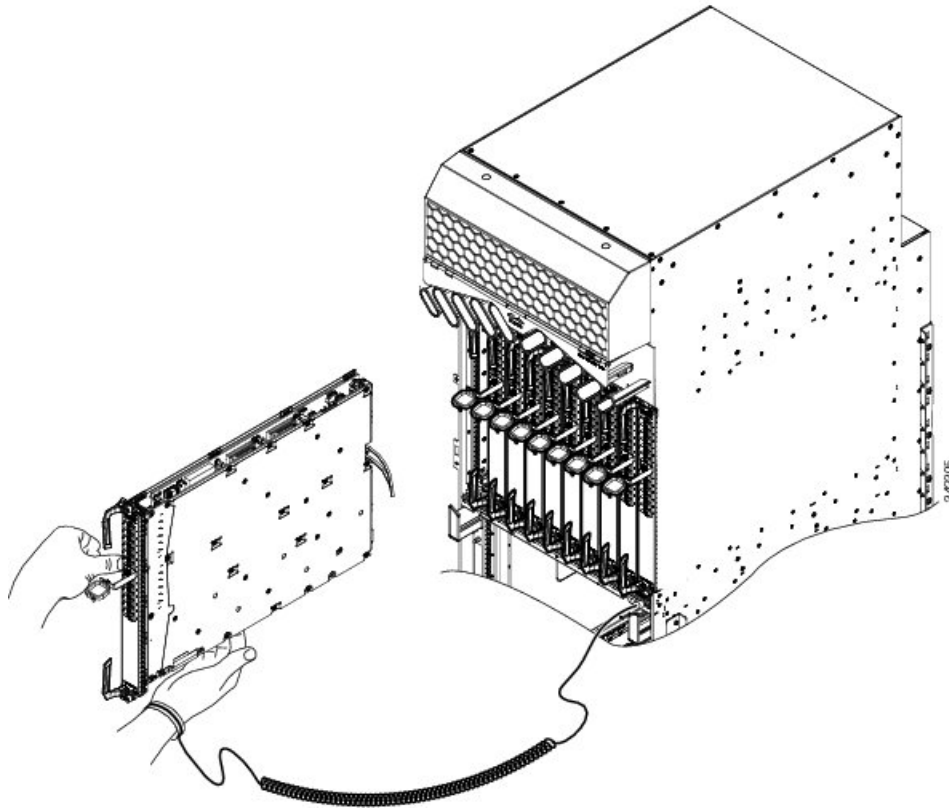
For line card configuration information, see [Verifying and Troubleshooting Line Card Installation](#).

## 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 the figure below or [Figure 4: Removing a Line Card \(Cisco ASR 9922 Router Shown\)](#), on page 8 as a reference and follow these steps:

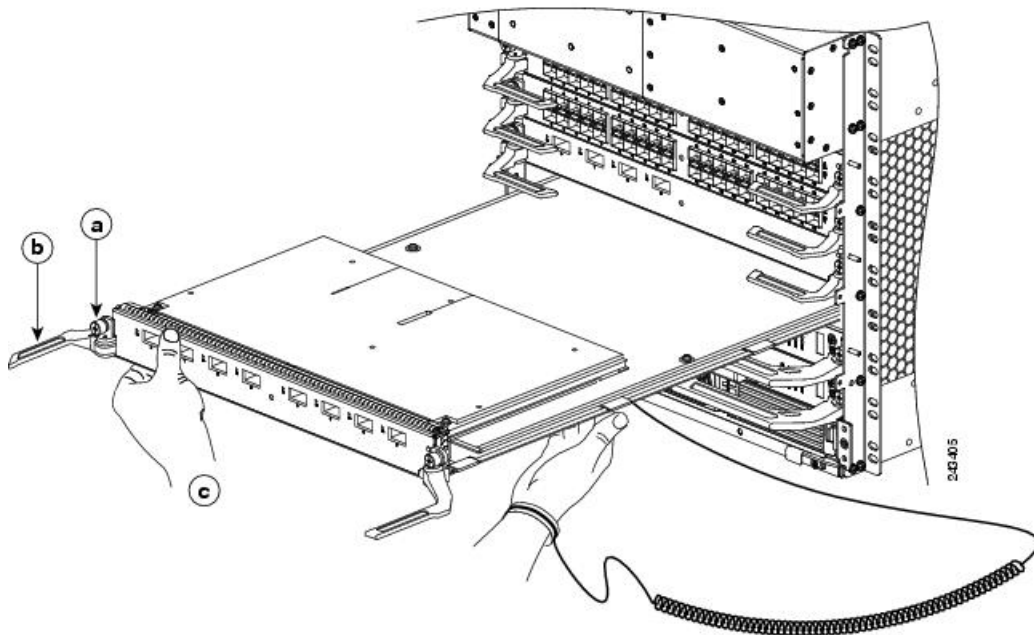
1. Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
2. Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.
3. Detach the line card cable-management bracket from the line card.
4. Use a screwdriver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

Figure 3: Removing a Line Card (Cisco ASR 9912 Router Shown)



a Loosen the captive screws	b Pivot the ejector levers to unseat the card from the backplane connector	c Slide the card out of the chassis
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Figure 4: Removing a Line Card (Cisco ASR 9922 Router Shown)



a	Loosen the captive screws	b	Pivot the ejector levers to unseat the card from the backplane connector	c	Slide the card out of the chassis
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**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.

5. Simultaneously pivot the ejector levers away from each other to release the line card from the backplane connector.
6. Grasp the ejector levers and pull the line card halfway out of the slot.
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. Avoid touching the line card printed circuit board, components, or any connector pins.
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.
9. If the line card slot is to remain empty, install a line card blank (Product Number A9K-LC-FILR) 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.



**Caution** Be careful not to damage or disturb the EMI spring fingers located on the front edge of the card face plate.





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**Note** Always insert a dust plug in an optical port opening for each port that is not in use.

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## Installing a Line Card

A line card slides into 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.



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**Note** See the installation and configuration guide for your router for information on line card slot types, slot width, and slot location.

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**Caution** When installing a line card, always fully tighten both captive installation screws to ensure that the card is correctly seated in the backplane connector. A card that is only partially seated in the backplane might not operate properly, even if it boots.

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**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.

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To install a line card, follow these steps:

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



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**Caution** To prevent ESD damage, handle line cards only by the metal card carrier. Do not touch any of the electrical components or circuitry.

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**Caution** To avoid damaging card mechanical components, never carry an RSP or line card by the captive installation screws or ejector levers. Doing so can damage these components and cause card insertion problems.

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3. Grasp the front panel of the line card with one hand and place your other hand under the metal card carrier to support the weight of the card ([Figure 3: Removing a Line Card \(Cisco ASR 9912 Router Shown\), on page 7](#) or [Figure 4: Removing a Line Card \(Cisco ASR 9922 Router Shown\), on page 8](#)). Position the card for insertion into the card cage slot. Avoid touching the line card printed circuit board, components, or any connector pins.

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 levers are fully latched.




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**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.

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**Note** On the Cisco ASR 9922 Router, the line cards in the lower half of the chassis (slots 10 through 19) are inserted upside down.

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5. Simultaneously pivot both ejector levers toward each other until they are parallel to the line card front panel. This action firmly seats the card in the backplane.
6. Tighten the captive screw on each end of the line card front panel to ensure proper EMI shielding and to prevent the line card from becoming partially dislodged from the backplane. Tighten the captive screws to a torque of 10 +/-1 in-lb.




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**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 ensure correct seating in the backplane connector, prevent accidental removal, and provide proper grounding and EMI shielding for the router.

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7. Install the cable-management bracket. See [Installing a Line Card Cable Management Bracket, on page 60](#).
8. Install the interface cables. See [Installing and Removing Fiber-Optic Interface Cables, on page 64](#).
9. For information on installing SFP and XFP modules, see [Installing and Removing SFP Modules, on page 29](#) and [Installing and Removing XFP Modules, on page 39](#).
10. For help in troubleshooting the hardware installation, see [Verifying and Troubleshooting Line Card Installation](#).

## Steps for OIR Line Card Removal and Insertion

Online insertion and removal (OIR) is supported, enabling you to install a card while the line card is operating. Follow these steps when removing or inserting a line card by using the Cisco IOS XR **shutdown** command.

1. Shut down the line card location with the **(admin-config) hw-module shutdown location 0/0/CPU0** command.
2. Confirm that the LEDs have gone from green to off.
3. Physically remove the line card to be replaced.
4. Physically insert the replacement line card.

5. Return the line card to the up state with the **(admin-config) no hw-module shutdown location 0/0/CPU0** command.

## Installing and Removing a Modular Line Card

This section includes the following topics:

Before you perform the following procedures, make sure you review the safety guidelines. See [Safety](#), on page 1 and [Preventing Electrostatic Discharge](#), on page 3.



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**Note** Some of the procedures in the following sections use illustrations of a 10-slot Cisco ASR 9000 Series Router to support the descriptions of removing and installing modular line cards. Although the card cages of Cisco ASR 9000 Series Aggregation Services Routers differ, the designated use of slots and the process of installing and removing a MLC are basically the same. Therefore, separate procedures and illustrations are not included in this guide.

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## Required Tools and Equipment

You need the following tools and parts to remove and install modular line cards (MLCs) and MPAs:

- Flat-blade or Phillips screwdriver
- ESD-preventive wrist or ankle strap and instructions
- Interface cables to connect the SIP with another router or switch

## Handling a Modular Line Card

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



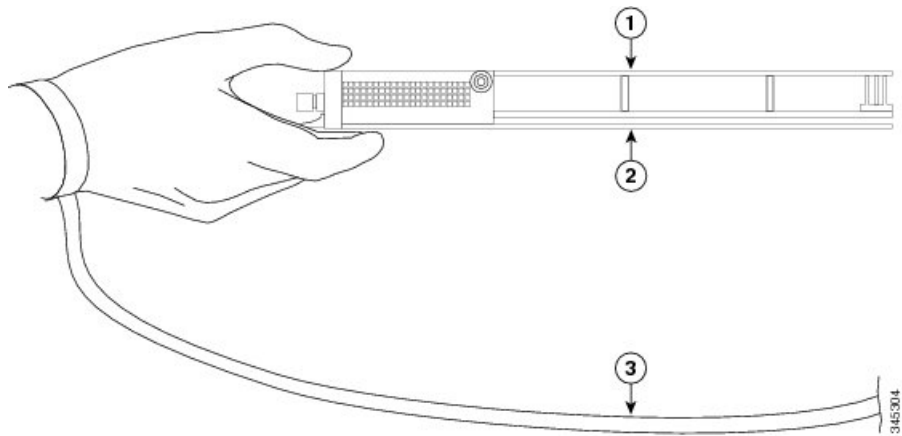
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**Caution** Always handle the MLC by the carrier edges and handle; never touch the its components or connector pins.

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When a slot is not in use, a blank must fill the empty slot to allow the router to conform to electromagnetic interference (EMI) emissions requirements and to allow proper airflow across the installed modules. If you plan to install an MLC in a slot that is not in use, you must first remove the blank.

Figure 5: Handling a Modular Line Card



1	Metal Carrier	2	Printed Circuit Board
3	Grounding Strap		

## Guidelines for Modular Line Card Removal and Installation

- Online insertion and removal (OIR) is supported, enabling you to remove and install MLCs 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 `hw-module loc rack/slot/CPU0 maint` command before removing a MLC.

- After you reinstall a MLC, the router automatically downloads the necessary software from the Route Switch Processor (RSP). 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 MLC at a time. Allow at least 15 seconds for the router to complete the preceding tasks before removing or inserting another MLC.

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

**Caution**

When you remove a MLC, always use the ejector levers to ensure that the connector pins disconnect from the backplane in the logical sequence expected by the router. Any card that is only partially connected to the backplane can halt the router. When you install a MLC, 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. A card that is only partially seated in the backplane will cause the router to hang and subsequently crash.

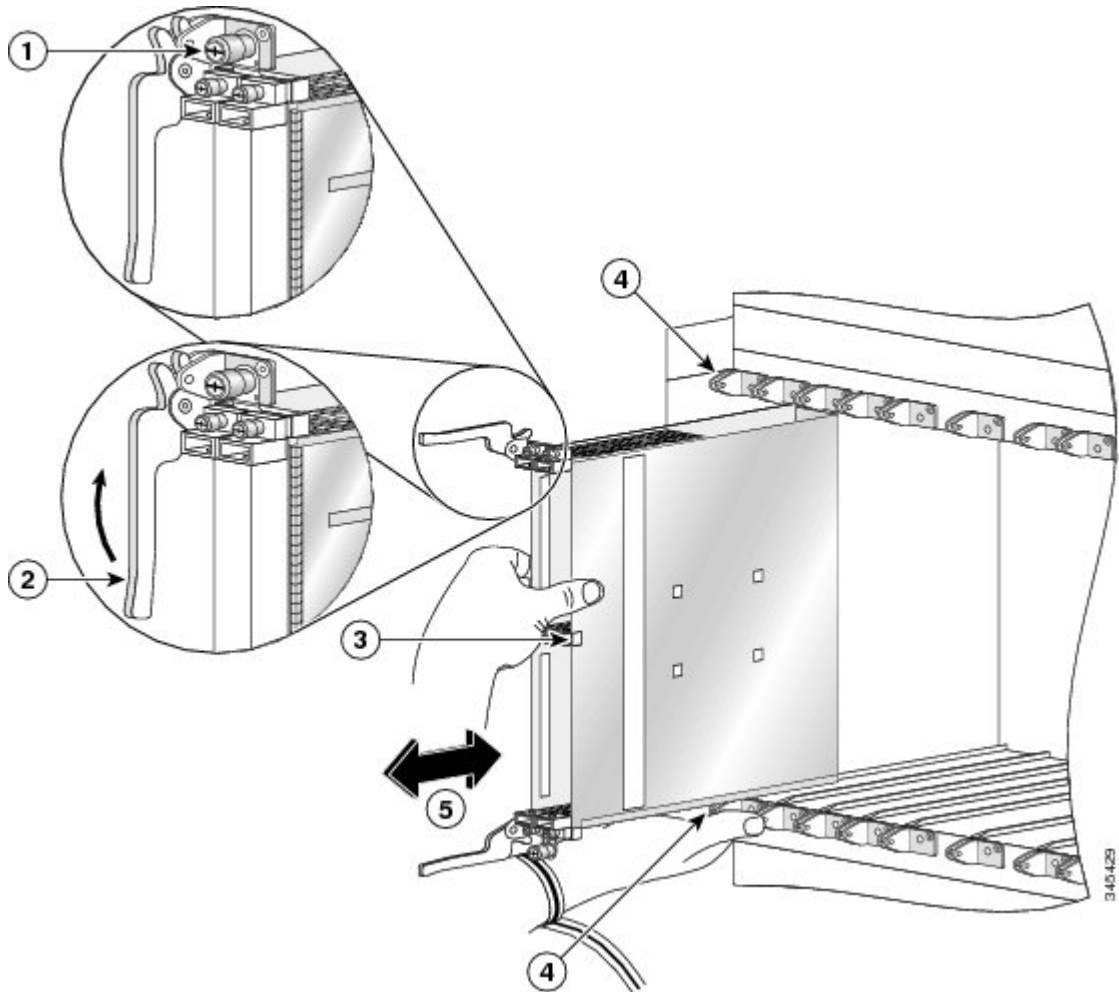
## Removing a Modular Line Card

If you are replacing a failed modular line card (MLC), remove the existing MLC first, then install the new MLC in the same slot. To remove a MLC, use the figure below as a reference and follow these steps:

1. Attach an ESD-preventive wrist strap and follow its instructions for use.
2. Disconnect and remove all interface cables from the ports; write down the current connections of the cables to the ports on the MPAs and the MPA locations if you remove the MPA.
3. Detach the cable-management bracket from the MLC.

Use a screwdriver to loosen the captive screw at each end of the MLC faceplate. (See callout 1 on the figure below).

Figure 6: Removing and Installing a Modular Line Card



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

1. Grasp the two card ejector levers and simultaneously pivot both ejector levers 90 degrees away from the front edge of the card carrier to release the MLC from the backplane connector (see the above figure).
2. Grasp the ejector levers and pull the MLC halfway out of the slot.
3. Grasp the MLC by the center and gently pull it straight out of the slot, keeping your other hand under the MLC to guide it (see the above figure). Avoid touching the MLC printed circuit board, components, or any connector pins.
4. Place the removed MLC on an antistatic mat, or immediately place it in an antistatic bag if you plan to return it to the factory.
5. If the MLC slot is to remain empty, install a line card blank to keep dust out of the chassis and to maintain proper airflow through the MLC compartment. Secure the line card blank to the chassis by tightening its captive screws.

## Installing a Modular Line Card

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



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**Note** See the Cisco ASR 9000 Series Aggregation Services Router Hardware Installation Guide for information on line card slot types in order to determine an appropriate slot in which to install the MLC.

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

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To install a modular line card, follow these steps:

1. Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
2. Choose an available MLC slot for the card and verify that the MPA interface cables are long enough for you to connect the MLC with any external equipment.



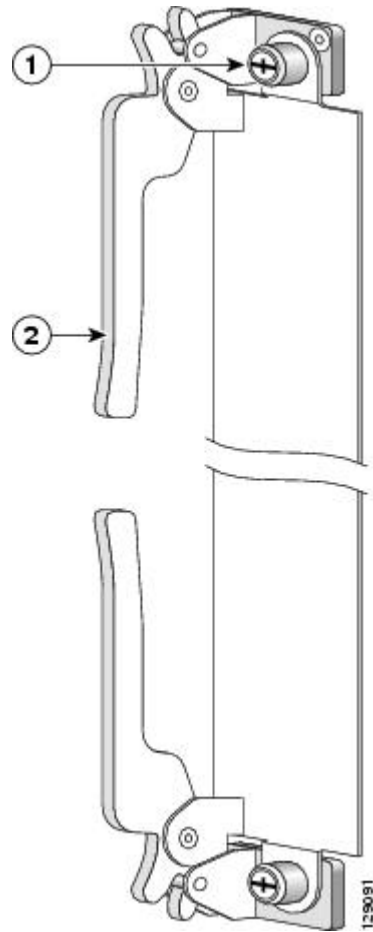
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**Caution** To prevent ESD damage, handle MLCs by the captive installation screws, the provided handle, ejector levers, or the card carrier edges only. Do not touch any of the electrical components or circuitry.

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3. Grasp the handle of the MLC 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 MLC printed circuit board, components, or any connector pins.
4. Carefully slide the MLC 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 MLC until the ejector lever hooks are fully latched (see the figure below).

Figure 7: Ejector Levers and Captive Screws



1	Captive screw	2	Ejector lever
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**Caution** When you install a MLC, 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.

5. Simultaneously pivot both ejector levers toward each other until they are perpendicular to the MLC faceplate. This action firmly seats the card in the backplane.
6. Use a 3/16-inch flat-blade screwdriver to tighten the captive screw on each end of the MLC faceplate to ensure proper EMI shielding and to prevent the MLC from becoming partially dislodged from the backplane. Tighten the locking thumbscrews on both sides of the MLC to a torque of between 8.3 and 11 inch-pounds (94 to 124 N-cm). Do not overtighten.





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

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7. Install the MPAs and SFP modules in the MPAs that use them. See [Installing and Removing Modular Port Adapters, on page 17](#).
8. If you are replacing a MLC, install the MPA in the same bays as you noted in Step 2 under [Removing a Line Card, on page 6](#).
9. Install the interface cables.

## Installing and Removing Modular Port Adapters

The following sections describe how to install or remove MPA:

### Handling Modular Port Adapters

Each modular port adapter (MPA) circuit board is mounted to a metal carrier and is sensitive to electrostatic discharge (ESD) damage.



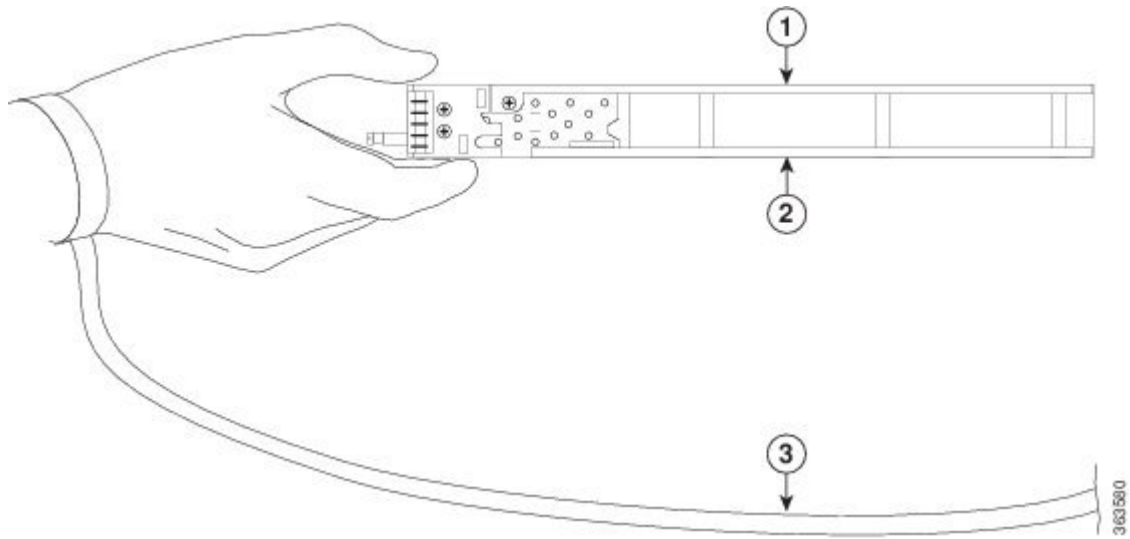
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**Caution** Always handle the MPA by the carrier edges and handle; never touch the MPA components or connector pins (See the figure below).

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When a bay is not in use, a blank MPA Slot Filler (A9K-MPA-FILR) must fill the empty bay to allow the router or switch to conform to electromagnetic interference (EMI) emissions requirements and to allow proper airflow across the installed modules. If you plan to install a MPA in a bay that is not in use, you must first remove the blank.

Figure 8: Handling a Modular Port Adapter



1	Metal Carrier	2	Printed Circuit Board
3	Grounding Strap		

## Online Insertion and Removal

Cisco ASR 9000 Series Router modular line cards (MLCs) and modular port adapters (MPAs) support online insertion and removal (OIR). Modular port adapters (MPAs) can be inserted or removed independently from the MLC. OIR of a MLC with installed modular port adapters (MPAs) is also supported.



**Caution** Cisco IOS XR Software 6.6.1 and later releases support online insertion and removal (OIR) of Cisco NCS 5500 series modular port adapters (MPAs).

Cisco NCS 5500 series modular port adapters (MPAs) support online insertion and removal (OIR).

### Limitation:

- During online insertion and removal of MPA on the Cisco ASR 9000 Series router, the field-programmable gate array (FPGA) turns off and the physical interface (PHY) is unavailable to inhibit the clock. As a result, you will observe a SyncE jump of 80 - 120 ns on downstream nodes.

Modular port adapters (MPAs) support the following types of OIR:

- Soft OIR

Soft OIR uses the IOS XR **hw-module subslot rack/slot/subslot reload**, **hw-module subslot rack/slot/subslot shutdown**, and **no hw-module subslot rack/slot/subslot shutdown** commands to complete online insertion and removal. Refer to the Hardware Redundancy and Node Administration Commands chapter of the *Cisco ASR 9000 Series Aggregation Services Router System Management Command Reference* for command syntax.

- Managed OIR

A managed online insertion and removal of Modular port adapters (MPAs) is comprised of the following steps:

- Shut down the MPA with the **hw-module subslot rack/slot/subslot shutdown** command.
- Confirm that the LEDs have gone from green to off.
- Execute the **do show platform** command to verify that the MPA to be removed is in the disabled state.
- Physically remove the MPA to be replaced.
- Physically insert the replacement MPA. After inserting the MPA in the slot, tighten the MPA screw located on the right side within 10 seconds. Ensure that you first tighten the right screw and then the left.




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**Note** Tighten the captive screws on the MPA within 10 seconds. Otherwise, the MPA shuts down and moves to **Disabled** state. To recover the MPA, tighten both the captive screws and then execute the **hw-module subslot rack/slot/subslot reload** command.

---

- Return the MPA to the up state with the **no hw-module subslot rack/slot/subslot shutdown** command.

- Hard OIR

Hard OIR is the physical online insertion and removal of modular port adapters (MPAs) without software commands. There are three types of hard OIR supported:

- If the bay is empty when the Cisco ASR 9000 Series Router MLC boots, you can do the following:
  - Insert a 20GE MPA
  - Remove and then insert a replacement 20GE MPA
  - Insert a 4 10-GE MPA
  - Remove and then insert a replacement 4 10GE MPA
- If the MLC boots with a 20GE MPA in the bay you can remove and then insert a replacement 20GE MPA or a replacement 4 10GE MPA
- If the MLC boots with a 4 10GE MPA in the bay you can remove and then insert a replacement 4 10GE MPA or replacement 20GE MPA




---

**Note** Cisco recommends waiting for at least 2 minutes before doing successive MPA OIRs (Soft OIR or Hard OIR). An empty bay during the Cisco ASR 9000 Series Router MLC bootup will default to 20GE MPA mode.

---

## Modular Port Adapter Installation and Removal

This section provides step-by-step instructions for removing and installing a modular port adapter (MPA) in a modular line card (MLC).




---

**Note** After you remove the MPA from the slot, wait for 60 seconds before you reinsert the MPA.

---




---

**Note** After you unscrew both ejector screws, wait for 15 seconds before removing MPA from the slot.

---

To remove and install a MPA, do the following:

1. To insert the MPA, locate the guide rails inside the MLC that hold the MPA in place. They are at the top left and top right of the MPA slot and are recessed about an inch.
2. Carefully slide the MPA all the way in the MLC until the MPA is firmly seated in the MPA interface connector. When fully seated, the MPA might be slightly behind the faceplate.




---

**Note** The MPA will slide easily into the slot if it is properly aligned on the tracks. If the MPA does not slide easily, do NOT force it. Remove the MPA and reposition it, paying close attention to engaging it on the tracks. Push the MPA inside the slot until you hear a click. Continue to push the MPA further until you hear a second click. The MPA is fully seated only after the second click is heard.

---

3. After the MPA is properly seated, use a number 2 Phillips screwdriver to tighten the captive screws on the MPA. Ensure that you first tighten the right screw and then the left.




---

**Note** Tighten the captive screws on the MPA within 10 seconds. Otherwise, the MPA shuts down and moves to **Disabled** state. To recover the MPA, tighten both the captive screws and then execute the **hw-module subslot rack/slot/subslot reload** command.

---




---

**Note** Avoid over torquing the MPA captive screws when installing the MPA. Tighten the captive screws on the MPA to a torque of 17 +/-1 inch-pound.

---

4. To remove the MPA from the MLC, use a number 2 Phillips screwdriver to loosen the captive screws on the MPA. Ensure that you first loosen the right screw and then the left.
5. Grasp the MPA and pull the MPA from the MLC. (You have already disconnected the cables from the MPA.)

## Optical Device Installation and Removal

Any contamination of the fiber connection can cause failure of the component or failure of the whole system. A particle that partially or completely blocks the core generates strong back reflections, which can cause instability in the laser system. Inspection, cleaning, and reinspection are critical steps to take before making fiber-optic connections.

### Cleaning Optical Devices

See the [Inspection and Cleaning Procedures for Fiber Optic Connections](#) document for information on cleaning optical devices.

### Safe Removal of CFP2-DCO Modules

The CFP2-DCO modules, when in use, can exhibit high temperatures. Therefore, we recommend that you do not handle these optical modules with bare hands while removing them from ports of MPAs.

Use the following steps to remove CFP2-DCO modules from a router safely:

1. Use the interface `shutdown` command to shut down the port from which you want to remove the CFP2-DCO module, and then wait for 60 seconds.
2. Press the latch and pull the cable assembly out from the optical module. After you have pulled the cables out, pull the CFP2-DCO module out.

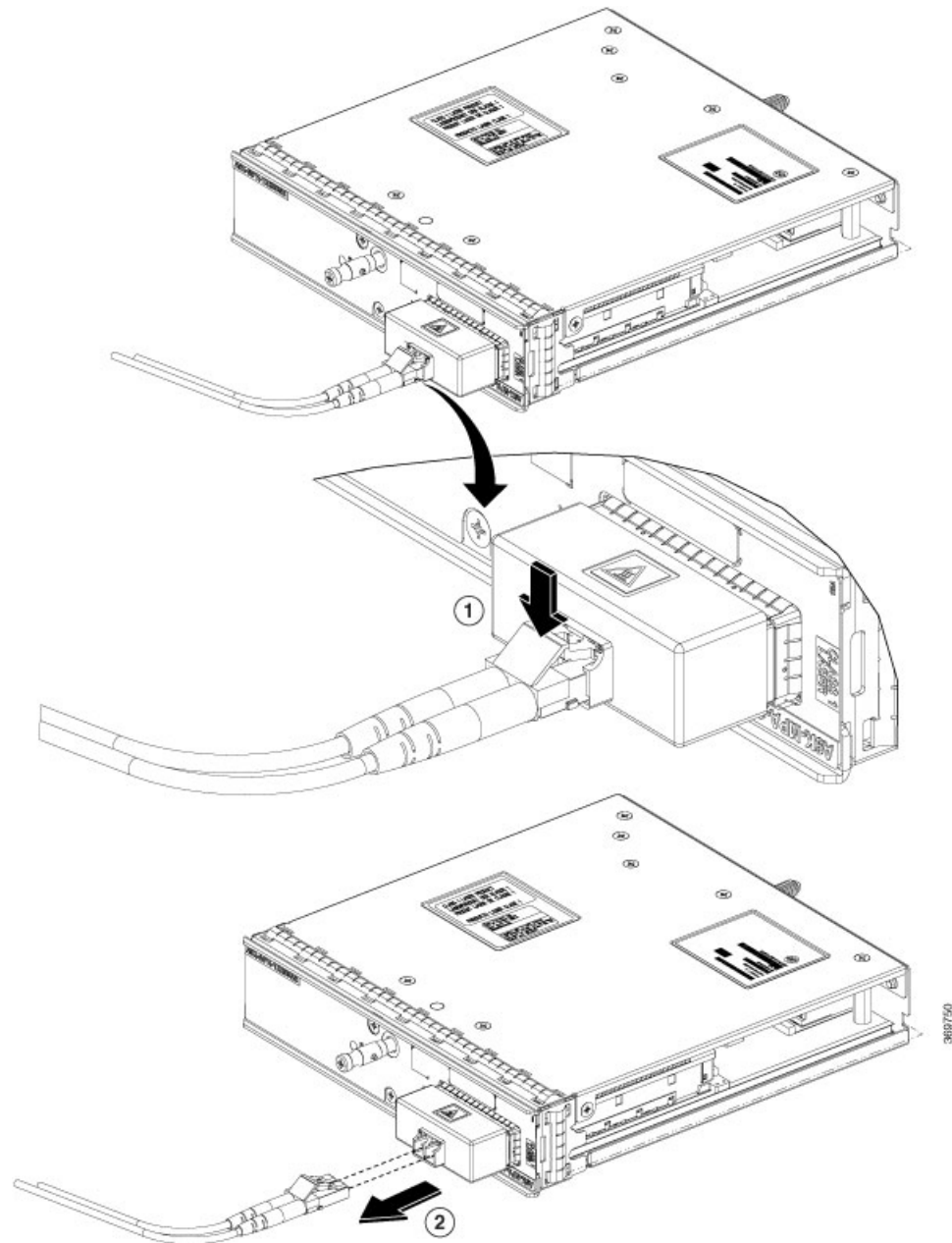


---

**Note**

- The CFP2-DCO modules may have become hot. Therefore, hold the latch to pull out the optical module from the port.
  - We recommend that you use a thermally insulated pad to handle the optical module when you draw it out of the connector.
  - While removing optical cables, ensure that there is minimal disturbance to the adjacent cables.
-

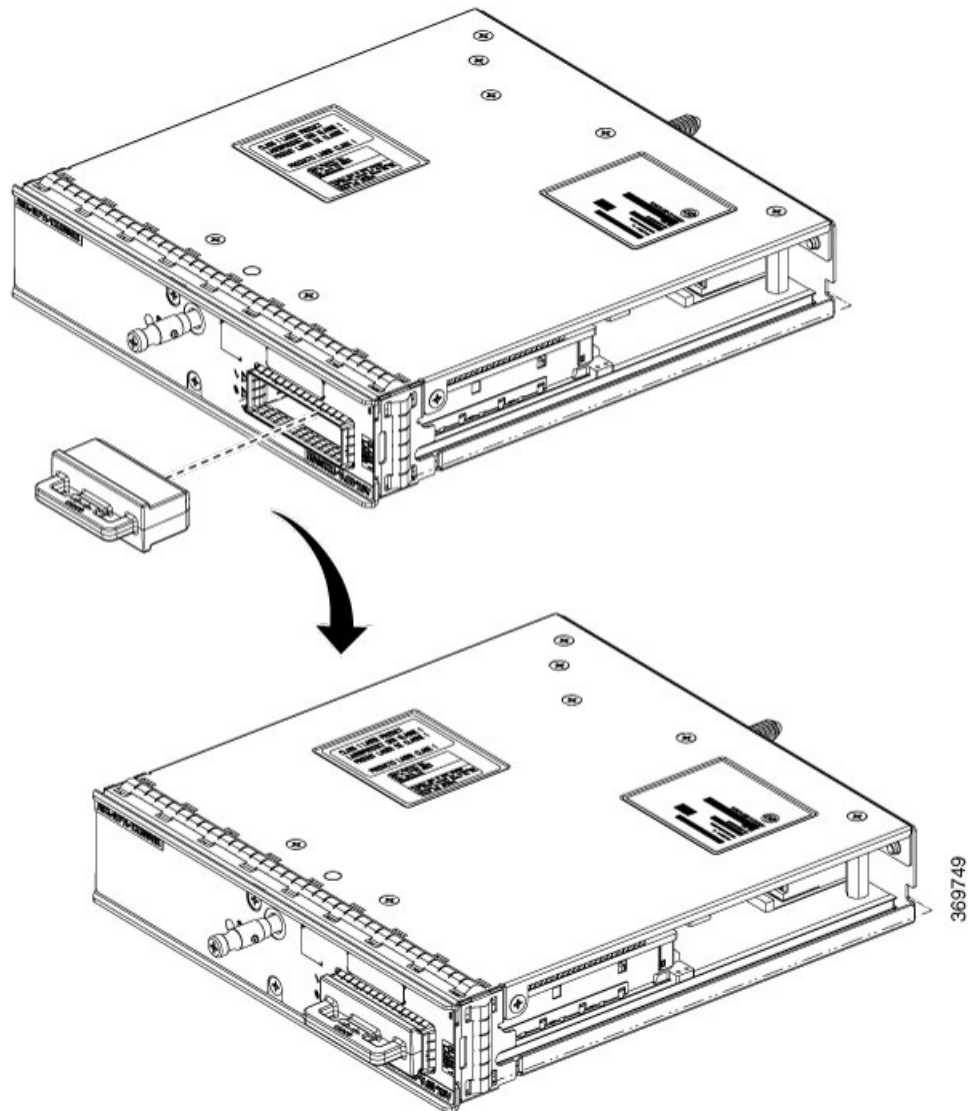
Figure 9: Removal of CFP2-DCO Modules



- |   |  |   |   |
|---|--|---|---|
| 1 | Press the latch on the cables and pull them out. | 2 | Pull out the optical module by holding its latch. |
|---|--|---|---|

3. After you have removed the optical module, cover the port with a CFP2 dust plug.

Figure 10: Covering Port with CFP2 Dust Plug



4. Secure the cables of the optical module at a suitable place to prevent them from hanging midair.

## Checking the Installation

This section describes the procedures you can use to verify the modular line card (MLC) and modular port adapter (MPA) installation, and includes information on the following topics:

### Verifying the Installation

This section describes how to verify the MLC and MPA installation by observing the MLC LED states, the MPA LED states, and the information displayed on the console terminal.

When the system has reinitialized all interfaces, the MLC STATUS LED should be green (on) and the MPA STATUS LEDs should be green (on). The port LEDs (C/A and A/L) may be green (on), depending on your

connections and configuration. The console screen also displays a message as the system discovers each interface during its reinitialization.

The following sample display shows the events logged by the system as a MLC with a MPA was removed from module slot 4 in the router. In this example, interface 0 (interface 4/0/0) on the MPA was up and active when the MLC was removed from the router. Note that the system logs that the MLC was removed from slot 4 and that interface 4/0/0 is changed to *down*.

```
RP/0/RSP0/CPU0:Dec 21 21:55:21.196 : invmgr[246]: %PLATFORM-INV-6-OIROUT : OIR: Node 0/4/CPU0
removed
RP/0/RSP0/CPU0:Dec 21 21:55:21.176 : invmgr[246]: %PLATFORM-INV-6-OIROUT : OIR: Node 0/4/0
removed
```

When you reinsert the MLC with the installed MPA, the system automatically brings up the interface that was changed to *down* when the MLC was removed.

```
RP/0/RSP0/CPU0:Dec 21 21:55:50.318 : invmgr[246]: %PLATFORM-INV-6-OIRIN : OIR: Node 0/4/CPU0
inserted
...
RP/0/RSP0/CPU0:Dec 21 21:59:12.979 : shelfmgr[371]: %PLATFORM-SHELFMGR-6-NODE_STATE_CHANGE
: 0/4/0 A9K-MPA-4X10GE state:INITIALIZED
..
LC/0/4/CPU0:Dec 19 15:07:33.019 : ifmgr[196]: %PKT_INFRA-LINEPROTO-5-UPDOWN : Line protocol
on Interface GigabitEthernet0/4/0/0, changed state to Up
```

Use the following procedure to verify that a MLC and MPA are installed correctly:

1. Observe the console display messages and verify that the system discovers the MLC, while the system reinitializes each interface, as follows:
  - a. As a MLC is initialized, the STATUS LED will first be amber, indicating that power is on, but the MLC is being configured. When the MLC is active, the STATUS LED will illuminate green.
  - b. Modular port adapters (MPAs) will follow the same sequence after the MLC has completed its initialization. The MPA STATUS LEDs will illuminate amber, turning to green when the modular port adapters (MPAs) become active.
  - c. When the MLC and MPA STATUS LEDs are green, all associated interfaces are configurable.

See *Cisco ASR 9000 Series Router Getting Started Guide* and *Cisco Series Router Interface and Hardware Component Configuration Guide* for configuration instructions.

- If a MLC or MPA is replaced with a module of the same type (as in an OIR or hardware swap), the previous configuration is reinstated when the MLC or MPA becomes active.
  - If a MLC or MPA has not been previously installed in the same slot or subslot, then the configuration for all associated interfaces is empty.
2. If the modular line cards (MLCs) and modular port adapters (MPAs) have not become active within three minutes, refer to the system console messages. If there is no indication that a field-programmable device (FPD) upgrade is underway, see [Verifying and Troubleshooting the Line Card Installation](#).




---

**Note** New interfaces are not available until you configure them.

---



## Using show Commands to Verify Modular Line Card and Modular Port Adapter Status

The following procedure uses **show** commands to verify that the new modular port adapters (MPAs) are configured and operating correctly.

1. Use the **show running-config** command to display the system configuration. Verify that the configuration includes the new MPA interfaces.
2. Display information about the installed modular line cards (MLCs) using the **show diag** command.
3. Use the **show hw-module fpd location rack/slot/subslot** command to verify the FPD version information of the modular port adapters (MPAs) installed in the system.



**Note** If a MPA does not meet the minimum version required, the FPD may need to be updated. See the *Cisco ASR 9000 Series Aggregation Services Router System Management Configuration Guide* for instructions. If the update fails, the failing module is powered down and an error message displays on the system console.

4. Use the **show platform** command to check the state of all the boards in the chassis, including the MLC and the modular port adapters (MPAs).

The MPA state should be “OK” and the MLC card state should be “IOS XR RUN” in the **show platform** command output

5. Finally, you can use the **show version** command to obtain software version information for the installed modular line cards (MLCs) as well as interfaces available.

## Using show Commands to Display Modular Port Adapter Information

The following tables describe the show commands you can use to display modular port adapter (MPA) information.

**Table 2: show Commands to Display Modular Port Adapter Information**

Command	Type of Information Provided
show running-config	Router’s running configuration and interfaces available in the system.
show platform	Router’s installed line card and MPA type, slot, and state information.
show diag	MPA type in that slot, number of ports, hardware revision, part number, and EEPROM contents.
<b>show hw-module fpd location</b> <i>rack/slot/subslot</i>	FPD version information of modular port adapters (MPAs) in the system.
<b>show version</b>	Cisco IOS XR software version, names and sources of configuration files, and boot images.

Table 3: show Commands to Display Modular Port Adapter Information

Command	Type of Information Provided	Example
show controllers <i>type rack/slot/subslot/port</i>	Network link status, register contents, and controller chip errors.	show controllers Gigabit Ethernet 0/0/1/1
show interfaces <i>type rack/slot/subslot/port</i>	Line status and data link protocol status for a particular MPA port. Statistics about data traffic sent and received by the port.	show interfaces Gigabit Ethernet 0/0/1/1
show diag <i>rack/slot/subslot/</i>	MPA type in that slot, number of ports, hardware revision, part number, and EEPROM contents.	show diag 0/0/1
show version	Cisco IOS XR software version and boot images.	show version



**Note** When a MLC is moved to a new slot, the system recognizes the new interfaces but leaves them in the shutdown state until you configure them and change their state to up. When a new MLC is inserted into a slot where a MLC previously resided, provided you reinstall the modular port adapters (MPAs) and interfaces and their cables in the same configuration as in the previous MLCs, the interfaces will come up in the same state as though you reinserted the old MLC.

The following sample display shows the events logged by the system as you insert a *new* MLC in module slot 4.

```
RP/0/RSP0/CPU0:Dec 21 21:55:50.318 : invmgr[246]: %PLATFORM-INV-6-OIRIN : OIR: Node 0/4/CPU0
  inserted
...
RP/0/RSP0/CPU0:Dec 21 21:59:12.979 : shelfmgr[371]: %PLATFORM-SHELFMGR-6-NODE_STATE_CHANGE
 : 0/4/0 A9K-MPA-4X10GE state:INITIALIZED
..
LC/0/4/CPU0:Dec 19 15:07:33.019 : ifmgr[196]: %PKT_INFRA-LINEPROTO-5-UPDOWN : Line protocol
 on Interface GigabitEthernet0/4/0/0, changed state to Up
```

Use the following procedure to verify that the MLC is installed correctly:

1. Observe the console display messages and verify that the system discovers the MLC, while the system reinitializes each interface, as follows:
  - If you installed a new MLC, the STATUS LED should be on (green). The system should recognize all new interfaces but leave them configured as *down*.
  - If you replaced a MLC, the STATUS LED should be on (green). The interfaces will come up in the same state as though you reinserted the old MLC.
2. Verify that the STATUS LED on the MPA goes on (is green) and remains on after the reinitialization is complete. If the STATUS LED remains on, proceed to Step 5. If the STATUS LED does not remain on, proceed to Step 3.
3. If the STATUS LED on a MPA fails to go on, the MPA or the MLC might not be fully seated.
  - Remove the MPA from the MLC.

- Inspect the MPA. Verify there are no bent pins or parts and that there is nothing lodged in the two devices that could prevent a good connection.
- Insert the MPA in the MLC by sliding the MPA all the way in the MLC until the MPA is firmly seated in the MPA interface connector. When fully seated in the MLC, the MPA might be slightly behind the MLC faceplate. After the MPA is properly seated, use a number 2 Phillips screwdriver to tighten the jackscrew.



---

**Note** The MPA will slide easily into the slot if it is properly aligned on the tracks. If the MPA does not slide easily, do NOT force it. Remove the MPA and reposition it, paying close attention to engaging it on the tracks.

---

- After the system reinitialization, the STATUS LED on the MPA should go on and remain on. If the STATUS LED remains on, proceed to Step 5. If it does not, try reseating the MPA in a different subslot within the MLC.

If the STATUS LED on a MPA fails to go on after reseating the MPA in a different subslot within the MLC, proceed to Step 4.

4. If the STATUS LED on a MPA still fails to go on, remove the MPA from the MLC, then remove the MLC and install it in another available slot on the router. Wait for the STATUS LED on the MLC to turn green.
  - If the STATUS LED goes on, suspect a failed backplane port in the original slot.
  - If the STATUS LED fails to go on, remove the MLC and ensure the MPA is firmly seated in its slot. Remove and reinstall it accordingly.
  - If the STATUS LED still fails to go on, but other LEDs on the MPA go on to indicate activity, proceed to Step 5 to resume the installation checkout; suspect that the STATUS LED on the MPA or the MPA bay has failed. Contact a service representative to report the problem and obtain further instructions.
  - If no LEDs are lit on the MPA:
    - Verify that the MPA is supported on the MLC and that it has the required hardware revision. If the MPA is not supported or has an old hardware revision, the show diag command indicates that the MLC is deactivated.
    - If there is another MLC available in the router, to test your MPA move the MPA to the other MLC.
    - Suspect a faulty MLC. Contact a service representative to report the problem and obtain further instructions.



---

**Note** If you move the MPA to a different subslot in the MLC and it works, there are probably issues with the subslot in the MLC. Contact a service representative re: the broken subslot. If you test the MPA in another MLC and it works, the original MLC probably has some issues and needs troubleshooting. Contact a service representative to report the problem and obtain further instructions.

---

5. If the MPA is new and is not a replacement, configure the new MPA using the instructions in the *Cisco IOS XR Getting Started Guide for the Cisco ASR 9000 Series Router* and *Cisco ASR 9000 Series Aggregation Services Router Interface and Hardware Component Configuration Guide*.




---

**Note** New interfaces are not available until you configure them.

---

6. If the MLC is a replacement, use the **show interfaces** command or the **show controllers** command to verify the status of the modular port adapters (MPAs). See *Using show Commands to Verify Modular Line Card and Modular Port Adapter Status*.  
  
If you replaced a MLC with another MLC with a different MPA installed, the system recognizes the interfaces on the previously configured MPA but does not recognize the new MPA interfaces. The new interfaces remain in the shutdown state until you configure them.
7. When the interfaces are up, check the activity of each MPA by observing the carrier LED.
8. If the carrier LED fails to go on and a cable is connected to the interface port, check the cable connection and make certain it is properly seated in the connector.
9. Repeat Step 1 through Step 8 to verify that any additional modular line cards (MLCs) are properly installed.

If you experience other problems that you are unable to solve, contact TAC (see *Obtaining Documentation and Submitting a Service Request*), or a service representative for assistance.

To configure the new interface, see the *Cisco ASR 9000 Series Aggregation Services Router Interface and Hardware Component Configuration Guide*.

## Using the Ping Command to Verify Network Connectivity

This section provides brief descriptions of the **ping** command. The **ping** command allows you to verify that a MPA port is functioning properly and to check the path between a specific port and connected devices at various locations on the network. After you verify that the system and the MLC have booted successfully and are operational, you can use this command to verify the status of the MPA ports.

See the *Cisco ASR 9000 Series Aggregation Services Router Getting Started Guide* and *Cisco ASR 9000 Series Aggregation Services Router Interface and Hardware Component Configuration Guide* for more information on bringing up and configuring the Cisco ASR 9000 Series Router, the Cisco A9K-MOD160G, and the Cisco A9K-MOD80G-H. For more information on command syntax, refer to the guides listed in the *Obtaining Documentation and Submitting a Service Request* for detailed command descriptions and examples.

The **ping** command sends an echo request out to a remote device at an IP address that you specify. After sending a series of signals, the command waits a specified time for the remote device to echo the signals. Each returned signal is displayed as an exclamation point (!) on the console terminal; each signal that is not returned before the specified timeout is displayed as a period (.). A series of exclamation points (!!!!!) indicates a good connection; a series of periods (.....) or the messages [timed out] or [failed] indicate that the connection failed.

Following is an example of a successful **ping** command to a remote server with the IP address 10.1.1.60:

```
Router# ping 10.1.1.60
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 10.1.1.60, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/15/64 ms
Router#
```

If the connection fails, verify that you have the correct IP address for the destination device and that the destination device is active (powered on), and then repeat the **ping** command.

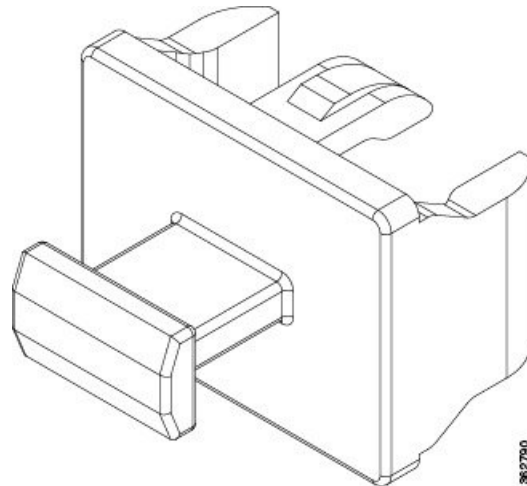
## Installing and Removing SFP Modules

Before you remove or install an SFP or SFP+ module, read the installation information in this section and the safety information in [Laser Safety, on page 2](#).



**Caution** Protect the line card by inserting a clean SFP/SFP+ module cage cover (A9K-SFP10G-COVER), shown in the figure below, into the optical module cage when there is no SFP or SFP+ module installed.

*Figure 11: SFP/SFP+ Module Cage Cover*



**Caution** Protect the SFP or SFP+ modules by inserting clean dust covers into them after the cables are removed. Be sure to clean the optic surfaces of the fiber cables before you plug them back into the optical ports of another module. Avoid getting dust and other contaminants into the optical ports of your SFP or SFP+ modules, because the optics do not work correctly when obstructed with dust.



**Caution** We strongly recommended that you do not install or remove the SFP or SFP+ module with fiber-optic cables attached to it because of the potential to damage the cable, the cable connector, or the optical interfaces in the module. Disconnect all cables before removing or installing an SFP or SFP+ module. Removing and inserting an module can shorten its useful life, so you should not remove and insert modules any more often than is absolutely necessary.

SFP and SFP+ modules use one of four different latching devices to install and remove the module from a port. The four types of SFP module latching devices are described in the following sections:

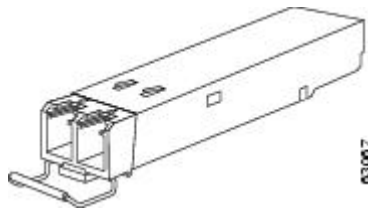


**Note** When installing an SFP or SFP+ module, you should hear a click as the triangular pin on the bottom of the module snaps into the hole in the receptacle, indicating that the module is correctly seated and secured in the receptacle. Verify that the modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP or SFP+ module.

## Bale Clasp SFP or SFP+ Module

The bale clasp SFP or SFP+ module has a clasp that you use to remove or install the module (see the figure below).

*Figure 12: Bale Clasp SFP or SFP+ Module*

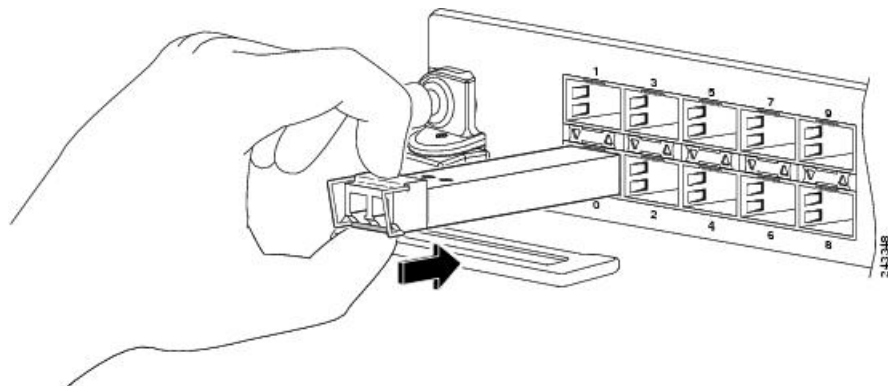


## Installing a Bale Clasp SFP or SFP+ Module

To install this type of SFP or SFP+ module, follow these steps:

1. Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
2. Close the bale clasp before inserting the SFP module.
3. Line up the SFP module with the port and slide it into the port (see the figure below).

*Figure 13: Installing a Bale Clasp SFP Module into a Port*



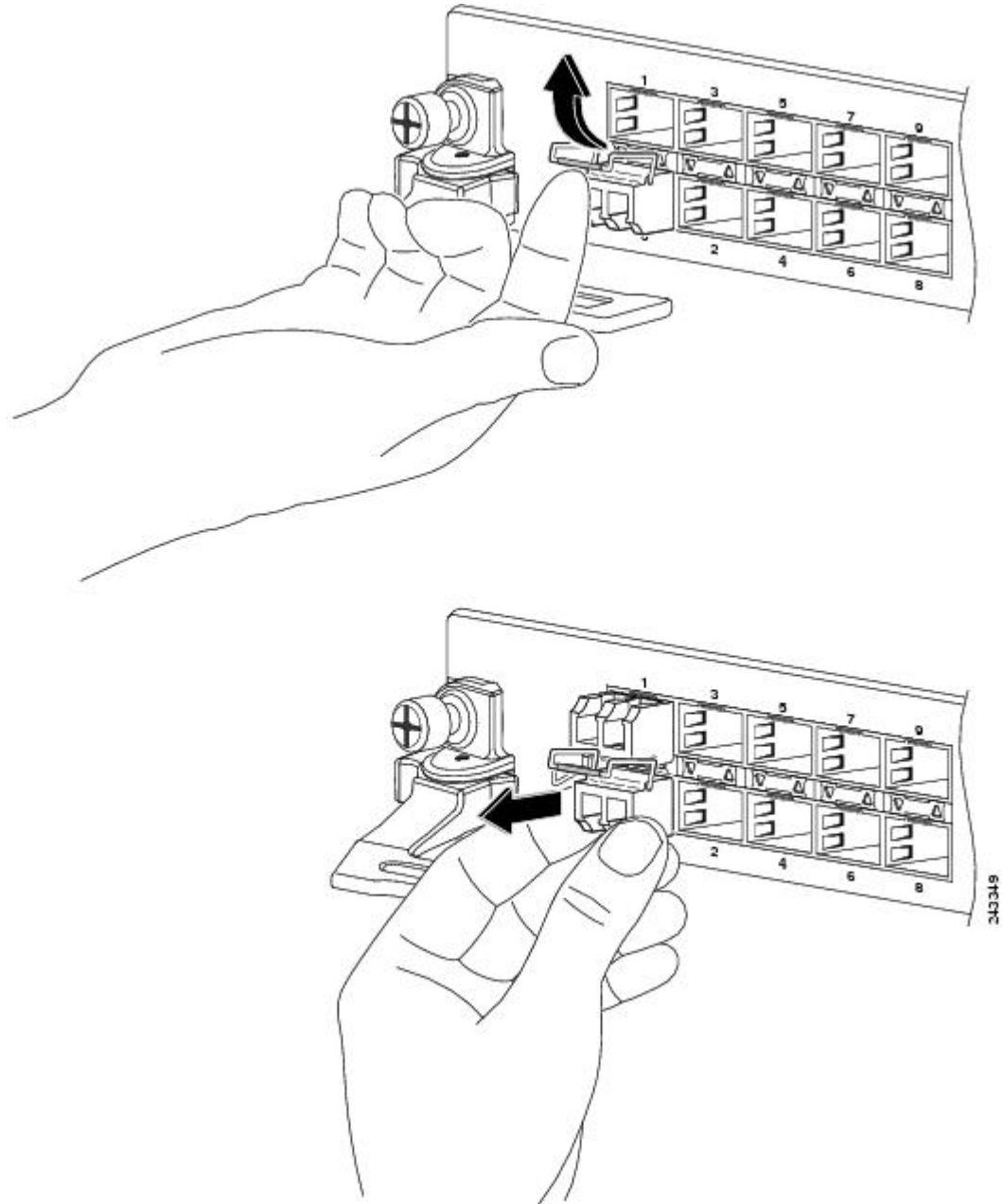
**Note** When installing an SFP or SFP+ module, you should hear a click as the triangular pin on the bottom of the SFP module snaps into the hole in the receptacle, indicating that the module is correctly seated and secured in the receptacle. Verify that the SFP modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP module.

## Removing a Bale Clasp SFP or SFP+ Module

To remove this type of SFP or SFP+ module, follow these steps:

1. Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
2. Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.
3. Open the bale clasp on the SFP module with your index finger in a downward direction, as shown in the figure below. If the bale clasp is obstructed and you cannot use your index finger to open it, use a small flat-blade screwdriver or other long, narrow instrument to open the bale clasp.
4. Grasp the SFP module between your thumb and index finger and carefully remove it from the port, as shown in the figure below.

Figure 14: Removing a Bale Clasp SFP or SFP+ Module



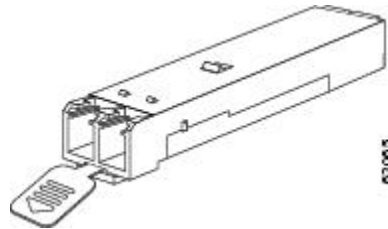
5. Place the removed SFP module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.
6. Protect your line card by inserting clean SFP module cage covers into the optical module cage when there is no SFP module installed.



## Mylar Tab SFP or SFP+ Module

The mylar tab SFP or SFP+ module has a tab to pull to remove the module from a port as shown in the following figure.

*Figure 15: Mylar Tab SFP or SFP+ Module*

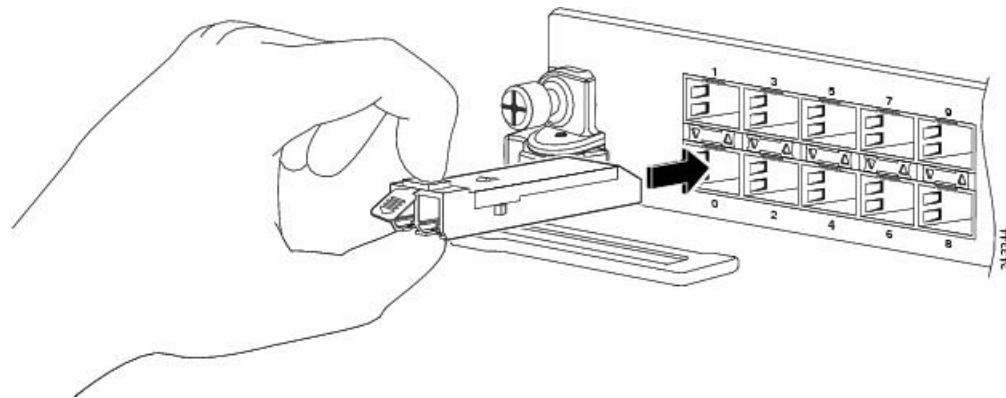


## Installing a Mylar Tab SFP or SFP+ Module

To install this type of SFP or SFP+ module, follow these steps:

1. Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
2. Line up the SFP module with the port, and slide it into place as shown in the following figure.

*Figure 16: Installing a Mylar Tab SFP Module*



**Note** When installing an SFP module, you should hear a click as the triangular pin on the bottom of the SFP module snaps into the hole in the receptacle, indicating that the module is correctly seated and secured in the receptacle. Verify that the SFP modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP module.

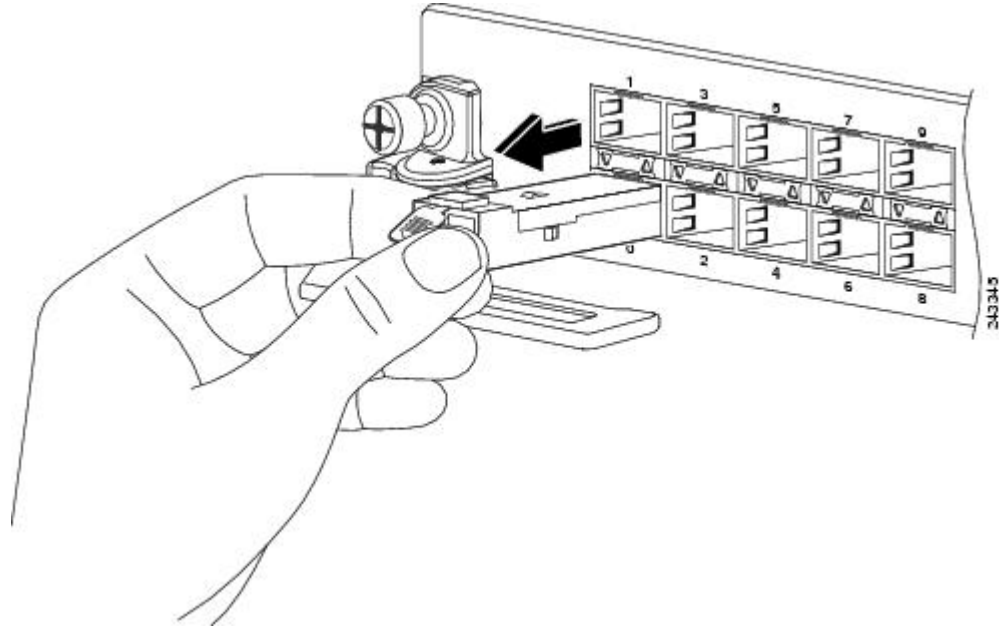
## Removing a Mylar Tab SFP or SFP+ Module

To remove this type of SFP or SFP+ module, follow these steps:

1. Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
2. Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.

- Pull the tab gently in a slightly downward direction until it disengages from the port, then pull the SFP module out as shown in the following figure.

*Figure 17: Removing a Mylar Tab SFP Module*



- Place the removed SFP module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.
- Protect your line card by inserting clean SFP module cage covers into the optical module cage when there is no SFP module installed.

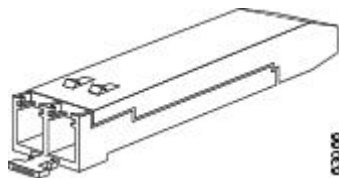


**Note** When pulling the tab to remove the SFP module, be sure to pull in a straight outward motion so you remove the SFP module from the port in a parallel direction. Do not twist or pull the tab, because you might disconnect it from the SFP module.

## Actuator Button SFP or SFP+ Module

The actuator button SFP or SFP+ module includes a button that you push to remove the SFP module from a port as shown in the following figure.

*Figure 18: Actuator Button SFP or SFP+ Module*

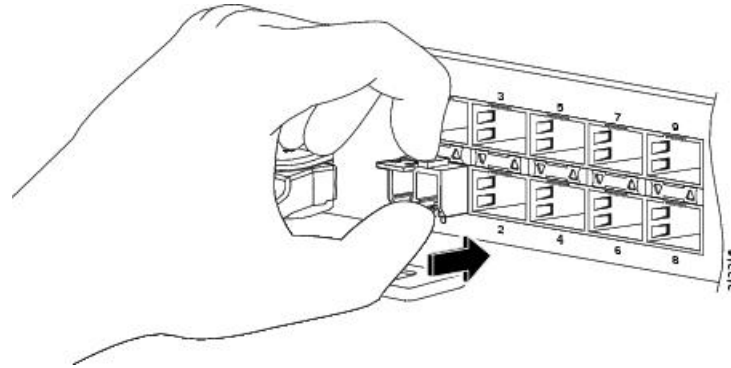


## Installing an Actuator Button SFP Module

To install this type of SFP or SFP+ module, follow these steps:

1. Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
2. Line up the SFP module with the port and slide it in until the actuator button clicks into place as shown in the following figure. Be sure not to press the actuator button as you insert the SFP module because you might inadvertently disengage the SFP module from the port.

**Figure 19: Installing an Actuator Button SFP or SFP+ Module**



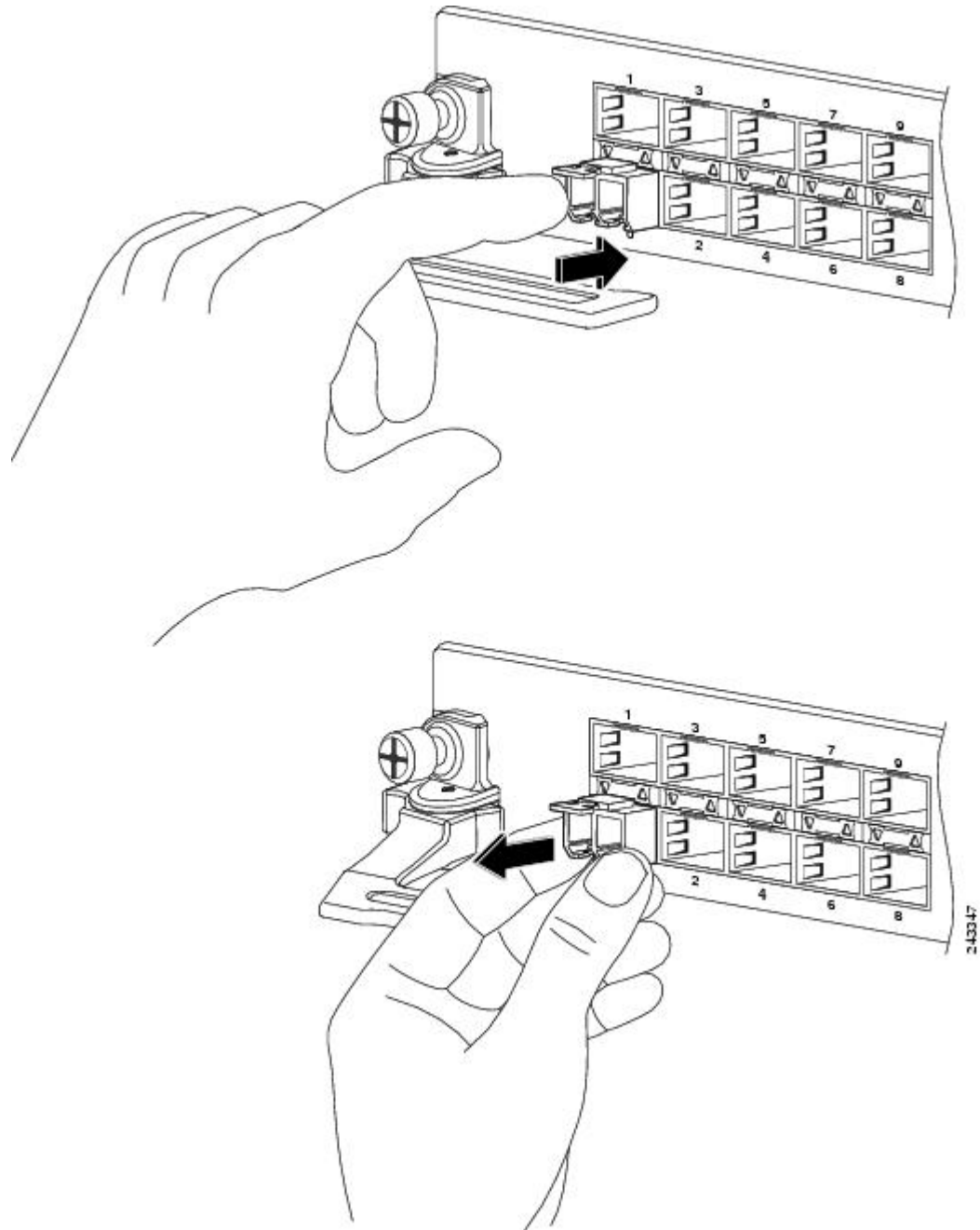
**Note** When installing an SFP module, you should hear a click as the triangular pin on the bottom of the SFP module snaps into the hole in the receptacle, indicating that the module is correctly seated and secured in the receptacle. Verify that the SFP modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP module.

## Removing an Actuator Button SFP or SFP+ Module

To remove this type of SFP or SFP+ module, follow these steps:

1. Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
2. Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.
3. Gently press the actuator button on the front of the SFP module until it clicks and the latch mechanism activates, releasing the SFP module from the port (see the figure below).

*Figure 20: Removing an Actuator Button SFP or SFP+ Module from a Port*

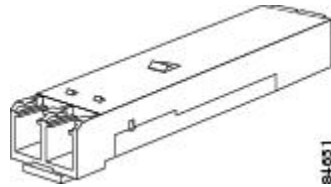


4. Grasp the actuator button between your thumb and index finger and carefully pull the SFP module from the port.
5. Place the removed SFP module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.
6. Protect your line card by inserting clean SFP module cage covers into the optical module cage when there is no SFP module installed.

## Slide Tab SFP or SFP+ Module

The slide tab SFP or SFP+ module has a tab underneath the front of the module that you use to disengage the module from a port (see the figure below).

*Figure 21: Slide Tab SFP or SFP+ Module*

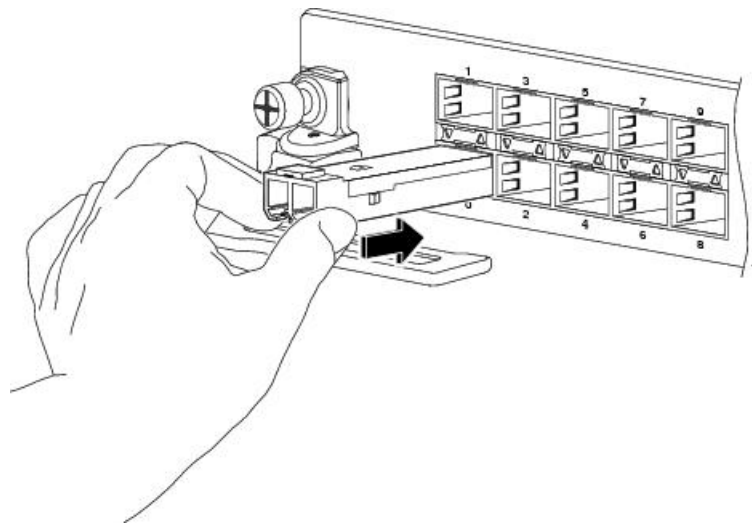


## Installing a Slide Tab SFP or SFP+ Module

To install this type of SFP module into a line card, follow these steps:

1. Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
2. Line up the SFP module with the port and gently push on it until it snaps into the slot tightly (see the figure below).

*Figure 22: Installing a Slide Tab SFP or SFP+ Module*



**Note** When installing an SFP module, you should hear a click as the triangular pin on the bottom of the SFP module snaps into the hole in the receptacle, indicating that the module is correctly seated and secured in the receptacle. Verify that the SFP modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP module.

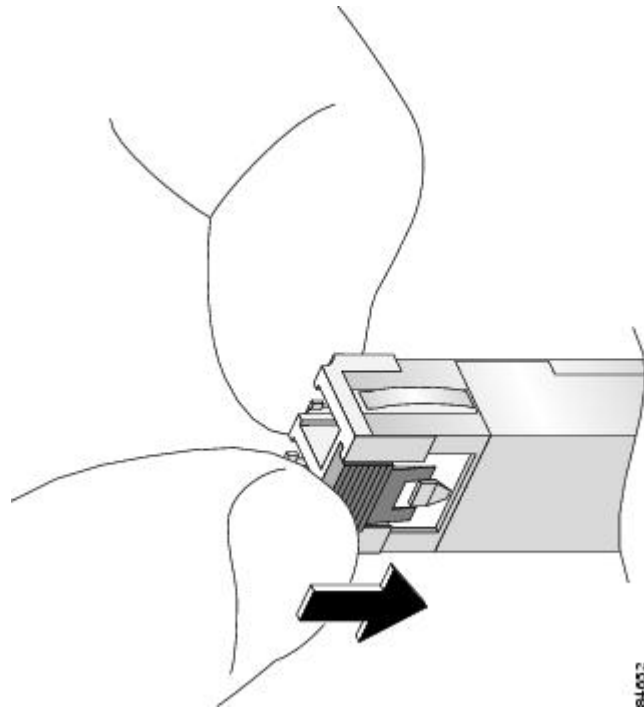
## Removing a Slide Tab SFP or SFP+ Module

To remove this type of SFP or SFP+ module, follow these steps:

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

2. Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.
3. Grasp the SFP module between your thumb and index finger.
4. With your thumb, push the slide tab on the bottom front of the SFP module in the direction of the line card to disengage the module from the line card port (see the figure below).

**Figure 23: Disengaging the Slide Tab**

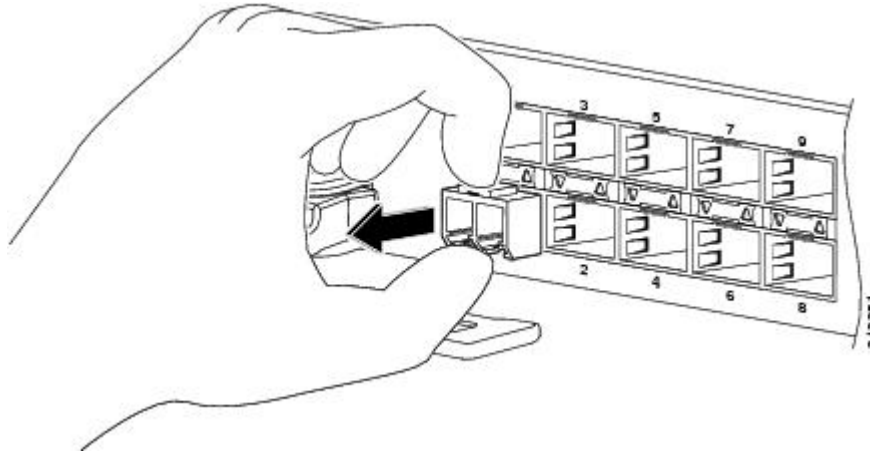


5. With the tab still pushed, carefully pull the SFP module from the port as shown in the figure below.



**Caution** You must disengage the SFP module by pushing on the slide tab before you can pull out the module. If you pull on the SFP module without disengaging the tab, you can damage the module.

*Figure 24: Removing a Slide Tab SFP or SFP+ Module*

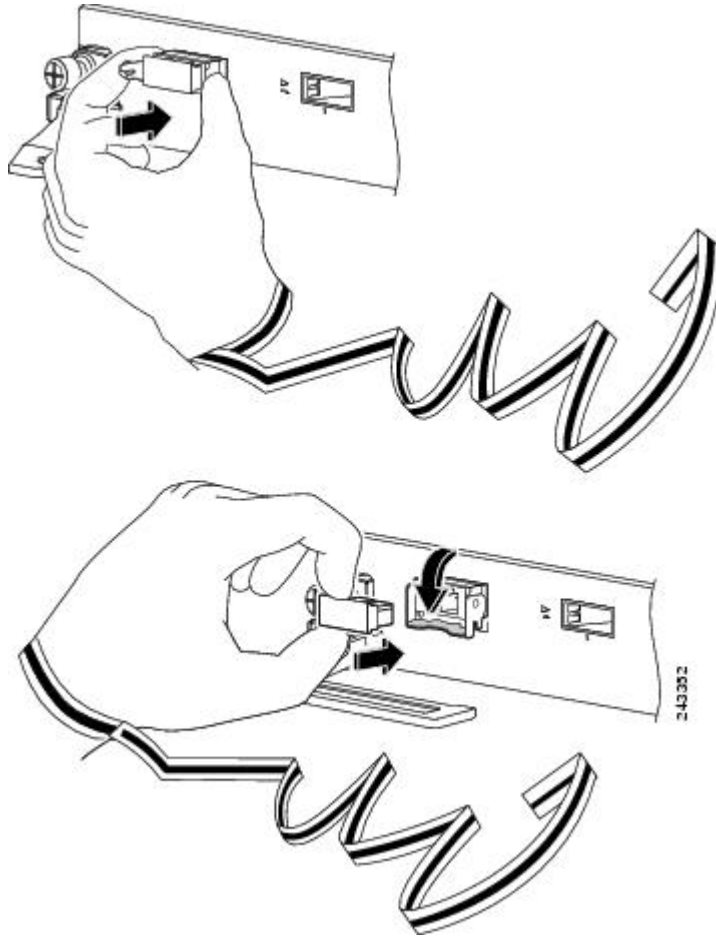


6. Place the removed SFP module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.
7. Protect your line card by inserting clean SFP module cage covers into the optical module cage when there is no SFP module installed.

## Installing and Removing XFP Modules

The 10-Gigabit Ethernet (GE) XFP transceiver module is a hot-swappable I/O device that plugs into 10GE ports (see the figure below). The XFP transceiver module connects the electrical circuitry of the system with the optical network.

Figure 25: 10-Gigabit Ethernet XFP Transceiver Module



1	Transmit optical bore	4	Bale clasp (locked position)
2	Receive optical bore	5	Dust plug
3	Transceiver socket connector	6	Bale clasp (unlocked position)



**Note** The dual LC connector on the XFP transceiver modules supports network interface cables with either Physical Contact (PC) or Ultra-Physical Contact (UPC) polished face types. The dual LC connector on the XFP transceiver modules does not support network interface cables with an Angle Polished Connector (APC) polished face type.





---

**Caution** We strongly recommended that you do not install or remove the XFP module with fiber-optic cables attached to it because of the potential of damaging the cable, the cable connector, or the optical interfaces in the XFP module. Disconnect all cables before removing or installing an XFP module. Removing and inserting an XFP module can shorten its useful life, so you should not remove and insert XFP modules any more often than is absolutely necessary.

---

## Installing a 10-Gigabit Ethernet XFP Transceiver Module



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**Caution** The XFP transceiver is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling XFP transceivers or coming into contact with system modules.

---

To install an XFP transceiver, follow these steps:

1. Remove the XFP transceiver from its protective packaging.



---

**Note** Do not remove the optical bore dust plug until directed to do so later in the procedure.

---

2. Check the label on the XFP transceiver body to verify that you have the correct model for your network.
3. Position the XFP transceiver in front of the XFP socket opening on the module. Slide the XFP transceiver part of the way into the transceiver socket on the system module front panel.
4. Remove the optical bore dust plug from the XFP transceiver.
5. Pivot the bale clasp up so that it is parallel with the transceiver body (see the figure below).
6. Continue sliding the XFP transceiver into the socket until the XFP transceiver is mated with the transceiver socket connector.
7. Latch the XFP transceiver in the transceiver socket by pivoting the bale clasp down so that the bale clasp is perpendicular to the transceiver body (see the figure below).

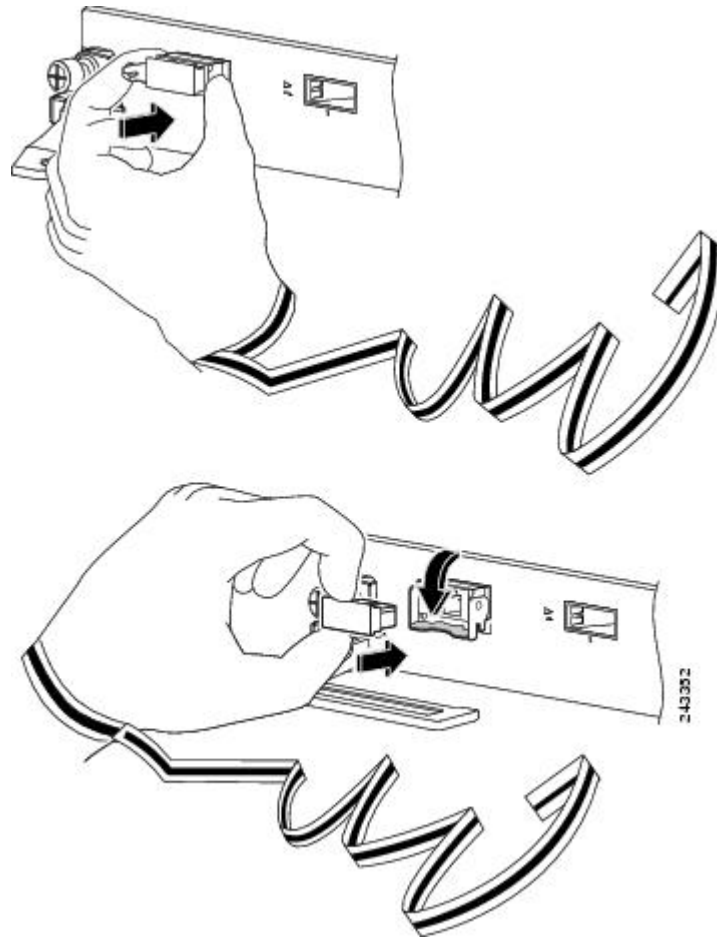


---

**Caution** If the latch is not fully engaged, you may accidentally disconnect the XFP transceiver.

---

Figure 26: Installing the 10-Gigabit Ethernet XFP Transceiver Module



8. Immediately reinstall the dust plug in the XFP transceiver optical bores. Do not remove the dust plug until you are ready to attach the network interface cable.



**Note** 10-Gigabit XFP transceivers are keyed to prevent incorrect insertion.

## Removing a 10-Gigabit Ethernet XFP Transceiver Module



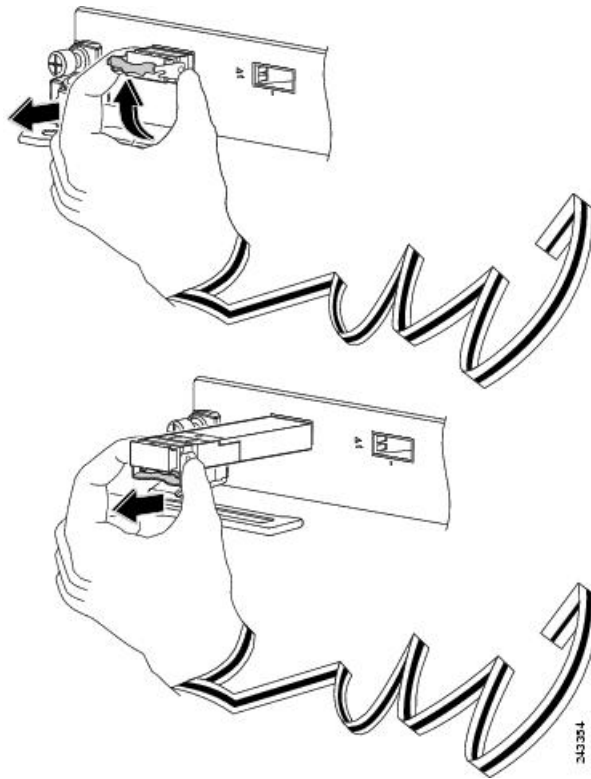
**Caution** The XFP transceiver is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling XFP transceivers or coming into contact with modules.

If you are removing an XFP transceiver, follow these steps:

1. Disconnect the network interface cable from the XFP transceiver connectors. Immediately reinstall the dust plug in the fiber-optic cable LC connector.

2. Pivot the XFP transceiver bale clasp up to release the XFP transceiver from the socket (see the figure below).
3. Slide the XFP transceiver out of the socket. Pivot the bale clasp down and immediately install the dust plug in the XFP transceiver optical bores (see the figure below).
4. Immediately place the XFP transceiver in an antistatic bag.

**Figure 27: Removing the 10-Gigabit Ethernet XFP Transceiver Module**



## Cabling a 10-Gigabit Ethernet XFP Transceiver Module



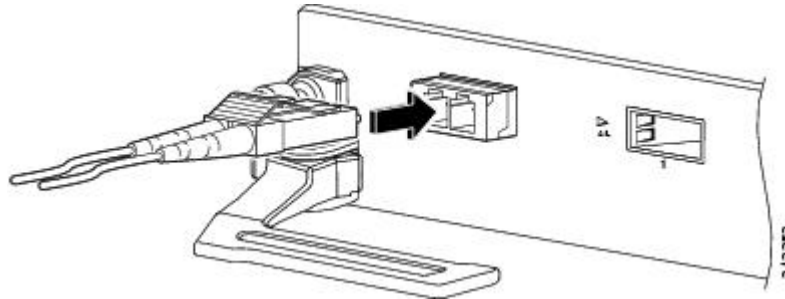
- Note** Before removing the dust plugs and making any optical connections, follow these guidelines:
- Always keep the protective dust plugs on the unplugged fiber-optic cable connectors and the transceiver optical bores until you are ready to make a connection.
  - Always inspect and clean the LC connector end faces just before making any connections. See [Cleaning Fiber-Optic Connectors](#).
  - Always grasp the LC connector housing to plug or unplug a fiber-optic cable.

To cable a 10-Gigabit Ethernet XFP transceiver module:

1. Remove the dust plugs from the optical network interface cable LC connectors ([Figure 26: Installing the 10-Gigabit Ethernet XFP Transceiver Module, on page 42](#)). Save the dust plugs for future use.

2. Inspect and clean the LC connector's fiber-optic end faces.
3. Remove the dust plugs from the XFP transceiver module optical bores.
4. Immediately attach the network interface cable LC connectors to the XFP transceiver module (see the figure below) for an illustration of cabling the XFP transceiver module).

**Figure 28: Cabling a 10-Gigabit Ethernet XFP Transceiver Module**



## Installing and Removing 100-Gigabit Ethernet CFP Transceiver Modules

This section provides the installation, cabling, and removal instructions for the Cisco 100-Gigabit C Form-factor Pluggable (CFP) transceiver modules. The modules are hot-swappable input/output (I/O) devices that connect the system's module port electrical circuitry with either a copper or a fiber-optic network.

### Overview

The Cisco 100-Gigabit Ethernet CFP transceiver modules are hot-swappable I/O devices that plug into 100-Gigabit Ethernet module ports.

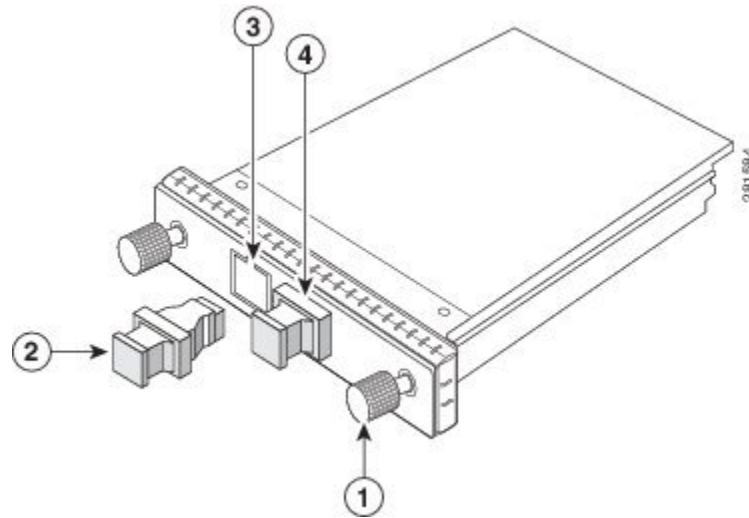



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**Note** Note: The dual SC connectors on the optical CFP transceivers support network interface cables with either Physical Contact (PC) or Ultra-Physical Contact (UPC) flat polished face types. The dual SC connectors on the optical CFP transceivers do not support network interface cables with an Angle Polished Connector (APC) polished face type.

---

Figure 29: CFP Transceiver



1	Captive installation screws	2	Optical bore dust plug
3	Transmit optical bore, SC connector	4	Receive optical bore, SC connector

## Required Tools

You will need these tools to install the CFP transceiver module:

- Small flat-blade screwdriver for removing the CFP transceiver socket cover.
- Wrist strap or other personal grounding device to prevent electro-static discharge (ESD) occurrences.
- Fiber-optic end-face cleaning tools and inspection equipment. For complete information on inspecting and cleaning fiber-optic connections, See [Cleaning Fiber-Optic Connectors](#).

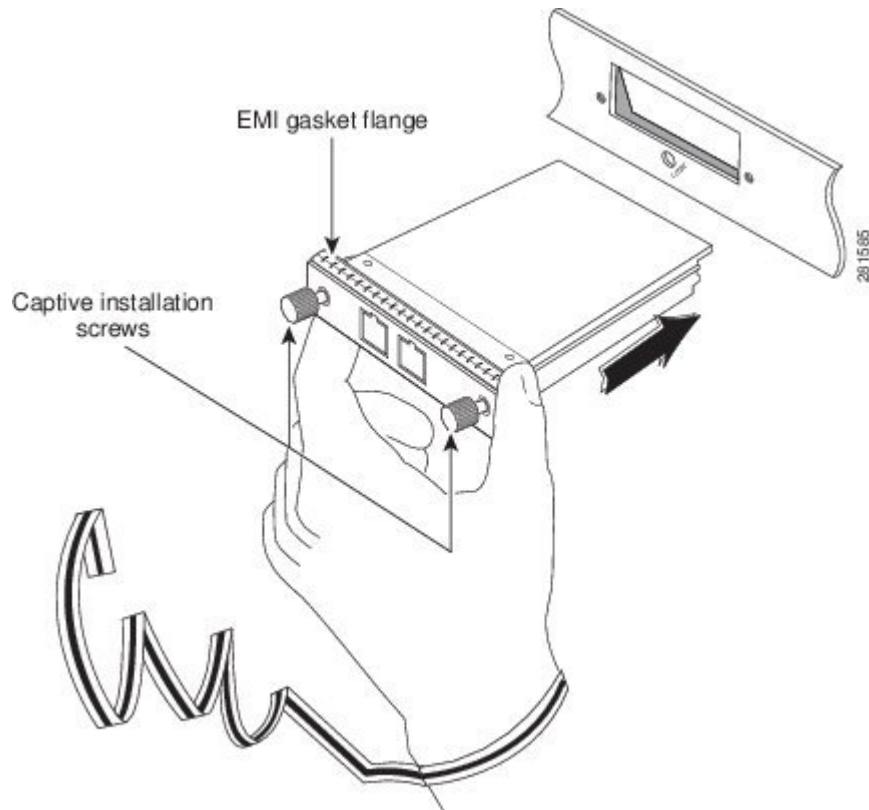
## Installing a CFP Transceiver Module



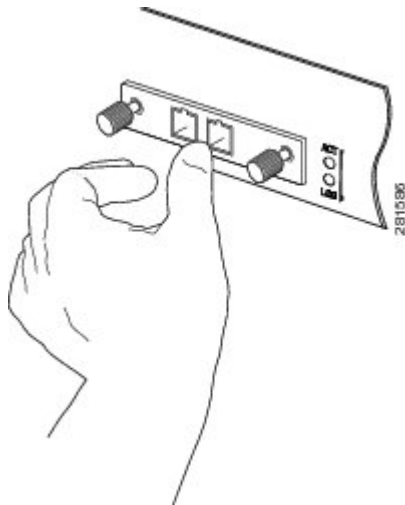
**Caution** The CFP transceiver is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling the CFP transceivers or coming into contact with the modules.

To install a CFP transceiver, follow these steps:

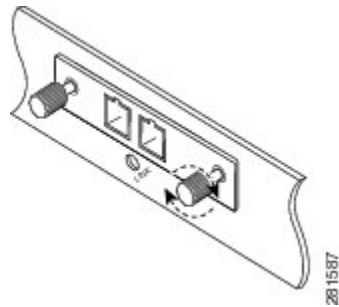
1. Remove the CFP transceiver from its protective packaging.
2. Check the label on the CFP transceiver body to verify that you have the correct model for your network.
3. Remove the dust plug from the CFP transceiver module optical port and set it aside.
4. Align the CFP device into the transceiver port socket of your networking module, and slide it in until the CFP transceiver EMI gasket flange makes contact with the module faceplate (see the figure below).

**Figure 30: Installing a CFP Transceiver Module**

5. Press firmly on the front of the CFP transceiver with your thumb to fully seat it in the transceiver socket. (see the figure below.)

**Figure 31: Seating the CFP Transceiver Module in the Socket**

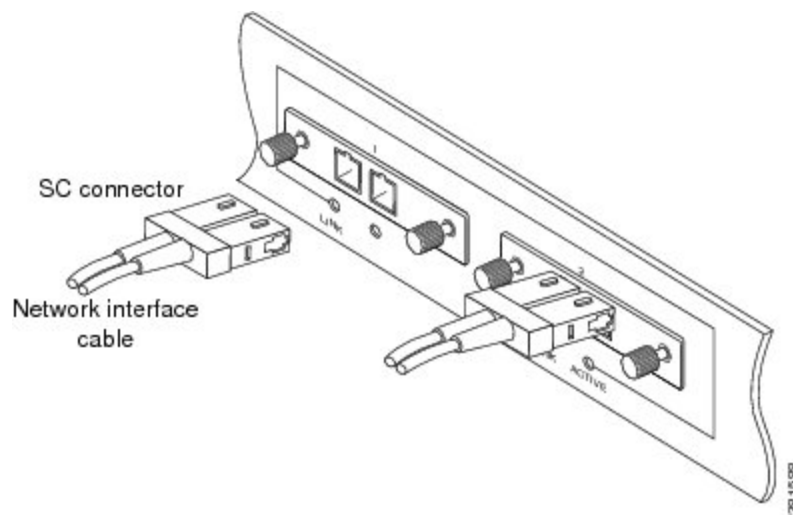
6. Gently tighten the two captive installation screws on the transceiver to secure the CFP transceiver in the socket (see the figure below).

**Figure 32: Securing a CFP Transceiver Module**

7. Reinstall the dust plug into the CFP transceiver's optical bore until you are ready to attach the network interface cable.

8. When you are ready to attach the network cable interface, remove the dust plugs and inspect and clean fiber connector end faces, and then immediately attach the network interface cable connectors into the CFP transceiver optical bores (see the figure below).

For complete information on inspecting and cleaning fiber-optic connections, see *Cleaning Fiber-Optic Connectors*.

**Figure 33: Cabling an Optical CFP Transceiver Module with SC Connectors**

## Removing a CFP Transceiver Module



### Caution

The CFP transceiver is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling the CFP transceivers or coming into contact with the modules.



### Warning

Class 1 laser product. Statement 1008



**Warning** Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

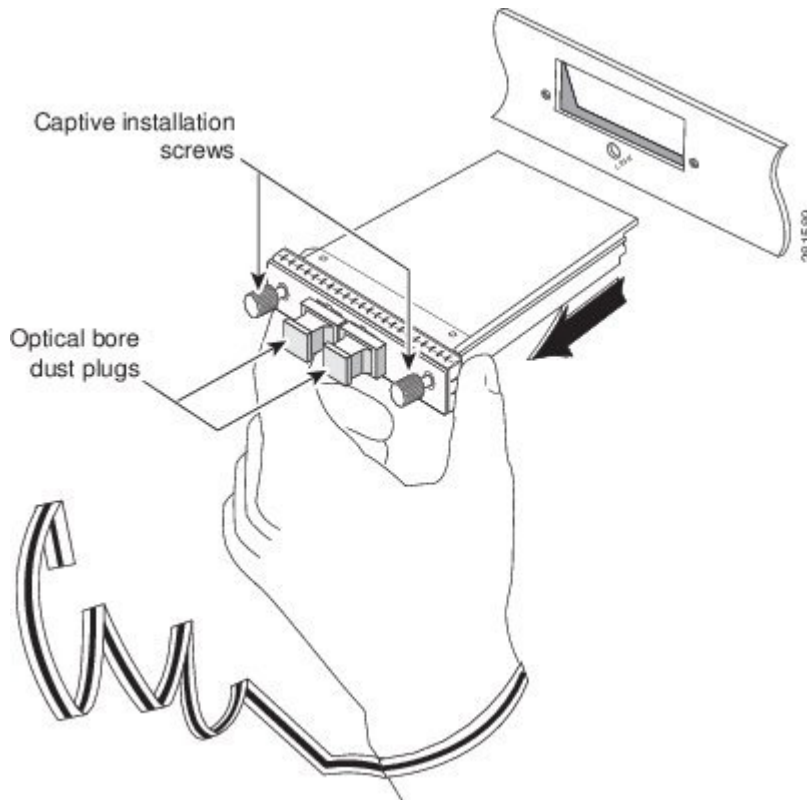


**Warning** Ultimate disposal of this product should be handled according to all national laws and regulations. Statement 1040

If you need to remove a CFP transceiver, follow these steps:

1. Disconnect the network fiber-optic cable from the CFP transceiver connectors. Immediately reinstall the dust plugs in the CFP transceiver optical bores.
2. Loosen the two captive installation screws that secure the CFP to the networking module.
3. Slide the CFP transceiver out of the module socket (see the figure below). Immediately place the CFP transceiver in antistatic protective packaging.

**Figure 34: Removing a CFP Transceiver Module**





# Install and Remove QSFP Transceiver Modules

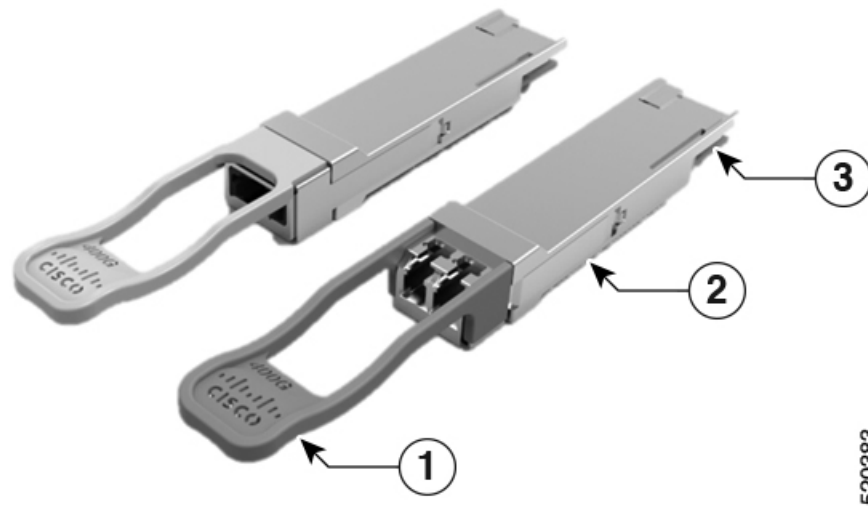


**Note** In this section, QSFP refers to QSFP+, QSFP28, and QSFP-DD. Refer to the [Cisco Optical Transceiver Handling Guide](#) for additional details on optical transceivers.

This section provides the installation, cabling, and removal instructions for the Quad Small Form-Factor Pluggable (QSFP) transceiver modules. The modules are hot-swappable input/output (I/O) devices that connect the system's module port electrical circuitry with either a copper or a fiber-optic network.

The following figure shows the 400-Gigabit QSFP-DD transceiver module.

**Figure 35: 400-Gigabit QSFP-DD Transceiver Module**



1	Pull-tab	2	QSFP-DD transceiver body
3	Electrical connection to the module circuitry		



**Warning** This icon is a hot surface warning. To avoid personal injury, do not touch without proper protection.



## Required Tools and Equipment

You need these tools to install the transceiver modules:

- Wrist strap or other personal grounding device to prevent ESD occurrences.

- Antistatic mat or antistatic foam to set the transceiver on.
- Fiber-optic end-face cleaning tools and inspection equipment.

For information on inspecting and cleaning fiber-optic connections, see [Cleaning Fiber-Optic Connectors](#), on page 66.

## Installing the QSFP Transceiver Module

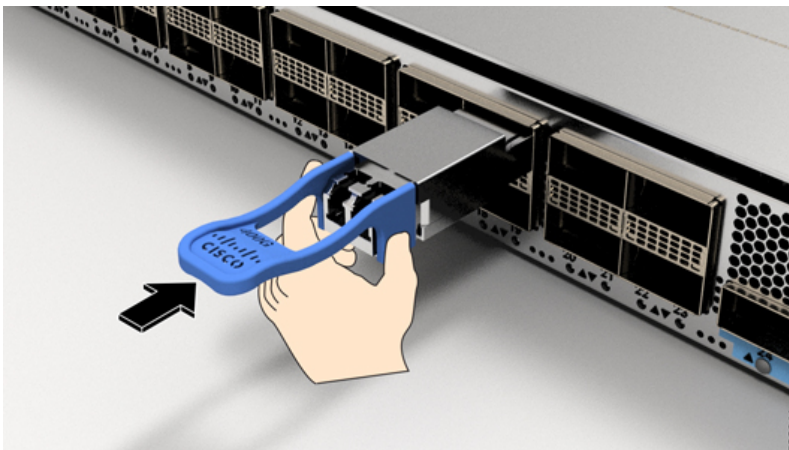


**Caution** The QSFP transceiver module is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling QSFP transceiver modules or coming into contact with system modules.

The QSFP transceiver module has a pull-tab latch. To install a QSFP transceiver module, follow these steps:

- Step 1** Attach an ESD wrist strap to yourself and a properly grounded point on the chassis or the rack.
- Step 2** Remove the transceiver module from its protective packaging.
- Step 3** Check the label on the transceiver module body to verify that you have the correct model for your network. Do not remove the dust plug until you're ready to attach the network interface cable. Dust plug is not shown in the images.
- Step 4** Hold the transceiver by the pull-tab so that the identifier label is on the top.
- Step 5** Align the transceiver module in front of the module's transceiver socket opening and carefully slide the transceiver into the socket until the transceiver makes contact with the socket electrical connector (see the figure below).

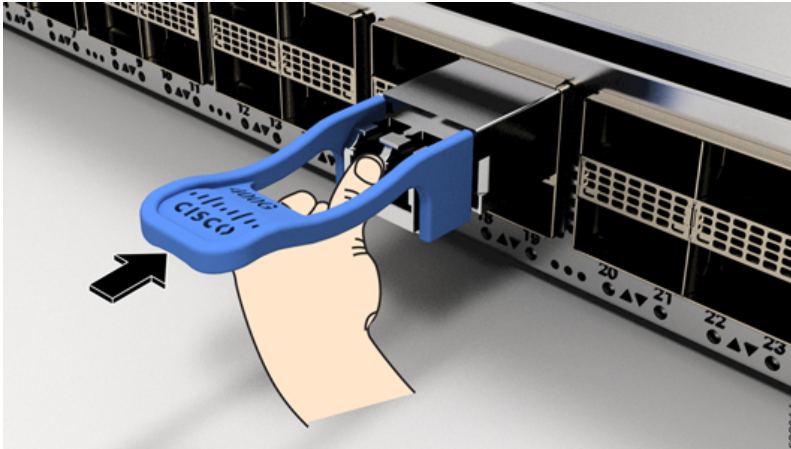
*Figure 36: Installing the QSFP Transceiver Module*



- Step 6** Press firmly on the front of the transceiver module with your thumb to fully seat the transceiver in the module's transceiver socket (see the below figure).

**Caution** If the latch is not fully engaged, you might accidentally disconnect the transceiver module.

Figure 37: Seating the QSFP Transceiver Module



## Attach the Optical Network Cable

### Before you begin

Before you remove the dust plugs and make any optical connections, follow these guidelines:

- Keep the protective dust plugs installed in the unplugged fiber-optic cable connectors and in the transceiver optical bores until you are ready to make a connection.
- Inspect and clean the MPO connector end faces just before you make any connections. For complete information on inspecting and cleaning fiber-optic connections, see the [Inspection and Cleaning Procedures for Fiber-Optic Connections](#) document.
- Grasp the MPO connector only by the housing to plug or unplug a fiber-optic cable.



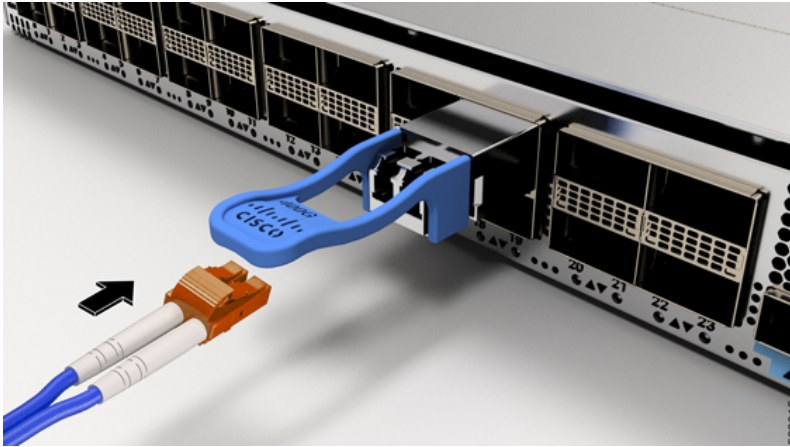
**Note** QSFP transceiver modules are keyed to prevent incorrect insertion.



**Note** The multiple-fiber push-on (MPO) connectors on the optical QSFP transceivers support network interface cables with either physical contact (PC) or ultra-physical contact (UPC) flat polished face types. The MPO connectors on the optical QSFP transceivers do not support network interface cables with an angle-polished contact (APC) face type.

- Step 1** Remove the dust plugs from the optical network interface cable MPO connectors. Save the dust plugs for future use.
- Step 2** Inspect and clean the MPO connector's fiber-optic end faces.
- Step 3** Remove the dust plugs from the transceiver module optical bores.
- Step 4** Immediately attach the network interface cable MPO connectors to the transceiver module (see the figure below).

Figure 38: Cabling a Transceiver Module



## Removing the QSFP Transceiver Module



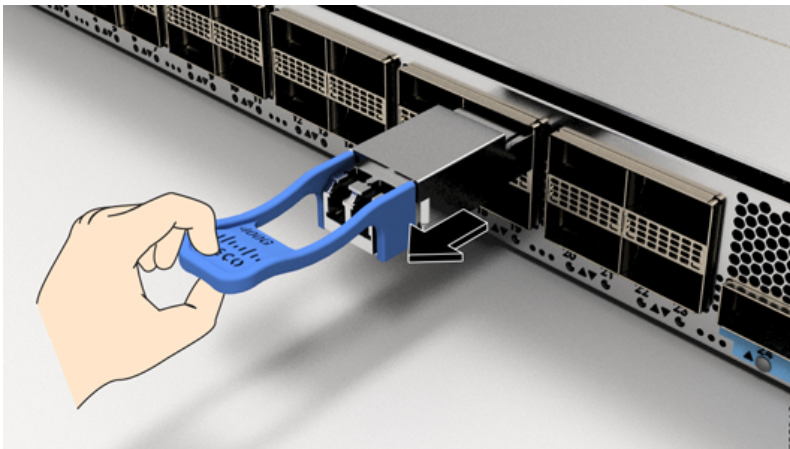
### Caution

The QSFP transceiver module is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling transceiver modules or coming into contact with modules.

To remove a QSFP transceiver module, follow these steps:

- Step 1** Disconnect the network interface cable from the transceiver connector.
- Step 2** Install the dust plug immediately into the transceiver's optical bore
- Step 3** Grasp the pull-tab and gently pull to release the transceiver from the socket.

Figure 39: Removing the QSFP Transceiver Module



- Step 4** Slide the transceiver out of the socket.

**Step 5** Place the transceiver module into an antistatic bag.

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## Installing and Removing CPAK Transceiver or Adapter Modules

This section provides the installation, cabling, and removal instructions for the CPAK pluggable optical transceiver modules.

### CPAK Module Overview

The Cisco CPAK transceiver module is a hot-swappable input/output device that plugs into a Cisco port on the 4-port and 8-port 100-Gigabit Ethernet line cards (See [4-Port 100-Gigabit Ethernet Line Card with CPAK](#) and [8-Port 100-Gigabit Ethernet Line Card with CPAK](#)). The modules have a total of 82 pins (40 pins on the top row and 42 on the bottom row) on the electrical interface and either a multifiber push-on (MPO) or duplex SC connector on the optical interface.

The following types of CPAK modules or adapters are supported:

- CPAK 100GBASE-SR10

Delivers 100-Gbps links over 24-fiber ribbon cables terminated with MPO/MTP connectors. It can also be used in 10 x 10-Gbps mode along with ribbon-to-duplex-fiber breakout cables for connectivity to ten 10GBASE-SR optical interfaces and has the option to breakout to 2X40G-Gbps interfaces. It supports link lengths of 100m and 150m on laser-optimized OM3 and OM4 multifiber cables. OTN rates are also supported.

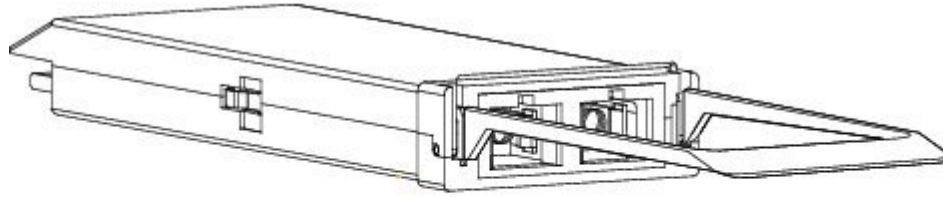
- CPAK 100GBASE-SR4

Supports link lengths of up to 70m (100m) over OM3 (OM4) Multimode Fiber with MPO-12 connectors. It primarily enables high-bandwidth 100G optical links over 12-fiber parallel fiber terminated with MPO-12 multifiber connectors. CPAK-100GE-SR4 supports 100GBase Ethernet rate. This module supports 100G LAN mode only; OTN modes and breakout are not supported.

- CPAK 100GBASE-LR4

Supports 100-Gbps optical links over standard single-mode fiber (SMF, G.652) terminated with SC connectors. Nominal power consumption is less than 5.5W.

The LR4 module is IEEE 802.3ba-compliant and supports link lengths of up to 10 km over standard SMF, G.652. It delivers an aggregate data signal of 100-Gbps, carried over four wavelength-division multiplexing (WDM) wavelengths operating at a nominal 25 Gbps per lane in LAN mode. OTU4 rate is also supported. Optical multiplexing and demultiplexing of the four wavelengths are managed within the module.

**Figure 40: Example of 100-Gigabit Ethernet CPAK Transceiver Module**

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- CPAK 10x10G-LR

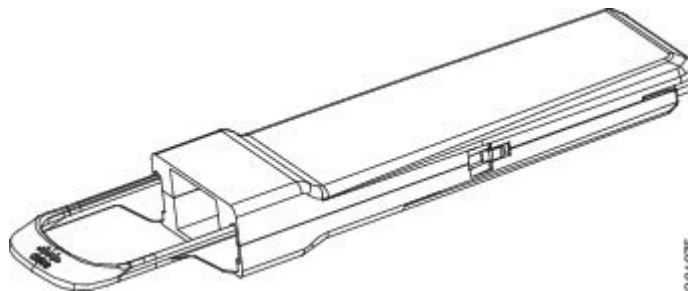
Used in 10 x 10-Gbps mode along with ribbon-to-duplex SMF breakout cables for connectivity to ten 10GBASE-LR optical interfaces. It supports link lengths up to 10km over standard SMF, G.652. The module delivers 10Gbps industry-standard links, and optionally 40 Gbps links for CPAK-to-CPAK applications.

- CPAK 100GBASE-PSM4

The Cisco CPAK-100G-PSM4 Module supports link lengths of up to 500 meters over Single-Mode Fiber (SMF) with MPO connectors. The 100 Gigabit Ethernet signal is carried over 12-fiber parallel fiber terminated with MPO multifiber connectors. This module supports 100G LAN mode only; OTN modes and breakout are not supported.

- CPAK adapter module

The CPAK adapter module is a hot-swappable pluggable adapter module that serves as a physical host for a 40GE QSFP+ transceiver module and enables a 40GE QSFP+ transceiver module to be connected to a CPAK port. From the QSFP+ transceiver module perspective, the CPAK adapter module is the host device. From the CPAK port perspective, the adapter module is a CPAK transceiver module. The CPAK adapter module is powered only if it has a QSFP+ transceiver plugged in. Hence, the router detects the CPAK adapter only when the adapter holds a QSFP transceiver module.

**Figure 41: CPAK Adapter Module**

36-4875

Apart from physical hosting the QSFP+ transceiver module, the CPAK adapter provides following functions:

- Provide inrush control, voltage regulation, and power filtering.
- Manage the CPAK and QSFP+ low-speed signals, and register map.
- Signal conditioning retimers.

- Terminate unused channels (channels 4 to 9).

For enabling the CPAK adapter and QSFP module, you need to configure the 1X40 breakout interface with the **hw-module location rack/slot/CPU0** command in global configuration mode. Example:

```
Router# configure terminal
Router(config)# hw-module location 0/1/CPU0 port 3 breakout 1xFortyGigE
Router(config)# commit
```




---

**Note** 2x40G Breakout mode is not supported.

---

The CPAK adapter module supports only the following 40GE QSFP+ transceiver modules:

- QSFP-40G-LR4
- QSFP-40GE-LR4
- QSFP-40G-ER

## CPAK Module Installation and Removal




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**Note** When you use the CPAK optical module with the CFP2 adapter, you must remove and insert both parts. Removing or inserting the CPAK optical module without having removed or inserted the CFP2 adapter results in the "not a valid part" error.

---

## Required Tools and Equipment

You need these tools to install the CPAK transceiver or adapter modules:

- Wrist strap or other personal grounding device to prevent ESD occurrences.
- Antistatic mat or antistatic foam to set the transceiver on.
- Fiber-optic end-face cleaning tools and inspection equipment.

For complete information on inspecting and cleaning fiber-optic connections, see [Cleaning Fiber-Optic Connectors, on page 66](#).

## Installing the CPAK Transceiver or Adapter Module




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**Caution** The CPAK transceiver or adapter module is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling CPAK modules or coming into contact with system modules.

---

To install a CPAK transceiver or adapter module, follow these steps:

1. Attach an ESD wrist strap to yourself and a properly grounded point on the chassis or the rack.

2. Remove the CPAK module from its protective packaging.
3. Check the label on the CPAK module to verify that you have the correct model for your network.
4. Remove the optical bore dust plug and set it aside.
5. Align the CPAK module in front of the module's socket opening and carefully slide the CPAK module into the socket until the module makes contact with the socket electrical connector.
6. Press firmly on the front of the CPAK module with your thumb to fully seat the module in the module's socket.




---

**Caution** If the latch is not fully engaged, you might accidentally disconnect the CPAK transceiver or adapter module.

---

Reinstall the dust plug into the CPAK transceiver or adapter module optical bore until you are ready to attach the network interface cable. Do not remove the dust plug until you are ready to attach the network interface cable.

## Attaching the Optical Network Cable

Before removing the dust plugs and making any optical connections, follow these guidelines:

- Keep the protective dust plugs installed in the unplugged fiber-optic cable connectors and in the transceiver optical bores until you are ready to make a connection.
- Inspect and clean the MPO connector end faces just before you make any connections. See the Tip following step 2 in the next procedure for a pointer to a fiber-optic inspection and cleaning white paper.
- Grasp the MPO connector only by the housing to plug or unplug a fiber-optic cable.




---

**Note** For the CPAK-100G-SR10 module, the multiple-fiber push-on (MPO) connectors use network interface cables with either physical contact (PC) or ultra-physical contact (UPC) flat polished face types. The CPAK-10X10G-LR module can only use network interface cables with the angle-polished contact (APC) face type (typical of single mode fiber MPO assemblies).

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**Note** Cisco also provides a fiber optic breakout panel. The breakout panel is an enclosure used to protect and manage fiber optic cables on the Cisco ASR 9000 Series Routers. For detailed instructions on installing and mounting the breakout panel, see the [http://www.cisco.com/c/en/us/td/docs/routers/ncs6000/breakout\\_panel/ncs\\_breakoutpanel.html](http://www.cisco.com/c/en/us/td/docs/routers/ncs6000/breakout_panel/ncs_breakoutpanel.html)

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1. Remove the dust plugs from the optical network interface cable MPO connectors. Save the dust plugs for future use.
2. Inspect and clean the MPO connector's fiber-optic end faces. To clean the connector, you can purchase an MPO connector cleaner, such as the US Conec 7104 IBC In-Bulhead Adapter Cleaner" from a third-party vendor.
3. Remove the dust plugs from the CPAK module optical bores.
4. Immediately attach the network interface cable MPO connectors to the CPAK module.



## Removing the CPAK transceiver or adapter module



**Caution** The CPAK transceiver or adapter module is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling CPAK transceiver or adapter modules or coming into contact with modules.



**Note** To connect the CPAK optical module in the A9K-MPA-1X200GE, A9K-MPA-2X100GE, and A9K-MPA-1X100GE modular port adapters (MPAs) that operate in the Cisco ASR 9000 Series 400G and 200G modular line cards, you must use the CVR-CFP2-CPAK adapter. During an OIR of the CPAK optical module from the system, you must remove the optics along with adapter. Removing the optical module and the adapter separately can result in alarms.

To remove a CPAK module, follow these steps:

1. Disconnect the network interface cable from the CPAK module connector.
2. Immediately install the dust plug into the module's optical bore.
3. Grasp the tab and gently pull straight out to release the module from the socket.
4. %Slide the module out of the socket. ;
5. Place the CPAK module into an antistatic bag.

## Line Card Cable Management

Cisco ASR 9000 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.

The cable-management system consists of the following separate components:

- A cable-management tray mounted on the Cisco ASR 9010 Router chassis. See the <http://www.cisco.com/c/en/us/td/docs/routers/asr9000/hardware/installation/guide/asr9kHIGbk.html> for more information.
- A cable-management bracket that attaches to a line card.
- Cable management brackets that attach to the sides of the router chassis (Cisco ASR 9006 Router only)



**Note** The illustrations in this section show one type of line card, but the line card cable-management procedures in this section are the same regardless of the specific line card.

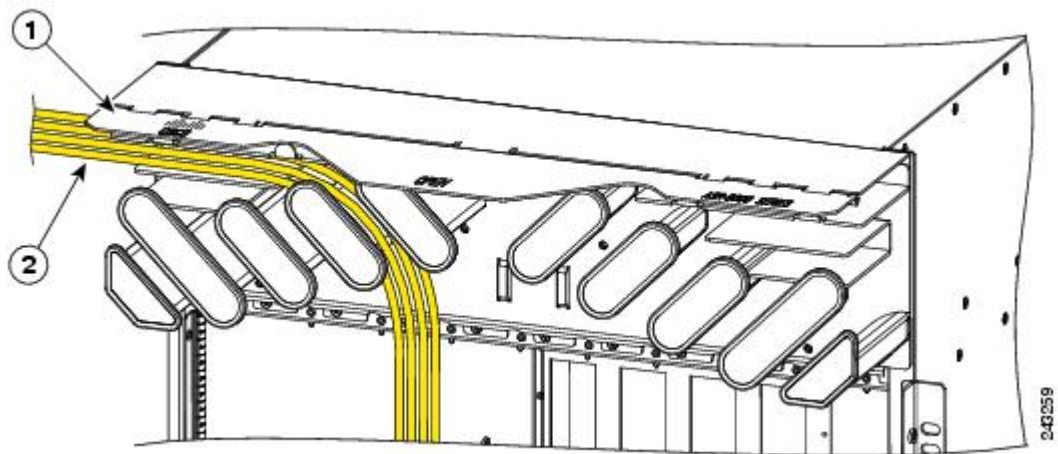


**Caution** Excessive bending of interface cables can damage the cables.

## Cable Management Tray

A cable-management tray is mounted at the top of the Cisco ASR 9010 Router chassis for routing interface cables to the RSP and line cards. The figure below shows a typical cable routing through the cable-management tray. The tray has a hinged cover that can be raised for greater access to the cable management dividers.

**Figure 42: Example Cable Routing through the Cisco ASR 9010 Router Cable Management Tray**



1	Hinged cover (shown in the raised position)	2	Cable bundle routed through the tray
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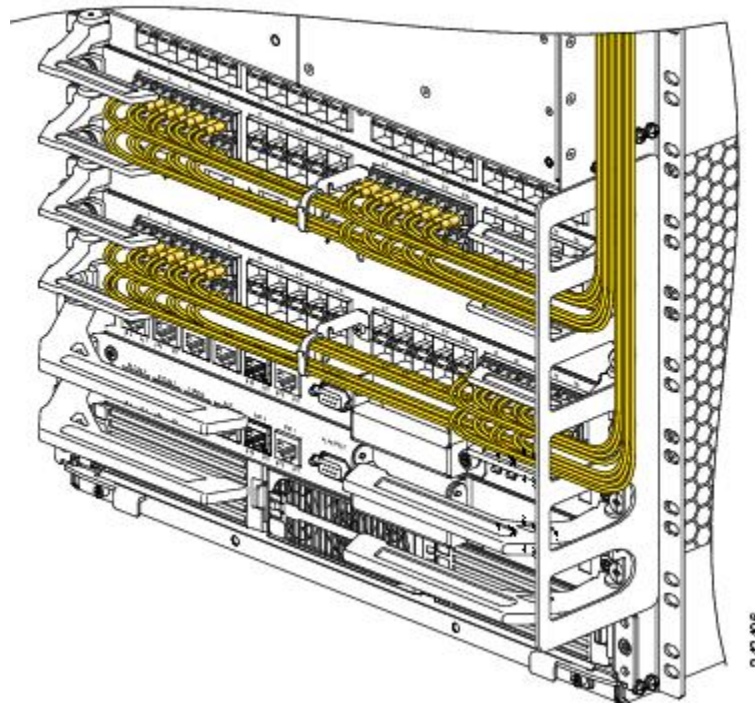
Each line card has its own cable routing slot in the cable management tray. For example, the cables shown in the figure above are cables being routed to line card 3 in slot 3 in a Cisco ASR 9010 Router.

## Router Cable Management Brackets

The Cisco ASR 9006 Router provides for a cable management bracket on each side of the router chassis. The following figure shows a typical cable routing for the Cisco ASR 9006 Router.

Each line card has its own cable routing slot in the Cisco ASR 9006 Router cable management brackets. For example, the cables shown in the following figure show the cables being routed to line card 0 in slot 3 and line card 2 in slot 5.

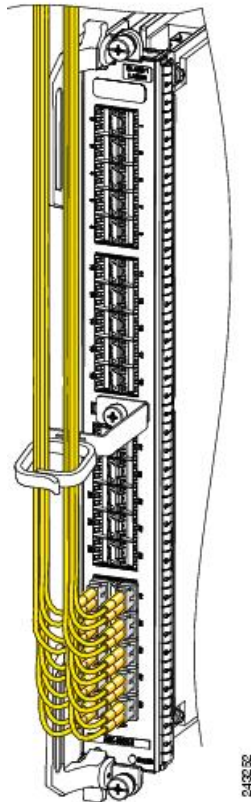
Figure 43: Example Cable Routing through Cisco ASR 9006 Router Cable Management Brackets



## Line Card Cable Management Bracket

This section describes the line card cable-management bracket. The following figure shows the line card cable-management bracket attached to a 40-Port Gigabit Ethernet line card.

Figure 44: 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.



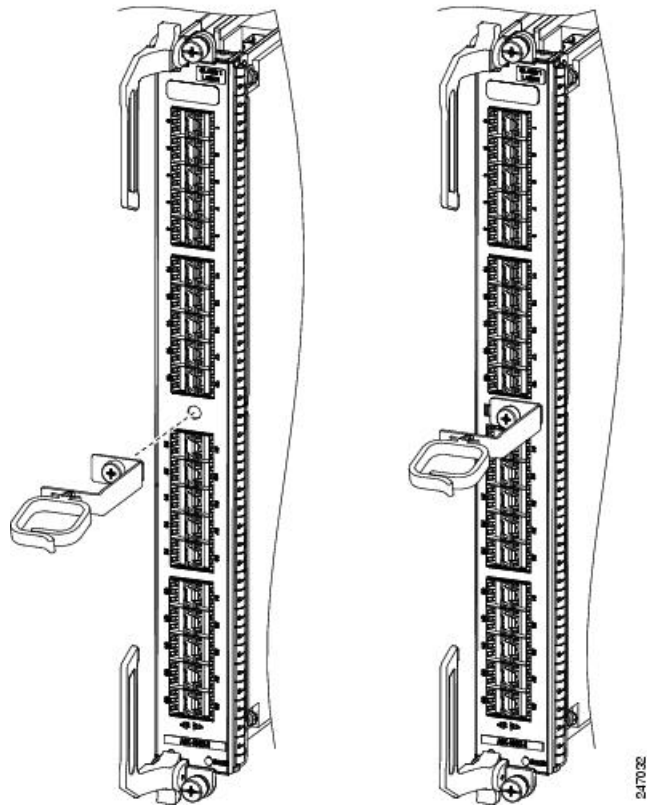
**Caution** Do not use the cable-management bracket as a handle to pull out or push in the line card. The cable-management bracket is designed to hold the interface cables and may break if you use the bracket to push, pull, or carry the line card after it is removed from the router.

## Installing a Line Card Cable Management Bracket

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

1. Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
2. Position the cable-management bracket over the front of the line card front panel.
3. Insert and tighten the captive screw(s) to secure the bracket (see the above figure).
4. Starting with the port on the line card closest to the bracket, connect each interface cable to the intended port (see [Figure 44: Cable-Management Bracket, on page 60](#)).

Figure 45: Cable-Management Bracket Installation and Removal



## Removing a Line Card Cable-Management Bracket

To remove a line card cable-management bracket, follow these steps (see [Installing a Line Card Cable Management Bracket, on page 60](#)):

1. Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
2. Note the current interface cable connections to the ports on each line card.
3. Starting with the interface cable for the bottom port on the line card, disconnect the cable from the line card interface.
4. Repeat Step 3 for all remaining interface cables, proceeding from the bottom ports upward, then proceed to Step 5.
5. Loosen the captive installation screw on the cable-management bracket and remove the bracket from the line card ([Figure 45: Cable-Management Bracket Installation and Removal, on page 61](#)).

For information on connecting and disconnecting interface cables, see *Installing and Removing Fibre-Optic Interface Cables..*

# Cables and Connectors

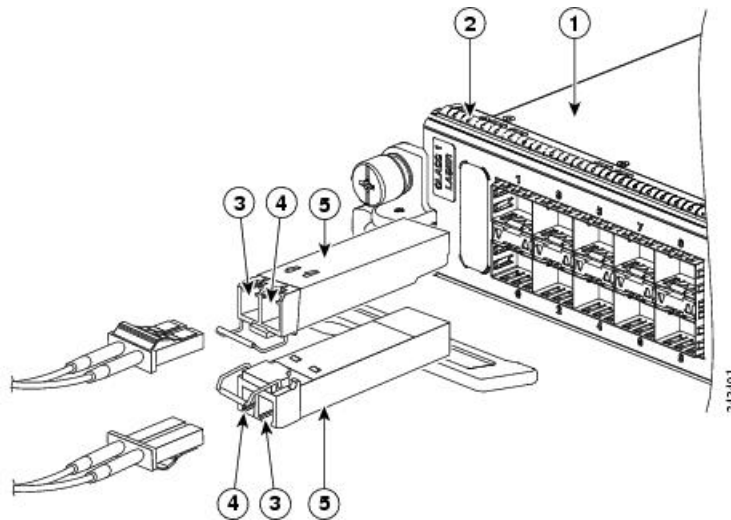
## Gigabit Ethernet Interfaces

### Gigabit Ethernet SFP Modules

The 40-Port Gigabit Ethernet (GE) line card and the Gigabit Ethernet ports of the 2-Port 10 GE + 20-Port GE combination line card use SFP modules. The Gigabit Ethernet laser optical transceiver module is a field-replaceable small form-factor pluggable (SFP) module that plugs into the receptacle (or cage) located on the line card and provides the Gigabit Ethernet optical interface (see the figure below). The module has two optical interfaces—laser transmit (TX) and laser receive (RX)—and an electrical interface (to the line card).

The SFP+ modules used on the 16-Port 10GE oversubscribed line card are enhanced SFP modules.

**Figure 46: SFP Module and Fiber-Optic Cable**



1	Component side of line card	4	Receive (RX)
2	EMI gasket	5	Top surface of SFP module
3	Transmit (TX)		

The SFP modules have LC connectors. The only restriction is that each port must match the specifications on the other end of the cable (short or long wavelength), and must not exceed the recommended cable length for reliable communication.

Fiber-optic transmission specifications identify two types of fiber: single-mode (SMF) and multimode (MMF). The maximum distance for single-mode installations is determined by the amount of light loss in the fiber path. If your environment requires the light to travel close to the typical maximum distance, you should use an optical time domain reflectometer (OTDR) to measure the power loss.

**Caution**

Use only the SFP and SFP+ modules supplied by Cisco Systems, Inc. with your Ethernet line card. Each module contains an internal serial EEPROM that is security-programmed by the module manufacturer with information that provides a way for the Cisco IOS XR software to identify and validate the module as qualified to operate properly with Cisco Ethernet line cards. Unapproved SFP or SFP+ modules (those not purchased directly from Cisco Systems, Inc.) do not work on Ethernet line cards. To verify the version of the installed module, see [Verifying the Transceiver Modules](#).

## 10-Gigabit Ethernet XFP Modules

The 8-Port 10-Gigabit Ethernet (GE) 2:1 oversubscribed line card, 4-Port 10GE line card, and 8-Port 10GE 80 Gbps line rate card use single-mode fiber-optic cables. The maximum distance for single-mode installations is determined by the amount of light loss in the fiber path. If your environment requires the light to travel close to the typical maximum distance, you should use an OTDR to measure the power loss.

## Fiber-Optic Interface Cables

Depending on the line card (see [Ethernet Line Card Comparison](#)), use a single-mode or multimode fiber-optic interface cable with LC-type connectors to connect an Ethernet interface on the line card in your Cisco ASR 9000 Series Router to another Ethernet interface, router, or switch.

**Note**

Fiber optic cables are not available from Cisco Systems. They can be purchased from cable vendors.

The following types of cables are used with line cards to connect your router to another router or switch:

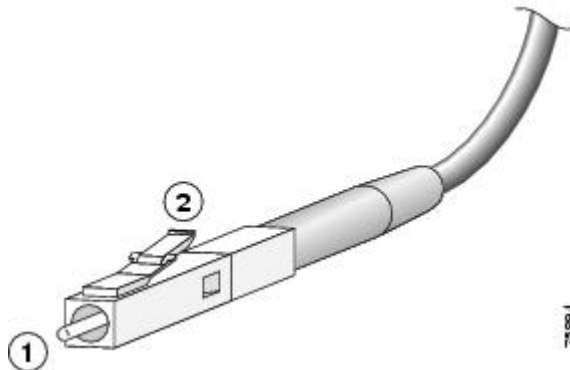
- Single-mode—Generally yellow in color.
- Multimode—Generally gray or orange in color. Multimode cables are multifiber cables that carry 12 channels of fiber data.
- Lucent connector (LC)—See figure below *Simplex LC Cable Connector* and *Duplex LC Cable Connector*.

You can use two cables with simplex connectors, or one cable with dual, keyed connectors.

**Warning**

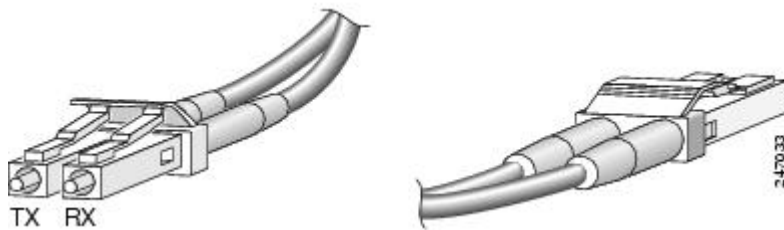
Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

Figure 47: Simplex LC Cable Connector



1	LC connector	2	Spring-action disconnect latch
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Figure 48: Duplex LC Cable Connector



**Note** Connectors on the fiber-optic cables must be free of dust, oil, or other contaminants. Before connecting the cable to the line card, carefully clean the fiber-optic connectors using an alcohol wipe or other suitable cleanser. See [Cleaning Fiber-Optic Connectors](#), on page 66 for more information. The connector on the cable might be supplied with a dust cover. If it is, remove the dust cover before trying to connect the cable to the line card port.

## Installing and Removing Fiber-Optic Interface Cables

This section contains information on installing and removing fiber-optic interface cables to connect your router to another router or switch.



**Note** Although the line cards differ, the process of installing and removing interface cables is basically the same for each card. Therefore, separate procedures and illustrations are not included in this publication.

### Installing Fiber-Optic Interface Cables

To install fiber-optic cables, you can use two LC connectors ([Figure 47: Simplex LC Cable Connector](#), on page 64) or one duplex LC connector ([Figure 48: Duplex LC Cable Connector](#), on page 64).





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**Note** Optical fiber cables are available from cable vendors. These cables are not available from Cisco.

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**Warning** Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

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**Warning** Class 1 Laser Product. Statement 1008

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**Warning** Class 1 LED Product. Statement 1027

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**Note** Connectors on the fiber-optic cables must be free of dust, oil, or other contaminants. Before connecting the cable to the line card, carefully clean the fiber-optic connectors using an alcohol wipe or other suitable cleanser. See [Cleaning Fiber-Optic Connectors, on page 66](#) for more information.

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To install a cable, follow these steps:

1. Remove the connector dust cover if one is present.
2. Align the connector end of the cable to the appropriate port. Observe the RX and TX cable relationship on the cables.
3. Attach fiber cable between the port in the line card and the device to which the line card is connected.
4. Insert the fiber cable connector until it clicks and locks into place.
5. Repeat these steps until all cabling is complete.



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**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.

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## Removing Fiber-Optic Interface Cables

To remove line card interface cables, follow these steps:

1. Attach an ESD-preventive wrist or ankle strap to your wrist and follow its instructions for use.
2. Press on the spring-action disconnect latch to disconnect the interface cable connectors from the line card interface ports.




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**Warning** Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

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**Note** It is not necessary to remove the interface cables from the line card cable management bracket.

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3. Insert a dust plug into the optical port openings of each port that is not being used.
4. Use a screwdriver to loosen the captive installation screw of the line card cable management bracket.
5. Detach the line card cable management bracket and optical fiber cable bundle from the line card and place it carefully out of the way.

## Cleaning Fiber-Optic Connectors

Fiber-optic connectors are used to connect two fibers together. When these connectors are used in a communication system, proper connection becomes a critical factor. They can be damaged by improper cleaning and connection procedures. Dirty or damaged fiber-optic connectors can result in communication that is inaccurate or not repeatable.

Fiber-optic connectors differ from electrical or microwave connectors. In a fiber-optic system, light is transmitted through an extremely small fiber core. Because fiber cores are often 62.5 microns or less in diameter, and dust particles range from a tenth of a micron to several microns in diameter, dust and any other contamination at the end of the fiber core can degrade the performance of the connector interface where the two cores meet. Therefore, the connector must be precisely aligned and the connector interface must be absolutely free of foreign material.

Connector loss, or insertion loss, is a critical performance characteristic of a fiber-optic connector. Return loss is also an important factor. Return loss specifies the amount of reflected light: the lower the reflection, the better the connection. The best physical contact connectors have return losses of better than  $-40$  dB, but  $-20$  to  $-30$  dB is more common.

The connection quality depends on two factors: the type of connector and the proper cleaning and connection techniques. Dirty fiber connectors are a common source of light loss. Keep the connectors clean at all times, and keep the dust plugs or covers installed when the connectors are not in use.

Before installing any type of cable or connector, use a lint-free alcohol pad from a cleaning kit to clean the ferrule, the protective tube or cone that surrounds the fiber core, and the end-face surface of the fiber core.

As a general rule, any time you detect a significant, unexplained loss of light, clean the connectors. To clean the optical connectors, use a CLETOP fiber optic cleaning cassette and follow the manufacturer's usage instructions.

If a CLETOP cleaning cassette is not available, follow these steps:




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**Warning** Because invisible laser radiation may 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. Statement 70

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1. Use a lint-free tissue soaked in 99 percent pure isopropyl alcohol and gently wipe the end-face of the fiber core. Wait for five seconds for the surfaces to dry and wipe the surfaces a second time.

2. Use clean, dry, oil-free compressed air to remove any residual dust from the connector.
3. Use a magnifying glass or inspection microscope to inspect the ferrule at angle. Do not look directly into the aperture. If you detect any contamination, repeat the Step 1 and Step 2 indicated above.

For more information about cleaning fiber-optic connectors, as well as SFP/XFP transceivers, see [Inspection and Cleaning Procedures for Fiber-Optic Connections](#).

## Type RJ-45 10/100/1000BASE-T Copper Cables

For an Ethernet line card equipped with copper SFP transceivers, use an EIA/TIA–568-compliant cable with MDI wiring and RJ-45 connectors (see the below figure) to connect your Cisco ASR 9000 Series Router to another router or switch.

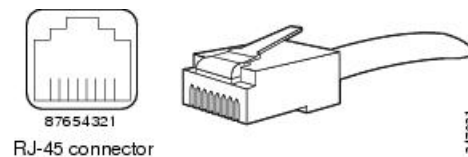


**Note** EIA/TIA–568-compliant cable with MDI wiring and RJ-45 connectors are available from a wide variety of sources. These cables are not available from Cisco Systems, Inc.



**Note** To comply with the intrabuilding lightning surge requirements of Telecordia GR-1089-CORE, Issue II, Revision 01, February 1999, you must use a shielded cable when connecting to copper SFP transceiver ports. The shielded cable is terminated by shielded connectors on both ends, with the cable shield material tied to both connectors.

**Figure 49: RJ-45 Cable Connector**



## Removing and Installing RJ-45 10/100/1000BASE-T Copper Cables

This section contains information on removing and installing RJ-45 copper cables to connect your router to another router or switch.

### Installing RJ-45 Cables

Insert the RJ-45 connector into an open port until the connector clicks and locks into place. Attach one cable between each line card interface and the device to which the line card is connected.

### Removing RJ-45 Cables

To remove line card cables, follow these steps:

1. Attach an ESD-preventive wrist or ankle strap to your wrist and follow its instructions for use.
2. Disconnect the interface cable connectors from the line card interface ports.



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**Note** It is not necessary to remove the interface cables from the line card cable-management bracket.

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3. Use a screwdriver to loosen the captive installation screw of the line card cable management bracket.
4. Detach the line card cable management bracket and optical fiber cable bundle from the line card and place it carefully out of the way.