



# Packet-Over-SONET Line Card Installation

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This hardware installation note contains instructions for installing and troubleshooting Packet-over-SONET (POS) line cards on supported Cisco XR 12000 Series Routers.

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## Important Information

This section contains important information about the following:

- [POS Line Card Product Numbers, page 2](#)
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## POS Line Card Product Numbers

[Table 1](#) lists the Cisco product numbers to which this publication applies. This guide replaces the individual POS line card installation and configuration documents for the Cisco XR 12000 Series Router.

**Table 1** *POS Line Card Product Numbers*

POS Line Card	Cisco Product Number
OC-3c/STM-1c ISE	4OC3X/POS-IR-LC-B= 4OC3X/POS-MM-MJ-B= 4OC3X/POS-LR-LC-B= 8OC3X/POS-IR-LC-B= 8OC3X/POS-MM-MJ-B= 16OC3X/POS-I-LC-B= 16OC3X/POS-M-MJ-B=
4-Port OC-12c/STM-4c ISE	4OC12X/POS-I-SC-B= 4OC12X/POS-M-SC-B=
OC-48c/STM-16c ISE	OC48X/POS-IR-SC= OC48X/POS-LR-SC= OC48X/POS-SR-SC=

## Router Hardware Installation

For hardware installation and configuration information for Cisco XR 12000 Series Routers, refer to the installation and configuration guide for your router. The guide includes information on the router switch fabric and how it affects operation of the line card, as well as line card slot locations, slot width, and other requirements.

Also refer to the field-replaceable unit (FRU) publications that describe how to install, maintain, and replace router subsystems, such as cooling fans, power supplies, chassis backplanes, and so on.

## Supported Platforms

[Table 2](#) lists the supported router platforms for POS line cards.

**Table 2** *POS Line Card Supported Router Platforms*

POS Line Card	Supported Platforms
OC-3c/STM-1c ISE	All Cisco XR 12000 Series Routers
4-Port OC-12c/STM-4c ISE	All Cisco XR 12000 Series Routers
OC-48c/STM-16c ISE	All Cisco XR 12000 Series Routers

**Note**

POS line cards with Engine type 0, 1, 2, 4, 4<sup>+</sup>, 6, and 6<sup>+</sup> are not supported on Cisco XR 12000 Series Routers. Engine 3 line card families will operate in a router with one CSC and three SFCs.

See [Table 13 on page 33](#) for information on the engine of each line card. See the appropriate Cisco XR 12000 Series Router installation and configuration guide for information about the switch fabric and other related requirements.

## Memory Options

POS line card memory options vary by line card. See [“Line Card Memory” section on page 33](#) for more information.

## Related Documentation

This publication describes the basic installation and initial configuration of a POS line card. For complete configuration information, refer to the following publications:

- *Cisco IOS XR Interface and Hardware Component Configuration Guide, Release 3.2*
- *Cisco IOS XR Interface and Hardware Component Command Reference, Release 3.2*
- *Cisco IOS XR Release 3.2 Release Notes for Cisco XR 12000 Series Routers*
- *Regulatory Compliance and Safety Information for Cisco XR 12000 Series Routers*

See the [“Obtaining Documentation and Submitting a Service Request” section on page 50](#) for information on how to obtain these publications.

## Product Overviews

The following sections provide information about the POS line card products:

- [POS Line Card Comparison, page 4](#)
- [OC-3c/STM-1c ISE POS Line Card, page 5](#)
- [4-Port OC-12c/STM-4c ISE POS Line Card, page 7](#)
- [OC-48c/STM-16c ISE POS Line Card, page 8](#)

## POS Line Card Comparison

Table 3 provides comparative information about POS line cards.

**Table 3** *POS Line Card Hardware Comparison*

POS Line Card	Line Card Part Number	Ports	SFP	Cable and Connector	Wavelength and Optics	Memory (Default Route, Packet)
<b>Optical Carrier 3 (OC-3) Speed</b>						
OC-3c/STM-1c ISE POS Line Card	4OC3X/POS-IR-LC-B=	4		Single-mode fiber with Lucent connectors (LCs)	1310 nm IR	Engine 3 256 MB, 512 MB
	4OC3X/POS-MM-MJ-B=	4		Multimode fiber with mechanical transfer registered jack (MTRJ) connectors	1310 nm short-reach (SR)	Engine 3 256 MB, 512 MB
	4OC3X/POS-LR-LC-B=	4		Single-mode fiber with LC connectors	1310 nm LR	Engine 3 256 MB, 512 MB
	8OC3X/POS-IR-LC-B=	8		Single-mode fiber with LC connectors	1310 nm IR	Engine 3 256 MB, 512 MB
	8OC3X/POS-MM-MJ-B=	8		Multimode fiber with MTRJ connectors	1310 nm SR	Engine 3 256 MB, 512 MB
	16OC3X/POS-I-LC-B=	16		Single-mode fiber with LC connectors	1310 nm IR	Engine 3 256 MB, 512 MB
	16OC3X/POS-M-MJ-B=	16		Multimode fiber with MTRJ connectors	1310 nm SR	Engine 3 256 MB, 512 MB
<b>OC-12 Speed</b>						
4-Port OC-12c/STM-4c ISE POS Line Card	4OC12X/POS-I-SC-B=	4		Single-mode fiber with SC connectors	1310 nm IR	Engine 3 256 MB, 512 MB
	4OC12X/POS-M-SC-B=	4		Multimode fiber with SC connectors	1310 nm	Engine 3 256 MB, 512 MB
<b>OC-48 Speed</b>						
OC-48c/STM-16c ISE POS Line Card	OC48X/POS-SR-SC=	1		Single-mode fiber with SC connectors	1310 nm SR	Engine 3 256 MB, 512 MB
	OC48X/POS-IR-SC	1		Single-mode fiber with SC connectors	1550 nm IR	Engine 3 256 MB, 512 MB
	OC48X/POS-LR-SC=	1		Single-mode fiber with SC connectors	1550 nm LR2	Engine 3 256 MB, 512 MB

## OC-3c/STM-1c ISE POS Line Card


**Note**

Unless otherwise specified, throughout this publication the 4-port, 8-port and 16-port OC-3c/STM-1c ISE POS line cards are all referred to as the OC-3c/STM-1c ISE POS line card.

These line cards provide Cisco XR 12000 Series Routers with 155 Mbps of bandwidth for each interface and are concatenated, which provides for increased efficiency by eliminating the need to partition the bandwidth. [Table 4](#) lists the different versions of the OC-3c/STM-1c ISE POS line card that are available.

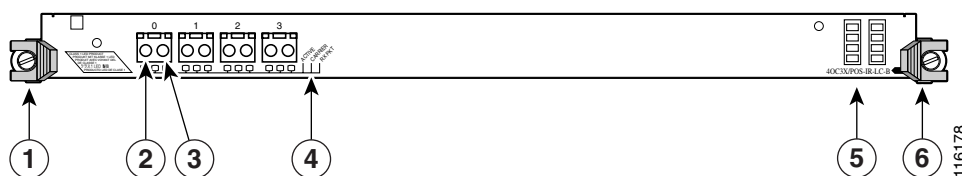
**Table 4** OC-3c/STM-1c ISE POS Line Card Versions

Line Card	Product Code	Ports	Reach <sup>1</sup>	Optic Type	Connector Type
4-Port OC-3c/STM-1c ISE	4OC3X/POS-IR-LC-B=	4	IR	Single-mode	LC
	4OC3X/POS-MM-MJ-B=	4	SR	Multimode	MTRJ
	4OC3X/POS-LR-LC-B=	4	LR	Single-mode	LC
8-Port OC-3c/STM-1c ISE	8OC3X/POS-IR-LC-B=	8	IR	Single-mode	LC
	8OC3X/POS-MM-MJ-B=	8	SR	Multimode	MTRJ
16-Port OC-3c/STM-1c ISE	16OC3X/POS-I-LC-B=	16	IR	Single-mode	LC
	16OC3X/POS-M-MJ-B=	16	SR	Multi-mode	MTRJ

1. Intermediate-reach (IR), short-reach (SR), long-reach (LR)

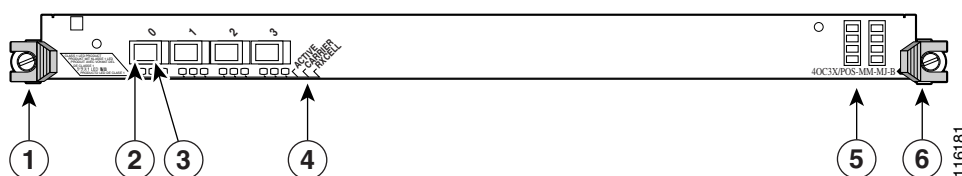
[Figure 1](#) and [Figure 2](#) show the 4-port versions of the line card.

**Figure 1** 4-Port OC-3c/STM-1c ISE POS Line Card, LC Version



<b>1</b>	Ejector lever	<b>4</b>	Status LEDs
<b>2</b>	TX port	<b>5</b>	Alphanumeric LEDs
<b>3</b>	RX port	<b>6</b>	Ejector lever

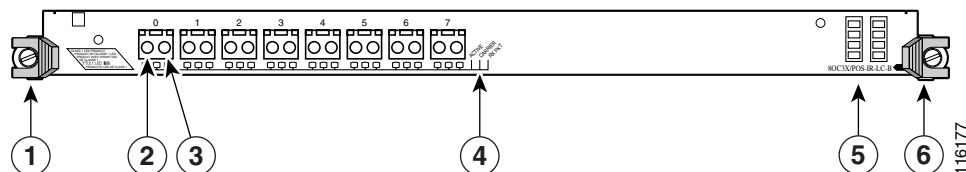
**Figure 2** 4-Port OC-3c/STM-1c ISE POS Line Card, MTRJ Version



1	Ejector lever	4	Status LEDs
2	TX port	5	Alphanumeric LEDs
3	RX port	6	Ejector lever

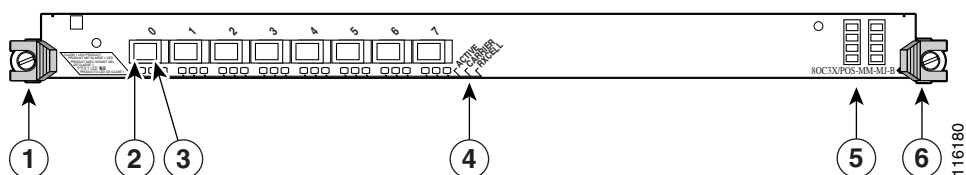
Figure 3 and Figure 4 show the 8-port versions of the line card.

**Figure 3** 8-Port OC-3c/STM-1c ISE POS Line Card, LC Version



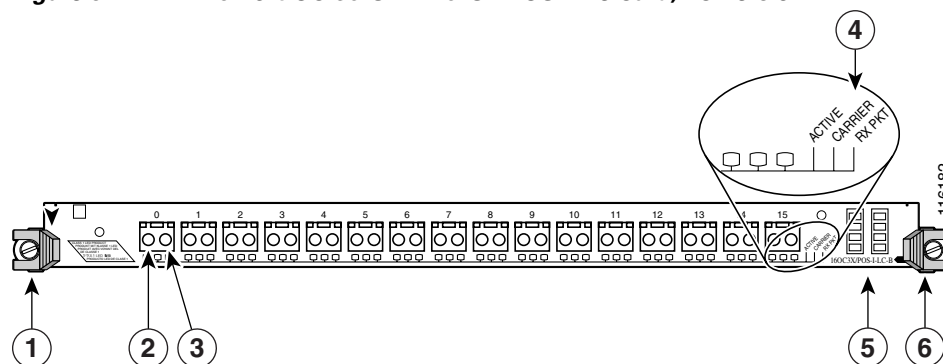
1	Ejector lever	4	Status LEDs
2	TX port	5	Alphanumeric LEDs
3	RX port	6	Ejector lever

**Figure 4** 8-Port OC-3c/STM-1c ISE POS Line Card, MTRJ Version

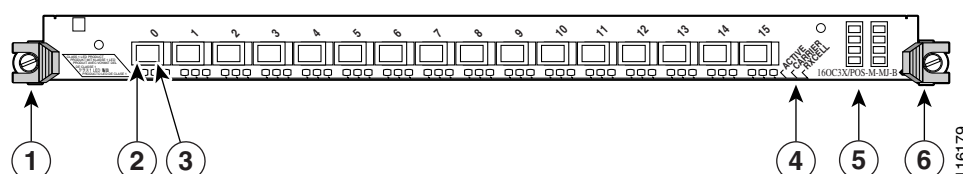


1	Ejector lever	4	Status LEDs
2	TX port	5	Alphanumeric LEDs
3	RX port	6	Ejector lever

Figure 5 and Figure 6 show the 16-port versions of the line card.

**Figure 5** 16-Port OC-3c/STM-1c ISE POS Line Card, LC Version

1	Ejector lever	4	Status LEDs
2	TX port	5	Alphanumeric LEDs
3	RX port	6	Ejector lever

**Figure 6** 16-Port OC-3c/STM-1c ISE POS Line Card, MTRJ Version

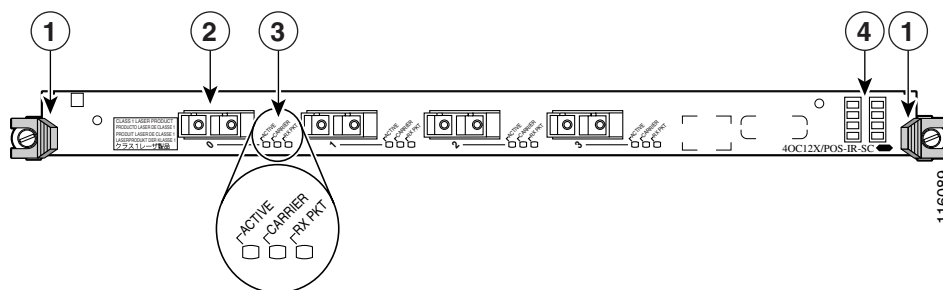
1	Ejector lever	4	Status LEDs
2	TX port	5	Alphanumeric LEDs
3	RX port	6	Ejector lever

The OC-3c/STM-1c ISE POS line card ships with 512 MB of packet memory, which is not field serviceable. Additionally, the line card route processor memory has a default configuration of 256 MB and can be upgraded to 512 MB. See the [“Line Card Memory”](#) section on page 33 for more information.

## 4-Port OC-12c/STM-4c ISE POS Line Card

The 4-port OC-12c/STM-4c ISE POS line card provides the Cisco XR 12000 Series Routers with four 622-Mbps concatenated POS interfaces on a single card and provides four OC-12c/STM-4c full-duplex single-mode intermediate-reach interfaces or multimode short-reach interfaces.

[Figure 7](#) shows a front view of the 4-port OC-12c/STM-4c ISE POS line card.

**Figure 7 4-Port OC-12c/STM-4c ISE POS Line Card Front Panel**

1	Ejector lever	3	Status LEDs
2	Port 0	4	Alphanumeric LEDs

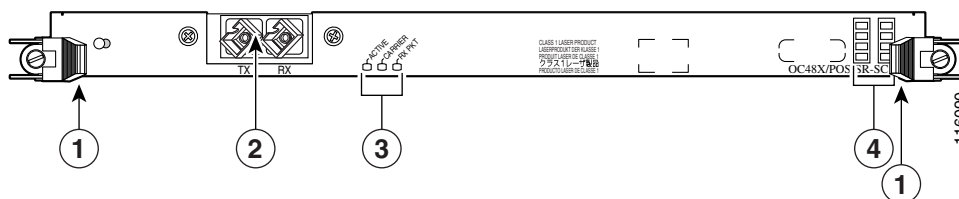
For SONET fiber-optic connections, use one duplex SC-type connector or two simplex SC-type connectors.

The 4-port OC-12c/STM-4c ISE POS line card route memory default is 256 MB and is upgradeable to 512 MB. It has 512 MB of packet memory. See the [“Line Card Memory”](#) section on page 33 for more information.

## OC-48c/STM-16c ISE POS Line Card

The OC-48c/STM-16c ISE POS line card provides the Cisco XR 12000 Series Router with a single 2.5-Gbps POS interface on a single card and an OC-48/STM-16 full duplex single-mode interface. There is a short-reach and a long-reach version of the line card.

[Figure 8](#) shows a front view of the OC-48c/STM-16c ISE POS line card.

**Figure 8 OC-48c/STM-16c ISE POS Line Card Front Panel and Backplane Connector**

1	Ejector lever	3	Status LEDs
2	Port 0	4	Alphanumeric LEDs

The line card route memory default is 256 MB and is upgradeable to 512 MB. It has 512 MB of packet memory. See the [“Line Card Memory”](#) section on page 33 for more information.



# Preparing for Installation

The following sections provide information about preparing to install line cards:

- [Safety Guidelines, page 9](#)
- [Preventing Electrostatic Discharge, page 9](#)
- [Required Tools and Equipment, page 10](#)

## Safety Guidelines

Before you perform any procedure in this publication, review the safety guidelines in this section to avoid injuring yourself or damaging the equipment.

The following guidelines are for your safety and to protect equipment. The guidelines do not include all hazards. Be alert.



### Note

Review the safety warnings listed in the *Regulatory Compliance and Safety Information for Cisco 12000 Series Internet Router* publication (Document Number 78-4347-xx) that accompanied your router before installing, configuring, or maintaining a line card.

- 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.

Before working with laser optics, see the [“Laser Safety” section on page 49](#).

## 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. We recommend 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.
- Handle POS line cards by the captive installation screws, the provided handle, ejector levers, or the line card metal carrier only; avoid touching the board or connector pins.
- Place removed POS line cards board-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 POS line cards and clothing. The wrist strap protects the board from ESD voltages on the body only; ESD voltages on clothing can still cause damage.



**Warning**

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

## Required Tools and Equipment

You need the following tools and parts to remove and install POS line cards:

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

## Any SFP modules or memory you need to install that are not already installed



**Note**

If you need additional equipment, see [Cisco.com](http://Cisco.com) or your service representative for ordering information.

Refer to the individual line card descriptions in the “[Product Overviews](#)” section on [page 3](#) for more information. [Table 3 on page 4](#) summarizes the hardware requirements for each POS line card.

See the “[Line Card Interface Cables](#)” section on [page 22](#) for information on required interface cables.

## Removing and Installing a Line Card

The following sections provide procedures for removing or installing a line card:

- [Guidelines for Line Card Removal and Installation, page 11](#)
- [Removing a Line Card, page 11](#)
- [Installing a Line Card, page 13](#)



**Note**

See the “[Guidelines for Line Card Removal and Installation](#)” section on [page 11](#) before removing a line card while power to the router is on.



**Note**

The procedures in the following sections use illustrations of a Cisco 12012 Router to support the descriptions of removing and installing line cards. Although the card cages of the Cisco 12000 Series Routers differ in the number of card slots, the designated use of slots and the process of removing and installing a line card are basically the same. Therefore, separate procedures and illustrations for other Cisco routers are not included in this publication.

## Guidelines for Line Card Removal and Installation

Guidelines for line card removal and installation include the following:

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



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

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



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

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

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



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

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

For line card configuration information, see the *IOS XR Software Configuration Guide*.

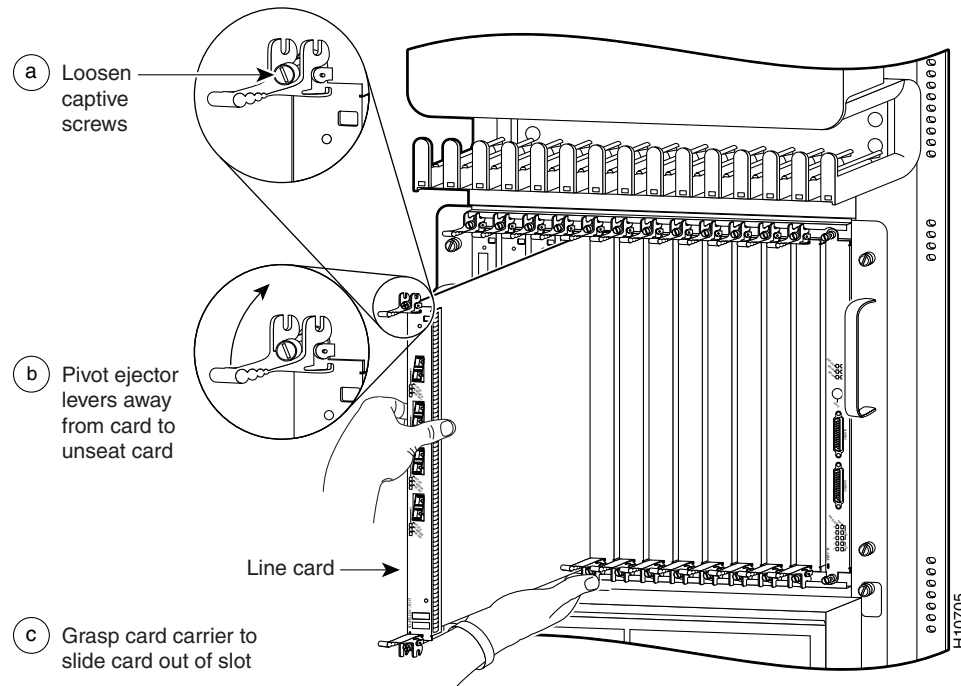
## Removing a Line Card

If you are replacing a failed line card, remove the existing line card first, then install the new line card in the same slot. To remove a line card, use [Figure 9](#) as a reference and follow these steps:

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

- Step 2** Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.
- Step 3** Detach the line card cable-management bracket from the line card.
- Step 4** Use a screwdriver to loosen the captive screw at each end of the line card faceplate. (See [Figure 9a](#).)

**Figure 9** *Line Card Removal and Installation*



**Caution**

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

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



**Note**

The following warning applies to removing very-short-reach line cards.



**Warning**

**Class 1M laser radiation when open. Do not view directly with optical instruments.**



**Caution**

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



**Note**

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

For information on disconnecting interface cables, see the [“Removing and Installing Interface Cables” section on page 25](#).

For information on removing the cable-management bracket, see the [“Line Card Cable-Management Bracket” section on page 15](#).

## Installing a Line Card

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



**Note**

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



**Caution**

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

To install a line card, follow these steps:

**Step 1**

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

**Step 2**

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



**Caution**

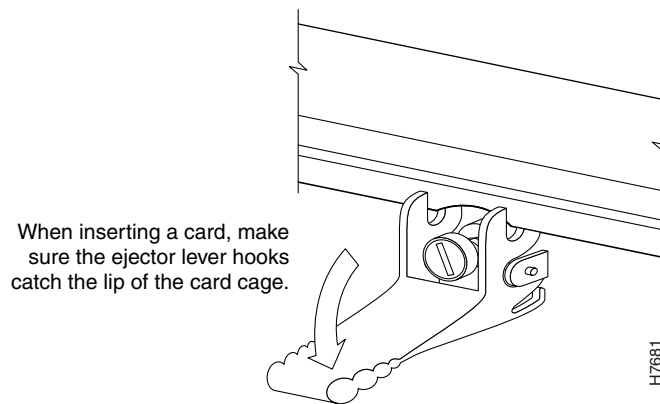
To prevent ESD damage, handle line cards by the captive installation screws, the provided handle, ejector levers, or the card carrier edges only. Do not touch any of the electrical components or circuitry.

**Step 3**

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

- Step 4** Carefully slide the line card into the slot until the ejector levers make contact with the edges of the card cage, then *stop* when the ejector lever hooks catch the lip of the card cage. If they do not catch, try reinserting the line card until the ejector lever hooks are fully latched. (See [Figure 10](#).)

**Figure 10** *Ejector Levers*



**Caution**

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

- Step 5** Simultaneously pivot both ejector levers toward each other until they are perpendicular to the line card faceplate. This action firmly seats the card in the backplane.
- Step 6** Use a 3/16-inch flat-blade screwdriver to tighten the captive screw on each end of the line card faceplate to ensure proper EMI shielding and to prevent the line card from becoming partially dislodged from the backplane.



**Caution**

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

- Step 7** Install the cable-management bracket.
- Step 8** Install GBIC or SFP modules, and EPA daughter cards, in the line cards that use them.
- Step 9** Install the interface cables.

For information on installing cable-management brackets, see the [“Installing a Line Card Cable-Management Bracket”](#) section on page 20.

For information on installing SFP modules, see the [“Line Card Cable-Management Bracket”](#) section on page 15.

For information on installing interface cables, see the [“Removing and Installing Interface Cables”](#) section on page 25.

For information on verifying and troubleshooting the hardware installation, see the [“Verifying and Troubleshooting the Line Card Installation”](#) section on page 26.

# Line Card Cable-Management Bracket

**Note**

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

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

**Caution**

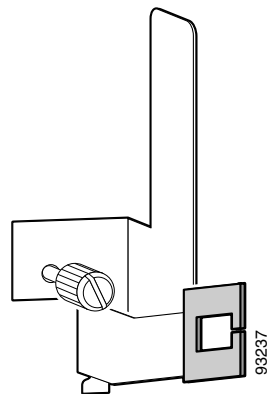
Excessive bending of interface cables can damage the cables.

The cable-management system consists of two separate components:

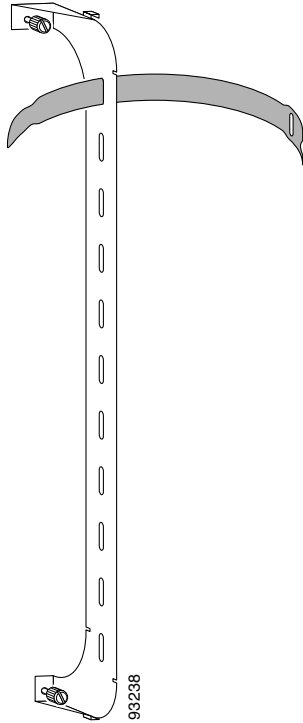
1. A cable-management tray that is mounted on the chassis. Refer to the appropriate Cisco XR 12000 Series Router installation and configuration guide for more information on the cable-management tray.
2. A cable-management bracket that attaches to a line card.

This section describes the line card cable-management bracket. [Figure 11](#) shows the single-port line card cable-management bracket; [Figure 12](#) shows the multiport line card cable-management bracket.

**Figure 11**      **Single-Port Line Card Cable-Management Bracket**



**Figure 12**      **Multiport Line Card Cable-Management Bracket**



**Note**

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



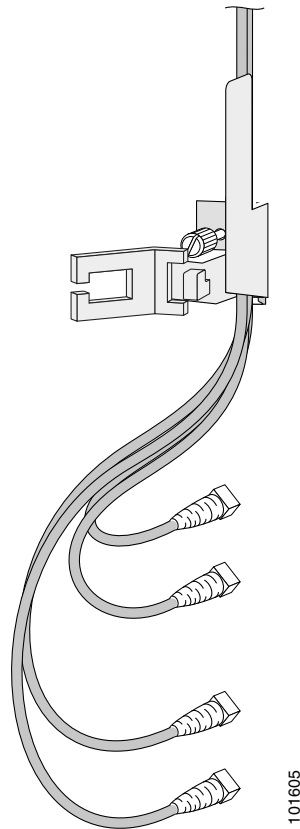
**Caution**

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

When more than two fibers are used, they should not loop through the rubber hook, but should pass through the bracket as shown in [Figure 13](#).



**Figure 13**      **Single-Port Line Card Cable-Management Bracket with Multiple Fibers**



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

- [Removing a Line Card Cable-Management Bracket, page 17](#)
- [Installing a Line Card Cable-Management Bracket, page 20](#)

## Removing a Line Card Cable-Management Bracket

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

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



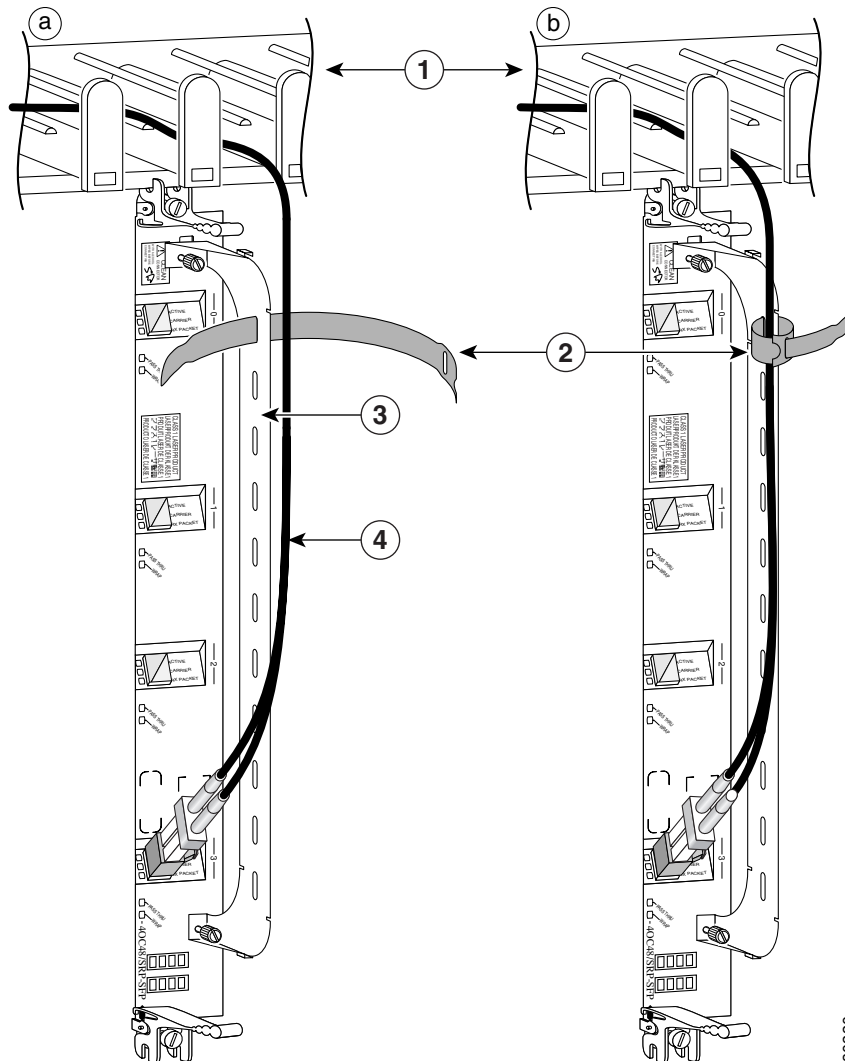
**Note**

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

---

- Step 4** For multiport line card cable-management brackets, proceed upward and remove the interface from the Velcro strap on the end of the cable standoff. (See [Figure 14](#).)
- For single-port line card cable-management brackets, carefully remove the interface cable from the cable clip. (See [Figure 15](#).) Avoid any kinks or sharp bends in the cable.
- Step 5** Repeat Step 3 and Step 4 for all remaining interface cables, then proceed to Step 6.
- Step 6** For multiport line card cable-management brackets, loosen the captive installation screw at each end of the cable-management bracket and remove the bracket from the line card.
- For single-port line card cable-management brackets, loosen the captive installation screw on the cable-management bracket and remove the bracket from the line card.

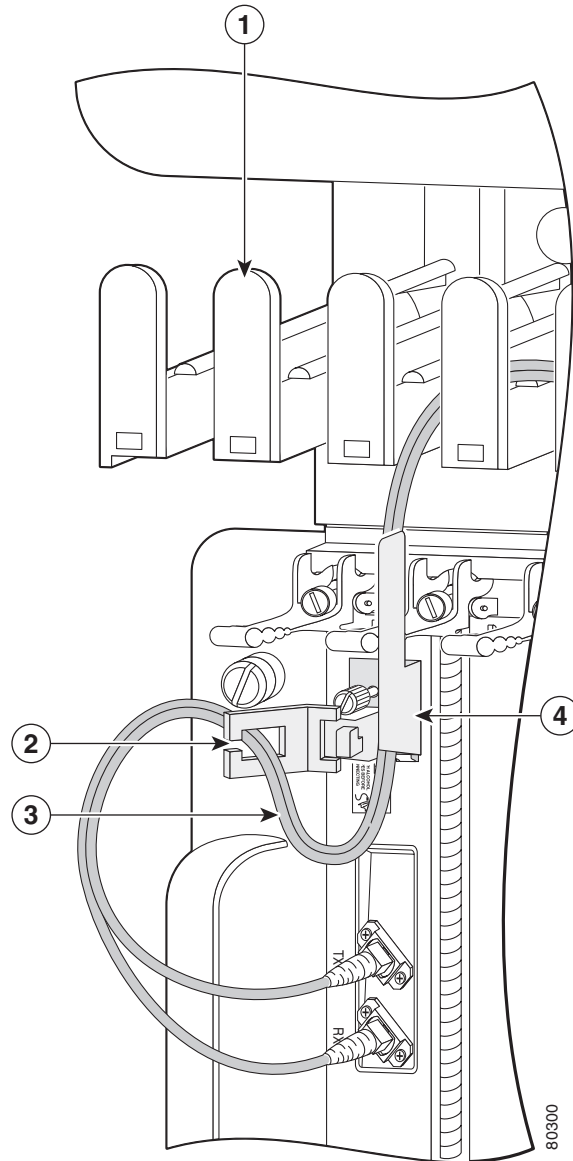
**Figure 14** *Multiport Line Card Cable-Management Installation and Removal (4-Port OC-48c/STM-16c DPT Line Card Shown)*



80220

1	Chassis cable-management tray	3	Line card cable-management bracket
2	Velcro straps	4	Fiber cable

**Figure 15**      *Single-Port Line Card Cable-Management Bracket Installation and Removal (1-Port OC-192c/STM-64c DPT Line Card Shown)*



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

## Installing a Line Card Cable-Management Bracket

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

- 
- Step 1** Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
- Step 2** Attach the line card cable-management bracket to the line card as follows:
- a. Position the cable-management bracket over the front of the line card faceplate.
  - b. Insert and tighten the captive screw(s) to secure the bracket to the line card.
  - c. Starting with the bottom port on the line card, connect each interface cable to the intended port.
- Step 3** For multiport line card cable-management brackets, carefully wrap the cables with the supplied Velcro strap. (See [Figure 14](#).)
- For single-port line card cable-management brackets, carefully press the interface cable onto the cable clip. (See [Figure 15](#).) Avoid any kinks or sharp bends in the cable.
- 

For information on disconnecting and connecting interface cables, see the [“Removing and Installing Interface Cables”](#) section on page 25.

## Cabling and Specifications

The following sections provide informaton about specifications and cabling for POS line cards:

- [Packet-Over-SONET Interface](#), page 20
- [Power Budget and Signal Specifications](#), page 21
- [Line Card Interface Cables](#), page 22

## Packet-Over-SONET Interface

POS is a high-speed method of transporting Internet Protocol (IP) traffic between two points. This technology combines the Point-to-Point Protocol (PPP) with Synchronous Optical Network (SONET) and Synchronous Digital Hierarchy (SDH) interfaces.

PPP was designed as a standard method of communicating over point-to-point links. Initial deployment was over short local lines, leased lines, and plain-old-telephone-service (POTS) (also called *basic telephone service*) for users of modems. As new packet services and higher speed lines are introduced, PPP can be deployed easily in these environments as well.

SONET is an octet-synchronous multiplex scheme defined by the American National Standards Institute (ANSI) standard (T1.1051988) for optical digital transmission at hierarchical rates from 51.840 Mbps to 2.5 Gbps (Synchronous Transport Signal, STS-1 to STS-48) and greater. SDH is an equivalent international standard for optical digital transmission at hierarchical rates from 155.520 Mbps (STM-1) to 2.5 gigabits per second (Gbps) (STM-16) and greater. SONET electrical specifications have been defined for single-mode fiber, multimode fiber, and CATV 75-ohm coaxial cable. (For example, the 4-port OC-3c/STM-1c POS line card allows transmission over single-mode and multimode optical fiber at Optical Carrier 3 [OC-3] rates. OC-3 is the Optical Carrier 3 specification for SONET STS-3c and SDH STM-1 transmission rates.)

SONET/SDH transmission rates are integral multiples of 51.840 Mbps. The following transmission multiples are currently specified and commonly used:

- OC-3c/STM-1c—155.520 Mbps
- OC-12c/STM-4c—622.080 Mbps
- OC-48c/STM-16c—2488.320 Mbps
- OC-192c/STM-64c—9953.280 Mbps

The POS specification (RFC 1619) describes the use of PPP encapsulation over SONET/SDH links. Because SONET/SDH is, by definition, a point-to-point circuit, PPP is well-suited for use over these links. PPP treats SONET/SDH transport as octet-oriented full-duplex synchronous links. PPP presents an octet interface to the physical layer. The octet stream is mapped into the SONET/SDH Synchronous Payload Envelope (SPE), with the octet boundaries aligned with the SPE octet boundaries. The PPP frames are located by row within the SPE payload. Because frames are variable in length, the frames are allowed to cross SPE boundaries.

The basic rate for POS is OC-3/STM-1, which is 155.520 Mbps. The available information bandwidth is 149.760 Mbps, which is the OC-3c/STM-1 SPE with section, line, and path overhead removed.

## Power Budget and Signal Specifications

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

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

This section contains the following:

- [OC-3c/STM-1c ISE POS Line Card Power Specifications, page 21](#)
- [4-Port OC-12c/STM-4c ISE POS Line Card Power Specifications, page 22](#)
- [OC-48c/STM-16c ISE POS Line Card Power Specifications, page 22](#)

### OC-3c/STM-1c ISE POS Line Card Power Specifications

All OC-3c/STM-1c ISE POS line cards provide 155 Mbps laser-based SONET/SDH-compliant interfaces. [Table 5](#) lists the power ratings and distances of each line card. The actual distance in any given case depends on the quality of the fiber attached to the transceiver.

All versions of the line card meet both the EN60825/IEC60825 and FDA - Code of Federal Regulations (USA) laser safety standards.

**Table 5** OC-3c/STM-1c ISE POS Line Card Power Specifications

Transceiver <sup>1</sup>	Power Budget <sup>2</sup>	Transmit Power <sup>3</sup>	Receive Power	Typical Maximum Distance
Multimode, short-reach	9 dBm	-20 dBm to -14 dBm	-30 dBm to -14 dBm	1.2 miles (2 km)
Single-mode, intermediate-reach	12 dBm	-20 dBm to -14 dBm	-28 to -8 dBm	9.3 miles (15 km)
Single-mode, long-reach	28 dBm	-20 dBm to -14 dBm	-34 dBm to -10 dBm	24.8 miles (40 km)

1. IR optic is standard compliant with G.957 S-1.1 and GR-235 IR-1. LR optic is standard compliant with G.957 L-1.1 and GR-235 LR-1.
2. All power budgets include a 1 dB optical path penalty.
3. Measurement Conditions: Transmit power is measured at the end of 1 meter of 62.5/125um, numerical aperture =0.275 unattenuated optical fiber with cladding modes removed. When using 50/125um unattenuated optical fiber with cladding modes removed, the numerical aperture = 0.20 Fiber for the test, and the minimum optical power is -23.5dBm.

## 4-Port OC-12c/STM-4c ISE POS Line Card Power Specifications

Table 6 lists the specifications for these line cards.

**Table 6** 4-Port OC-12c/STM-4c POS/SDH ISE Power Budget and Signal Requirements

Transceiver	Power Budget	Transmit Power	Receive Power	Typical Maximum Distance
Single-mode, intermediate-reach, 1310 nm	16 dB	-15 to -8 dBm	-28 to -7 dBm	9.3 miles (15 km)
Multimode, 1310 nm	6 dB	-20 to -14 dBm	-26 to -14 dBm	0.625 mile (1 km)

## OC-48c/STM-16c ISE POS Line Card Power Specifications

Good quality single-mode fiber with very few splices can carry the short-reach and long-reach compliant OC-48/STM-16 signals. If your environment requires the light to travel close to the typical maximum distance (as listed in Table 7), use an OTDR to measure the power loss.

**Table 7** OC-48c/STM-16c ISE POS Line Card Power Specifications

Transceiver	Power Budget	Transmit Power	Receive Power	Typical Maximum Distance
Single-mode, short-reach, 1310 nm	8 dB	-10 to -3 dBm	-18 to 0 dBm	1.25 miles (2 km)
Single-mode, long-reach, 1550 nm	26 dB	-2 to +3 dBm	-28 to -9 dBm	50 miles (80 km)

## Line Card Interface Cables

The following types of cables are used with POS 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 also multifiber cables that carry 12 channels of fiber data.



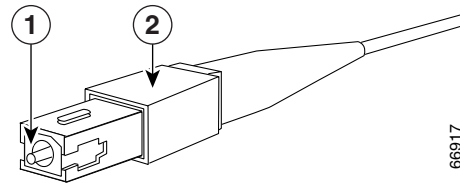
### Note

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

The following types of cable connectors are used with POS line cards:

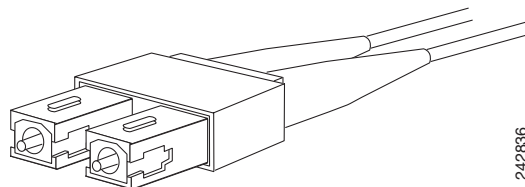
- Subscriber connector (SC)—See [Figure 16](#) and [Figure 17](#).
- Multiple terminations push-pull latch (MTP)—See [Figure 18](#).
- Lucent connector (LC)— See [Figure 19](#).
- Fiber connector (FC)—See [Figure 20](#). FC connectors do not have a spring-action disconnect latch.
- Mechanical transfer registered jack (MTRJ) connector—See [Figure 21](#).

**Figure 16**      *Simplex SC Cable Connector (Single-mode)*

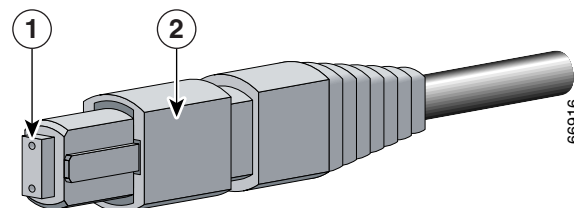


<b>1</b>	SC cable connector	<b>2</b>	Spring-action disconnect latch
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**Figure 17**      *Duplex SC Cable Connector*

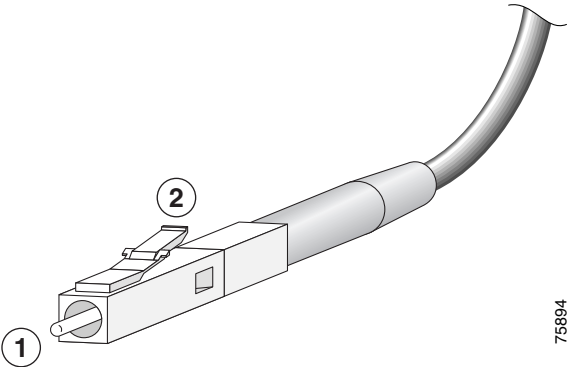


**Figure 18**      *Simplex MTP Cable Connector (Multimode - VSR Only)*



<b>1</b>	MTP female connector	<b>2</b>	Spring-action disconnect latch
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Figure 19 Simplex LC Cable Connector



1	LC connector	2	Spring-action disconnect latch
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Figure 20 Simplex FC Cable Connector

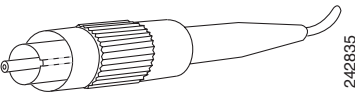
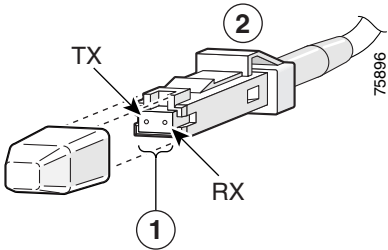


Figure 21 MTRJ Cable Connector (Orange)



1	MTRJ fiber cable	2	Spring-action disconnect latch
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Attach one simplex or duplex fiber cable between the line card and the device to which the line card is connected. Observe the receive (RX) and transmit (TX) cable relationship shown in [Figure 22](#).

[Table 8](#) lists the required specifications for very-short-reach (VSR) cables.



Note

You must use multimode fiber cables with fiber ribbon that meets these specifications.

Table 8 VSR Cable Specifications

Parameter	Specification
Fiber	62.5-micrometer fiber
Fiber cable maximum attenuation	3.75 dB/km



**Table 8**      **VSR Cable Specifications (continued)**

Parameter	Specification
Minimum modal bandwidth	400 MHz/km at 850 nm
Link power budget	6.0 dB
Unallocated margin in link power budget	0.60 dB
Maximum number of connectors	4
Maximum connector loss (per connector)	0.5 dB
Minimum operating range	2-300 m

## Removing and Installing Interface Cables

To remove an interface cable, follow these steps:

- Step 1** Attach an ESD-preventive wrist or ankle strap to your wrist and follow its instructions for use.
- Step 2** Press on the spring-action disconnect latch to disconnect the cable from the interface ports. (See [Figure 16](#) through [Figure 20](#).) FC connectors do not have a spring-action disconnect latch.
- Step 3** Slowly pull the connector from the port.



**Warning**

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



**Warning**

**Class 1 laser product (single-mode).**



**Warning**

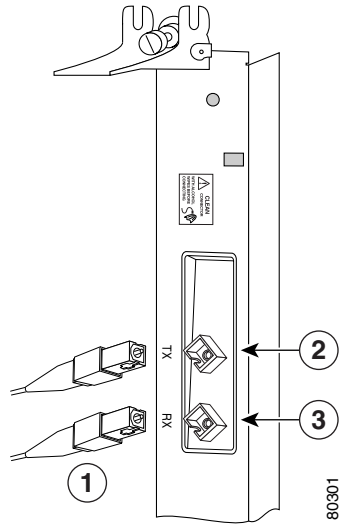
**Class 1 LED product (multimode).**

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

To install an interface cable, follow these steps:

- Step 1** Attach an ESD-preventive wrist or ankle strap to your wrist and follow its instructions for use.
- Step 2** Remove the connector dust cover, if one is present.
- Step 3** Align the connector end of the cable to the appropriate port. Observe the receive (RX) and transmit (TX) cable relationship, as shown in [Figure 22](#).

**Figure 22**      **Attaching Fiber Cables (Simplex, SC Connectors Shown)**



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

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



**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.

## Verifying and Troubleshooting the Line Card Installation

The following sections describe how to verify and troubleshoot line card installation:

- [Initial Boot Process, page 27](#)
- [Alphanumeric LEDs, page 27](#)
- [Status LEDs, page 30](#)
- [Troubleshooting the Installation, page 31](#)
- [SONET/SDH Clocking Issues, page 32](#)

## Initial Boot Process



### Note

Many new line cards are designated as *administratively down* by default. Status LEDs are off until you configure the interfaces and use the **no shutdown** command.

During a typical line card boot process, the following events occur:

1. The line card maintenance bus (MBus) module receives power and begins executing the MBus software.
2. The line card MBus module determines the type of card on which it resides, performs internal checks, and prepares to accept the Cisco IOS software from the RP.
3. The RP powers up the line card and loads the line card with its Cisco IOS software.

To verify that the line card is working properly, perform the following operational checks:

- During the line card boot process, observe the line card alphanumeric LEDs to ensure that the card is running the typical initialization sequence. The sequence should end with IOS RUN.
- Observe the line card status LEDs to verify that the Active LED (Link LED or status LED for line cards with no Active LED) is on. If an Active LED is not on, verify that the associated interface is not shut down.

If one of these conditions is not met, refer to the *IOS XR Software Configuration Guide* to identify any possible problems.

## Alphanumeric LEDs

POS line cards have two four-digit alphanumeric LED displays at one end of the faceplate, near the ejector lever, that display a sequence of messages indicating the state of the card. In general, the LEDs do not turn on until the RP recognizes and powers up the card. As it boots, the line card displays a sequence of messages similar to those in [Table 9](#).



### Note

It is normal for some displayed messages to appear too briefly to be read. Also, some messages listed in [Table 9](#) and [Table 10](#) may not appear on your line card.

**Table 9**      **Alphanumeric LED Messages During a Typical Initialization Sequence**

LED Display <sup>1</sup>	Meaning	Source
MROM nnnn	MBus microcode execute; nnnn is the microcode version number.	MBus controller
LMEM TEST	Low memory on the line card is being tested.	Line card ROM monitor
LROM RUN	Low memory test has been completed.	Line card ROM monitor
BSS INIT	Main memory is being initialized.	Line card ROM monitor
RST SAVE	Contents of the reset reason register are being saved.	Line card ROM monitor

**Table 9**      *Alphanumeric LED Messages During a Typical Initialization Sequence (continued)*

LED Display <sup>1</sup>	Meaning	Source
IO RST	Reset I/O register is being accessed.	Line card ROM monitor
EXPT INIT	Interrupt handlers are being initialized.	Line card ROM monitor
TLB INIT	TLB is being initialized.	Line card ROM monitor
CACH INIT	CPU data and instruction cache is being initialized.	Line card ROM monitor
MEM INIT	Size of the main memory on the line card is being discovered.	Line card ROM monitor
LROM RDY	ROM is ready for the download attempt.	Line card ROM monitor
ROMI GET	ROM image is being loaded into line card memory.	RP IOS software
ROM VGET <sup>2</sup>	ROM image is receiving a response.	RP IOS software
FABI WAIT	Line card is waiting for the fabric downloader to load. <sup>3</sup>	RP IOS software
FABM WAIT <sup>2</sup>	Line card is waiting for the fabric manager to report that the fabric is usable.	RP IOS software
FABL DNLD	Fabric downloader is being loaded into line card memory.	RP IOS software
FABL STRT	Fabric downloader is being launched.	RP IOS software
FABL RUN	Fabric downloader has been launched and is running.	RP IOS software
IOS DNLD	Cisco IOS software is being downloaded into line card memory.	RP IOS software
IOS FABW <sup>2</sup>	Cisco IOS software is waiting for the fabric to be ready.	RP IOS software
IOS VGET <sup>2</sup>	Line card is obtaining the Cisco IOS version.	RP IOS software
IOS RUN	Line card is enabled and ready for use.	RP IOS software
IOS STRT	Cisco IOS software is being launched.	RP IOS software
IOS TRAN	Cisco IOS software is transitioning to active.	RP IOS software
IOS UP	Cisco IOS software is running.	RP IOS software

1. The entire LED sequence shown in [Table 9](#) might occur too quickly for you to read; therefore, this sequence is provided in this tabular form as a baseline for how a line card should function at startup.

2. This LED sequence only appears in Cisco IOS release 12.0(24)S or later.
3. The fabric downloader loads the Cisco IOS software image onto the line card.

Table 10 lists other messages displayed on the line card alphanumeric LED displays.

**Table 10**      **Other Alphanumeric LED Messages**

LED Display	Meaning	Source
MAL FUNC	Line card malfunction reported by field diagnostics.	RP
MISM ATCH <sup>1</sup>	Line card type mismatch in paired slots.	RP
PWR STRT <sup>1</sup>	Line card has been newly powered on.	RP
PWR ON	Line card is powered on.	RP
IN RSET	In reset.	RP
RSET DONE	Reset complete.	RP
MBUS DNLD	MBus agent downloading.	RP
MBUS DONE	MBus agent download complete.	RP
ROMI DONE	Acquisition of ROM image complete.	RP
MSTR WAIT	Waiting for mastership determination.	RP
CLOK WAIT	Waiting for slot clock configuration.	RP
CLOK DONE	Slot clock configuration done.	RP
FABL LOAD	Loading fabric downloader <sup>2</sup> complete.	RP
IOS LOAD	Downloading of Cisco IOS software is complete.	RP
BMA ERR	Cisco IOS software BMA error.	RP
FIA ERR	Cisco IOS fabric interface ASIC configuration error.	RP
CARV ERR	Buffer carving failure.	RP
DUMP REQ	Line card requesting a core dump.	RP

**Table 10**      **Other Alphanumeric LED Messages (continued)**

LED Display	Meaning	Source
DUMP RUN	Line card dumping core.	RP
DUMP DONE	Line card core dump complete.	RP
DIAG MODE	Diagnostic mode.	RP
DIAG LOAD	Downloading field diagnostics over the MBus.	RP
DIAG F_LD	Downloading field diagnostics over the fabric.	RP
DIAG STRT	Launching field diagnostics.	RP
DIAG HALT	Cancel field diagnostics.	RP
DIAG TEST	Running field diagnostics tests.	RP
DIAG PASS <sup>1</sup>	Field diagnostics were completed successfully.	RP
POST STRT	Launching power-on self-test (POST).	RP
UNKN STAT	Unknown state.	RP
ADMN DOWN	Line card is administratively down.	RP
SCFG PRES <sup>1</sup>	Incorrect <b>hw-module slot srp</b> command entered.	RP
SCFG <sup>1</sup> REDQ	Required <b>hw-module slot srp</b> command not entered.	RP

1. This LED sequence only appears in Cisco IOS release 12.0(24)S or later.

2. The fabric downloader loads the Cisco IOS software image onto the line card.

## Status LEDs

Interface status LEDs show the status of each fiber-optic connector. POS line cards contain the following status LEDs:

- Active—Indicates the active condition of this port
- Carrier—Indicates the status of SONET framing reception on this port
- RX PKT or RX Packet—Indicates the status of packet reception on this port. It flashes when data is being received.

The status LEDs might not go on until after you have configured the line card interfaces (or turned them on, if they were shut down). To verify correct operation of each interface, complete the configuration procedures for the line card. (See the *IOS XR Software Configuration Guide*.)

The different operating states of the status LEDs are shown in [Table 11](#) and [Table 12](#).

**Table 11** *POS Line Card Status LED Descriptions*

LED	Color/Activity	Description
<b>ACTIVE</b> <sup>1</sup>	Green	Port is active.
	Yellow (blinking)	Fiber misconnection detected (for example, side A is connected to neighbor side A).
	Off	Port is not active.
<b>CARRIER</b>	Green	SONET frames are being received on this port.
	Off	SONET frames are not being received on this port.
<b>RX PKT</b>	Green	Packets are being received on this port. <sup>2</sup>
	Off	Packets are not being received on this port.

1. This LED remains on even if the interface is administratively down or if the link to the network is lost.

2. Packets forwarded back onto the ring do not trigger this LED.

**Table 12** *Explanation of Status LEDs*

LED State			Explanation
Active	Carrier	RX Pkt	
Off	Off	Off	Port is off.
On	Off	Off	Port is on.
On	On	Off	Line protocol is up.
On	On	Flash	Line card is receiving data.

## Troubleshooting the Installation



### Note

Many new line cards are designated as *administratively down* by default. Status LEDs are off until you configure the interfaces and use the **no shutdown** command.

If the Active LED (Link LED or status LED for line cards with no Active LED) or the alphanumeric display LEDs on a line card do not go on, there is either a problem with the line card installation or a hardware failure. To verify that the line card is installed correctly, follow these steps:

### Step 1

If the Active LED fails to go on, but the alphanumeric display LEDs on the line card indicate activity, verify that the initialization sequence ends with IOS RUN. If this is the case, verify that the interface is not shut down. If it is not, suspect a circuitry problem with the Active LED and contact a service representative for further assistance.

**Step 2** If the Active LED on the line card fails to go on or the alphanumeric display LEDs do not indicate IOS RUN, check the router connections as follows:

- a. Verify that the line card board connector is fully seated in the backplane. Loosen the captive installation screws and firmly pivot the ejector levers toward each other until both are perpendicular to the line card faceplate. Tighten the captive installation screws.
- b. Verify that all power cords and data cables are firmly connected at both ends.
- c. Verify that all memory modules on the card are fully seated and secured to their sockets.

After the line card reinitializes, the Active LED on the line card should go on. If the Active LED goes on, the installation is complete; if the Active LED does not go on, proceed to the next step.

**Step 3** If the Active LED still fails to go on, remove the POS line card and try installing it in another available line card slot.

- If the Active LED goes on when the line card is installed in the new slot, suspect a failed backplane port in the original line card slot.
- If the Active LED and alphanumeric display LEDs still do not go on, halt the installation. Contact a service representative to report the faulty equipment and obtain further instructions.

**Step 4** If an error message displays on the console terminal during the line card initialization, see the appropriate reference publication for error message definitions. If you experience other problems that you cannot solve, contact a service representative for assistance.

For more information on troubleshooting and diagnostics, refer to the installation and configuration guide that came with your Cisco XR 12000 Series Router.

**Step 5** If you perform online insertion or removal of the GBIC or SFP without shutting down the interface, a warning message is displayed on the console device.

## SONET/SDH Clocking Issues

This section provides an overview of SONET/SDH clocking issues. A POS line card supports both line and internal clocking functions. Line clocking is derived from the incoming signal from a given port. Internal clocking is derived from the clock that is internal to the line card.

Each port can be configured independently of any other in a line-timed setup, going back as far as the first payload processor. However, on a POS line card, the second level of payload processing ties the ports to a common clock source which is timed from only one port. This can result in pointer justifications if the remaining ports are not synchronous. However, with a properly configured router, these pointer justifications can be limited to provide the same performance as a SONET cross-connect device.



### Note

Pointer justifications do not affect data throughput. All configurations of a POS line card provide total data throughput regardless of pointer justifications. Under no circumstances does any data loss occur. All configurations provide 100 percent error-free data flow.

The line card uses Stratum3 (S3) as the internal clock reference. However, if one of the ports is Stratum1 (S1) accurate, it can be used as the local reference for the system clock. In this case, pointer justifications are very limited. If the system clock is timed from an S1 clock source, from a valid SONET network,



then there will be no pointer justifications on any synchronous interface. There are minimal pointer justifications (limited to S1 pointer justifications) on any asynchronous interface if it is on another SONET network. Pointer justification in this case is proportional to the accuracy of the other port clock.

A POS line card has the ability to select an input port as the source of synchronization for the system clock. This eliminates pointer justifications on any port that is synchronous with the selected port. Any other port on that line card that is not synchronous to the selected reference port will encounter pointer justifications at a rate proportional to clock accuracy of the port.

If the port is locally timed, it is Stratum3. If the port is line-timed, it depends on the attached network. It could be another Stratum3 clock, a Stratum1, or something much worse. This issue only applies to multiport cards and can be avoided if all ports on the line card are connected to the same SONET/SDH network.

## Line Card Memory

This section contains information about the following:

- [Line Card Memory Locations, page 33](#)
- [Removing and Installing Line Card Memory, page 35](#)

You can replace the route memory on POS line cards. Route memory modules are installed into 144-pin small-outline DIMM (SODIMM) sockets. Route memory runs the Cisco IOS software image and stores the updated network routing tables downloaded from the route processor.

[Table 13](#) provides information about the various hardware engines available with the POS line cards. The engine determines where the memory is placed.

**Table 13**      **POS Line Card Engines**

POS Line Card	Hardware Engine
OC-3c/STM-1c ISE	Engine 3, Internet Services Engine (ISE)
4-Port OC-12c/STM-4c ISE	
OC-48c/STM-16c ISE	



### Caution

The user serviceability of memory modules varies from line card to line card. Read this section carefully before attempting to remove or install any line card memory module.

## Line Card Memory Locations

The following sections contain general line card memory information for each POS line card:

- [ISE Line Card Memory Locations, page 34](#)
- [POS Line Card Route Memory Options, page 34](#)
- [POS Line Card Packet Memory Options, page 35](#)

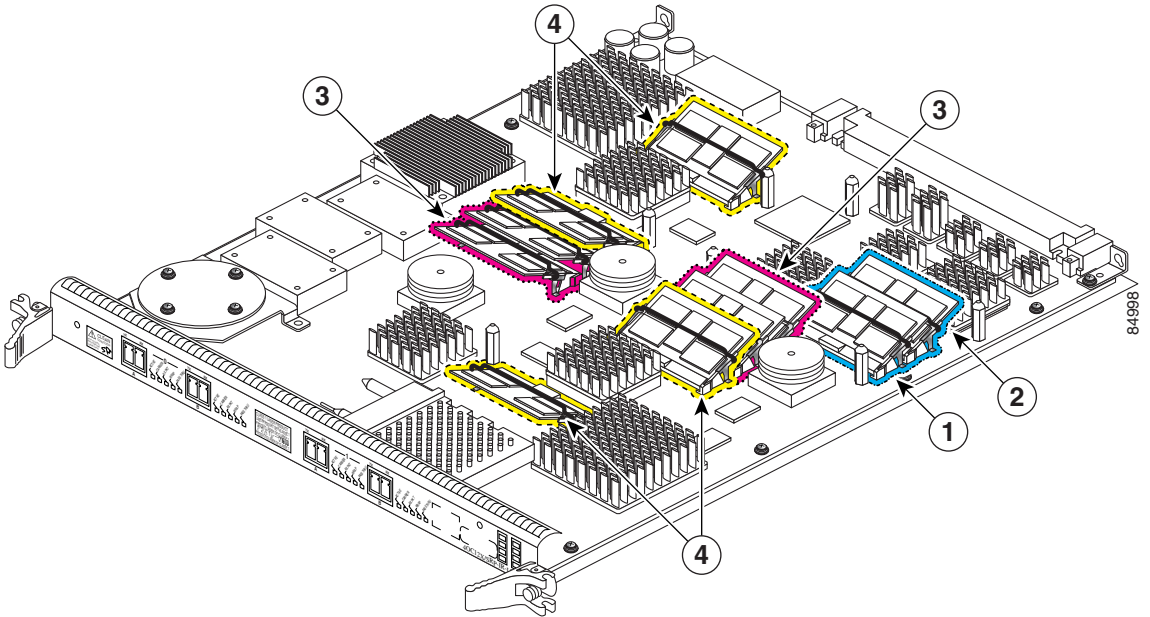
Memory removal and installation instructions are found in the [“Removing and Installing Line Card Memory”](#) section on page 35.

# ISE Line Card Memory Locations

Figure 23 shows the small outline DIMM (SODIMM) socket locations on an ISE line card. This line card is equipped with 10 SODIMM sockets:

- Two route memory SODIMM sockets
- Four packet memory sockets (not user serviceable)
- Four TLU/PLU memory sockets (not user serviceable)

Figure 23 ISE Line Card Memory Locations



1	Route memory SODIMM0	3	Four packet memory SODIMM sockets (not field serviceable)
2	Route memory SODIMM1	4	Four TLU/PLU memory SODIMM sockets (not field serviceable)

# POS Line Card Route Memory Options

Route memory runs the Cisco IOS software image and stores updated network routing tables downloaded from the route processor (RP). Line card route memory ranges from 128 MB to 512 MB. Table 14 lists the available route memory configurations and associated product numbers of the memory modules used for upgrading route memory on POS line cards. For the most up-to-date memory options, refer to *Cisco 12000 Series Router Memory Replacement Instructions* publication.

**Table 14**      *Route Memory Configurations for POS Line Cards*

Total Route Memory Ordered	Cisco Product Number	DIMM Module	Route Memory DIMM Sockets	Line Card Engine Type
512 MB	MEM-LC-ISE-512= <sup>1</sup>	2 256-MB DIMMs	DIMM0 and DIMM1	ISE

1. This option is the upgrade. The standard default DIMM configuration is 2 x 128 MB

## POS Line Card Packet Memory Options

Line card packet memory temporarily stores data packets awaiting switching decisions by the line card processor. Once the line card processor makes the switching decisions, the packets are propagated into the router switch fabric for transmission to the appropriate line card.

Table 15 lists the packet memory options for POS line cards that have replaceable packet memory.



**Caution**

Not all line cards support replaceable packet memory. See the “[Line Card Memory Locations](#)” section on page 33 for more information.

**Table 15**      *POS Line Card Packet Memory Options*

Total Packet Memory <sup>1</sup>	Cisco Product Number	DIMM Modules	DIMM Sockets
512 MB (upgrade)	MEM-PKT-512-UPG= <sup>2</sup>	2 RX 128-MB DIMMs 2 TX 128-MB DIMMs	RX DIMM0 and DIMM1 TX DIMM0 and DIMM1

1. The DIMMs installed in a given buffer (either receive or transmit) must be the same type and size, but the individual receive and transmit buffers can operate with different memory capacities.

2. Only applicable to Engine 2 line cards.

## Removing and Installing Line Card Memory

Before beginning the memory replacement procedures in this section, ensure that you have the proper tools and equipment at hand, and that you are using appropriate ESD-prevention equipment and techniques. When removing or installing memory, observe the guidelines in the following sections:

- [Removing a DIMM, page 35](#)
- [Installing a DIMM, page 37](#)
- [Removing a SODIMM, page 38](#)
- [Installing a SODIMM, page 40](#)
- [Checking the Installation of Line Card Memory, page 44](#)

### Removing a DIMM

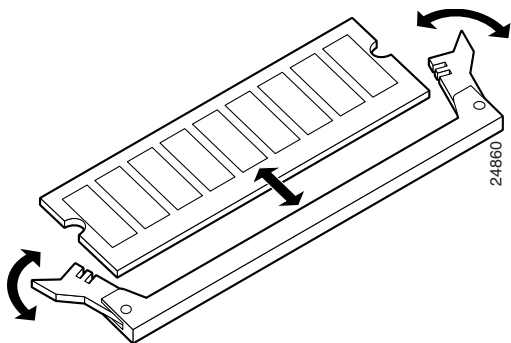
To remove a DIMM from a line card, follow these steps:

- Step 1** Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
- Step 2** Place the line card on an antistatic mat so that the faceplate is nearest to you.
- Step 3** Locate the DIMM sockets on the line card.

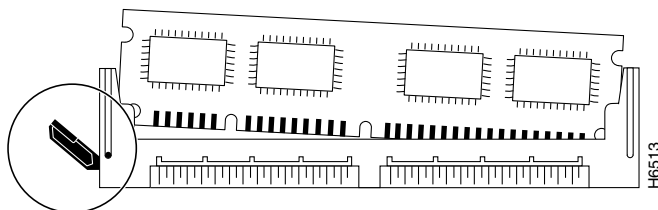
**Note**

Some line cards use DIMM sockets equipped with dual release levers, as shown in [Figure 24](#); other line cards use DIMM sockets equipped with a single release lever, as shown in [Figure 25](#). Both DIMM sockets operate in the same general way.

**Figure 24** *DIMM Socket with Dual Release Levers*



**Figure 25** *DIMM Socket with Single Release Lever*



**Step 4** Use the socket release levers to eject the DIMM.

- For a socket with dual release levers (see [Figure 24](#)), pull down both levers at the same time to eject the DIMM.
- or
- For a socket with a single release lever (see [Figure 25](#)), pull the lever to eject the DIMM.

**Caution**

Handle the edges of the DIMM only. Do not touch the integrated circuit devices on the DIMM, the metal traces, or fingers, along the edge of the DIMM, or the pins in the DIMM socket.

**Step 5** As one end of the DIMM is released, grasp the top corners of the DIMM with the thumb and forefinger of each hand and pull the DIMM completely out of its socket.

**Step 6** Immediately place the DIMM in an antistatic bag to protect it from ESD damage.

**Step 7** Repeat [Step 4](#) through [Step 6](#) for any remaining DIMMs that you want to remove.

## Installing a DIMM

This section contains instructions for installing DIMM memory into a line card.



### Note

If you are upgrading packet memory, both DIMM sockets of a given pair (either the transmit buffer or the receive buffer) must be populated with a DIMM of the same type and size.

To install DIMMs in a line card, follow these steps:

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

**Step 2** Place the line card on an antistatic mat so that the faceplate is nearest to you.



### Caution

To prevent router and memory problems, all DIMMs installed in the line card must be 3.3V devices.

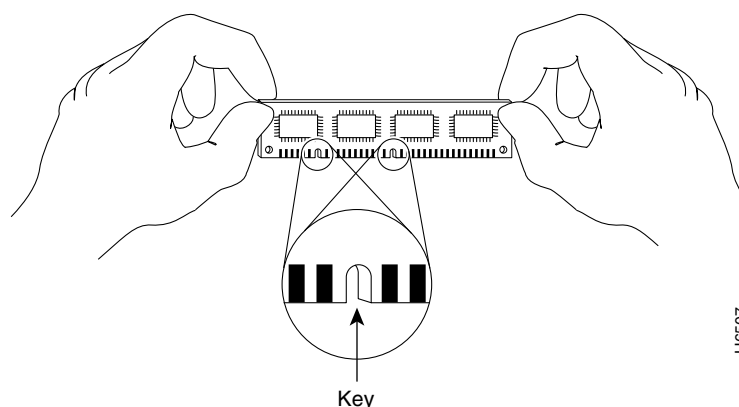
**Step 3** Remove the new DIMM from its protective antistatic bag.

**Step 4** Grasp the edges of the DIMM only. Do not touch the integrated circuit devices on the DIMM, the metal traces, or fingers, along the edge of the DIMM, or the pins in the DIMM socket. (See [Figure 26](#).)

**Step 5** To position the DIMM for insertion, orient it at the same angle as the DIMM socket. The two notches (keys) on the bottom edge of the module ensure that the DIMM edge connector is registered properly in the socket. (See [Figure 26](#).)

If necessary, rock the DIMM back and forth gently to align it in the socket.

**Figure 26 Handling a DIMM**



### Caution

When inserting DIMMs into a socket, apply firm, but not excessive, pressure. If you damage a DIMM socket, you must return the line card for repair.

**Step 6** Gently insert the DIMM into the socket and push until the DIMM snaps into place and the release lever is flush against the side of the socket.

- Step 7** Verify that the release lever is flush against the side of the socket. If it is not, the DIMM might not be seated properly. On a socket with dual release levers, both levers should be flush against the sides of the DIMM.
- If the module appears misaligned, carefully remove it and reseal it, ensuring that the release lever is flush against the side of the DIMM socket.
- Step 8** Repeat [Step 3](#) through [Step 7](#) to install any remaining DIMMs for your memory configuration.
- 

## Removing a SODIMM

To remove a SODIMM, follow these steps:

- 
- Step 1** Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
- Step 2** Place the line card on an antistatic mat so that the faceplate is nearest to you.
- Step 3** Locate the route memory socket on the line card.
- Step 4** If present, remove the SODIMM retaining clip from the memory module socket. Grasp the latch arm intersection located on each side of the clip and gently slide the clip out. (See [Figure 27](#).) Save the retaining clip.



---

**Note** Some line cards do not require a retaining clip.

---



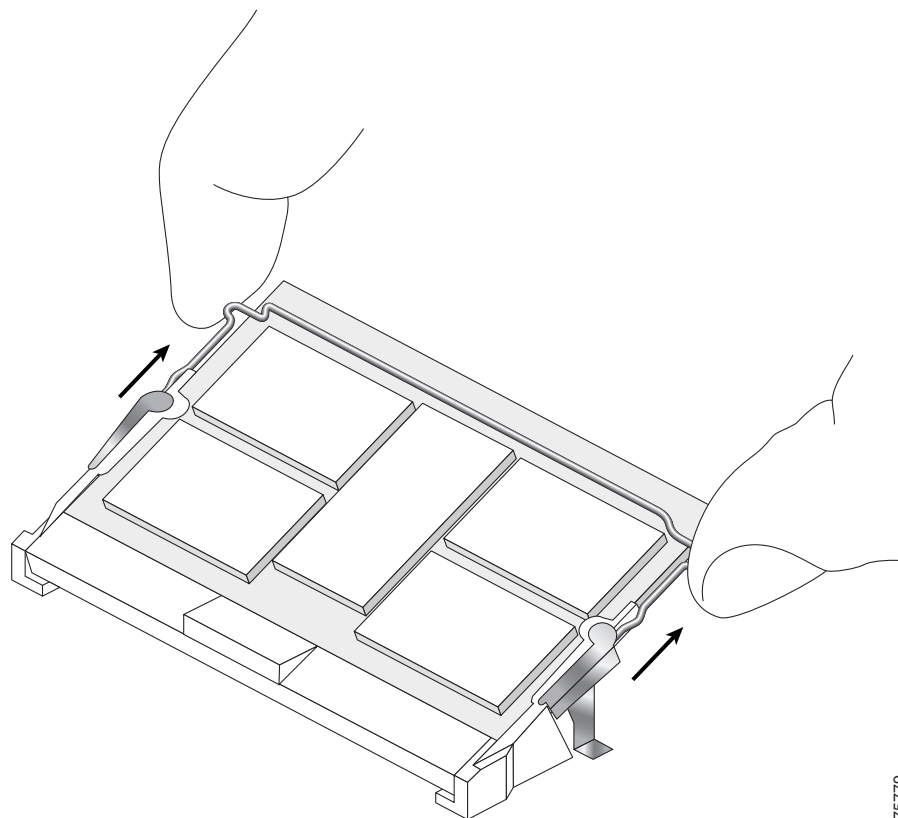
**Caution**

---

If the retaining clip is bent or damaged, do not attempt to fix or reuse it. This can cause serious damage to the line card. Each SODIMM replacement ships with a spare retaining clip, in case there is any damage to the existing clip.

---

**Figure 27 Remove Retaining Clip from Memory Module Socket**



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- Step 5** Remove the SODIMM by gently moving the plastic latches in an outward direction, parallel to and away from the memory module, until it releases and rotates to a 45-degree angle. (See [Figure 28](#) and [Figure 29a](#).)



**Caution**

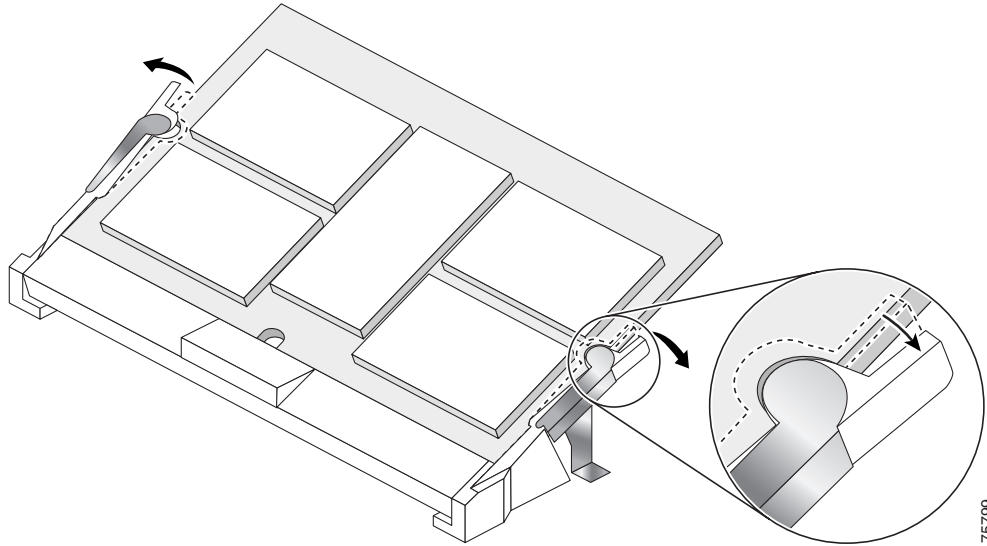
The plastic latch on the SODIMM socket is enclosed by the metal strain-relief latch. The plastic latch should *never* be moved past the metal strain-relief latch.



**Caution**

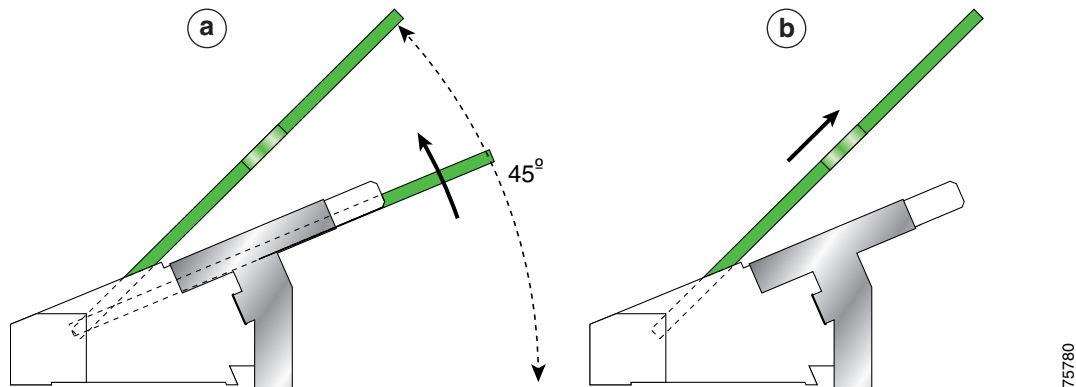
Handle the edges of the SODIMM only. Do not touch the integrated circuit devices on the SODIMM; the metal traces, or fingers, along the edge of the SODIMM; or the pins in the SODIMM socket.

**Figure 28** *Moving the Plastic Latch Away from the SODIMM*



- Step 6** As the SODIMM is released, it positions itself at a 45-degree angle. Gently pull the SODIMM module out of the socket. Continue to keep the module at a 45-degree angle until it is completely removed from the socket guides. (See [Figure 29b](#).)

**Figure 29** *Removing a 144-pin SODIMM Module*



- Step 7** Immediately place the SODIMM in an antistatic bag to protect it from ESD damage.

## Installing a SODIMM

To install a SODIMM module, follow these steps:

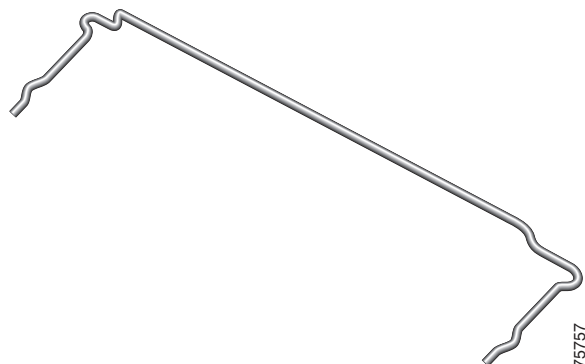
- Step 1** Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
- Step 2** Place the line card on an antistatic mat so that the faceplate is nearest to you.
- Step 3** If there is a retaining clip, check to make sure that it has not been damaged or bent. (See [Figure 30](#).)





**Note** Some line cards do not require a retaining clip.

**Figure 30** *SODIMM Socket Retaining Clip*



**Caution** If the retaining clip is damaged, do not use it. This can damage the SODIMM socket.

**Step 4** Locate the route memory socket on the line card.

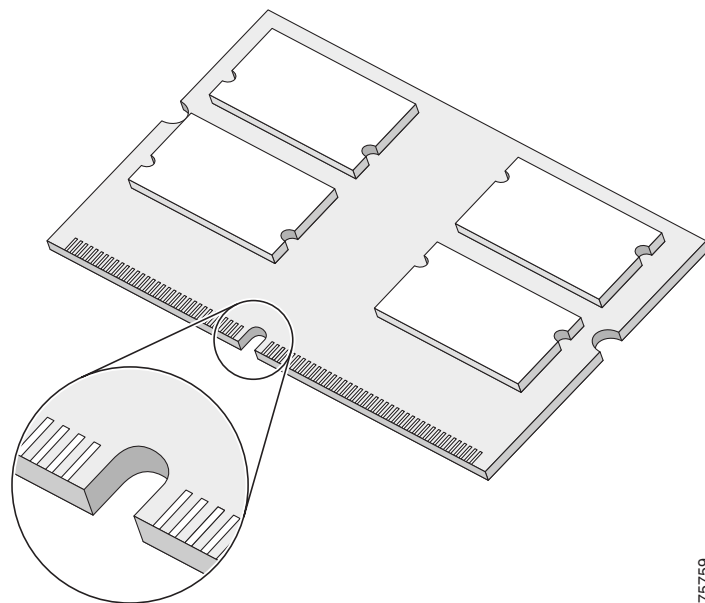
**Step 5** Remove the new SODIMM from its protective antistatic bag.



**Caution** Grasp the edges of the SODIMM only. Do not touch the integrated circuit devices on the SODIMM; the metal traces, or fingers, along the edge of the SODIMM; or the pins in the SODIMM socket.

**Step 6** Line up the SODIMM key with the key in the board socket. (See [Figure 31](#).)

**Figure 31** *SODIMM with Key in Face-up Position*



**Step 7** The SODIMM must be lined up at a 45-degree angle. (See [Figure 32a.](#))



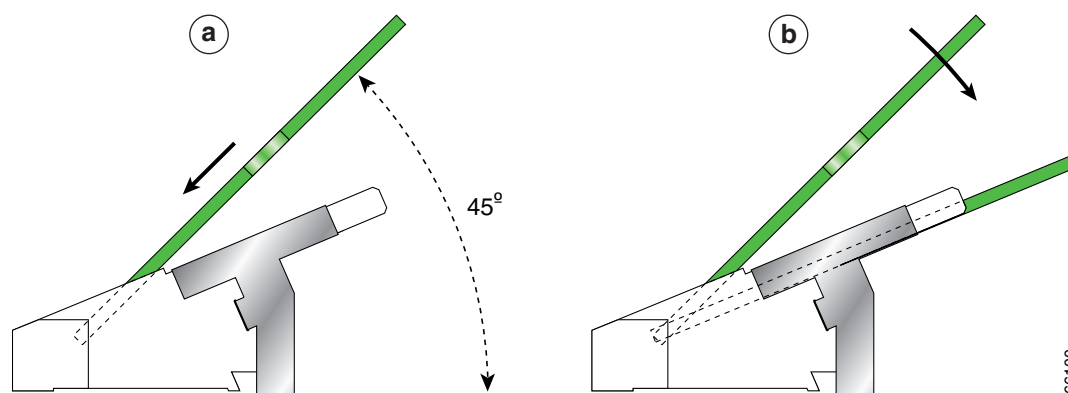
**Note**

When the key is in the face-up position, the metal traces on the left side of the key measure 0.9 inch (23.20 mm). The metal traces on the right side of the key measure 1.29 inches (32.80 mm). The SODIMM can not be inserted until the keys are lined up properly.

**Step 8** Place both thumbs at the end of the socket and use your index fingers to guide the module into the socket until it is fully seated.

Be sure that your index fingers are located on the outer corners of the SODIMM to maintain even pressure when the module is being seated in the socket.

**Figure 32** *Inserting a 144-pin SODIMM Module*



**Step 9** Gently press the SODIMM down using your index fingers, distributing even pressure across the module until it locks into the tabs. (See [Figure 32b.](#))



**Caution**

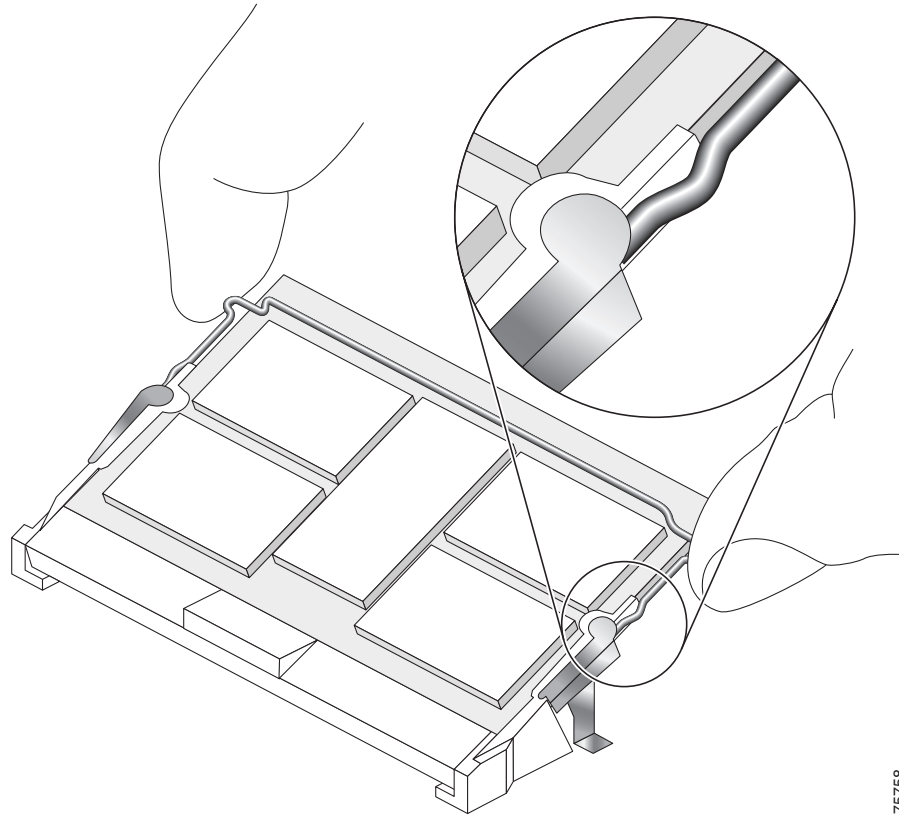
Excessive pressure can damage a SODIMM socket.

**Step 10** Verify that the release levers are flush against the side of the socket. If they are not, the SODIMM might not be seated properly.

**Step 11** If the module appears misaligned, carefully remove it and reseal it, ensuring that the release lever is flush against the side of the SODIMM socket.

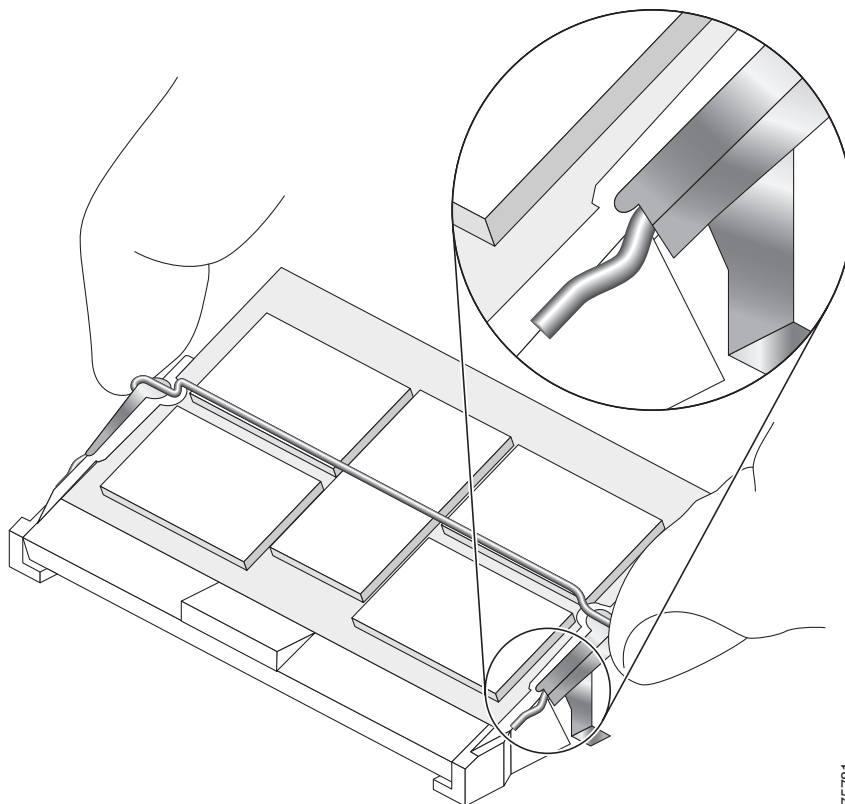
**Step 12** If there is a retaining clip, insert it by sliding the clip between the metal strain relief and the plastic latch. (See [Figure 33.](#))

**Figure 33**      **Inserting the Retaining Clip**



The clip is properly installed when the clip detente protrudes below the strain relief and plastic latch. (See [Figure 34.](#))

**Figure 34**      *Retaining Clip Completely Installed into Module Latch*



## Checking the Installation of Line Card Memory

After you install line card memory and reinstall the line card in the router, the router reinitializes the line card and detects the memory change as part of the reinitialization cycle. The time required for the router to initialize can vary with different router configurations and memory configurations.

If the line card does not reinitialize properly after you upgrade memory, or if the console terminal displays a checksum or memory error, verify that you installed the correct SODIMMs and that they are installed correctly on the line card.

To check the installation of line card memory, follow these steps:

- 
- Step 1**      Check that the SODIMM is fully inserted into the socket.
  - Step 2**      Reinstall the line card and perform another installation check.
- 

If the router fails to restart properly after several attempts and you are unable to resolve the problem, access Cisco.com or contact your Cisco service representative for assistance. Before calling, however, make note of any console error messages, unusual LED states, or other router indications or behaviors that might help to resolve the problem.

# Regulatory, Compliance, and Safety Information

This section includes regulatory, compliance, and safety information in the following sections:

- [Translated Safety Warnings and Agency Approvals, page 45](#)
- [Electromagnetic Compatibility Regulatory Statements, page 45](#)
- [Laser Safety, page 49](#)

## Translated Safety Warnings and Agency Approvals

The complete list of translated safety warnings and agency approvals is available in the *Regulatory Compliance and Safety Information for Cisco XR 12000 Series Routers* publication. (Document Number 78-4347-xx.)

## Electromagnetic Compatibility Regulatory Statements

This section contains the following information:

- [FCC Class A Compliance, page 45](#)
- [CISPR 22, page 46](#)
- [Canada, page 46](#)
- [Europe \(EU\), page 46](#)
- [Class A Notice for Hungary, page 47](#)
- [VCCI Class A Notice for Japan, page 47](#)
- [Class A Notice for Taiwan and Other Traditional Chinese Markets, page 48](#)
- [VCCI Compliance for Class B Equipment, page 48](#)
- [Class A Notice for Korea, page 49](#)

## FCC Class A Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio-frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case users will be required to correct the interference at their own expense.

Modifying the equipment without Cisco's authorization may result in the equipment no longer complying with FCC requirements for Class A digital devices. In that event, your right to use the equipment may be limited by FCC regulation and you may be required to correct any interference to radio or television communication at your own expense.

You can determine whether your equipment is causing interference by turning it off. If the interference stops, it was probably caused by the Cisco equipment or one of its peripheral devices. If the equipment causes interference to radio or television reception, try to correct the interference by using one or more of the following measures:

- Turn the television or radio antenna until the interference stops.
- Move the equipment to one side or the other of the television or radio.
- Move the equipment farther away from the television or radio.
- Plug the equipment into an outlet that is on a different circuit from the television or radio. (That is, make certain the equipment and the television or radio are on circuits controlled by different circuit breakers or fuses.)

## CISPR 22

This apparatus complies with CISPR 22/EN55022 Class B radiated and conducted emissions requirements.

## Canada

### English Statement of Compliance

This class A digital apparatus complies with Canadian ICES-003.

### French Statement of Compliance

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

## Europe (EU)

This apparatus complies with EN55022 Class B and EN55024 standards when used as ITE/TTE equipment, and EN300386 for Telecommunications Network Equipment (TNE) in both installation environments, telecommunication centers and other indoor locations.

## Class A Notice for Hungary



### Warning

This equipment is a class A product and should be used and installed properly according to the Hungarian EMC Class A requirements (MSZEN55022). Class A equipment is designed for typical commercial establishments for which special conditions of installation and protection distance are used.

Figyelmeztetés a felhasználói kézikönyv számára: Ez a berendezés "A" osztályú termék, felhasználására és üzembe helyezésére a magyar EMC "A" osztályú követelményeknek (MSZ EN 55022) megfelelően kerülhet sor, illetve ezen "A" osztályú berendezések csak megfelelő kereskedelmi forrásból származhatnak, amelyek biztosítják a megfelelő speciális üzembe helyezési körülményeket és biztonságos üzemelési távolságok alkalmazását.

## VCCI Class A Notice for Japan



### Warning

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions. Statement 191

警告 これは、情報処理装置等電波障害自主規制協議会（VCCI）の規定に基づくクラスA装置です。この装置を家庭環境で使用すると、電波妨害を引き起こすことがあります。この場合には、使用者が適切な対策を取るよう要求されることがあります。

## Class A Notice for Taiwan and Other Traditional Chinese Markets



### Warning

**This is a Class A Information Product, when used in residential environment, it may cause radio frequency interference, under such circumstances, the user may be requested to take appropriate countermeasures.** Statement 257

### 警告

這是甲類資訊產品，在居住環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

## VCCI Compliance for Class B Equipment



### Warning

**This is a Class B product based on the standard of the Voluntary Control Council for Interference from Information Technology Equipment (VCCI). If this is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.** Statement 157

### 警告

VCCI準拠クラスB機器（日本）

この機器は、Information Technology EquipmentのVoluntary Control Council for Interference（VCCI）の規格に準拠したクラスB製品です。この機器をラジオやテレビ受信機の近くで使用した場合、混信を発生する恐れがあります。本機器の設置および使用に際しては、取扱説明書に従ってください。



## Class A Notice for Korea



Warning

**This is a Class A Device and is registered for EMC requirements for industrial use. The seller or buyer should be aware of this. If this type was sold or purchased by mistake, it should be replaced with a residential-use type.** Statement 294

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## Laser Safety

POS line cards are equipped with a Class 1 laser (VSR is Class 1M), which emits invisible radiation. Do not stare into operational line card ports. The following laser warnings apply to POS line cards:

- [Class 1 Laser Product Warning](#)
- [Class 1M Laser Product Warnings \(VSR Only\)](#)
- [General Laser Warning](#)

### Class 1 Laser Product Warning

The following warning applies to single-mode SR, IR, and LR optics:



Warning

**Class 1 laser product.**

### Class 1M Laser Product Warnings (VSR Only)

The following warnings apply to line cards with VSR optics:



Warning

**Laser radiation. Do not view directly with optical instruments. Class 1M laser product.**



Warning

**For diverging beams, viewing the laser output with certain optical instruments within a distance of 100 mm may pose an eye hazard. For collimated beams, viewing the laser output with certain optical instruments designed for use at a distance may pose an eye hazard.**



Warning

**Class 1M laser radiation when open. Do not view directly with optical instruments.**

## General Laser Warning

The following warning applies to all POS line cards:



### Warning

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

For translated safety warnings, refer to the *Regulatory Compliance and Safety Information for Cisco 12000 Series Internet Routers* publication (Document Number 78-4347-xx).

## Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

<http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>

Subscribe to the *What's New in Cisco Product Documentation* as a Really Simple Syndication (RSS) feed and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service and Cisco currently supports RSS Version 2.0.

This document is to be used in conjunction with the installation and configuration guide for your Cisco XR 12000 Series Router.

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