Cisco CRS Carrier Routing System 8-Slot Line Card Chassis Enhanced Router Installation Guide

First Published: --

Last Modified: --

CONTENTS

Preface

This installation guide describes how to install power, air circulation, line card, and exterior components into and remove them from a Cisco CRS 8-Slot Line Card Chassis Enhanced router. This installation guide does not provide background information and basic theory-of-operation for anyone wanting to understand the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

Audience

This document is intended for those who unpack the Cisco NCS 6000 Series chassis and Cisco installation partners who are responsible for moving and securing the Cisco NCS 6000 Series chassis. No additional knowledge of routing or the Cisco IOS XR software is assumed.

Documentation Conventions

This document uses the following conventions:

Convention	Description
bold font	Commands and keywords and user-entered text appear in **bold** font.
Italic font	Document titles, new or emphasized terms, and arguments for which you supply values are in *italic* font.
[ ]	Elements in square brackets are optional.
{x	y	z}	Required alternative keywords are grouped in braces and separated by vertical bars.

Convention	Description
[x | y | z]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.
courier font	Terminal sessions and information the system displays appear in courier font.
	Indicates a variable for which you supply values, in context where italics cannot be used.
< >	Nonprinting characters such as passwords are in angle brackets.
[ ]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

Note   *Means reader take note*. Notes contain helpful suggestions or references to material not covered in the manual.

Tip   *Means the following information will help you solve a problem*. The tips information might not be troubleshooting or even an action, but could be useful information, similar to a Timesaver.

Caution   *Means reader be careful*. In this situation, you might perform an action that could result in equipment damage or loss of data.

Warning   IMPORTANT SAFETY INSTRUCTIONS

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device.

SAVE THESE INSTRUCTIONS

Warning   Statements using this symbol are provided for additional information and to comply with regulatory and customer requirements.

Related Documentation

For complete planning, installation, and configuration information, see the following documents that are available on Cisco.com at the following URL:
http://www.cisco.com/c/en/us/support/routers/network-convergence-system-6000-series-router/products-installation-guides-list.html.

- *Cisco Network Convergence System 6000 Series Routers Site Planning Guide*

- *Cisco Network Convergence System 6000 Series Routers Unpacking, Moving, and Securing Guide*

- *Cisco Network Convergence System 6000 Fabric Card Chassis Hardware Installation Guide*

- *Regulatory Compliance and Safety Information for the Cisco Network Convergence System 6000 Series Routers*

Changes to This Document

This table lists the technical changes made to this document since it was first created.

Table 1: Changes to This Document

Date	Summary
May 2016	Add support for NC6-LC-BLANK2= impedance card.
March 2015	Updated "Installing Fabric Cards" procedure in Chapter 5.
September 2014	Cable management brackets now ship preinstalled on the chassis. Updated procedures to reflect change. Reorganized document for better usability.
January 2014	Added support for the 60-Port 10Gbps Line Card with SFP+ Optics Module (Lean Core [NC6-60X10GE-L-S] and Multi-Service Core [NC6-60X10GE-M-S].
September 2013	Initial release of this document. This document introduces the Cisco NCS 6008 8-Slot Line Card Chassis.

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see *What's New in Cisco Product Documentation*, at: http://www.cisco.com/c/en/us/td/docs/general/whatsnew/whatsnew.html.

Subscribe to *What's New in Cisco Product Documentation*, which lists all new and revised Cisco technical documentation as an RSS feed and delivers content directly to your desktop using a reader application. The RSS feeds are a free service.

Overview of Chassis Installation Steps

- Overview of Chassis Installation Steps, page 1

Overview of Chassis Installation Steps

The following table lists the steps to install the chassis component and prepare the Cisco CRS 8-Slot Line Card Chassis Enhanced router for operation.Use the table as a checklist to ensure that all components are properly installed in the correct order. For information about a task, see the appropriate section of this installation guide.

Table 2: Overview of Installation Steps

Installation Steps	See	Check
1 Verify that the chassis is securely installed in rack.	Cisco CRS Carrier Routing System 8-Slot Line Card Chassis Enhanced Router Unpacking, Moving, and Securing Guide	
1 Ground the chassis.	"Installing the Chassis Ground Cable" section on page 3-6 .	
1 Install both AC or DC power shelves in the chassis.	"Installing an AC or DC Power Shelf" section on page 3-8 .	
1 Install AC cables or DC wiring on first power shelf.	"Installing AC Power Cords or DC Power Shelf Wiring" section on page 3-14 .	
1 Install AC cables or DC wiring on second power shelf.	"Installing AC Power Cords or DC Power Shelf Wiring" section on page 3-14 .	

Installation Steps	See	Check
1 Install power modules in both power shelves.	"Installing a Power Module" section on page 3-17 .	
1 Power up the chassis and verify basic chassis operation.	"Power Up and Power Down a Chassis" section on page 3-20 .	
1 Install fan trays, air filter and rear exhaust screen.	"Installing Air Circulation Components" section on page 4-2	
1 Install external cosmetic components on the front (PLIM) side of the chassis.	"Installing the Front Side Exterior Components" section on page 5-1	
1 Install line cards and PLIMs and route cables.	Chapter 6, "Installing Line Cards, PLIMs, and Associated Components"	

Note   For chassis component removal procedures, see Chapter 7, "Removing Chassis Components."

C H A P T E R 2

Cisco CRS Carrier Routing System 8-Slot Line Card Chassis Enhanced Router Overview

Chassis Overview

This chapter provides an overview of the Cisco CRS 8-Slot Line Card Chassis Enhanced router. It contains the following sections:

Overview

The Cisco CRS 8-Slot Line Card Chassis Enhanced router can be installed in locations where the 16-slot system may not fit (for example, colocation facilities, data centers, and many Tier II and Tier III locations). The routing system consists of a single rack-mount chassis that contains the following major system components:

- Modular services cards (MSCs), forwarding processor (FP) cards, and label switch processor (LSP) cards, also called line cards (up to eight)

- Physical layer interface modules, or PLIMs (up to eight, one for each line card)

- Two route processor (RP) cards or two performance route processor (PRP) cards

- Switch fabric cards (four required)

- SPA Interface Processors (SIPs) and Shared Port Adapters (SPAs) which can be installed instead of PLIMs

  ◦ SIP is a carrier card that is similar to a PLIM and inserts into a line card chassis slot and interconnects to an MSC, FP, or LSP like a PLIM. Unlike PLIMs, SIPs provide no network connectivity on their own.

  ◦ SPA is a modular type of port adapter that inserts into a subslot of a compatible SIP carrier card to provide network connectivity and increased interface port density. A SIP can hold one or more SPAs, depending on the SIP type and the SPA size. POS/SDH and Gigabit Ethernet SPAs are available.

- A chassis midplane that connects MSCs, FPs, or LSPs to their PLIMs and to switch fabric cards

The Cisco CRS 8-Slot Line Card Chassis Enhanced router supports 40G, 140G, and 400G fabric cards, as follows:

- The Cisco CRS-1 Carrier Routing System uses fabric cards designed for 40 G operation (CRS-8-FC/S or CRS-8-FC/M cards).

- The Cisco CRS-3 Carrier Routing System uses fabric cards designed for 140G operation (CRS-8-FC140/S or CRS-8-FC140/M cards).

- The Cisco CRS-X Carrier Routing System uses fabric cards designed for 400G operation (CRS-8-FC400/S fabric card and CRS-8-FC400/M fabric card).

For detailed information about the CRS back-to-back system, see Introduction to the CRS-3 Back-to-Back System .

A mixture of 40G, 140G, and 400G fabric cards is not supported except during migration.

> **Note** Throughout this document, the generic term Cisco CRS Carrier Routing system refers to the Cisco CRS-1, Cisco CRS-3, and Cisco CRS-X Carrier Routing Systems, unless otherwise specified.

The following figure shows the front view of a Cisco CRS 8-Slot Line Card Chassis Enhanced router with AC and DC power shelves installed.

Figure 1: Front (PLIM) View of the Cisco CRS 8-Slot Line Card Chassis Enhanced Router

CRS 8-Slot AC Front

CRS 8-Slot DC Front
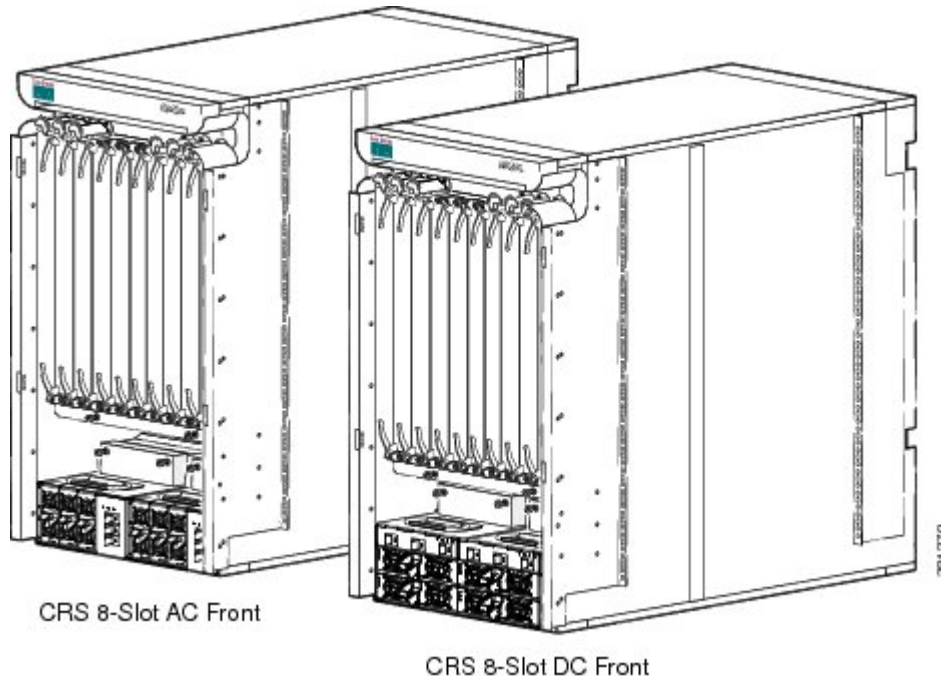
The following figure shows the rear view of a Cisco CRS 8-Slot Line Card Chassis Enhanced router with AC and DC power systems installed.

Figure 2: Rear (MSC) View of the Cisco CRS 8-Slot Line Card Chassis Enhanced Router

CRS 8-Slot AC Rear

CRS 8-Slot DC Rear
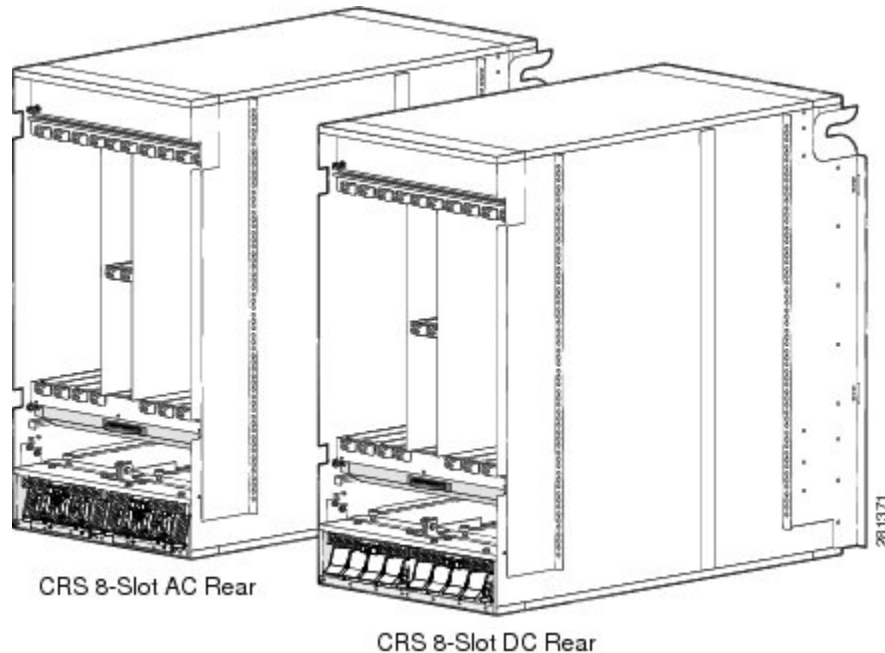
Chassis Components

This section lists the main components of a Cisco CRS 8-Slot Line Card Chassis Enhanced router. It primarily identifies the components that are considered field-replaceable units (FRUs), but where additional detail is useful identifies subassemblies that are not field replaceable. The Cisco CRS 8-Slot Line Card Chassis Enhanced router contains:

- As many as eight MSC, FP or LSP cards (all referred to as line cards), and eight PLIMs. The line card and PLIM are an associated pair of cards that connect through the chassis midplane. The line card provides the forwarding engine for Layer 3 routing of user data that is switched through the system, and the PLIM provides the physical interface and connectors for the user data. The line card can be associated with several different PLIMs, which provide different interface speeds and technologies.

Note For a complete list of line cards, route processors, SPAs and SIPs, and interface modules supported in the Cisco CRS 8-Slot Line Card Chassis Enhanced router, go to the Cisco Carrier Routing System Data Sheets at: http://www.cisco.com/en/US/products/ps5763/products_data_sheets_list.html .

- Chassis midplane. The midplane connects a line card to its associated PLIM. The midplane design allows a line card to be removed from the chassis without having to disconnect the cables that are attached to the associated PLIM. The midplane distributes power, connects the line cards to the switch fabric cards, and provides control plane interconnections. The midplane is not field replaceable by the customer.

Note   For a complete list of available PLIMs, consult your Cisco sales representative or visit: http://www.cisco.com

- One or two route processor cards (RPs). The RPs provide the intelligence of the system by functioning as the Cisco CRS 8-Slot Line Card Chassis Enhanced router system controller (serving as part of the control plane in multi-chassis systems) and providing route processing. Only one RP is required for system operation. For redundant operation, you can order a second RP as an option (CRS-8-RP/R). When two RPs are used, only one RP is active at a time. The second RP acts as a "standby" RP, serving as a backup if the active RP fails.

The RP also monitors system alarms and controls the system fans. LEDS on the front panel indicate active alarm conditions.

A Performance Route Processor (PRP) is also available for the Cisco CRS 8-Slot Line Card Chassis Enhanced router. Two PRPs perform the same functions as two RPs, but provide enhanced performance for both route processing and system controller functionality.

Note   A chassis may not be populated with a mix of RP and PRP cards. Both route processor cards should be of the same type (RP or PRP). If you are using the Cisco CRS-X system, PRPs are required.

- Four half-height switch fabric cards (SFCs). These fabric cards provide the three-stage Benes switch fabric for the routing system.

Note   The Cisco CRS 8-Slot Line Card Chassis Enhanced router supports either 40G fabric (FC/S cards), 140G fabric (FC-140/S cards), or 400G fabric (FC-400/S cards). A router with a mix of 40G, 140G, and 400G fabric cards is not a supported mode of operation. Such a mode is temporarily allowed only during the upgrade process.

- A power system that provides redundant power to the chassis. Two types of power systems are available: either AC or DC power.

- Upper and lower fan trays. The fans pull cool air through the chassis. A removable air filter is located below the PLIM card cage at the front of the chassis.

Chassis Overview

This section provides an overview of the physical chassis characteristics:

Slot Numbers

The following figure shows the slot numbering on the front (PLIM) side of the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

Figure 3: Cisco CRS 8-Slot Line Card Chassis Enhanced Router Slot Numbering—Front (PLIM) Side
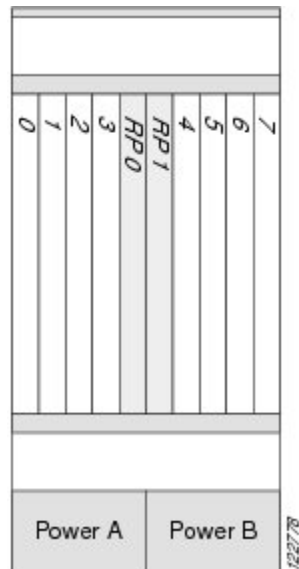
As shown, the components on the front (PLIM) side of the chassis include:

- Eight PLIM slots: left to right, 0, 1, 2, 3, 4, 5, 6, 7

- Two route processor card slots, RP0 and RP1

- Two power supplies (A and B) - 6 power modules (PMs) for AC & 8 power modules (PMs) for DC

The following image shows the slot numbers on the rear (MSC) side of the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

Figure 4: Cisco CRS 8-Slot Line Card Chassis Enhanced Router Slot Numbers—Rear (MSC) Side
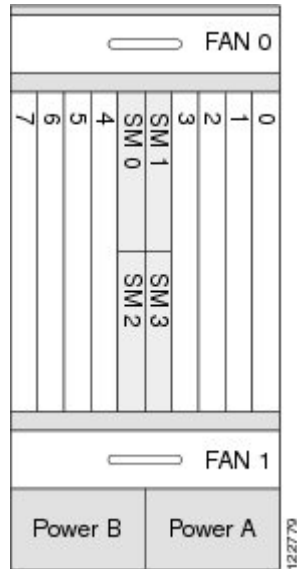
As shown, the components on the rear (MSC) side of the chassis include:

- Upper fan tray 0
- Card cage, including:
  - Eight line card slots (0, 1, 2, 3, 4, 5, 6, 7)
  - Four half-height switch fabric card slots (SM0, SM1, SM2, and SM3)
- Lower fan tray 1
- Two power supplies (A and B) - 6 power modules (PMs) for AC & 8 power modules (PMs) for DC

The MSC slot numbers on the rear of the chassis are reversed from the PLIM slot numbers on the front side of the chassis. A mated MSC and PLIM are slot specific and mated through the midplane. The MSC slot 0, on the far right side of the chassis looking at it from the rear (MSC) side, is mated with the PLIM slot 0, on the far left side of the chassis looking at it from the front (PLIM) side. All other MSC and PLIM slots (1 through 7) are mated via matching slot numbers through the midplane also.

Cable Management

The Cisco CRS 8-Slot Line Card Chassis Enhanced router has cable management features for the front (PLIM) side of the chassis, just above the card cage. The horizontal cable management trays have a special telescoping feature that allows them to be extended when the chassis is upgraded with higher-density cards. This extension also helps when installing the cables in the chassis.

Note Do not install the front cover on the chassis when the telescoping feature is in use.

The following figure shows the cable management bracket.

Figure 5: Cable Management Bracket
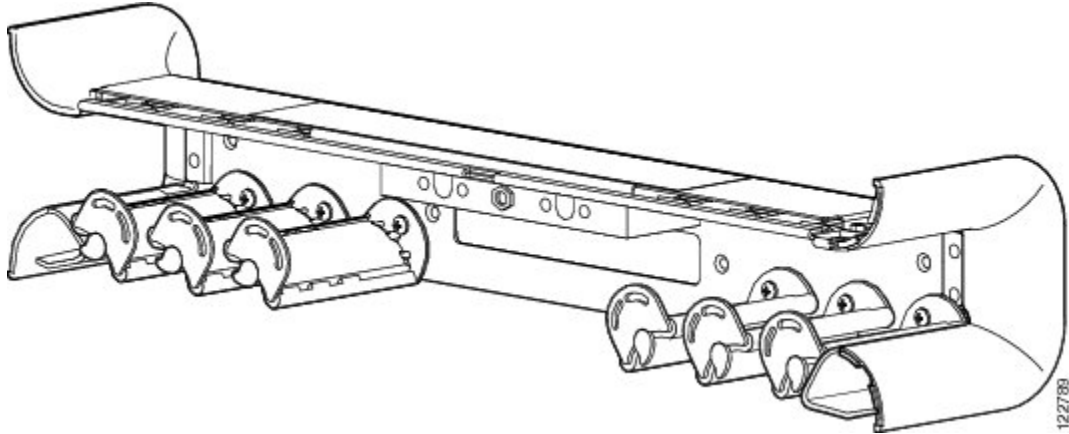
Safety Guidelines

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

Note Although power shelves may be installed or removed without powering down the system, for safety purposes we recommend that you power down the system before you install or remove a power shelf.

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 Regulatory Compliance and Safety Information that are applicable to your router before installing, configuring, or troubleshooting any installed card.

- Never attempt to lift an object that might be too heavy for you to lift by yourself.

- 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.

- Keep tools and router components away from walk areas.

- Do not wear loose clothing, jewelry, and other items that could get caught in the router while working with line cards, or their associated components.

- Use Cisco equipment in accordance with its specifications and product-usage instructions.

- Do not work alone if potentially hazardous conditions exist.

- Make sure your installation follows national and local electrical codes: in the United States, National Fire Protection Association (NFPA) 70, United States National Electrical Code; in Canada, Canadian Electrical Code, part I, CSA C22.1; in other countries, International Electrotechnical Commission (IEC) 60364, part 1 through part 7.

- Connect only a DC power source that follows the safety extra-low voltage (SELV) requirements in UL/CSA/IEC/EN 60950-1 and AS/NZS 60590 to the DC-input power system.

- Make sure that you have a readily accessible two-poled disconnect device incorporated in the wiring of a CRS configured with the DC-input power system.

- Make sure that you provide short-circuit (overcurrent) protection as part of the building installation.

Preventing Electrostatic Discharge

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. We recommend to use an ESD-preventive strap whenever you handle network equipment or one of its components.

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 a bare metal surface on the chassis.

- Handle a card by its ejector levers, when applicable, or the card's metal carrier only; avoid touching the board or connector pins.

- Place a removed card 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 card and clothing. The wrist strap protects the board only from ESD voltage on the body; ESD voltage on clothing can still cause damage.

Installing Power Components

Installing Power Components

This chapter provides instructions on how to install Cisco CRS 8-Slot Line Card Chassis Enhanced router power components.

This chapter presents the following topics:

Power Systems Overview

The chassis power system provides power to chassis components and is made up of two AC or DC power shelves that contain AC or DC power modules (PMs).

The AC power system requires single-phase AC input power to the power shelves. If you have 3-phase AC Delta or AC Wye at your equipment, a *Cisco CRS power distribution unit (PDU)* will be required to convert 3-phase AC input power to single-phase AC input power for the power shelf. The power system also includes SNMP MIBS and XML support.

Note   In the AC power system, PDU refers to the *Cisco CRS PDU* which is required to convert 3-phase AC-Wye or AC-Delta input power to single-phase AC input power for the AC power shelf. For further information and installation instructions, see the Cisco CRS 3-Phase AC Power Distribution Unit, on page 32 *section* .

This section contains the following topics:

Basic Chassis Power Details

The Cisco CRS 8-Slot Line Card Chassis Enhanced router can be configured with either a DC-input power subsystem or an AC-input power subsystem. Site power requirements differ, depending on the source voltage used.

Follow these precautions and recommendations when planning power connections to the router:

- Check the power at your site before installation to ensure that you are receiving clean power. Install a power conditioner, if necessary.

- Install proper grounding to avoid damage from lightning and power surges.

The Cisco CRS 8-Slot Line Card Chassis Enhanced router requires that at least one power shelf and its components be installed to operate properly; however, if you install only one power shelf and its components, your system will not be 2N redundant.

Two types of power shelves exist: an AC shelf and a DC shelf. An AC power shelf houses the AC PMs, while a DC power shelf houses the DC PMs. It is required that you use only one type of power shelf, either AC or DC, in a chassis at a time.

⚠️

Danger   This unit might have more than one power supply connection. All connections must be removed to de-energize the unit. **Statement 1028**

Bonding and Grounding Guidelines

The chassis allows you to connect the central office ground system or interior equipment ground system to the bonding and grounding receptacles on the router chassis. Six chassis grounding points are provided at the rear (MSC) side of the chassis. Each side of the chassis has one pair of threaded ground studs located on the inside of the chassis and two sets of grounding receptacles located on the outside of the chassis.

The following figure shows the grounding points on the rear (MSC) side of the chassis. These ground points are also called the network equipment building system (NEBS) bonding and grounding points.

✎

Note   These bonding and grounding receptacles satisfy the Telcordia NEBS requirements for bonding and grounding connections.

⚠️

Caution Do not remove the chassis ground cable unless the chassis is being replaced.

Figure 6: NEBS Bonding and Grounding Points (Rear of Chassis)
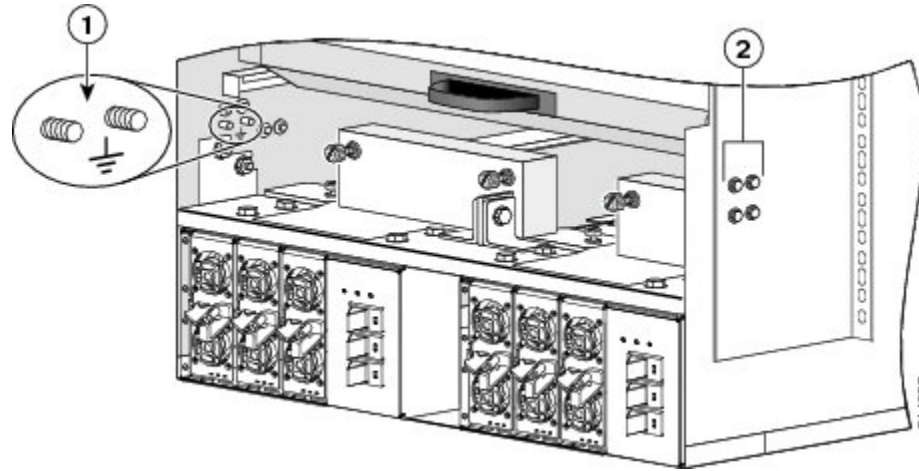
1	NEBS bonding and grounding points (inside chassis)
2	NEBS bonding and grounding points (outside chassis)

DC Power Systems

The Cisco CRS 8-Slot Line Card Chassis Enhanced router DC power system can provide up to 8,400 W to power the line card chassis.

✏️

Note Depending on the hardware deployed at your site, your system may not consume the maximum power supplied by the power system.

The Cisco CRS 8-Slot Line Card Chassis Enhanced router does not contain an alarm module. The DC PM monitors PM status and processes alarm functions. The PM distributes power and passes PM status signals to the system. Alarms are processed through the route processor (RP). LEDs on the front panel of the RP card indicate active alarm conditions.

Each DC powered chassis contains two DC power shelves for 2N redundancy. The shelves contain the input power connectors. Each shelf can accept up to four DC PMs. The power shelves and DC PMs are field replaceable. If DC power to one power shelf fails, the other power shelf provides enough power for the chassis. This 2N power redundancy enables the routing system to operate in spite of single power failure.

The following figure shows the wiring on the rear of a DC power shelf.

Figure 7: DC Power Shelf Wiring
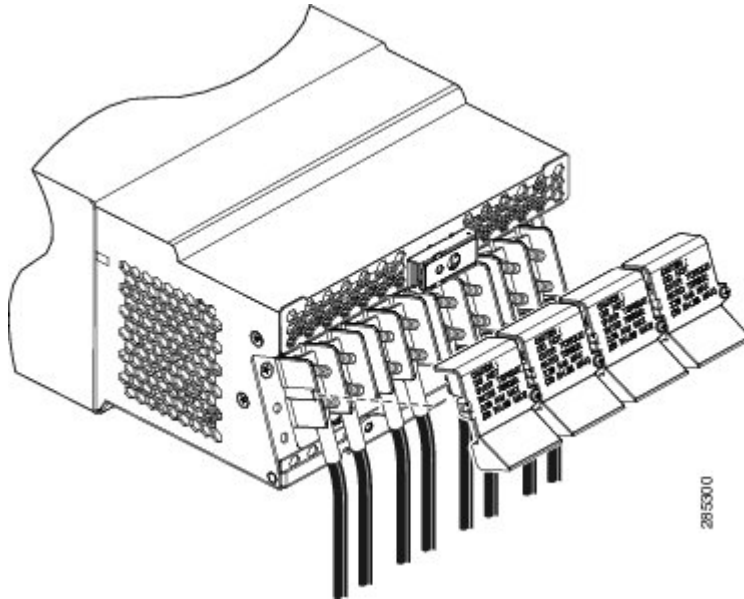
Each power shelf operates with up to four DC inputs of −48/−60 VDC (nominal), 60 A. The power shelf accepts input DC power in the range −40 to −72 VDC.

We recommend that the terminal block covers, shown in Figure 7: DC Power Shelf Wiring, on page 14, should only be removed when wiring and unwiring the power shelf. The terminal block cover is slotted in such a way that cables can only come out the bottom portion of each cover.

The power supply terminal posts are centered 0.63 inches (5/8 inch) (1.6 cm) apart and are M6-threaded. We recommend that you use an appropriately sized 180-degree angle (straight) industry standard 2-hole, standard barrel compression lug, as shown in the following figure.

Figure 8: 180-Degree (Straight) DC Power Cable Lug
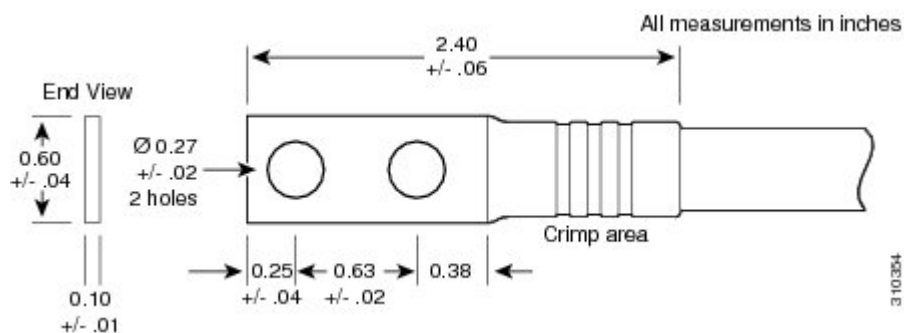
Note   DC power cables have a torque value of 20 in.-lb (2.26 N-m) and chassis ground cable connectors have a torque value of 30 in.-lb (3.39 N-m).

For additional power details, see Appendix A, "Technical Specifications."

AC Power Systems

The Cisco CRS 8-Slot Line Card Chassis Enhanced router AC power system can provide up to 9,000 W to power the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

Note Depending on the hardware deployed at your site, your system may not consume the maximum power supplied by the power system.

Each AC powered chassis contains two AC power shelves for 2N redundancy. The shelves contain the input power connectors. Each shelf can contain up to three AC PMs. The power shelves and the AC PMs are field replaceable.

The Cisco CRS 8-Slot Line Card Chassis Enhanced router does not contain an alarm module. The AC PM monitors PM status and processes alarm functions. The AC PM distributes power and passes PM status signals to the system. Each PM has its own integrated fuse to protect the system, and each PM is plugged into its own power outlet. Alarms are processed through the RP. LEDs on the front panel of the RP indicate active alarm conditions.

The AC power system requires single-phase AC input power. If you have 3-phase AC Delta or AC Wye at your equipment, a *Cisco CRS PDU* will be required to convert 3-phase AC input power to single-phase AC input power for the power shelf. For further information, see Cisco CRS 3-Phase AC Power Distribution Unit, on page 32.

The AC power shelf has the following input VAC power requirements:

- Single-phase, 200 to 240 VAC nominal, 50 to 60 Hz, 16 Ax3.

- Each power shelf contains three IEC-320-C22 receptacles which can accept up to three IEC-320-C21 connector plugs.

Note In order to maintain a balanced 3-phase power load, three AC PMs are required to be installed in a Cisco CRS 8-slot line card chassis AC power shelf.

Note We recommend that you use appropriate short-circuit protection in compliance with national and local electrical codes.

For additional power details, see Appendix A, "Technical Specifications."

How to Install Power Components

This section describes how to install power components in the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

Note Although there are differences between the different types of power shelves and PMs (AC and DC), they are installed and removed using the same procedures.

We recommend that you install the power components in the order outlined in this section. This section contains the following procedures:

Installing the Chassis Ground Cable

This section describes how to install the ground cable on the Cisco CRS 8-Slot Line Card Chassis Enhanced router. For complete information on regulatory compliance and safety, see Regulatory Compliance and Safety Information for the Cisco CRS Carrier Routing System .

Prerequisites

To ensure a satisfactory ground connection, you need the following parts:

- One grounding lug that has two M6 bolt holes with 0.63-inch (5/8 inch) (1.6 cm) of spacing between them, center to center, and a 6-AWG multistrand copper cable. The lug is similar to the type used for the DC-input power supply leads, as shown in #con_1225323/fig_1227720.

- Four M6 hex-head nuts with integrated locking washers are shipped pre-installed on the inside of the chassis.

- Eight M6 hex-head bolts with integrated locking washers are shipped pre-installed on the outside of the chassis.

- Cisco recommend at least 6 AWG multistrand copper ground cable. This cable is not available from Cisco Systems; it is available from any commercial cable vendor. The cable should be sized according to local and national installation requirements.

Caution The DC Return of the Cisco CRS 8-Slot Line Card Chassis Enhanced router should remain isolated from the system frame and chassis (DC-I: Isolated DC Return).

Required Tools and Equipment

You need the following tools to perform this task:

- One ground lug for equipment-side ground connection. In a rack application, the rack-side of the ground cable will also require a lug.

- Ground cable

- Crimping tool and lug specific die

- 3/8 in. drive socket wrench

- 10-mm 6 pt. socket

- Torque wrench with 10-mm 6 pt. socket and rated accuracy at 30 in.-lb (3.39 N-m)

Steps

To attach the ground cable to the chassis, perform the following steps:

Procedure

Step 1	Use the crimping tool mandated by the lug manufacturer to crimp the lug to the ground cable.
Step 2	Using the 10-mm socket, attach the ground cable to one of the grounding points at the rear of the chassis. Then use the torque wrench to tighten to a torque of 30 in.-lb (3.39 N-m). The following figure shows how the ground cable is attached to the different ground points on the chassis.

Figure 9: Ground Cables Attached to Chassis Grounding Points
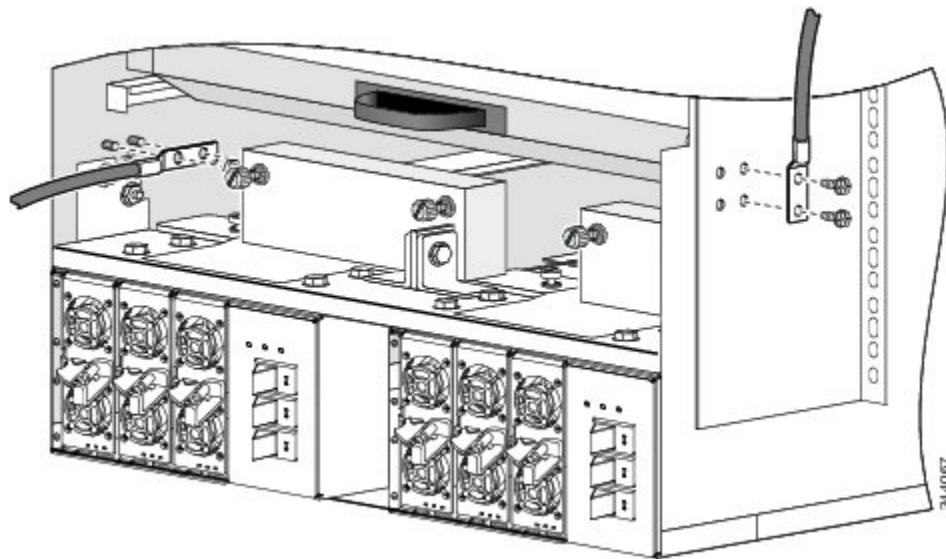
What to Do Next

After the chassis ground cable has been attached, install the power shelves in the chassis. See the Installing an AC or DC Power Shelf, on page 17 for more information.

Installing an AC or DC Power Shelf

This section describes how to install an AC or DC power shelf in the Cisco CRS 8-Slot Line Card Chassis Enhanced router. For complete information on regulatory compliance and safety, see the Regulatory Compliance and Safety Information for the Cisco CRS Carrier Routing System.

Although there are differences between the AC and DC power shelves, they are installed using the same procedures.

The following figure shows the rear view of the AC power shelf.
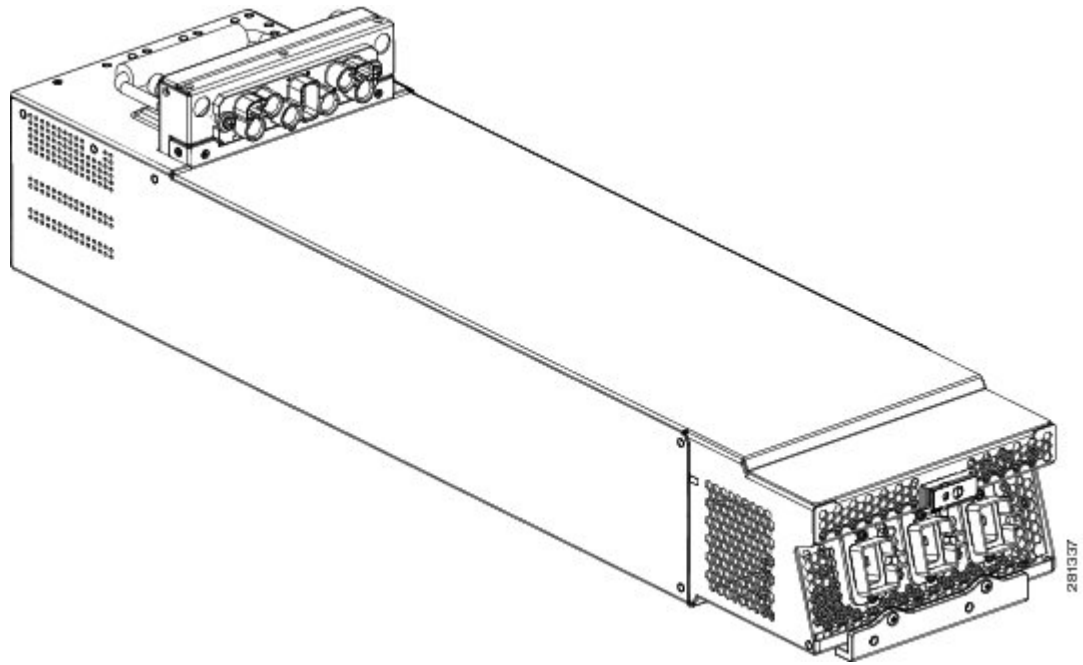
The following figures show the rear view of the DC power shelf.

Figure 10: DC Power Shelf, Rear View
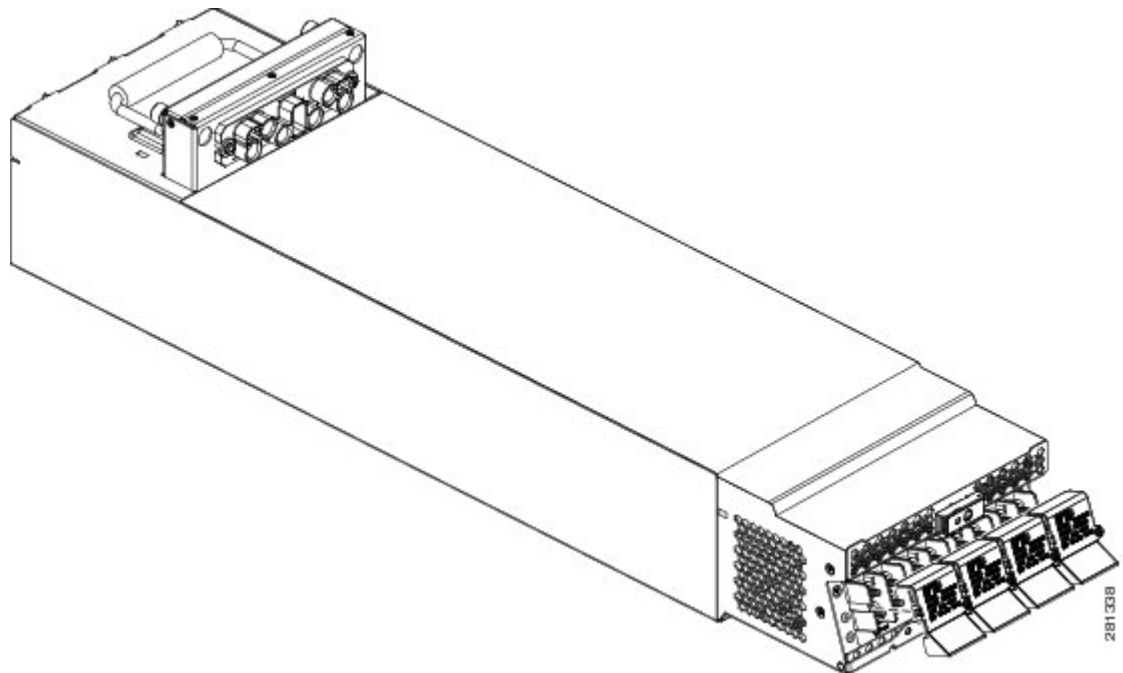
Required Tools and Equipment

You need the following tools to perform this task:

- 6-in. long number 1 Phillips screwdriver

- number 2 Phillips screwdriver

- 5/32 x 6-in. flat blade screwdriver

- 10-mm 6-pt. socket wrench

- 3/8-in. drive socket wrench

- AC or DC power shelf

    - DC power shelf (Cisco product number CRS-8-PSH-DC-B), or

    - AC power shelf (Cisco product number CRS-8-PSH-AC-B)

Steps

To install the power shelf, go to the rear of the chassis and perform the following steps:

Procedure

Step 1 Ensure that all power cords are disconnected from the power shelf.

Step 2 At the front (PLIM) side of the chassis, using the number 2 Phillips screwdriver, insert the power shelf so that it stops against the rear mounting bracket, then fasten the power shelf to the chassis. (There are two screws per shelf, see the following figure.

Figure 11: Fastening the Power Shelf to the Chassis
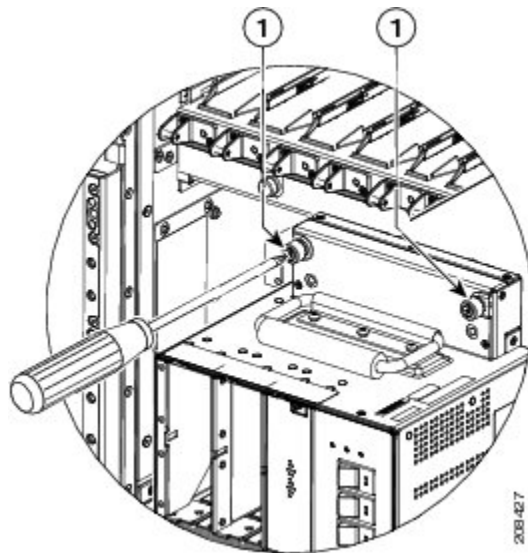
1	Screws to tighten and secure power shelf to chassis.

Step 3   At the rear of the chassis, using the 10-mm socket wrench, loosen the hex head bolts which secure the bracket to the chassis, as shown in the following figure.

Figure 12: Securing Nuts on Mounting Studs
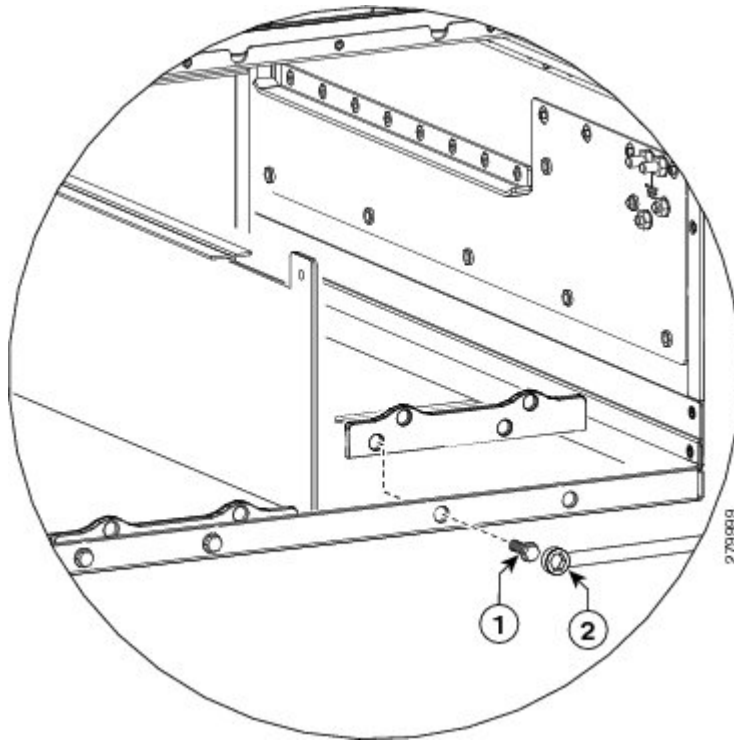
1	M6 hex nuts that secure bracket to chassis (two on each side of the chassis)
2	10-mm wrench to secure hex nuts

Step 4   Using the flat-blade screwdriver, install power shelf mounting screws, to secure power shelf to rear mounting bracket.

Figure 13: Securing Power Supplies to Cross Bracket and Rear Mounting Brackets

1	Power shelf mounting screws, two slotted screws per shelf
2	M6 hex head bolts to secure power shelf, four per shelf

Step 5   Secure the power shelf using the 10-mm hex head bolts (four per power shelf).

Step 6   Retighten the hex head bolts which secure the bracket to the chassis. See Figure 12: Securing Nuts on Mounting Studs, on page 20.

What to Do Next

After the power shelves have been installed in the chassis, install the DC input wiring and DC terminal block covers or install the AC cords, as described in Installing AC Power Cords or DC Power Shelf Wiring, on page 21.

Installing AC Power Cords or DC Power Shelf Wiring

This section describes how to install the DC input wiring and DC terminal block covers, or install the AC power cords on the Cisco CRS 8-Slot Line Card Chassis Enhanced router. For complete information on regulatory compliance and safety, see Regulatory Compliance and Safety Information for the Cisco CRS Carrier Routing System.

Installing DC Power Shelf Wiring

This section describes how to connect the DC input wiring to rear of the DC power shelf and install the terminal block covers. For more detailed information on chassis DC power systems, see DC Power Systems, on page 13.

The following figure shows the power cable connections at the rear of the DC power shelf.

Figure 14: DC Power Shelf Cable Wiring for Power Shelf

⚠️
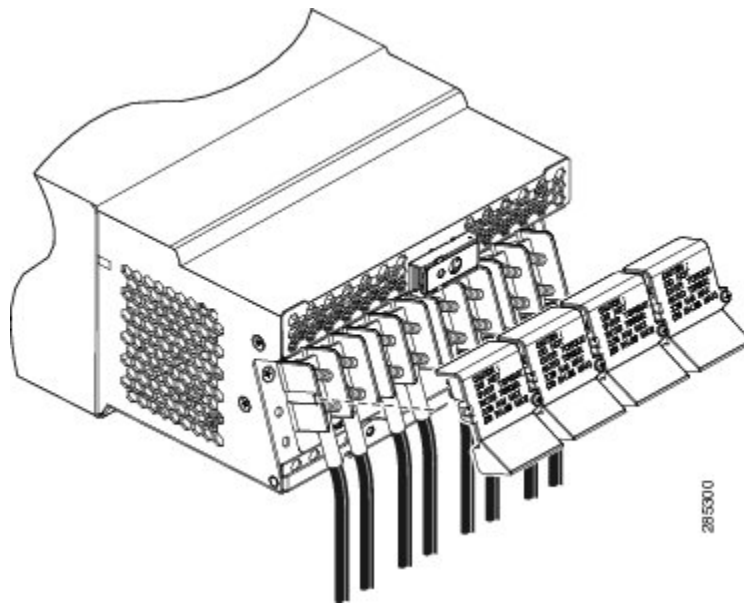
Caution   When wiring the power shelf, be sure to attach the chassis ground cable to the chassis first. For more information, see Bonding and Grounding Guidelines, on page 12 and Installing the Chassis Ground Cable, on page 16.

Prerequisites

Before performing this task, ensure that both power shelves are installed in the chassis.

⚠️

Caution   Before installing wiring on the power shelf, make sure that the input power cables are not energized.

Required Tools and Equipment

You need the following tools to perform this task:

- DC power cables

- DC power cable lugs

- Crimping tool and lug specific die

- 3/8 in. ratchet wrench with 10-mm socket

- Multimeter

- Torque wrench with 10-mm 6 pt. socket and rated accuracy at 20 in.-lb (2.26 N-m)

Steps

To wire the DC power shelf, perform the following steps:

Procedure

Step 1   Remove the terminal block covers, if installed.

Step 2   Verify the following resistance values on both power shelves:

- The resistance between the positive and negative power terminal studs of each input must be greater than 90 KOhm.

- The resistance between each positive terminal stud and bare metal surface on the power shelf must be greater than 10 MOhm.

- The resistance between each negative terminal stud and bare metal surface on the power shelf must be greater than 10 MOhm.

Note   Typical hand held Ohm meters will not measure 10 MOhms, instead they will auto range to acquire a measurement and give an out of range reading. This is an acceptable reading provided that the meter is in calibration.

Step 3 Use the crimping tool mandated by the lug manufacturer to crimp the lugs to the DC-input cables. For details on lugs, see DC Power Systems, on page 13.

The cable should be sized according to local and national installation requirements. Use only copper cable.

> **Note** The terminal posts are centered 0.63 inches (5/8 inch) (1.60 cm) apart and are M6-threaded. We recommend that you use an appropriately sized 180-degree (straight) industry standard 2-hole, standard barrel compression lug.

> **Caution** This is a positive ground system; make sure to connect the positive lead to the +RTN terminal and the negative lead to the -48V terminal.

Step 4 Using the wrench, attach the positive and negative cable pairs to each terminal block on the first power shelf (Power A). Start with PM0 (located on the right side) and move left, finishing with PM3 (located on the left side).Use the torque wrench to tighten to a torque of 20 in.-lb (2.26 N-m).

Step 5 Using the wrench, attach the positive and negative cable pairs to each terminal block on the second power shelf (Power B). Start with PM0 (located on the right side) and move left, finishing with PM3 (located on the left side).Use the torque wrench to tighten to a torque of 20 in.-lb (2.26 N-m).

Step 6 After all DC cabling is installed install the distribution covers. See Installing DC Terminal Block Covers, on page 30. This should be done prior to applying power for safety.

What to Do Next

After the DC power shelf wiring has been installed, install the DC PMs. For more information, see Installing a Power Module, on page 25.

Installing AC Power Cords

This section describes how to install input AC power cords on the rear of the power shelf.

> **Note** When wiring the power shelf, be sure to connect the chassis ground cable first. For more information see Bonding and Grounding Guidelines, on page 12 and Installing the Chassis Ground Cable, on page 16.

Prerequisites

Before performing this task, ensure that both power shelves are installed in the chassis.

If you have AC Delta or AC Wye at your equipment, a *Cisco CRS PDU* will be required to convert 3-phase AC input power to single-phase AC input power for the power shelf. For further information, see Cisco CRS 3-Phase AC Power Distribution Unit, on page 32.

> **Note** If you have a Cisco CRS PDU installed, the AC power cords must be installed as labeled. For further information, see Cisco CRS 3-Phase AC Power Distribution Unit, on page 32.

> **Note** Before installing input AC power cords on the power shelf, make sure that the input power cords are not energized.

Required Tools and Equipment

You need the following tools to perform this task:

- 6-in. long number 1 Phillips screwdriver

- Input AC power cords, depending on locale (See Appendix B, "Product IDs.")

Steps

To install the AC cords, go to the rear of the chassis and perform the following steps:

Procedure

Step 1 Insert the AC cords into the AC cord clamps, as shown in the following figure.

Figure 15: Inserting AC Cord into Cord Clamp
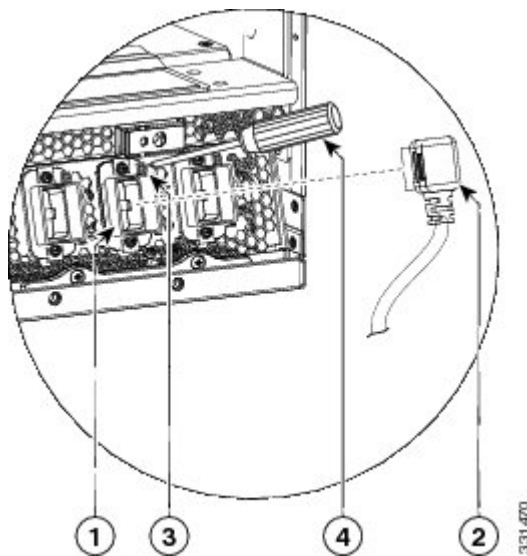
1	Cord clamp	3	Screw that secures the cord in clamp
2	Cord to be inserted into clamp	4	Screwdriver that tightens screw

Step 2 Use the Phillips screwdriver to tighten the screw that clamps the cord in place, see Figure 15: Inserting AC Cord into Cord Clamp, on page 24.

What to Do Next

After you install the AC input cords, install the AC or DC PMs. For more information, see Installing a Power Module, on page 25.

Installing a Power Module

This section describes how to install the AC or DC PMs, shown in the following figure, in the Cisco CRS 8-Slot Line Card Chassis Enhanced router. For complete information on regulatory compliance and safety, see *Regulatory Compliance and Safety Information* for the Cisco CRS Carrier Routing System.

Although there are differences between the AC and DC PMs, they are installed in the same manner.

Figure 16: Power Module
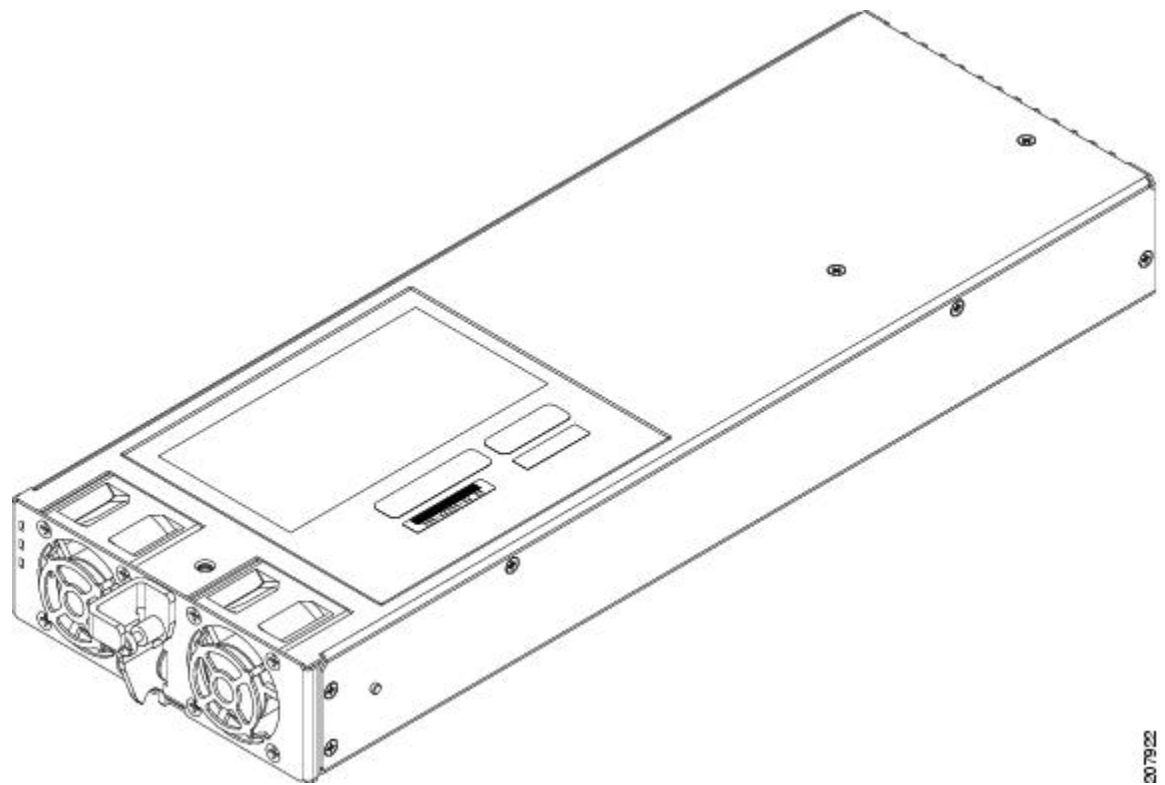
Prerequisites

Before performing this task, you must first install both power shelves.

⚠️

Caution   Do not attempt to install the PMs until the power shelf is in place and screwed into the chassis.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap

- 6-in. long number 1 Phillips screwdriver

- Torque screwdriver with number 1 Phillips bit and rated accuracy at 5.5 in-lb (0.62 N-m)

- AC or DC PM

    ◦ AC PM (Cisco product number CRS-PM-AC=)

    ◦ DC PM (Cisco product number CRS-PM-DC=)

Steps

To install the AC or DC PMs in the power shelf, go to the front of the chassis and perform the following steps:

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.

Step 2 Using two hands to support and guide the PM, slide it into the power shelf.

Figure 17: Sliding PM Into Power Shelf
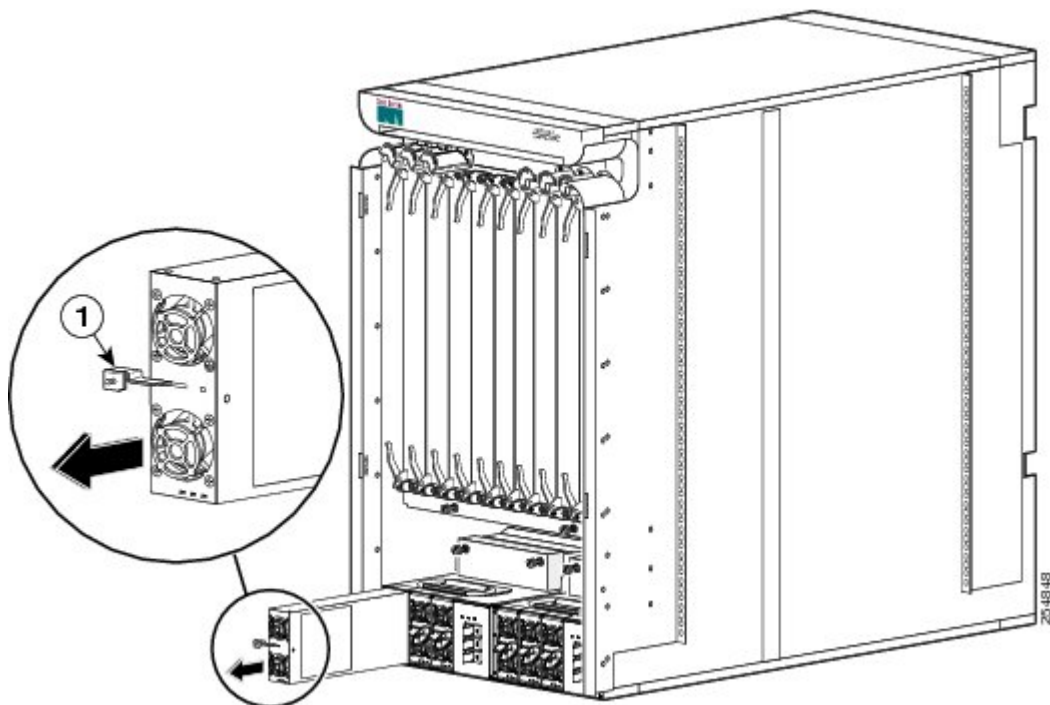
| 1 | Ejector pulled away from the PM. |

Step 3   Flip up Figure 17: Sliding PM Into Power Shelf, on page 26 Figure 3-15) and with nominal install torque of 5.5 in-lb (0.62 N m) of torque, screw the PM into the shelf (see following figure). Do not exceed an install torque value of 10 in-lb (1.13 N-m).

Figure 18: Securing the Ejector Into the PM
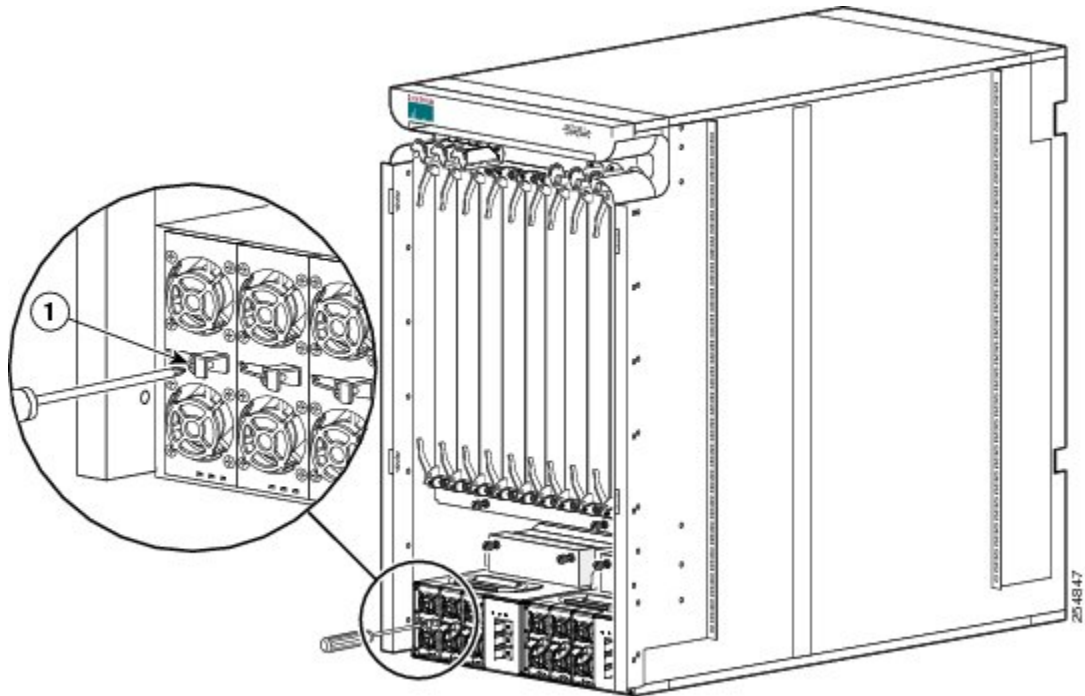
| 1 | Screw the ejector into the PM |

Step 4   Fill the power shelf, in PM ascending order, to the required configuration.

Power Up and Power Down a Chassis

This section describes how to power up and power down a chassis with an AC or DC power shelf. For details on the chassis power systems, see Basic Chassis Power Details, on page 11, DC Power Systems, on page 13, and AC Power Systems, on page 15.

Most components on the chassis, such as the PMs and fan trays, can be removed or installed in the chassis while it is running. Although it is possible to install or remove a power shelf while the chassis is running, it is recommended to remove power from the chassis completely, if possible, for service protection and safety.

Power Up a Chassis

This section describes how to power up a chassis with a AC or DC power shelf.

Prerequisites

Before performing this task, you must install and wire the power shelves, install the PMs, and install the route processor (RP) card. See Installing an AC or DC Power Shelf, on page 17, Installing AC Power Cords or DC Power Shelf Wiring, on page 21, Installing a Power Module, on page 25, and Installing an RP, PRP, or DRP Card, page 6-20 for more information.

Steps

To power up the chassis, perform the following steps:

Procedure

Step 1 Make sure that the facility power breakers for shelf (Power A) and shelf (Power B) are in the OFF position. [AC or DC]

Step 2 Make sure that I/O switches on the rear of the shelf (Power A) and shelf (Power B) are in the OFF position. [AC or DC]

Step 3 Make sure all boards (RPs, PLIMs, SFCs, and FPs) are pulled-out and disconnected from the backplane (if installed). [AC or DC] See Installing an RP, PRP, or DRP Card, page 6-20 for more information.

Step 4 For AC systems, go to Step 5. For DC systems only, complete the following:

a) Energize the facility breaker to PM 0, on power shelf A.

b) Measure the voltage at the input terminal block and verify that the DC voltage between the positive and negative terminals is between -48 VDC and -60 VDC. Make a note of this voltage measurement.

c) Verify that PM 0 Input_OK LED is lit

d) Turn the facility breaker to the OFF position.

   Caution   Make sure that the polarity of the DC input wiring is correct.

   Caution   This is a positive ground system; make sure to connect the positive lead to the +RTN terminal and the negative lead to the -48V terminal.

e) Repeat Steps 4a. through 4d. for each of the remaining DC inputs on power shelf A.

f) Repeat Steps 4a. through 4d. for each of the DC inputs on power shelf B.

g) Continue with Step 6 to complete the power up procedure.

Step 5 For AC systems only, complete the following:

a) Open circuit breakers on PDU for each feed (3 A & 3 B).

b) Connect 3 phase Delta / Wye into source outlet.

c) Energize the office 3 phase breakers for side A.

d) Close PM0 (AB) breaker on PDU for side A, verify power IN OK LED is on.

e) Repeat Step 5d. for PM 1 & 2 side A.

f) De-energize the office three phase breaker.

g) Repeat Steps 5c. through 5f. for side B.

h) Continue with Step 6 to complete the power up procedure.

Step 6   Turn the facility breakers for power shelf A to the ON position. Verify that the Input_OK LED on all of the PMs installed in shelf A are green. [AC or DC]

Step 7   Turn the I/O switch at the rear of the power shelf A to the ON position. Verify that the Output_OK LED on all of the PMs installed in power shelf A are green. [AC or DC]

Step 8   Repeat Step 6 and Step 7 for power shelf B. [AC or DC]

Step 9   Turn the I/O switch at the rear of both power shelves (Power A and Power B) to the OFF position. [AC or DC]

Step 10   Verify that none of the Output_OK LEDs on the PMs installed in the shelf are green. [AC or DC]

Step 11   Install all boards (RPs, PLIMs, SFCs, FPs, FANs & FAN Filter) in the chassis. [AC or DC] For more information, see Chapters 4 & 6.

Step 12   Turn the I/O switch at the rear of both power shelves (Power A and Power B) to the ON position. [AC or DC]

Step 13   Measure the input voltage of each DC input and compare this value to the voltage measurement noted in Step 4b [DC only]. Verify that the equipment is still receiving the correct input voltage.

Power Down a Chassis

This section describes how to power down a chassis with a AC or DC power shelf.

Prerequisites

Before performing this task, you must ensure that the system software has been shut down.

Steps

To power down the chassis, perform the following steps:

Procedure

Step 1   Turn the power shelf power output breakers to the OFF position.
Note   There is no required order in which you must turn off the power shelves.

Step 2   Turn the facility breaker for both power shelves (Power A and Power B) to the OFF position.
Note   To power down the chassis entirely, both power shelves must be disconnected to de-energize the chassis completely.

What to Do Next

The following table shows the LED status indicator lights for the AC and DC PMs installed in a power shelf.

Table 3: PM LED Status Indicator Lights

LED Name	Color	Function or Meaning
Input_OK	Green	On: The input voltage is present and within regulation range. Blinking: The input voltage is present but out of regulation range. Off: The input voltage is not present.
Output_OK	Green	On: The output voltage is on. Blinking: The PM is in a power limit or an OC condition. Off: The output voltage is off.
Fault	Red	On: An internal fault is detected within the PM. Off: The PM has no internal fault.

What to Do Next

After the DC power shelf wiring has been installed, attach the terminal block covers. Continue to the Installing DC Terminal Block Covers, on page 30 for instructions.

Installing DC Terminal Block Covers

The following figure shows the DC terminal block cover.

Figure 19: DC Terminal Block Cover
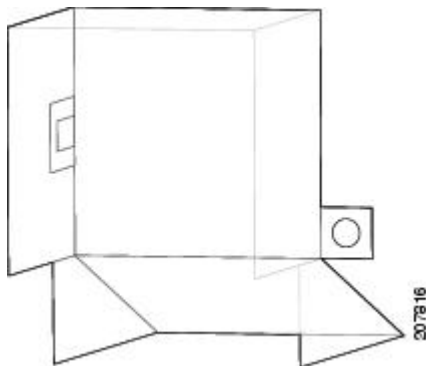
Note   Install the terminal block cover after the input wiring is installed, but before the power is energized.

Required Tools and Equipment

You need the following tools to perform this task:

- 6-in. long number 1 Phillips screwdriver
- Terminal block covers

Steps

To install the DC terminal block covers, go to the rear of the chassis and perform the following steps:

Procedure

Step 1 Align the DC terminal block cover with the cover latch tab.

Step 2 Use the Phillips screwdriver to secure the screw into the mounting standoff, see following figure.

Figure 20: Securing the DC Terminal Block Cover
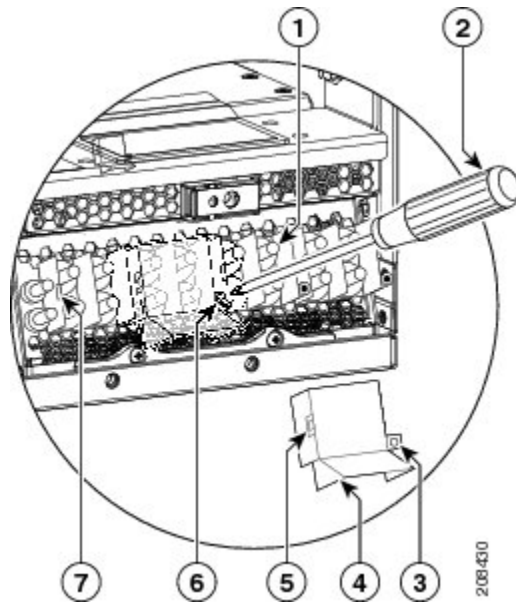
1	Mounting Standoff	5	Opening to align over mounting pins
2	Screwdriver securing the cover	6	Screw to tighten
3	Opening to align over mounting pins	7	Cover latch tab
4	Terminal block cover		

Converting from One Power System to Another

To convert a Cisco CRS 8-Slot Line Card Chassis Enhanced router with from AC to DC power, or from DC to AC power, perform the following steps:

Procedure

Step 1 Power down the chassis completely.

Step 2 Remove the AC or DC PMs from the power shelves. See Removing AC or DC PMs, page 7-24 ,

Step 3 Remove the AC or DC wiring from the rear of the power shelves. See the Removing AC Power Cords or DC Power Shelf Wiring, page 7-27 .

Step 4 Remove the power shelves. See Removing a Power Shelf, page 7-30 .

Step 5 Install the new power shelves. SeeInstalling an AC or DC Power Shelf, on page 17.

Step 6 Install the power shelf wiring. See Installing AC Power Cords or DC Power Shelf Wiring, on page 21.

Note   If you are converting from DC power to AC power, and if you have 3-phase AC Delta or AC Wye power at your equipment, a *Cisco CRS PDU* will be required to convert 3-phase AC input power to single-phase AC input power for the power shelf. For further information, refer to *the* Cisco CRS 3-Phase AC Power Distribution Unit, on page 32 *section* .

Step 7 Install the AC or DC PMs. See Installing a Power Module, on page 25.

Step 8 Power the chassis back up. See the Power Up and Power Down a Chassis, on page 27.

What to Do Next

⚠

Caution   Use only one type of power shelf—AC or DC—and its mating AC or DC PM in a chassis at one time.

Cisco CRS 3-Phase AC Power Distribution Unit

This section describes the Cisco CRS Power Distribution Unit (PDU). The PDU converts 3-phase AC input power to single-phase AC output power that connects directly to the rear of the modular configuration AC power shelf.

The AC PDU includes either an AC Delta or AC Wye power interface, and has power input and power output cords entering and exiting the box. The PDU can be installed in a 19-inch rack or other locations, depending on the PDU type, by using chassis mounting brackets.

In this document, single PDU refers to the individual PDU that converts 3-phase AC input power to single-phase AC output power. Cisco product numbers for single PDUs are as follows:

- PDU-321-3-Delta—3-phase to single-phase AC Delta PDU, 1 input/3 output

- PDU-321-3-Wye—3-phase to single-phase AC Wye PDU, 1 input/3 output

- PDU-321-6-Delta—3 phase to single-phase AC Delta PDU, 2 input/6 output

- PDU-321-6-Wye—3-phase to single-phase AC Wye PDU, 1 input/6 output

A PDU kit refers to all the components that are required to be installed in a redundant Cisco CRS system. A PDU kit contains 2 single PDUs and any necessary mounting brackets or hardware. When ordering a Cisco CRS system, a PDU kit Cisco product number should be ordered. Cisco product numbers for PDU kits are as follows:

- CRS-8-PDU-Delta—Redundant 3-phase to single-phase Delta PDU for Cisco CRS 8-slot line card chassis, 2 input/6 output

- CRS-8-PDU-Wye—Redundant 3-phase to single-phase Wye PDU for Cisco CRS 8-slot line card chassis, 2 input/6 output

Cisco CRS PDU Kit for Cisco CRS 8-Slot Line Card Chassis

This section describes the Cisco CRS PDU kit for the Cisco CRS 8-slot line card chassis. The PDU has power input and power output cords entering and exiting the box. One single PDU is required for each modular configuration AC power shelf installed in the chassis for system redundancy. Each PDU kit consists of two identical single PDUs, either AC Delta (Cisco product number PDU-321-3-Delta) or AC Wye (Cisco product number PDU-321-3-Wye), installed in a 19-inch rack tray (Cisco product number CRS-8-PDU-tray). One PDU kit is required to be installed for system redundancy.

Note   In order to maintain a balanced 3-phase power load, three AC power modules (PMs) are required to be installed in a Cisco CRS 8-slot line card chassis AC modular configuration power shelf.

The following figure shows the single Delta PDU (Cisco product number PDU-321-3-Delta). The single Wye PDU (Cisco product number PDU-321-3-Wye) is similar.

Figure 21: PDU-321-3-Delta—Front and Rear Views
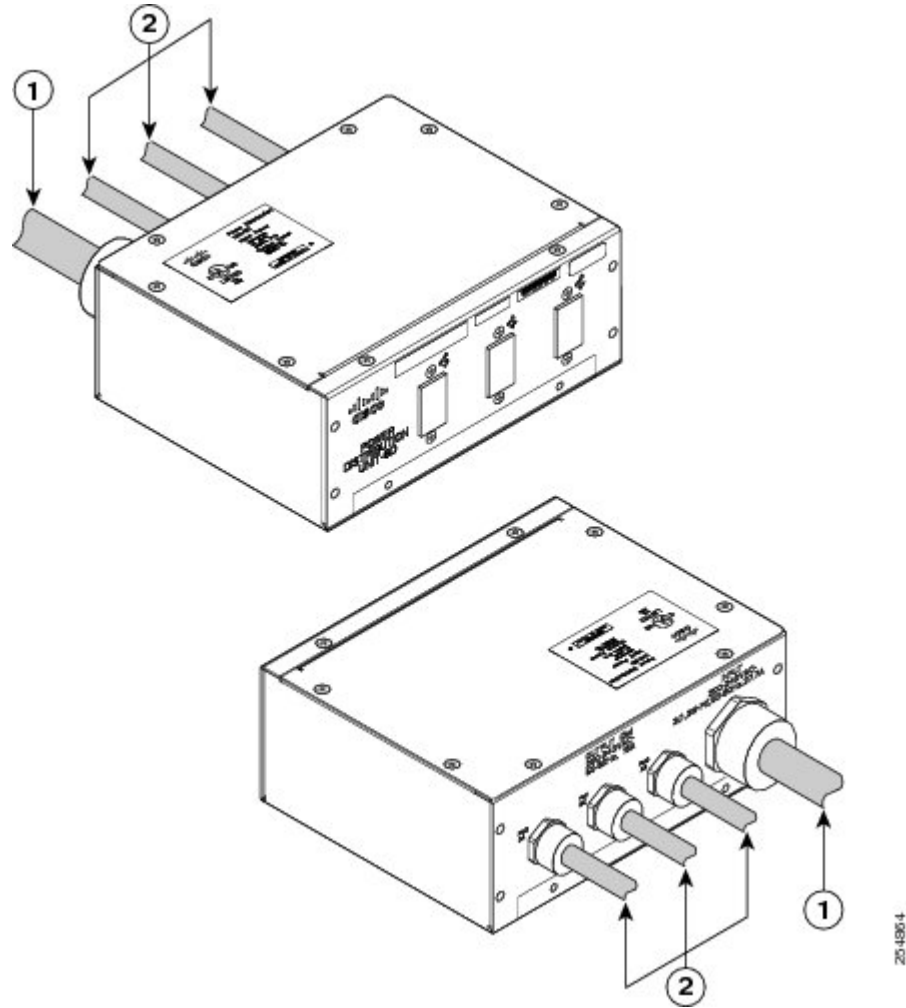
The following figure shows the Delta PDU kit that converts 3-phase AC input power to single-phase AC output power for the Cisco CRS 8-slot Line Card Chassis Enhanced router.

Figure 22: CRS-8-PDU-Delta Kit—Front and Rear Views
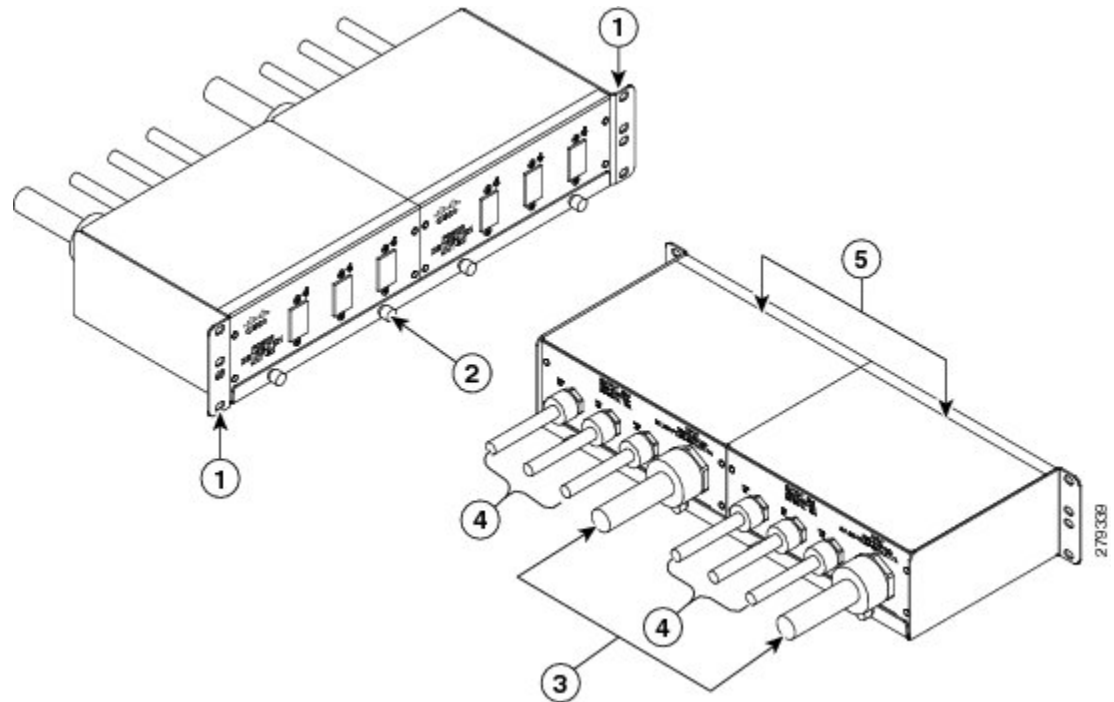
1	Rack mounting brackets	4	Single-phase AC output cords
2	Rack tray (Cisco product number CRS-8-PDU-tray=)	5	Two PDUs (Cisco product number PDU-321-3-Delta)
3	3-phase AC input cords		

The following figure shows the Wye PDU kit that converts 3-phase AC input power to single-phase AC output power for the Cisco CRS 8-slot Line Card Chassis Enhanced router.

Figure 23: CRS-8-PDU-Wye Kit—Front and Rear Views
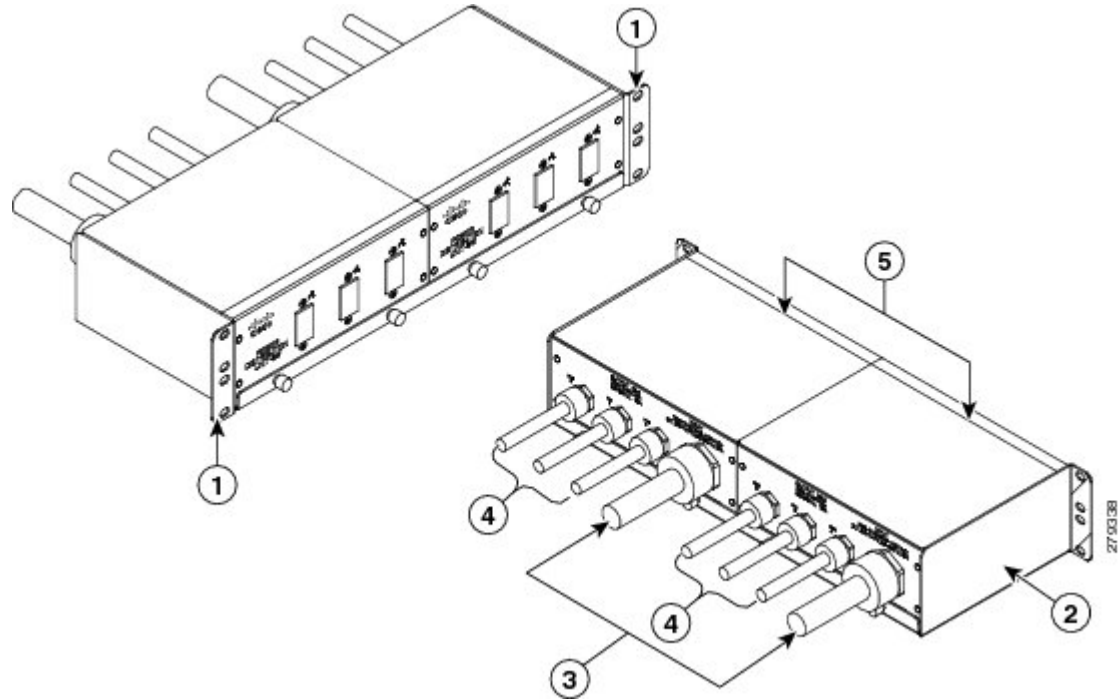
1	Rack mounting brackets	4	Single-phase AC output cords
2	Rack tray (Cisco product number CRS-8-PDU-tray=)	5	Two PDUs (Cisco product number PDU-321-3-Wye)
3	3-phase AC input cords		

Safety Warnings

These warnings are translated into several languages in Regulatory Compliance and Safety Information for the Cisco CRS Power Distribution Unit that is available online.

⚠️

Danger   This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use. Statement 39

Note   In statement 39, host refers to the rack or chassis that the Cisco CRS PDU is mounted to.

Danger   This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated not greater than: **250 V/60 A—CRS-8-PDU-Delta=415 V/16 A— CRS-8-PDU-Wye=250 V/60 A—CRS-16-PDU-Delta=415 V/32 A— CRS-16-PDU-Wye=250 V/60 A—CRS-FCC-PDU-Delta=**415 V/32 A— CRS-FCC-PDU-Wye= Statement 1005

Danger   To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:This unit should be mounted at the bottom of the rack if it is the only unit in the rack.When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack. Statement 1006

Danger   Take care when connecting units to the supply circuit so that wiring is not overloaded. Statement 1018

Danger   The plug-socket combination must be accessible at all times, because it serves as the main disconnecting device. Statement 1019

Danger   This unit might have more than one power supply connection. All connections must be removed to de-energize the unit. Statement 1028

Danger   This product requires short-circuit (overcurrent) protection, to be provided as part of the building installation. Install only in accordance with national and local wiring regulations. Statement 1045

Danger   To prevent the system from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of:40°C (131°F) Statement 1047

Danger   Stability hazard. The rack stabilizing mechanism must be in place, or the rack must be bolted to the floor before you slide the unit out for servicing. Failure to stabilize the rack can cause the rack to tip over. Statement 1048

General Power and Grounding Requirements

This section describes the power and grounding requirements you must consider when planning the site facilities for the PDU.

> **Note** A certified electrician should review the information in these sections to ensure that the installation site meets these requirements. For larger system configurations, consult a facilities electrical expert to determine the load that the routing system may put on the facility power plant.

- Installation of the PDU must follow national and local electrical codes:

  - In the United States—United States National Fire Protection Association (NFPA) 70 and United States National Electrical Code (NEC)

  - In Canada—Canadian Electrical Code, part I, CSA C22.1

  - In other countries—International Electrotechnical Commission (IEC) 60364, parts 1 through 7

- Two separate and independent AC power sources are needed to provide 2N redundancy for system power. Each power source requires its own circuit breaker.

- Each power source must provide clean power to the site. If necessary, install a power conditioner.

- Site must provide short-circuit (over-current) protection for devices.

- Proper grounding is required at the site to ensure that equipment is not damaged by lightning and power surges. In addition, a grounding-type AC power outlet is required for AC-powered systems.

- Include power requirements for any external terminals and test equipment used with your system when planning for the power for the site.

> **Note** Review the safety warnings in *Regulatory Compliance and Safety Information for the Cisco CRS Power Distribution Unit* before attempting to install the routing system

Installing or Removing the PDU Kit

This section describes how to install an AC Delta or AC Wye PDU kit on the Cisco CRS 8-slot Line Card Chassis Enhanced router:

> **Note** Review the safety warnings in Regulatory Compliance and Safety Information for the Cisco CRS Power Distribution Unit before attempting to install the Cisco CRS PDU.All field replaceable units (FRUs) and blank covers must be properly installed in the system.

Cisco CRS PDU Kit for Cisco CRS 8-Slot Line Card Chassis Enhanced Router

This section describes how to install or remove a PDU kit in the Cisco CRS 8-slot Line Card Chassis Enhanced router in a rack.

The procedure for installing or removing a PDU kit is the same for the AC Delta and AC Wye PDU. This section contains the following procedures:

Installing the PDU Kit

This section describes how to install an AC Delta or AC Wye PDU kit in the 19-inch Cisco CRS 8-slot Line Card Chassis Enhanced router rack.

> **Note** Although there are differences between the AC Delta and AC Wye PDU, they are installed in the same manner.

> **Caution** Before you begin this procedure, ensure that all power is disconnected from the Cisco CRS PDU. Remove the PDU input plug(s) from the branch circuit outlet(s).

Before you install the PDU kit, be aware of the following:

- If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient temperature. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature. See Table 5: Cisco CRS PDU Environmental Specifications.

- Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.

- Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.

- Consideration should be given to the connection of the equipment to the supply circuit, and to the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.

- Reliable earthing of rack-mounted equipment should be maintained. Pay particular attention to supply connections other than direct connections to the branch circuit (e.g. use of power strips).

Required Tools and Equipment

The following tools are required to install the PDU kit:

- 3/8 in. flat blade screwdriver

- Number 1 x 6 in. Phillips screwdriver

- PDU kit

  ◦ AC Delta PDU kit (Cisco product number CRS-8-PDU-Delta=), or

  ◦ AC Wye PDU kit (Cisco product number CRS-8-PDU-Wye=)

![Note icon]

Note   Rack-mounting screws are not shipped with the PDU kit. You can use 10-32, 10-24, 12-24, or M5 screws. (M6 and 1/4-20 screws do not fit.)

Steps

To install the PDU kit in the 19-inch rack, perform the following steps:

Procedure

Step 1   Align the rack-mounting bracket holes on the PDU kit with the holes on the vertical rack posts.

Step 2   Insert and partially tighten the four screws—two on each side—to attach the rack-mounting brackets on the PDU kit to the vertical rack brackets. See the following figure.

Figure 24: PDU Kit Mounting Holes
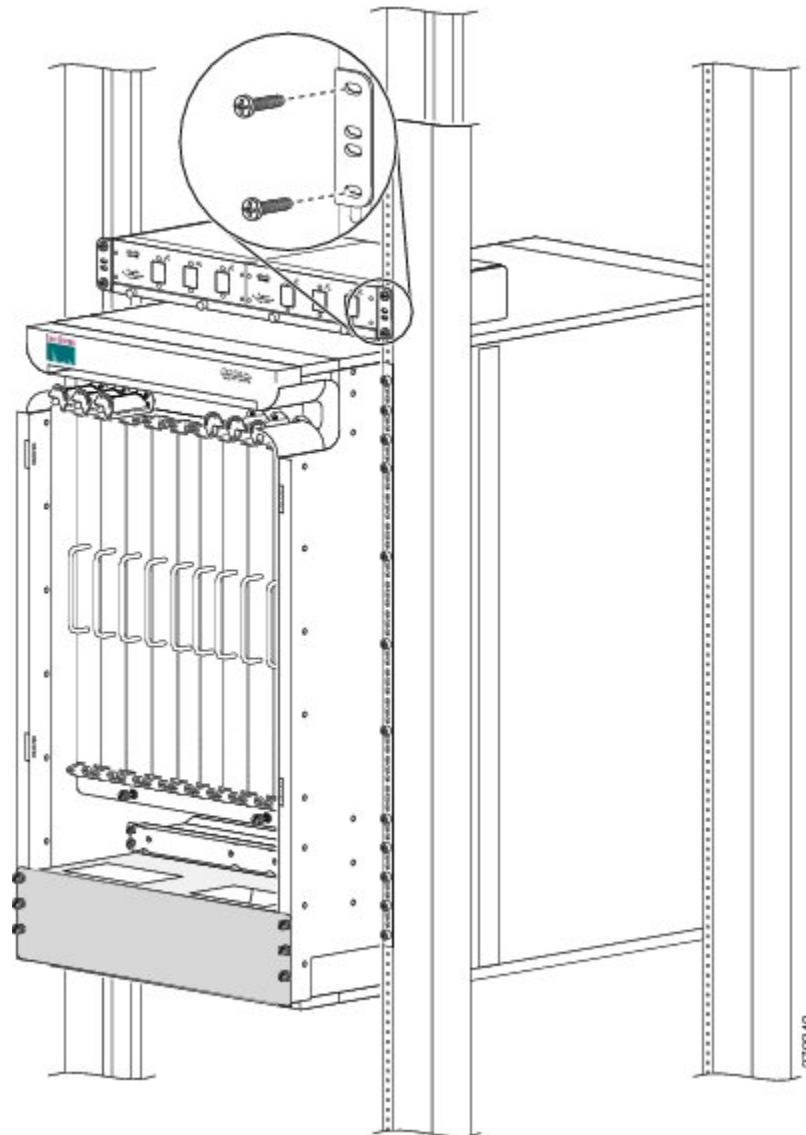
Step 3   Use the appropriate tool to fully tighten the screws.

Step 4   Connect the output cords on the PDU to the rear of the Cisco CRS 8-slot Line Card Chassis Enhanced router modular configuration AC power shelf.

Note Each output cord on the PDU has a label that designates into which socket it should be plugged (PM0, PM1, and so on).

Figure 25: Connecting Power Cords to Rear of Modular Configuration AC Power Shelf
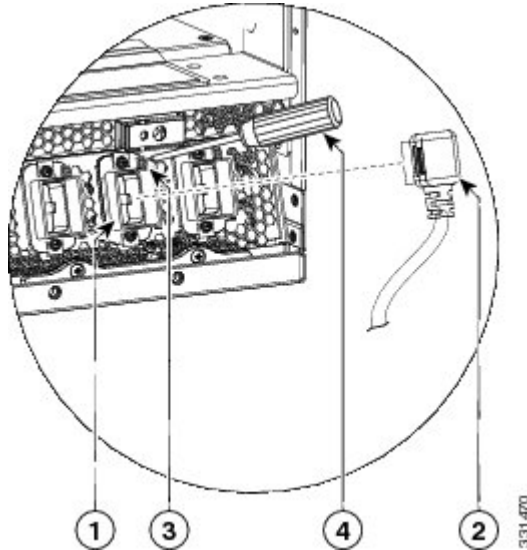
1	Cord clamp	3	Screw that secures cord
2	Cord to be inserted into clamp	4	Screwdriver that tightens screw

Step 5 Use the number 1 Phillips screwdriver to tighten the screw that clamps the coFigure 25: Connecting Power Cords to Rear of Modular Configuration AC Power Shelf, on page 42 Figure 3-23 .

Step 6 Plug the PDU AC input plug into the facility power to energize the Cisco CRS 8-slot Line Card Chassis Enhanced router.

What to Do Next

After you have installed the PDU kit, you can power up the power modules and the chassis and put the Cisco CRS 8-slot Line Card Chassis Enhanced router into service.

Removing the PDU Kit

This section describes how to remove an AC Delta or AC Wye PDU kit from the Cisco CRS 8-slot line card chassis rack.

Note Although there are differences between the AC Delta and AC Wye PDU, they are removed in the same manner.

⚠️ **Caution**   Before you begin this procedure, ensure that all power is disconnected from the Cisco CRS PDU. Remove the PDU input plug(s) from the branch circuit outlet(s).

Required Tools and Equipment

The following tools are required to remove the PDU kit from the Cisco CRS 8-slot Line Card Chassis Enhanced router in a 19-inch rack:

- 3/8 in. flat blade screwdriver
- Number 1 x 6 in. Phillips screwdriver

Steps

To remove the PDU kit from the 19-inch rack, perform the following steps:

Procedure

Step 1   To disconnect the PDU output cords from the rear of the Cisco CRS 8-slot Line Card Chassis Enhanced router modular configuration AC power shelf, use the number 1 Phillips screwdriver to loosen the screw that clamps the cord in place and remove the cord.

Figure 26: Disconnecting Power Cords from Rear of Modular Configuration AC Power Shelf
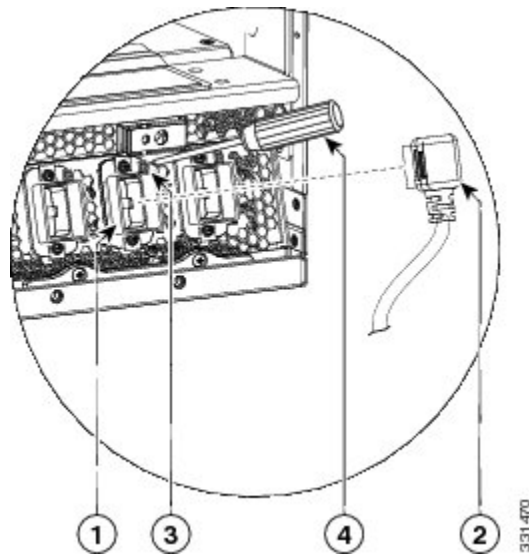
1	Cord clamp	3	Screw that secures cord clamp
2	Cord removed from clamp	4	Screwdriver that loosens screw

Step 2 Use the 3/8 in. flat blade screwdriver to remove the four screws—two on each side—that attach the rack-mounting brackets on the PDU kit to the vertical rack brackets.

Figure 27: PDU Kit Mounting Holes
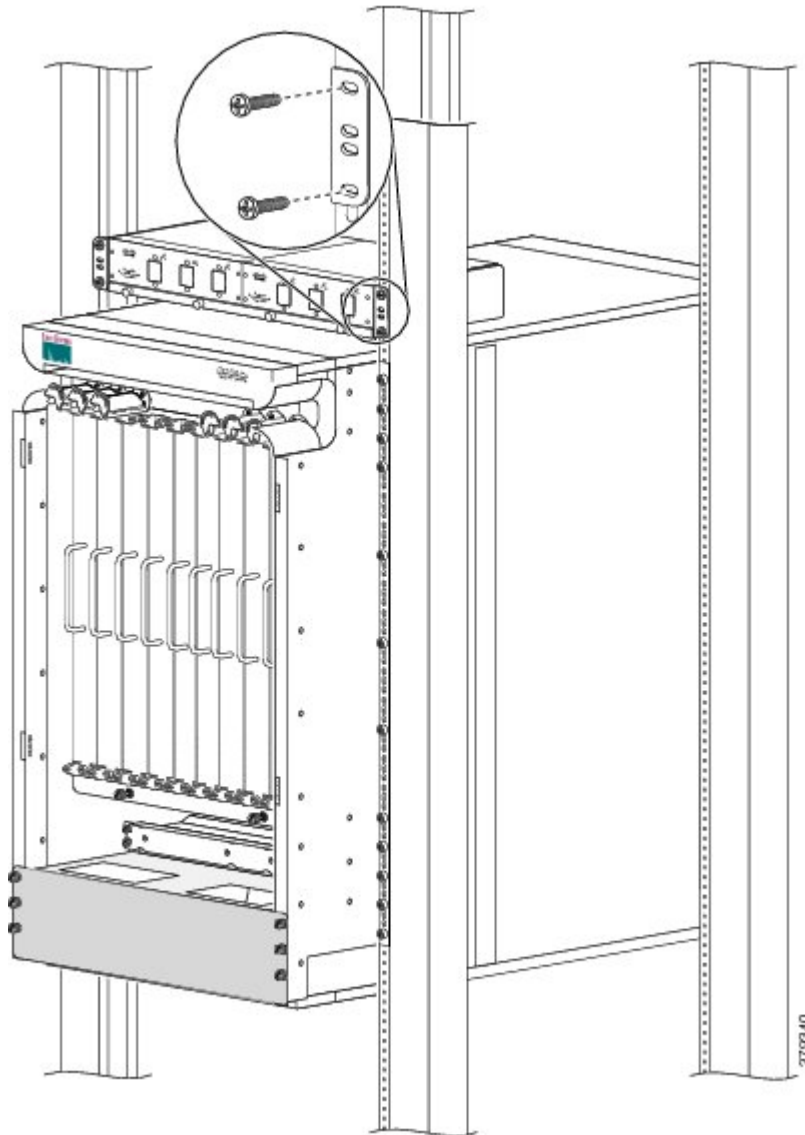
Step 3 Carefully remove the PDU kit from the rack.

Installing a Single PDU in a Cisco CRS 8-Slot Line Card Chassis Enhanced Router PDU Kit

This section describes how to install a single AC Delta or AC Wye PDU in the 19-inch rack tray.

Note   Although there are differences between the AC Delta and AC Wye PDU, they are installed in the same manner.

Prerequisites

Caution   Before you begin this procedure, ensure that power is disconnected from the Cisco CRS PDU being installed. Remove the PDU input plug from the branch circuit outlet.

Required Tools and Equipment

The following tool is required to install a single PDU in the 19-inch rack tray:

- Number 1 x 6 in. Phillips screwdriver

Steps

To install the single PDU from the 19-inch rack tray, perform the following steps:

Procedure

Step 1   Position the PDU and associated power cords in the 19-inch rack tray.

Step 2   Use the number 1 Phillips screwdriver to fasten the four panel fasteners (two at front and two at rear) that retain the single PDU in the 19-inch rack tray. See following figure that shows the panel fasteners on the front of the 19-inch rack tray.

Figure 28: Fastening Front Panel Fasteners that Retain Single PDU in 19-inch Rack Tray
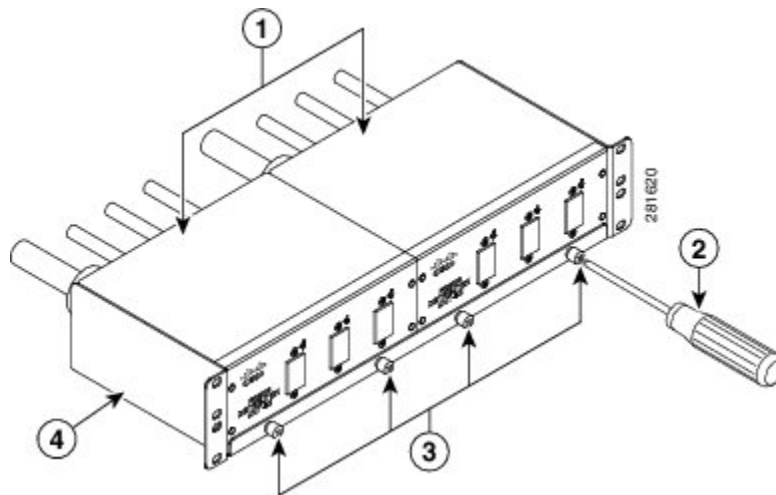
1	Two single PDUs installed in 19-inch tray	3	Four panel fasteners on front of 19-inch rack tray

2	Screwdriver that tightens panel fastener	4	19-inch rack tray

Step 3 Connect the output cords on the PDU being installed to the rear of the Cisco CRS 8-slot Line Card Chassis Enhanced router modular configuration AC power shelf.

Note Each output cord on the PDU has a label that designates into which socket it should be plugged (PM0, PM1, and so on).

Figure 29: Connecting Power Cords to Rear of Modular Configuration AC Power Shelf
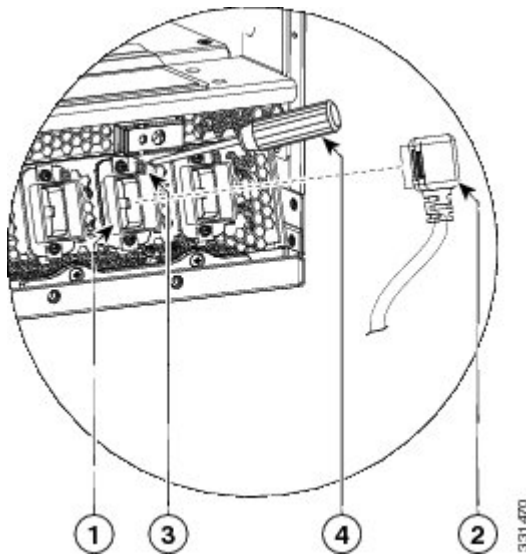
1	Cord clamp	3	Screw that secures cord clamp
2	Cord to be inserted into clamp	4	Screwdriver that tightens screw

Step 4 Use the number 1 Phillips screwdriver to tighten the screw that clamps the cord in place. SeeFigure 29: Connecting Power Cords to Rear of Modular Configuration AC Power Shelf Figure 3-27 .

Step 5 Plug the PDU AC input plug into the facility power to energize the Cisco CRS 8-slot line card chassis.

Removing a Single PDU from a Cisco CRS-8 PDU Kit

This section describes how to remove a single AC Delta or AC Wye PDU from the 19-inch rack tray.

✎

Note   Although there are differences between the AC Delta and AC Wye PDU, they are removed in the same manner.

Prerequisites

⚠

Caution   Before you begin this procedure, ensure that power is disconnected from the Cisco CRS PDU being replaced. Remove the PDU input plug from the branch circuit outlet.

Required Tools and Equipment

The following tool is required to remove a single PDU from the 19-inch rack tray:

- Number 1 x 6 in. Phillips screwdriver

Steps

To remove the single PDU from the 19-inch rack tray, perform the following steps:

Procedure

Step 1   Disconnect the output cords on the PDU being removed from the rear of the Cisco CRS 8-slot line card chassis modular configuration AC power shelf. Use the number 1 Phillips screwdriver to loosen the screw that clamps the cord in place and remove the cord.

Figure 30: Disconnecting Power Cords from Rear of Modular Configuration AC Power Shelf
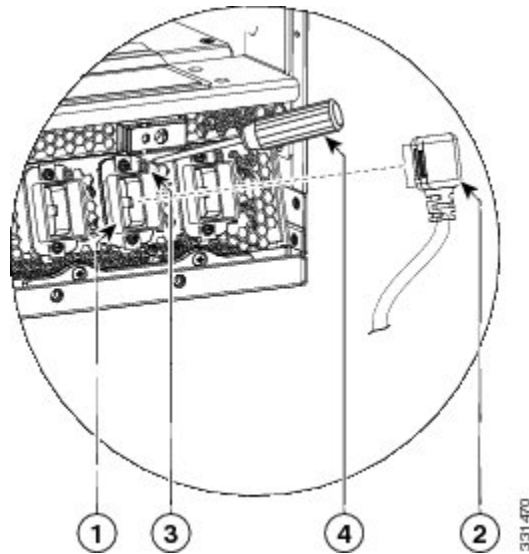
| 1 | Cord clamp | 3 | Screw that secures cord clamp |

2	Cord removed from clamp	4	Screwdriver that loosens screw

Step 2 Use the number 1 Phillips screwdriver to unfasten only the four panel fasteners (two on front and two on rear) that retain the single PDU you want to remove in the 19-inch rack tray. The following figure shows the panel fasteners on the front of the 19-inch rack tray.

Figure 31: Removing Front Panel Fasteners that Retain Single PDU in 19-inch Rack Tray
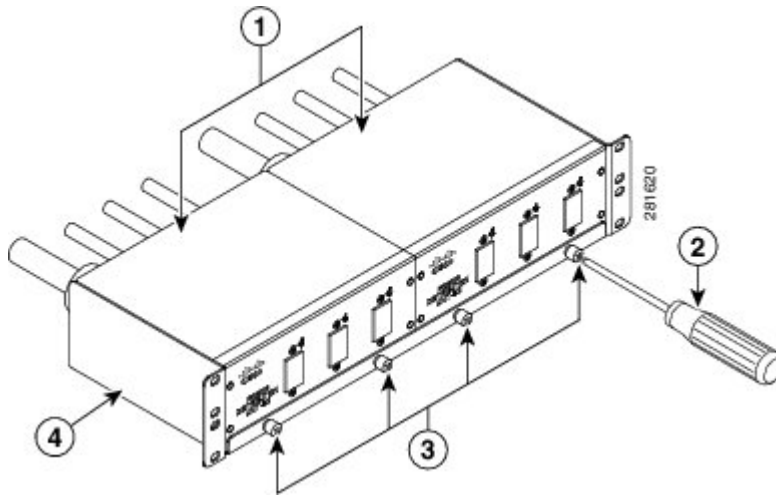
1	Two single PDUs installed in 19-inch tray	3	Four panel fasteners on front of 19-inch rack tray
2	Screwdriver that loosens panel fastener	4	19-inch rack tray

Step 3 Remove the PDU and associated power cords from the 19-inch rack tray.

Installing PDU Kit in Rack

This section describes how to install an AC Delta (PDU-321-6-Delta) or AC Wye PDU (PDU-321-6-Wye) in a 19-inch rack.

Note Although there are differences between the AC Delta and AC Wye PDU, they are installed in the same manner.

Prerequisites

⚠️

Caution Before you begin this procedure, ensure that all power is disconnected from the Cisco CRS PDU. Remove the PDU input plug(s) from the branch circuit outlet(s).

Before you install the PDU, be aware of the following:

- If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature. See #con_1296153/tab_1296311.

- Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.

- Mounting of the equipment in the rack should be such that a hazardous condition is not achieved because of uneven mechanical loading.

- Consideration should be given to the connection of the equipment to the supply circuit, and to the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.

- Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (for example, use of power strips).

Required Tools and Equipment

The following tools are required to install the PDU in a rack:

- 3/8 in. flat blade screwdriver

- Number 1 x 6 in. Phillips screwdriver

- PDU kit

    ◦ AC Delta PDU kit (Cisco product number CRS-16-PDU-Delta=), or

    ◦ AC Wye PDU kit (Cisco product number CRS-16-PDU-Wye=)

✎

Note Rack mounting screws are not shipped with the PDU kit. Use 10-32, 10-24, 12-24, or M5 screws. (M6 and 1/4-20 screws do not fit.)

Steps

To install the PDU in the 19-inch rack, perform the following steps:

Procedure

Step 1   Align the rack-mounting bracket holes on the PDU with the holes on the vertical rack posts.

Step 2   Insert and partially tighten the four screws—two on each side—to attach the rack mounting brackets on the PDU to the rack vertical mounting brackets. The following figure shows two PDUs being installed in a 19-inch rack.

Figure 32: Installing PDU in Rack
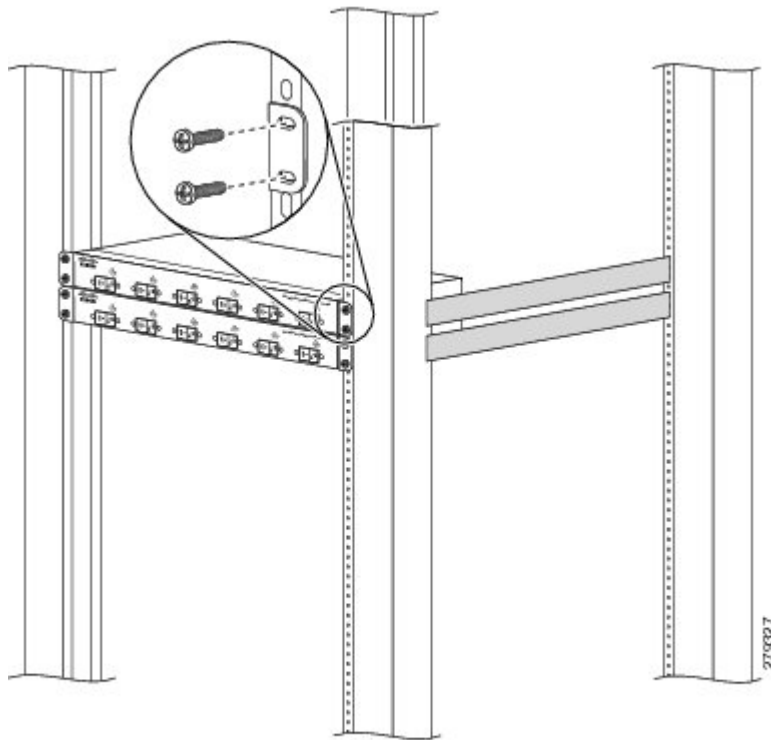
Step 3   Use the appropriate tool to fully tighten the screws.

Step 4   Connect the output cords on the PDU to the rear of the modular configuration AC power shelf on the Cisco CRS 8-slot line card chassis enhanced router. See following figure.

Note   Each output cord on the PDU has a label that designates into which socket it should be plugged (PM0, PM1, and so on).

Figure 33: Connecting Power Cords to Rear of Modular Configuration AC Power Shelf
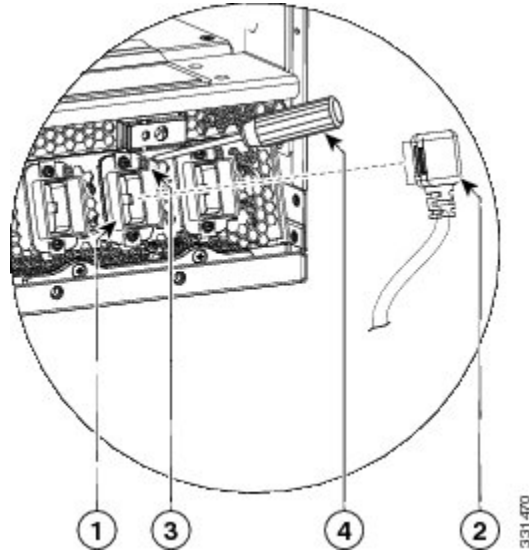
1	Screw that secures the cord clamp	3	Screw that secures cord clamp
2		4	Screwdriver tightening screw

Step 5   Use the number 1 Phillips screwdriver to tighten the screw that clamps the cord in place.

Step 6   Plug the PDU AC input plug into the facility power to energize the Cisco CRS 8-slot line card chassis enhanced router.

What to Do Next

After the installation of the PDU is complete, you can power up the power modules and the chassis and put the Cisco CRS 8-slot Line Card Chassis Enhanced router into service. See the Cisco CRS Carrier Routing System 8-Slot Line Card Chassis Enhanced Router Installation Guide for more information.

Removing PDU Kit from Rack

This section describes how to remove an AC Delta (PDU-321-6-Delta) or AC Wye PDU (PDU-321-6-Wye) from a 19-inch rack.

> **Note** Although there are differences between the AC Delta and AC Wye PDU, they are removed in the same manner.

Prerequisites

> ⚠
>
> **Caution** Before you begin this procedure, ensure that all power is disconnected from the Cisco CRS PDU. Remove the PDU input plug(s) from the branch circuit outlet(s).

Required Tools and Equipment

The following tools are required to remove the PDU from a 19-inch rack:

- 3/8 in. flat-blade screwdriver
- Number 1 x 6 in. Phillips screwdriver

Steps

To remove the PDU from the 19-inch rack, perform the following steps:

Procedure

Step 1 To disconnect the PDU output cords from the rear of the modular configuration AC power shelf, use the number 1 Phillips screwdriver to loosen the screw that clamps the cord in place and remove the cord.

Figure 34: Disconnecting Power Cords From Rear of Modular Configuration AC Power Shelf
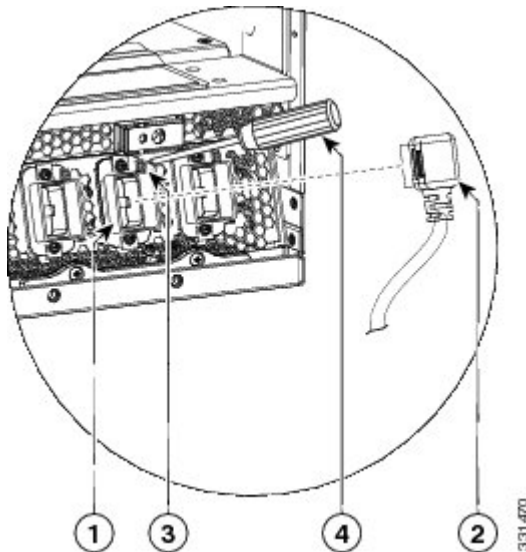
1	Screw that secures the cord clamp	2	Cord removed from clamp

3	Screwdriver to loosen screw	4	Screwdriver to loosen screw

Step 2 Use the 3/8 in. flat-blade screwdriver to remove the four screws—two on each side—attaching the rack mounting brackets on the PDU to the rack vertical mounting brackets.

Figure 35: Removing PDU from Rack
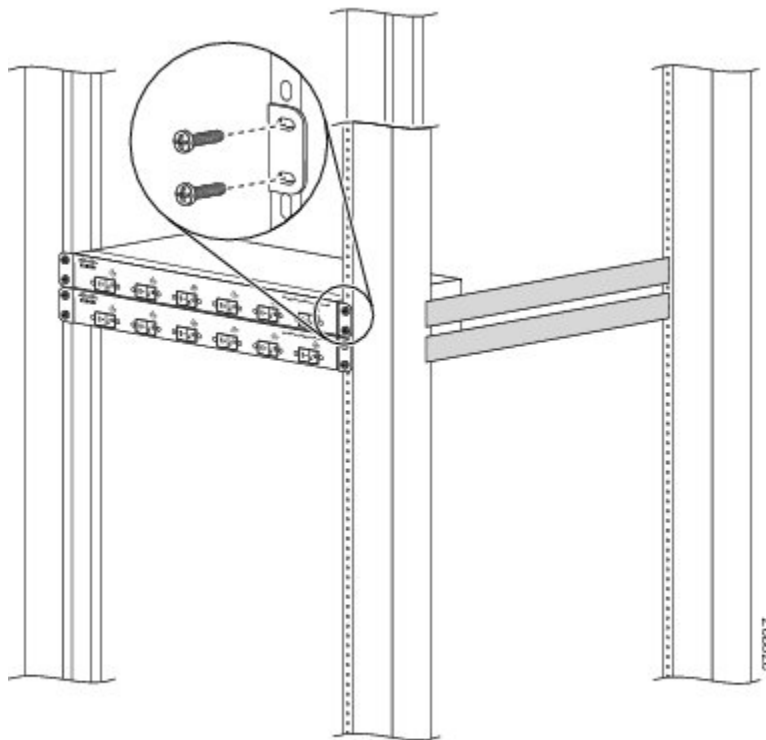
Step 3 Carefully remove the PDU from the rack and place on the workstation.

Specifications

This section describes the specifications for the Cisco CRS Power Distribution Unit.

The requirements for the Cisco CRS PDU are:

- Cisco CRS PDU is field retrofittable with Cisco CRS Carrier Router System installation base.

- Cisco CRS PDU supports Cisco CRS 8-slot line card chassis to operate with partial and full power modular capacity.

- Cisco CRS PDU supports 2N redundant mode and allows replacement of either of the two redundant PDUs without impacting system traffic.

The following table lists the specifications for both types of Cisco CRS PDU available for use with the Cisco CRS 8-slot line card chassis, PDU-321-3-Delta and PDU-321-3-Wye.

Table 4: PDU-321-3-Delta and PDU-321-3-Wye Specifications

Description	Value
Height	3.5 in. (8.9 cm)
Width	8.75 in. (22.2 cm), single PDU17.5 in. (44.5 cm), including rack tray19.3 in. (49.0 cm), including rack mounting brackets
Depth	7.0 in. (17.8 cm)
Weight	43 lb. (19 kg), PDU-321-3-Delta, including tray31 lb. (14 kg), PDU-321-3-Wye, including tray
Input cord length	177 in. (450 cm)
Output cord length	138 in. (350 cm)
PDU-321-3-Delta	3-Phase AC Delta
Input	200 to 240 VAC, 50 to 60 Hz, 27.7 ATolerance: +/−10% (180 to 264) VAC, 50 to 60 Hz, 27.7 A
Rated Current	27.7 A
Recommended AC Service	40 A minimum, 60 A maximum dedicated branch circuit
Output	200 to 240 VAC, 50 to 60 Hz, 16 ATolerance: +/−10%(180 to 264) VAC, 50 to 60 Hz, 16 A
Input Connection (per single PDU)	One IEC 60309, 250V/60A, 3W+PE (3 wire + protective earthing)1
Output Connection (per single PDU)	Three IEC-320-C21 Connector 90 degree female cords
PDU-321-3-Wye	3-Phase AC Wye
Input	200 to 240 (L-N)/346 to 415 (L-L) VAC, 50 to 60 Hz, 16 ATolerance: +/−10% (180 to 264)(L-N)/(311 to 456)(L-L) VAC, 50 to 60 Hz, 16 A
Rated Current	16 A

Description	Value
Recommended AC Service	16 A dedicated branch circuit
Output	200 to 240 VAC, 50 to 60 Hz, 16 ATolerance: +/−10%(180 to 264) VAC, 50 to 60 Hz, 16 A
Input Connection (per single PDU)	One IEC 60309, 415V/16A, 3W+N+PE (3 wire + neutral + protective earthing)[1]
Output Connection Type (per single PDU)	Three IEC-320-C21 Connector 90 degree female cords

[1] Protective earthing conductor (ground wire).

The following table lists the environmental specifications for the Cisco CRS PDU.

Table 5: Cisco CRS PDU Environmental Specifications

Description	Value
Temperature	
Operating, nominal	41 to 104 o F (5 to 40 o C)
Nonoperating	40 to 158 o F (-40 to 70 o C)
Humidity	
Operating	5 to 85% noncondensing
Nonoperating	5 to 90% noncondensing, short-term
Altitude	197 to 5906 ft. (-60 to 1800 m) at 122 o F (50 o C), short-termUp to 13,123 ft. (4000 m) at 104 o F (40 o C) or below

C H A P T E R **4**

Installing Air Circulation Components

- Installing and Upgrading Air Circulation Components, page 57

Installing and Upgrading Air Circulation Components

This chapter provides instructions on how to install and upgrade the Cisco CRS 8-Slot Line Card Chassis Enhanced router air circulation components.

This chapter presents the following topics:

About Line Card Chassis Airflow

The Cisco CRS 8-Slot Line Card Chassis Enhanced router has two fan trays, each with four fans, that cool the chassis card cages.

The top fan pulls air into the lower portion of the front of the chassis, up across the cards in the front of the chassis, and through the upper fan tray. Air flows out of the upper fan tray and down across all the modular service cards and switch fabric cards through the lower fan tray; air is then exhausted out the bottom of the rear of the chassis (see Figure 36: Airflow Through the Cisco CRS 8-Slot Line Card Chassis Enhanced Router, on page 58).

In addition, each AC or DC power module at the bottom of the chassis has self-contained fans that pull in cool air from the front of the chassis and exhaust the warm air out the rear of the chassis.

A replaceable air filter is located on the front of the chassis below the PLIM card cage. How often the air filters should be replaced depends on the facility environment. In a dirty environment, or when you start getting frequent temperature alarms, you should always check the intake grills for debris, and then check the air filters to see if they need to be replaced.

Note We recommend that you check the air filters once a month. Replace a filter when you notice a significant amount of dust.

Figure 36: Airflow Through the Cisco CRS 8-Slot Line Card Chassis Enhanced Router
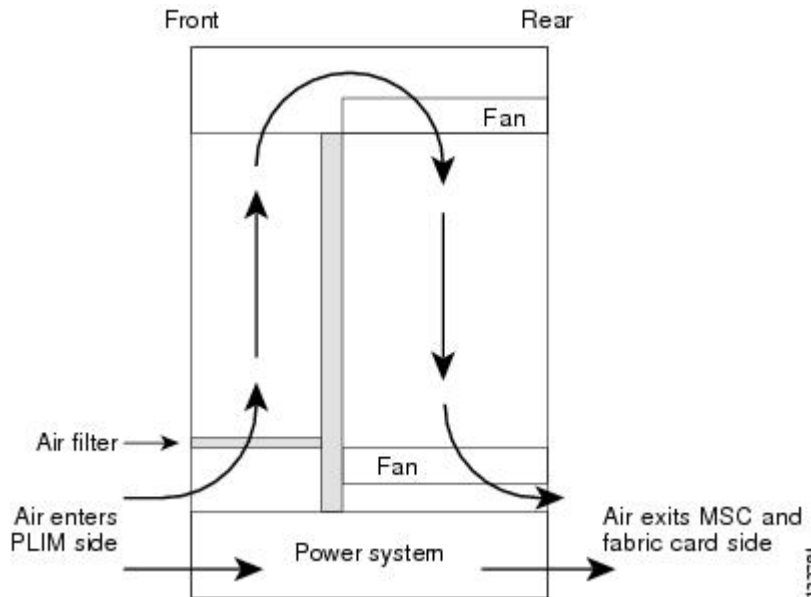
The Cisco CRS 8-Slot Line Card Chassis Enhanced router airflow volumes are:

- Chassis airflow: Up to 1000 cubic feet (28, 317liters) per minute

- Power system airflow: Up to 240 cubic feet (6,800 liters) per minute

Installing Air Circulation Components

This section contains the following procedures:

Installing a Lower Fan Tray

This section describes how to install a fan tray (if applicable) in the lower fan tray slot of the Cisco CRS 8-Slot Line Card Chassis Enhanced router. For information on the chassis airflow and circulation, see About Line Card Chassis Airflow, on page 57.

A Cisco CRS 8-Slot Line Card Chassis Enhanced router fan tray operates in either the upper or lower fan tray slot. Each fan tray installs into the rear (MSC) side of the chassis . Each fan tray contains four fans.

Figure 37: Fan Tray
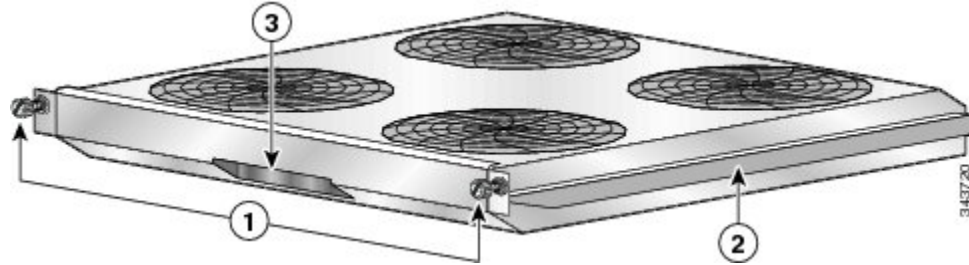
1	Captive screws	3	Fan tray handle
2	Fan tray rail		

Prerequisites

Before performing this task, remove the optional rear exhaust grille, if installed.

Required Tools and Equipment

You need the following tools and part to perform this task:

- ESD-preventive wrist strap
- Number 2 Phillips screwdriver
- Fan tray

Steps

To install a lower fan tray, follow these steps:

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the rear (MSC) side of the chassis or a bare metal surface on the chassis.

Step 2 Using two hands to support the fan tray, position it in front of the fan tray bay so that the rails on the sides of the fan tray are aligned with the rail guides on the interior of the chassis.

Caution A fan tray weighs approximately 19.15 pounds (8.69 kg). Use both hands when handling a fan tray.

Caution Do not set the fan tray down on the connector; doing so could damage it.

Step 3 Slide the fan tray all the way in. Press it firmly into the chassis so that the connector on the back of the fan tray is seated firmly against the connector on the interior of the chassis.

Caution To prevent damage to the chassis connector, do not use excessive force when inserting a fan tray into its bay.

Step 4 Using the Number 2 Phillips screwdriver, tighten the two captive screws (one for each side).

Note All electrical and control line connections are made automatically when the connectors mate.

What to Do Next

After performing this task, reinstall the optional rear exhaust grille, if applicable.

Installing the Chassis Air Filter

This section describes how to install (if applicable) the air filter in the Cisco CRS 8-Slot Line Card Chassis Enhanced router. For further information, see About Line Card Chassis Airflow, on page 57.

The chassis has a serviceable air filter mounted in a slide-out tray, accessible from the rear of the chassis just above the lower fan tray. The Cisco CRS 8-Slot Line Card Chassis Enhanced router air filter plugs into the front (PLIM) side of the chassis .

Figure 38: Chassis Air Filter
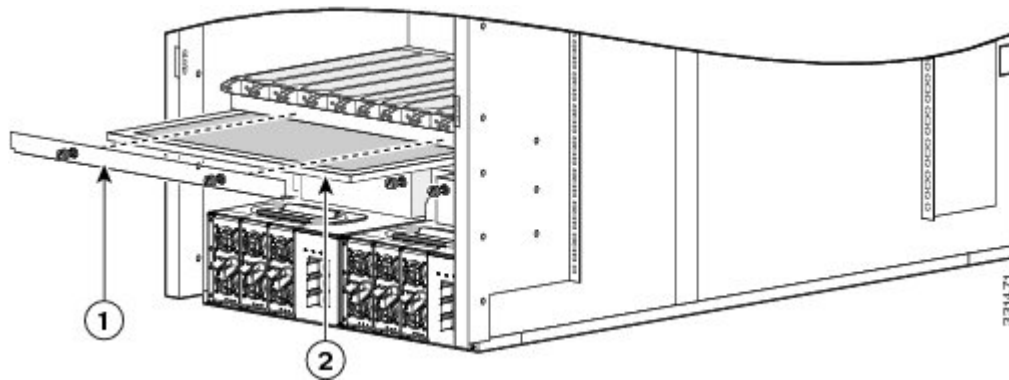
1	Air filter cover plate (with captive screws)	2	Chassis air filter

Prerequisites

Before performing this task, you must first remove the front cover and inlet grille, if installed.

⚠️

Caution   Never operate the Cisco CRS 8-Slot Line Card Chassis Enhanced router without an air filter. Doing so can damage the hardware.

Required Tools and Equipment

You need the following tools and part to perform this task:

- ESD-preventive wrist strap

- Number 2 Phillips screwdriver

- Chassis air filter

Steps

To install the chassis air filter, follow these steps:

Procedure

Step 1   Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.

Step 2   Using two hands to support the air filter, orient it so that the ridge on the front of the air filter faces outward from the front of the chassis and the wire-grid backing support is facing up.

Step 3   Slide the air filter into the air filter slot until it is seated fully within the slot.

Step 4   Hold the air filter cover plate in place and using a Number 2 Phillips screwdriver, tighten the two captive screws on the front of the plate.

What to Do Next

After performing this task, reinstall the inlet grill and the front cover, if applicable.

Installing a Rear Exhaust Grille

This section describes how to install a rear exhaust grille on the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

Prerequisites

There are no prerequisites for this task.

Required Tools and Equipment

You need the following tools and part to perform this task:

- ESD-preventive wrist strap
- Number 2 Phillips screwdriver
- Rear exhaust grille

Steps

To install a rear exhaust grille, follow these steps:

Figure 39: Installing Rear Exhaust Grille
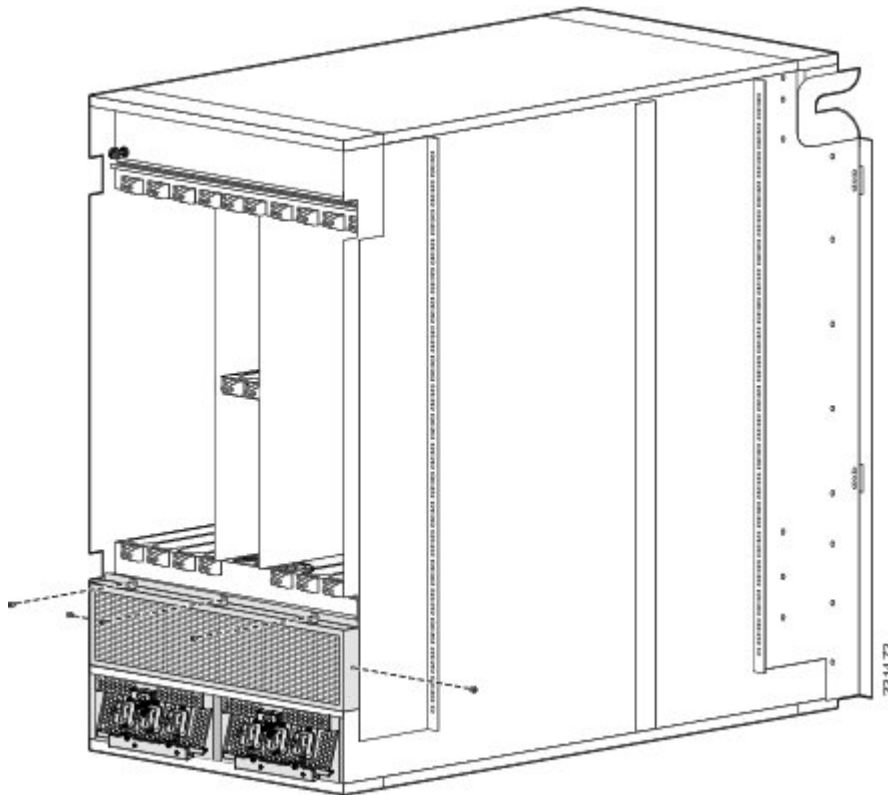
1	Rear exhaust grille

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the rear (MSC) side of the chassis or a bare metal surface on the chassis.

Step 2 Attach the rear exhaust grille to the rear of the chassis using the five panel fasteners. Tighten the three screws on top with a # 2 Phillips screwdriver. Hand-tighten the two screws on the side.

Installing an Upper Fan Tray

This section describes how to install a fan tray in the upper fan tray slot of the Cisco CRS 8-Slot Line Card Chassis Enhanced router. For information on the chassis airflow and circulation, see About Line Card Chassis Airflow.

A Cisco CRS 8-Slot Line Card Chassis Enhanced router fan tray operates in either the upper or lower fan tray slot. Each fan tray installs into the rear (MSC) side of the chassis (see Figure 37: Fan Tray).

Prerequisites

There are no prerequisites for this task.

Required Tools and Equipment

You need the following tools and parts to perform this task:

- ESD-preventive wrist strap

- Number 2 Phillips screwdriver

- Fan tray

Steps

To install an upper fan tray, follow these steps:

Procedure

Step 1   Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the rear (MSC) side of the chassis or a bare metal surface on the chassis.

Step 2   Using the screwdriver, unscrew the two captive screws holding the fan tray bay door in place.

Step 3   Lift the door up; you may need a second person to hold it in the open position.

Step 4   Using two hands to support the fan tray, position it in front of the fan tray bay so that the rails on the sides of the fan tray are aligned with the rail guides on the interior of the chassis.

         Caution   A fan tray weighs approximately 19.15 pounds (8.69 kg). Use both hands when handling a fan tray.

Step 5   Slide the fan tray into the fan tray bay. Stop when the fan tray meets the chassis connector in the back of the fan tray bay.

         Notice that the tray (and rail guides) drop just inside the fan tray bay door, so that the fan tray "drops" into its final position as it gets almost all the way into the chassis.

         Caution   To prevent damage to the chassis connector, do not use excessive force when inserting a fan tray into its bay.

Step 6   Firmly push on the fan tray to seat the fan tray connector in the chassis connector.

         Note   All electrical and control line connections are made automatically when the connectors mate.

Step 7   Lower the fan tray bay door and tighten the two captive screws on the fan tray bay door.

Upgrading Fan Trays-Summary Steps

> ✎
> **Note** The new fan trays (CRS-8-FANTRAY-B) are only supported if you are using Cisco IOS-XR release 4.3.2 or later.

The following section describes how to upgrade upper and lower legacy fan trays (CRS-8-LCC-FAN-TR) to the new fan trays (CRS-8-FANTRAY-B). This section covers the following topics:

> ✎
> **Note** You can use either the legacy or the new fan trays in the Cisco CRS 8-Slot Line Card Chassis Enhanced router. A mix of fan trays is not a supported mode of operation. Such a mode is temporarily allowed only during the fan tray upgrade.

Prerequisites

The upgrading process is slightly different, depending upon which Cisco IOS-XR release you are using.

- If you are using a Cisco IOS-XR release prior to 5.1.1, follow all of the #task_1088779/_1088802 and #task_1088779/_1088792 below, also the steps in the Verifying the Fan Tray section.

- If you are using the Cisco IOS-XR release 5.1.1 or later, follow only these steps: #task_1088779/_1088823 and #task_1088779/_1089946 in the #task_1088779/_1088802, which correspond to Step 5 and Step 6 in the #task_1088779/_1088792. Also follow the steps in the Verifying the Fan Tray section.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap

- Large Phillips screwdriver

- Upper and lower fan trays (CRS-8-FANTRAY-B)

Summary Steps

Procedure

Step 1 Shut down the envmon and envmon_mon processes.
Note Since this is a hot swap, make sure to have the new fan trays readily available. Once you remove a legacy fan tray, insert the new fan tray immediately, making sure to seat it firmly against its connector.

Step 2 Replace the upper fan tray with the new fan tray.

Step 3 Replace the lower fan tray with the new fan tray.

Step 4 Start the envmon and envmon_mon processes again.

Step 5 Wait for 20 seconds, then restart the invmgr process.

Upgrading Fan Trays-Detailed Steps

Procedure

	Command or Action	Purpose
Step 1	**process mandatory off envmon** **Example:** `RP/0/RP0/CPU0:ios(admin)#process mandatory off envmon`	Sets the mandatory reboot options for the envmon process.
Step 2	**process shutdown envmon** **Example:** `RP/0/RP0/CPU0:ios(admin)#process shutdown envmon`	Terminates the envmon process.
Step 3	**process mandatory off envmon_mon** **Example:** `RP/0/RP0/CPU0:ios(admin)#process mandatory off envmon_mon`	Sets the mandatory reboot options for the envmon_mon process.
Step 4	**process shutdown envmon_mon** **Example:** `RP/0/RP0/CPU0:ios(admin)#process shutdown envmon_mon`	Terminates the envmon_mon process.
Step 5	Remove the upper legacy fan tray and install the new upper fan tray.	**Note** Since this is a hot swap, make sure to have the new fan tray readily available. Once you remove the legacy fan tray, insert the new fan tray immediately, making sure to seat it firmly against its connector. Inserts the new upper fan tray. LEDs on the new fan tray glow green upon insertion. (Green and amber may be observed for a short duration.)
Step 6	Remove the lower legacy fan tray and install the new lower fan tray.	**Note** Since this is a hot swap, make sure to have the new fan tray readily available. Once you remove the legacy fan tray, insert the new fan tray immediately, making sure to seat it firmly against its connector. Inserts the new lower fan tray. LEDs on the new fan tray glow green upon insertion. (Green and amber may be observed for a short duration.)

	Command or Action	Purpose
Step 7	**process start envmon** **Example:** `RP/0/RP0/CPU0:ios(admin)#process start envmon`	Starts the envmon process back up, which detects the new fan trays.
Step 8	**process start envmon_mon** **Example:** `RP/0/RP0/CPU0:ios(admin)#process start envmon_mon`	Starts the envmon_mon process back up, which detects the new fan trays.
Step 9	**process restart invmgr** **Example:** `RP/0/RP0/CPU0:ios(admin)#process restart invmgr`	Wait for 20 seconds, then restart the invmgr process.
Step 10	process mandatory on envmon_mon **Example:** `RP/0/RP0/CPU0:ios(admin)#process mandatory on envmon_mon`	Reset the mandatory reboot options for the envmon_mon process.
Step 11	process mandatory on envmon **Example:** `RP/0/RP0/CPU0:ios(admin)#process mandatory on envmon`	Reset the mandatory reboot options for the envmon process.

Verifying the Fan Tray

To verify which fan tray is installed, run the following commands:

- admin show diag fans
- admin show inventory fans

Example of admin show diag fans for new fan trays

```
RP/0/RP0/CPU0:ios#admin show diag fans
Rack 0 - Fan Tray 0 (Upper): CRS 8 Slots Fan Tray for CRS-8/S-B
  MAIN:  board type 900163
         800-39053-01 rev 05
         dev N/A
         S/N FLAM16370WNU
  PCA:   73-14855-01 rev 05
  PID:   CRS-8-FANTRAY-B
  VID:   V00
  CLEI:
```

```
ECI:   0
Rack 0 - Fan Tray 1 (Lower): CRS 8 Slots Fan Tray for CRS-8/S-B
  MAIN:  board type 900163
         800-39053-01 rev 05
         dev N/A
         S/N FLM17035W2A
  PCA:   73-14855-01 rev 05
  PID:   CRS-8-FANTRAY-B
  VID:   V00
  CLEI:
  ECI:   0
```

Example of admin show diag fans for legacy fan trays

```
RP/0/RP0/CPU0:ios#admin show diag fans
Rack 0 - Fan Tray 0 (Upper): Cisco CRS-1 Series Fan Tray for 8 slots LCC
  MAIN:  board type 900160
         800-23275-09 rev D0
         dev N/A
         S/N TBM16492777
  PCA:   73-8701-06 rev A0
  PID:   CRS-8-LCC-FAN-TR
  VID:   V05
  CLEI:  IPPQAH1JAA
  ECI:   155763
Rack 0 - Fan Tray 1 (Lower): Cisco CRS-1 Series Fan Tray for 8 slots LCC
  MAIN:  board type 900160
         800-23275-09 rev D0
         dev N/A
         S/N TBM16492767
  PCA:   73-8701-06 rev A0
  PID:   CRS-8-LCC-FAN-TR
  VID:   V05
  CLEI:  IPPQAH1JAA
  ECI:   155763
```

Example of admin show inventory fans for new fan trays

```
RP/0/RP0/CPU0:ios#admin show inventory fans
NAME: "Rack 0 - Fan Tray Upper", DESCR: "CRS 8 Slots Fan Tray for CRS-8/S-B"
PID: CRS-8-FANTRAY-B, VID: V00, SN: FLAM16370WNU
NAME: "Rack 0 - Fan Tray Lower", DESCR: "CRS 8 Slots Fan Tray for CRS-8/S-B"
PID: CRS-8-FANTRAY-B, VID: V00, SN: FLM17035W2A
```

Example of admin show inventory fans for legacy fan trays

```
RP/0/RP0/CPU0:ios#admin show inventory fans
NAME: "Rack 0 - Fan Tray Upper", DESCR: "Cisco CRS-1 Series Fan Tray for 8 slots LCC"
PID: CRS-8-LCC-FAN-TR, VID: V05, SN: TBM16492777
NAME: "Rack 0 - Fan Tray Lower", DESCR: "Cisco CRS-1 Series Fan Tray for 8 slots LCC"
PID: CRS-8-LCC-FAN-TR, VID: V05, SN: TBM16492767
```

Installing Exterior Components

Installing Exterior Components

This chapter provides instructions for installing the exterior cosmetic components on the Cisco CRS 8-Slot Line Card Chassis Enhanced router. This chapter presents the following topics:

Overview of the Exterior Components

Exterior cosmetic components for the Cisco CRS 8-Slot Line Card Chassis Enhanced router are not required to be installed; they are provided as optional components (except for the cable management bracket, which is preinstalled). The Cisco CRS 8-Slot Line Card Chassis Enhanced router is shipped with the following exterior components:

- Inlet grille (shipped separately)

- Front cover (shipped separately)

You can also install the optional exterior exhaust grille for the rear of the chassis. This exterior component for the rear of the chassis does not ship automatically with the product; it must be ordered separately. For more information about installing the rear exhaust grille, see Installing a Rear Exhaust Grille, page 4-5 .

Installing the Front Side Exterior Components

This section contains the following procedures:

Installing the Inlet Grille

This section describes how to install the inlet grille on a Cisco CRS 8-Slot Line Card Chassis Enhanced router. The grille covers the power module and air intake areas at the bottom of the front (PLIM) side of the chassis, just below the card cage.

Figure 40: Inlet Grille
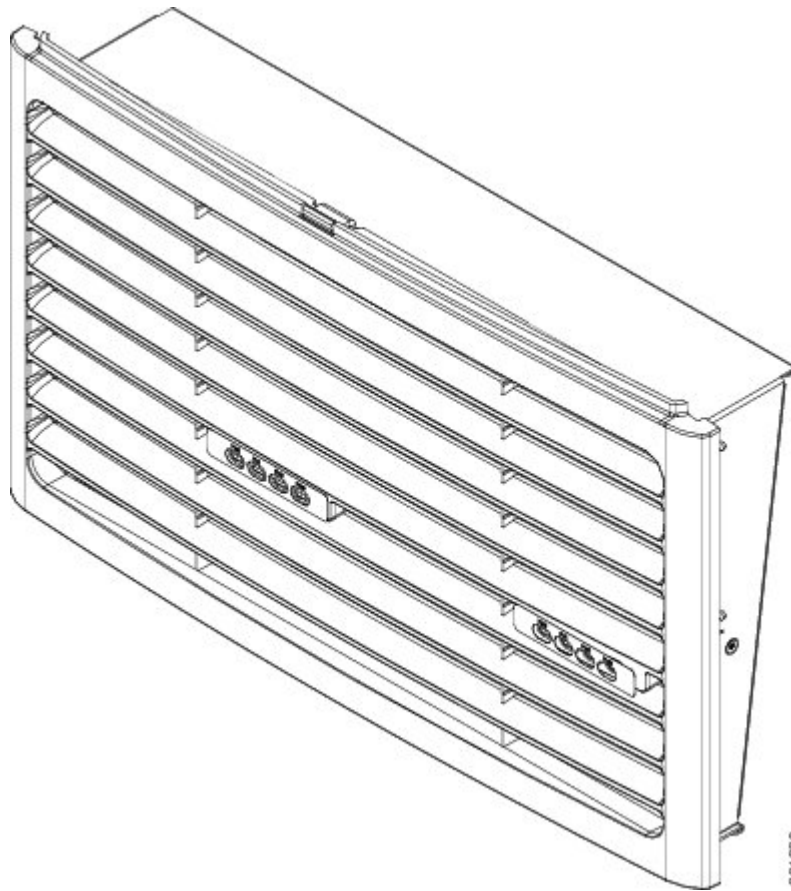
Prerequisites

Before installing the inlet grille, you should mount the chassis in a rack and remove the rear handle pulls. See the Cisco CRS Carrier Routing System 8-Slot Line Card Chassis Enhanced Router Unpacking, Moving, and Securing Guide.

Required Tools and Equipment

- ESD-preventive wrist strap

- Inlet grille (Cisco product number: CRS-8-PW-GRILL)

Steps

To install the inlet grille, perform the following steps:

Procedure

Step 1	Remove the new inlet grille from its packaging, then set the packaging aside.
Step 2	Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
Step 3	Align and insert the hooks at the bottom of the inlet grille into the cutouts at the bottom of the chassis casing on the front (PLIM) side of the chassis, just in front of the power modules.
Step 4	Rotate the top of the inlet grille toward the chassis, and snap it into place on the ball studs.

What to Do Next

After performing this task, you may install the front cover. See .

Installing the Front Cover

This section describes how to install the front cover. The front cover protects the card cage on the front (PLIM) side of the chassis.

The following figure shows the front cover installed on the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

Figure 41: Front Cover Installed on the Cisco CRS 8-Slot Line Card Chassis Enhanced Router
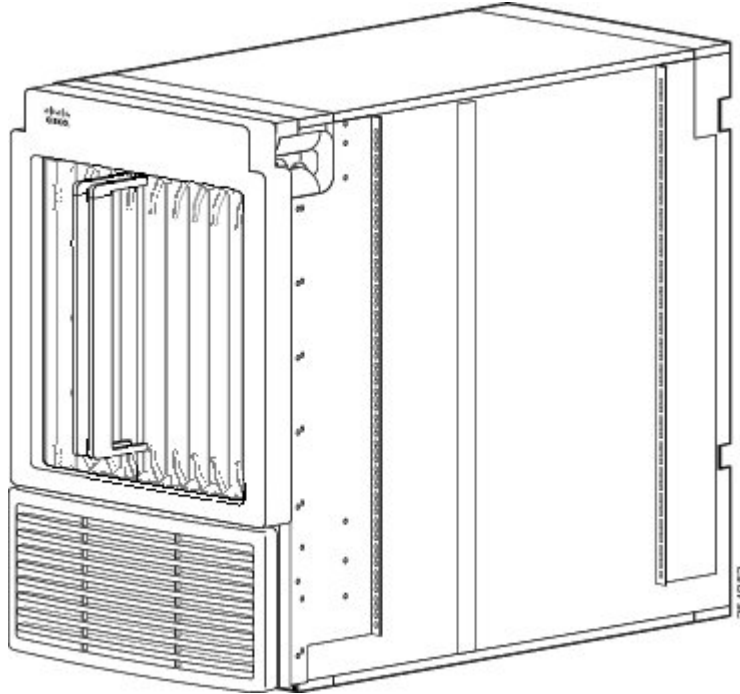
Prerequisites

Before installing the front cover, you should mount the chassis in a rack and remove the rear handle pulls. See the Cisco CRS Carrier Routing System 8-Slot Line Card Chassis Enhanced Router Unpacking, Moving, and Securing Guide .

Required Tools and Equipment

- ESD-preventive wrist strap

- Number 1 Phillips screwdriver

- Front cover (Cisco product number: CRS-8-FRONT-COVER=) [Optional]

Steps

To install the front cover, perform the following steps:

Procedure

Step 1   Remove the new front cover from its packaging.

Step 2   Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.

Step 3   Install the ball stud retainer brackets on the vertical chassis rack rails, two on the left and two on the right.

Figure 42: Location of Ball Stud Retainer Brackets on Vertical Chassis Rack Rails
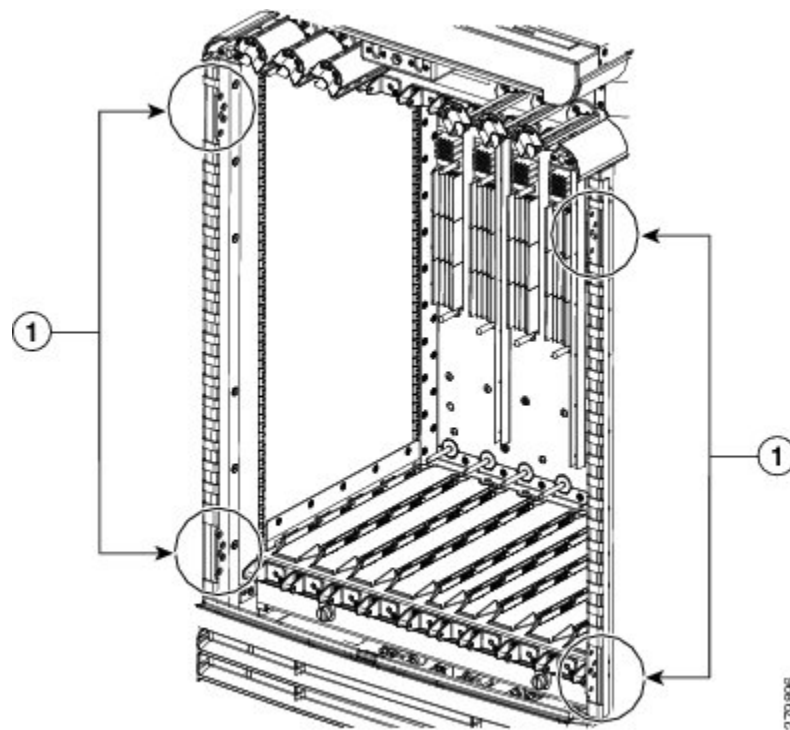
| 1 | Ball stud retainer brackets |

Step 4 Using the screwdriver, tighten the four flat head screws that attach each ball stud retainer bracket to the vertical chassis rack rails.

Figure 43: Attaching the Ball Stud Retainer Bracket to the Left Vertical Chassis Rack Rail.
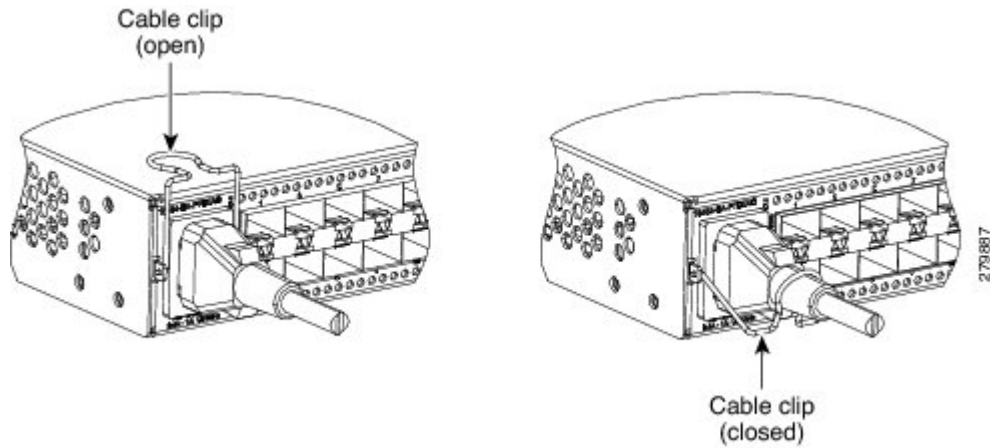
Step 5 Align the four ball studs on the front cover with the holes on the ball stud retainer brackets.

Step 6 Firmly press until the four ball studs snap into place. Refer to Figure 41: Front Cover Installed on the Cisco CRS 8-Slot Line Card Chassis Enhanced Router.

Installing Line Cards, PLIMs, and Associated Components

Installing Line Cards, PLIMs, and Associated Components

This chapter provides instructions on how to install the Cisco CRS 8-Slot Line Card Chassis Enhanced router modular services cards (MSCs), physical layer interface modules (PLIMs), and any associated components. This chapter presents the following topics:

About Installing and Removing Cards and Associated Components

This section contains some general information about installing and removing cards, PLIMs, and associated components.

Guidelines and Warnings for Card Installation and Removal

This section contains the guidelines for card installation and removal.

⚠

Caution Removing more than one card at a time can misalign the chassis and may damage the card or chassis when reinserting the cards. Remove and reinsert only one card at a time.

Online (in-service) insertion and removal (OIR) is supported, enabling you to remove and install cards while the router is operating. OIR is seamless to users on the network, maintains all routing information, and ensures session preservation. Notifying the software or resetting the power is not required. However, you have the option of using the **shutdown** command before removing a card.

The different cards and PLIMs in the line card chassis are all attached to the chassis itself using a pair of ejector levers and captive screws. The two ejector levers release the card or PLIM from its midplane connector.

The exact location of the ejector levers and captive screws varies slightly from card to card, but are in general in the same location: on the upper and bottom of the faceplate of the card. .

Figure 44: Ejector Levers and Captive Screws
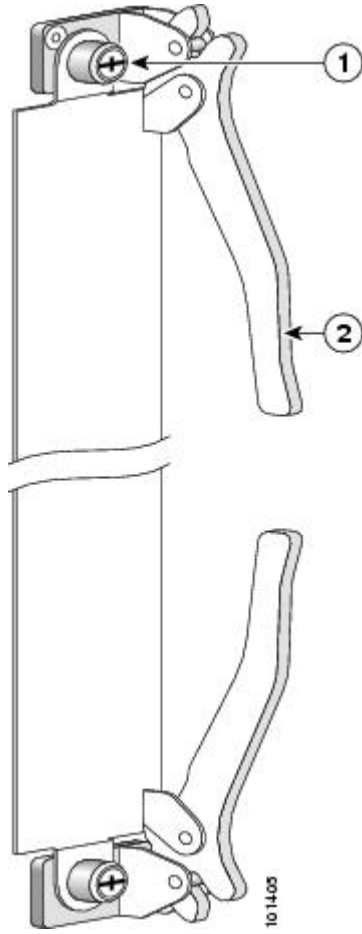
1	Captive screw	2	Ejector lever

The following figure shows how to operate the ejector levers. Be sure to operate both levers simultaneously.

Figure 45: Operating Ejector Levers
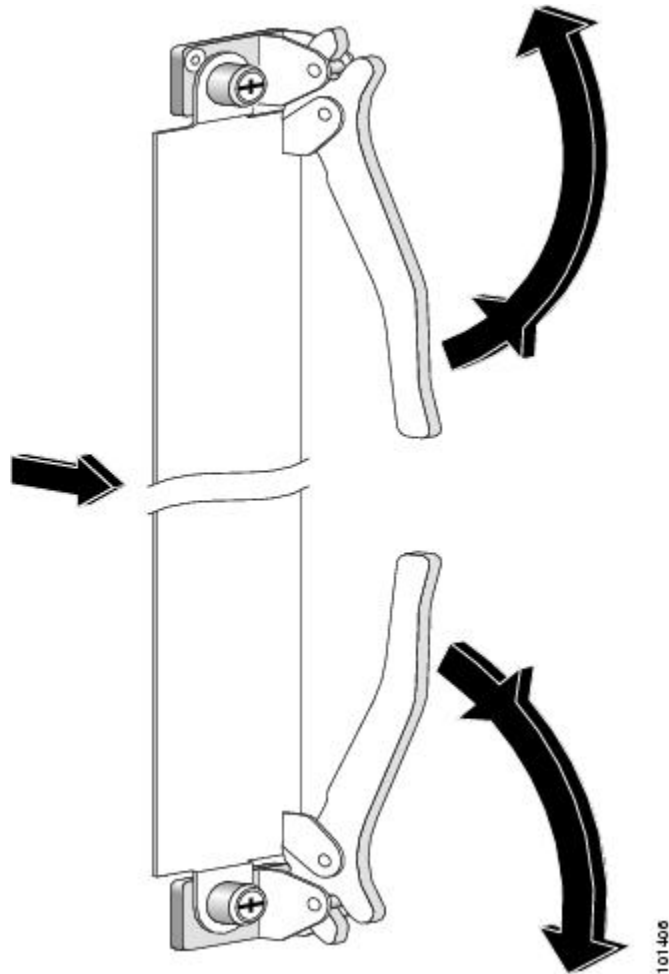
When shipped, every slot in the chassis contains either an impedance carrier, or is covered by a slot cover (see About Impedance Carriers and Slot Covers, on page 81).

Note   While it is not critical for you to install the cards in a certain order, following the card installation recommendations in this chapter will make your installation process easier.

Chassis Slot Numbers

Figure 46: Cisco CRS 8-Slot Line Card Chassis Enhanced Router Slot Numbers—Front (PLIM) Side
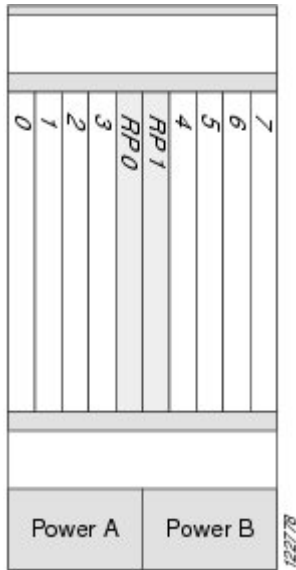
Figure 47: Cisco CRS 8-Slot Line Card Chassis Enhanced Router Slot Numbers—Rear (MSC) Side
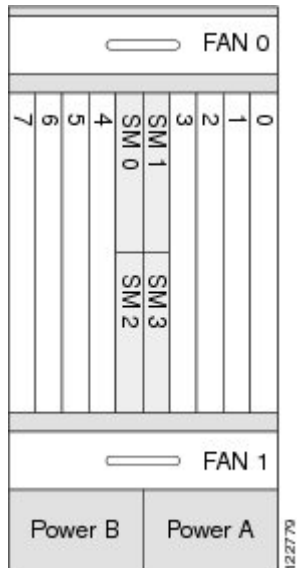
Recommended Order of Card Installation

Card should be installed in a particular order. We recommend the following order when removing the impedance carriers and installing the cards in the chassis (see Figure 46: Cisco CRS 8-Slot Line Card Chassis Enhanced Router Slot Numbers—Front (PLIM) Side and Figure 47: Cisco CRS 8-Slot Line Card Chassis Enhanced Router Slot Numbers—Rear (MSC) Side):

1 Install the RP cards first one card at a time, the left one (slot RP0) before the right one (slot RP1). Tighten the screws only after fully inserting both RP cards.

Note It is important to engage and partially tighten all screws first, before fully tightening them with a screwdriver. This action helps ensure that all parts are aligned properly in the chassis.

1 Install the switch fabric cards one at a time in the same manner.

We recommend that you install fabric cards from left to right, starting from top to bottom, in this order:

- ◦ Slot SM0

  ◦ Slot SM1

  ◦ Slot SM2

  ◦ Slot SM3

- For the line cards and PLIMs, you must remove one impedance carrier, install a functional board, and tighten the screw; then repeat the process until all cards and PLIMs have been installed.

Cautions and Recommendations

Caution When you remove a card, always use the ejector levers to ensure that the connector pins disconnect from the midplane in the sequence expected by the router.

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

Do not operate the Cisco CRS 8-Slot Line Card Chassis Enhanced router with any slots completely empty; doing so could lead to an airflow bypass condition that diverts airflow from slots containing heat-generating electronics, possibly causing thermal alarms to occur at lower-than-expected ambient temperatures.

To avoid airflow bypass, all slots should be filled with their appropriate cards or impedance carriers. If you have to replace a card, we recommend leaving the card in place in the chassis until you are ready to install the new one.

Tip To lessen the possibility of damaging the connectors on the chassis midplane, you should visually inspect the connector pins on the cards before you insert them into the chassis.

About Impedance Carriers and Slot Covers

When shipped, all slots in the chassis either contain impedance carriers or are covered by slot covers to help maintain chassis stiffness and ensure that the chassis is undamaged during shipment. Four different types of impedance carriers and slot covers exist for the four different sizes of slots in the chassis.

Figure 48: Switch Fabric Slot (Half Height) Slot Cover
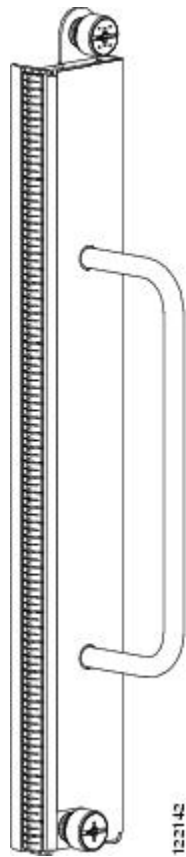
Figure 49: RP Slot Impedance Carrier
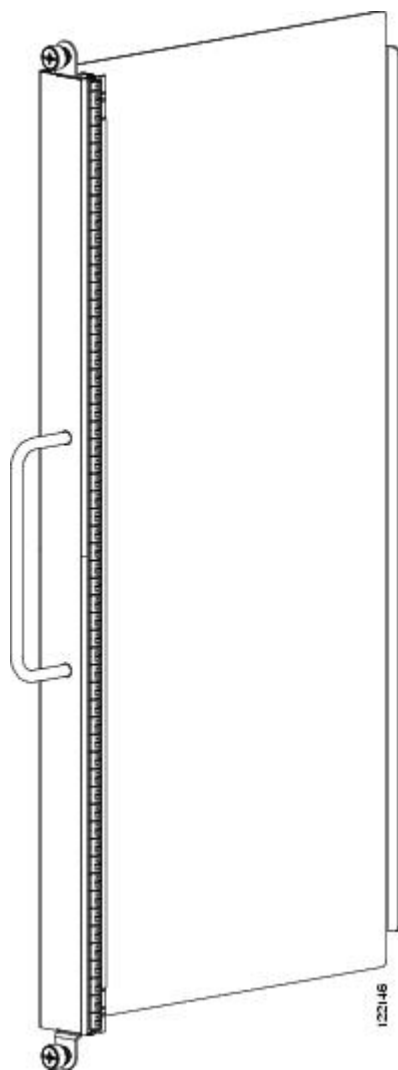
Figure 50: PLIM Slot Impedance Carrier

138972
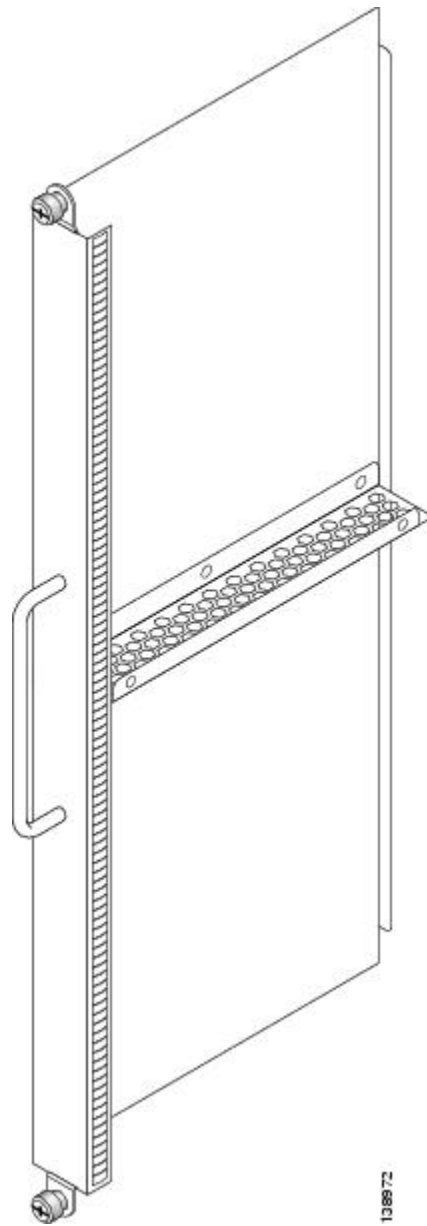
Figure 51: MSC Slot Impedance Carrier
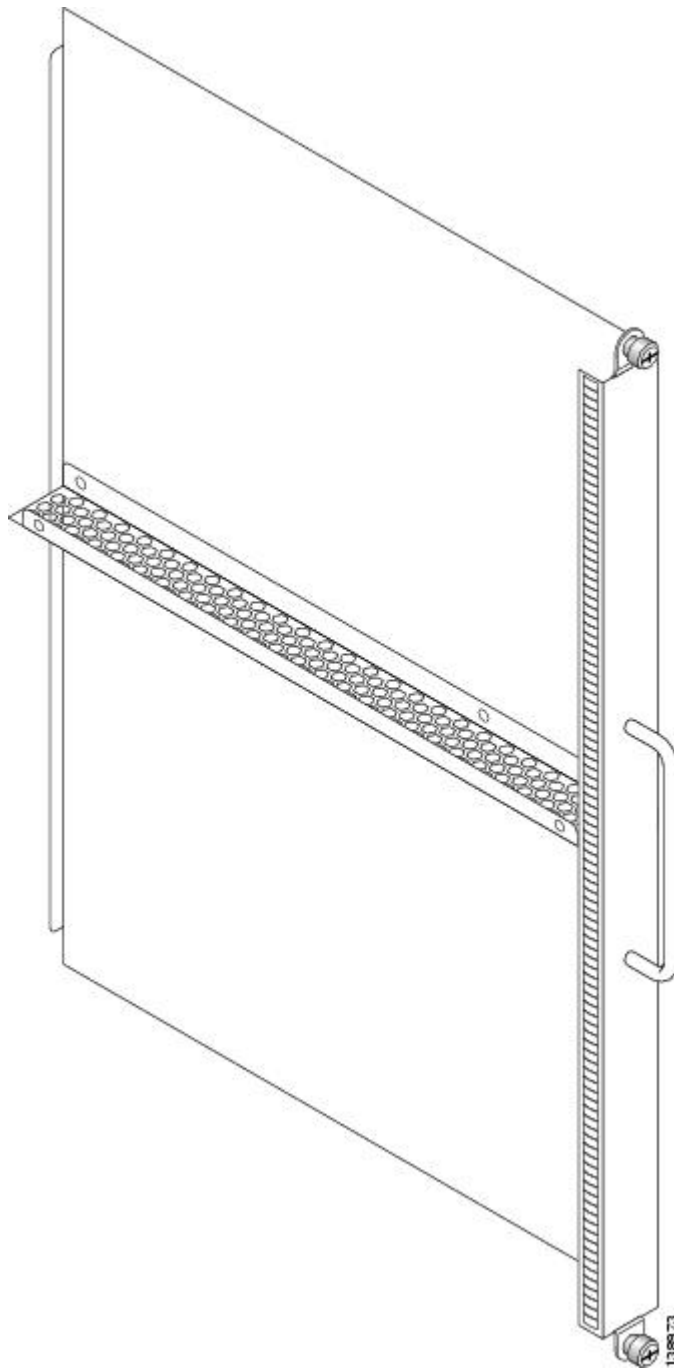
For further information on installing and removing the slot covers and impedance carriers, see Installing a Slot Cover, on page 89, Removing a Slot Cover, on page 91, Installing an Impedance Carrier, on page 93, and Removing an Impedance Carrier, on page 95.

About Distributed Route Processors and Distributed Route Processor PLIMs

The Cisco CRS Carrier Routing System provides distributed route processor (DRP) support through the installation of DRP PLIMs and DRP cards on the Cisco CRS 8-Slot Line Card Chassis Enhanced router (see

Figure 52: DRP PLIM and Figure 53: DRP Card). The installation of DRPs provides you with the ability to configure the system for logical router support and additional processor power for multichassis systems.

Figure 52: DRP PLIM
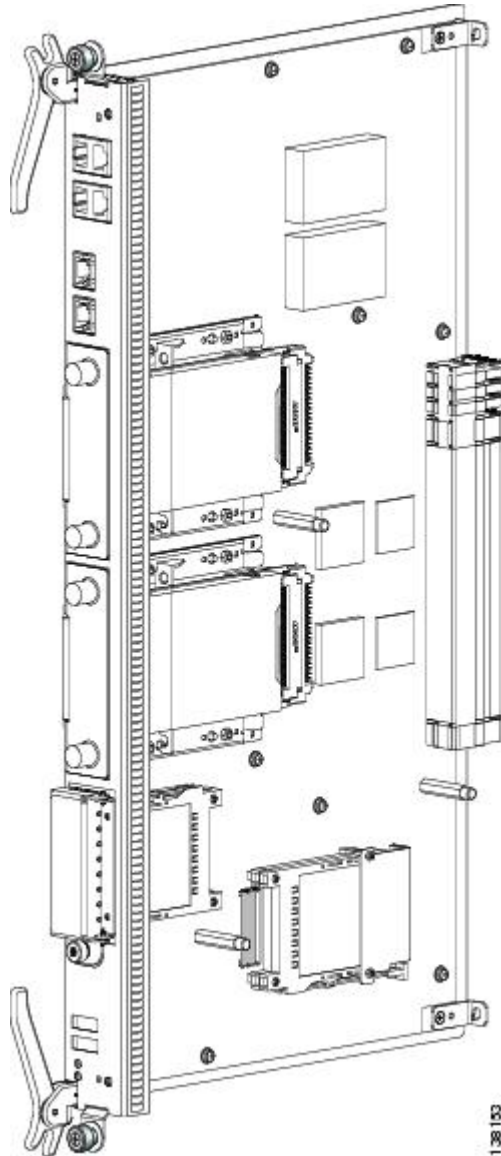
Figure 53: DRP Card
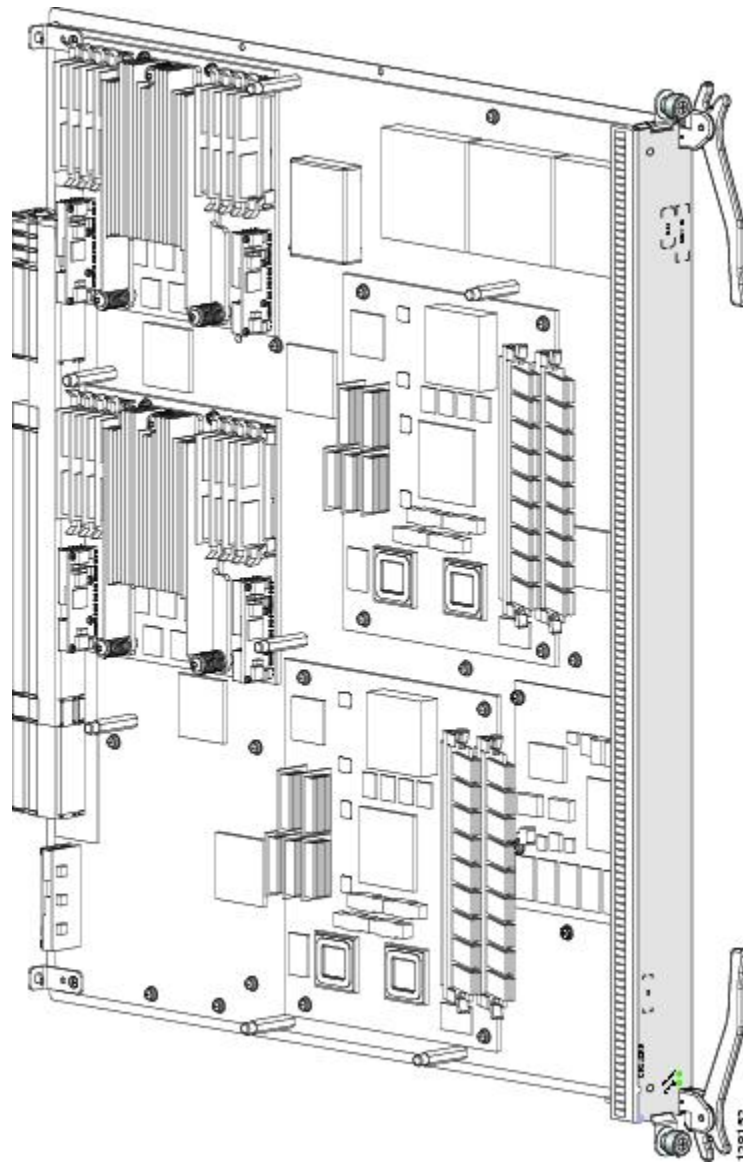
For DRP support, you must install both the DRP PLIM in a PLIM slot on the front (PLIM) side of the chassis and a DRP card in the corresponding slot on the rear (MSC) side of the chassis. The DRP PLIM and DRP cards are installed in the same manner as regular PLIMs and MSCs. See Installing a Physical Layer Interface Module, on page 120 or Installing an MSC, FP, or LSP, on page 111 for further information.

DRPs contain two CPU complexes, independent of each other, each with its own hard drive. In addition, the DRP provides you with two PCMCIA card slots, similar to the RP. For further information, see About Hard Drives and PCMCIA Cards, on page 88. For installation or removal information, see Installing a Physical Layer Interface Module, on page 120.

About Small Form-Factor Pluggable (SFP) Modules

The SFP module for the line card chassis uses the bale clasp latch type.

⚠

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

✎

Note   Only the 16-port OC-48c/STM-16c MSC uses SFP modules.

About Hard Drives and PCMCIA Cards

Optional and replaceable hard drives and PCMCIA cards are available for the DRP cards.

The hard drive is an IDE hard drive used for gathering debugging information, such as core dumps from the DRPs or MSCs. The IDE hard drive is typically powered down and activated only when there is a need to store data. The drive is not vital to a functioning chassis and is optional.

✎

Note   Core dumps are discoverable only through intervention with the chassis system software.

Physically, the DRP hard drive is a hot-pluggable PC board and sled-mounted drive with a connector interface that gets cleanly seated into a route processor card. In general, removal and replacement of this drive is not required.

The DRP cards provide two PCMCIA flash slots, each card providing up to 1 GB of flash storage. One of the PCMCIA flash subsystems is accessible externally, is removable, and allows you to transfer images and configurations by plugging in a PCMCIA flash card. The other subsystem is fixed to the DRP, not removable, and for permanent storage of configurations and images.

About Cable Management Brackets

The Cisco CRS 8-Slot Line Card Chassis Enhanced router includes a cable management system that organizes the interface cables entering and exiting the different cards, keeping them out of the way and free of sharp bends.

⚠

Caution   Excessive bending of interface cables can damage the cables.

The Cisco CRS 8-Slot Line Card Chassis Enhanced router arrives preinstalled with a horizontal cable management bracket on the front of the chassis and an optional horizontal cable management bracket is orderable for the rear of the chassis.

✎

Note   If you have Back-to-Back (B2B) installation of fabric cards, it is essential that you use the rear cable management brackets for ideal cable management.

The following figure shows the front cable management bracket.

Figure 54: Front Cable Management Bracket
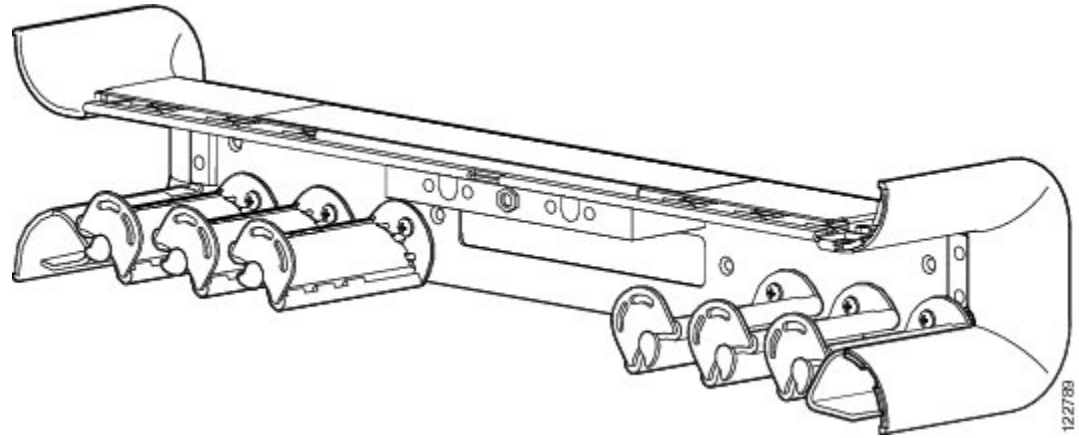
The following figure shows the rear cable management bracket.

Installing or Removing a Slot Cover

This section contains the following procedures:

Installing a Slot Cover

This section describes how to install a slot cover in the Cisco CRS 8-Slot Line Card Chassis Enhanced router. The chassis is shipped with slot covers over the switch fabric card and RP card slots; we advise installing slot

covers over any empty slots in the chassis. Both slot cover types are installed in the same manner. For more detailed information on the slot covers, see About Impedance Carriers and Slot Covers, on page 81.

Figure 55: Switch Fabric Slot (Half Height) Slot Cover
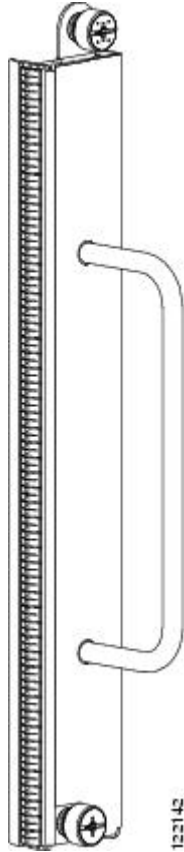
Prerequisites

Before performing this task, remove the front cover, if installed, and ensure that the slot over which you are about to install the cover is empty. See Removing an RP, PRP, or DRP Card, page 7-8 and Removing a Switch Fabric Card, page 7-4 .

Required Tools and Equipment

You need the following tools and part to perform this task:

- ESD-preventive wrist strap
- Number 2 Phillips or number 2 common (flat-head) screwdriver
- Slot cover

Steps

To install a slot cover, follow these steps:

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the rear (MSC) side or a bare metal surface on the chassis.

Step 2 Using the handle, hold the slot cover in place over the slot.

Step 3 Partially tighten the four captive screws on the front panel of the slot cover (either by hand or with the screwdriver) to make sure that they are both engaged.

Step 4 To seat the slot cover firmly in place, fully tighten the captive screws.

What to Do Next

After performing this task, reinstall the front cover, if applicable.

Removing a Slot Cover

This section describes how to remove a slot cover from the Cisco CRS 8-Slot Line Card Chassis Enhanced router. The chassis is shipped with slot covers over the switch fabric card and RP card slots. Both slot cover

types are removed in the same manner. For more detailed information on the slot covers, see About Impedance Carriers and Slot Covers, on page 81.

Figure 56: Switch Fabric Slot (Half Height) Slot Cover
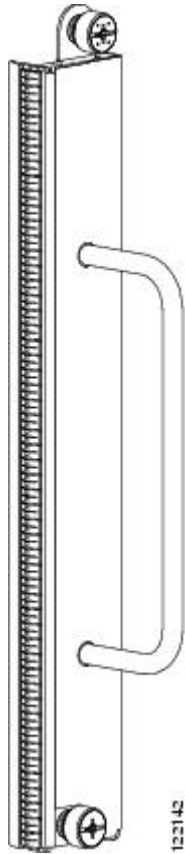
Prerequisites

Before performing this task, remove the front cover, if installed.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap

- Number 2 Phillips or number 2 common (flat-head) screwdriver

Steps

To remove a slot cover, follow these steps:

Procedure

Step 1   Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the rear (MSC) side or a bare metal surface on the chassis.

Step 2   Grasp the slot cover with one hand.

Step 3   Loosen the captive screws that attach the slot cover to the chassis.

Step 4   Holding the slot cover by the handle, remove it and set it carefully aside.

What to Do Next

After performing this task, store the slot cover for later reuse. You may now install a card in the uncovered slot. See Installing a Switch Fabric Card, on page 106 and Installing an RP, PRP, or DRP Card, on page 96 for further details.

Installing or Removing an Impedance Carrier

This section contains the following procedures:

Installing an Impedance Carrier

This section describes how to install an impedance carrier into the Cisco CRS 8-Slot Line Card Chassis Enhanced router. The chassis is shipped with impedance carriers installed in the MSC and PLIM slots. Both

impedance carrier types are installed in the same manner. For more detailed information on impedance carriers, see About Impedance Carriers and Slot Covers, on page 81.

Figure 57: MSC Slot Impedance Carrier
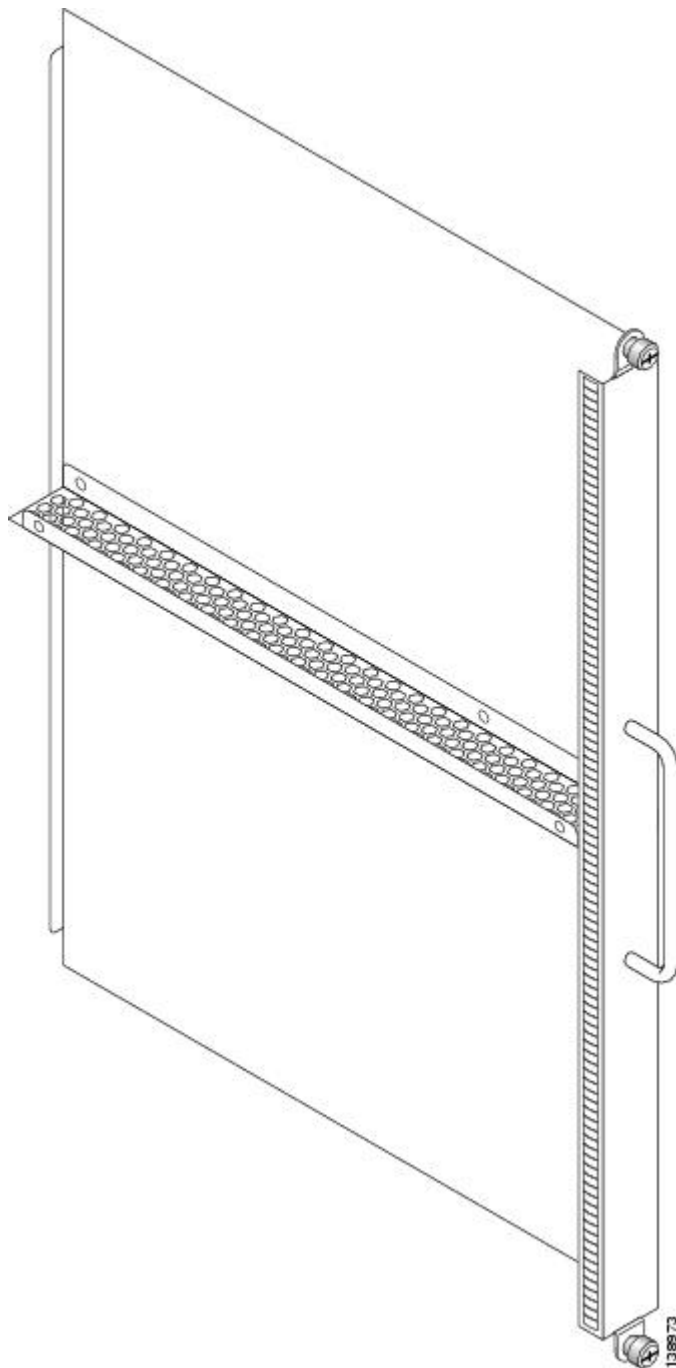
Prerequisites

Before performing this task, remove the front cover, if installed, and ensure that the slot in which you are about to install the impedance carrier is empty. Depending on the slot in which you are installing an impedance carrier, see About Impedance Carriers and Slot Covers, on page 81, Removing an MSC, FP, or LSP, page 7-6 or Removing a PLIM, page 7-9 .

Required Tools and Equipment

You need the following tools and part to perform this task:

- ESD-preventive wrist strap

- Number 2 Phillips or number 2 common (flat-head) screwdriver

- Impedance carrier (MSC impedance carrier Cisco Product number CRS-MSC-IMPEDANCE=; PLIM impedance carrier Cisco Product number CRS-INT-IMPEDANCE=)

Steps

To install an impedance carrier, follow these steps:

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the rear (MSC) side or a bare metal surface on the chassis.

Step 2 Use both hands while inserting an impedance carrier. Use one hand on the faceplate and the other hand along the base of the impedance carrier to guide it into a slot.

Step 3 Slide the impedance carrier into the chassis until the captive screw plates are flush with the chassis.

Step 4 Partially tighten the two captive screws on the front panel of the impedance carrier (either by hand or with the screwdriver) to make sure that they are both engaged.

Step 5 To seat the impedance carrier firmly in the slot, fully tighten the captive screws.

What to Do Next

After performing this task, reinstall the front cover, if applicable.

Removing an Impedance Carrier

This section describes how to remove an impedance carrier from the Cisco CRS 8-Slot Line Card Chassis Enhanced router. Both impedance carrier types are removed in the same manner. (For reference, #con_1283445/fig_1284640 shows an MSC impedance carrier.) For more detailed information on impedance carriers, see About Impedance Carriers and Slot Covers, on page 81.

Prerequisites

Before performing this task, remove the front cover, if installed.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- Number 2 Phillips or number 2 common (flat-head) screwdriver

Steps

To remove an impedance carrier, follow these steps:

Procedure

Step 1   Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the rear (MSC) side or a bare metal surface on the chassis.

Step 2   Identify the impedance carrier to be removed from the card cage.

Step 3   To loosen the impedance carrier from the slot, turn the two captive screws on the front panel of the card counterclockwise.

Step 4   Grasp the impedance carrier handle with one hand and gently pull it halfway from the slot.

Step 5   Place one hand under the impedance carrier to guide it.

Step 6   Holding the impedance carrier underneath and by the handle, pull it from the slot and set it carefully aside.

What to Do Next

After performing this task, store the impedance carrier for future use. You may now install a card in the uncovered slot. See the Installing an MSC, FP, or LSP, on page 111 and Installing a PLIM, on page 120 for further details.

Installing an RP, PRP, or DRP Card

This section contains the following procedures:

Installing an RP, PRP, or DRP Card

This section describes how to install a route processor (RP), performance route processor (PRP), or distributed route processor (DRP) card in the chassis.

Every Cisco CRS 8-Slot Line Card Chassis Enhanced router contains two RP cards in dedicated slots on the front (PLIM) side of the chassis.

Note   A chassis may not be populated with a mix of RP and PRP cards. Both route processor cards should be of the same type (RP or PRP). If you are using Cisco CRS-X, you must use only PRP cards.

Note   For enhanced immunity to external electromagnetic disturbance levels of 10V per meter and 10 V RMS, you must use a shielded Ethernet (CAT5 or better STP) cable on the Management Ethernet connection of the RP card (CRS-8-RP). The use of a shielded Ethernet cable on the Management Ethernet connection of the PRP card (CRS-8-PRP-6G or CRS-8-PRP-12G) is optional. The grounded end of the shielded Ethernet cable should be at the RP (or PRP) end.

⚠️

Caution   Be careful while handing the PRP line cards to avoid pressing the memory module latches on the daughter board and accidently disengaging the memory modules. For the location of these latches, see the following figure.

Figure 58: Memory Modules Latches on the Daughter Board
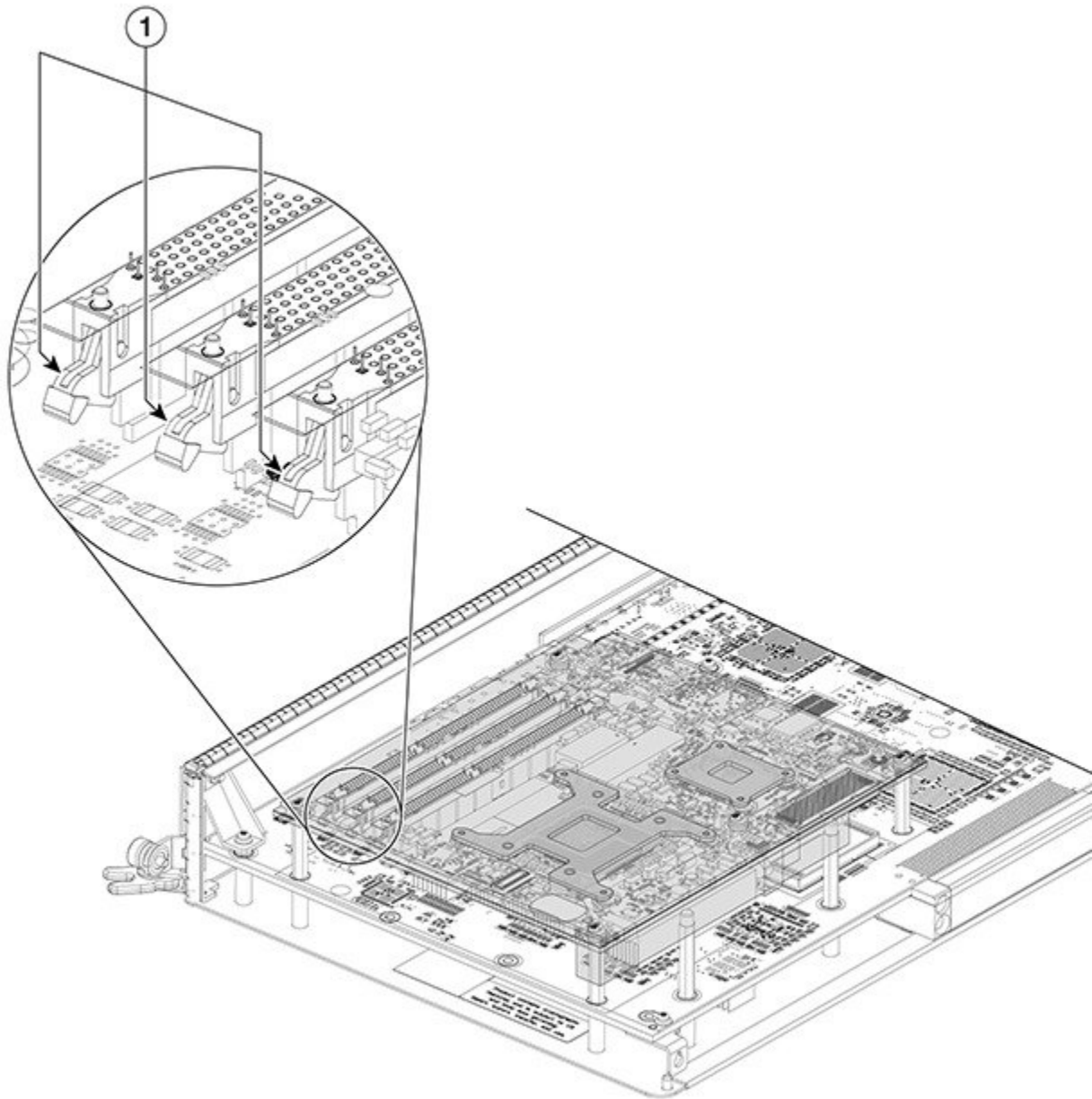
| 1 | Memory Module Latches |

Prerequisites

Because chassis operation may be impacted by the installation of a route processor card, perform these tasks only if one of the following conditions exists:

- When you are certain that the second RP in the chassis is operational and, if not already the active RP, ready to assume control (this happens automatically)

- When the chassis is undergoing scheduled maintenance

- When the Cisco CRS 8-slot line card chassis is powered down

Failure to follow these guidelines can result in interruptions in data communications and network connectivity.

Before performing this task, remove the front cover, if installed.

Figure 59: Route Processor (RP) Card for the 8-Slot Cisco CRS 8-Slot Line Card Chassis Enhanced Router
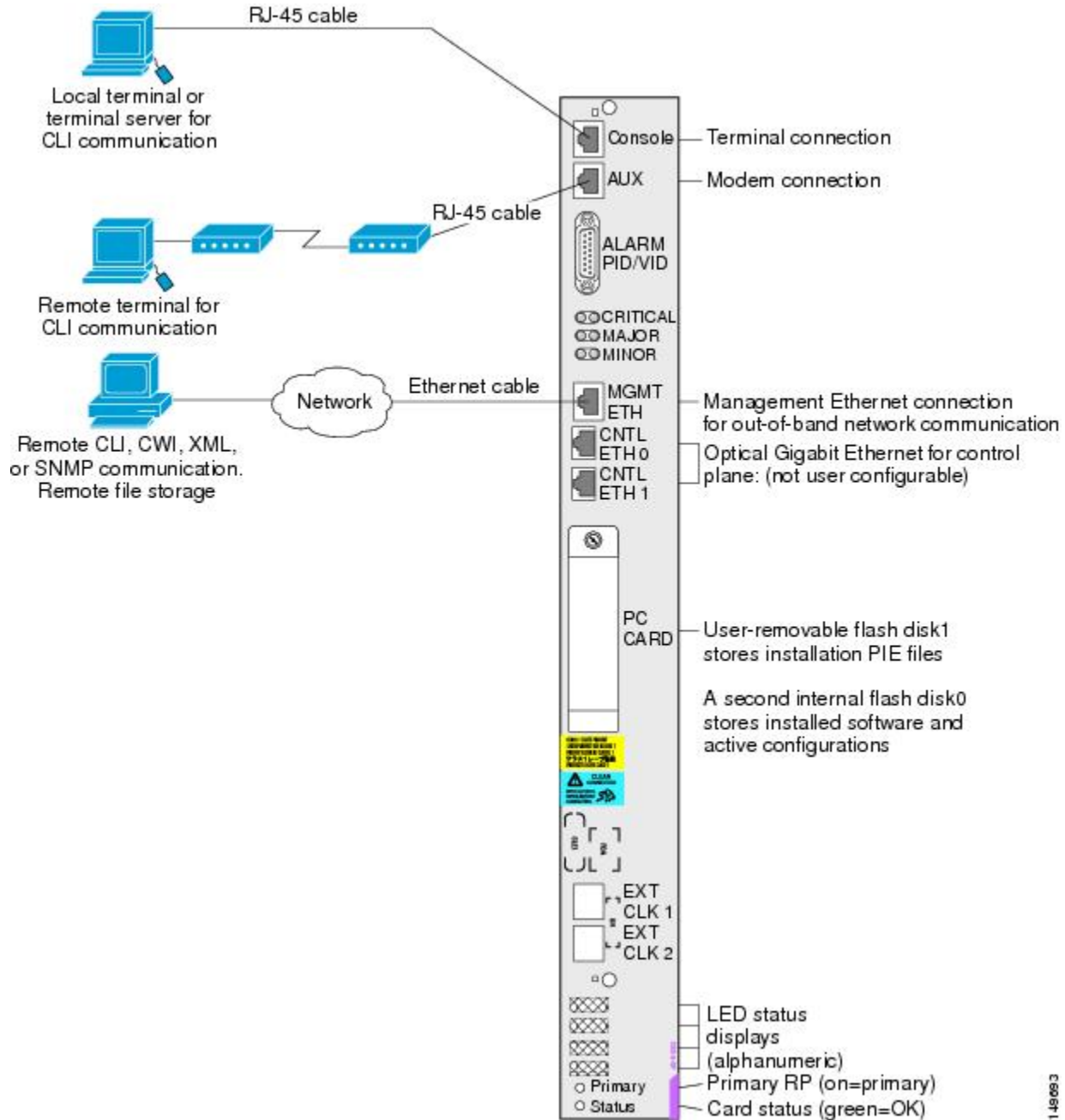
Required Tools and Equipment

You need the following tools and part to perform this task:

- ESD-preventive wrist strap

- Number 2 Phillips or number 2 common (flat-head) screwdriver

- RP, PRP, or DRP card:

  - RP card—Cisco product number: CRS-8-RP=

  - PRP card—Cisco product number: CRS-8-PRP-6G=

  - PRP card—Cisco product number: CRS-8-PRP-12G=

  - DRP card—Cisco product number: CRS-DRP-CPU=

Steps

To install an RP or DRP card, follow these steps:

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front (PLIM) side or a bare metal surface on the chassis.

Step 2 Remove the card from its antistatic packaging.

Step 3 Visually inspect the connector pins on the card before you insert it into the chassis. Do not attempt to install a card with bent pins, as this may damage the chassis midplane connectors.

Step 4 Identify the card to be replaced in the card cage. Remove any cables connected to the front panel of the card.

Step 5 Use the screwdriver to turn the two captive screws on the front panel of the card counterclockwise to loosen the card from the slot.

Step 6 Grasp the two card ejector levers and simultaneously pivot both ejector levers 90 degrees away from the front edge of the card carrier to unseat the card from the backplane connector.

Step 7 Touching only the metal card carrier, slide the card from the slot and place it directly into an antistatic sack or other ESD-preventive container. If you plan to return the defective card to the factory, repackage it in the shipping container you received with the replacement card.

Step 8 Grasp the card carrier handle with one hand and place your other hand under the carrier to support and guide it into the correct slot. Slide the card halfway into the slot. Avoid touching the card circuitry or any connectors.
    Note Alignment grooves exist on each slot in the card cage. When you install a card in the card cage, make sure that you align both edges of the card carrier in the slot grooves.

Step 9 Pivot both card ejector levers so that the openings on the card ejector cams at the top and bottom of the card pass over the tabs on each side of the card cage slot.
    Caution Verify that the openings on the card ejector cams pass over the tabs; otherwise, one or both ejector levers may bind when you attempt to close the ejector levers, thereby damaging or breaking one or both ejector levers.

Step 10 Continue sliding the card into the card cage slot until the openings on the card ejector cams engage the tabs on each side of the card cage slot.
    Note An RP or DRP card has guide pins that make initial contact with the backplane connector as you slide the card into its slot. After the guide pins make contact, continue pushing on the card carrier until the card ejector levers begin pivoting forward, toward the handle in the card carrier.

Step 11 To seat the card in the backplane connector, grasp both card ejector levers and pivot them inward toward the handle in the card carrier until they are flush against the front edge of the card carrier.

Step 12 Partially tighten the two captive screws on the front panel of the card (either by hand or with the screwdriver) to make sure that they are both engaged.

Step 13 Use the screwdriver to turn the two captive screws on the front panel of the card clockwise to seat the card firmly in the slot.

Step 14 Reattach any cables you removed in Step 3.

What to Do Next

After performing this task, reinstall the front cover, if applicable, and verify that the card has been installed properly (see the Verifying the Installation of an RP, PRP, or DRP Card, on page 103). If you are performing the initial installation of the system, install the switch fabric cards (see the Installing a Switch Fabric Card, on page 105).

Verifying the Installation of an RP, PRP, or DRP Card

This section describes how to verify and troubleshoot the installation of a route processor (RP) or distributed route processor (DRP) card in the Cisco CRS 8-Slot Line Card Chassis Enhanced router..

This section describes how to verify that the card has been properly installed. Status indicators on the RP front panel include:

- Alphanumeric LED display

- Status OK LED

- Active/Standby LED

The following figure shows the RP card front panel.

Figure 60: RP Card Front Panel
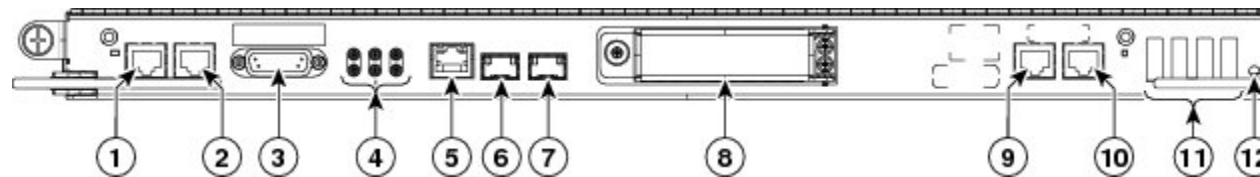
1	Console port	6	Control Ethernet 0 port	11	Alphanumeric LEDs
2	AUX port	7	Control Ethernet 1 port	12	PRIMARY LED
3	Alarm connector	8	PC card slot	13	STATUS LED

4	Alarm LED array	9	EXT CLK 0 port		
5	Management Ethernet port	10	EXT CLK 1 port		

Figure 61: PRP Card Front Panel, on page 104 shows the PRP card front panel.

Figure 61: PRP Card Front Panel
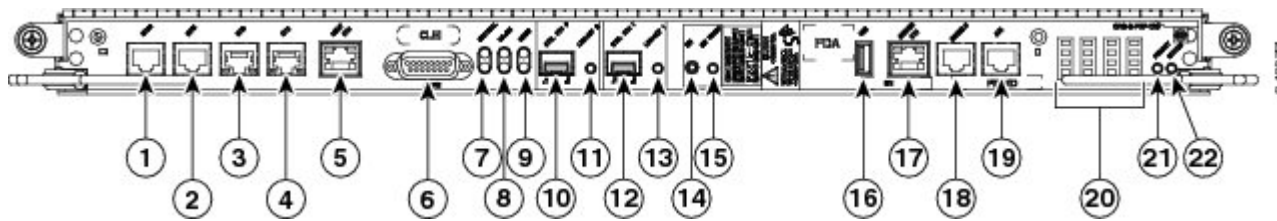
1	BITS 0	12	Control Ethernet 1 port (SFP or SFP+)
2	BITS 1	13	Link/Active 1 LED
3	DTI 0	14	OIR push button—Press to initiate OIR process
4	DTI 1	15	OIR Ready LED
5	Management Ethernet RJ45 port	16	USB socket
6	Alarm connector	17	Service Ethernet RJ45 port
7	Critical Alarm LED	18	Console port
8	Major Alarm LED	19	Auxiliary port
9	Minor Alarm LED	20	Alphanumeric LED Display
10	Control Ethernet 0 port (SFP or SFP+)	21	PRIMARY LED—PRP active or standby indicator
11	Link/Active 0 LED	22	STATUS LED—Card status indicator

Understanding the Alphanumeric LEDs

At one end of the faceplate, near an ejector lever, an RP, PRP, or DRP card has an alphanumeric LED display that shows a sequence of messages indicating the state of the card.

Note   It is normal for some displayed messages to appear too briefly in the LED display to be read.

Troubleshooting the RP, PRP, or DRP Card

If the installed or replaced card fails to operate or to power up on installation, do the following:

1   Make sure that the card is seated firmly in the Cisco CRS 8-Slot Line Card Chassis Enhanced router slot. One easy way to verify physical installation is to see whether the front faceplate of the card is even with the fronts of the other cards installed in the card cage.

Note   PRP cards only—If the PRP is not seated properly, the blue OIR Ready LED on the faceplate glows solidly, and the Primary and Status LEDs keep blinking to indicate that the card is not seated correctly. If this happens, remove the card fully and re-insert fully.

1   Check whether the ejector levers are latched and that the captive screws are fastened properly. If you are uncertain, unlatch the levers, loosen the screws, and attempt to reseat the card.
2   Examine the alarm LEDs on the to see if there are any active alarm conditions.
3   Examine the power shelves to see whether the chassis, as a whole, is receiving power.

Status LEDs

Use the status LEDs, located on the card faceplate, to verify the correct installation of the card:

- When the card is properly installed, the Status LED turns green. If this LED is off, verify that the card is installed correctly.

- When the Status LED is blinking yellow, a problem exists on the board.

- When the Status LED is off, the board state is unknown. Verify that there is power to the board by looking at the indicators on the power module.

- When the Primary LED is on, the board is executing control processing functions and is not in a secondary or standby role.

- If there is a failure during the board boot sequence, the four-row, four-character alphanumeric display indicates the current boot phase to assist you in debugging the board failure.

Installing a Switch Fabric Card

This section contains the following procedures:

Installing a Switch Fabric Card

This section describes how to install a switch fabric card in the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

Depending on the card, the fabric card can be used in a CRS single-chassis system or a CRS back-to-back system. Figure 62: CRS-8-FC400/S Switch Fabric Card shows the single-chassis fabric card (CRS-8-FC400/S).

Figure 63: CRS-8-FC400/M Back-to-Back Switch Fabric Card shows the back-back fabric card (CRS-8-FC400/M).

Figure 62: CRS-8-FC400/S Switch Fabric Card
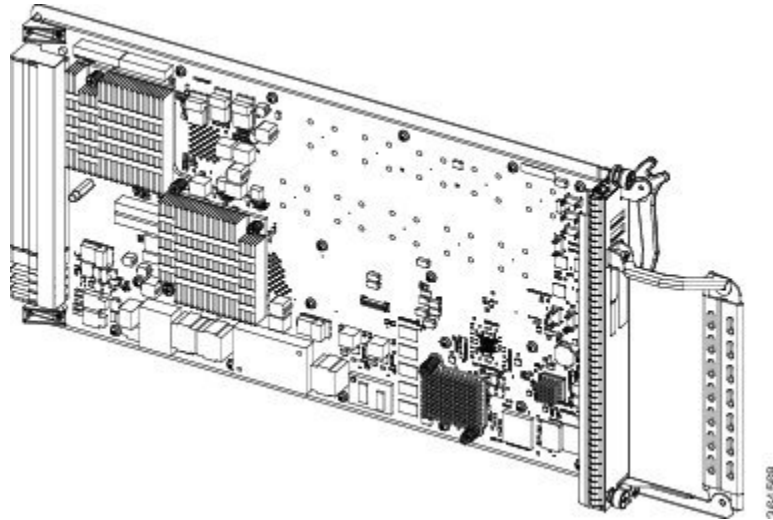
Figure 63: CRS-8-FC400/M Back-to-Back Switch Fabric Card
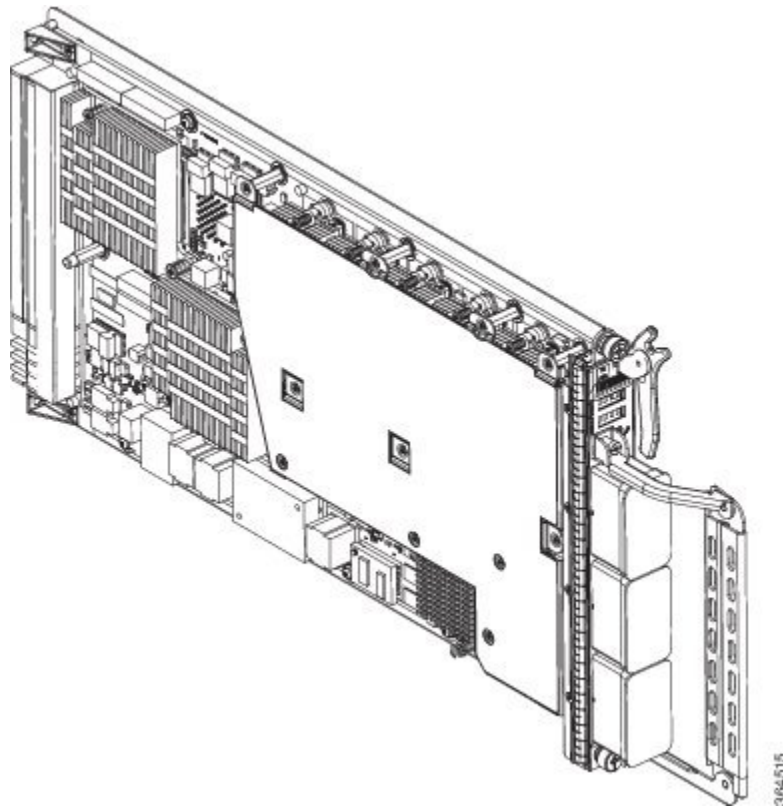
Prerequisites

Before performing this task, remove any switch fabric card or switch fabric impedance cover from the slot in which you plan on installing the switch fabric card. See About Impedance Carriers and Slot Covers, on page 81 and Removing a Switch Fabric Card, page 7-4 .

⚠️

Caution   Removing more than one switch fabric card at a time can misalign the chassis and may damage the card or chassis when reinserting the cards. Remove and reinsert only one card at a time.

Required Tools and Equipment

You need the following tools and part to perform this task:

- ESD-preventive wrist strap

- Number 2 Phillips or number 2 common (flat-head) screwdriver

- Switch fabric card

Steps

⚠️

Caution   For a CRS back-to-back installation, do not remove the dust caps from the three bulkhead connectors until the fiber bundle is connected to the port or connector. After installation, retain and store the dust caps in a clearn, dust-free area. For more information, see Cabling the CRS Back-to-Back System .

To install a switch fabric card, see Figure 64: Installing a Switch Fabric Card and follow these steps:

Figure 64: Installing a Switch Fabric Card
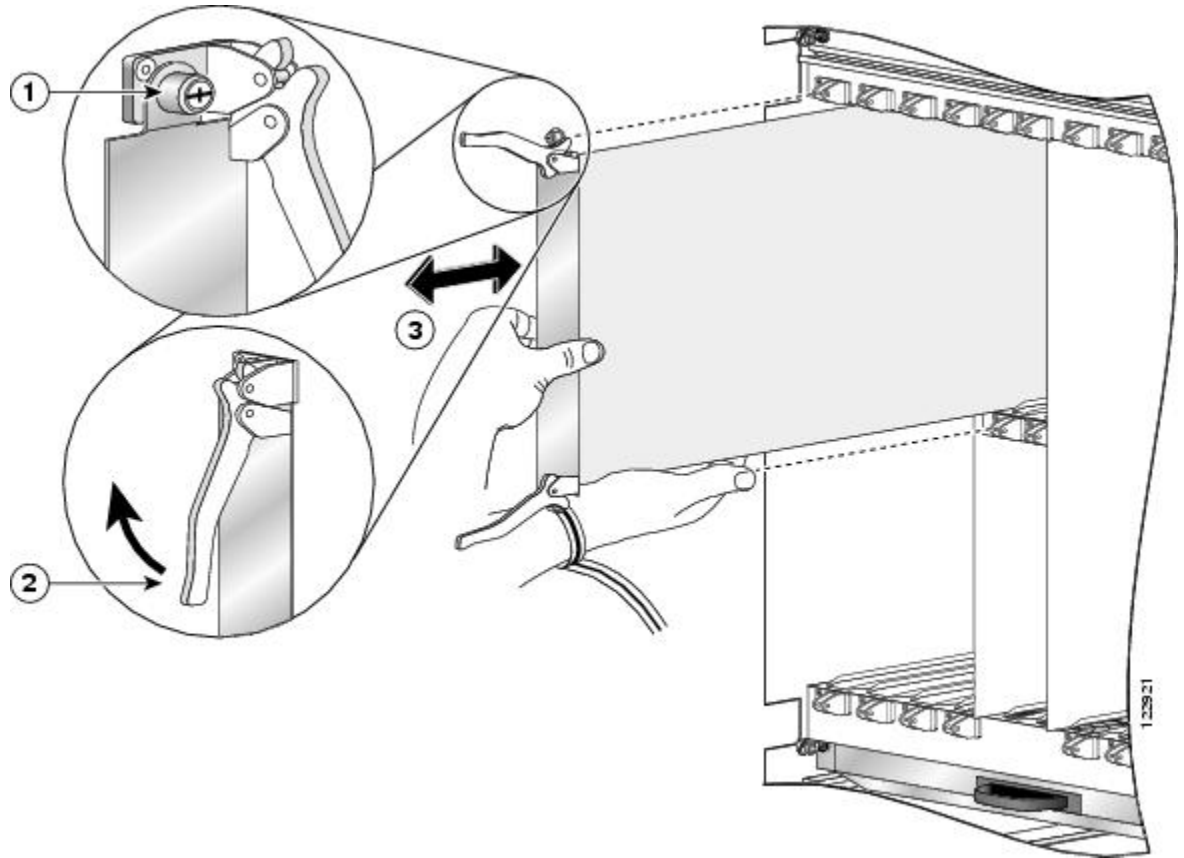
1	Captive screw	3	Direction of installation or removal
2	Ejector lever		

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the rear (MSC) side or a bare metal surface on the chassis.

Step 2 Remove the switch fabric card from its antistatic packaging.

Step 3 Visually inspect the connector pins on the card before you insert it into the chassis. Do not attempt to install a card with bent pins, as this may damage the chassis midplane connectors.

Step 4 Grasp the card carrier handle with one hand and place your other hand under the carrier to support and guide it into the correct slot.

Step 5 Position the card for insertion into the card cage slot. Avoid touching the card circuitry or any connectors.

Note Alignment grooves exist on each slot in the card cage. When you install a card in the card cage, make sure that you align both edges of the card carrier in the slot grooves.

Step 6 Orient the switch fabric card so that the PCB faces left and the carrier is to the right; if the card does not slide easily into the slot, the orientation may be wrong and the disorientation rejection flange is stopping the card from going in. Reorient the switch fabric card, if applicable.

Step 7 Carefully slide the switch fabric card into the slot until the ejector levers meet 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 switch fabric card until the ejector lever hooks are fully latched.

Note The insertion of the switch fabric card into the chassis may require more force than is typical of the other cards in the chassis.

Step 8 Pivot both card ejector levers so that the openings on the card ejector cams at the top and bottom of the card pass over the tabs on each side of the card cage slot.

Caution Verify that the openings on the card ejector cams pass over the tabs; otherwise, one or both ejector levers may bind when you attempt to close the levers, thereby damaging or breaking one or both of them.

Step 9 Continue sliding the card into the card cage slot until the openings on the card ejector cams engage the tabs on each side of the card cage slot.

Note Switch fabric cards have guide pins that make initial contact with the midplane connector as you slide a card into its slot. After the guide pins make contact, continue pushing the card carrier until the card ejector levers begin pivoting forward, toward the handle in the card carrier.

Step 10 To seat the card in the midplane connector, grasp both card ejector levers and pivot them inward toward the handle in the card carrier until they are flush against the front edge of the card carrier.

Tip The flange on the front panel of the card carrier should be flush against the card cage.

Step 11 Partially tighten the two captive screws on the front panel of the card (either by hand or with the screwdriver) to make sure that they are both engaged.

Step 12 Use the screwdriver to fully tighten the captive screws to seat the card firmly in the slot.

What to Do Next

After performing this task, verify that the card has been installed properly (see Verifying the Installation of a Switch Fabric Card, on page 110). If you are performing the initial installation of the system, install the MSCs (see Installing an MSC, FP, or LSP, on page 111).

Verifying the Installation of a Switch Fabric Card

This section describes how to verify that a switch fabric card has been properly installed. Figure 65: Switch Fabric Card Front View, on page 110 shows the switch fabric card front panel.

Figure 65: Switch Fabric Card Front View
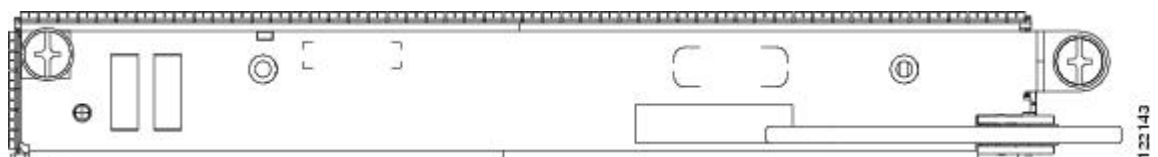
Understanding the Alphanumeric LEDs

At one end of the faceplate, near an ejector lever, a switch fabric card has an alphanumeric LED display that shows a sequence of messages indicating the state of the card.

Note It is normal for some displayed messages to appear too briefly in the LED display to be read.

Troubleshooting the Switch Fabric Card

If the installed or replaced switch fabric card fails to operate or to power up on installation:

1 Make sure that the card is seated firmly in the Cisco CRS 8-Slot Line Card Chassis Enhanced router slot. One easy way to verify physical installation is to see whether the front faceplate of the switch fabric card is even with the fronts of the other cards installed in the card cage.
2 Check whether the ejector levers are latched and that the captive screws are fastened properly. If you are uncertain, unlatch the levers, loosen the screws, and attempt to reseat the switch fabric card.
3 Examine the alarm LEDs on the RP to see if there are any active alarm conditions.
4 Examine the power shelves to see whether the chassis, as a whole, is receiving power.

Switch Fabric Card Status LEDs

Use the status LEDs, located on the switch fabric card faceplate, to verify the correct installation of the card:

- When the card is properly installed, the Status turns green. If this LED is off, verify that the card is installed correctly.

- When the Status is blinking yellow, a problem exists on the board.

- When the Status is off, the board state is unknown. Verify that there is power to the board by looking at the indicators on the power module.

- If there is a failure during the board boot sequence, the two-row, four-character alphanumeric display indicates the current boot phase to assist you in debugging the board failure.

Installing an MSC, FP, or LSP

Note The following line cards are only supported if the new fan-tray (CRS-8-FANTRAY-B) is in use: CRS-MSC-X, CRS-FP-X, and CRS-LSP-X. For more details, see Upgrading Fan Trays, page 4-8 .

This section contains the following procedures:

Installing an MSC, FP, or LSP

This section describes how to install an MSC, FP, or LSP line card in the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

The MSC, FP, and LSP line cards are Layer 3 forwarding engines in the Cisco CRS Series routing system. A line card can be paired with different types of physical layer interface modules (PLIMs) to provide a variety of interfaces.

- The MSCs include: CRS-MSC, CRS-MSC-B, CRS-MSC-140G, CRS-FP-X/ CRS-FP-X-L(400G).

- The FPs include: CRS-FP-140, CRS-FP-X/ CRS-FP-X-L (400G).

- The LSPs include: CRS-LSP, CRS-LSP-X (400G).

A line card fits into any available MSC slot and connects directly to the midplane. If you install a new line card, you must first remove the MSC impedance carrier from the available slot.

⚠

Caution Be careful while handing these line cards to avoid pressing the memory module latches on the daughter board and accidently disengaging the memory modules. For the location of these latches, see the following figure.

Figure 66: Memory Modules Latches on the Daughter Board
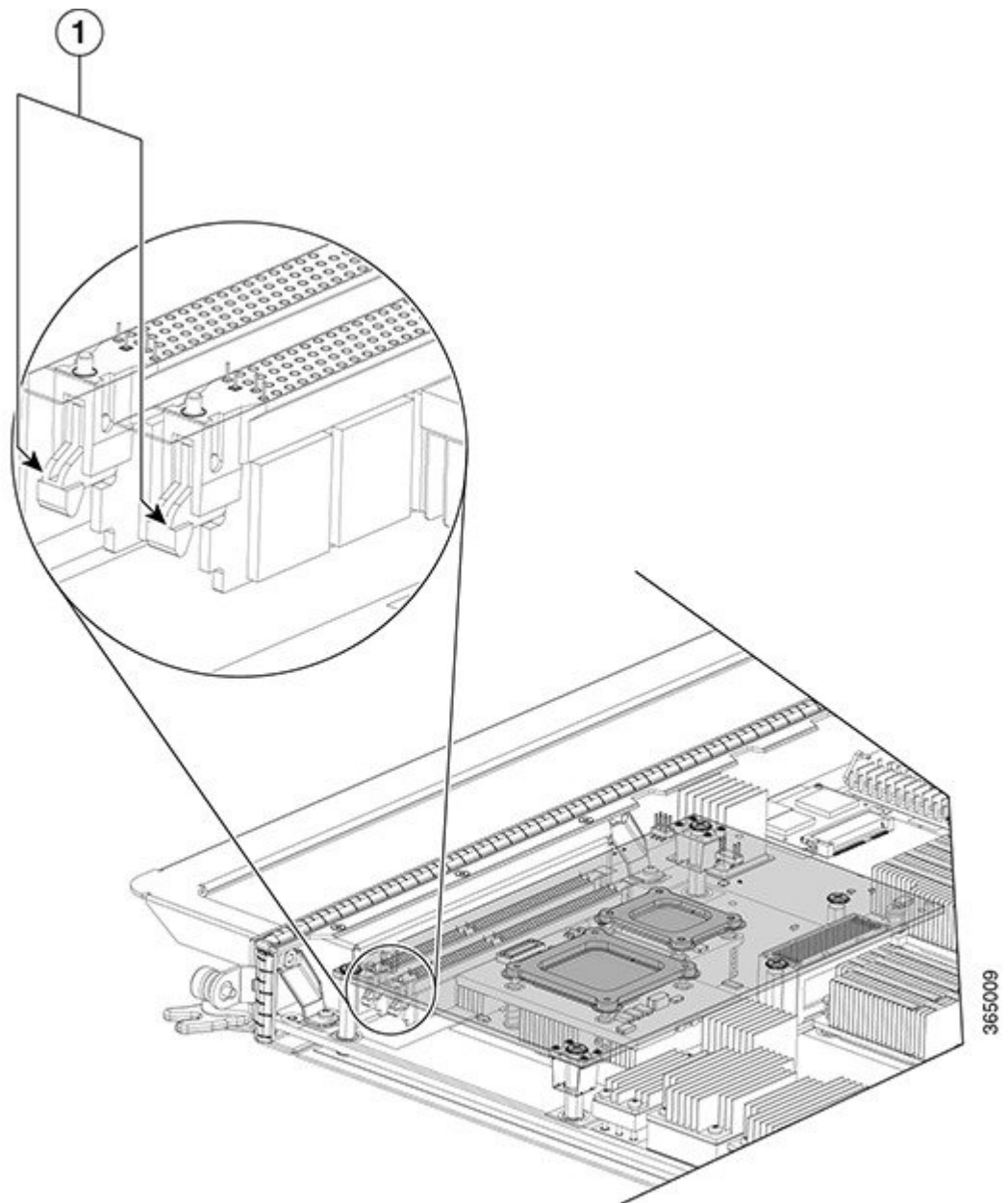
1	Memory Module Latches

The following figure shows the CRS-MSC-140G MSC. The other MSC, FP, and LSP cards are similar.

Figure 67: Modular Services Card (CRS-MSC)
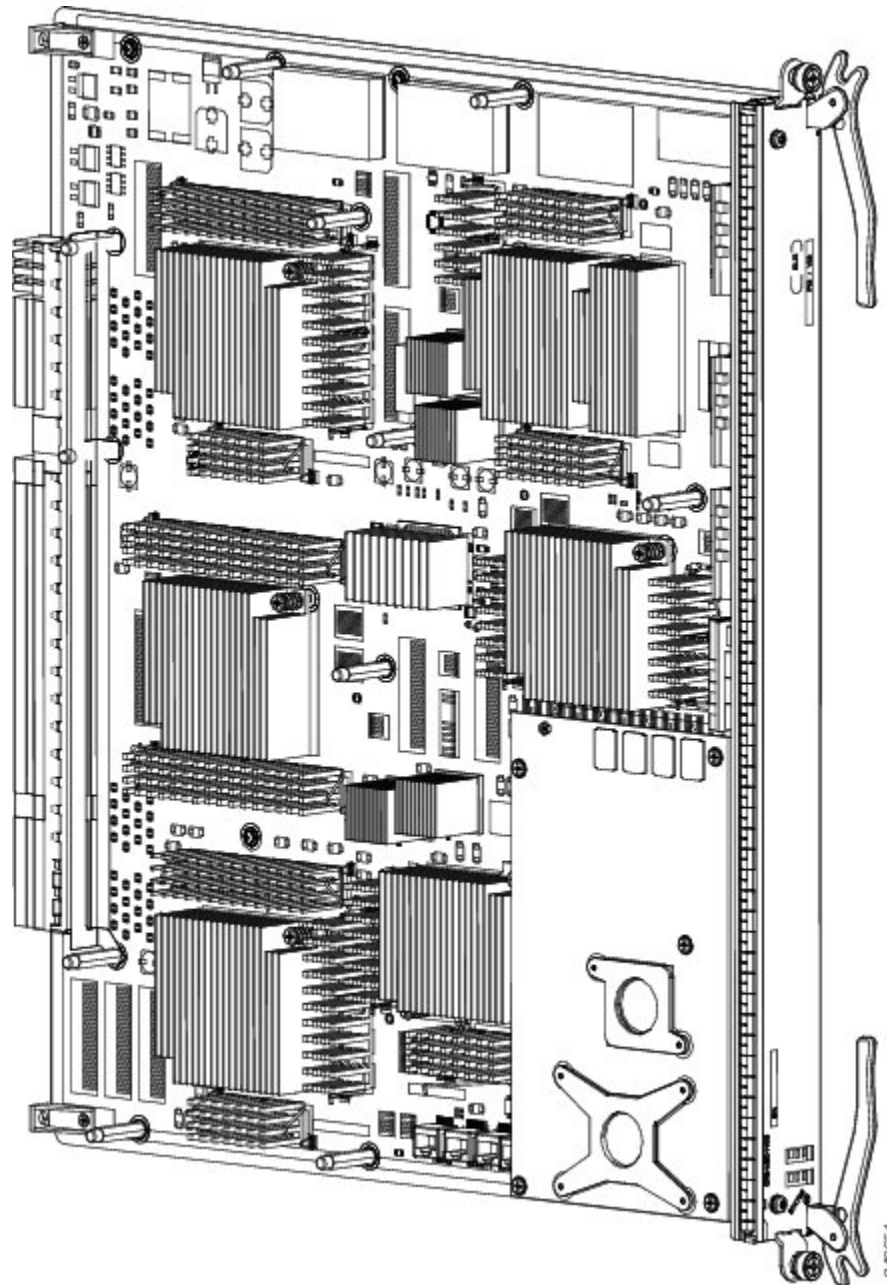
Prerequisites

Note See Chapter 2, "Chassis Overview," for information on MSC slot types, numbers, widths, and locations.

⚠️

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

⚠️

Caution   Do not carry an MSC by the bracket attached to the faceplate.

Required Tools and Equipment

You need the following tools and part to perform this task:

- ESD-preventive strap

- Number 2 Phillips or number 2 common (flat-head) screwdriver

- MSC, FP, or LSP line card (see the product data sheet for ordering details).

Steps

To install a line card, follow these steps:

Figure 68: Installing an MSC
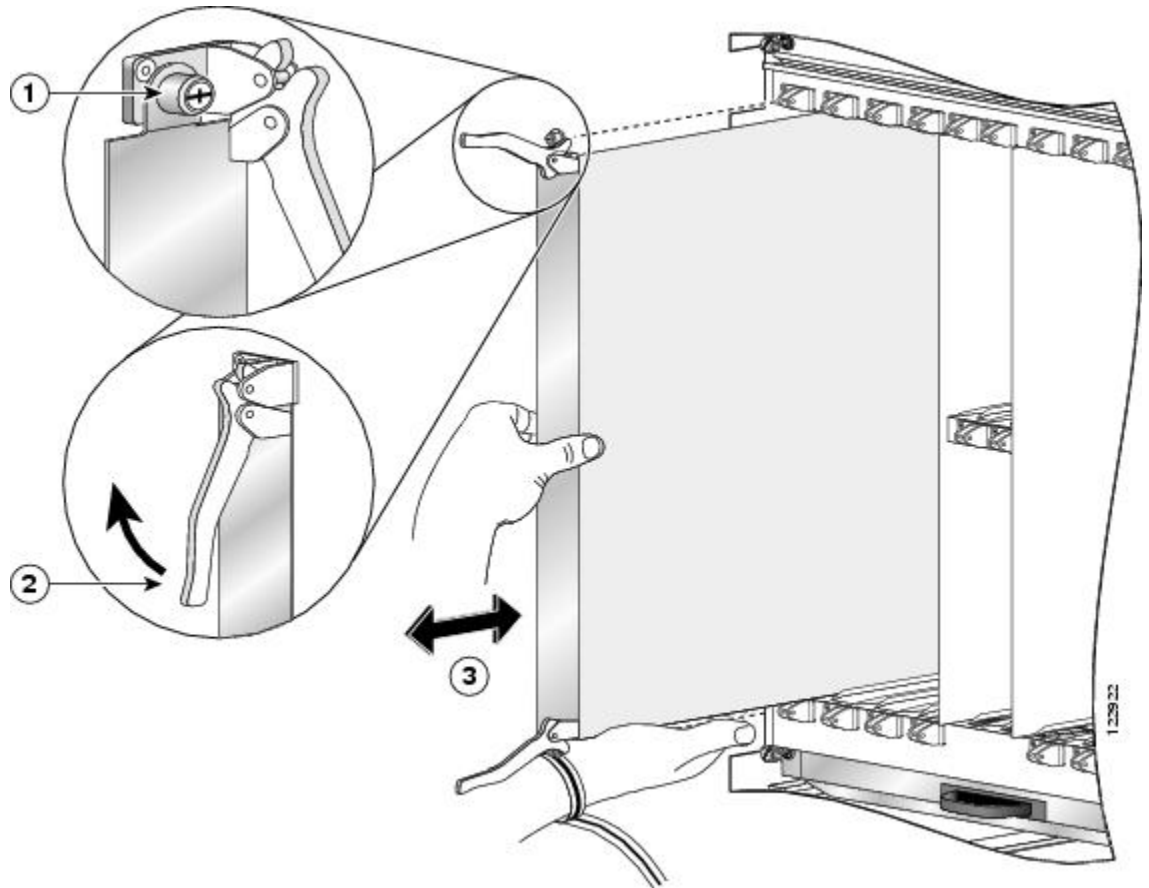
1	Captive screw	3	Direction of installation or removal
2	Ejector lever		

Procedure

Step 1   Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the rear (MSC) side or a bare metal surface on the chassis.

Step 2   Choose an available MSC slot for the MSC.

       Caution   To prevent ESD damage, handle a line card by its ejector levers or the card carrier edges only. Do not touch any of the electrical components, pins, or circuitry.

Step 3   Remove the MSC impedance carrier from the slot you need to fill and set it aside.

     Note   Remove only one impedance carrier and install one MSC at a time. Be sure to verify that each line card is fully installed and secured before installing another card.

Step 4   Remove the line card you are installing from its antistatic packaging.

Step 5   Visually inspect the connector on the card before you insert it into the chassis. Do not attempt to install a card with a damaged connector, as this action may damage the chassis midplane pins.

Step 6   Use both hands while inserting an line card. Use one hand on the faceplate and the other hand along the base of the line card to guide it into a slot.

Step 7   Orient the line card so that the PCB faces left and the carrier is to the right; if the card does not slide easily into the slot, the orientation may be wrong and the misorientation rejection flange is stopping the card from going into the slot. Reorient the line card, if applicable.

Step 8   Make sure that the ejector levers are oriented properly to engage with the pin as the line card slides into the slot. Carefully slide the line card into the slot until the ejector levers engage the catches, then *stop*.

Step 9   Simultaneously pivot the ejector levers toward the faceplate of the line card. Do not force the line card; the ejector levers properly seat the line card against the midplane.

     Note   If the captive screws are difficult to tighten, check to ensure that each ejector lever is properly secured to each catch and that the line card is properly seated in the slot.

Step 10   Partially tighten the two captive screws on the front panel of the card (either by hand or with the screwdriver) to make sure that they are both engaged.

Step 11   Use a screwdriver to fully tighten the captive screws next to each line card ejector lever to ensure proper EMI shielding and to prevent the card from becoming partially dislodged from the midplane.

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

**Step 12**   Attach the bracket to the line card; use the screws that came with it.

What to Do Next

After performing this task, verify that the card has been installed properly (see Verifying the Installation of an MSC, FP, or LSP, on page 118). If you are performing the initial installation of the system, install the PLIMs (see Installing a Physical Layer Interface Module, on page 120).

Verifying the Installation of an MSC, FP, or LSP

This section describes how to verify that a line card has been properly installed.

The following figure is an illustration of the MSC-140G front panel.

Figure 69: CRS-MSC-140G Front Panel
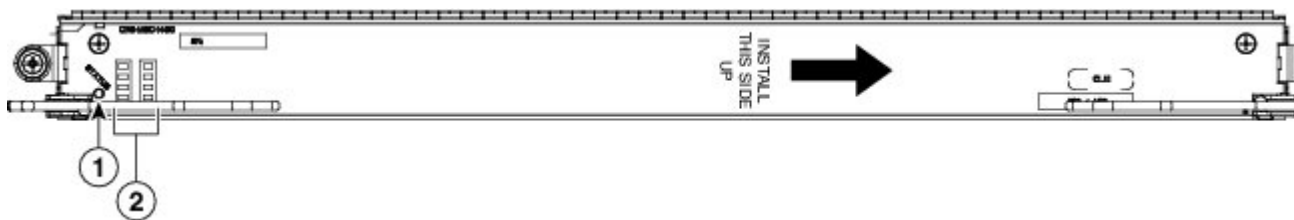
1	Status LED	2	Alphanumeric LEDs

The following figure shows the FP-140 FP face panel.

Figure 70: CRS-FP140 Front Panel
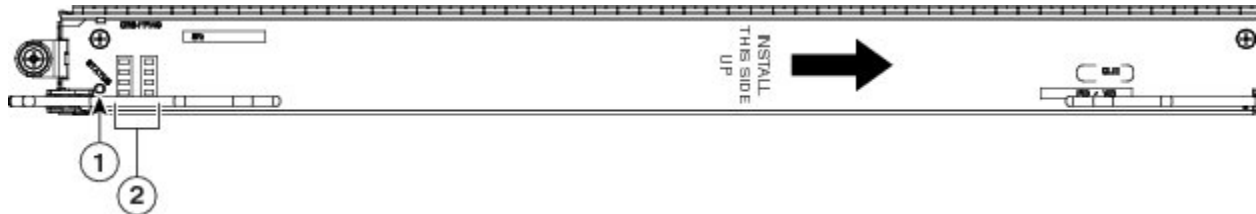
1	Status LED	2	Alphanumeric LEDs

The following figure shows the CRS-LSP front panel.

Figure 71: CRS-LSP Front Panel
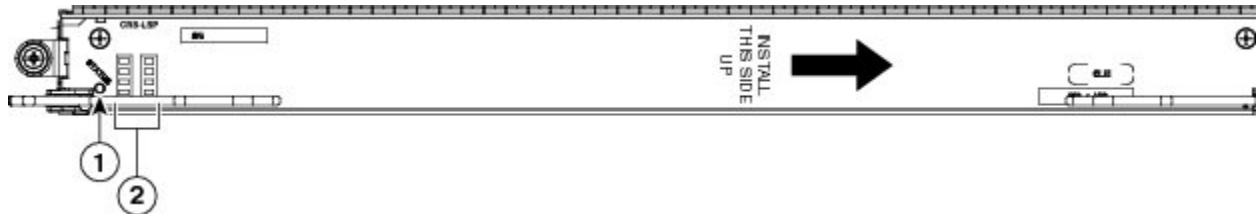
1	Status LED	2	Alphanumeric LEDs

Understanding the Alphanumeric LEDs

At one end of the faceplate, near an ejector lever, a line card has two four-digit alphanumeric LED displays that show a sequence of messages indicating the state of the card.

Note It is normal for some displayed messages to appear too briefly in the LED display to be read.

Troubleshooting the MSC, FP, or LSP

If the installed or replaced line card fails to operate or to power up on installation:

1 Make sure that the card is seated firmly in the Cisco CRS 8-Slot Line Card Chassis Enhanced router slot. One easy way to verify physical installation is to see whether the front faceplate of the MSC is even with the fronts of the other cards installed in the card cage.

2 Check whether the ejector levers are latched and that the captive screws are fastened properly. If you are uncertain, unlatch the levers, loosen the screws, and attempt to reseat the MSC.

3 Examine the Cisco CRS 8-Slot Line Card Chassis Enhanced router alarm LEDs on the RP to see if there are any active alarm conditions.

4 Examine the Cisco CRS 8-Slot Line Card Chassis Enhanced router power distribution units (PDUs) to see whether the chassis, as a whole, is receiving power.

Status LEDs

Use the status LEDs, located on the line card faceplate, to verify the correct installation of the card:

- When the card is properly installed, the Status LED turns green. If this LED is off, verify that the card is installed correctly.

- When the Status LED is blinking yellow, a problem exists on the board.

- When the Status LED is off, the board state is unknown. Verify that there is power to the board by looking at the indicators on the power module.

Installing a Physical Layer Interface Module

This section contains the following procedures:

Installing a PLIM

This section describes how to install a PLIM in the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

A physical layer interface module (PLIM) is paired with an MSC through the midplane of the chassis. A PLIM provides the ability to choose several interfaces.

Figure 72: Typical Physical Layer Interface Module (a 14-port 10-GE XFP PLIM)
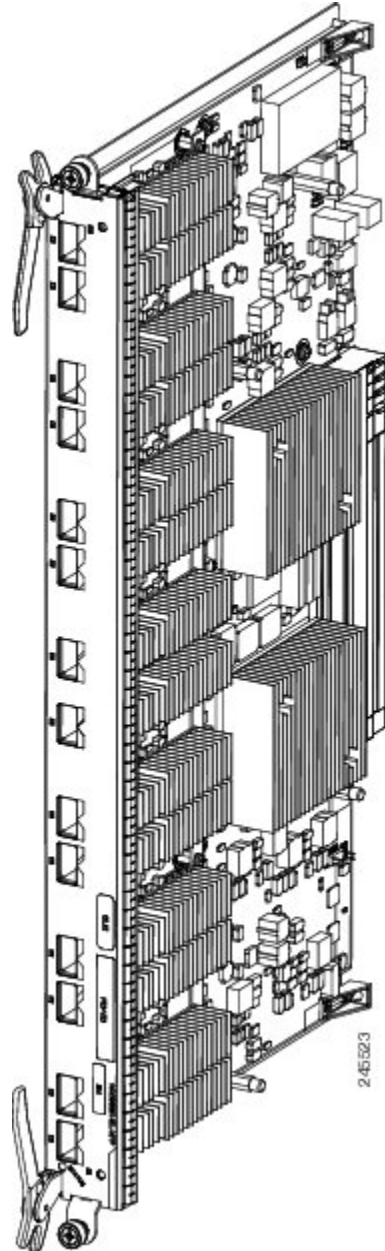
⚠️

Caution   The system may indicate a hardware failure if you do not follow proper procedures. Remove or install only one PLIM at a time. Allow at least 15 seconds for the system to complete the preceding tasks before removing or installing another PLIM.

Prerequisites

Before performing this task, remove the front cover, if installed.

Required Tools and Equipment

You need the following tools and part to perform this task:

- ESD-preventive wrist strap
- Number 2 Phillips or number 2 common (flat-head) screwdriver
- PLIM

Steps

To install a PLIM, follow these steps:

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front (PLIM) side or a bare metal surface on the chassis.

Step 2 Remove the PLIM from its antistatic packaging.

Step 3 Visually inspect the connector pins on the card before you insert it into the chassis. Do not attempt to install a card with bent pins, as this may damage the chassis midplane connectors.

Step 4 Remove the PLIM impedance carrier from the slot you need to fill and set it aside.

Note Remove only one impedance carrier and install one PLIM at a time. Be sure to verify that each PLIM is fully installed and secured before installing another card.

Step 5 Grasp the card carrier handle with one hand and place your other hand under the carrier to support and guide it into the correct slot. Slide the card halfway into the slot. Avoid touching the card circuitry or any connectors.

Figure 73: Installing a PLIM
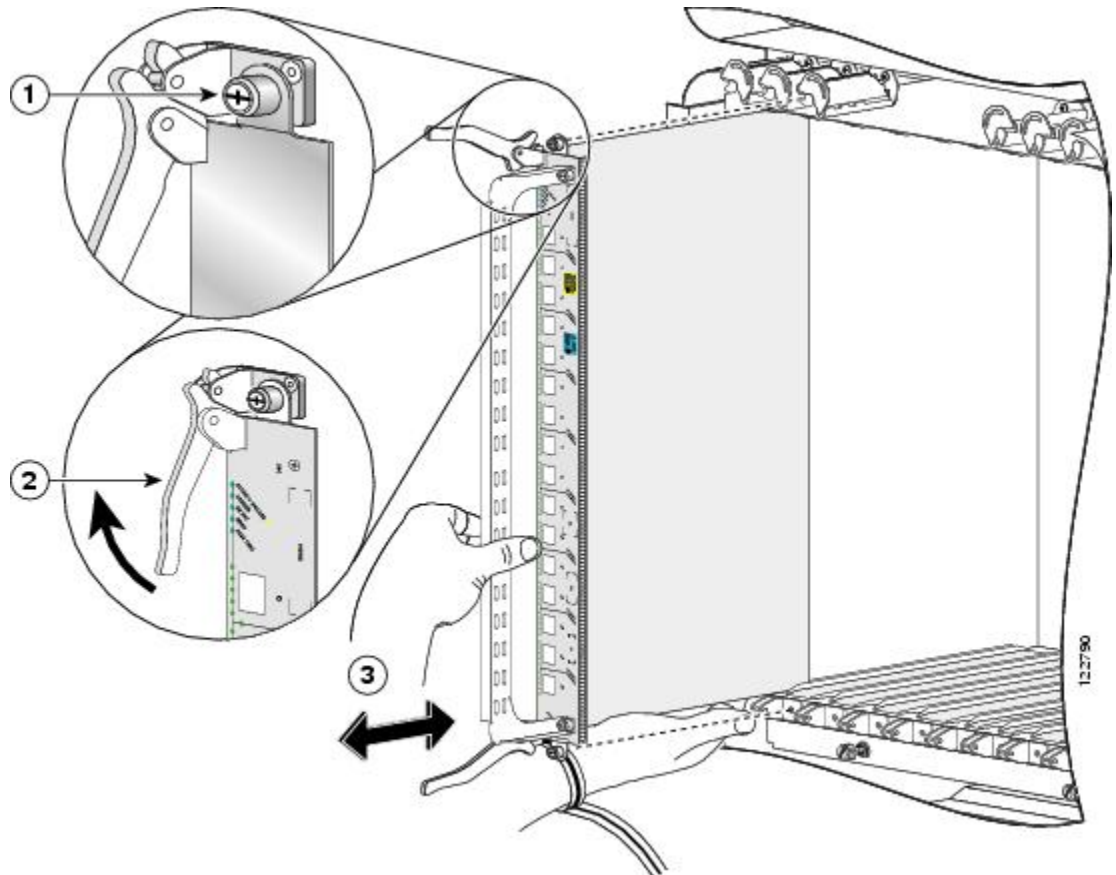
1	Captive screw	3	Direction of installation or removal
2	Ejector lever		

Step 6 Pivot both card ejector levers so that the openings on the card ejector cams at the top and bottom of the card pass over the tabs on each side of the card cage slot.

Caution Verify that the openings on the card ejector cams pass over the tabs; otherwise, one or both ejector levers may bind when you attempt to close the ejector levers, thereby damaging or breaking one or both ejector levers.

Step 7 Continue sliding the card into the card cage slot until the openings on the card ejector cams engage the tabs on each side of the card cage slot.

Note Guide pins exist that make initial contact with the backplane connector as you slide a card into its slot. After the guide pins make contact, continue pushing on the card carrier until the card ejector levers begin pivoting forward, toward the handle in the card carrier.

Step 8 To seat the card in the midplane connector, grasp both card ejector levers and pivot them inward toward the handle in the card carrier until they are flush against the front edge of the card carrier.

Step 9 Partially tighten the two captive screws on the front panel of the card (either by hand or with the screwdriver) to make sure that they are both engaged.

Step 10 Tighten the captive screws on the PLIM.

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

Step 11 Install the SFP optical modules, if applicable (in a PLIM that uses an SFP module, such as the a 14-port 10-GE XFP PLIM).

Step 12 Install the PLIM cable management bracket.

Step 13 Install the interface cables.

What to Do Next

> ⚠️
>
> **Danger** 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

Some PLIMs contain Class 1 lasers, and some contain Class 1M. See the documentation for the specific PLIM for details.

What to Do Next

After performing this task, reinstall the front cover, if applicable, and verify that the PLIM has been installed properly (see Verifying the Installation of a PLIM, on page 124).

Verifying the Installation of a PLIM

This section describes how to verify that the PLIM has been properly installed.

The following figure shows the PLIM front panel (in this case, a 14-port 10-GE XFP PLIM).

Figure 74: PLIM Front Panel Indicators
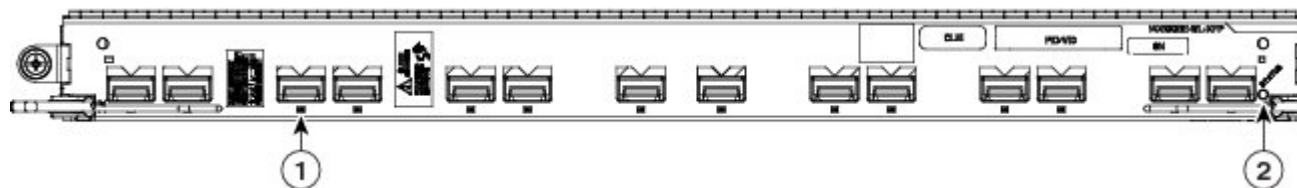
1	Port LED (one per port)	2	Status LED

Troubleshooting the PLIM

If the installed or replaced PLIM fails to operate or to power up on installation:

- Make sure that the PLIM is seated firmly in the Cisco CRS 8-Slot Line Card Chassis Enhanced router slot. One easy way to verify physical installation is to see whether the front faceplate of the PLIM is even with the fronts of the other PLIMs installed in the card cage.

- Check whether the ejector levers are latched and that the captive screws are fastened properly. If you are uncertain, unlatch the levers, loosen the screws, and attempt to reseat the PLIM.

- Examine the alarm LEDs on the RP to see if there are any active alarm conditions.

- Examine the power shelves to see whether the chassis, as a whole, is receiving power.

Use the status LEDs, located on the PLIM faceplate, to verify the correct installation of the card:

There are two types of LEDs on a PLIM: the board-level LED labeled **Status** and the port-level LEDs that are labeled differently depending on the PLIM type. When the PLIM is properly installed, the Status LED turns green. If this LED is off, verify that the associated MSC, FP, or LSP line card is installed correctly. For details on the information provided by the port-level LEDs, see the documentation specific to that PLIM.

Installing a PCMCIA Card

This section describes how to install a PCMCIA card in an RP or a DRP card PCMCIA slot. For more detailed information on PCMCIA cards, see About Hard Drives and PCMCIA Cards, on page 88. The following figure shows you the location of the PCMCIA door in the RP card faceplate. (The PCMCIA cards for the DRP are in a similar location.)

Note   Only disk1: can be installed in or removed from the Cisco CRS 8-Slot Line Card Chassis Enhanced router Route Processor.

Figure 75: RP Card PCMCIA Slot Door
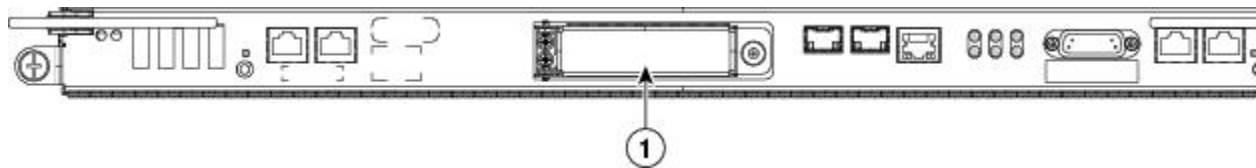
1 - PCMCIA flip-up door

Note   Only the original route processor (RP) card uses a PCMCIA card. The performance route processor (PRP) card has a USB connector for using a flash drive.

Prerequisites

Before performing this task, remove the front cover, if installed. If you are replacing a PCMCIA card, see Removing an RP PCMCIA Card, page 7-12 to remove the PCMCIA card from the PCMCIA card slot.

Required Tools and Equipment

You need the following tools and part to perform this task:

- ESD-preventive strap
- Number 2 Phillips or number 2 common (flat-head) screwdriver
- PCMCIA card

Steps

To install a PCMCIA card, follow these steps:

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front (PLIM) side or a bare metal surface on the chassis.

Step 2 Using the screwdriver, loosen the captive screw at the bottom of the PCMCIA slot door on the faceplate of the card.

Step 3 While lifting the hinged PCMCIA slot door up, carefully insert the new PCMCIA flash card into the left slot of the PCMCIA card cage.
When the card is fully inserted, the release button pops up. (If the button fails to pop up, you may not have the card in right side up; turn the card over and try again.)

Step 4 Close the door to keep dust out, and tighten the captive screw.

What to Do Next

After performing this task, replace the front cover, if applicable.

Installing a Small Form-Factor Pluggable (SFP) Module

This section describes how to install a bale-clasp SFP module. The module has a clasp used to install and remove the module .

Figure 76: Bale-Clasp SFP Module
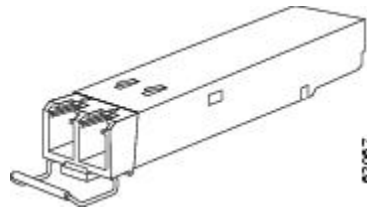
For general information about SFP modules, see About Small Form-Factor Pluggable (SFP) Modules, on page 87. For information on SFP optical cleaning, see "Inspection and Cleaning Procedures for Fiber-Optic Connections," at the following URL:

http://www.cisco.com/warp/public/127/cleanfiber2.html

Danger   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

Prerequisites

Before installing a module, remove the front cover, if installed.

Required Tools and Equipment

You need the following tools and part to perform this task:

- ESD-preventive wrist strap
- Bale-clasp SFP module

Steps

To install a bale-clasp SFP module (into a PLIM), follow these steps:

Procedure

Step 1   Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front (PLIM) side or a bare metal surface on the chassis.

Step 2   Close the bale clasp before inserting the module.

Step 3   Align the module with the port and slide it into the port .

Note   Be careful to hold the module in such a way so as to not damage the bale clasp.

Figure 77: Installing a Bale-Clasp SFP Module into a Port

What to Do Next

After performing this task, replace the front cover, if applicable.

Installing the Front Cable Management Bracket

This section shows how to install the front Cable Management Bracket. The following figure displays a front cable management bracket.

Figure 78: Front Cable Management Bracket

Prerequisites

Be sure that no cables impede your access to the area of the chassis on which you wish to install the bracket.

Before installing a front cable management bracket on the front (PLIM) side of the chassis, remove the front cover and inlet grille, if installed.

Required Tools and Equipment

You need the following tools and parts to perform this task:

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver
- Medium flat-blade screwdriver
- Cable management bracket

Steps

To install a cable management bracket, follow these steps:

Procedure

Step 1   Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket or a bare metal surface on the chassis.

Step 2   If applicable, remove the Cisco logo bezel from the front of the chassis.

a)   Gently insert the flat-blade screwdriver between the edge of the bezel and the face of the chassis and pry the bezel loose.
The bezel is attached to the front of the chassis with four ball studs.

b)   Pull the bezel firmly toward you to detach it.

Step 3   Position the front cable management bracket on the chassis.

Step 4   Insert and tighten the four screws to secure the bracket to the chassis.
Tip   For ease of attachment, install the inner screws first.
Caution   Be careful not to damage the plastic bracket arms.

Step 5   If applicable, reattach the logo bezel by snapping it back onto the front of the chassis.

What to Do Next

Use the front cable management bracket to organize your cables. Then reinstall the inlet grille and front cover. See Installing the Front Side Exterior Components, page 5-1 for more information.

Installing the Rear Cable Management Bracket

This section shows how to install the rear Cable Management Bracket. The following figure displays a rear cable management bracket.
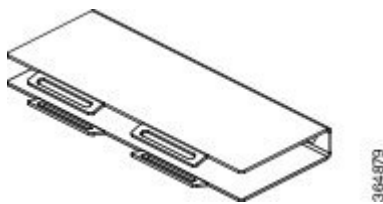
Prerequisites

Be sure that no cables impede your access to the area of the chassis on which you wish to install the bracket.

Required Tools and Equipment

You need the following tools and parts to perform this task:

• ESD-preventive wrist strap

- 6-in. long number 1 Phillips screwdriver

- Rear Cable management bracket

Steps

To install a rear cable management bracket, follow these steps:

Procedure

Step 1   Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket or a bare metal surface on the chassis.

Step 2   Remove the two screws from the chassis, where the bracket will be installed. The rear cable management bracket does not come with screws as they are reused from the chassis.
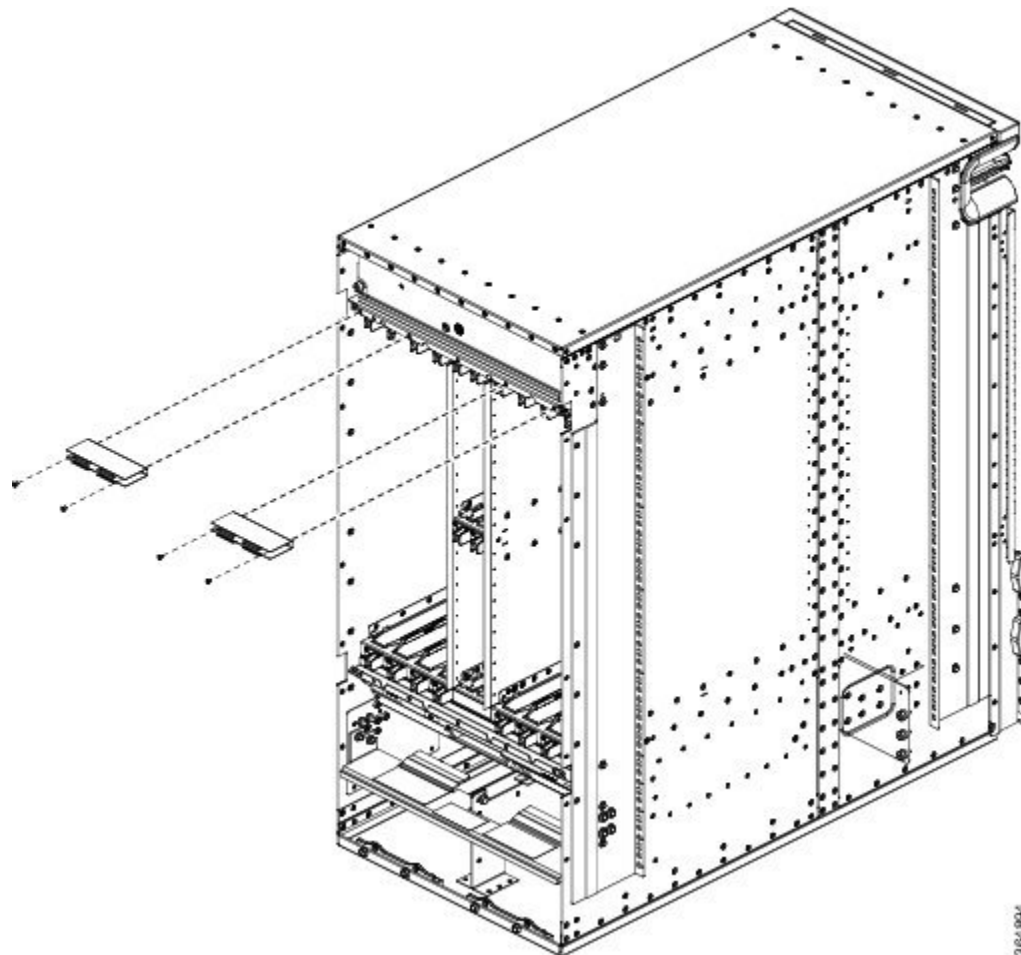
Step 3   Position the rear cable management bracket on the chassis.

Step 4   Insert and tighten the two screws to secure the bracket to the chassis.

What to Do Next

Use the rear cable management bracket to organize your cables.

Removing Chassis Components

- Removing Chassis Components, page 133

Removing Chassis Components

This chapter provides instructions on how to remove components from the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

This chapter presents the following topics:

Removing Line Cards, PLIMs and Associated Components

This section provides instructions on how to remove the Cisco CRS 8-Slot Line Card Chassis Enhanced router cards, physical layer interface modules (PLIMs), and any associated components.

For general information about installing and removing cards, PLIMs, and associated components, see About Installing and Removing Cards and Associated Components, page 6-1 .

For information on installing and removing the slot covers and impedance carriers, see Installing or Removing a Slot Cover, page 6-13 and Installing or Removing an Impedance Carrier, page 6-17 .

This section presents the following topics:

Replacing a Pillow Block

This section describes how to install a replacement pillow block on the chassis after removing a damaged pillow block. A pillow block is a bracket with a pin that is attached to the chassis above and below each card slot. When you install or remove a card from the chassis, the card ejector levers hook into the pillow blocks above and below the card slot to secure the cards to the slot and allow you to install and remove the cards.

Prerequisites

Before performing this task, you must first remove the front cover, if installed. Have the pillow block replacement kit (Cisco product number: CRS-PILLBLK=) at hand.

Required Tools and Equipment

You need the following tools and parts to perform this task:

- ESD-preventive wrist strap
- Pillow block replacement kit (Cisco product number: CRS-PILLBLK=)

The following items are included in the CRS-PILLBLK= pillow block replacement kit:

- 2 replacement pillow blocks
- 6 Torx-head screws
- 1 T10 Torx screwdriver (See item 1 in #task_1084430/fig_1090076.)

Steps

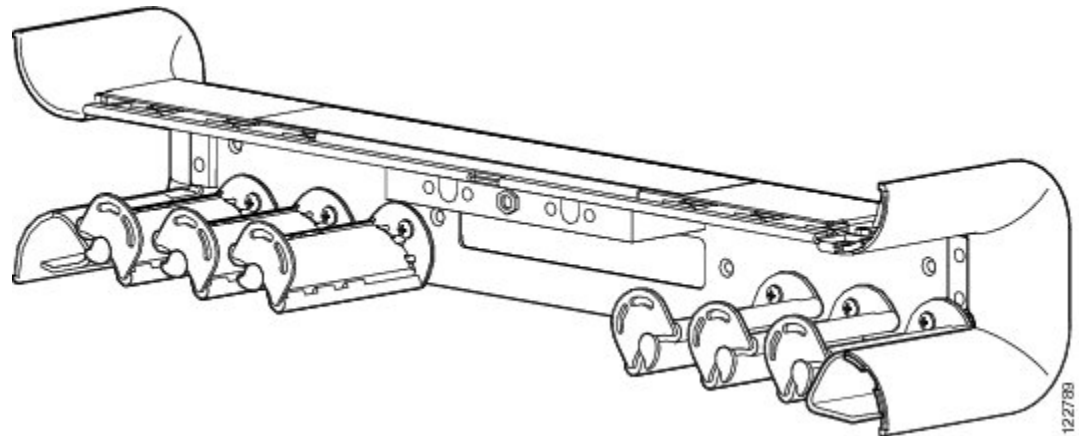To replace a pillow block, follow these steps:

Procedure

Step 1   Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.

Step 2   Locate the pillow block to be replaced. Use the T10 Torx screwdriver to remove the lower right screw.

Figure 79: Replacing a Pillow Block
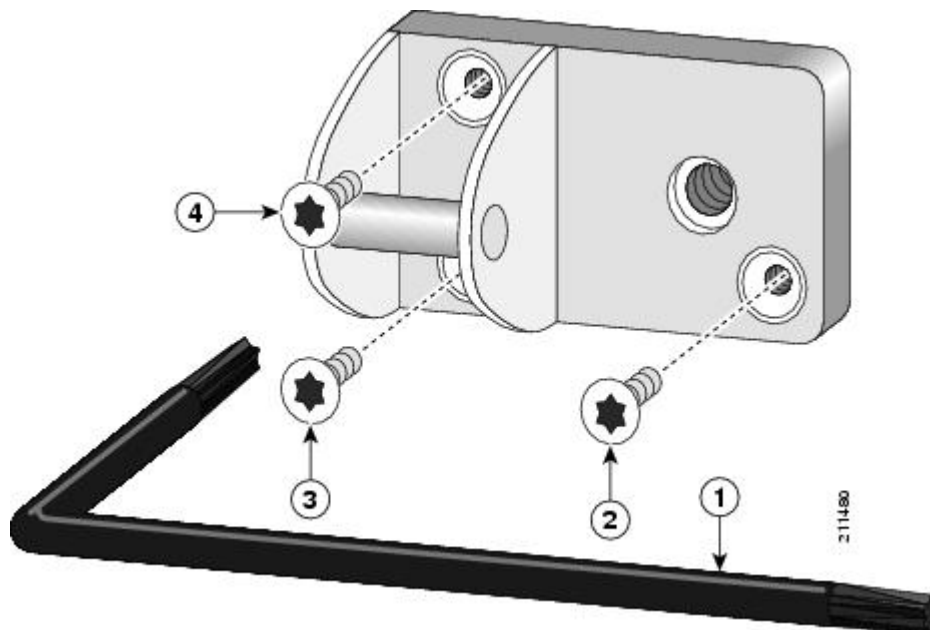
1	T10 Torx screwdriver	3	Lower left screw

2	Lower right screw	4	Top left screw

Step 3 Remove the lower left screw (located below the pillow block pin). (See item number 3 in above figure.

Step 4 Remove the top left screw (located above the pillow block pin). (See item number 4 in above figure.

Step 5 Remove the pillow block and set it aside.

Step 6 Repeat this procedure for the card slot's other pillow block if applicable.

Step 7 Have the replacement pillow block and T10 Torx-head screws near at hand.

Step 8 Position the pillow block and align the screw holes.

Step 9 Use the T10 Torx screwdriver to install the top left screw (located above the pillow block pin). (See item number 2 in above figure)

Step 10 Install the lower right screw (see item number 3 in above figure).

Step 11 Install the lower left screw (located below the pillow block pin). (See item number 4 in above figure)

Step 12 Repeat this procedure for the card slot's other pillow block if applicable.

What to Do Next

After performing this task, replace the front cover, if applicable.

Removing a Switch Fabric Card

This section describes how to remove a switch fabric card from the Cisco CRS 8-Slot Line Card Chassis Enhanced router. See Figure 62: CRS-8-FC400/S Switch Fabric Card for the CRS-8-FC400/S fabric card and Figure 63: CRS-8-FC400/M Back-to-Back Switch Fabric Card for the back-to-back CRS-8-FC400/M fabric card.

Note For detailed cabling information for the back-to-back fabric card, see the Cisco CRS-3 Carrier Routing System 16-Slot Back-to-Back Cabling and Upgrade Guide .

Prerequisites

Caution Removing more than one switch fabric card at a time can misalign the chassis and may damage the card or chassis when reinserting the cards. Remove and reinsert only one card at a time.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap

• Number 2 Phillips or number 2 common (flat-head) screwdriver

Steps

To remove a switch fabric card, see Figure 80: Removing a Switch Fabric Card, on page 136 and follow these steps:

⚠️

Caution   For CRS back-to-back fabric card installations: If the fiber bundles are already attached on the fabric card, remove the fiber bundles, add the metal caps on the cable, and put the dust caps on the card. This prevents contamination or damage to the cable.

Figure 80: Removing a Switch Fabric Card
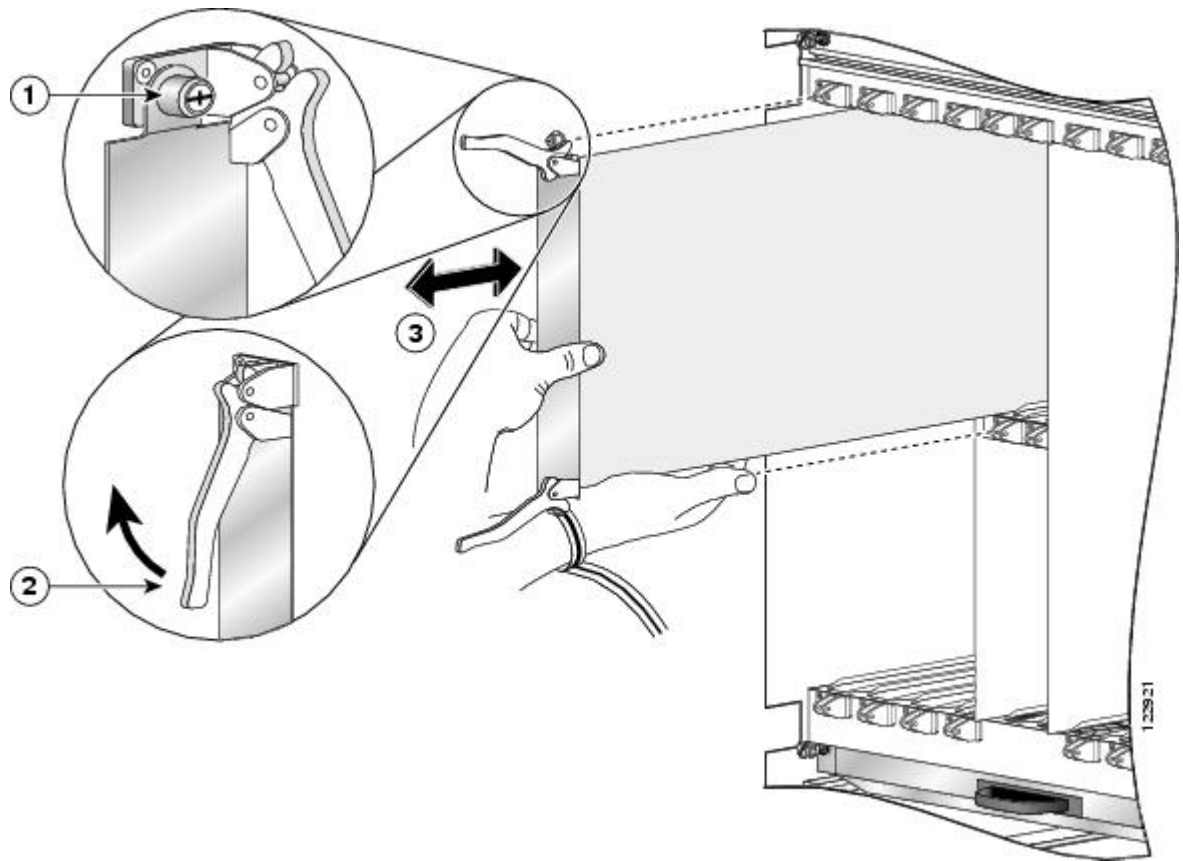
1	Captive screw	3	Direction of installation or removal
2	Ejector lever		

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the rear (MSC) side or a bare metal surface on the chassis.

Step 2 Identify the switch fabric card to be removed from the card cage.

Step 3 To loosen the card from the slot, turn the two captive screws on the front panel of the card counterclockwise.

Step 4 To unseat the card from the midplane connector, grasp the two card ejector levers and simultaneously pivot both ejector levers 90 degrees (70 degrees for a newer switch fabric card) away from the front edge of the card carrier.

Step 5 Touching only the metal card carrier, slide the card from the slot and place it directly into an antistatic sack or other ESD-preventive container. If you plan to return the defective card to the factory, repackage it in its original shipping container.

What to Do Next

If you need to install a replacement switch fabric card, see Installing a Switch Fabric Card, page 6-26 .

Removing an MSC, FP, or LSP

This section describes how to remove a line card from the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

Prerequisites

⚠

Caution   Use the cable management bracket to slide cards from the card carrier. *Do not lift cards by the cable management bracket* . Rotate cards onto their vertical axes, then lift them from the bottom, using the cable management bracket only as an aid for balance.

Required Tools and Equipment

You need the following tools and part to perform this task:

- ESD-preventive strap

- Number 2 Phillips or number 2 common (flat-head) screwdriver

- Impedance carrier (Cisco Product number CRS-MSC-IMPEDENCE=)

Steps

To remove an MSC, FP, or LSP line card, see Figure 81: Removing a Line Card, on page 138 and follow these steps:

Figure 81: Removing a Line Card

1	Captive screw	3	Direction of installation or removal
2	Ejector lever		

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the rear (MSC) side or a bare metal surface on the chassis.

Step 2 Use a screwdriver to loosen the captive screw next to each MSC ejector lever.

Caution To prevent ESD damage, handle a line card by its ejector levers or the card carrier edges only. Do not touch any of the electrical components, pins, or circuitry.

Step 3 Simultaneously pivot the ejector levers away from the faceplate to release the line card from the midplane connectors.

Step 4 Grasp the cable management bracket and gently pull the line card halfway from the slot.

Step 5 Move one hand under the line card to guide it.
Avoid touching the line card printed circuit board, components, or any connector pins. *Do not lift cards by the cable management bracket* —lift the cards from the bottom, using the cable management bracket only as an aid for balance.

Step 6 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 7 If the MSC slot is to remain empty, install an MSC impedance carrier to keep dust from the chassis and maintain proper airflow through the MSC compartment.

Step 8 Use a screwdriver to tighten the captive screws next to each impedance carrier ejector lever to ensure proper EMI shielding and to maintain proper airflow throughout the chassis.

What to Do Next

If you need to install a replacement MSC, FP, or LSP line card, see "Installing an MSC, FP, or LSP" section on page 6-32 .

Removing an RP, PRP, or DRP Card

This section describes how to remove a route processor (RP), performance route processor (PRP), or distributed route processor (DRP) card from the chassis.

Every Cisco CRS 8-Slot Line Card Chassis Enhanced router contains two route processor cards in dedicated slots on the front (PLIM) side of the chassis.

Note   For enhanced immunity to external electromagnetic disturbance levels of 10V per meter and 10V RMS, you must use a shielded Ethernet (CAT5 or better STP) cable on the Management Ethernet connection of the RP card (CRS-8-RP). The use of a shielded Ethernet cable on the Management Ethernet connection of the PRP card (CRS-8-PRP-6G or CRS-8-PRP-12G) is optional. The grounded end of the shielded Ethernet cable should be at the RP (or PRP) end.

Prerequisites

Because chassis operation may be impacted by the removal of an RP card, perform these tasks only if one of the following conditions exists:

- When you are certain that the second RP in the chassis is operational and, if not already the active RP, ready to assume control (this happens automatically)

- When the chassis is undergoing scheduled maintenance

- When the Cisco CRS 8-Slot Line Card Chassis Enhanced routerr is powered down

Failure to follow these guidelines can result in interruptions in data communications and network connectivity.

Before performing this task, remove the front cover, if installed.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- Number 2 Phillips or number 2 common (flat-head) screwdriver

Steps

To remove an RP or DRP card, follow these steps:

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front (PLIM) side or a bare metal surface on the chassis.

Step 2 Identify the card to be removed from the card cage. Remove any cables connected to the front panel of the card.

Step 3 Use the screwdriver to turn the two captive screws on the front panel of the card counterclockwise to loosen the card from the slot.

Step 4 Grasp the two card ejector levers and simultaneously pivot both ejector levers 90 degrees away from the front edge of the card carrier to unseat the card from the backplane connector.

Step 5 Touching only the metal card carrier, slide the card from the slot and place it directly into an antistatic sack or other ESD-preventive container. If you plan to return the defective card to the factory, repackage it in the shipping container you received with the replacement card.

What to Do Next

After performing this task, reinstall the front cover, if applicable. If you need to install a replacement RP, DRP, or PRP card, see Installing an RP, PRP, or DRP Card, page 6-20 .

Removing a PLIM

This section describes how to remove a PLIM from the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

⚠

Caution The system may indicate a hardware failure if you do not follow proper procedures. Remove or install only one PLIM at a time. Allow at least 15 seconds for the system to complete the preceding tasks before removing or installing another PLIM.

✎

Note We strongly recommend that you use the **shutdown** command before removing a PLIM to prevent anomalies when you reinstall a new or reconfigured PLIM.

Prerequisites

Before performing this task, remove the front cover, if installed.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap

- Number 2 Phillips or number 2 common (flat-head) screwdriver

Steps

To remove a PLIM, follow these steps:

Procedure

Step 1   Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front (PLIM) side or a bare metal surface on the chassis.

Step 2   Identify the card to be replaced.

Step 3   Loosen the two captive screws holding the card in place.

Step 4   Grasp the two card ejector levers and simultaneously pivot both ejector levers 90 degrees (70 degrees for a newer PLIM) away from the front edge of the card carrier to unseat the card from the backplane connector.

Step 5   Grasp the handle and gently pull the PLIM halfway from the slot .

Figure 82: Removing a PLIM
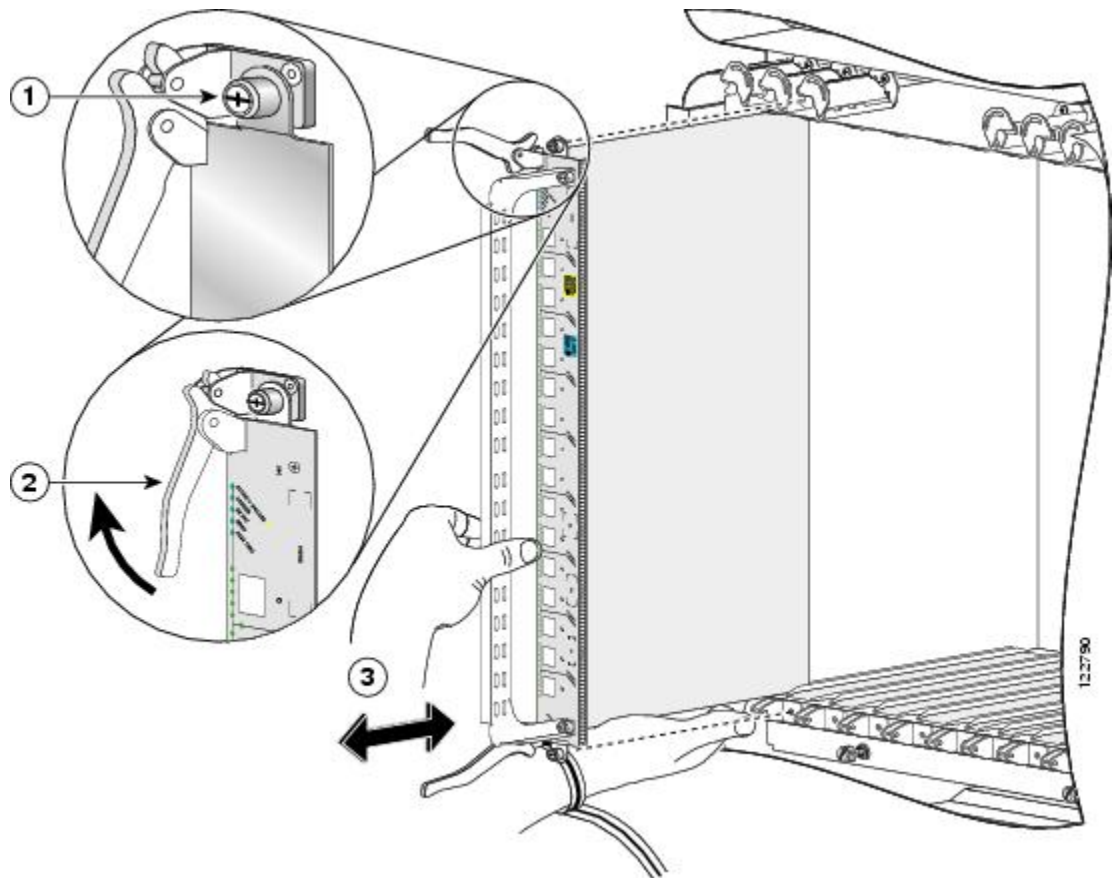
1	Captive screw	3	Direction of installation or removal
2	Ejector lever		

Step 6 Move one hand under the PLIM to guide it. Avoid touching the PLIM printed circuit board, components, or any connector pins.

Tip *Do not lift cards by the handle* ; lift from the bottom, using the handle only as an aid for balance.

Step 7 Slide the card from the slot and place it directly into an antistatic sack or other ESD-preventive container.

What to Do Next

Danger 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

Some PLIMs contain Class 1 lasers, and some contain Class 1M. See the documentation for the specific PLIM for details.

What to Do Next

After performing this task, reinstall the front cover, if applicable. If you need to install a replacement PLIM, see Installing a Physical Layer Interface Module, page 6-39 .

Removing an RP PCMCIA Card

This section describes how to remove a PCMCIA card from an RP or a DRP card PCMCIA slot. For more detailed information on PCMCIA cards, see the About Hard Drives and PCMCIA Cards, page 6-12 ,

Prerequisites

Before performing this task, remove any front (PLIM) side cover plates.

Required Tools and Equipment

You need the following tools to perform this task:

• ESD-preventive strap

• Number 2 Phillips or number 2 common (flat-head) screwdriver

Steps

To remove the PCMCIA card, follow these steps:

Procedure

Step 1	Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front (PLIM) side or a bare metal surface on the chassis.
Step 2	Using the screwdriver, loosen the captive screw at the bottom of the PCMCIA slot door on the faceplate of the card.
Step 3	While lifting the hinged PCMCIA slot door up, press the release button for the card slot to disengage the card from the card.
Step 4	Carefully pull out the far-left removable PCMCIA flash card.
Step 5	Place the removed PCMCIA card on an antistatic mat, or place it in an antistatic bag if you plan to return it to the factory.
Step 6	If the PCMCIA card slot is to remain empty, close the door to keep dust out, and tighten the captive screw with the screwdriver. Otherwise, install the new PCMCIA card.

What to Do Next

After performing this task, reinstall the front cover, if applicable. If you intend to install a new PCMCIA card, see Installing a PCMCIA Card, page 6-44 .

Removing a Bale-Clasp SFP Module

This section describes how to remove a bale-clasp SFP module. The module has a clasp used to install and remove the module .

Figure 83: Bale-Clasp SFP Module
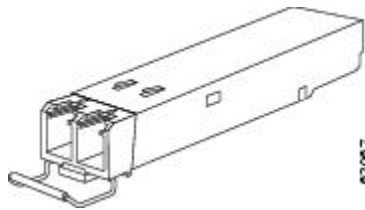
Prerequisites

Before performing this task, remove the front cover, if installed. Before removing a module, disconnect any connected interface cables.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- Small flat-blade screwdriver

Steps

To remove a bale clasp SFP module (from a PLIM), follow these steps:

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front (PLIM) side or a bare metal surface on the chassis.

Step 2 Disconnect and remove all interface cables from the ports. Be sure to note the current connections of the cables to the ports on the PLIM.

Step 3 Open the bale clasp on the module with your index finger in a downward direction . If the bale clasp is obstructed and you cannot use your index finger to open it, use a small screwdriver or other long, narrow instrument to open the bale clasp.

Step 4 Grasp the module between your thumb and index finger and carefully remove it from the port .

Note   Be careful to hold the module in such a way so as to not damage the bale clasp.

Figure 84: Removing a Bale-Clasp SFP Module
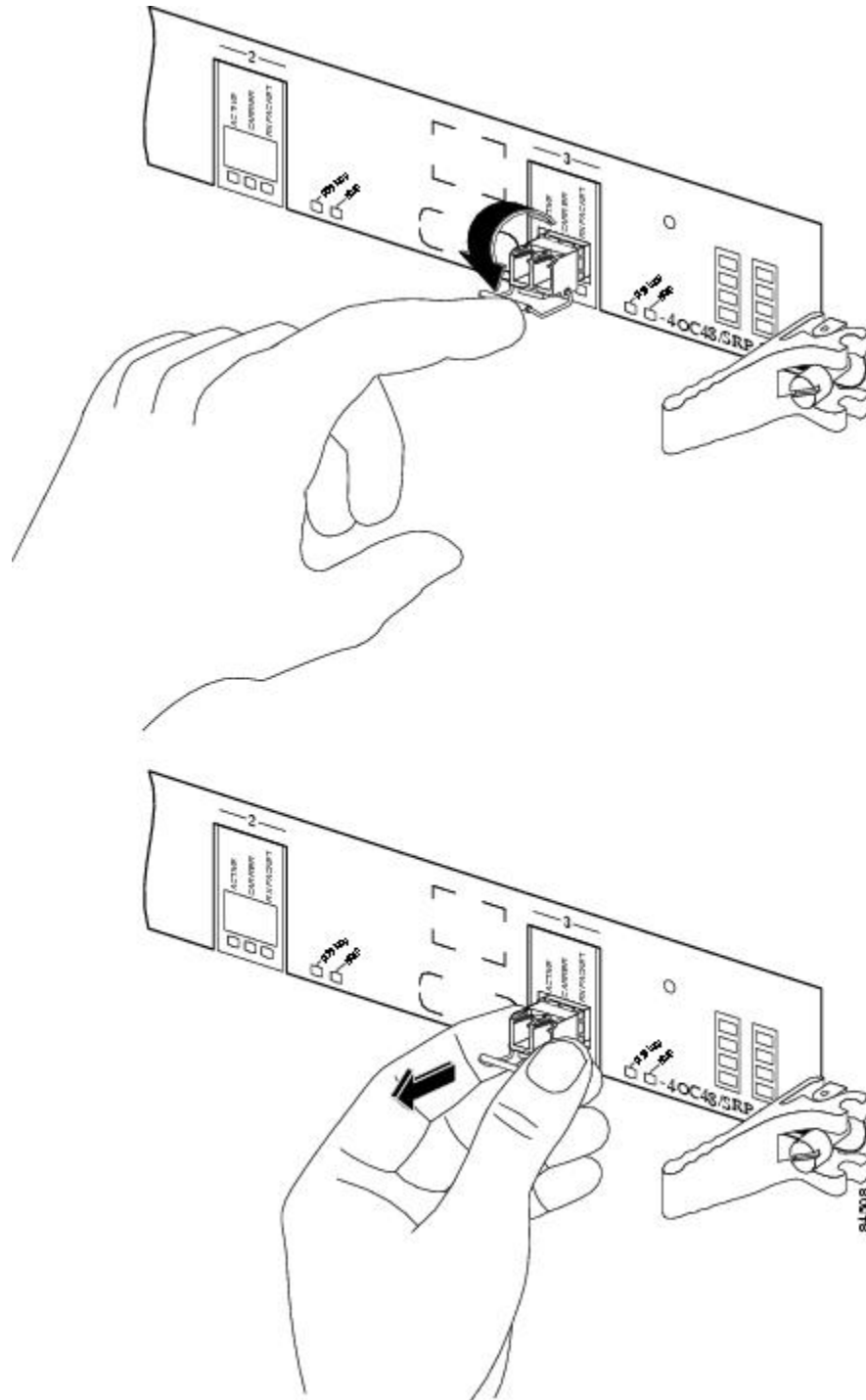
Step 5 If you plan to return it to the factory, place the removed module on an antistatic mat, or immediately place it in a static-shielding bag.

Step 6 Protect the PLIM by inserting clean SFP module cage covers into the optical module cage when there is no module installed.

What to Do Next

After performing this task, reinstall the front cover.

Removing the Front Cable Management Bracket

The following sections shows how to remove the Front Cable Management Bracket.

Prerequisites

The front cable management bracket arrives pre-installed on the chassis. Remove any cables from the bracket before you begin removing it.

Before performing this task, remove the front cover, if installed.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- 6 in. long number 1 Phillips screwdriver
- Medium flat-blade screwdriver

Steps

To remove the cable management bracket, follow these steps:

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket or a bare metal surface on the chassis.

Step 2 If applicable, remove the Cisco logo bezel from the front of the chassis.

a) Gently insert the flat-blade screwdriver between the edge of the bezel and the face of the chassis and pry the bezel loose.
The bezel is attached to the front of the chassis with four ball studs.

b) Pull the bezel firmly towards you to detach it.

Step 3 Remove all screws on either side of the front cable management bracket. Refer to Figure 7-7 for the screw locations.

Tip For ease of removal, remove the outer screws first.

Caution Be careful not to damage the plastic bracket arms.

Step 4 Set the bracket carefully aside.

What to Do Next

You may now install a replacement front cable management bracket, if applicable. See Installing the Cable Management Bracket, page 6-46 for more information.

Removing the Rear Cable Management Bracket

The following sections shows how to remove the Rear Cable Management Bracket.

Prerequisites

Remove any cables from the bracket before you begin removing it.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- 6 in. long number 1 Phillips screwdriver

Steps

To remove the rear cable management bracket, follow these steps:

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket or a bare metal surface on the chassis.

Step 2 Remove the two screws on the rear cable management bracket to be removed. Refer to the Figure 6-38 for the screw locations.

Step 3 Set the bracket carefully aside.

Step 4 Insert and tighten the two screws back onto the chassis.

What to Do Next

You may now install a replacement rear cable management bracket, if applicable. See Installing the Front Cable Management Bracket, page 6-47 for more information.

Replacing a SFP on a Line Card that Uses an Articulated Bracket

To replace a failed, defective, or retired SFP from a line card that is currently in service, and using an articulated cable management bracket, proceed as follows:

Procedure

Step 1 For a line card with multiple articulated brackets, select the fibers to be removed from the bracket with the SFP to be removed.
For a line card with a single articulated bracket, begin with #task_1108016/_1108024.

Step 2 Undo and remove the Velcro from the articulated bracket to release the fibers.

Step 3 From the physical location of the SFP to be removed, determine which end of the articulated bracket will be unscrewed:

- For the upper half of the line card, remove the top screw.

- For the lower half of the line card, remove the lower screw.

- If there is any interference with another installed bracket, choose the other screw location.

Step 4 Pivot the articulated bracket up or down, depending on which screw was removed.

Step 5 Label and disconnect the fibers from the port and put them aside.

Step 6 Remove the SFP.

Step 7 Replace with the new SFP (or a dust cap if the port is not going to be reused).

Step 8 Re-install the fibers that were removed in #task_1108016/_1108031 per the labels.

Step 9 Pivot the articulated bracket back into position and secure.

Step 10 Re-dress and secure the fibers to the articulated bracket with Velcro.

Removing the Exterior Cosmetic Components

This section describes how to remove exterior cosmetic components from the front (PLIM) side of the chassis. To remove a particular part, see the appropriate step or steps in the procedure that follows.

This section describes how to perform the following tasks:

Removing the Inlet Grille

This section describes how to remove the inlet grille from a Cisco CRS 8-Slot Line Card Chassis Enhanced router. The grille covers the power module and air intake areas at the bottom of the front (PLIM) side of the chassis, just below the card cage.

Prerequisites

No prerequisites exist for this task.

Required Tools and Equipment

No tools are required to perform this task.

Steps

To remove the inlet grille, perform the following steps:

Procedure

Step 1   Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.

Step 2   While facing the front (PLIM) side of the chassis, firmly grasp the top outside edges of the inlet grille.

Step 3   Pull the top of the grille firmly away from the chassis; it loosens from the connecting ball studs.

Step 4   Slide the hooks at the bottom of the grille free of the cutouts at the bottom of the chassis casing.

Step 5   Carefully set the inlet grille aside.

What to Do Next

Be sure that all parts have been carefully set aside and repackaged appropriately.

Removing the Front Cover

This section describes how to remove the front cover. The front cover protects the card cage on the front (PLIM) side of the chassis.

Prerequisites

There are no prerequisites for this task.

Required Tools and Equipment

No tools are required to perform this task.

Steps

To remove the front cover, follow these steps:

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.

Step 2 While facing the front (PLIM) side of the chassis, firmly grasp the outside edges of the front cover.

Step 3 Pull the front cover firmly away from the chassis; the four ball studs on the front cover loosen from the four ball stud retainer brackets installed on the vertical chassis rack rails.

Step 4 Carefully set the inlet grille aside.

What to Do Next

Be sure that all parts have been carefully set aside and repackaged appropriately.

Removing Air Circulation Components

This section provides instructions on how to remove the Cisco CRS 8-Slot Line Card Chassis Enhanced router air circulation components.

This section presents the following topics:

Removing the Rear Exhaust Grille

This section describes how to remove a rear exhaust grille on the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

Prerequisites

There are no prerequisites for this task.

Required Tools and Equipment

You need the following tools and part to perform this task:

- ESD-preventive wrist strap
- Number 2 Phillips screwdriver

Steps

To remove a rear exhaust grille, follow these steps:

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the rear (MSC) side of the chassis or a bare metal surface on the chassis.

Step 2 Remove the five panel fasteners that attach the rear exhaust grille to the chassis.

Figure 85: Removing Rear Exhaust Grille
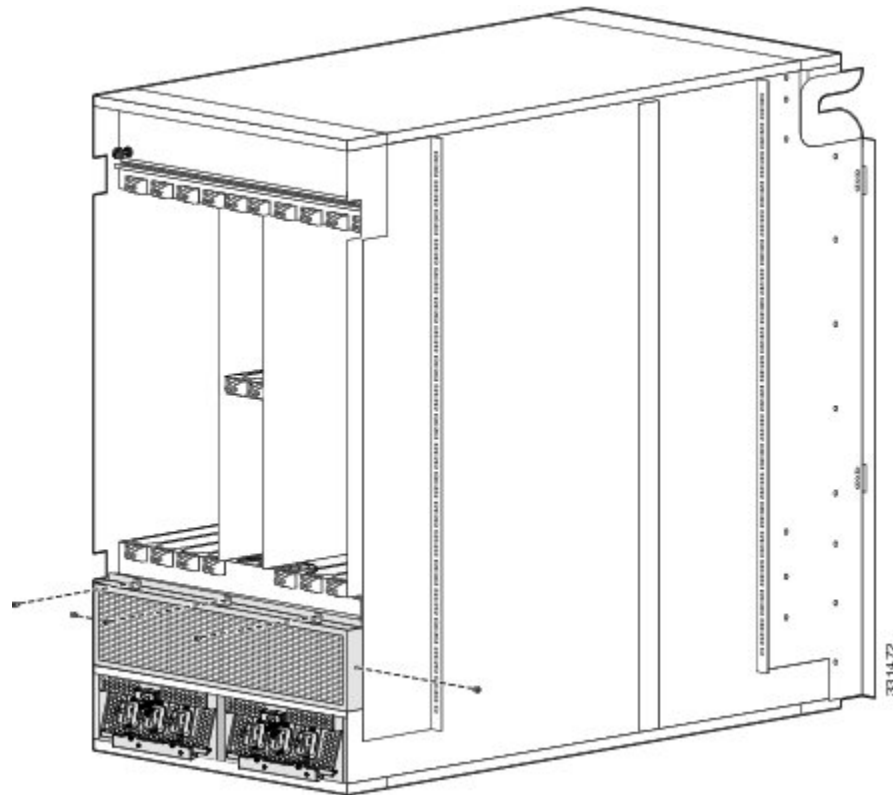
1	Rear exhaust grille

Step 3 Remove the rear exhaust grille from the rear of the chassis, and carefully set it aside.

What to Do Next

Be sure that all parts have been carefully set aside and repackaged appropriately.

Removing a Lower Fan Tray

This section describes how to remove a fan tray from the lower fan tray slot of the Cisco CRS 8-Slot Line Card Chassis Enhanced router. For information on the chassis airflow and circulation, see About Line Card Chassis Airflow, page 4-1 . For complete information on regulatory compliance and safety, see Regulatory Compliance and Safety Information for the Cisco CRS Carrier Routing System .

A Cisco CRS 8-Slot Line Card Chassis Enhanced router fan tray operates in either the upper or lower fan tray slot. Each fan tray is installed into the rear (MSC) side of the chassis .

Figure 86: Fan Tray
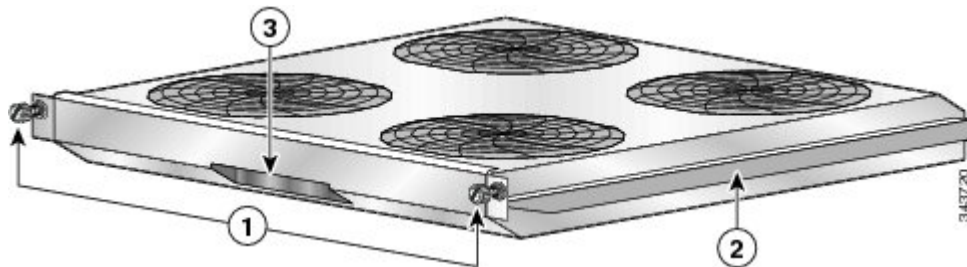
1	Captive screws	3	Fan tray handle
2	Fan tray rail		

Prerequisites

Before performing this task, you must first remove the optional rear exhaust grille, if installed.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- Large flat-blade screwdriver

Steps

To remove a lower fan tray, follow these steps:

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the rear (MSC) side of the chassis or a bare metal surface on the chassis.

Step 2 Using the screwdriver, loosen the two captive screws on the fan tray.

> **Caution**   A fan tray weighs approximately 19.15 pounds (8.69 kg). Use both hands when handling a fan tray.

Step 3   Use your free hand to support the fan tray, then slide the fan tray completely from the fan tray bay.

Step 4   Set the fan tray safely aside.

> **Caution**   Do not set the fan tray down on the connector; doing so could damage it.

What to Do Next

If you need to install a new lower fan tray, see Installing a Lower Fan Tray, page 4-2 for more information.

Removing an Upper Fan Tray

This section describes how to remove a fan tray from the upper fan tray slot of the Cisco CRS 8-Slot Line Card Chassis Enhanced router. For information on the chassis airflow and circulation, see About Line Card Chassis Airflow, page 4-1 .

A Cisco CRS 8-Slot Line Card Chassis Enhanced router fan tray operates in either the upper or lower fan tray slot. Each fan tray is installed into the rear (MSC) side of the chassis (see #con_1099876/fig_1086095).

Prerequisites

There are no prerequisites.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- Large Phillips screwdriver

Steps

To remove an upper fan tray, follow these steps:

Procedure

Step 1   Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the rear (MSC) side of the chassis or a bare metal surface on the chassis.

Step 2   Using the screwdriver, unscrew the two captive screws holding the fan tray bay door in place.

Step 3   Lift the door up; you may need a second person to hold it in the open position.

Step 4   Pull firmly and steadily on the fan tray handle to unseat it from the chassis connector, and then slide it partway from the fan tray bay.

> **Caution**   Do not pull too hard on the fan tray; too strong a pull can cause the tray to slide out too quickly, causing your hand to scrape against the fan tray door.

Step 5 Place your hand under the fan tray to support it from beneath.

Caution A fan tray weighs approximately 19.15 pounds (8.69 kg). Use both hands when handling a fan tray.

Step 6 Slide the fan tray from the bay and set it carefully aside.

Step 7 Replace the fan tray bay door and tighten the two captive screws on the fan tray cover bay door.

What to Do Next

If you need to install a new lower fan tray, see Installing an Upper Fan Tray, page 4-6 for more information.

Removing the Chassis Air Filter

This section describes how to remove the air filter in the Cisco CRS 8-Slot Line Card Chassis Enhanced router. For further information, see About Line Card Chassis Airflow, page 4-1 .

The Cisco CRS 8-Slot Line Card Chassis Enhanced router air filter plugs into the front (PLIM) side of the chassis.

Prerequisites

Before performing this task, you must first remove the front cover and inlet grille, if installed.

⚠

Caution Never operate the Cisco CRS 8-Slot Line Card Chassis Enhanced router without an air filter. Doing so can damage the hardware.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- Number 2 Phillips screwdriver

Steps

To remove the chassis air filter, follow these steps:

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.

Step 2 Using the screwdriver, loosen the two captive screws on the air filter cover faceplate.

Step 3 Remove the cover faceplate and set it carefully aside.

Step 4 Grasp the air filter and carefully slide it from the slot.

Step 5 Set the air filter carefully aside.

What to Do Next

If you need to install a new air filter, see Installing the Chassis Air Filter, page 4-4 for more information.

Removing Power Components

This section describes how to remove power components from the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

Note Although there are differences between the different types of power shelves and PMs (AC and DC), they are installed and removed using the same procedures.

While it is possible to remove power components from the Cisco CRS 8-Slot Line Card Chassis Enhanced router separately, some parts (such as the power shelf) require that other parts be removed first.

We recommend that you remove the power components in the order outlined in this section. This section contains the following procedures:

Removing AC or DC PMs

This section describes how to remove AC or DC PMs from the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

Note Although there are differences between the AC and DC PMs, they are removed in the same manner.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap

- 6-in. long number 1 Phillips screwdriver

Steps

To remove the AC or DC PMs, perform the following steps:

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.

Step 2 At the front of the chassis, unscrew the ejectors from the PMs, as shown in .

Figure 87: Unscrew Ejectors from PM
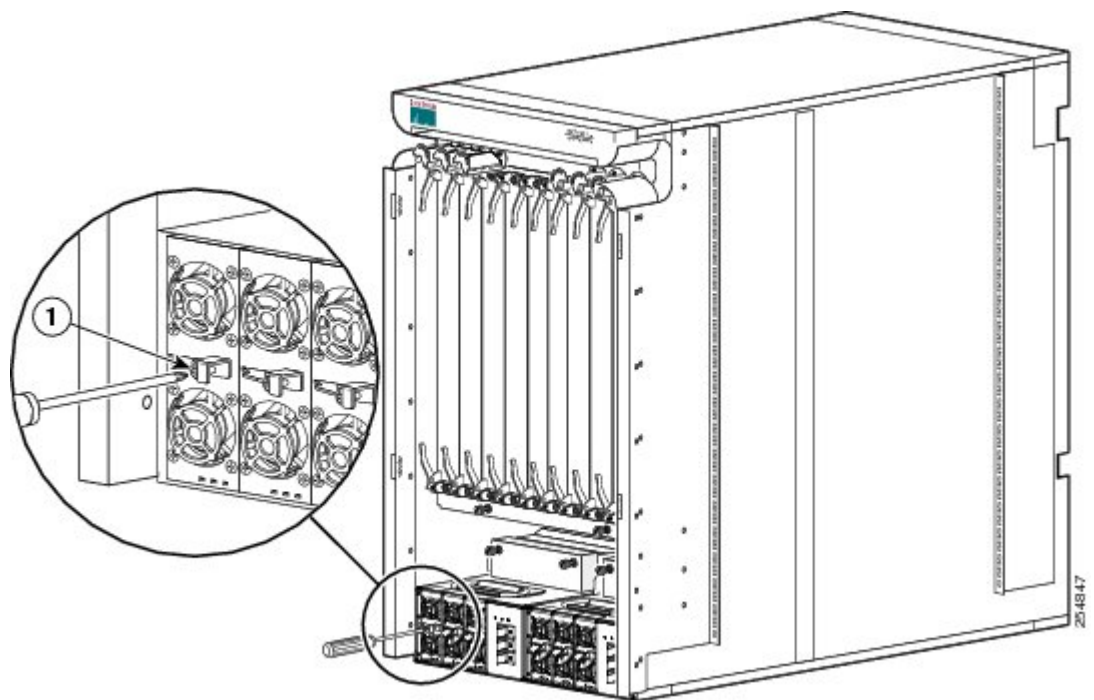
| 1 | Ejector on PM |

Step 3 After unscrewing the ejector, carefully slide the PM out of the power shelf, as shown in Figure 88: Removing the PM, on page 157.

Figure 88: Removing the PM
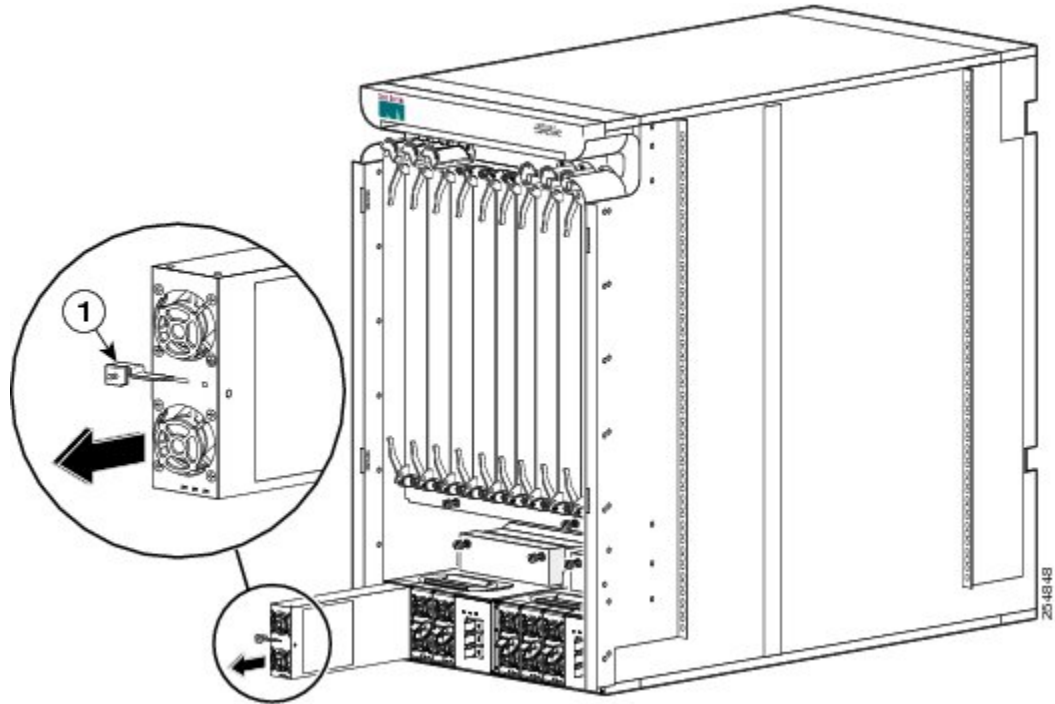
1	Ejector on PM

What to Do Next

After the PMs have been removed from the chassis, you can remove the power shelf wiring. Continue to Removing AC Power Cords or DC Power Shelf Wiring, on page 157 for instructions. If you need to install a replacement PM, see Installing a Power Module, page 3-17 for more information.

Removing AC Power Cords or DC Power Shelf Wiring

This section describes how to remove the DC input wiring, DC terminal block covers and the AC power cords from the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

Removing DC Power Shelf Wiring

This section describes how to remove the DC wiring from the DC power shelf. For more detailed information on chassis DC power systems, see DC Power Systems, page 3-3 .

The following figure shows the power cable connections at the rear of the DC power shelf.

Figure 89: DC Power Shelf Power Cable Connections
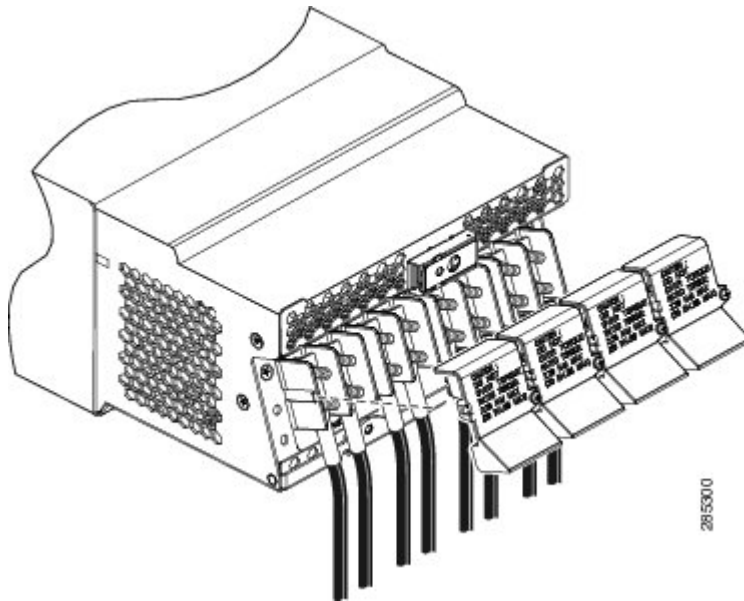
Prerequisites

Before performing this task, power down and remove DC PMs in the shelf you want to disconnect.

Note   Before removing wiring from the power shelf, make sure that the input power cables are not energized.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver
- 10-mm. socket wrench

Steps

To remove the wiring from the DC power shelf, perform the following steps:

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the rear (MSC) side of the chassis or a bare metal surface on the chassis.

Step 2 Use the screwdriver to remove the screw that secures the terminal block cover into the mounting standoff.

Figure 90: Removing the DC Terminal Block Cover
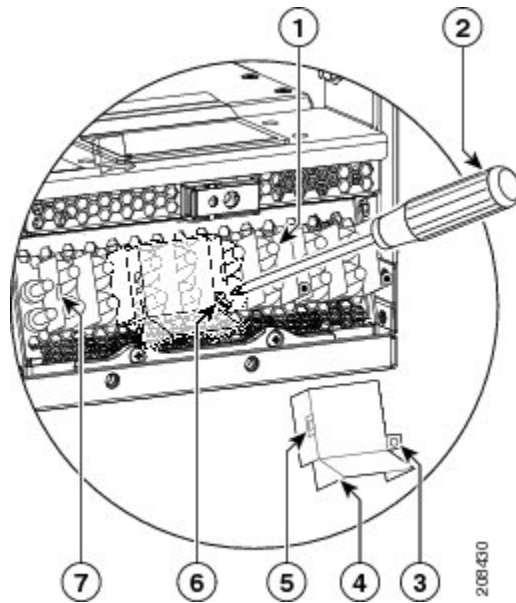
1	Mounting Standoff	5	Opening that aligns over mounting pins
2	Screwdriver removing the cover	6	Screw to remove
3	Opening that aligns over mounting pins	7	Cover latch tab
4	Terminal block cover		

Step 3 Remove the terminal block cover.

Step 4 Using the 10-mm. socket wrench, remove the positive cables from the terminal block.

Step 5 Using the 10-mm. socket wrench, remove the negative cables from the terminal block.

   Note   When a cable is removed from the rear of the DC power shelf, we recommend that it should be wrapped with standard black electrical tape.

Step 6 Reattach the terminal block cover.

Removing AC Power Shelf Wiring

This section describes how to remove input AC cords from the AC power shelf.

Prerequisites

Before performing this task, power down and remove AC PMs in the shelf you want to disconnect.

Note Before removing wiring from the power shelf, make sure that the input power cables are not energized.

Required Tools and Equipment

You need the following tools to perform this task:

• 6-in. long number 1 Phillips screwdriver

Steps

To remove the input AC cords, go to the rear of the chassis and perform the following steps:

Procedure

Step 1 Use the screwdriver to loosen the screw that clamps the cord in place.
Step 2 Remove the cord from the cord clamp.

Figure 91: Removing Cord from Cord Clamp
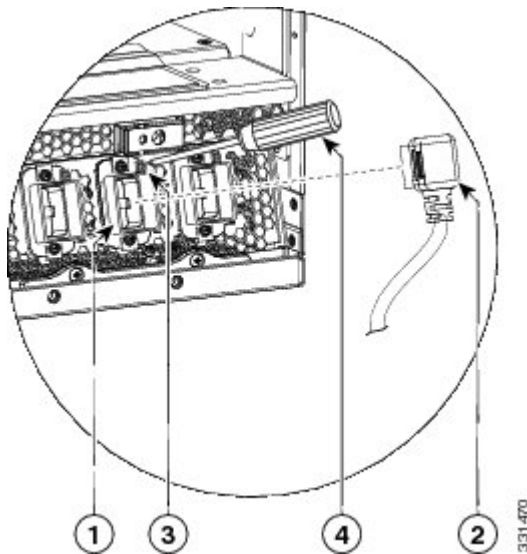
| 1 | Cord Clamp | 3 | Screw that secures the cord in clamp |
| 2 | Cord removed from clamp | 4 | Screwdriver that loosens screw |

What to Do Next

After you remove the DC wiring and DC terminal block covers or AC cords, remove the power shelf. See Removing a Power Shelf, on page 161.

Removing a Power Shelf

This section describes how to remove a power shelf from the Cisco CRS 8-Slot Line Card Chassis Enhanced router

Although there are differences between the AC and DC power shelves, they are removed in the same manner.

Prerequisites

Before performing this task, remove DC input power wiring or AC input cords from the shelf that you want to disconnect. For more information, see Removing AC Power Cords or DC Power Shelf Wiring, on page 157.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver
- 5/32 x 6 in. flat-blade screwdriver
- One 10-mm. 6 pt. combination wrenches

Steps

To remove the power shelf, perform the following steps:

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the rear (MSC) side of the chassis or a bare metal surface on the chassis.

Step 2 Using a 10-mm. wrench, remove the hex head bolts that secure the power shelf to the cross bracket.

Step 3 Using the flat-blade screwdriver, remove the power shelf mounting screws.

Figure 92: Removing Power Shelf to Cross Bracket to Rear Mounting Brackets
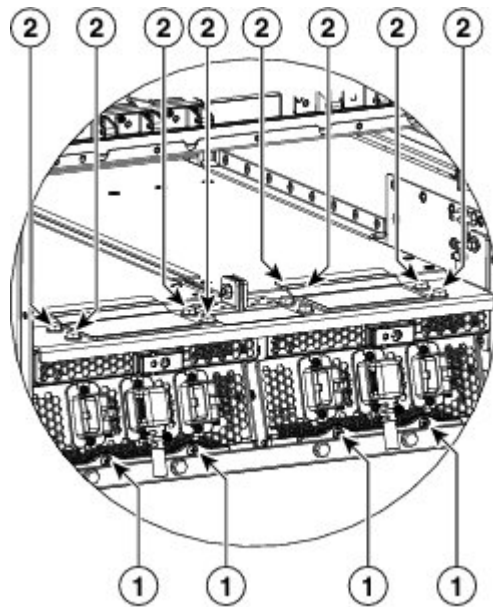
1	Power shelf mounting screws, two slotted screws per shelf
2	M6 Hex head bolts to secure power shelf, four per shelf

1	Nut/bolt to remove	2	10-mm wrench	3	10-mm wrench

Step 4 Remove the ESD-preventive wrist strap from the rear (MSC) side of the chassis. Go to the front of the chassis and reattach to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.

Step 5 Remove the screws, two per shelf, that secure the power shelf to the chassis. Carefully remove the power shelf.

Figure 93: Removing Screws that Secure Shelf to Chassis
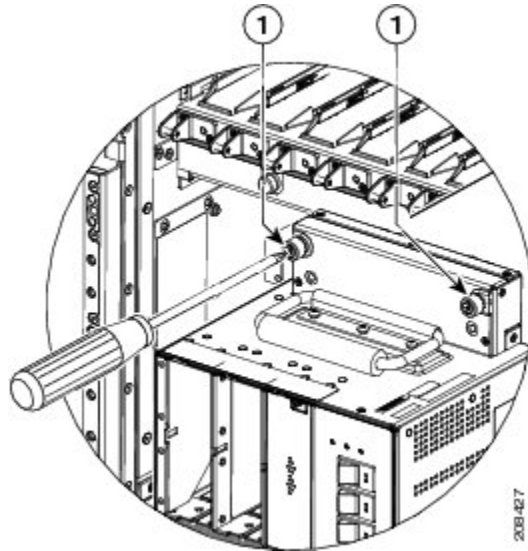
d

1	Screws that secure power shelf to chassis.

What to Do Next

After performing this task, replace the front cover. If you need to install a replacement power shelf, see Installing an AC or DC Power Shelf, page 3-8 for more information.

Removing the Chassis Ground Cable

This section describes how to remove the chassis ground cable on the Cisco CRS 8-Slot Line Card Chassis Enhanced router. For complete information on regulatory compliance and safety, see Regulatory Compliance and Safety Information for the Cisco CRS Carrier Routing System.

Prerequisites

Before performing this task, remove the AC or DC input power wiring from both power shelves, and remove both power shelves from the chassis.

⚠️

Caution   Do not remove the chassis ground cable unless the chassis is being replaced.

Required Tools and Equipment

You need the following tools and equipment to perform this task:

- 3/8 in. drive socket wrench
- 10-mm 6 pt. socket wrench

Steps

To remove the ground cable from the chassis, perform the following steps:

Procedure

Using the 10-mm wrench, remove the two M6 nuts or bolts that attach the ground cable to the grounding point at the rear of the chassis. The following figure shows how the ground cable is attached to the different ground points on the chassis.

Figure 94: Ground Cables Attached to Chassis Grounding Points
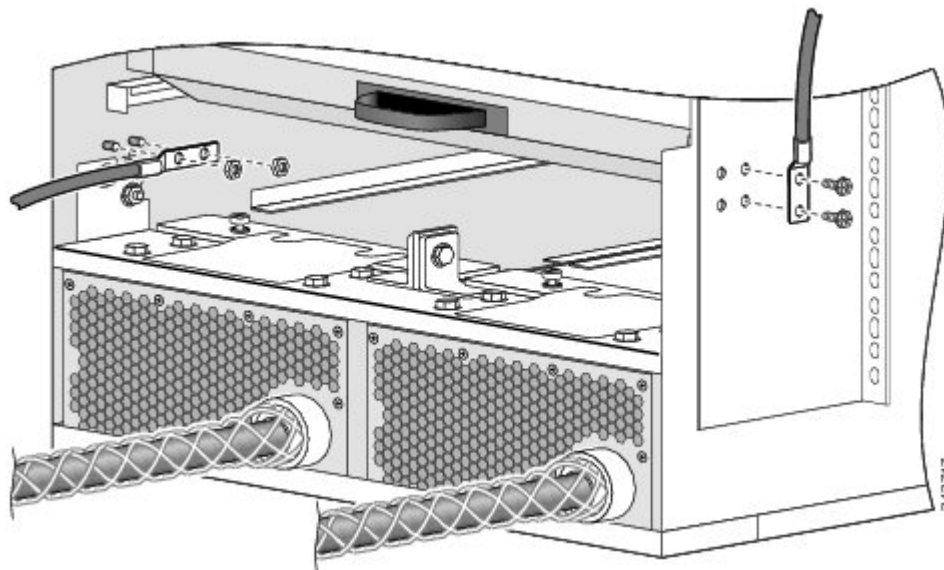
What to Do Next

Technical Specifications

- Technical Specifications, page 165

Technical Specifications

The following table lists the technical specifications for the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

Table 6: Cisco CRS 8-Slot Line Card Chassis Enhanced Router Component and Power Specifications

Supported Cards and Modules	**8 modular services cards (MSCs), forwarding processor (FP) cards, or label switch processor (LSP) cards (line cards)** **8 physical layer interface modules (PLIMs), one for each MSC, FP, or LSP** **4 switch fabric cards (SFCs)** **2 route processor (RP) cards or 2 performance route processor (PRP) cards** **2 fan trays** **1 air filter**
Power Shelves	2 AC or 2 DC power shelves(cannot mix AC and DC power shelves in the chassis)
DC power shelf	Accepts up to 4 DC PMs
AC power shelf	Accepts up to 3 AC PMs
Maximum Power Consumption	This represents total input power.
Maximum DC	9.5 kW (assuming 88% efficiency)
Maximum AC	9.8 kW (assuming 92% efficiency)

Supported Cards and Modules	8 modular services cards (MSCs), forwarding processor (FP) cards, or label switch processor (LSP) cards (line cards) 8 physical layer interface modules (PLIMs), one for each MSC, FP, or LSP 4 switch fabric cards (SFCs) 2 route processor (RP) cards or 2 performance route processor (PRP) cards 2 fan trays 1 air filter
	Note Proper grounding is also required at the site to ensure that equipment is not damaged by lightning or power surges.
DC Power Lug Torque Ranges	
Minimum torque	20 in-lb (2.2 N-m)
Maximum torque	30 in-lb (3.3 N-m)
Power Redundancy	
DC	2N: Up to four A battery plant feeds and up to four B battery plant feeds required.
AC	2N: Up to three A AC single-phase power sources and up to three B AC single-phase power sources required.
Inrush current	
DC	90 Apk max
AC	30 Apk max
DC Input	
Nominal input voltage	−48 VDC North America−60 VDC International(range −40 to −72 VDC)
Input current	50 A max @ −48 VDC40 A max @ −60 VDC60 A at −40 VDC (maximum)
AC Input	
Input voltage	Single-phase 200 to 240 VAC (nominal)(range 180 to 264 VAC)
Line frequency	50 to 60 Hz (nominal)(range 47 to 63 Hz)

Supported Cards and Modules	8 modular services cards (MSCs), forwarding processor (FP) cards, or label switch processor (LSP) cards (line cards) 8 physical layer interface modules (PLIMs), one for each MSC, FP, or LSP 4 switch fabric cards (SFCs) 2 route processor (RP) cards or 2 performance route processor (PRP) cards 2 fan trays 1 air filter
Recommended AC service	16 A

The following table lists the environmental specifications for the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

Table 7: Cisco CRS 8-Slot Line Card Chassis Enhanced Router Environmental Specifications

Description	Value
Temperature	Operating, nominal: 41° to 104°F (5° to 40°C)Operating, short-term: 23° to 122°F (−5° to 50°C)Nonoperating: −40° to 158°F (−40° to 70°C)
Humidity	Operating: 5 to 85% noncondensingNonoperating: 5 to 90% noncondensing, short-term operation
Altitude	1 to 5,906 ft (-60 to 1,800 m) at 122°F (50°C), short-termUp to 13,123 ft (4,000 m) at 104°F (40°C) or below
Heat dissipation	27,350 BTUs/hr
External cooling requirements	2.3 tons
Acoustic noise	74 dB at 3.28 ft. (1 meter) in front of chassis (nominal reading at room temperature)
Shock	Operating: 5 to 500 Hz, 0.5g[2] (0.1 oct/min)[3] Nonoperating: 5 to 100 Hz, 1 g (0.1 oct/min)100 to 500 Hz, 15 g (0.2 oct/min)500 to 1000 Hz, 1.5 g (0.2 oct/min)
Vibration	Operating: 0.35 Grms[4] from 3 to 500 HzNonoperating: 1.0 Grms from 3 to 500 Hz

[2] g = Gravity
[3] oct/min = Octave per minute

[4] Grms = The root mean square value of acceleration, where 1G equals 32.17 ft/sec (9.81 m/sec). Table A-3 lists the physical specifications for the Cisco CRS 8-Slot Line Card Chassis Enhanced router .

Table 8: Cisco CRS 8-Slot Line Card Chassis Enhanced Router and Equipment Rack Specifications

Cisco CRS 8-Slot Line Card Chassis Enhanced Router Specifications	
Chassis Dimensions	
Height	38.5 in. (97.8 cm)
Width	17.5 in. (44.5 cm) 18.9 in. (48.0 cm) mounting rail flange, outside to outside
Depth	36.6 in. (93.0 cm) without cosmetics40.5 in. (102.9 cm) with full cosmetics
Chassis Weight	
Chassis shipping weight	418.3 lb. (189.7 kg) chassis with shipping crate and pallet330.8 lb. (138 kg) chassis with fans, PDUs, and blanks (as shipped)
Chassis with all cards and power modules, no cosmetics	600 lb. (272.2 kg)
Chassis, fully loaded with line cards and full cosmetics	650 lb. (294.8 kg)
Equipment Rack Specifications	
Rack Dimensions	
Height	Available aperture in rack for two chassis in a single rack: • 78.6 in. (199.6 cm)
Width	Vertical posts: • 19.5 in. (49.5 cm) inside-to-inside minimum • 23.6 in. (60.0 cm) outside-to-outside maximum
Depth	Exterior of four-post rack: • Optimal: 27 in. (68.6 cm), for best access to mounting hardware • Optional: 30, 36, or 42 in. (76.2, 91.4, or 106.7 cm) and other standard depths allowed, allow less space for cable management

Cisco CRS 8-Slot Line Card Chassis Enhanced Router Specifications	
Equipment Rack Specifications (continued)	
Load (weight) rating	The rack must support the following weights and specifications: • 650 lb. (294.8 kg) single chassis with full cosmetics • 1300 lb. (589.7 kg) two chassis, each with full cosmetics • 95 lb. (43.0 kg) or more for each chassis for cabling • Additional weight of other components in rack **Note** ANSI specification T1.336 (2003), which defines static load and safety margins, recommends that racks be designed to support at least two times the anticipated load. **Note** See ANSI specification T1.329 (2002) for dynamic load requirements and earthquake resistance specifications.
Chassis and rack footprint(floor contact area)	5.9 sq. ft. (0.55 sq. m), 23.6 in. rack width by 36 in. chassis depth (60 cm rack width by 91.4 cm chassis depth)
Maximum floor loading	600 lb/4.5 sq. ft. = 133 lb/sq. ft. (without cosmetics)272.2 kg/4134.2 sq. cm = 0.07 kg/sq. cm 650 lb/4.9 sq. ft. = 132.7 lb/sq. ft. (with cosmetics)294.8 kg/4580.1 sq. cm = 0.06 kg/sq. cm **Note** Be sure to include the weight of the rack when you consider floor loading requirements. The above numbers do not include rack weight.
Rack Anchoring	

Cisco CRS 8-Slot Line Card Chassis Enhanced Router Specifications	
General considerations	• The rack must be bolted to the floor. For more information, see the *Cisco CRS Carrier Routing System 8-Slot Line Card Chassis Enhanced Router Unpacking, Moving, and Securing Guide.* • Consider floor and overhead anchoring requirements for the site, and size and load capacity of anchors and floor structure. • Make sure that floor mounting bolts are accessible, especially if annual retorquing of bolts is required.
Floor mounting holes	• Outrigger L-brackets: Depends on chosen rack • Internal frame holes: Depends on chosen rack
Chassis Clearances	
Two chassis in a single rack	0.5-in. (1.27 cm) between chassis for horizontal shelf brackets
Front and rear of chassis	40.4-in. (102.6 cm) for chassis installation36-in. (91.4 cm) for service access and airflow
Inlet and exhaust openings on chassis and power modules	6-in. (15.2 cm)
Top of chassis	No overhead clearance for a single chassis. Two chassis in a rack requires 0.5-inch (1.27 cm) between chassis for mounting rails.
Mounting Rails and Hardware	
Rail openings (aperture)	• 17.75 in. (45.1 cm), side to side • 22.8 in. (57.9 cm), front to back (adjustable or fixed)

Cisco CRS 8-Slot Line Card Chassis Enhanced Router Specifications	
Horizontal mounting rails	The equipment rack should contain horizontal mounting rails to place the chassis on. The mounting rails, which must be able to hold at least 650 lb (294.8 kg), support the weight of the chassis. • A set of brackets is included in the chassis installation kit, which is available as an option (CRS-8-INSTALL-KT=). Install these brackets and place the chassis on them. For details, see the *Cisco CRS Carrier Routing System 8-Slot Line Card Chassis Enhanced Router Unpacking, Moving, and Securing Guide.* **Note** In addition to supporting the chassis, the mounting rails are also designed to space adjustable rack rails at 22.8-inches (front to back) for chassis installation.
Mounting holes	EIA standard mounting-hole spacing: • 18.25-inches to 18.31-inches (46.36 to 46.51 cm), center-to-center horizontal spacing • 0.5 + 0.625 + 0.625-inches (1.27 + 1.59 + 1.59 cm),vertical-hole-spacing pattern; repeats on 1.75-inch (4.45 cm) pitch ETSI racks have mounting rails with EIA standard spacing.
Mounting screws	• 48 screws for each chassis, 12 screws in each of 4 vertical rails, installed in holes with tick marks • Number 10-32 x 5/8 in. long socket head cap screws (sixty screws provided with the chassis) **Note** If you plan to use mounting screws other than the ones shipped with the chassis, you can use 10-32, 10-24, 12-24, or M5 screws. (M6 and 1/4-20 screws do not fit.)
Compliance	Make sure that the rack complies with all appropriate standards for your geographical area—for example, NEBS Seismic Zone 4 (GR-63-CORE, Sections 4.4.1 and 4.4.2).
Additional Rack Considerations	
Interface cables	When choosing a rack, consider cabling needs (chassis front). Allow at least 95 lb (43.1 kg) weight for each chassis for cables.

APPENDIX B

Product IDs

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Product IDs

This appendix provides information about the product IDs for components of the Cisco CRS 8-Slot Line Card Chassis Enhanced router. It contains the following tables:

These tables list the components that make up the routing system, their product IDs (the part numbers to use to order the components), and descriptions.

Note See the Cisco online ordering and pricing tool for the most up-to-date information on the routing system and product IDs (Cisco login required).

Note For a complete list of line cards, route processors, SPAs and SIPs, and interface modules supported in the Cisco CRS 8-slot line card chassis, see Cisco CRS Data Sheets.

Chassis Product IDs

Table 9: 8-Slot Routing System Component Product IDs, on page 173 lists the product IDs for components in the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

Table 9: 8-Slot Routing System Component Product IDs

Component	Product ID	Description
CRS 8-Slot Line Card Chassis Enhanced router	CRS-8-LCC-B	Cisco CRS 8-Slot Line Card Chassis Enhanced router(spare chassis)

Component	Product ID	Description
Fan tray	CRS-8-LCC-FAN-TR(=) CRS-8-FANTRAY-B	Cisco CRS 8-slot fan tray and fans (spare)(2 required for each chassis) **Note** The new fan trays (CRS-8-FANTRAY-B) are only supported if you are using Cisco IOS-XR release 4.3.2 or later.
Air filter	CRS-8-LCC-FILTER(=)	Cisco CRS 8-Slot Line Card Chassis Enhanced router filter pack (spare)
Inlet grille	CRS-8-PW-GRILL(=)	Cisco CRS 8-Slot Line Card Chassis Enhanced router inlet air grille
Installation kit	CRS-8-INSTALL-KT(=)	Cisco CRS 8-Slot Line Card Chassis Enhanced router installation kit(includes a set of horizontal shelf brackets, mounting screws, and other items)
AC power components		
AC power shelf	CRS-8-PSH-AC-B	Cisco CRS single-phase AC power shelf(two required for each chassis)
AC PM	CRS-PM-AC(=)	Cisco CRS AC PM[5](up to three required for each power shelf)
DC power components		
DC power shelf	CRS-8-PSH-DC-B	Cisco CRS DC power shelf (two required for each chassis)
DC PM	CRS-PM-DC(=)	Cisco CRS DC PM(up to four required for each power shelf)
Switch fabric cards		
Switch fabric cards	CRS8FCS(=)CRS8FC40S(=)CRS8FC400S(=)CRS8FC400M(=)	Cisco CRS switch fabric card (half-height)(four required for each chassis)
Switch fabric blank	CRS-8-FC-BLANK(=)	Blank card carrier for each switch fabric slot (used during shipment, must be replaced by a switch fabric card)
Switch fabric handle	CRS-8-FC-HANDLE(=)	Handle for carrying card (spare)
Route processor card		

Component	Product ID	Description
Route processor (RP)[6]	CRS-8-RP(=)	Cisco CRS RP card(one required for each chassis; for redundant operation, you also need CRS-8-RP/R=)
Route processor, redundant	CRS-8-RP/R(=)	Optional route processor for redundant RP operation(one required for each chassis, along with CRS-8-RP=)
Route processor memory	CRS-MEM-2G(=)CRS-MEM-4G(=)	RP memory module, 2 gigabytesRP memory module, 4 gigabytes
Route processor blank	CRS-8-RP-BLANK(=)	Blank card carrier for each route processor slot(used during shipment, must be replaced by a route processor card)
Performance route processor (PRP)[7]	CRS-8-PRP-6G(=) CRS-8-PRP-12G(=)	Cisco CRS performance route processor card
Route processor handle	CRS-8-RP-HANDLE(=)	Handle for carrying card (spare)

5 PM = power module
6 RP = route processor
7 PRP = performance route processor

Optional Line Card, PLIM, SIP, and SPA Product IDs

Note For a complete list of PLIM product IDs, see the Cisco CRS Carrier Routing System Ethernet Physical Layer Interface Module Installation Note . For a complete list of SIP and SPA product IDs, see the http://www.cisco.com/c/en/us/td/docs/interfaces_modules/shared_port_adapters/install_upgrade/crs/crs1/installation/guide/spahw.html Cisco CRS SIP and SPA Hardware Installation Guide .

Table 10: Line Card Product IDs and Table 11: PLIM Component Product IDs list the product IDs for the modular services cards (MSCs), forwarding processor (FP) cards, label switch processor (LSP) cards (line cards); physical layer interface modules (PLIMs); SIPs and SPAs available for the Cisco CRS 8-Slot Line Card Chassis Enhanced router.

Table 10: Line Card Product IDs

Component	Product ID	Description
MSC[8]	CRS-MSC-B(=)CRS-MSC-140G(=)CRS-MSC-X (200G)CRS-MSC-X-L (200G)	Cisco CRS Layer 3 modular service card (every MSC must have an associated PLIM)

Component	Product ID	Description
FP card	CRS-FP40CRS-FP140CRS-FP-X (200G)CRS-FP-X-L (200G)	Cisco CRS Layer 3 forwarding processor(every FP must have an associated PLIM)
LSP card	CRS-LSP	Cisco label switch processor(every LSP must have an associated PLIM)
MSC impedance carrier	CRS-MSC-IMPEDANCE(=)	Blank card carrier for each empty MSC slot (required for EMI compliance and cooling)

[8] Refer to the product data sheet for ordering details.

Table 11: PLIM Component Product IDs

Component	Product ID	Description
1xOC-768 PLIM	1OC768-POS-SR(=)	1-port OC-768c/STM-256c PLIM, with short-reach optics (POS)
4xOC-192 PLIM	4OC192-POS/DPT-LR(=)	4-port OC-192c/STM-64c PLIM, with long-reach optics (POS or DPT)
	4OC192-POS/DPT-IR(=)	4-port OC-192c/STM-64c PLIM, with intermediate-reach optics (POS or DPT)
	4OC192-POS/DPT-SR(=)	4-port OC-192c/STM-64c PLIM, withshort-reach optics (POS or DPT)
	4OC192-POS/DPT-VS(=)	4-port OC-192c/STM-64c PLIM, with very-short-reach optics (POS or DPT)
16xOC-48 PLIM	16OC48-POS/DPT(=) POM-OC48-LR2-LC-C(=)POM-OC48-SR-LC-C(=)	OC-48c/STM-16c PLIM, uses small form-factor pluggable (SFP) modules (POS or DPT) The PLIM uses 1 to 16 single-mode, long- and short-reach optic modules (mixing allowed): • Long-reach optics (POM-OC48-LR2-LC-C=) • Short-reach optics (POM-OC48-SR-LC-C=)

Component	Product ID	Description
8x10-GE XENPAK PLIM	8-10GBE(=) CRS-XENPAK10GB-LR(=)	10-GE PLIM, uses XENPAK optic modules. The PLIM uses 1 to 8 single-mode, long-reachoptic modules: Long-reach optics (CRS-XENPAK10GB-LR=)
8x10-GE and 4x10-GE XFP PLIMs	8-10GBE-WL-XFP(=) 4-10GBE-WL-XFP(=)	10-GE PLIM, uses XFP optic modules. These PLIMs use 1 to 8 (or 1 to 4) single-mode, XFP optic modules.
20x10-GE and 14x10-GE XFP PLIMs	20X10GBE-WL-XFP 14X10GBE-WL-XFP	10-GE PLIM, uses XFP optic modules. These PLIMs use 1 to 20 (or 1 to 14) single-mode, XFP optic modules.
1x100-GE CFP PLIM	1X100GBE(=)	100-GE PLIM, uses one CFP optic module.
PLIM impedance carrier	CRS-INT-IMPEDANCE(=)	Blank card carrier for each empty PLIM slot (required for EMI compliance and cooling)

Table 12: SIP and SPA Component Product IDs

Component	Product ID	Description
Cisco CRS SPA Interface Processor-800	CRS1-SIP-800	Occupies one PLIM slot on the Cisco CRS 8-Slot Line Card Chassis Enhanced router. Supports six normal-height SPAs or three double-height SPAs or any combination in between.
1-Port OC-192c/ STM- 64 POS/RPR XFP SPA	SPA-OC192POS-XFP	—
4-Port OC-3c/STM-1 POS SPA	SPA-4XOC3-POS	—
8-Port OC-12c/STM-4 Multirate POS SPA	SPA-8XOC12-POS	—
8-Port Gigabit Ethernet SPA	SPA-8X1GE	—