Cisco CRS Carrier Routing System Fabric Card Chassis Installation Guide

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Preface

This preface explains the objectives, intended audience, and organization of *Cisco CRS Carrier Routing System Fabric Card Chassis Installation Guide* and describes the conventions that convey instructions and other information.

Note Throughout the remainder of this installation guide, abbreviated terms are used to identify the formal names of the components that make up the multishelf system.

Objective

This installation guide describes how to install components into and remove them from an FCC. This installation guide does not provide background information and basic theory-of-operation for anyone wanting to understand the Cisco CRS Carrier Routing System.

Audience

This guide is intended for FCC installers and Cisco installation partners who are responsible for installing the FCC components. The chassis installers are expected to have installed networking hardware in the past. 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.
[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, refer to the following documents:

- Cisco CRS Carrier Routing System Fabric Card Chassis Unpacking, Moving, and Securing Guide
- Cisco CRS Carrier Routing System Multishelf System Description
- Cisco CRS Carrier Routing System Multishelf System Interconnection and Cabling Guide
- Cisco CRS Carrier Routing System Multishelf System Site Planning Guide
- Cisco CRS-1 Carrier Routing System to Cisco CRS-3 Carrier Routing System Migration Guide
- Cisco CRS 3-Phase AC Power Distribution Unit Installation Guide
- Cisco CRS Carrier Routing System Fiber-Optic Cleaning Guide
- Cisco CRS Carrier Routing System Regulatory Compliance and Safety Information

For a complete listing of software documentation available, refer to *About Cisco IOS XR Software Documentation* , available online at

http://cisco.com/en/US/products/ps5763/tsd_products_support_series_home.html

Changes to This Document

The table lists the technical changes made to this document since it was first printed.

Table 1: Changes to This Document

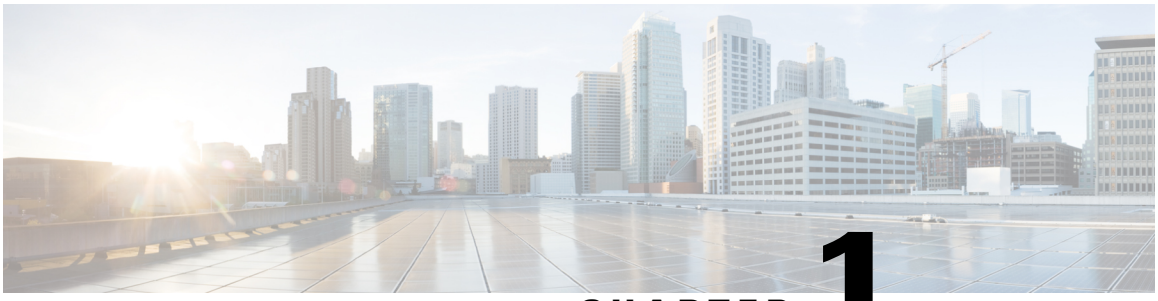
Date	Change Summary
July 2016	Added information about new CRS-FCC-SFC-400-B switch fabric cards.
July 2014	Added information about new CRS-FCC-SFC-400 switch fabric cards and new CRS-FCC-SC-GE22-B shelf controller card for the 400 G CRS-X system.
February 2012	Added a note to the procedure "Powering Up and Down a Chassis with Fixed Configuration DC Power" section.
December 2011	Technical corrections were included in Chapter2, “Installing and Removing Power Components”.
November 2011	Added procedures for installing and removing modular configuration power slot covers to Chapter2, “Installing and Removing Power Components”.
September 2011	Updated Appendix A, “Cisco CRS Carrier Routing System Fabric Card Chassis Specifications,” and Appendix B “Product IDs.”
July 2011	Updated information about fixed and modular configuration AC and DC power systems. Added new modular configuration AC cord clamp. Technical and editorial updates were made.
April 2011	This document was updated with technical corrections. Document updates to grounding and modular configuration power sections. Added information about new CRS-FCC-SFC-140 switch fabric cards for the 140 G system. Appendix B “Retrofitting Older CRS Chassis” was removed.
September 2010	Added new modular DC power systems, see Chapter2, “Installing and Removing Power Components” Updated Appendix A “Cisco CRS Carrier Routing System Fabric Card Chassis Specifications.”
May 2008	New procedures on installing and removing a pillow block were added to Chapter4, "Installing and Removing Fabric Cards and Card Components".

Date	Change Summary
September 2007	New information on the DC power shelf PEMs and the input-power-present LEDs was added to Chapter2, “Installing and Removing Power Components” Technical updates were made to Appendix B “Retrofitting Older CRS Chassis.” Information was added on installing the new front inlet grille screen and updates were added to the rear upper grille in Chapter5, “Installing and Removing Exterior Cosmetic Components”.
February 2007	Information on the 22-port shelf controller Gigabit Ethernet card was added.
September 2006	Technical corrections were included.
April 2006	Made technical updates to power components chapter.
December 2005	Chapter 2, “Unpacking and Securing the Fabric Card Chassis,” was updated as follows: • Information supporting new dolly design added • Information supporting new alternate mounting inrigger blocks added
July 2005	Initial Release of this document.

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, and Cisco currently supports RSS Version 2.0.



CHAPTER 1

Overview

This chapter provides a brief description of the Cisco CRS Fabric Card Chassis (FCC) from the highest level. This chapter contains illustrations of the front and rear of the chassis, complete with callouts to each hardware component. For details on each subsystem discussed in this chapter, see *Cisco CRS Series Carrier Routing System Multishelf System Description*.

Chassis Overview

Two major building blocks combine to form multishelf systems:

- LCC—As part of the multishelf system, the LCC is a chassis that has 16 slots for modular services cards (MSCs) or forwarding processor (FPs) cards; associated physical layer interface modules (PLIMs) and SPA Interface Processors (SIPs).
- The FCC is the centerpiece of the multishelf system. See the Fabric Card Chassis Components for more information.

Note The multishelf system consists of LCCs and FCCs. This installation guide describes the FCC installation procedures. See the Cisco CRS Carrier Routing System 16-Slot Line Card Chassis Installation Guide for specific LCC installation procedures.

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.

Note For safety, the FCC must be secured following the installation procedures for the site. Use of the unistrut is optional for overhead securing.

Fabric Card Chassis Components

This section lists the main components of the FCC. It primarily identifies the components that are considered field-replaceable units (FRUs).

The FCC contains:

- Switch fabric cards (SFCs). The SFCs are the main component of the multishelf system that enables packets to be switched from source to destination. The SFCs on the FCC provide Stage 2 of the three-stage Benes switch fabric for the multishelf system. The S13 SFCs in the LCC provide Stage 1 and Stage 3 of the switch fabric. Three types of SFCs are supported: CRS-FCC-SFC for the 40 G CRS-1 system, CRS-FCC-SFC-140 for the 140 G CRS-3 system, CRS-FCC-SFC-400/CRS-FCC-SFC-400-B for the CRS-X system. Either eight or twenty-four SFCs are needed, depending on vertical or horizontal cabling. SFCs are located at the front of the FCC.

Caution The FCC supports either 40 GB switch fabric cards (CRS-FCC-SFC), 140 GB switch fabric cards (CRS-FCC-SFC-140), or 400 GB switch fabric cards (CRS-FCC-SFC-400/CRS-FCC-SFC-400-B) for the 400 G CRS-X system. An FCC with a mix of 40 GB,140 GB and 400 GB SFCs is not a supported mode of operation. Such a mode is temporarily allowed only during the upgrade process.

- Optical Interface Modules (OIMs). The OIMs are passive devices that provide the fiber cross-connect function. The OIMs distribute the fibers within each cable bundle to the SFCs. Each OIM is matted to an SFC. The OIMs are monitored by the OIM-LED card. Each OIM has 9 interfaces and either 8 or 24 OIMs are needed, depending on vertical or horizontal cabling. The OIMs and cables are located at the rear of the FCC.
- Integrated Shelf Controller Gigabit Ethernet (SCGE) cards. The 22-port SCGE card (CRS-FCC-SC-22GE or CRS-FCC-SC-22GE-B) serves as a shelf controller for the FCC, providing the control function similar to the RP for LCC. The 22-port integrated GE switch provides the connectivity for control protocol between the FCC and LCC. Two 22-port SCGE card is included in each FCC for redundancy. Only one shelf controller card is active at a time. The second acts as a “standby” shelf controller, serving as a backup if the active card fails. SCGE cards located at the front of the chassis.

- Two types of power systems are available: fixed configuration power and modular configuration power. Both power configurations use either AC or DC power. Both configurations of the AC and DC power systems are fully redundant.
- Upper and lower fan trays. The fan trays contain fans that push and pull air through the chassis. A removable air filter is also located above the lower fan tray.

Figure 1: Front (SFC) and Rear (OIM) View of FCC—Fixed Configuration AC Power, on page 3 shows the front (SFC) side and rear (OIM) side view of an FCC with a fixed configuration AC power system installed.

Figure 1: Front (SFC) and Rear (OIM) View of FCC—Fixed Configuration AC Power

1	Power shelves	4	Lower card cage
2	Upper fan tray	5	Chassis air filter (accessible from front)
3	Upper card cage	6	Lower fan tray (accessible form front)

Figure 2: Front (SFC) View of Fixed Configuration Power Shelves Installed in FCC, on page 3 shows the front (SFC) side view of a fixed configuration AC and DC power system installed at the top of the FCC

Figure 2: Front (SFC) View of Fixed Configuration Power Shelves Installed in FCC

Figure 3: Rear (OIM) View of Fixed Configuration Power Shelves Installed in FCC, on page 3 shows the rear (OIM) side view of a fixed configuration AC and DC power system installed at the top of the FCC.

Figure 3: Rear (OIM) View of Fixed Configuration Power Shelves Installed in FCC

Figure 4: Front (SFC) View of Modular Configuration Power Shelves Installed in FCC, on page 3 shows the front (SFC) side view of a modular configuration AC and DC power system installed at the top of the FCC.

Figure 4: Front (SFC) View of Modular Configuration Power Shelves Installed in FCC

Figure 5: Rear (OIM) View of Modular Configuration Power Shelves Installed in FCC, on page 4 shows the rear (OIM) side view of an AC and DC modular configuration power system installed at the top of the FCC.

Figure 5: Rear (OIM) View of Modular Configuration Power Shelves Installed in FCC

Chassis Slot Numbers

This section identifies the locations and slot numbers for major cards that plug into the chassis.

Figure 6: FCC Front (SFC) Side Slot Numbers , on page 4 shows the chassis slot numbers on the front (SFC) side of the FCC.

Figure 6: FCC Front (SFC) Side Slot Numbers

1	Upper card cage
2	Lower card cage

As shown in Figure 6: FCC Front (SFC) Side Slot Numbers , on page 4, the components on the front (SFC) side of the FCC include:

- Upper card cage with 12 switch fabric slots (left to right: 0, 1, 2, 3 . . . 10, 11) followed by one 22-port SCGE card slot (SCGE0) on the far right.
- Lower card cage with 12 switch fabric slots (left to right: 12, 13, 14 . . . 21, 22, 23) followed by one 22-port SCGE card slot (SCGE1) on the far right.

Figure 7: FCC Rear (OIM) Side Slot Numbers and Module Locations, on page 4 shows the chassis slot numbers on the rear (OIM) side of the FCC.

Figure 7: FCC Rear (OIM) Side Slot Numbers and Module Locations

1	Upper card cage
2	Lower card cage

As shown in Figure 7: FCC Rear (OIM) Side Slot Numbers and Module Locations, on page 4, slot numbers on the OIM side of the chassis include:

- OIM side of upper card cage, with one OIM LED panel (LM0) on the far left, followed by 12 OIM slots (left to right: 11, 10, 9 . . . 2, 1, 0).
- OIM side of lower card cage, with one OIM LED panel (LM1) on the far left, followed by 12 OIM slots (left to right: 23, 22, 21 . . . 14, 13, 12).

The OIM slot numbers are reversed from the SFC slot numbers on the other side of the chassis. The SFC slot numbers match their corresponding OIM slot numbers on the rear side of the chassis. OIM slot 0 is on the far right side of the of the chassis looking at it from the rear (OIM) side; SFC slot 0 is on the far left side of chassis looking at it from the front (SFC) side.

Chassis Footprint

For each installation site, Cisco provides one aluminum drill template of an FCC footprint, showing the location of the hole pattern needed to be drilled into the floor.

Cisco can also provide a mylar template of the FCC footprint, including its door swings and the clearance needed to remove and replace components, that can be used for planning the aisle space required for the installation and maintenance of an FCC.

Figure 8: Top View of FCC, on page 5 is a top view of the FCC footprint (with optional front and rear cosmetics installed).

Figure 8: Top View of FCC

1	23.6 in. (60 cm), width of chassis
2	41 in. (104 cm), depth of chassis (with doors attached and closed)

Chassis Cable Management

The FCC has cable management features for both the front (SFC) side of the chassis and the rear (OIM) side of the chassis. Both the front (SFC) and rear (OIM) sides have vertical cable troughs on the left and right sides of the chassis. In addition, the rear (OIM) side of the chassis has three horizontal cable management brackets close to the card cages.

For further details, see Chapter 5, “Installing and Removing Exterior Cosmetic Components.”

Chassis Exterior Cosmetic Components

The FCC also includes front and rear locking doors, bezels, and side panels. The exterior cosmetic components are shipped in a separate package and must be installed on the FCC during system installation.

Chassis Cooling System

The FCC cooling system includes the components and controls that draw ambient air through the system to dissipate heat and keep the system operating in a desired temperature range. The complete FCC cooling system includes:

- Two fan trays
- Temperature sensors distributed on cards and modules in the chassis
- Operating software that controls the cooling system
- Air filter
- Inlet and outlet air vents and bezels
- Impedance carriers for empty chassis slots
- Power module cooling fans

The airflow through the FCC is controlled by a push-pull configuration. As shown in Figure 9: Airflow Through FCC, on page 6, ambient air flows in at the bottom front (SFC) side and up through the card cages until it exhausts at the top rear (OIM) side of the FCC. The bottom fan tray pulls ambient air in from the bottom front of the chassis; the top fan tray pushes warm air out the back of the chassis. The power modules in the power shelves have their own self-contained cooling fans.

A replaceable air filter is positioned above the lower fan tray. How often the air filter 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 filter to see if it needs replacement.

Before removing the air filter for replacement, you should have a spare filter on hand; then, when you remove the dirty filter, install the spare filter in the chassis.

Figure 9: Airflow Through FCC

1	Front (SFC) side of chassis	6	Power shelves (two)
2	Air intake	7	Air exhaust
3	Lower fan tray	8	Upper card cage
4	Air filter	9	Lower card cage
5	Upper fan tray	10	Rear (OIM) side of chassis

Chassis Power System

Two types of power systems are available for the FCC: fixed configuration power and modular configuration power. Both power systems can be powered by either AC or DC power.

The chassis power system takes the facility power and converts it to the DC voltage necessary to power chassis components.

See Chapter 2, "Installing and Removing Power Components," for detailed information.

Safety Guidelines

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

Note Although power shelves can 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 for the Cisco CRS Carrier Routing System* before installing, configuring, or troubleshooting any installed card.

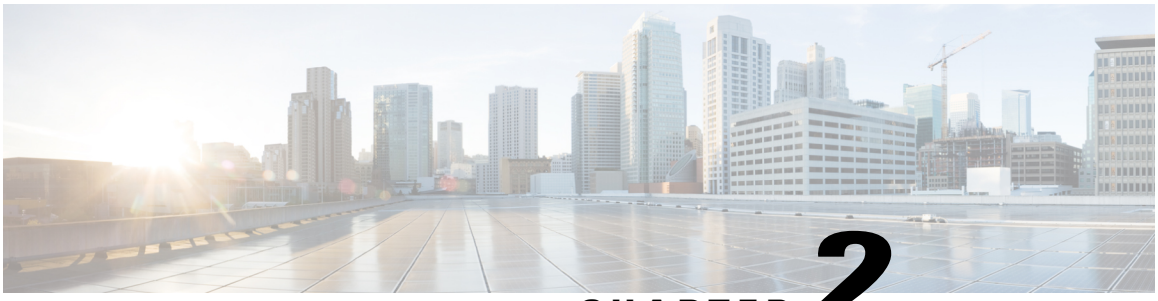
- Never attempt to lift an object that might be too heavy for you to lift by yourself.
- Keep the work area clear and dust free during and after installation. Do not allow dirt or debris to enter into any laser-based components.
- Keep tools and router components away from walk areas.
- Do not wear loose clothing, jewelry, and other items that could get caught in the router while working with OIMs, SFCs, and 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 complies with 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 complies with the safety extra-low voltage (SELV) requirements in UL/CSA/IEC/EN 60950-1 and AS/NZS 60590 to the FCC DC-input power system.
- Make sure that you have a readily accessible two-poled disconnect device incorporated in the fixed wiring of an FCC configured with the DC-input power system.
- Make sure that you provide short-circuit (overcurrent) protection as part of the building installation for the FCC.

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 use of 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 its 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 from only ESD voltage on the body; ESD voltage on clothing can still cause damage.



CHAPTER 2

Installing and Removing Power Components

This chapter provides instructions on how to install and remove the Cisco CRS Carrier Routing System Fabric Card Chassis (FCC) power components.

Power Systems Overview

There are two options for power systems: the fixed configuration power system and the modular configuration power system. Power components are not interchangeable between the fixed and modular configuration power system.

Fixed configuration power system consists of two power shelves, DC power entry modules (PEMs) or AC rectifiers, and alarm modules. It is available in versions for DC and AC power supplies. The AC version requires either 3-phase AC-Delta or 3-phase AC-Wye input power to the power shelves. In redundant configuration, the fixed configuration power system provides power sharing per load zone. The fixed configuration power system includes SNMP MIBS and XML support.

Modular configuration power system consists of two power shelves, AC or DC power modules (PMs), and alarm modules. It is available in versions for DC and AC power supplies. However, unlike the fixed configuration power system, the AC version of the modular configuration power system requires single-phase AC input power to the power shelves; there is no 3-phase AC-Wye or AC-Delta. 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. At the shelf level, the power system provides 2N redundancy; the PMs themselves provide load-share redundancy. The modular configuration power system also includes SNMP MIBS and XML support.

Note In a modular configuration 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 modular configuration AC power shelf. For further information, refer to *Cisco CRS 3-Phase AC Power Distribution Unit Installation Guide* .

This chapter contains the following topics:

Power Component Information Common to the Two Types of Power Systems

This section introduces general information shared by the fixed configuration power components and the modular configuration power components in the following topics:

Basic Chassis Power Details

The FCC can be configured with either an AC-input power subsystem or a DC-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 and periodically after 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 FCC 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 power shelf and a DC power shelf. A fixed configuration AC power shelf houses the AC rectifiers, while a fixed configuration DC power shelf houses the DC PEMs. A modular configuration AC power shelf houses the AC PMs, while a modular configuration DC power shelf houses the DC PMs. It is required that you use only one type of power shelf in a chassis at a time.

Note In a modular configuration power system, both AC and DC power supplies are referred to as power modules (PMs)

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

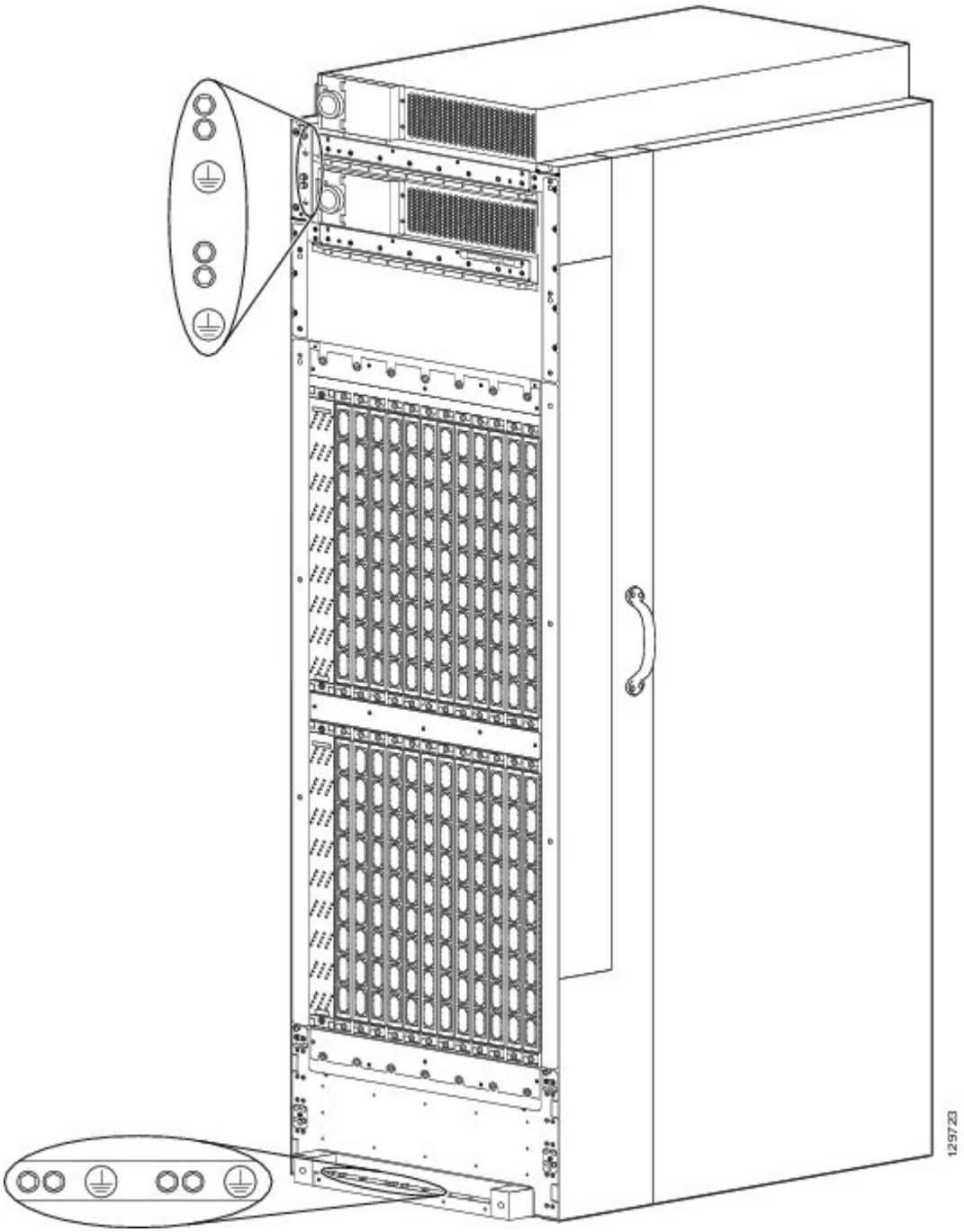
Bonding and Grounding Guidelines

The router chassis has a safety earth ground connection in conjunction with power cabling to the fixed configuration power shelves. The chassis allows you to connect the central office ground system or interior equipment grounding system to the bonding and grounding receptacles on the router chassis, when either a

fixed or modular configuration power system is installed. Two sets of two threaded ground inserts are located on top of the chassis rear (OIM) side panel on the back of the chassis to the left of the lower power shelf, and two sets of threaded ground inserts are located at the bottom rear of the chassis (see the figure titled *NEBS Bonding and Grounding Points*). These grounding points are also referred to as the network equipment building system (NEBS) bonding and grounding points. The location of the grounding points on the FCC is the same for both fixed and modular configuration power systems.

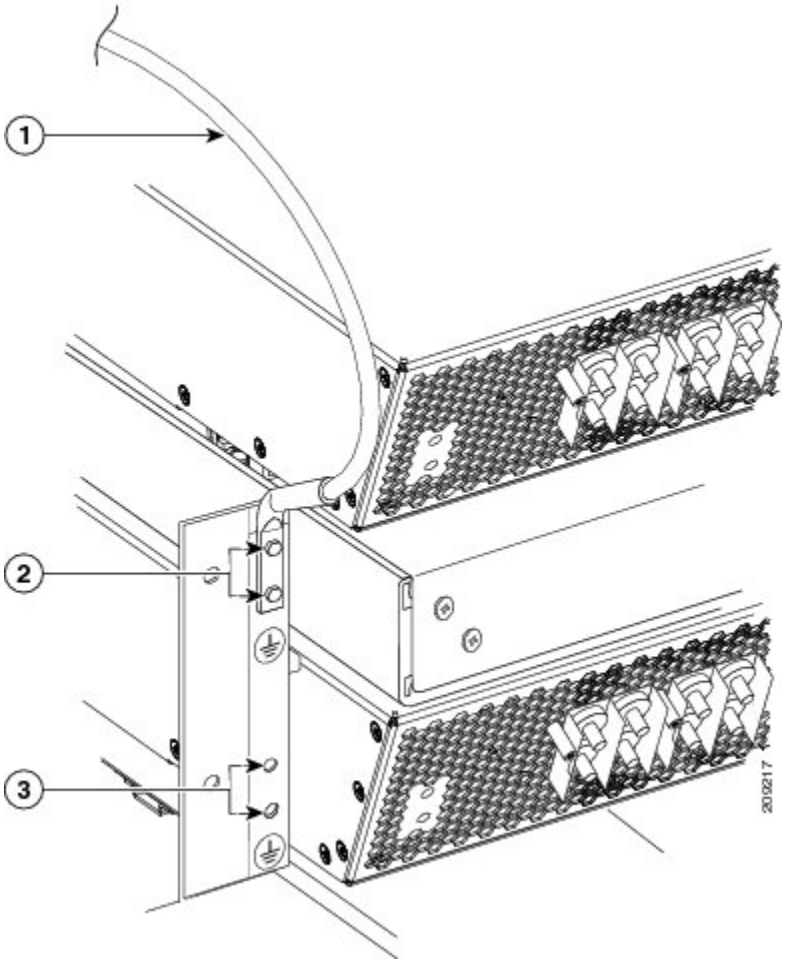
Note These bonding and grounding receptacles satisfy the Telcordia NEBS requirements for supplemental bonding and grounding connections.

Figure 10: NEBS Bonding and Grounding Points



The top grounding points are obscured by a cover plate. When the cover plate is removed, you can easily see the labels indicating the location of the grounding points. Two grounding points are provided at the top of the chassis; although you may use both if you wish, only one is needed for NEBS grounding purposes. This figure shows the NEBS bonding and grounding points on the rear of the chassis, located next to the modular configuration DC power shelves.

Figure 11: NEBS Bonding and Grounding Points at Top of Chassis— With Modular Configuration DC Power Shelves Installed



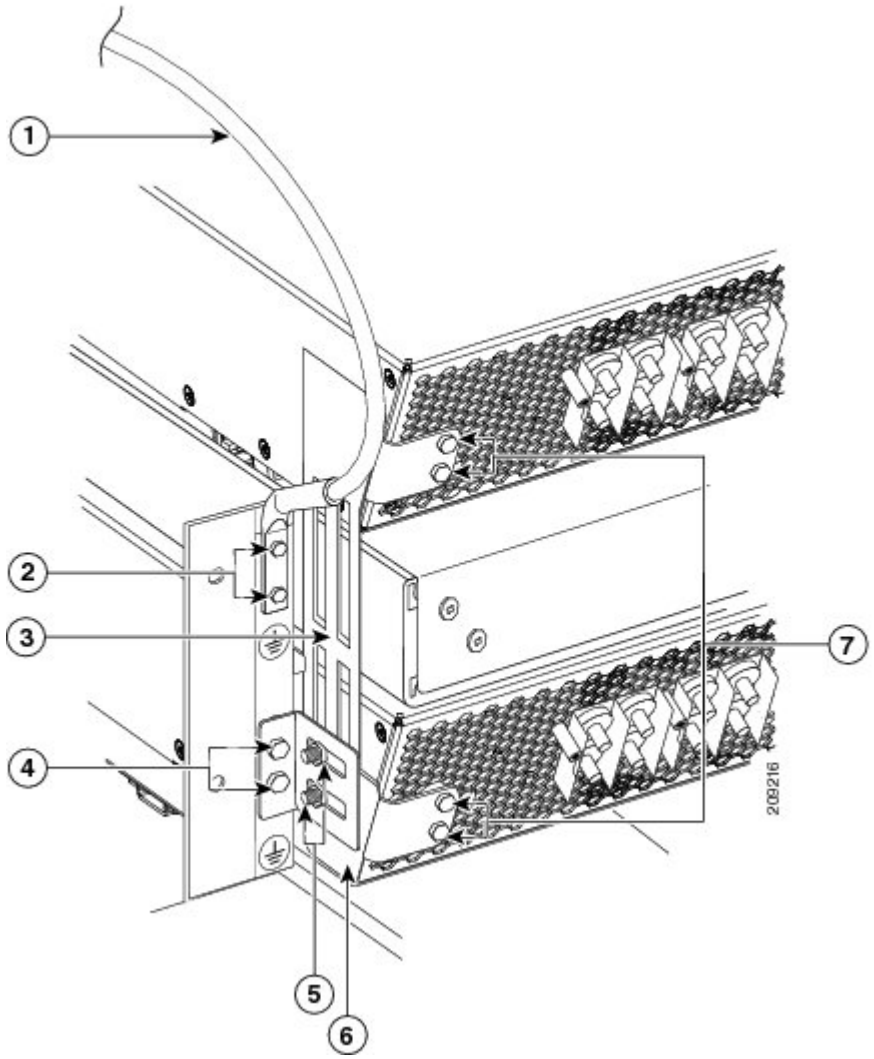
1	Chassis ground cable
2	Top NEBS bonding and grounding points
3	Bottom NEBS bonding and grounding points (fixed configuration power only)

Note A 45-degree grounding lug is shown in the figure titled *NEBS Bonding and Grounding Points at Top of Chassis— With Modular Configuration DC Power Shelves Installed*. A 180-degree (straight) grounding lug can also be used.

Note Two NEBS bonding and grounding points are provided. Only the top grounding point can be used if modular configuration power shelves are installed.

Modular configuration power shelf grounding is accomplished by installing an external ground bracket between the power shelves and attached to the chassis. The bolts that connect the external grounding brackets to the chassis and the power shelf have a torque value of 30 in-lb (3.39 N-m). See the Installing Power Shelf Grounding Brackets, on page 73 for more information.

Figure 12: Power Shelf Grounding Brackets—Modular Configuration Power Shelves Shown



1	Chassis ground cable	5	Two M6 hex nuts attaching grounding L-bracket to shelf grounding bracket
2	Two M6 hex bolts attaching ground lug to chassis	6	Grounding L-bracket
3	Shelf grounding bracket	7	Four M6 hex bolts attaching shelf grounding bracket to power shelves
4	Two M6 hex bolts attaching grounding L-bracket to chassis		

Installing the Chassis Ground cable

This section describes how to install the ground cable on the FCC.

Prerequisites

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

- One grounding lug that has two M6 bolt holes with 0.63 inches (5/8 inch) (1.60 cm) of spacing center to center between them and a 6-AWG or larger multistrand copper cable.

- The grounding lug used can be either a 180-degree (straight) lug, or a 45-degree angle lug, as shown in the figures below. We recommend that you use a 45-degree angle ground lug for the upper grounding point.

Figure 13: 180-Degree (Straight) Chassis Ground Lug

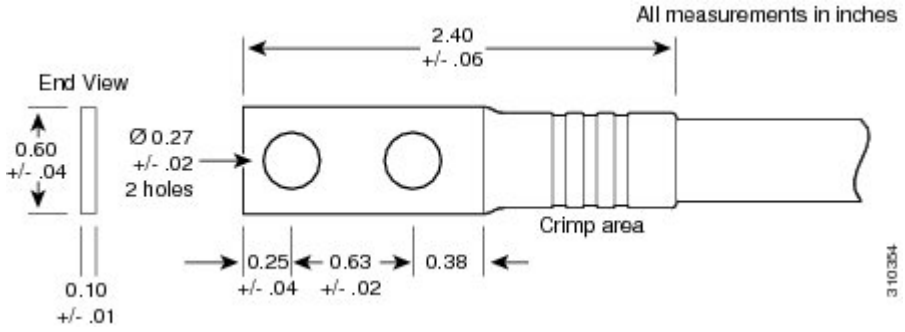
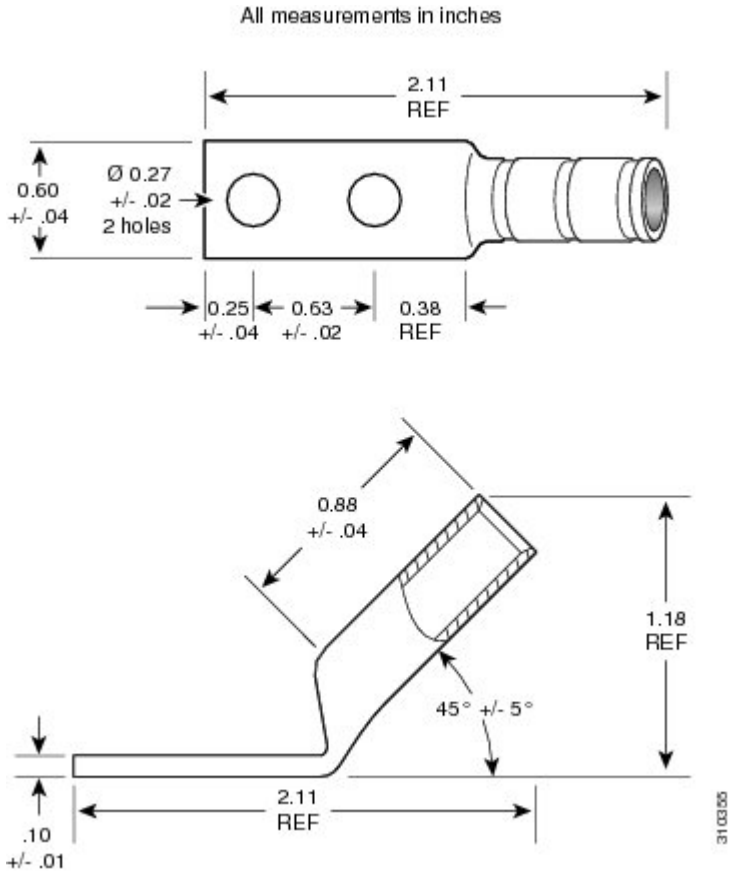


Figure 14: 45-Degree Angle Chassis Ground Lug



- Two M6 hex head bolts and integrated locking washers are pre-installed on the chassis.

- Although we recommend at least 6-AWG multistrand copper ground cable, the actual ground cable diameter and length depends on your router location and site environment. This cable is not available from Cisco Systems; it is available from any commercial cable vendor. The ground cable should be sized according to local and national installation requirements.

Note The DC return of this system should remain isolated from the system frame and chassis (DC-I: Isolated DC Return).

Required Tools and Equipment

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

- Ground lug
- Ground cable
- Crimping tool and lug specific die
- 10-mm 6 pt. combination wrench
- 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:

SUMMARY STEPS

1. Use the crimping tool mandated by the lug manufacturer to crimp the lug to the ground cable.
2. Using the 10-mm wrench, attach the ground cable to the grounding point on top of the chassis rear (OIM) side panel, as shown in Figure 11: NEBS Bonding and Grounding Points at Top of Chassis— With Modular Configuration DC Power Shelves Installed, on page 13 and Figure 12: Power Shelf Grounding Brackets—Modular Configuration Power Shelves Shown, on page 14. Use the torque wrench to tighten to a torque of 30 in.-lb (3.39 N-m).

DETAILED STEPS

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 wrench, attach the ground cable to the grounding point on top of the chassis rear (OIM) side panel, as shown in Figure 11: NEBS Bonding and Grounding Points at Top of Chassis— With Modular Configuration DC Power Shelves Installed, on page 13 and Figure 12: Power Shelf Grounding Brackets—Modular Configuration Power Shelves Shown, on page 14. Use the torque wrench to tighten to a torque of 30 in.-lb (3.39 N-m).

DC Power Systems

Each DC-powered chassis contains two DC power shelves for 2N redundancy. The shelves contain the input power connectors.

- In the fixed configuration power system, each power shelf contains two DC PEMs. The PEMs are field replaceable. Each DC PEM has its own circuit breaker.
- In the modular configuration power system, each power shelf can accept up to six DC PMs. The power shelves and DC PMs are field replaceable.

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

Fixed Configuration DC Power

The FCC fixed configuration DC power system provides 8,800 watts to power the chassis.

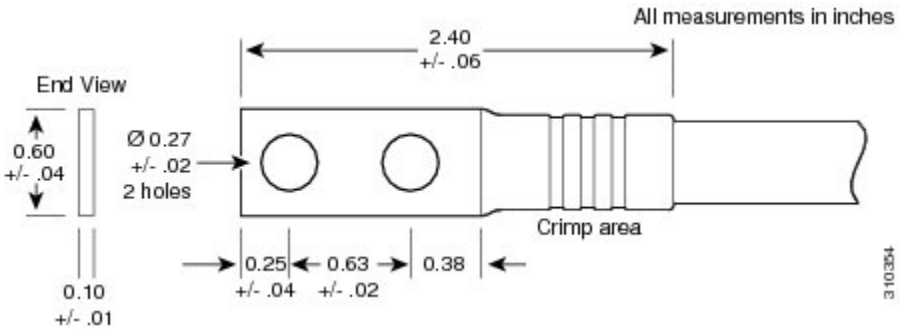
Due to its power load zones, the FCC using fixed configuration power requires a total of eight dedicated 60 A DC input power connections, two for each DC PEM, to provide DC power to all six power zones. We recommend that you have two separate, redundant –48 VDC power battery sources to provide power to the FCC. Connect the four “A” 60 Amp DC inputs to the upper power shelf to one battery, and the four “B” 60 Amp inputs to the lower power shelf to the other battery.

At sites where the FCC is equipped with a DC-input power shelf and DC PEMs, observe the following guidelines:

- All power connection wiring should follow the rules and regulations in the National Electrical Code (NEC) and any local codes.
- Each DC-input PEM connection is rated at 60 A maximum. A dedicated, commensurately rated DC power source is required for each PEM connection.
- For DC power cables, we recommend that you use commensurately rated, high-strand-count copper cable. Each DC PEM requires two DC inputs of nominal –48/–60 VDC, 60 A service. Each DC input consists of one pair of cable leads, source DC (–) and source DC return (+). Each power shelf requires one grounding cable. The length of the cables depends on your router location. These cables are not available from Cisco Systems; they are available from any commercial vendor.
- DC power cables must be terminated by cable lugs at the power shelf end. The lugs should be dual-hole and able to fit over M6 terminal studs at 0.63 in (5/8 inch) (1.60 cm) centers. For example, Panduit part number LCD2-14A-Q; see this figure.

- Maximum wire size at the DC input terminal block is 2 AWG.

Figure 15: DC Power Cable Lug



The following figure shows a typical DC power distribution scheme. The ground cable is to the far left on the shelf. The DC terminal block power connector studs have a 20 in.-lb (2.26 N-m) torque value; the power shelf ground cable connector studs have a 30 in.-lb (3.39 N-m) torque value.

The color coding of the source DC power cable leads depends on the color coding of the site DC power source. Typically, green or green and yellow indicates that the cable is a ground cable. Follow your local practices for cable color code and markings. You must ensure that the power cables are connected to the DC-input power shelf terminal studs in the proper positive (+) and negative (–) polarity.

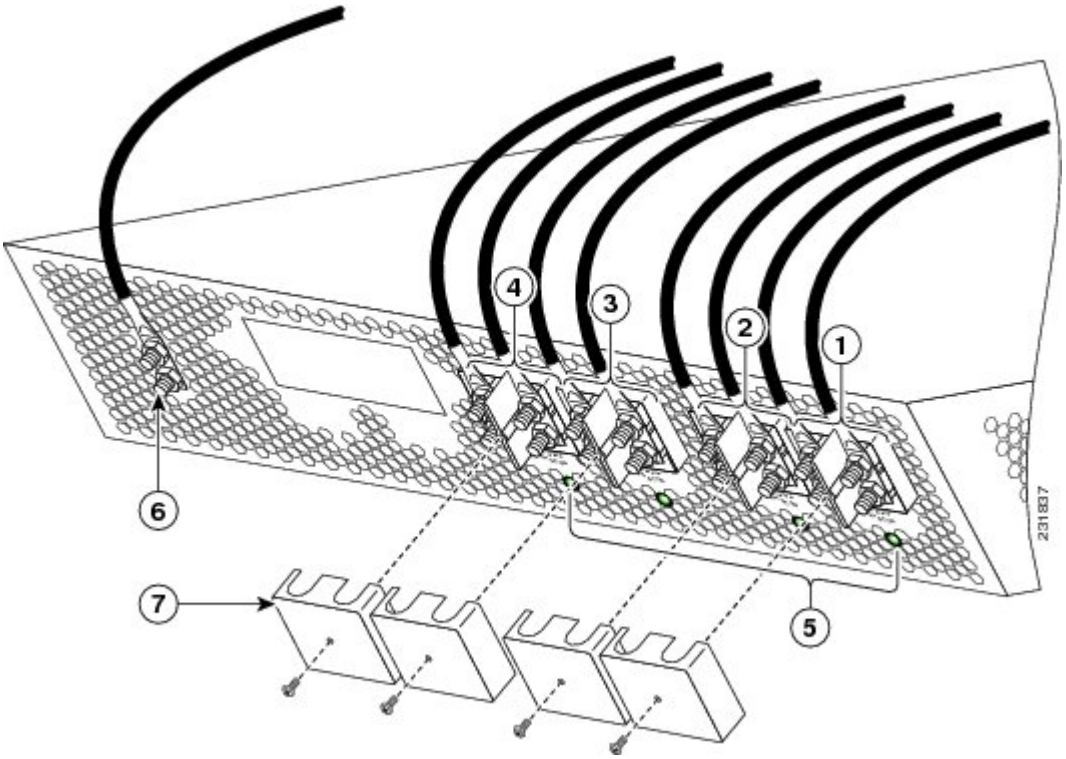
Sometimes, the source DC cable leads might have a positive (+) or a negative (–) label, but you must verify the polarity by measuring the voltage between the DC cable leads. When making the measurement, the positive (+) lead and the negative (–) lead must always match the (+) and (–) labels on the power shelf.

⚠

Caution The DC-input PEM contains circuitry to trip the breaker on the PEM if it detects a reverse-polarity condition. When installing DC power cables, make sure that the polarity of the DC input wiring is correct.

This figure shows the cable wiring on the rear of the fixed configuration DC power shelf.

Figure 16: Fixed Configuration DC Power Shelf Cable Wiring



1	PEM O, input 1	5	Input-power-present LEDs
2	PEM 0, input 2	6	Ground lugs and nuts
3	PEM 1, input 3	7	Terminal block cover
4	PEM 1, input 4		

This table lists the DC input current and voltage specifications.

Table 2: DC Input Current and Voltage Information

Nominal input voltage	–48 VDC North America–60 VDC European Community(range: –42 VDC to –75 VDC)
Input line current	50 A maximum at –48 VDC40 A maximum at –60 VDC
Inrush current	168 A peak at –75 VDC(maximum for 1 ms)

Each wiring block on the power shelf contains two sets of terminals, one positive and one negative, and is covered by a plastic terminal block cover that snaps onto the power shelf and is secured by a screw to a torque value of 4 to 5 in.-lb (.46 to .58 N-m). You must remove the terminal block cover or rotate it out of the way before you work with the cables.

For additional power details, see Appendix 1, "Cisco CRS-1 Carrier Routing System Fabric Card Chassis Specifications" or *Cisco CRS Carrier Routing System Multishelf System Description* .

Modular Configuration DC Power

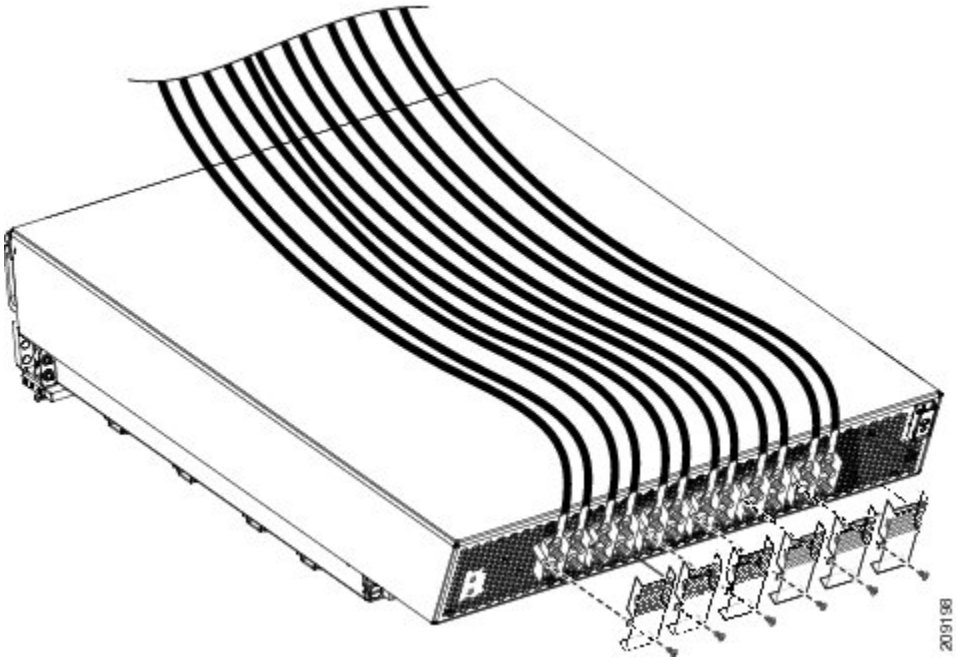
The FCC modular configuration DC power system can provide up to 12,600 watts to power the chassis. However, by default, the power capability of a system when shipped, with four DC PMs per shelf, is 8,400 watts.

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

Each modular configuration DC power shelf supports up to six DC PMs. The power shelves and DC PMs are field replaceable.

This figure shows the cables and terminal block covers for the modular configuration power shelf.

Figure 17: DC Power Shelf Cable Wiring for Modular Configuration Power Shelf



Each power shelf operates with up to six DC inputs of –48/–60 VDC (nominal), 60 A. The power shelf accepts input DC power in the range –40 to –72 VDC.

This table lists the modular configuration DC input current and voltage specifications.

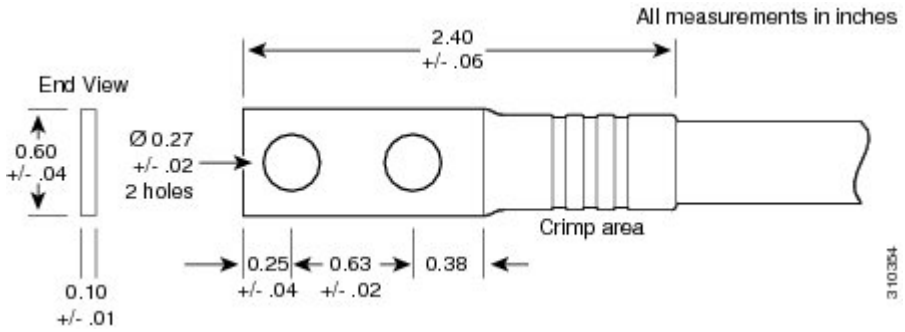
Table 3: DC Input Current and Voltage Information

Nominal input voltage	–48 VDC North America–60 VDC European Community(range: –40 VDC to –72 VDC)
Input line current	50 A maximum at –48 VDC40 A maximum at –60 VDC60 A maximum at –40 VDC

Each wiring block on the modular configuration DC power shelf contains two sets of terminals, one positive and one negative, and is covered by a plastic terminal block cover that is secured by a screw to a torque value of 5 to 7 in-lb (0.56 to 0.79 N-m). Each DC power cable is connected to the power shelf with a torque value of 20 in-lb (2.26 N-m). Maximum wire size at the DC input terminal block is 2 AWG.

The power supply 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 angle (straight) industry standard 2-hole, standard barrel compression lug, as shown in this figure.

Figure 18: DC Power Cable Lug



The power shelf grounding is accomplished by installing an external ground bracket between the power shelves and attached to the chassis. The bolts that connect the external grounding brackets to the chassis and the power shelf have a torque value of 30 in-lb (3.39 N-m).

For additional power details, see Appendix 1, "Cisco CRS-1 Carrier Routing System Fabric Card Chassis Specifications" or *Cisco CRS Carrier Routing System Multishelf System Description* .

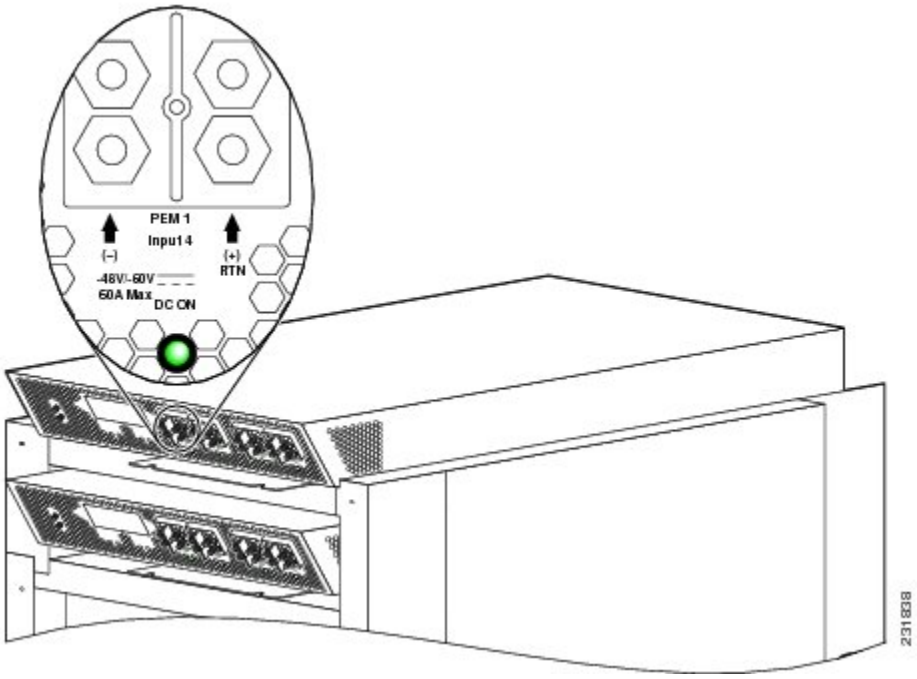
Input-Power-Present-LEDs

In both power configurations, the DC input-power-present LEDs provide a visual indication to service personnel that the is voltage present across the input terminal connection. The figure titled *Input-Power-Present LEDs-Fixed Configuration DC Power Shown* shows the DC input-power-present LEDs on the rear of the fixed configuration DC power shelf. The modular configuration DC power shelf has similar visual indicators. The LED provides a warning to service personnel that there is power present.

Note Power should be disconnected before servicing the input power connections.

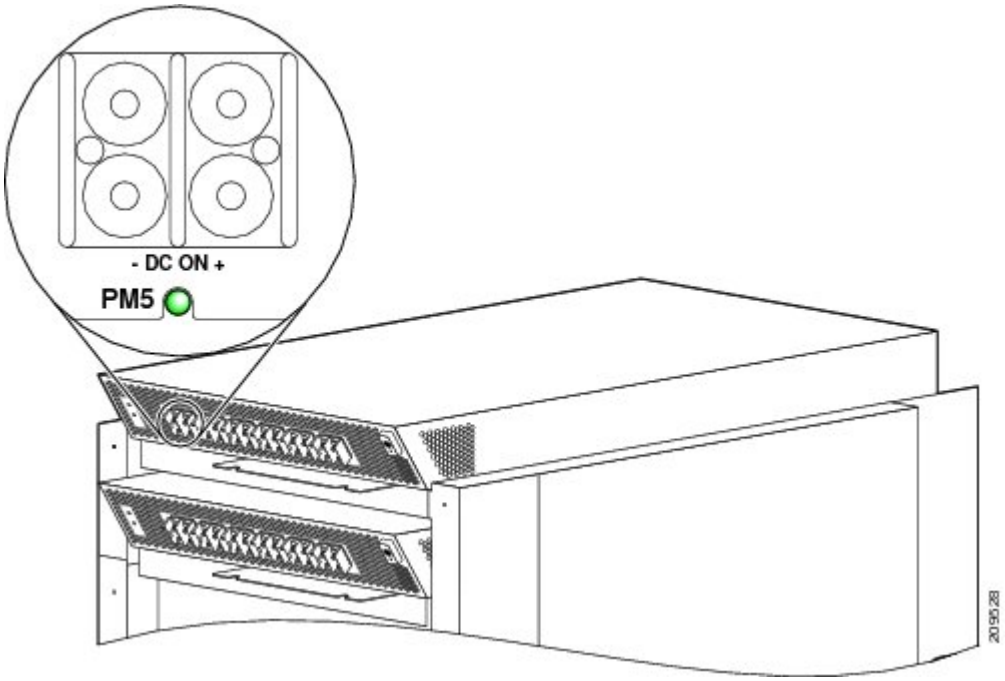
This figure shows the input-power-present LEDs on the rear of the fixed configuration DC power shelf.

Figure 19: Input-Power-Present LEDs—Fixed Configuration DC Power Shown



This figure shows the input-power -present LEDs on the rear of the fixed configuration DC power shelf.

Figure 20: Input-Power-Present LEDs—Modular Configuration DC Power Shown



The input-power-present LED starts to light up when the voltage reaches –20 VDC and the LED gets brighter as voltage increases; the input-power-present LED is fully lit when input voltage reaches –38 VDC.

Caution If the input voltage polarity is reversed, or if the LED circuit fails, the LED will not light. When this is the case, service personnel should check for hazardous voltages before working on the unit.

DC Power Cable Characteristics

In both configurations, a conductor must be large enough to meet the voltage loss requirement of your facility. Also, the protective earth conductor must be large enough to carry all the current if the –48 VDC return fails. This latter requirement is for safety.

For site preparation, proper cable size and insulation shall be selected. For a planned power distribution, calculation shall be done prior to meet the proper voltage drop and temperature rise.

AC Power Systems

Each AC powered chassis contains two AC power shelves for 2N redundancy. The shelves contain the input power connectors.

- In the fixed configuration power system, each power shelf contains three AC power rectifiers. The power shelves and AC power rectifiers are field replaceable. Each shelf and AC power rectifier has its own circuit breaker.
- In the modular configuration power system, each shelf can contain up to six AC PMs. The power shelves and the AC PMs are field replaceable.

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

Fixed Configuration AC Power

The FCC fixed configuration AC power system provides 13,200 watts to power the chassis.Two versions of the 3-phase AC power shelf are available to provide either an AC Delta or an AC Wye input configuration. Each of the AC power shelf versions has a different Cisco part number to distinguish the Wye from the Delta configuration. The AC connections to the FCC are made to terminal blocks on the AC power shelves that have been hard wired for Wye or Delta configuration. All chassis should have two power shelves of the same type, that is, two Delta or two Wye AC power shelves.

In the fixed configuration power system, each power shelf supports three AC-to-DC rectifiers that are field replaceable. The AC-to-DC rectifiers convert 200-to-240 VAC power to –54 VDC used by the FCC chassis.

The AC Wye power shelf has a Wye 3-phase, 5-wire connection: 200 to 240 (L-N)/346 to 415 (L-L) VAC, 3W+N+PE, 50 to 60 Hz, 25 A. For redundant operation, two 3-phase Wye branch circuits are required: 32 A (International), with one power connection to each power shelf.

The AC Delta power shelf has a Delta 3-phase, 4-wire connection: 200 to 240 VAC, 3-phase, 3W+PE, 50 to 60 Hz, 42 A. For redundant operation, two 3-phase Delta 60-A branch circuits are required, with one power connection to each power shelf.

Note The power cables for the fixed configuration AC power shelves do not arrive preattached and need to be installed.

For additional power details, see Appendix 1, “Cisco CRS-1 Carrier Routing System Fabric Card Chassis Specifications” or *Cisco CRS Carrier Routing System Multishelf System Description* .

Modular Configuration AC Power Systems

The FCC modular configuration AC power system can provide up to 18,000 watts to power the chassis. However, by default, the maximum power capability of a system when shipped with three AC PMs is 9,000 watts.

Each modular configuration power shelf supports up to six PMs. The power shelves and PMs are field replaceable.

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

Unlike the fixed configuration AC power system, which requires 3-phase AC Delta and AC Wye input power, the modular configuration AC power system requires single-phase AC input power. If you have 3-phase AC Delta or AC Wye at your site, a *Cisco CRS Power Distribution Unit* will be required to convert 3-phase input power to single phase input power for the power shelf. For further information, refer to *Cisco CRS Power Distribution Unit Quick Start Guide.*

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

- Single-phase, 200 to 240 VAC nominal, 50 to 60 Hz, 16 A.Each power shelf contains six IEC-320-C22 receptacles which can accept up to six IEC-320-C21 connector female cords.

Note If you have a *Cisco CRS 3-Phase AC PDU* installed, either three or six AC PMs are required to be installed in each modular configuration AC power shelf to maintain a balanced 3-phase power load. If only three AC PMs are required in each power shelf, they must be installed in either slots 0, 1, 2 or slots 3,4,5.

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

For additional power details, see Appendix 1, “Cisco CRS-1 Carrier Routing System Fabric Card Chassis Specifications” or *Cisco CRS Carrier Routing System 16-Slot Line Card Chassis System Description* .

How to Install and Remove Fixed Configuration Power Shelf Components

This section contains the following procedures:

Installing a Fixed Configuration Power Shelf

This section describes how to install a fixed configuration AC or DC power shelf in the FCC. For information on the difference between the power types, see the DC Power Systems, on page 18 and the AC Power Systems, on page 24. For complete information on regulatory compliance and safety, see Cisco CRS Carrier Routing System Regulatory Compliance and Safety Information.

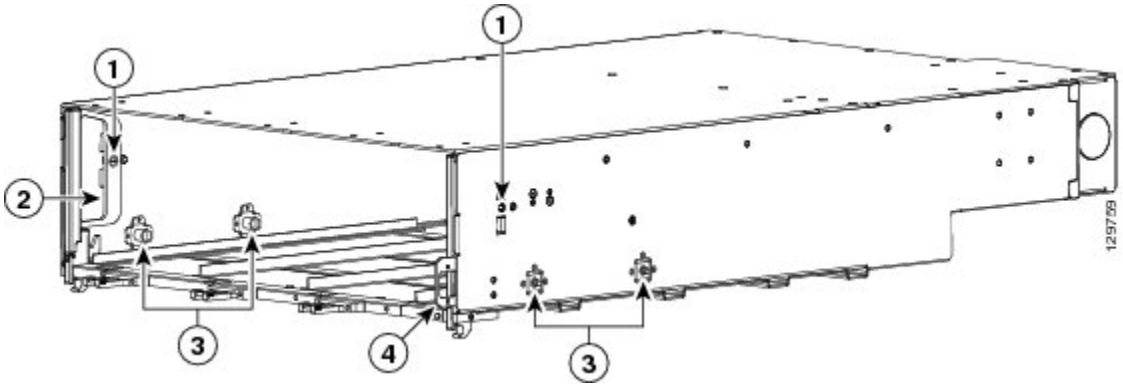
The power shelf encloses:

- The power modules: three AC rectifiers for an AC power shelf or two DC PEMs for a DC power shelf
- An alarm module
- Power distribution connections and wiring

The power shelf is installed in the FCC from the front (SFC) side of the chassis. Although differences exist among the different power shelf types (AC Wye, AC Delta, and DC), they are installed in the same manner.

This figure shows a fixed configuration AC power shelf. The fixed configuration DC power shelf is similar.

Figure 21: Fixed Configuration AC Power Shelf



1	Lever handle captive screws	3	Power shelf captive screws
2	Lever handle (left lever handle shown)	4	Power shelf I/O switch

Prerequisites

Before performing this task, you must first remove the upper grille on the front (SFC) side of the chassis, if installed.

Note Do not install the power shelf in the chassis with AC rectifiers, DC PEMs, or alarm module installed in the power shelf.

Required Tools and Equipment

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

- ESD-preventive wrist strap
- 1/4-in. x 6-in. long slotted screwdriver
- Fixed configuration AC or DC Power shelf
  - AC Wye power shelf Cisco product number: CRS-FCC-PS-ACW=
  - AC Delta power shelf Cisco product number: CRS-FCC-PS-ACD=
  - DC power shelf Cisco product number: CRS-FCC-PS-DC=

Steps

To install a fixed configuration AC or DC power shelf, use Figure 21: Fixed Configuration AC Power Shelf , on page 27 as a reference and perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Make sure that the power I/0 switch on the shelf, located on the front [SFC] side of the chassis, is in the OFF position.
3. The lever handles are fastened down for shipment. Use the screwdriver to turn the two captive screws, one on each lever handle, to unfasten them.
4. Holding the power shelf underneath with one hand and steadying it with the other, lift the shelf up and slide it partway into one of the power shelf slots on the front (SFC) side of the chassis.
5. Slide the power shelf fully into the chassis and lift the lever handles up to lock the tray into position. Be sure to align the guide pins on the chassis with the holes on the power shelf.
6. Use the screwdriver to turn the two captive screws on the lever handles of the power shelf clockwise to attach them to the interior of the shelf.
7. Use the screwdriver to turn the four captive screws on the interior of the power shelf clockwise to firmly anchor the shelf to the sides of the chassis.

DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

Step 2 Make sure that the power I/0 switch on the shelf, located on the front [SFC] side of the chassis, is in the OFF position.

Step 3 The lever handles are fastened down for shipment. Use the screwdriver to turn the two captive screws, one on each lever handle, to unfasten them.

Step 4 Holding the power shelf underneath with one hand and steadying it with the other, lift the shelf up and slide it partway into one of the power shelf slots on the front (SFC) side of the chassis.

Caution An empty power shelf weighs approximately 36 lb (16.3 kg). Because of the rack-mounted height of the chassis, you should be especially careful while lifting and removing the power shelf. To prevent injury, keep your back straight and lift with your legs, not your back. Avoid sudden twists or lateral moves. It is safer to use two people and a ladder to install or remove the power shelf rather than a single person.

Step 5 Slide the power shelf fully into the chassis and lift the lever handles up to lock the tray into position. Be sure to align the guide pins on the chassis with the holes on the power shelf.

Step 6 Use the screwdriver to turn the two captive screws on the lever handles of the power shelf clockwise to attach them to the interior of the shelf.

Step 7 Use the screwdriver to turn the four captive screws on the interior of the power shelf clockwise to firmly anchor the shelf to the sides of the chassis.

What to Do Next

After performing this task, wire the power shelf (see the Installing Fixed Configuration AC Power Shelf Cord, on page 31, and the Installing Fixed Configuration DC Power Shelf Wiring, on page 39), install the power modules (see the Installing an AC Rectifier or DC PEM, on page 43), and install the alarm modules (see the Installing a Fixed Configuration Alarm Module , on page 46).

Removing a Fixed Configuration Power Shelf

This section describes how to remove a fixed configuration AC or DC power shelf from the FCC. For information on the difference between the power types, see the DC Power Systems, on page 18 and the AC Power Systems, on page 24. For complete information on regulatory compliance and safety, see Cisco CRS Carrier Routing System Regulatory Compliance and Safety Information.

The power shelf is installed in the FCC from the front (SFC) side of the chassis. Although differences exist among the different power shelf types (AC Wye, AC Delta, and DC), they are installed and removed in the same manner. Figure 21: Fixed Configuration AC Power Shelf , on page 27 shows a fixed configuration AC Wye power shelf for reference.

Prerequisites

Before performing this task, remove the upper grille on the front (SFC) side of the chassis, if installed.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- 1/4-in. x 6-in. long slotted screwdriver

Steps

To remove a fixed configuration AC or DC power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Move the shelf power I/O switch, located on the front [SFC] side of the chassis, to the OFF position.
3. For AC, at the AC service circuit breaker box open all associated equipment circuit breakers for shelf(s) to be removed. Use the lockout and tag procedures per your local practices. Unplug the power cord from the receptacle and then remove the power leads from the power block. Refer to the Removing Fixed Configuration AC Power Shelf Wiring.For DC, At the BDFB or power plant, remove the associated fuses / circuit breakers for shelf(s) to be removed. Use the lockout and tag procedures per your local practices. Remove DC distribution cables from the rear of the associated power shelf and tape the bare lugs for protection. Refer to the Removing Fixed Configuration DC Power Shelf Wiring for more information.
4. Remove all power modules (three AC rectifiers in an AC power shelf or two DC PEMs in a DC power shelf) from the shelf you are removing. (See the Removing an AC Rectifier or DC PEM.)
5. Remove the alarm module. (See the “Removing a Fixed Configuration Alarm Module” section.)
6. While facing the front (SFC) side of the chassis, use the screwdriver to loosen the four captive screws (two on each side) on the interior of the power shelf by turning them counterclockwise.
7. Use the screwdriver to loosen the two lever screws on the front panel of the power shelf by turning them counterclockwise.
8. Pull the lever handles down with both hands and slide the power shelf partway from the slot in the chassis.
9. Once the power shelf is partially removed using the handles, grab both sides of the power shelf and continue to remove fully.
10. Set the power shelf carefully aside.

DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

Step 2 Move the shelf power I/O switch, located on the front [SFC] side of the chassis, to the OFF position.

Step 3 For AC, at the AC service circuit breaker box open all associated equipment circuit breakers for shelf(s) to be removed. Use the lockout and tag procedures per your local practices. Unplug the power cord from the receptacle and then remove the power leads from the power block. Refer to the Removing Fixed Configuration AC Power Shelf Wiring.For DC, At the BDFB or power plant, remove the associated fuses / circuit breakers for shelf(s) to be removed. Use the lockout and tag procedures per your local practices. Remove DC distribution cables from the rear of the associated power shelf and tape the bare lugs for protection. Refer to the Removing Fixed Configuration DC Power Shelf Wiring for more information.

Step 4 Remove all power modules (three AC rectifiers in an AC power shelf or two DC PEMs in a DC power shelf) from the shelf you are removing. (See the Removing an AC Rectifier or DC PEM.)

Step 5 Remove the alarm module. (See the “Removing a Fixed Configuration Alarm Module” section.)

Step 6 While facing the front (SFC) side of the chassis, use the screwdriver to loosen the four captive screws (two on each side) on the interior of the power shelf by turning them counterclockwise.

Step 7 Use the screwdriver to loosen the two lever screws on the front panel of the power shelf by turning them counterclockwise.

Step 8 Pull the lever handles down with both hands and slide the power shelf partway from the slot in the chassis.

Caution An empty power shelf weighs approximately 36 lb (16.3 kg). Because of the rack-mounted height of the chassis, you should be especially careful while lifting and removing the power shelf. To prevent injury, keep your back straight and lift with your legs, not your back. Avoid sudden twists or lateral moves. It is safer to use two people and a ladder to install or remove the power shelf rather than a single person.

Step 9 Once the power shelf is partially removed using the handles, grab both sides of the power shelf and continue to remove fully.

Step 10 Set the power shelf carefully aside.

What to Do Next

After performing this task, you may install a replacement power shelf (see the Installing a Fixed Configuration Power Shelf).

Installing Fixed Configuration AC Power Shelf Cord

This section describes how to install the AC Wye and AC Delta power shelf cord in a fixed configuration AC power system.

For additional power shelf details, see Cisco CRS Series Carrier Routing System Description or Appendix 1, "Cisco CRS-1 Carrier Routing System Fabric Card Chassis Specifications" .

Prerequisites

Before performing this task, ensure that both power shelves are installed in the chassis and remove the upper grille on the rear (OIM) side, if installed.

Note Before installing the AC power cord on the power shelf, make sure that the input power cord is not plugged into the facility power.

Required Tools and Equipment

You need the following tools to perform this task:

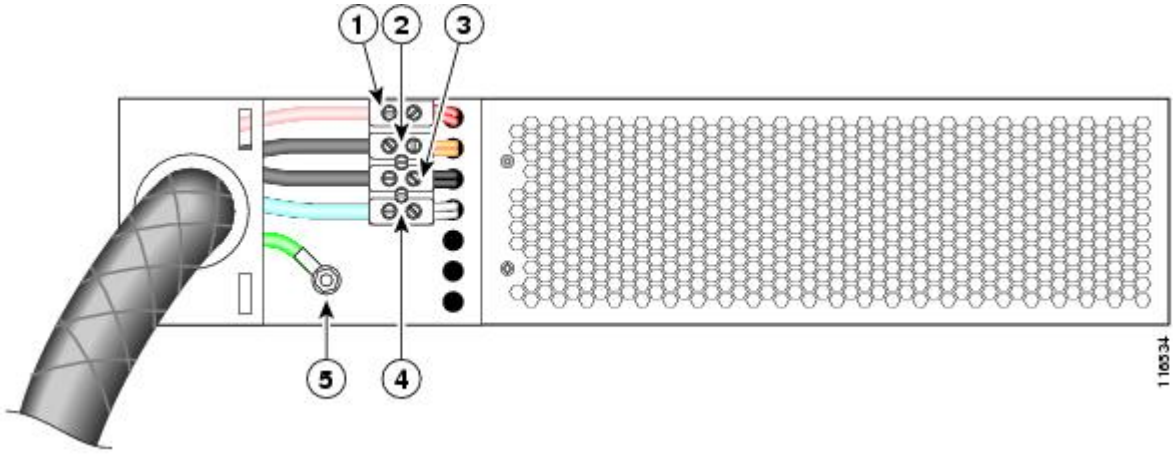
- ESD-preventive wrist strap
- Stripping tool to remove power cable conductor insulation
- 1/4-in. x 6-in. long slotted screwdriver
- Torque screwdriver with 1/4-in. slotted head and rated accuracy at 9 in-lb (1.04 N-m)
- Torque wrench with 10-mm 6 pt. socket and rated accuracy at 20 in.-lb (2.26 N-m)

AC Wye Power Shelf Cord

The AC Wye power shelf arrives with a 5-wire Wye cord with an IEC 60309 plug rated 415 V/32 A, IP44, 3W+N+PE; it is 4 meters long. The power shelf has five corresponding terminations: three active ("hot"), one neutral, and one ground. The ground lug and terminal block are located behind a removable cover on the rear of the power shelf. The terminal block contains four terminations to attach the three active cable conductors and one neutral cable conductor from the input power cord. The ground cable conductor from the input power cord is attached to the ground lug.

The rear of the AC Wye power shelf is shown in this figure.

Figure 22: AC Wye Power Cord



1	Lead 1 (L1)	4	Lead 4 (L4—neutral)
2	Lead 2 (L2)	5	Ground
3	Lead 3 (L3)		

Note Leads 1, 2 and 3 (L1, L2, and L3) are not associated with any particular color of cable conductor because they are not connected to neutral (L4) or the safety ground (5).

Note We recommend that you rotate the L1, L2, and L3 wiring connection for the two power shelves to improve system availability due to common phase outage.

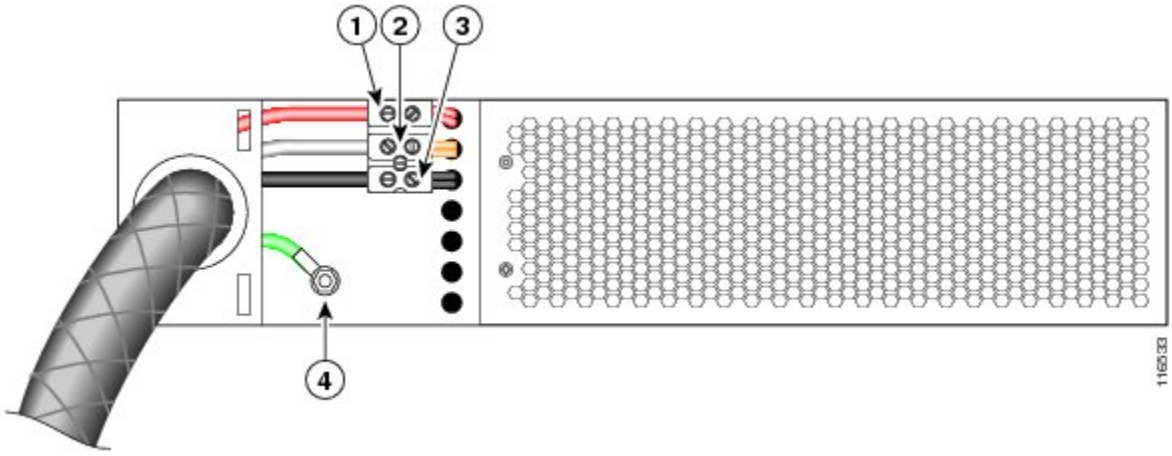
Note The ground cable conductor connector nuts have a 20 in-lb (2.26 N-m) torque value, and the power cable conductor connector screws on the terminal block have a 9 in-lb (1.04 N-m) torque value.

AC Delta Power Shelf Cord

The AC Delta power shelf arrives with a 4-wire Delta cord with an IEC 60309 plug rated 250 V/60 A, IP67, 3W+PE; it is 4 meters long. The power shelf has four corresponding terminations: three active (“hot”) and one ground. The ground lug and terminal block are located behind a removable cover on the rear of the power shelf. The terminal block contains three terminations to attach the three active cable conductors from the input power cord. The ground cable conductor from the input power cord is attached to the ground lug.

The rear of the AC Delta power shelf is shown in this figure:

Figure 23: AC Delta Power Cord



1	Lead 1 (L1)	3	Lead 3 (L3)
2	Lead 2 (L2)	4	Ground

Note L1, L2, and L3 are not associated with any particular color of cable conductor as long as they are not connected to neutral or the safety ground (4).

Note We recommend that you rotate the L1, L2, and L3 wiring connection for the two power shelves to improve system availability due to common phase outage.

Note The ground cable conductor connector screws have a 20 in-lb (2.26 N-m) torque value, and the power cable conductor connector screws on the terminal block have a 9 in-lb (1.04 N-m) torque value.

Steps

To wire a fixed configuration AC Wye or AC Delta power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. For AC Wye only, choose your neutral cable conductor; white is usually neutral. Be sure to perform a continuity check with a volt meter to verify that the neutral pin (labeled with an "N" on the plug) is connected to the neutral cable conductor.
3. Remove the rear cover from the power shelf.
4. The shelf arrives with two wiring holes for the power cable. Choose the wiring hole for your cable and remove the knock-out plug, if needed.
5. Ensure that the insulating layer has been removed from the cable conductor ends.
6. Insert the AC power cord and tighten the cable bushing lock nut.
7. Remove the M6 nut from ground connection (green cable conductor is typically ground), attach the ground cable conductor, and tighten the nut (ground cable conductor has a closed-ring connector) to a torque value of 20 in-lb (2.26 N-m).
8. For AC Wye only, connect the neutral cable conductor to the terminal block by backing out the left side terminal block screw, inserting the cable conductor, and tightening the screw to a torque value of 9 in-lbs (1.04 N-m). Do not loosen the screw on the right side of the terminal block.
9. Connect the other three active cable conductors in the same way as the neutral cable conductor. Back out the left side terminal block screw, insert the cable conductor, and tighten the screw to a torque value of 9 in-lbs (1.04 N-m). Do not loosen the screw on the right side of the terminal block.

DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

Step 2 For AC Wye only, choose your neutral cable conductor; white is usually neutral. Be sure to perform a continuity check with a volt meter to verify that the neutral pin (labeled with an "N" on the plug) is connected to the neutral cable conductor.

Step 3 Remove the rear cover from the power shelf.

Step 4 The shelf arrives with two wiring holes for the power cable. Choose the wiring hole for your cable and remove the knock-out plug, if needed.

Step 5 Ensure that the insulating layer has been removed from the cable conductor ends.

Step 6 Insert the AC power cord and tighten the cable bushing lock nut.

Step 7 Remove the M6 nut from ground connection (green cable conductor is typically ground), attach the ground cable conductor, and tighten the nut (ground cable conductor has a closed-ring connector) to a torque value of 20 in-lb (2.26 N-m).

Step 8 For AC Wye only, connect the neutral cable conductor to the terminal block by backing out the left side terminal block screw, inserting the cable conductor, and tightening the screw to a torque value of 9 in-lbs (1.04 N-m). Do not loosen the screw on the right side of the terminal block.

Note Be careful not to back the connection screws too far or they fall out.

Step 9 Connect the other three active cable conductors in the same way as the neutral cable conductor. Back out the left side terminal block screw, insert the cable conductor, and tighten the screw to a torque value of 9 in-lbs (1.04 N-m). Do not loosen the screw on the right side of the terminal block.

What to Do Next

After performing this task, the AC rectifiers can be installed. See the Installing an AC Rectifier or DC PEM for more information.

Removing Fixed Configuration AC Power Shelf Wiring

This section describes how to remove the AC Wye and AC Delta power shelf cords in the fixed configuration power system.

For additional power shelf details, see *Cisco CRS Series Carrier Routing System Description* or *Cisco CRS-1 Carrier Routing System Fabric Card Chassis Specifications* chapter.

Prerequisites

Before performing this task, power down and remove the AC rectifiers and the alarm module from the shelf you want to disconnect. Remove the upper grille on the rear (OIM) side of the chassis, if installed.

Note Before removing AC power cords from the power shelf, make sure that the input power cords are not energized.

Required Tools and Equipment

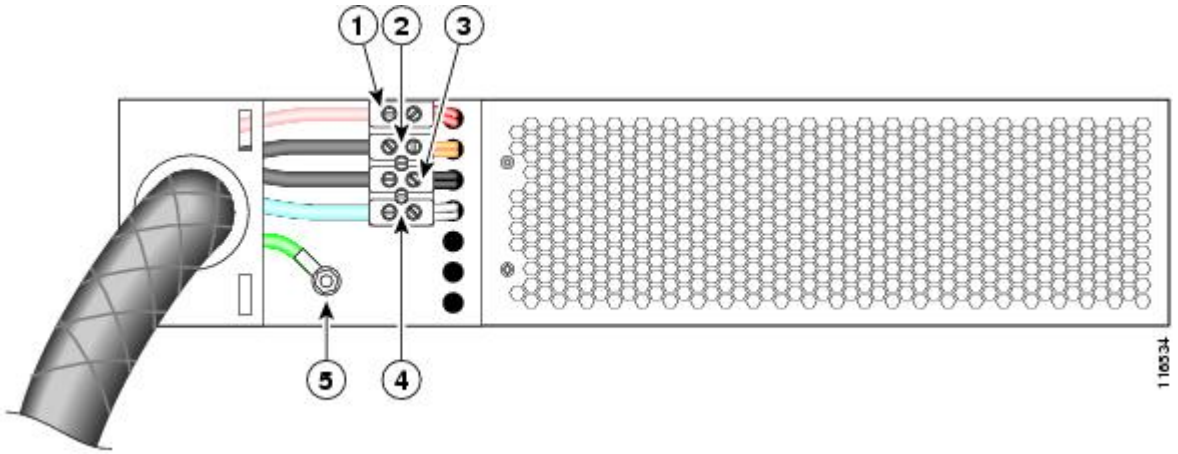
You need the following tools to perform this task:

- ESD-preventive wrist strap
- 3/8-in. ratchet wrench with 10-mm socket
- 1/4-in. x 6-in. long slotted screwdriver

AC Wye Power Shelf Cords

The rear of the AC Wye power shelf is shown in this figure.

Figure 24: AC Wye Power Cord



1	Lead 1 (L1)	4	Lead 4 (L4, neutral)
2	Lead 2 (L2)	5	Ground
3	Lead 3 (L3)		

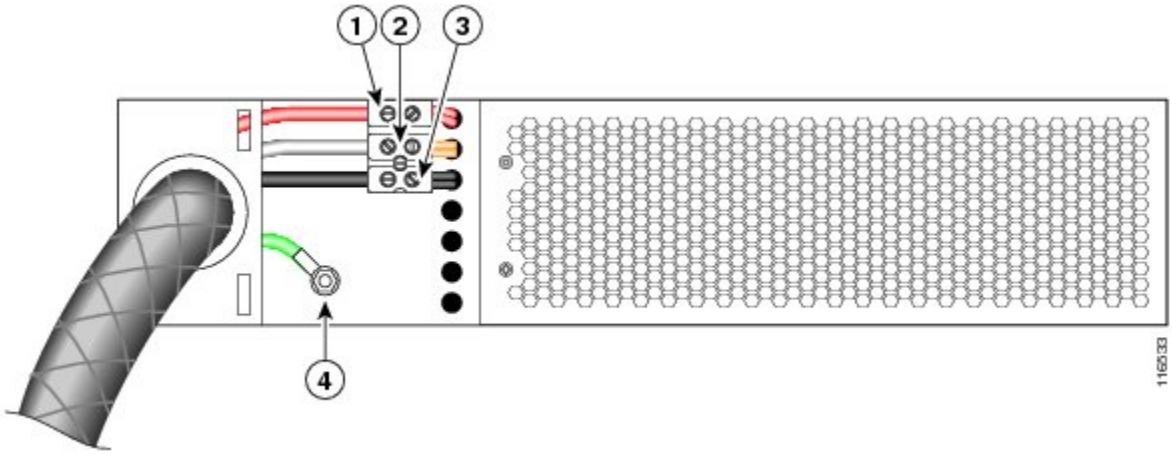
Note Leads 1, 2, and 3 (L1, L2, and L3) are not associated with any particular color of cable conductor because they are not connected to neutral (L4) or the safety ground (5).

Note When removing AC power cords from the fixed configuration power shelf, be sure to remove the ground cable conductor last.

AC Delta Power Shelf Cords

The rear of the AC Delta power shelf is shown in this figure.

Figure 25: AC Delta Power Shelf Cord



1	Lead 1 (L1)	3	Lead 3 (L3)
2	Lead 2 (L2)	4	Ground

Note Leads 1, 2, and 3 (L1, L2, and L3) are not associated with any particular color of cable conductor because they are not connected to neutral or the safety ground (4).

Note When removing AC cords from the fixed configuration power shelf, be sure to remove the ground cable conductor last.

Steps

To disconnect the power cord from the fixed configuration AC Wye or AC Delta power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Disconnect the three active cable conductors by loosening the screw on the left side of the terminal block for each cable conductor and removing the cable conductor.
3. For AC Wye only, disconnect the neutral cable conductor by backing out the left side terminal block screw and removing the cable conductor. White is usually neutral.
4. Remove the M6 nut from the ground connection (green is typically the ground cable conductor) and remove the ground cable conductor.

DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

Step 2 Disconnect the three active cable conductors by loosening the screw on the left side of the terminal block for each cable conductor and removing the cable conductor.

Note Be careful not to back the connection screws too far or they fall out.

Step 3 For AC Wye only, disconnect the neutral cable conductor by backing out the left side terminal block screw and removing the cable conductor. White is usually neutral.

Step 4 Remove the M6 nut from the ground connection (green is typically the ground cable conductor) and remove the ground cable conductor.

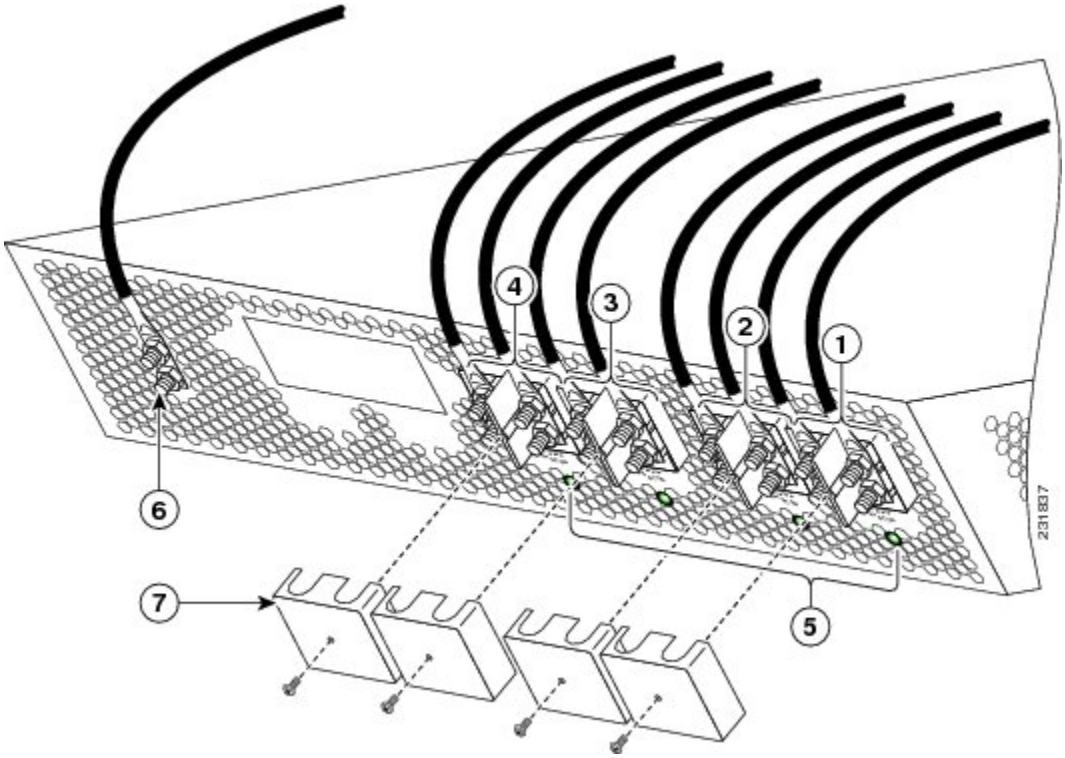
What to Do Next

After performing this task, the power shelf can be removed. For more information, see the Removing a Fixed Configuration Power Shelf, on page 29 section.

Installing Fixed Configuration DC Power Shelf Wiring

This section describes how to install the DC wiring on the fixed configuration DC power shelf. This figure shows the cable wiring on the rear of the FCC fixed configuration DC power shelf.

Figure 26: Fixed Configuration DC PEMs and Wiring Blocks



1	PEM O, input 1	5	Input-power-present LEDs
2	PEM 0, input 2	6	Ground lug nuts
3	PEM 1, input 3	7	Terminal block covers
4	PEM 1, input 4		

For additional power shelf details, see Cisco CRS Series Carrier Routing System Description or Appendix 1, “Cisco CRS-1 Carrier Routing System Fabric Card Chassis Specifications” .

Note When wiring the power shelf, be sure to connect the ground cable first.

Prerequisites

Before performing this task, ensure that both power shelves are installed in the chassis. Remove the upper grille on the rear (OIM) side of the chassis, if installed.

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

Note If the cables are wrapped with black electrical tape, be sure to remove tape from the cables before installing cabling on the power shelf.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- 3/8 in. ratchet wrench with 10-mm socket
- Crimping tool and lug specific die
- Multimeter
- Torque wrench with 10-mm 6 pt. socket and rated accuracy at 30 in.-lb (2.26 N-m)
- Torque wrench with 10-mm 6 pt. socket and rated accuracy at 20 in.-lb (2.26 N-m)

Steps

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

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Remove the terminal block cover.
3. Verify the following resistance values:
4. Use the crimping tool mandated by the lug manufacturer to crimp the lugs to the DC-input cables and the power shelf grounding cable. For details on lugs, see the DC Power Systems.
5. Using a 10-mm socket wrench, attach the ground cable to the ground cable terminal. Then use the torque wrench to tighten to a torque of 30 in.-lb (3.39 N-m).
6. Using the wrench, attach the positive and negative cables to each terminal block. Then use the torque wrench to tighten to a torque of 20 in.-lb (2.26 N-m).
7. Reattach the terminal cover with a phillips screwdriver. Insert and tighten the screw holding the cover to the wiring terminal block.

DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

Step 2 Remove the terminal block cover.

Step 3 Verify the following resistance values:

- 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.

Step 4 Use the crimping tool mandated by the lug manufacturer to crimp the lugs to the DC-input cables and the power shelf grounding cable. For details on lugs, see the DC Power Systems.
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.

Step 5 Using a 10-mm socket wrench, attach the ground cable to the ground cable terminal. Then use the torque wrench to tighten to a torque of 30 in.-lb (3.39 N-m).

Step 6 Using the wrench, attach the positive and negative cables to each terminal block. Then use the torque wrench to tighten to a torque of 20 in.-lb (2.26 N-m).

Step 7 Reattach the terminal cover with a phillips screwdriver. Insert and tighten the screw holding the cover to the wiring terminal block.

What to Do Next

After the power shelf wiring has been connected, the DC PEMs can be installed. For more information, see the Installing an AC Rectifier or DC PEM.

Removing Fixed Configuration DC Power Shelf Wiring

This section describes how to remove the DC power shelf wiring from the fixed configuration power shelf.

For additional power shelf details, see *Cisco CRS Series Carrier Routing System Description* or appendix titled *Cisco CRS-1 Carrier Routing System Fabric Card Chassis Specifications*.

Note When removing DC wiring from the fixed configuration power shelf, be sure to remove the ground cable last.

Prerequisites

Before performing this task, power down and remove the DC PEMs and the alarm module from the shelf you want to disconnect. Remove the upper grille on the rear (OIM) side of the chassis, if installed.

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

Steps

To disconnect wiring from the fixed configuration DC power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Remove the terminal block cover
3. Using the 10-mm socket wrench, remove the positive and negative cables from each terminal block.
4. Using the wrench, remove the ground cable from the ground cable terminal.
5. Replace the terminal block covers.

DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

Step 2 Remove the terminal block cover

Step 3 Using the 10-mm socket wrench, remove the positive and negative cables from each terminal block.

Step 4 Using the wrench, remove the ground cable from the ground cable terminal.

Note When a cable is removed from the rear of the fixed configuration DC power shelf, we recommend that it should be wrapped with standard black electrical tape.

Step 5 Replace the terminal block covers.

What to Do Next

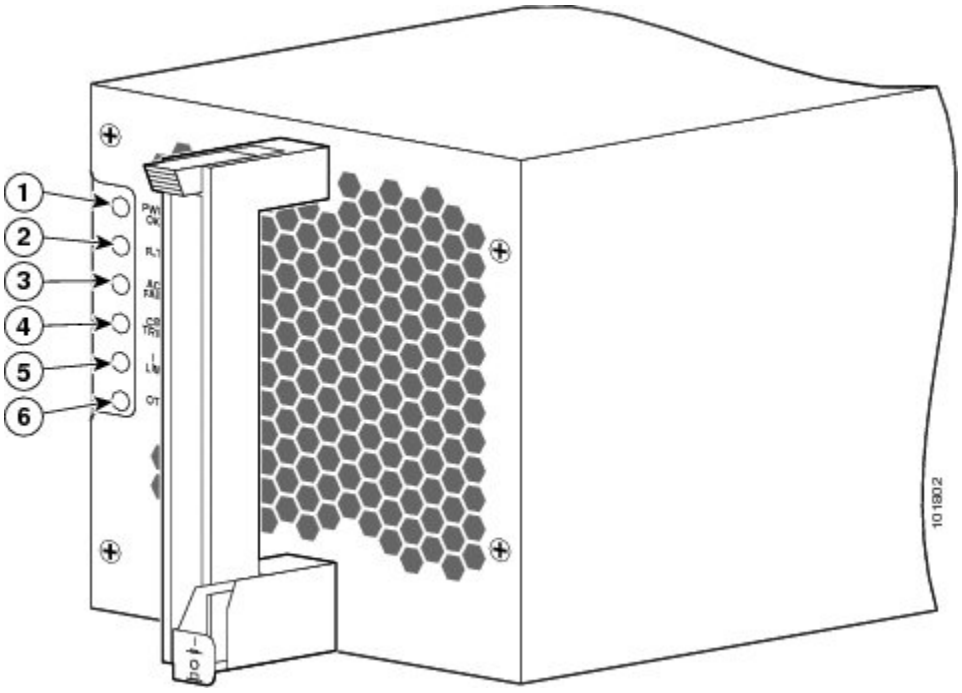
After the power shelf wiring has been disconnected, the power shelf can be removed. For more information, see the Removing a Fixed Configuration Power Shelf, on page 29 section.

Installing an AC Rectifier or DC PEM

This section describes how to install an AC rectifier or DC PEM in a fixed configuration power shelf in the FCC. For information on the power types, see the DC Power Systems and the AC Power Systems. For complete information on regulatory compliance and safety, see Cisco CRS Carrier Routing System Regulatory Compliance and Safety Information.

The power module is installed into the power shelf on the front (SFC) side of the chassis. Although differences exist among the AC rectifiers and DC PEMs (AC Wye, AC Delta, and DC), they are installed in the same manner. This figure shows an AC rectifier for reference. The fixed configuration DC PEM is similar.

Figure 27: Fixed Configuration AC Rectifier



1	PWR OK	4	CBREAKER TRIP
2	FLT	5	ILIM
3	AC INPUT FAIL	6	OT

Prerequisites

Before performing this task, you must first remove the upper grille on the front (SFC) side of the chassis, if installed.

Required Tools and Equipment

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

- ESD-preventive wrist strap
- Fixed configuration AC rectifier or DC PEM
  - AC rectifier Cisco product number CRS16-AC-RECT=
  - DC PEM Cisco product number CRS16-DC-PEM=)

Steps

To install an AC rectifier or DC PEM in a fixed configuration power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Turn the power switch to the OFF position.
3. While facing the front (SFC) side of the chassis, press the ejector lever release button at the top of the AC rectifier or DC PEM to release the ejector lever.
4. Pivot the ejector lever away from the module faceplate.
5. Using two hands to support and guide the AC rectifier or DC PEM, slide it into the power system shelf until the connector on the back of the module just makes contact with the connector on the backplane of the power shelf.
6. Seat the power module in the power shelf backplane by pivoting the ejector lever to hook the slot on the floor of the power shelf and then pushing the ejector lever until it is flush with the power module faceplate. You hear a click when the ejector lever locks into place.
7. Push the power tab at the bottom front of the power module in to the ON position.

DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

Step 2 Turn the power switch to the OFF position.

Step 3 While facing the front (SFC) side of the chassis, press the ejector lever release button at the top of the AC rectifier or DC PEM to release the ejector lever.

Step 4 Pivot the ejector lever away from the module faceplate.

Step 5 Using two hands to support and guide the AC rectifier or DC PEM, slide it into the power system shelf until the connector on the back of the module just makes contact with the connector on the backplane of the power shelf.

Caution To prevent damage to the power shelf backplane connector, do not use excessive force when inserting a power module into its power shelf bay.

Caution A power module weighs about 19 lb (8.6 kg). Because of the weight of the module and the elevated position of the power shelf, you should use two hands when handling the module. It is safer to use two people and a ladder to install or remove the module rather than a single person.

Step 6 Seat the power module in the power shelf backplane by pivoting the ejector lever to hook the slot on the floor of the power shelf and then pushing the ejector lever until it is flush with the power module faceplate. You hear a click when the ejector lever locks into place.

Step 7 Push the power tab at the bottom front of the power module in to the ON position.

What to Do Next

After performing this task, replace the upper grille on the front (SFC) side of the chassis.

Removing an AC Rectifier or DC PEM

This section describes how to remove an AC rectifier or DC PEM from the FCC. For information on the power types, see the DC Power Systems and the AC Power Systems. For complete information on regulatory compliance and safety, see Cisco CRS Carrier Routing System Regulatory Compliance and Safety Information.

Although differences exist among the AC rectifiers and DC PEMs (AC Wye, AC Delta, and DC), they are removed in the same manner. Figure 27: Fixed Configuration AC Rectifier, on page 43 shows a DC PEM for reference.

Prerequisites

Before performing this task, you must first remove the upper grille on the front (SFC) side of the chassis, if installed.

Required Tools and Equipment

You need the following tool to perform this task:

- ESD-preventive wrist strap

Steps

To remove an AC rectifier or DC PM from a fixed configuration power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. While facing the front (SFC) side of the chassis, pull the power tab at the bottom front of the module out to the OFF position.
3. Press the ejector lever release button at the top of the power module to release the ejector lever.
4. Pivot the ejector lever away from the power module faceplate to eject the module from the power shelf backplane connector.
5. Grasp the power module handle and pull the module halfway from the bay. Be sure not to pull the module by the ejector lever, but rather by the handle only.
6. Be sure to support the module while you slide the module completely from the bay.
7. Set the power module carefully aside.

DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

Step 2 While facing the front (SFC) side of the chassis, pull the power tab at the bottom front of the module out to the OFF position.

Step 3 Press the ejector lever release button at the top of the power module to release the ejector lever.

Step 4 Pivot the ejector lever away from the power module faceplate to eject the module from the power shelf backplane connector.

Note Pulling out the ejector lever not only physically ejects the module from the power shelf backplane connector, but also toggles an internal microswitch, shutting off power within the power module.

Step 5 Grasp the power module handle and pull the module halfway from the bay. Be sure not to pull the module by the ejector lever, but rather by the handle only.

Caution A power module weighs about 19 lb (8.6 kg). Because of the weight of a module and the elevated position of the power shelf, you should use two hands when handling the module. It is safer to use two people and a ladder to install or remove the module rather than a single person.

Step 6 Be sure to support the module while you slide the module completely from the bay.

Step 7 Set the power module carefully aside.

What to Do Next

After performing this task, install a replacement AC Rectifier or DC PEM if necessary (see the Installing an AC Rectifier or DC PEM) and replace the upper grille on the front (SFC) side of the chassis.

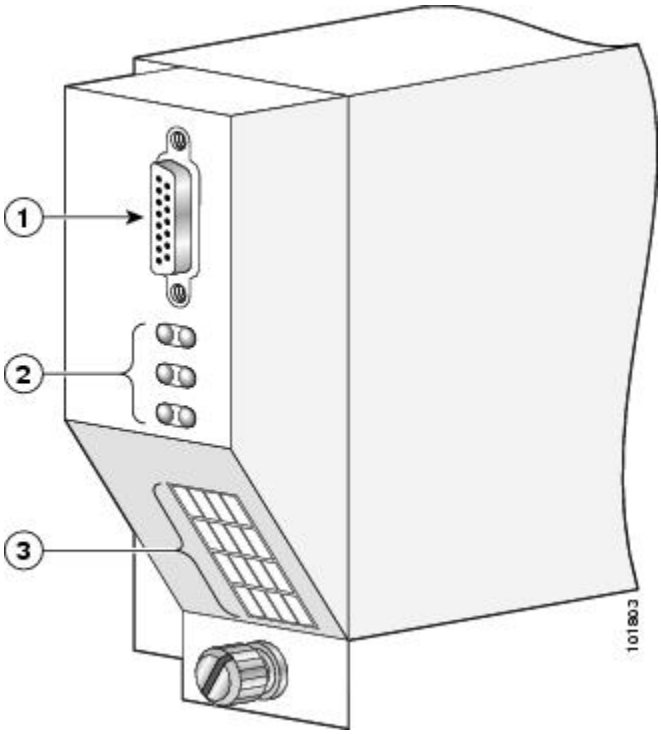
Installing a Fixed Configuration Alarm Module

This section describes how to install an alarm module in a fixed configuration power shelf in the FCC. An alarm module can be installed only in the far right slot of the power shelf (as you are facing the front [SFC] side of the chassis). For complete information on regulatory compliance and safety, see Cisco CRS Carrier Routing System Regulatory Compliance and Safety Information.

Each AC or DC power shelf contains an alarm module, which monitors the status of the power shelf and provides an external interface for system alarms. A dedicated alarm module slot exists on the right side of each fixed configuration power shelf. The same alarm module is used in all fixed configuration power shelves.

This figure shows a fixed configuration alarm module.

Figure 28: Fixed Configuration Alarm Module



1	External alarm connector	3	LED display
2	Alarm LEDs		

Prerequisites

Before performing this task, you must first remove the upper grille on the front (SFC) side of the chassis, if installed.

Required Tools and Equipment

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

- ESD-preventive wrist strap
- 6-in long number 1 Phillips screwdriver
- Fixed configuration alarm module (Cisco product number CRS-16-ALARM=)

Steps

To install a fixed configuration alarm module, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Using two hands to support and guide the alarm module, slide it into the far right bay on the power shelf (as you face the front [SFC] side of the chassis) until the connector on the back of the alarm module just makes contact with the connector on the backplane of the power shelf. Verify that the guide pin on the chassis front panel is correctly aligned with the hole on the front of the alarm module.
3. Seat the alarm module in the power shelf backplane by pressing it firmly to the power shelf backplane connector.
4. Use the Phillips screwdriver to turn the captive screw at the bottom of the alarm module clockwise to seat the alarm module connectors in the connectors on the power shelf interface panel.

DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

Caution To prevent damage to the alarm module backplane connector, do not use excessive force when inserting an alarm module into its power shelf bay.

Step 2 Using two hands to support and guide the alarm module, slide it into the far right bay on the power shelf (as you face the front [SFC] side of the chassis) until the connector on the back of the alarm module just makes contact with the connector on the backplane of the power shelf. Verify that the guide pin on the chassis front panel is correctly aligned with the hole on the front of the alarm module.

Caution An alarm module weighs about 4.2 lb (2 kg). Because of the weight of the alarm module and the elevated position of the power shelf, you should use two hands when handling the alarm module. It is safer to use a ladder to install or remove the alarm module.

Step 3 Seat the alarm module in the power shelf backplane by pressing it firmly to the power shelf backplane connector.

Step 4 Use the Phillips screwdriver to turn the captive screw at the bottom of the alarm module clockwise to seat the alarm module connectors in the connectors on the power shelf interface panel.

What to Do Next

After performing this task, replace the upper grille on the front (SFC) side of the chassis.

Removing a Fixed Configuration Alarm Module

This section describes how to remove an alarm module from a fixed configuration power shelf in the FCC. The alarm module is installed only in the far right slot of the power shelf (as our are facing the front [SFC] side of the chassis. For complete information on regulatory compliance and safety, see Regulatory Compliance and Safety Information for the Cisco CRS Carrier Routing System.

Figure 28: Fixed Configuration Alarm Module, on page 47 shows a fixed configuration alarm module.

Prerequisites

Before performing this task, you must first remove the upper grille on the front (SFC) side of the chassis, 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

Steps

To remove an alarm module, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Use the screwdriver to loosen the captive screw that fastens the alarm module to the front (SFC) side of the chassis.
3. Grasp the alarm module and pull it halfway from the bay.
4. Use your free hand to support the alarm module while you slide the alarm module completely from the bay.
5. Set the alarm module carefully aside.

DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

Step 2 Use the screwdriver to loosen the captive screw that fastens the alarm module to the front (SFC) side of the chassis.

Step 3 Grasp the alarm module and pull it halfway from the bay.

Caution An alarm module weighs about 4.2 lb (2 kg). Because of the weight of the alarm module and the elevated position of the power shelf, you should use two hands when handling the alarm module. It is safer to use a ladder to install or remove the alarm module.

Step 4 Use your free hand to support the alarm module while you slide the alarm module completely from the bay.

Step 5 Set the alarm module carefully aside.

What to Do Next

After performing this task, install a replacement alarm module (if necessary) and replace the upper grille on the front (SFC) side of the chassis.

Powering Up and Down a Chassis with Fixed Configuration AC Power

This section describes how to power up and power down an FCC with fixed configuration AC power shelves installed. For details on the fixed configuration AC power system, see the AC Power Systems. For complete information on regulatory compliance and safety, see *Regulatory Compliance and Safety Information for the Cisco CRS Carrier Routing System* .

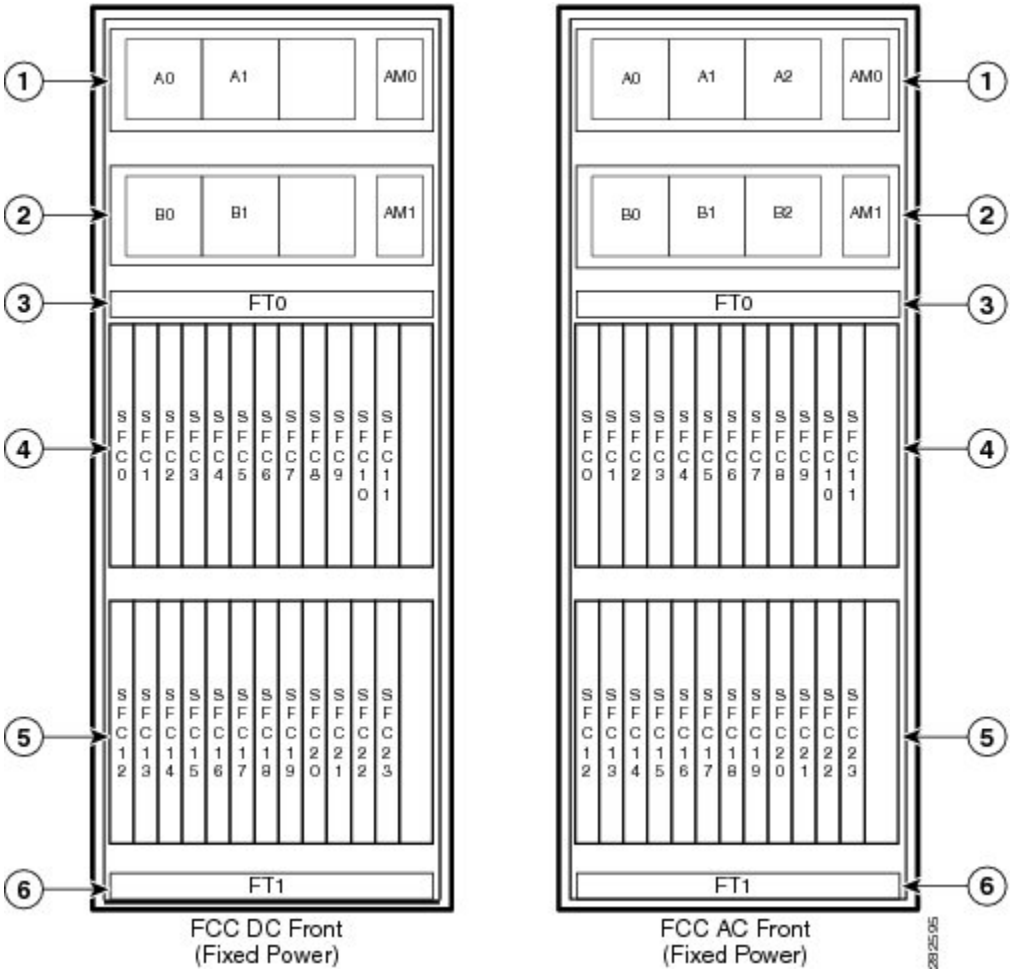
Each power shelf in the FCC has its own I/O switch for shelf power cutoff. Power shelf linkage cuts power to the chassis as a whole when both power shelves are turned off.

Most components on the chassis, including the power shelves, power modules, alarm modules, 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.

Note While the chassis can be powered on by switching on the power shelf I/O switch (if all individual power rectifier power switches are in the on position), this method draws a large power surge on start-up. We recommend following the procedure outlined below to power the chassis on and off.

This figure shows the Front (SFC) side of the FCC with fixed configuration power installed.

Figure 29: FCC Front (SFC) Side Slot Numbers



1	Power shelf PS0	4	Upper card cage
2	Power shelf PS1	5	Lower card cage
3	Fan tray FT0	6	Fan tray FT1

Prerequisites

Before performing this task, you must install and wire the power shelves, and install the AC rectifiers, alarm modules, SCGE cards, and exterior cosmetic components. See the Installing a Fixed Configuration Power Shelf, the Installing Fixed Configuration AC Power Shelf Cord or Installing Fixed Configuration DC Power Shelf Wiring, the Installing an AC Rectifier or DC PEM, the Installing a Fixed Configuration Alarm Module , and *Installing and Removing Exterior Cosmetic Components* chapter for more information.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- Multimeter
- 1/4-in. x 6-in. long slotted screwdriver

Steps

To power on the chassis, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Make sure that the safety ground wiring is connected.
3. Make sure that the facility power breakers for the upper (PS0) and lower (PS1)power shelves are in the OFF position.
4. Make sure that all the I/O switches are in the OFF position. That is, make sure all I/O levers are pulled out. There are total of six I/O levers for the AC power rectifiers (one for each of the six AC rectifiers) and two I/O levers for the AC power shelves (one for each power shelf).
5. Make sure all SFCs are pulled-out and disconnected from the backplane.
6. Remove the cover plate from the rear of the AC power shelves.
7. Plug in AC power cords.
8. For AC Delta and AC wye, verify the following resistance values (see Figure 22: AC Wye Power Cord , on page 32 and Figure 23: AC Delta Power Cord, on page 33):
9. Make sure that each input power cable is connected, and energize the facility breaker to each input.
10. Measure the voltage between the following:
11. Turn the facility breaker for the upper power shelf (PS0) to the OFF position. Repeat for the facility power breaker for the lower power shelf (PS1).
12. Turn the facility breaker for the upper power shelf (PS0) to the ON position. Repeat for the facility power breaker for the lower power shelf (PS1).
13. Turn the power shelf I/O switches on both power shelves (PS0 and PS1) to the ON position. Verify that the “CBREAKER TRIP” LED on the front panel of each power rectifier is yellow and that no other LEDs are active.
14. Turn the first power rectifier (A0; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51) power switch on the upper power shelf (PS0) to the ON position. Verify that the “PWR OK” LED on the power rectifier (A0) front panel is green and that no other LEDs are active. Repeat for the other two rectifiers (A1 and A2; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51).
15. Turn the first power rectifier (B0; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51) I/O switch on the lower power shelf (PS1) to the ON position. Verify that the “PWR OK” LED on the power rectifier (B0) front panel is green and that no other LEDs are active. Repeat for the other two rectifiers (B1 and B2; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51).
16. Turn the I/O switches on all power rectifiers and both power shelves to the OFF position. Verify that no LEDs on the power rectifier front panels are active.
17. Insert all boards into the chassis (see *Installing and Removing Fabric Cards and Card Components* chapter).
18. Turn the power shelf I/O switches (PS0 and PS1) to the ON position.
19. Turn all power rectifier I/O switches to the ON position.
20. Measure the input voltage of each input and compare this value to the voltage measurement noted in step 7. Verify that the voltage is between 200 to 240 VAC, ensure that the voltage drop is within the acceptable limits for your site.
21. Turn the I/O switches on all power rectifiers and both power shelves to the OFF position. Turn the facility breaker for the upper power shelf (PS0) to the OFF position. Repeat for the facility power breaker for the lower power shelf (PS1).
22. Replace the cover plate on the rear of the AC power shelves.

23. Turn the facility breaker for the upper power shelf (PS0) to the ON position. Repeat for the facility power breaker for the lower power shelf (PS1).
24. Turn both power shelf I/O switches (PS0 and PS1) to the ON position. Turn all power rectifier I/O switches to the ON position.

DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

Step 2 Make sure that the safety ground wiring is connected.

Step 3 Make sure that the facility power breakers for the upper (PS0) and lower (PS1)power shelves are in the OFF position.

Step 4 Make sure that all the I/O switches are in the OFF position. That is, make sure all I/O levers are pulled out. There are total of six I/O levers for the AC power rectifiers (one for each of the six AC rectifiers) and two I/O levers for the AC power shelves (one for each power shelf).

Step 5 Make sure all SFCs are pulled-out and disconnected from the backplane.

Step 6 Remove the cover plate from the rear of the AC power shelves.

Step 7 Plug in AC power cords.

Step 8 For AC Delta and AC wye, verify the following resistance values (see Figure 22: AC Wye Power Cord , on page 32 and Figure 23: AC Delta Power Cord, on page 33):

- From L1 to GND should be greater than 1 MOhms
- From L2 to GND should be greater than 1 MOhms
- From L3 to GND should be greater than 1 MOhms

For AC Wye only, verify the following resistance values:

- From L1 to L4 (Neutral) should be greater than 1 MOhms
- From L2 to L4 (Neutral) should be greater than 1 MOhms
- From L3 to L4 (Neutral) should be greater than 1 MOhms

Step 9 Make sure that each input power cable is connected, and energize the facility breaker to each input.

Step 10 Measure the voltage between the following:

- Between L1 and L2 (AC Delta only)
- Between L2 and L3 (AC Delta only)
- Between L3 and L1 (AC Delta only)
- Between L1 and L4 (AC Wye only)
- Between L2 and L4 (AC Wye only)
- Between L3 and L4 (AC Wye only)

Verify that the AC voltage is between 200 to 240 VAC. Make a note of this voltage measurement.

Step 11 Turn the facility breaker for the upper power shelf (PS0) to the OFF position. Repeat for the facility power breaker for the lower power shelf (PS1).

Step 12 Turn the facility breaker for the upper power shelf (PS0) to the ON position. Repeat for the facility power breaker for the lower power shelf (PS1).

Step 13 Turn the power shelf I/O switches on both power shelves (PS0 and PS1) to the ON position. Verify that the "CBREAKER TRIP" LED on the front panel of each power rectifier is yellow and that no other LEDs are active.

Step 14 Turn the first power rectifier (A0; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51) power switch on the upper power shelf (PS0) to the ON position. Verify that the "PWR OK" LED on the power rectifier (A0) front panel is green and that no other LEDs are active. Repeat for the other two rectifiers (A1 and A2; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51).

Step 15 Turn the first power rectifier (B0; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51) I/O switch on the lower power shelf (PS1) to the ON position. Verify that the "PWR OK" LED on the power rectifier (B0) front panel is green and that no other LEDs are active. Repeat for the other two rectifiers (B1 and B2; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51).

Step 16 Turn the I/O switches on all power rectifiers and both power shelves to the OFF position. Verify that no LEDs on the power rectifier front panels are active.

Step 17 Insert all boards into the chassis (see *Installing and Removing Fabric Cards and Card Components* chapter).

Step 18 Turn the power shelf I/O switches (PS0 and PS1) to the ON position.

Step 19 Turn all power rectifier I/O switches to the ON position.

Step 20 Measure the input voltage of each input and compare this value to the voltage measurement noted in step 7. Verify that the voltage is between 200 to 240 VAC, ensure that the voltage drop is within the acceptable limits for your site.

Step 21 Turn the I/O switches on all power rectifiers and both power shelves to the OFF position. Turn the facility breaker for the upper power shelf (PS0) to the OFF position. Repeat for the facility power breaker for the lower power shelf (PS1).

Step 22 Replace the cover plate on the rear of the AC power shelves.

Step 23 Turn the facility breaker for the upper power shelf (PS0) to the ON position. Repeat for the facility power breaker for the lower power shelf (PS1).

Step 24 Turn both power shelf I/O switches (PS0 and PS1) to the ON position. Turn all power rectifier I/O switches to the ON position.

What to Do Next

Note For appropriate SFC LED information, see the appropriate section in *Installing and Removing Fabric Cards and Card Components* chapter or the specific documentation for the card.

To power down the chassis entirely, you must power down both of the power shelves by moving the power shelf I/O switch to the OFF position by lifting up on the lever and pulling it out. Both power shelves must be disconnected to de-energize the chassis completely.

Note All AC power cords must be de-energized to fully remove power from the chassis.

This table shows the meaning of the LED status lights on the front panel of the AC power rectifiers in the fixed configuration power system.

Table 4: AC Power Rectifier LED Status Indicator Lights—Fixed Configuration Power

LED Name	Color	Function or Meaning
PWR OK	Green	Rectifier module is operating normally in a powered-up condition
FLT	Yellow	A fault has been detected in the rectifier
AC INPUT FAIL	Yellow	The AC is out of range or the rectifier is not receiving AC power input
CBREAKER TRIP	Yellow	Rectifier I/O switch is in the OFF position
OT	Yellow	Rectifier is in an over-temperature condition and a shutdown has occurred
ILIM	Yellow	Rectifier is operating in a current limit condition

Powering Up and Down a Chassis with Fixed Configuration DC Power

This section describes how to power up and power down an FCC with fixed configuration DC power shelves installed. For details on the chassis power systems, see the DC Power Systems. For complete information on regulatory compliance and safety, see *Regulatory Compliance and Safety Information for the Cisco CRS Carrier Routing System*.

Each power shelf in the FCC has its own I/O switch for shelf power cutoff; the FCC as a whole does not have a single power switch that powers the entire chassis and all its components up and down. Power shelf linkage cuts power to the chassis as a whole when both power shelves are turned off.

Most components on the chassis, including the power shelves, power modules, alarm modules, 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.

Note Although the chassis can be powered on by switching on the two power shelf I/O switches (if all individual PEM power switches are in the ON position), this method draws a large power surge on start-up. We recommend following the procedure outlined below to power the chassis on and off.

Prerequisites

Before performing this task, you must install and wire the power shelves, and install the DC PEMs, alarm modules, SCGE cards, and exterior cosmetic components. See theInstalling a Fixed Configuration Power Shelf, the Installing Fixed Configuration AC Power Shelf Cord or Installing Fixed Configuration DC Power Shelf Wiring,the Installing an AC Rectifier or DC PEM, the Installing a Fixed Configuration Alarm Module , the *Installing an SCGE Card section* and *Installing and Removing Exterior Cosmetic Components* chapter for more information. Wiring at the BDFB or at the power plant should be complete.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- Multimeter

Steps

To power on the chassis, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Verify that the safety ground wiring is connected to the upper and lower power shelves.
3. Make sure that the facility power breakers for the upper (PS0) and lower (PS1) power shelves are in the OFF position.
4. Make sure that all the I/O switches are in the OFF position. That is, make sure all I/O levers are pulled out. There are total of four I/O levers for the DC PEMs (one for each of the four DC PEMs) and two I/O levers for the DC power shelves (one for each power shelf).
5. Make sure all SFCs are pulled-out and disconnected from the backplane.
6. Energize the facility breaker to PEM 0, input 1 on the upper power shelf, PS0.
7. 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.
8. Turn the facility breaker to the OFF position.
9. Repeat steps 7 through 9 for each of the remaining three DC inputs on the upper power shelf, PS0.
10. Repeat steps 7 through 9 for each of the four DC inputs on the lower power shelf, PS1.
11. Turn the facility power breakers for the upper power shelf, PS0, to the ON position. Repeat for the lower power shelf, PS1.
12. Turn the upper power shelf (PS0; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51) I/O switch to the ON position. Verify that the “CBREAKER TRIP” LED on the front panel of each DC PEM is yellow and that no other LEDs are active.
13. Turn the first PEM (A0; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51) I/O switch on the upper power shelf (PS0) to the ON position. Verify that the “PWR OK” LED on the front panel of the DC PEM is green and that no other LEDs are active. Repeat for the other DC PEM (A1; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51).
14. Turn the lower power shelf (PS1; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51) I/O switch to the ON position. Verify that the “CBREAKER TRIP” LED on the front panel of the DC PEM is yellow and that no other LEDs are active.
15. Turn the first DC PEM (B0; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51) I/O switch on the lower power shelf (PS1) to the ON position. Verify that the “PWR OK” LED on the front panel of the DC PEM is green and that no other LEDs are active. Repeat for the other DC PEM (B1; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51).
16. Turn the I/O switches on all PEMs and both power shelves to the OFF position. Verify that no LEDs on the PEM front panels are active.
17. Insert all boards into the chassis (see *Installing and Removing Fabric Cards and Card Components* chapter).
18. Turn the power shelf (PS0 and PS1) I/O switches to the ON position.
19. Turn all DC PEM I/O switches to the ON position.
20. Measure the input voltage of each input and compare this value to the voltage measurement noted in step 7. Verify that the equipment is still receiving the correct input voltage measured in step 7.

DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

Step 2 Verify that the safety ground wiring is connected to the upper and lower power shelves.

Step 3 Make sure that the facility power breakers for the upper (PS0) and lower (PS1) power shelves are in the OFF position.

Step 4 Make sure that all the I/O switches are in the OFF position. That is, make sure all I/O levers are pulled out. There are total of four I/O levers for the DC PEMs (one for each of the four DC PEMs) and two I/O levers for the DC power shelves (one for each power shelf).

Step 5 Make sure all SFCs are pulled-out and disconnected from the backplane.

Step 6 Energize the facility breaker to PEM 0, input 1 on the upper power shelf, PS0.

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.

Step 7 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.

Step 8 Turn the facility breaker to the OFF position.

Step 9 Repeat steps 7 through 9 for each of the remaining three DC inputs on the upper power shelf, PS0.

Step 10 Repeat steps 7 through 9 for each of the four DC inputs on the lower power shelf, PS1.

Step 11 Turn the facility power breakers for the upper power shelf, PS0, to the ON position. Repeat for the lower power shelf, PS1.

Step 12 Turn the upper power shelf (PS0; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51) I/O switch to the ON position. Verify that the “CBREAKER TRIP” LED on the front panel of each DC PEM is yellow and that no other LEDs are active.

Step 13 Turn the first PEM (A0; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51) I/O switch on the upper power shelf (PS0) to the ON position. Verify that the “PWR OK” LED on the front panel of the DC PEM is green and that no other LEDs are active. Repeat for the other DC PEM (A1; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51).

Step 14 Turn the lower power shelf (PS1; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51) I/O switch to the ON position. Verify that the “CBREAKER TRIP” LED on the front panel of the DC PEM is yellow and that no other LEDs are active.

Step 15 Turn the first DC PEM (B0; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51) I/O switch on the lower power shelf (PS1) to the ON position. Verify that the “PWR OK” LED on the front panel of the DC PEM is green and that no other LEDs are active. Repeat for the other DC PEM (B1; see Figure 29: FCC Front (SFC) Side Slot Numbers, on page 51).

Step 16 Turn the I/O switches on all PEMs and both power shelves to the OFF position. Verify that no LEDs on the PEM front panels are active.

Step 17 Insert all boards into the chassis (see *Installing and Removing Fabric Cards and Card Components* chapter).

Step 18 Turn the power shelf (PS0 and PS1) I/O switches to the ON position.

Step 19 Turn all DC PEM I/O switches to the ON position.

Note If the “PWR OK” LED on the front panel of any of the DC PEMs remains yellow after turning the DC PEM I/O switch to the ON position, turn off the PEM with the PEM I/O switch, wait 15 seconds then turn the PEM I/O switch back on.

Step 20 Measure the input voltage of each input and compare this value to the voltage measurement noted in step 7. Verify that the equipment is still receiving the correct input voltage measured in step 7.

Note Should there be an initial yellow LED indication at turn-on, turn off the PEM with the PEM I/O switch, wait 15 seconds, and then turn the PEM back on.

Note For appropriate SFC LED information, see the appropriate section in *Installing and Removing Fabric Cards and Card Components* chapter or the specific documentation for the card.

To power down the chassis entirely, you must power down both of the power shelves by moving the power shelf I/O switch to the OFF position by lifting **up** on the lever and pulling it out. Both power shelves must be disconnected to de-energize the chassis completely.

Note All DC power cables must be de-energized to fully remove power from the chassis.

This table shows the meaning of the LED status lights on the DC PEMs.

Table 5: DC PEM LED Status Indicator Lights

LED Name	Color	Function or Meaning
PWR OK	GREEN	DC PEM is operating normally in a powered up condition.
FAULT	YELLOW	A fault has been detected within the DC PEM.
DC INPUT FAIL	YELLOW	This is an indication that DC input is out of range or is not being provided to the DC PEM
OT	YELLOW	The DC PEM is in an over temperature condition and shutdown has occurred
CBREAKER TRIP	YELLOW	PEM I/O switch is in the OFF position

Converting from One Fixed Configuration Power System to Another

To convert an FCC with a fixed configuration power system from AC to DC power, or from DC to AC power, perform the following steps:

SUMMARY STEPS

1. Power down the chassis completely. See the Powering Up and Down a Chassis with Fixed Configuration AC Power or the Powering Up and Down a Chassis with Fixed Configuration DC Power for more information.
2. Remove the alarm modules. See the Removing a Fixed Configuration Alarm Module.
3. Remove the AC rectifiers or DC PEMs. See the Removing an AC Rectifier or DC PEM.
4. Unplug the AC power cords or remove the DC fusing from the power source. Remove the AC or DC wiring from the rear of the fixed configuration power shelf. Remove the AC power cords or DC wiring and ground wire from the rear of the fixed configuration power shelves. See the Removing Fixed Configuration AC Power Shelf Wiring and the Removing Fixed Configuration DC Power Shelf Wiring.
5. Remove both power shelves. See the *Removing a Fixed Configuration Power Shelf* section.
6. Install the new power shelves. See the Installing a Fixed Configuration Power Shelf.
7. Install the wiring on the rear of the power shelf. See the Installing Fixed Configuration AC Power Shelf Cord or the Installing Fixed Configuration DC Power Shelf Wiring.
8. Install the AC rectifiers or DC PEMs, and the alarm modules in both power shelves. See the Installing an AC Rectifier or DC PEM and the Installing a Fixed Configuration Alarm Module .
9. Replace the DC fuses or restore AC service.
10. Power the chassis back up. See the Powering Up and Down a Chassis with Fixed Configuration AC Power or the Powering Up and Down a Chassis with Fixed Configuration DC Power for more information.

DETAILED STEPS

Step 1 Power down the chassis completely. See the Powering Up and Down a Chassis with Fixed Configuration AC Power or the Powering Up and Down a Chassis with Fixed Configuration DC Power for more information.

Step 2 Remove the alarm modules. See the Removing a Fixed Configuration Alarm Module.

Step 3 Remove the AC rectifiers or DC PEMs. See the Removing an AC Rectifier or DC PEM.

Step 4 Unplug the AC power cords or remove the DC fusing from the power source. Remove the AC or DC wiring from the rear of the fixed configuration power shelf. Remove the AC power cords or DC wiring and ground wire from the rear of the fixed configuration power shelves. See the Removing Fixed Configuration AC Power Shelf Wiring and the Removing Fixed Configuration DC Power Shelf Wiring.

Step 5 Remove both power shelves. See the *Removing a Fixed Configuration Power Shelf* section.

Step 6 Install the new power shelves. See the Installing a Fixed Configuration Power Shelf.

Step 7 Install the wiring on the rear of the power shelf. See the Installing Fixed Configuration AC Power Shelf Cord or the Installing Fixed Configuration DC Power Shelf Wiring.

Step 8 Install the AC rectifiers or DC PEMs, and the alarm modules in both power shelves. See the Installing an AC Rectifier or DC PEM and the Installing a Fixed Configuration Alarm Module .

Step 9 Replace the DC fuses or restore AC service.

Step 10 Power the chassis back up. See the Powering Up and Down a Chassis with Fixed Configuration AC Power or the Powering Up and Down a Chassis with Fixed Configuration DC Power for more information.

What to Do Next

Caution Use only one type of fixed configuration power shelf—AC Wye, AC Delta, or DC—and its mating AC rectifier or DC PEM in a chassis at one time.

How to Install and Remove Modular Configuration Power Components

This section describes how to install and remove modular configuration power components in the FCC.

Before you can install the modular configuration power components, you must install the modular configuration power shelf into the chassis. After installing the power shelf, you can install the PMs and alarm module into the power shelf.

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

If you are replacing a fixed configuration power system with a modular configuration power system, you must change the entire power shelf before you can install the power components. For more information, refer to the How to Convert a Chassis from Fixed Configuration Power to Modular Configuration Power.

This section contains the following procedures:

Installing a Modular Configuration Power Shelf

This section describes how to install the modular configuration DC power shelves in the FCC.

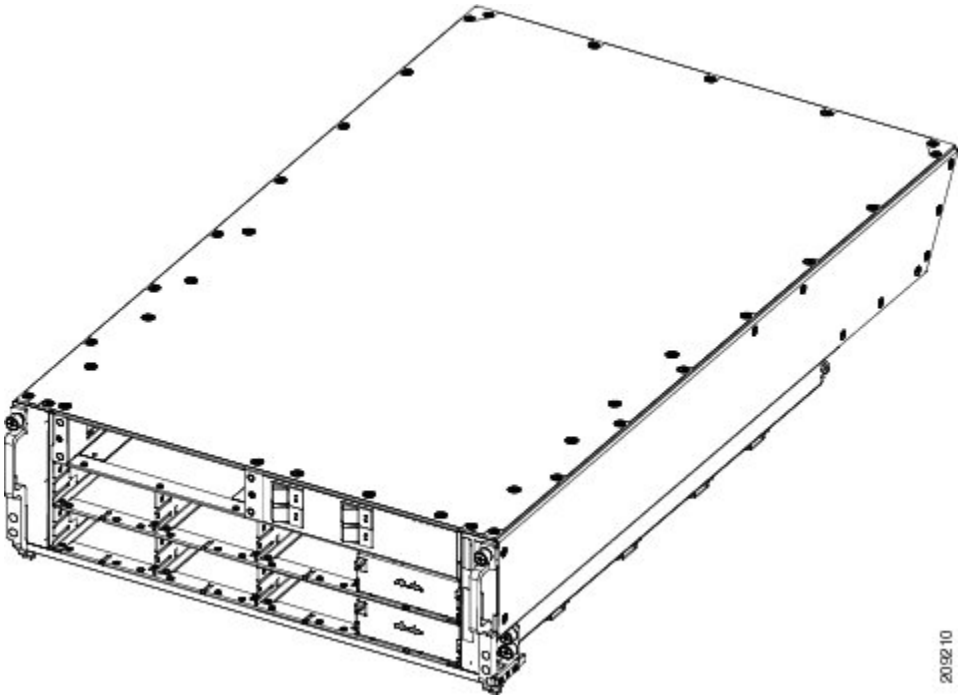
Caution Do not use the handles for lifting or supporting the power shelf, since this could severely damage the handles.

Caution Do not bend the handles sideways during any part of the installation process.

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

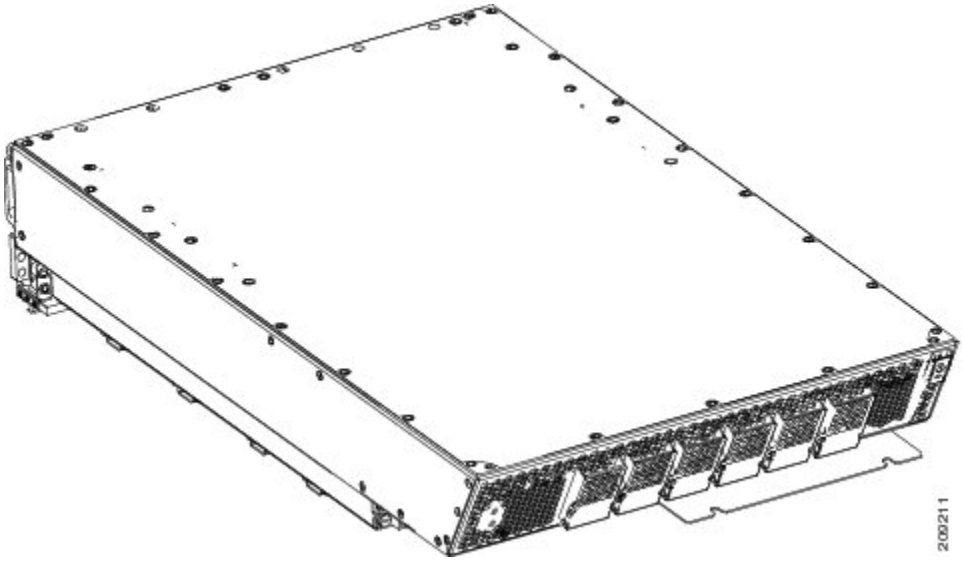
This figure shows the front view of the modular configuration DC power shelf.

Figure 30: Modular Configuration DC Power Shelf, Front View



This figure shows the rear view of the modular configuration DC power shelf.

Figure 31: Modular Configuration DC Power Shelf, Rear View



This figure shows the front view of the modular configuration AC power shelf.

This figure shows the rear view of the modular configuration AC power shelf.

Prerequisites

Remove the upper grilles on the front and rear of the chassis, if installed. Verify that the power shelf that you are about to install is the correct power shelf.

Note Do not install the power shelf in the chassis with AC or DC PMs, or alarm module installed in the power shelf.

Required Tools and Equipment

You need the following tools to perform this task:

- 6-in. long number 1 Phillips screwdriver
- 10-mm 6 pt. combination wrench
- Modular configuration AC or DC power shelf
  - AC power shelf (Cisco product number CRS-FCC-PSH-AC=)
  - DC power shelf (Cisco product number CRS-FCC-PSH-DC=)

Steps

To install the modular configuration power shelf, perform the following steps:

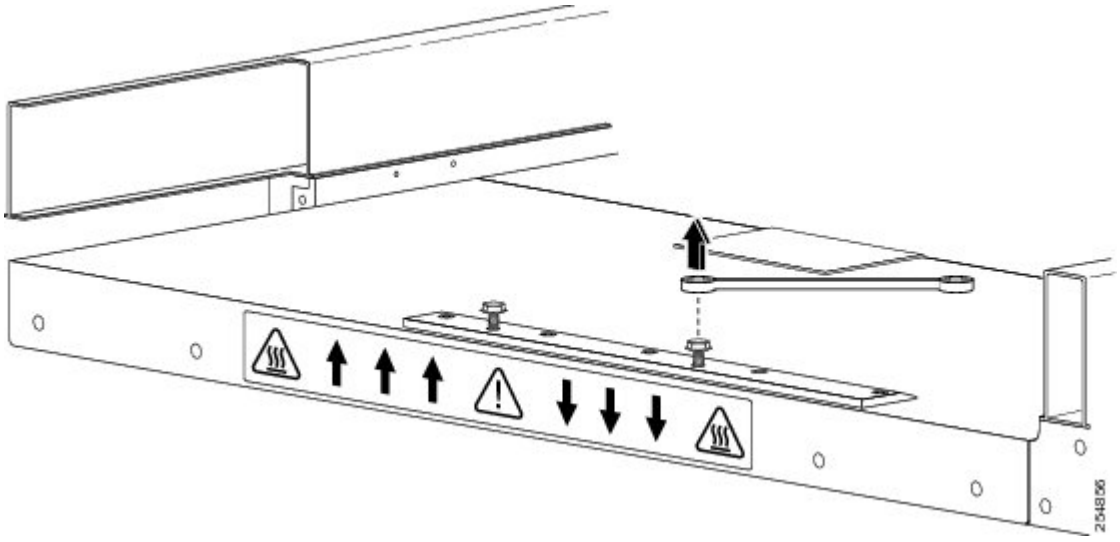
SUMMARY STEPS

1. Using the 10-mm wrench, loosen the two bolts on the rear of the chassis that clamp the rear of the power shelf to the chassis, as shown in this figure.
2. Install the mounting blocks on the left and right sides of the chassis. The left side is shown in this figure. A second mounting block is located on the right side.
3. Unscrew the ejector handles from the front face of the shelf, one on each side.
4. Holding the power shelf underneath with one hand and steadying it with the other, lift the shelf up and slide it partway into the power shelf slot on the front (SFC) side of the chassis.
5. Grasping both handles simultaneously, push both the left and right handles up in unison to push the shelf into the chassis. See the figure *Using Handles to Push the Shelf into the Chassis*. Slide the shelf all the way into the chassis, pushing in the shelf until both handles hook around the pins, as shown in the figure *Shelf Handles Hooked Around Pins*.
6. Use the wrench to tighten the two bolts that attach the rear of the power shelf to the rear of the chassis.
7. Using the screwdriver, turn the captive screws at the top of the left and right handles, as shown in the figure below.
8. Use the screwdriver to screw the shelf to the left and right mounting blocks through the handle holes. There are four holes, two on each handle, as shown in the figure.

DETAILED STEPS

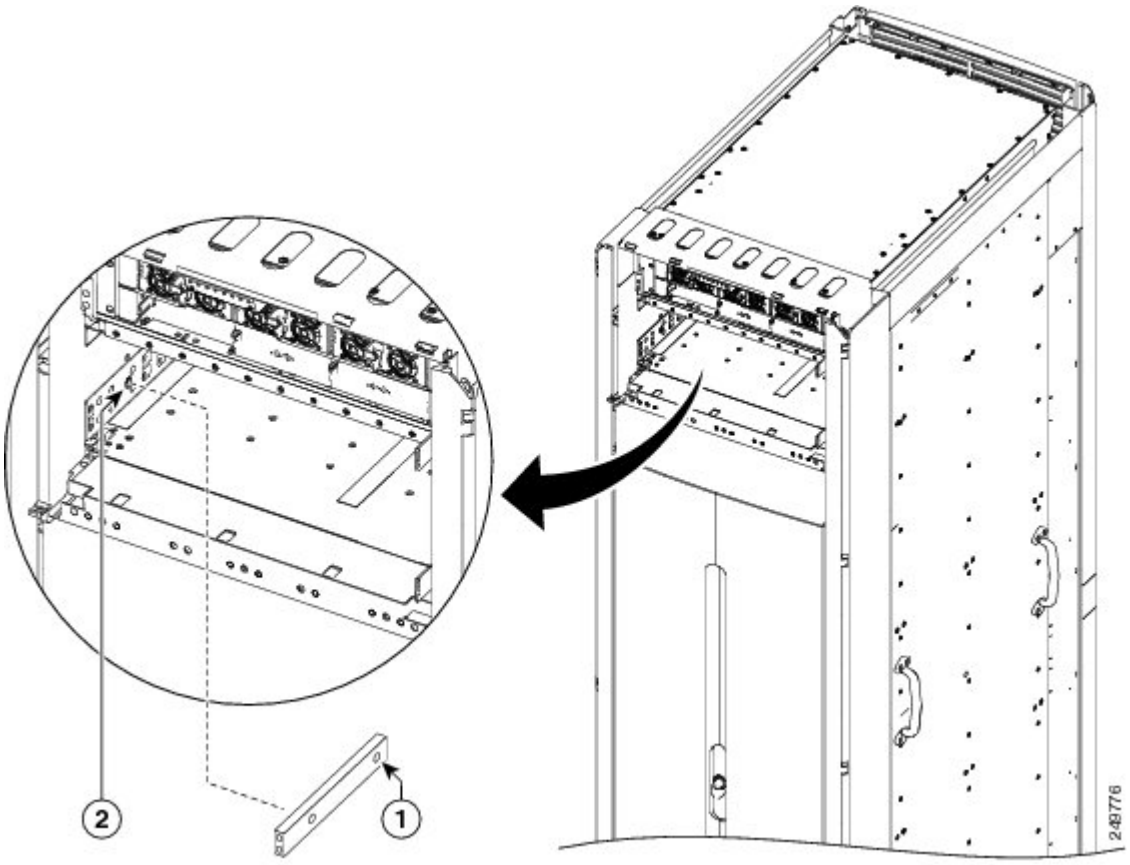
Step 1 Using the 10-mm wrench, loosen the two bolts on the rear of the chassis that clamp the rear of the power shelf to the chassis, as shown in this figure.

Figure 32: Loosening Bolts on Rear of Chassis



Step 2 Install the mounting blocks on the left and right sides of the chassis. The left side is shown in this figure. A second mounting block is located on the right side.

Figure 33: Mounting Block Position in Chassis, One per Side



1	Mounting block with two screw holes.
2	Holes in chassis to be aligned with mounting block

Step 3 Unscrew the ejector handles from the front face of the shelf, one on each side.

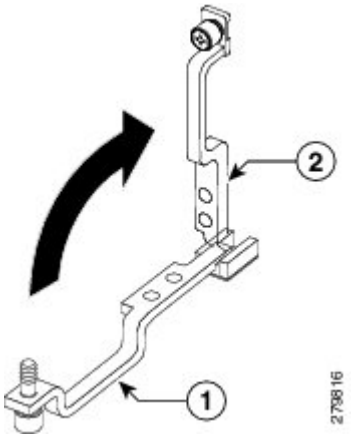
Caution In the following step, make sure both handles swing straight up. Use care not to bend the handles sideways.

Step 4 Holding the power shelf underneath with one hand and steadying it with the other, lift the shelf up and slide it partway into the power shelf slot on the front (SFC) side of the chassis.

Caution Because of the weight of the power shelf and the rack-mounted height of the chassis, you should be especially careful while lifting and removing the power shelf. To prevent injury, keep your back straight and lift with your legs, not your back. Avoid sudden twists or lateral moves. It is safer to use two people and a ladder to install or remove the power shelf rather than a single person. After two people have placed the power shelf in position, one person can slide it into place.

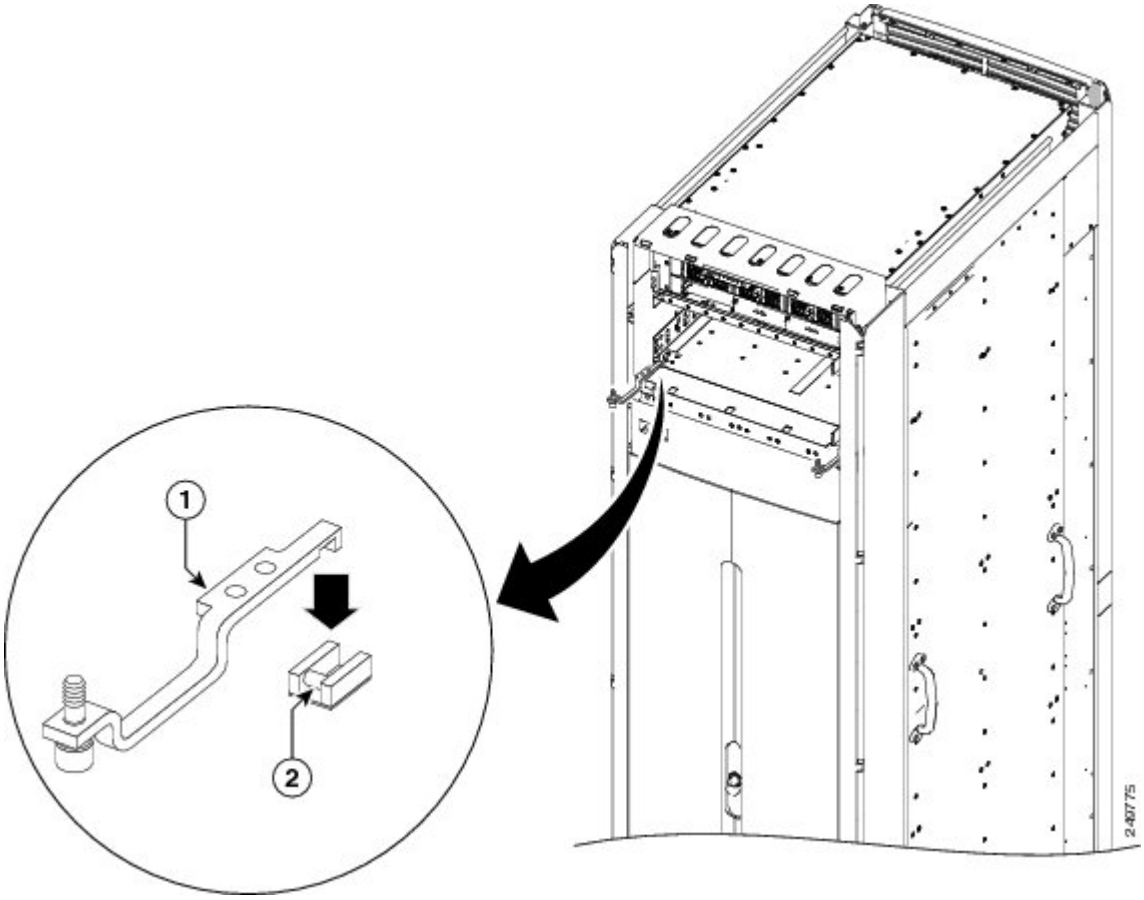
Step 5 Grasping both handles simultaneously, push both the left and right handles up in unison to push the shelf into the chassis. See the figure *Using Handles to Push the Shelf into the Chassis*. Slide the shelf all the way into the chassis, pushing in the shelf until both handles hook around the pins, as shown in the figure *Shelf Handles Hooked Around Pins*.

Figure 34: Using Handles to Push the Shelf into the Chassis



1	Ejector handles pulled away from shelf.
2	Ejector handles pushed up to slide in shelf.

Figure 35: Shelf Handles Hooked Around Pins



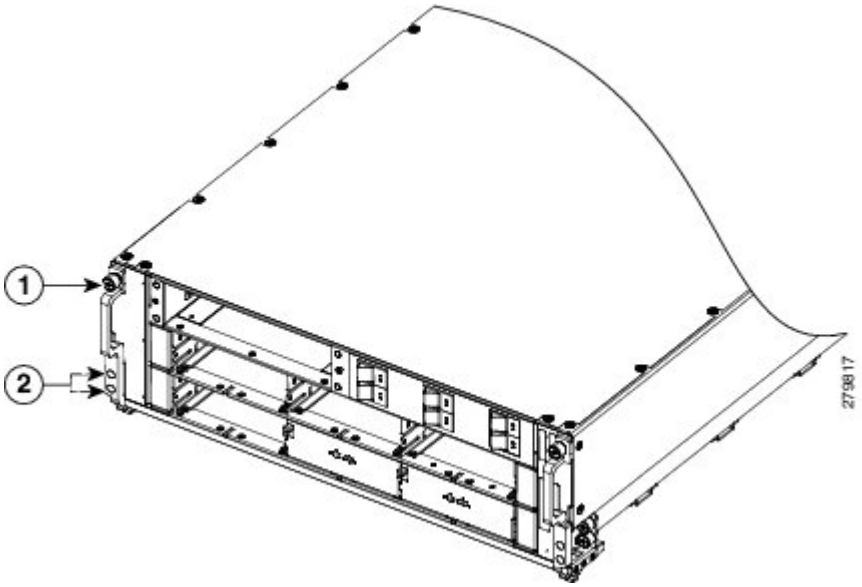
1	Ejector handles section that fits around mounting pins.
2	Mounting pins which are permanently installed in the chassis and cannot be moved or removed.

Step 6 Use the wrench to tighten the two bolts that attach the rear of the power shelf to the rear of the chassis.

Step 7 Using the screwdriver, turn the captive screws at the top of the left and right handles, as shown in the figure below.

Step 8 Use the screwdriver to screw the shelf to the left and right mounting blocks through the handle holes. There are four holes, two on each handle, as shown in the figure.

Figure 36: Securing the Power Shelf Ejector Handle



1	Top mounting screw in handle.
2	Holes for the screw that attaches the power shelf to the mounting block though the handle.

What to Do Next

After the modular configuration power shelves are installed in the chassis, install the grounding lug and brackets, and AC or DC power shelf wiring. Continue to the Installing Power Shelf Grounding Brackets and the Installing AC or DC Power Self Wiring for instructions.

Removing a Modular Configuration Power Shelf

This section describes how to remove an AC or DC modular configuration power shelf from the FCC.

Prerequisites

Before performing this task, remove the upper grilles on the front (SFC) side and rear (OIM) side of the chassis, AC or DC PMs, alarm module, AC or DC input wiring from the shelf you want to disconnect, and power shelf grounding brackets. For more information, see the Removing a Modular Configuration Power Module, the Removing a Modular Configuration Alarm Module, and the Removing Power Shelf Grounding Brackets.

Required Tools and Equipment

You need the following tools to perform this task:

- 6 in. long number 1 Phillips screwdriver
- 10-mm 6 pt. combination wrench

Caution Do not use the handles for lifting or supporting the power shelf, since this could severely damage the handles.

Caution Do not bend the handles sideways during any part of the removal process.

Steps

To remove a modular configuration power shelf, perform the following steps:

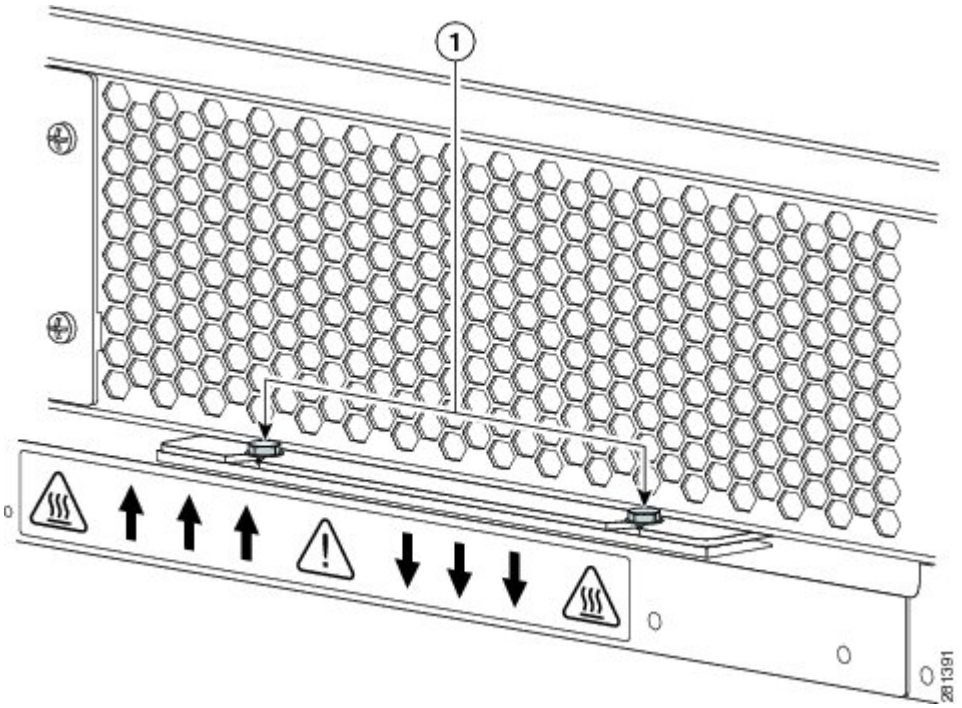
SUMMARY STEPS

1. Using the wrench, loosen the two bolts on the rear of the chassis that clamp the rear of the power shelf to the rear of the chassis. See this figure.
2. Insert the screwdriver through the hole in the mounting handles, and unscrew the shelf from the right and left side of the mounting blocks. See this figure.
3. Using the screwdriver, unscrew the captive screw on the left and right handles. There are two captive screws, one on each handle, as shown in the above figure.
4. Grasping both handles simultaneously, pull both the left and right handles down in unison to pull the shelf partially out of the chassis.
5. When the shelf is partially out of the chassis and the ejector handles are away from the pins, hand-tighten the handle screws back into the shelf.
6. Slide out the shelf out so that two people can safely remove it and carefully set it down on a flat surface.

DETAILED STEPS

Step 1 Using the wrench, loosen the two bolts on the rear of the chassis that clamp the rear of the power shelf to the rear of the chassis. See this figure.

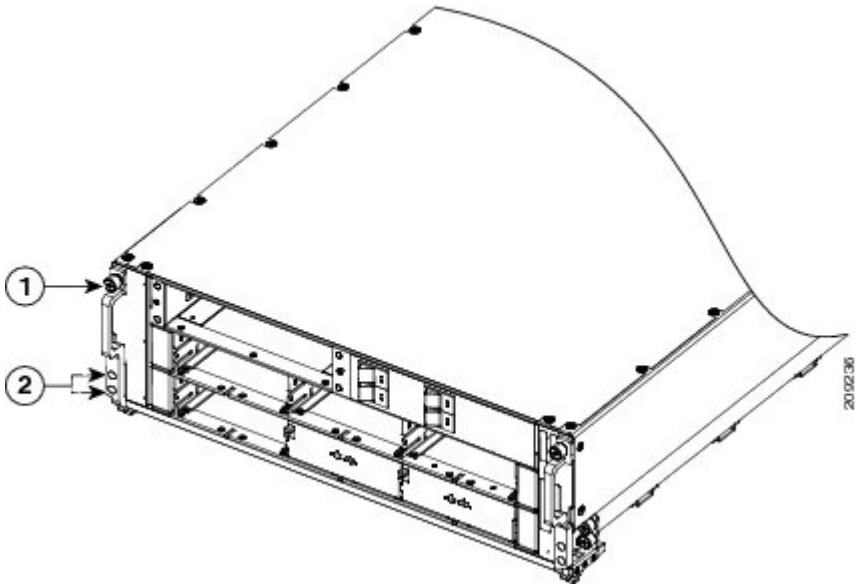
Figure 37: Remove Bolts that Secure Rear of Power Shelf to Rear of Chassis



1	Bolts that secure rear of power shelf to rear of chassis

Step 2 Insert the screwdriver through the hole in the mounting handles, and unscrew the shelf from the right and left side of the mounting blocks. See this figure.

Figure 38: Unscrewing the Power Shelf from the Mounting Blocks

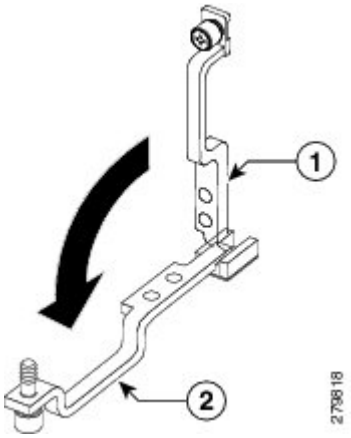


1	Top mounting screw in handle.
2	Holes for the screw that attaches the power shelf to the mounting block though the handle.

Step 3 Using the screwdriver, unscrew the captive screw on the left and right handles. There are two captive screws, one on each handle, as shown in the above figure.

Note The handles will fall down and slightly away from the shelf, as shown in this figure.

Figure 39: Mounting Handle Fallen Away from the Shelf



1	Initial position, with handle in place against the power shelf
2	Handle pulled down for removal of power shelf

Step 4 Grasping both handles simultaneously, pull both the left and right handles down in unison to pull the shelf partially out of the chassis.

Step 5 When the shelf is partially out of the chassis and the ejector handles are away from the pins, hand-tighten the handle screws back into the shelf.

Step 6 Slide out the shelf out so that two people can safely remove it and carefully set it down on a flat surface.

Caution Because of the weight of the power shelf and the rack-mounted height of the chassis, you should be especially careful while lifting and removing the power shelf. To prevent injury, keep your back straight and lift with your legs, not your back. Avoid sudden twists or lateral moves. It is safer to use two people and a ladder to install or remove the power shelf rather than a single person.

What to Do Next

After performing this task, replace any front (SFC) side cosmetic covers.

Installing Power Shelf Grounding Brackets

This section describes how to install the external grounding brackets on the FCC modular configuration power shelf. The installation procedure for installing the power shelf grounding brackets is the same for both the AC and DC modular configuration power shelves.

Caution Verify that the chassis is connected to a reliable earth ground; the ground cable must be installed in accordance with local electrical safety standards. For more information, see c_Bonding_and_Grounding_Guidelines_1165801.

Prerequisites

Before performing this task, ensure that the chassis grounding cable and both power shelves are installed in the chassis. See the Installing the Chassis Ground cable and the Installing a Modular Configuration Power Shelf for more information. Remove the upper grille on the rear (OIM) side of the chassis, if installed.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- 3/8-in. ratchet wrench with 10-mm socket
- Torque wrench with 10-mm socket and rated accuracy at 20 in.-lb (2.26 N-m)

Steps

To install the power shelf grounding brackets, go to the rear (OIM) side of the chassis and perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the rear (OIM) side of the chassis or a bare metal surface on the chassis.
2. Align the shelf grounding bracket with the power shelves.
3. Attach the shelf grounding bracket to both power shelves using the four M6 hex head bolts provided. Do not tighten. See this figure.
4. Attach the grounding L-bracket to the shelf grounding bracket using the two M6 hex nuts provided. Do not tighten. See this figure.
5. Attach the grounding L-bracket to the chassis using the two M6 hex bolts provided. Use the torque wrench to tighten the M6 hex bolts to a torque of 20 in-lb (2.26 N-m).
6. Using the torque wrench, tighten the four M6 hex bolts attaching the grounding bracket to the power shelves to a torque of 20 in-lb (2.26 N-m).
7. Using the torque wrench, tighten the two M6 hex nuts attaching the L-bracket to the Power shelf to a torque of 20 in-lb (2.26 N-m).

DETAILED STEPS

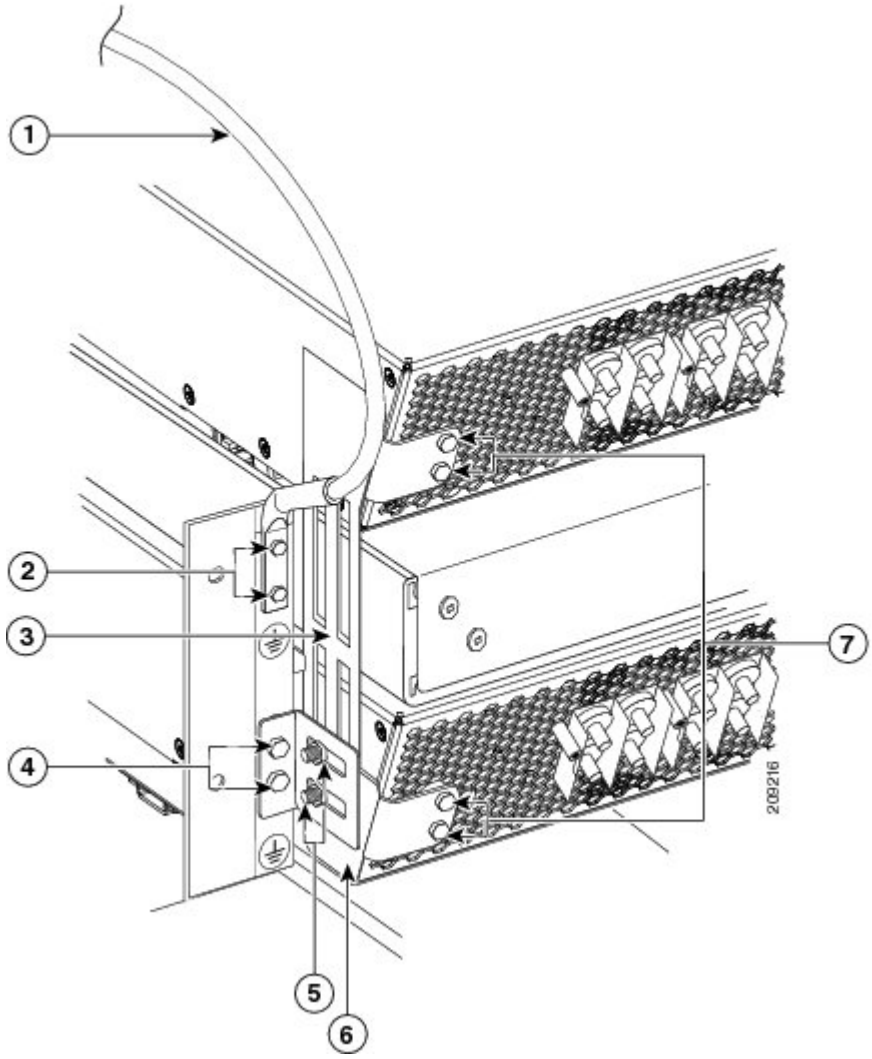
Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the rear (OIM) side of the chassis or a bare metal surface on the chassis.

Step 2 Align the shelf grounding bracket with the power shelves.

Step 3 Attach the shelf grounding bracket to both power shelves using the four M6 hex head bolts provided. Do not tighten. See this figure.

Step 4 Attach the grounding L-bracket to the shelf grounding bracket using the two M6 hex nuts provided. Do not tighten. See this figure.

Figure 40: Power Shelf Grounding Brackets



1	Chassis ground cable	5	Two M6 hex nuts attaching grounding L-bracket to shelf grounding bracket (step 4)
2	Two M6 hex bolts attaching ground lug to chassis	6	Grounding L-bracket (step 5)
3	Shelf grounding bracket (step 3)	7	Four M6 hex bolts attaching shelf grounding bracket to power shelves (step 3)
4	Two M6 hex bolts attaching grounding L-bracket to chassis (step 5)		

Step 5 Attach the grounding L-bracket to the chassis using the two M6 hex bolts provided. Use the torque wrench to tighten the M6 hex bolts to a torque of 20 in-lb (2.26 N-m).

Step 6 Using the torque wrench, tighten the four M6 hex bolts attaching the grounding bracket to the power shelves to a torque of 20 in-lb (2.26 N-m).

Step 7 Using the torque wrench, tighten the two M6 hex nuts attaching the L-bracket to the Power shelf to a torque of 20 in-lb (2.26 N-m).

What to Do Next

After the power shelf grounding brackets have been installed in the chassis, install the input wiring for the power shelf (see Installing AC or DC Power Self Wiring),install the alarm module (see Installing a Modular Configuration Alarm Module), and install the PMs (see Installing a Modular Configuration Power Module).

Removing Power Shelf Grounding Brackets

This section describes how to remove the power shelf grounding brackets for the Cisco CRS Fabric Card Chassis modular configuration power system. The procedure for removing the power shelf grounding brackets is the same for both the AC and DC modular configuration power supplies.

Prerequisites

Before performing this task, power down and remove any PMs and the alarm module in the shelf you want to remove, and remove the power wiring. See the Removing a Modular Configuration Power Module, theRemoving a Modular Configuration Alarm Module, and the Installing Modular Configuration AC Power Shelf Wiring for more information. Remove the upper grille on the rear (OIM) side of the chassis, if installed.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- 3/8-in. ratchet wrench with 10-mm socket

Steps

To remove the power shelf grounding brackets, go to the rear (OIM) side of the chassis and perform the following steps:

SUMMARY STEPS

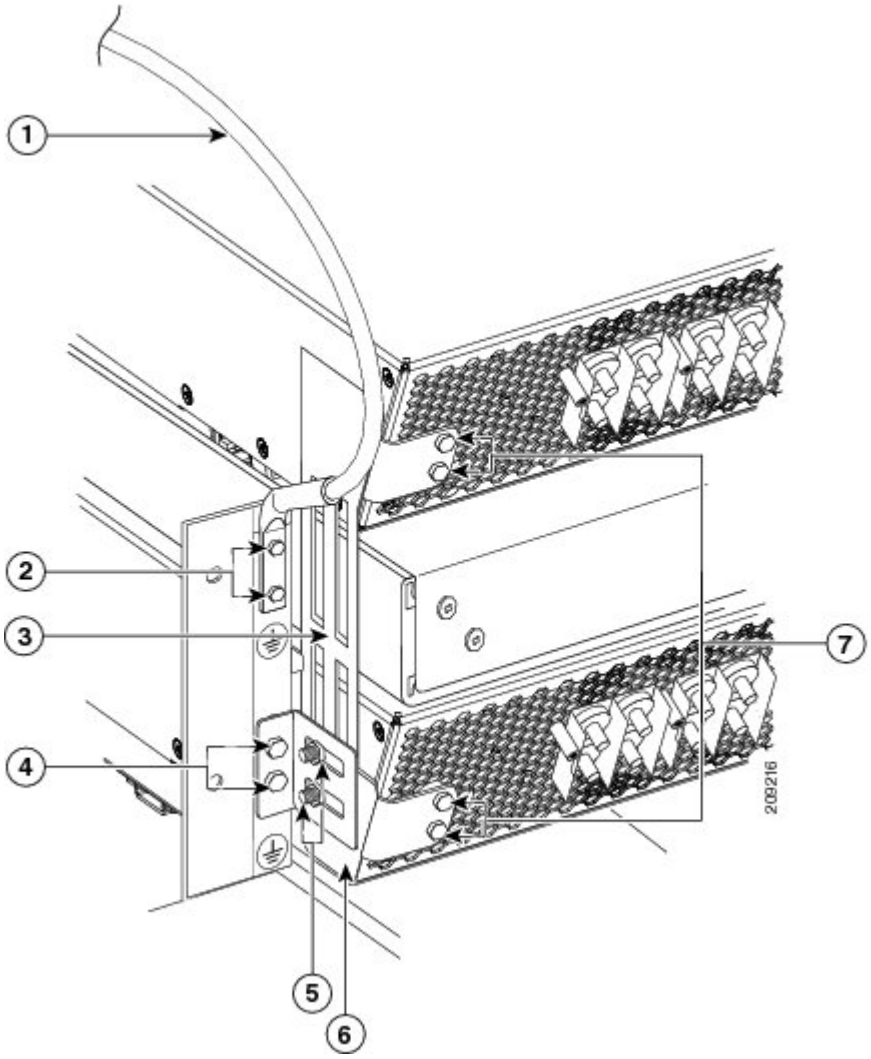
1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the rear (OIM) side of the chassis or a bare metal surface on the chassis.
2. Using a 10 mm socket wrench, loosen the two M6 hex nuts that attach the L-bracket to the power shelf. Do not fully remove. See this figure.
3. Using a 10 mm socket wrench, loosen the four M6 hex bolts that attach the grounding bracket to the power shelves. Do not fully remove. See above figure.
4. Use a 10 mm socket wrench to remove the M6 hex bolts that attach the grounding L-bracket to the chassis. See above figure.
5. Remove the two M6 hex nuts that attach the grounding L-bracket to the shelf grounding bracket.
6. Remove the grounding L-bracket. See above figure.
7. Remove the four M6 hex bolts that attach the grounding bracket to the power shelves.
8. Remove the shelf grounding bracket from the power shelves. See above figure.
9. If the chassis is being replaced, use the 10-mm socket wrench to remove the ground cable from the grounding point on top of the chassis rear (OIM) side panel.

DETAILED STEPS

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 (OIM) side of the chassis or a bare metal surface on the chassis.

Step 2 Using a 10 mm socket wrench, loosen the two M6 hex nuts that attach the L-bracket to the power shelf. Do not fully remove. See this figure.

Figure 41: Power Shelf Grounding Brackets



1	Chassis ground cable	5	Two M6 hex nuts attaching grounding L-bracket to shelf grounding bracket (step 2)

2	Two M6 hex bolts attaching ground lug to chassis	6	Grounding L-bracket (step 6)
3	Shelf grounding bracket (step 8)	7	Four M6 hex bolts attaching shelf grounding bracket to power shelves (step 3)
4	Two M6 hex bolts attaching grounding L-bracket to chassis (step 4)		

Note A 45-degree grounding lug is shown in the above figure. A 180-degree (straight) grounding lug can also be used.

Step 3 Using a 10 mm socket wrench, loosen the four M6 hex bolts that attach the grounding bracket to the power shelves. Do not fully remove. See above figure.

Step 4 Use a 10 mm socket wrench to remove the M6 hex bolts that attach the grounding L-bracket to the chassis. See above figure.

Step 5 Remove the two M6 hex nuts that attach the grounding L-bracket to the shelf grounding bracket.

Step 6 Remove the grounding L-bracket. See above figure.

Step 7 Remove the four M6 hex bolts that attach the grounding bracket to the power shelves.

Step 8 Remove the shelf grounding bracket from the power shelves. See above figure.

Step 9 If the chassis is being replaced, use the 10-mm socket wrench to remove the ground cable from the grounding point on top of the chassis rear (OIM) side panel.

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

What to Do Next

After the power shelf grounding brackets have been removed, the power shelf can be removed from the chassis. See Removing a Modular Configuration Power Shelf.

Installing AC or DC Power Self Wiring

This section describes how to connect the DC input wiring to the rear of the power shelf and install the DC terminal block covers and AC cords on the FCC.

Installing Modular Configuration DC Power Shelf Wiring

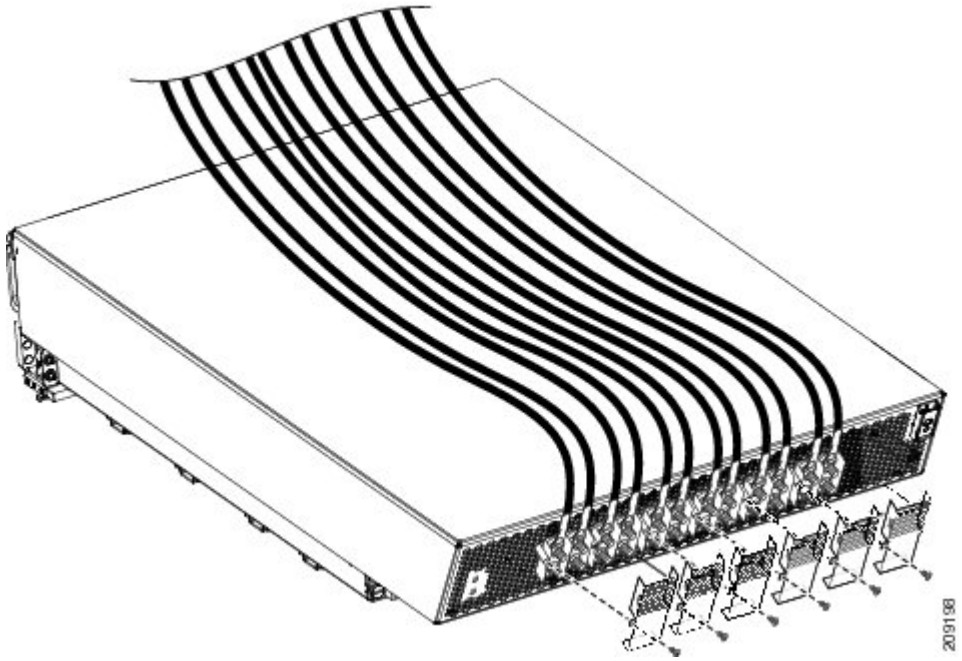
This section describes how to install the DC input wiring on the modular configuration DC power shelf.

Note When wiring the power shelf, be sure to connect the chassis ground cable and install auxiliary grounding brackets first. For more information, see the Bonding and Grounding Guidelines and the Installing Power Shelf Grounding Brackets.

Note Do not connect the ground cables directly to the power shelf. For more information, see the Installing Power Shelf Grounding Brackets.

This figure shows the cable wiring for the modular configuration DC power shelf.

Figure 42: DC Power Shelf Cable Wiring for Modular Configuration DC Power Shelf



For additional power shelf details, see Cisco CRS Series Carrier Routing System Description or Appendix 1, Cisco CRS-1 Carrier Routing System Fabric Card Chassis Specifications.

Prerequisites

Before performing this task, ensure that both power shelves are installed in the chassis. Remove the upper grille on the rear (OIM) side of the chassis, if installed.

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:

- ESD-preventive wrist strap
- Crimping tool and lug specific die
- 3/8 in. ratchet wrench with 10-mm socket
- Torque wrench with 10-mm 6-pt. socket and rated accuracy at 20 in.-lb (2.26 N-m)

Steps

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

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Remove the terminal block covers.
3. Verify the following resistance values:
4. Use the crimping tool mandated by the lug manufacturer to crimp the lugs to the DC-input cables. For details on lugs, see the DC Power Systems.
5. Using the 10-mm 6 pt. socket wrench, attach the positive and negative cable pairs to each terminal block for both power shelves. Use the torque wrench to tighten to a torque of 20 in.-lb (2.26 N-m).
6. Reattach the terminal covers. For more information, see the Installing DC Terminal Block Covers.

DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

Step 2 Remove the terminal block covers.

Step 3 Verify the following resistance values:

- 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.

Step 4 Use the crimping tool mandated by the lug manufacturer to crimp the lugs to the DC-input cables. For details on lugs, see the DC Power Systems.
The cable should be sized according to local and national installation requirements. Use only copper cable.

Note The power supply terminal block lug opening width is 0.63 inch (1.60 cm). 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.

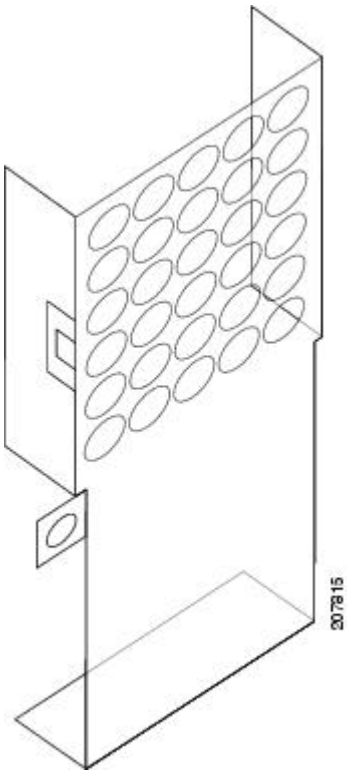
Step 5 Using the 10-mm 6 pt. socket wrench, attach the positive and negative cable pairs to each terminal block for both power shelves. Use the torque wrench to tighten to a torque of 20 in.-lb (2.26 N-m).

Step 6 Reattach the terminal covers. For more information, see the Installing DC Terminal Block Covers.

Installing DC Terminal Block Covers

This figure shows the terminal block cover.

Figure 43: 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 to perform this task:

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver

Steps

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

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Align the DC terminal block cover with the cover latch tab.
3. Use the screwdriver to secure the screw into the mounting standoff, as shown in this figure.

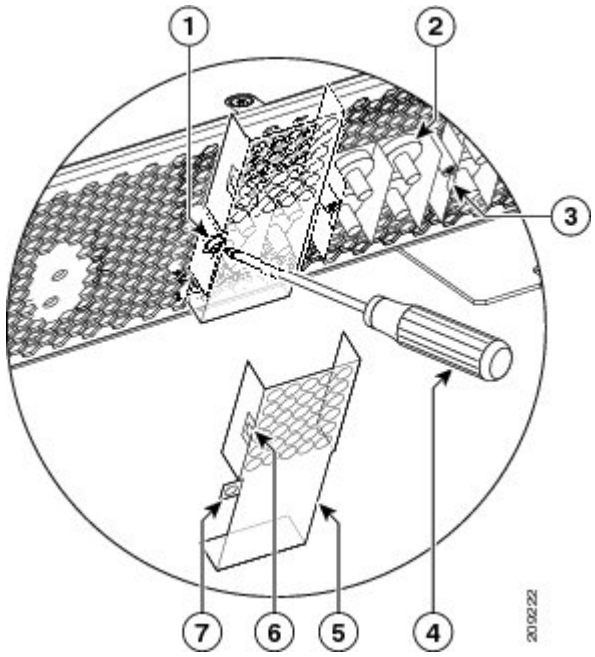
DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

Step 2 Align the DC terminal block cover with the cover latch tab.

Step 3 Use the screwdriver to secure the screw into the mounting standoff, as shown in this figure.

Figure 44: Securing the Terminal Block Cover



1	Screw to tighten (pre-installed on terminal block)	5	Terminal block cover

2	DC terminal block	6	Opening to align over mounting pins
3	Cover latch tab	7	Opening to align over mounting pins
4	Screwdriver securing the cover		

Installing Modular Configuration AC Power Shelf Wiring

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

Note When wiring the power shelf, be sure to connect the chassis ground cable and install auxiliary grounding brackets first. For more information, see the Bonding and Grounding Guidelines and the Installing Power Shelf Grounding Brackets .

Do not connect the ground cables directly to the modular configuration power shelf. For more information, see the Installing Power Shelf Grounding Brackets .

Prerequisites

Before performing this task, ensure that both power shelves are installed in the chassis. Remove the upper grille on the rear (OIM) side of the chassis, if installed.

If you have AC Delta or AC Wye at your equipment, ensure that two *Cisco CRS PDUs* are installed to convert 3-phase AC input power to single-phase AC input power for the power shelves. For further information, refer to *Cisco CRS 3-Phase AC Power Distribution Unit Installation Guide* .

Note Before installing input AC 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

Steps

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

SUMMARY STEPS

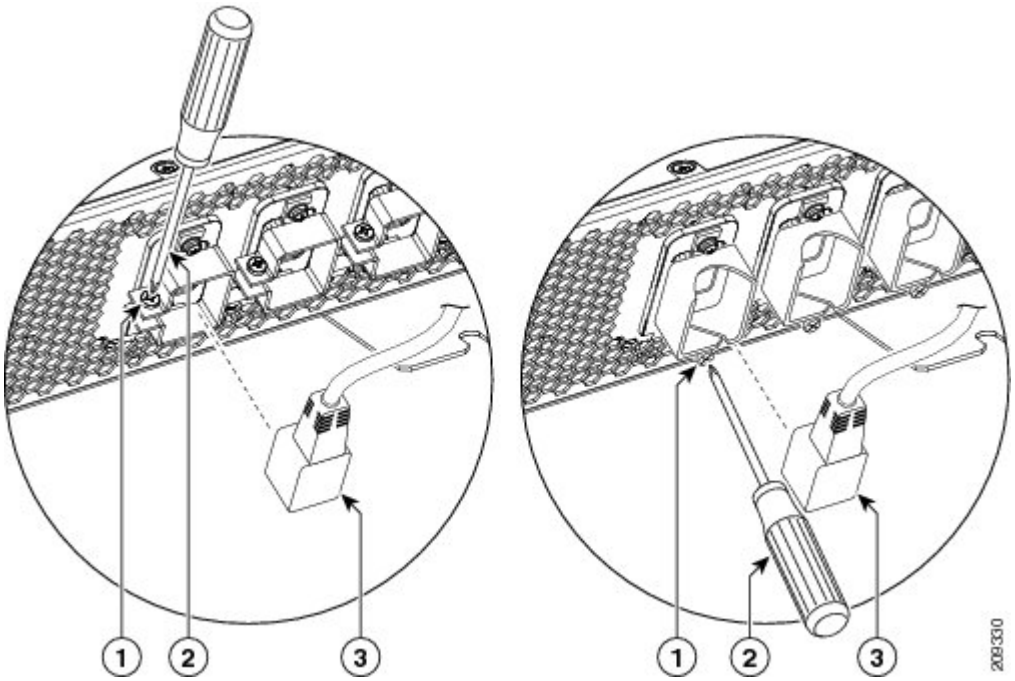
1. Insert the cords into the cord clamps, see this figure.
2. Use the screwdriver to tighten the screws that clamp the cords in place, see the above figure.

DETAILED STEPS

Step 1 Insert the cords into the cord clamps, see this figure.

Note If you have a Cisco CRS PDU installed, the AC cords must be installed as labeled. For further information, refer to *Cisco CRS 3-Phase AC Power Distribution Unit Installation Guide*.

Figure 45: Cord Being Inserted into Cord Clamp



1	Screw that secures the cord clamp	3	Cord to be inserted into clamp
2	Screwdriver tightening screw		

Note In the above figure, the AC cord clamp shown on the left was available until June 2011, and the AC cord clamp shown on the right is available from June 2011 onwards. The location of the screw that secures the cord in the cord clamp is different.

Step 2 Use the screwdriver to tighten the screws that clamp the cords in place, see the above figure.

What to do next

After you install the DC terminal block covers or AC cords, install the alarm module (see Installing a Modular Configuration Alarm Module).

Removing AC or DC Power Shelf Wiring

This section describes how to remove the DC input wiring, DC terminal blocks and AC cords from the rear of the power shelf on the FCC.

Removing Modular Configuration DC Power Shelf Wiring

This section describes how to remove the DC power shelf wiring from the rear of the modular configuration DC power shelf.

For additional power shelf details, see *Cisco CRS Series Carrier Routing System Description* or *Appendix 1, "Cisco CRS-1 Carrier Routing System Fabric Card Chassis Specifications."*

Prerequisites

Before performing this task power down and remove DC PMs and the alarm module in the shelf you want to disconnect. Remove the upper grille on the rear (OIM) side of the chassis, if installed.

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

Steps

To disconnect wiring from the fixed configuration DC power shelf, perform the following steps:

SUMMARY STEPS

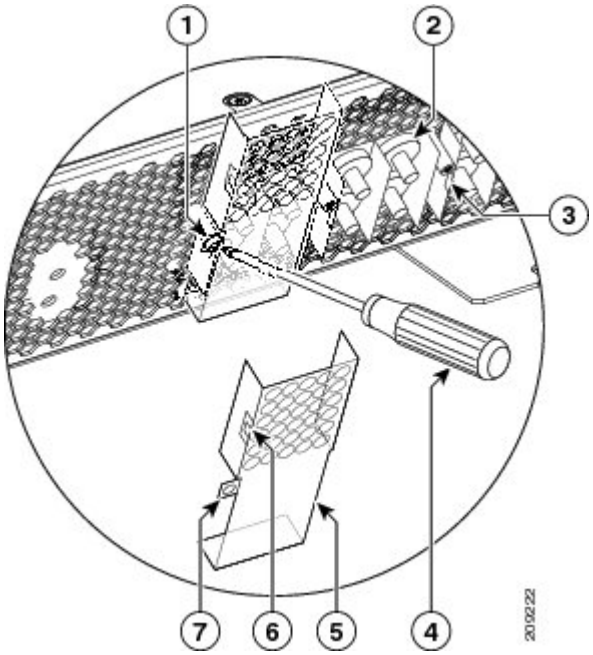
1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Use the screwdriver to remove the screw that secures the terminal block cover into the mounting standoff.
3. Remove the terminal block cover.
4. Using the 10-mm socket wrench, remove the positive and negative cable pairs from each terminal block.
5. Replace the terminal block cover.

DETAILED STEPS

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 (SFC) 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 46: Removing the Terminal Block Cover



1	Screw to tighten (pre-installed on terminal block)	5	Terminal block cover
2	DC terminal block	6	Opening to align over mounting pins
3	Cover latch tab	7	Opening to align over mounting pins

4	Screwdriver securing the cover		

Step 3 Remove the terminal block cover.

Step 4 Using the 10-mm socket wrench, remove the positive and negative cable pairs from each terminal block.

Note When a cable is removed from the rear of the DC modular configuration power shelf, we recommend that it should be wrapped with standard black electrical tape.

Step 5 Replace the terminal block cover.

Removing Modular Configuration AC Power Shelf Wiring

This section describes how to remove input AC cords from the rear of the modular configuration AC power shelf.

Prerequisites

Before performing this task power down and remove AC PMs and the alarm module in the shelf you want to disconnect. Remove the upper grille on the rear (OIM) side of the chassis, if installed.

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

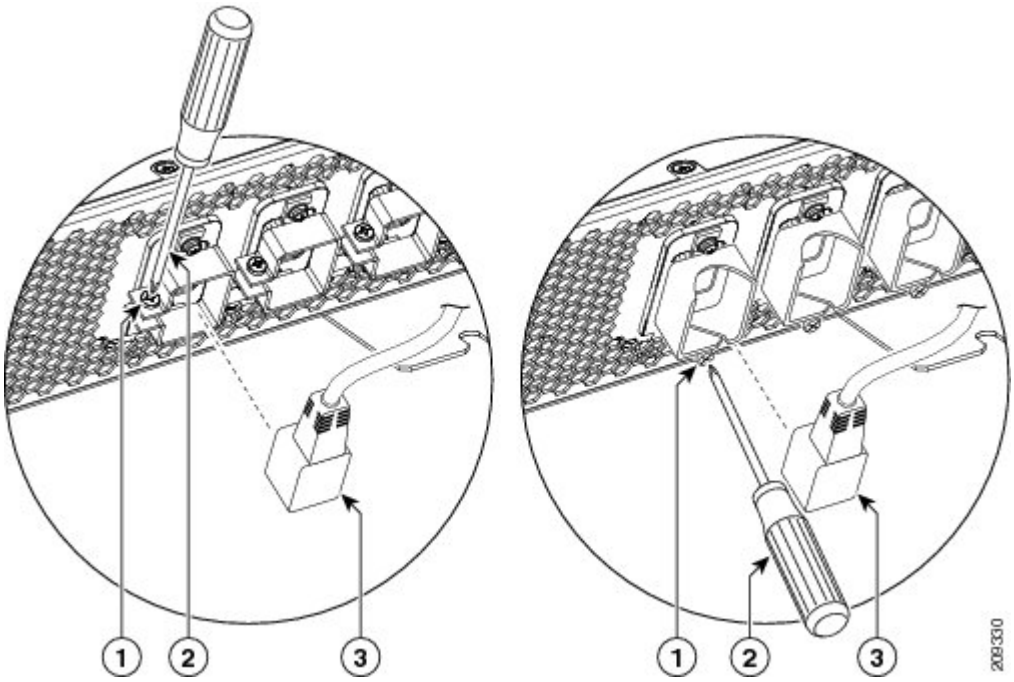
SUMMARY STEPS

1. Use the screwdriver to loosen the screws that clamp the cords in place, see this figure .
2. Remove the cords from the cord clamps.

DETAILED STEPS

Step 1 Use the screwdriver to loosen the screws that clamp the cords in place, see this figure .

Figure 47: Cord Being Removed from Cord Clamp



1	Screw that secures the cord clamp	3	Cord to be inserted into clamp
2	Screwdriver tightening screw		

Note In the above figure, the AC cord clamp shown on the left was available until June 2011, and the AC cord clamp shown on the right is available from June 2011 onwards. The location of the screw that secures the cord in the cord clamp is different.

Step 2 Remove the cords from the cord clamps.

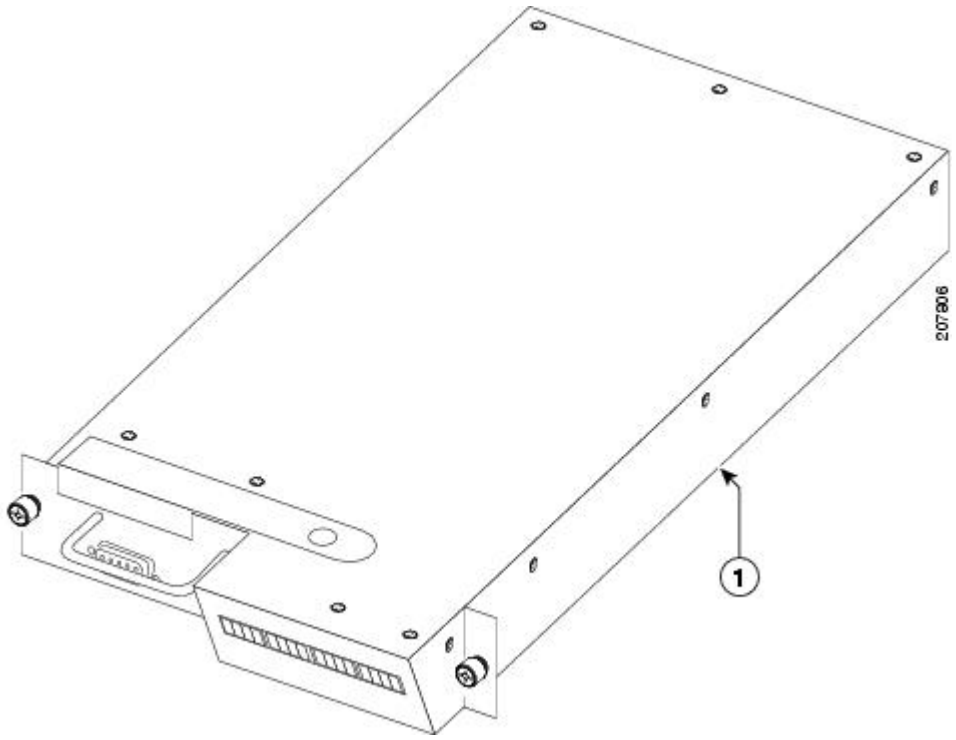
What to do next

After you remove the DC wiring and DC terminal block covers or AC cords, remove the power shelf. See the Removing a Modular Configuration Power Shelf .

Installing a Modular Configuration Alarm Module

This section describes how to install the alarm module, shown in this figure, in a modular configuration AC or DC power shelf in the FCC.

Figure 48: Modular Configuration Alarm Module



1	Side of alarm module to be installed on right side of opening.

Caution Do not attempt to install the alarm module until the modular configuration power shelf is in place and screwed into the chassis.

Prerequisites

Before performing this task remove the upper grille on the front (SFC) side of the chassis, 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
- Modular configuration alarm module (Cisco product number CRS-16-ALARM-C=)

Steps

To install the alarm module, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Slide the alarm module into the top left bay on the power shelf, with the display on the right side and the handle on the left side.
3. Hand tighten the two captive screws on the alarm module.
4. Use the screwdriver to securely fasten the alarm module to the power shelf.

DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

Step 2 Slide the alarm module into the top left bay on the power shelf, with the display on the right side and the handle on the left side.

Step 3 Hand tighten the two captive screws on the alarm module.

Step 4 Use the screwdriver to securely fasten the alarm module to the power shelf.

What to Do Next

After the alarm module is installed in the power shelf, you can install the PMs. Continue to the Installing a Modular Configuration Power Module for instructions.

Removing a Modular Configuration Alarm Module

This section describes how to remove the alarm module from the modular configuration power shelf installed in the FCC.

Prerequisites

Before performing this task remove the upper grille on the front (SFC) side of the chassis, 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

Steps

To remove the alarm module from a modular configuration power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Remove the upper grille on the front (SFC) side of the chassis. For detailed instructions, see *Installing and Removing Exterior Cosmetic Components*" chapter.
3. Use the screwdriver to loosen the two captive screws securing the alarm module to the power shelf.
4. Loosen by hand the panel fasteners on the alarm module.
5. Carefully slide the alarm module out of the power shelf.

DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

Step 2 Remove the upper grille on the front (SFC) side of the chassis. For detailed instructions, see *Installing and Removing Exterior Cosmetic Components*" chapter.

Step 3 Use the screwdriver to loosen the two captive screws securing the alarm module to the power shelf.

Step 4 Loosen by hand the panel fasteners on the alarm module.

Step 5 Carefully slide the alarm module out of the power shelf.

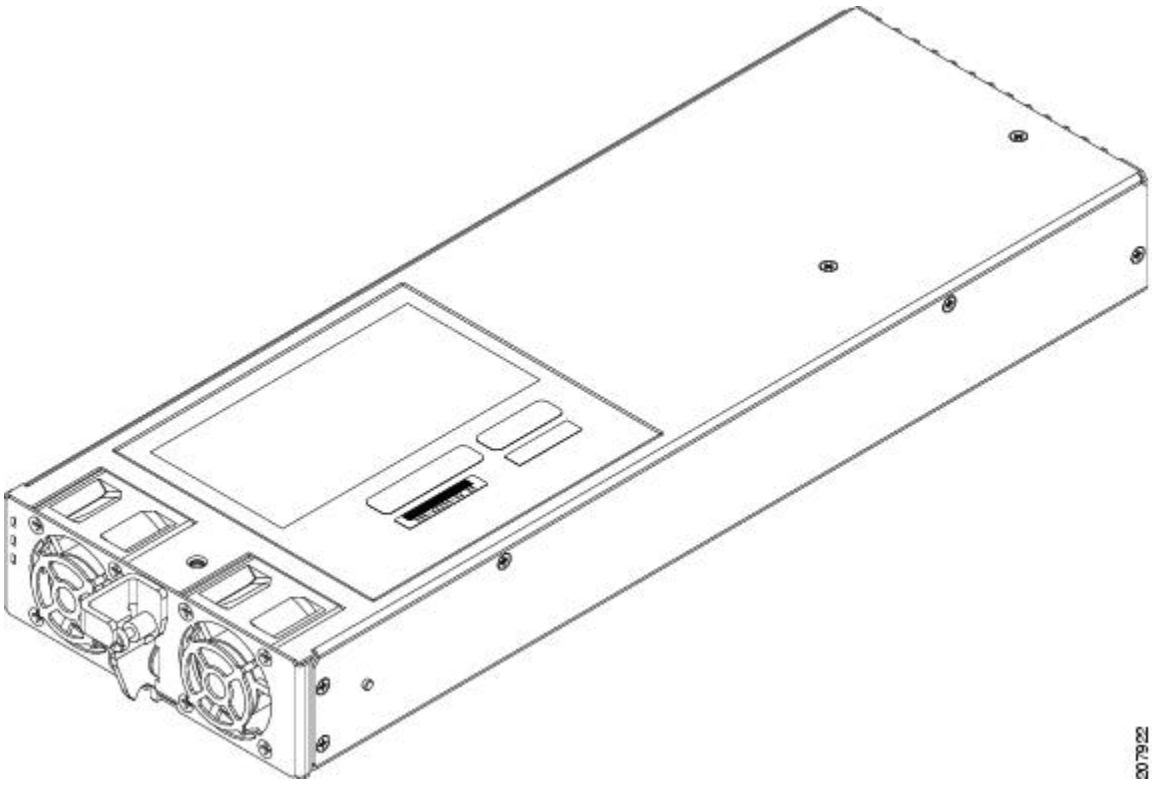
What to Do Next

After the modular configuration alarm module is removed from the power shelf, you can remove the power shelf wiring. Continue to the Removing AC or DC Power Shelf Wiring for instructions

Installing a Modular Configuration Power Module

This section describes how to install the AC or DC PMs, shown in this figure, in a modular configuration power shelf installed in the FCC.

Figure 49: Modular Configuration PM



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

Prerequisites

Before performing this task remove the upper grille on the front (SFC) side of the chassis, 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

- Torque screwdriver with number 1 Phillips bit and rated accuracy at 5.5 in.-lb (0.62 N-m)
- Modular Configuration PM
  - AC PM (Cisco product number CRS-PM-AC=), or
  - DC PM (Cisco product number CRS-PM-DC=)

Steps

To install the PM in a modular configuration power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Using two hands to support and guide the PM, slide it into the power shelf.
3. Flip up the ejector and with nominal install torque of 5.5 in-lb (0.62 N m) of torque, screw the PM into the shelf (see this figure). Do not exceed an install torque value of 10 in-lb (1.13 N-m).
4. Fill the power shelf to the required configuration

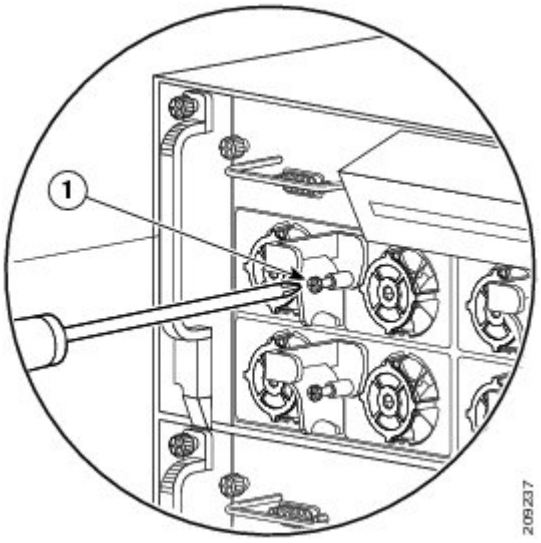
DETAILED STEPS

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 (SFC) 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.

Step 3 Flip up the ejector and with nominal install torque of 5.5 in-lb (0.62 N m) of torque, screw the PM into the shelf (see this figure). Do not exceed an install torque value of 10 in-lb (1.13 N-m).

Figure 50: Securing the Power Module to the Shelf



1	Screw securing PM to power shelf

Step 4 Fill the power shelf to the required configuration

What to Do Next

After the modular configuration PMs are installed in the chassis, install power module slot covers in empty PM slots, if any. For more information, see the Installing a Modular Configuration Power Module Slot Cover.

Removing a Modular Configuration Power Module

This section describes how to remove a PM, as shown in Figure 49: Modular Configuration PM, on page 93, from a modular configuration power shelf in the FCC.

Prerequisites

Before performing this task remove the upper grille on the front (SFC) side of the chassis, 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

Steps

To remove a PM from a modular configuration power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Remove the upper grille on the front (SFC) side of the chassis. For detailed instructions, go to *Installing and Removing Exterior Cosmetic Components* chapter.
3. Using the screwdriver, unscrew the ejector from the PM.
4. Flip down the ejector, slide the power module out of the power shelf, and place it carefully down on a flat surface.

DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

Step 2 Remove the upper grille on the front (SFC) side of the chassis. For detailed instructions, go to *Installing and Removing Exterior Cosmetic Components* chapter.

Step 3 Using the screwdriver, unscrew the ejector from the PM.

Step 4 Flip down the ejector, slide the power module out of the power shelf, and place it carefully down on a flat surface.

What to Do Next

After the alarm module and PMs have been removed from the chassis, you can remove the power shelf. Continue to the Removing a Modular Configuration Power Shelf for instructions.

Installing a Modular Configuration Power Module Slot Cover

This section describes how to install power module slot covers, in empty power module slots in the power shelves installed in the FCC. For complete information on regulatory compliance and safety, see Regulatory Compliance and Safety Information for the Cisco CRS Carrier Routing System.

Although the AC and DC power module slot covers differ slightly in size, they are installed using the same procedures.

Prerequisites

Before performing this task, you must first remove the upper grille on the front (SFC) side of the chassis, if installed, and install the alarm module and power modules to the required configuration in each power shelf.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- AC or DC PM Slot Cover
  - AC PM slot cover (Cisco product number 700–29097–xx), or
  - DC PM slot cover (Cisco product number 700–29098–xx)

Steps

To install a PM slot cover in a modular configuration power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Align the PM slot cover with the empty PM slot in the power shelf.
3. Insert the two tabs on the right side of the PM slot cover into the two holes on the right side of the PM slot. See this figure.
4. Push the left side of the PM slot cover gently until it clicks into place. See this figure.

DETAILED STEPS

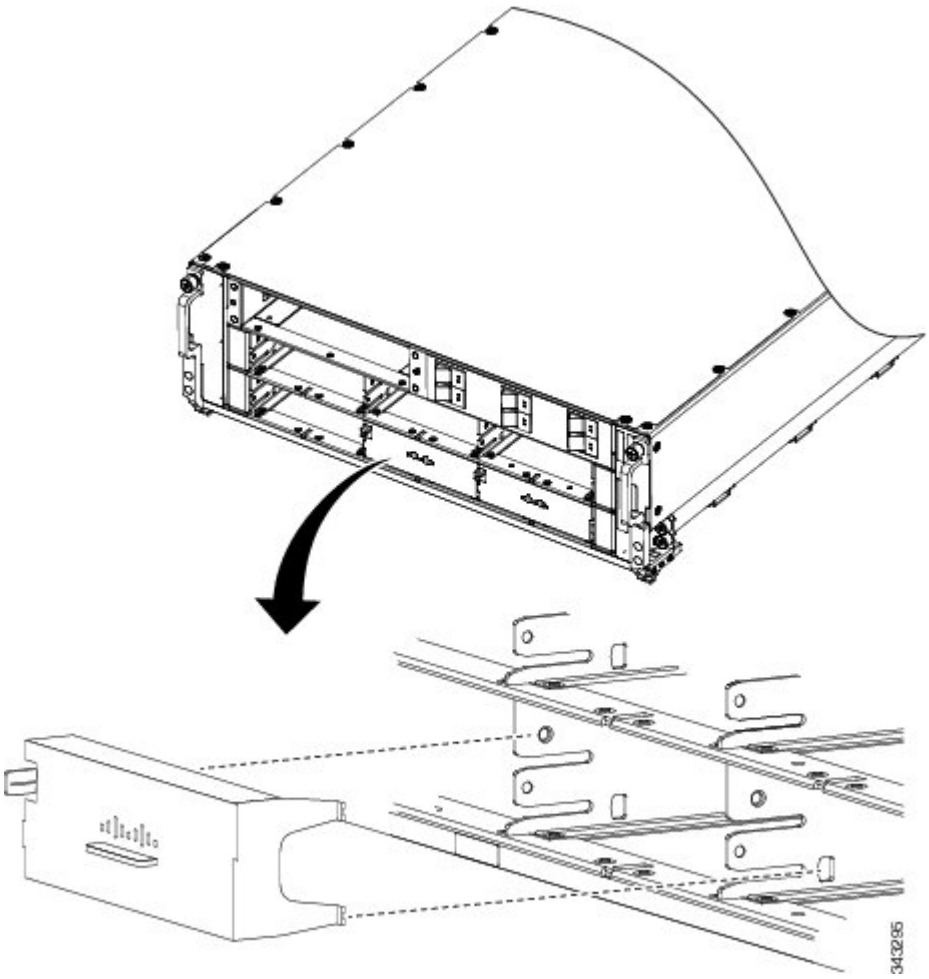
Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.

Step 2 Align the PM slot cover with the empty PM slot in the power shelf.

Step 3 Insert the two tabs on the right side of the PM slot cover into the two holes on the right side of the PM slot. See this figure.

Step 4 Push the left side of the PM slot cover gently until it clicks into place. See this figure.

Figure 51: Installing PM Slot Cover



What to Do Next

After the PM slot covers are installed in the chassis, install the upper grille on the front (SFC) side of the chassis.

Removing a Modular Configuration Power Module Slot Cover

This section describes how to remove a PM slot cover from a PM slot in a modular configuration AC or DC power shelf. 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, you must first remove the upper grille on the front (SFC) side of the chassis, if installed.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap

Steps

To remove a PM slot cover from a power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Gently pinch the tab on the left side of the PM slot cover to detach the PM slot cover from the PM slot. See Figure 51: Installing PM Slot Cover , on page 98.
3. Remove the two tabs on the right side of the PM slot cover from the two holes on the right side of the PM slot. See Figure 51: Installing PM Slot Cover , on page 98.
4. Set the PM slot cover aside.

DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

Step 2 Gently pinch the tab on the left side of the PM slot cover to detach the PM slot cover from the PM slot. See Figure 51: Installing PM Slot Cover , on page 98.

Step 3 Remove the two tabs on the right side of the PM slot cover from the two holes on the right side of the PM slot. See Figure 51: Installing PM Slot Cover , on page 98.

Step 4 Set the PM slot cover aside.

What to Do Next

After performing this task, install an AC or DC PM, if necessary (see the Installing a Modular Configuration Power Module) and re-install the upper grille on the front (SFC) side of the chassis. If you plan to remove the power shelf completely, you must first remove all of the PM slot covers, PMs, and the alarm module from the power shelf. See the Removing a Modular Configuration Power Module and the Removing a Modular Configuration Alarm Module for more information.

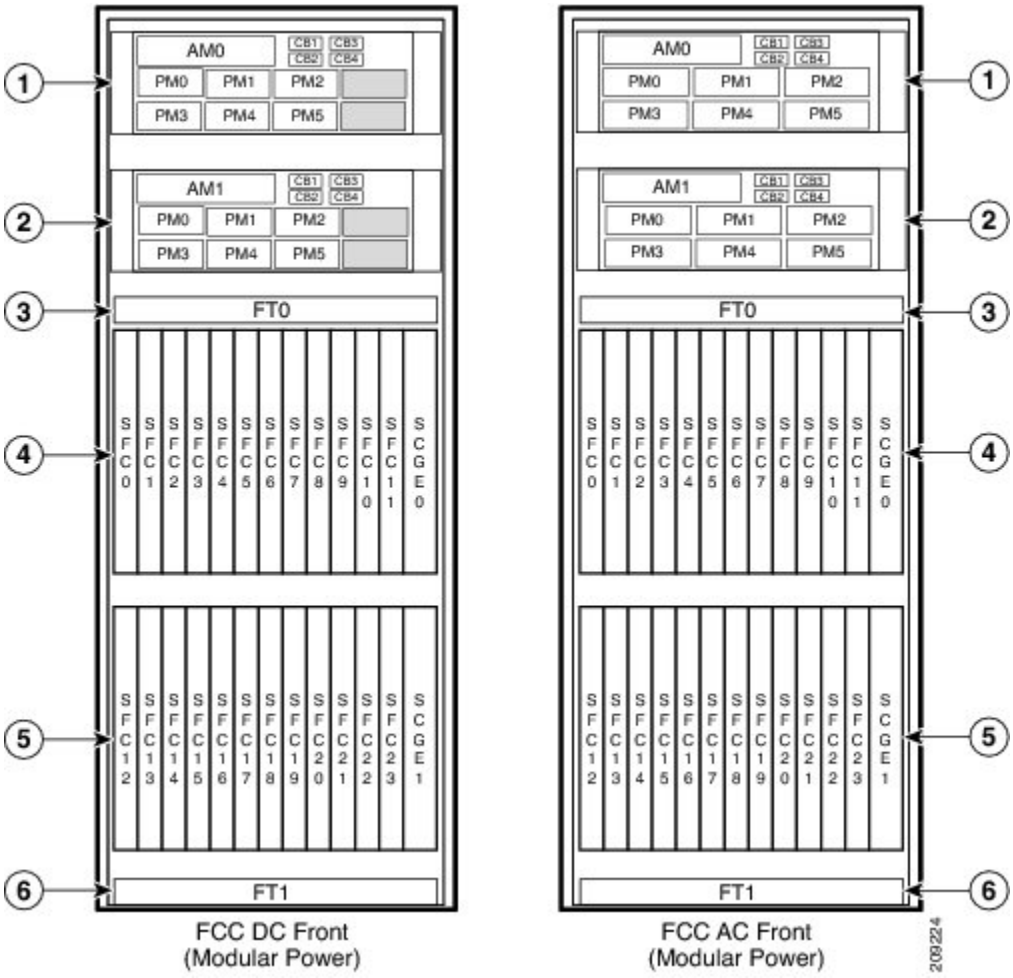
Power Up and Power Down a Chassis with Modular Configuration Power

This section describes how to power up and power down a chassis with a modular configuration AC or DC power shelf. For details on the chassis power system, see the Basic Chassis Power Details, the AC Power Systems, and the DC Power Systems. For complete information on regulatory compliance and safety, see *Regulatory Compliance and Safety Information for the Cisco CRS Carrier Routing System* .

Most components on the chassis, such as the PMs, alarm modules, 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.

This figure shows the Front (SFC) side of the FCC with modular configuration power installed.

Figure 52: FCC Front (SFC) Side Slot Numbers



1	Power shelf, Power A	4	Upper card cage
2	Power shelf, Power B	5	Lower card cage
3	Fan tray FT0	6	Fan tray FT1

Power Up a Chassis with Modular Configuration Power

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

Prerequisites

Before performing this task, you must install and wire the power shelves, and install the PMs, alarm modules, SCGE cards, and exterior cosmetic components. See the Installing a Modular Configuration Power Shelf, the Installing AC or DC Power Self Wiring, the *Installing an SCGE Card* section, and *Installing and Removing Exterior Cosmetic Components* chapter for more information. If you have a modular configuration DC power system installed, wiring at the BDFB or at the power plant should be complete.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- Multimeter

Steps

To power on the chassis, perform the following steps:

SUMMARY STEPS

1. Make sure that the facility power breakers for the upper (Power A) and lower (Power B) power shelves are in the OFF position.
2. Make sure that I/O switches on the rear of the upper (Power A) and lower (Power B) power shelves are in the OFF position.
3. Make sure all SFCs are pulled-out and disconnected from the backplane.
4. If you have a modular configuration DC power system installed:
5. Turn the facility breakers for the upper power shelf (Power A) to the ON position. Verify that the Input_OK LED on all of the PMs installed in the upper shelf are green.
6. Turn the I/O switch at the rear of the upper power shelf (Power A) to the ON position. Verify that the Output_OK LED on all of the PMs installed in the upper shelf are green.
7. Repeat step 5 and step 6 for the lower power shelf (Power B).
8. Turn the I/O switch at the rear of both upper power shelves (Power A and Power B) to the OFF position. Verify that none of the Output_OK LEDs on the PMs installed in the shelf are green.
9. Install all SFCs in the chassis. For more information, see the *Installing and Removing Fabric Cards and Card Components* chapter.
10. Turn the I/O switch at the rear of both power shelves (Power A and Power B) to the ON position.
11. If you have a modular configuration DC power system installed, measure the input voltage of each DC input and compare this value to the voltage measurement noted in step 4. Verify that the equipment is still receiving the correct input voltage measured in step 4.

DETAILED STEPS

Step 1 Make sure that the facility power breakers for the upper (Power A) and lower (Power B) power shelves are in the OFF position.

Step 2 Make sure that I/O switches on the rear of the upper (Power A) and lower (Power B) power shelves are in the OFF position.

Step 3 Make sure all SFCs are pulled-out and disconnected from the backplane.

Step 4 If you have a modular configuration DC power system installed:

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

d) Repeat steps a through c for each of the remaining DC inputs on the upper power shelf, Power A.

e) Repeat steps a through d for each of the DC inputs on the lower power shelf, Power B.

Step 5 Turn the facility breakers for the upper power shelf (Power A) to the ON position. Verify that the Input_OK LED on all of the PMs installed in the upper shelf are green.

Step 6 Turn the I/O switch at the rear of the upper power shelf (Power A) to the ON position. Verify that the Output_OK LED on all of the PMs installed in the upper shelf are green.

Step 7 Repeat step 5 and step 6 for the lower power shelf (Power B).

Step 8 Turn the I/O switch at the rear of both upper power shelves (Power A and Power B) to the OFF position. Verify that none of the Output_OK LEDs on the PMs installed in the shelf are green.

Step 9 Install all SFCs in the chassis. For more information, see the *Installing and Removing Fabric Cards and Card Components* chapter.

Step 10 Turn the I/O switch at the rear of both power shelves (Power A and Power B) to the ON position.

Note For appropriate SFC LED information, see the appropriate section in the *Installing and Removing Fabric Cards and Card Components* chapter or the specific documentation for the card.

Step 11 If you have a modular configuration DC power system installed, measure the input voltage of each DC input and compare this value to the voltage measurement noted in step 4. Verify that the equipment is still receiving the correct input voltage measured in step 4.

Power Down a Chassis with Modular Configuration Power

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

To power down the chassis, perform the following steps:

SUMMARY STEPS

1. Turn the I/O switches at the rear of both power shelves, Power A and Power B, to the OFF position.
2. Turn off all facility power breakers (AC or DC) for the upper power shelf (Power A). Repeat for all facility power breakers for the lower power shelf (Power B).

DETAILED STEPS

Step 1 Turn the I/O switches at the rear of both power shelves, Power A and Power B, to the OFF position.

Note There is no required order in which you must turn off the power shelves.

Step 2 Turn off all facility power breakers (AC or DC) for the upper power shelf (Power A). Repeat for all facility power breakers for the lower power shelf (Power B).

Note All DC power cables or AC power cords must be de-energized to fully remove power from the chassis.

What to Do Next

This table shows the LED status indicator lights for the AC and DC PMs in a modular configuration power system.

Table 6: PM LED Status Indicator Lights—Modular Configuration Power

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

Converting from One Modular Configuration Power System to Another

To convert an FCC with a modular configuration power system from AC to DC power, or from DC to AC power, perform the following steps:

SUMMARY STEPS

1. Power down the chassis completely and turn the facility power breakers to the OFF position. See the Power Up and Power Down a Chassis with Modular Configuration Power .
2. Remove the AC or DC PMs. See the Removing a Modular Configuration Power Module .
3. Remove the alarm modules. See the Removing a Modular Configuration Alarm Module .
4. Unplug the AC power cords or remove the DC fusing from the power source. Remove the AC or DC wiring from the rear of the power shelf. See the Removing AC or DC Power Shelf Wiring.
5. Remove the power shelves. See the Removing a Modular Configuration Power Shelf .
6. Install the new power shelves. See the Installing a Modular Configuration Power Shelf .
7. Install the power shelf wiring. See the Installing AC or DC Power Self Wiring .
8. Install the alarm modules. See the Installing a Modular Configuration Alarm Module .
9. Install the AC or DC PMs. See the Installing a Modular Configuration Power Module .
10. Power the chassis back up. See the Power Up and Power Down a Chassis with Modular Configuration Power .

DETAILED STEPS

Step 1 Power down the chassis completely and turn the facility power breakers to the OFF position. See the Power Up and Power Down a Chassis with Modular Configuration Power .

Step 2 Remove the AC or DC PMs. See the Removing a Modular Configuration Power Module .

Step 3 Remove the alarm modules. See the Removing a Modular Configuration Alarm Module .

Step 4 Unplug the AC power cords or remove the DC fusing from the power source. Remove the AC or DC wiring from the rear of the power shelf. See the Removing AC or DC Power Shelf Wiring.

Step 5 Remove the power shelves. See the Removing a Modular Configuration Power Shelf .

Step 6 Install the new power shelves. See the Installing a Modular Configuration Power Shelf .

Step 7 Install the power shelf wiring. See the Installing AC or DC Power Self Wiring .

Note If you are converting from DC to AC power, and 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, refer to *Cisco CRS 3-Phase AC Power Distribution Unit Installation Guide* .

Step 8 Install the alarm modules. See the Installing a Modular Configuration Alarm Module .

Step 9 Install the AC or DC PMs. See the Installing a Modular Configuration Power Module .

Step 10 Power the chassis back up. See the Power Up and Power Down a Chassis with Modular Configuration Power .

What to Do Next

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

How to Convert a Chassis from Fixed Configuration Power to Modular Configuration Power

Caution Do not attempt to convert from fixed configuration power to modular configuration power while the FCC is powered up and running. Ensure that you have powered down the system and all power is disconnected from the system.

This section lists the steps to be performed to convert the FCC from fixed configuration power to modular configuration power.

Prerequisites

Before performing this task, you must completely power down the system and ensure that all power is disconnected from the system. See the Power Up and Power Down a Chassis with Modular Configuration Power for more information.

Steps

To convert the chassis from fixed to modular configuration power, perform the following steps:

SUMMARY STEPS

1. Remove the alarm modules. See the Removing a Fixed Configuration Alarm Module.
2. Remove the AC rectifiers or DC PEMs. See the Removing an AC Rectifier or DC PEM.
3. Unplug the AC power cords or remove the DC fusing from the power source. Remove the AC or DC wiring from the rear of the fixed configuration power shelf, as described in the Removing Fixed Configuration AC Power Shelf Wiring and the Removing Fixed Configuration DC Power Shelf Wiring.
4. For fixed configuration DC only, remove the ground cable connected to the rear of the power shelf. This ground cable will not be used when installing a modular configuration power shelf. Remove the fixed configuration power shelves, as described in Figure 49: Modular Configuration PM, on page 93.
5. Install the modular power shelves, see Installing a Modular Configuration Power Shelf.
6. Install the DC wiring or AC power cords on the rear of the power shelf. See the Installing AC or DC Power Self Wiring for more information.
7. Install the power modules, as described in Installing a Modular Configuration Power Module.
8. Install the alarm modules. See Installing a Modular Configuration Alarm Module.
9. Replace the DC fuses or restore AC service. Power the chassis back up. See the Power Up and Power Down a Chassis with Modular Configuration Power.

DETAILED STEPS

Step 1 Remove the alarm modules. See the Removing a Fixed Configuration Alarm Module.

Step 2 Remove the AC rectifiers or DC PEMs. See the Removing an AC Rectifier or DC PEM.

Step 3 Unplug the AC power cords or remove the DC fusing from the power source. Remove the AC or DC wiring from the rear of the fixed configuration power shelf, as described in the Removing Fixed Configuration AC Power Shelf Wiring and the Removing Fixed Configuration DC Power Shelf Wiring.

Step 4 For fixed configuration DC only, remove the ground cable connected to the rear of the power shelf. This ground cable will not be used when installing a modular configuration power shelf. Remove the fixed configuration power shelves, as described in Figure 49: Modular Configuration PM, on page 93.

Step 5 Install the modular power shelves, see Installing a Modular Configuration Power Shelf.

Note Do not connect ground cables directly to the rear of a modular configuration power shelf. For more information, see the Installing Power Shelf Grounding Brackets.

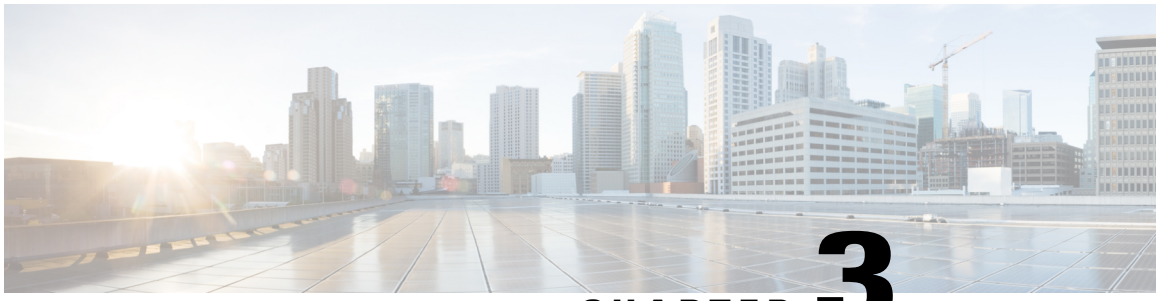
Step 6 Install the DC wiring or AC power cords on the rear of the power shelf. See the Installing AC or DC Power Self Wiring for more information.

Step 7 Install the power modules, as described in Installing a Modular Configuration Power Module.

Step 8 Install the alarm modules. See Installing a Modular Configuration Alarm Module.

Step 9 Replace the DC fuses or restore AC service. Power the chassis back up. See the Power Up and Power Down a Chassis with Modular Configuration Power.

Steps



CHAPTER 3

Installing and Removing Air Circulation Components

This chapter provides instructions on how to replace the Cisco CRS Carrier Routing System Fabric Card Chassis (FCC) air circulation components.

Note The chassis is shipped with the fan trays and air filter pre-installed.

Information About the Air Circulation Components

This section contains some general information about the air circulation components in the following topics:

About the Fan Trays

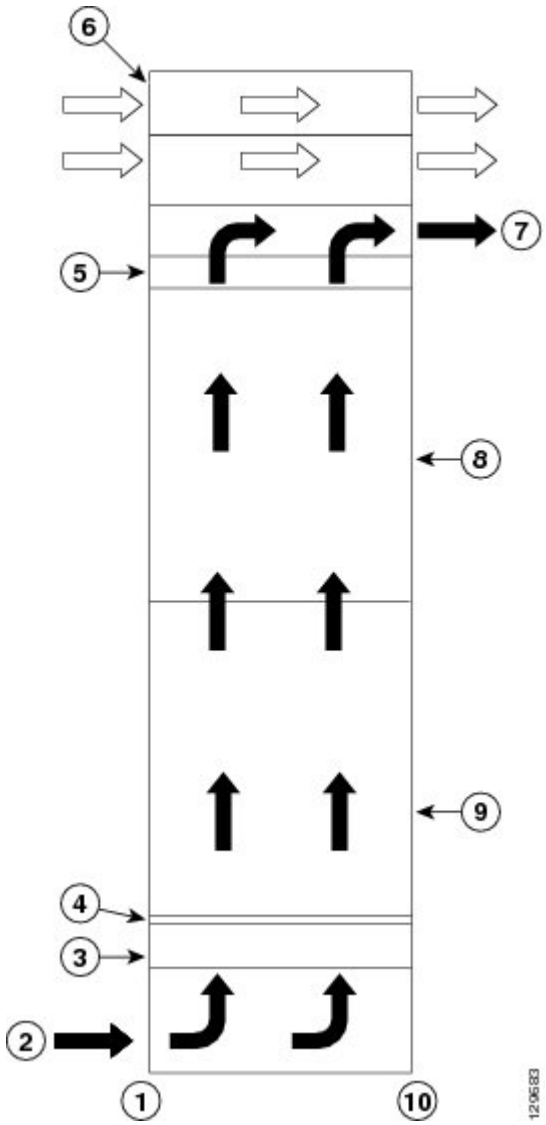
The FCC has two fan trays (see figure below), one just below the lower card cage and the other just above the upper card cage. The chassis can run with only one fan tray operating. If a failure occurs in one fan tray, the other fan tray acts as the redundant fan tray to assure fault-tolerant system performance; the chassis continues to operate while the failed fan tray is replaced.

The FCC fan tray operates in either the upper or lower fan tray slots. Each fan tray installs into the front (SFC) side of the chassis and contains:

- Nine fans
- Fan tray board
- Front-panel status LED

Note The upper and lower fan trays are interchangeable and installed in the same manner.

Figure 53: Chassis Air Circulation, Side View



1	Front (SFC) side of chassis	6	Power shelves (two)
2	Air intake	7	Air exhaust
3	Lower fan tray	8	Upper card cage
4	Air filter	9	Lower card cage

5	Upper fan tray	10	Rear (OIM) side of chassis

About the Air Filter

The chassis has a serviceable air filter mounted in a slide-out tray accessible from the front of the chassis just below the lower card cage (see Figure 53: Chassis Air Circulation, Side View, on page 110). The air filter removes dust from the room air drawn into the router by the two fan trays. Once a month (or more often in dusty environments) you should examine the air filter and replace it if it appears damaged or excessively dirty.

Note A lattice of wire exists on both sides of the filter material with an arrow denoting airflow direction and a pair of sheet metal straps on the downstream side of the filter.

Caution Periodic maintenance of the air filter is required to maintain proper air flow in the system as well as to avoid optical contamination. It is highly recommended to clean air filters once in three months and also replace the air filter once in a year.

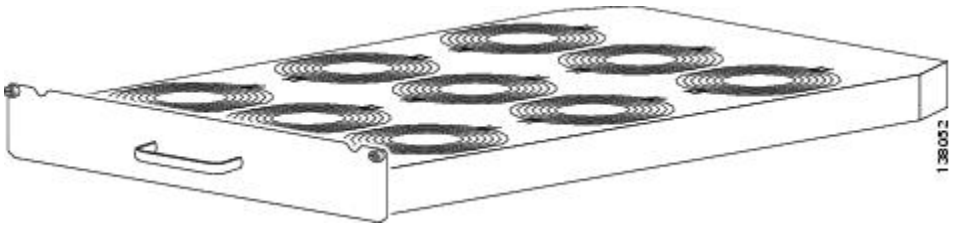
How to Install and Remove Air Circulation Components

This section contains the following procedures:

Replacing a Fan Tray

This section describes how to replace a fan tray (see figure below) in the FCC. For information on the fan tray, see the Information About the Air Circulation Components, on page 109.

Figure 54: Fan Tray



Prerequisites

Before performing this task, you must first open the doors on the front (SFC) side of the chassis. If you are replacing the upper fan tray, you must remove the logo bezel from the front (SFC) side of the chassis. If you are replacing the lower fan tray, you must remove the lower grille from the front (SFC) side of the chassis.

Required Tools and Equipment

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

- ESD-preventive wrist strap
- 6-in.long number 1 Phillips screwdriver
- Fan tray (Cisco product number CRS-FCC-FAN-TR=)

Steps

To replace a fan tray, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front of the chassis or to a bare metal surface on the chassis.
2. Using the screwdriver, loosen the two captive screws on the fan tray cover faceplate.
3. Grasp the fan tray handle and pull it straight out to disconnect the fan tray from the chassis backplane connector at the back of the fan tray slot. Slide the fan tray halfway from the fan tray slot.
4. Use your free hand to support the bottom of the fan tray, then slide the fan tray completely from the fan tray slot.
5. Set the fan tray carefully aside.
6. To install the replacement fan tray, using two hands to support the fan tray, position it in front of the fan tray slot so that the fan tray connector that is recessed into the back of the fan tray is aligned with the connector mounted in the back corner of the fan tray slot.
7. Slide the fan tray into the fan tray slot. Stop when the fan tray makes contact with the chassis connector in the back of the fan tray slot.
8. Firmly push on the fan tray handle to seat the fan tray connector in the chassis connector. (When completely seated, the fan tray faceplate flanges meet the front of the chassis.)
9. Tighten the two captive screws on the fan tray faceplate.

DETAILED STEPS

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

Step 2 Using the screwdriver, loosen the two captive screws on the fan tray cover faceplate.

Caution Because of the weight of the fan tray, approximately 44 lb (20 kg), you should be especially careful while removing the fan tray from the chassis. To prevent injury, keep your back straight and lift with your legs, not your back. Avoid sudden twists or lateral moves. It is safer to use two people to remove the fan tray rather than a single person.

Step 3 Grasp the fan tray handle and pull it straight out to disconnect the fan tray from the chassis backplane connector at the back of the fan tray slot. Slide the fan tray halfway from the fan tray slot.

Step 4 Use your free hand to support the bottom of the fan tray, then slide the fan tray completely from the fan tray slot.

Step 5 Set the fan tray carefully aside.

Step 6 To install the replacement fan tray, using two hands to support the fan tray, position it in front of the fan tray slot so that the fan tray connector that is recessed into the back of the fan tray is aligned with the connector mounted in the back corner of the fan tray slot.

Caution Because of the weight of the fan tray, approximately 44 lb (20 kg), you should be especially careful while installing the fan tray in the chassis. To prevent injury, keep your back straight and lift with your legs, not your back. Avoid sudden twists or lateral moves. It is safer to use two people to install or remove the fan tray rather than a single person. After two people have placed the power shelf in position, one person can slide it into place.

Step 7 Slide the fan tray into the fan tray slot. Stop when the fan tray makes contact with the chassis connector in the back of the fan tray slot.

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

Step 8 Firmly push on the fan tray handle to seat the fan tray connector in the chassis connector. (When completely seated, the fan tray faceplate flanges meet the front of the chassis.)

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

Step 9 Tighten the two captive screws on the fan tray faceplate.

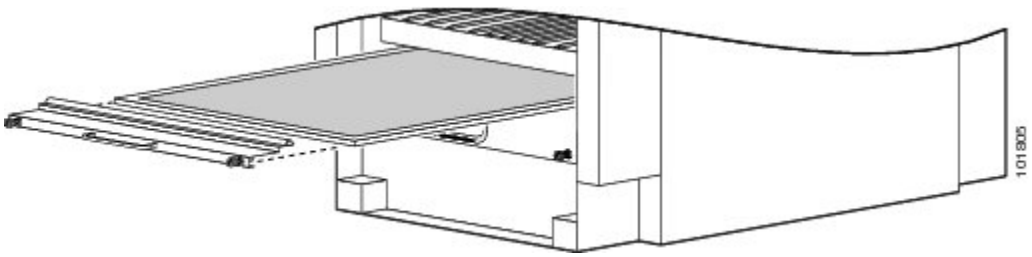
What to Do Next

After performing this task, close the doors and replace the upper or lower grille on the front (SFC) side of the chassis. For more information, see the How to Install and Remove Air Circulation Components, on page 111.

Replacing the Air Filter

This section describes how to replace the air filter (see figure below) in the FCC. For further information, see the Information About the Air Circulation Components, on page 109.

Figure 55: Air Filter



Prerequisites

Before performing this task, you must first open the doors and remove the lower grille on the front (SFC) side of the chassis.

Required Tools and Equipment

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

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver
- Air filter (Cisco product number CRS-FCC-FILTER=)

Steps

To replace the air filter, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front of the chassis or to a bare metal surface on the chassis.
2. Use the screwdriver to loosen the captive screws (one on each side of the air filter door) that fasten the air filter door to the chassis.
3. Remove the air filter door and set it carefully aside.
4. Grasp the retractable plastic handle at the front of the air filter and carefully slide out the air filter.
5. Set the air filter carefully aside.
6. To install the replacement air filter, using two hands to support the air filter, orient it so that the retractable plastic handle on the front of the air filter faces outward from the front of the chassis.
7. Align the replacement air filter with the air filter slot.
8. Slide the air filter into the air filter slot until it is fully within the bay.
9. Place the air filter door over the air filter slot and, using the screwdriver, tighten the two captive screws that attach the door to the chassis.

DETAILED STEPS

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

Step 2 Use the screwdriver to loosen the captive screws (one on each side of the air filter door) that fasten the air filter door to the chassis.

Step 3 Remove the air filter door and set it carefully aside.

Step 4 Grasp the retractable plastic handle at the front of the air filter and carefully slide out the air filter.

Step 5 Set the air filter carefully aside.

Step 6 To install the replacement air filter, using two hands to support the air filter, orient it so that the retractable plastic handle on the front of the air filter faces outward from the front of the chassis.

Step 7 Align the replacement air filter with the air filter slot.

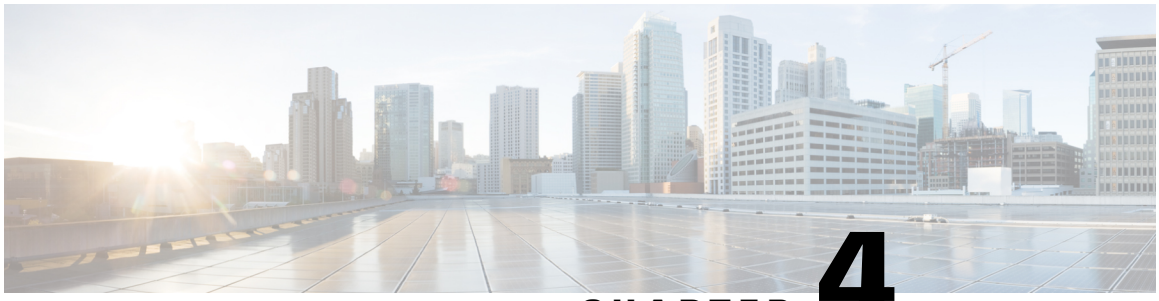
Step 8 Slide the air filter into the air filter slot until it is fully within the bay.

Step 9 Place the air filter door over the air filter slot and, using the screwdriver, tighten the two captive screws that attach the door to the chassis.

Caution All four edges of the air filter door are lined with EMI-preventive gaskets consisting of many raised, conductive contacts. Align and seat the door carefully to avoid damage to the EMI-preventive gaskets. A damaged gasket can result in reduced EMI performance.

What to Do Next

After performing this task, replace the lower grille and close the doors on the front (SFC) side of the chassis. For more information, see the How to Install and Remove Air Circulation Components, on page 111.



CHAPTER 4

Installing and Removing Fabric Cards and Card Components

This chapter provides instructions on how to install and remove the Cisco CRS Carrier Routing System Fabric Card Chassis (FCC) cards and card components.

This chapter presents the following topics:

Information About Installing and Removing Cards and Associated Components

This section contains some general information about the cards and card components in the following sections:

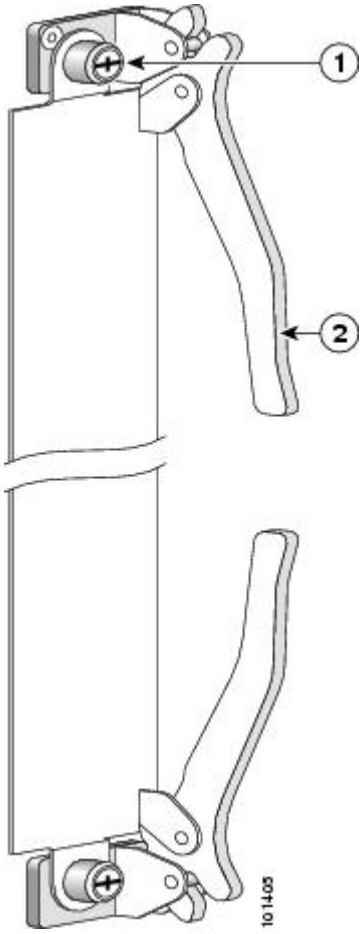
Guidelines for Card Installation and Removal

Guidelines for card installation and removal include the following:

- Online (in-service) insertion and removal (OIR) is supported, enabling you to remove and install cards while the router is operating. You must shut down the controller fabric plane and the card itself to safely remove or insert a card in a running system. See the software documentation for information on the **shutdown** command.
- The different cards in the FCC are all attached to the chassis itself using a pair of ejector levers and captive screws. The two ejector levers are used to release the card from its backplane (and associated OIM) connectors. 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 ends of the card faceplate. The figure below shows the location of the ejector levers and captive screws (on an SFC).

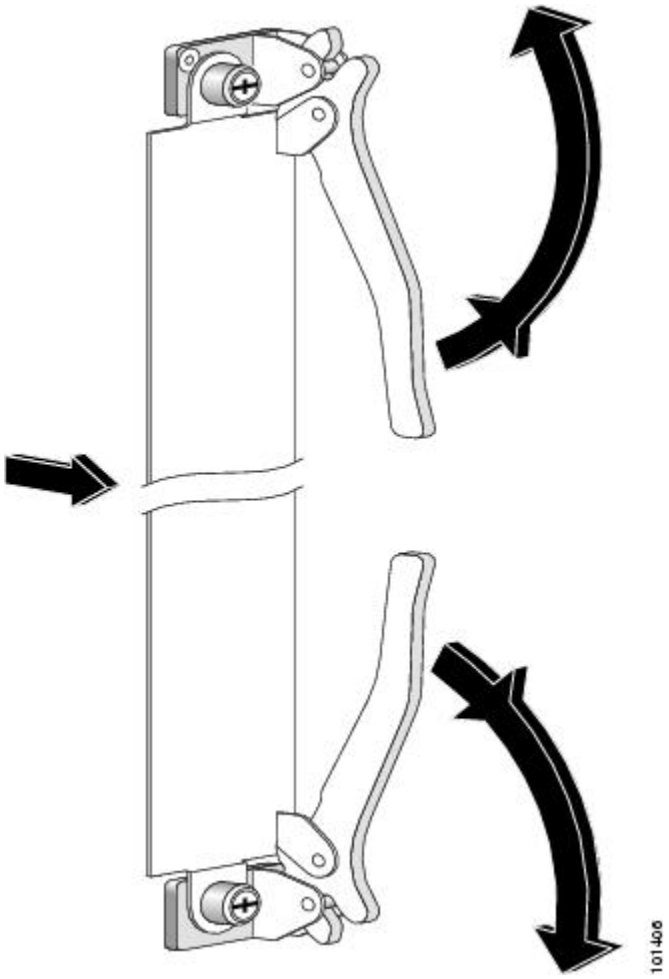
Figure 56: Ejector Levers and Captive Screws



1	Captive screw	2	Ejector lever

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

Figure 57: Operating Ejector Levers



Caution When you remove a card, always use the ejector levers to ensure that the connector pins disconnect from the backplane 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.

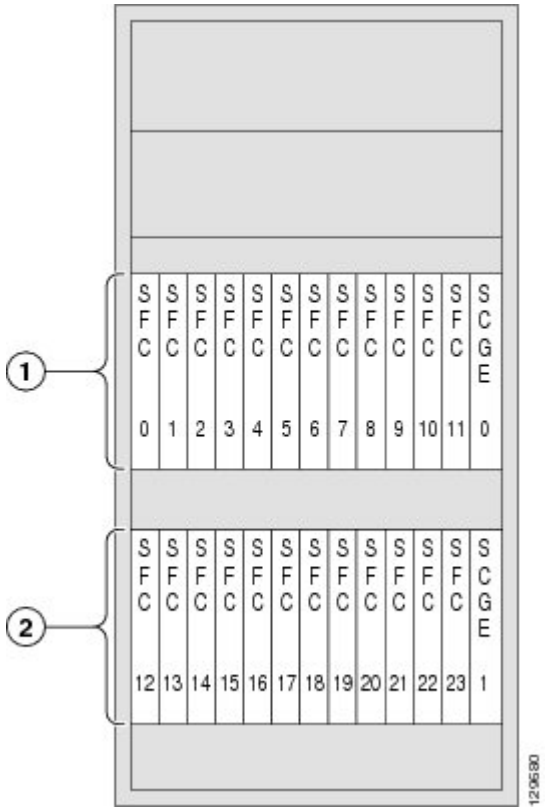
Information About Card and Optical Interface Module (OIM) Installation Order

The FCC contains two card cages; each card cage contains 12 slots for the SFCs and an additional slot for the shelf controller Gigabit Ethernet (SCGE) card (see figure below on FCC Front (SFC) Side Slot Numbers). Each OIM associated with an SFC has 9 optical bulkhead array connectors. The SFCs and SCGEs are installed in the front (SFC) side of the chassis; the OIMs are installed in the rear.

Note Be sure to install the OIMs before the SFCs; otherwise, you will be unable to install the OIM.

You need one 22-port SCGE card for each card cage; the SCGE is installed in the far right slot (as you are facing the front [SFC] side of the chassis) of the top or bottom card cage.

Figure 58: FCC Front (SFC) Side Slot Numbers



1	Upper card cage	2	Lower card cage

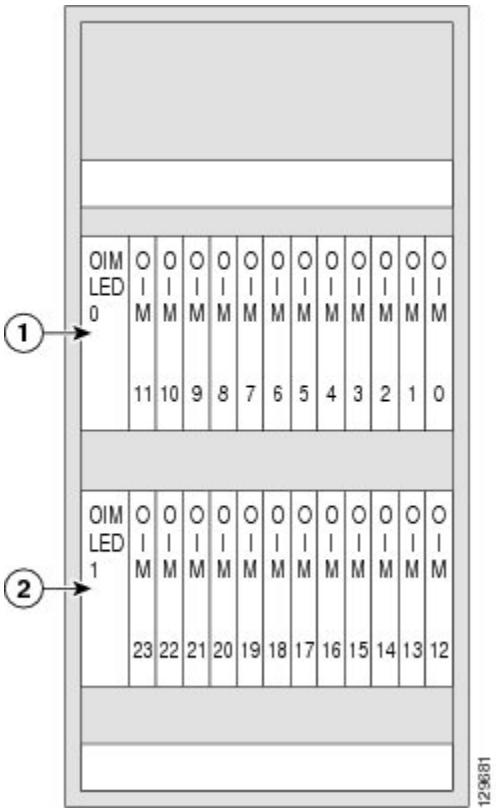
As shown in the figure above, the FCC numbers on the front (SFC) side of the chassis include:

- Upper card cage with 12 switch fabric slots (left to right: 0, 1, 2, 3. . . 10, 11) followed by one 22-port SCGE card slot (SCGE0) on the far right.

- Lower card cage with 12 switch fabric slots (left to right: 12, 13, 14 . . . 21, 22, 23) followed by one 22-port SCGE card slot (SCGE1) on the far right.

See this figure for the FCC slot numbers on the rear (OIM) side of the chassis.

Figure 59: FCC Slot Numbers and Module Locations Rear (OIM) Side



1	Upper card cage	2	Lower card cage

As shown in above figure, slot numbers on the OIM side of the chassis include:

- OIM side of upper card cage, with one OIM LED module (LM0) on the far left, followed by 12 OIM slots (left to right: 11, 10, 9 . . . 2, 1, 0).
- OIM side of lower card cage, with one OIM LED module (LM1) on the far left, followed by 12 OIM slots (left to right: 23, 22, 21 . . . 14, 13, 12).

The OIM slot numbers match their corresponding SFC slot numbers on the other side of the chassis; OIM slot 0 is on the far right of the rear of the chassis (matching SFC slot 0 on the far left of the front of the chassis).

Caution For proper chassis airflow, all slots need to be populated with a card or an impedance carrier. We recommend removing or inserting one card at a time. Allow at least 15 seconds for the router to complete the preceding tasks before removing or installing another card. (See Information About Impedance Carriers, Slot Covers,OIM Impedance Carriers, and Card Cage Cover Plates, on page 122)

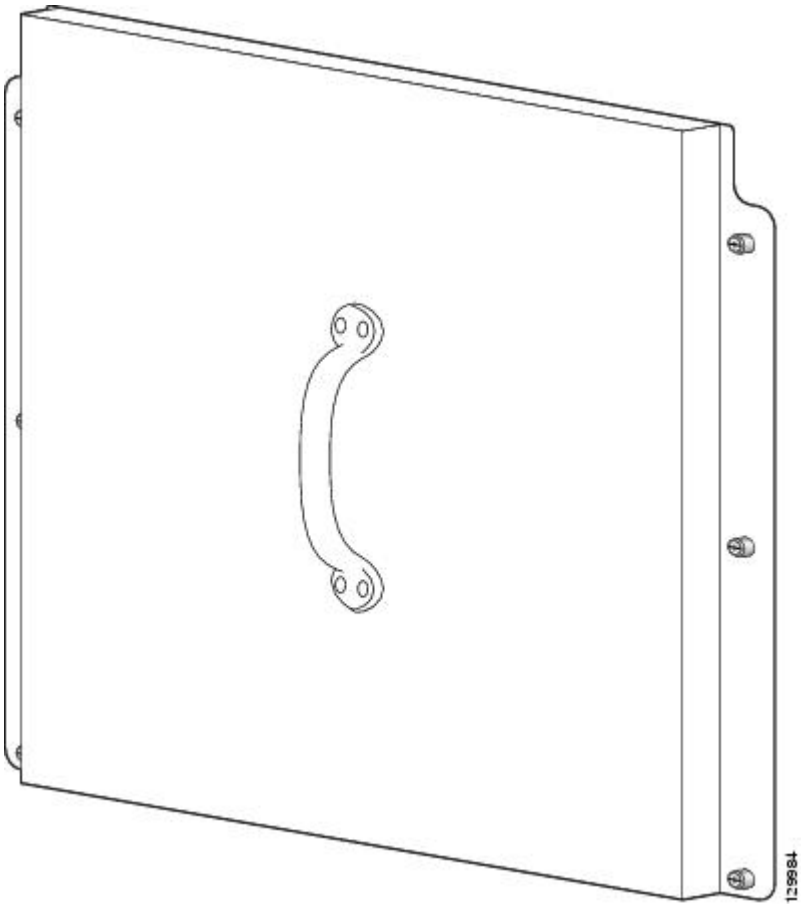
The FCC is equipped with two card cages, each of which is divided into two power zones, making four total chassis power zones.

For detailed information about how to install cards in the chassis to ensure high availability, see the *Cisco CRS Carrier Routing System Multishelf System Site Planning Guide* .

Information About Impedance Carriers, Slot Covers,OIM Impedance Carriers, and Card Cage Cover Plates

For safety and to help maintain chassis stiffness, the chassis is shipped with both the upper and lower card cages covered with cover plates (see the following figure).

Figure 60: Card Cage Cover Plate



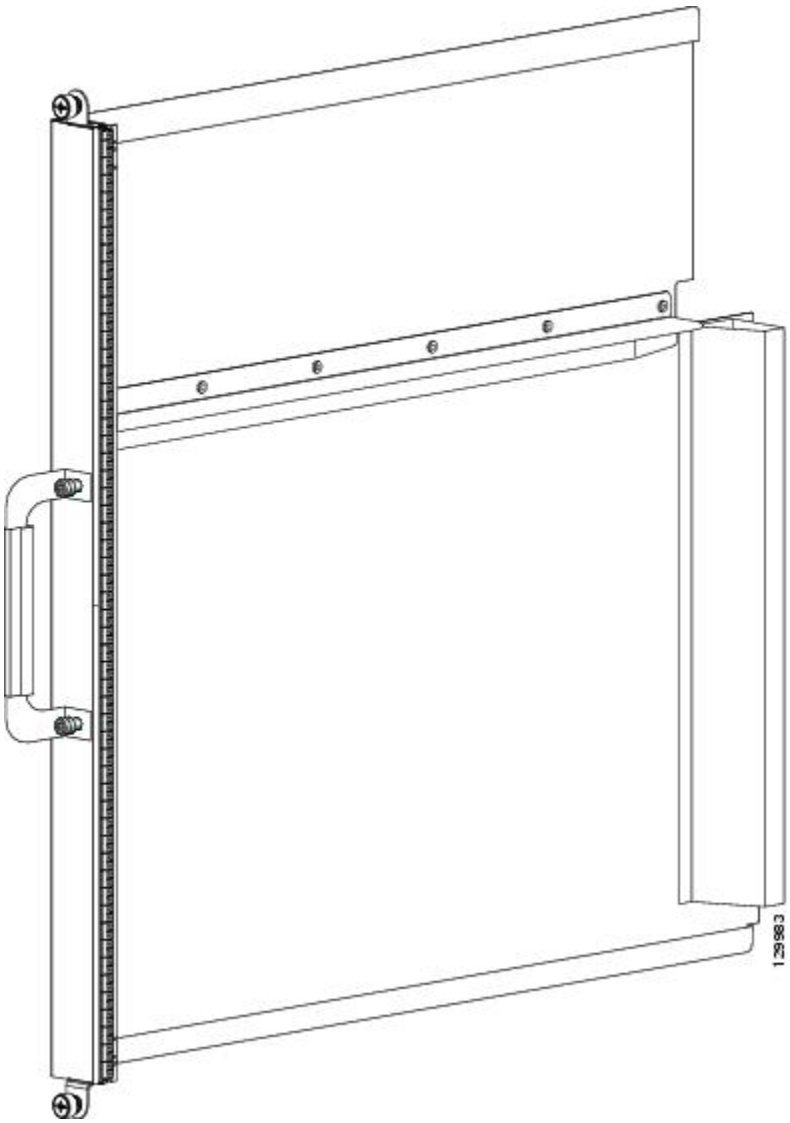
You should leave the card cage cover plates in place while moving and securing the chassis; remove the plates only when you are ready to begin installing the cards in the chassis. See the Removing the Card Cage Cover Plate, on page 126.

No SFC or OIM slots are empty during chassis shipment.

- The chassis is shipped with impedance carriers (see figure, SFC Slot Impedance Carrier) installed in all SFC slots except 0, 3, 6, 9, 12, 15, 18, and 21.
- The chassis is shipped with slot covers (see figure, SFC Slot Cover) over slots 0, 3, 6, 9, 12, 15, 18, and 21.

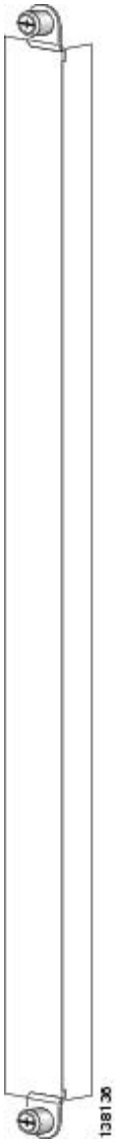
The following figure shows the SFC slot impedance carrier. For information on installing and removing the impedance carriers, see Installing an Impedance Carrier, on page 128 and Removing an Impedance Carrier, on page 131.

Figure 61: SFC Slot Impedance Carrier



The following figure shows the SFC slot cover. For information on installing and removing the impedance carriers, see Installing a Slot Cover, on page 132 and Removing a Slot Cover, on page 134.

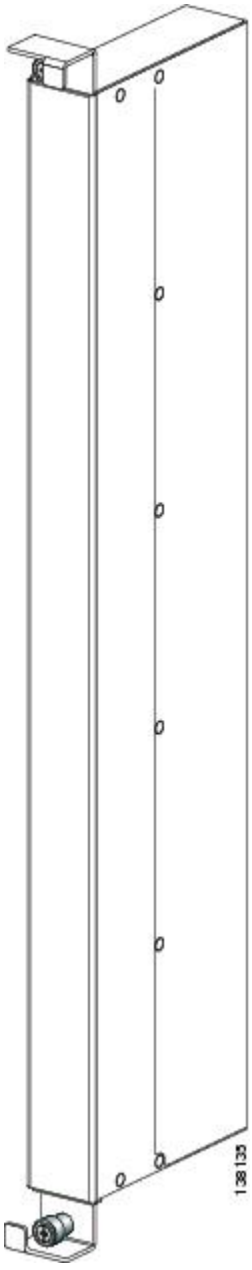
Figure 62: SFC Slot Cover



The chassis is shipped with OIM impedance carriers (see figure, OIM Impedance Carrier) in all OIM slots on the rear (OIM) side of the chassis. For information on installing and removing the OIM impedance carriers,

see the Installing an OIM Impedance Carrier, on page 140 and the Removing an OIM Impedance Carrier, on page 142.

Figure 63: OIM Impedance Carrier



To provide the chassis with proper cooling and help maintain stiffness, we recommend that you leave the cover plates and impedance carriers in place until you are ready to install the SFCs.

Note Do not leave blank slots in the chassis. All slots must be covered using impedance cards or blanks.

Information About PCMCIA Cards

The SCGE card provides two PCMCIA flash slots that each provide up to 1 GB of flash storage. One PCMCIA flash subsystem 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 SCGE card, not removable, and is for permanent storage of configurations and images.

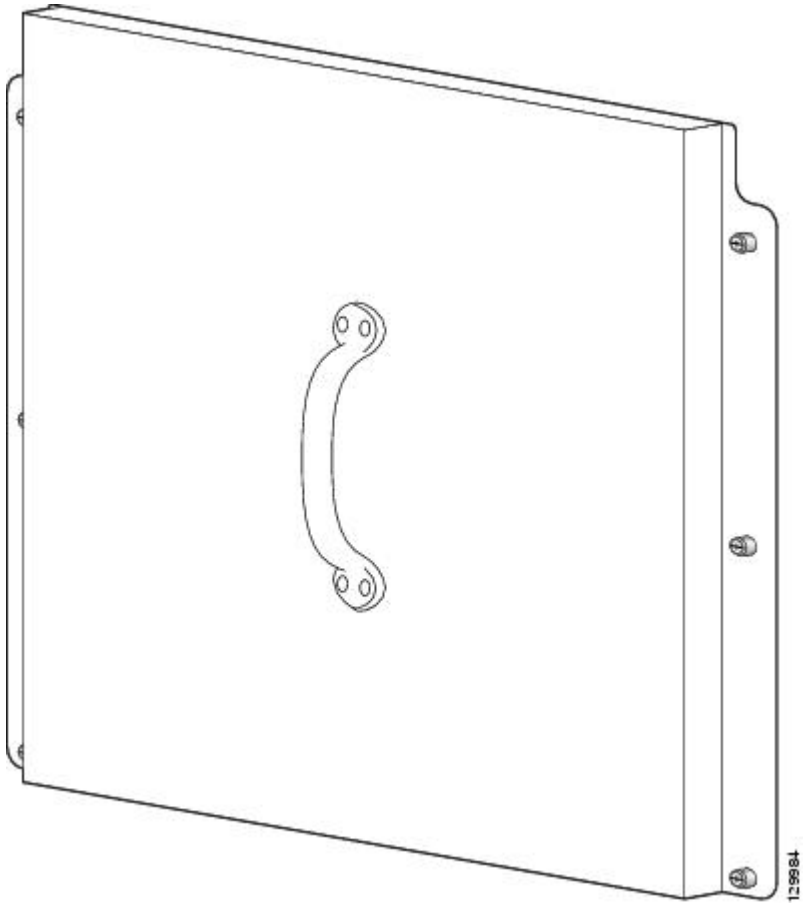
How to Install and Remove Cards and Associated Components

This section contains the following procedures:

Removing the Card Cage Cover Plate

This section describes how to remove the card cage cover plates from the FCC. This figure shows the cover plate that is installed over both the upper and lower card cages to provide additional stability and safety during shipment.

Figure 64: Card Cage Cover Plate



Prerequisites

Before performing this task, make sure that you have moved the chassis into its final location and secured it to the floor. For details, see *Unpacking, Moving, and Securing the Cisco CRS Carrier Routing System Fabric Card Chassis* .

Tools and Equipment

You need the following tools to remove a card cage cover plate:

- ESD-preventative wrist strap
- 6-in. long number 1 Phillips screwdriver

Steps

To remove a card cage cover plate, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front (SFC) side of the chassis or to a bare metal surface on the chassis.
2. Use the screwdriver to loosen the bottom four captive screws (two for each side) on the upper card cage cover plate.
3. While holding the handle firmly, loosen the remaining two screws (one for each side) that attach the cover plate to the chassis.
4. Set the cover plate carefully aside.
5. Repeat the procedure for the lower cover plate.

DETAILED STEPS

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

Step 2 Use the screwdriver to loosen the bottom four captive screws (two for each side) on the upper card cage cover plate.

Step 3 While holding the handle firmly, loosen the remaining two screws (one for each side) that attach the cover plate to the chassis.

Note Although this procedure can be safely performed by one person, the weight of the cover plate makes it easier to have one person hold the plate while a second person loosens the screws.

Step 4 Set the cover plate carefully aside.

Step 5 Repeat the procedure for the lower cover plate.

What to Do Next

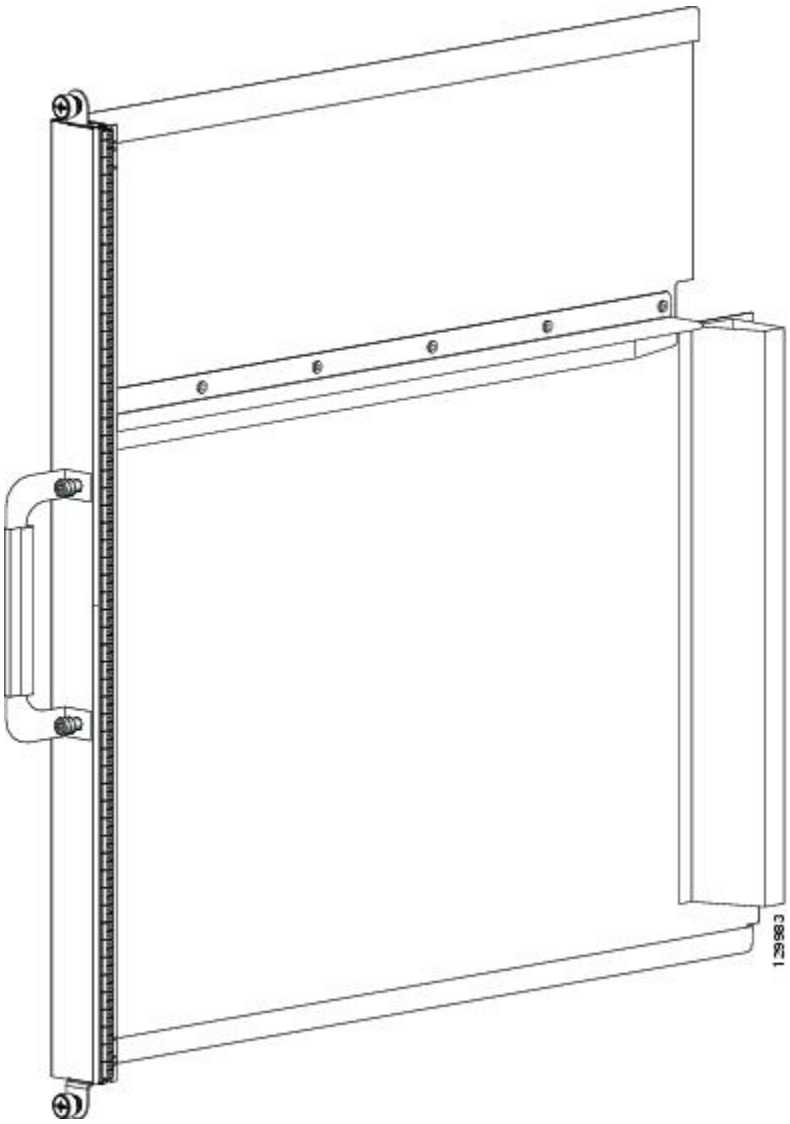
After performing this task, you may install any card cage components. See the Installing an SFC, on page 151 and the Installing an SCGE Card, on page 162.

Installing an Impedance Carrier

This section describes how to install an impedance carrier in the FCC. The chassis is shipped with impedance carriers installed (see the following figure) in all SFC slots except 0, 3, 6, 9, 12, 15, 18, and 21 (see the Information About Card and Optical Interface Module (OIM) Installation Order, on page 120). For more detailed information on impedance carriers, see the Information About Impedance Carriers, Slot Covers,OIM Impedance Carriers, and Card Cage Cover Plates, on page 122.

This figure shows an SFC slot impedance carrier.

Figure 65: SFC Slot Impedance Carrier



Prerequisites

Before performing this task, open the cosmetic doors (if installed) and ensure that the slot in which you are about to install the impedance carrier is empty. See the Information About Impedance Carriers, Slot Covers,OIM Impedance Carriers, and Card Cage Cover Plates, on page 122 and either the Removing an SFC, on page 156 or the Removing an SCGE Card, on page 167 (depending on the slot in which you are installing an impedance carrier).

Required Tools and Equipment

You need the following tools and part to install an impedance carrier:

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver
- Impedance carrier (Cisco Product number CRS-SFC-IMPEDANCE=)

Steps

To install an impedance carrier, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front (SFC) side of the chassis or to a bare metal surface on the chassis.
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.
3. Slide the impedance carrier into the chassis until the captive screw plates are flush with the chassis.
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.
5. Use the screwdriver to fully tighten the captive screws to seat the impedance carrier firmly in the slot.

DETAILED STEPS

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front (SFC) side of the chassis or to 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 Use the screwdriver to fully tighten the captive screws to seat the impedance carrier firmly in the slot.

What to Do Next

After performing this task, you may close the doors on the front (SFC) side of the chassis (if installed). For more information, see the How to Install and Remove Cards and Associated Components, on page 126.

Removing an Impedance Carrier

This section describes how to remove an impedance carrier from the FCC. The chassis is shipped with impedance carriers installed (see Figure 65: SFC Slot Impedance Carrier, on page 129) in all SFC slots except 0, 3, 6, 9, 12, 15, 18, and 21 (see the Information About Card and Optical Interface Module (OIM) Installation Order, on page 120). For more detailed information on impedance carriers, see the Information About Impedance Carriers, Slot Covers,OIM Impedance Carriers, and Card Cage Cover Plates, on page 122.

Figure 65: SFC Slot Impedance Carrier, on page 129 shows an SFC slot impedance carrier.

Prerequisites

Before performing this task open the cosmetic doors (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

Steps

To remove an impedance carrier, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front (SFC) side of the chassis or to a bare metal surface on the chassis.
2. Identify the impedance carrier to be removed from the card cage. Use the screwdriver to turn the two captive screws on the front panel of the card counterclockwise to loosen it from the slot.
3. Grasp the impedance carrier handle with one hand and gently pull it halfway from the slot.
4. Place one hand under the impedance carrier to guide it.
5. Holding the impedance carrier underneath and by the handle, pull it from the slot and set it carefully aside.

DETAILED STEPS

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

Step 2 Identify the impedance carrier to be removed from the card cage. Use the screwdriver to turn the two captive screws on the front panel of the card counterclockwise to loosen it from the slot.

Step 3 Grasp the impedance carrier handle with one hand and gently pull it halfway from the slot.

Step 4 Place one hand under the impedance carrier to guide it.

Step 5 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 an OIM in the corresponding slot. See the Installing an OIM, on page 143, the Installing an OIM LED Module, on page 147, the Installing an SFC, on page 151, and the Installing an SCGE Card, on page 162 for further details.

Installing a Slot Cover

This section describes how to install a slot cover (see the following figure) in the FCC. The chassis is shipped with slot covers over SFC slots 0, 3, 6, 9, 12, 15, 18, and 21; all other slots are shipped with impedance carriers.

For more detailed information on the slot covers, see the Information About Impedance Carriers, Slot Covers,OIM Impedance Carriers, and Card Cage Cover Plates, on page 122.

Figure 66: SFC Slot Cover

Prerequisites

Before performing this task, open the front (SFC) side cosmetic doors (if installed) and remove the card cage cover plate (if necessary), and ensure that the slot over which you are about to install the cover is empty. See the Removing the Card Cage Cover Plate, on page 126 and the Removing an SFC, on page 156.

Required Tools and Equipment

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

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver
- Slot cover

Steps

To install a slot cover, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front (SFC) side of the chassis or to a bare metal surface on the chassis.
2. Hold the slot cover in place over the slot.
3. Partially tighten the two 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.
4. Use the screwdriver to fully tighten the captive screws to seat the slot cover firmly in place.

DETAILED STEPS

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

Step 2 Hold the slot cover in place over the slot.

Step 3 Partially tighten the two 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 Use the screwdriver to fully tighten the captive screws to seat the slot cover firmly in place.

What to Do Next

After performing this task, you may close the doors on the front (SFC) side of the chassis (if installed). For more information, see How to Install and Remove Cards and Associated Components, on page 126.

Removing a Slot Cover

This section describes how to remove a slot cover (see Figure 66: SFC Slot Cover, on page 133) from the FCC. The chassis is shipped with slot covers over SFC slots 0, 3, 6, 9, 12, 15, 18, and 21; all other slots are shipped with impedance carriers. For more detailed information on the slot covers, see the Information About Impedance Carriers, Slot Covers,OIM Impedance Carriers, and Card Cage Cover Plates, on page 122.

Prerequisites

Before performing this task, open the front (SFC) side cosmetic doors (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

Steps

To remove a slot cover, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front (SFC) side of the chassis or to a bare metal surface on the chassis.
2. Use the screwdriver to loosen the two captive screws that attach the slot cover to the chassis.
3. Remove the slot cover and set it carefully aside.

DETAILED STEPS

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

Step 2 Use the screwdriver to loosen the two captive screws that attach the slot cover to the chassis.

Step 3 Remove the slot cover 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 the Installing an SFC, on page 151 for further details.

Installing 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 open the front cosmetic doors (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 key (See item 1 in Figure 67: Installing a Pillow Block, on page 137.)

Steps

To install a pillow block, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Locate the slot where the pillow block was removed.
3. Have the replacement T10 Torx-head screws near at hand.
4. Position the pillow block and align the screw holes.
5. Use the T10 Torx key to install the top left screw (located above the pillow block pin). (See item number 2 in the figure below.)
6. Install the lower right screw (see item number 3 in the above figure).
7. Install the lower left screw (located below the pillow block pin). (See item number 4 in the above figure.)
8. Repeat this procedure for the card slot's other pillow block if necessary.

DETAILED STEPS

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 (SFC) side of the chassis or a bare metal surface on the chassis.

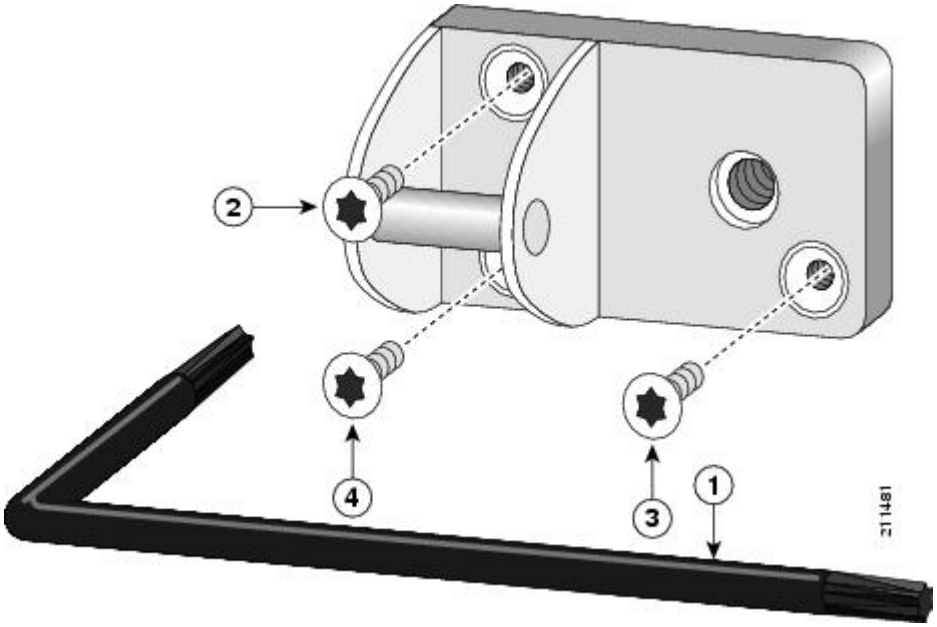
Step 2 Locate the slot where the pillow block was removed.

Step 3 Have the replacement T10 Torx-head screws near at hand.

Step 4 Position the pillow block and align the screw holes.

Step 5 Use the T10 Torx key to install the top left screw (located above the pillow block pin). (See item number 2 in the figure below.)

Figure 67: Installing a Pillow Block



1	T10 Torx key	3	Lower right screw
2	Top left screw, above pillow block pin	4	Lower left screw, below pillow block pin

Step 6 Install the lower right screw (see item number 3 in the above figure).

Step 7 Install the lower left screw (located below the pillow block pin). (See item number 4 in the above figure.)

Step 8 Repeat this procedure for the card slot's other pillow block if necessary.

What to Do Next

After performing this task, you may close the doors on the front (SFC) side of the chassis (if installed). For more information, see the How to Install and Remove Cards and Associated Components, on page 126.

Removing a Pillow Block

This section describes how to remove a damaged pillow block from the chassis. 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 open the front cosmetic doors (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
- 1 T10 Torx key—included in pillow block replacement kit

Steps

To remove a damaged pillow block, perform the following steps:

SUMMARY STEPS

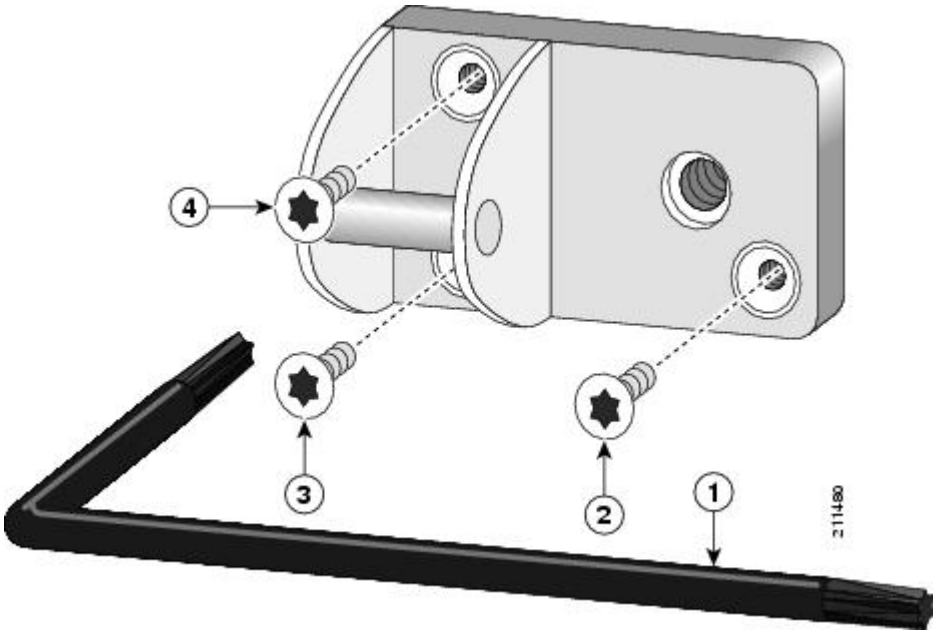
1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (SFC) side of the chassis or a bare metal surface on the chassis.
2. Locate the pillow block to be replaced. Use the T10 Torx key to remove the lower right screw. (See item number 2 in the below figure.)
3. Remove the lower left screw (located below the pillow block pin). (See item number 3 in the above figure.)
4. Remove the top left screw (located above the pillow block pin). (See item number 4 in the above figure.)
5. Remove the pillow block and set it aside.
6. Repeat this procedure for the card slot's other pillow block if necessary.

DETAILED STEPS

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 (SFC) 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 key to remove the lower right screw. (See item number 2 in the below figure.)

Figure 68: Removing a Pillow Block



1	T10 Torx key	3	Lower left screw, below pillow block pin
2	Lower right screw	4	Top left screw, above pillow block pin

Step 3 Remove the lower left screw (located below the pillow block pin). (See item number 3 in the above figure.)

Step 4 Remove the top left screw (located above the pillow block pin). (See item number 4 in the 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 necessary.

What to Do Next

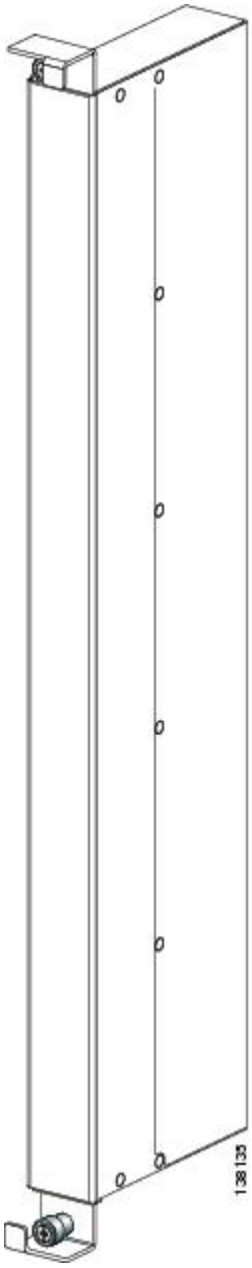
After performing this task, you may install a new pillow block (see the Installing a Pillow Block, on page 135).

Installing an OIM Impedance Carrier

This section describes how to install an OIM impedance carrier (see the following figure) in the FCC. The chassis is shipped with an OIM impedance carrier in each OIM slot on the rear (OIM) side of the chassis. For

more detailed information on the OIM impedance carriers, see the Information About Impedance Carriers, Slot Covers,OIM Impedance Carriers, and Card Cage Cover Plates, on page 122.

Figure 69: OIM Impedance Carrier



Prerequisites

Before performing this task, open the rear (OIM) side cosmetic doors (if installed) and ensure that the slot in which you are about to install the OIM impedance carrier is empty. See the Removing an OIM, on page 146.

Required Tools and Equipment

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

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver
- OIM impedance carrier (Cisco product number CRS-OIM-IMPEDANCE=)

Steps

To install an OIM impedance carrier, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the rear (OIM) side of the chassis or to a bare metal surface on the chassis.
2. Hold the OIM impedance carrier in place over the slot. Slide the OIM into place in the slot.
3. Use the screwdriver to turn the two captive screws (two at the top and two on the bottom) on the flanges of the OIM impedance carrier clockwise to seat the blank firmly in place.

DETAILED STEPS

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

Step 2 Hold the OIM impedance carrier in place over the slot. Slide the OIM into place in the slot.

Note The OIM impedance carriers fit tightly together; you may need to apply a little pressure to get them to seat completely in the chassis. Be careful not to push too hard or abruptly.

Step 3 Use the screwdriver to turn the two captive screws (two at the top and two on the bottom) on the flanges of the OIM impedance carrier clockwise to seat the blank firmly in place.

What to Do Next

After performing this task, you may close the doors on the rear (OIM) side of the chassis (if installed). For more information, see the "Installing the Rear (OIM) Side Cosmetic Components" section on page 5-21 .

Removing an OIM Impedance Carrier

This section describes how to remove an OIM impedance carrier (see Figure 69: OIM Impedance Carrier, on page 141) from the FCC. The chassis is shipped with an OIM impedance carrier in each OIM slot on the rear (OIM) side of the chassis. For more detailed information on the OIM impedance carriers, see the Information About Impedance Carriers, Slot Covers,OIM Impedance Carriers, and Card Cage Cover Plates, on page 122.

Prerequisites

Before performing this task, you must first open the rear (OIM) cosmetic doors (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

Steps

To remove an OIM impedance carrier, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the rear (OIM) side of the chassis or to a bare metal surface on the chassis.
2. While facing the rear (OIM) side of the chassis, use the screwdriver to turn the two captive screws on the flanges of the OIM impedance carrier counterclockwise to loosen the blank.
3. Remove the OIM impedance carrier and set it carefully aside.

DETAILED STEPS

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

Step 2 While facing the rear (OIM) side of the chassis, use the screwdriver to turn the two captive screws on the flanges of the OIM impedance carrier counterclockwise to loosen the blank.

Step 3 Remove the OIM impedance carrier and set it carefully aside.

Note The OIM impedance carriers fit tightly together; you may need to pull firmly to unseat it completely from the chassis. Be careful not to pull too hard or abruptly.

What to Do Next

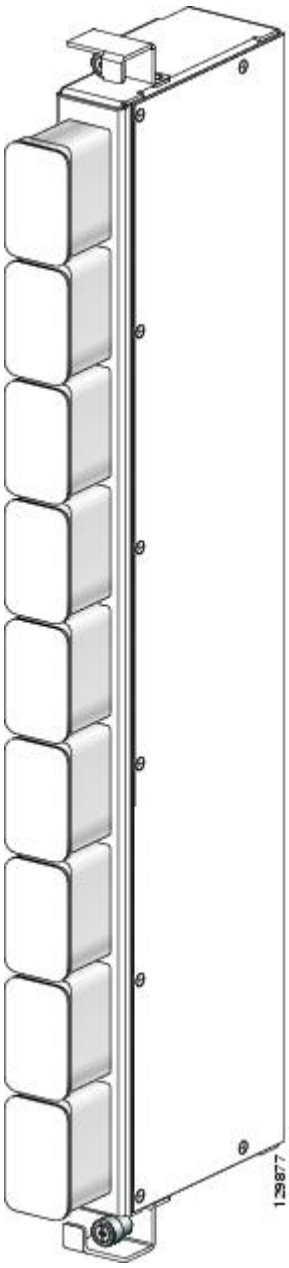
After performing this task, store the OIM impedance carrier for later reuse. You may now install an OIM in the slot. See the Installing an OIM, on page 143 for further details.

Installing an OIM

This section describes how to install an optical interface module (OIM) in the FCC. The OIM provides wiring connectivity between the SFCs and other chassis in your multishelf system. For more detailed information on the OIM, see Cisco CRS Carrier Routing System Multishelf System Description.

This figure shows an OIM.

Figure 70: Optical Interface Module (OIM)



Prerequisites

Before performing this task, you must first open the rear (OIM) side cosmetic doors (if installed) and remove the OIM impedance carrier (if necessary), see the Removing an OIM Impedance Carrier, on page 142. An OIM can be installed in any of the slots OIM0 to OIM11 (upper card cage) and OIM12 to OIM23 (lower card cage).

Required Tools and Equipment

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

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver
- OIM (Cisco product number CRS-FCC-OIM-1S=)

Steps

To install an OIM, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the rear (OIM) side of the chassis or to a bare metal surface on the chassis.
2. Remove the OIM from its packaging.
3. Remove all dust caps from the high-density backplane mounted (HBMT) connectors (the connectors that mate with the SFC in the chassis), and set them aside.
4. While facing the back of the chassis, determine the slots in which you will be installing the SFCs. Slide the OIM into place in back of the slot.
5. Use the screwdriver to turn the two captive screws (two at the top and two at the bottom) on the flanges of the OIM clockwise to seat the module firmly in place.

DETAILED STEPS

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

Step 2 Remove the OIM from its packaging.

Step 3 Remove all dust caps from the high-density backplane mounted (HBMT) connectors (the connectors that mate with the SFC in the chassis), and set them aside.

Step 4 While facing the back of the chassis, determine the slots in which you will be installing the SFCs. Slide the OIM into place in back of the slot.

Note The OIMs fit tightly together; you may need to apply a little pressure to get them to seat completely in the chassis. Be careful not to push too hard or abruptly.

Step 5 Use the screwdriver to turn the two captive screws (two at the top and two at the bottom) on the flanges of the OIM clockwise to seat the module firmly in place.

Caution Do not remove the dust caps from the bulkhead array adapter sockets until you are ready to attach the optical array cables.

What to Do Next

After performing this task, you may install an SFC (see the Installing an SFC, on page 151).

Removing an OIM

This section describes how to remove an optical interface module (OIM) from the FCC. The OIM provides wiring connectivity between the SFCs and other chassis in your multishelf system. For more detailed information on the OIM, see Cisco CRS Carrier Routing System Multishelf System Description.

Prerequisites

Before performing this task, you must first open the rear (OIM) side cosmetic doors (if installed), disconnect any cables connected to the OIM (see *Cisco CRS Carrier Routing System Multishelf System Interconnection and Cabling Guide*), and put dust caps on all the OIM connectors.

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 an OIM, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the rear (OIM) side of the chassis or to a bare metal surface on the chassis.
2. If there is an SFC mated to the OIM you are removing, partially eject the SFC from its slot. See Step 2 through Step 4 in the Removing an SFC, on page 156. You do not have to fully remove the SFC from the slot.
3. While facing the rear (OIM) side of the chassis, use the screwdriver to turn the two captive screws on the flanges of the OIM counterclockwise to loosen the module.
4. Remove the OIM and set it carefully aside.
5. If you are storing the OIM, you should replace the dust caps on all connectors, including the HBMT connectors.

DETAILED STEPS

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

Step 2 If there is an SFC mated to the OIM you are removing, partially eject the SFC from its slot. See Step 2 through Step 4 in the Removing an SFC, on page 156. You do not have to fully remove the SFC from the slot.

Step 3 While facing the rear (OIM) side of the chassis, use the screwdriver to turn the two captive screws on the flanges of the OIM counterclockwise to loosen the module.

Step 4 Remove the OIM and set it carefully aside.

Note The OIMs fit tightly together; you may need to pull firmly to unseat it completely from the chassis. Be careful not to pull too hard or abruptly.

Step 5 If you are storing the OIM, you should replace the dust caps on all connectors, including the HBMT connectors.

What to Do Next

After performing this task, you may close the rear (OIM) side cosmetic doors (if installed). For more information, see the "Installing the Rear (OIM) Side Cosmetic Components" section on page 5-21 .

Installing an OIM LED Module

This section describes how to install an OIM LED module in the FCC. The OIM LED module provides connectivity information on how the cards in your fiber chassis are functioning in your multishelf system.

For more detailed information on the OIM LED module, see Cisco CRS Carrier Routing System Multishelf System Description.

Figure 71: OIM LED Module

Prerequisites

Before performing this task, you must first open the rear (OIM) side cosmetic doors (if installed). An OIM LED module can be installed only in an LM0 (upper card cage) or LM1 (lower card cage) slot.

Required Tools and Equipment

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

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver
- OIM LED module (Cisco product number CRS-FCC-LED=)

Steps

To install an OIM LED module, use perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the rear (OIM) side of the chassis or to a bare metal surface on the chassis.
2. Remove the OIM LED module from its packaging.
3. While facing the rear (OIM) side of the chassis, firmly press the OIM LED module into place in back of the slots on the far left side of the chassis until the LED module locks into place.
4. Use the screwdriver to turn the two captive screws (one on the top and one on the bottom) on the flanges of the OIM LED module clockwise to seat the module firmly in place.

DETAILED STEPS

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

Step 2 Remove the OIM LED module from its packaging.

Step 3 While facing the rear (OIM) side of the chassis, firmly press the OIM LED module into place in back of the slots on the far left side of the chassis until the LED module locks into place.

Step 4 Use the screwdriver to turn the two captive screws (one on the top and one on the bottom) on the flanges of the OIM LED module clockwise to seat the module firmly in place.

What to Do Next

After performing this task, you may close the doors on the rear (OIM) side of the chassis (if installed). For more information, see the "Installing the Rear (OIM) Side Cosmetic Components" section on page 5-21 .

Removing an OIM LED Module

This section describes how to remove an OIM LED module from the FCC. The OIM LED module provides connectivity information on how the cards in your fiber chassis are functioning in your multishelf system.

For more detailed information on the OIM LED modules, see Cisco CRS Carrier Routing System Multishelf System Description.

Prerequisites

Before performing this task, you must first open the rear (OIM) side cosmetic doors (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

Steps

To remove an OIM LED module, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the rear (OIM) side of the chassis or to a bare metal surface on the chassis.
2. While facing the rear (OIM) side of the chassis, use the screwdriver to turn the two captive screws on the flanges of the OIM LED module counterclockwise to loosen the module.
3. Holding the top and bottom flanges of the module, tug firmly to unseat the module from the chassis.
4. Remove the OIM LED module and set it carefully aside.

DETAILED STEPS

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

Step 2 While facing the rear (OIM) side of the chassis, use the screwdriver to turn the two captive screws on the flanges of the OIM LED module counterclockwise to loosen the module.

Step 3 Holding the top and bottom flanges of the module, tug firmly to unseat the module from the chassis.

Note The OIM LED module locks tightly into place on the back of the chassis and may require considerable force to pry loose. Be careful not to pry too hard and damage the module.

Step 4 Remove the OIM LED module and set it carefully aside.

What to Do Next

After performing this task, you may install a new OIM LED module. For more information, see the Installing an OIM LED Module, on page 147.

Installing an SFC

This section describes how to install a switch fabric card (SFC) in the FCC. For more detailed information on the different types of switch fabric cards available and details on the cards themselves, see Cisco CRS Carrier Routing System Multishelf System Description.

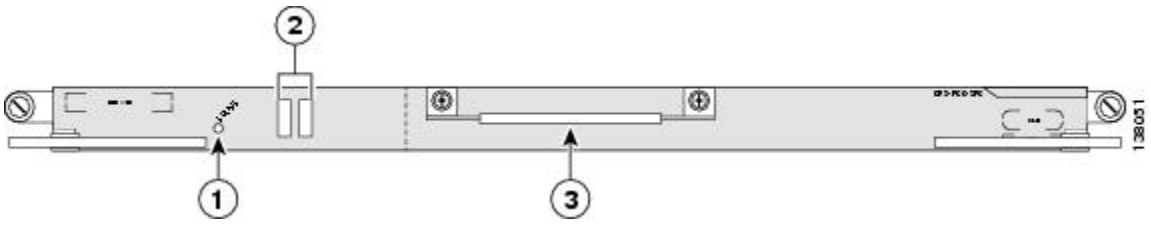
Warning Class 1M laser radiation when open. Do not view directly with optical instruments. Statement 281

Warning For diverging beams, viewing the laser output with certain optical instruments within a distance of 100 mm may pose an eye hazard. For collimated beams, viewing the laser output with certain optical instruments designed for use at a distance may pose an eye hazard. Statement 282

Warning Laser radiation. Do not view directly with optical instruments. Class 1M laser product. Statement 283

This figure shows the front view of a CRS-FCC-SFC switch fabric card that is installed in a 40G multishelf system. The CRS-FCC-SFC-140 and CRS-FCC-SFC-400 are similar.

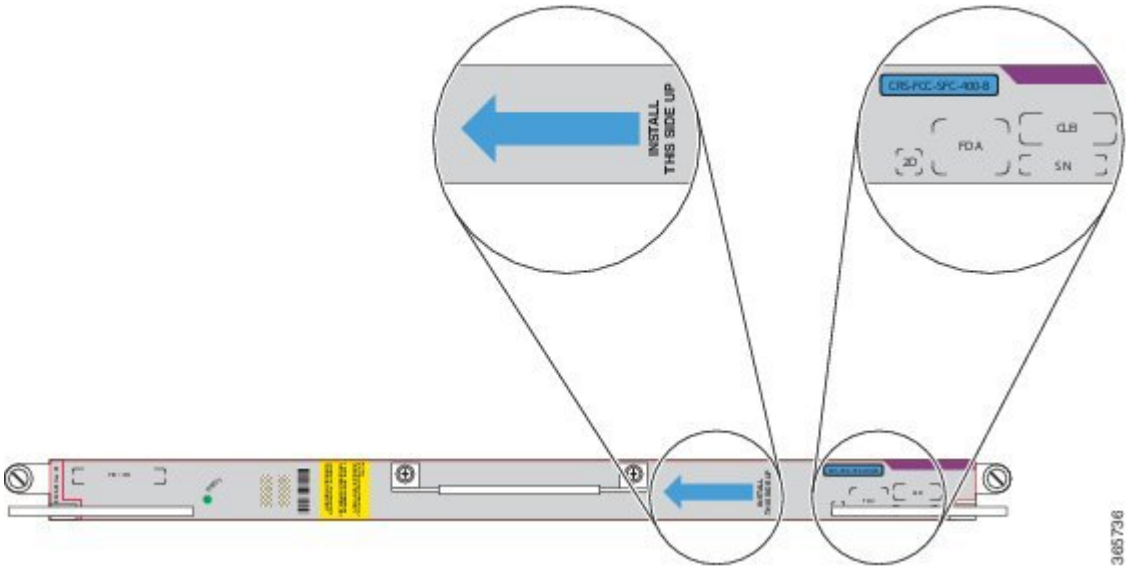
Figure 72: Switch Fabric Card—CRS-FCC-SFC



1	Status LED	3	Handle
2	Alphanumeric display		

This figure shows the front view of a CRS-FCC-SFC-400-B switch fabric card that is used in CRS-X systems.

Figure 73: Switch Fabric Card—CRS-FCC-SFC-400-B



Prerequisites

Before performing this task, you must first open the front (SFC) side cosmetic doors (if installed). You must already have an OIM installed in your chassis in the slot corresponding to where you plan to install the SFC before you install the SFC (for example, if you are planning on installing the SFC in slot 0, you must have an OIM installed in slot 0 on the rear of the chassis), and you must remove any impedance carrier or slot cover from the slot in which you are installing the SFC. See the Installing an OIM, on page 143, the Removing a Slot Cover, on page 134, and the Removing an Impedance Carrier, on page 131. If you are replacing an SFC, you must remove the currently installed SFC from the slot and set it carefully aside. See the Removing an SFC, on page 156 for more information.

An SFC can be installed in any of the slots SFC0 to SFC11 (upper card cage) and SFC12 to SFC23 (lower card cage).

Note Remove only one impedance carrier or SFC and install one SFC at a time. Be sure to verify that each SFC is fully installed and secured before installing another card. Allow at least 15 seconds for the router to complete the preceding tasks before removing or installing another card.

Caution Use the slide-assistance arm to slide cards from the card carrier. DO NOT LIFT CARDS BY THE SLIDE-ASSISTANCE ARM! Rotate cards onto their vertical axes, then lift them from the bottom, using the slide-assistance arm only as an aid for balance.

Required Tools and Equipment

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

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver
- Switch fabric card
  - 40 G SFC (Cisco product number CRS-FCC-SFC), or
  - 140 G SFC (Cisco product number CRS-FCC-SFC-140), or
  - 400 G SFC (Cisco product number CRS-FCC-SFC-400) or (Cisco product number CRS-FCC-SFC-400-B)

Steps

To install an SFC, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front of the chassis or to a bare metal surface on the chassis.
2. Choose a mated SFC slot with an OIM.
3. Remove the SFC you are installing from its antistatic packaging.
4. Use the screwdriver to unscrew and remove the sheetmetal cover over the HBMT connectors on the rear of the SFC, and set it aside.
5. Remove the caps from the HBMT connectors on the back of the card, and set them carefully aside.
6. Visually inspect the connector on the card before you insert it into the chassis. Do not attempt to install a card with a damaged or dirty connector, as this action may damage the backplane connector or OIM.
7. Position the card for insertion into the card cage slot. Avoid touching the card circuitry or any connectors.
8. Grasp the slide assistance arm with one hand and place your other hand under the carrier to support and guide it into the correct slot. DO NOT LIFT CARDS BY THE SLIDE-ASSISTANCE ARM; lift them from the bottom, using the slide-assistance arm only as an aid for balance. See the figure below.
9. Slide the card halfway into the slot.
10. Pivot both card ejector levers so 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.
11. 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.
12. 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.
13. Use the screwdriver to turn the two captive screws on the front panel of the SFC clockwise to seat the card firmly in the slot.

DETAILED STEPS

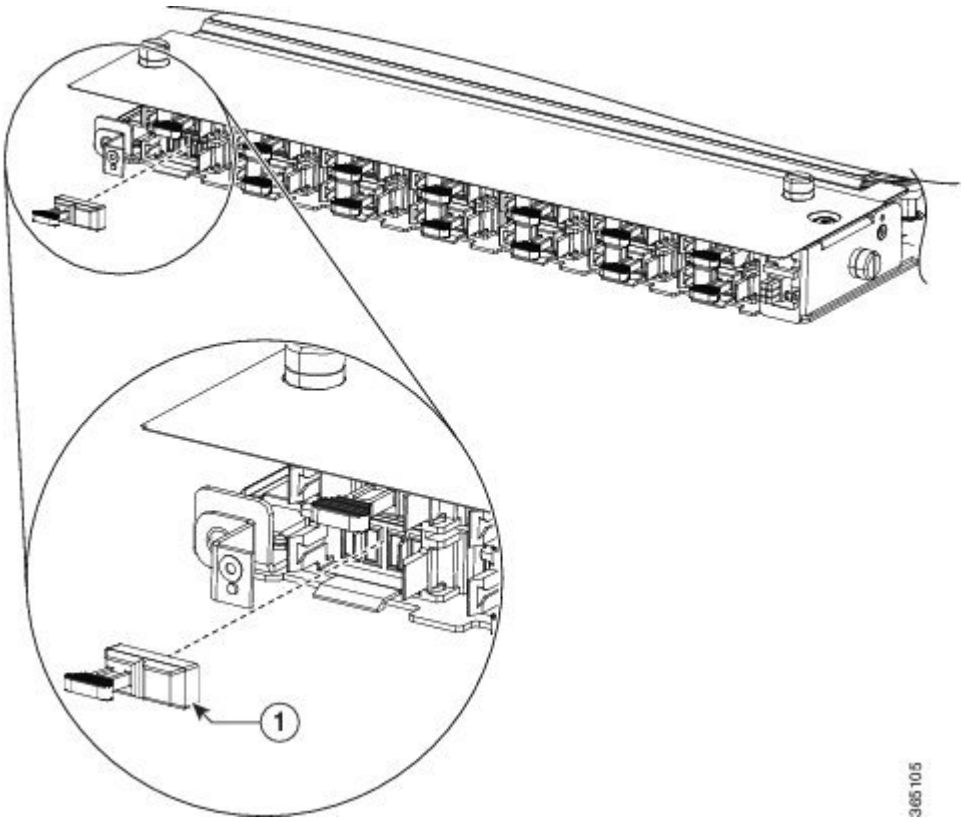
Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front of the chassis or to a bare metal surface on the chassis.

Step 2 Choose a mated SFC slot with an OIM.

Step 3 Remove the SFC you are installing from its antistatic packaging.

Step 4 Use the screwdriver to unscrew and remove the sheetmetal cover over the HBMT connectors on the rear of the SFC, and set it aside.

Step 5 Remove the caps from the HBMT connectors on the back of the card, and set them carefully aside.



	Dust Cap

Step 6 Visually inspect the connector on the card before you insert it into the chassis. Do not attempt to install a card with a damaged or dirty connector, as this action may damage the backplane connector or OIM.

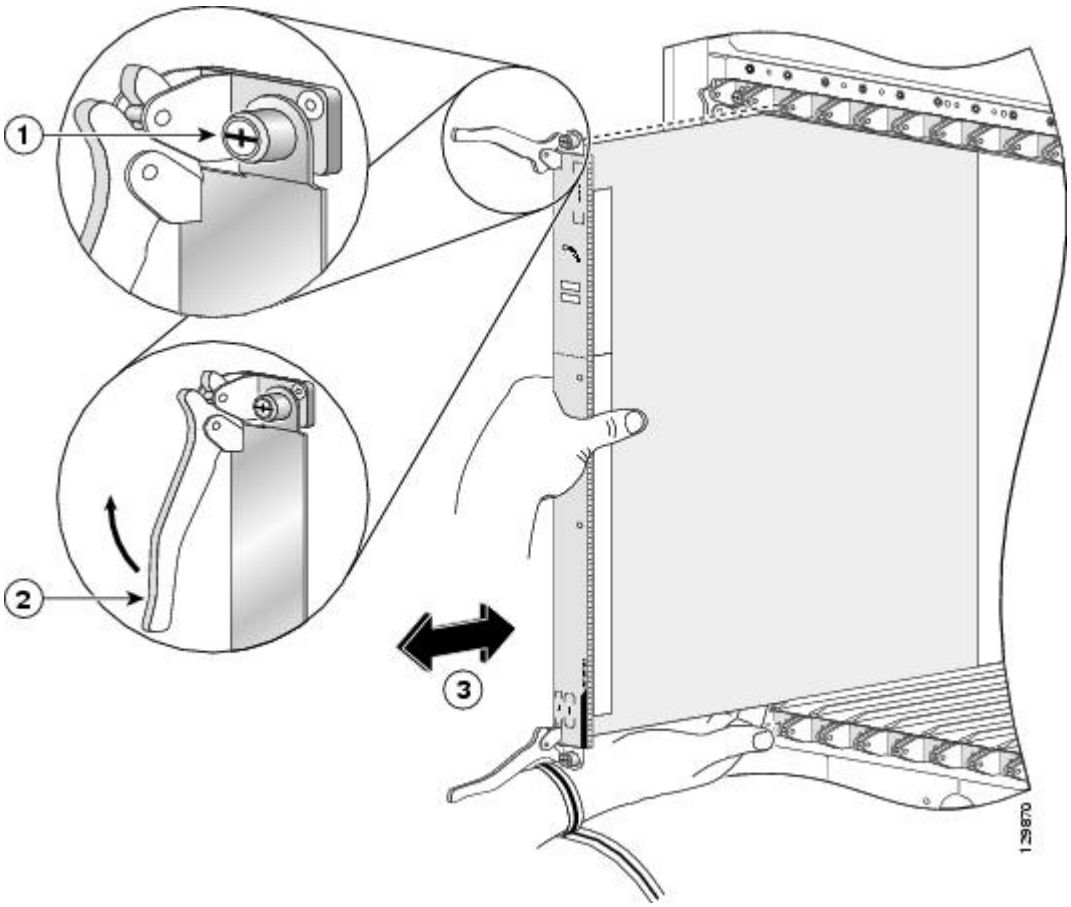
Step 7 Position the card for insertion into the card cage slot. Avoid touching the card circuitry or any connectors.

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

Step 8 Grasp the slide assistance arm with one hand and place your other hand under the carrier to support and guide it into the correct slot. DO NOT LIFT CARDS BY THE SLIDE-ASSISTANCE ARM; lift them from the bottom, using the slide-assistance arm only as an aid for balance. See the figure below.

Caution An SFC weighs about 30 lb (14 kg). You should use two hands when handling an SFC.

Figure 74: Installing a Switch Fabric Card



1	Captive screw	3	Direction of installation or removal
2	Ejector lever		

Step 9 Slide the card halfway into the slot.

Step 10 Pivot both card ejector levers so 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 might bind when you attempt to close the ejector levers, thereby damaging or breaking one or both ejector levers.

Step 11 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 SFC 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 12 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 13 Use the screwdriver to turn the two captive screws on the front panel of the SFC clockwise to seat the card firmly in the slot.

What to Do Next

After performing this task, you may close the doors on the front (SFC) side of the chassis (if installed). For more information, see the How to Install and Remove Cards and Associated Components, on page 126.

Removing an SFC

This section describes how to remove a switch fabric card (SFC) from the FCC. For more detailed information on the different types of switch fabric cards available and details on the cards themselves, see the Cisco CRS Carrier Routing System Multishelf System Description.

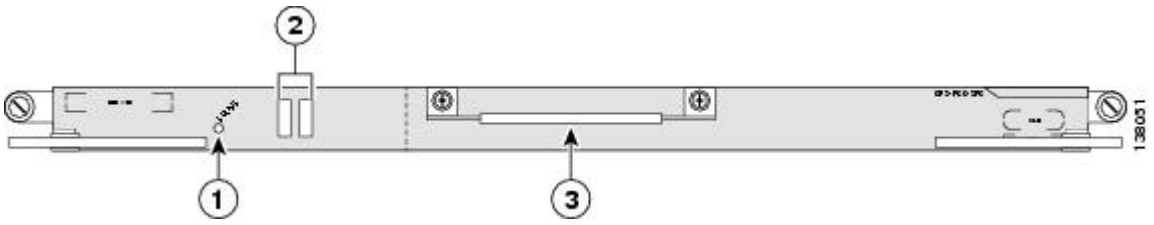
Caution Class 1M laser radiation when open. Do not view directly with optical instruments. Statement 281

Warning For diverging beams, viewing the laser output with certain optical instruments within a distance of 100 mm may pose an eye hazard. For collimated beams, viewing the laser output with certain optical instruments designed for use at a distance may pose an eye hazard. Statement 282

Warning Laser radiation. Do not view directly with optical instruments. Class 1M laser product. Statement 283

This figure shows the front view of a CRS-FCC-SFC switch fabric card that is installed in a 40G multishelf system. The CRS-FCC-SFC-140 and CRS-FCC-SFC-400 are similar.

Figure 75: Switch Fabric Card—CRS-FCC-SFC

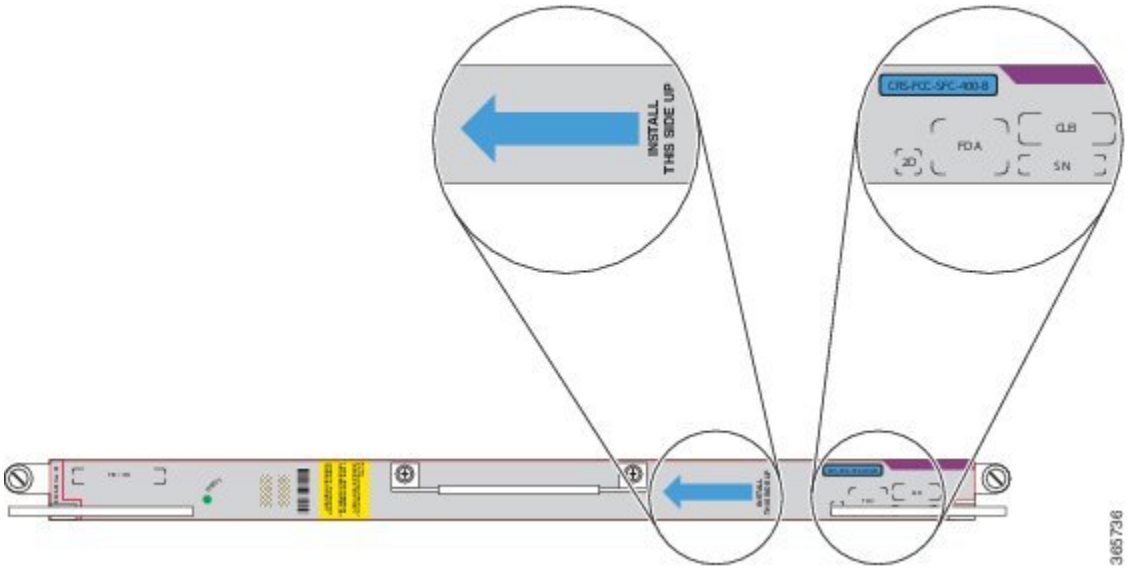


1	Status LED	3	Handle

2	Alphanumeric display		

This figure shows the front view of a CRS-FCC-SFC-400-B switch fabric card that is used for CRS-X systems.

Figure 76: Switch Fabric Card—CRS-FCC-SFC-400-B



Prerequisites

Before performing this task, you must first open the front cosmetic doors (if installed).

Caution Use the slide-assistance arm to slide cards from the card carrier. DO NOT LIFT CARDS BY THE SLIDE-ASSISTANCE ARM! Rotate cards onto their vertical axes, then lift them from the bottom, using the slide-assistance arm only as an aid for balance.

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 an SFC, perform the following steps:

SUMMARY STEPS

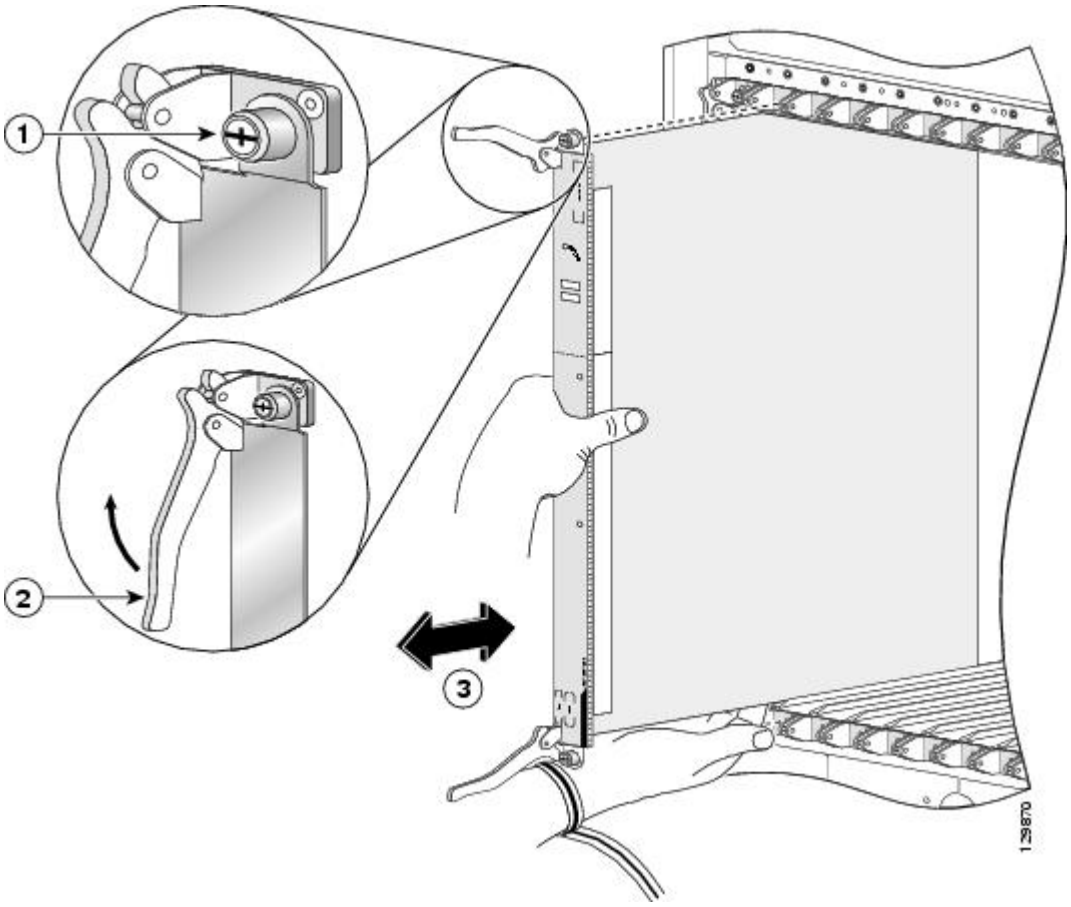
1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front of the chassis or to a bare metal surface on the chassis.
2. Identify the card to be removed in the card cage. Use the screwdriver to turn the two captive screws on the front panel of the card counterclockwise to loosen the card from the slot. See this figure.
3. Grasp the two card ejector levers and simultaneously pivot both ejector levers about 90 degrees away from the front edge of the card carrier to unseat the card from the backplane connector.
4. Grasp the slide-assistance arm and gently pull the SFC halfway from the slot.
5. Move one hand under the SFC to guide it. Avoid touching the SFC printed circuit board, components, and any connector pins. DO NOT LIFT CARDS BY THE SLIDE-ASSISTANCE ARM; lift them from the bottom, using the slide-assistance arm only as an aid for balance.
6. Slide the card completely from the slot.
7. Replace the caps on the HBMT connectors on the back of the card.
8. Place the card directly into an antistatic sack or other ESD-preventive container. If you plan to return the defective card to the factory, repackage it in a Cisco SFC shipping container.

DETAILED STEPS

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

Step 2 Identify the card to be removed in the card cage. Use the screwdriver to turn the two captive screws on the front panel of the card counterclockwise to loosen the card from the slot. See this figure.

Figure 77: Removing a Switch Fabric Card



1	Captive screw	3	Direction of installation or removal
2	Ejector lever		

Step 3 Grasp the two card ejector levers and simultaneously pivot both ejector levers about 90 degrees away from the front edge of the card carrier to unseat the card from the backplane connector.

Caution To prevent ESD damage, handle an SFC by its ejector levers, the SFC carrier edges, or the slide-assistance arm only. Do not touch any of the electrical components, pins, and circuitry.

Step 4 Grasp the slide-assistance arm and gently pull the SFC halfway from the slot.

Step 5 Move one hand under the SFC to guide it. Avoid touching the SFC printed circuit board, components, and any connector pins. DO NOT LIFT CARDS BY THE SLIDE-ASSISTANCE ARM; lift them from the bottom, using the slide-assistance arm only as an aid for balance.

Step 6 Slide the card completely from the slot.

Caution An SFC weighs about 30 lb (14 kg). You should use two hands when handling an SFC.

Step 7 Replace the caps on the HBMT connectors on the back of the card.

Step 8 Place the card directly into an antistatic sack or other ESD-preventive container. If you plan to return the defective card to the factory, repackage it in a Cisco SFC shipping container.

What to Do Next

After performing this task, you may install a new replacement SFC, See the Installing an SFC, on page 151.

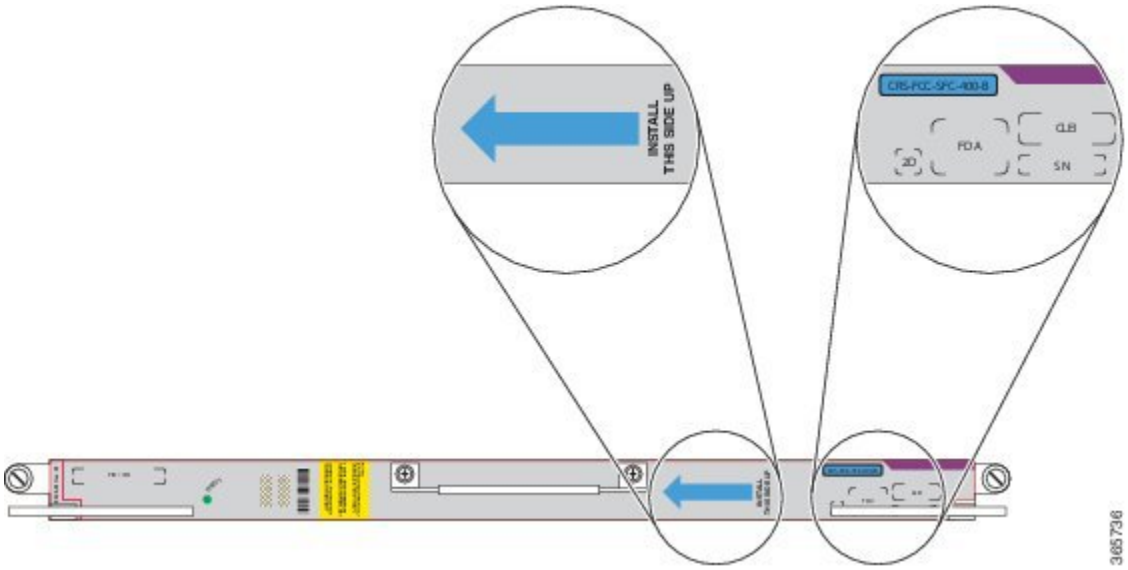
Verifying the Installation of an SFC

This section describes how to verify that a switch fabric card (SFC) has been properly installed. The figure below shows the front panel on the 40 G CRS-FCC-SFC switch fabric card. The front panel on the CRS-FCC-SFC-140 and CRS-FCC-SFC-400 are similar.

Figure 78: SFC Front Panel—CRS-FCC-SFC

The figure below shows the front panel on the 400 G CRS-FCC-SFC-400-B switch fabric card. The blue arrow indicates the direction in which the PLIM has to be installed. The product number is indicated inside a blue bubble.

Figure 79: SFC Front Panel—CRS-FCC-SFC-400-B



Understanding the Alphanumeric LEDs

At one end of the faceplate, near an ejector lever, an SFC has two four-digit alphanumeric LED displays that show a sequence of messages indicating the state of the card. In normal operation, the LED module should display IOS-XR .

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

Troubleshooting the SFC

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

- Make sure that the card is seated firmly in the FCC slot. One easy way to verify physical installation is to see whether the front faceplate of the SFC is even with the fronts of the other cards 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 SFC.
- Examine the FCC alarm module to see if there are any active alarm conditions. (See the section on the alarm module in *Cisco CRS Carrier Routing System Multishelf System Description* .)
- Examine the FCC power shelves to see whether the chassis, as a whole, is receiving power.

Use the Status LEDs, located on the SFC faceplate, to verify the correct installation of the SFC:

- When the SFC is properly installed, the Status LED turns green. If this LED is off, verify that the SFC is installed correctly.
- If a failure occurs during the board boot sequence, the two four-digit alphanumeric LED displays indicate the current boot phase to assist you in debugging the board failure.

Installing an SCGE Card

This section describes how to install a shelf controller Gigabit Ethernet (SCGE) card in the FCC. For more detailed information on the SCGE card, see Cisco CRS Carrier Routing System Multishelf System Description.

Each card cage in the FCC has a slot for an SCGE card (see following figure, CRS-FCC-SC-22GE SCGE Card—Front Panel View). Each populated card cage requires one SCGE card.

Warning Class 1 Laser Product. Statement 113

Warning Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures. Statement 125

Caution Always use an electrostatic discharge (ESD) wrist strap when handling SCGE cards.

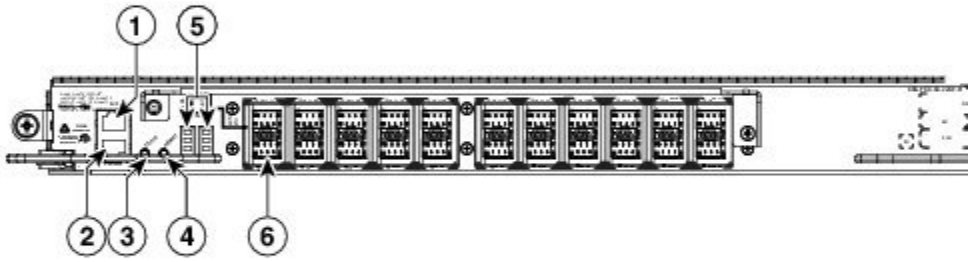
This figure shows the front panel of the CRS-FCC-SC-22GE SCGE card in a horizontal view.

Figure 80: CRS-FCC-SC-22GE SCGE Card—Front Panel View

1	RJ-45 auxiliary (AUX) port	5	Alphanumeric LEDs
2	RJ-45 console port	6	Gigabit ethernet interface
3	Status LED	7	PCMCIA card slots
4	Primary LED		

This figure shows the front panel of the CRS-FCC-SC-22GE-B SCGE card in a horizontal view.

Figure 81: CRS-FCC-SC-22GE-B SCGE Card—Front Panel View



1	RJ-45 auxiliary (AUX) port	4	Primary LED
2	RJ-45 console port	5	Alphanumeric LEDs
3	Status LED	6	Gigabit ethernet interface

Prerequisites

Before performing this task, you must first open the front cosmetic doors (if installed). An SCGE card can be installed only in an SCGE0 (upper card cage) or SCGE1 (lower card cage) slot.

Caution You can use the card 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 bracket only as an aid for balance.

Required Tools and Equipment

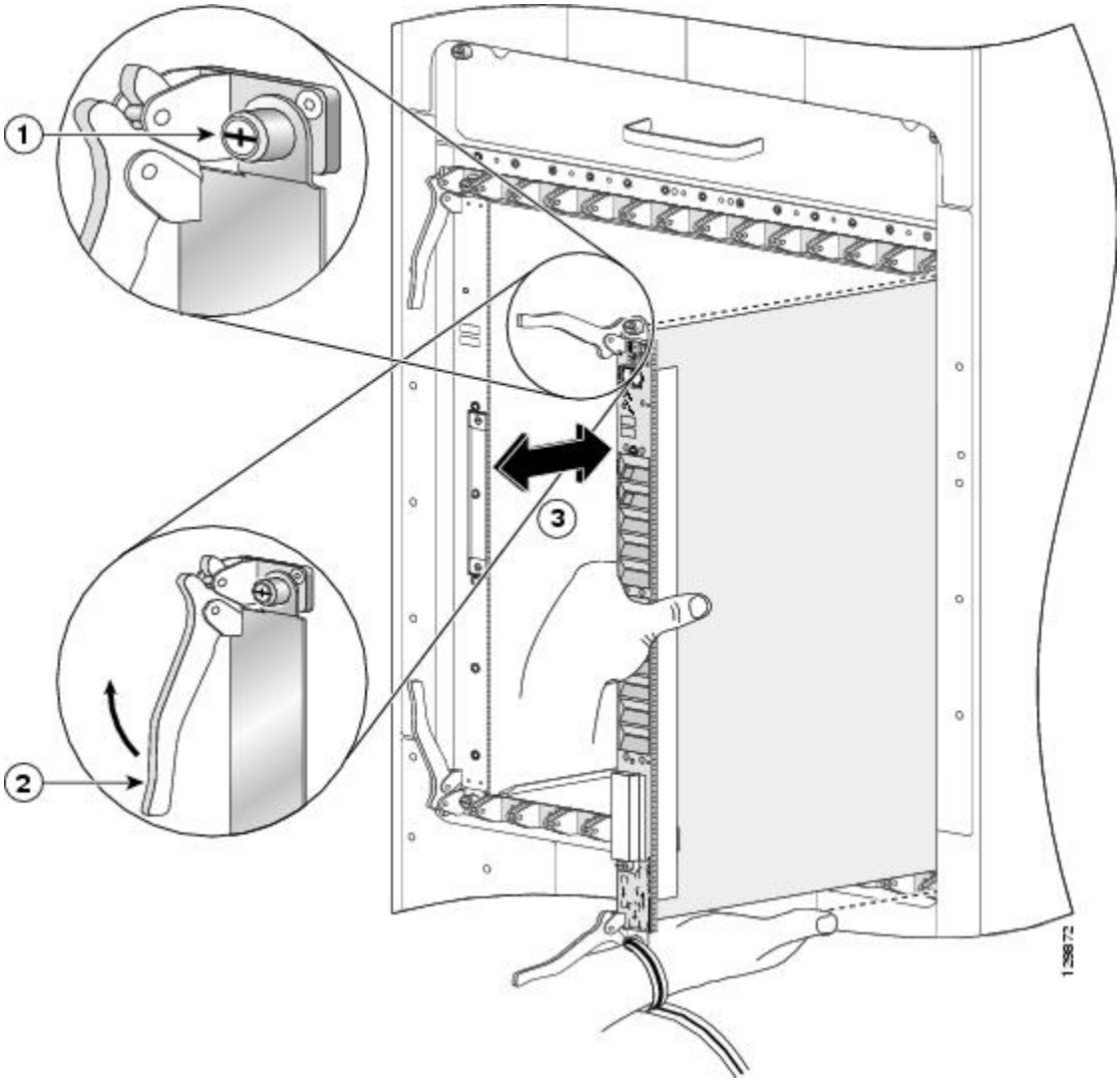
You need the following tools and part to perform this task:

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver
- 22-port SCGE card (Cisco product number CRS-FCC-SC-22GE or CRS-FCC-SC-22GE-B)

Steps

To install an SCGE card, see the following figure and perform the following steps:

Figure 82: Installing an SCGE Card



1	Captive screw	3	Direction of installation or removal
2	Ejector lever		

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front of the chassis or to a bare metal surface on the chassis.
2. Remove the SCGE slot impedance carrier or the SCGE card you are replacing from the designated slot, and set it aside. (See the Removing an Impedance Carrier, on page 131 or the Removing an SFC, on page 156.)
3. Remove the SCGE card you are installing from its antistatic packaging.
4. 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 backplane connector or OIM.
5. Grasp the card cable management bracket with one hand and place your other hand under the card to support and guide it into the correct slot. DO NOT LIFT CARDS BY THE CABLE MANAGEMENT BRACKET; lift them from the bottom, using the cable management bracket only as an aid for balance.
6. Slide the card halfway into the slot. Avoid touching the card circuitry and any connectors.
7. Pivot both card ejector levers so 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.
8. 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.
9. 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.
10. Use the screwdriver to turn the two captive screws on the front panel of the SCGE card clockwise to seat the card firmly in the slot.

DETAILED STEPS

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

Step 2 Remove the SCGE slot impedance carrier or the SCGE card you are replacing from the designated slot, and set it aside. (See the Removing an Impedance Carrier, on page 131 or the Removing an SFC, on page 156.)

Caution To prevent ESD damage, handle an SCGE card by its ejector levers, the SCGE card carrier edges, or the card cable management bracket only. Do not touch any of the electrical components, pins, and circuitry.

Note Remove only one impedance carrier or SCGE card and install one SCGE card at a time. Be sure to verify that each SCGE card is fully installed and secured before installing another card. Allow at least 15 seconds for the router to complete the preceding tasks before removing or installing another card.

Step 3 Remove the SCGE card you are installing from its antistatic packaging.

Step 4 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 backplane connector or OIM.

Note Rails exist on the upper and lower left edge of the cards that align with the slots in the card cage. When you install a card in the card cage, make sure that you align these rails when sliding the cards into the chassis.

Step 5 Grasp the card cable management bracket with one hand and place your other hand under the card to support and guide it into the correct slot. DO NOT LIFT CARDS BY THE CABLE MANAGEMENT BRACKET; lift them from the bottom, using the cable management bracket only as an aid for balance.

Caution An SCGE card weighs about 30 lb (14 kg). You should use two hands when handling an SCGE card.

Step 6 Slide the card halfway into the slot. Avoid touching the card circuitry and any connectors.

Step 7 Pivot both card ejector levers so 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 might bind when you attempt to close the ejector levers, thereby damaging or breaking one or both ejector levers.

Step 8 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 SCGE card has guide pins 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 9 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 10 Use the screwdriver to turn the two captive screws on the front panel of the SCGE card clockwise to seat the card firmly in the slot.

What to Do Next

After performing this task, you may close the doors on the front (SFC) side of the chassis (if installed). For more information, see the How to Install and Remove Cards and Associated Components, on page 126.

Removing an SCGE Card

This section describes how to remove a shelf controller Gigabit Ethernet (SCGE) from the FCC. For more detailed information on the SCGE card, see Cisco CRS Carrier Routing System Multishelf System Description.

Each card cage in the FCC has a slot for an SCGE card. Each populated card cage requires an SCGE card.

Warning Class 1 Laser Product. Statement 113

Warning Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures. Statement 125

Caution Always use an electrostatic discharge (ESD) wrist strap when handling SCGE cards.

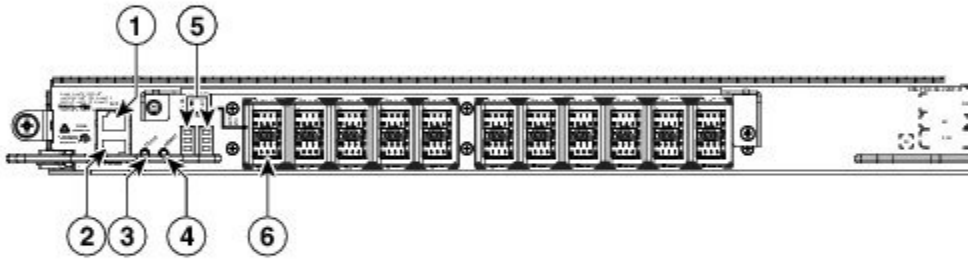
This figure shows the front panel of the CRS-FCC-SC-22GE SCGE card in a horizontal view.

Figure 83: CRS-FCC-SC-22GE SCGE Card—Front Panel View

1	RJ-45 auxiliary (AUX) port	5	Alphanumeric LEDs
2	RJ-45 console port	6	Gigabit ethernet interface
3	Status LED	7	PCMCIA card slots
4	Primary LED		

This figure shows the front panel of the CRS-FCC-SC-22GE-B SCGE card in a horizontal view.

Figure 84: CRS-FCC-SC-22GE-B SCGE Card—Front Panel View



1	RJ-45 auxiliary (AUX) port	4	Primary LED
2	RJ-45 console port	5	Alphanumeric LEDs
3	Status LED	6	Gigabit ethernet interface

Prerequisites

Before performing this task, you must first open the front cosmetic doors (if installed).

Caution You can use the card 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 bracket only as an aid for balance.

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 an SCGE card, see Figure 85: Removing an SCGE Card , on page 171 and perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front of the chassis or to a bare metal surface on the chassis.
2. Identify the card to be removed in the card cage. Use the screwdriver to turn the two captive screws on the front panel of the SFC counterclockwise to loosen the card from the slot. See Figure 4-31 .
3. Grasp the two card ejector levers and simultaneously pivot both ejector levers about 90 degrees away from the front edge of the card carrier to unseat the card from the backplane connector.
4. Grasp the card cable management bracket and gently pull the SCGE card halfway from the slot.
5. Move one hand under the card to guide it. Avoid touching the card's printed circuit board, components, and any connector pins. DO NOT LIFT CARDS BY THE CARD CABLE MANAGEMENT BRACKET; lift them from the bottom, using the cable management bracket only as an aid for balance.
6. Slide the card completely from the slot.
7. Place the card directly into an antistatic sack or other ESD-preventive container. If you plan to return the defective card to the factory, repackage it in a Cisco SCGE card shipping container.

DETAILED STEPS

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

Step 2 Identify the card to be removed in the card cage. Use the screwdriver to turn the two captive screws on the front panel of the SFC counterclockwise to loosen the card from the slot. See Figure 4-31 .

Figure 85: Removing an SCGE Card

1	Captive screw	3	Direction of installation or removal
2	Ejector lever		

Step 3 Grasp the two card ejector levers and simultaneously pivot both ejector levers about 90 degrees away from the front edge of the card carrier to unseat the card from the backplane connector.

Caution To prevent ESD damage, handle an SCGE card by its ejector levers, the SCGE card carrier edges, or the card cable management bracket only. Do not touch any of the electrical components, pins, and circuitry.

Step 4 Grasp the card cable management bracket and gently pull the SCGE card halfway from the slot.

Step 5 Move one hand under the card to guide it. Avoid touching the card's printed circuit board, components, and any connector pins. DO NOT LIFT CARDS BY THE CARD CABLE MANAGEMENT BRACKET; lift them from the bottom, using the cable management bracket only as an aid for balance.

Step 6 Slide the card completely from the slot.

Caution An SCGE card weighs about 30 lb (14 kg). You should use two hands when handling an SCGE card.

Step 7 Place the card directly into an antistatic sack or other ESD-preventive container. If you plan to return the defective card to the factory, repackage it in a Cisco SCGE card shipping container.

What to Do Next

After performing this task, you may close the doors on the front (SFC) side of the chassis (if installed). For more information, see the How to Install and Remove Cards and Associated Components, on page 126.

Verifying the Installation of an SCGE Card

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

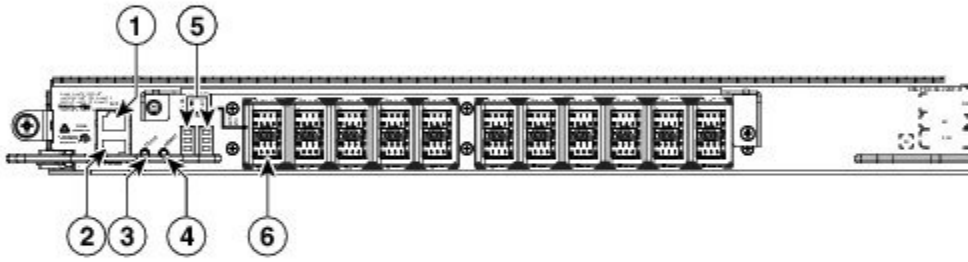
This figure shows the front panel of the CRS-FCC-SC-22GE SCGE card in a horizontal view.

Figure 86: CRS-FCC-SC-22GE SCGE Card—Front Panel View

1	RJ-45 auxiliary (AUX) port	5	Alphanumeric LEDs
2	RJ-45 console port	6	Gigabit ethernet interface
3	Status LED	7	PCMCIA card slots
4	Primary LED		

This figure shows the front panel of the CRS-FCC-SC-22GE-B SCGE card in a horizontal view.

Figure 87: CRS-FCC-SC-22GE-B SCGE Card—Front Panel View



1	RJ-45 auxiliary (AUX) port	4	Primary LED
2	RJ-45 console port	5	Alphanumeric LEDs
3	Status LED	6	Gigabit ethernet interface

Understanding the Alphanumeric LEDs

At one end of the faceplate, near an ejector lever, an SCGE 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 SCGE Card

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

- Make sure that the card is seated firmly into the FCC slot. One easy way to verify physical installation is to see whether the front faceplate of the SCGE card is even with the fronts of the other cards 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 SCGE card.
- Examine the alarm module to see if there are any active alarm conditions. (See a section on the alarm module in Cisco CRS Carrier Routing System Multishelf System Description.)
- Examine the power shelves to see whether the chassis, as a whole, is receiving power.

Use the Status LEDs, located on the SCGE 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 status is unknown. Verify that there is power to the board by looking at the indicators on the power shelf.
- If there is a failure during the board boot sequence, the two four-digit alphanumeric display indicates the current boot phase to assist you in debugging the board failure.

Installing a PCMCIA Card Into an SCGE Card

This section describes how to install a PCMCIA card in the PCMCIA slot of a 22-port SCGE card (CRS-FCC-SC-22GE only) card. For more detailed information on the SCGE PCMCIA card, see Cisco CRS Carrier Routing System Multishelf System Description.

The CRS-FCC-SC-22GE SCGE card provides two PCMCIA flash slots, each of which provides up to 1 GB of flash storage. One of the PCMCIA flash subsystems is accessible externally and removable and allows you to transfer images and configurations by plugging in a PCMCIA flash card. The other subsystem is fixed to

the SCGE card, not removable, and is for permanent storage of configurations and images. This figure shows the location of the PCMCIA door in the CRS-FCC-SC-22GE SCGE card faceplate.

Figure 88: Front View of CRS-FCC-SC-22GE Card

1	RJ-45 auxiliary (AUX) port	5	Alphanumeric LEDs
2	RJ-45 console port	6	Gigabit ethernet interface
3	Status LED	7	PCMCIA card slots
4	Primary LED		

Prerequisites

If you are replacing a PCMCIA card, see the Removing a PCMCIA Card From the SCGE Card, on page 176 to remove the PCMCIA card from the CRS-FCC-SC-22GE SCGE PCMCIA card slot.

Before performing this task open the cosmetic doors (if installed).

Required Tools and Equipment

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

- ESD-preventive strap
- 1/4 in. x 6 in. long slotted screwdriver
- PCMCIA card

Steps

To install a PCMCIA card into a CRS-FCC-SC-22GE SCGE card PCMCIA slot, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front of the chassis or to a bare metal surface on the chassis.
2. Using the screwdriver, loosen the captive screw at the bottom of the PCMCIA slot door on the faceplate of the card.
3. While lifting the hinged PCMCIA slot door up, carefully insert the new PCMCIA 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.)
4. Close the door to keep dust out, and tighten the captive screw with the screwdriver.

DETAILED STEPS

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front of the chassis or to 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 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 with the screwdriver.

What to Do Next

After performing this task, you may close the doors on the front (SFC) side of the chassis (if installed). For more information, see the How to Install and Remove Cards and Associated Components, on page 126.

Removing a PCMCIA Card From the SCGE Card

This section describes how to remove a PCMCIA card from the PCMCIA slot of a CRS-FCC-SC-22GE SCGE card. For more detailed information on the CRS-FCC-SC-22GE PCMCIA card, see Cisco CRS Carrier Routing System Multishelf System Description.

The CRS-FCC-SC-22GE card provides two PCMCIA flash slots, each of which provides up to 1 GB of flash storage. One of the PCMCIA flash subsystems is accessible externally and removable and allows you to transfer images and configurations by plugging in a PCMCIA flash card. The other subsystem is fixed to the

SCGE card, not removable, and is for permanent storage of configurations and images. This figure shows the location of the PCMCIA door in the CRS-FCC-SC-22GE card faceplate.

Figure 89: Front View of CRS-FCC-SC-22GE SCGE Card

1	RJ-45 auxiliary (AUX) port	5	Alphanumeric LEDs
2	RJ-45 console port	6	Gigabit ethernet interface
3	Status LED	7	PCMCIA card slots
4	Primary LED		

Prerequisites

Before performing this task, open the front (SFC) side cosmetic doors (if installed).

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive strap
- 1/4 in. x 6 in. long slotted screwdriver

Steps

To remove a PCMCIA card from a CRS-FCC-SC-22GE card PCMCIA slot, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front of the chassis or to a bare metal surface on the chassis.
2. Using the screwdriver, loosen the captive screw at the bottom of the PCMCIA slot door on the faceplate of the card.
3. While lifting the hinged PCMCIA slot door up, press the release button on the card slot to disengage the card from the card, and then carefully pull out the far left removable PCMCIA flash card.
4. Place the removed PCMCIA card on an antistatic mat, or immediately place it in an antistatic bag if you plan to return it to the factory.
5. 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 your new PCMCIA card.

DETAILED STEPS

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front of the chassis or to 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.

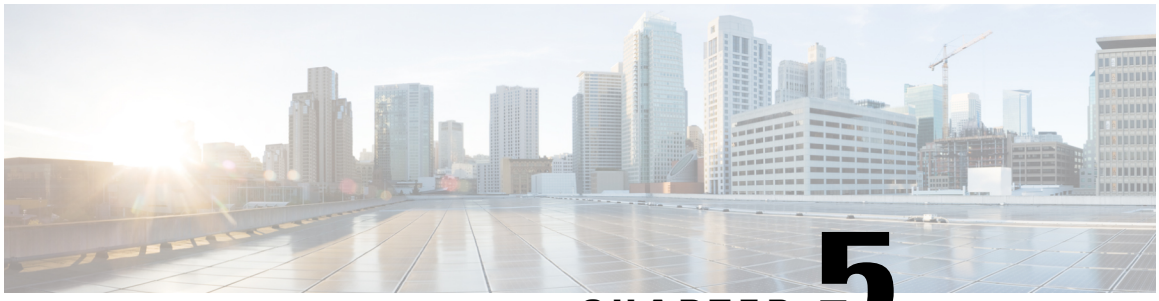
Step 3 While lifting the hinged PCMCIA slot door up, press the release button on the card slot to disengage the card from the card, and then carefully pull out the far left removable PCMCIA flash card.

Step 4 Place the removed PCMCIA card on an antistatic mat, or immediately place it in an antistatic bag if you plan to return it to the factory.

Step 5 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 your new PCMCIA card.

What to Do Next

If you intend to install a new PCMCIA card, see the Installing a PCMCIA Card Into an SCGE Card, on page 174.



CHAPTER 5

Installing and Removing Exterior Cosmetic Components

This chapter provides instructions on how to install and remove the Cisco CRS Carrier Routing System Fabric Card Chassis exterior cosmetic components.

This chapter presents the following topics:

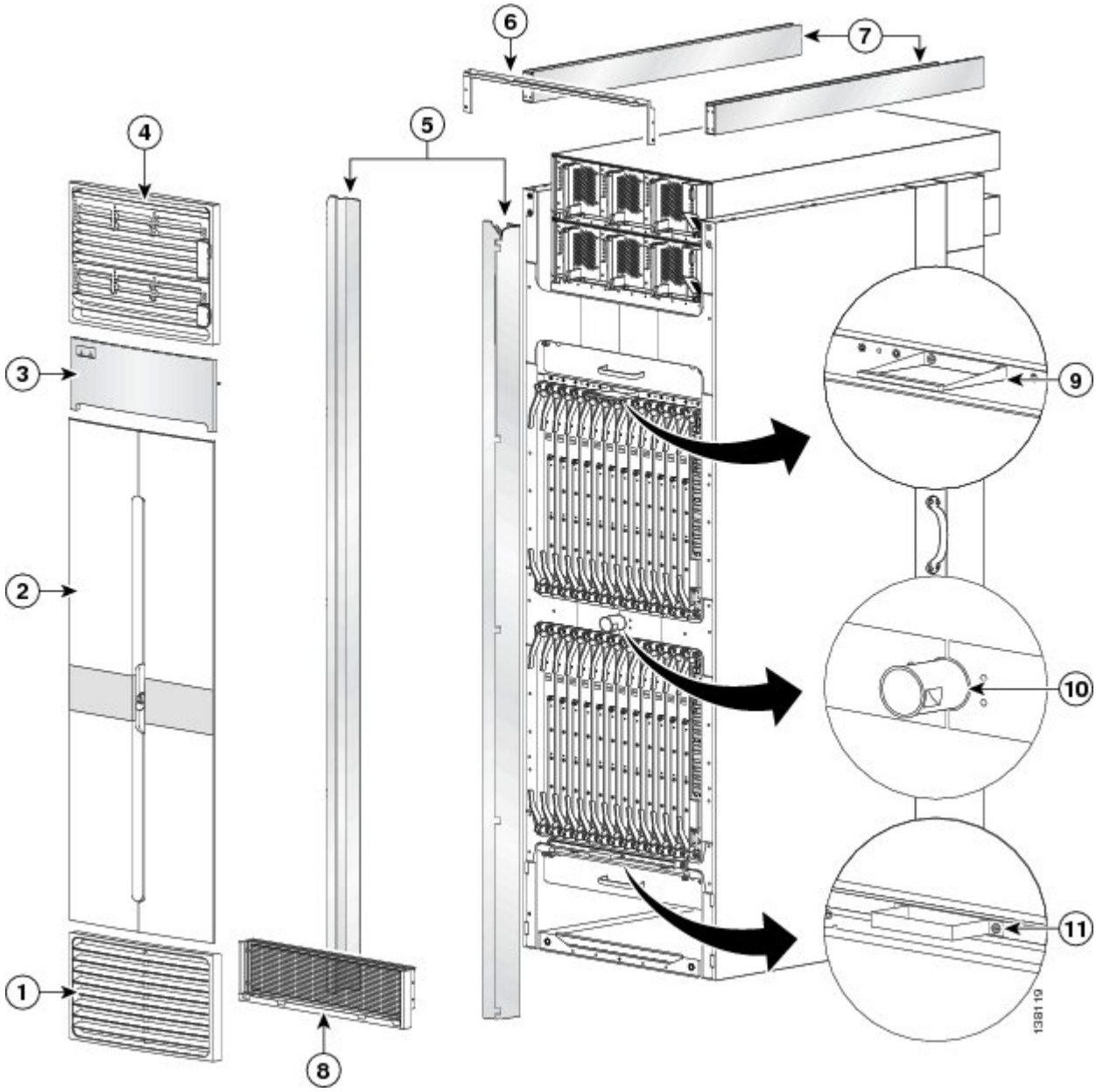
Information about the Exterior Cosmetic Components

This section contains general information about the exterior cosmetic components.

The FCC is shipped with exterior cosmetic components for the front (SFC) and rear (OIM) side of the chassis.

The figure below shows the exterior cosmetics for the front (SFC) side of a chassis with fixed configuration power shelves installed. The front view of an FCC with modular configuration power shelves installed is similar.

Figure 90: FCC Front (SFC) Side Exterior Cosmetic Components—Fixed Configuration Power Shown

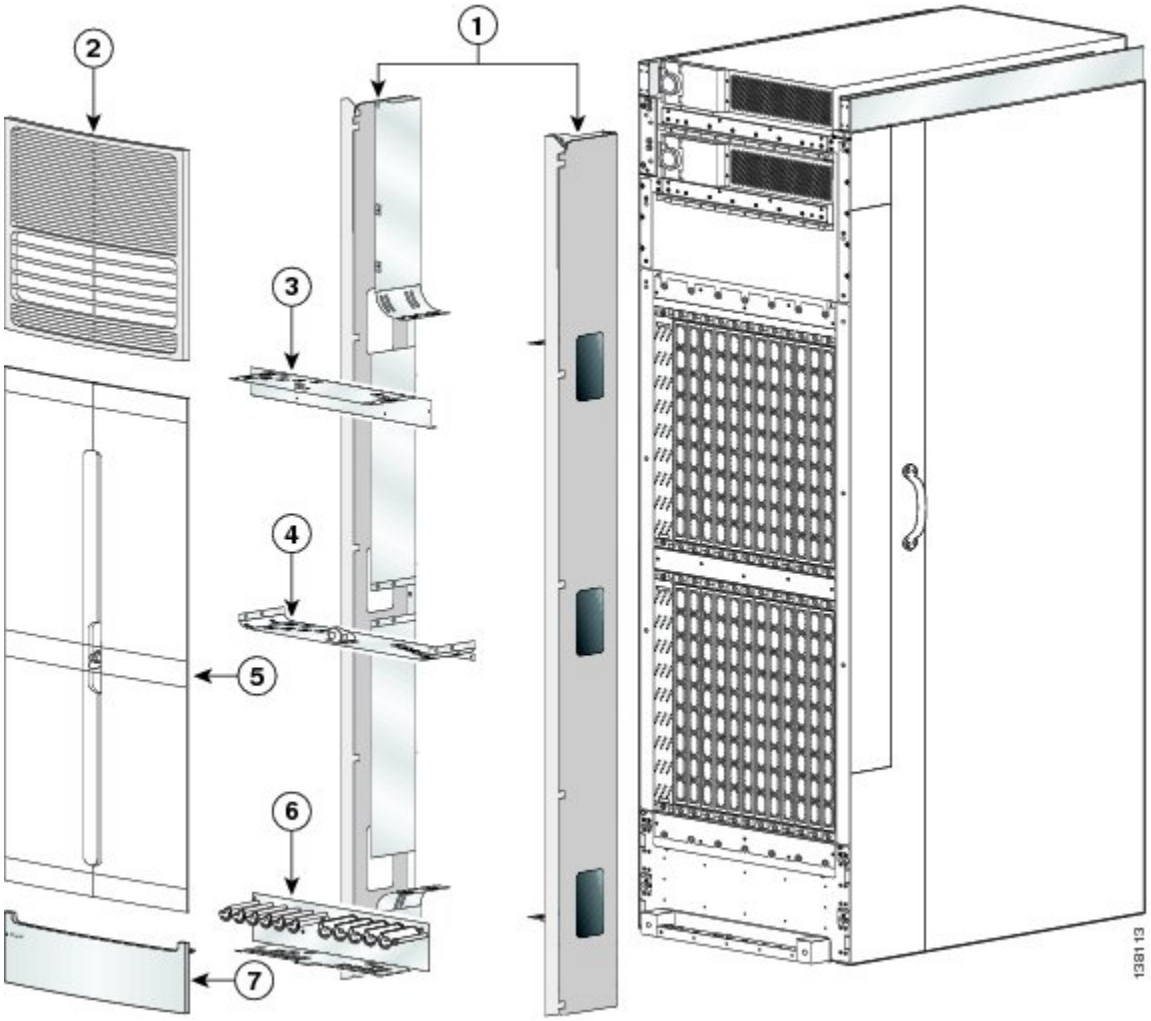


1	Lower grille	7	Unistruts
2	Doors	8	Lower grille screen and frame assembly

3	Logo bezel	9	Upper door stop
4	Upper grille (optional)	10	Strike tube
5	Vertical cable troughs	11	Lower door stop
6	Upper grille support		

The figure below shows the exterior cosmetics on the rear (OIM) side of an FCC with fixed configuration power shelves installed. The rear view of an FCC with modular configuration power shelves installed is similar.

Figure 91: FCC Rear (OIM) Side Exterior Cosmetic Components—Fixed Configuration Power Shown



1	Vertical cable troughs	5	Doors

2	Upper grille	6	Lower horizontal cable guide assembly
3	Upper horizontal cable guide	7	Lower bezel
4	Middle horizontal cable guide with strike tube attached		

Installing the Front (SFC) Side Cosmetic Components

This section describes how to install the front (SFC) side exterior cosmetic covers on the FCC. Figure 90: FCC Front (SFC) Side Exterior Cosmetic Components—Fixed Configuration Power Shown, on page 180 shows the exterior cosmetics for the front (SFC) side of a chassis with fixed configuration power shelves installed. The front view of an FCC with modular configuration power shelves installed is similar.

Note While it is possible to install the various front exterior components on the chassis in a different order, it is easier to install them in the order outlined in this section.

This section describes how to perform the following tasks:

Prerequisites

Before performing this task, you must first unpack and secure the chassis. See *Cisco CRS Carrier Routing System Fabric Card Chassis Unpacking, Moving, and Securing Guide* .

Required Tools and Equipment

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

- 8-in. long number 1 Phillips screwdriver—magnetic head preferable
- 10-mm hex key wrench
- 2-mm hex key wrench (for adjusting door set screws)
- Torque wrench with 10-mm hex key and rated accuracy at 40 to 50 in-lb. (4.52 to 5.65 N-m)
- Front cosmetic kit (Cisco product number: CRS-FCC-FRNT-CM=)
- Front doors (Cisco product number: CRS-FCC-DRS-FR=)

Steps

To install the front (SFC) side exterior cosmetic components, perform the following steps:

SUMMARY STEPS

1. Attach each unistrut to the top of the chassis by inserting the twelve M12 hex head bolts and washers, six for each strut, into the bolt holes on the inside of the strut and tightening with the 10-mm hex key wrench. The closed end of a unistrut faces the front [SFC] side of the chassis), see the figure below.
2. Attach the front upper grille support (number 1 in the figure below) to the unistruts by inserting four M4x14-mm flat head screws, two for each unistrut, through the holes at the top of the front vertical cable troughs and tightening them to the unistruts with the screwdriver.
3. Attach the power shelf shutoff extenders (number 2 in the figure below) by inserting the four M4 panhead screws, two for each power shelf shutoff extender, and tightening them with the screwdriver.
4. Attach the front vertical cable troughs—one on the right and one on the left—to the front (SFC) side of the chassis (see the figure below) by i nserting the 10 M4x14-mm flat head screws (5 on each side). Use the screwdriver to fasten screws to attach the cable troughs firmly to the chassis.
5. Attach the front upper grille (optional) by carefully inserting the tabs on the grille into the hook hanger brackets on the top of the upper grille support (see the figure below).
6. Press the grille firmly against the grille support until it snaps onto the ball stud snaps on the front (SFC) side of the chassis.
7. Place the logo bezel (see the figure below) over the bezel support, and press firmly until the bezel snaps onto the ball stud snaps on the front (SFC) side of the chassis.
8. Using the screwdriver, loosen the four captive screws, two on each side, that secure the lower grille screen to its frame assembly; then carefully set the screen aside. See the figure below.
9. Attach the frame assembly to the chassis (see the figure below) by aligning the four screws, two on each side, on the frame to the screw holes on the chassis and tightening them with the screwdriver.
10. Reattach the inlet grille screen (see the above figure) to the frame assembly by aligning the four captive screws on the screen to the screw holes on the frame assembly and tightening the screws with the screwdriver.
11. Attach the lower grille to the chassis by carefully inserting the tabs on the grille into the hook hanger brackets. See the figure below.
12. Press the lower grille firmly until it snaps onto the ball stud snaps. See the figure below.
13. Orient the doors so that the keyhole slots are pointing upwards.
14. Align the doors vertically in their appropriate positions so you can determine where to thread the first two screws that are adjacent to the keyholes. See the figure below. Set the doors aside, and thread the two screws.
15. Place the doors on the screws in the keyhole positions, two for each door.
16. Insert four M4x8-mm wafer-head screws (two on each side) into the appropriate screw holes in the doors, and use the screwdriver to tighten fully.
17. Insert and fully tighten all screws.
18. Ensure that the doors are properly aligned.

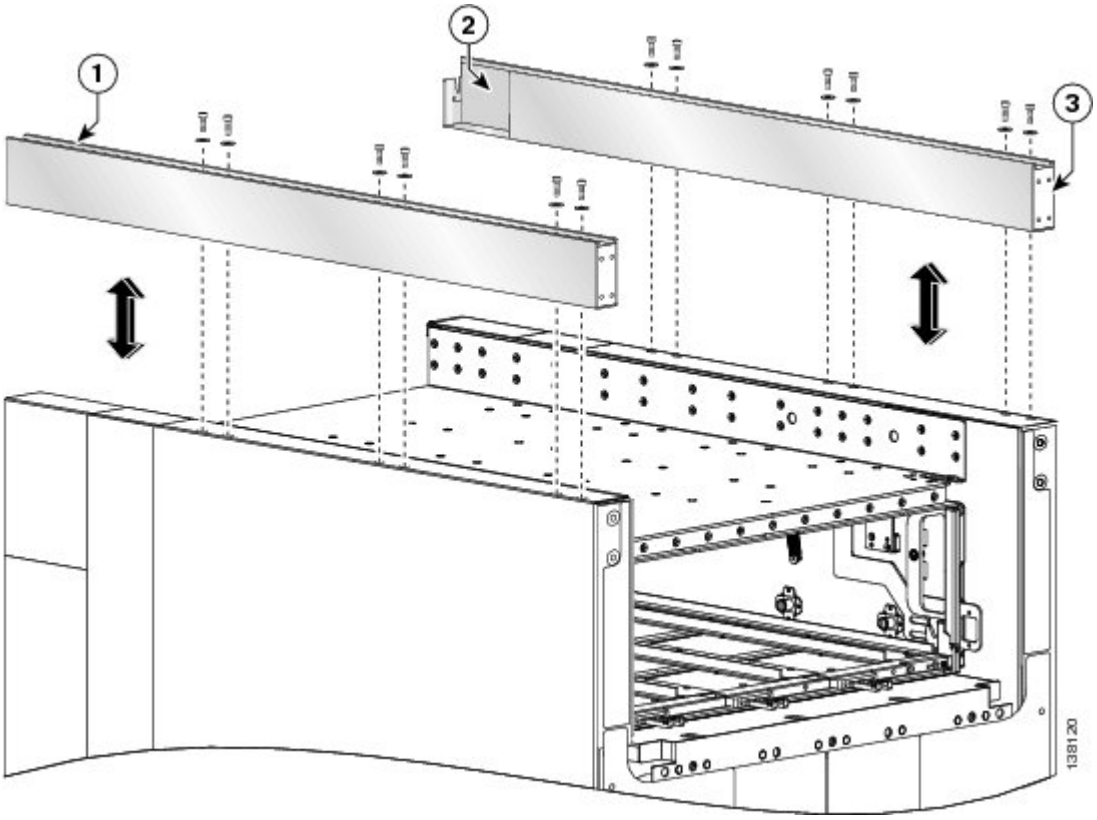
DETAILED STEPS

Step 1 Attach each unistrut to the top of the chassis by inserting the twelve M12 hex head bolts and washers, six for each strut, into the bolt holes on the inside of the strut and tightening with the 10-mm hex key wrench. The closed end of a unistrut faces the front [SFC] side of the chassis), see the figure below.

Note The right unistrut (as you face the front [SFC] side of the chassis) has a cutaway in the rear to admit the chassis ground cable; the left strut does not.

Caution Cisco recommends an install torque range for the unistrut bolts between 40 and 50 to in-lb. (between 4.52 N-m and 5.65 N-m).

Figure 92: Attaching the Unistrut



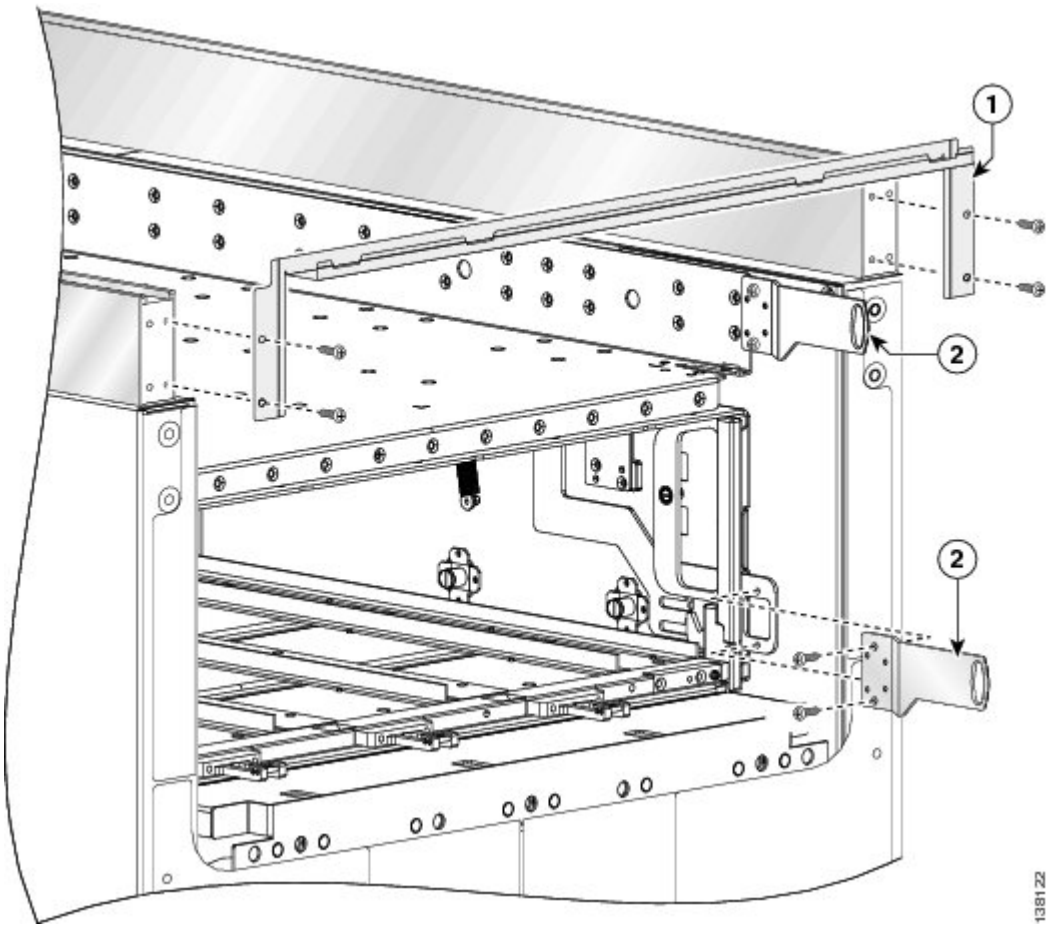
1	Left unistrut	3	Closed end at front of unistrut
2	Right strut with cutaway at rear		

Step 2 Attach the front upper grille support (number 1 in the figure below) to the unistruts by inserting four M4x14-mm flat head screws, two for each unistrut, through the holes at the top of the front vertical cable troughs and tightening them to the unistruts with the screwdriver.

Note Both fixed configuration power shelves must be installed in the chassis before installing the power shelf shutoff extenders. See the chapter *Installing and Removing Power Components* for more information.

Step 3 Attach the power shelf shutoff extenders (number 2 in the figure below) by inserting the four M4 panhead screws, two for each power shelf shutoff extender, and tightening them with the screwdriver.

Figure 93: Attaching the Front (SFC) Side Upper Grille Support and Power Shelf Shutoff Extenders

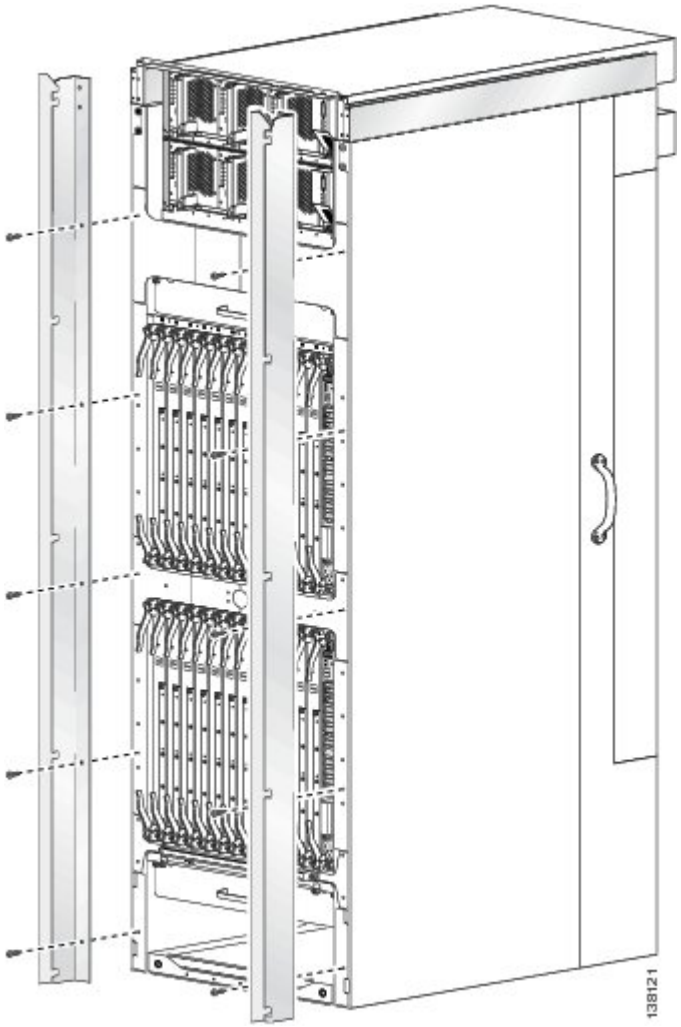


1	Front upper grille support	2	Power shelf shutoff extender

Step 4 Attach the front vertical cable troughs—one on the right and one on the left—to the front (SFC) side of the chassis (see the figure below) by i nserting the 10 M4x14-mm flat head screws (5 on each side). Use the screwdriver to fasten screws to attach the cable troughs firmly to the chassis.

Note We recommend that you use two people to install the troughs, one person to hold the troughs in place while the other person inserts and tightens the screws.

Figure 94: Attaching the Front (SFC) Side Vertical Cable Troughs—Fixed Configuration Power Shown



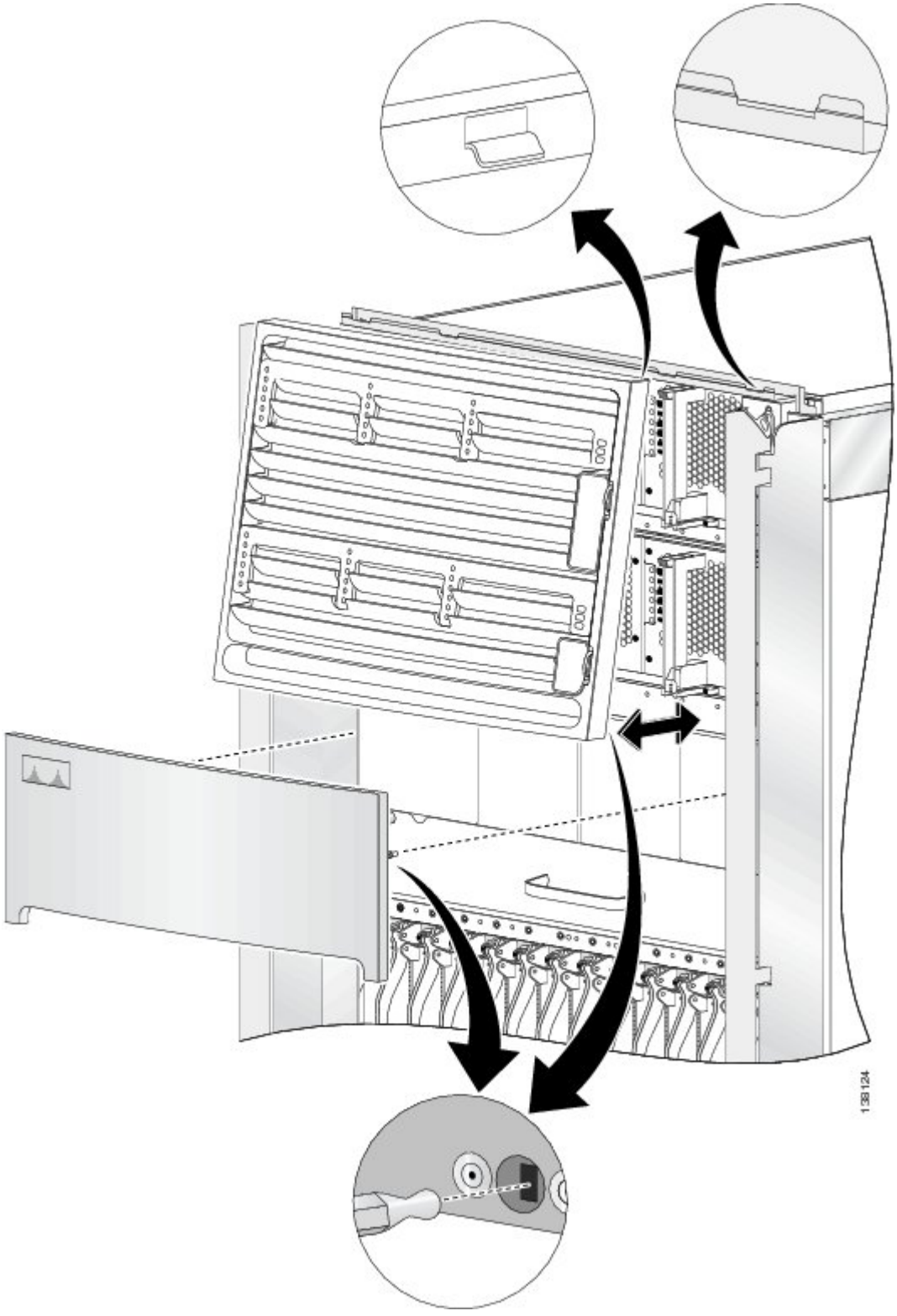
Step 5 Attach the front upper grille (optional) by carefully inserting the tabs on the grille into the hook hanger brackets on the top of the upper grille support (see the figure below).

Step 6 Press the grille firmly against the grille support until it snaps onto the ball stud snaps on the front (SFC) side of the chassis.

Note Before you attach the upper grille, you *must* have the power shutoff extenders installed (fixed configuration power only). See Step 3.

Step 7 Place the logo bezel (see the figure below) over the bezel support, and press firmly until the bezel snaps onto the ball stud snaps on the front (SFC) side of the chassis.

Figure 95: Attaching the Front (SFC) Side Upper Grille and Logo Bezel—Fixed Configuration Power Shown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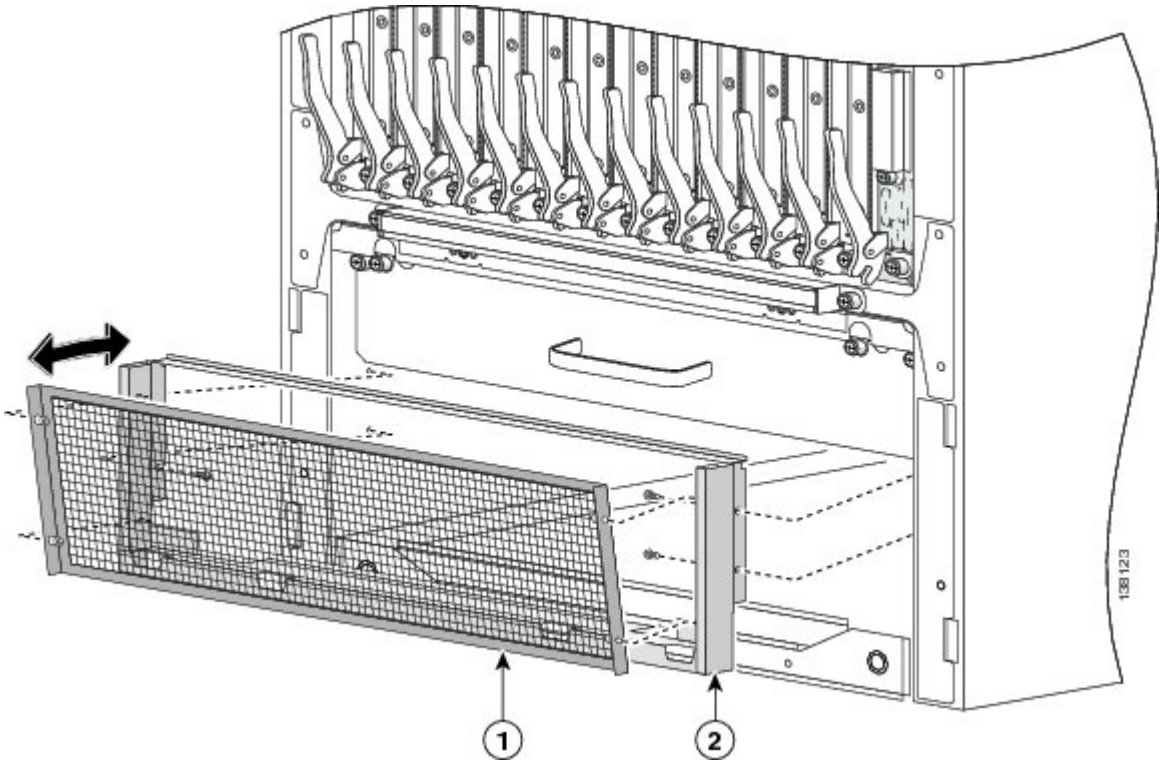
Note In this task, you must first remove the lower grille screen from the frame, because the screws that attach the frame assembly to the chassis are inboard of the screen—that is, the new screen is shipped already installed into the new frame assembly, but you cannot attach the new frame to the chassis until you remove the screen first. When the new frame assembly is installed, you can reinstall the lower grille screen into the new frame.

Step 8 Using the screwdriver, loosen the four captive screws, two on each side, that secure the lower grille screen to its frame assembly; then carefully set the screen aside. See the figure below.

Step 9 Attach the frame assembly to the chassis (see the figure below) by aligning the four screws, two on each side, on the frame to the screw holes on the chassis and tightening them with the screwdriver.

Figure 96: Installing the Lower Grille Screen and Frame Assembly



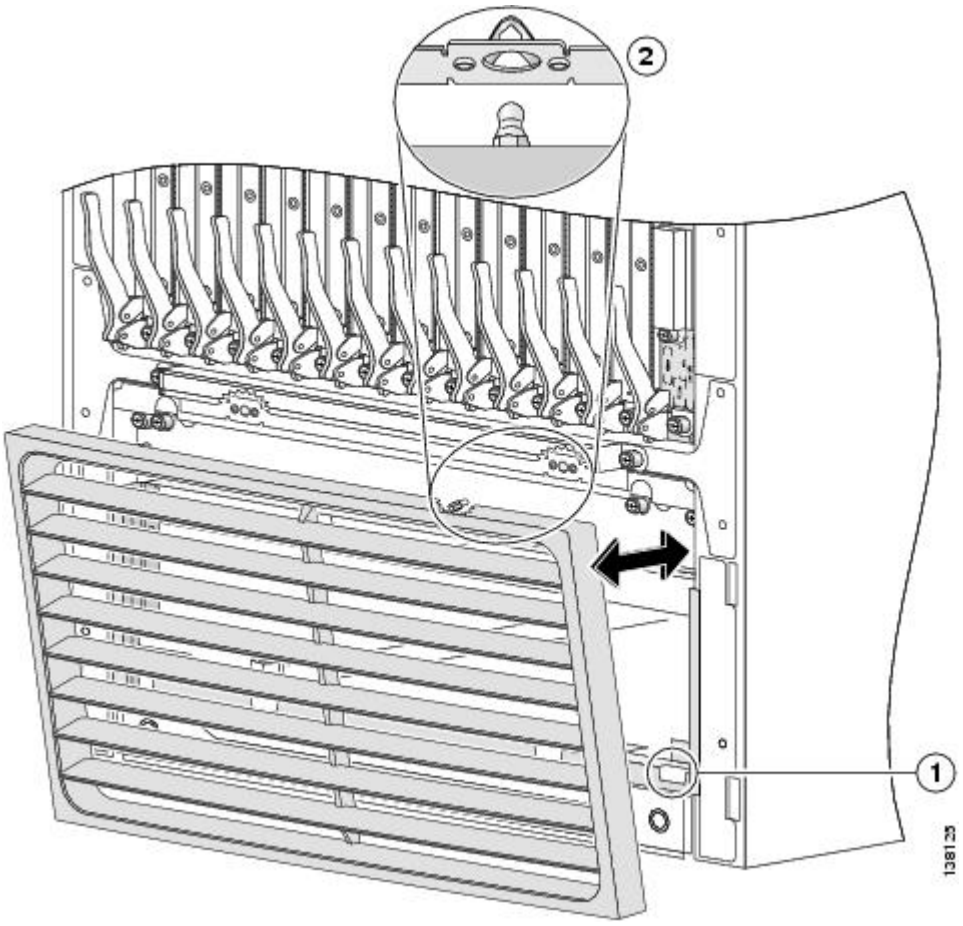
1	Lower grille screen	2	Lower grille screen frame assembly

Step 10 Reattach the inlet grille screen (see the above figure) to the frame assembly by aligning the four captive screws on the screen to the screw holes on the frame assembly and tightening the screws with the screwdriver.

Step 11 Attach the lower grille to the chassis by carefully inserting the tabs on the grille into the hook hanger brackets. See the figure below.

Step 12 Press the lower grille firmly until it snaps onto the ball stud snaps. See the figure below.

Figure 97: Installing the Lower Grille



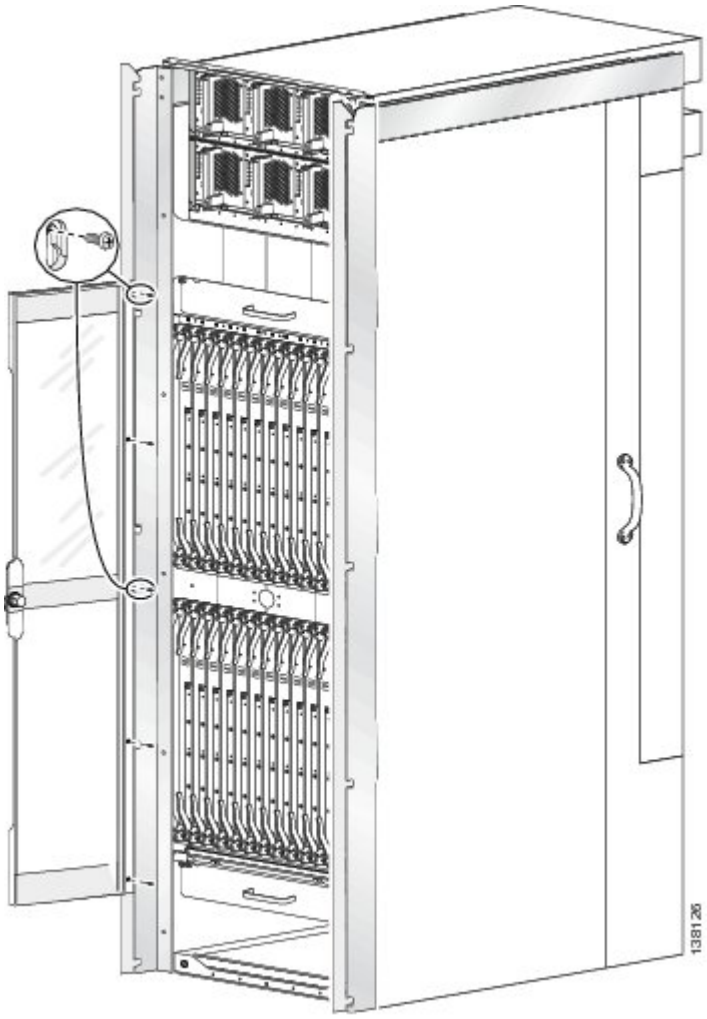
1	Hook hanger brackets	2	Ball stud

Step 13 Orient the doors so that the keyhole slots are pointing upwards.

Step 14 Align the doors vertically in their appropriate positions so you can determine where to thread the first two screws that are adjacent to the keyholes. See the figure below. Set the doors aside, and thread the two screws.

Caution The doors scratch easily, so they should be handled with care.

Figure 98: Attaching the Front (SFC) Side Exterior Doors



Step 15 Place the doors on the screws in the keyhole positions, two for each door.

Step 16 Insert four M4x8-mm wafer-head screws (two on each side) into the appropriate screw holes in the doors, and use the screwdriver to tighten fully.

Note Verify that Step 13 was completed correctly to ensure proper orientation of doors. The screw locations vary depending on the door. If all screw holes for a door do not align with the screw holes on the front (SFC) side of the chassis, you need to use the other door.

Step 17 Insert and fully tighten all screws.

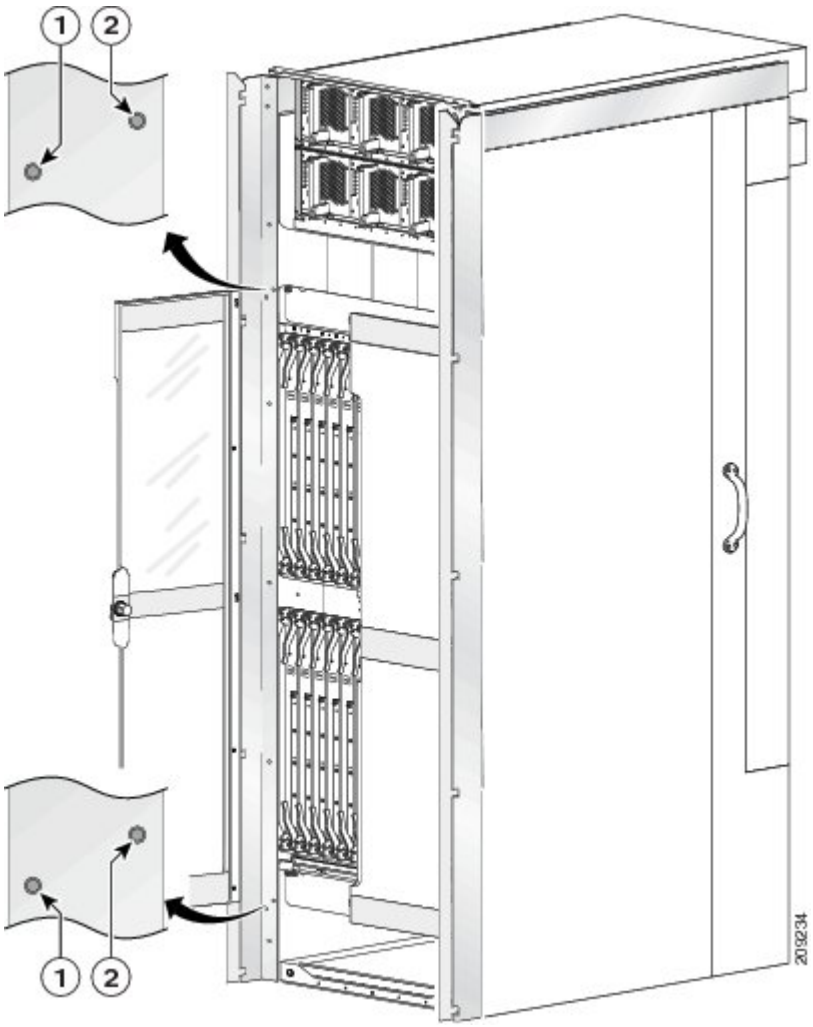
Step 18 Ensure that the doors are properly aligned.

a) Check to see if the doors close without interfering with each other.

Note Typically, the doors will close without interfering with each other. However, you may need to adjust either the left or right door, or both, to align the doors properly. Adjust doors only if necessary.

b) To decrease the door gap, loosen the five screws that secure the vertical trough to the chassis. Using the 2 mm hex key wrench, tighten the bottom set screws (number 1 in the figure below) one full turn. Snug the five screws that attach the vertical trough to the chassis and check the door alignment.
c) To increase the door gap, loosen the five screws that secure the vertical trough to the chassis. Using the 2 mm hex key wrench, tighten the top set screws (number 2 in the figure below) one full turn. Snug the five screws that attach the vertical trough to the chassis and check the door alignment.

Figure 99: Aligning the Door on the Front of the Chassis - Left Door Shown



1	Bottom set screw	2	Top set screw

d) Repeat the procedure as necessary until the doors are properly aligned.
e) Tighten the five screws that secure the vertical trough to the chassis.

Removing the Front (SFC) Side Cosmetic Components

This section describes how to remove the front (SFC) side exterior cosmetic components, shown in Figure 90: FCC Front (SFC) Side Exterior Cosmetic Components—Fixed Configuration Power Shown, on page 180, from the chassis. This section includes all the steps for you to remove *all* the front cosmetic parts from the chassis, but you are not required to do so. To remove a particular part, see the appropriate step or steps in the procedure that follows.

Note While it is possible to remove most of the front cosmetic components on the FCC separately, some parts (such as a unistrut) require that other parts be removed first.

This section describes how to perform the following tasks:

Prerequisites

No prerequisites exist for this task.

Required Tools and Equipment

You need the following tools to perform this task:

- 8-in. long number 1 Phillips screwdriver—magnetic head preferable
- 10-mm hex key wrench

Steps

To remove the front (SFC) side external cosmetic components, perform the following steps:

SUMMARY STEPS

1. Ensure that you have all the original packaging material for the cosmetic components available.
2. Remove the front exterior doors by unscrewing all the screws except those adjacent to the keyholes (see the figure below); lift the doors, and set them carefully aside.
3. Remove the front lower grille (see the figure below) by unsnapping the top portion from the ball stud snaps on the grille frame.
4. Rotate the grille toward you on its hook hanger brackets, then lift it clear of the support, and set it carefully aside.
5. Remove the logo bezel (see the figure below) by unsnapping it from the ball stud snaps on either side of the bezel support, and then set it carefully aside.
6. Remove the upper grille (see the figure below) by unsnapping the bottom portion from the ball stud snaps on the logo bezel support assembly.
7. Rotate the grille toward you on its hook hanger brackets, then lift it clear of the support, and set it carefully aside.
8. Remove the front vertical cable troughs (see the figure below)—one right and one left—from the front (SFC) of the chassis:
9. Use the screwdriver to loosen the four captive screws, two on each side, that attach the inlet grille screen to the frame assembly. Remove the screen from the frame assembly. See the figure below.
10. Remove the four screws, two on each side, that attach the frame assembly to the chassis. See the figure below.
11. Rotate the assembly forward, lift it away from the front (SFC) side of the chassis, and set it aside.
12. Remove the power shelf shutoff extenders (number 2 in the figure below) by unscrewing the four screws, two screws per extender, and set the screws and the extenders aside.
13. Remove the front upper grille support (number 1 in the figure below) from the unistruts by unscrewing the four M4x14-mm flat head screws (two for each unistrut).
14. Set the screws aside, then lift the grille support away from the front (SFC) side of the chassis, and set it aside.
15. Use the 10-mm hex key wrench to remove the twelve M12 hex head bolts and washers, six on each unistrut, that attach the unistrut to the top of the chassis. See the figure below.

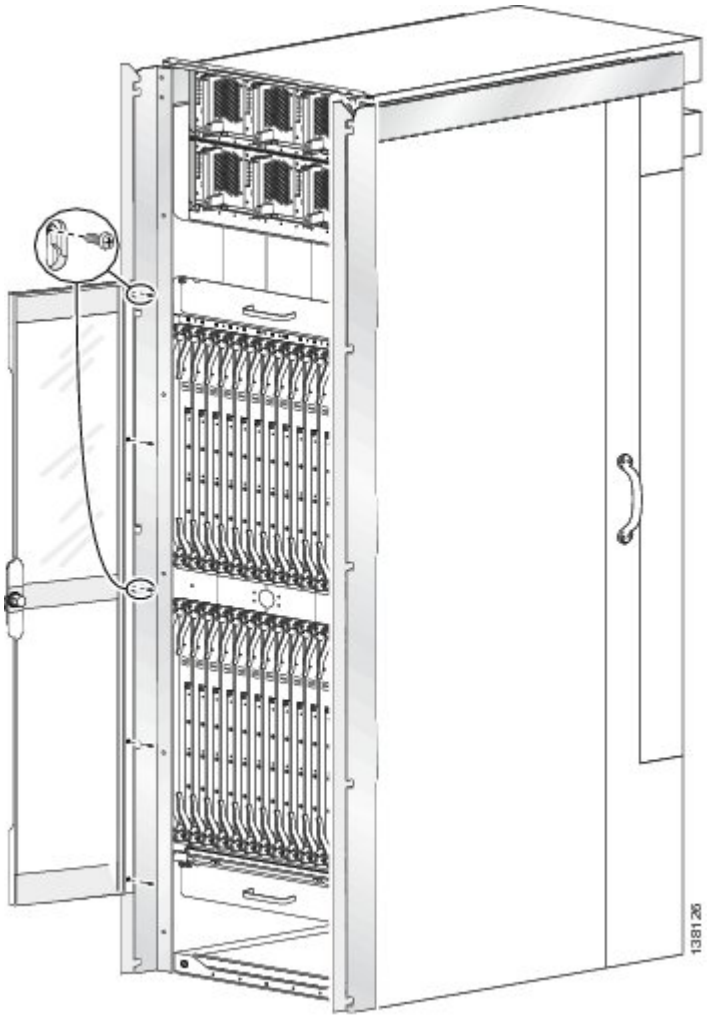
DETAILED STEPS

Step 1 Ensure that you have all the original packaging material for the cosmetic components available.

Step 2 Remove the front exterior doors by unscrewing all the screws except those adjacent to the keyholes (see the figure below); lift the doors, and set them carefully aside.

Caution The doors scratch easily, so they should be handled with care.

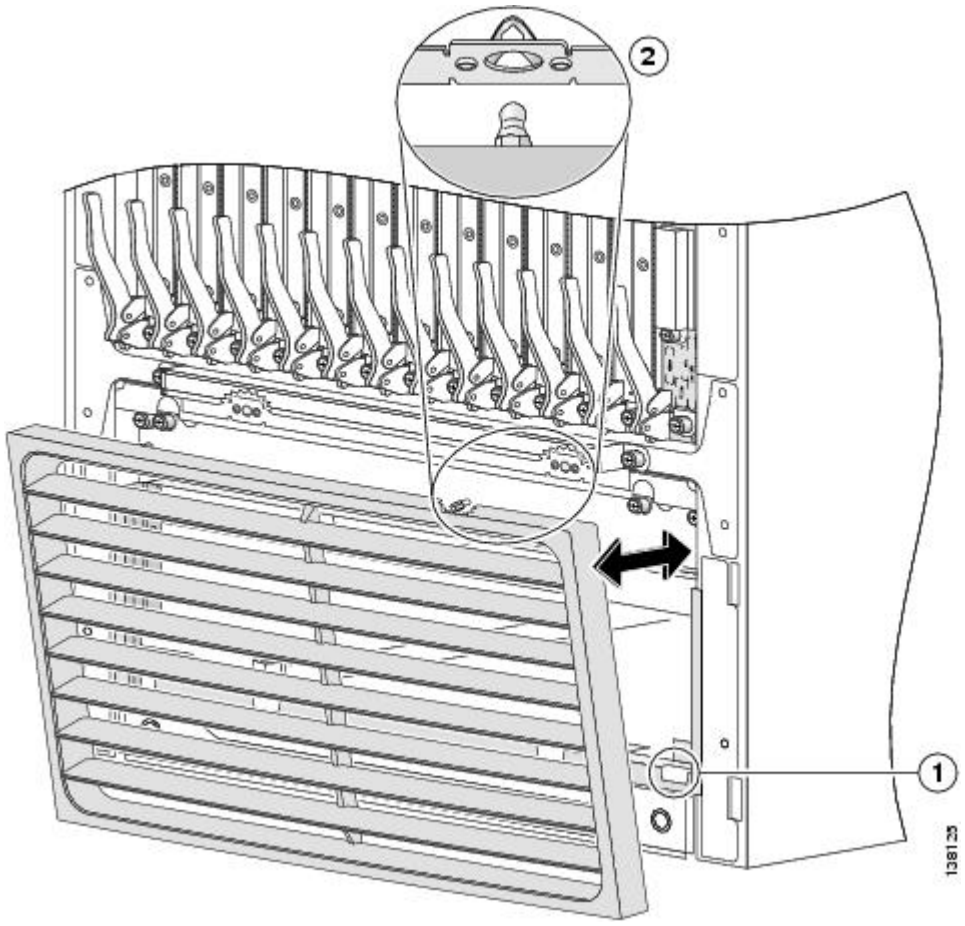
Figure 100: Removing the Front (SFC) Side Exterior Doors



Step 3 Remove the front lower grille (see the figure below) by unsnapping the top portion from the ball stud snaps on the grille frame.

Step 4 Rotate the grille toward you on its hook hanger brackets, then lift it clear of the support, and set it carefully aside.

Figure 101: Removing the Front (SFC) Side Lower Grille



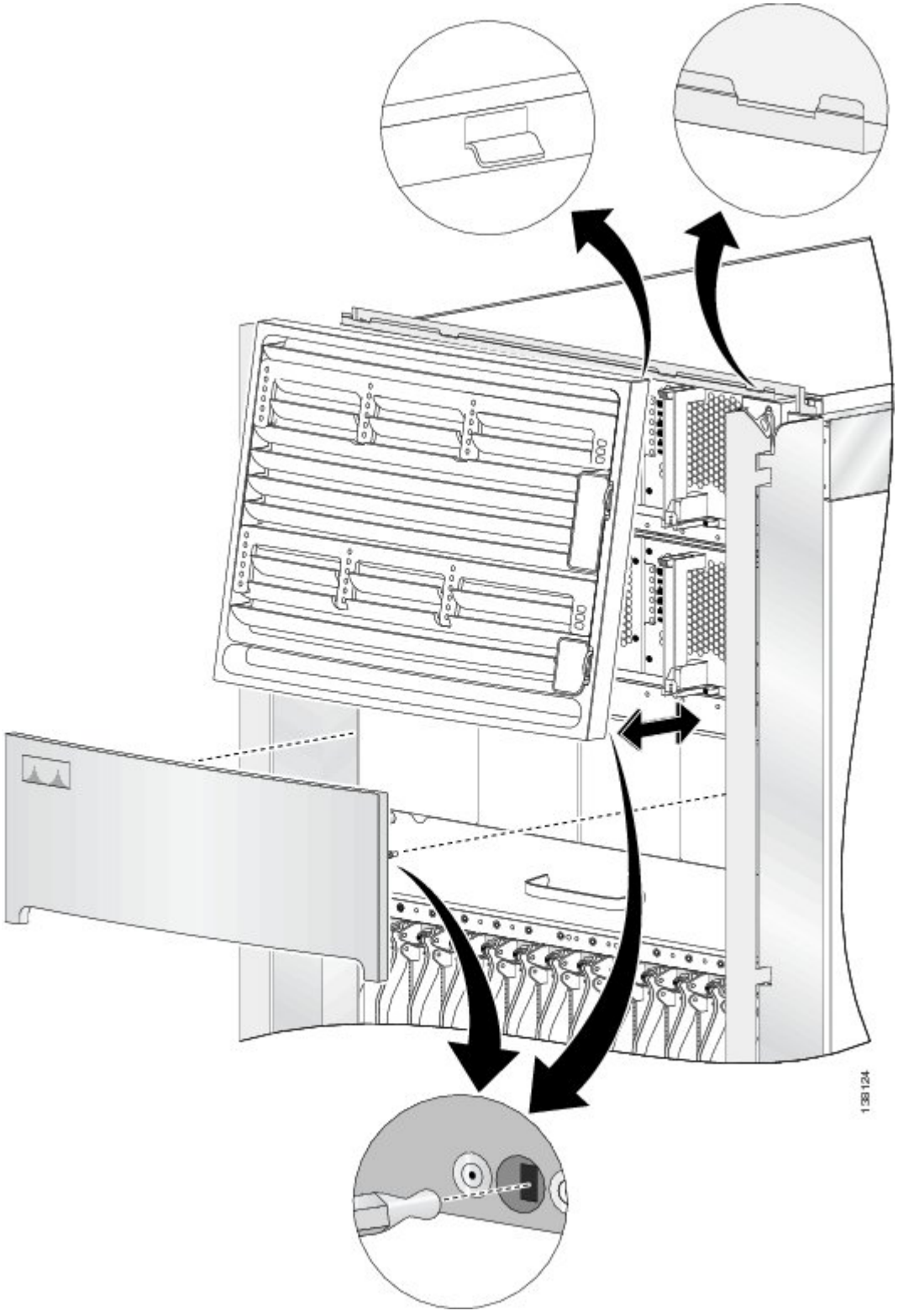
1	Hook hanger brackets		Ball stud

Step 5 Remove the logo bezel (see the figure below) by unsnapping it from the ball stud snaps on either side of the bezel support, and then set it carefully aside.

Step 6 Remove the upper grille (see the figure below) by unsnapping the bottom portion from the ball stud snaps on the logo bezel support assembly.

Step 7 Rotate the grille toward you on its hook hanger brackets, then lift it clear of the support, and set it carefully aside.

Figure 102: Removing the Logo Bezel and Front (SFC) Side Upper Grille—Fixed Configuration Power Shown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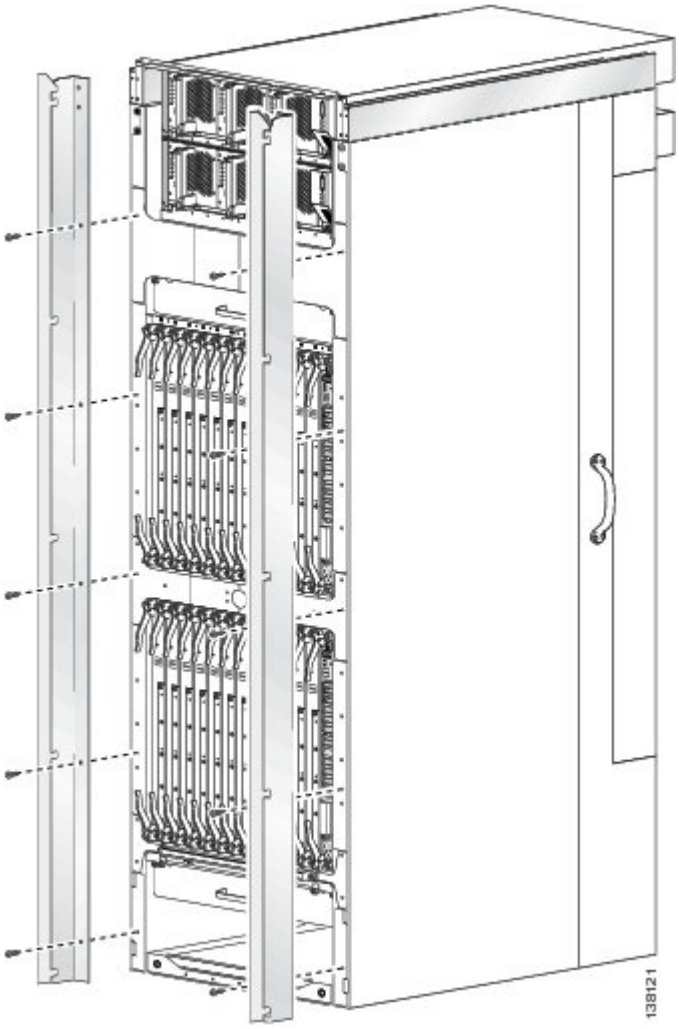
Step 8 Remove the front vertical cable troughs (see the figure below)—one right and one left—from the front (SFC) of the chassis:

a) Use the screwdriver to remove the 10 flat-head screws (5 on each side) from the cable troughs, and set them aside.

b) Slide the cable troughs upward slightly to unhook them from the guide slots; lift them away from the chassis, and set them aside.

Note We recommend that you use two people to remove the troughs, one person to hold the troughs while the other person removes the screws.

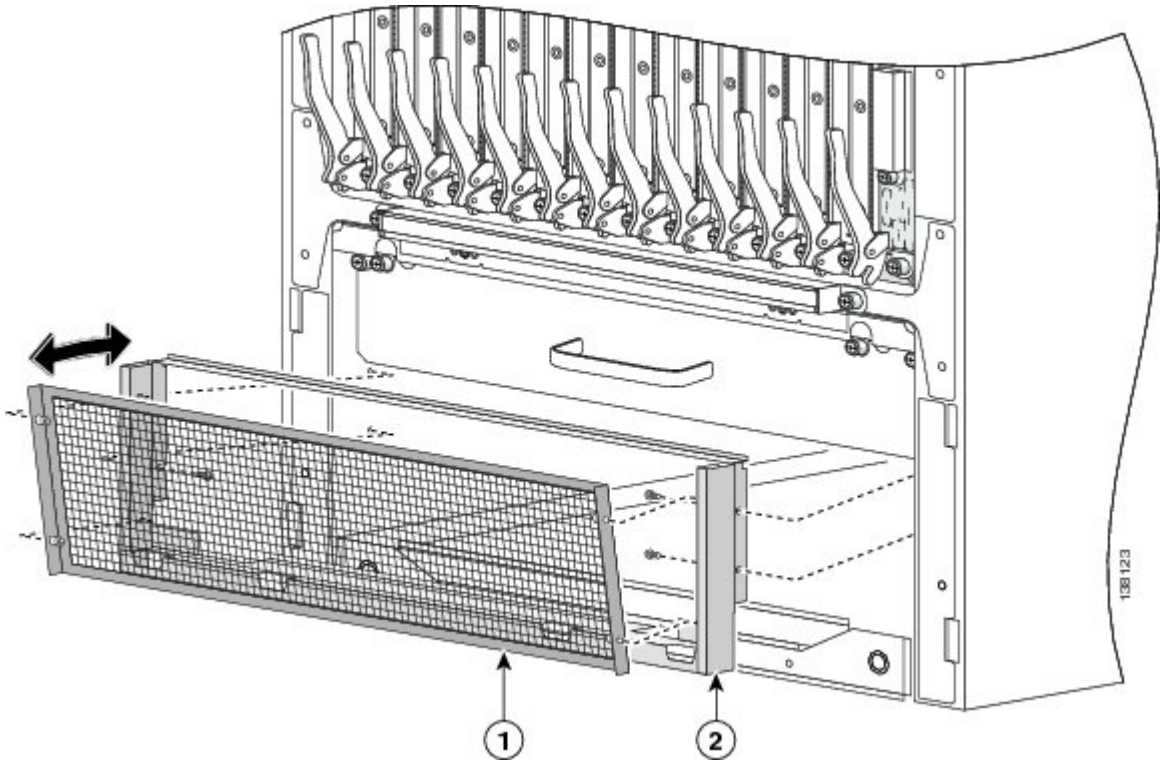
Figure 103: Removing the Front (SFC) Side Vertical Cable Troughs—Fixed Configuration Power Shown



Step 9 Use the screwdriver to loosen the four captive screws, two on each side, that attach the inlet grille screen to the frame assembly. Remove the screen from the frame assembly. See the figure below.

Step 10 Remove the four screws, two on each side, that attach the frame assembly to the chassis. See the figure below.

Figure 104: Removing the Front (SFC) Side Inlet Screen and Lower Grille Frame Assembly



1	Lower grille screen	2	Lower grille screen frame assembly

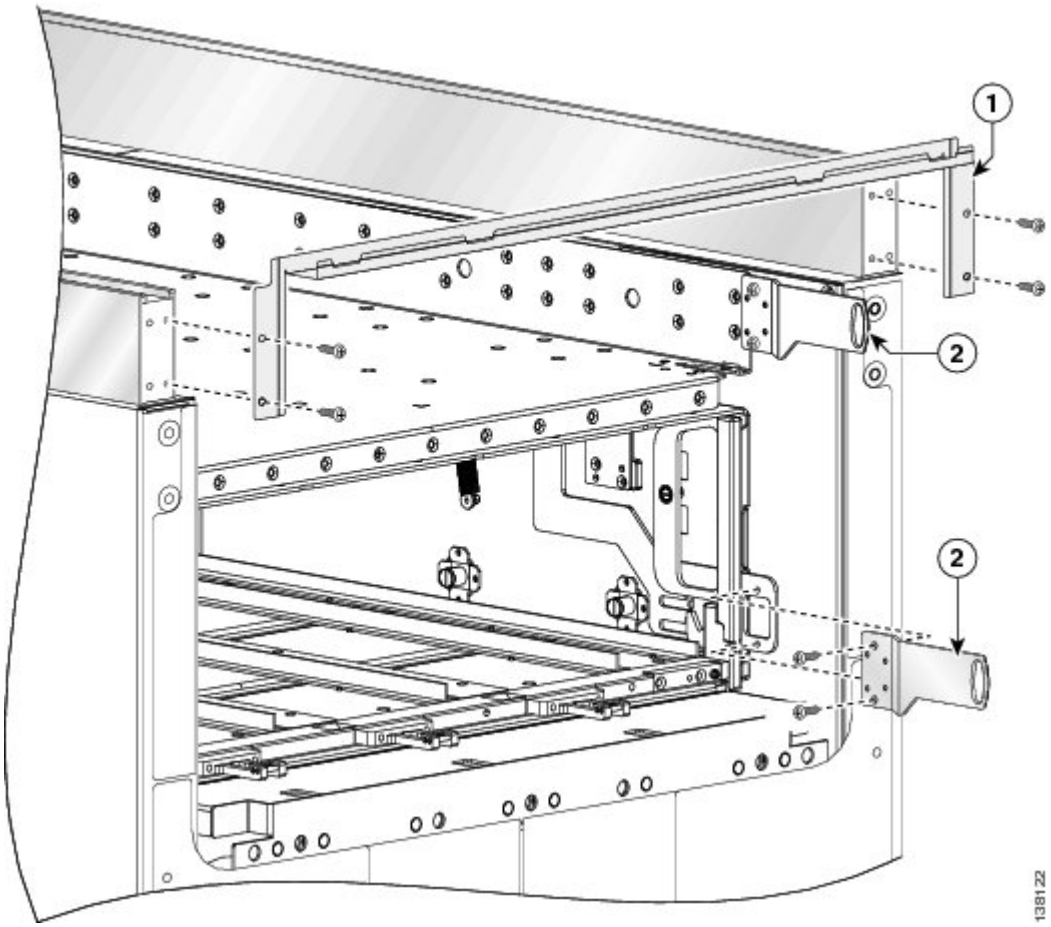
Step 11 Rotate the assembly forward, lift it away from the front (SFC) side of the chassis, and set it aside.

Step 12 Remove the power shelf shutoff extenders (number 2 in the figure below) by unscrewing the four screws, two screws per extender, and set the screws and the extenders aside.

Step 13 Remove the front upper grille support (number 1 in the figure below) from the unistruts by unscrewing the four M4x14-mm flat head screws (two for each unistrut).

Step 14 Set the screws aside, then lift the grille support away from the front (SFC) side of the chassis, and set it aside.

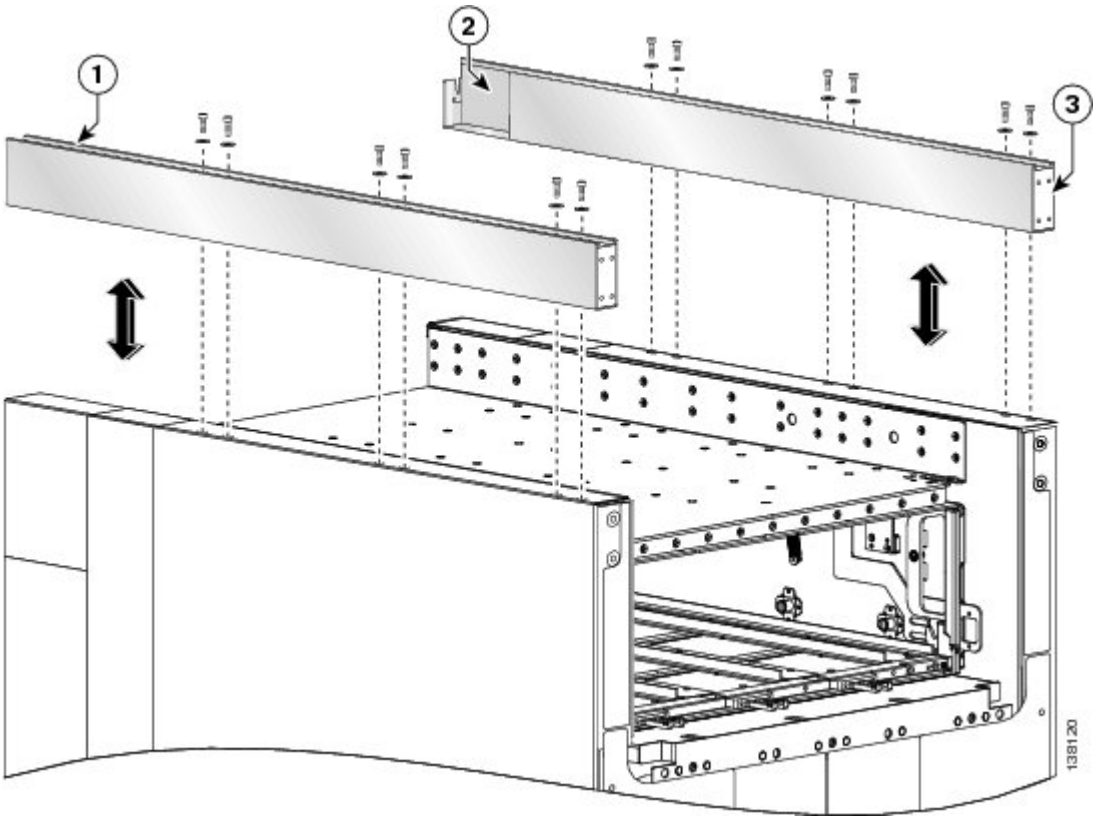
Figure 105: Removing the Front (SFC) Side Upper Grille Support and Power Shutoff Extenders



1	Front upper grille support	2	Power shutoff extender

Step 15 Use the 10-mm hex key wrench to remove the twelve M12 hex head bolts and washers, six on each unistrut, that attach the unistrut to the top of the chassis. See the figure below.

Figure 106: Removing the Unistrut



1	Left unistrut	3	Closed end at front of unistrut
2	Right unistrut with cutaway at rear		

What to Do Next

Be sure that all parts have been carefully set aside and repackaged appropriately.

Installing the Rear (OIM) Side Cosmetic Components

This section describes how to install the rear (OIM) side exterior cosmetic components, shown in Figure 91: FCC Rear (OIM) Side Exterior Cosmetic Components—Fixed Configuration Power Shown, on page 181, on the FCC.

Note While it is possible to install the various exterior components on the chassis in a different order, it is easier to install them in the order outlined in this section.

This section describes how to perform the following tasks:

Prerequisites

Before performing these tasks, you must first unpack and secure the chassis. See *Cisco CRS Carrier Routing System Fabric Card Chassis Unpacking, Moving, and Securing Guide* .

Required Tools and Equipment

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

- 8-inch long number 1 Phillips screwdriver—magnetic head preferable
- 2-mm hex key wrench
- Rear cosmetic kit (Cisco product number: CRS-FCC-REAR-CM=)
- Rear doors (Cisco product number: CRS-FCC-DRS-RR=)

Steps

To install the rear exterior cosmetic components, perform the following steps:

SUMMARY STEPS

1. Ensure that the unistruts are installed. See the Steps, on page 182.
2. Attach the rear vertical cable troughs —one right and one left—to the rear of the chassis (as shown in the figure below) by i nserting the 10 M4x14-mm flat head screws (5 on each side) and using the screwdriver to fasten the screws to attach the cable troughs firmly to the chassis.
3. If applicable, remove blank covers and install cable pass-through accessory plates.
4. Remove the blank plates by unscrewing the four screws on each one. See the figure below.
5. Attach the inner cut-out plates, as shown in the figure below, using the four screws provided. See the figure *Inner Cut-out Plate—Fixed Configuration Power Shown*.
6. Attach the outer cut-out panel using the screws provided. See the figure below.
7. Attach the rear upper horizontal cable guides (see the figure below) by inserting five longer Phillips screws through the holes in the face of the brackets and into the chassis and tightening them to the chassis with the screwdriver.
8. Insert the four short Phillips screws (two on each side) that attach the bracket to the vertical cable trough support flange and tighten them to the troughs with the screwdriver.
9. Attach the rear mid-chassis horizontal cable guide and strike tube (see the figure below) by inserting the five longer Phillips screws through the holes in the face of the brackets and into the rear (OIM) side of the chassis and tightening them to the chassis with the screwdriver.
10. Insert the four short Phillips screws (two on each side) that attach the bracket to the inside of the vertical cable troughs, and tighten them to the troughs with the screwdriver.
11. Attach the rear lower horizontal cable guides (see the figure below) by inserting four longer Phillips screws through the holes in the face of the brackets and into the chassis and tightening them to the chassis with the screwdriver.
12. Insert the four short Phillips screws (two on each side) that attach the bracket to the vertical cable trough support flanges and tighten them to the troughs with the screwdriver.
13. Attach the rear upper grille by carefully hooking the tabs on the top of the grille over the hook supports on the top of the vertical cable troughs (see the figure below).
14. Press the grille firmly against the grille support until it snaps onto the ball stud snaps on the rear (OIM) side of the chassis.
15. Attach the rear lower bezel by carefully inserting the tabs on the grille into the hook hanger brackets on the lower bezel frame. Press the grille firmly against the grille frame until it snaps onto the ball stud snaps on the rear (OIM) side of the chassis (see see the figure below).
16. Orient the doors so that the keyhole slots are pointing up.
17. Align the doors vertically in their appropriate positions so you can determine where to thread the first two screws that are adjacent to the keyholes. See the figure below. Set the doors aside, and thread the two screws.
18. Place the doors on the screws in the keyhole positions, two for each door.
19. Insert four M4x8-mm wafer-head screws (two on each side) into the appropriate screw holes in the doors, and use the screwdriver to fully tighten.
20. Insert and fully tighten all screws.
21. Ensure that the doors are properly aligned.

DETAILED STEPS

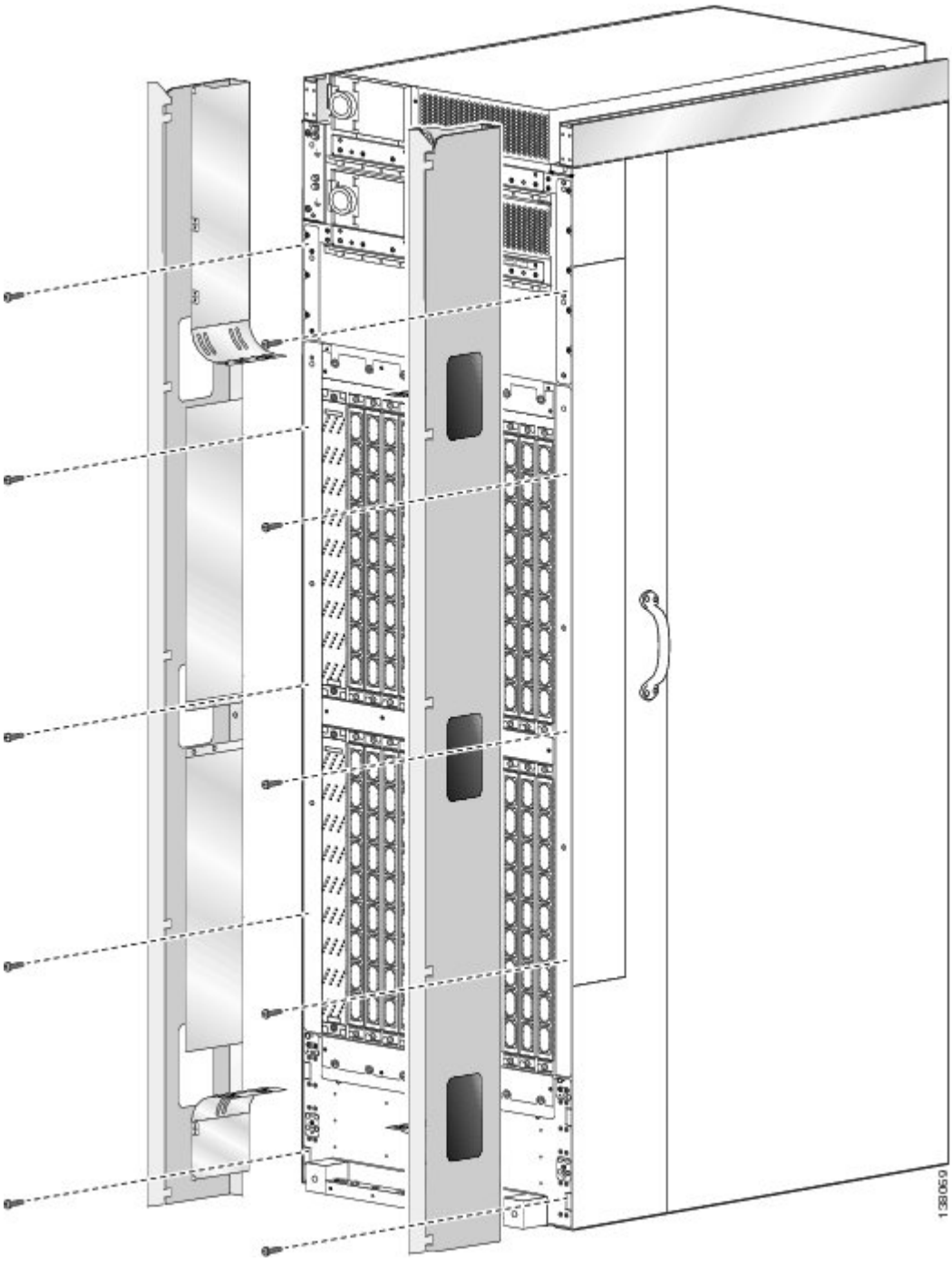
Step 1 Ensure that the unistruts are installed. See the Steps, on page 182.

Step 2 Attach the rear vertical cable troughs —one right and one left—to the rear of the chassis (as shown in the figure below) by i nserting the 10 M4x14-mm flat head screws (5 on each side) and using the screwdriver to fasten the screws to attach the cable troughs firmly to the chassis.

Note We recommend that you use two people to install the troughs, one person to hold the troughs in place while the other person inserts and tightens the screws.

Step 3 If applicable, remove blank covers and install cable pass-through accessory plates.

Figure 107: Installing Rear (OIM) Side Vertical Cable Troughs—Fixed Configuration Power Shown

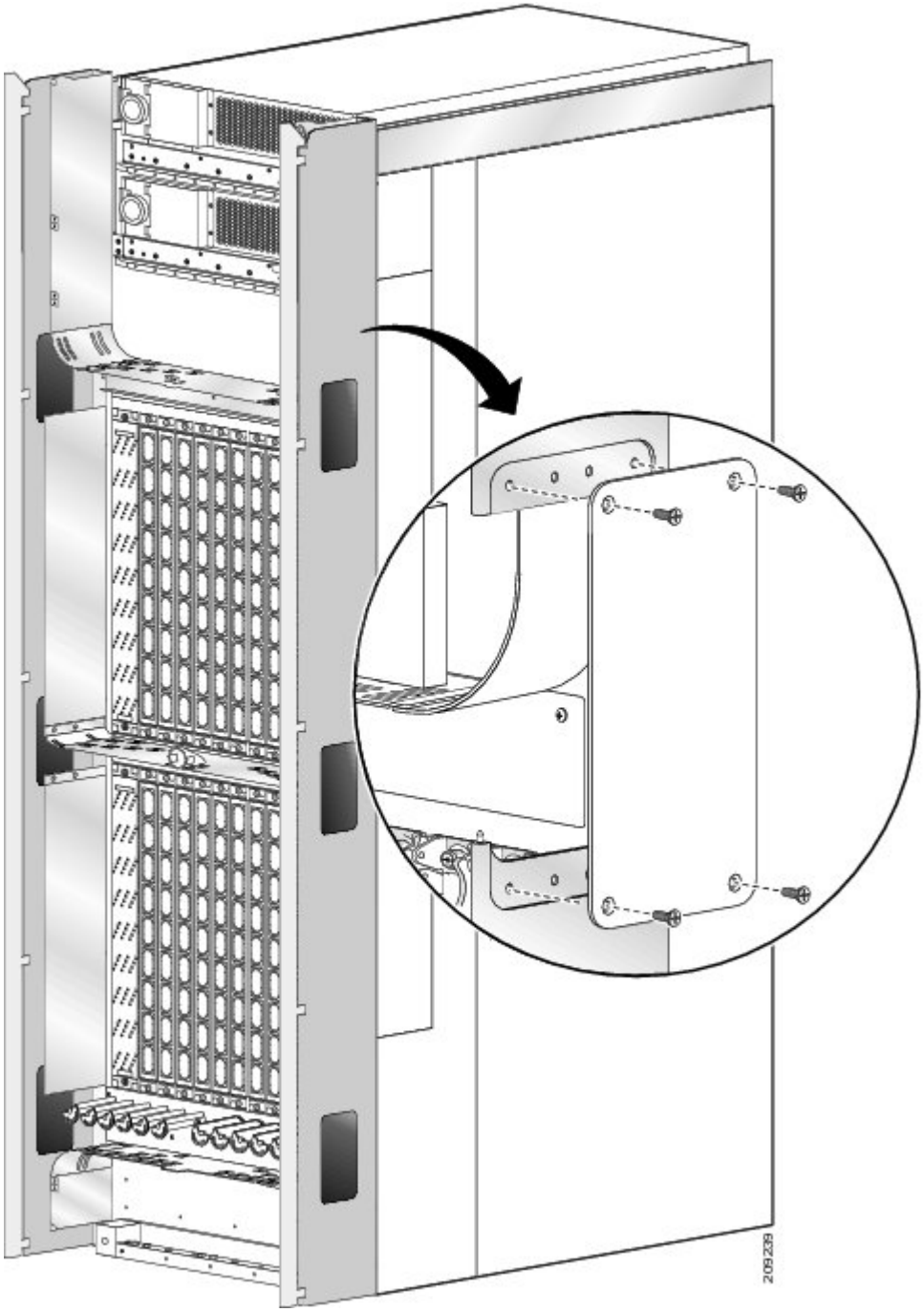


System growth and cable type will determine whether cable pass-through accessory plates are required to be installed.

- If the chassis is part of a multishelf system with vertical cabling, cable pass-through accessory plates are not required to be installed.
- If the chassis is part of a multishelf system with horizontal cabling, cable-pass-through accessory plates are required to be installed.
- If riser cable is installed on the chassis, cable-pass-through accessory plates are required to be installed.

Step 4 Remove the blank plates by unscrewing the four screws on each one. See the figure below.

Figure 108: Removing Blank Plates from Cable Troughs—Fixed Configuration Power Shown



Step 5 Attach the inner cut-out plates, as shown in the figure below, using the four screws provided. See the figure *Inner Cut-out Plate—Fixed Configuration Power Shown*.

Figure 109: Cut-out plate

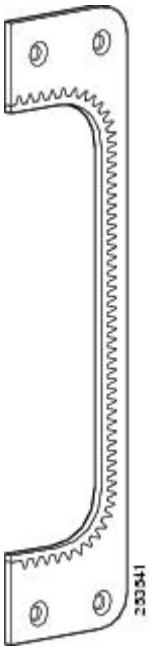
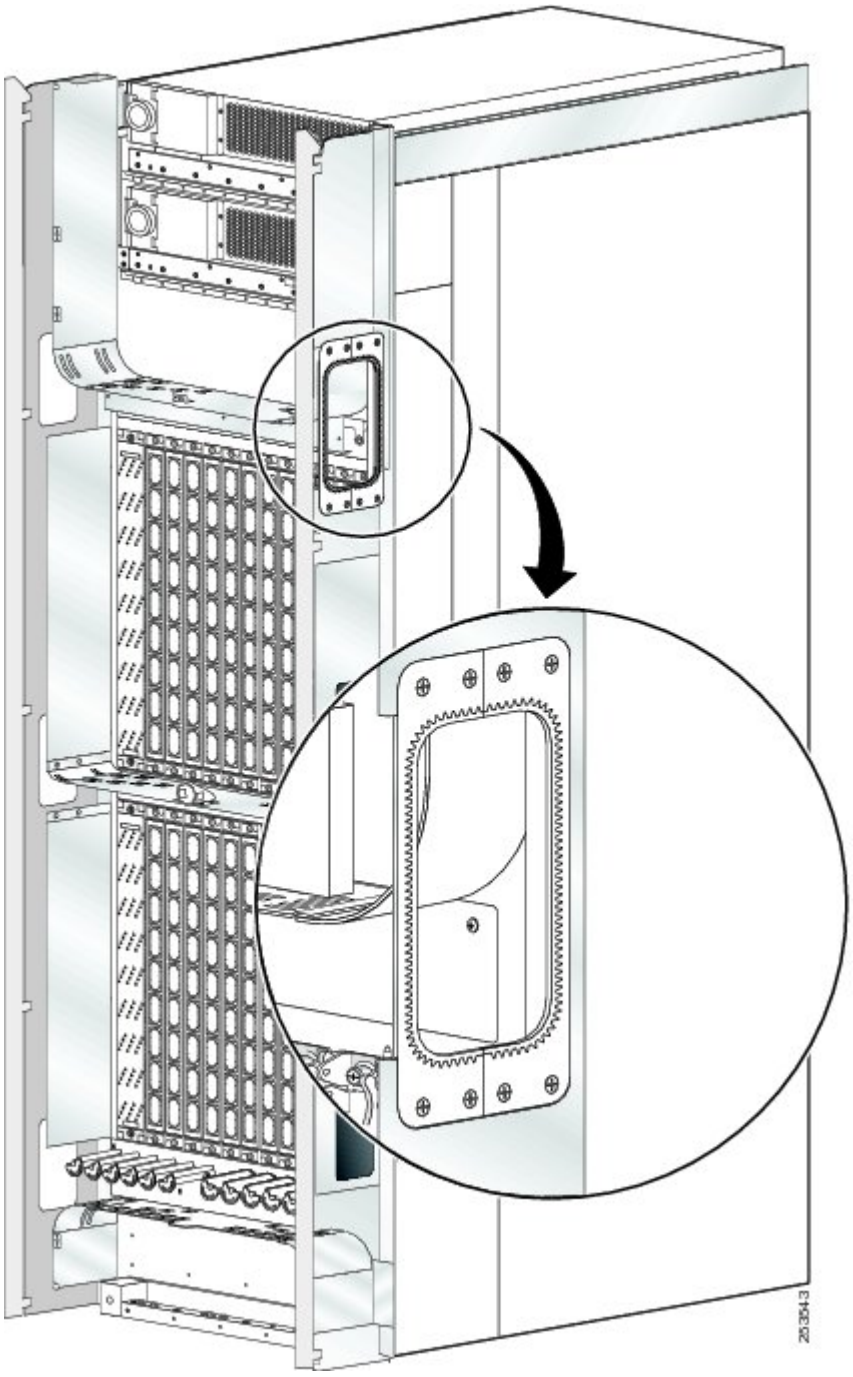


Figure 110: Inner Cut-out Plate—Fixed Configuration Power Shown

Step 6 Attach the outer cut-out panel using the screws provided. See the figure below.

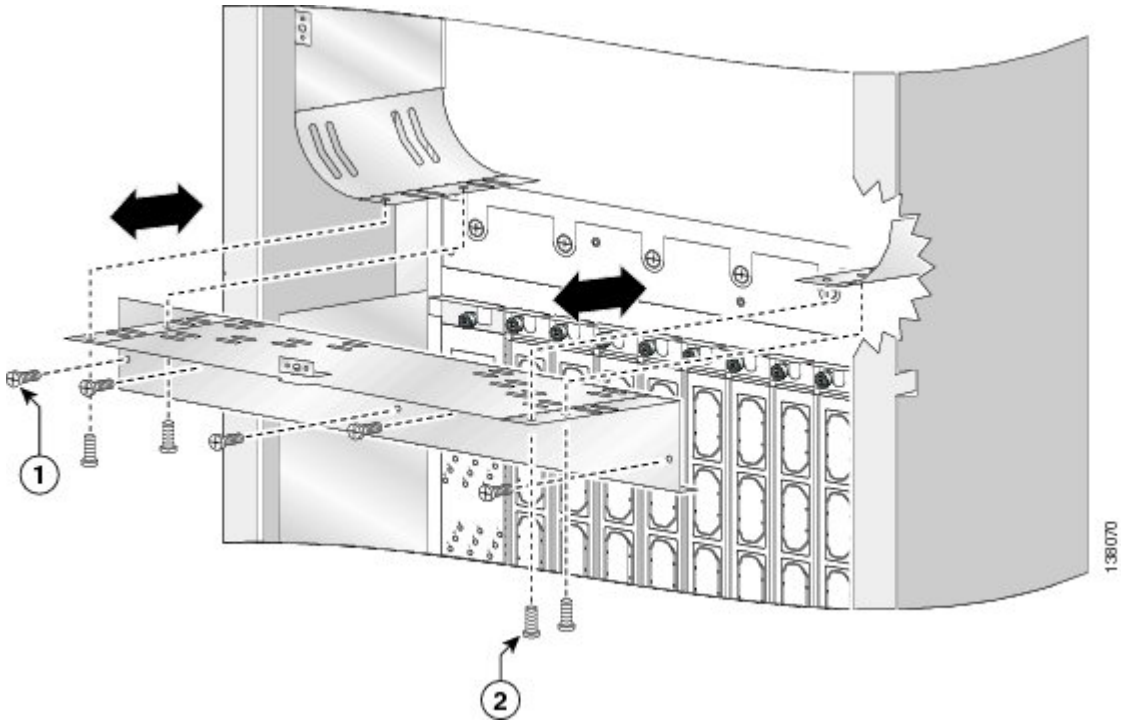
Figure 111: Outer cut-out plate—Fixed Configuration Power Shown



Note There are two different lengths of screws used to attach the horizontal cable guides; 4 mm long screws and 6 mm long. Extra screws are provided.

Step 7 Attach the rear upper horizontal cable guides (see the figure below) by inserting five longer Phillips screws through the holes in the face of the brackets and into the chassis and tightening them to the chassis with the screwdriver.

Figure 112: Attaching the Rear Upper Horizontal Cable Guide



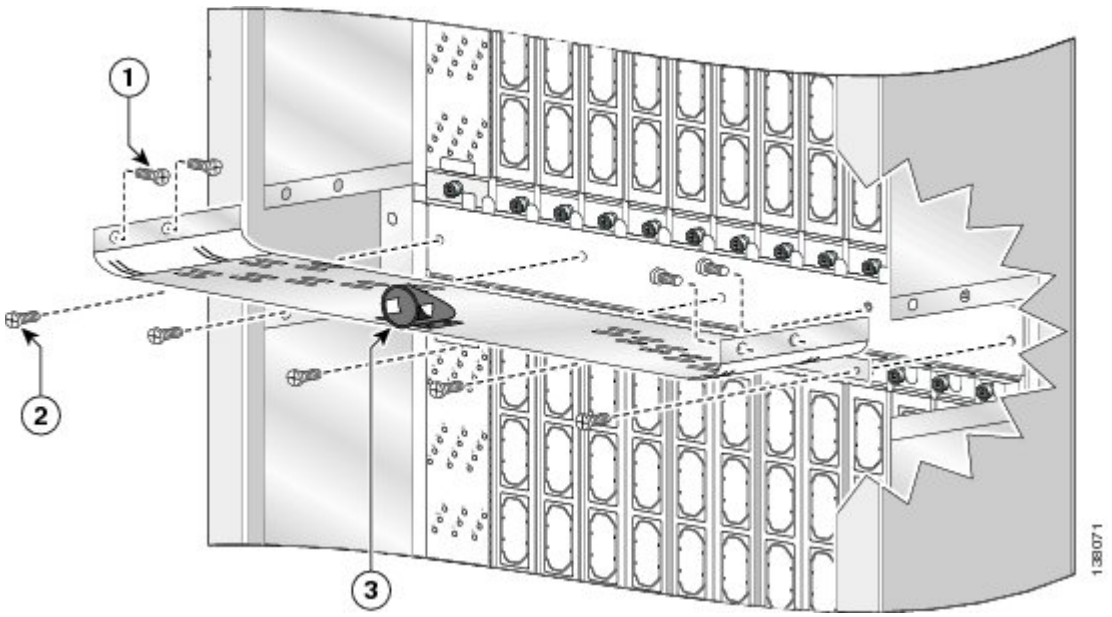
1	6 mm long screw attaching cable guide to chassis (quantity= 5)
2	4-mm long screw attaching cable guide to vertical trough (quantity=4)

Step 8 Insert the four short Phillips screws (two on each side) that attach the bracket to the vertical cable trough support flange and tighten them to the troughs with the screwdriver.

Step 9 Attach the rear mid-chassis horizontal cable guide and strike tube (see the figure below) by inserting the five longer Phillips screws through the holes in the face of the brackets and into the rear (OIM) side of the chassis and tightening them to the chassis with the screwdriver.

Caution Ensure that the rear mid-chassis horizontal cable guide is installed with the strike tube on the upper surface.

Figure 113: Attaching the Rear Mid-Chassis Horizontal Cable Guide and Strike Tube

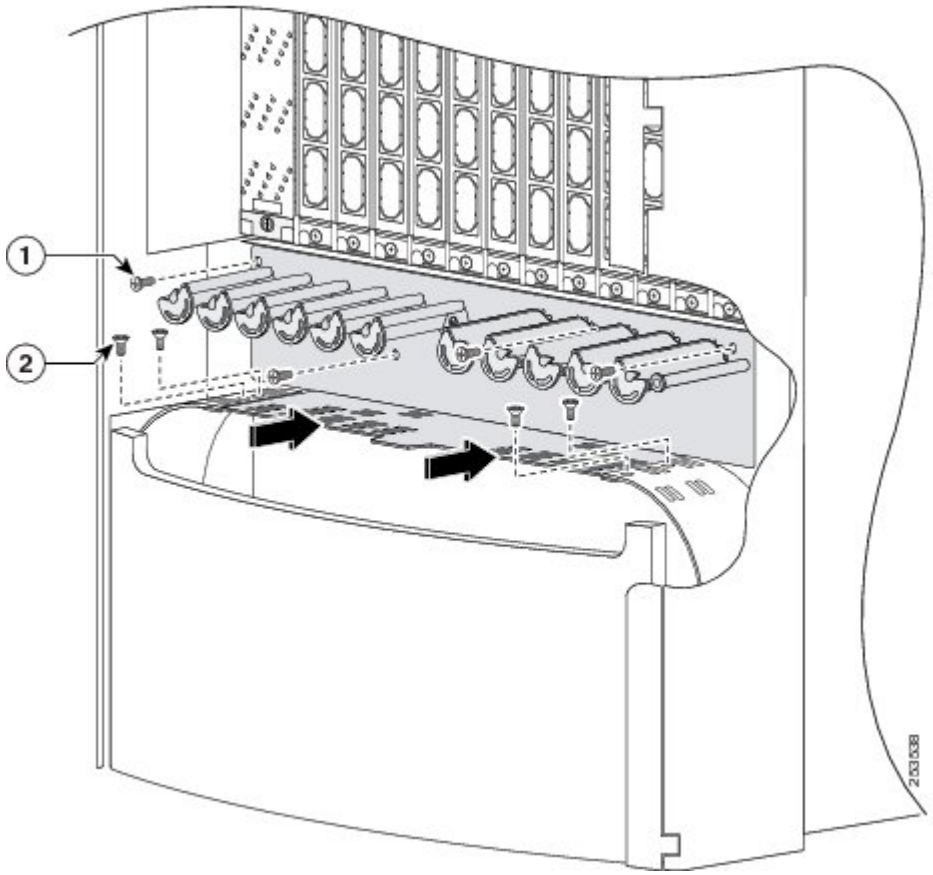


1	4 mm long screw attaching cable guide to vertical trough (quantity=4)
2	6 mm long screw attaching cable guide to chassis (quantity=5)
3	Strike tube on upper surface

Step 10 Insert the four short Phillips screws (two on each side) that attach the bracket to the inside of the vertical cable troughs, and tighten them to the troughs with the screwdriver.

Step 11 Attach the rear lower horizontal cable guides (see the figure below) by inserting four longer Phillips screws through the holes in the face of the brackets and into the chassis and tightening them to the chassis with the screwdriver.

Figure 114: Attaching the Rear Lower Horizontal Cable Guide

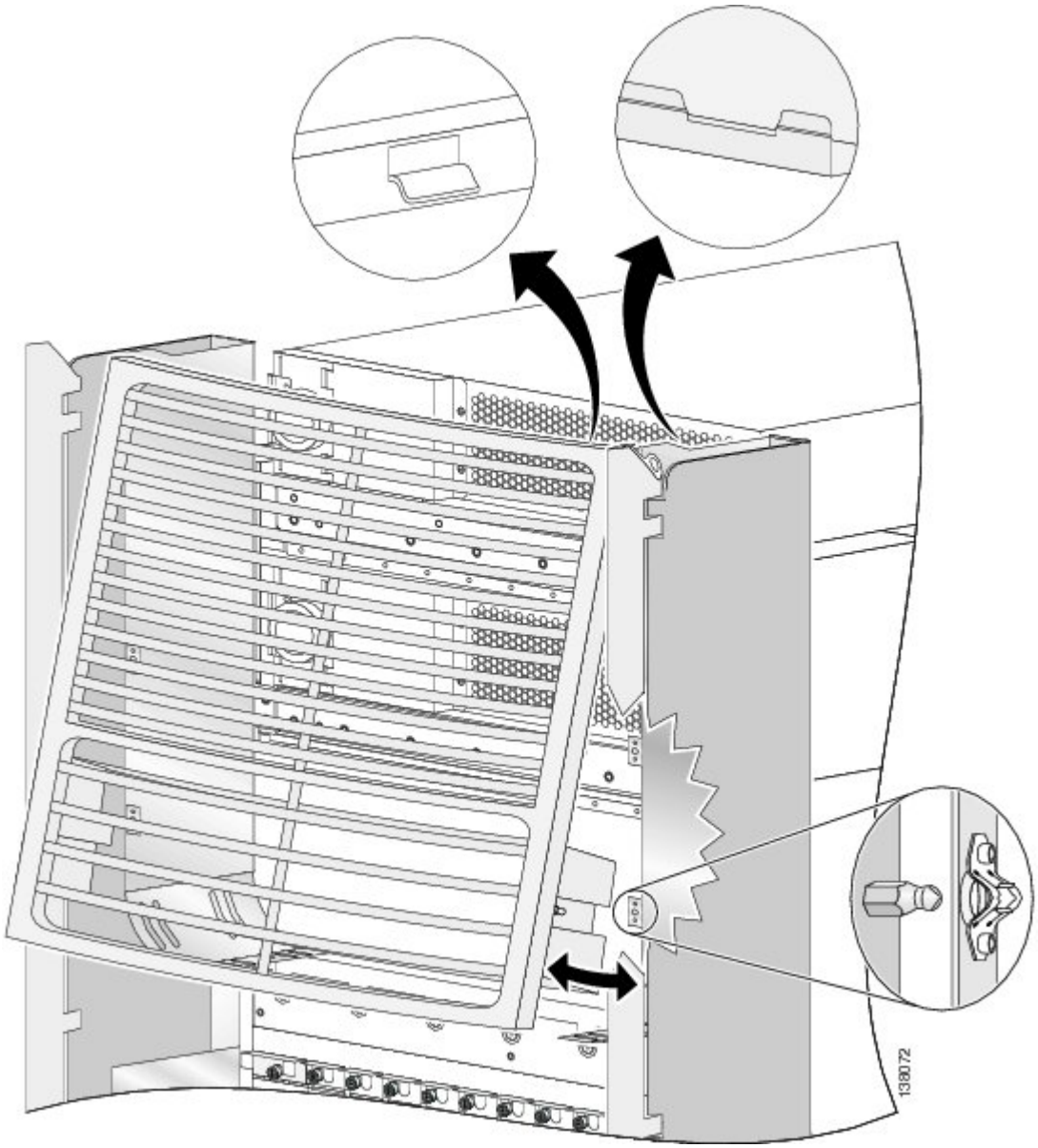


1	6 mm long screw attaching cable guide to chassis (quantity= 4)
2	4-mm long screw attaching cable guide to vertical trough (quantity=4)

Step 12 Insert the four short Phillips screws (two on each side) that attach the bracket to the vertical cable trough support flanges and tighten them to the troughs with the screwdriver.

Step 13 Attach the rear upper grille by carefully hooking the tabs on the top of the grille over the hook supports on the top of the vertical cable troughs (see the figure below).

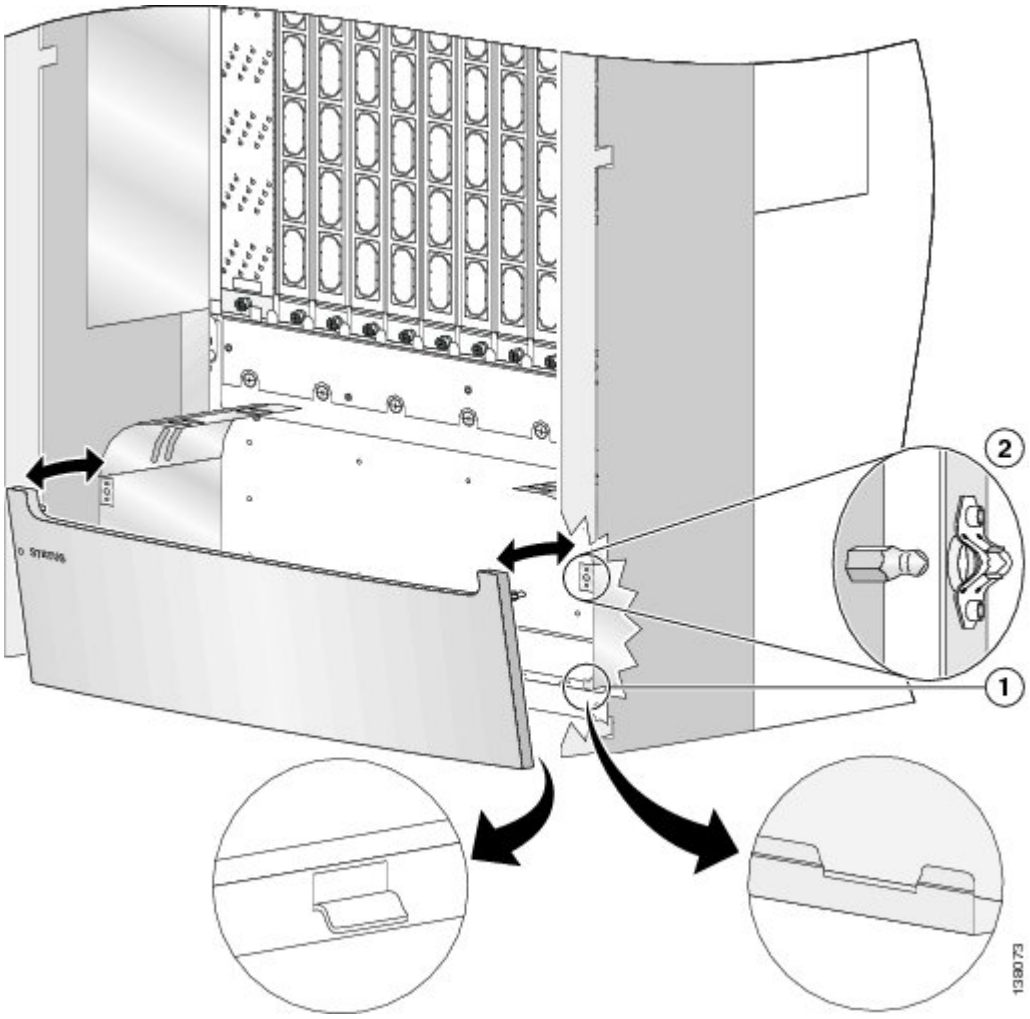
Figure 115: Attaching the Rear (OIM) Side Upper Grille—Fixed Configuration Power Shown



Step 14 Press the grille firmly against the grille support until it snaps onto the ball stud snaps on the rear (OIM) side of the chassis.

Step 15 Attach the rear lower bezel by carefully inserting the tabs on the grille into the hook hanger brackets on the lower bezel frame. Press the grille firmly against the grille frame until it snaps onto the ball stud snaps on the rear (OIM) side of the chassis (see see the figure below).

Figure 116: Attaching the Rear (OIM) Side Lower Bezel



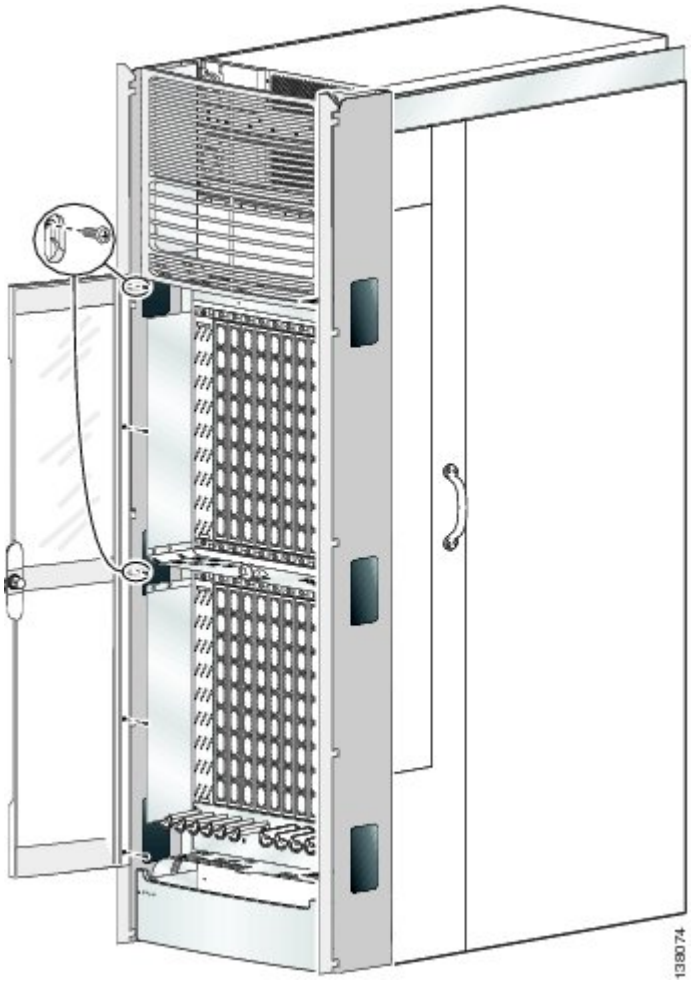
1	Hook hanger brackets	2	Ball stud

Step 16 Orient the doors so that the keyhole slots are pointing up.

Caution The doors scratch easily, so they should be handled with care.

Step 17 Align the doors vertically in their appropriate positions so you can determine where to thread the first two screws that are adjacent to the keyholes. See the figure below. Set the doors aside, and thread the two screws.

Figure 117: Attaching the Rear (OIM) Side Exterior Doors



Step 18 Place the doors on the screws in the keyhole positions, two for each door.

Step 19 Insert four M4x8-mm wafer-head screws (two on each side) into the appropriate screw holes in the doors, and use the screwdriver to fully tighten.

Note Verify that Step 16 was completed correctly to ensure proper orientation of doors. The screw locations vary depending on the door. If all screw holes for a door do not align with the screw holes on the front (SFC) side of the chassis, you need to use the other door.

Step 20 Insert and fully tighten all screws.

Step 21 Ensure that the doors are properly aligned.

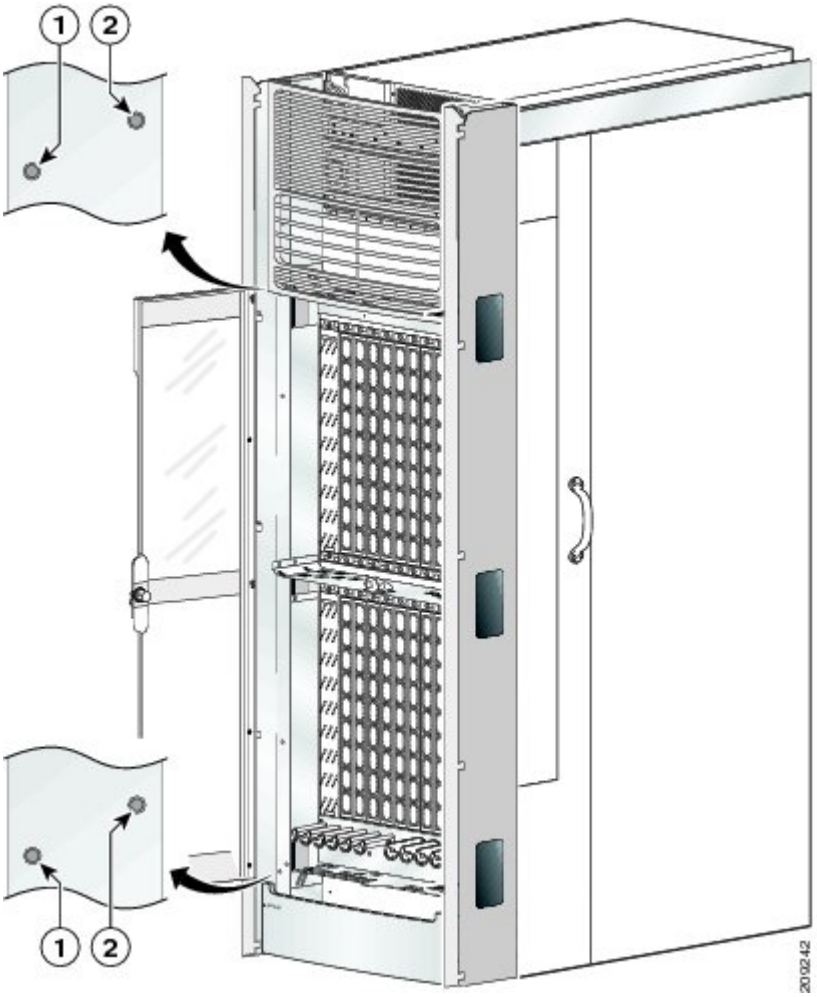
a) Check to see if the doors close without interfering with each other.

Note Typically, the doors will close without interfering with each other. However, you may need to adjust either the left or right door, or both, to align the doors properly. Adjust doors only if necessary.

b) To decrease the door gap, loosen the five screws that secure the vertical trough to the chassis. Tighten the bottom set screws (number 1 in Figure 99: Aligning the Door on the Front of the Chassis - Left Door Shown, on page 192) one full turn. Snug the five screws that attach the vertical trough to the chassis and check the door alignment.

c) To increase the door gap, loosen the five screws that secure the vertical trough to the chassis. Tighten the top set screws (number 2 in Figure 99: Aligning the Door on the Front of the Chassis - Left Door Shown, on page 192) one full turn. Snug the five screws that attach the vertical trough to the chassis and check the door alignment.

Figure 118: Aligning the Door on the Rear of the Chassis



1	Bottom set screw	2	Top set screw

d) Repeat the procedure as necessary until the doors are properly aligned.

e) Tighten the five screws that secure the vertical trough to the chassis.

What to Do Next

After performing this task, insert the rear horizontal Velcro cable bracket straps and install cabling that connects the FCC to the other components in the multishelf system. See the *Cisco CRS Carrier Routing System Multishelf System Interconnection and Cabling Guide* for more information.

This section describes how to remove the rear (OIM) side exterior cosmetic components, shown in Figure 91: FCC Rear (OIM) Side Exterior Cosmetic Components—Fixed Configuration Power Shown, on page 181, from the FCC. This section includes all the steps for you to remove all the cosmetic parts from your chassis, but you are not required to do so. To remove a particular part, see the appropriate step in the *Steps* section that follows.

This section describes how to perform the following tasks:

Note While it is possible to remove most of the rear cosmetic parts on the FCC separately, some parts (such as a unistrut) require that other parts be removed first.

Prerequisites

Ensure that you have all the original packaging material for the cosmetic components available.

Required Tools and Equipment

You need the following tools to perform this task:

- 8-in. long number 1 Phillips screwdriver—magnetic head preferable

Steps

To remove the rear (OIM) side cosmetic components, perform the following steps:

SUMMARY STEPS

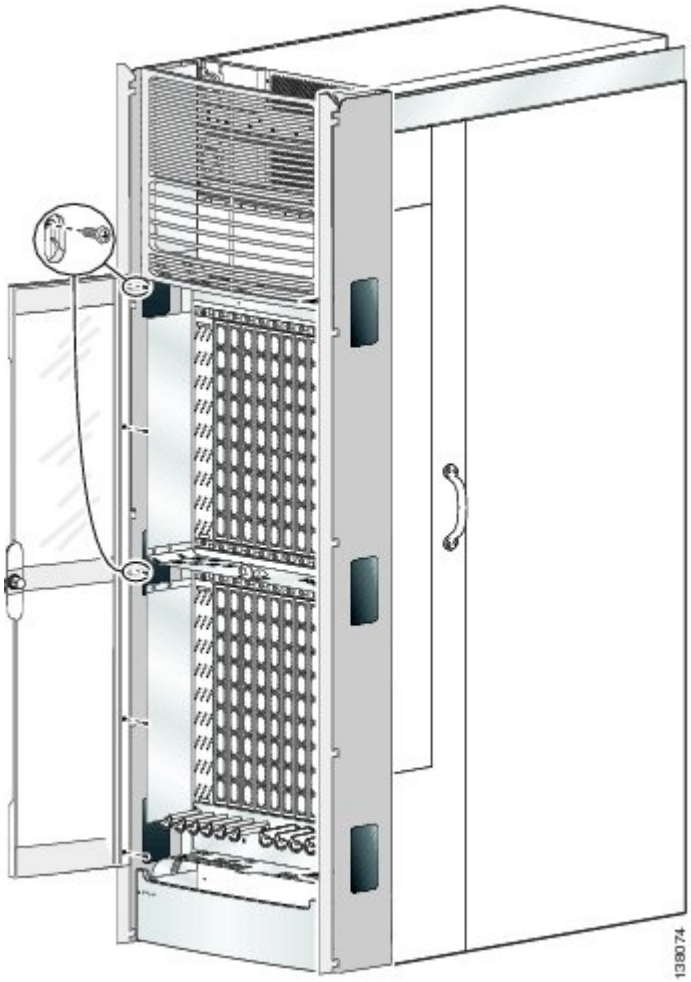
1. Remove the rear exterior doors by unscrewing all the screws except those adjacent to the keyholes (see the figure below); hold the doors to the chassis, lift the doors, and set them carefully aside.
2. Remove the rear lower bezel (see the figure below) by unsnapping the top portion from the ball stud snaps on the grille frame; rotate the grille toward you on its hook hanger brackets, then lift it clear of the support, and set it carefully aside.
3. Remove the rear upper grille (see the figure below) by unsnapping the bottom portion from the ball stud snaps on the logo bezel support assembly; rotate the grille toward you on its hook hanger brackets, then lift it clear of the support, and set it carefully aside.
4. Use the screwdriver to remove the four screws (two on each side) that attach the bracket to the vertical cable trough support flange (see the figure below), and set them aside.
5. Using the screwdriver, remove the five longer Phillips head screws that attach the face of the bracket to the chassis. Remove the cable guide and carefully set it aside. (see the figure below)
6. Use the screwdriver to remove the four flat head Phillips screws, two on each side, that attach the cable guide to the chassis, and set them aside. See the figure below.
7. Using the screwdriver, remove the five flat head Phillips screws that attach the cable guide to the chassis. Remove the cable guide and carefully set it aside. See the figure below.
8. Use the screwdriver to remove the four screws (two on each side) that attach the bracket to the vertical cable trough support flange, and set them aside. See the figure below.
9. Using the screwdriver, remove the four screws that attach the cable guide to the chassis. Remove the cable guide and carefully set it aside. See the figure below.
10. Remove the rear vertical cable troughs —one right and one left— from the rear of the chassis (see the figure below):

DETAILED STEPS

Step 1 Remove the rear exterior doors by unscrewing all the screws except those adjacent to the keyholes (see the figure below); hold the doors to the chassis, lift the doors, and set them carefully aside.

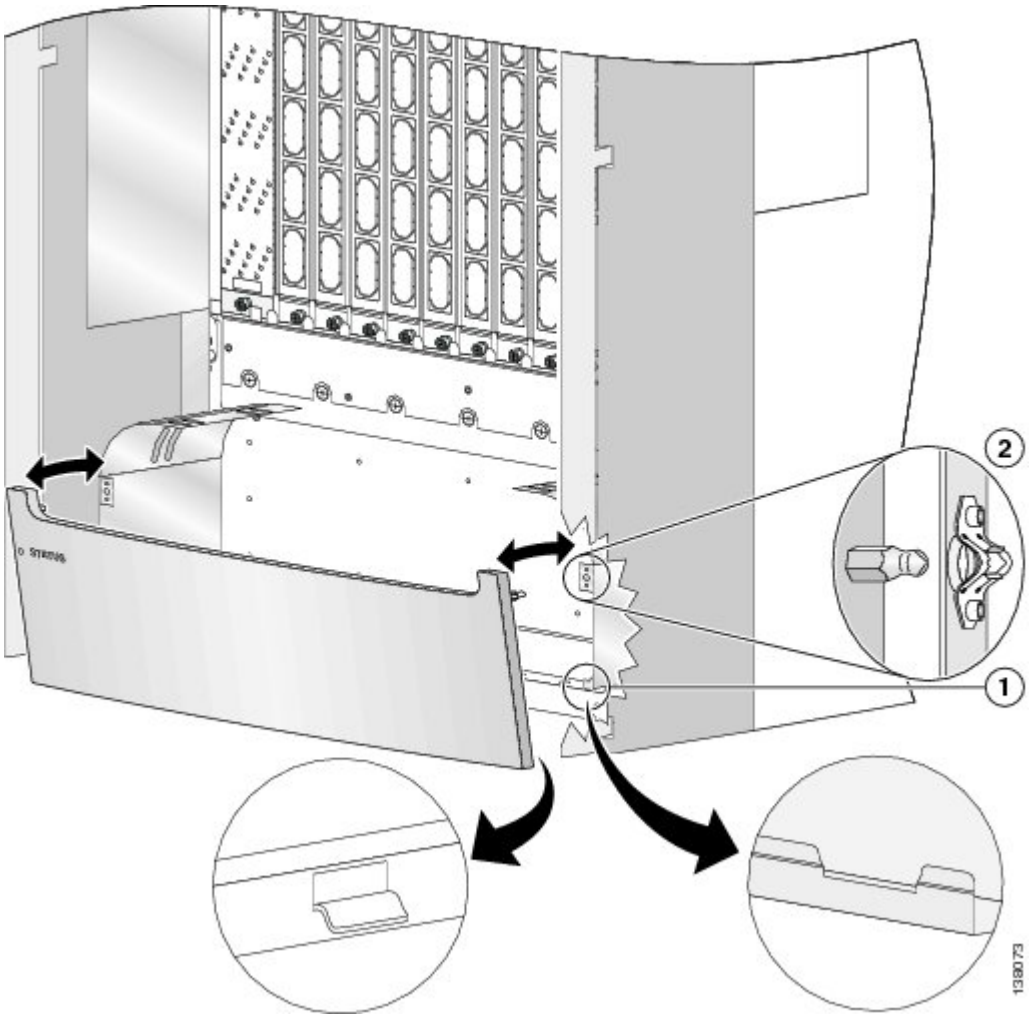
Caution The doors scratch easily, so they should be handled with care.

Figure 119: Removing the Rear (OIM) Side Exterior Doors



Step 2 Remove the rear lower bezel (see the figure below) by unsnapping the top portion from the ball stud snaps on the grille frame; rotate the grille toward you on its hook hanger brackets, then lift it clear of the support, and set it carefully aside.

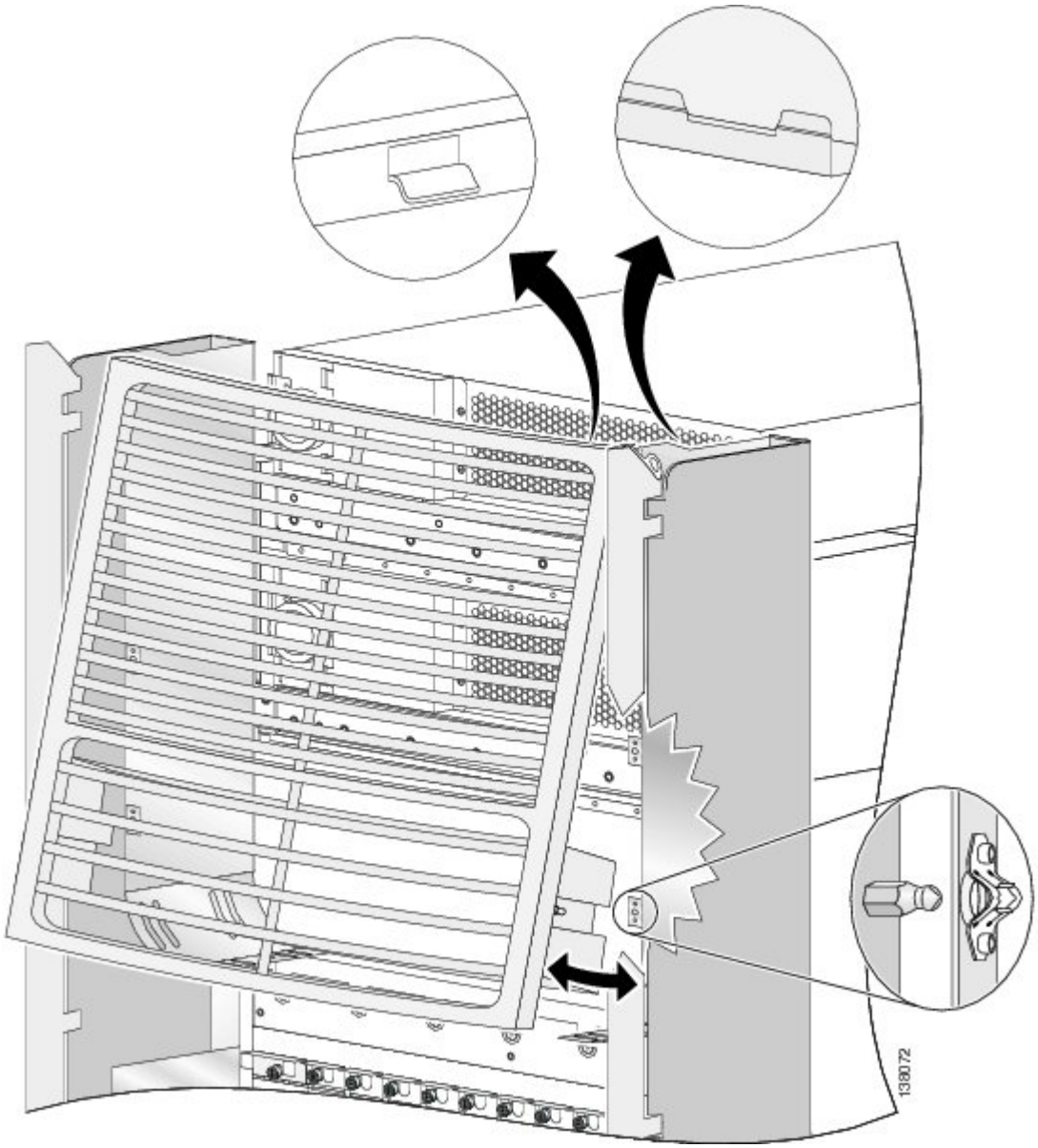
Figure 120: Removing the Rear (OIM) Side Lower Bezel



1	Hook hanger brackets	2	Ball stud

Step 3 Remove the rear upper grille (see the figure below) by unsnapping the bottom portion from the ball stud snaps on the logo bezel support assembly; rotate the grille toward you on its hook hanger brackets, then lift it clear of the support, and set it carefully aside.

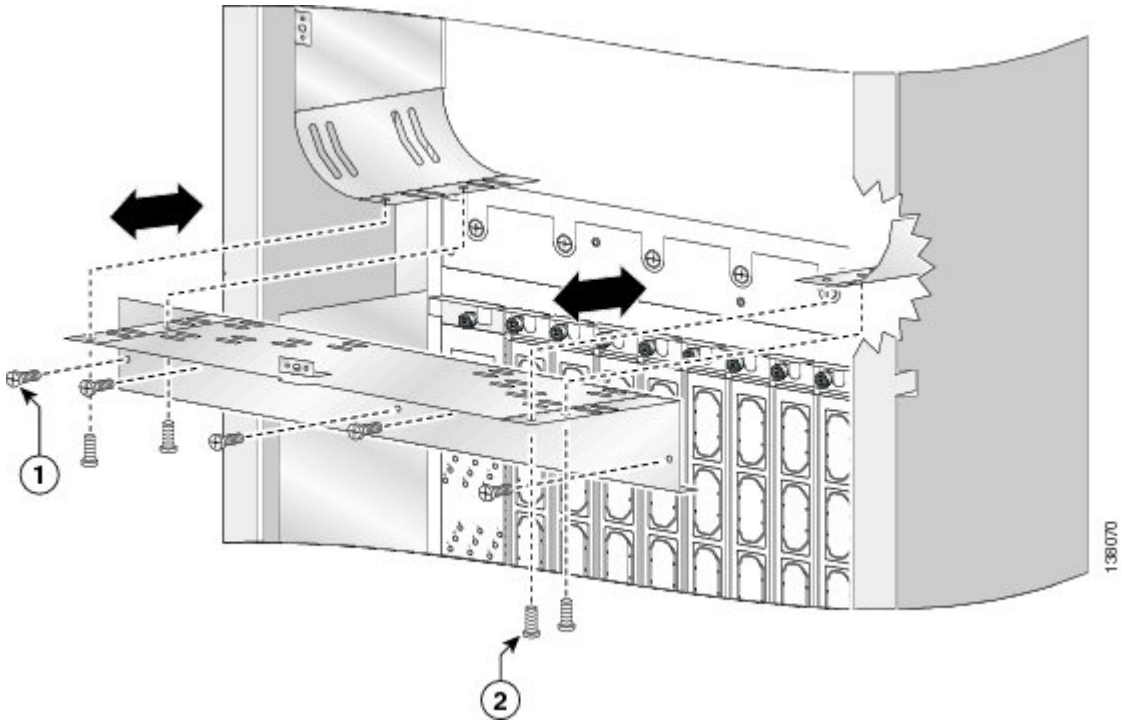
Figure 121: Removing the Rear (OIM) Side Upper Grille—Fixed Configuration Power Shown



Step 4 Use the screwdriver to remove the four screws (two on each side) that attach the bracket to the vertical cable trough support flange (see the figure below), and set them aside.

Step 5 Using the screwdriver, remove the five longer Phillips head screws that attach the face of the bracket to the chassis. Remove the cable guide and carefully set it aside. (see the figure below)

Figure 122: Removing the Rear Upper Horizontal Cable Guide

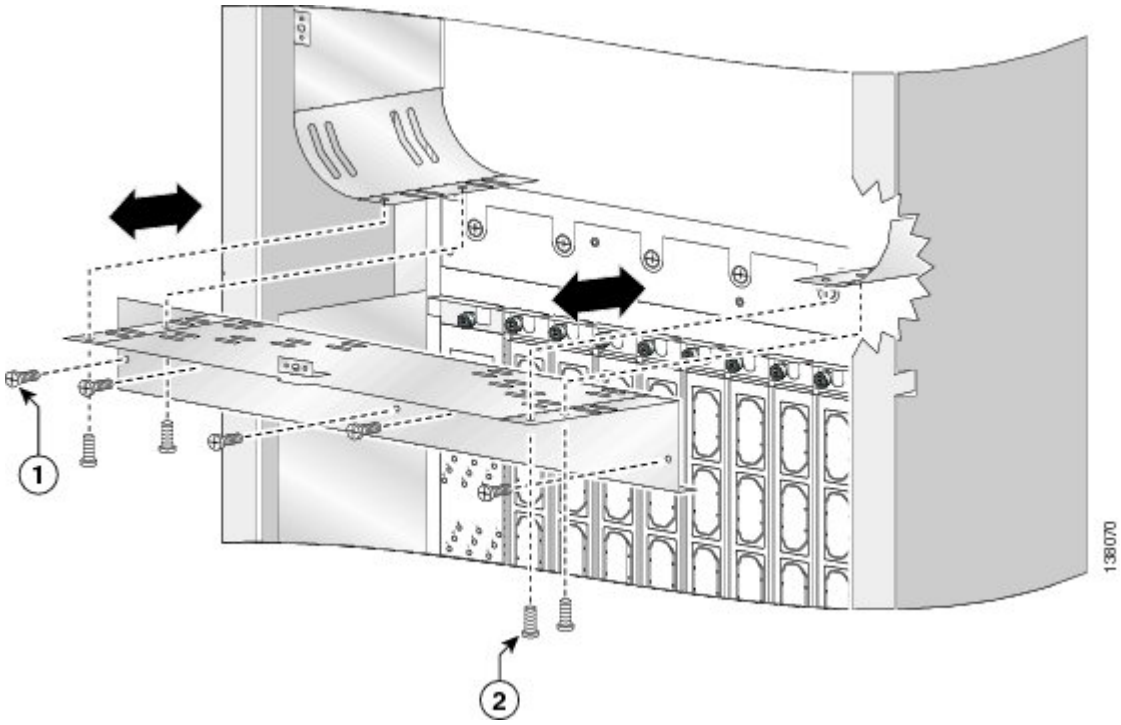


1	6 mm long screw attaching cable guide to chassis (quantity= 5)
2	4-mm long screw attaching cable guide to vertical trough (quantity=4)

Step 6 Use the screwdriver to remove the four flat head Phillips screws, two on each side, that attach the cable guide to the chassis, and set them aside. See the figure below.

Step 7 Using the screwdriver, remove the five flat head Phillips screws that attach the cable guide to the chassis. Remove the cable guide and carefully set it aside. See the figure below.

Figure 123: Removing the Rear Mid-Chassis Horizontal Cable Guide and Strike Tube

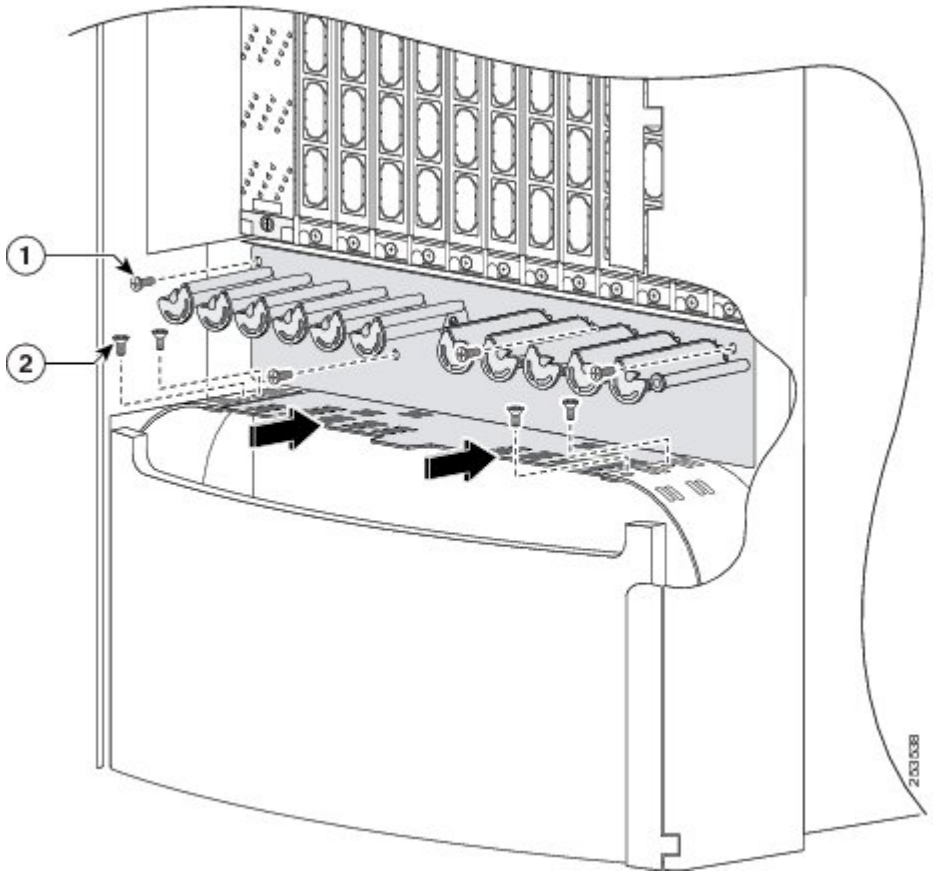


1	4 mm long screw attaching cable guide to vertical trough (quantity=4)
2	6 mm long screw attaching cable guide to chassis (quantity=5)
3	Strike tube on the upper surface

Step 8 Use the screwdriver to remove the four screws (two on each side) that attach the bracket to the vertical cable trough support flange, and set them aside. See the figure below.

Step 9 Using the screwdriver, remove the four screws that attach the cable guide to the chassis. Remove the cable guide and carefully set it aside. See the figure below.

Figure 124: Removing the Rear Lower Horizontal Cable Guide



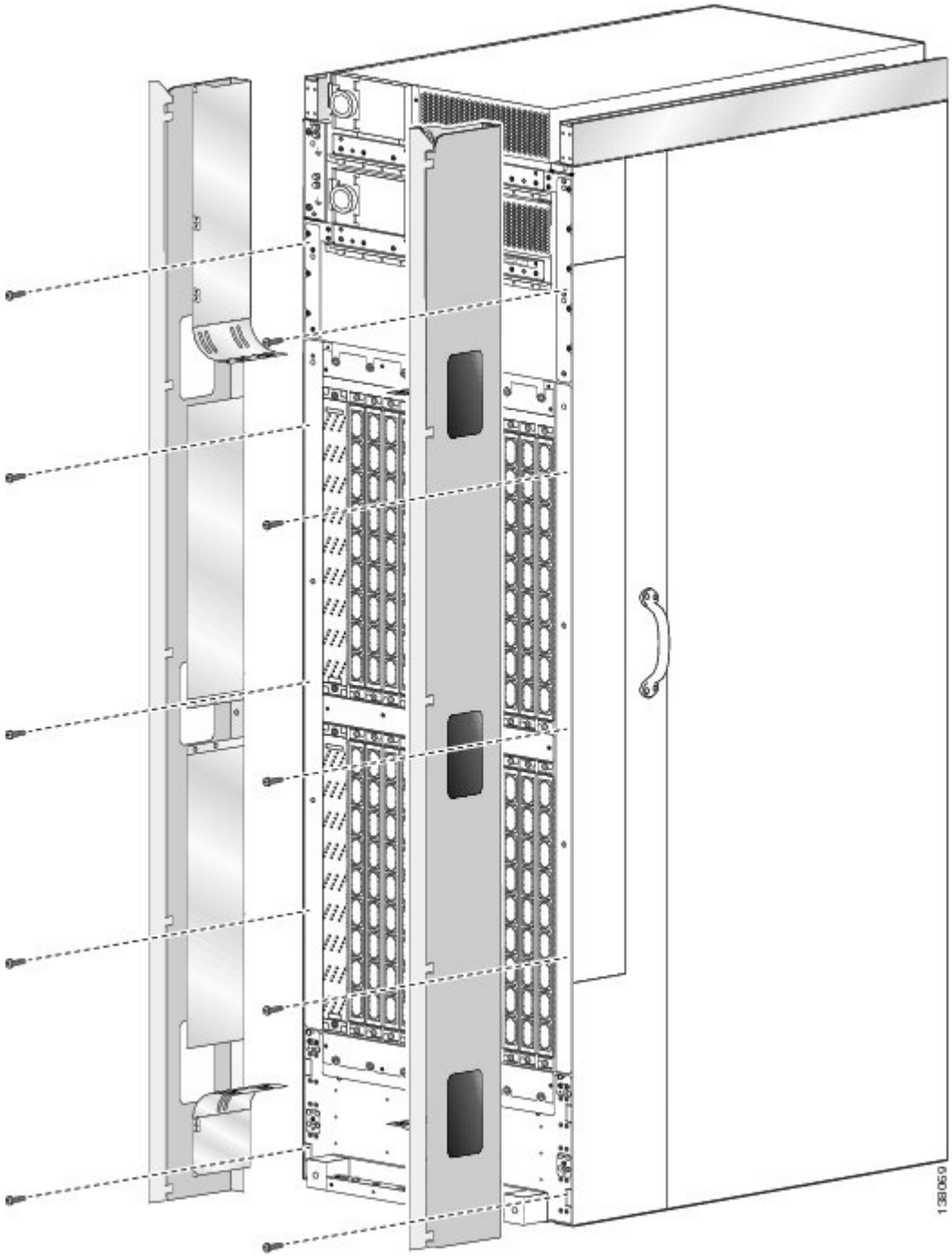
1	6 mm long screw attaching cable guide to chassis (quantity= 4)
2	4-mm long screw attaching cable guide to vertical trough (quantity=4)

Step 10 Remove the rear vertical cable troughs —one right and one left— from the rear of the chassis (see the figure below):

a) Unscrew the 10 M4x14-mm flat head screws (5 on each side) that hold the troughs to the chassis, and set them aside.
b) Slide the cable troughs upward slightly to unhook them from the guide slots; lift them away from the chassis, and set them carefully aside.

Note We recommend that you use two people to remove the troughs, one person to hold the troughs while the other person removes the screws.

Figure 125: Rear (OIM) Side Vertical Cable Troughs—Fixed Configuration Power Shown

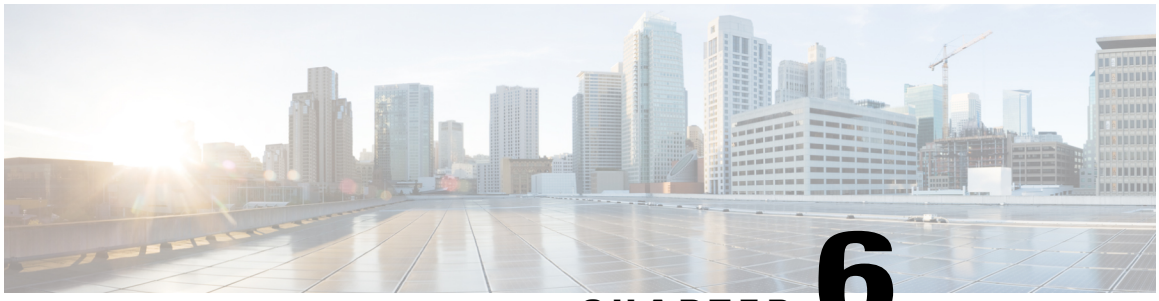


What to Do Next

Be sure that all parts have been carefully set aside and repackaged appropriately.

What to Do Next

Be sure that all parts have been carefully set aside and repackaged appropriately.



CHAPTER 6

Upgrading Chassis Components

This chapter provides instructions on how to upgrade chassis components on the Cisco CRS Carrier Routing System Fabric Card Chassis.

This chapter presents the following topics:

Upgrading the Inlet Grille Screen

To ensure protection against debris getting through the lower grille and into the chassis bay, Cisco Systems provides a screen that you can install behind the lower grille.

This section describes how to install the new lower grille screen in the FCC. To install the lower grille screen kit (CRS-FCC-SCRN-KIT) as an update to an existing system, you must:

1. Remove the lower grille from the front (SFC) side of the chassis.
2. Remove the lower grille frame assembly that is currently installed.
3. Install the new lower grille screen and frame assembly.
4. Re-install the lower grille on the front (SFC) side of the chassis.

Required Tools and Equipment

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

- 8 in. long number 1 Phillips screwdriver—magnetic head preferable

- Lower grille screen and frame assembly
  - Lower grille screen kit (Cisco product number: CRS-FCC-SCRN-KIT)

Removing the Lower Grille

This section describes how to remove the lower grille from the front (SFC) side of the FCC.

Prerequisites

There are no prerequisites for this task.

Steps

To remove the lower grille from your FCC, perform the following steps:

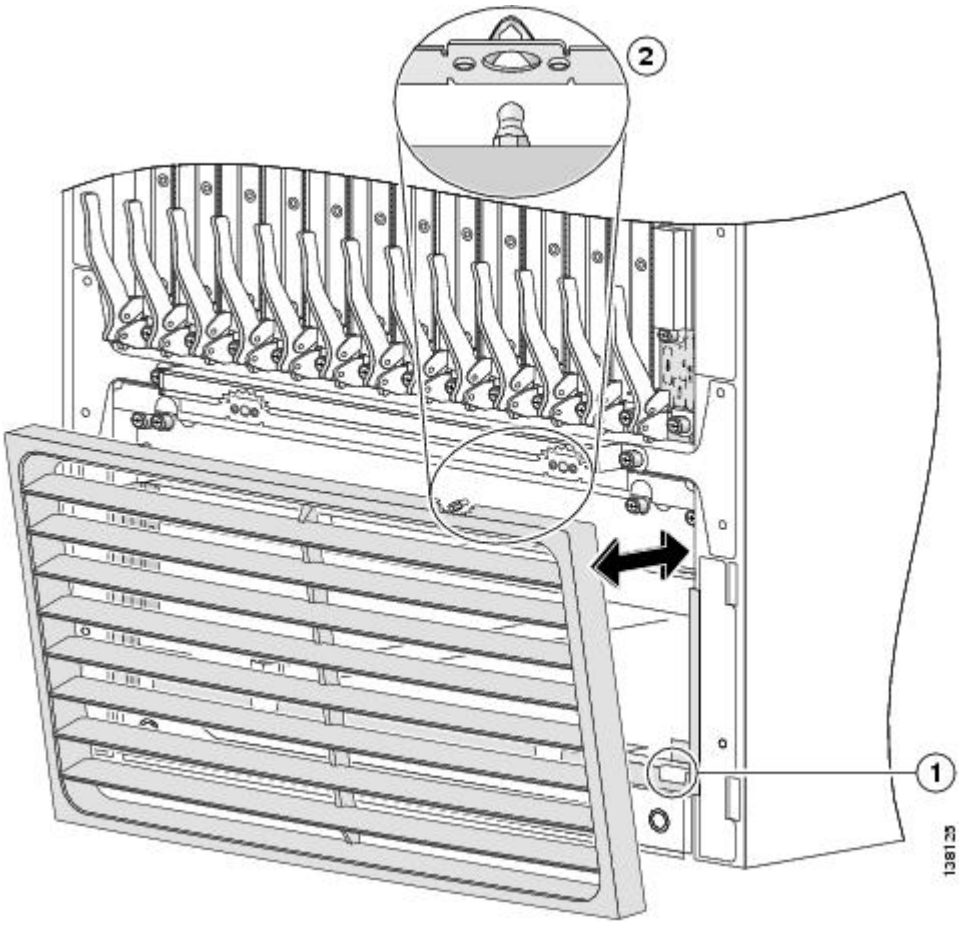
SUMMARY STEPS

1. Remove the lower grille by unsnapping the top portion from the ball stud snaps (see Figure 126: Removing the Lower Grille).
2. Rotate the grille toward you on its hook hanger brackets, then lift it clear of the support, and set it carefully aside for later use.

DETAILED STEPS

Step 1 Remove the lower grille by unsnapping the top portion from the ball stud snaps (see Figure 126: Removing the Lower Grille).

Figure 126: Removing the Lower Grille



1	Hook hanger brackets	2	Ball stud

Step 2 Rotate the grille toward you on its hook hanger brackets, then lift it clear of the support, and set it carefully aside for later use.

Removing the Currently Installed Lower Grille Frame Assembly

Once the lower grille has been removed, you must remove the currently installed lower grille frame assembly from the chassis.

Prerequisites

Before performing this task, ensure that the lower grille has been removed from the front (SFC) side of the chassis. See the Removing the Lower Grille, on page 230 for more information.

Steps

To remove the currently installed lower grille frame assembly, perform the following steps:

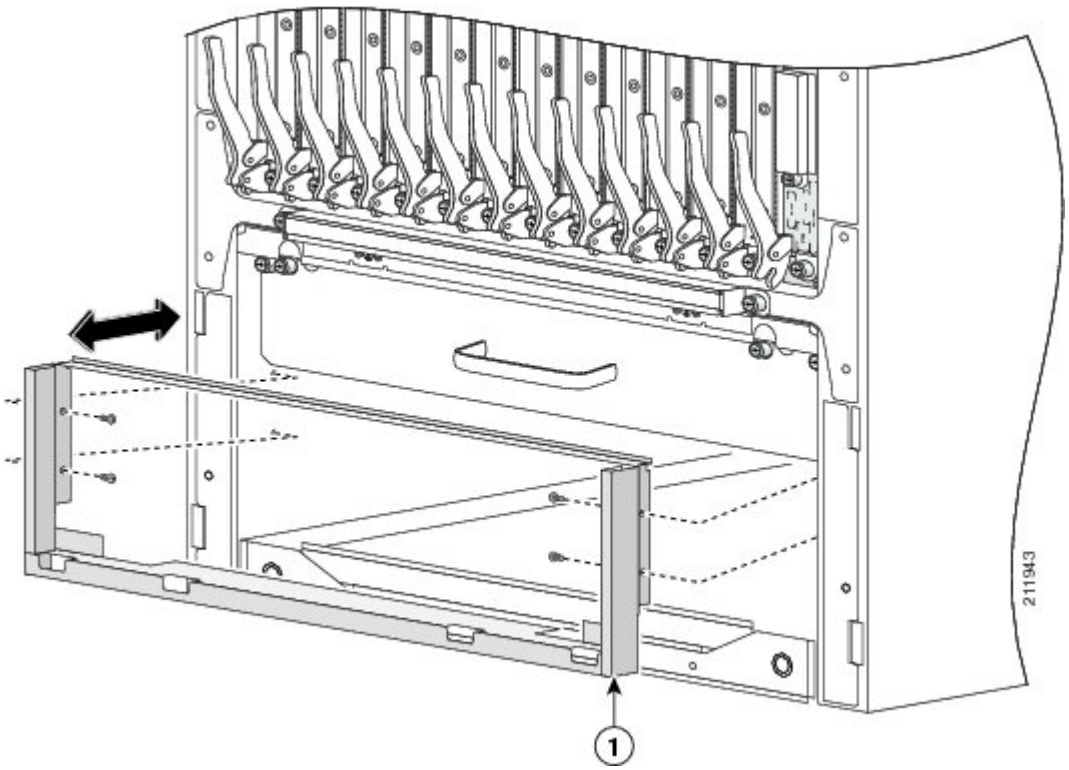
SUMMARY STEPS

1. Use the Phillips screwdriver to unscrew the four captive screws, two on each side, that attach the lower grille frame assembly to the chassis. See Figure 127: Removing the Original Lower Grille Frame Assembly.
2. Rotate the assembly forward, lift it away from the chassis, and set it aside.

DETAILED STEPS

Step 1 Use the Phillips screwdriver to unscrew the four captive screws, two on each side, that attach the lower grille frame assembly to the chassis. See Figure 127: Removing the Original Lower Grille Frame Assembly.

Figure 127: Removing the Original Lower Grille Frame Assembly



1	Lower grille frame assembly

Step 2 Rotate the assembly forward, lift it away from the chassis, and set it aside.

Installing the New Lower Grille Screen and Frame Assembly

This section describes how to install the lower grille screen and frame assembly in the chassis.

In this task, you must first remove the lower grille screen from the frame, because the screws that attach the frame assembly to the chassis are inboard of the screen—that is, the new screen is shipped already installed into the new frame assembly, but you cannot attach the new frame to the chassis until you remove the screen first. When the new frame assembly is installed in the chassis, you can reinstall the lower grille screen into the new frame.

Prerequisites

Before performing this task, ensure that the original lower grille and lower grille frame assembly have been removed. See the Removing the Lower Grille and the Removing the Currently Installed Lower Grille Frame Assembly for more information.

Steps

To install the new lower grille screen and frame assembly, perform the following steps:

SUMMARY STEPS

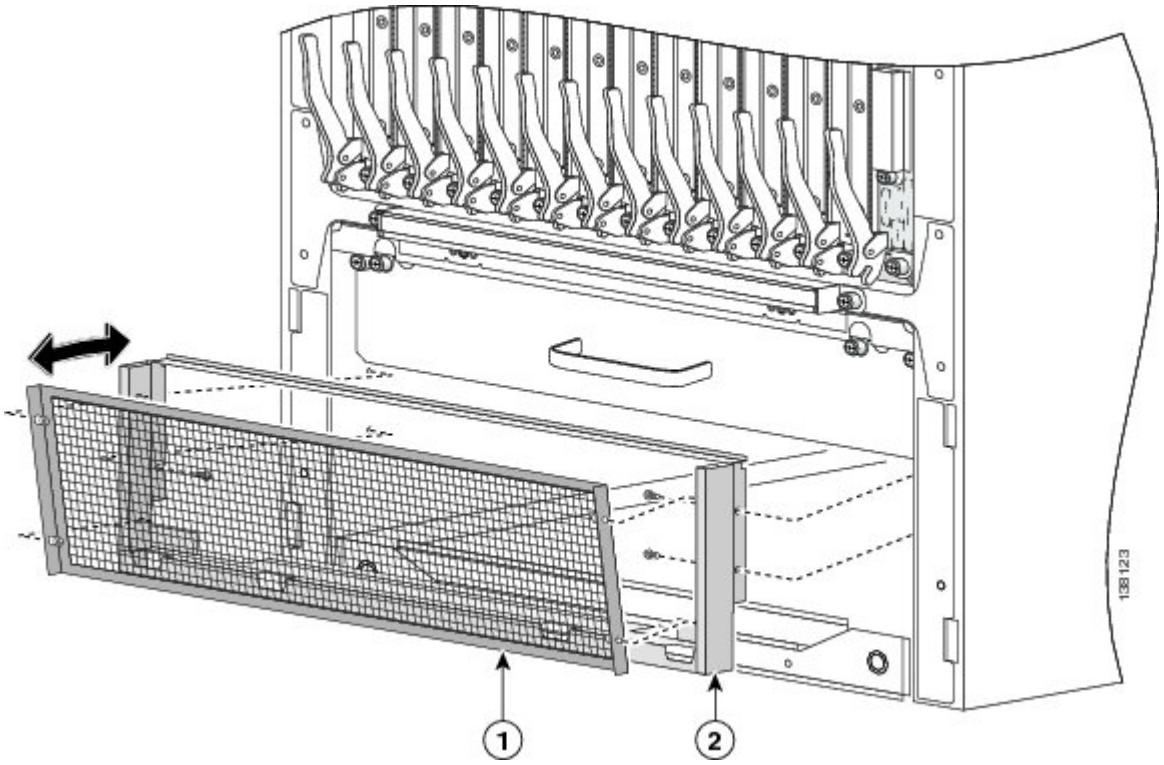
1. Using the Phillips screwdriver, loosen the four captive screws, two on each side, that secure the lower grille screen to its frame assembly; then carefully set the screen aside. See Figure 128: Installing the New Lower Grille Screen and Frame Assembly.
2. Attach the frame assembly to the chassis (see Figure 128: Installing the New Lower Grille Screen and Frame Assembly) by aligning the four screws, two on each side, on the frame to the screw holes on the chassis and tightening them with the screwdriver.
3. To reattach the lower grille screen (see Figure 128: Installing the New Lower Grille Screen and Frame Assembly) to the frame assembly, align the four captive screws on the screen to the screw holes on the frame assembly and tighten with the screwdriver.
4. Attach the lower grille to the chassis by carefully inserting the tabs on the grille into the hook hanger brackets. See Figure 129: Installing the Lower Grille.
5. Press the lower grille firmly until it snaps onto the ball stud snaps. See Figure 129: Installing the Lower Grille.

DETAILED STEPS

Step 1 Using the Phillips screwdriver, loosen the four captive screws, two on each side, that secure the lower grille screen to its frame assembly; then carefully set the screen aside. See Figure 128: Installing the New Lower Grille Screen and Frame Assembly.

Step 2 Attach the frame assembly to the chassis (see Figure 128: Installing the New Lower Grille Screen and Frame Assembly) by aligning the four screws, two on each side, on the frame to the screw holes on the chassis and tightening them with the screwdriver.

Figure 128: Installing the New Lower Grille Screen and Frame Assembly



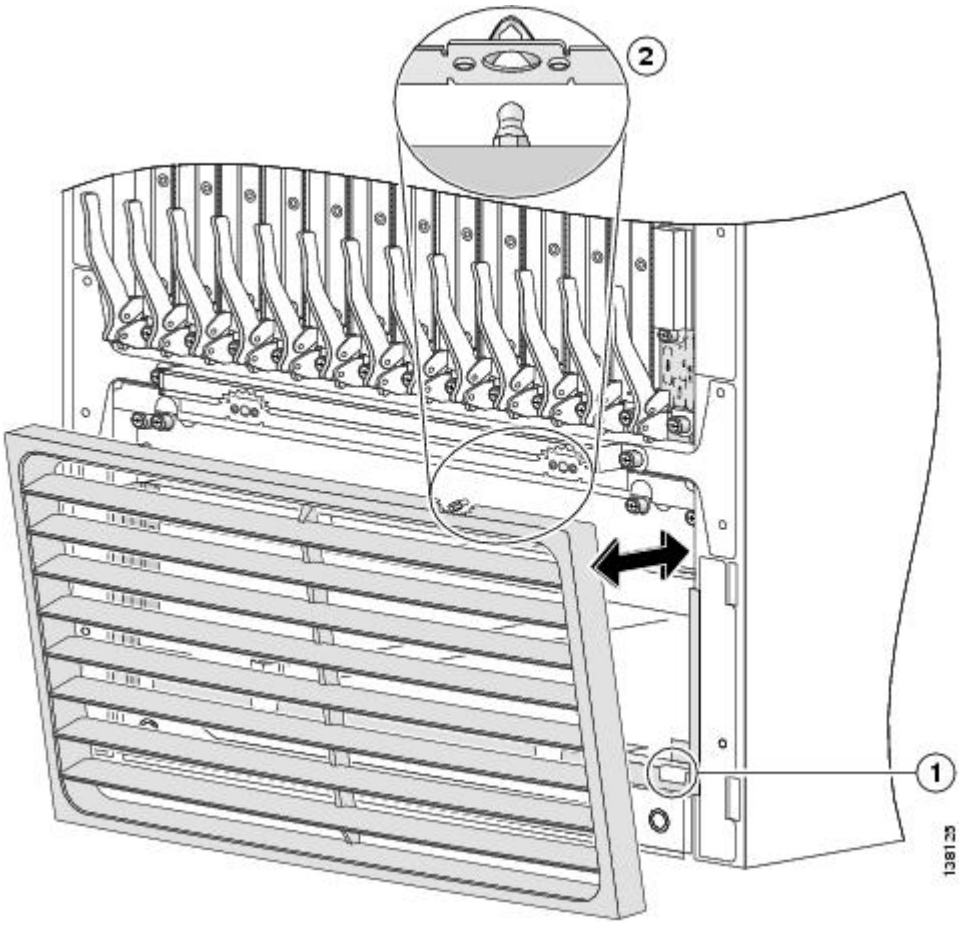
1	Lower grille screen	2	Lower grille screen frame assembly

Step 3 To reattach the lower grille screen (see Figure 128: Installing the New Lower Grille Screen and Frame Assembly) to the frame assembly, align the four captive screws on the screen to the screw holes on the frame assembly and tighten with the screwdriver.

Step 4 Attach the lower grille to the chassis by carefully inserting the tabs on the grille into the hook hanger brackets. See Figure 129: Installing the Lower Grille.

Step 5 Press the lower grille firmly until it snaps onto the ball stud snaps. See Figure 129: Installing the Lower Grille.

Figure 129: Installing the Lower Grille



1	Hook hanger brackets	2	Ball stud

Installing the Rear Vertical Cable Troughs and Cutout Assembly

This section describes how to remove the vertical troughs from the rear of the FCC, and replace with the new vertical cable troughs and cutout assembly.

To upgrade the rear vertical cable troughs, you must:

1. Remove the doors, lower bezel and upper grille from the rear (OIM) side of the chassis.
2. Remove the currently installed vertical cable troughs.
3. Install the new vertical cable troughs.
4. Install the cable pass-through accessory plates on the new vertical cable troughs.
5. Re-install the doors, lower bezel and upper grille on the rear (OIM) side of the chassis.

Upgrading the Currently Installed Vertical Cable Troughs

If you are installing the cable troughs with cutout assembly as an update to an existing system, the currently installed vertical trough must be removed from the chassis before the new vertical cable trough can be installed.

Prerequisites

Before performing this task, you must first remove the rear (OIM) side exterior doors, rear lower bezel, and rear upper grille. See the page , 218 for more information.

Undo all velcro and carefully move the existing cables to either the inside or outside of the existing vertical cable trough (whichever is easier). Carefully pull slack, if required.

Caution Do NOT disconnect cables from the chassis during the vertical cable trough upgrade procedure.

Required Tools and Equipment

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

- 8-in. long number 1 Phillips screwdriver—magnetic head preferable
- Cable management retrofit kit (Cisco product number: CRS-FCC-CM-RETRO=)

Steps

To replace the vertical trough on the FCC, perform the following steps:

SUMMARY STEPS

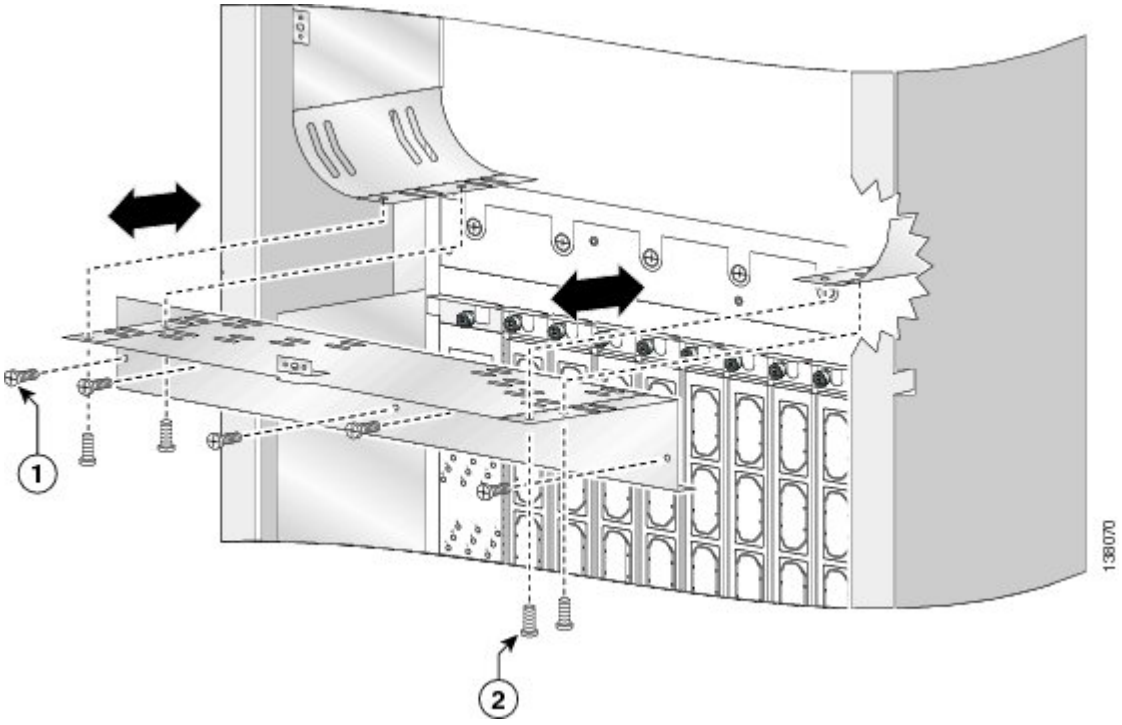
1. Remove the mounting screws that attach the upper, middle and lower horizontal cable guides to the vertical cable troughs (left and right sides of chassis).
2. Remove the five mounting screws that attach the upper horizontal cable guide to the chassis and remove upper cable guide completely. See Figure 130: Rear Upper Horizontal Cable Guide .
3. Remove the rear vertical cable troughs (see Figure 133: Rear (OIM) Side Vertical Cable Troughs—Fixed Configuration Power Shown)—one right and one left— from the rear of the chassis:
4. If you plan to upgrade the lower horizontal cable guide, remove the five mounting screws that attach the lower horizontal cable guide to the chassis and remove lower cable guide completely. Replace with new lower horizontal cable guide with spools, by installing the four screws that attach the cable guide to the chassis. See the Upgrading the Lower Horizontal Cable Guide for more information.
5. Attach the rear vertical cable troughs —one right and one left—to the rear of the chassis (as shown in Figure 133: Rear (OIM) Side Vertical Cable Troughs—Fixed Configuration Power Shown) by i nserting the 10 M4x14-mm flat head screws (5 on each side) and using the screwdriver to fasten the screws to attach the cable troughs firmly to the chassis.
6. Install the mounting screws that attach the upper horizontal cable guide to the chassis. See Figure 134: Installing Rear Upper Horizontal Cable Guide .
7. Re-install the mounting screws that attach the lower, middle and upper horizontal cable guides to the vertical cable troughs (left and right sides of chassis).

DETAILED STEPS

Step 1 Remove the mounting screws that attach the upper, middle and lower horizontal cable guides to the vertical cable troughs (left and right sides of chassis).

Figure 130: Rear Upper Horizontal Cable Guide shows the upper horizontal cable guide.

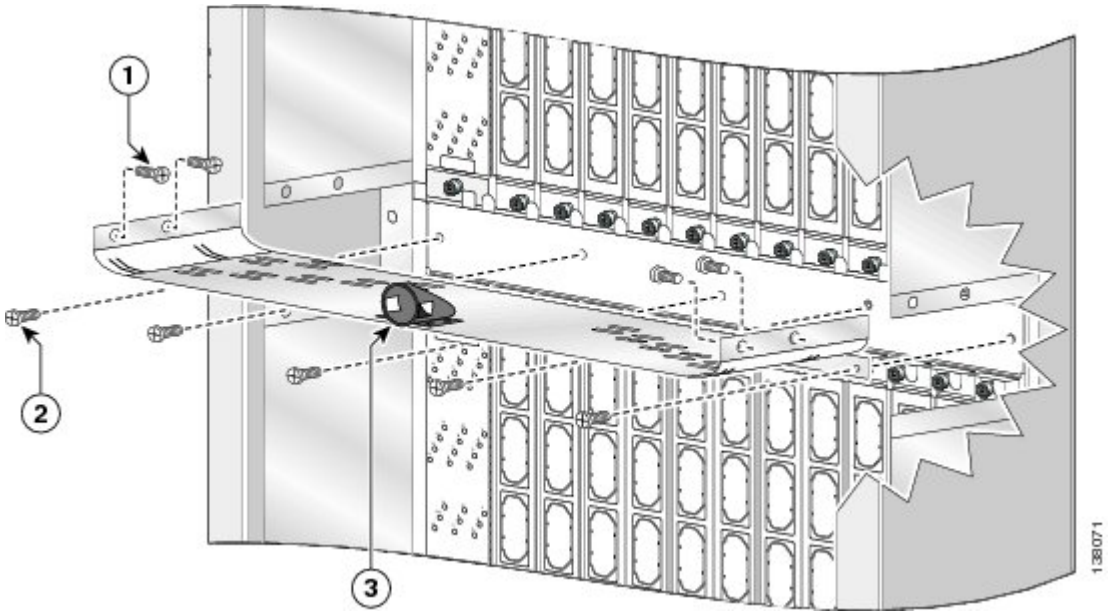
Figure 130: Rear Upper Horizontal Cable Guide



1	6 mm long screw attaching cable guide to chassis (quantity= 5)
2	4-mm long screw attaching cable guide to vertical trough (quantity=4)

Figure 131: Rear Mid-Chassis Horizontal Cable Guide and Strike Tube shows the mid-chassis horizontal cable guide.

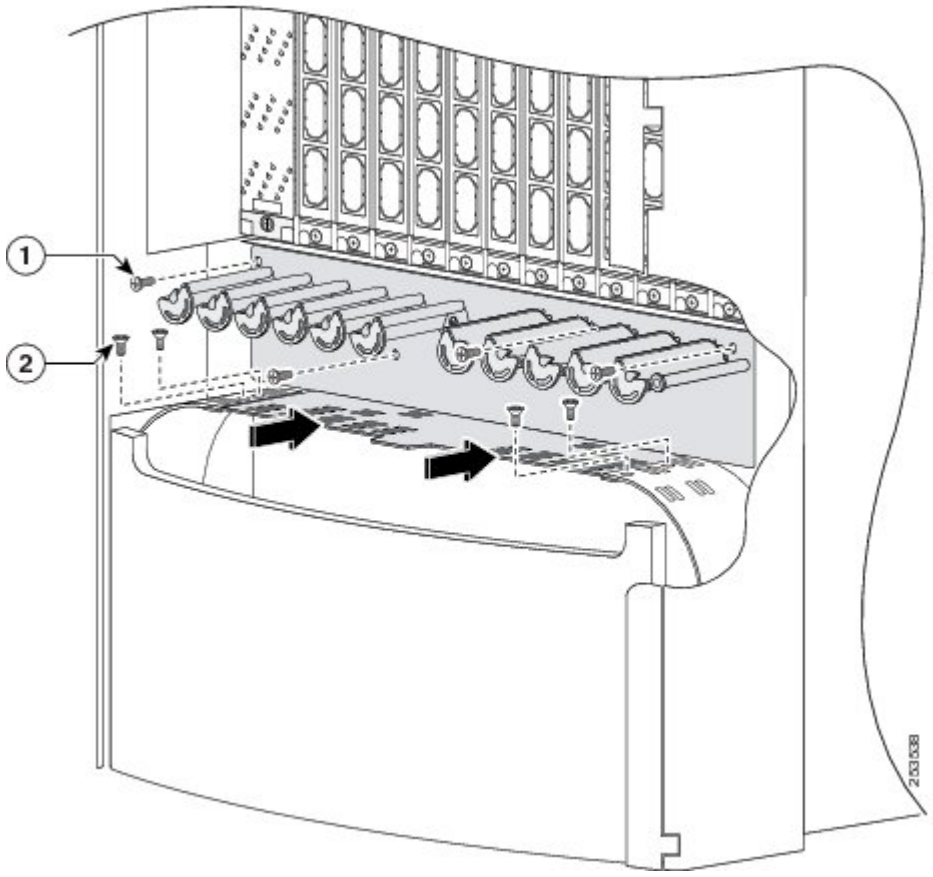
Figure 131: Rear Mid-Chassis Horizontal Cable Guide and Strike Tube



1	4 mm long screw attaching cable guide to vertical trough (quantity=4)
2	6 mm long screw attaching cable guide to chassis (quantity=5)
3	Strike tube on upper surface

Figure 132: Rear Lower Horizontal Cable Guide shows the lower horizontal cable guide.

Figure 132: Rear Lower Horizontal Cable Guide



1	6 mm long screw attaching cable guide to chassis (quantity= 4)
2	4-mm long screw attaching cable guide to vertical trough (quantity=4)

Step 2 Remove the five mounting screws that attach the upper horizontal cable guide to the chassis and remove upper cable guide completely. See Figure 130: Rear Upper Horizontal Cable Guide .

Step 3 Remove the rear vertical cable troughs (see Figure 133: Rear (OIM) Side Vertical Cable Troughs—Fixed Configuration Power Shown)—one right and one left— from the rear of the chassis:

a) Unscrew the 10 M4x14-mm flat head screws (5 on each side) that hold the troughs to the chassis, and set them aside.

b) Slide the cable troughs upward slightly to unhook them from the guide slots; lift them away from the chassis, and set them carefully aside.

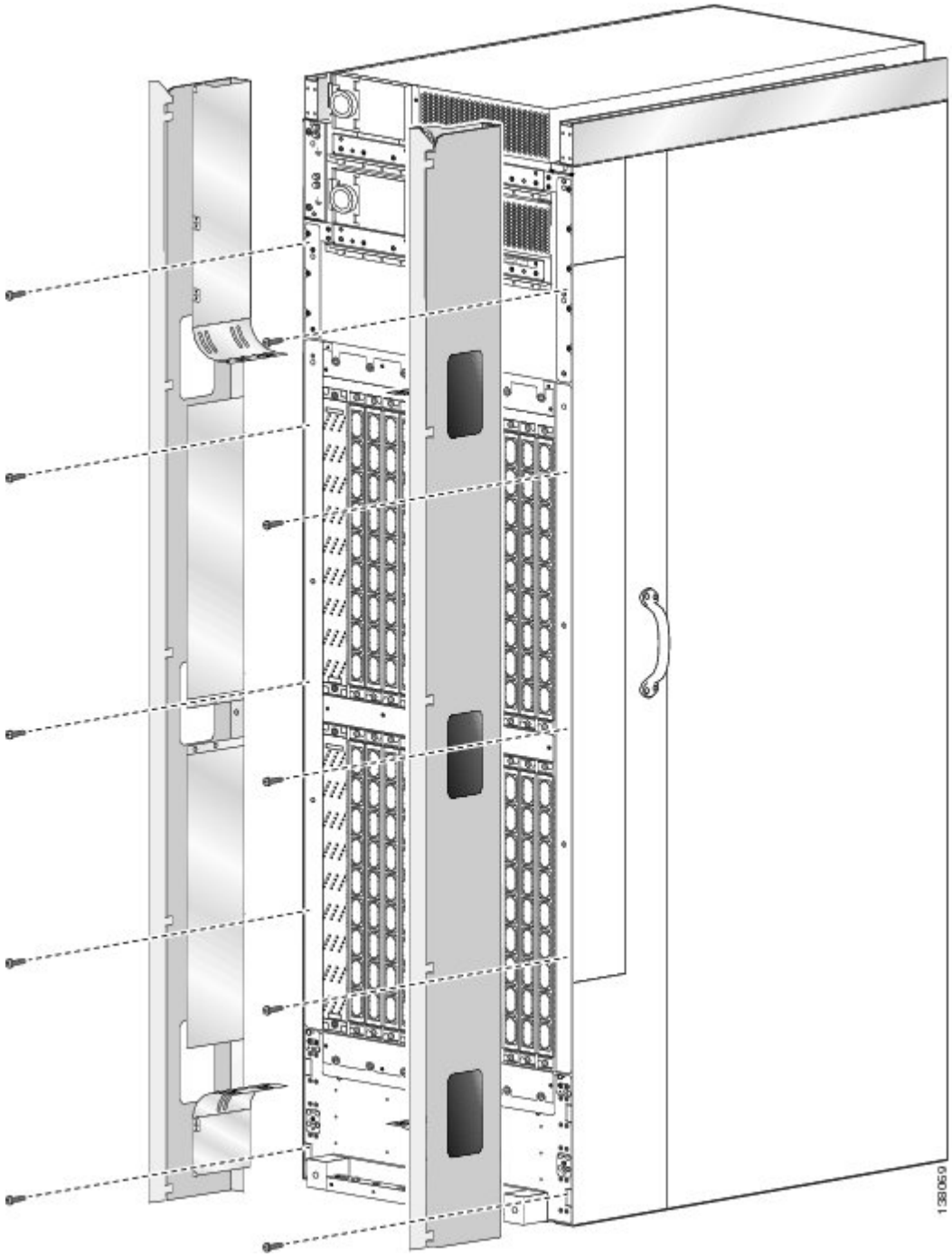
Note We recommend that you use two people to remove the troughs, one person to hold the troughs while the other person removes the screws.

Step 4 If you plan to upgrade the lower horizontal cable guide, remove the five mounting screws that attach the lower horizontal cable guide to the chassis and remove lower cable guide completely. Replace with new lower horizontal cable guide with spools, by installing the four screws that attach the cable guide to the chassis. See the Upgrading the Lower Horizontal Cable Guide for more information.

Step 5 Attach the rear vertical cable troughs —one right and one left—to the rear of the chassis (as shown in Figure 133: Rear (OIM) Side Vertical Cable Troughs—Fixed Configuration Power Shown) by i nserting the 10 M4x14-mm flat head screws (5 on each side) and using the screwdriver to fasten the screws to attach the cable troughs firmly to the chassis.

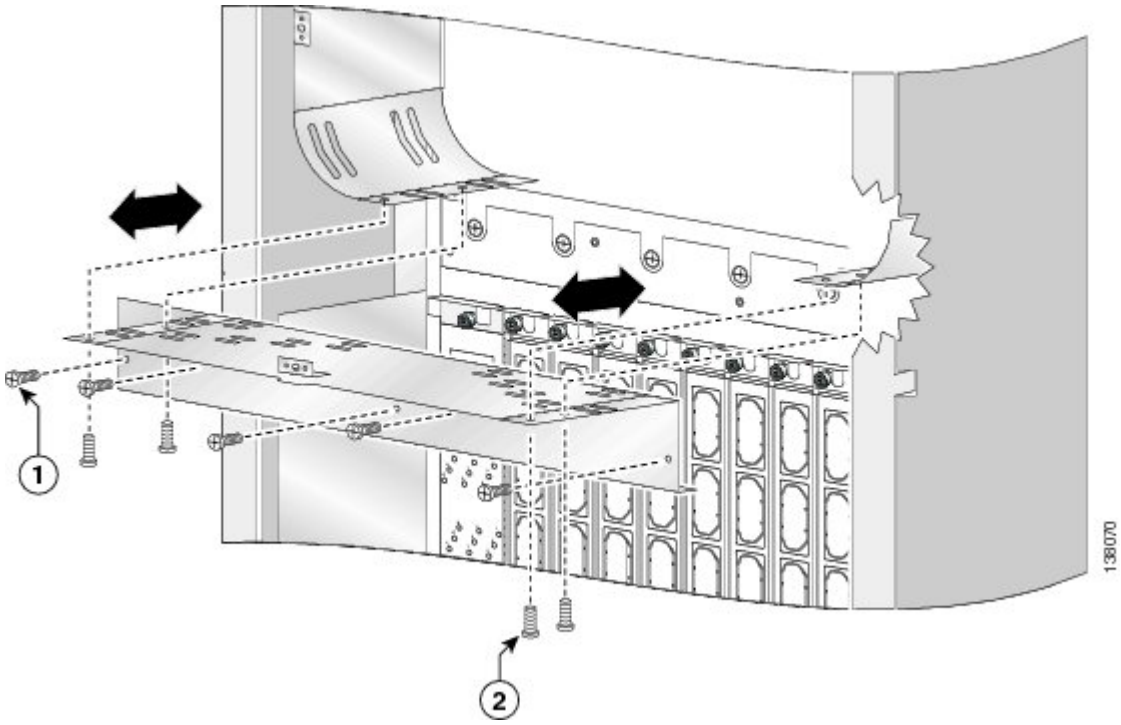
Note We recommend that you use two people to install the troughs, one person to hold the troughs in place while the other person inserts and tightens the screws.

Figure 133: Rear (OIM) Side Vertical Cable Troughs—Fixed Configuration Power Shown



Step 6 Install the mounting screws that attach the upper horizontal cable guide to the chassis. See Figure 134: Installing Rear Upper Horizontal Cable Guide .

Figure 134: Installing Rear Upper Horizontal Cable Guide



1	6 mm long screw attaching cable guide to chassis (quantity= 5)
2	4-mm long screw attaching cable guide to vertical trough (quantity=4)

Note If applicable, replace with new upper horizontal cable guide with additional velcro positions. See the Upgrading the Upper Horizontal Cable Guide for more information.

Step 7 Re-install the mounting screws that attach the lower, middle and upper horizontal cable guides to the vertical cable troughs (left and right sides of chassis).

Installing the Cable Pass-through Accessory Plates

Depending on the size of the installation, and the number and type of cables being used, the body of the chassis may become overcrowded and unable to accommodate all of the required cables. To resolve this, you can install pass-through accessory plates to allow cables be guided outside the vertical trough.

System growth and cable type will determine whether cable pass-through accessory plates are required to be installed.

- If the chassis is part of a multishelf system with vertical cabling, cable pass-through accessory plates are not required to be installed.
- If the chassis is part of a multishelf system with horizontal cabling, cable-pass-through accessory plates are required to be installed.
- If riser cable is installed on the chassis, cable-pass-through accessory plates are required to be installed.

Prerequisites

Before performing this task, you must first ensure that the doors have been removed from the rear (OIM) side of the chassis and that the vertical troughs with cut-out plates have been installed. See the "Removing the Rear Exterior Doors" section on page 5-36 and the Upgrading the Currently Installed Vertical Cable Troughs for more information.

Steps

Note If you do not plan to route existing cables through the cutouts on the vertical cable troughs, then you are only required to perform #task_1052997/_1053046, #task_1052997/_1053059 and #task_1052997/_1057913.

To attach the cable pass-through accessory plates to the vertical troughs, perform the following steps:

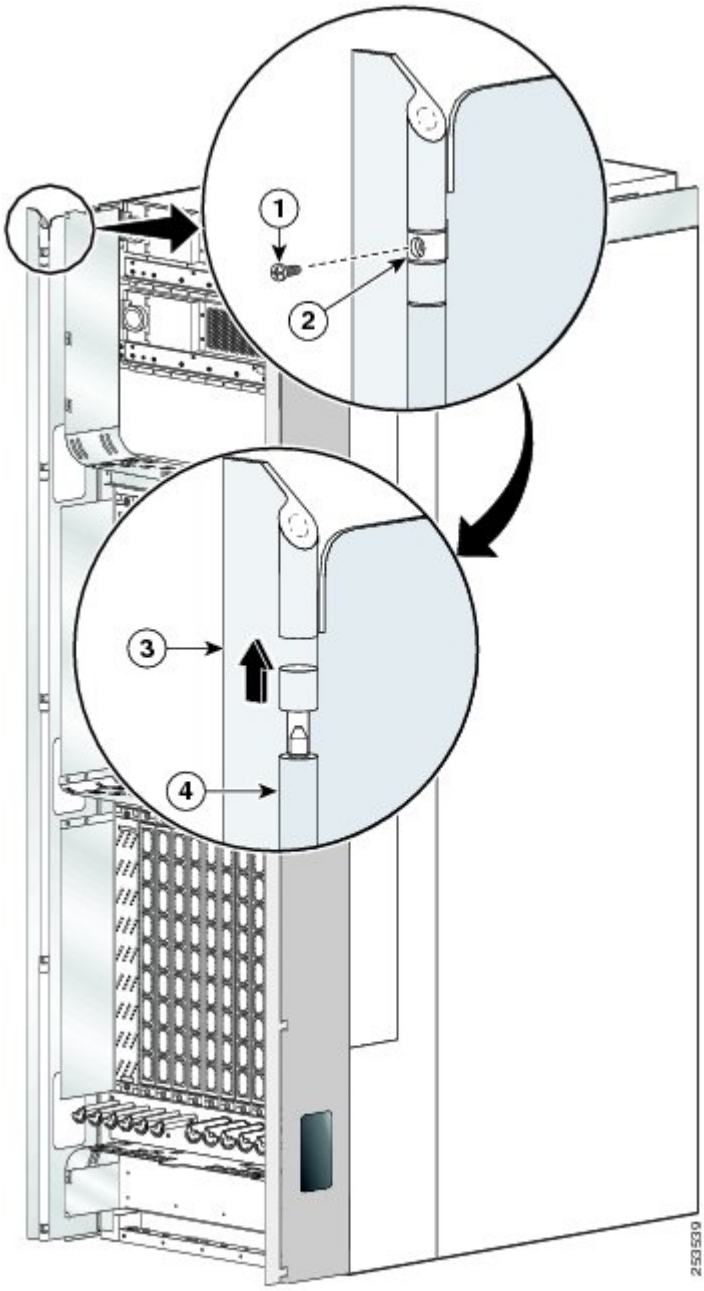
SUMMARY STEPS

1. Remove the hinge keepers and the door hinges from the rear of the chassis (left and right side). SeeFigure 135: Removing Hinge Keeper and Door Hinge. Optional—only required if you are going to route existing cables through the cutouts.
2. Remove the blank plates by unscrewing the four screws on each one. See Figure 136: Removing Blank Plates from Cable Troughs—Fixed Configuration Power Shown.
3. Attach the inner cut-out plates, as shown in Figure 137: Cut-out plate, using the four screws provided. See Figure 138: Inner Cut-out Plate—Fixed Configuration Power Shown.
4. Route the cables through the opening. Reposition cables in the vertical cable trough. Ensure that cables are secured with velcro on upper and middle horizontal cable management brackets.Optional—only required if you are going to route existing cables through the cutouts.
5. Attach the outer cut-out panel using the screws provided. See Figure 139: Outer cut-out plate—Fixed Configuration Power Shown.
6. Re-install the hinge keepers and door hinges. Optional—only required if you are going to route existing cables through the cutouts.
7. Re-install the doors on the rear (OIM) side of the chassis. Optional—only required if you are going to route existing cables through the cutouts.

DETAILED STEPS

Step 1 Remove the hinge keepers and the door hinges from the rear of the chassis (left and right side). See Figure 135: Removing Hinge Keeper and Door Hinge. Optional—only required if you are going to route existing cables through the cutouts.

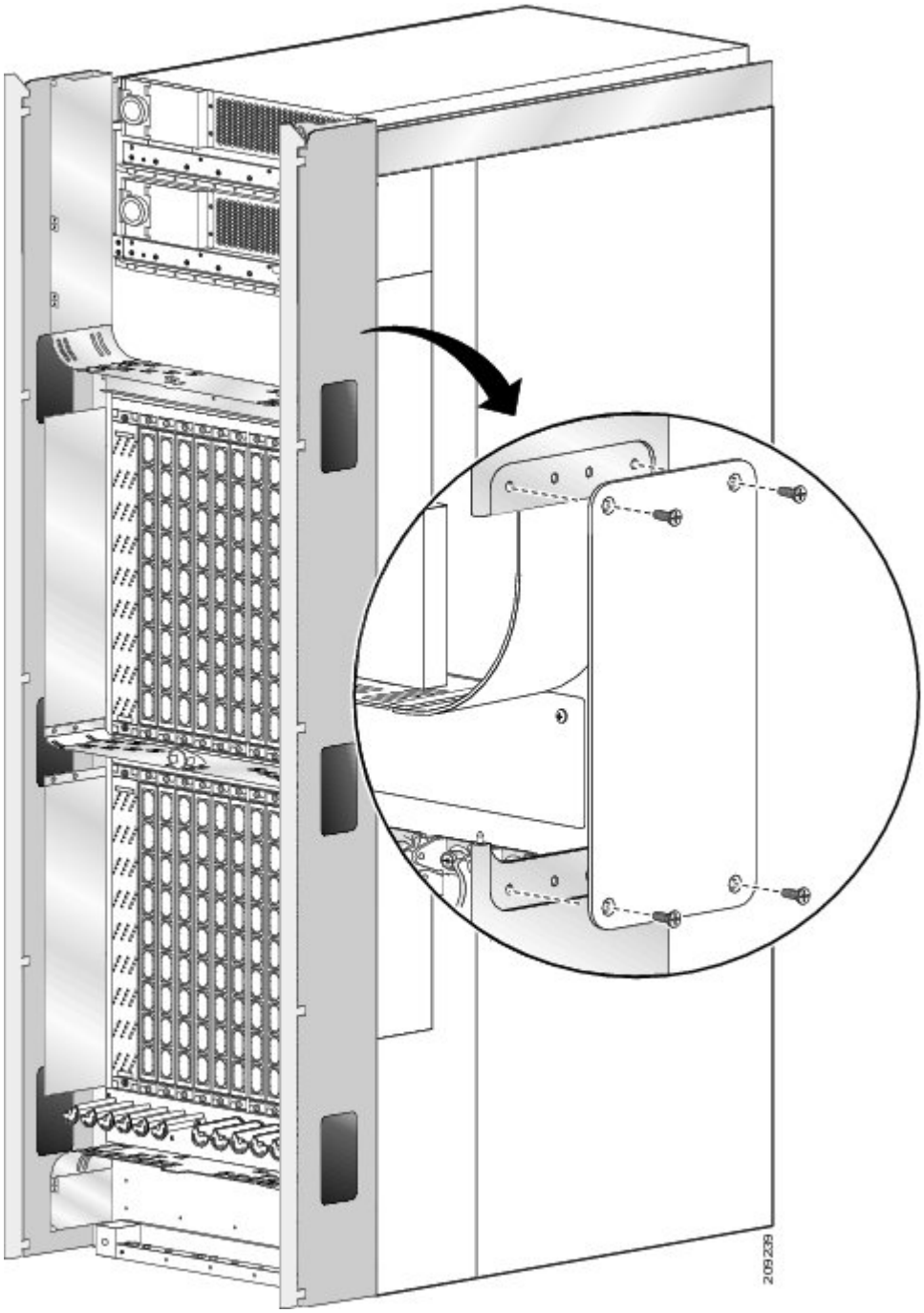
Figure 135: Removing Hinge Keeper and Door Hinge



1	Screw	3	Door hinge
2	Hinge keeper	4	Vertical trough

Step 2 Remove the blank plates by unscrewing the four screws on each one. See Figure 136: Removing Blank Plates from Cable Troughs—Fixed Configuration Power Shown.

Figure 136: Removing Blank Plates from Cable Troughs—Fixed Configuration Power Shown



Step 3 Attach the inner cut-out plates, as shown in Figure 137: Cut-out plate, using the four screws provided. See Figure 138: Inner Cut-out Plate—Fixed Configuration Power Shown.

Figure 137: Cut-out plate

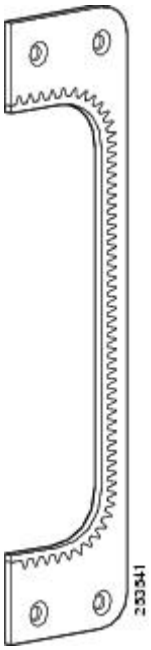
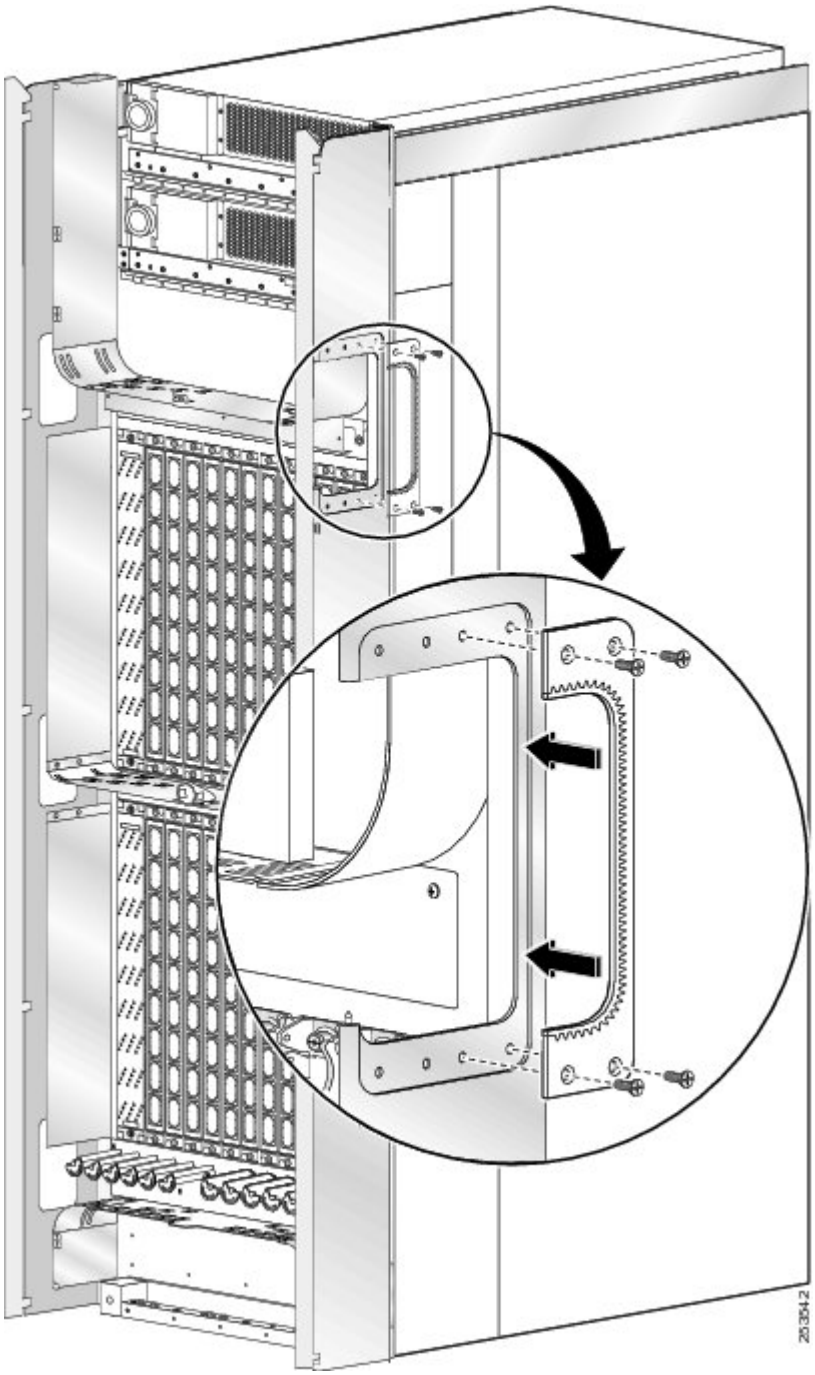


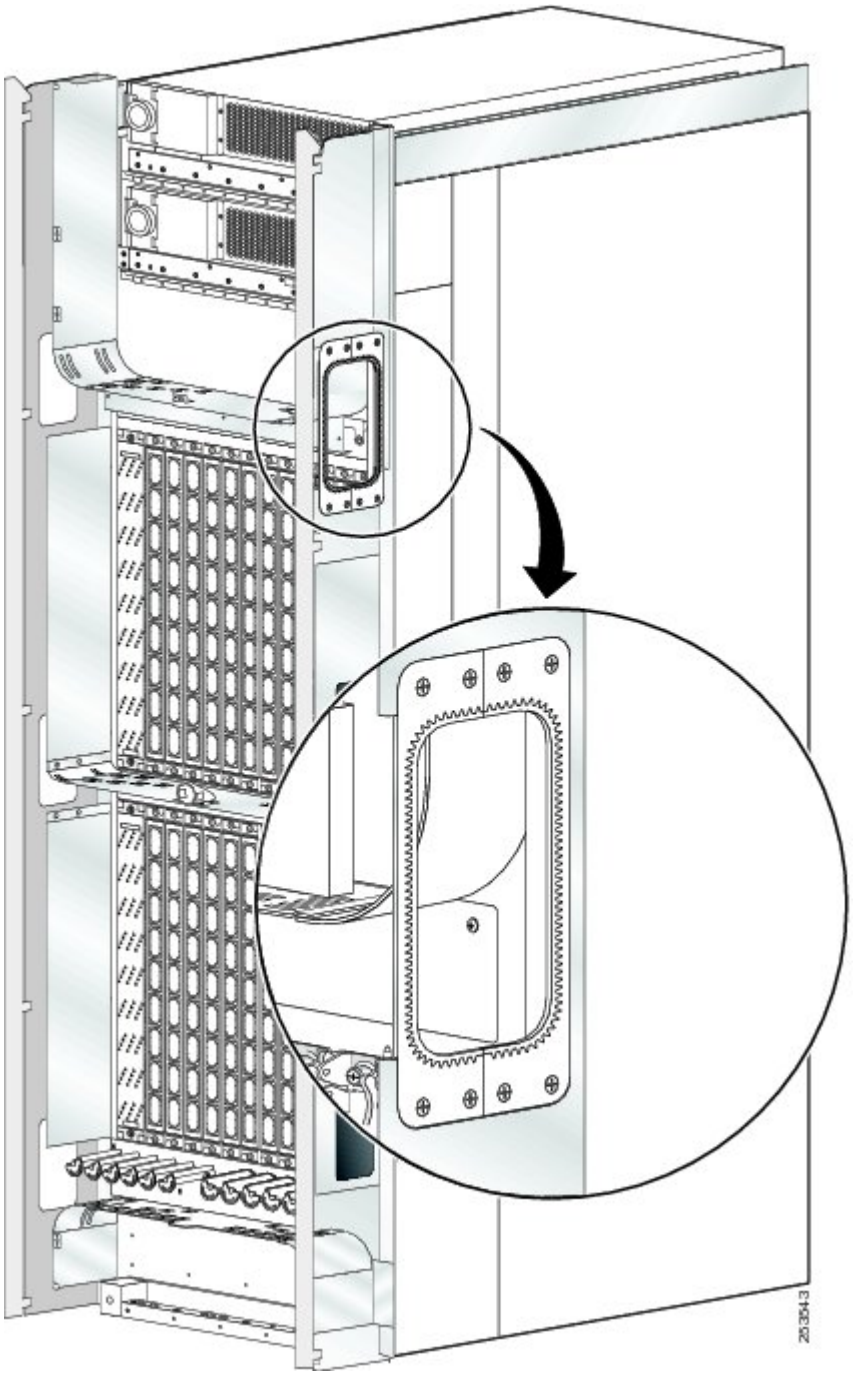
Figure 138: Inner Cut-out Plate—Fixed Configuration Power Shown


253542

Step 4 Route the cables through the opening. Reposition cables in the vertical cable trough. Ensure that cables are secured with velcro on upper and middle horizontal cable management brackets.Optional—only required if you are going to route existing cables through the cutouts.

Step 5 Attach the outer cut-out panel using the screws provided. See Figure 139: Outer cut-out plate—Fixed Configuration Power Shown.

Figure 139: Outer cut-out plate—Fixed Configuration Power Shown



Step 6 Re-install the hinge keepers and door hinges. Optional—only required if you are going to route existing cables through the cutouts.

Step 7 Re-install the doors on the rear (OIM) side of the chassis. Optional—only required if you are going to route existing cables through the cutouts.

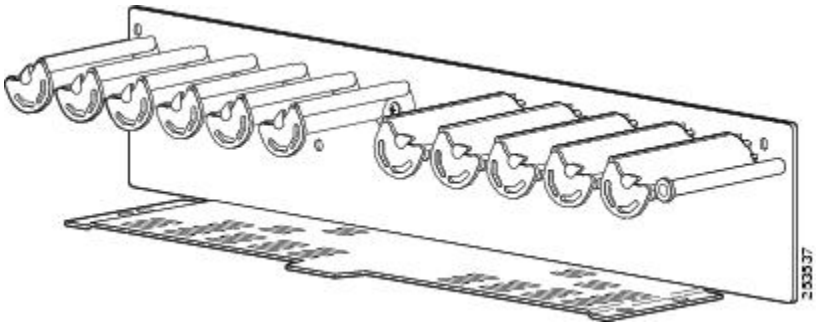
Upgrading the Lower Horizontal Cable Guide

If you are installing the new lower horizontal cable guide as an update to an existing system, the currently installed lower horizontal cable guide must be removed from the chassis before the new lower horizontal cable guide can be installed.

Note The lower horizontal cable guide should be replaced as part of the vertical cable trough replacement procedure described in the Upgrading the Currently Installed Vertical Cable Troughs.

Figure 140: New CRS Fabric Card Chassis Lower Horizontal Cable Guide shows the new lower horizontal cable guide.

Figure 140: New CRS Fabric Card Chassis Lower Horizontal Cable Guide



Required Tools and Equipment

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

- 8-in. long number 1 Phillips screwdriver—magnetic head preferable
- Cable management retrofit kit (Cisco product number: CRS-FCC-CM-RETRO=)

Prerequisites

Before performing this task, you must first open the doors on the rear (OIM) side of the chassis.

Steps

To upgrade the lower horizontal cable guide, perform the following steps:

SUMMARY STEPS

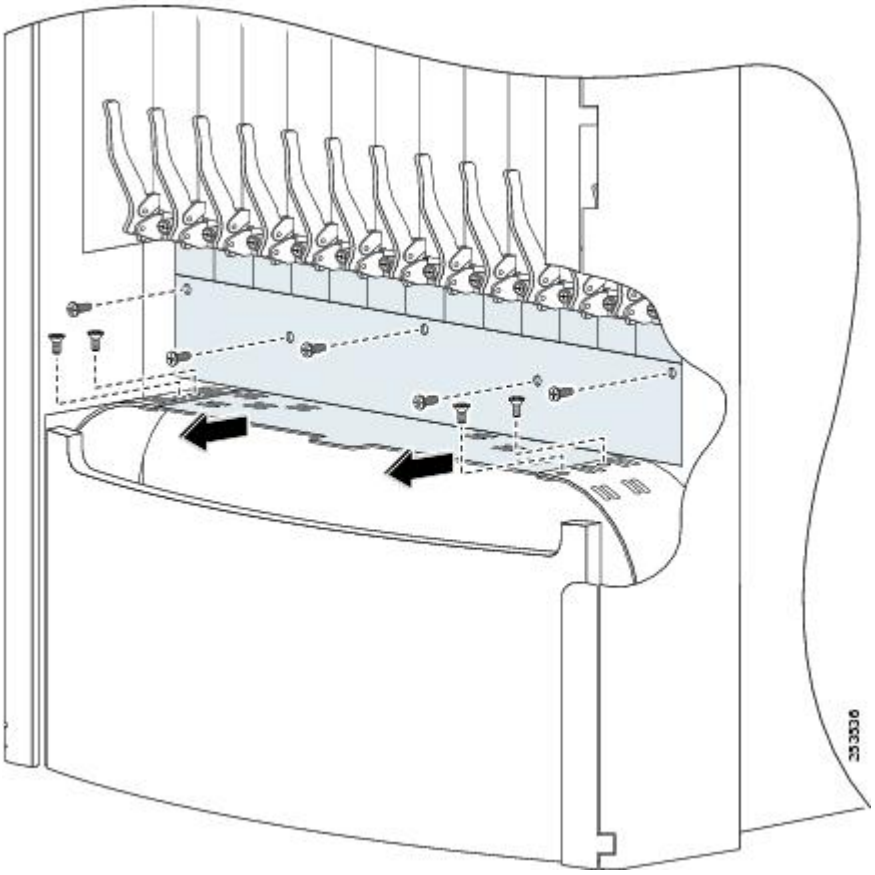
1. Remove the nine screws that attach the horizontal cable guide to the chassis as shown in Figure 141: Removing the Currently Installed Lower Horizontal Cable Guide. Four screws attach the cable guide to the vertical trough flanges, and five screws attach the cable guide to the rear of the chassis.
2. Pull lower horizontal cable guide straight out and set aside. See Figure 141: Removing the Currently Installed Lower Horizontal Cable Guide.
3. Slide the new lower horizontal cable guide into the chassis.
4. Attach the rear lower horizontal cable guide to the chassis by inserting four longer Phillips head screws through the holes in the face of the cable guide and into the chassis and tighten. See Figure 142: Installing the CRS Fabric Card Chassis Lower Fiber Guide.
5. Insert the four short screws (two on each side) that attach the bracket to the vertical cable trough support flange and tighten. See Figure 142: Installing the CRS Fabric Card Chassis Lower Fiber Guide.
6. Close the doors on the rear (OIM) side of the chassis.

DETAILED STEPS

Step 1 Remove the nine screws that attach the horizontal cable guide to the chassis as shown in Figure 141: Removing the Currently Installed Lower Horizontal Cable Guide. Four screws attach the cable guide to the vertical trough flanges, and five screws attach the cable guide to the rear of the chassis.

Step 2 Pull lower horizontal cable guide straight out and set aside. See Figure 141: Removing the Currently Installed Lower Horizontal Cable Guide.

Figure 141: Removing the Currently Installed Lower Horizontal Cable Guide

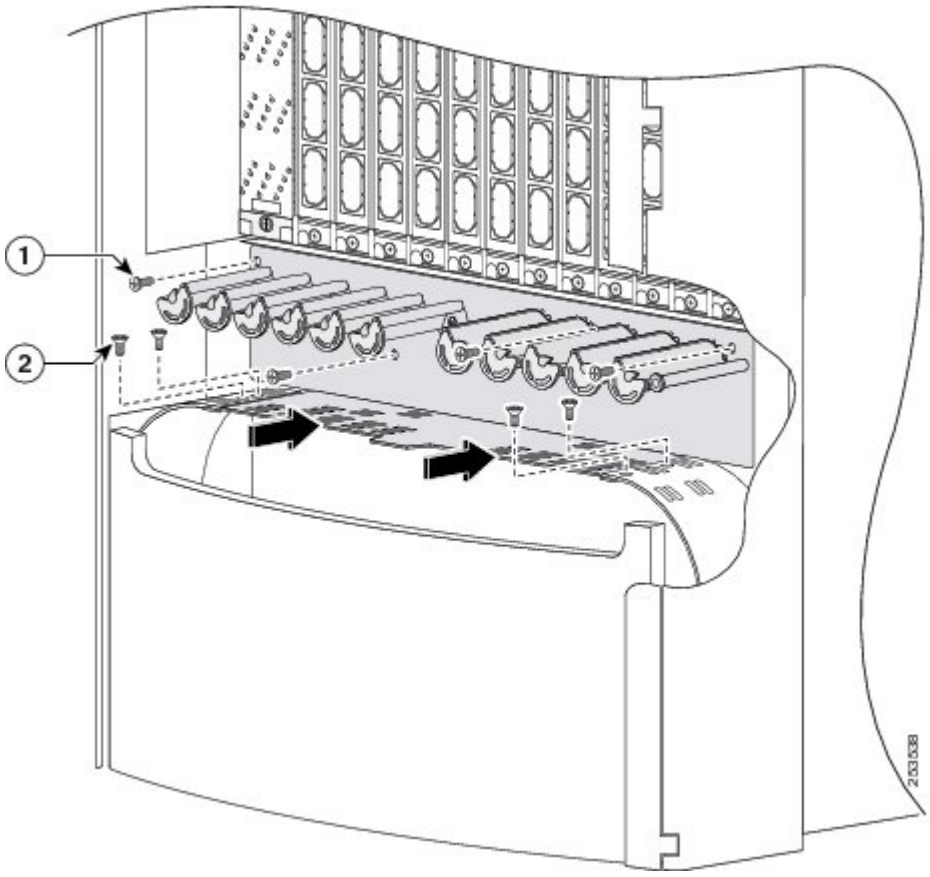


Step 3 Slide the new lower horizontal cable guide into the chassis.

Step 4 Attach the rear lower horizontal cable guide to the chassis by inserting four longer Phillips head screws through the holes in the face of the cable guide and into the chassis and tighten. See Figure 142: Installing the CRS Fabric Card Chassis Lower Fiber Guide.

Step 5 Insert the four short screws (two on each side) that attach the bracket to the vertical cable trough support flange and tighten. See Figure 142: Installing the CRS Fabric Card Chassis Lower Fiber Guide.

Figure 142: Installing the CRS Fabric Card Chassis Lower Fiber Guide



1	6 mm long screw attaching cable guide to chassis (quantity= 5)
2	4-mm long screw attaching cable guide to vertical trough (quantity=4)

Step 6 Close the doors on the rear (OIM) side of the chassis.

Upgrading the Upper Horizontal Cable Guide

If you are installing the new upper horizontal cable guide as an update to an existing system, the currently installed upper horizontal cable guide must be removed from the chassis before the new upper horizontal cable guide can be installed.

Note The upper horizontal cable guide should be replaced as part of the vertical cable trough replacement procedure described in the Upgrading the Currently Installed Vertical Cable Troughs.

Note The new upper horizontal cable guide contains additional slots.

Required Tools and Equipment

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

- 8-in. long number 1 Phillips screwdriver—magnetic head preferable
- Cable management retrofit kit (Cisco product number: CRS-FCC-CM-RETRO=)

Prerequisites

Before performing this task, open the doors on the rear (OIM) side of the chassis, if they haven't already been removed.

Steps

To upgrade the upper horizontal cable guide, perform the following steps:

SUMMARY STEPS

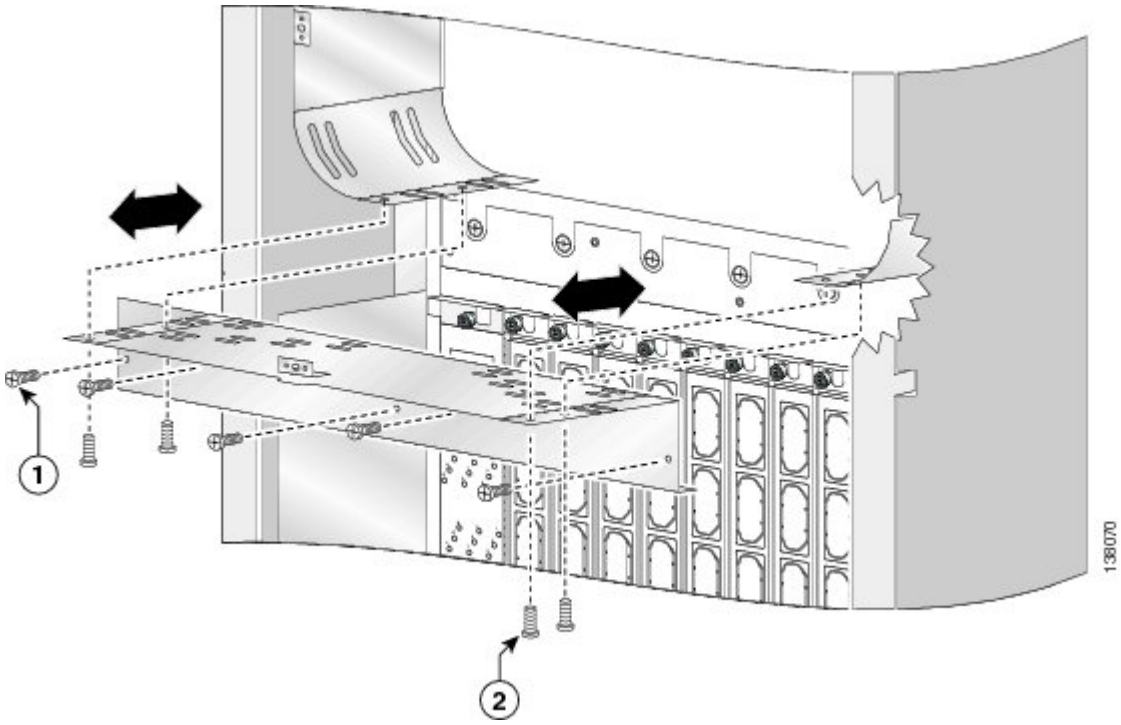
1. Use the screwdriver to remove the four screws (two on each side) that attach the bracket to the vertical cable trough support flange (see Figure 143: Removing the Rear Upper Horizontal Cable Guide), and set them aside.
2. Using the screwdriver, remove the five longer Phillips head screws that attach the face of the bracket to the chassis. Remove the cable guide and carefully set it aside. (see Figure 143: Removing the Rear Upper Horizontal Cable Guide)
3. Attach the new rear upper horizontal cable guide by inserting five longer Phillips screws through the holes in the face of the bracket and into the chassis and tighten.
4. Insert the four short Phillips screws (two on each side) that attach the bracket to the vertical cable trough support flange and tighten.
5. Re-install (if previously removed) and close the doors on the rear (OIM) side of the chassis. See the "Attaching the Rear Exterior Doors" section on page 5-33 .

DETAILED STEPS

Step 1 Use the screwdriver to remove the four screws (two on each side) that attach the bracket to the vertical cable trough support flange (see Figure 143: Removing the Rear Upper Horizontal Cable Guide), and set them aside.

Step 2 Using the screwdriver, remove the five longer Phillips head screws that attach the face of the bracket to the chassis. Remove the cable guide and carefully set it aside. (see Figure 143: Removing the Rear Upper Horizontal Cable Guide)

Figure 143: Removing the Rear Upper Horizontal Cable Guide



1	6 mm long screw attaching cable guide to chassis (quantity= 5)
2	4-mm long screw attaching cable guide to vertical trough (quantity=4)

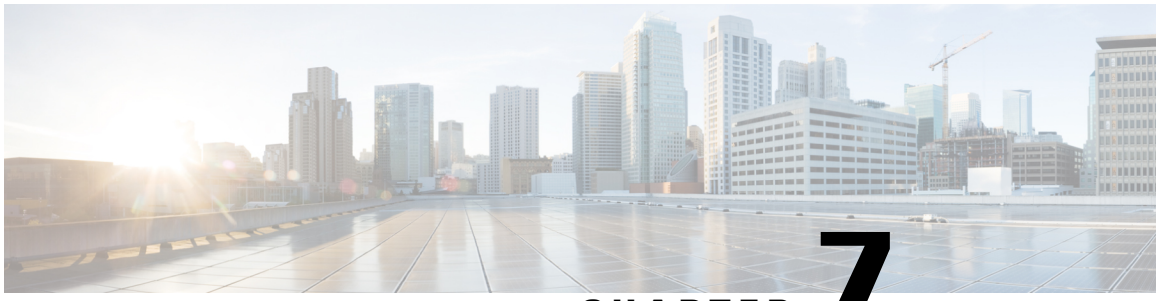
Step 3 Attach the new rear upper horizontal cable guide by inserting five longer Phillips screws through the holes in the face of the bracket and into the chassis and tighten.

Note There are two different lengths of screws used to attach the horizontal cable guides; 4 mm long screws and 6 mm long. Extra screws are provided.

Step 4 Insert the four short Phillips screws (two on each side) that attach the bracket to the vertical cable trough support flange and tighten.

Step 5 Re-install (if previously removed) and close the doors on the rear (OIM) side of the chassis. See the "Attaching the Rear Exterior Doors" section on page 5-33 .

Steps



CHAPTER 7

Cisco CRS-1 Carrier Routing System Fabric Card Chassis Specifications

This appendix contains tables that list the specifications for the main components of the Fabric Card Chassis.

Note For a complete list of cards supported in the Cisco CRS 16-slot line card chassis, go to the Cisco Carrier Routing System Data Sheets at http://www.cisco.com/en/US/products/ps5763/products_data_sheets_list.html .

FCC Specifications

Below table lists the system specifications for the FCC.

Table 7: Fabric Card Chassis System Specifications

Description	Value
Chassis Dimensions	
Height	80 in. (203.2 cm) as shipped84 in. (213.4 cm) as installed
Width	23.6 in. (60.0 cm) 26.1 in. (66.3 cm) with PDU and brackets

Description	Value
Depth	35 in. (89.0 cm) without doors and other cosmetics41 in. (104.1 cm) with front and rear doors
Floor space requirement	Chassis: 6 sq ft (0.56 sq m) Aisle spacing to install chassis (front): 48 in. (122 cm) Aisle spacing to service FRUs (front): 36 in. (91 cm) Aisle spacing to service FRUs (rear): 36 in. (91 cm)
Chassis Weight	
Chassis shipping weight	1175 lb (532 kg) FCC with shipping crate and pallet
Chassis with power shelves only, no power modules	849 lb (385 kg)
Chassis with power shelves, power modules, alarm module	970 lb (440 kg)
Chassis, fully loaded with cards, without cosmetics	1585 lb (719 kg)
Chassis, fully loaded with cards and cosmetics (doors, panels, grilles, and so on)	1629 lb (739 kg)
Chassis, fully loaded with cards and cosmetics (doors, panels, grilles, and so on), AC Wye PDU, and brackets	1689 lb (766 kg)
Chassis, fully loaded with cards and cosmetics (doors, panels, grilles, and so on), AC Delta PDU, and brackets	1715 lb (778 kg)
Floor Loading	
Chassis footprint	6.72 sq. ft (6243 sq. cm), with cosmetics and doors
Floor contact area	4.72 sq. ft (4385 sq. cm)
Maximum floor loading	Without cosmetics and doors: 1585 lb/4.72 sq. ft = 335 lb/sq. ft719 kg/4385 sq. cm = 0.164 kg/sq. cm With cosmetics and doors: 1695 lb/4.72 sq. ft = 359 lb/sq. ft769 kg/4385 sq. cm = 0.175 kg/sq. cm

Description	Value
Supported Cards and Modules	8 or 24 Switch fabric cards (SFCs) 8 or 24 Optical Interface Modules (OIMs) 2 Integrated Shelf Controller Gigabit Ethernet (SCGE)
Chassis Cooling	2 fan trays, push-pull configuration
Chassis airflow	Up to 2050 cubic ft (58,050 liters) per minute
Power shelf airflow	100 to 140 cubic ft (2832 to 3964 liters) per minute
AC power cord length	167 in. (4.25 m)

Fixed Configuration Power Specifications

Below table lists the fixed configuration power specifications for the Cisco Carrier Routing System FCC.

Table 8: Fabric Card Chassis Fixed Configuration Power Specifications

Description	Value
Power shelves	2 AC or 2 DC power shelves (Cannot mix AC and DC power shelves.)
DC power shelf	4 power entry modules (PEMs) per shelf
AC power shelf	6 PEMs per shelf
Maximum Input Power	
Fixed configuration DC, chassis fully loaded	9474 W (9.5 kW) 95% efficiency
Fixed configuration AC, chassis fully loaded	11,063 W (11.1 kW) 88% efficiency
Maximum Output Power	
Chassis fully loaded (DC)	9000 W (9.0 kW)
Chassis fully loaded (AC)	10,00 W (10.0 kW)
Power Redundancy (2N)	
DC	2N: Requires 4 “A” battery plant feeds and 4 “B” battery plant feeds (up to 8 total)
AC, 3-phase	2N: Requires two independent 3-phase AC sources

Description	Value
DC Input	
Nominal input voltage	–48 VDC North America–60 VDC European CommunityRange: –42 VDC to –75 VDC
Input current	49 A max at –48 VDC 39 A max at –60 VDC 56 A maximum at –42 VDC (low voltage extreme)
AC Input, Delta 3-phase	3W + PE (3 wire + protective earthing[1])
Nominal input voltage	3-phase 200 to 240 VAC, phase-to-phase (range 180 to 264 VAC, phase-to-phase)
Nominal line frequency	50 or 60 Hz (range 47 to 63 Hz)
Recommended AC service	60 A
AC Input, Wye 3-phase	3W + N + PE (3 wire + neutral + protective earthing1)
Nominal input voltage	3-phase 200-240/346-415 VAC(range 180 to 264 VAC, phase-to-neutral)(range 311 to 456 VAC, phase-to-phase)
Nominal line frequency	50 or 60 Hz (range 47 to 63 Hz)
Recommended AC service	40 A (North America)32 A (International)

1 Protective earthing conductor (ground wire).

Modular Configuration Power Specifications

Below table lists the modular configuration power specifications for the Cisco Carrier Routing System FCC.

Table 9: Fabric Card Chassis Modular Configuration Power Specifications

Description	Value
Power shelves	2 AC or 2 DC power shelves (Cannot mix AC and DC power shelves.)
DC power shelf	Supports up to 6 DC power modules (PMs) 4 PMs are shipped per shelf (although the shelf appears to accommodate 8, two are blank slots that cannot be used)

AC power shelf	Supports up to 6 DC power modules (PMs) 3 PMs are shipped per shelf
Maximum Input Power	
Modular configuration, DC, chassis fully loaded	11,111 watts (11.1 kW) 90% efficiency
Modular configuration, AC, chassis fully loaded	10,870 watts (10.9 kW) 92% efficiency
Maximum Output Power	
Chassis fully loaded (DC)	9000 W (9.0 kW)
Chassis fully loaded (AC)	10,00 W (10.0 kW)
Power Redundancy (2N)	
DC	2N: up to 6 “A” battery plant feeds and up to 6 “B” battery plant feeds required
AC	2N: up to 6 “A” AC single-phase power sources and up to 6 “B” AC single-phase power sources required
DC Input	
Nominal input voltage	–48 VDC North America–60 VDC European CommunityRange: –40 VDC to –72 VDC
Input current	36 A max at –48 VDC 31 A max at –60 VDC 50 A at –40 VDC (maximum)
AC input	Single-phase
Nominal input voltage	200 to 240 VAC (range 180 to 264 VAC)
Nominal line frequency	50 or 60 Hz (range 47 to 63 Hz)
Recommended AC service	20 A (North America) dedicated branch circuit16 A (International) dedicated branch circuit

Fabric Card Chassis Environmental Specifications

The following table lists the environmental specifications for the fabric chassis.

Table 10: Fabric Card Chassis 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)[2] Nonoperating: –40° to 158°F (–40° to 70°C)
Humidity	Operating: 5 to 85% noncondensing Nonoperating: 5 to 90% noncondensing, short-term operation
Altitude-	-197 to 5906 ft (–60 to 1800 m) at 122°F (50°C), short-term Up to 13,123 ft (4000 m) at 104°F (40°C) or below
Heat dissipation	32,324 BTU per hour—(maximum) fixed configuration DC[3] 38,773 BTU per hour—(maximum) fixed configuration AC[4] 37,911 BTU per hour—(maximum) modular configuration DC[5] 37,086 BTU per hour—(maximum) modular configuration AC[6]
Air exhaust temperature	129°F (54°C)—At room temperatures of 95 to 102°F (35 to 39°C) 149°F (65°C)—Maximum exhaust temperature on a fully loaded system during worst-case operating conditions (50°C and 6000 ft altitude) **Note** Air temperature rise is 15°C on a fully loaded system with fans running at maximum speed (5150 RPM). At room temperatures below 95°F (35°C), exhausted air is 66.2°F (19°C) higher than room temperature. At temperatures above 102°F (39°C), exhausted air is 59°F (15°C) higher than room temperature.
Air velocity (at exhaust)	1400 ft per minute (426.7 m per minute) at normal, room temperature, low fan speed (4000 RPM) 1800 ft per minute (548.6 m per minute) at high temperature or altitude, high fan speed (5150 RPM) **Note** Software controls the speed of the fans based on measurements from the chassis thermal sensors.

Description	Value
Sound power level (fixed configuration power)	Fan speed 3500 RPM, temperature 80°F (27°C): 78.2 dB—fixed configuration DC 83.0 dB—fixed configuration AC Fan speed 5150 RPM, temperature 104°F (40°C): 87.4 dB—fixed configuration DC 88 dB—fixed configuration AC
Sound power level (modular configuration power)	Fan speed 3500 RPM, temperature 80°F (27°C): 77.3 dB—modular configuration power Fan speed 5150 RPM, temperature 104°F (40°C): 87.0 dB—modular configuration power
Shock and vibration	Designed and tested to meet the NEBS shock and vibration standards defined in GR-63-CORE (Issue 2, April 2002).

2 Short-term refers to a period of not more than 96 consecutive hours and a total of not more than 15 days in 1 year. This refers to a total of 360 hours in any given year, but no more than 15 occurrences during that 1-year period.

3 Heat dissipation from the fixed configuration DC power system based on maximum output power capacity at 95% efficiency.

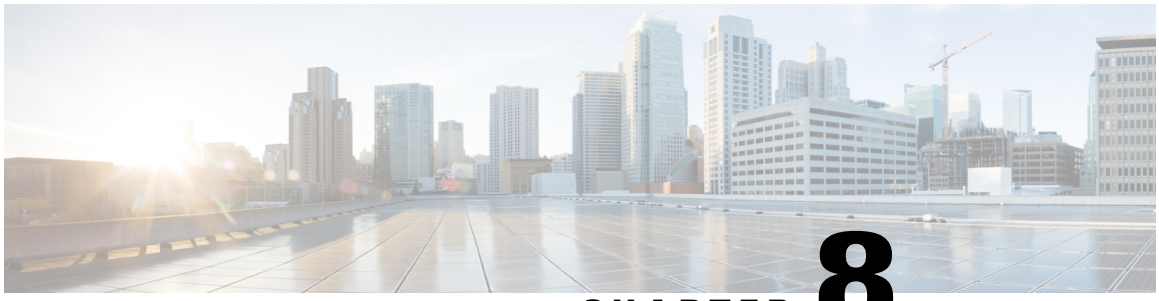
4 Heat dissipation from the fixed configuration AC power system based on maximum output power capacity at 88% efficiency.

5 Heat dissipation from the modular configuration DC power system based on maximum output power capacity at 90% efficiency.

6 Heat dissipation from the modular configuration AC power system based on maximum output power capacity at 92% efficiency. Depending on the hardware deployed at your site, your system may not consume or be capable of consuming the maximum power supplied by the power system.

Regulatory, Compliance, and Safety Specifications

For information about the regulatory, compliance, and safety standards to which the Cisco CRS-1 system conforms, see *Regulatory Compliance and Safety Information for the Cisco CRS Carrier Routing System* .



CHAPTER 8

Product IDs

This appendix provides information about the product structure and product IDs. It contains the following tables:

These tables list system components, their product IDs (the part numbers to use to order the component), and descriptions.

Note In the following tables, an equals sign (=) at the end of the product ID indicates that the component can be ordered as a spare. For those components, be sure to include the equals sign as part of the product ID.

Note Although this appendix provides product IDs for routing system components, the Cisco online ordering and pricing tool has the most up-to-date information on the routing system and product IDs: http://www.cisco.com. CCO login is required. Enter a search term such as "CRS" to view a list of components.

Chassis Product IDs

Table Multishelf System Product IDs lists the high-level product IDs.

Table Cisco CRS Fabric Card Chassis Product IDs lists the PIDs for the fabric card chassis and its components.

Table 11: Multishelf System Product IDs

Component	Product ID	Description
Multishelf System Components		
CRS multishelf system	CRS-MC-FC24	Cisco CRS Multishelf System

Table 12: Cisco CRS Fabric Card Chassis Product IDs

Component	Product ID	Description
Fabric card chassis (complete)	CRS-FC24(=)	Cisco CRS FCC for a multishelf system(without switch fabric cards)
Fabric card chassis (chassis only)	CRS-FCC(=)	Cisco CRS-1 FCC (spare chassis)
Fan tray with fans	CRS-FCC-FAN-TR(=)	Cisco CRS FCC fan tray with fans (spare)(2 required for each chassis)
Cards and modules		
Switch fabric card (fabric chassis)	CRS-FCC-SFC(=) CRS-FCC-SFC-140(=) CRS-FCC-SFC-400(=) CRS-FCC-SFC-400-B	S2 switch fabric cards for 40G CRS-1 system S2 switch fabric cards for 140G CRS-3 system S2 switch fabric cards for CRS-X 400G system(8 required for each fabric chassis) Version B of S2 switch fabric for CRS-X systems
Switch fabric card blank	CRS-SFC-IMPEDANCE(=)	Blank card carrier for each switch fabric slot (used for shipment; must be replaced with fabric card)
22-port shelf controller card	CRS-FCC-SC-22GE(=) CRS-FCC-SC-22GE-B(=)	22-port shelf controller Gigabit Ethernet (22-port SCGE) card for 40G CRS-1 system and 140G CRS-3 system 22-port shelf controller Gigabit Ethernet (22-port SCGE) card for140G CRS-3 system and 400G CRS-X system (2 recommended for each fabric chassis)
OIM, single-width	CRS-FCC-OIM-1S(=)	Optical interconnect module (OIM)(1 required for each S2 fabric card in fabric chassis)
OIM blank	CRS-OIM-IMPEDANCE(=)	Blank carrier for each empty OIM slot
SFC and OIM eight pack bundle	CRS-FC24-SFC-8P(=)	Eight pack of S2 switch fabric cards and optional interconnect modules
FM-LED	CRS-FCC-LED(=)	Fiber module LED card (2 required for each fabric chassis)

Component	Product ID	Description
FM-LED blank	CRS-FM-IMPEDANCE(=)	Blank carrier for each empty FM-LED slot(required for EMI compliance and cooling)
Fixed Configuration Power		
AC Delta power system	CRS-FCC-ACD-KIT(=)	AC Delta power system for fabric chassis(includes 2 power shelves and 6 AC rectifiers)
AC Wye power system	CRS-FCC-ACW-KIT(=)	AC Wye power system for fabric chassis(includes 2 power shelves and 6 AC rectifiers)
DC power system	CRS-FCC-DC-KIT(=)	DC power system for fabric chassis(includes 2 power shelves and 4 power modules)
AC power rectifier	CRS-16-AC-RECT(=)	AC power rectifier for line card chassis(6 required for each chassis; 3 required for each AC power shelf)
DC PEM	CRS-16-DC-PEM(=)	AC power entry module for line card chassis(6 required for each chassis; 3 required for each DC power shelf)
Alarm module	CRS-16-ALARM(=)	Chassis alarm module(1 required for each power shelf)
Modular Configuration Power		
AC power system	CRS-FCC-ACKIT-M(=)	AC power system for fabric chassis(includes 2 power shelves and 6 AC PMs)
DC power system	CRS-FCC-DCKIT-M(=)	DC power system for fabric chassis(includes 2 power shelves and 8 DC PMs)
Alarm module	CRS-16-ALARM-C(=)	Chassis alarm module(1 required for each power shelf)

Component	Product ID	Description
AC power cord	CRS-AC-CAB-NA CRS-AC-CAB-AU CRS-AC-CAB-UK CRS-AC-CAB-EU CRS-AC-CAB-IT	AC power cord—North America AC power cord—Australia AC power cord—United Kingdom AC power cord—Europe AC power cord—Italy **Note** Length of each power cord is 4.25 m.
Cable management and cosmetics		
Front cosmetics	CRS-FCC-FRNT-CM(=)	Front cosmetics and cable management kit (front door not included)
Rear cosmetics	CRS-FCC-REAR-CM(=)	Rear cosmetics and cable management kit(rear door not included)
Front door	CRS-FCC-DRS-FR(=)	Front door for fabric chassis
Rear door	CRS-FCC-DRS-RR(=)	Rear door for fabric chassis
AC power grille	CRS-FCC-ACGRILLE(=)	Front grille for fixed configuration AC power shelves
DC power grille	CRS-FCC-DCGRILLE(=)	Front grille for fixed configuration DC power shelves
Modular power grille	CRS-16-PW-GRILL(=)	Front grille for modular configuration AC and DC power shelves
Chassis installation accessories (included with chassis)		
Drill hole template	CRS-LCC-DRILLTEMP(=)	Aluminum template showing where to drill the mounting holes to secure the chassis to the floor
Chassis access template	CRS-LCC-FLOORTEMP (=)	Mylar template showing chassis door swings and maintenance access area
Inrigger kit	CRS-FCC-ALTMNT(=)	Alternate mounting kit for anchoring chassis to floor

Below table lists the PIDs for the Cisco CRS 16-slot line card chassis and its components.

Table 13: Cisco CRS 16-Slot Line Card Chassis Product IDs

Component	Product ID	Description
Line card chassis(complete)	CRS-16-LCC/M CRS-16LCC140/M CRS-16/S	Cisco CRS-1 40G LCC(with 2 route processors [RPs], S13 fabric cards, and optical array cables) Cisco CRS-3 140G LCC(with 2 route processors [RPs], S13 fabric cards, and optical array cables) Cisco CRS LCC(with 2 route processors [RPs] and S123 fabric cards)
Conversion Kit	CRS-16-MC-CONVCRS-16-MC140-CONV	Cisco CRS Multichassis conversion kit that converts a standalone Cisco CRS 16-Slot LCC into a Cisco CRS-1 Multichassis LCCCisco CRS Multichassis conversion kit that converts a standalone Cisco CRS 16-Slot LCC into a Cisco CRS-3 Multichassis LCC
Switch fabric card(single shelf system)	CRS-16-FC/S CRS-16-FC140/S	S123 switch fabric cards for CRS-1 40G system(8 required for each line card chassis) S123 switch fabric cards for CRS-3 140G system(8 required for each line card chassis)
Switch fabric card(multi shelf system	CRS-16-FC/M CRS-16-FC140/M CRS-16-FC400/M	S13 switch fabric cards for CRS-1 40G system(8 required for each line card chassis; replace existing fabric cards in the chassis) S13 switch fabric cards for CRS-3 140G system(8 required for each line card chassis; replace existing fabric cards in the chassis) S13 switch fabric cards for CRS-X 400G system(8 required for each line card chassis; replace existing fabric cards in the chassis)
Switch fabric cards		

Component	Product ID	Description
Switch fabric card (single-shelf system)	CRS-16-FC/S(=) CRS-16-FC140/S(=) CRS-16-FC400/S(=)	S123 switch fabric cards for CRS-140G system S123 switch fabric cards for CRS-3 140G system S123 switch fabric cards for CRS-X 400G system (8 required for each line card chassis)
Switch fabric card (multi-shelf system)	CRS-16-FC/M(=) CRS-16-FC140/M(=) CRS-16-FC400/M(=)	S13 switch fabric cards for CRS-1 40G system S13 switch fabric cards for CRS-3 140G system S13 switch fabric cards for CRS-X 400G system (8 required for each line card chassis)
Route processors		
Route processor	CRS-16-RP(=)	Route processor(2 required for each line card chassis)
Performance route processor (PRP)	CRS-16-PRP-6G= CRS-16-PRP-12G=	Performance route processor (6GB memory) Performance route processor (12GB memory) (2 PRPs required for each line card chassis)
Distributed route processor (DRP)	CRS-DRP(=)	Additional route processor for the system (optional) (includes two cards, DRP CPU and DRP PLIM)
	To order DRP cards separately, use the following IDs (both cards are required for DRP operation):	
	• CRS-DRP-B-CPU(=)	DRP card only (requires DRP PLIM)
	• CRS-DRP-B-PLIM(=)	DRP PLIM only (requires DRP CPU)
Fixed Configuration Power		
AC Delta power shelf	CRS-16-LCC-PS-ACD(=)	AC Delta power shelf for line card chassis (2 required for each chassis)

Component	Product ID	Description
AC Wye power shelf	CRS-16-LCC-PS-ACW(=)	AC Wye power shelf for line card chassis (2 required for each chassis)
DC power shelf	CRS-16-LCC-PS(=)	DC power shelf for line card chassis (2 required for each chassis)
AC power rectifier	CRS-16-AC-RECT(=)	AC power rectifier for line card chassis(6 required for each chassis; 3 required for each AC power shelf)
DC PEM	CRS-16-DC-PEM(=)	AC power entry module for line card chassis(6 required for each chassis; 3 required for each DC power shelf)
Alarm module	CRS-16-ALARM(=)	Chassis alarm module(2 required for each chassis; 1 required for each power shelf)
Modular Configuration Power		
AC power system	CRS-16-ACKIT-M(=)	AC power system for fabric chassis(includes 2 power shelves and 10 AC PMs)
DC power system	CRS-16-DCKIT-M(=)	DC power system for fabric chassis(includes 2 power shelves and 12 DC PMs)
AC power module	CRS-PM-AC	Modular AC power module (Up to 6 required for each power shelf)
DC power module	CRS-PM-DC	Modular DC power module (Up to 8 required for each power shelf)
Alarm module	CRS-16-ALARM-C(=)	Modular power alarm module(1 required for each power shelf)
AC power cord	CRS-AC-CAB-NA CRS-AC-CAB-AU CRS-AC-CAB-UK CRS-AC-CAB-EU CRS-AC-CAB-IT	AC power cord—North America AC power cord—Australia AC power cord—United Kingdom AC power cord—Europe AC power cord—Italy **Note** Length of each power cord is 4.25 m.
Cable management and cosmetics		
Front cosmetics	CRS-16-LCC-FRNT(=)	Front cosmetics and cable management kit

Component	Product ID	Description
Rear cosmetics	CRS-16-LCC-BCK-CM(=)	Rear cosmetics and cable management kit
Front door	CRS-16-LCC-DRS-FR(=)	Front doors
Rear door	CRS-16-LCC-DRS-RR(=)	Rear doors
AC power grille	CRS-16-ACGRILLE(=)	Front grille for fixed configuration AC power shelves
DC power grille	CRS-16-DCGRILLE(=)	Front grille for fixed configuration DC power shelves
Modular power grille	CRS-16-PW-GRILL(=)	Front grille for modular configuration AC and DC power shelves
Chassis installation accessories (included with chassis)		
Drill hole template	CRS-LCC-DRILLTEMP(=)	Aluminum template showing where to drill the mounting holes to secure the chassis to the floor
Chassis access template	CRS-LCC-FLOORTEMP (=)	Mylar template showing chassis door swings and maintenance access area
Chassis floor mounting kit	CRS-16-LCC-ALTMNT(=)	Alternate mounting kit for anchoring chassis to floor
For detailed specifications for Cisco CRS-1 PLIMs, RPs and other components refer to the data sheet on: http://www.cisco.com/en/US/partner/products/ps5763/products_data_sheets_list.html . CCO login is required.		
For additional information on Cisco CRS-1 SPA interface processor (SIP) and shared port adapters (SPAs), see *Cisco CRS SIP and SPA Hardware Installation Guide* .		

Fabric Cables

Table 14: Fabric Cables for the Cisco CRS-1 Multishelf System, on page 277 lists the product ID numbers for Cisco CRS fabric cables. These cables, which are available in different lengths, connect the S13 fabric cards (in the line card chassis) to the S2 fabric cards (in the fabric chassis). Be sure to order enough cables for your system. The interconnection cables listed are shipped as a set of 24 in the meter length specified.

In Table 14: Fabric Cables for the Cisco CRS-1 Multishelf System, on page 277, the cable name *LCC/M-FC-FBR-XX* means the following:

- *LCC/M* is "Line Card Chassis/Multishelf System."
- *FC* is Fabric (Card) Chassis.
- *FBR* is Fiber.
- *xx* is the length of the cable in meters.

Note = symbol at the end of a product ID number indicates that the part is a *spare* , which means the part can be ordered.

Note R = symbol at the end of a product ID number indicates that the part is a riser-rated fiber cable.

Table 14: Fabric Cables for the Cisco CRS-1 Multishelf System

Fabric Cable Product ID	Description and Length
LCC/M-FC-FBR-10=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 10 meters (32.8 feet)
LCC/M-FC-FBR-15=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 15 meters (49.2 feet)
LCC/M-FC-FBR-20=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 20 meters (65.6 feet)
LCC/M-FC-FBR-25=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 25 meters (82 feet)
LCC/M-FC-FBR-30=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 30 meters (98.43)
LCC/M-FC-FBR-40=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 40 meters (131.2 feet)
LCC/M-FC-FBR-50=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 50 meters (164 feet)
LCC/M-FC-FBR-60=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 60 meters (197 feet)
LCC/M-FC-FBR-70=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 70 meters (229.7)
LCC/M-FC-FBR-80=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 80 meters (262.5 feet)

Fabric Cable Product ID	Description and Length
LCC/M-FC-FBR-90=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 90 meters (295.3feet)
LCC/M-FC-FBR-100=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 100 meters (328 feet)
LCC/M-FC-FBR-10R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 10 meters (32.8 feet)
LCC/M-FC-FBR-15R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 15 meters (49.2 feet)
LCC/M-FC-FBR-20R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 20 meters (65.6)
LCC/M-FC-FBR-25R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 25 meters (82 feet)
LCC/M-FC-FBR-30R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 30 meters (98.43 feet)
LCC/M-FC-FBR-40R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 40 meters (131.2 feet)
LCC/M-FC-FBR-50R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 50 meters (164 feet)
LCC/M-FC-FBR-60R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 60 meters (197 feet)
LCC/M-FC-FBR-70R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 70 meters (229.7)
LCC/M-FC-FBR-80R=	Cisco CRS Line Card Chassis-Fabric Chassis Rise-rated r 80 meters (262.5 feet)
LCC/M-FC-FBR-90R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 90 meters (295.3feet)
LCC/M-FC-FBR-100R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 100 meters (328 feet)

Note The Cisco CRS fiber-optic cleaning kit (CRS-FIBER-CLN-KIT=) includes a cleaning tool that advances a continuous roll of lint-free cleaning cloth across the face of the optic. For more information, see the *Cisco CRS-1 Carrier Routing System Fiber-Optic Cleaning Guide* .